STOCK ASSESSMENTS FOR 2013-2014 GROUNDFISH FISHERIES

The Pacific Fishery Management Council (Council) process for setting groundfish harvest levels and other specifications depends on periodic assessments of the status of groundfish stocks and a report from an established assessment review body or, in the Council parlance, a Stock Assessment Review (STAR) Panel. The Scientific and Statistical Committee (SSC) reviews this information and makes a recommendation relative to the standards of 1) the best available science, and 2) soundness for use in groundfish fishery management decision-making by the Council. Some assessments do not get fully resolved in the STAR process and are then recommended for further review by the SSC Groundfish Subcommittee at the "mop-up" review panel meeting. Rebuilding analyses that use the results of new assessments of overfished species to predict stock biomass rebuilding under alternative rebuilding strategies are also reviewed at the "mop-up" panel. The Council then approves any new assessments and rebuilding analyses recommended by the SSC. Results of these analyses are used to set groundfish harvest levels and other specifications for the following biennial management period.

Stock assessments for three species (i.e., bocaccio, darkblotched rockfish, and widow rockfish) were reviewed at the September "mop-up" panel meeting in September. The Executive Summaries of these three assessments and the SSC Groundfish Subcommittee report with the "mop-up" panel recommendations are provided as Agenda Item E.1.a, Attachments 1-4, respectively. New rebuilding analyses for bocaccio, canary rockfish, darkblotched rockfish, Pacific ocean perch, petrale sole, and yelloweye rockfish were also reviewed at the "mop-up" panel and are provided as Agenda Item E.1.a, Attachments 5-10, respectively. The SSC will formally review these assessments, rebuilding analyses, and the SSC Groundfish Subcommittee report (Attachment 4) before making their recommendations on the rebuilding progress and the use of these analyses for making management decisions. **All the assessments in their entirety under Council consideration at this meeting are available on the November 2011 briefing book CD and website (electronic only).**

The Council should consider these assessments and rebuilding analyses, as well as the advice of the SSC, other advisory bodies, and the public before adopting the new stock assessments and rebuilding analyses for use in 2013-2014 groundfish management.

Council Action:

1. **Adopt those assessments recommended by the SSC.**
2. **Adopt those rebuilding analyses recommended by the SSC.**

Reference Materials:

1. Agenda Item E.1.a, Attachment 1: Status of bocaccio, Sebastes paucispinis, in the Conception, Monterey and Eureka INPFC areas as updated for 2011.
2. Agenda Item E.1.a, Attachment 2: Status and Future Prospects for the Darkblotched Rockfish Resource in Waters off Washington, Oregon, and California in 2011.
3. Agenda Item E.1.a, Attachment 3: Status of the widow rockfish resource in 2011.
4. Agenda Item E.1.a, Attachment 4: Scientific and Statistical Committee Groundfish Subcommittee Report on Stock Assessments and Rebuilding Analyses for 2013-2014 Groundfish Fisheries.
5. Agenda Item E.1.a, Attachment 5: Rebuilding analysis for bocaccio, based on the 2011 stock assessment.
6. Agenda Item E.1.a, Attachment 6: Rebuilding analysis for canary rockfish based on the 2011 updated stock assessment.
7. Agenda Item E.1.a, Attachment 7: Rebuilding Analysis for Darkblotched Rockfish in 2011.
8. Agenda Item E.1.a, Attachment 8: Rebuilding Analysis for Pacific Ocean Perch in 2011.
9. Agenda Item E.1.a, Attachment 9: Draft 2011 petrale sole rebuilding analysis.
10. Agenda Item E.1.a, Attachment 10: Rebuilding analysis for yelloweye rockfish based on the 2011 update stock assessment.

Agenda Order:

a. Agenda Item Overview — John DeVore
b. Reports and Comments of Advisory Bodies and Management Entities
c. Public Comment
d. **Council Action:** Consider and Approve Stock Assessments for Bocaccio, Darkblotched, and Widow Rockfish; and Rebuilding Analyses for Overfished Species

PFMC
10/14/11

REVISED DRAFT

October 7th, 2011

Status of bocaccio, *Sebastes paucispinis*, in the Conception, Monterey and Eureka INPFC areas as evaluated for 2011

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John C. Field
Groundfish Analysis Team
Fisheries Ecology Division,
Southwest Fisheries Science Center
110 Shaffer Rd. Santa Cruz CA 95060
John.Field@noaa.gov

EXECUTIVE SUMMARY

Stock

This revised update of the 2009 stock assessment of the bocaccio rockfish (*Sebastes paucispinis*) reports the best estimate of bocaccio abundance and productivity off of the west coast of the United States, from the U.S.-Mexico border to Cape Blanco, Oregon (representing the Conception, Monterey and Eureka INPFC areas). Note that due to some of the key uncertainties encountered in this assessment, a small number of structural changes were made to the model, which no longer conforms to the strict definition of an "update" as defined by the PFMC terms of reference.

Catches

Bocaccio rockfish have long been one of the most important targets of both commercial and recreational fisheries in California waters, accounting for between 25 and 30% of the commercial rockfish (*Sebastes*) historical catch over the past century. However, this percentage has declined in recent years as a result of stock declines, management actions and the development of alternative fisheries. Since 2002 catches have generally been less than 200 tons per year, with the largest fraction of catches coming from the southern California recreational fishery.

Table E1. Recent catches (in metric tons) of bocaccio rockfish south of Cape Blanco

	trawl south of 38° N	trawl north of 38° N	hook and line	setnet	rec south of 34.5° N	rec north of 34.5° N	total (S. of 43 ° N)
1999	19.00	53.00	26.00	20.70	7.20	71.00	196.90
2000	13.50	60.00	6.60	7.00	0.70	52.00	139.80
2001	9.20	49.00	4.40	7.80	0.90	60.00	131.30
2002	28.04	20.67	0.13	0.01	35.88	4.93	89.66
2003	5.07	0.31	0.00	0.00	5.53	1.87	12.78
2004	13.86	3.52	1.84	0.21	63.43	2.27	85.13
2005	24.64	0.43	1.50	0.17	69.90	10.70	107.34
2006	16.09	0.31	2.25	0.25	29.00	11.80	59.70
2007	4.06	1.58	3.39	0.38	44.20	8.92	62.53
2008	0.42	1.98	2.02	0.08	31.50	3.33	39.33
2009	1.12	4.85	1.50	0.03	40.30	9.70	57.50
2010	2.90	10.97	1.45	0.05	52.60	7.40	75.36

Data and Assessment

The last full assessment of bocaccio rockfish was done in 2009 using the SS3 assessment model. This revised update extends the time series included in that model for the CalCOFI larval abundance survey, the NWFSC Southern California Bight hook and line survey, the NWFSC combined trawl survey, the SWFSC juvenile abundance survey, and the recreational pier fishery juvenile index. No new length frequency data are available for commercial fisheries, however

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new length frequency data are available and included for southern and central/northern California recreational fisheries.

The length composition data from the 2010 NWFSC trawl survey is dominated by small (Young-of-the-Year, YOY) individuals and had an overly strong influence on the model results in the initial (pre-review) models. As a result, a narrow range of analyses were recommended by the SSC to address how best to address the potential magnitude of this year class. Ultimately, the STAT proposed a model in which it is assumed that the bottom trawl survey does not provide an accurate index of age 0 abundance. The index and associated length composition data were revised to remove age 0 fish (fish smaller than 20 cm), and age selectivity was fixed to be non-selective for age 0 fish. Additionally, in order to account for what is in all likelihood one or several strong incoming year classes (2009, 2010), we also include the southern California power plant impingement survey for YOY bocaccio (which is updated from the index presented in the 2009 assessment but not included in the base model due to truncation of the time series). This index extends nearly 30 years, and was found to have a strong correlation with the model estimated recruitment time series.

Stock spawning output

For this update, trends in abundance and historical recruitment are only modestly changed from the 2009 model results. The final result is slightly more pessimistic of stock status relative to the 2009 model, with depletion in the year 2011 estimated at 26%, relative to the 30% projected from the 2009 model. Continued decline in the NWFSC combined trawl survey index and hook and line survey index were the primary drivers of this change, moreover the CalCOFI index suggests a flattening of what was previously an increasing trend over the last two years. With respect to overall model trends, he spawning output exhibits a very moderate decline until about 1950, with a steep decline from the early 1950s followed by a sharp increase in the early 1960s. Spawning output is estimated to have exceeded the mean unfished biomass level through the early 70s, when high fishing mortality rates again resulted in rapid declines. Fishing mortality declined towards the end of the 1990s, in response to management restrictions. Since the early 2000s, spawning output has been increasing steadily, largely as a result of reduced fishing mortality and a strong 1999 year class, although the rate of increase has slowed in the later half of the 2000s. Indications of strong 2009 and 2010 year classes should lead to additional increases in abundance.

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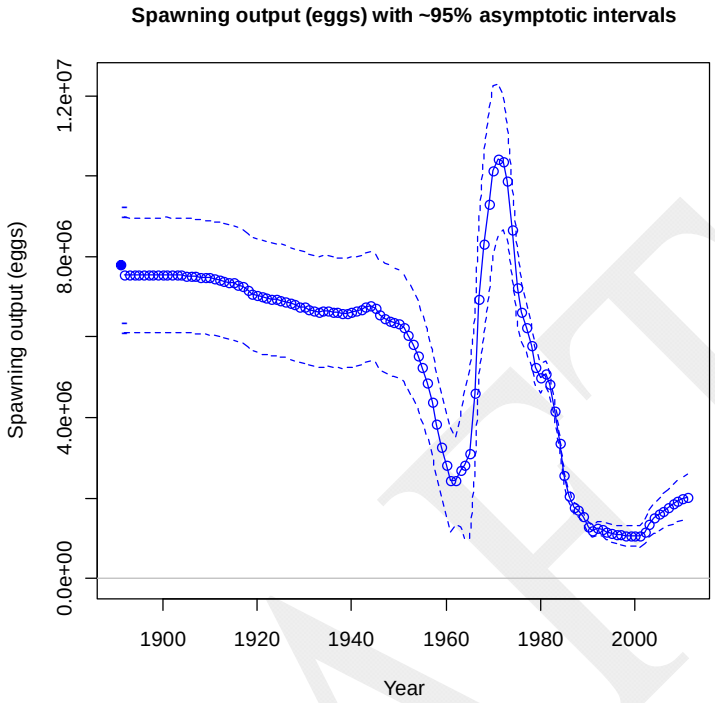

Figure E1. Estimated spawning output time series (1892-2011) for the base case, with approximate 95% confidence interval.

Table E2. Recent trends in estimated spawning output and relative depletion level

Year	Spawning Output (x 10^9)	CV spawning	Depletion	Confidence interval depletion (~95%)
1999	1067	0.123	0.137	(0.102 - 0.17)
2000	1055	0.126	0.135	(0.1 - 0.169)
2001	1052	0.129	0.135	(0.099 - 0.169)
2002	1161	0.129	0.149	(0.11 - 0.186)
2003	1357	0.129	0.174	(0.128 - 0.218)
2004	1505	0.129	0.193	(0.142 - 0.242)
2005	1588	0.131	0.203	(0.15 - 0.256)
2006	1672	0.132	0.214	(0.157 - 0.27)
2007	1764	0.133	0.226	(0.165 - 0.286)
2008	1850	0.135	0.237	(0.173 - 0.3)
2009	1932	0.136	0.247	(0.18 - 0.314)
2010	1987	0.137	0.254	(0.184 - 0.324)
2011	2029	0.138	0.260	(0.187 - 0.331)

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Recruitment

Recruitment for bocaccio is highly variable, with a small number of year classes tending to dominate the catch in any given fishery or region. Recruitment appears to have been at very low levels throughout most of the 1990s, but several recent year classes (1999, 2003, 2005) have been relatively strong given the decline in spawner abundance, and have resulted in an increase in abundance and spawning output. Currently there is strong evidence for a relatively strong 2009 year class and a strong to very strong 2010 year class. The relative strength of this year class was considered by the STAT and the review panel to be a significant axis of uncertainty for future management decisions, and variability in the magnitude of this year class was used to develop the decision table for this update. The net effect from the 2009 and 2010 year classes in the base model is equates roughly to the net recruitment realized from the 1999 year class (the largest observed year class since 1989), resulting in the stock most likely being accelerated in rebuilding relative to the 2009 model estimate, but not tremendously so. Estimated recruitments and model derived confidence intervals for those values are shown in Table E3 and Figure E3.

Table E3. Estimated recruitment with 95% confidence interval, 1999-2010

	Recruits (1000s)	Recruit CV	Confidence interval recruits
1999	7216	0.14	(5230 - 9200)
2000	309	0.36	(85 - 533)
2001	267	0.35	(80 - 453)
2002	1023	0.20	(614 - 1431)
2003	3187	0.15	(2243 - 4130)
2004	405	0.29	(168 - 642)
2005	3090	0.15	(2137 - 4043)
2006	707	0.27	(325 - 1089)
2007	1542	0.19	(958 - 2125)
2008	1475	0.21	(864 - 2086)
2009	3750	0.21	(2187 - 5311)
2010	3433	0.46	(305 - 6559)

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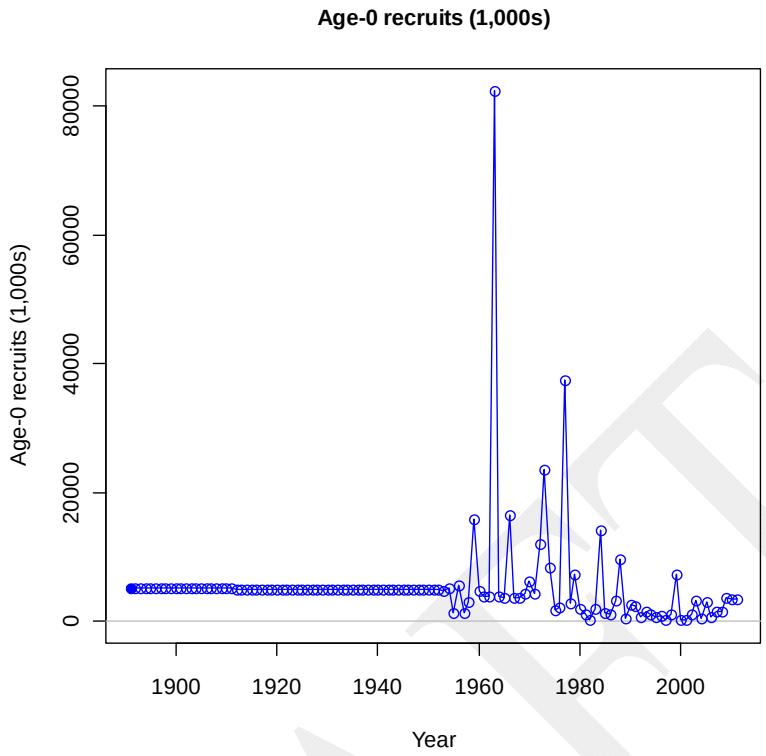

Figure E3. Estimated recruitment of bocaccio rockfish from 1892-2011

Reference Points

Reference points are presented in Table E4, which presents reference points for both the TOR and the STAT models, including the unfished summary biomass, unfished spawning output, mean unfished recruitment, the proxy estimates for MSY based on the $SPR_{50\%}$ rate, the fishing mortality rate associated with a spawning stock output of 40% of the unfished level, and MSY estimated based on the spawner/recruit relationship. The differences among point estimates of yield ranged from 1217 to 1234 tons, with the MSY estimated based on the spawner/recruit relationship leading to the higher value.

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Table E4. Summary of reference points for bocaccio rockfish from the base model

		Approx 95% Confidence Limits	
Unfished Stock	Estimate	Lower	Upper
Summary (1+) Biomass	44412	36148	52675
Spawning Output (x 109)	7812	6349	9275
Equilibrium recruitment	5112	4151	6073

	$SSB_{40\%}$	SPR proxy	MSY est.
SPR	0.502	0.500	0.445
Exploitation rate	0.065	0.065	0.078
Yield	1217	1218	1239
Spawning output (x 109)	3125	3107	2587
Summary biomass	18779	18682	15817
Recruits (x 103)	4070	4062	3802
SSB/SSB_0	0.400	0.398	0.331

Exploitation Status

The 2011 spawning output is estimated to be at 26% of the unfished spawning output, and exploitation rates are estimated to have ranged from 0.4 to 0.6% over the past five years, with corresponding SPR ratios of approximately 0.94 (ranging from 0.93 to 0.95) over that time (Table E5, Figures E5-E6).

Table E5. Base model estimated exploitation rate and spawning potential ratio (SPR)

Year	expl. rate	SPR rate
1999	0.035	0.681
2000	0.025	0.750
2001	0.019	0.822
2002	0.011	0.903
2003	0.001	0.987
2004	0.009	0.912
2005	0.011	0.891
2006	0.006	0.940
2007	0.006	0.939
2008	0.004	0.944
2009	0.005	0.944
2010	0.006	0.928

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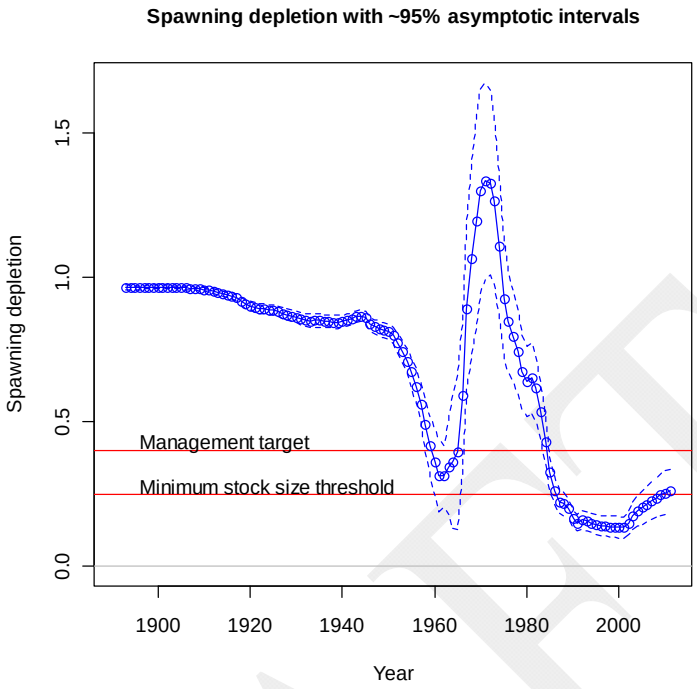

Figure E4. Time series of estimated depletion level of bocaccio from the STAT base model

Management Performance and forecast

Bocaccio rockfish were formally designated as overfished in March of 1999, and the OY has ranged from 218 and 307 tons since 2003 (Table E6), with actual catches (including discards) estimated to be less than half of that amount in most years. The current forecast is for an increasing abundance trend, with an expectation for sustained progress towards rebuilding as a result of the 2009 and 2010 year classes. Under the deterministic projection from the base model, the stock is not anticipated to rebuild until approximately 2020.

Table E6. Management performance

	Catch	OFL/ABC	ACL/OY
2001	131.30	122	100
2002	89.66	122	100
2003	12.78	244	20
2004	85.13	400	199
2005	107.34	566	307
2006	59.70	549	306
2007	62.53	602	218
2008	39.33	618	218
2009	57.50	793	288
2010	75.36	793	288
2011		737	263
2012		732	274

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Table E7. Forecast of bocaccio ACL and OFL, spawning biomass and depletion (ACL based on the SPR= 0.777 fishing mortality target)

	STAT 0Y (SPR 0.777 after 2012)	STAT larvae $x10^{12}$	STAT depletion
2011	*263*	2.03	0.26
2012	*274*	2.07	0.26
2013	303	2.17	0.28
2014	340	2.31	0.29
2015	375	2.46	0.31
2016	406	2.62	0.33
2017	436	2.79	0.35
2018	463	2.95	0.37
2019	489	3.11	0.39
2020	506	3.27	0.41
2021	522	3.42	0.43
2022	537	3.56	0.45

Unresolved problems and major uncertainties

A major uncertainty for this update is the relative magnitude of the incoming 2010 year class. Virtually all sources of information that could be informative with respect to this recruitment year indicate strong to very strong recruitment for both 2009 and 2010. Thus, it is reasonable to expect that this year class will in fact result in increased abundance, as well as increased availability (or, inability for avoidance) for many fisheries, particularly in the Southern California Bight where most of the (recent) recruitment appears to have taken place. Although either an update or a full assessment will not be conducted until 2013, it is possible to do a tentative ("turn the crank" style) model evaluation with a limited set of information from 2011 that may help to evaluate and refine estimates of the magnitude of the 2010 year class in particular, based on length frequency information from recreational fisheries, the NWFSC bottom trawl survey and potentially the NWFSC hook and line survey.

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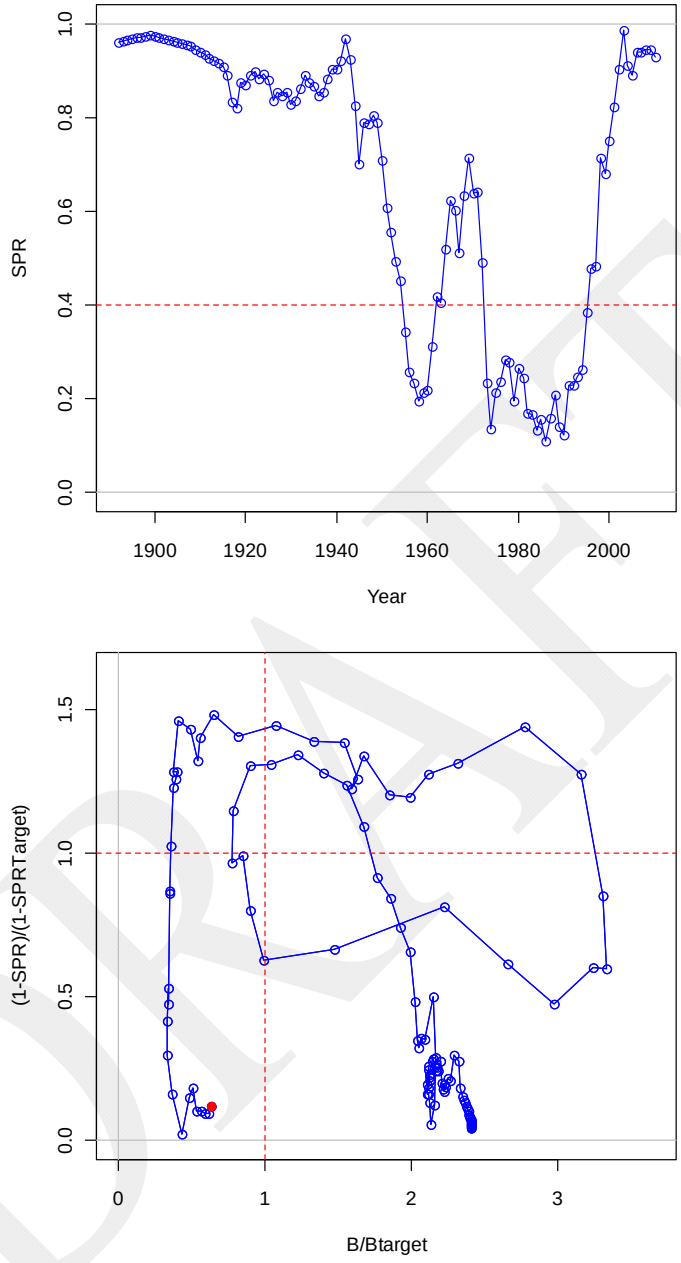

Figures E5- E6. Spawner potential ratio (SPR) over time (top), with reference proxy for Sebastes (note reference should be 0.5) and phase plot of SPR rate plotted against SSB, against target levels (bottom).

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Decision Table

As discussed earlier, currently what is likely the greatest source of uncertainty relevant to near term management decisions is the relative strength of the 2010 year class. In consultation with the September review panel, the decision table was structured to reflect this uncertainty, by bracketing what might be seen as highly optimistic and pessimistic results with respect to this year class. The rationale for this is that bocaccio are often encountered by fisheries, particularly the southern California recreational fishery, at high catch rates immediately following strong recruitment events, as young (and rapidly growing) bocaccio are often broadly dispersed over a range of habitats (see Figure 41 of main body of assessment). Consequently, despite the fact that recent catches have been substantially below target levels, there is some risk of reaching or exceeding adopted catch levels during periods of very high recruitment, particularly if this recruitment is underestimated in the model.

The bracketing of the magnitude of the 2010 year class was done by upweighting and downweighting the impingement survey dataset, leading alternatively to strong (comparable to 99 year class) or "weak" (comparable to average of the 2000s) estimates for the 2010 year class. This approach was considered reasonable as it is data-driven to a reasonable extent, and consistent with the weighting schemes used in the 2009 base model to determine states of nature (e.g., alternatively upweighting optimistic and pessimistic abundance indices).

In the resulting (deterministic) projections, assuming the maintenance of the current rebuilding SPR (0.777), the stock is anticipated to rebuild under both the base model and the "pessimistic" model by 2020, as these scenarios anticipate mean recruitment in years subsequent to 2010. Under the optimistic scenario, the stock could rebuild by 2016 for both the low and the baseline catch streams, with a slight delay (to 2017) if the catch streams corresponding to the high recruitment scenario are adopted. With respect to yield, the catch streams for the 2013-2014 management cycle under the rebuilding SPR are comparable (slightly greater) to 2011-2012 catches for the base model, nearly identical for the pessimistic model, and roughly 100 tons greater (per year) in the optimistic recruitment scenario. This reflects the potential for considerably greater abundance, encounter rates, and catches of smaller fish in particular if recruitment is indeed significantly greater than expected in the (current) base mode.

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Table E8: Decision Table for the bocaccio update

Catch basis		low 2010 rec		STAT. Base		higher 2010 rec	
low 2010 rec		larvaex10^{12}	depletion	larvaex10^{12}	depletion	larvaex10^{12}	depletion
2011	*263*	2.07	0.26	2.03	0.26	2.01	0.26
2012	*274*	2.11	0.27	2.07	0.27	2.07	0.27
2013	276	2.19	0.28	2.17	0.28	2.28	0.29
2014	306	2.28	0.29	2.31	0.30	2.59	0.33
2015	338	2.40	0.31	2.47	0.32	2.88	0.37
2016	370	2.54	0.33	2.64	0.34	3.14	0.40
2017	400	2.69	0.34	2.81	0.36	3.38	0.43
2018	427	2.85	0.36	2.98	0.38	3.59	0.46
2019	453	3.01	0.39	3.15	0.40	3.78	0.48
2020	476	3.16	0.40	3.31	0.42	3.96	0.51
2021	491	3.31	0.42	3.47	0.44	4.12	0.53
2022	506	3.46	0.44	3.62	0.46	4.27	0.55
STAT base		larvaex10^{12}	depletion	larvaex10^{12}	depletion	larvaex10^{12}	depletion
2011	*263*	2.07	0.26	2.03	0.26	2.01	0.26
2012	*274*	2.11	0.27	2.07	0.26	2.07	0.27
2013	303	2.19	0.28	2.17	0.28	2.28	0.29
2014	340	2.28	0.29	2.31	0.29	2.58	0.33
2015	375	2.39	0.31	2.46	0.31	2.87	0.37
2016	406	2.53	0.32	2.62	0.33	3.13	0.40
2017	436	2.67	0.34	2.79	0.35	3.35	0.43
2018	463	2.82	0.36	2.95	0.37	3.56	0.46
2019	489	2.97	0.38	3.11	0.39	3.74	0.48
2020	506	3.12	0.40	3.27	0.41	3.91	0.50
2021	522	3.26	0.42	3.42	0.43	4.07	0.52
2022	537	3.41	0.44	3.56	0.45	4.21	0.54
higher 2010 rec		larvaex10^{12}	depletion	larvaex10^{12}	depletion	larvaex10^{12}	depletion
2011	*263*	2.07	0.26	2.03	0.26	2.01	0.26
2012	*274*	2.11	0.27	2.07	0.27	2.07	0.27
2013	385	2.19	0.28	2.17	0.28	2.28	0.29
2014	444	2.27	0.29	2.30	0.29	2.57	0.33
2015	478	2.36	0.30	2.43	0.31	2.84	0.36
2016	501	2.48	0.32	2.57	0.33	3.08	0.39
2017	513	2.61	0.33	2.72	0.35	3.29	0.42
2018	524	2.74	0.35	2.87	0.37	3.47	0.44
2019	536	2.88	0.37	3.02	0.39	3.65	0.47
2020	549	3.01	0.39	3.16	0.40	3.81	0.49
2021	562	3.15	0.40	3.30	0.42	3.95	0.51
2022	574	3.28	0.42	3.44	0.44	4.09	0.52

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Research and Data Needs

Since large scale area closures and other management actions were initiated in 2001, the spatial distribution of fishing mortality has changed over both large and small spatial scales. Not only has this effectively truncated several abundance indices (recreational CPUE), this confounds the interpretation of survey indices for surveys that do not sample in the Cowcod Conservation Areas (CCAs), as insights from larval surveys suggest that there has been a change in the distribution of bocaccio in recent years such that the greatest abundance of bocaccio is found in that area. This, in turn, infers that fishing mortality is greater on the fraction of the stock currently outside of the CCAs, which may be undergoing localized depletion at a greater rate than the coastwide total stock due to the fact that the greatest catches of bocaccio are derived from these areas.

Stock structure for bocaccio rockfish on the West Coast remains an important issue to explore and consider. Although a reanalysis of the genetic evidence done for this assessment suggests no significant differentiation among the major oceanographic provinces in the California Current, the apparent differences in growth, maturity, and longevity, are indicative of moderate demographic isolation.

The potential to develop defensible aging criteria for bocaccio in the southern area should be evaluated further, particularly if such criteria could be developed in a coordinated effort among workers along the west coast.

The application of juvenile indices to inform future recruitment remains an area in need of additional research and development, including more extensive evaluation of two indices not included in the 2009 assessment (power plant impingement data and submersible observation data). A greater appreciation of the strengths and weaknesses of these indices is an important research priority.

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INTRODUCTION

This revised assessment update responds to the comments and recommendations of the Pacific Fishery Management Council Scientific and Statistical Committee (PFMC SSC) following a review of an initial draft of the updated assessment in June 2011. That draft was found by the SSC not to meet the terms of reference for an update, as there were significant changes to the model structure and data done in order to avoid what the STAT found to be unrealistic results from the traditional update (PFMC 2011). The "unrealistic" result was an extremely strong 2010 year class inferred from the length frequency data of the NWFSC combined trawl survey; although there are indeed signs of strong recruitment for bocaccio in 2009 and 2010 the magnitude of the 2010 recruitment estimate was essentially unprecedented (a "poorly informed" strong year class in the 1960s was as large or larger, but originated from a greater spawning stock biomass).

As this year class was essentially informed by a small number of length frequency observations and tows, the STAT considered the data unreliable for estimated the true magnitude of this year class, and excluded the 2010 length frequency data from the May draft of the model. The STAT then added a time series of pre-recruit (age 0) abundance data which had been used in past assessments, the power plant impingement dataset. This index was not included in the 2009 base model, however it was re-evaluated following the 2009 stock assessment when updated data became available, and subsequently found to have a strong correlation with the model estimates of recruitments. The STAT consequently considered this a more reliable indicator of impending year class strength than the NWFSC combined trawl dataset, and excluded the 2010 length frequency data from the latter dataset, and added the pre-recruit (age-0) abundance data from the impingement dataset. The STAT also reported the results from the model that adhered more closely to the terms of reference, but did not consider that model to be acceptable for providing management advice. That model projected that the bocaccio stock would rebuild by the year 2013, when the 2010 year class became mature, regardless of catch levels and only modestly sensitive to the assumed "states of nature" from the 2009 base model.

The SSC recognized that the model result under the strict interpretation of the terms of reference was questionable, but also concluded that because the model put forward by the STAT did not meet the terms of reference for an update, it could not be adopted for management without further review. The SSC recommended that a revised document be developed and reviewed at the Sept. 2011 "mop up" panel, at which time various alternative means of addressing the key uncertainty in the update could be investigated. The model reported here is the base model proposed by the STAT and recommended for adoption for management by that review panel. Although this assessment no longer meets the criteria for an "updated" assessment as defined in the terms of reference, the scope of the revisions are limited to deal with this specific issue. Consequently, this update does not include the background information provided in the full 2009 assessment, for which the 2009 assessment should be referred to (Field et al. 2009). Moreover, dataset descriptions, diagnostics and model fits are included only for time series that were extended in this update, as the model results and fits through the year 2009 change only modestly for these datasets.

DATA

Fishery Dependent Data

Commercial and Recreational catches

Commercial bocaccio catch estimates were updated from 2008 through 2010 based on the NWFSC total mortality reports, consistent with the means by which catches were estimated in the 2009 assessment (Tables 1-2). As no estimate was available for 2010, catches in this year were estimated by applying the discard rates inferred from the West Coast Groundfish Observer Program to catch estimates from CalCOM. Discard rates were approximately 85% for the trawl fishery in 2008-2009 (those rates were applied to 2010 estimates as preliminary 2010 bycatch rates were 100%). No discards were observed in fixed gear fisheries for any of these years, thus fixed gear landing estimates were based on fixed gear catches. A more rigorous evaluation of bycatch data and rates by gear type and region should be undertaken in the next full assessment. Recreational catch estimates for 2008-2010 were provided by John Budrick (CDFG) based on the CRFSS sampling system. Although recent efforts have been undertaken to improve species-specific estimates of historical catches in Oregon (Gertseva et al. in prep), this effort currently does not provide region-specific catch estimates, which is key to bocaccio where only the catches south of Cape Blanco are included in the model. Consequently, historical catch data were not revisited, but should be in the next full assessment.

Commercial Length Frequency Compositions

The number of length observations available from traditional (CalCOM) sources of length frequency data were inadequate (single digits each for 2009, 2010) to include as length composition information in this update. Consequently, no new commercial length frequency data are included in the update. Length frequency information is available from the bycatch monitoring program, but as this information was not incorporated in the 2009 assessment it is not included in this update. Revisiting an appropriate way to incorporate this data should be done in the next assessment.

Recreational Length Frequency Data

New recreational length frequency data area available from the CRFSS monitoring program (accessed from the RecFIN website) for 2009-2010. The total number of clusters, fish sampled, and initial effective sample sizes are presented as Table 3.

Fishery-Dependent Indices

None of the fishery-dependent indices (trawl or recreational CPUE) were updated for this assessment as all of the time series have been effectively truncated by management actions.

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Fishery-Independent Data

CalCOFI larval abundance data

The CalCOFI larval abundance time series was updated with a small number of observations from (late) 2008, and new observations for all of 2009 and the January survey for 2010. The index was developed with the same approach adopted in the past assessment, a delta-GLM model with the main (fixed) effects of interest being year (adjusted to spawning season), month and line-station effects. These estimates and the associated standard errors estimated from a jackknife routine were used in the model as a relative index of population spawning output (Figures 2, Table 4). The year effects through 2008 were virtually identical from the most recent GLM results, the new estimates for 2009 and 2010 estimates were suggestive of a flattening, or potentially a decline, from the increasing trend observed through most of the 2000s.

Northwest Center Trawl Survey

The Northwest Fishery Science Center has conducted combined shelf and slope trawl surveys since 2003, based on a random-grid design from depths of 55 to 1280 meters. Additional details on this survey and design are available in the abundance and distribution reports by Keller et al. (2008). Bocaccio CPUE (kg/ha) and negative tows (in depths less than 350 m) pooled over all years are shown as Figure 3a and b; data for 2010 in the Southern California Bight only is shown in Figures 4a and b and discussed in greater detail momentarily. Additional data on the number of tows, number of positive tows, number of length measurements and mean CPUE rates by depth and INPFC area are provided in Tables 5.

The 2009 assessment used a GLMM approach for the development of a relative abundance index (using standard depth strata and area, as well as year, as factors), this index was updated with the latest catch data. The 2009 and the updated (2011) index are shown in Figure 5a. The 2011 index varies modestly from the 2009 index in the years 2005-2006, this is likely a result of changes to the definition of "standard" tows by the NWFSC between the 2009 data request and the 2011 data request, as tows that took place in recently closed (state MPA) areas were excluded from the 2011 data request (a document describing the rationale and results of this tuning is in preparation by the NWFSC). This resulted in a reduction of the number of acceptable hauls used to develop the index, particularly in 2005-2006 when 11 and 2 positive tows were removed respectively. Despite the modest difference between the 2009 and 2011 index, the general pattern is unchanged, with a peak in abundance in 2004 (likely reflecting a strong 2003 year class), a decline in 2005, and a smaller peak in 2006 with declining abundance since that time.

Length frequency data were based on the expanded length frequencies provided by Beth Horness (NWFSC), shown in Figure 5b through 2010. The length frequency data in most of the early years are dominated by the 1999 year class, with signs of the incoming 2003 and 2005 year classes in later survey years. Perhaps most importantly, the 2010 length frequency data are entirely dominated by small (16-20 cm) bocaccio, which represented over 85% of all of the fish encountered in the assessment region for that year (relative to just over 2% of all lengths encountered in the 2003-2009 time period). Although the majority of these fish came from a single haul, over 1 dozen hauls had age-0 fish in 2010, all of which were from hauls centered on

the eastern half of the northern channel Islands (Figures 4a-b) and conducted during the second (fall) sweep of the survey. This has previously been described as a region that often has patchy, but highly abundant, numbers of YOY fish late in the year during years of successful recruitment (Love et al. 2005).

As this length composition data have tremendous influence on the model results, leading to what the STAT considered to be a likely unrealistic model projection, alternative means of dealing with these data were explored. Specifically, the STAT considered decoupling of the trawl survey young-of-the-year (YOY) from the age 1+ population, a reasonable approach for using the survey data. As the ageing of bocaccio in general is not feasible, we assumed that bocaccio smaller than 20 cm were young-of-the-year, and those 20 cm or larger were age 1+ (the base model assumes both males and females are 26 cm length at age 1.5). The length composition data from the survey were used to assign the relative CPUE for each tow to "YOY" or "Age 1+" biomass, in order to run separate GLMs of each index. However, due to the paucity of positive tows for age 0 bocaccio in most years (only 4 years had more than 1 positive tow in the region in which most positives were derived; see Tables 6-7) the resulting index could only be estimated for 6 of the 8 years of the survey. Moreover, a six year time series was only possible when the model was allowed to estimate year effects based on only a single positive observation in a single strata (which consequently precludes the estimation of a CV, as there were insufficient positive observations to conduct a jackknife). Thus this index was not considered reliable, and was not incorporated into the model. However, to the extent it does inform recruitment, the results are consistent with moderately strong recruitment events in 2003 and 2005 and the expectation of strong recruitment in 2009 and 2010. The revised index for age 1+, and the index for age 0 bocaccio are shown in Figure 5b. The index differed only modestly for the estimated age 1+ abundance relative to the index in which all catches were included in the estimation.

NWFSC Southern California Bight hook-and-line survey

A hook and line survey CPUE index developed by the NWFSC was developed by Harms et al. (2008, 2010) was used in the last assessment and updated in this assessment (J. Harms and J. Wallace, pers. com). The extended index (Figure 6a) and associated length frequency data (Figure 6b) are used in the model. The index suggested a slight decline from 2004-2008 in the last assessment, the most recent data points suggest a steeper decline from the early period into 2009- 2010, with the 2010 data point being less than 1/3rd the value of the 2004 data point. As the selectivity of this survey is strongly dome-shaped, and the length frequency data are not indicative of a strong incoming year class, this likely represents the continued decline and reduced selectivity of recent dominant year classes (1999, 2003, 2005) with some sign of a moderately strong year class in 2009. As with the trawl survey index, the hook and line survey index does not include sampling in the Cowcod Conservation Areas where much of the spawning biomass of bocaccio is thought to reside.

Recruitment Indices

Two young-of-the-year (YOY) recruitment indices were used in the 2009 bocaccio assessment: the coastwide midwater trawl survey index (2001-2008) and a recreational pier fishery CPUE index that included historical data from the 1950s and 60s. The coastwide midwater trawl survey

index was updated by Ralston (2010) and show in Figure 7a and Table 8; the updated time series was included in the model. The 2010 estimated recruitment was the highest in the 10 year time series of this data set. The pier fishery index was also updated (Figure 7b), with several positive records of bocaccio in 2009, but only one positive record from currently available data for 2010. This record was for several fish, which would have led to a high 2010 value for this index if a minimum number of positive values was reduced to 1 (included as a dashed line on the figure), but this precludes the ability to estimate error with a jackknife routine, and thus was not done for the model (consistent with the original approach adopted in the 2009 assessment). The estimated 2009 value is among the highest in recent decades (Figure 7b; note that to evaluate the most recent data, the scale is truncated to exclude the 1950s and 1960s estimates).

A third juvenile index, based in power plant impingement data, was revisited (the data had been used or proposed in past assessments) and discussed in the 2009 assessment but not used due to the fact that the time series at that time only extended to 2001. However a connection to the data sources subsequently became available and an index was developed and evaluated in Field et al. (2010; attached as an appendix). The power plant impingement index represents data collected from coastal cooling water intakes at five Southern California electrical generating stations from 1972 to 2010 (and ongoing). These data have been previously described and published by Love et al. (1998) and Miller et al (2009) with respect to trends in abundance of *Sebastes* species and queenfish (*Seriphus politus*), respectively (See either of these manuscripts for additional information, and the precise location of the facilities). More recently, a manuscript describing abundance trends in sand basses (*Paralabrix spp*) in the southern California Bight was published using these (and other) data (Erisman et al. 2011).

The dataset includes observations on as many as 1.8 million fish encountered in three basic types of power plant impingement surveys (E. Miller unpublished data.). The three principle "types" of survey data include "normal operations" (fish sampled off of intake screens during normal operations, typically done every 24 hours although we aggregated these by month for any given plant to avoid excessive weighting of these data), "heat treatments" (periodic events in which a given volume of water is treated at high temperatures to kill off biofouling organisms, all fishes in that known volume of water are subsequently enumerated), and a third set ("fish chase") data that are unique to the San Onofre power plant but were not used in this analysis due to the low frequency of occurrence of bocaccio in those data. Although the frequency of all of these sampling methods is irregular over the 28 year time series, as a result of changes in operating schedules, regulatory requirements and changes in ownership over time, the time series is uninterrupted at the annual scale from 1972-2008.

As with the pier recruitment index, the impingement index was developed using a Delta-GLM (generalized linear model) approach to combine a binomial model for presence/absence information with a model of catch per unit effort for positive observations. Akaike's Information Criteria (AIC) was used to determine the appropriate error distributions and covariates. Year effects are independently estimated covariates which reflect a relative index of abundance for each year, error estimates for these parameters are developed with a jackknife routine. For the impingement data, the other covariates included month, the power plant (essentially "station" or spatial effects, five total), and survey type ("normal operations" or "heat treatments," described above). The resulting recruitment indices from 1972-2008 were compared to the estimated

recruitments from the 2009 stock assessment (which did not include this index), and the natural log of both the predictor (indices) and response (assessment recruits) values were used for the regression to best mimic the behavior of stock assessment model optimization routines. The power plant index compared very well (R^2 of 0.58) with the assessment estimated recruitments for the 1972-2008 period (Figures 8a-b). Although the data and index were not extensively reviewed by the 2009 STAR Panel, due to the short duration of the time series, the extended time series is included in this assessment due to the perceived or potential value of these data in assessing the relative strength of the 2010 year class.

A final juvenile index, based on a visual (Delta submersible) survey of Southern California Bight oil rigs and natural reefs was also developed and presented in Field et al. (2010) and updated for informative purposes only in this assessment (see Love et al. 2005 for more details regarding this survey). Data from this survey begin in 1995 and were reported through 2008 in the manuscript, for which the index was developed in a manner consistent with the other juvenile indices. The index was updated to include data from 2010, and the results are consistent with the expectation that 2010 should be among the highest recruitment years in recent history for bocaccio (Figure 9a-b). However, as this index was neither discussed nor included in the 2009 assessment, nor is the time series as long as the impingement index, it is not included in the model but referenced solely for informational purposes.

Model Description

Modeling software

The 2009 assessment used the Stock Synthesis 3 (SS-V3.03A) modeling framework developed by Dr. Richard Methot (Methot 2009a; Methot 2009b). While we originally (May 2011 draft) conducted the update with the SS3 version used in the 2009 assessment, other STAT teams did their updated assessments using more recent versions of SS3, which facilitated rapid viewing and comparison of model results by virtue of being able to use the most recent "R4SS" viewing and graphing code. As the model results and likelihood values changed only trivially (Figure 10, Table 9), we considered this a worthwhile upgrade. The 2009 model used uninformative priors on many of the selectivity parameters in early modeling efforts, as well as the Dorn (2002 and updated) beta prior distribution for steepness was used in the 2009 base model and is continued here.

Base model results

In the initial model that strictly followed the terms of reference for stock assessment updates, the length frequency data from the NWFSC 2010 bottom trawl survey had a very strong influence on the model behavior with respect to the estimation of the 2010 year class. Consequently, this revised update included the inquiries recommended by the SSC in May of 2011, and developed a revised model that is not strictly an update, but neither explored all of the questions and avenues that might have been investigated in a full assessment. In the current base model, the combined trawl survey was disaggregated into an age-0 and age 1+ index of relative abundance, with only the age 1+ index used in the model, and the impingement age-0 abundance index was added as a pre-recruit index. This model was the result of a suite of explorations, in which alternative

selectivity forms (dome-shaped, time-varying), as well as alternative time periods for the recruitment bias correction phase-in were also explored, none of which made a substantive difference in the basic result or the relative magnitude of the 2010 year class when all of the length data were included. Although the impingement index was not a part of the 2009 assessment model, the index was reported in that assessment through 2001 (the year to which data were then available) and would have been included (or, at a minimum, explored further) had the more recent data been available at that time. Moreover, the methodology for the development of this index is entirely consistent with that of similar indices included in the 2009 assessment, as well as documented in a recent publication (Field et al. 2010 attached as an appendix) for which the impingement time series was demonstrated to be the best performing YOY abundance index for this species (out of four evaluated).

A summary of the available data by type and year is included as Figure 11. Selectivity curves for all surveys and fisheries are shown in Figure 12. Fits to the updated relative abundance indices (CalCOFI, the NWFSC hook and line index, the NWFSC trawl survey index, the juvenile trawl survey index, the pier fishery CPUE index and the impingement index) are shown in Figures 13-18, in both arithmetic and log space, including plots of the observed vs. predicted values. Fits to the truncated time series (trawl CPUE, triennial survey and the recreational CPUE indices) are not included as they are essentially unchanged from the 2009 assessment. Note that the fits to both the hook and line and the trawl survey index are very poor; these indices estimate a declining trend in abundance while the model (based on CalCOFI and other indices) estimates an increasing trend, these inconsistencies relate directly to what the STAT considers to be the greatest uncertainties and data needs; reconciliation of trend data from the areas solely outside of closed areas with those for the entire S. California Bight (e.g., CalCOFI). Fits to the length composition data, along with plots of residual values and input relative to effective sample sizes, for the recreational fisheries and updated surveys are presented as Figures 19-26 (note that fisheries for which no new data are available were not included as the fits have not changed significantly).

To track the influence of updating the various time series and data sources, we added updated data sequentially, and show basic model results as well as likelihood values and model trends for each addition leading up to what would have been the Terms of Reference (TOR) model and the final resulting base model (Table 9). Virtually all of the updated indices led to slightly more pessimistic estimates of stock status (with the exception of the YOY indices), although the influence was relatively modest for the recreational (length frequency) data and the CalCOFI data, and more substantial for the NWFSC SCB hook and line survey and the NWFSC combined bottom trawl survey, both of which exhibited particularly strong declines in recent years.

Point estimates of parameters (including the recruitment deviation point estimate values) for the base model are reported in Tables 10 and 11, along with the corresponding estimates from the 2009 model. With the exception of the selectivity parameters for the NWFSC combined trawl survey, the growth, recruitment and selectivity and parameter values changed very little. However, the recruitment deviation parameters changed modestly, and (with the exception of the poorly informed early period, which juggles among several years for the very strong early 1950s year class) generally had a bias towards lower recruitments, particularly in the last 20 or so years in the time series. This is presumably a consequence of the need to "balance" the recruitment

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deviations such that they sum to zero. The net effect is that the combination of the 2009 and 2010 year classes in the base model equate roughly (slightly less than) the net recruitment realized from the 1999 year class (the largest observed year class since 1989). By contrast, the 2010 year class estimated in the (unreported) TOR model was nearly 10 times the recruitment of the 1999 year class. Although such optimism may be overly exuberant, there is a reasonable probability that the magnitude of this recruitment could be significantly greater than currently estimated.

The base model results are shown as Figures 27-33 (and in Table 12) for summary biomass, spawning output, depletion, age-0 recruits, recruitment deviation estimates, the spawner-recruit curve, the equilibrium yield curve, and the estimated SPR (including phase plot against B target). The resulting estimates of unfished summary (age 1+) biomass, spawning output and mean age 0 recruitment are only modestly changed from the 2009 results (approximately 44,000 mt, 7,800 x 10^9 larvae and 5.1 million recruits, respectively). Similarly, the estimated steepness was only modestly changed from the 2009 base model (0.60, relative to 0.58 in the 2009 model). General biomass trends were virtually identical to the 2009 model, although the current base is slightly more pessimistic than the 2009 model, with depletion estimated to be at 26% of the unfished level in 2011 (by contrast, the projected depletion level in 2011 for the 2009 model was 30% of the unfished level).

Uncertainty and sensitivity analysis

As discussed earlier, currently what is likely the greatest source of uncertainty relevant to near term management decisions is the relative strength of the 2010 year class. Greater analysis of some data streams precluded an update that strictly adhered to the PFMC terms of reference for stock assessment updates, as the magnitude of this year class was spectacularly optimistic (and, in the opinion of the STAT, unrealistically so). Moreover, although there are several indications of strong recruitment in 2010, this result was almost entirely due to the fact that over 85% of the individual fish encountered by the 2010 NWFSC combined trawl survey were YOY bocaccio (in contrast to just 2% for the preceding 7 years of the survey). As length composition data may be overemphasized relative to other index data in many models (Francis 2011), the influence of the survey length frequency data were overwhelming, resulting in an estimated 2010 recruitment value far above any observed in the historical time series and a recruitment deviation estimate far greater than any estimated by the model. This resulted in some dilemmas regarding the most appropriate way to parameterize this assessment. It should be pointed out that several sources of information point to this year class as being quite strong, including the juvenile trawl survey, the impingement data, the submersible survey index, the fact that there have been relatively cool and productive ocean conditions in the southern California Current in recent years. As the true strength of the 2010 year class will only be manifest in time, the very strong magnitude of the recruitment inferred by the trawl survey length frequency data were not considered entirely reliable by the STAT for the purposes of the update.

Specifically, the model that adhered to the terms of reference and included the 2010 length frequency data projects the stock will be rebuilt by 2013, and above the mean unfished level of spawning output by 2016. By contrast, under the STAT model, the stock is projected to rebuild steadily from the strong 2009 and 2010 year classes, reaching 40% of the unfished spawning

potential between 2018 and 2021 (depending upon the catch stream). While this is earlier than projected with the 2009 model, it is consistent with the range of projections from that assessment and the subsequent rebuilding plan. Figures 34 and 35 shows a comparison of the 2009 model estimates and ten year projections for spawning biomass, relative depletion, recruitment and recruitment deviation values, along with that of the base model presented here and the model that would have strictly adhered to the terms of reference (TOR model). Although it is entirely possible that the 2010 recruitment for bocaccio will be considerably greater than projected in this base model, the STAT views the probability of recruitment at the level estimated by the terms of reference model to be very unlikely.

In consultation with the September review panel, the panel agreed with this determination, and accepted the revised model that included the impingement index as a reasonable base model to address this unique situation. Subsequently, the decision table (Table 13) was structured to reflect the uncertainty, by bracketing what might be seen as highly optimistic and pessimistic results with respect to this year class. A comparison of the resulting spawning output, depletion, recruitment and recruitment deviation time series are also shown in Figures 36-37. The rationale for this is that bocaccio are often encountered by fisheries, particularly the southern California recreational fishery, at high catch rates immediately following strong recruitment events (Figure 38), as young (and rapidly growing) bocaccio are often broadly dispersed over a range of habitats. Consequently, despite the fact that recent catches have been substantially below target levels, there is some risk of reaching or exceeding adopted catch levels during periods of very high recruitment, particularly if this recruitment is underestimated in the model.

The bracketing of the magnitude of the 2010 year class was done by upweighting and downweighting the impingement survey dataset, leading alternatively to strong (comparable to 99 year class; the total recruits is greater although the recruitment deviation parameter is slightly lower; difference reflects the increase in spawning biomass since 1999) or "weak" (essentially a recruitment deviation of 0, comparable to average of the 2000s) estimates for the 2010 year class. This approach was considered reasonable as it is data-driven to a reasonable extent, and consistent with the weighting schemes used in the 2009 base model to determine states of nature (e.g., alternatively upweighting optimistic and pessimistic abundance indices). Note that both the upweighting and the downweighting of the impingement index resulted in very slightly different recruitment time series and subsequent depletion levels in 2010 (due to the constraint that recruitment deviations must sum to, or very close to, zero). To minimize dramatic changes in the estimation of earlier recruitment and abundance trends, the CV on pre-2009 impingement data was doubled, essentially narrowing the focus of the upweighting to the most recent years of the impingement dataset. Subsequent to this change, differences in historical recruitments and biomass trends were negligible.

In the resulting (deterministic) projections, assuming the maintenance of the current rebuilding SPR (0.777), the stock is anticipated to rebuild under both the base model and the "pessimistic" model by 2020, as these scenarios anticipate mean recruitment in years subsequent to 2010. Under the optimistic scenario, the stock could rebuild by 2016 for both the low and the baseline catch streams, with a slight delay (to 2017) if the catch streams corresponding to the high recruitment scenario are adopted. With respect to yield, the catch streams for the 2013-2014 management cycle under the rebuilding SPR are comparable (slightly greater) to 2011-2012

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catches for the base model, nearly identical for the pessimistic model, and roughly 100 tons greater (per year) in the optimistic recruitment scenario. This reflects the potential for considerably greater abundance, encounter rates, and catches of smaller fish in particular if recruitment is indeed significantly greater than expected in the (current) base mode. These catch streams are reported in the decision table, and in Figure 39.

There were no troubling or worrisome results from the retrospective analyses (Figures 40-41), although they too also illustrate the generally more pessimistic perception of relative spawning output as driven with the most recent data for various time series.

The STAT also notes that the poor fits to two of the more recent survey time series are considerably more pessimistic than the results of the base model. Although this 2011 assessment was not a typical "update" relative to the terms of reference, the narrow scope of new analysis did not provide an opportunity to take a more comprehensive look at these inconsistencies. However, as in the 2009 assessment, the STAT notes that there should be concerns over how these indices are interpreted, given that neither of these surveys cover the area that is currently the greatest region of bocaccio abundance, within the cowcod conservation areas (CCAs), as recently demonstrated by Ralston and MacFarlane (2010, see also Figure 42). These surveys may well capture the relative abundance trends in the coastal areas of the southern California Bight, where fishing mortality is also focused on a fraction of the total available habitat (and biomass) for bocaccio. Specifically, even relatively modest differences in abundance at the time of the cowcod area closures of 2001, if coupled with low or negligible movement of adult fish subsequent to that period, could result in an accumulation of biomass in the closed areas since that time which would not be captured by these surveys. Thus, relative declines may in fact be steep in the open areas (although see discussion on ontogenetic changes in habitat preferences with size/age in the 2009 assessment as well), but spawning potential may be stable or increasing as a whole throughout the range (as inferred by the CalCOFI larval abundance index) as a result of management measures. Resolving how best to measure and assess the actual biomass trends of bocaccio throughout the survey area, remains a key uncertainty and research need for assessment of this species.

Reference Points

Reference points are presented in Table 14, which report the unfished summary biomass, unfished spawning output, mean unfished recruitment and the proxy estimates for MSY based on the $SPR_{50\%}$ rate, the fishing mortality rate associated with a spawning stock output of 40% of the unfished level, and MSY estimated based on the spawner/recruit relationship. The corresponding yields for these three estimates varied by a relatively minor amount, ranging from 1217 to 1234 tons (by contrast, the 2009 model estimated a range of yield values from 1250 to 1270). Despite the minor difference in yield between the SPR proxy and the estimated MSY rate, there is a considerable range of spawning biomass levels associated with these alternatives (with the modestly greater OY under the estimated MSY rate associated with a considerably lower relative abundance).

Future Research Needs

Research needs are discussed comprehensively in the 2009 assessment and have changed little since that time. Particularly important is the observation that most of the fishing mortality on bocaccio rockfish takes place in the southern California recreational fishery, where a broad area of habitat is closed to fishing in the cowcod conservation areas (CCAs) and rockfish conservation areas (RCAs). As the NWFSC combined trawl survey and the NWFSC hook and line survey do not index abundance in the CCAs (they do survey within the RCAs), where larval distribution data suggest the greatest abundance of bocaccio is currently found, the time series derived from these indices in this region are likely to be biased, and inconsistent with the CalCOFI index that captures the entire region. Although this is not a problem limited to bocaccio, the problem is particularly acute to populations that have their greatest distribution in the Southern California Bight.

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Table 1. Total catches (metric tons) and PFMC adopted ABC/OY values for bocaccio rockfish.

	Catch	ABC	OY
1999	196.90	230	230
2000	139.80	164	100
2001	131.30	122	100
2002	89.66	122	100
2003	12.78	244	20
2004	85.13	400	199
2005	107.34	566	307
2006	59.70	549	306
2007	62.53	602	218
2008	39.33	618	218
2009	57.50	793	288
2010	75.36	793	288
2011		737	263
2012		732	274

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Table 2. Estimated domestic commercial landings and discards of bocaccio rockfish south of Cape Blanco, by region and gear type, 1999-2010 (metric tons).

	trawl south of 38° N	trawl north of 38° N	hook and line	setnet	rec south of 34.5° N	rec north of 34.5° N
1999	19.00	53.00	26.00	20.70	7.20	71.00
2000	13.50	60.00	6.60	7.00	0.70	52.00
2001	9.20	49.00	4.40	7.80	0.90	60.00
2002	28.04	20.67	0.13	0.01	35.88	4.93
2003	5.07	0.31	0.00	0.00	5.53	1.87
2004	13.86	3.52	1.84	0.21	63.43	2.27
2005	24.64	0.43	1.50	0.17	69.90	10.70
2006	16.09	0.31	2.25	0.25	29.00	11.80
2007	4.06	1.58	3.39	0.38	44.20	8.92
2008	0.42	1.98	2.02	0.08	31.50	3.33
2009	1.12	4.85	1.50	0.03	40.30	9.70
2010	2.90	10.97	1.45	0.05	52.60	7.40

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Table 3. Total number of length frequency observations, subsamples, and input effective sample size for recreational fisheries, 2008-2010 (see 2009 assessment for complete table).

	Southern California			Central/Northern California		
	obs	samples	Neff	obs	samples	Neff
2008	1811	484	400	163	88	110
2009	2085	444	400	215	89	119
2010	1869	368	400	184	87	112

Table 4. Total number of plankton tows, positive tows, and the mean cpue of positives for 2000-2010 (see 2009 assessment for complete table).

	Northern area (lines<77)			Southern area (lines>=77)		
	total tows	positive	ave cpue	total tows	positives	ave cpue
2000				96	8	0.8
2001				93	6	0.5
2002				118	10	1.0
2003	46	4	0.6	143	14	1.0
2004	46	3	1.3	99	11	4.9
2005				146	16	1.6
2006	28	4	1.6	149	13	0.7
2007	10	4	5.6	108	11	1.2
2008	***20***	***1***	***0.3***	176	13	1.8
2009	***24***	***1***	***0.2***	***170***	***10***	***0.7***
2010	***15***	***3***	***3.0***	***129***	***10***	***0.9***

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Table 5. Summary of all bocaccio catch information for NWFSC combined shelf-slope bottom trawl survey, by latitude and inside of 350 meters depth, 2003-2010.

Total number of hauls, 50 to 350 m

lat	2003	2004	2005	2006	2007	2008	2000	2010
32	37	39	48	49	57	50	64	60
34.5	20	18	17	16	23	24	29	24
36	23	24	32	31	29	41	42	38
38	34	39	50	45	33	42	33	45
40.5	56	28	50	34	41	36	44	49
43	129	136	167	172	196	164	171	180

Number of positive tows

lat	2003	2004	2005	2006	2007	2008	2000	2010
32	9	9	13	11	12	2	8	16
34.5	7	4	2	2	6	3	6	10
36	6	7	12	9	6	8	4	6
38	8	10	8	12	1	8	5	3
40.5	4	0	3	1	2	1	1	0
43	5	0	2	3	3	4	0	1

Percent positive

lat	2003	2004	2005	2006	2007	2008	2000	2010
32	0.24	0.23	0.27	0.22	0.21	0.04	0.13	0.27
34.5	0.35	0.22	0.12	0.13	0.26	0.13	0.21	0.42
36	0.26	0.29	0.38	0.29	0.21	0.20	0.10	0.16
38	0.24	0.26	0.16	0.27	0.03	0.19	0.15	0.07
40.5	0.07	0.00	0.06	0.03	0.05	0.03	0.02	0.00
43	0.04	0.00	0.01	0.02	0.02	0.02	0.00	0.01

Mean CPUE (kg/ha) of positives

lat	2003	2004	2005	2006	2007	2008	2000	2010
32	2.0	3.0	1.7	1.8	6.1	2.3	0.8	1.1
34.5	1.0	5.8	1.7	29.0	3.7	1.7	4.7	2.2
36	2.1	66.0	14.3	2.1	4.7	11.4	3.2	1.2
38	3.5	4.0	3.2	3.4	1.9	4.8	2.5	1.8
40.5	2.7	0.0	2.7	0.3	2.7	0.0	4.5	0.0
43	5.0	0.0	1.4	27.1	6.8	5.1	0.0	0.7

Number of length measurements

lat	2003	2004	2005	2006	2007	2008	2000	2010
32	37	54	111	92	98	7	26	207
34.5	15	29	4	81	25	10	44	48
36	11	378	165	16	21	63	19	8
38	25	32	22	22	1	21	8	3
40.5	9	0	15	1	4	1	3	0
43	16	0	2	50	8	9	0	1

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Table 6. Summary of presumed young-of-the-year (<20 cm) bocaccio catch data for NWFSC combined shelf-slope bottom trawl survey, 2003-2010.

Total number of hauls, 50 to 350 m

lat	2003	2004	2005	2006	2007	2008	2000	2010
32	37	39	48	49	57	50	64	60
34.5	20	18	17	16	23	24	29	24
36	23	24	32	31	29	41	42	38
38	34	39	50	45	33	42	33	45
40.5	56	28	50	34	41	36	44	49
43	129	136	167	172	196	164	171	180

Number of positive tows

lat	2003	2004	2005	2006	2007	2008	2000	2010
32	4	0	6	0	1	0	2	12
34.5	3	0	0	0	0	0	0	1
36	0	1	0	0	0	0	0	0
38	0	0	0	0	0	0	0	0
40.5	0	0	0	0	0	1	0	0
43	0	0	0	0	0	1	0	0

Percent positive

lat	2003	2004	2005	2006	2007	2008	2000	2010
32	0.11	0	0.13	0	0.02	0	0.03	0.20
34.5	0.15	0	0	0	0	0	0	0.04
36	0	0.04	0	0	0	0	0	0
38	0	0	0	0	0	0	0	0
40.5	0	0	0	0	0	0.03	0	0
43	0	0	0	0	0	0.01	0	0

Mean CPUE (kg/ha) of positives

lat	2003	2004	2005	2006	2007	2008	2000	2010
32	0.031	0	0.026	0	0.046	0	0.136	0.846
34.5	0.034	0	0	0	0	0	0	0.022
36	0	0.017	0	0	0	0	0	0
38	0	0	0	0	0	0	0	0
40.5	0	0	0	0	0	0.012	0	0
43	0	0	0	0	0	0.013	0	0

Number of length measurements

lat	2003	2004	2005	2006	2007	2008	2000	2010
32	8	1	28	0	1	0	6	194
34.5	6		1	0	0	0	0	1
36	0	10	5	0	0	0	0	0
38	0	0	0	0	0	0	0	0
40.5	0	0	0	0	0	1	0	0
43	0	0	0	0	0	1	0	0

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Table 7. Summary of age 1 plus (>=20 cm) bocaccio catch data for NWFSC combined shelf-slope bottom trawl survey, 2003-2010.

Total number of hauls, 50 to 350 m

lat	2003	2004	2005	2006	2007	2008	2000	2010
32	37	39	48	49	57	50	64	60
34.5	20	18	17	16	23	24	29	24
36	23	24	32	31	29	41	42	38
38	34	39	50	45	33	42	33	45
40.5	56	28	50	34	41	36	44	49
43	129	136	167	172	196	164	171	180

Number of positive tows

lat	2003	2004	2005	2006	2007	2008	2000	2010
32	5	9	7	11	12	2	7	5
34.5	4	4	2	2	6	3	6	9
36	6	7	12	9	6	8	4	6
38	8	10	8	12	1	8	5	3
40.5	4	0	3	1	2	0	1	0
43	5	0	2	3	3	3	0	1

Percent positive

lat	2003	2004	2005	2006	2007	2008	2000	2010
32	0.14	0.23	0.15	0.22	0.21	0.04	0.11	0.08
34.5	0.20	0.22	0.12	0.13	0.26	0.13	0.21	0.38
36	0.26	0.29	0.38	0.29	0.21	0.20	0.10	0.16
38	0.24	0.26	0.16	0.27	0.03	0.19	0.15	0.07
40.5	0.07	0.00	0.06	0.03	0.05	0.00	0.02	0.00
43	0.04	0.00	0.01	0.02	0.02	0.02	0.00	0.01

Mean CPUE (kg/ha) of positives

lat	2003	2004	2005	2006	2007	2008	2000	2010
32	0.530	0.682	0.533	0.411	1.288	0.093	0.079	0.140
34.5	0.414	1.298	0.200	3.630	0.961	0.216	0.972	0.970
36	0.555	18.757	5.348	0.598	0.965	2.217	0.308	0.187
38	0.832	1.024	0.509	0.918	0.058	0.916	0.374	0.121
40.5	0.195	0.000	0.165	0.010	0.132	0.000	0.101	0.000
43	0.195	0.000	0.017	0.472	0.105	0.124	0.000	0.004

Number of length measurements

lat	2003	2004	2005	2006	2007	2008	2000	2010
32	29	53	83	92	97	7	20	13
34.5	9	29	3	81	25	10	44	47
36	11	368	160	16	21	63	19	8
38	25	32	22	22	1	21	8	3
40.5	9	0	15	1	4	0	3	0
43	16	0	2	50	8	8	0	1

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Table 8: Juvenile trawl survey young-of-the-year (YOY) index, 2001-2010

	09.Index	09.CV	11.Index	11.CV
2001	0.4	0.018	0.369	0.021
2002	0.59	0.018	0.583	0.021
2003	0.16	0.026	0.123	0.029
2004	0.39	0.017	0.353	0.021
2005	0.54	0.024	0.519	0.028
2006	0.09	0.017	0.115	0.017
2007	0.21	0.018	0.225	0.022
2008	0.23	0.018	0.243	0.021
2009			0.262	0.021
2010			0.625	0.033

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Table 9: Key model outputs and likelihood values.

	2009 base model	2009 in SS3.21e	update CalCOFI, add 2011 catches, LFs	update H&L, trawl and pier pre-recruit	Update combo trawl survey (TOR base)	revise combo index (no age 0)	Revise combo, add impinge (STAT base)
R0	5060	5076	5161	5096	5158	5010	5106
SSB0	7861300	7906480	7960810	7802300	7880530	7663930	7812060
biomass0	44070	44225	44763	44028	44532	43271	44116
S2009/SSB0	0.281	0.281	0.272	0.257	0.251	0.244	0.247
S2011/SSB0			0.293	0.271	0.263	0.257	0.260
H. est	0.573	0.574	0.588	0.577	0.611	0.583	0.595
Likelihoods	3102.1	3098.0	3179.2	3237.8	3330.1	3279.0	3303.8
Survey	85.4	85.3	89.0	120.0	124.0	119.3	143.1
Length_comp	2982.4	2978.6	3056.8	3083.4	3166.2	3124.6	3126.5
Recruitment	32.9	32.7	32.0	32.8	37.4	33.6	32.7
Parm_priors	1.4	1.4	1.4	1.5	2.5	1.6	1.5
Survey							
Trawl_south	7.6	7.6	7.5	7.4	7.4	7.3	7.2
RecSouth	7.7	7.7	7.9	8.0	8.0	8.0	8.0
RecCentral	10.1	10.0	10.4	10.6	10.6	10.7	10.8
CalCOFI	21.3	21.3	22.3	21.5	21.6	21.2	21.7
Triennial	4.1	4.1	4.0	3.9	3.9	3.8	3.8
CPFV_index	6.0	6.0	5.9	5.7	5.7	5.6	5.6
SCB_hook	2.4	2.3	2.6	33.5	32.2	32.4	32.3
Combo	2.9	2.9	3.0	2.9	3.8	3.8	3.8
Juv_trawl	3.9	3.9	4.8	5.2	9.5	5.5	5.7
Pier_index	19.4	19.3	20.8	21.5	21.2	20.9	20.5
Impingement	0.0	0.0	0.0	0.0	0.0	86.3	23.6
Length							
Trawl_south	468.1	466.6	466.0	465.7	465.6	465.5	466.5
hook-line	363.0	363.2	362.9	363.0	363.4	363.2	363.3
setnet	356.2	355.9	354.6	354.0	354.2	354.0	354.3
RecSouth	375.4	375.0	416.5	419.9	440.1	422.5	422.8
RecCentral	365.2	364.8	399.4	397.5	401.6	396.0	396.7
Trawl_north	365.4	364.7	366.0	368.3	368.6	368.9	369.2
CalCOFI	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Triennial	151.0	150.9	150.3	148.8	148.1	148.5	148.4
CPFV_index	213.1	212.9	214.4	215.1	215.9	215.3	215.3
SCB_hook	60.9	60.8	57.9	81.0	79.7	81.3	81.0
Combo	137.3	137.1	139.0	139.5	199.7	177.9	177.7

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Table 10. Fixed and estimated parameter values with standard deviations for the base model.

Parameter	est.	09.value	11 value	11 stdev
Natural mortality, both sexes	no	0.15		
Length@Amin, both sexes	no	26		
Length@Amax, females	yes	67.75	67.29	0.34
VonBert K females	yes	0.22	0.22	0.00
Length@Amax, males	yes	58.89	58.49	0.30
VonBert K males	yes	0.27	0.27	0.01
CV of size at Amin, both sexes	no	0.1		
CV of size at Amax, both sexes	no	0.08		
log R0	yes	8.53	8.54	0.09
Steepness (h)	yes	0.57	0.60	0.08
Sigma-R	no	1		
Initial F, hook and line fleet	yes	0.01	0.01	0.00
length@peak_trawlsou	yes	43.42	43.25	0.18
Width of top_trawlsou	no	-4.82	-4.82	
Ascending width_trawlsou	no	4.3	4.30	
Decending width_trawlsou	no	4.76	4.76	
Initial sel_trawlsou	no	-10.5	-10.50	
final sel_trawlsou	no	-0.77	-0.77	
length@peak_hook and line	yes	50.24	50.06	0.78
Width of top_hook and line	yes	-4.09	-4.12	2.52
Ascending width_hook and line	yes	4.33	4.32	0.13
Decending width_hook and line	yes	3.98	3.99	0.52
Initial sel_hook and line	yes	-9.41	-9.38	4.09
final sel_hook and line	yes	-0.67	-0.66	0.31
length@peak_setnet	yes	48.57	48.47	0.36
Width of top_setnet	yes	-7.41	-7.48	5.31
Ascending width_setnet	yes	3.45	3.44	0.10
Decending width_setnet	yes	4.15	4.14	0.18
Initial sel_setnet	yes	-6.07	-6.03	0.32
final sel_setnet	yes	-1.59	-1.58	0.21
length@peak_southern rec	yes	38.37	38.27	0.49
Width of top_southern rec	yes	-7.64	-7.84	5.05
Ascending width_southern rec	yes	4.66	4.58	0.11
Decending width_southern rec	yes	5.47	5.32	0.10
Initial sel_southern rec	yes	-4.47	-4.65	0.28
final sel_southern rec	yes	-3.23	-3.05	0.35
logistic, size infl_central rec	yes	34.44	33.70	0.44
logistic, width 95%_central rec	yes	11.7	11.03	0.54
logistic, size infl_northern trawl	yes	40.34	40.13	0.38
logistic, width 95%_northern trawl	yes	6.35	6.21	0.52
length@peak_triennial	no	24	24.00	
Width of top_triennial	no	-9.79	-9.79	
Ascending width_triennial	no	6.11	6.11	
Decending width_triennial	no	5.56	5.56	
Initial sel_triennial	no	-2.86	-2.86	
final sel_triennial	no	-1.25	-1.25	
length@peak_SCB hook line	yes	55.07	47.81	3.24
Width of top_SCB hook line	yes	-5.73	-1.46	0.52
Ascending width_SCB hook line	yes	6	5.28	0.39
Decending width_SCB hook line	yes	2.92	2.61	1.19
Initial sel_SCB hook line	yes	-7.76	-5.75	1.40
final sel_SCB hook line	yes	-1.12	-1.13	0.45
logistic, size inflection_NWFSC combo	yes	22.56	9.91	12.39
logistic, width 95% inflect_NWFSC combo	yes	15.19	15.86	9.17

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Table 11. Fixed and estimated parameter values for recruitment deviations for the base model.

Parameter	09.value	11 value	11 stdev
RecrDev_1954	0.13	0.08	0.61
RecrDev_1955	-1.03	-1.29	0.67
RecrDev_1956	0.26	0.18	0.65
RecrDev_1957	-0.96	-1.23	0.68
RecrDev_1958	-0.31	-0.36	0.97
RecrDev_1959	0.36	1.35	1.10
RecrDev_1960	0.07	0.17	1.23
RecrDev_1961	0	0.07	1.12
RecrDev_1962	3.18	0.04	1.10
RecrDev_1963	0.04	3.06	0.32
RecrDev_1964	0.03	-0.03	1.05
RecrDev_1965	0	-0.08	1.02
RecrDev_1966	1.42	1.34	0.58
RecrDev_1967	-0.14	-0.19	0.96
RecrDev_1968	-0.13	-0.17	0.96
RecrDev_1969	0.02	-0.01	1.02
RecrDev_1970	0.42	0.39	0.98
RecrDev_1971	0.52	0.09	0.95
RecrDev_1972	1.02	1.16	0.26
RecrDev_1973	1.96	1.90	0.13
RecrDev_1974	0.95	0.92	0.16
RecrDev_1975	-0.87	-0.51	0.26
RecrDev_1976	-0.15	-0.28	0.24
RecrDev_1977	2.57	2.54	0.08
RecrDev_1978	-0.14	-0.03	0.32
RecrDev_1979	1.01	0.95	0.11
RecrDev_1980	-0.32	-0.36	0.18
RecrDev_1981	-0.97	-1.02	0.19
RecrDev_1982	-2.66	-2.69	0.35
RecrDev_1983	-0.22	-0.28	0.11
RecrDev_1984	1.77	1.72	0.06
RecrDev_1985	-0.58	-0.59	0.16
RecrDev_1986	-0.65	-0.71	0.15
RecrDev_1987	0.6	0.50	0.12
RecrDev_1988	1.67	1.61	0.10
RecrDev_1989	-1.31	-1.27	0.29
RecrDev_1990	0.56	0.43	0.15
RecrDev_1991	0.5	0.39	0.17
RecrDev_1992	-0.81	-0.86	0.29
RecrDev_1993	0.04	-0.08	0.17
RecrDev_1994	-0.25	-0.38	0.18
RecrDev_1995	-0.86	-0.95	0.23
RecrDev_1996	-0.27	-0.45	0.18
RecrDev_1997	-1.84	-1.87	0.33
RecrDev_1998	-0.13	-0.29	0.21
RecrDev_1999	1.73	1.57	0.15
RecrDev_2000	-1.67	-1.57	0.36
RecrDev_2001	-1.5	-1.71	0.34
RecrDev_2002	-0.2	-0.43	0.20
RecrDev_2003	0.85	0.62	0.13
RecrDev_2004	-1.15	-1.50	0.28
RecrDev_2005	0.68	0.51	0.13
RecrDev_2006	-1.48	-0.99	0.25
RecrDev_2007	-0.86	-0.24	0.16
RecrDev_2008	-0.87	-0.31	0.18
RecrDev_2009	n/a	0.61	0.18
RecrDev_2010	n/a	0.51	0.44

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Table 12. Time series of key model outputs for 2011 base model.

Year	Total biomass	Summary biomass	Spawning output	CV spawning	Depletion	Recruits (x 103)	CV recruits	Total catch	Exploit. rate	SPR rate
Unfished	44183	44116	7812	0.094	1.000	5106	0.094	0	0.000	1.00
1893	42757	42691	7533	0.097	0.964	5074	0.093	157	0.004	0.96
1894	42746	42680	7532	0.097	0.964	5074	0.093	148	0.003	0.97
1895	42740	42674	7533	0.097	0.964	5074	0.093	139	0.003	0.97
1896	42739	42673	7533	0.097	0.964	5074	0.093	131	0.003	0.97
1897	42742	42676	7535	0.097	0.964	5075	0.093	123	0.003	0.97
1898	42751	42685	7537	0.097	0.965	5075	0.093	115	0.003	0.97
1899	42765	42698	7539	0.097	0.965	5075	0.093	108	0.003	0.97
1900	42784	42718	7543	0.097	0.966	5076	0.093	119	0.003	0.97
1901	42790	42724	7544	0.096	0.966	5076	0.093	131	0.003	0.97
1902	42783	42717	7543	0.096	0.966	5076	0.093	142	0.003	0.97
1903	42765	42698	7540	0.096	0.965	5075	0.093	154	0.004	0.96
1904	42735	42669	7535	0.096	0.965	5075	0.093	165	0.004	0.96
1905	42696	42630	7528	0.096	0.964	5074	0.093	176	0.004	0.96
1906	42649	42583	7520	0.096	0.963	5073	0.093	188	0.004	0.96
1907	42594	42527	7510	0.096	0.961	5072	0.093	199	0.005	0.95
1908	42531	42465	7499	0.097	0.960	5070	0.093	210	0.005	0.95
1909	42462	42396	7486	0.097	0.958	5069	0.093	237	0.006	0.95
1910	42373	42307	7470	0.097	0.956	5067	0.093	263	0.006	0.94
1911	42264	42198	7450	0.097	0.954	5065	0.093	289	0.007	0.93
1912	42137	42071	7427	0.097	0.951	5062	0.093	316	0.008	0.93
1913	41993	41927	7400	0.098	0.947	5059	0.093	342	0.008	0.92
1914	41835	41769	7371	0.098	0.944	5055	0.093	368	0.009	0.92
1915	41663	41597	7339	0.098	0.939	5051	0.093	395	0.009	0.91
1916	41479	41413	7305	0.099	0.935	5047	0.092	474	0.011	0.89
1917	41228	41162	7260	0.099	0.929	5041	0.092	747	0.018	0.83
1918	40721	40655	7171	0.100	0.918	5030	0.092	799	0.020	0.82
1919	40194	40129	7077	0.102	0.906	5018	0.092	529	0.013	0.88
1920	39976	39910	7032	0.102	0.900	5012	0.092	550	0.014	0.87
1921	39761	39695	6988	0.103	0.895	5006	0.092	463	0.012	0.89
1922	39655	39590	6963	0.103	0.891	5003	0.092	417	0.011	0.90
1923	39609	39544	6949	0.103	0.890	5001	0.091	489	0.012	0.88
1924	39500	39434	6926	0.103	0.887	4998	0.091	442	0.011	0.89
1925	39447	39382	6913	0.103	0.885	4996	0.091	505	0.013	0.88
1926	39338	39273	6891	0.103	0.882	4993	0.091	711	0.018	0.83
1927	39031	38966	6837	0.104	0.875	4986	0.091	610	0.016	0.85
1928	38841	38776	6802	0.104	0.871	4981	0.091	639	0.016	0.85
1929	38635	38570	6763	0.105	0.866	4975	0.091	597	0.015	0.85
1930	38487	38422	6733	0.105	0.862	4971	0.091	715	0.019	0.83
1931	38232	38167	6687	0.106	0.856	4964	0.091	689	0.018	0.84
1932	38024	37960	6645	0.106	0.851	4958	0.090	556	0.015	0.86
1933	37967	37903	6629	0.106	0.849	4956	0.090	429	0.011	0.89
1934	38046	37982	6638	0.106	0.850	4957	0.090	494	0.013	0.88
1935	38058	37993	6637	0.106	0.850	4957	0.090	534	0.014	0.87

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Table 12 (continued)

Year	Total biomass	Summary biomass	Spawning output	CV spawning	Depletion	Recruits (x 103)	CV recruits	Total catch	Exploit. rate	SPR rate
1936	38029	37964	6630	0.106	0.849	4956	0.090	632	0.017	0.85
1937	37900	37836	6608	0.106	0.846	4953	0.090	589	0.016	0.85
1938	37821	37757	6593	0.106	0.844	4951	0.090	461	0.012	0.88
1939	37876	37812	6600	0.105	0.845	4952	0.090	373	0.010	0.90
1940	38021	37956	6621	0.105	0.848	4955	0.090	382	0.010	0.90
1941	38150	38085	6642	0.104	0.850	4958	0.090	308	0.008	0.92
1942	38346	38281	6675	0.104	0.854	4963	0.090	124	0.003	0.97
1943	38715	38650	6738	0.103	0.862	4972	0.090	292	0.008	0.92
1944	38901	38836	6768	0.102	0.866	4976	0.090	737	0.019	0.83
1945	38647	38582	6716	0.103	0.860	4969	0.090	1413	0.037	0.70
1946	37752	37687	6541	0.105	0.837	4943	0.090	880	0.023	0.79
1947	37417	37353	6473	0.106	0.829	4933	0.090	890	0.024	0.79
1948	37099	37035	6408	0.107	0.820	4923	0.089	766	0.021	0.81
1949	36910	36846	6374	0.108	0.816	4918	0.089	828	0.022	0.79
1950	36662	36598	6333	0.108	0.811	4912	0.089	1216	0.033	0.71
1951	36022	35958	6228	0.110	0.797	4895	0.089	1759	0.049	0.61
1952	34856	34792	6031	0.114	0.772	4863	0.089	1966	0.057	0.56
1953	33499	33436	5808	0.118	0.743	4824	0.088	2271	0.068	0.49
1954	31882	31815	5535	0.124	0.709	5185	0.599	2402	0.075	0.45
1955	30154	30137	5249	0.130	0.672	1304	0.675	3053	0.101	0.34
1956	27653	27581	4863	0.140	0.623	5536	0.645	3650	0.132	0.26
1957	24339	24322	4377	0.153	0.560	1318	0.690	3566	0.147	0.23
1958	21109	21070	3829	0.172	0.490	3013	0.978	3580	0.170	0.19
1959	17968	17761	3253	0.200	0.416	15886	1.050	2847	0.160	0.21
1960	16398	16337	2807	0.235	0.359	4664	1.268	2436	0.149	0.22
1961	16511	16459	2440	0.270	0.312	3981	1.159	1924	0.117	0.31
1962	17515	17464	2432	0.229	0.311	3879	1.128	1731	0.099	0.42
1963	19556	18479	2674	0.263	0.342	82499	0.230	2008	0.109	0.40
1964	25268	25218	2820	0.332	0.361	3805	1.077	1523	0.060	0.52
1965	37326	37277	3100	0.348	0.397	3734	1.040	1746	0.047	0.62
1966	49154	48938	4621	0.218	0.592	16595	0.572	3418	0.070	0.60
1967	57295	57246	6953	0.143	0.890	3741	0.958	5331	0.093	0.51
1968	60687	60637	8303	0.137	1.063	3763	0.961	3405	0.056	0.63
1969	62814	62758	9314	0.126	1.192	4264	1.017	2347	0.037	0.71
1970	63450	63370	10136	0.106	1.297	6138	0.969	2846	0.045	0.64
1971	61683	61626	10412	0.094	1.333	4343	0.946	2497	0.041	0.64
1972	59216	59060	10355	0.083	1.326	11959	0.240	3653	0.062	0.49
1973	55434	55125	9871	0.073	1.264	23622	0.088	7201	0.131	0.24
1974	49393	49285	8665	0.066	1.109	8306	0.134	9001	0.183	0.14
1975	43263	43239	7233	0.064	0.926	1839	0.247	6404	0.148	0.21
1976	39913	39884	6626	0.057	0.848	2264	0.226	6177	0.155	0.24
1977	36165	35676	6225	0.050	0.797	37479	0.035	4861	0.136	0.28
1978	34519	34482	5788	0.045	0.741	2839	0.317	4367	0.127	0.28
1979	35467	35370	5247	0.043	0.672	7376	0.084	6116	0.173	0.20

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Table 12 (continued)

Year	Total biomass	Summary biomass	Spawning output	CV spawning	Depletion	Recruits (x 103)	CV recruits	Total catch	Exploit. rate	SPR rate
1980	34421	34396	4988	0.038	0.638	1981	0.176	5384	0.157	0.26
1981	33001	32988	5099	0.031	0.653	1028	0.184	5752	0.174	0.25
1982	29624	29622	4832	0.028	0.619	190	0.345	6599	0.223	0.17
1983	23902	23876	4175	0.027	0.534	2048	0.103	5598	0.234	0.17
1984	18527	18342	3374	0.028	0.432	14189	0.028	4676	0.255	0.13
1985	14514	14497	2560	0.033	0.328	1271	0.154	2864	0.198	0.16
1986	13344	13330	2047	0.037	0.262	1027	0.138	3121	0.234	0.11
1987	12023	11981	1750	0.040	0.224	3230	0.078	2649	0.221	0.16
1988	11120	10994	1686	0.040	0.216	9600	0.049	2304	0.210	0.21
1989	10653	10646	1552	0.043	0.199	516	0.287	2756	0.259	0.14
1990	9991	9957	1291	0.051	0.165	2569	0.107	2624	0.264	0.12
1991	9250	9220	1173	0.060	0.150	2343	0.121	1714	0.186	0.23
1992	9155	9146	1252	0.064	0.160	690	0.283	1832	0.200	0.23
1993	8575	8556	1221	0.073	0.156	1485	0.145	1593	0.186	0.25
1994	7856	7841	1171	0.084	0.150	1076	0.163	1294	0.165	0.26
1995	7174	7167	1121	0.096	0.143	592	0.216	818	0.114	0.38
1996	6796	6783	1090	0.106	0.140	961	0.166	547	0.081	0.48
1997	6540	6537	1086	0.112	0.139	232	0.328	498	0.076	0.48
1998	6227	6212	1063	0.120	0.136	1119	0.205	211	0.034	0.71
1999	6204	6110	1067	0.123	0.137	7216	0.138	213	0.035	0.68
2000	6514	6510	1055	0.126	0.135	309	0.363	160	0.025	0.75
2001	7347	7344	1052	0.129	0.135	267	0.349	139	0.019	0.82
2002	8142	8129	1161	0.129	0.149	1023	0.200	90	0.011	0.90
2003	8801	8760	1357	0.129	0.174	3187	0.148	13	0.001	0.99
2004	9433	9427	1505	0.129	0.193	405	0.293	85	0.009	0.91
2005	9962	9922	1588	0.131	0.203	3090	0.154	107	0.011	0.89
2006	10390	10381	1672	0.132	0.214	707	0.270	60	0.006	0.94
2007	10862	10842	1764	0.133	0.226	1542	0.189	63	0.006	0.94
2008	11210	11191	1850	0.135	0.237	1475	0.207	39	0.004	0.94
2009	11505	11456	1932	0.136	0.247	3750	0.208	58	0.005	0.94
2010	11879	11834	1987	0.137	0.254	3433	0.455	75	0.006	0.93
2011	12492	12447	2029	0.138	0.260	3441	1.007			

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Table 13: Decision table for base model

Catch basis		low 2010 rec		STAT. Base		higher 2010 rec	
low 2010 rec		larvaex10^{12}	depletion	larvaex10^{12}	depletion	larvaex10^{12}	depletion
2011	*263*	2.07	0.26	2.03	0.26	2.01	0.26
2012	*274*	2.11	0.27	2.07	0.27	2.07	0.27
2013	276	2.19	0.28	2.17	0.28	2.28	0.29
2014	306	2.28	0.29	2.31	0.30	2.59	0.33
2015	338	2.40	0.31	2.47	0.32	2.88	0.37
2016	370	2.54	0.33	2.64	0.34	3.14	0.40
2017	400	2.69	0.34	2.81	0.36	3.38	0.43
2018	427	2.85	0.36	2.98	0.38	3.59	0.46
2019	453	3.01	0.39	3.15	0.40	3.78	0.48
2020	476	3.16	0.40	3.31	0.42	3.96	0.51
2021	491	3.31	0.42	3.47	0.44	4.12	0.53
2022	506	3.46	0.44	3.62	0.46	4.27	0.55
STAT base		larvaex10^{12}	depletion	larvaex10^{12}	depletion	larvaex10^{12}	depletion
2011	*263*	2.07	0.26	2.03	0.26	2.01	0.26
2012	*274*	2.11	0.27	2.07	0.26	2.07	0.27
2013	303	2.19	0.28	2.17	0.28	2.28	0.29
2014	340	2.28	0.29	2.31	0.29	2.58	0.33
2015	375	2.39	0.31	2.46	0.31	2.87	0.37
2016	406	2.53	0.32	2.62	0.33	3.13	0.40
2017	436	2.67	0.34	2.79	0.35	3.35	0.43
2018	463	2.82	0.36	2.95	0.37	3.56	0.46
2019	489	2.97	0.38	3.11	0.39	3.74	0.48
2020	506	3.12	0.40	3.27	0.41	3.91	0.50
2021	522	3.26	0.42	3.42	0.43	4.07	0.52
2022	537	3.41	0.44	3.56	0.45	4.21	0.54
higher 2010 rec		larvaex10^{12}	depletion	larvaex10^{12}	depletion	larvaex10^{12}	depletion
2011	*263*	2.07	0.26	2.03	0.26	2.01	0.26
2012	*274*	2.11	0.27	2.07	0.27	2.07	0.27
2013	385	2.19	0.28	2.17	0.28	2.28	0.29
2014	444	2.27	0.29	2.30	0.29	2.57	0.33
2015	478	2.36	0.30	2.43	0.31	2.84	0.36
2016	501	2.48	0.32	2.57	0.33	3.08	0.39
2017	513	2.61	0.33	2.72	0.35	3.29	0.42
2018	524	2.74	0.35	2.87	0.37	3.47	0.44
2019	536	2.88	0.37	3.02	0.39	3.65	0.47
2020	549	3.01	0.39	3.16	0.40	3.81	0.49
2021	562	3.15	0.40	3.30	0.42	3.95	0.51
2022	574	3.28	0.42	3.44	0.44	4.09	0.52

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Table 14: Base model reference points

STAT model reference points

Unfished Stock	Estimate	95% Confidence Limits Lower	Upper
Summary (1+) Biomass	44412	36148	52675
Spawning Output (x 10^9)	7812	6349	9275
Equilibrium recruitment	5112	4151	6073

Yield reference Points

	$SSB_{40\%}$	SPR proxy	MSY est.
SPR	0.502	0.500	0.445
Exploitation rate	0.065	0.065	0.078
Yield	1217	1218	1239
Spawning output (x 109)	3125	3107	2587
Summary biomass	18779	18682	15817
Recruits (x 10^3)	4070	4062	3802
SSB/SSB_0	0.400	0.398	0.331

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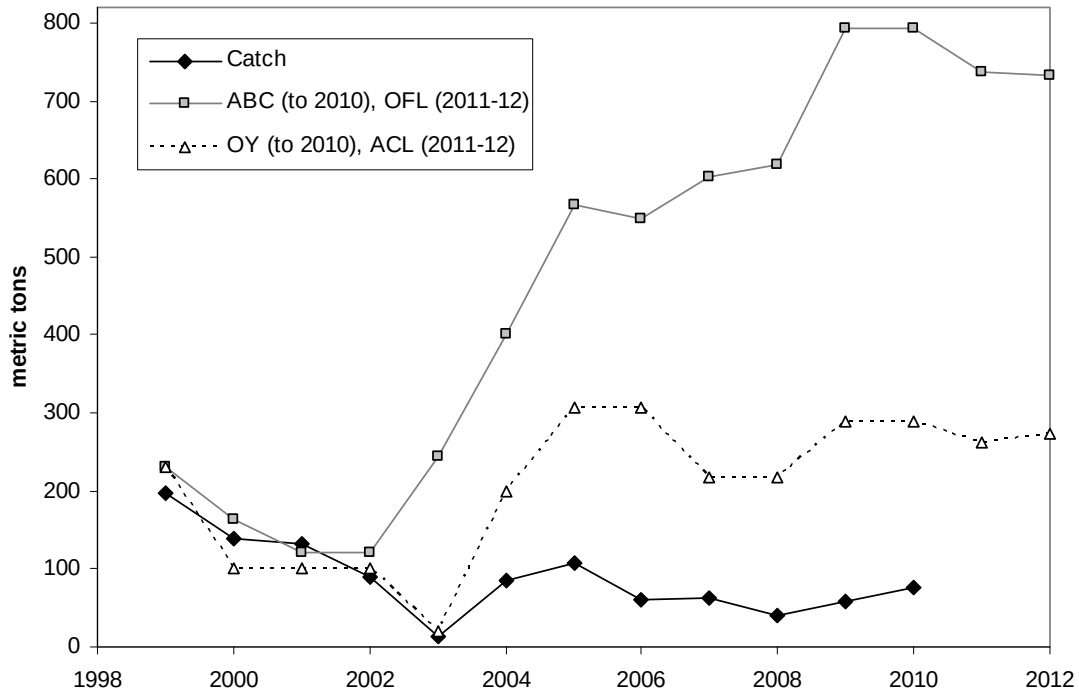

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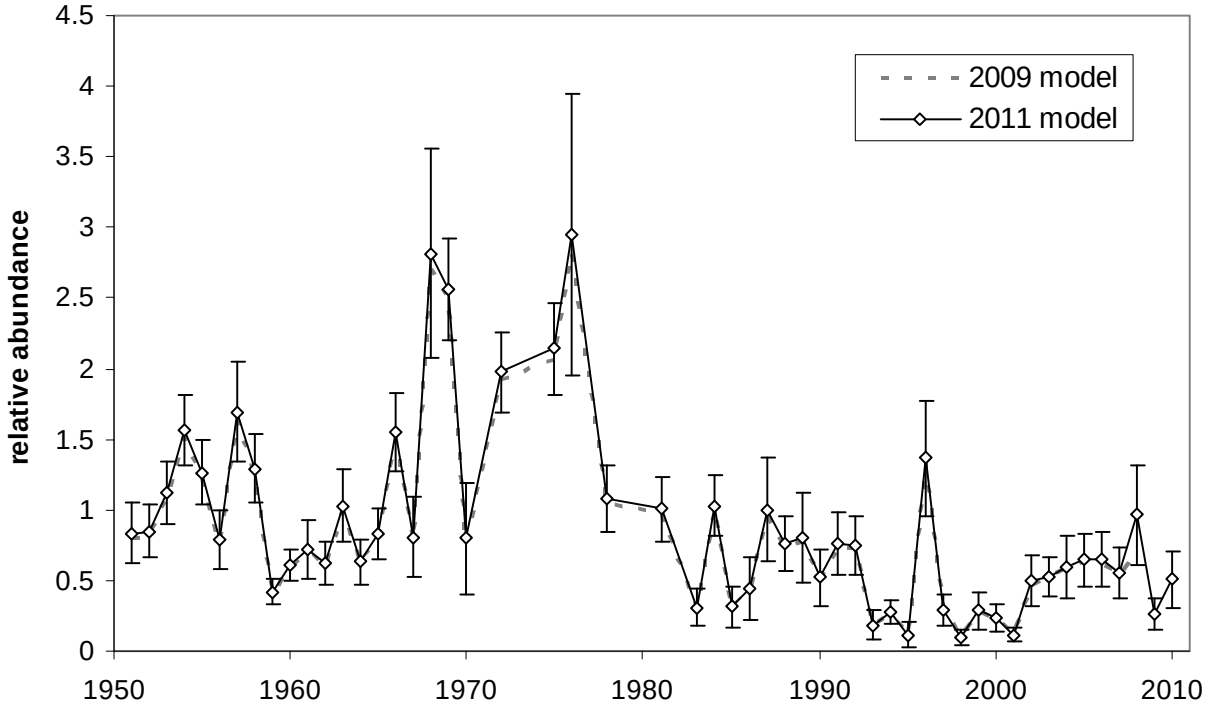
Figure 1: Management performance with PFMC adopted ABC and OY values (to 2010, OFL and ACL values for 2011-2012) relative to estimated catches from 1999-2012.



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Figures 2. CalCOFI larval abundance indices for the coastwide bocaccio model updated through part of 2010 as compared to 2009 estimate.

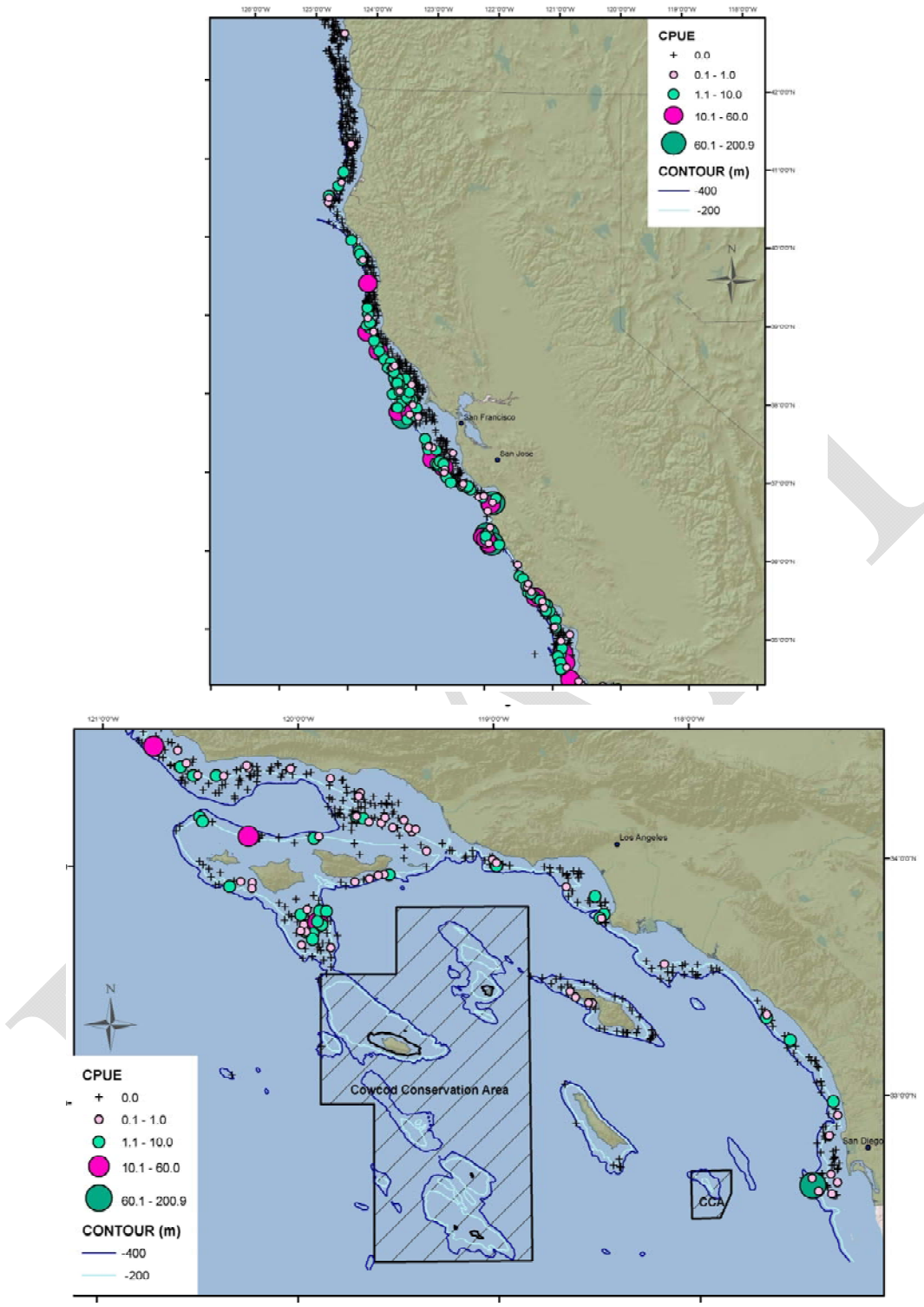
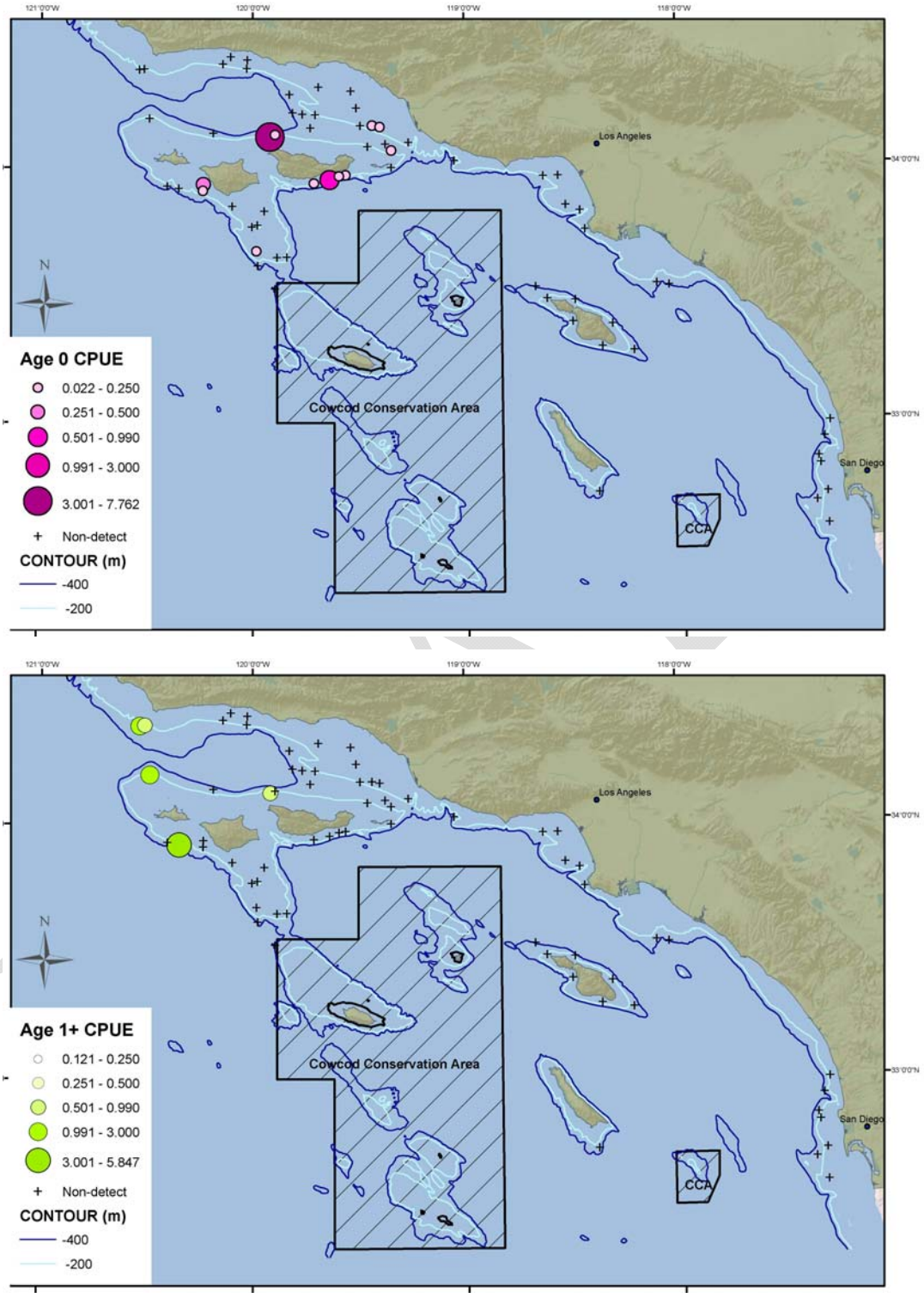
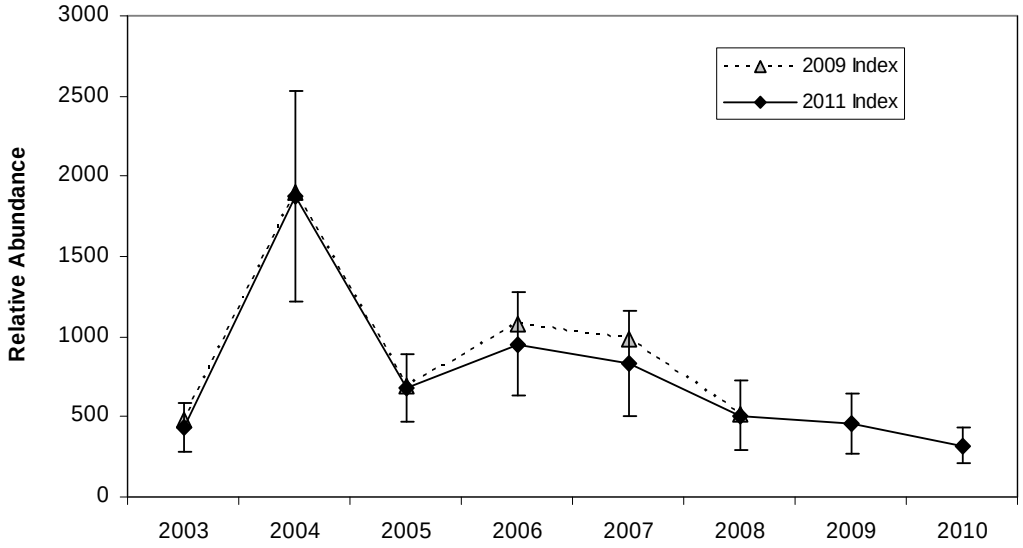
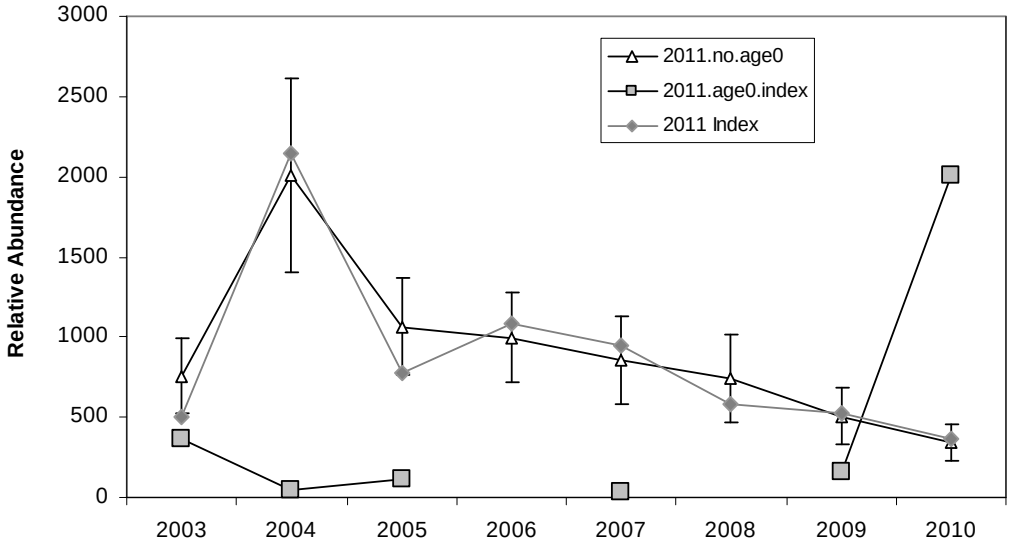


Figure 3a-b: NWFSC Combined shelf-slope survey CPUE for bocaccio rockfish, all years (2003-2010) combined.

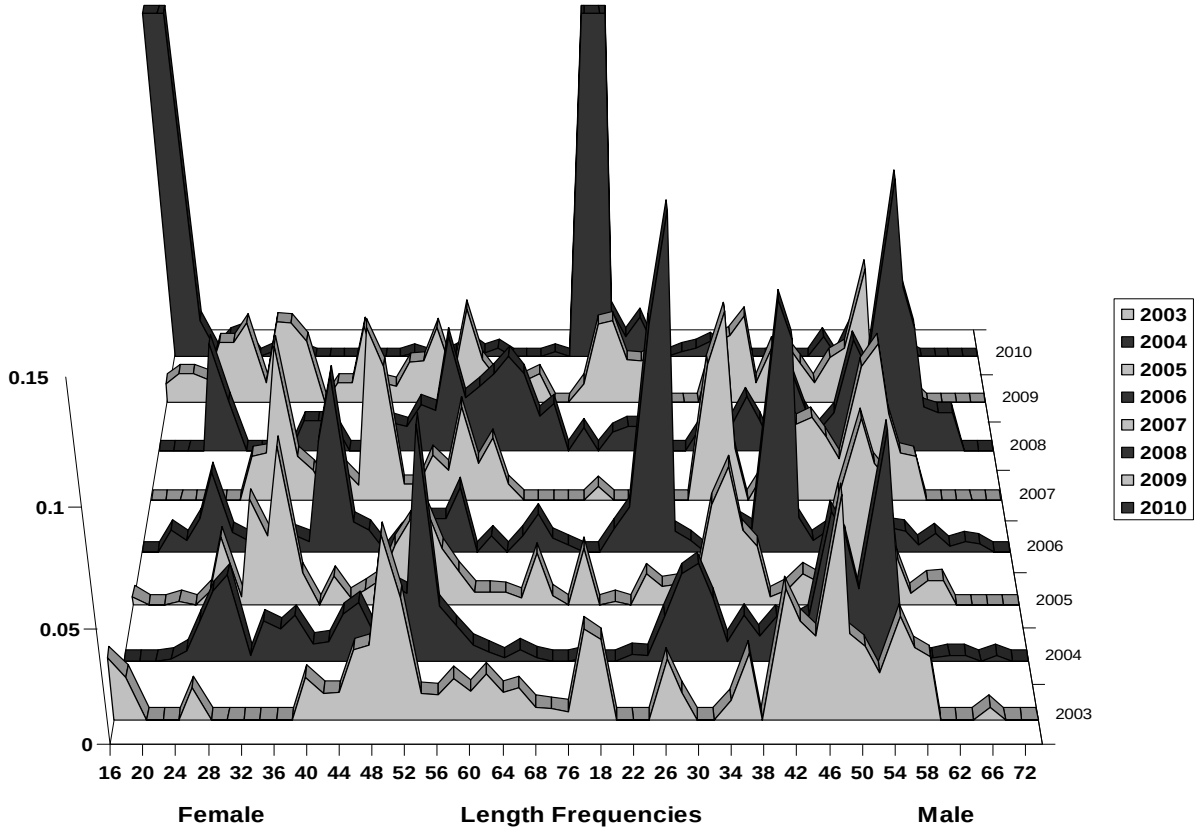


Figures 4a-b. Northwest Fisheries Science Center combined trawl survey catches of likely age-0 (<22 cm) bocaccio (top) and likely age 1+ (=>22 cm) bocaccio (bottom) in the Southern California Bight during 2010.





Figures 5a-b. 5a (top), Comparison 2009 and updated 2011 GLMM relative abundance estimates for bocaccio rockfish from the NWFSC Combined survey with all data. Error bars shown for 2011 only (comparable to 2009. 5b (bottom) the revised 2011 index as in 5a, and with all age 0 fish (<20 cm) removed, as well as an age 0 "index" based on CPUE data.



Figures 5c. Length frequency information for the 2003-2010 combined trawl survey.

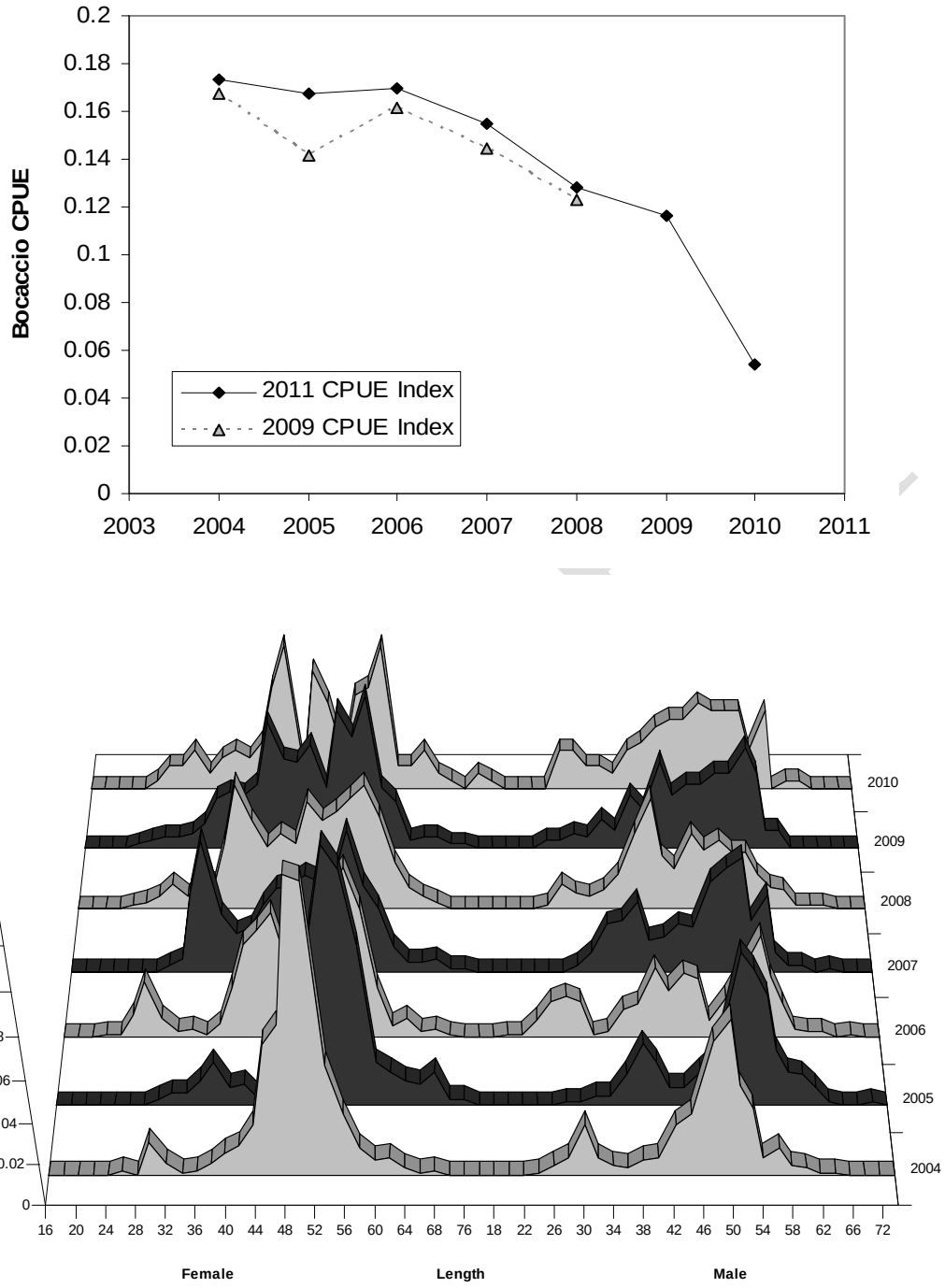
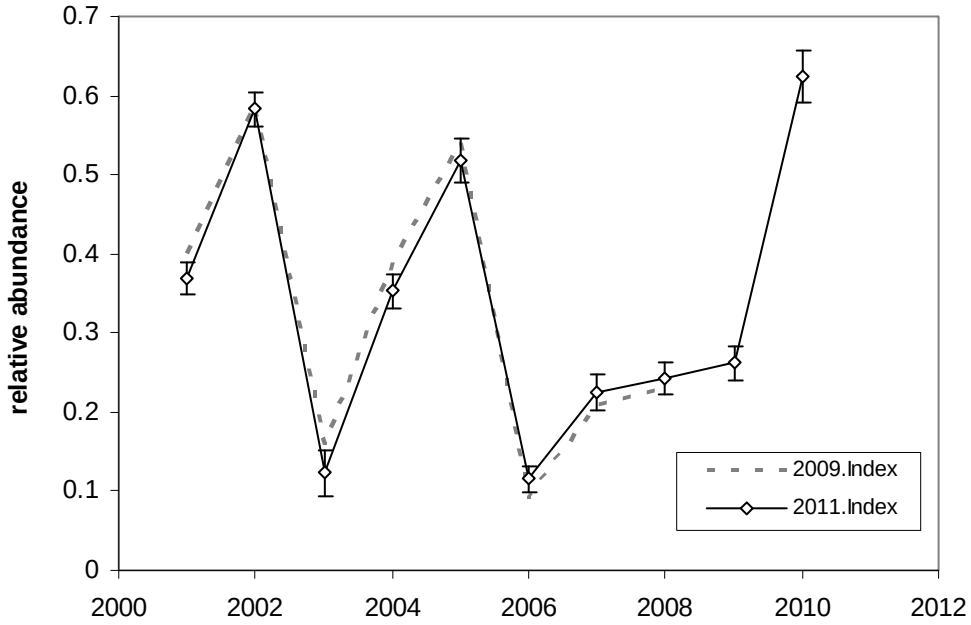
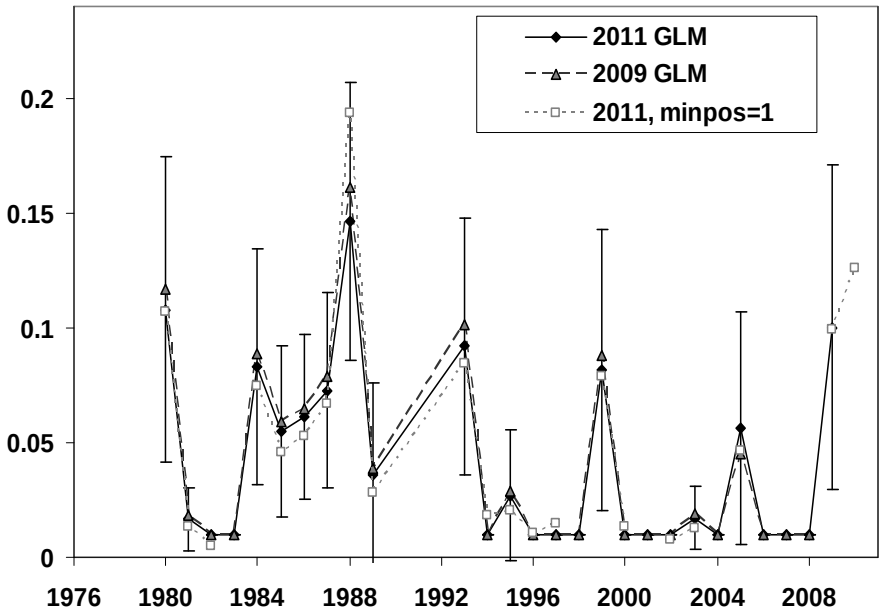


Figure 6a-b. Figure 6a (top) Catch rate indices of bocaccio abundance for the NWFSC hook-and-line survey in the Southern California Bight, 2004-2010 and Figure 6b (bottom), length frequency distribution for all bocaccio rockfish measured in the same survey.





Figures 7a-b. Figure 7a (top), 2009 and current index for the coastwide pelagic juvenile trawl survey index of bocaccio YOY abundance; 7b (bottom), 2009 and current index for the 1980-2010 pier fishery index.

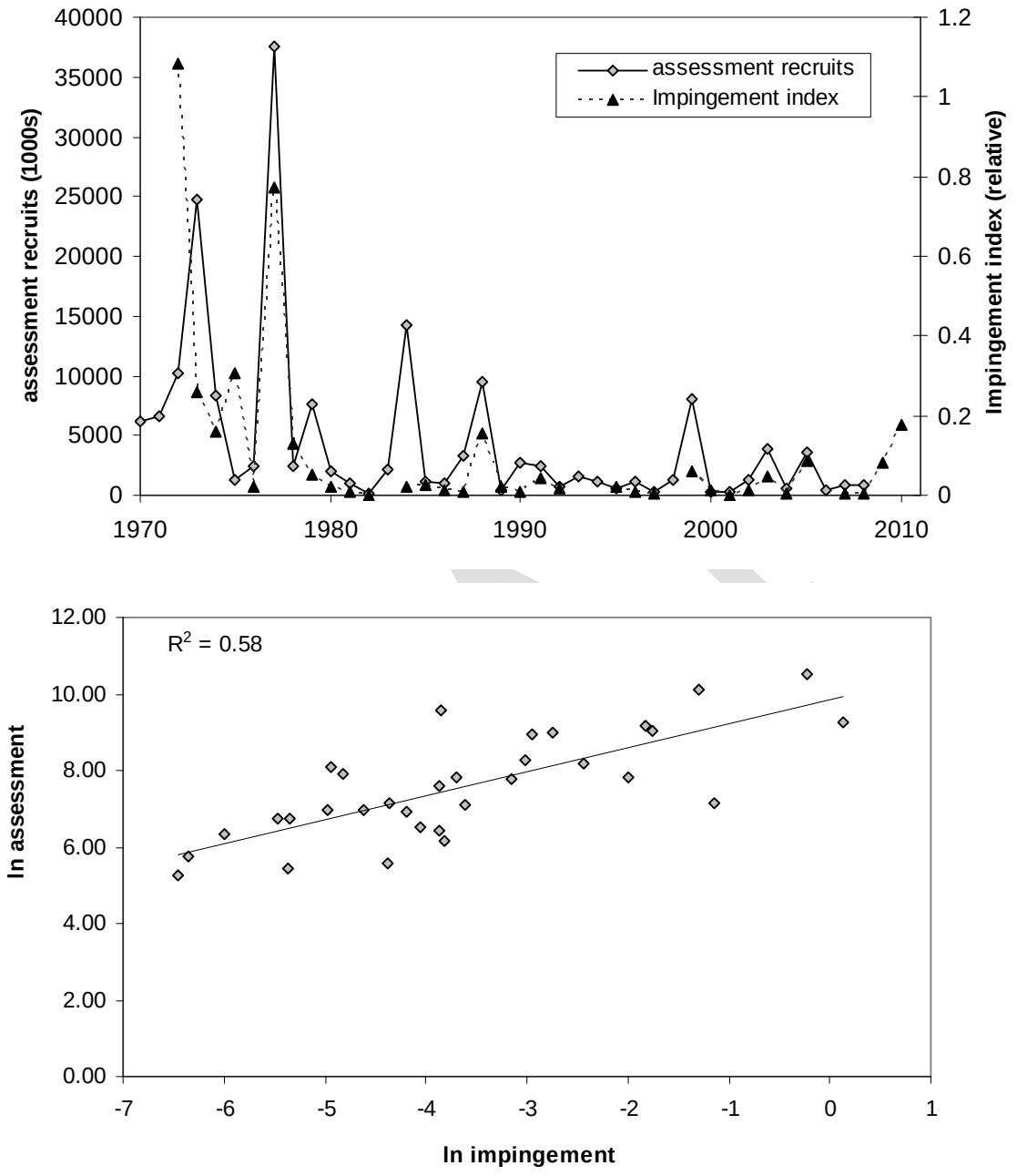


Figure 8a-b. Recruitment estimates from the 2009 model (run with zero emphasis on the recruitment indices) compared to an index of age-0 abundance developed from the Power plant impingement dataset provided by Eric Miller (MBC Applied Environmental Sciences).

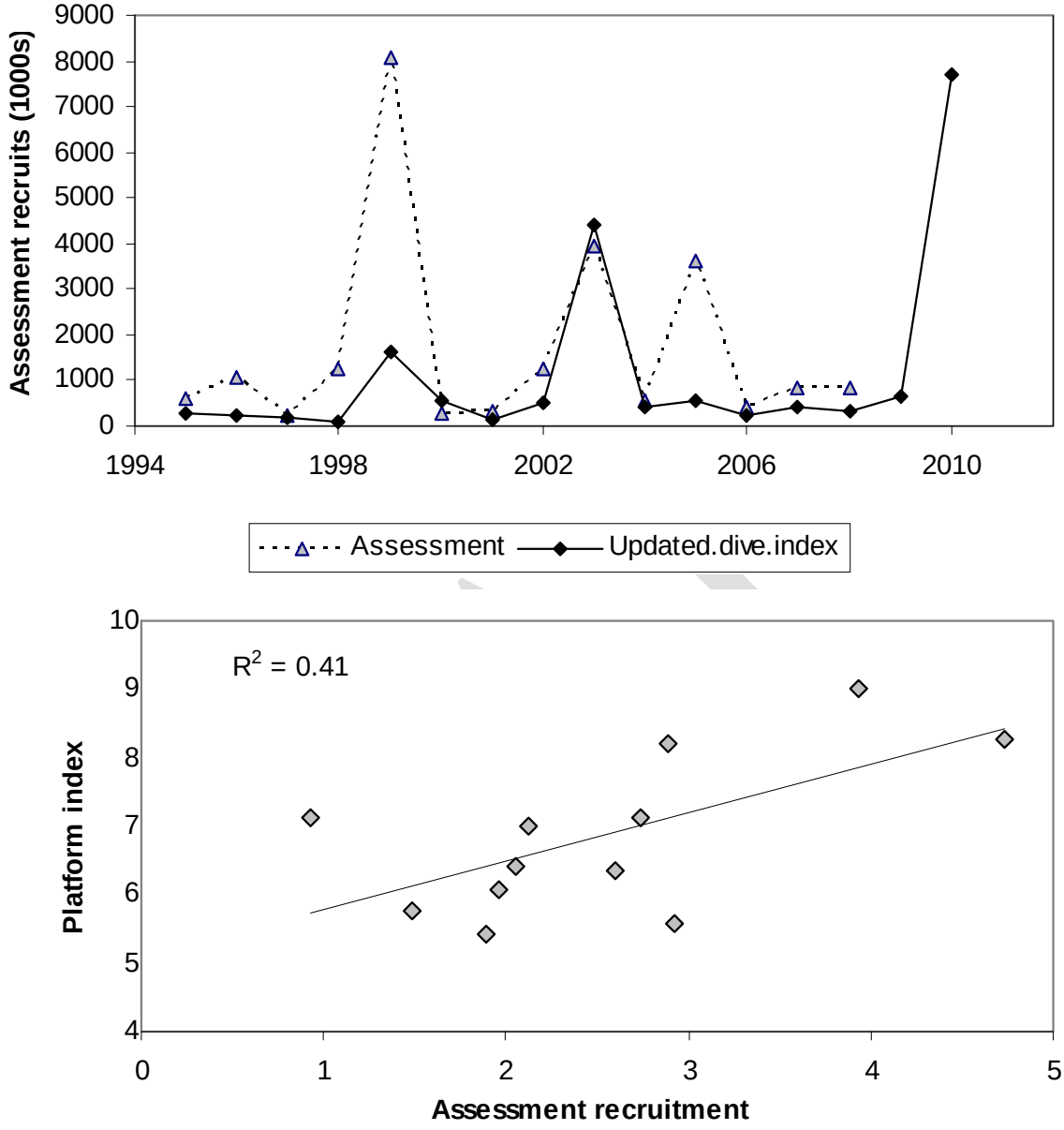


Figure 9a-b: Recruitment estimates from the 2009 model (run with zero emphasis on the recruitment indices) compared to an index of age-0 abundance developed from the delta submersible dive survey conducted by M. Love (USCB, Pers. Com).

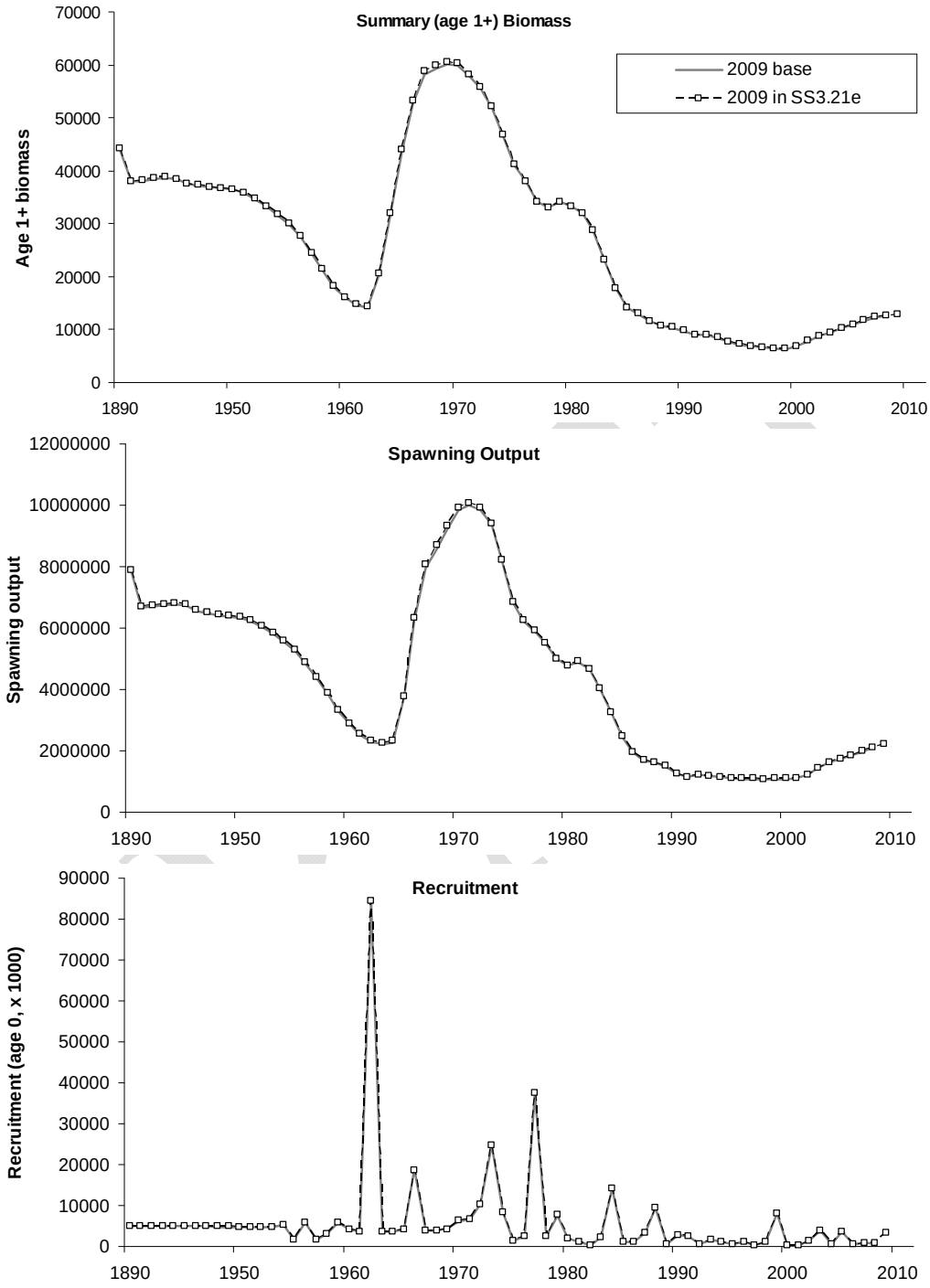


Figure 10: Comparison of the 2009 base model with in both the 2009 SS3 version and SS3 version 3.21e (used for this assessment).

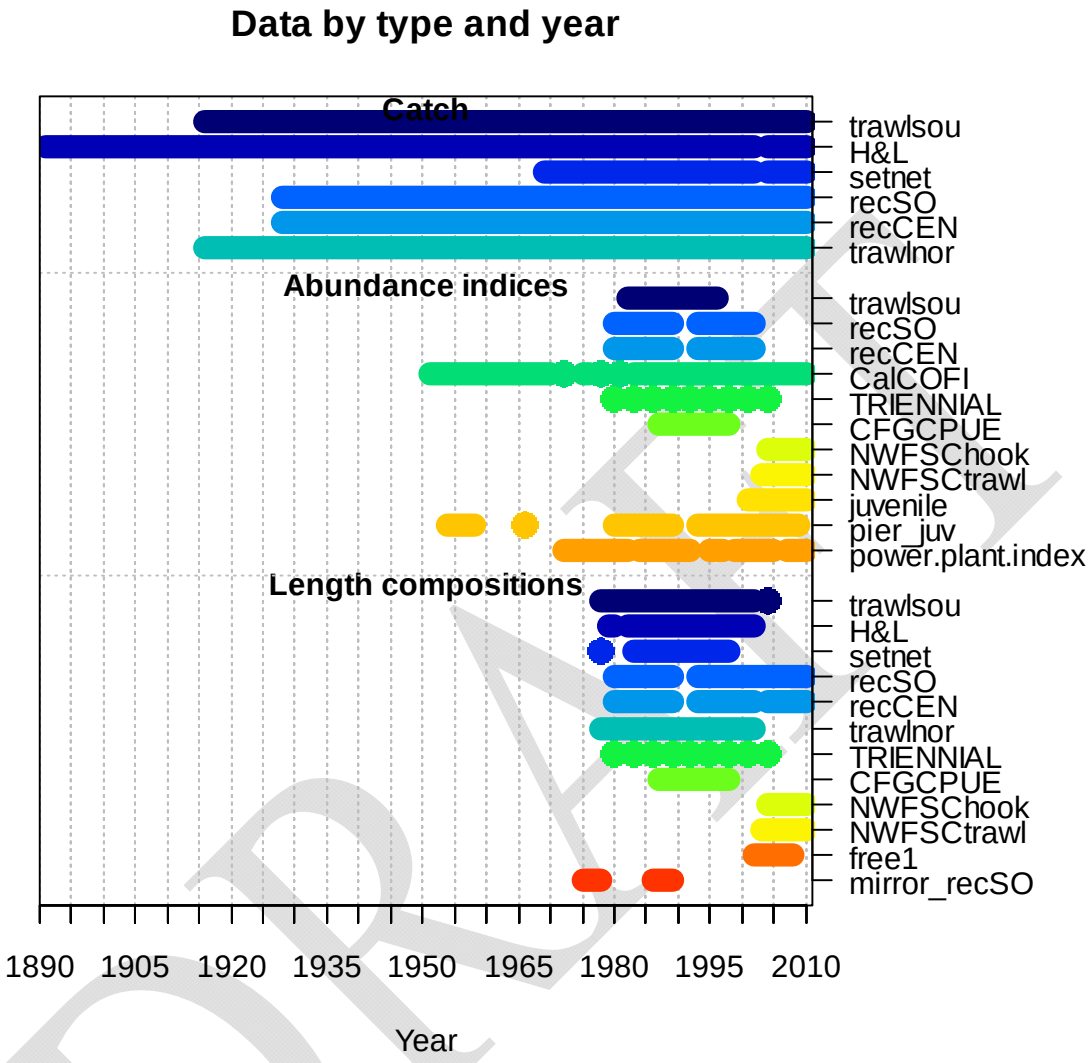


Figure 11: Summary of major sources of data used in the bocaccio model (only fits to updated data or time series are shown in the update).

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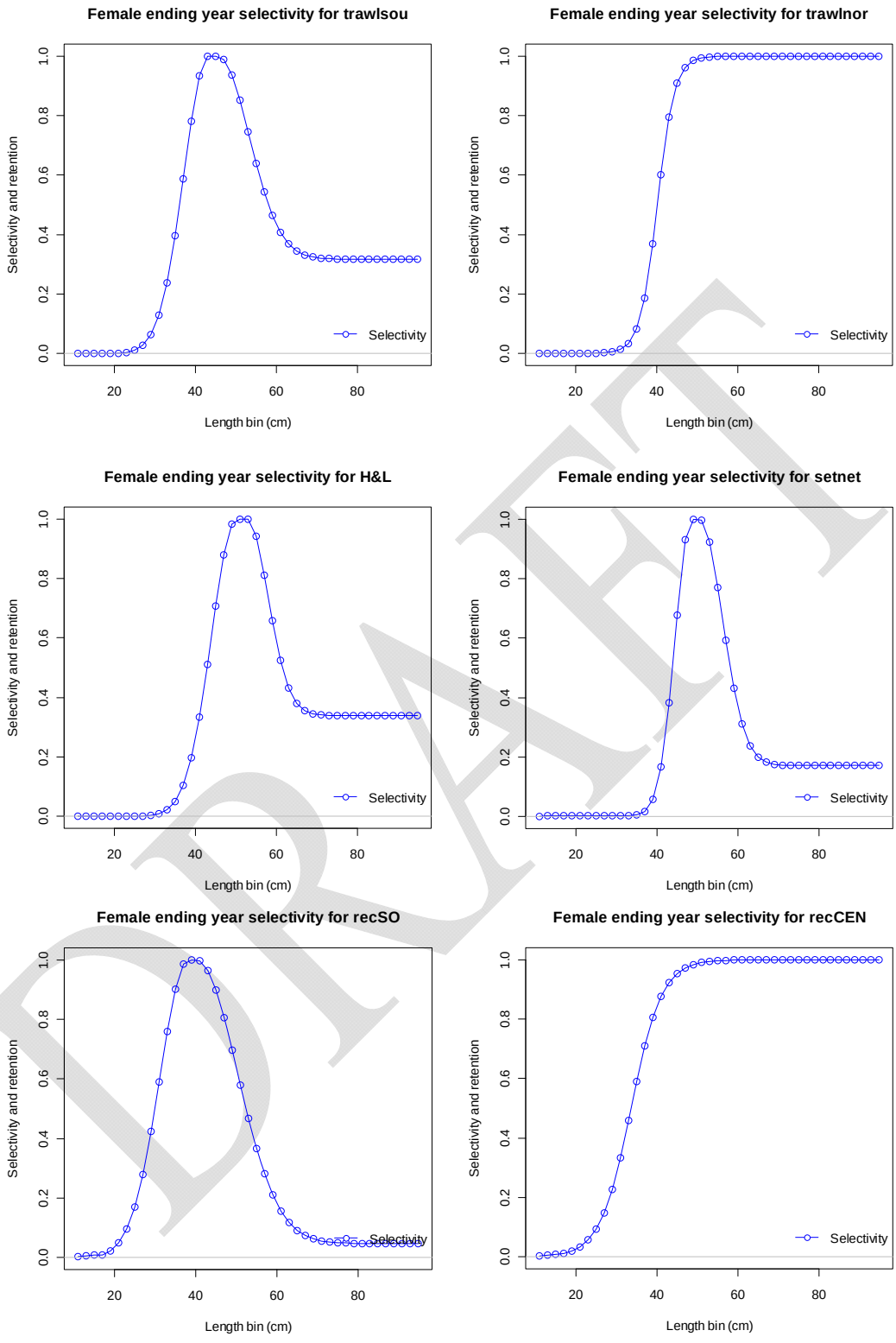
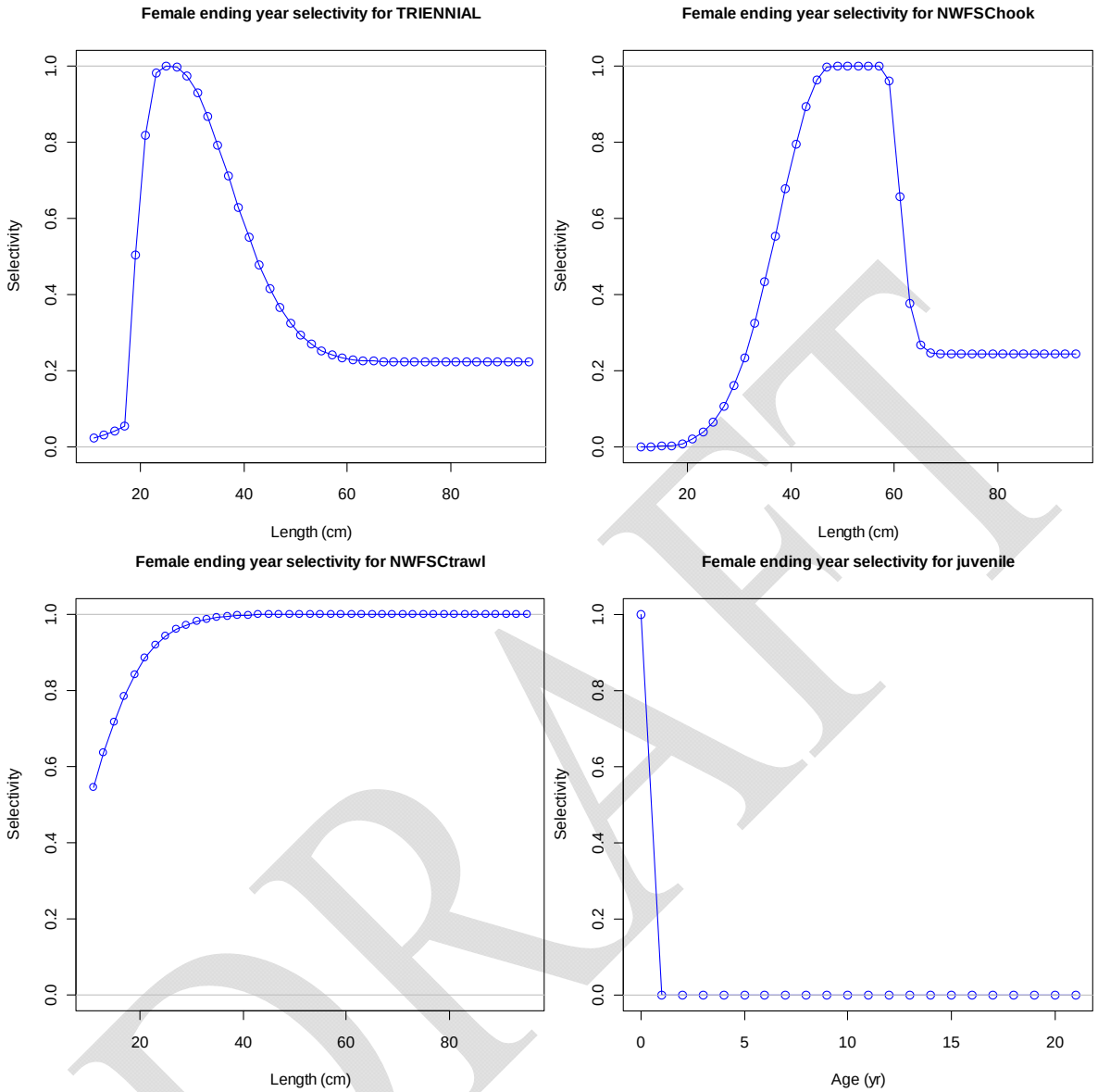


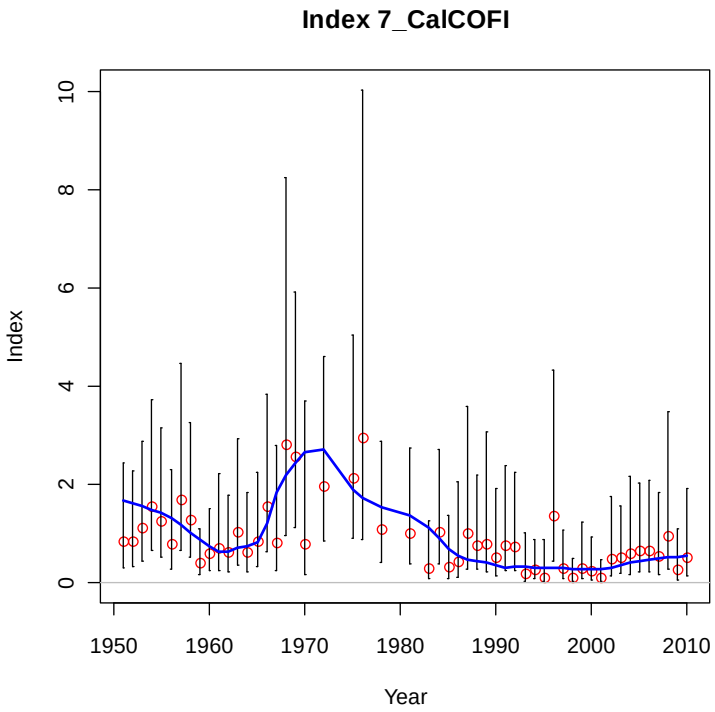
DRAFT

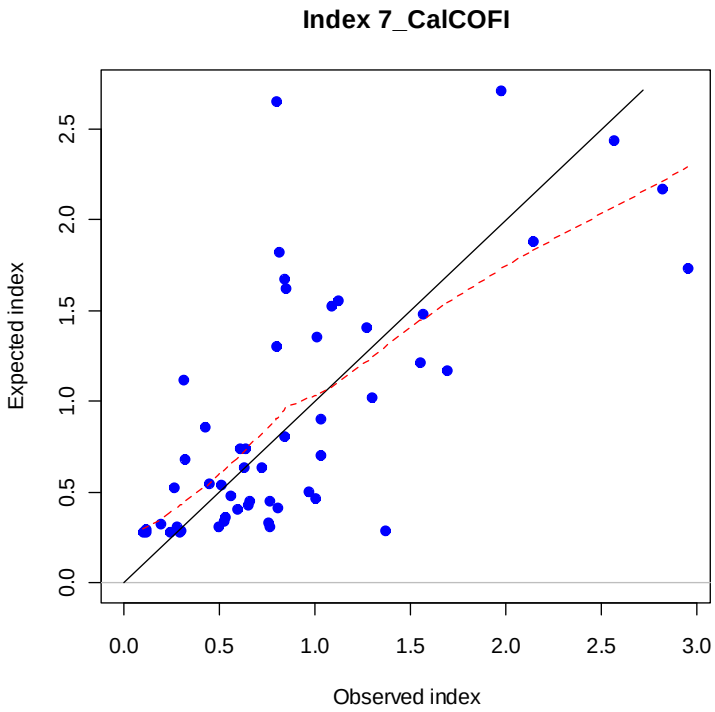
Figures 10a-f. Estimated selectivity curves for the bocaccio base model for commercial fisheries, trawl (north and south of 38° N latitude), hook-and-line, set net, and southern and central California recreational fisheries.

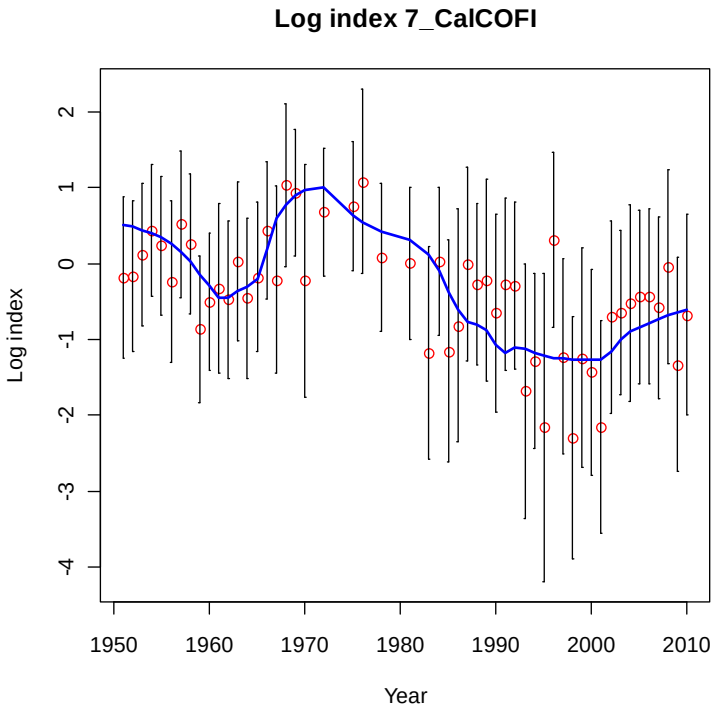


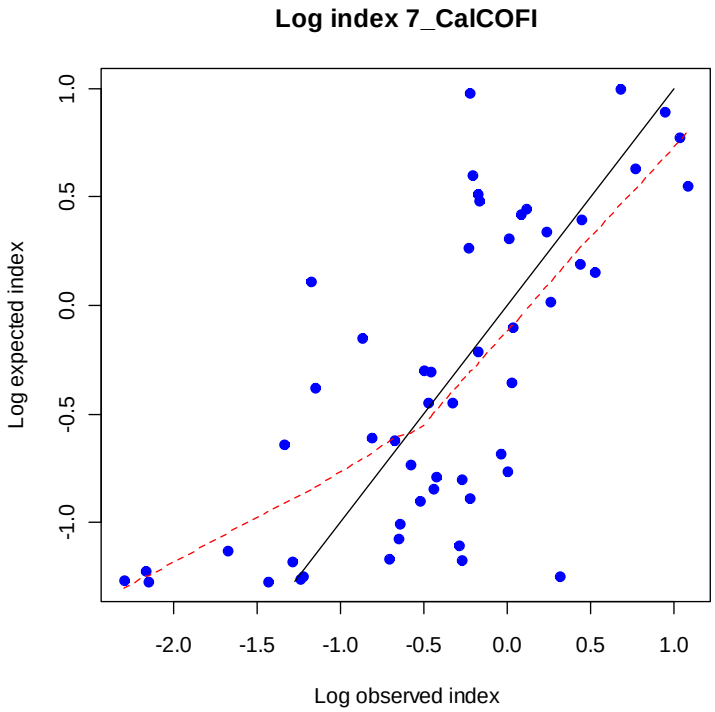
DRAFT

Figures 10g-j. Selectivity curves for bocaccio in the triennial survey (fixed), the NWFSC Southern California Bight hook-and-line survey, the NWFSC combined shelf and slope survey, and age selectivity for the pelagic juvenile age-0 survey.

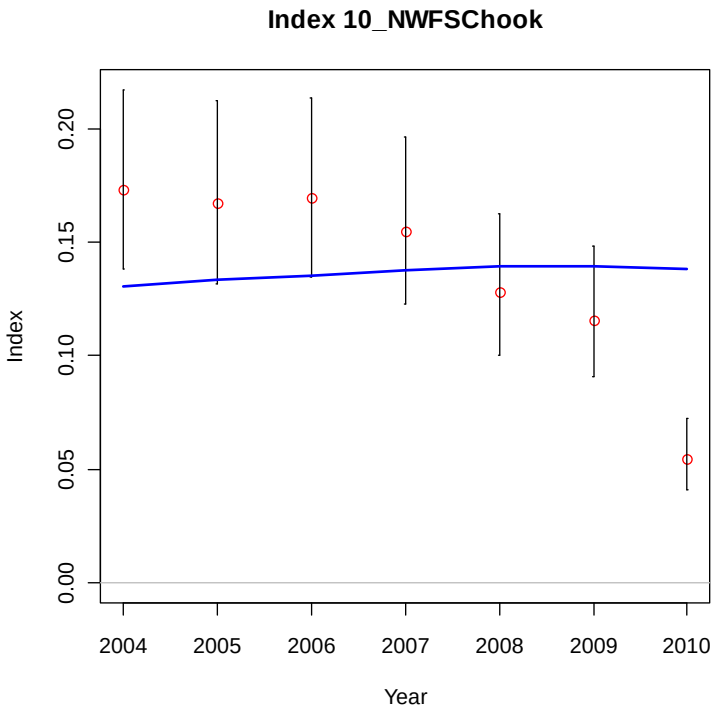


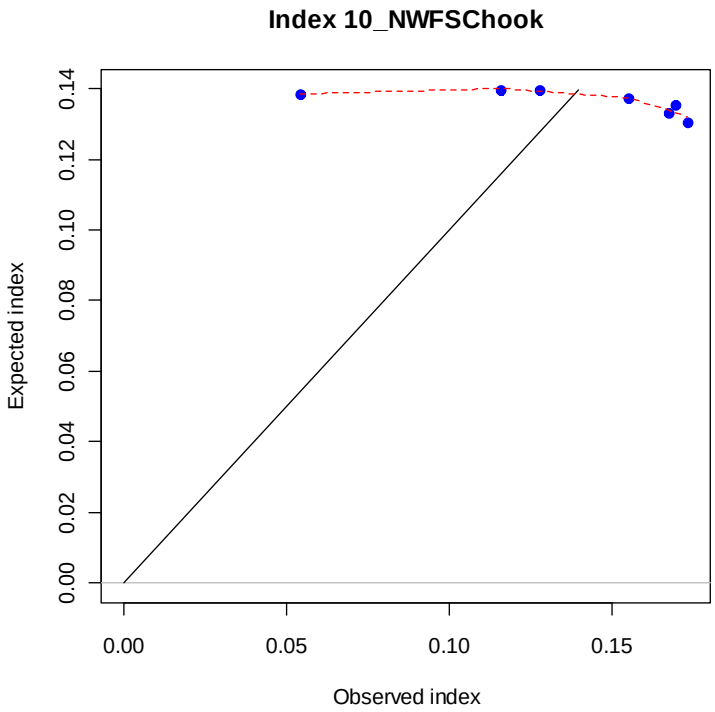


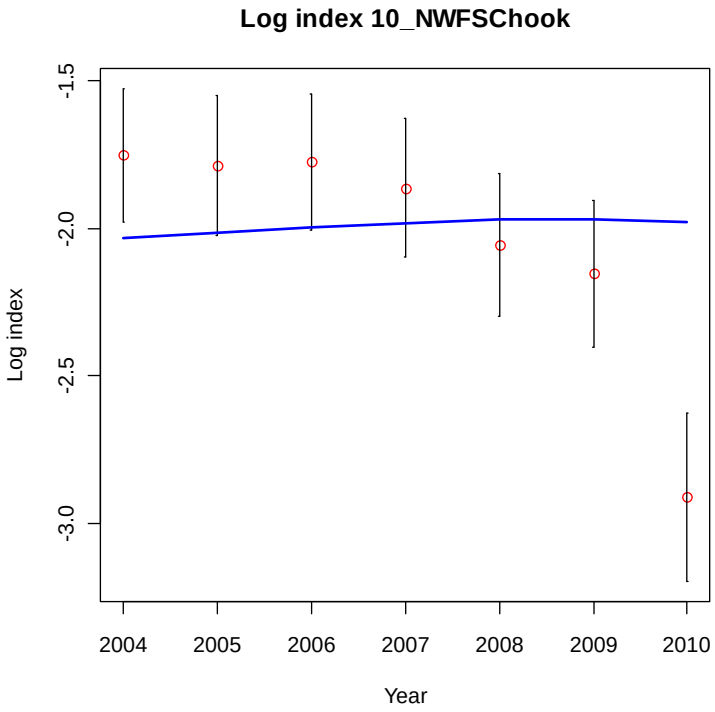


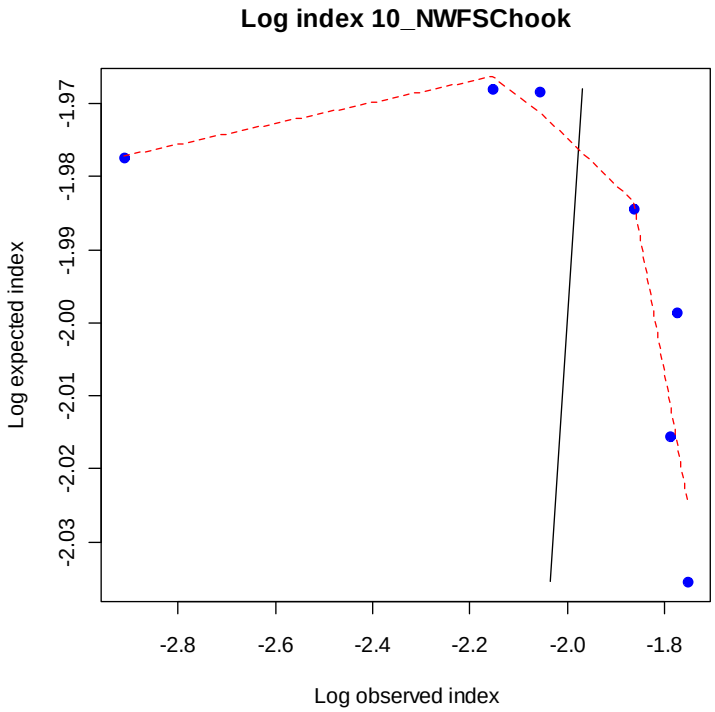


Figures 13a-d. Arithmetic and log fits, with corresponding observed and predicted values, to the CalCOFI larval abundance time series of bocaccio abundance.









Figures 14a-d. Arithmetic and log fits, with corresponding observed and predicted values, to the NWFSC hook and line survey GLMM index of bocaccio abundance.

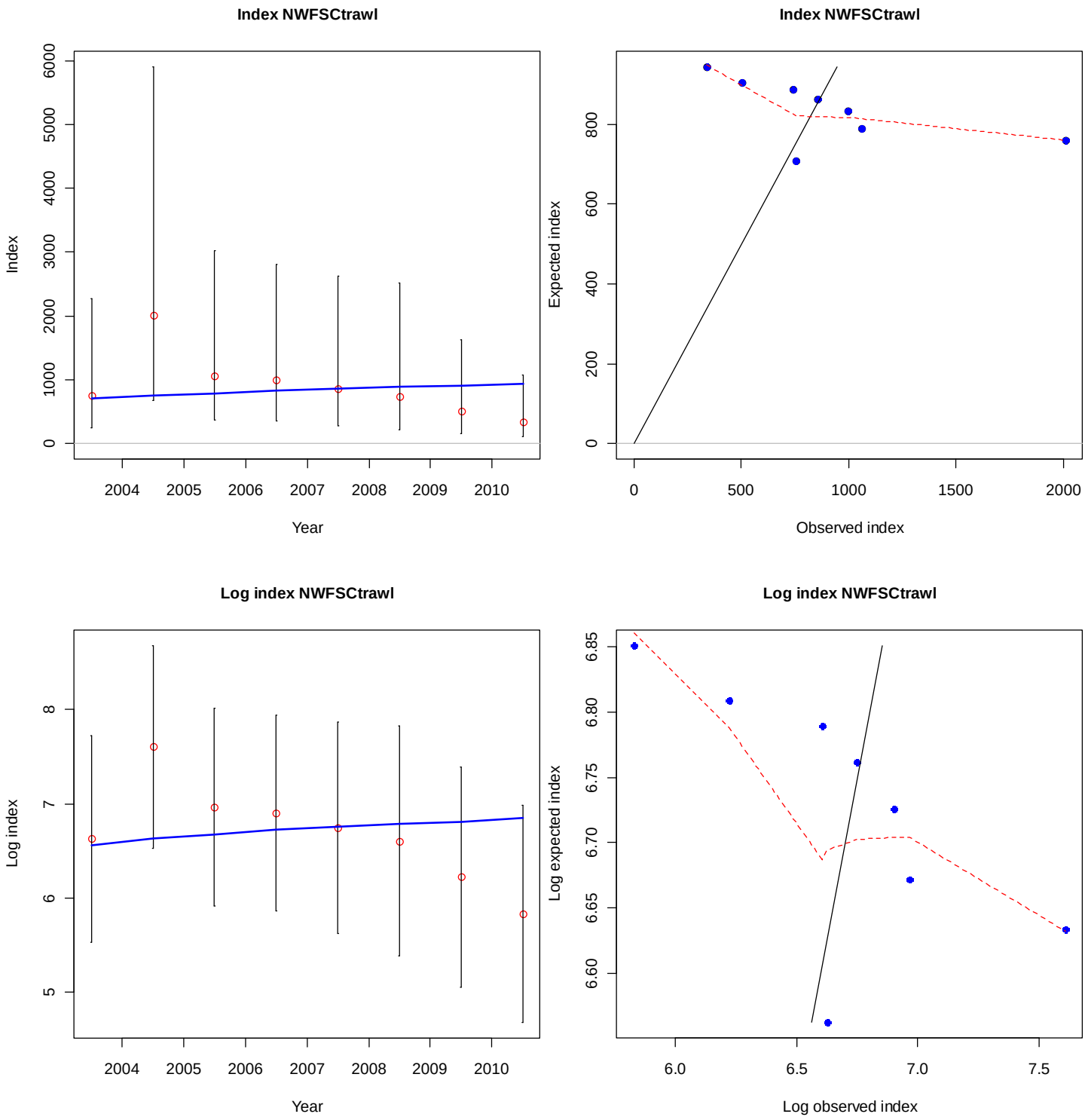


Figure 15a-d: Arithmetic and log fits, with corresponding observed and predicted values, to the NWFSC combined trawl survey index (revised to exclude age 0 fish).

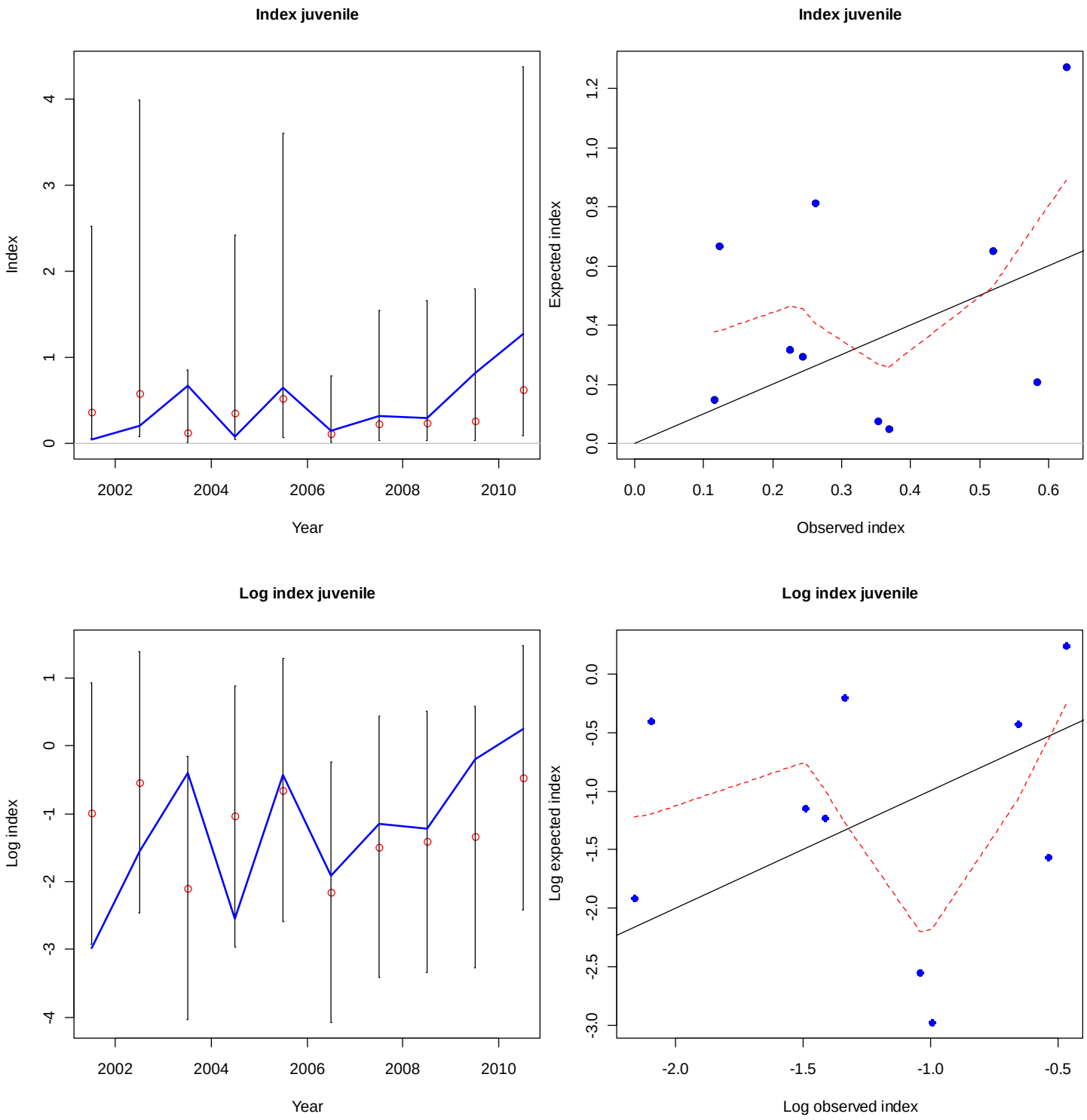


Figure 16a-d: Arithmetic and log fits, with corresponding observed and predicted values, to the SWFSC juvenile trawl survey index.

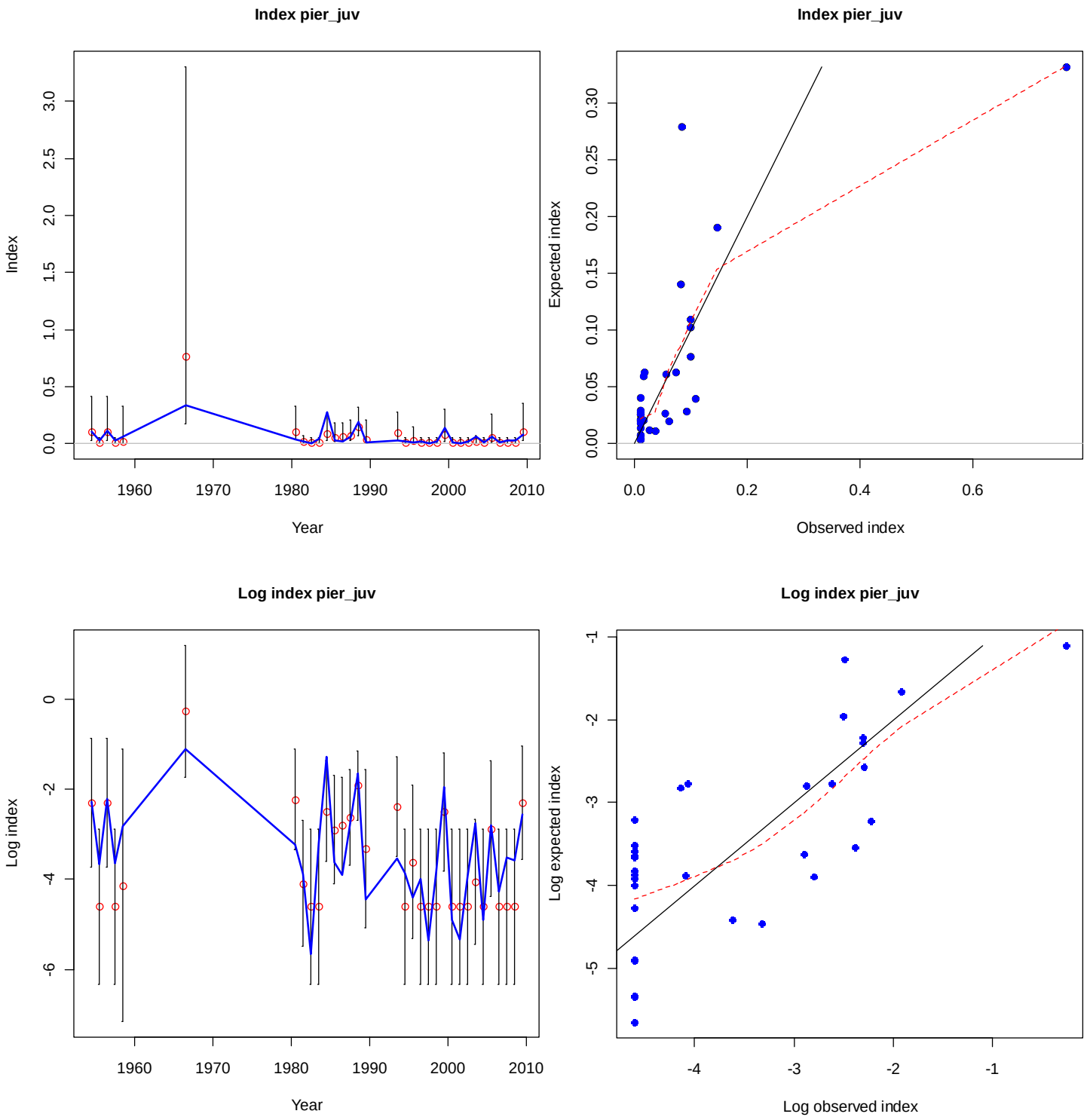


Figure 17a-d: Arithmetic and log fits, with corresponding observed and predicted values, to the Pier fishery index of age 0 (YOY) bocaccio.

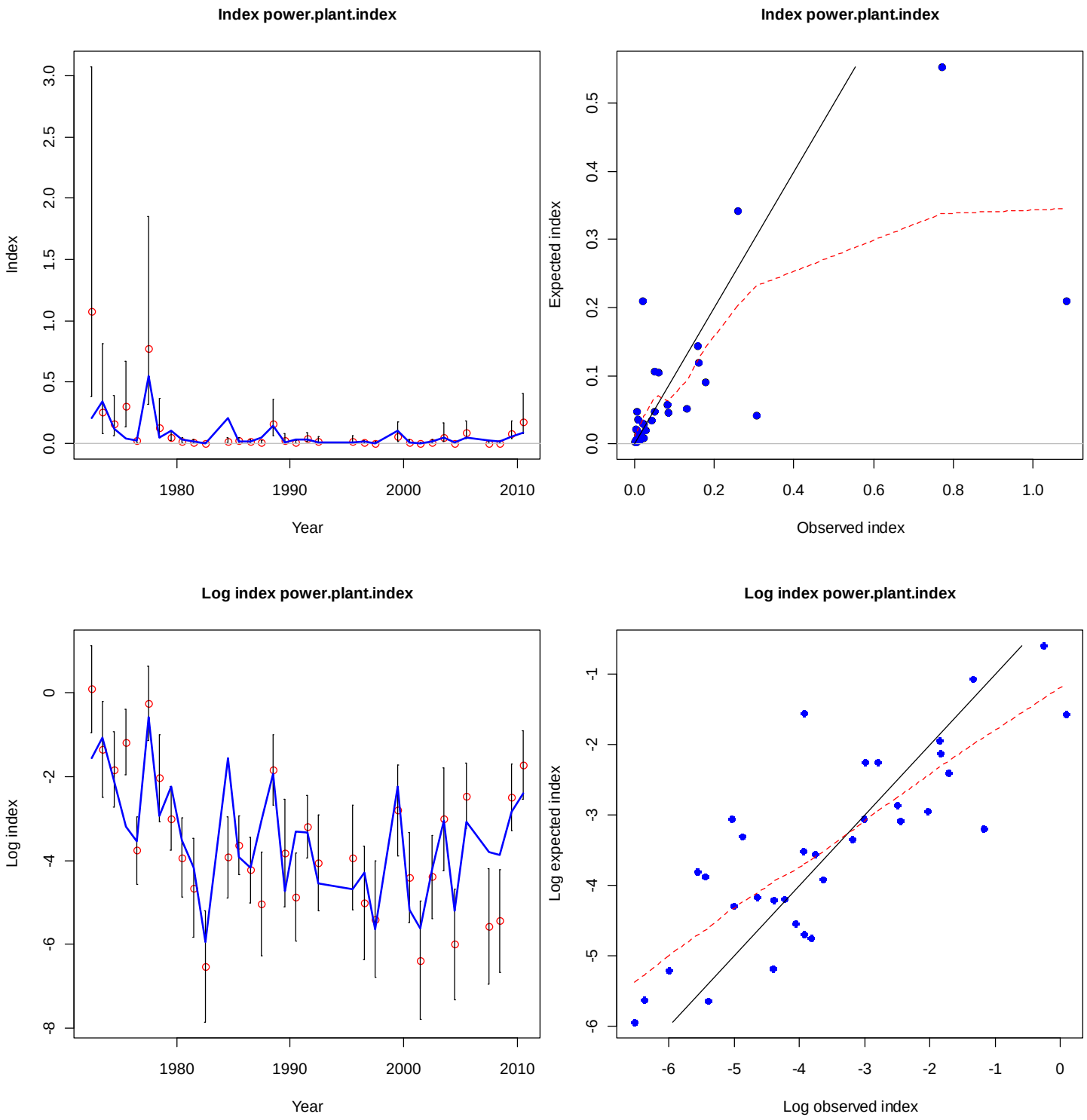


Figure 18: Arithmetic and log fits, with corresponding observed and predicted values, to the power plant impingement index.

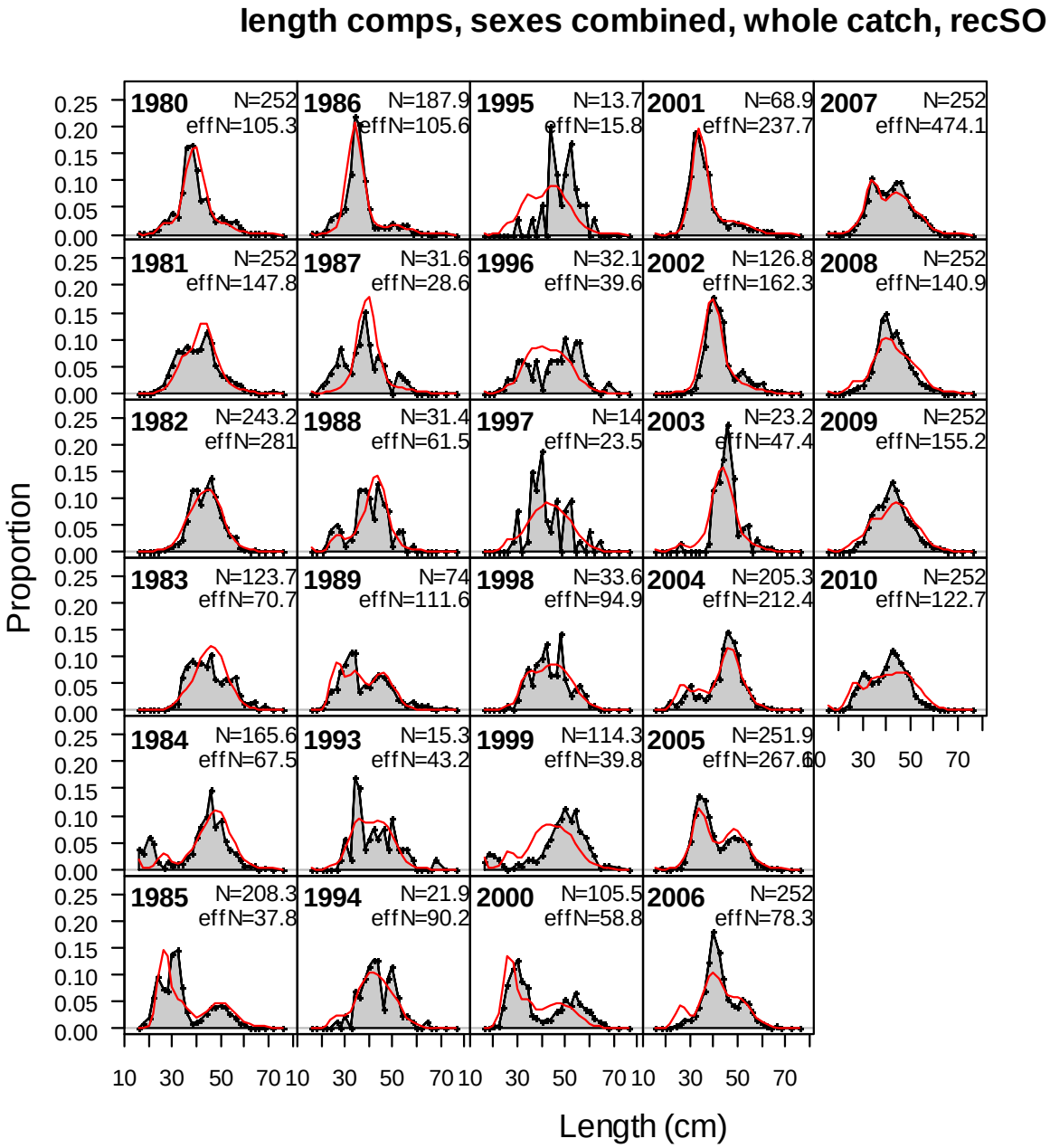


Figure 19: Fits to length frequency data (sexes combined) for the southern recreational fishery (2009 and 2010 data are new to update).

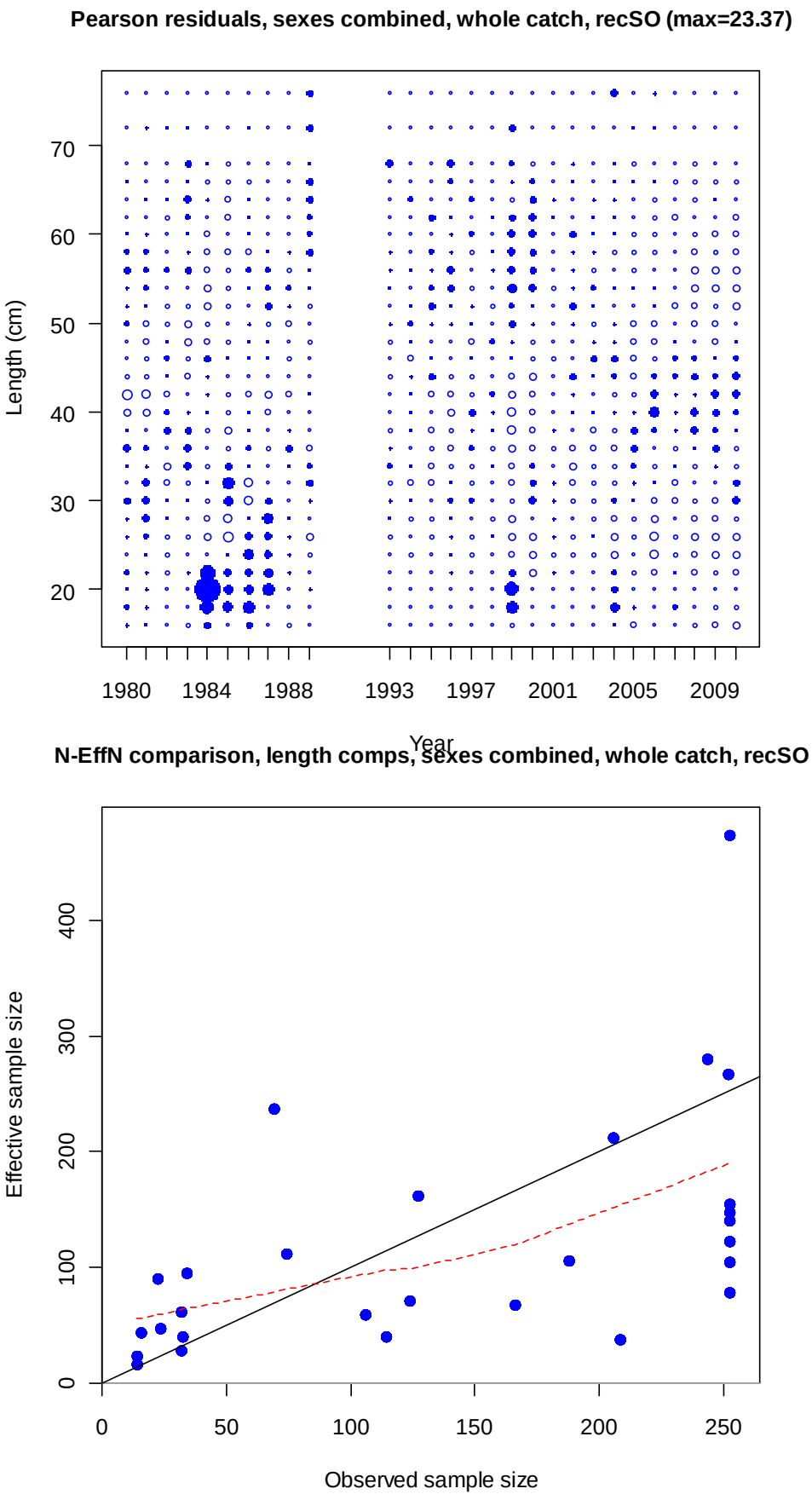


Figure 20: Residuals to length frequency fits and observed vs. effective sample sizes for the southern recreational fishery.

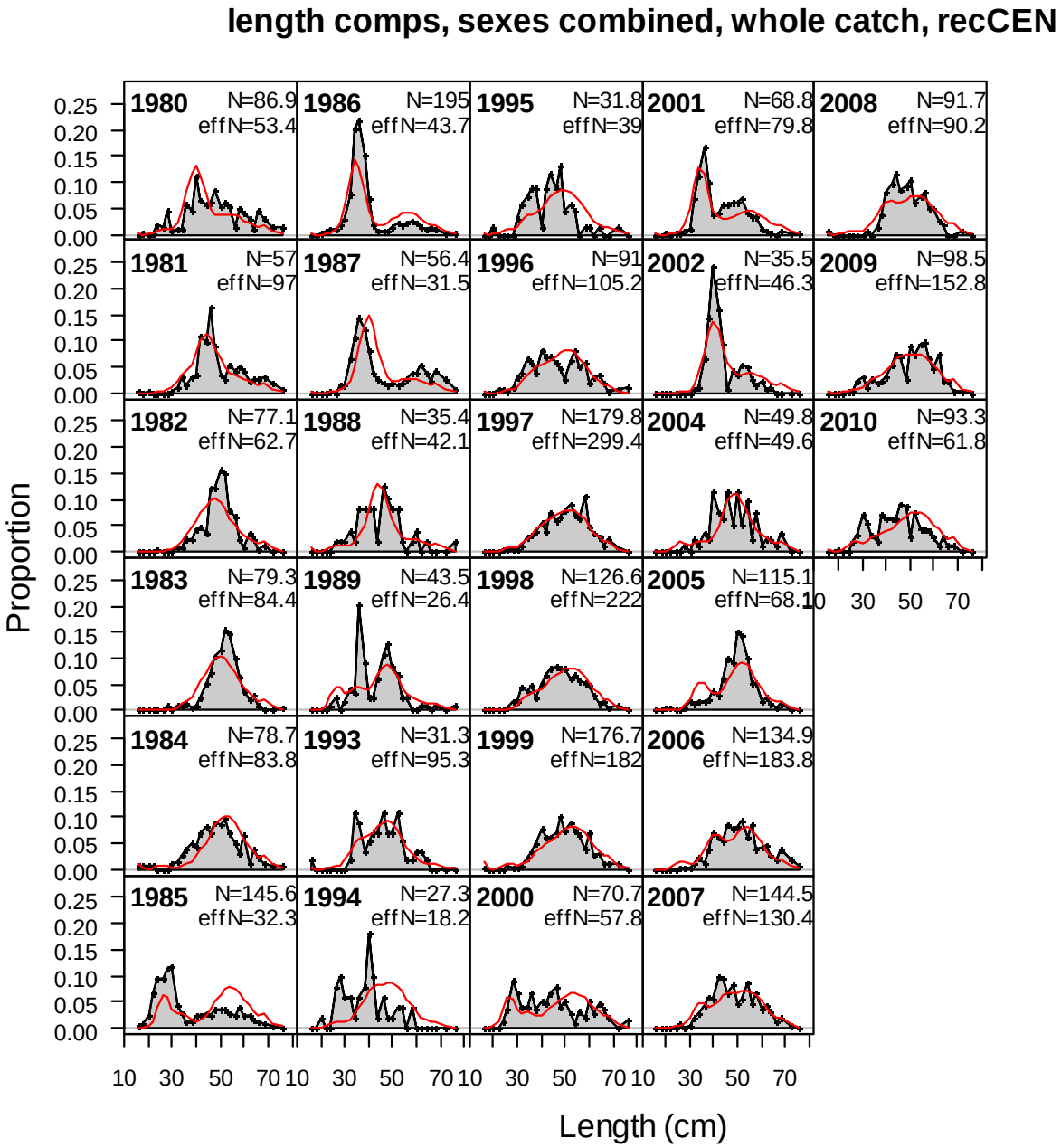
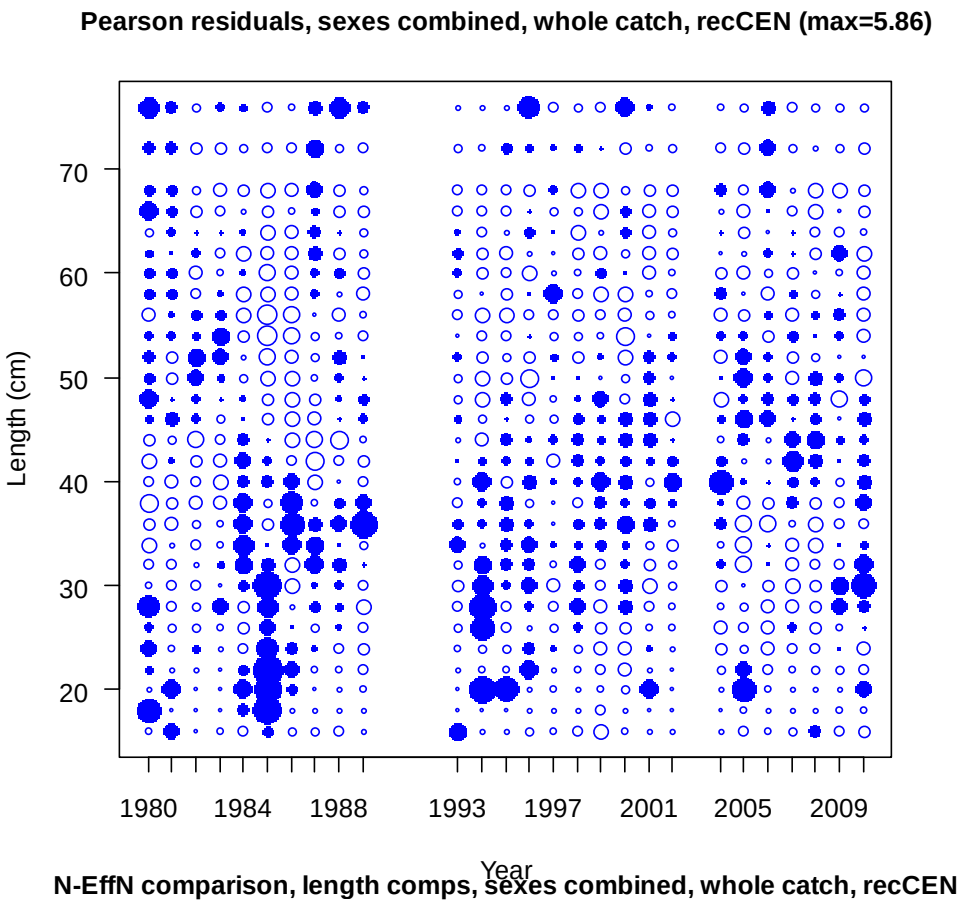


Figure 21: Fits to length frequency data (sexes combined) for the central California recreational fishery (2009 and 2010 data are new to update).



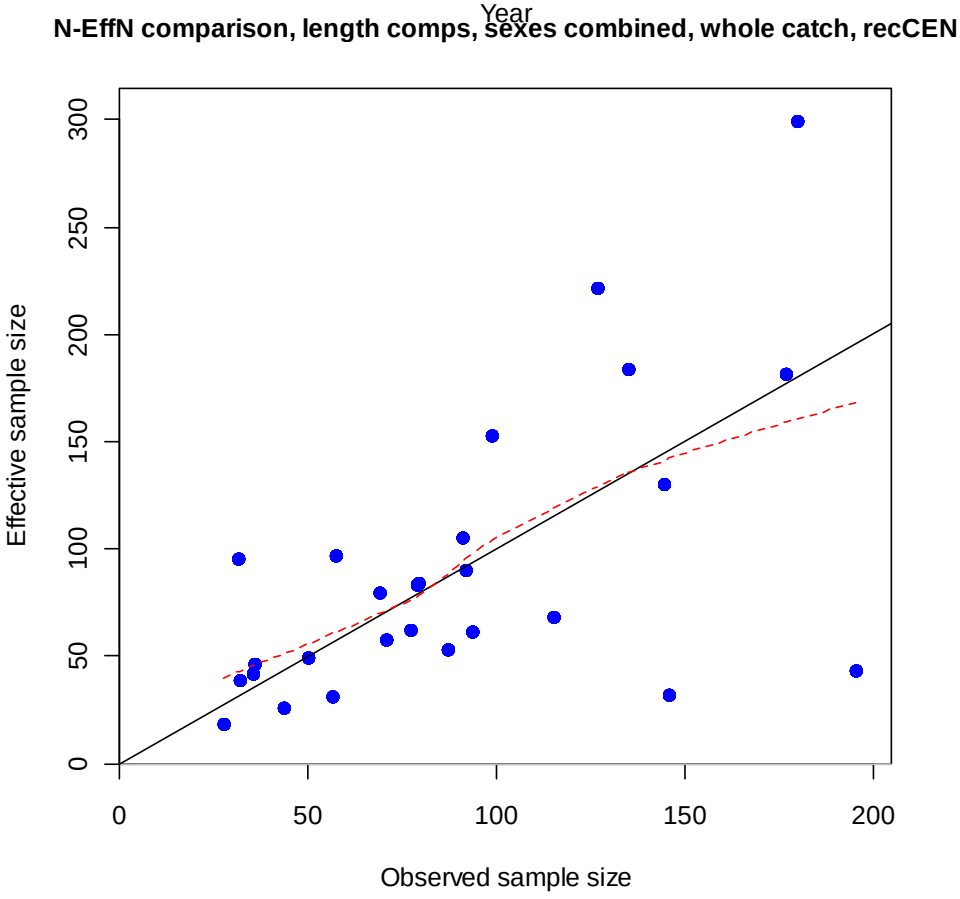


Figure 22: Residuals to length frequency fits and observed vs. effective sample sizes for the southern recreational fishery.

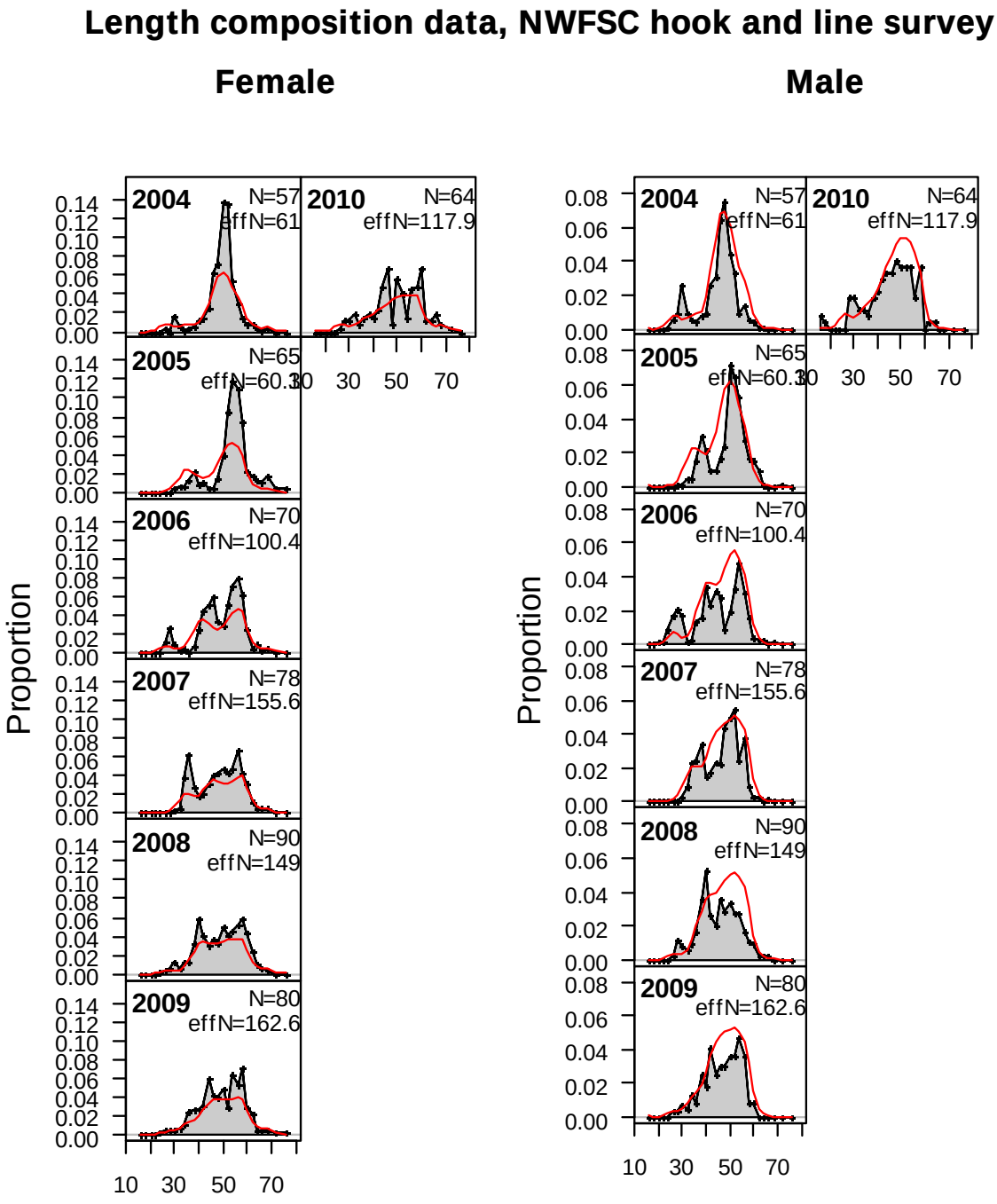


Figure 23: Fits to the NWFSC hook and line survey length frequency data.

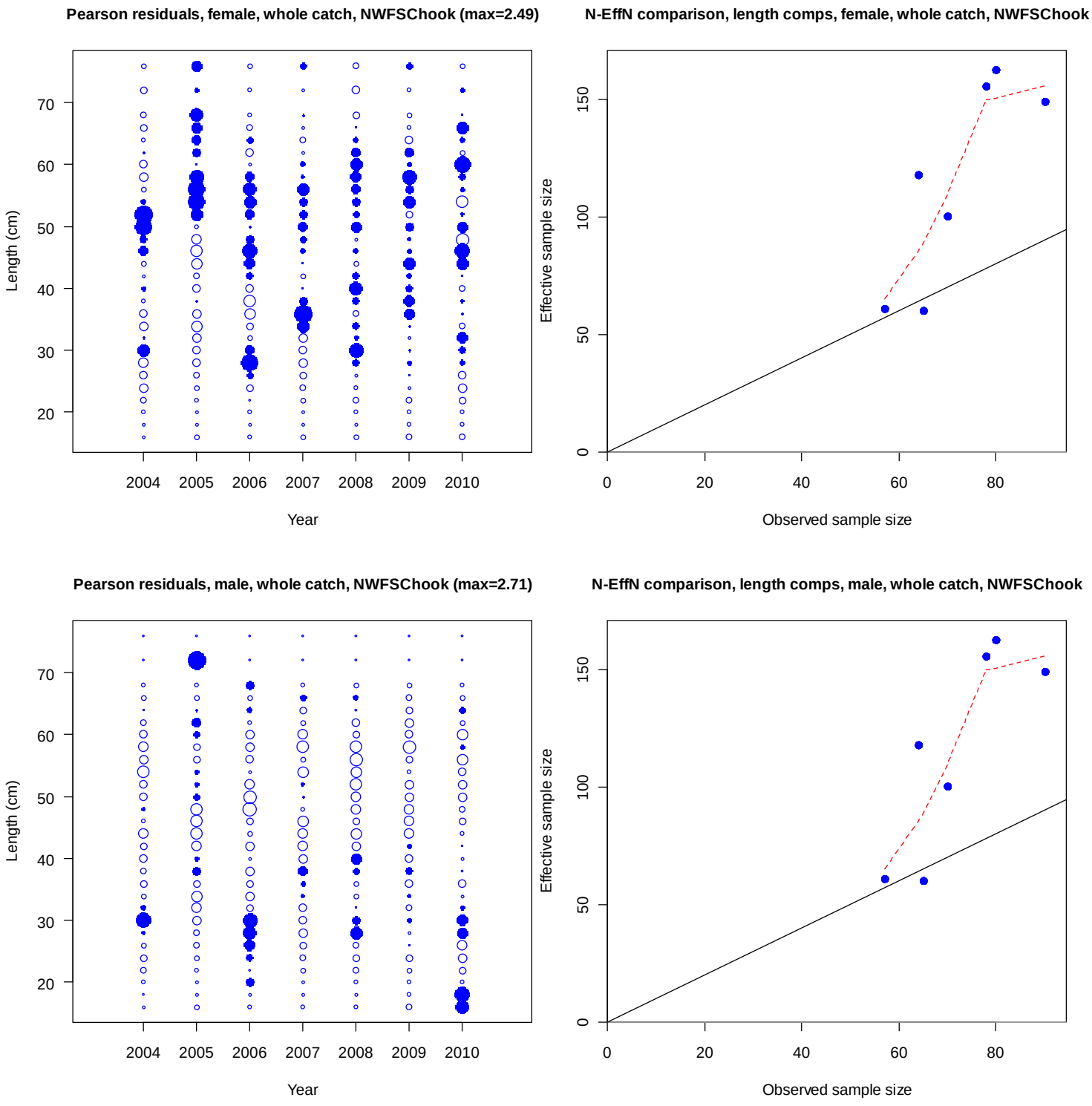


Figure 24: Residuals to length frequency fits and observed vs. predicted sample sizes for NWFSC hook and line survey data.

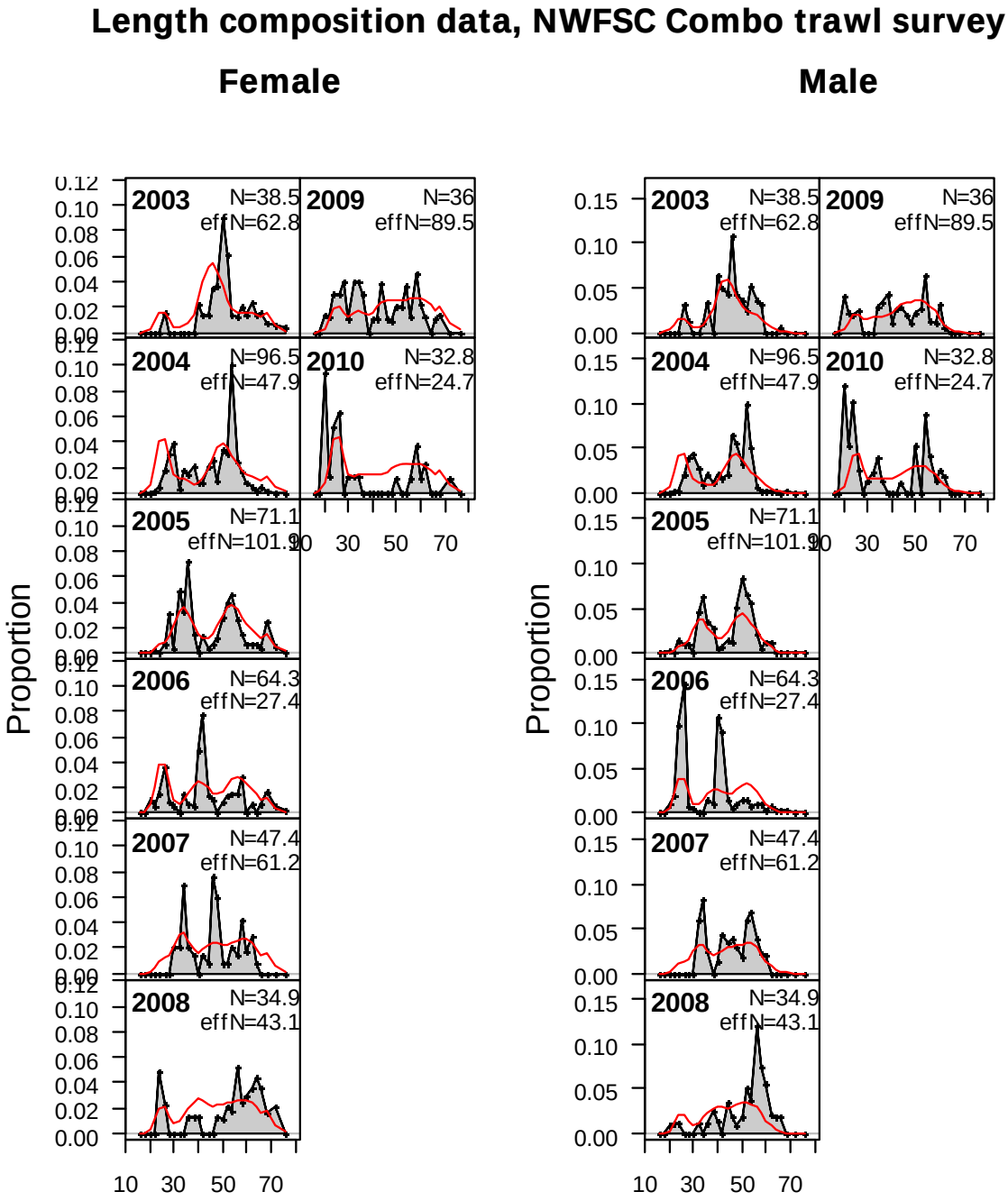


Figure 25: Fits to the NWFSC combined shelf-slope trawl survey length frequency data (for base model, sizes <20 cm removed, selectivity unselected for age-0 fish).

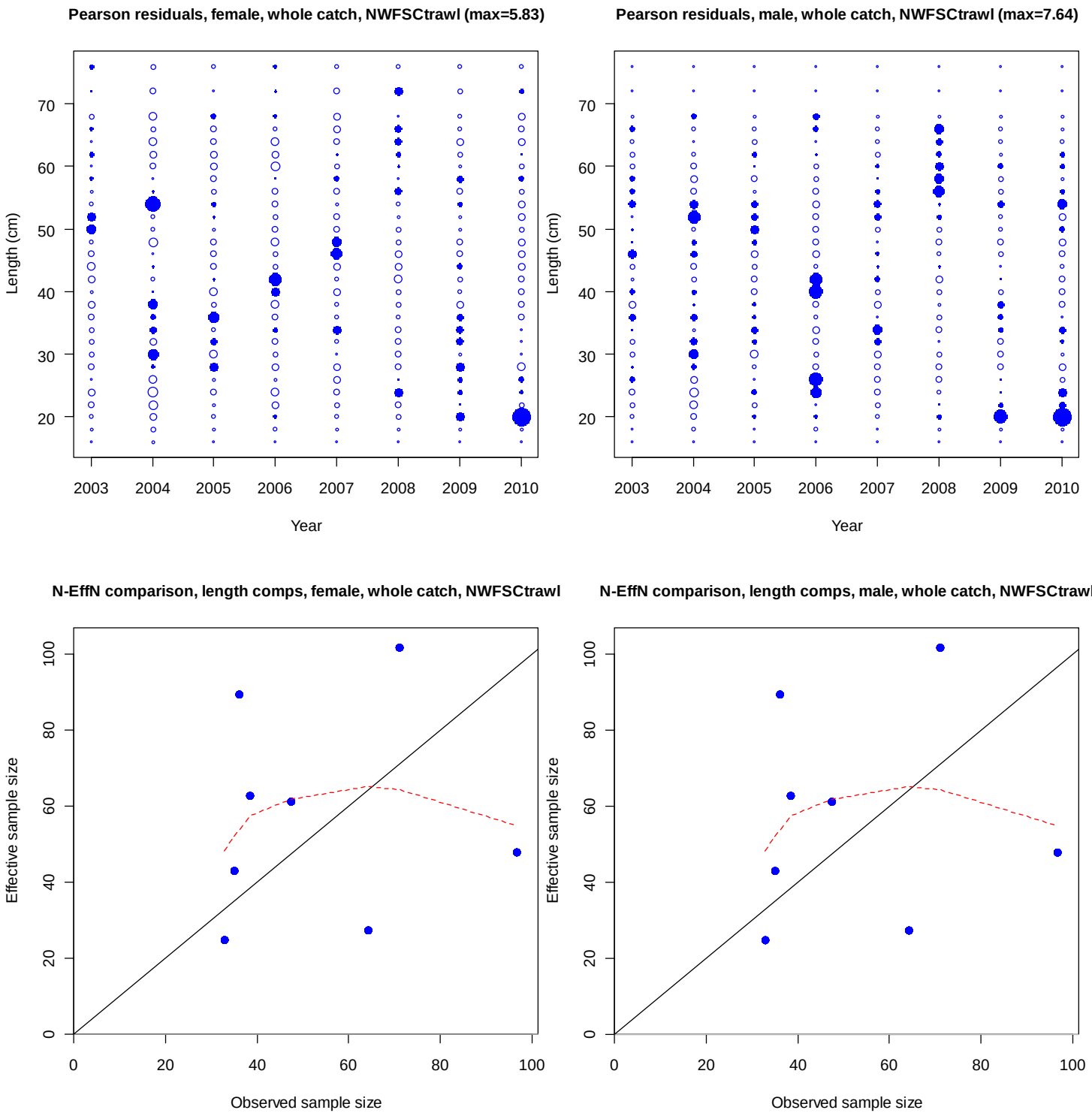


Figure 26: Residuals to length frequency fits and observed vs. predicted sample sizes for NWFSC shelf-slope bottom trawl survey data

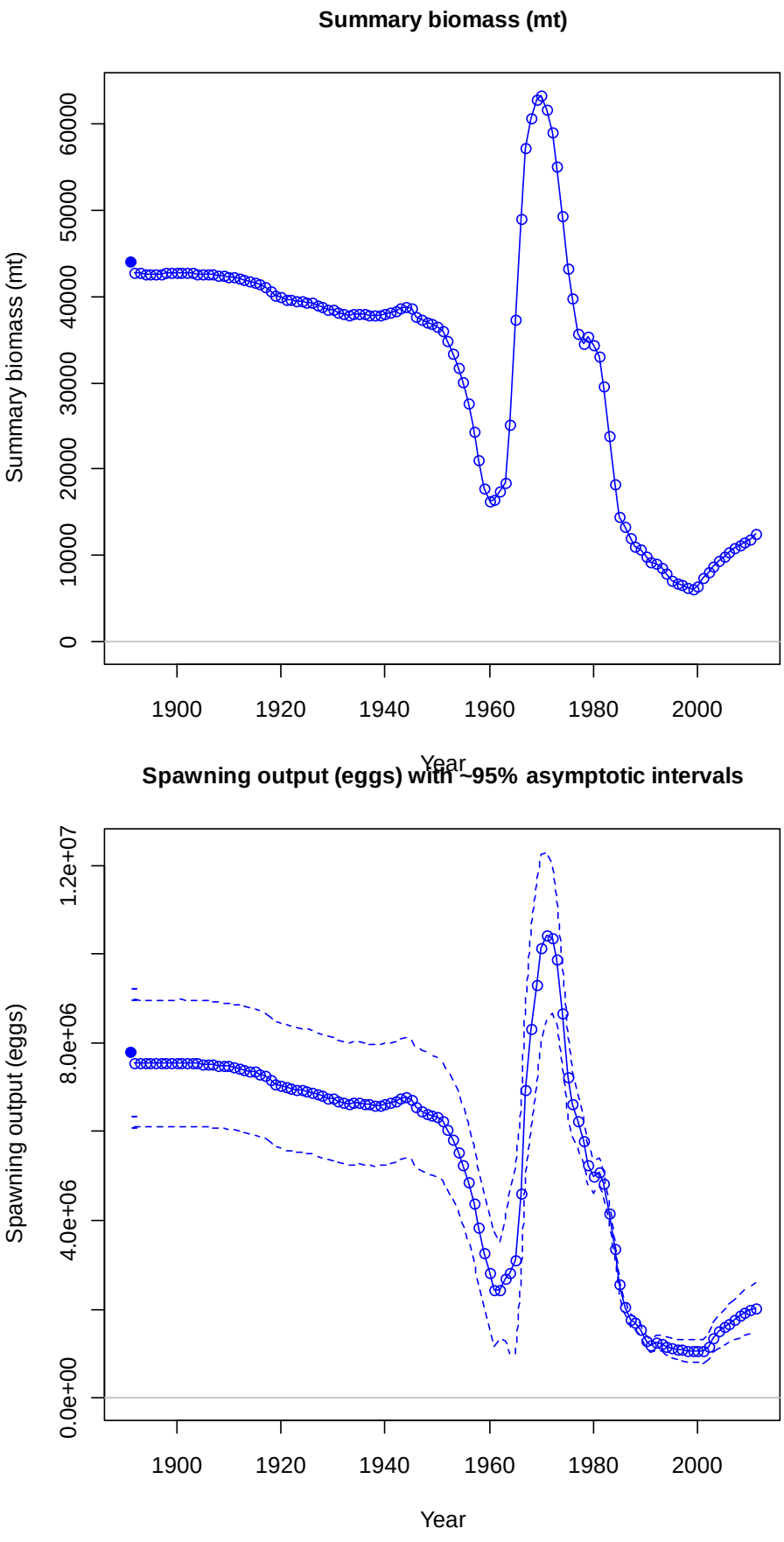


Figure 27: Summary biomass and spawning output for 2011 base model.

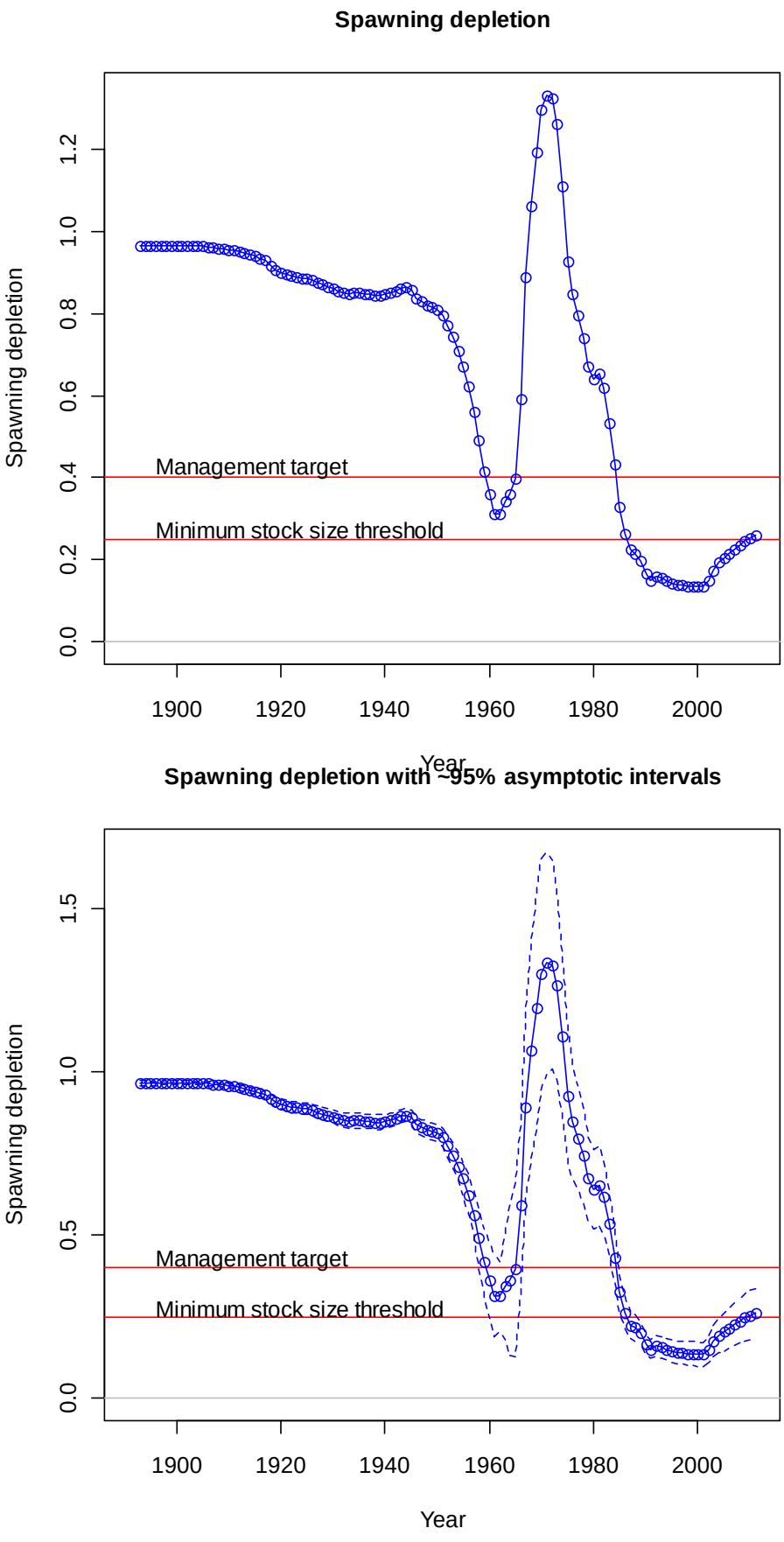


Figure 28: Relative depletion (top) with ~ 95% confidence limits (bottom) for 2011base model.

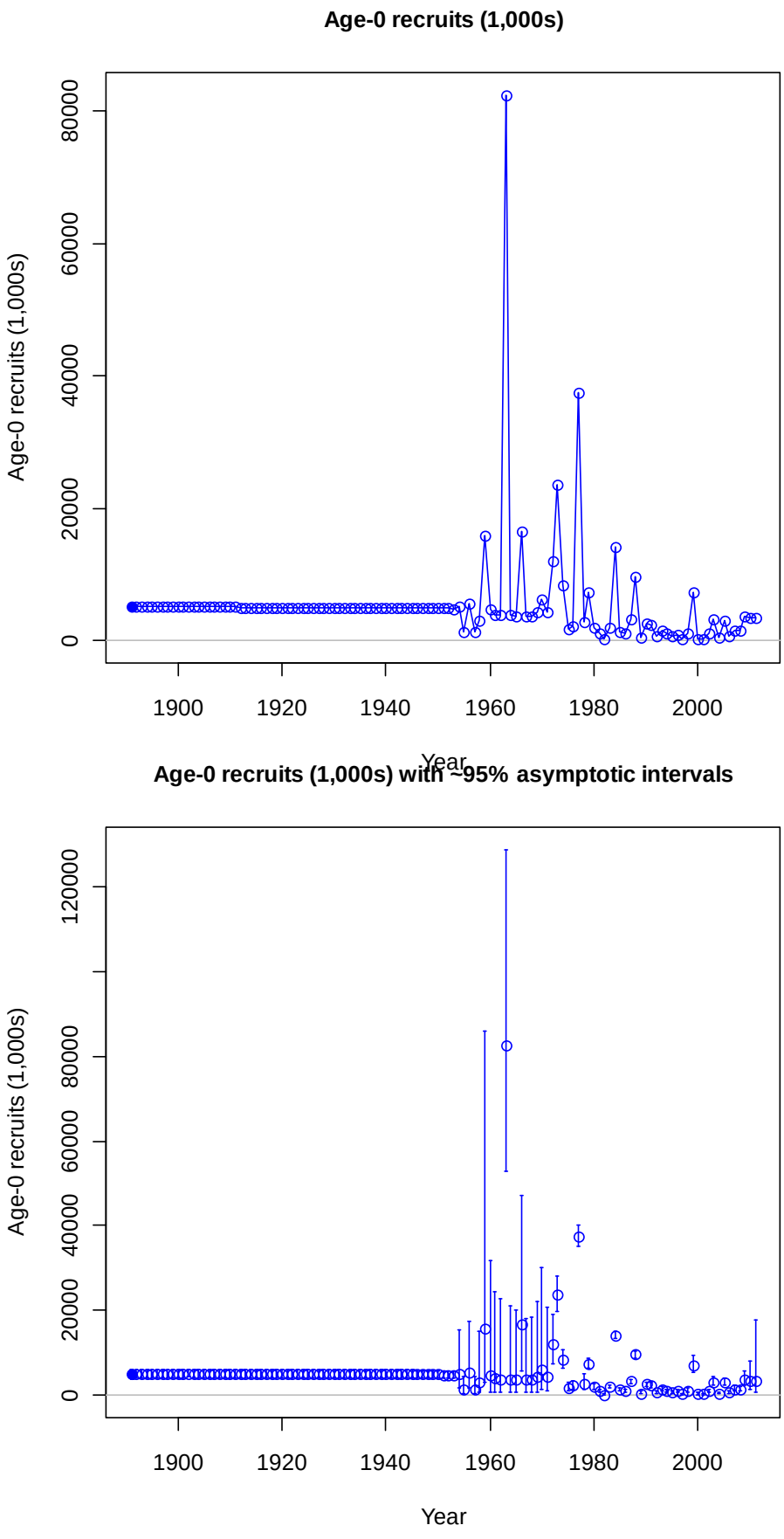


Figure 29: Estimated age 0 recruitments (top) and with ~95% confidence intervals (bottom) for 2011 base model.

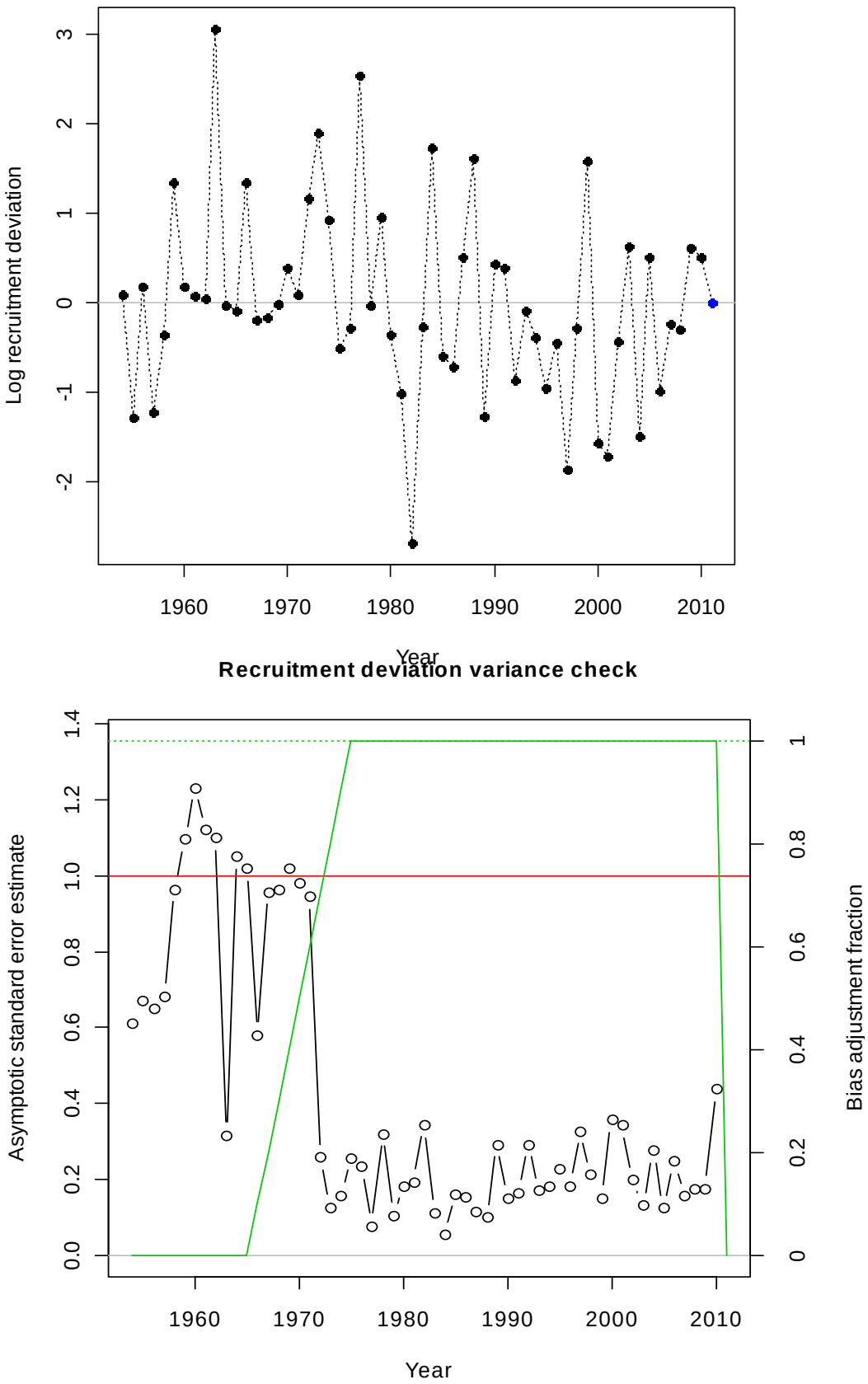


Figure 30: Estimated recruitment deviation parameter values (top) with approximate standard error estimates (bottom).

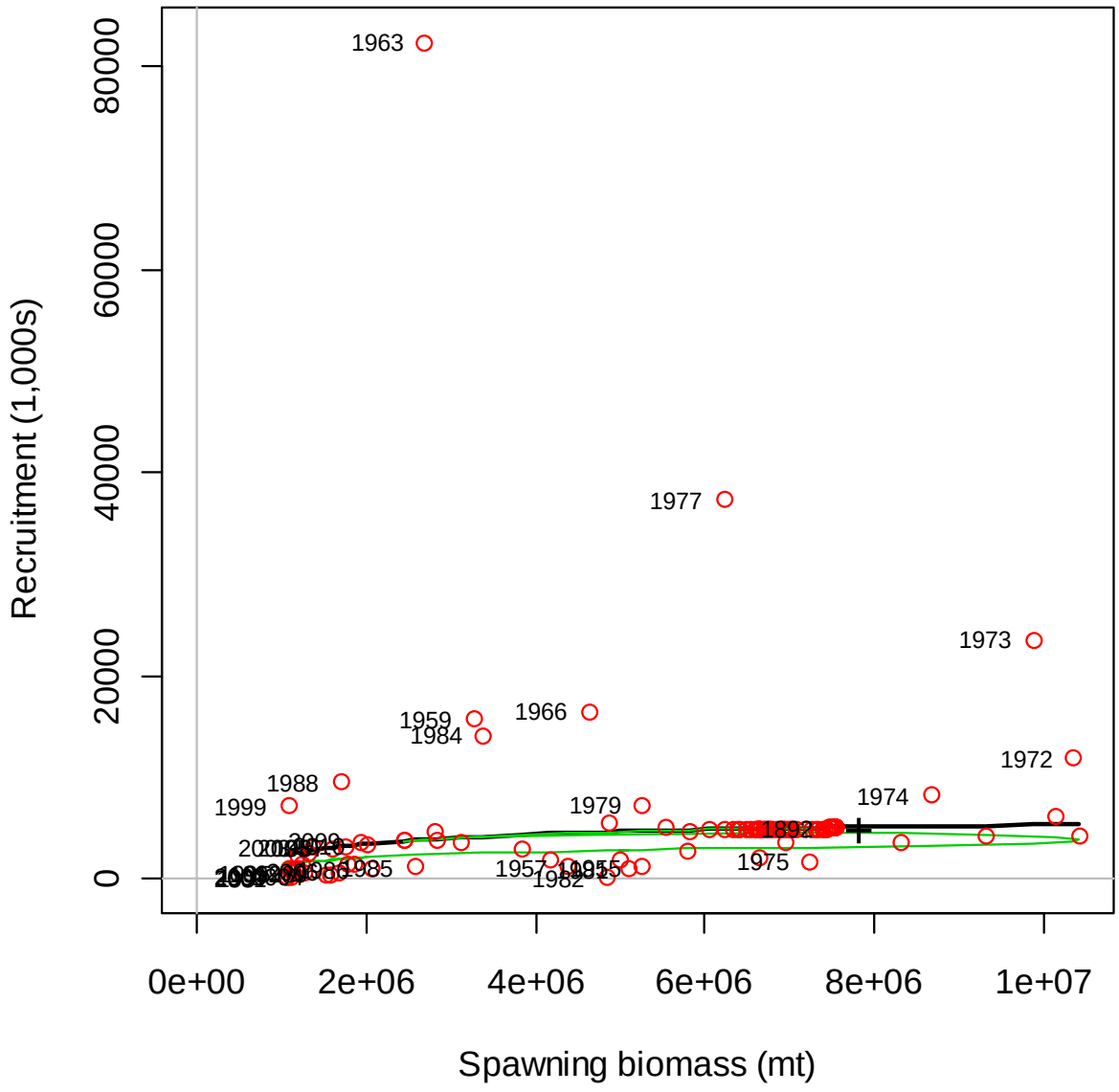
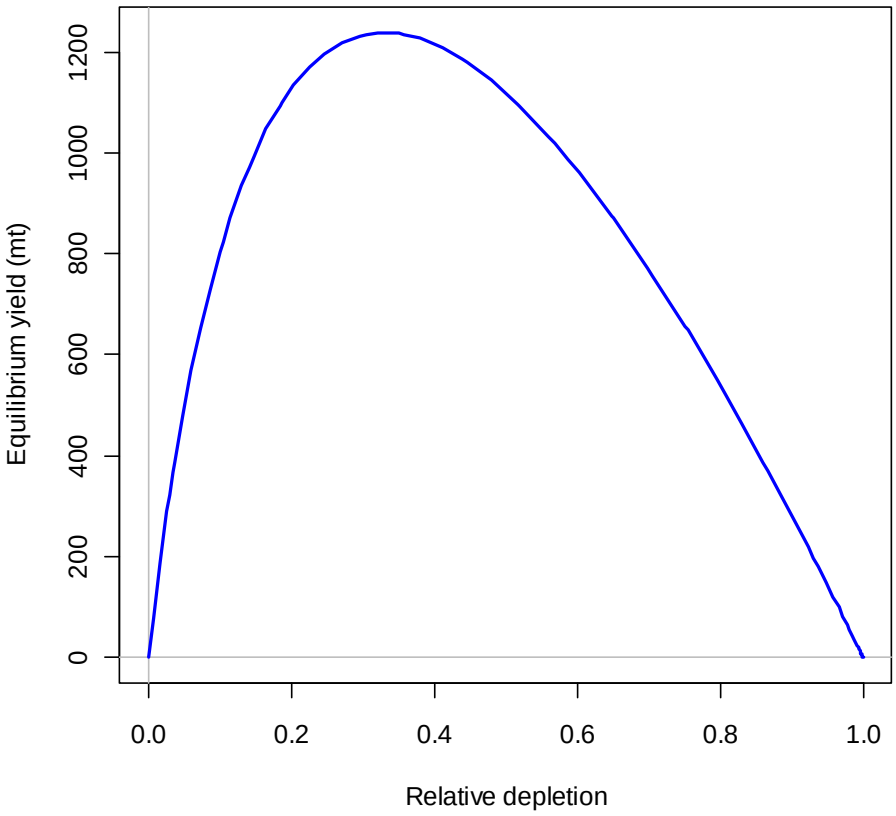


Figure 31: Estimated spawner-recruit relationship, with observed recruitments, for the STAT base model



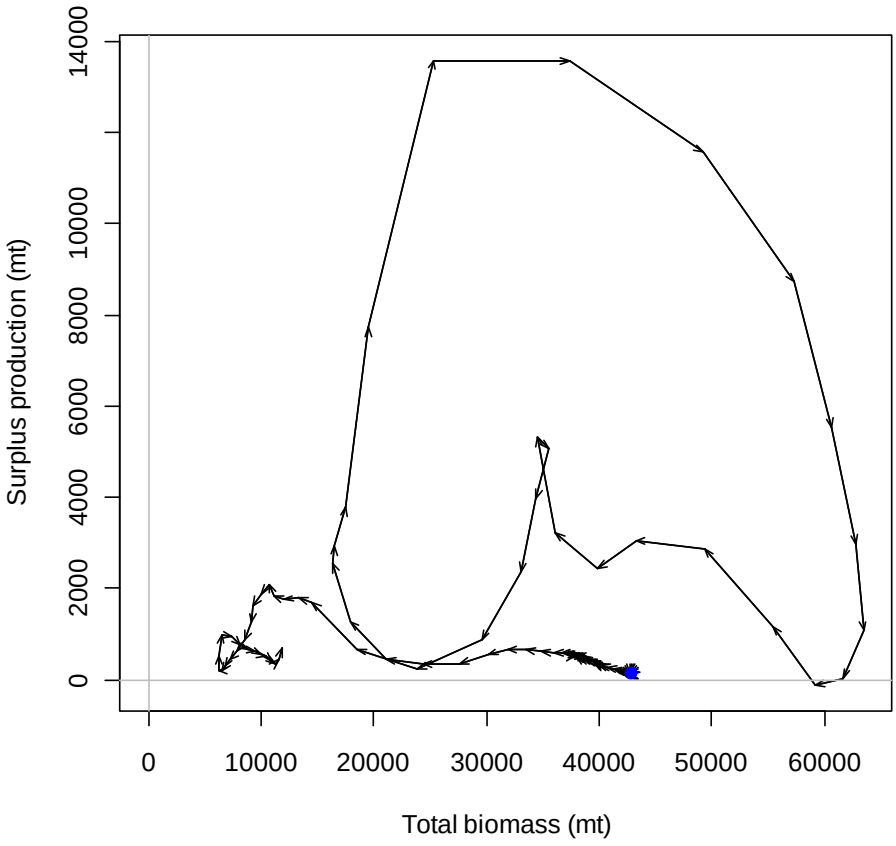
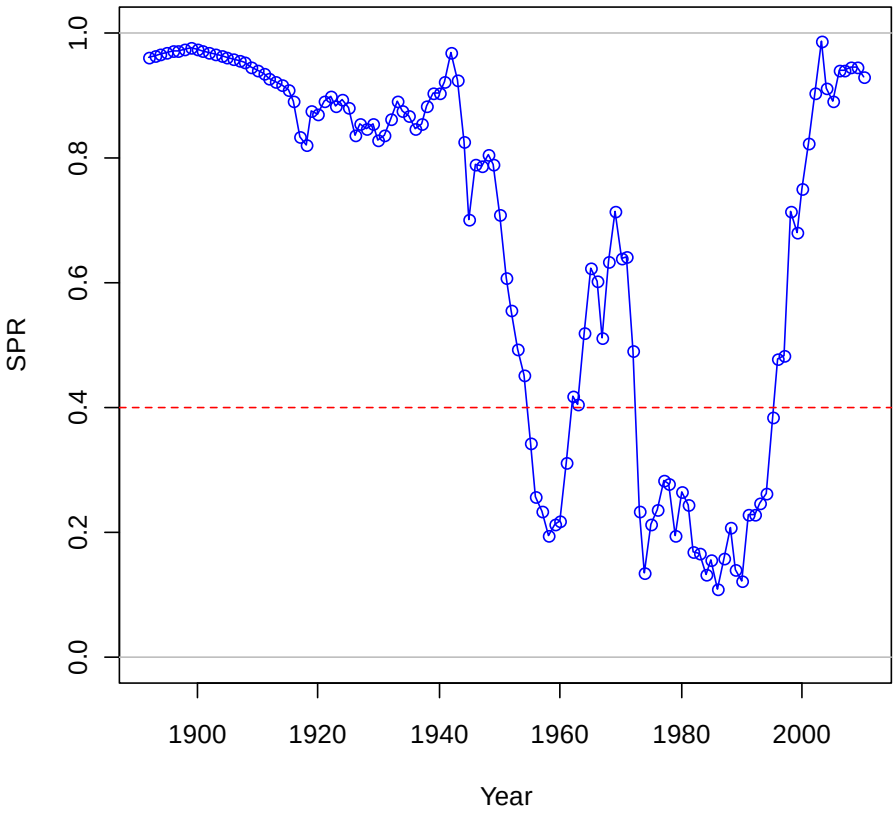


Figure 32: Estimated equilibrium yield curve (top) and phase plot of total biomass against surplus production (bottom) for STAT base model



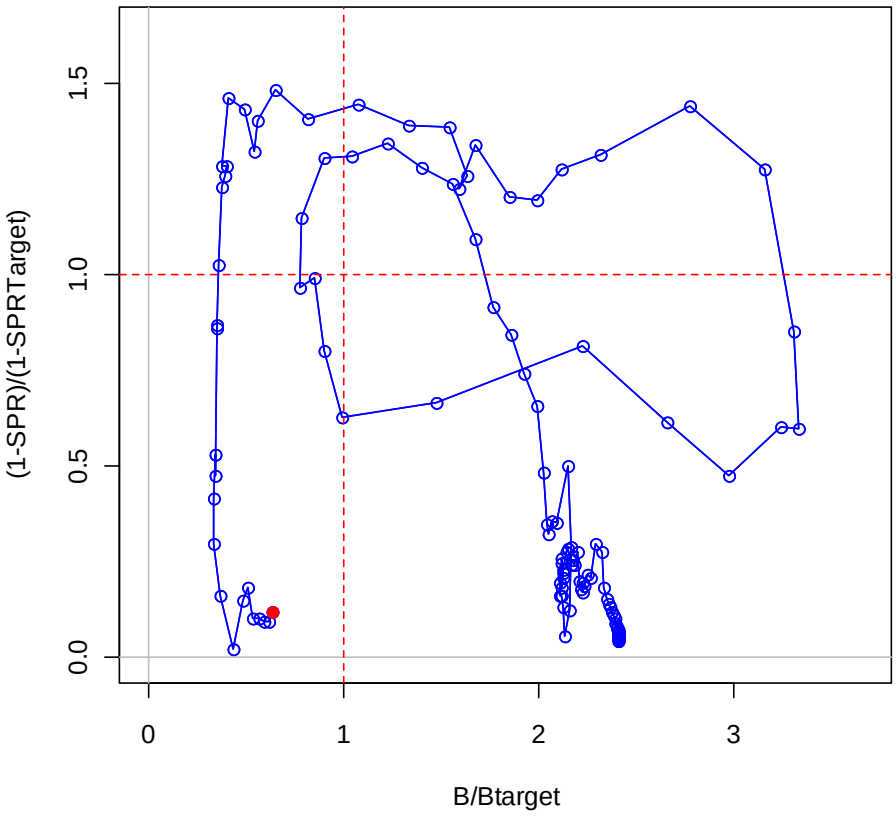
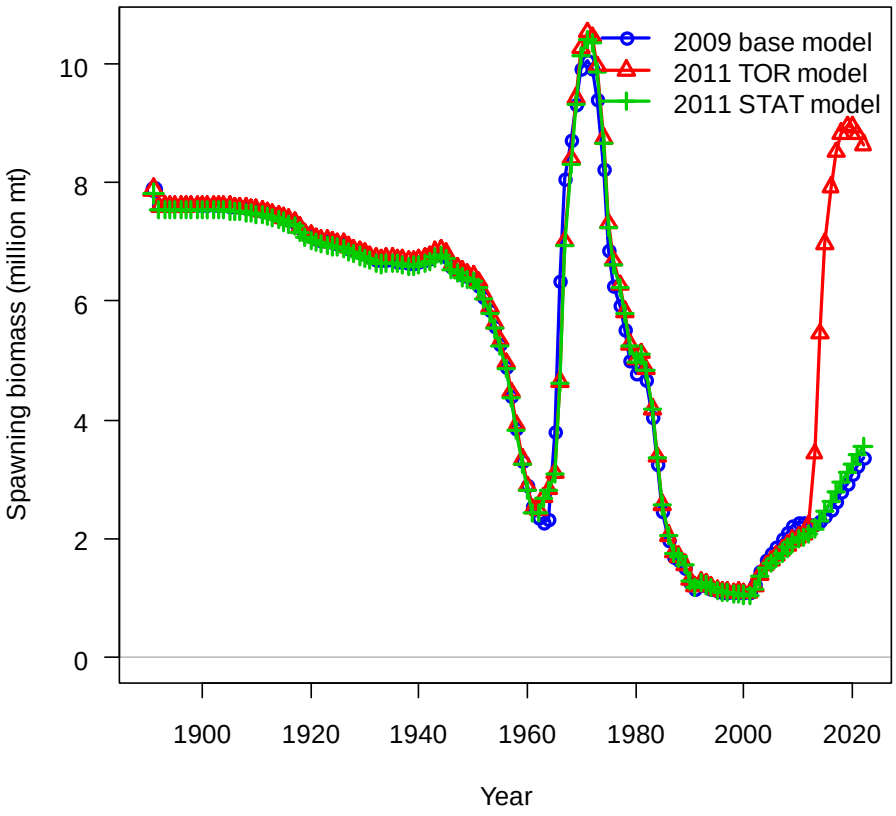


Figure 33: Base model estimates of SPR and relative SPR against biomass (relative to target)- NOTE SPR target incorrectly listed here as 0.4, should be 0.5.



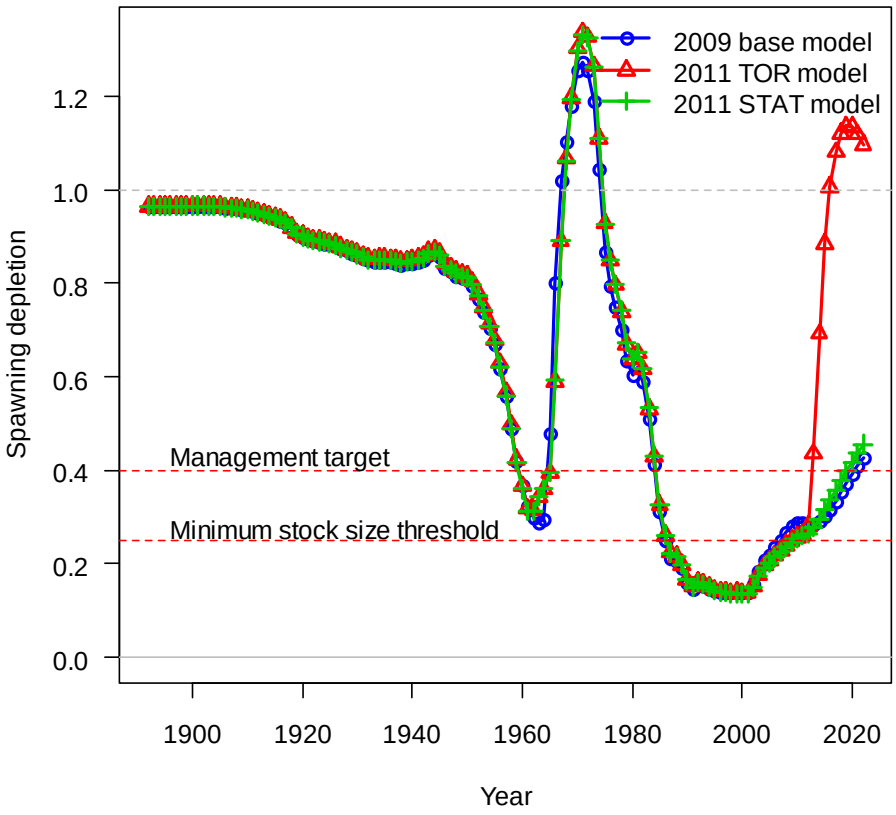


Figure 34: Comparison of 2009, 2011 base model, and Terms of Reference ("TOR") 2011 model (for sensitivity) spawning output and depletion trends.

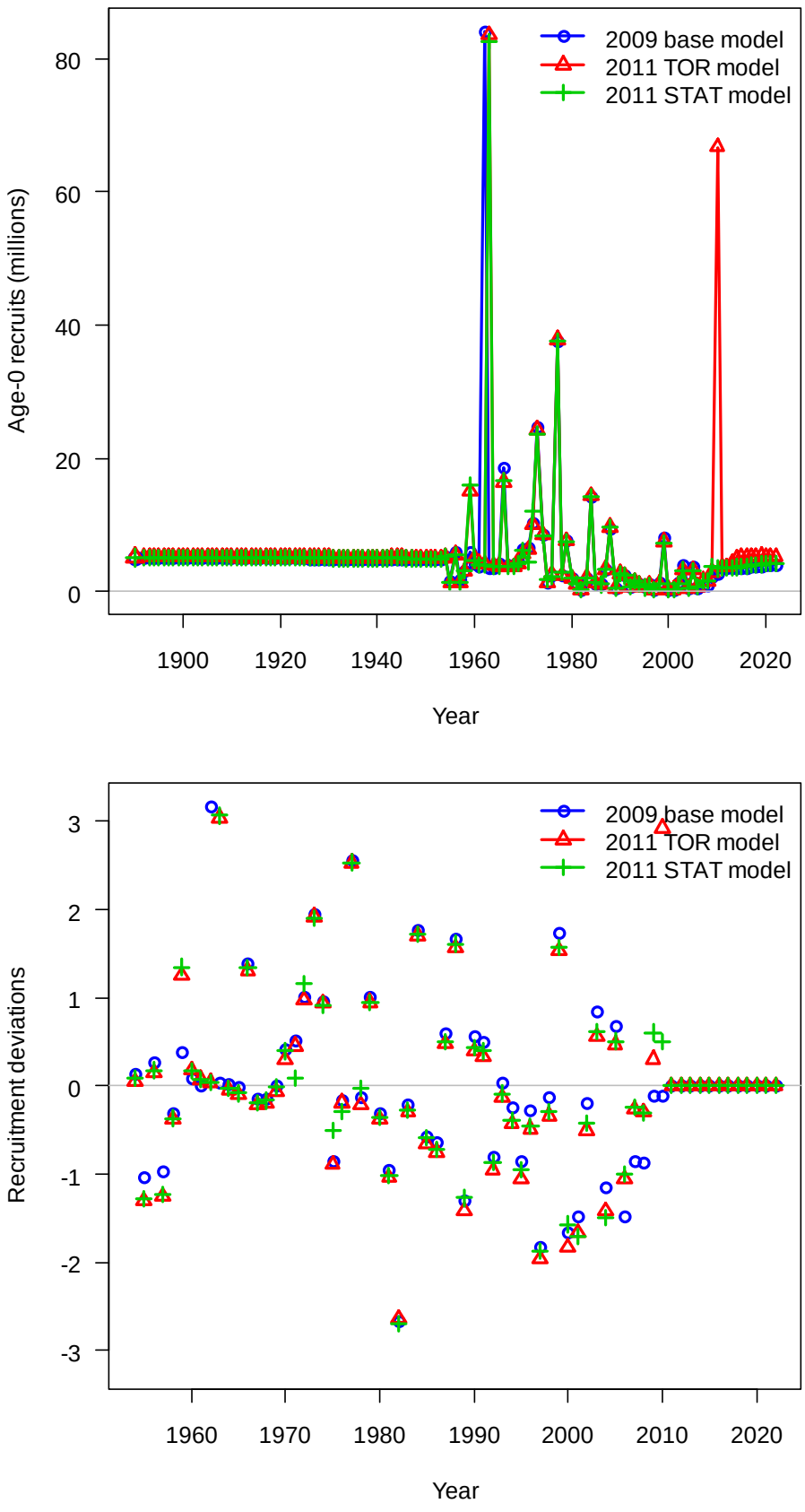
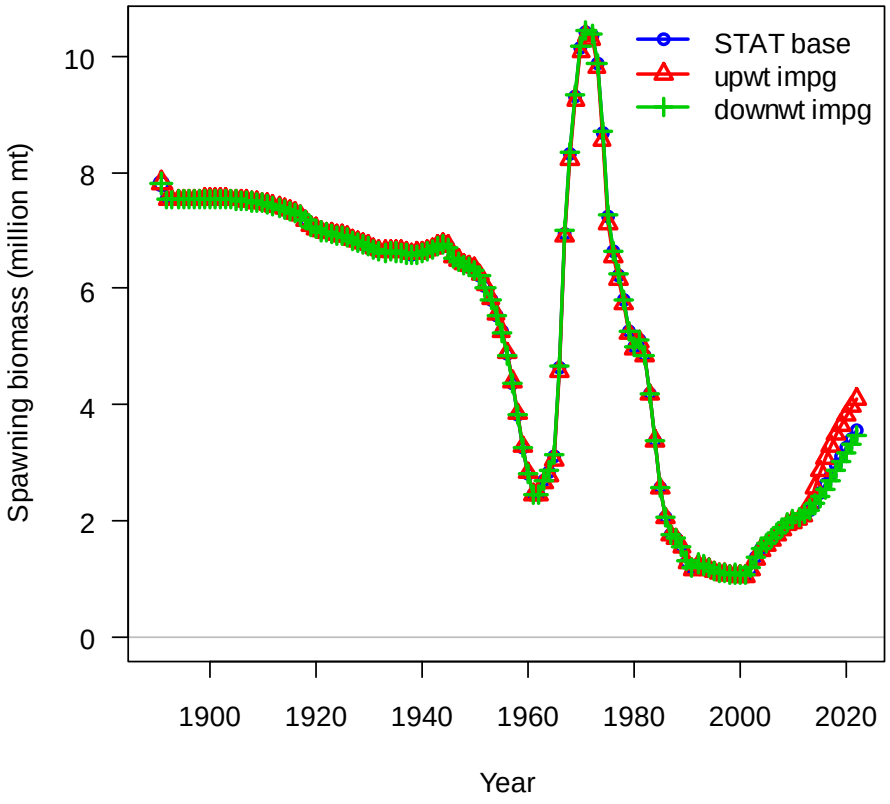


Figure 35: Comparison of 2009, 2011 base model, and Terms of Reference ("TOR") 2011 model (for sensitivity) recruitment and recruitment deviation values.



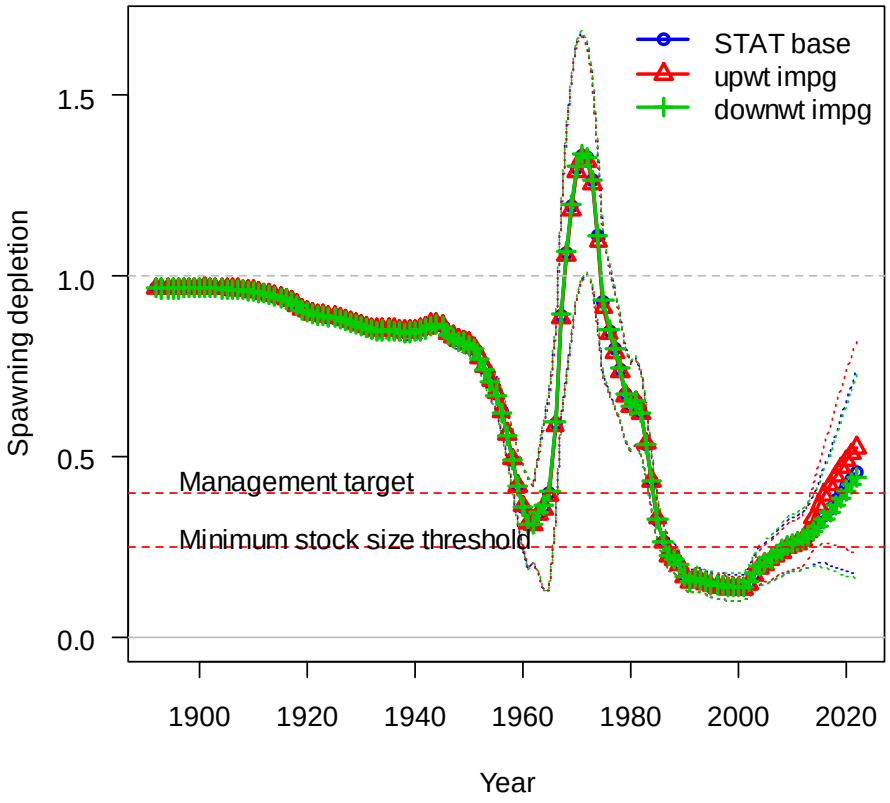


Figure 36: Comparison of the 2011 base model, with upweighted and downweighted impingement data, base model spawning output and depletion trends.

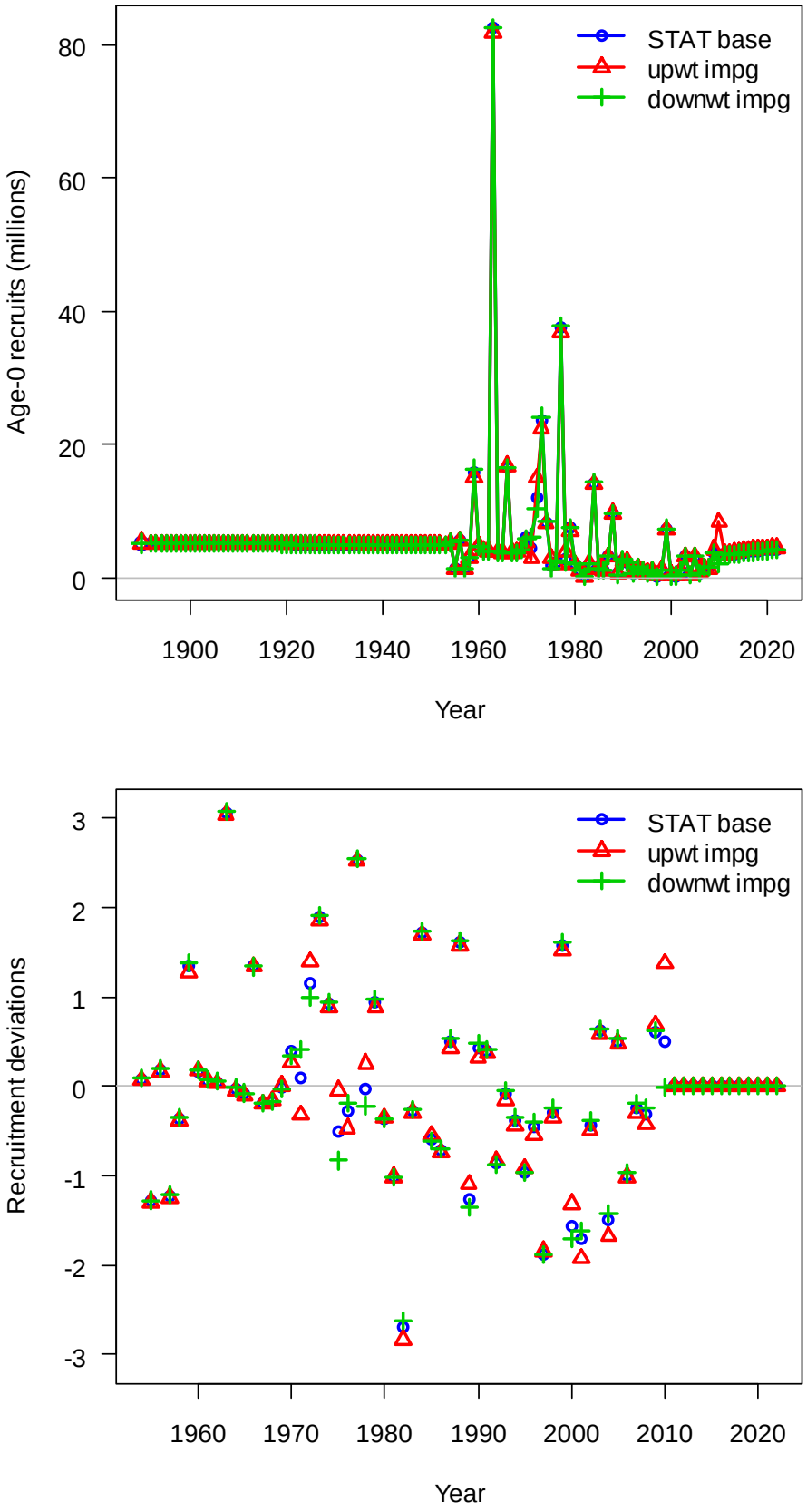


Figure 37: Comparison of the 2011 base model, with upweighted and downweighted impingement data, recruitment and recruitment deviation values.

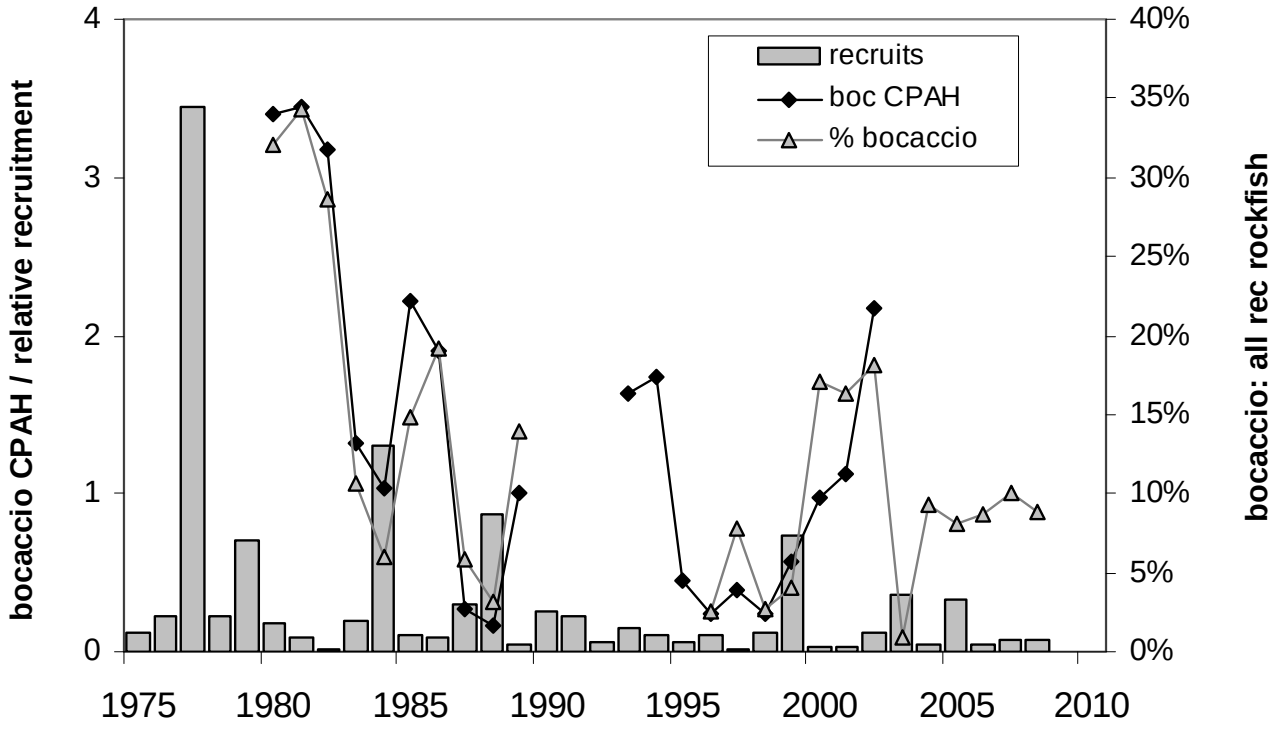


Figure 38: Estimated annual recruitment (grey bars) relative to Southern California recreational fishery catch rates (black line) and the percentage of the total southern California recreational catch represented by bocaccio (grey line).

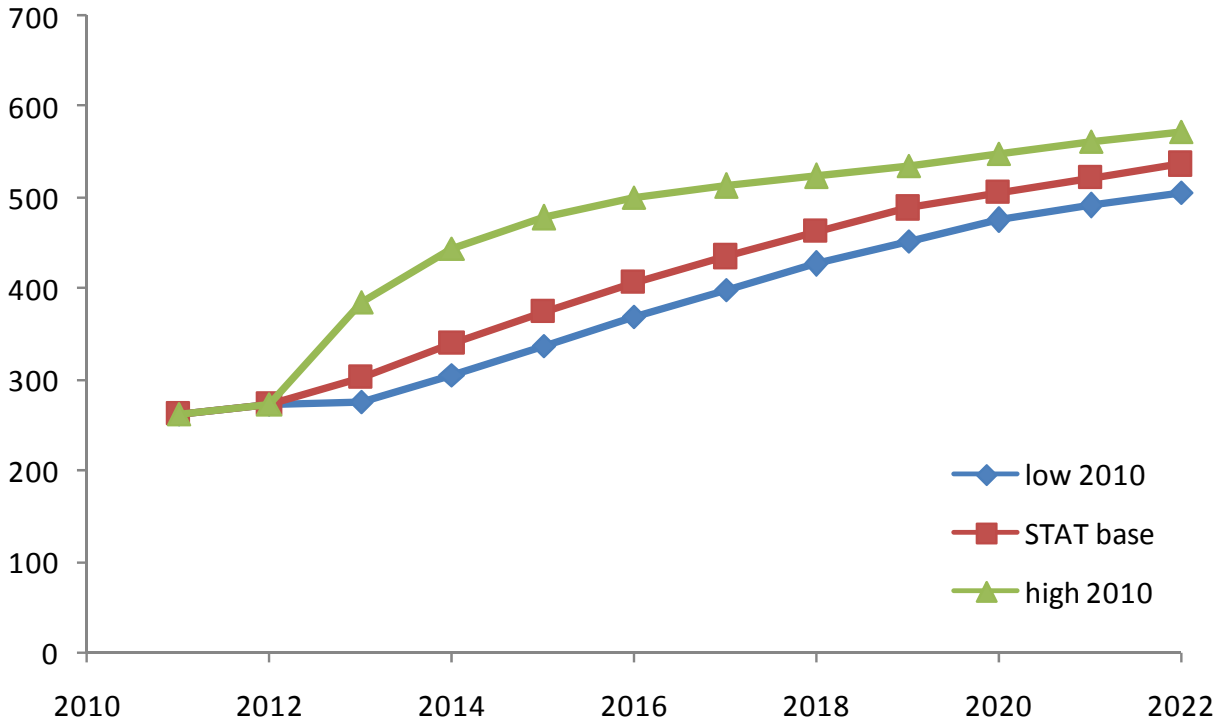
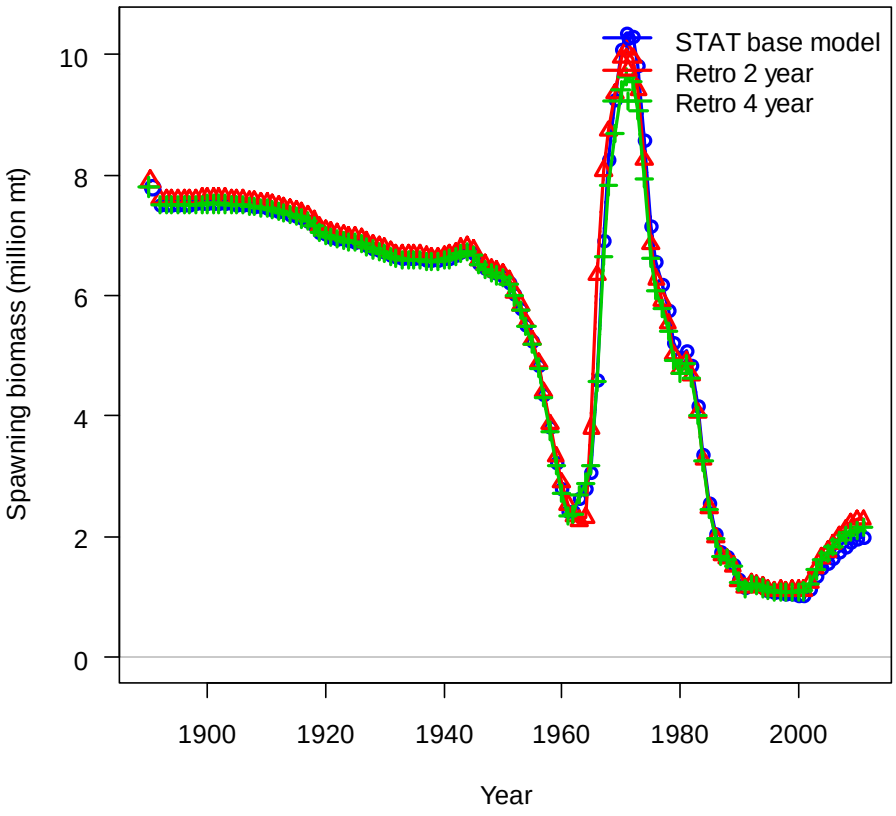


Figure 39: Catch streams associated with the 0.777 SPR rate as applied to projections from the base, low and high 2010 recruitment scenarios



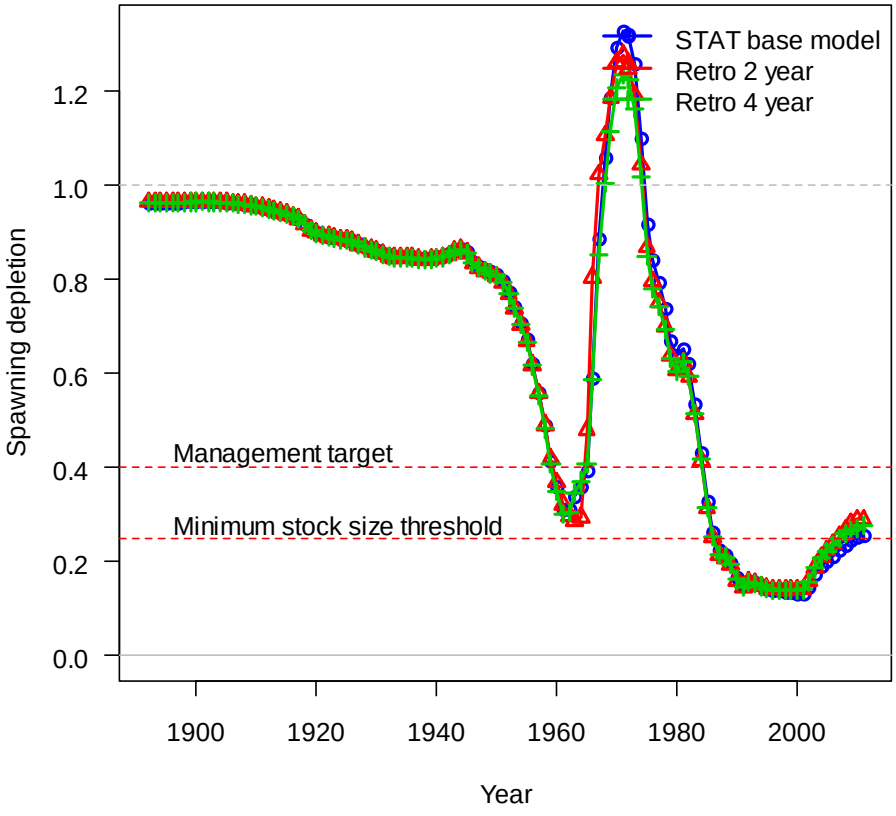


Figure 40: Retrospective analysis of STAT base model spawning output and depletion trends.

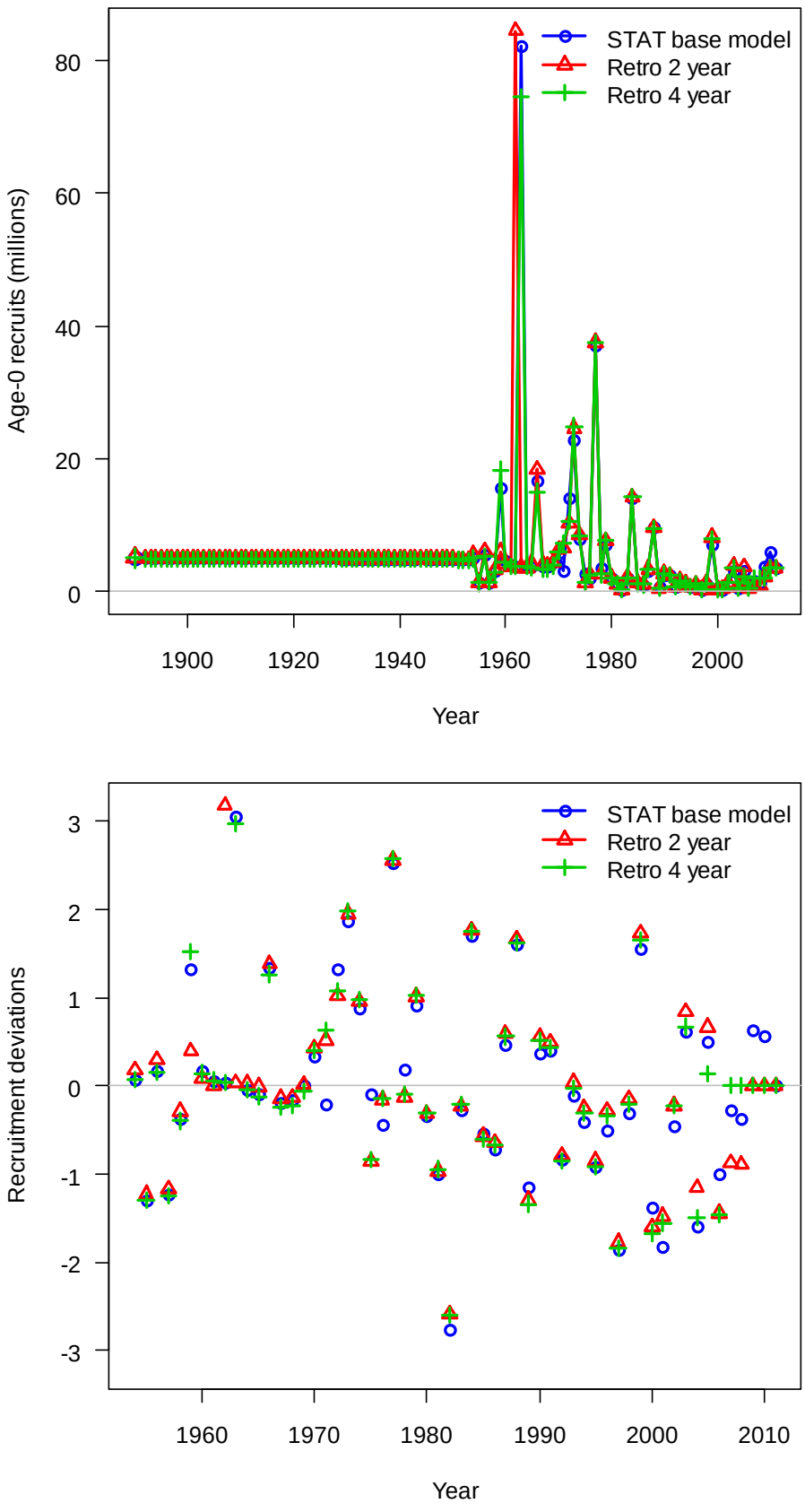


Figure 41: Retrospective analysis of STAT base model recruitment and recruitment deviations.

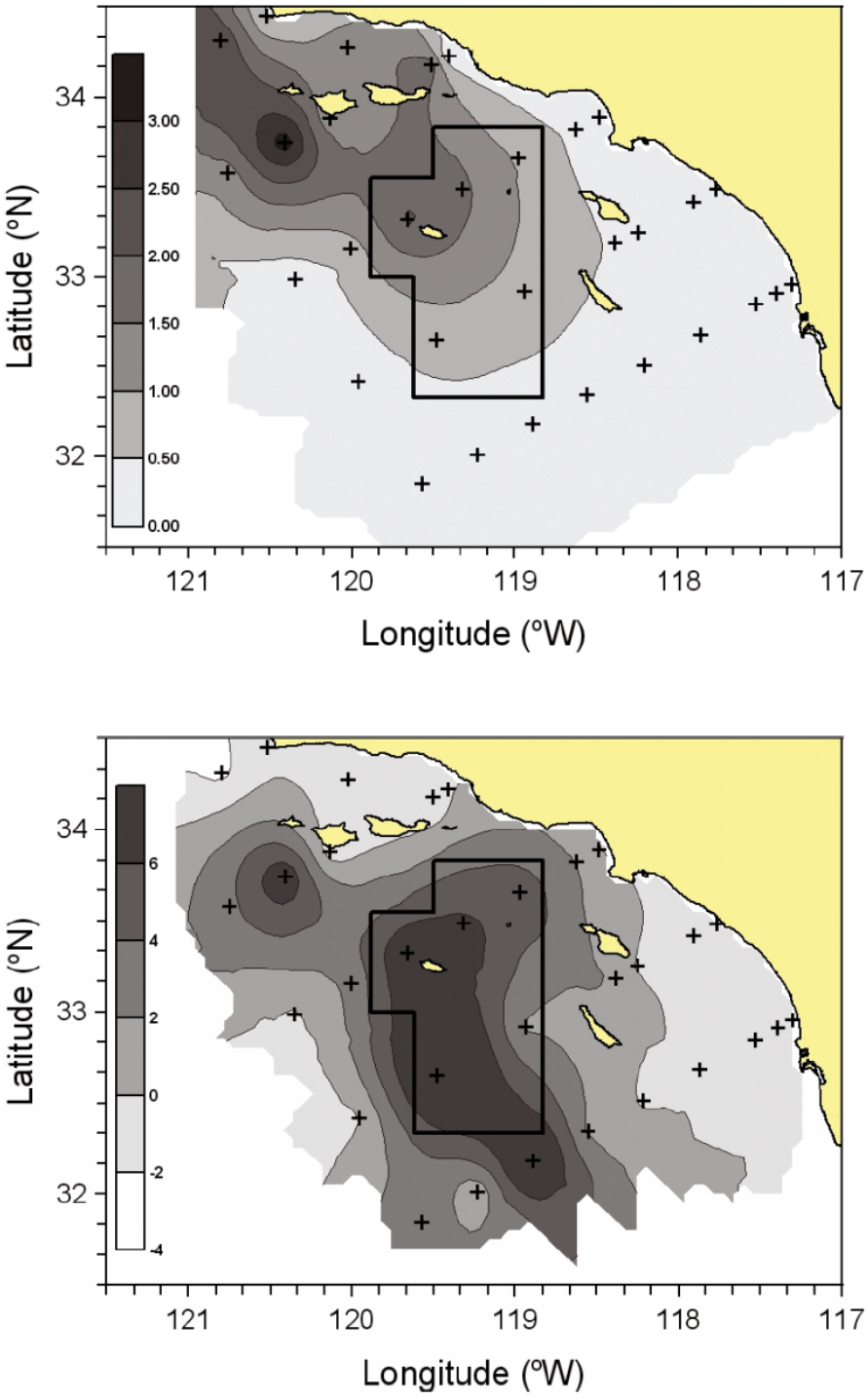


Figure 42: Figures 32a-b. Spatial distribution of bocaccio larvae (number per 10 m2) based on long-term mean of station effects (top) and as 2002-2003 anomalies from the long-term mean distribution (bottom).

Appendix A: Data, control, starter and forecast files for 2011 bocaccio update

Starter file

```
#V3.20b
#C starter comment here
boc8.dat
boc4f.ctl
0 # 0=use init values in control file; 1=use ss3.par
0 # run display detail (0,1,2)
1 # detailed age-structured reports in REPORT.SSO (0,1)
0 # write detailed checkup.sso file (0,1)
0 # write parm values to ParmTrace.sso (0=no,1=good,active; 2=good,all; 3=every_iter,all_parms; 4=every,active)
1 # write to cumreport.sso (0=no,1=like&timeseries; 2=add survey fits)
0 # Include prior_like for non-estimated parameters (0,1)
1 # Use Soft Boundaries to aid convergence (0,1) (recommended)
3 # Number of datafiles to produce: 1st is input, 2nd is estimates, 3rd and higher are bootstrap
7 # Turn off estimation for parameters entering after this phase
10 # MCeval burn interval
2 # MCeval thin interval
0 # jitter initial parm value by this fraction
1890 # min yr for sdreport outputs (-1 for styr)
2022 # max yr for sdreport outputs (-1 for endyr; -2 for endyr+Nforecastyrs
0 # N individual STD years
#vector of year values
0.0001 # final convergence criteria (e.g. 1.0e-04)
0 # retrospective year relative to end year (e.g. -4)
1 # min age for calc of summary biomass
1 # Depletion basis: denom is: 0=skip; 1=rel X*B0; 2=rel X*Bmsy; 3=rel X*B_styr
1 # Fraction (X) for Depletion denominator (e.g. 0.4)
3 # SPR_report_basis: 0=skip; 1=(1-SPR)/(1-SPR_tgt); 2=(1-SPR)/(1-SPR_MSY); 3=(1-SPR)/(1-SPR_Btarget); 4=rawSPR
1 # F_report_units: 0=skip; 1=exploitation(Bio); 2=exploitation(Num); 3=sum(Frates); 4=true F for range of ages
#COND 10 15 #_min and max age over which average F will be calculated with F_reporting=4
3 # F_report_basis: 0=raw; 1=F/Fspr; 2=F/Fmsy ; 3=F/Fbtgt
999 # check value for end of file
```

Forecast file

```
# for all year entries except rebuilder; enter either: actual year, -999 for styr, 0 for endyr, neg number for rel. endyr
1 # Benchmarks: 0=skip; 1=calc F_spr,F_btgt,F_msy
2 # MSY: 1= set to F(SPR); 2=calc F(MSY); 3=set to F(Btgt); 4=set to F(endyr)
0.77 # SPR target (e.g. 0.40)
0.4 # Biomass target (e.g. 0.40)
#_Bmark_years: beg_bio, end_bio, beg_selex, end_selex, beg_relF, end_relF (enter actual year, or values of 0 el. endyr)
0 0 0 0 0 0
# 2010 2010 2010 2010 2010 2010 # after processing
1 #Bmark_relF_Basis: 1 = use year range; 2 = set relF same as forecast below
1 # Forecast: 0=none; 1=F(SPR); 2=F(MSY) 3=F(Btgt); 4=Ave F (uses first-last relF yrs); 5=input annual F scalar
12 # N forecast years
1 # F scalar (only used for Do_Forecast==5)
#_Fcast_years: beg_selex, end_selex, beg_relF, end_relF (enter actual year, or values of 0 or -integer to be rel. endyr)
0 0 -3 0
# 2010 2010 2007 2010 # after processing
1 # Control rule method (1=catch=f(SSB) west coast; 2=F=f(SSB) )
0.4 # Control rule Biomass level for constant F (as frac of Bzero, e.g. 0.40)
0.1 # Control rule Biomass level for no F (as frac of Bzero, e.g. 0.10)
1 # Control rule target as fraction of Flimit (e.g. 0.75)
3 #_N forecast loops (1-3) (fixed at 3 for now)
3 #_First forecast loop with stochastic recruitment
0 #_Forecast loop control #3 (reserved for future bells&whistles)
0 #_Forecast loop control #4 (reserved for future bells&whistles)
0 #_Forecast loop control #5 (reserved for future bells&whistles)
2023 #FirstYear for caps and allocations (should be after years with fixed inputs)
0 # stddev of log(realized catch/target catch) in forecast (set value>0.0 to cause active impl_error)
0 # Do West Coast gfish rebuilder output (0/1)
2000 # Rebuilder: first year catch could have been set to zero (Ydecl)(-1 to set to 1999)
2011 # Rebuilder: year for current age structure (Yinit) (-1 to set to endyear+1)
1 # fleet relative F: 1=use first-last alloc year; 2=read seas(row) x fleet(col) below
# Note that fleet allocation is used directly as average F if Do_Forecast=4
2 # basis for fcast catch tuning and for fcast catch caps and allocation (2=deadbio; 3=retainbio; 5=deadnum; 6=retainnum)
# Conditional input if relative F choice = 2
# Fleet relative F: rows are seasons, columns are fleets
# 0.0934707 0.0262569 0.00218684 0.777667 0.0598171 0.0406017
# max totalcatch by fleet (-1 to have no max) must enter value for each fleet
-1 -1 -1 -1 -1 -1
# max totalcatch by area (-1 to have no max); must enter value for each fleet
-1
# fleet assignment to allocation group (enter group ID# for each fleet, 0 for not included in an alloc group)
0 0 0 0 0 0
#_Conditional on >1 allocation group
# allocation fraction for each of: 0 allocation groups
0 # Number of forecast catch levels to input (else calc catch from forecast F)
2 # basis for input Fcast catch: 2=dead catch; 3=retained catch; 99=input Hrate(F) (units are from fleetunits; note new
# Input
fixed catch values
#Year Seas Fleet Catch(or_F)
#
999 # verify end of input
```

Control File

#C growth parameters are estimated
#_3.21 version
1 #_N_Growth_Patterns
1 #_N_Morphs_Within_GrowthPattern
#_Cond 1 #_Morph_between/within_stdev_ratio (no read if N_morphs=1)
#_Cond 1 #vector_Morphdist_(-1_in_first_val_gives_normal_approx)

#_Cond 0 # N recruitment designs goes here if N_GP*nseas*area>1
#_Cond 0 # placeholder for recruitment interaction request
#_Cond 1 1 1 # example recruitment design element for GP=1, seas=1, area=1

#_Cond 0 # N_movement_definitions goes here if N_areas > 1
#_Cond 1.0 # first age that moves (real age at begin of season, not integer) also cond on do_migration>0
#_Cond 1 1 1 2 4 10 # example move definition for seas=1, morph=1, source=1 dest=2, age1=4, age2=10

3 #_Nblock_Patterns
11 6 18 #_blocks_per_pattern
begin and end years of blocks
1975 1977
1978 1980
1981 1983
1984 1986
1987 1989
1990 1992
1993 1995
1996 1998
1999 2001
2002 2004
2005 2008

1970 1979
1980 1988
1989 1991
1992 1998
1999 2003
2004 2008

1973 1974
1975 1976
1977 1978
1979 1980
1981 1982
1983 1984
1985 1986
1987 1988
1989 1990
1991 1992
1993 1994
1995 1996
1997 1998
1999 2000
2001 2002
2003 2004
2005 2006
2007 2008

0.5 #_fracfemale
1 #_natM_type:_0=1Parm; 1=N_breakpoints;_2=Lorenzen;_3=agespecific;_4=agespec_withseasinterpolate
2 #_N_breakpoints

```
1 5 # age(real) at M breakpoints
1 # GrowthModel: 1=vonBert with L1&L2; 2=Richards with L1&L2; 3=not implemented; 4=not implemented
1.5 #_Growth_Age_for_L1
25 #_Growth_Age_for_L2 (999 to use as Linf)
0 #_SD_add_to_LAA (set to 0.1 for SS2 V1.x compatibility)
0 #_CV_Growth_Pattern:  0 CV=f(LAA); 1 CV=F(A); 2 SD=F(LAA); 3 SD=F(A)
1 #_maturity_option:  1=length logistic; 2=age logistic; 3=read age-maturity matrix by growth_pattern; 4=read age-fecundity
#_placeholder for empirical age-maturity by growth pattern
1 #_First_Mature_Age
1 #_fecundity option:(1)eggs=Wt*(a+b*Wt);(2)eggs=a*L^b;(3)eggs=a*Wt^b
0
1 #_parameter_offset_approach (1=none, 2= M, G, CV_G as offset from female-GP1, 3=like SS2 V1.x)
2 #_env/block/dev_adjust_method (1=standard; 2=with logistic trans to keep within base parm bounds)

#_growth_parms
#_LO HI INIT PRIOR PR_type SD PHASE env-var use_dev dev_min dev_max dev_std Block Blk_Fxn
0.05 0.25 0.15 0.16 0 0.8 -3 0 0 0 0 0.5
 0 0 # NatM_p_1_Fem_GP:1
0.05 0.25 0.15 0.16 0 0.8 -3 0 0 0 0 0.5
 0 0 # NatM_p_2_Fem_GP:1
1 45 26 27 0 10 -4 0 0 0 0 0.5
 0 0 # L_at_Amin_Fem_GP_1
60 80 67.738 69 0 10 3 0 0 0 0 0.5
 0 0 # L_at_Amax_Fem_GP_1
0.15 0.25 0.21958 0.21 0 0.8 3 0 0 1970 2008 0.5
 3 1 # VonBert_K_Fem_GP_1
0.05 0.25 0.1 0.1 0 0.8 -6 0 0 0 0 0.5
 0 0 # CV_young_Fem_GP_1
0.05 0.25 0.08 0.1 0 0.8 -3 0 0 0 0 0.5
 0 0 # CV_old_Fem_GP_1
0.05 0.25 0.15 0.16 0 0.8 -3 0 0 0 0 0.5
 0 0 # NatM_p_1_Mal_GP:1
0.05 0.25 0.15 0.16 0 0.8 -3 0 0 0 0 0.5
 0 0 # NatM_p_2_Mal_GP:1
1 45 26 27 0 10 -4 0 0 0 0 0.5
 0 0 # L_at_Amin_Mal_GP_1
50 70 58.9149 61 0 10 3 0 0 0 0 0.5
 0 0 # L_at_Amax_Mal_GP_1
0.2 0.3 0.26418 0.2 0 0.8 3 0 0 1970 2008 0.5
 3 1 # VonBert_K_Mal_GP_1
0.05 0.25 0.1 0.1 0 0.8 -6 0 0 0 0 0.5
 0 0 # CV_young_Mal_GP_1
0.05 0.25 0.08 0.1 0 0.8 -3 0 0 0 0 0.5
 0 0 # CV_old_Mal_GP_1
-3 3 7.355E-06 2.44E-06 0 0.8 -3 0 0 0 0
 0.5 0 0 # Wtlen_1_Mal
-3 4 3.11359 3.34694 0 0.8 -3 0 0 0 0 0.5
 0 0 # Wtlen_2_Mal
30 60 39.9 37.7 0 0.8 -3 0 0 0 0 0.5
 0 0 # Mat50%_Fem
-3 3 -0.359 -0.2876 0 0.8 -3 0 0 0 0 0.5
 0 0 # Mat_slope_Fem
#-3 3 0.22475 0.25 0 0.8 -3 0 0 0 0 0.5
 0 0 # Eg/gm_inter_Fem
#-3 3 0.03657 0 0 0.8 -3 0 0 0 0 0.5
 0 0 # Eg/gm_slope_wt_Fem
-3 3 192.5 190 0 0.8 -3 0 0 0 0 0.5
 0 0 # Eg/gm_inter_Fem
-3 3 49.3 36.57 0 0.8 -3 0 0 0 0 0.5
 0 0 # Eg/gm_slope_wt_Fem
```

```
-3          3 7.355E-06                     2.44E-06 0 0.8              -3          0 0 0 0
            0.5         0 0 # Wtlen_1_Mal
-3          4 3.11359           3.34694   0 0.8               -3          0 0 0 0 0.5
            0 0 # Wtlen_2_Mal
0 0 0 0 -1                                          0 -4                0 0 0 0 0
            0 0 # RecrDist_GP_1
0 0 0 0 -1                                          0 -4                0 0 0 0 0
            0 0 # RecrDist_Area_                            1
0 0 0 0 -1                                          0 -4                0 0 0 0 0
            0 0 # RecrDist_Seas_                          1
0 0 0 0 -1                                          0 -4                0 0 0 0 0
            0 0 # CohortGrowDev


#_Cond 0  #custom_MG-env_setup (0/1)
#_Cond -2 2 0 0 -1 99 -2 #_placeholder when no MG-environ parameters

1 #_Cond 0  #custom_MG-block_setup (0/1)
#_Cond -2 2 0 0 -1 99 -2 #_placeholder when no MG-block parameters
#_LO      HI          INIT        PRIOR    PR_type SD          PHASE
-5          5 0 0 0 -5                                          -4
-5          5 0 0 0 -5                                          -4
-5          5 0 0 0 -5                                          -4
```

```
#_Cond -4 #_MGparm_Dev_Phase

#_Spawner-Recruitment
3 #_SR_function
#_LO HI INIT PRIOR PR_type SD PHASE
6 15 9.5 9 0 10 1 # SR_R0
0.2 1 0.736 0.73 0 0.186 5 # SR_steep
0 2 1 0.95 0 0.8 -4 # SR_sigmaR
-5 5 0 0 0 1 -3 # SR_envlink
-5 5 0 0 0 1 -4 # SR_R1_offset
0 0 0 0 -1 0 -99 # SR_autocorr
0 #_SR_env_link
0 #_SR_env_target_0=none;1=devs;_2=R0;_3=steepness

1 #do_recdev:  0=none; 1=devvector; 2=simple deviations
1954 # first year of main recr_devs; early devs can preceed this era
2010 # last year of main recr_devs; forecast devs start in following year
2 #_recdev phase

1 # (0/1) to read 11 advanced options
0 #_recdev_early_start (0=none; neg value makes relative to recdev_start)
-4 #_recdev_early_phase
0 #_forecast_recruitment phase (incl. late recr) (0 value resets to maxphase+1)
1 #_lambda for prior_fore_recr occurring before endyr+1
1965 #_last_early_yr_nobias_adj_in_MPD
1975 #_first_yr_fullbias_adj_in_MPD
2010 #_last_yr_fullbias_adj_in_MPD
2011 #_first_recent_yr_nobias_adj_in_MPD
1.
0
-5 #min rec_dev
5 #max rec_dev
0 #_read_recdevs
#_end of advanced SR options
# read specified recr devs
#_Yr Input_value


#Fishing Mortality info
0.26 # F ballpark for tuning early phases
1980 # F ballpark year (neg value to disable)
3 # F_Method:  1=Pope; 2=instan. F; 3=hybrid (hybrid is recommended)
2.9 # max F or harvest rate, depends on F_Method

#need these three lines when doing option 2
#0.1  # start F
#1    # overall phase
#0    # N detailed inputs
#5  # need this for Fmethod 3, number if tuning iterations in hybrid F, 4 or 5 usually good
5

# no additional F input needed for Fmethod 1
# read overall start F value; overall phase; N detailed inputs to read for Fmethod 2
# read N iterations for tuning for Fmethod 3 (recommend 3 to 7)
#Fleet Year Seas F_value se phase (for detailed setup of F_Method=2)

#_initial_F_parms
#_LO HI INIT PRIOR PR_type SD PHASE
0 0.1 0 0.01 1 99 -2 # InitF_1FISHERY1
0.0001 0.05 0.007 0.007 0 99 2 # InitF_1FISHERY2
0 0.1 0 0.01 1 99 -2 # InitF_1FISHERY3
0 0.1 0 0.01 1 99 -2 # InitF_1FISHERY4
```

0 0.1 0 0.01 1 99 -2 # InitF_1FISHERY5
0 0.1 0 0.01 1 99 -2 # InitF_1FISHERY6

#_Q_setup
# A=do power, B=env-var, C=extra SD, D=devtype(<0=mirror, 0/1=none, 2=cons, 3=rand, 4=randwalk);
E=0=num/1=bio, F=err_type
#A B C D
0 0 0 0 # fleet (fishery or survey) # 1
0 0 0 0 # fleet (fishery or survey) # 2
0 0 0 0 # fleet (fishery or survey) # 3
0 0 0 0 # fleet (fishery or survey) # 4
0 0 0 0 # fleet (fishery or survey) # 5
0 0 0 0 # fleet (fishery or survey) # 6
0 0 0 0 # fleet (fishery or survey) # 7
0 0 0 0 # fleet (fishery or survey) # 8
0 0 0 0 # fleet (fishery or survey) # 9
0 0 0 0 # fleet (fishery or survey) # 10
0 0 0 0 # fleet (fishery or survey) # 11
0 0 0 0 # fleet (fishery or survey) # 12
0 0 0 0 # fleet (fishery or survey) # 13
0 0 0 0 # fleet (fishery or survey) # 14
0 0 0 0 # fleet (fishery or survey) # 15
0 0 0 0 # fleet (fishery or survey) # 16

#_Cond 0 #_If q has random component, then 0=read one parm for each fleet with random q; 1=read a parm for each year of index
#_Q_parms(if_any)
LO HI INIT PRIOR PR_type SD PHASE

#_size_selex_types
#_Pattern Discard Male Special
24 0 0 0 # FISHERY1 trawl
24 0 0 0 # FISHERY2 hookline
24 0 0 0 # FISHERY3 gillnet
24 0 0 0 # FISHERY4 southrec
1 0 0 0 # FISHERY5 cenrec
1 0 0 0 # Fishery6 trawlnorth
30 0 0 0 # SURVEY1 calcofi
24 0 0 0 # SURVEY2 triennial
5 0 0 5 # SURVEY3 deb w-v
24 0 0 0 # SURVE4 hookline
1 0 0 0 # SURVEY5 nwc combo
33 0 0 0 # SURVEY6 juvenile survey
0 0 0 0 # SURVEY7 pier index
0 0 0 0 # SURVEY8 60s MBay rec LFs
5 0 0 1 # SURVEY9 mirror southern trawl to look at LFs from observer fleet
5 0 0 4 # SURVEY10 - mirror southern rec (for CPFV obs. LFs)

#_age_selex_types
#_Pattern ___ Male Special
11 0 0 0 # 1 FISHERY1
11 0 0 0 # 1 FISHERY2
11 0 0 0 # 1 FISHERY3
11 0 0 0 # 1 FISHERY4
11 0 0 0 # 1 FISHERY5
11 0 0 0 # 1 FISHERY6
11 0 0 0 # 2 SURVEY1
11 0 0 0 # 3 SURVEY2
11 0 0 0 # 3 SURVEY3
11 0 0 0 # 3 SURVEY4

```
11 0 0 0 # 3 SURVEY5
11 0 0 0 # 3 SURVEY6
11 0 0 0 # 3 SURVEY7
11 0 0 0 # 3 SURVEY8
11 0 0 0 # 3 SURVEY9
11 0 0 0 # 3 SURVEY10

#_LO HI INIT PRIOR PR_type SD PHASE env-var use_dev dev_minyr dev_maxyr dev_stddev Block Block_Fxn
#_size_sel: trawl - try logistic-

15      60      45.5    46      0 20            3 0 0 0 0 0.5
        0 0 # PEAK                      value
-10     10      -4.822  5 0 10                  -4      0 0 0 0 0.5
        0 0 # TOP                       logistic
1 15            4.296   3.5     0 10            -4      0 0 0 0 0.5
        0 0 # WIDTH                     exp
-1      9 4.76          2 0 10                  -4      0 0 0 0 0.5
        0 0 # WIDTH                     exp
-15     9 -10.5         -4.5    0 10            -4      0 0 0 0 0.5
        0 0 # INIT                      logistic
-5      9 -0.766        2 0 10                  -4      0 0 0 0 0.5
        0 0 # FINAL                     logistic

# size_se1: 1- male offsets- 4 lines
#1      60      16      20      0 100           -5      0 0 0 0 0.5
        0 0 # size@dogleg
#-10    0 0 0 0 10                              -5      0 0 0 0 0.5
        0 0 # log(relmalesel)                    at minL
#-10    0 0 0 0 10                              -5      0 0 0 0 0.5
        0 0 # log(relmalesel)                    at dogleg
#-10    0 0 0 0 10                              -5      0 0 0 0 0.5
        0 0 # log(relmalesel)                    at maxL
# size_se1: 1- male offsets- 4 lines
# fishery 2
15      60      52.459  55      0 20            3 0 0 0 0 0.5
        0 0 # PEAK                      value
-10     10      -10     5 0 10                  3 0 0 0 0 0.5
        0 0 # TOP                       logistic
1 15            4.096   3.5     0 10            3 0 0 0 0 0.5
        0 0 # WIDTH                     exp
-1      9 4.744         2 0 10                  3 0 0 0 0 0.5
        0 0 # WIDTH                     exp
-15     9 -11.22        -4.5    0 10            3 0 0 0 0 0.5
        0 0 # INIT                      logistic
-5      9 -1            2 0 10                  3 0 0 0 0 0.5
        0 0 # FINAL                     logistic
# fishery 3
15      60      50.713  55      0 20            3 0 0 0 0 0.5
        0 0 # PEAK                      value
-10     10      -9.8    -5      0 10            3 0 0 0 0 0.5
        0 0 # TOP                       logistic
1 15            3.008   3.5     0 10            3 0 0 0 0 0.5
        0 0 # WIDTH                     exp
-1      9 4.408         2 0 10                  3 0 0 0 0 0.5
        0 0 # WIDTH                     exp
-15     9 -11.22        -6      0 10            3 0 0 0 0 0.5
        0 0 # INIT                      logistic
-5      9 -1.76         2 0 10                  3 0 0 0 0 0.5
        0 0 # FINAL                     logistic
#_size_sel: 4 double logistic-
15      60      36      40      0 20            3 0 0 0 0 0.5
        0 0 # PEAK                      value
```

```
-10         10          -7          -5          0 10                3 0 0 0 0 0.5
            0 0 # TOP                                   logistic
1 15                    4 3.5                   0 10                3 0 0 0 0 0.5
            0 0 # WIDTH                                 exp
-1          9 5.2                   5 0 10              3 0 0 0 0 0.5
            0 0 # WIDTH                                 exp
-15         9 -4                    -4.5        0 10                3 0 0 0 0 0.5
            0 0 # INIT                                  logistic
-5          9 -3.28                 -4          0 10                3 0 0 0 0 0.5
            0 0 # FINAL                                 logistic
# size_sel fishery 5 cenrec double logistic
#15         80          54.68       55          0 20                3 0 0 0 0 0.5
            0 0 # PEAK                                  value
#-10        10          5.1         5 0 10              3 0 0 0 0 0.5
            0 0 # TOP                                   logistic
#1          15          6.1         3.5         0 10                3 0 0 0 0 0.5
            0 0 # WIDTH                                 exp
#-1         9 2.5                   2 0 10              3 0 0 0 0 0.5
            0 0 # WIDTH                                 exp
#-15        9 -2.86                 -4.5        0 10                3 0 0 0 0 0.5
            0 0 # INIT                                  logistic
#-5         9 1.25                  2 0 10              3 0 0 0 0 0.5
            0 0 # FINAL                                 logistic
#_size_sel: cenRec - try logistic-
5           50          40          35          0           50      3       0       0       0       0       0
 0                      0 #
0.0001      35          10          15          0           10      3       0       0       0       0       0
 0                      0 #

# size_sel fishery 6 trawlnorth double logistic
#13         80          54.68       55          0 20                3 0 0 0 0 0.5
            0 0 # PEAK                                  value
#-10        10          -9.792      5 0 10              3 0 0 0 0 0.5
            0 0 # TOP                                   logistic
#1          15          6.112       3.5         0 10                3 0 0 0 0 0.5
            0 0 # WIDTH                                 exp
#-1         9 5.56                  2 0 10              3 0 0 0 0 0.5
            0 0 # WIDTH                                 exp
#-15        9 -2.86                 -4.5        0 10                3 0 0 0 0 0.5
            0 0 # INIT                                  logistic
#-5         9 -1.25                 2 0 10              3 0 0 0 0 0.5
            0 0 # FINAL                                 logistic

# size sel for fishery 6- northern trawl
5           50          40          35          0           50      3       0       0       0       0       0
 0                      0 #
0.0001      35          10          5           0           10      3       0       0       0       0       0
 0                      0 #
#-1 20 -1 -1 -1 99 -3 0 0 0 0 0.5 0 0 # SizeSel_1P_1_SURVEY3 - min and max bins
#-1 20 -1 -1 -1 99 -3 0 0 0 0 0.5 0 0 # SizeSel_1P_2_SURVEY3 - min and max bins# sel survey 8 triennial
# size selectivity survey 8 - triennial
#5          50          40          20          0           50      3       0       0       0       0       0
 0                      0 #
#0.0001     35          10          5           0           10      3       0       0       0       0       0
 0                      0 #

# sel survey 8 - triennial double logistic
15 80 24 25 0                                   20 -3               0       0       0       0       0.5
            0 0 # PEAK                                  value
-10         10          -9.792      5 0 10                          -3      0 0 0 0 0.5
            0 0 # TOP                                   logistic3
```

```
1 15            6.112   3.5     0 10            -3      0 0 0 0 0.5
        0 0 # WIDTH                     exp
-1      9 5.56          2 0 10          -3      0 0 0 0 0.5
        0 0 # WIDTH                     exp
-15     9 -2.86         -4.5    0 10            -3      0 0 0 0 0.5
        0 0 # INIT                      logistic
-5      9 -1.25         2 0 10          -3      0 0 0 0 0.5
        0 0 # FINAL                     logistic
# size sel 9 cpfv, set to mirror northrec
-1 20 -1 -1 -1 99 -3 0 0 0 0 0.5 0 0 # SizeSel_1P_1_SURVEY3 - min and max bins
-1 20 -1 -1 -1 99 -3 0 0 0 0 0.5 0 0 # SizeSel_1P_2_SURVEY3 - min and max bins# sel survey 8 triennial


#_size_sel: 10 SCB hook line double logistic-
15      60      54      55      0 20            3 0 0 0 0 0.5
        0 0 # PEAK                      value
-10     10      -3.9    -5      0 10            3 0 0 0 0 0.5
        0 0 # TOP                       logistic
1 15            12.2    3.5     0 10            3 0 0 0 0 0.5
        0 0 # WIDTH                     exp
-1      9 5.2           2 0 10          3 0 0 0 0 0.5
        0 0 # WIDTH                     exp
-15     9 -1.7          -4.5    0 10            3 0 0 0 0 0.5
        0 0 # INIT                      logistic
-5      9 -3.3          2 0 10          3 0 0 0 0 0.5
        0 0 # FINAL                     logistic

# size sel. 11 - combo survey - mirror triennial
#-1 20 -1 -1 -1 99 -3 0 0 0 0 0.5 0 0 # SizeSel_1P_1_SURVEY3 - min and max bins
#-1 20 -1 -1 -1 99 -3 0 0 0 0 0.5 0 0 # SizeSel_1P_2_SURVEY3 - min and max bins# sel survey 8 triennial
5       50      30      25      0       50      3       0       0       0       0       0
 0              0 #
0.0001  35      10      15      0       10      3       0       0       0       0       0
 0              0 #
# size selectivity survey 11 - NWFSC combo survey
#13     60      28.52   55      0 20            3 0 0 0 0 0.5
        0 0 # PEAK                      value
#-10    10      -1.23   5 0 10          3 0 0 0 0 0.5
        0 0 # TOP                       logistic
#1      15      4.43    3.5     0 10            3 0 0 0 0 0.5
        0 0 # WIDTH                     exp
#-2     9 -1.5          2 0 10          3 0 0 0 0 0.5
        0 0 # WIDTH                     exp
#-15    9 -0.58         -4.5    0 10            3 0 0 0 0 0.5
        0 0 # INIT                      logistic
#-5     9 -0.03         2 0 10          3 0 0 0 0 0.5
        0 0 # FINAL                     logistic

# size selectivity survey 14 - 60s LFs from CenCal Rec fishery- mirror cen/north rec
#-1 20 -1 -1 -1 99 -3 0 0 0 0 0.5 0 0 # SizeSel_1P_1_SURVEY
#-1 20 -1 -1 -1 99 -3 0 0 0 0 0.5 0 0 # SizeSel_1P_2_SURVEY
# size sel. 15 bycatch LF data from observer program, link to southern trawl fishery
-1 20 -1 -1 -1 99 -3 0 0 0 0 0.5 0 0 # SizeSel_1P_1_SURVEY
-1 20 -1 -1 -1 99 -3 0 0 0 0 0.5 0 0 # SizeSel_1P_2_SURVEY
# size sel. 16 mirror southern rec for LF data from CPFV observer program
-1 20 -1 -1 -1 99 -3 0 0 0 0 0.5 0 0 # SizeSel_1P_1_SURVEY
-1 20 -1 -1 -1 99 -3 0 0 0 0 0.5 0 0 # SizeSel_1P_2_SURVEY


0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_1P_1_FISHERY1
0 21 40 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_1P_2_FISHERY1
0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_1P_1_FISHERY2
```

```
0 21 40 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_1P_2_FISHERY2
0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_1P_1_FISHERY3
0 21 40 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_1P_2_FISHERY3
0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_1P_1_FISHERY4
0 21 40 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_1P_2_FISHERY4
0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_1P_1_FISHERY5
0 21 40 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_1P_2_FISHERY5
0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_1P_1_FISHERY6
0 21 40 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_1P_2_FISHERY6
0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_2P_1_SURVEY1
0 21 40 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_2P_2_SURVEY1
0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_2P_1_SURVEY2
0 21 40 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_2P_2_SURVEY2
0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_3P_1_SURVEY3
0 21 40 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_2P_2_SURVEY3
0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_3P_1_SURVEY4
0 21 40 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_2P_2_SURVEY4

# make NWFSC combo survey unselected for age 0 fish (don't mess with size selectivity)
0 21 1 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_3P_1_SURVEY5
0 21 40 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_2P_2_SURVEY5

0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_3P_1_SURVEY6
0 21 0 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_3P_2_SURVEY6
0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_3P_1_SURVEY7
0 21 0 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_3P_2_SURVEY7

0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_3P_1_SURVEY8
0 21 0 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_3P_2_SURVEY8

0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_3P_1_SURVEY9
0 21 40 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_2P_2_SURVEY9
0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_3P_1_SURVEY10
0 21 40 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_2P_2_SURVEY10




#_Cond 0 #_custom_sel-env_setup (0/1)
#_Cond -2 2 0 0 -1 99 -2 #_placeholder when no enviro fxns


# Tag loss and Tag reporting parameters go next
0  # TG_custom:  0=no read; 1=read if tags exist
#_Cond -6 6 1 1 2 0.01 -4 0 0 0 0 0 0 0  #_placeholder if no parameters

1 #_Variance_adjustments_to_input_values
#_1 2 3
  0.06 0 0 0.59 0.6 0 0.285 0.5 0.22 -0.06 0.25 0.96 0 0.37 0 0#_add_to_survey_CV
#  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 #_add_to_survey_cv
  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 #_add_to_discard_stddev
  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 #_add_to_bodywt_CV
  0.76 1 0.81 0.63 0.83 0.485 1 0.32 1 1 1 1 1 1 1 0.63 #_mult_by_lencomp_N
#  1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 #_mult_by_length comp_N
  1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 #_mult_by_agecomp_N
  1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 #_mult_by_size-at-age_N
# removed for SSv3.20: 30 #_DF_for_discard_like
# removed for SSv3.20: 30 #_DF_for_meanbodywt_like

4 #_maxlambdaphase
0 #_sd_offset
```

```
6 # number of changes to make to default Lambdas (default value is 1.0)
# Like_comp codes:  1=surv; 2=disc; 3=mnwt; 4=length; 5=age; 6=SizeFreq; 7=sizeage; 8=catch;
# 9=init_equ_catch; 10=recrdev; 11=parm_prior; 12=parm_dev; 13=CrashPen; 14=Morphcomp; 15=Tag-comp;
16=Tag-negbin
#like_comp fleet/survey  phase  value  sizefreq_method

1 1 1 1 1
1 8 1 1 1
1 14 1 1 1
4 15 1 0 1
6 4 1 0 1
6 5 1 0 1


# lambdas (for info only; columns are phases)
0 # (0/1) read specs for more stddev reporting
# runfaster using ss3 bat -nohess nox
# R output viewer commands- after loading routines
#myreplist <- SSv3_output(dir='c:\\SS3ver3\\bocstar\\', covar=F)
#SSv3_plots(replist=myreplist,plot=1:7)
#
999
```

Data file

#_bootstrap file: 1
1892 #_styr
2010 #_endyr
1 #_nseas
12 #_months/season
1 #_spawn_seas
6 #_Nfleet
10 #_Nsurveys
1 #_N_areas
trawlsou%H&L%setnet%recSO%recCEN%trawlnor%CalCOFI%TRIENNIAL%CFGCPUE%NWFSChook%NWFSCt
rawl%juvenile%pier_juv%power.plant.index%free1%mirror_recSO
0.5 0.5 0.5 0.5 0.5 0.5 0.1 0.5 0.5 0.78 0.66 0.5 0.75 0.5 0.5 0.5 #_surveytiming_in_season
SCB hook and line, and NWFSC combo based on Julian days
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 #_area_assignments_for_each_fishery_and_survey
1 1 1 1 1 1 #_units of catch: 1=bio; 2=num
0.01 0.01 0.01 0.01 0.01 0.01 #_se of log(catch) only used for init_eq_catch and for Fmethod 2 and 3
2 #_Ngenders
21 #_Nages
0 152.72 0 0 0 0 #_init_equil_catch_for_each_fishery
119 #_N_lines_of_catch_to_read
#_catch_biomass(mtons):_columns_are_fisheries,year,season

#TWL	HKL	NET	RecSou	RecNor	ORWA_all	year	season
0	166.77	0	0	0	0	1892	1
0	157.4	0	0	0	0	1893	1
0	148.03	0	0	0	0	1894	1
0	138.66	0	0	0	0	1895	1
0	130.93	0	0	0	0	1896	1
0	123.2	0	0	0	0	1897	1
0	115.47	0	0	0	0	1898	1
0	107.73	0	0	0	0	1899	1
0	119.2	0	0	0	0	1900	1
0	130.66	0	0	0	0	1901	1
0	142.12	0	0	0	0	1902	1
0	153.59	0	0	0	0	1903	1
0	165.05	0	0	0	0	1904	1
0	176.36	0	0	0	0	1905	1
0	187.68	0	0	0	0	1906	1
0	198.99	0	0	0	0	1907	1
0	210.3	0	0	0	0	1908	1
0	236.64	0	0	0	0	1909	1
0	262.98	0	0	0	0	1910	1
0	289.32	0	0	0	0	1911	1
0	315.66	0	0	0	0	1912	1
0	342	0	0	0	0	1913	1
0	368.34	0	0	0	0	1914	1
0	394.68	0	0	0	0	1915	1
54.77	418.96	0	0	0	0.160	1916	1
85.57	661.43	0	0	0	0.320	1917	1
96.66	701.13	0	0	0	0.720	1918	1
66	463.1	0	0	0	0.160	1919	1
67.82	482.28	0	0	0	0.220	1920	1
56.38	406.03	0	0	0	0.330	1921	1
49.37	367.12	0	0	0	0.250	1922	1
55.07	434.14	0	0	0	0.080	1923	1
36.97	405.15	0	0	0	0.270	1924	1
29.85	474.63	0	0	0	0.870	1925	1
83.2	627.09	0	0	0	0.810	1926	1
111.29	497.26	0	0	0	1.500	1927	1
150.62	482.9	0	1.99	2.39	1.210	1928	1

119.43	441.16	0		3.99	4.79	28.040	1929	1
135.62	551	0		5.99	5.51	16.700	1930	1
45.59	578.08	0		7.99	7.34	49.580	1931	1
68.87	430.61	0		9.99	9.18	37.280	1932	1
89.53	257.34	0		11.98	11.02	59.260	1933	1
108.88	316.57	0		13.98	12.85	41.380	1934	1
90.51	369.17	0		15.98	14.69	43.190	1935	1
107.86	473.58	0		15.98	16.53	17.690	1936	1
91.98	408.44	0		27.51	19.59	41.130	1937	1
76.46	295.45	0		22.18	19.27	47.540	1938	1
49.95	200.11	0		19.63	16.85	86.170	1939	1
45.57	238.49	0		14.07	24.27	59.720	1940	1
32.44	187.35	0		13	22.43	53.070	1941	1
7.9	72.1	0		6.91	11.91	25.550	1942	1
7.56	70.44	0		6.6	11.39	196.130	1943	1
2.94	83.63	0		5.42	9.35	635.220	1944	1
55.17	127.08	0		7.23	12.47	1211.050	1945	1
111.53	122.33	0		12.45	21.47	611.940	1946	1
5.57	198.21	0		37.32	16.99	631.600	1947	1
81.94	150.23	0		102.08	33.9	397.440	1948	1
94	176.56	0		132.83	43.94	380.480	1949	1
303.66	327.61	0		156.82	53.55	374.730	1950	1
765.29	262.44	0		135.78	63.17	532.060	1951	1
1310.96	180.88	0		151.62	54.97	268.000	1952	1
1678.25	70.2	0		171.23	46.81	304.510	1953	1
1597.98	89.11	0		410.71	58.19	245.780	1954	1
1764.99	122.87	0		760.57	69.38	334.950	1955	1
2006.22	299.57	0		917.14	77.46	349.930	1956	1
2219.46	271.26	0		529.88	76.8	468.870	1957	1
2459.84	213.5	0		301.14	123.49	482.050	1958	1
2062.66	125.38	0		177.61	102.75	378.690	1959	1
1731.86	92.91	0		185.13	81.26	344.610	1960	1
1297.35	80.89	0		211.89	68.5	265.670	1961	1
1147.09	68.25	0		204.46	80.38	230.360	1962	1
1314.09	85.06	0		194.38	88.71	326.220	1963	1
942.79	70.17	0		244.36	74.98	190.470	1964	1
965.94	81.03	0		319.14	106.55	273.070	1965	1
2410.23	129.52	0		564.3	118.21	196.070	1966	1
4036.28	117.9	0		770.19	111.44	294.710	1967	1
1996.47	80.71	0		832.18	103.9	391.890	1968	1
1132.64	78.02	17.41	785	110.52	223.000	1969	1	
1341.14	82.39	15.06	1039.41	117.87	250.090	1970	1	
961.36	81.56	58.73	966.96	104.45	323.740	1971	1	
1648.11	122.56	70.95	1308.7	123.08	379.600	1972	1	
4537.05	151.53	167.3	1510.62	186.09	648.420	1973	1	
5956.32	164.1	261.65	1892.59	200.89	525.550	1974	1	
3316.02	158.13	285.36	1865.23	200.29	578.560	1975	1	
3424.73	218.88	123.1	1489.03	215.7	705.480	1976	1	
2381.4	188.75	158.08	1265.09	193.57	673.610	1977	1	
1878.87	247.93	124.75	1174.03	195.63	745.440	1978	1	
3299.31	351.15	235.32	1713.94	230.22	286.170	1979	1	
3054.87	320.49	215.88	942.92	264.04	586.080	1980	1	
1779.75	312.34	353.03	908.12	234.52	2164.520	1981	1	
2323.84	392.92	387.01	1225.49	371.85	1897.440	1982	1	
1914.02	238.56	588.49	265.96	310.65	2280.140	1983	1	
1891.75	367.29	547.07	181.6	67.14	1621.380	1984	1	
582.41	143.01	1091.66	324.48	67.93	654.150	1985	1	
789.66	258.99	1085.78	433.75	175.84	376.540	1986	1	
650.4	277.14	967.86	91.7	106.14	555.370	1987	1	
590	496.55	371.48	106.54	44.32	695.430	1988	1	
594.21	362.92	981.88	182.16	81.71	553.310	1989	1	
681.56	458.67	793.27	160.27	68.02	462.620	1990	1	

498.36 266.28 457.6 160.27 68.02 263.310 1991 1
362.09 468.03 640.31 160.27 68.02 133.250 1992 1
358.87 417.33 430.18 115.71 68.02 202.860 1993 1
377.01 193.06 262.64 243.9 68.02 149.530 1994 1
215.41 56.74 281.15 34.24 68.02 162.450 1995 1
225.84 66.23 91.83 68.36 32.22 62.910 1996 1
136.26 53.37 34.94 68.71 111.26 93.850 1997 1
41.16 39.38 39.21 33.53 25.87 31.970 1998 1
19.01 20.68 7.18 80.06 60.21 25.980 1999 1
13.48 7.01 0.73 58.24 74.42 6.570 2000 1
9.21 7.82 0.88 62.68 53.84 4.440 2001 1
total mortality reports- NWFSC total mort report for com fisheries 2002-2007
based on J. Budrick data for rec. fisheries 2004-2007, and scorecard estimates for all 2008 fisheries

#trl_s hk_ln setnet Rec_S Rec_N trawl north
28.04 0.13 0.01 35.88 4.93 20.67 2002 1
5.07 0 0 5.53 1.87 0.31 2003 1
13.86 1.84 0.21 63.43 2.27 3.52 2004 1
24.64 1.5 0.17 69.9 10.7 0.43 2005 1
16.09 2.25 0.25 29 11.8 0.31 2006 1
4.06 3.39 0.38 44.2 8.92 1.58 2007 1
20.42 2.02 0.08 31.50 3.33 1.98 2008 1
1.12 1.50 0.03 40.30 9.70 4.85 2009 1
2.90 1.45 0.05 52.60 7.40 10.97 2010 1

221 #_N_cpue_and_surveyabundance_observations
#_Units: 0=numbers; 1=biomass; 2=F
#_Errtype: -1=normal; 0=lognormal; >0=T
#_Fleet Units Errtype
1 1 0 # fleet (fishery or survey) # 1
2 1 0 # fleet (fishery or survey) # 2
3 1 0 # fleet (fishery or survey) # 3
4 1 0 # fleet (fishery or survey) # 4
5 1 0 # fleet (fishery or survey) # 5
6 1 0 # fleet (fishery or survey) # 6
7 1 0 # fleet (fishery or survey) # 7
8 1 0 # fleet (fishery or survey) # 8
9 1 0 # fleet (fishery or survey) # 9
10 1 0 # fleet (fishery or survey) # 10
11 1 0 # fleet (fishery or survey) # 11
12 1 0 # fleet (fishery or survey) # 12
13 1 0 # fleet (fishery or survey) # 13
14 1 0 # fleet (fishery or survey) # 14
15 1 0 # fleet (fishery or survey) # 15
16 1 0 # fleet (fishery or survey) # 16
#_year seas index obs se(log)
1982 1 1 166.4 0.32 #areaweightedCPUEfromRalston
1983 1 1 73.1 0.32 #areaweightedCPUEfromRalston
1984 1 1 72.3 0.32 #areaweightedCPUEfromRalston
1985 1 1 30.7 0.32 #areaweightedCPUEfromRalston
1986 1 1 31.2 0.32 #areaweightedCPUEfromRalston
1987 1 1 44.4 0.32 #areaweightedCPUEfromRalston
1988 1 1 51.6 0.32 #areaweightedCPUEfromRalston
1989 1 1 35.8 0.32 #areaweightedCPUEfromRalston
1990 1 1 37.1 0.32 #areaweightedCPUEfromRalston
1991 1 1 26.9 0.32 #areaweightedCPUEfromRalston
1992 1 1 20.4 0.32 #areaweightedCPUEfromRalston
1993 1 1 19.7 0.32 #areaweightedCPUEfromRalston
1994 1 1 23.9 0.32 #areaweightedCPUEfromRalston
1995 1 1 15.2 0.32 #areaweightedCPUEfromRalston
1996 1 1 8.7 0.32 #areaweightedCPUEfromRalston

```
1980    1 4 3.401               0.071906949     #MRFsoCAL
1981    1 4 3.447               0.059646908     #MRFsoCAL
1982    1 4 3.173               0.073301426     #MRFsoCAL
1983    1 4 1.318               0.081365149     #MRFsoCAL
1984    1 4 1.034               0.084548676     #MRFsoCAL
1985    1 4 2.224               0.091706845     #MRFsoCAL
1986    1 4 1.91                0.105307369     #MRFsoCAL
1987    1 4 0.275               0.448819689     #MRFsoCAL
1988    1 4 0.169               0.387042386     #MRFsoCAL
1989    1 4 0.997               0.137842628     #MRFsoCAL
1993    1 4 1.631               0.255474245     #MRFsoCAL
1994    1 4 1.732               0.142670896     #MRFsoCAL
1995    1 4 0.448               0.358378941     #MRFsoCAL
1996    1 4 0.246               0.203184778     #MRFsoCAL
1997    1 4 0.395               0.38023361      #MRFsoCAL
1998    1 4 0.234               0.202021118     #MRFsoCAL
1999    1 4 0.566               0.091309348     #MRFsoCAL
2000    1 4 1.098               0.086438291     #MRFsoCAL
2001    1 4 1.28                0.113037949     #MRFsoCAL
2002    1 4 2.01                0.08355396      #MRFsoCAL

1980    1 5 0.917               0.118186092     #MRFnorth
1981    1 5 1.28                0.170552193     #MRFnorth
1982    1 5 1.326               0.131232941     #MRFnorth
1983    1 5 1.377               0.143163299     #MRFnorth
1984    1 5 0.388               0.126294711     #MRFnorth
1985    1 5 0.75                0.081166137     #MRFnorth
1986    1 5 1.39                0.07061189      #MRFnorth
1987    1 5 0.914               0.154768554     #MRFnorth
1988    1 5 0.294               0.1734864       #MRFnorth
1989    1 5 0.457               0.157321533     #MRFnorth
1993    1 5 0.202               0.345617372     #MRFnorth
1994    1 5 0.351               0.236456026     #MRFnorth
1995    1 5 0.482               0.197847986     #MRFnorth
1996    1 5 0.535               0.099354307     #MRFnorth
1997    1 5 0.42                0.125405334     #MRFnorth
1998    1 5 0.432               0.14513239      #MRFnorth
1999    1 5 0.802               0.066825326     #MRFnorth
2000    1 5 1.961               0.089420947     #MRFnorth
2001    1 5 2.022               0.115414586     #MRFnorth
2002    1 5 2.618               0.162618942     #MRFnorth

1951    1 7 0.8356082           0.2600304       #CalCOFIindex
1952    1 7 0.8477566           0.2198659       #CalCOFIindex
1953    1 7 1.1203115           0.1946184       #CalCOFIindex
1954    1 7 1.5595068           0.1593167       #CalCOFIindex
1955    1 7 1.2647899           0.1813438       #CalCOFIindex
1956    1 7 0.7930313           0.2586213       #CalCOFIindex
1957    1 7 1.6910182           0.209057 #CalCOFIindex
1958    1 7 1.2934664           0.187288 #CalCOFIindex
1959    1 7 0.4205862           0.2053309       #CalCOFIindex
1960    1 7 0.6059711           0.1798713       #CalCOFIindex
1961    1 7 0.7215946           0.2842966       #CalCOFIindex
1962    1 7 0.6241535           0.2465393       #CalCOFIindex
1963    1 7 1.0273862           0.2474056       #CalCOFIindex
1964    1 7 0.6319091           0.2547808       #CalCOFIindex
1965    1 7 0.8358392           0.2157732       #CalCOFIindex
1966    1 7 1.550326    0.1764235       #CalCOFIindex
1967    1 7 0.808292    0.347014 #CalCOFIindex
1968    1 7 2.8134619           0.26283         #CalCOFIindex
1969    1 7 2.5614508           0.1417053       #CalCOFIindex
1970    1 7 0.7970022           0.4980813       #CalCOFIindex
```

```
1972    1 7 1.9745682                   0.1459947       #CalCOFIindex
1975    1 7 2.1435162                   0.1515554       #CalCOFIindex
1976    1 7 2.9527088                   0.3385088       #CalCOFIindex
1978    1 7 1.0812648                   0.2139001       #CalCOFIindex
1981    1 7 1.0067293                   0.2256607       #CalCOFIindex
1983    1 7 0.3079739                   0.4329301       #CalCOFIindex
1984    1 7 1.0295769                   0.2097524       #CalCOFIindex
1985    1 7 0.3150882                   0.4627654       #CalCOFIindex
1986    1 7 0.4419074                   0.4968653       #CalCOFIindex
1987    1 7 0.9991566                   0.3677525       #CalCOFIindex
1988    1 7 0.758646            0.2576719       #CalCOFIindex
1989    1 7 0.8016189                   0.3971494       #CalCOFIindex
1990    1 7 0.5212969                   0.3795327       #CalCOFIindex
1991    1 7 0.762163            0.2951539       #CalCOFIindex
1992    1 7 0.7505338                   0.2754136       #CalCOFIindex
1993    1 7 0.1866505                   0.5711888       #CalCOFIindex
1994    1 7 0.2767606                   0.3024538       #CalCOFIindex
1995    1 7 0.1149556                   0.7522513       #CalCOFIindex
1996    1 7 1.3652737                   0.3017633       #CalCOFIindex
1997    1 7 0.2939504                   0.3710218       #CalCOFIindex
1998    1 7 0.1007829                   0.5326119       #CalCOFIindex
1999    1 7 0.2891032                   0.4504429       #CalCOFIindex
2000    1 7 0.2381801                   0.4086741       #CalCOFIindex
2001    1 7 0.1161277                   0.4280781       #CalCOFIindex
2002    1 7 0.4933842                   0.3644697       #CalCOFIindex
2003    1 7 0.5258488                   0.26999         #CalCOFIindex
2004    1 7 0.5947927                   0.3758298       #CalCOFIindex
2005    1 7 0.6444137                   0.2998567       #CalCOFIindex
2006    1 7 0.6522035                   0.3031658       #CalCOFIindex
2007    1 7 0.5582143                   0.3251469       #CalCOFIindex
2008    1 7 0.9627358                   0.3697702       #CalCOFIindex
2009    1 7 0.2627943                   0.4361989       #CalCOFIindex
2010    1 7 0.5093906                   0.3887055       #CalCOFIindex


1980    1 8 2227.932433                 0.149683111     #TRIENNIAL
1983    1 8 1849.416128                 0.176692006     #TRIENNIAL
1986    1 8 723.6568073                 0.159390796     #TRIENNIAL
1989    1 8 529.7149835                 0.143672021     #TRIENNIAL
1992    1 8 319.1654707                 0.228586262     #TRIENNIAL
1995    1 8 192.9998349                 0.194757645     #TRIENNIAL
1998    1 8 56.92735471                 0.301249017     #TRIENNIAL
2001    1 8 121.4857726                 0.261983439     #TRIENNIAL
2004    1 8 439.3928644                 0.214285691     #TRIENNIAL


1987    1 9 3.545               0.161148115     #VandenbergCPUE
1988    1 9 2.349               0.140405176     #VandenbergCPUE
1989    1 9 3.001               0.121154053     #VandenbergCPUE
1990    1 9 6.009               0.14611662      #VandenbergCPUE
1991    1 9 4.637               0.172508578     #VandenbergCPUE
1992    1 9 3.543               0.12570181      #VandenbergCPUE
1993    1 9 2.319               0.131726504     #VandenbergCPUE
1994    1 9 1.46                0.168399042     #VandenbergCPUE
1995    1 9 1.721               0.15083795      #VandenbergCPUE
1996    1 9 1.457               0.169280019     #VandenbergCPUE
1997    1 9 1.823               0.157419694     #VandenbergCPUE
1998    1 9 1.646               0.215088204     #VandenbergCPUE


2004    1       10      0.1735 0.1749   #S_Cal_Hook_line
```

```
2005    1       10      0.1674 0.1821   #S_Cal_Hook_line
2006    1       10      0.1697 0.1775   #S_Cal_Hook_line
2007    1       10      0.1551 0.1801   #S_Cal_Hook_line
2008    1       10      0.1279 0.1832   #S_Cal_Hook_line
2009 1          10      0.116   0.1865  #S_Cal_Hook_line
2010    1       10      0.0544 0.2057   #S_Cal_Hook_line


2003    1 11            756.00  0.3099737       # NWFSC
2004    1 11            2009.26 0.3003482       # NWFSC
2005    1 11            1061.88 0.2844723       # NWFSC
2006    1 11            995.03  0.2800638       # NWFSC
2007    1 11            853.49  0.3239426       # NWFSC
2008    1 11            739.19  0.3744739       # NWFSC
2009    1 11            504.57  0.3481183       # NWFSC
2010    1 11            340.89  0.3388633       # NWFSC


2001    1       12      0.369 0.021     #       pre-recruit index
2002    1       12      0.583 0.021     #       pre-recruit index
2003    1       12      0.123 0.029     #       pre-recruit index
2004    1       12      0.353 0.021     #       pre-recruit index
2005    1       12      0.519 0.028     #       pre-recruit index
2006    1       12      0.115 0.017     #       pre-recruit index
2007    1       12      0.225 0.022     #       pre-recruit index
2008    1       12      0.243 0.021     #       pre-recruit index
2009    1       12      0.262 0.021     #       pre-recruit index
2010    1       12      0.625 0.033     #       pre-recruit index

# Pier Index
1954 1          13      0.1     0.72528
1955 1          13      0.01    0.88207
1956 1          13      0.1     0.72528
1957 1          13      0.01    0.88207
1958 1          13      0.01593 1.54141
1966 1          13      0.76471 0.74688
1980 1          13      0.1078  0.5675
1981 1          13      0.01668 0.71192
1982 1          13      0.01    0.88207
1983 1          13      0.01    0.88207
1984 1          13      0.08304 0.56998
1985 1          13      0.05492 0.61209
1986 1          13      0.06104 0.54481
1987 1          13      0.07279 0.54011
1988 1          13      0.14651 0.39676
1989 1          13      0.03599 0.8973
1993 1          13      0.09198 0.56186
1994 1          13      0.01    0.88207
1995 1          13      0.02682 0.8694
1996 1          13      0.01    0.88207
1997 1          13      0.01    0.88207
1998 1          13      0.01    0.88207
1999 1          13      0.08153 0.66772
2000 1          13      0.01    0.88207
2001 1          13      0.01    0.88207
2002 1          13      0.01    0.88207
2003 1          13      0.01713 0.70799
2004 1          13      0.01    0.88207
2005 1          13      0.05629 0.77327
2006 1          13      0.01    0.88207
2007 1          13      0.01    0.88207
2008 1          13      0.01    0.88207
```

2009 1 13 0.10024 0.63688

#impingement
1972 1 14 1.081498823 0.53295
1973 1 14 0.259325532 0.5834
1974 1 14 0.159835516 0.45561
1975 1 14 0.306401577 0.39862
1976 1 14 0.023219121 0.41032
1977 1 14 0.771328406 0.44772
1978 1 14 0.130167483 0.52614
1979 1 14 0.049954159 0.38914
1980 1 14 0.019524608 0.48278
1981 1 14 0.009536932 0.59967
1982 1 14 0.001457321 0.67585
1984 1 14 0.01972994 0.48843
1985 1 14 0.026307506 0.35308
1986 1 14 0.014595918 0.40102
1987 1 14 0.006518048 0.63352
1988 1 14 0.156822144 0.42722
1989 1 14 0.02186896 0.65176
1990 1 14 0.007665479 0.53995
1991 1 14 0.041142176 0.3786
1992 1 14 0.017166439 0.58308
1995 1 14 0.019559837 0.63674
1996 1 14 0.006634418 0.69229
1997 1 14 0.004508517 0.70812
1999 1 14 0.06060139 0.55093
2000 1 14 0.012255996 0.54458
2001 1 14 0.001699715 0.72195
2002 1 14 0.012410641 0.50146
2003 1 14 0.048994218 0.62496
2004 1 14 0.002481634 0.67372
2005 1 14 0.085269324 0.40251
2007 1 14 0.00381591 0.70406
2008 1 14 0.004342091 0.62414
2009 1 14 0.082489813 0.40111
2010 1 14 0.178638522 0.41895

0 #_N_fleets_with_discard
#_discard_units (1=same_as_catchunits(bio/num); 2=fraction; 3=numbers)
#_discard_errtype: >0 for DF of T-dist(read CV below); 0 for normal with CV; -1 for normal with se; -2 for lognormal
#_Fleet units errtype
1 2 30 # FISHERY1
0 #_N_discard_obs

0 #_N_meanbodywt_obs
30 #_DF_meanwt

2 # length bin method: 1=use databins; 2=generate from binwidth,min,max below; 3=read vector
2 # binwidth for population size comp
10 # minimum size in the population (lower edge of first bin and size at age 0.00)
94 # maximum size in the population (lower edge of last bin)

-1 #_comp_tail_compression
1e-007 #_add_to_comp
0 #_combine males into females at or below this bin number
29 #_N_LengthBins
16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 72 76

208 #_N_Length_obs

trawl fishery south of 38 26 currently#fish Female

Male

#Yr Seas Flt/Svy Gender Part Stewart, max400 16 18 20 22 24
26 28 30 32 34 36 38 40 42 44 46
48 50 52 54 56 58 60 62 64 66 68
72 76 16 18 20 22 24 26 28 30 32
34 36 38 40 42 44 46 48 50 52 54
56 58 60 62 64 66 68 72 76
1978 1 1 3 0 196.8 0 0 0 0 0 4
20 40 26 15 8 13 19 20 47 67 54
32 30 19 26 17 15 12 8 10 6 3
1 0 0 0 0 0 2 14 13 10 4
10 19 27 48 80 60 60 23 22 23 17
10 3 4 0 0 1 0 1
1979 1 1 3 0 211.7 0 1 0 0 0 3
31 55 64 75 66 42 27 20 17 29 41
48 52 36 15 18 15 11 7 3 7 4
2 0 0 1 0 0 1 4 3 16 26
19 18 12 17 39 55 70 33 21 24 16
13 5 2 0 0 1 0 0
1980 1 1 3 0 244.8 0 0 0 0 0 0
0 3 2 5 10 33 115 111 65 14 6
16 24 30 20 17 13 10 11 9 15 6
5 0 0 0 0 0 1 0 0 1 7
20 63 101 68 23 23 33 24 27 20 16
7 9 7 1 0 1 0 0
1981 1 1 3 0 165 0 0 0 0 0 0
1 6 7 2 2 4 9 35 87 80 32
8 4 8 9 12 5 7 4 2 1 2
0 0 0 0 0 0 0 0 3 3 4
8 6 26 79 73 27 11 20 14 11 10
5 2 1 1 0 0 0 0
1982 1 1 3 0 342 0 0 0 0 0 0
1 2 6 2 11 37 62 56 52 55 75
91 83 47 19 18 27 26 20 18 7 5
9 0 0 0 0 0 0 1 1 8 10
20 49 59 62 91 162 116 58 40 42 27
20 12 4 4 0 0 0 0
1983 1 1 3 0 349 0 0 0 0 0 0
0 0 1 1 6 11 16 33 70 74 71
73 142 100 41 25 29 14 22 16 10 6
11 0 0 0 0 0 0 1 2 1 3
9 11 25 66 111 132 148 94 68 60 25
16 9 3 2 0 0 0 0
1984 1 1 3 0 400 0 0 0 0 0 0
0 0 0 1 0 8 11 26 45 48 60
78 93 97 110 71 47 26 27 20 16 12
13 0 0 0 0 0 0 0 0 1 1
5 10 31 57 94 134 155 165 133 100 53
23 16 9 3 2 0 0 0
1985 1 1 3 0 340.8 0 0 0 0 1 3
18 22 35 15 1 5 8 8 15 31 43
40 58 31 43 49 37 22 9 11 15 10
7 0 0 0 0 0 6 9 12 21 7
3 3 11 33 43 63 77 96 94 62 35
24 7 2 3 3 0 0 0
1986 1 1 3 0 369 0 0 0 0 0 0
1 36 88 157 231 191 120 37 13 7 9

| | | |

3 1 10 12 19 30 59 21 9 11 4
2 1 0 0 0 0 0 0
1997 1 1 3 0 103.7 0 0 0 0 0 1
0 0 0 0 2 2 3 3 8 12 13
20 31 16 15 14 14 5 6 7 1 5
4 0 0 0 0 0 0 0 0 0 1
1 7 8 14 12 31 23 29 16 15 7
12 5 2 1 2 0 0 0
1998 1 1 3 0 59.7 0 0 0 0 0 0
0 0 2 6 6 6 2 6 8 7 10
16 9 10 13 9 8 3 2 8 1 0
0 0 0 0 0 0 0 0 1 3 9
5 5 6 8 9 19 23 27 10 13 8
0 2 0 0 1 0 0 0
1999 1 1 3 0 78.5 0 0 0 0 0 0
0 0 0 0 4 17 27 16 10 8 13
15 15 11 14 8 7 5 7 2 0 0
1 0 0 0 0 0 0 0 1 1 5
4 22 17 16 16 21 27 44 38 16 5
3 1 0 0 0 0 0 0
2000 1 1 3 0 25.2 0 0 0 0 0 0
0 4 6 3 1 3 1 6 4 8 7
6 3 1 0 3 0 1 1 0 0 0
0 0 0 0 0 0 0 0 6 4 3
5 2 5 1 7 6 4 1 1 0 0
0 0 0 0 0 0 0 0
2001 1 1 3 0 92.2 0 0 0 0 0 0
3 10 39 31 17 34 15 9 2 9 15
12 17 7 7 2 6 1 5 1 1 0
0 0 0 0 0 0 0 2 15 42 23
21 19 6 7 7 17 22 14 7 3 1
1 1 0 0 0 0 0 0
2002 1 1 3 0 38 0 0 0 0 0 0
0 0 0 0 1 6 9 13 10 5 1
1 7 7 6 3 3 6 6 0 0 0
1 0 0 0 0 0 0 0 0 1 2
2 10 14 15 5 6 4 8 5 2 1
0 0 0 0 0 0 0 0
#2003 1 1 3 0 1.2 0 0 0 0 0 0
0 0 0 0 0 1 0 0 0 0 0
1 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0
2004 1 1 3 0 33.2 0 0 0 0 0 0
1 0 0 1 1 0 0 1 3 2 5
8 17 18 13 1 6 2 4 0 1 0
0 0 0 0 0 0 0 0 1 0 0
0 1 2 1 3 3 9 8 5 1 0
0 0 0 0 0 0 0
#2005 1 1 3 0 1.5 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 1 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 1 1 1 0 0
0 0 0 0 0 0 0
#2007 1 1 3 0 5.3 0 0 0 0 0 0
0 0 0 0 0 0 0 1 0 0 1
0 0 1 0 2 1 1 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 2 1 0
0 0 0 0 0 0 0

```
#2008    1 1 3 0 2.2                                    0 0 0 0 0 0
         0 0 0 0 0 0 0 0 0 0 0 0
         1 0 0 0 1 0 0 0 0 0 0 0
         0 0 0 0 0 0 0 0 0 0 0 0
         0 0 0 0 0 0 0 0 0 0 0 0
         0 0 0 0 0 0 0 0
#
```

```
#Yr      Seas     Flt/Svy  Gender  Part    Stewart, max400    16 18 20 22 24
         26 28 30 32 34 36 38 40 42 44 46
         48 50 52 54 56 58 60 62 64 66 68
         72 76 16 18 20 22 24 26 28 30 32
         34 36 38 40 42 44 46 48 50 52 54
         56 58 60 62 64 66 68 72 76
1979     1 2 3 0 5.3                                    0 0 0 0 0 0
         0 0 0 0 0 0 0 0 0 0 0 1
         1 1 1 0 0 0 0 1 1 0 0
         0 0 0 0 0 0 0 0 0 0 0 0
         0 0 0 1 0 1 1 4 0 1 1
         1 1 0 0 0 0 0 0
1980     1 2 3 0 18.9                                   0 0 0 0 0 0
         0 0 0 0 0 0 0 1 0 1 0
         0 0 1 3 1 1 4 4 3 2 1
         6 0 0 0 0 0 0 0 0 0 0
         0 1 0 0 0 0 0 1 1 1 4
         6 4 3 1 0 0 0 0
1982     1 2 3 0 17.7                                   0 0 0 0 0 0
         0 0 0 0 0 0 0 0 0 1 0
         3 1 0 2 2 1 2 1 0 0 1
         1 0 0 0 0 0 0 0 0 0 0
         0 0 0 0 1 0 0 0 0 0 1
         0 2 0 0 0 0 1 0
1983     1 2 3 0 18.5                                   0 0 0 0 0 0
         0 0 0 0 0 0 2 0 1 3 1
         2 5 2 3 5 0 1 1 1 1 0
         0 0 0 0 0 0 0 0 0 0 0
         0 0 1 3 1 2 1 3 5 4 3
         3 0 1 0 0 0 0 0
1984     1 2 3 0 22.4                                   0 0 0 0 0 0
         0 0 0 0 0 0 0 0 1 0 0
         0 1 2 3 3 0 3 2 2 1 2
         1 0 0 0 0 0 0 0 0 0 0
         0 0 0 0 0 1 2 5 7 5 4
         0 2 0 0 0 0 0 0
1985     1 2 3 0 34.9                                   0 0 0 0 0 0
         0 0 0 1 0 3 2 2 6 9 4
         5 9 4 3 2 1 0 0 1 0 1
         0 0 0 0 0 0 0 0 0 0 0
         0 1 2 11                                       2 5 3 5 7 3 2
         0 0 0 0 0 0 0 0
1986     1 2 3 0 72.7                                   0 0 0 0 0 0
         1 0 0 2 1 4 6 4 2 3 17
         9          14 17 14 13 16 5                                    5      0      0      0
         0 0 0 0 0 0 0 0 1 3 4
         3 2 3 3 2 4 17                                                 23     25     20     11
         2 3 0 0 0 0 0 0
1987     1 2 3 0 56.3                                   0 0 0 0 0 0
         0 1 0 1 6 7 11                                                 8 15          9 6
```

6 5 11 5 6 3 1 2 0 0 0
0 0 0 0 0 0 0 0 0 3 4
12 13 10 10 13 6 16 12 6 6 3
4 3 0 1 1 1 0 0
1988 1 2 3 0 23.3 0 0 0 0 0 0
0 0 0 0 0 2 1 1 8 5 9
9 4 1 4 2 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 2 0 10 7 5 3 5 2 1 0
1 0 0 0 0 0 0 0
1989 1 2 3 0 44.4 0 0 0 0 0 0
0 0 0 0 0 0 0 0 5 5 9
7 7 10 4 7 1 3 0 1 0 0
1 0 0 0 0 0 0 0 0 0 0
0 0 0 2 7 7 6 12 7 1 5
2 2 0 0 1 0 0 0
1990 1 2 3 0 23.3 0 0 0 0 0 0
0 0 0 0 0 4 2 0 3 2 6
1 2 7 0 2 0 0 0 1 0 0
0 0 0 0 0 0 0 0 0 0 0
3 4 4 3 5 2 7 5 3 2 0
0 0 0 0 0 0 0 0
1991 1 2 3 0 49.8 0 0 0 0 0 0
0 0 0 1 0 0 4 6 6 3 4
3 4 3 6 7 4 5 1 0 2 0
1 0 0 0 0 0 0 1 0 0 0
1 2 10 10 4 8 1 3 8 6 3
1 1 0 2 1 0 0 0
1992 1 2 3 0 111.4 0 0 0 0 0 0
0 0 0 5 8 8 2 10 25 46 37
15 5 9 2 4 6 4 3 0 2 1
1 0 0 0 0 0 0 0 0 0 1
9 2 4 16 37 25 10 13 5 7 4
0 2 0 1 0 0 0 0
1993 1 2 3 0 109.9 0 0 0 0 0 0
0 0 0 2 0 2 4 14 16 48 25
15 11 5 3 4 1 2 2 0 0 0
0 0 0 0 0 0 0 0 1 1 2
2 2 7 17 19 11 10 8 3 0 2
0 0 0 0 0 0 0 0
1994 1 2 3 0 86.2 0 0 0 0 0 0
0 0 0 0 0 0 4 2 10 13 8
21 28 22 12 6 4 6 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0
1 1 3 3 9 14 19 8 10 4 1
2 0 0 0 0 0 0 0
1995 1 2 3 0 39.4 0 0 0 0 0 0
0 0 0 0 0 0 0 3 5 1 3
11 10 10 9 5 2 0 0 0 1 0
0 0 0 0 0 0 0 0 0 0 1 0
0 0 1 5 2 10 5 2 1 0 0
2 1 0 0 0 0 0 0
1996 1 2 3 0 105.8 0 0 0 0 0 0
0 0 0 1 1 0 7 10 10 15 24
33 26 21 23 12 4 1 3 0 1 0
2 0 0 0 0 0 0 0 0 0 2
4 2 9 12 21 20 28 12 7 3 3
1 0 0 0 0 0 0 0
1997 1 2 3 0 76.5 0 0 0 0 0 0
0 0 0 0 0 0 1 2 5 10 17
21 38 44 25 17 10 5 2 2 3 1
0 0 0 0 0 0 0 0 0 0 0

```
        1 0 1 5 4 12                                    12      14      5 5 2
        1 0 0 0 0 0 0 0
1998    1 2 3 0 58.3                            0 0 0 0 0 0
        0 0 0 0 1 1 1 5 8 13                                                    16
        14 17 17 10 11 3                                1       0       2       0       0
        1 0 0 0 0 0 0 0 0 0 0
        0 1 3 5 11                              10      12      8 8 5 3
        0 1 0 3 0 0 0 0
1999    1 2 3 0 23.5                            0 0 0 0 0 0
        0 0 0 0 0 0 0 1 2 2 6
        8 6 9 11                        4 2 2 2 0 0 0
        0 0 0 0 0 0 0 0 0 0 0
        0 1 0 0 1 2 4 10                                                3 7 4
        3 5 1 1 1 0 0 0
2000    1 2 3 0 16                              0 0 0 0 0 0
        0 1 0 0 0 0 0 0 1 1 1
        2 2 3 2 2 0 0 0 0 1 0
        0 0 0 0 0 0 0 0 0 0 0
        0 0 1 0 6 1 3 2 3 1 1
        3 2 3 1 1 0 0 0
2001    1 2 3 0 40.9                            0 0 0 0 0 0
        0 0 1 3 10                              5 0 3 1 4 3
        5 6 11                  5 8 4 5 3 2 0 2
        0 0 0 0 0 0 0 0 1 2 2
        8 3 2 1 3 7 3 6 6 7 5
        5 7 3 0 0 0 0 0
2002    1 2 3 0 6.9                             0 0 0 0 0 0
        0 0 0 0 0 0 0 1 1 0 1
        3 3 2 0 0 0 0 0 0 0 0
        0 0 0 0 0 0 0 0 0 0 0
        0 0 0 0 0 0 0 0 3 0 0
        0 0 0 0 0 0 0 0
#
```

```
#Yr     Seas    Flt/Svy   Gender   Part     Stewart, max400   16 18 20 22 24
        26 28 30 32 34 36 38 40 42 44 46
        48 50 52 54 56 58 60 62 64 66 68
        72 76 16 18 20 22 24 26 28 30 32
        34 36 38 40 42 44 46 48 50 52 54
        56 58 60 62 64 66 68 72 76
1978    1 3 3 0 19                              0 0 0 0 0 0
        0 0 0 0 0 3 3 3 3 2 7
        4 2 2 2 1 1 1 1 1 1 2
        1 0 0 0 0 0 0 0 0 0 0
        0 0 3 1 4 9 5 4 1 2 1
        1 0 0 1 0 0 0 1
#1979   1 3 3 0 3.7                             0 0 0 0 0 0
        0 0 0 0 0 0 0 1 2 0 0
        0 0 1 0 2 1 3 0 0 0 0
        0 0 0 0 0 0 0 0 0 0 0
        0 0 0 1 2 2 3 1 0 1 0
        0 0 0 0 0 0 0 0
#1982   1 3 3 0 2.2                             0 0 0 0 0 0
        0 0 0 0 0 0 1 0 0 0 0
        1 0 0 1 0 0 1 0 2 0 0
        0 0 0 0 0 0 0 0 0 0 0
        0 0 1 0 0 1 0 0 0 0 0
        0 1 0 0 0 0 0 0
```

1983 1 3 3 0 41.2 0 0 0 0 0 0
0 0 0 0 0 1 0 2 3 2 5
3 3 5 3 1 0 0 3 2 1 0
0 0 0 0 0 0 0 0 0 0 0
0 0 1 1 4 5 1 4 2 5 1
2 0 0 0 0 0 0 0
1984 1 3 3 0 88.3 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 1
2 4 2 2 1 1 3 1 0 0 1
1 0 0 0 0 0 0 0 0 0 0
0 0 0 0 1 2 4 7 2 5 5
0 1 0 0 0 0 0 0
1985 1 3 3 0 348.5 1 1 2 2 1 0
0 1 0 0 1 4 8 14 38 35 47
38 32 22 28 25 17 12 14 7 3 3
5 0 2 3 0 5 0 0 1 0 0
1 3 4 23 63 88 103 60 42 32 24
15 11 3 7 1 0 0 0
1986 1 3 3 0 338.8 0 0 0 0 0 0
0 0 2 1 0 2 7 7 4 8 28
56 67 80 99 67 37 21 14 7 8 2
9 0 0 0 0 0 0 0 0 0 0
1 9 3 8 10 24 91 133 158 159 84
30 12 7 4 0 0 1 0
1987 1 3 3 0 263.7 0 0 0 0 0 0
0 0 0 0 0 4 16 42 65 45 20
20 28 57 44 48 35 17 11 5 4 2
3 0 0 0 0 0 0 0 0 0 0
5 7 35 63 42 36 45 67 107 93 43
26 7 3 3 1 0 0 0
1988 1 3 3 0 225.4 1 0 0 0 0 0
0 0 1 1 0 2 5 24 61 105 111
62 38 20 16 10 14 8 7 4 4 1
1 0 0 0 0 0 0 0 0 1 0
2 2 13 34 104 113 72 34 31 19 10
12 8 5 2 0 2 0 0
1989 1 3 3 0 323.3 0 0 0 0 0 0
0 2 0 4 3 4 4 12 43 89 130
120 117 84 45 30 6 8 9 5 4 3
1 0 0 0 0 0 0 0 1 1 0
0 1 13 28 90 165 155 100 50 26 21
12 8 5 0 1 0 1 0
1990 1 3 3 0 232.4 0 0 0 0 0 0
0 0 1 2 7 33 49 24 45 60 41
58 53 60 35 25 11 11 4 4 3 1
0 0 0 0 0 0 1 0 0 0 1
12 16 28 23 46 61 76 60 39 15 5
5 1 0 0 0 0 0 0
1991 1 3 3 0 89.9 0 0 0 0 0 0
0 0 0 1 2 5 21 51 51 34 21
10 8 6 5 4 4 2 0 1 2 0
1 0 0 0 0 0 0 0 0 0 4
1 8 26 28 24 16 14 15 11 4 3
0 1 0 0 0 0 0 0
1992 1 3 3 0 234.6 0 0 0 0 0 0
0 0 0 3 6 8 7 20 83 151 164
106 50 20 12 16 6 11 0 1 0 0
0 0 0 0 0 0 0 0 0 0 3
3 8 15 64 147 145 66 29 22 13 4
2 1 0 0 0 0 0 0
1993 1 3 3 0 111.6 0 0 0 0 0 0
0 3 5 0 7 3 8 9 41 69 51

```
        29 12 19 11 15 3                                    5       0       1       0       0
        0 0 0 0 0 0 0 0 0 3 1
        1       3       6       33 37 31 13 10 11 6                                         1
        0 0 0 0 0 0 0 0
1994    1 3 3 0 80                                  0 0 0 0 0 0
        0 0 0 0 0 0 1 2 7 14                                                                29
        24      20      10      0 1 2 2 1 1 0 0
        0 0 0 0 0 0 0 0 0 0 0
        1 0 2 5 19                                  21      15      11      4 3 1
        0 0 0 0 0 0 0 0
1995    1 3 3 0 70.1                                0 0 0 0 0 0
        0 0 0 0 0 0 1 1 6 3 12
        16      31      17      8 2 9 1 4 1 0 0
        0 0 0 0 0 0 0 0 0 0 0
        0 0 1 6 16                                  27      24      8 6 2 2
        0 0 0 0 0 0 0 0
1996    1 3 3 0 43.6                                0 0 0 0 0 0
        0 0 0 1 0 0 0 0 0 3 10
        12      19      10      4 0 2 0 0 0 0 0
        0 0 0 0 0 0 0 0 0 0 0
        0 0 0 0 4 17                                        21      10      5 2 0
        1 0 0 0 0 0 0 0
1997    1 3 3 0 24.5                                0 0 0 0 0 0
        0 0 0 0 0 0 1 0 2 0 7
        6 8 8 6 1 4 0 0 0 0 0
        0 0 0 0 0 0 0 0 0 0 0
        0 0 1 1 3 10                                        12      7 3 2 2
        0 0 0 0 0 0 0 0
1998    1 3 3 0 33.5                                0 0 0 0 0 0
        0 0 0 0 0 0 0 1 1 6 4
        16      16      10      9 3 5 1 0 1 0 0
        0 0 0 0 0 0 0 0 0 0 0
        0 0 2 1 5 6 13                                              16      6 4 0
        0 0 1 0 0 0 0 0
#1999   1 3 3 0 4.5                                 0 0 0 0 0 0
        0 0 0 0 0 0 0 0 0 1 1
        4 5 7 5 0 0 0 0 0 0 0
        0 0 0 0 0 0 0 0 0 0 0
        0 0 0 0 0 0 2 1 0 0 0
        0 0 0 0 0 0 0 0
#2002   1 3 3 0 4.4                                 0 0 0 0 0 0
        0 0 0 0 0 0 0 0 0 0 1
        0 0 0 0 0 0 0 0 0 0 0
        0 0 0 0 0 0 0 0 0 0 0
        0 0 0 0 0 2 0 7 11                                                          4 0
        0 0 0 0 0 0 0 0
#2004   1 3 3 0 4.3                                 0 0 0 0 0 0
        0 0 0 0 0 0 0 0 0 0 0
        0 1 0 2 0 4 2 3 3 0 0
        0 0 0 0 0 0 0 0 0 0 0
        0 0 0 0 0 0 0 0 1 1 0
        0 0 0 0 0 0 0 0

#Yr     Seas    Flt/Svy   Gender   Part    Neff    16 18 20 22 24 26
        28 30 32 34 36 38 40 42 44 46 48
        50 52 54 56 58 60 62 64 66 68 72
        76 16 18 20 22 24 26 28 30 32 34
        36 38 40 42 44 46 48 50 52 54 56
        58 60 62 64 66 68 72 76
1980    1 4 0 0 400                                 4 2 3 20                        30      63
        64      101 87          208 427 435 312 169 173 104 68
        89 68 52 64 33 15 5                                         4       5       1       0
```

0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
1981 1 4 0 0 400 1 1 2 7 13 31
74 116 181 172 197 177 176 187 256 210 118
76 67 60 45 31 18 6 6 1 1 3
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
1982 1 4 0 0 386 0 0 0 0 3 5
16 25 27 44 108 207 208 164 213 253 190
121 83 59 51 18 11 4 5 1 2 1
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
1983 1 4 0 0 196.4 0 0 0 1 0 0
3 7 8 45 59 66 61 62 59 73 42
35 42 38 45 19 10 9 12 2 7 1
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
1984 1 4 0 0 262.9 23 17 35 29 9 2
8 4 6 6 14 17 35 48 59 87 46
53 30 23 17 11 4 4 5 0 2 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
1985 1 4 0 0 330.6 1 10 27 74 126 96
94 185 194 104 42 11 17 22 35 53 49
57 49 35 26 11 12 1 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
1986 1 4 0 0 298.2 5 5 5 13 36 47
52 60 145 284 264 133 63 16 18 19 20
27 19 21 25 3 9 5 3 0 1 1
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
1987 1 4 0 0 50.2 0 0 2 3 5 7
11 7 5 10 12 20 12 6 9 7 3
0 5 4 3 1 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
1988 1 4 0 0 49.9 0 0 0 1 3 4
3 1 2 3 9 9 8 5 10 7 6
1 3 3 0 1 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
1989 1 4 0 0 117.4 0 0 3 8 18 19
37 42 53 54 18 24 22 29 32 30 25
21 11 9 5 9 5 4 4 3 1 2
1 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
1993 1 4 0 0 24.3 0 0 0 0 0 0
1 3 1 9 8 2 3 4 3 4 2
5 2 2 2 1 0 0 0 0 1 0
0 0 0 0 0 0 0 0 0 0 0

0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
1994 1 4 0 0 34.8 0 0 0 0 0 1
0 2 0 6 5 8 10 11 11 3 8
10 5 2 2 1 0 0 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
1995 1 4 0 0 21.8 0 0 0 0 0 0
0 1 0 0 1 0 2 0 7 4 2
4 6 3 2 2 0 1 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
1996 1 4 0 0 51 0 0 0 1 1 3
3 7 7 6 3 7 1 5 7 7 7
12 7 11 11 4 2 1 0 1 2 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
1997 1 4 0 0 22.3 0 0 0 0 0 0
1 4 0 1 8 6 10 3 2 5 0
4 5 0 1 0 2 0 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
1998 1 4 0 0 53.4 0 0 0 0 0 1
0 2 5 8 5 9 10 13 7 7 15
6 3 4 5 3 1 1 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
1999 1 4 0 0 181.4 7 13 11 8 3 0
2 5 3 9 8 7 11 21 25 38 44
53 41 50 33 28 19 12 1 3 3 2
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
2000 1 4 0 0 167.5 0 0 2 2 20 43
58 66 46 41 12 11 7 8 8 16 19
29 22 35 24 19 16 11 7 4 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
2001 1 4 0 0 109.4 0 0 0 1 0 6
18 42 72 69 49 43 18 11 9 5 8
8 6 3 3 3 2 2 2 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
2002 1 4 0 0 201.3 0 0 0 0 0 0
3 3 7 23 62 112 129 113 95 37 20
25 31 18 12 11 13 2 1 1 2 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
2003 1 4 0 0 36.8 0 0 0 0 0 2
0 0 0 0 0 2 14 16 21 29 17
4 5 6 0 3 1 1 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0

```
2004    1 4 0 0 325.8                                   1 3 5 14                                8 17
        27 44 24 27 20 25 48 55 105                                                             135     116
        97      52      37      21      8 8 5 4 2 2 0
        2 0 0 0 0 0 0 0 0 0 0
        0 0 0 0 0 0 0 0 0 0 0
        0 0 0 0 0 0 0 0
2005    1 4 0 0 399.9                                   0 2 0 0 3 6
        20 77 148                 195     185     143     91 54 58 74 86
        84 83 68 34 17 8                                        6       3       3       0       1
        0 0 0 0 0 0 0 0 0 0 0
        0 0 0 0 0 0 0 0 0 0 0
        0 0 0 0 0 0 0 0
2006    1 4 0 0 400                                     1 0 1 2 8 17
        28      29      46      69      128 224 334 263 169 96                                  80
        72 98 82 56 28 13 6                                             2       4       2       1
        1 0 0 0 0 0 0 0 0 0 0
        0 0 0 0 0 0 0 0 0 0 0
        0 0 0 0 0 0 0 0
2007    1 4 0 0 400                                     2 3 0 5 5 18
        44      74      133 228 173 167 158 184 208 209 148
        107     74 68 58 38 24 3                                        6       0       2       0
        0 0 0 0 0 0 0 0 0 0 0
        0 0 0 0 0 0 0 0 0 0 0
        0 0 0 0 0 0 0 0
2008    1 4 0 0 400                                     0 0 0 0 7 15
        23      27      51      74      151 247 267 193 209 171 120
        88 65 31 25 20 12 11 2                                                  1       1       0
        0 0 0 0 0 0 0 0 0 0 0
        0 0 0 0 0 0 0 0 0 0 0
        0 0 0 0 0 0 0 0
2009    1 4 0 0 400                                     0 0 1 4 5 12
        33      43      94      148 177 173 209 273 238 190 127
        109     95 51 30 30 14 14 10 1                                                  4       0
        0 0 0 0 0 0 0 0 0 0 0
        0 0 0 0 0 0 0 0 0 0 0
        0 0 0 0 0 0 0 0
2010    1 4 0 0 400                                     0 0 2 6 20                                      62
        83      129 118 93                  101 126 154 208 198 170 135
        111     54 35 23 17 12 4                                        6       0       2       0
        0 0 0 0 0 0 0 0 0 0 0
        0 0 0 0 0 0 0 0 0 0 0
        0 0 0 0 0 0 0 0
#



#"year  Seas    Flt/Svy  Gender  Part    Stewart, max400  16 18 20 22 24
        26 28 30 32 34 36 38 40 42 44 46
        48 50 52 54 56 58 60 62 64 66 68
        72 76 16 18 20 22 24 26 28 30 32
        34 36 38 40 42 44 46 48 50 52 54
        56 58 60 62 64 66 68 72 76
1978    1 5 3 0 -98                                     0 0 0 0 2 4
        2 4 0 3 5 8 7 9 28                                                                      32      15
        14      7 3 9 13                                10      4 8 11                          20      9
        2 1 0 0 0 0 3 1 1 3 1
        5       5       11 7                19 18 20 16 22 19 17
        14 12 12 13 3                                   0       1       1
1979    1 5 3 0 -22                                     0 0 0 0 0 3
        1 7 25                  44      26      7 0 4 7 20                                      14
```

11 11 7 9 11 17 18 12 23 32 13
12 0 0 0 0 0 0 2 4 2 4
4 3 7 4 14 10 22 14 16 17 26
34 34 35 16 13 4 3 1
1980 1 5 3 0 -86.7 0 0 0 0 0 0
1 0 1 4 2 15 33 23 9 5 4
4 3 8 6 3 7 5 2 8 7 6
0 0 0 0 0 0 2 1 0 1 0
12 15 20 6 6 3 8 4 4 5 8
5 4 8 4 3 2 0 0
1981 1 5 3 0 -59.3 0 0 0 0 0 0
1 0 11 13 2 1 4 8 9 15 19
5 4 6 4 6 2 2 3 5 3 2
1 0 0 0 0 0 0 2 0 6 8
5 3 4 6 17 11 8 7 8 4 9
6 7 1 3 1 2 0 0
1982 1 5 3 0 -63 0 0 0 0 0 1
0 0 0 1 5 3 3 8 7 5 14
16 15 9 6 6 10 3 3 2 7 2
2 0 0 0 0 0 2 0 0 0 0
0 2 4 3 5 14 20 8 7 7 5
7 6 2 1 2 1 0 0
1983 1 5 3 0 -40.7 0 0 0 0 0 0
0 0 0 0 0 1 3 6 3 10 4
3 10 7 8 4 2 2 4 4 1 0
1 0 0 0 0 0 0 1 0 2 0
1 0 4 5 5 11 9 3 12 7 8
4 2 1 5 1 0 0 0
1984 1 5 3 0 -20.7 0 0 0 0 0 0
0 0 0 0 1 0 1 2 4 0 1
7 2 3 2 10 4 2 1 3 2 0
1 0 0 0 0 0 0 0 0 0 3
0 0 4 4 2 3 3 3 4 5 2
4 3 2 0 1 0 0 0

#YEAR

1980 1 5 0 0 104.7 0 1 0 1 5 4
11 2 3 3 14 11 28 16 14 15 21
13 15 13 4 12 10 7 3 11 7 4
4 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
1981 1 5 0 0 68.7 1 0 1 0 0 0
0 1 3 8 4 8 9 28 25 41 23
9 7 14 11 13 11 6 7 7 8 5
2 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
1982 1 5 0 0 92.9 0 0 0 0 1 0
0 0 3 3 7 7 14 15 11 38 38
49 46 24 21 8 3 11 7 1 4 0
0 0 0 0 0 0 0 0 0 0 0

0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0
1983 1 5 0 0 95.5 0 0 0 0 0 0
3 1 4 3 5 2 4 9 19 26 37
42 55 53 36 23 13 8 10 3 1 0
2 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0
1984 1 5 0 0 94.8 1 1 1 1 0 0
0 2 3 5 7 9 8 13 15 13 17
16 18 13 9 6 12 2 7 4 2 1
1 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0
1985 1 5 0 0 175.4 2 5 12 38 52 53
63 65 24 15 7 7 13 13 15 13 20
19 19 15 13 21 14 14 8 7 4 3
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0
1986 1 5 0 0 234.9 0 0 1 5 8 8
18 29 72 190 204 142 66 18 4 5 7
13 21 17 19 24 19 15 11 14 8 3
1 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0
1987 1 5 0 0 68 0 0 0 0 1 0
3 3 15 24 33 27 18 9 6 4 3
4 3 4 6 9 9 12 9 5 10 6
2 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0
1988 1 5 0 0 42.6 0 0 0 0 0 1
1 1 2 1 4 4 4 4 1 6 5
4 4 1 0 1 2 0 1 0 0 0
1 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0
1989 1 5 0 0 52.4 0 0 0 0 1 3
0 2 5 4 24 11 3 3 7 13 15
10 8 3 3 0 0 1 1 0 1 0
1 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0
#YEAR 16 18 20 22 168 26 28 30 32 34 36
38 40 42 44 46 48 50 52 54 56 58
60 62 64 66 68 72 76 16 18 20 22
24 26 28 30 32 34 36 38 40 42 44
46 48 50 52 54 56 58 60 62 64 66
68 72 76
1993 1 5 0 0 37.7 1 0 0 0 0 0
0 0 1 6 5 2 3 4 4 6 4
4 6 3 1 1 2 2 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0
1994 1 5 0 0 32.9 0 0 1 0 0 4
5 3 3 1 3 4 9 5 1 3 1
1 2 2 0 2 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0

1995 1 5 0 0 38.3 0 0 1 0 0 0
0 2 4 5 6 6 1 6 8 6 9
3 4 3 0 1 1 0 1 0 0 1
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
1996 1 5 0 0 109.6 0 0 0 2 2 1
3 7 9 15 13 9 19 16 16 13 11
6 14 19 12 13 4 7 8 4 1 2
3 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
1997 1 5 0 0 216.6 0 0 0 1 5 4
4 2 10 21 25 32 44 31 60 48 53
63 71 55 49 84 37 29 22 11 20 6
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
1998 1 5 0 0 152.5 0 0 0 0 0 3
8 9 22 18 24 13 26 35 40 43 41
41 31 35 29 27 24 14 6 8 2 5
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
1999 1 5 0 0 212.9 2 0 0 0 0 3
1 2 3 14 22 30 49 38 39 43 63
47 55 47 40 25 44 17 20 6 7 6
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
2000 1 5 0 0 85.2 0 0 0 0 3 10
25 18 11 11 18 10 14 13 19 22 11
14 8 2 9 5 14 8 13 10 5 0
4 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
2001 1 5 0 0 82.9 0 0 1 0 1 1
2 3 23 36 55 33 12 14 18 19 20
20 22 14 11 11 3 2 1 0 2 1
1 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
2002 1 5 0 0 42.8 0 0 0 0 0 0
0 0 1 2 12 26 44 29 17 1 8
6 10 9 5 3 4 1 2 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
2004 1 5 0 0 60 0 0 0 0 0 0
1 0 2 1 3 2 9 6 5 9 4
9 4 8 2 6 1 2 2 1 3 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
2005 1 5 0 0 138.7 0 0 1 1 0 0
1 5 3 5 4 6 10 8 16 26 24
39 37 26 14 14 5 7 3 1 3 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
2006 1 5 0 0 162.5 0 0 0 0 0 1
1 1 3 6 3 11 19 17 15 24 22

23 26 17 24 11 12 13 7 5 11 5
2 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
2007 1 5 0 0 174.1 0 0 0 0 0 2
0 1 5 7 11 15 14 26 25 18 22
12 14 23 12 18 9 11 8 3 5 1
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
2008 1 5 0 0 110.494 1 0 0 0 0 0
0 0 1 0 2 6 13 16 19 14 15
17 10 12 13 8 8 4 3 0 0 1
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
2009 1 5 0 0 118.67 0 0 0 0 1 1
5 7 2 6 4 5 7 12 16 15 6
19 16 20 21 14 10 16 5 5 1 1
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
2010 1 5 0 0 112.392 0 0 1 0 0 4
6 13 10 6 4 13 12 12 12 17 16
5 14 8 8 7 5 2 5 2 2 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0

#

#year Seas Flt/Svy Gender Part Stewart, max400 16 18 20 22 24
26 28 30 32 34 36 38 40 42 44 46
48 50 52 54 56 58 60 62 64 66 68
72 76 16 18 20 22 24 26 28 30 32
34 36 38 40 42 44 46 48 50 52 54
56 58 60 62 64 66 68 72 76
1978 1 6 3 0 179.5 0 0 0 0 1 1
0 0 0 0 0 0 3 5 27 52 42
16 8 4 15 15 16 9 17 18 19 12
5 0 0 0 0 0 0 0 0 0 0
0 1 7 18 51 53 19 12 24 23 37
27 14 9 3 1 0 0 0
1979 1 6 3 0 67.4 0 0 0 0 0 0
0 1 2 5 1 0 1 0 1 1 7
8 11 4 3 2 6 3 5 4 5 2
3 0 0 0 0 0 0 0 1 2 4
2 0 1 0 2 7 13 6 5 8 14
9 11 4 1 1 0 2 2
1980 1 6 3 0 220.9 0 0 0 0 0 0
0 0 0 8 17 61 96 55 44 10 3
7 8 11 10 6 2 2 6 4 1 4
5 0 0 0 0 0 0 0 0 0 7
28 77 71 39 14 4 9 9 13 12 4
4 12 0 3 0 0 0 0
1981 1 6 3 0 195.2 0 0 0 0 0 0
0 0 1 0 0 4 12 35 83 104 65
24 2 0 3 0 2 2 4 2 4 6

5 0 0 0 0 0 0 0 0 0 0
7 12 24 73 111 65 15 2 6 6 11
7 10 5 3 2 2 0 0
1982 1 6 3 0 243.8 0 0 0 0 0 0
0 0 0 1 3 19 19 38 13 36 67
94 90 49 15 2 4 6 4 1 2 5
9 0 0 0 0 0 0 0 0 0 0 2
9 19 21 19 38 98 97 39 18 8 8
19 20 6 5 2 0 0 0
1983 1 6 3 0 365.8 0 0 0 0 0 0
0 0 0 0 2 9 16 39 36 46 41
50 54 110 79 31 11 7 11 11 11 11
28 0 0 0 0 0 0 0 0 1 0
1 4 16 36 50 51 111 126 64 25 20
17 28 21 10 2 1 0 0
1984 1 6 3 0 245.7 0 0 0 0 0 0
0 0 0 0 1 0 0 2 10 14 21
28 37 34 78 68 33 13 9 12 10 6
36 0 0 0 0 0 0 0 0 0 0
1 0 4 9 16 28 64 105 108 54 23
16 26 22 6 3 0 0 0
1985 1 6 3 0 196.1 0 0 0 0 0 0
0 0 0 0 1 0 3 0 1 6 2
18 23 23 28 43 55 20 9 3 3 3
9 0 0 0 0 0 0 0 0 0 0
0 2 0 3 9 11 23 55 85 78 31
17 17 8 6 0 0 0 0
1986 1 6 3 0 167.2 0 0 0 0 0 0
0 0 0 4 14 13 9 5 0 1 0
4 7 11 20 20 38 29 26 9 4 4
3 0 0 0 0 0 0 0 1 4 9
32 21 15 4 0 0 5 22 36 78 50
19 11 9 6 1 1 0 0
1987 1 6 3 0 255.6 0 0 0 0 0 0
0 0 0 2 7 27 64 118 101 50 16
2 2 3 4 9 17 22 26 25 9 2
7 0 0 0 0 0 0 0 1 1 1
12 65 113 112 58 14 5 4 21 43 36
26 12 6 3 2 0 0 0
1988 1 6 3 0 178.3 0 0 0 0 0 0
0 0 0 0 0 10 6 21 37 54 63
30 15 3 1 1 3 8 10 10 3 3
3 0 0 0 0 0 0 0 0 0 1
0 10 20 39 89 101 26 13 6 11 31
17 6 7 3 1 0 0 0
1989 1 6 3 0 129.2 0 0 0 0 0 0
1 1 2 3 1 0 1 1 6 15 27
26 25 20 13 3 2 3 3 5 4 0
1 0 0 0 0 0 0 0 0 2 3
2 3 1 5 17 45 68 34 16 6 25
24 6 5 2 2 0 0 0
1990 1 6 3 0 160.1 0 0 0 0 0 0
0 0 6 10 8 14 18 13 10 15 9
6 15 14 21 13 5 1 1 5 10 4
4 0 0 0 0 0 0 2 6 14 17
18 20 24 20 16 21 20 44 36 26 21
20 10 8 5 2 0 0 0
1991 1 6 3 0 124 0 0 0 0 0 0
0 0 0 4 1 5 28 39 45 21 22
8 4 9 20 18 9 7 2 2 2 1
2 0 0 0 0 0 0 1 0 0 3

2 22 49 68 36 20 13 17 25 21 13
14 18 8 1 0 0 0 0
1992 1 6 3 0 45.9 0 0 0 0 0 0
0 0 0 1 1 1 0 0 6 17 18
13 9 13 1 4 9 5 3 2 2 2
3 0 0 0 0 0 0 0 0 0 0
0 1 0 7 8 19 18 6 5 10 9
5 8 2 1 1 0 0 0
1993 1 6 3 0 43.7 0 0 0 0 0 0
0 0 0 0 0 0 1 1 2 3 10
10 19 10 2 4 6 6 2 1 2 2
0 0 0 0 0 0 0 0 0 0 0
1 0 3 5 7 24 31 17 29 12 3
7 3 6 1 0 0 0 0
1994 1 6 3 0 53.5 0 0 0 0 0 0
0 0 0 0 0 1 2 1 6 3 6
6 5 10 14 8 7 4 4 6 1 4
1 0 0 0 0 0 0 0 0 0 0
0 3 2 11 18 11 22 35 29 14 10
11 7 5 4 1 0 0 0
1995 1 6 3 0 40.2 0 0 0 0 0 0
0 0 1 0 0 0 1 1 1 1 2
2 2 1 1 6 3 5 5 9 4 0
4 0 0 0 0 0 0 1 0 1 1
1 0 0 3 2 0 1 10 14 9 7
13 12 16 8 2 4 0 0
1996 1 6 3 0 18.1 0 0 0 0 0 0
0 0 0 0 0 0 1 1 0 1 0
3 2 3 3 4 4 0 0 2 3 1
1 0 0 0 0 0 0 0 0 0 0
0 0 0 0 2 1 0 2 3 8 5
4 2 1 1 1 0 0 0
1997 1 6 3 0 17.6 0 0 0 0 0 0
0 0 0 0 0 0 0 0 1 0 0
0 0 0 1 0 3 4 3 2 0 3
7 0 0 0 0 0 0 0 0 0 0
0 0 1 0 0 0 0 2 3 8 9
5 6 4 4 3 1 0 0
1998 1 6 3 0 21.6 0 0 0 0 0 0
0 0 0 0 0 0 1 1 2 3 9
9 5 2 0 0 2 7 8 5 5 2
3 0 0 0 0 0 0 0 0 0 0
0 0 0 1 3 1 1 1 3 3 8
12 5 1 2 1 0 0 0
1999 1 6 3 0 7.8 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 2 1 1 0 0 1 1
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 1 0 0 0 0 2 1
4 2 4 1 0 0 0 0
2000 1 6 3 0 13.9 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 3 0
1 0 0 1 3 2 0 10 5 5 1
4 0 0 0 0 0 0 0 0 0 0
0 0 1 0 1 5 5 3 0 2 4
3 1 1 3 1 0 0 0
2001 1 6 3 0 7.2 0 0 0 0 0 0
0 0 0 0 1 0 0 0 0 0 0
0 0 0 0 1 0 0 0 1 1 0
1 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 1 0 0 0 1
3 3 1 1 0 1 0 0

```
2002    1 6 3 0 23.7                                    0 0 0 0 0 0
        0 1 0 0 0 6 21                                                  11      6 5 0
        1 0 1 0 0 0 1 0 3 3 1
        1 0 0 0 0 0 0 0 0 0 0 1
        2 15            10      7 2 1 1 2 0 0 0
        0 3 1 1 0 0 0 0
#2005   1 6 3 0 1.2                                    0 0 0 0 0 0
        0 0 0 0 0 0 0 0 0 0 0 0
        0 0 0 0 0 0 0 0 0 0 0 0
        1 0 0 0 0 0 0 0 0 0 0 0
        0 0 0 0 0 0 0 0 0 0 0 0
        0 0 0 1 0 0 0 0
#2007   1 6 3 0 2.2                                    0 0 0 0 0 0
        0 0 0 0 0 0 0 0 0 0 0 0
        1 0 0 1 0 0 0 0 0 0 0 0
        0 0 0 0 0 0 0 0 0 0 0 0
        0 0 0 0 0 0 0 0 0 0 0 0
        0 0 0 0 0 0 0 0
#2008   1 6 3 0 9.8                                    0 0 0 0 0 0
        0 0 0 0 0 0 0 2 3 4 1
        0 0 1 0 0 0 1 0 0 0 0
        0 0 0 0 0 0 0 0 0 0 0
        0 0 0 1 2 0 1 0 2 1 1
        0 0 0 1 0 0 0 0

#Yr     Seas    Flt/Svy Gender  Part    Nsamp   16 18 20 22 24 26
        28 30 32 34 36 38 40 42 44 46 48
        50 52 54 56 58 60 62 64 66 68 72
        76 16 18 20 22 24 26 28 30 32 34
        36 38 40 42 44 46 48 50 52 54 56
        58 60 62 64 66 68 72 76
#1977   1 8 3 0 163                                    0 0 0 0.001                                     0.001   0
        0.001 0.001     0.004   0.0071  0.0071  0.0307 0.0501  0.047   0.0409 0.0317  0.0358
        0.0153 0.0143   0.0266  0.0153  0.0225  0.  0184 0.0255  0.0194  0.0174  0.0276  0.003
        0.001 0         0       0       0       0.002 0.001     0.004   0.002   0.0051  0.0081
        0.0112 0.0225   0.0603  0.0552  0.044   0.0327 0.0276  0.0358  0.0327  0.045   0.0307
        0.045   0.0245 0.0276  0.0092  0.003   0.004   0       0
1980    1 8 3 0 81                                     0 0 0 0 0.0078                                  0.0216
        0.0078 0        0       0       0.0078 0.0451  0.1119  0.1375  0.1041  0.0176  0
        0.0039 0.0039   0.0058  0       0.0019 0.0019  0.0019  0       0       0       0
        0 0 0 0 0 0.0078                                        0.0353  0.0137  0.0019  0 0
        0.0098 0.0648   0.1611  0.1335  0.053   0.0039 0.0019  0.0019  0.0039  0.0019  0.0039
        0.0078 0.0039   0.0039  0.0019  0       0.0019 0       0
1983    1 8 3 0 75                                     0 0 0 0 0 0
        0 0 0 0.002                             0 0.002         0.0041  0.0062  0.0062  0.0083  0.0188
        0.0167 0.0439   0.0899  0.1087  0.0313  0.0062 0.0083  0.0083  0       0.0083 0.0062
        0 0 0 0 0 0 0 0 0 0 0 0
        0.0041 0        0       0.0083 0.0271   0.0271  0.0585 0.1778  0.1485  0.0606  0.0439
        0.0376 0.0167   0.0083  0.0041  0       0       0       0
1986    1 8 3 0 39                                     0 0 0 0 0.019                                   0.0095
        0.0047 0.0047   0.019   0.0428 0.0523   0.0476  0.0238  0       0       0       0
        0       0.0047 0.0047  0       0.0095 0.0142  0.0333  0.0476  0.0285  0.0285  0
        0.0047  0 0 0 0 0.0047                                 0.038   0.0238  0 0.038         0.0761
        0.1523 0.0761   0.0142  0       0       0       0.0047 0       0.0238 0.0238  0.038
        0.0238 0.0238   0.019   0.0142 0        0.0047 0       0
1989    1 8 3 0 400                                    0.0014  0 0 0.0044                      0.0404  0.1596
        0.1456 0.0147   0.0066  0.0132  0.0206  0.0066 0.0007  0.0022  0.0007  0       0.0044
        0.0103 0.0036   0.0117  0.0036  0.0022  0.0014 0       0.0022 0.0014  0.0014  0
        0 0.008         0.0007  0 0.0103        0.0699  0.2008 0.142   0.0117 0.0044  0.011
        0.0125 0.0044   0       0.0007 0.0014   0.0095  0.0125  0.0183  0.0073  0.0014  0.0029
        0.0051 0.0029   0.0007  0       0       0.0007 0       0
```

```
1992 1 8 3 0 78 0 0 0 0 0.0076 0.0329
0.0482 0.0228 0.0228 0.0304 0.0203 0. 0228 0.0101 0.0279 0.0609 0.0532 0.0507
0.0101 0 0.005 0.0025 0.0076 0 0 0.0025 0.0025 0 0
0 0 0 0.0025 0 0.0126 0.0532 0.0507 0.0152 0.0279 0.038
0.0964 0.0304 0.0406 0.0482 0.0583 0. 0304 0.0126 0.0203 0.0025 0.0076 0.0025
0 0 0.0025 0.0025 0 0 0.0025 0
1995 1 8 3 0 63 0 0 0.0178 0.0773 0.0952 0.0119
0.0178 0.0238 0.0178 0.0178 0. 0238 0 0 0 0.0059 0.0178 0.0178
0.0059 0.0119 0.0059 0.0119 0.0297 0.0178 0.0119 0.0178 0 0.0178 0.0119
0 0 0.0178 0.0476 0.0714 0.0535 0.0178 0.0178 0.0119 0.0357 0.0297
0.0119 0.0059 0 0.0059 0.0059 0.0059 0.0357 0.0119 0.0357 0.0178 0.0297
0.0119 0.0178 0.0119 0 0 0 0 0
1998 1 8 3 0 31 0 0 0 0 0.0169 0
0 0.0677 0.1525 0.1186 0.0508 0.0508 0 0 0 0.0338 0
0 0.0169 0 0 0.0169 0 0.0169 0.0169 0 0.0169 0
0 0 0 0.0169 0.0169 0 0 0.0338 0.0338 0.0677 0.0338
0.0169 0 0 0 0 0.0169 0.0169 0.0847 0.0169 0 0.0169
0.0338 0 0.0169 0 0 0 0 0
2001 1 8 3 0 34 0 0.014 0.014 0.0281 0 0
0 0.014 0.1267 0.0704 0.1267 0.014 0.014 0.014 0.014 0 0
0 0.014 0 0 0.014 0 0 0 0 0.0281 0.014
0 0 0 0 0 0 0 0 0.014 0.0563 0.0845
0.1408 0.014 0.0281 0 0 0 0 0.0422 0.014 0.0281 0.014
0 0.014 0.014 0.014 0 0 0 0
2004 1 8 3 0 65 0.0045 0 0 0.0045 0.0273 0.0593
0.0045 0 0 0 0 0 0 0.0091 0.0045 0.0182 0.0319
0.0228 0.0456 0.073 0.0456 0.0273 0. 0182 0.0182 0.0182 0.0136 0.0228 0.0091
0.0045 0 0 0.0045 0.0182 0.0273 0.0547 0.0091 0.0045 0 0
0.0045 0 0 0.0091 0.0091 0.0136 0.0136 0.073 0.0593 0.0319 0.0547
0.0182 0.0273 0.0228 0.0273 0.0182 0.0136 0 0
```

#CPFV observer LFs

```
#Year Seas Flt/Svy Gender Part NSamp 16 18 20 22 24 26
28 30 32 34 36 38 40 42 44 46 48
50 52 54 56 58 60 62 64 66 68 72
76 16 18 20 22 24 26 28 30 32 34
36 38 40 42 44 46 48 50 52 54 56
58 60 62 64 66 68 72 76
1987 1 9 0 0 197.5 3 1 2 0 0 4
6 6 16 33 69 107 101 101 111 76 65
29 26 29 29 26 20 21 19 2 14 1
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
1988 1 9 0 0 300.3 1 4 10 2 7 6
9 16 30 22 54 78 92 140 198 129 130
80 44 22 18 26 20 15 22 18 28 5
1 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
1989 1 9 0 0 361 1 0 1 13 24 24
49 57 63 55 55 59 45 65 114 133 186
126 111 95 55 19 26 15 10 12 12 9
1 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
1990 1 9 0 0 192.6 0 1 2 1 8 18
25 83 157 124 58 58 80 53 31 44 42
55 47 36 24 12 7 2 2 1 5 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
```

```
1991 1 9 0 0 179.1                                  0 0 1 3 1 4
     8 1 3 6 18                                     24  54  103 123 75  66
     57 57 64 50 42 37 28 16 8                                  15 6
     1 0 0 0 0 0 0 0 0 0 0
     0 0 0 0 0 0 0 0 0 0 0
     0 0 0 0 0 0 0 0
1992 1 9 0 0 395.8                                  0 0 4 2 4 9
     21 34 59 50 41 49 78 109                                   191 196 181
     132  122  73 58 86 77 56 23 15 17 12
     3 0 0 0 0 0 0 0 0 0 0
     0 0 0 0 0 0 0 0 0 0 0
     0 0 0 0 0 0 0 0
1993 1 9 0 0 296.9                                  1 0 0 2 0 1
     8  21 25 25 28 41 43 45 66 72 143
     113  122  78 57 49 66 60 30 21 29 12
     1 0 0 0 0 0 0 0 0 0 0
     0 0 0 0 0 0 0 0 0 0 0
     0 0 0 0 0 0 0 0
1994 1 9 0 0 210.4                                  0 0 0 1 3 10
     12 6  8  13 25 57 50 48 66 58 63
     63 49 51 36 25 17 21 14 8                                  11 5
     1 0 0 0 0 0 0 0 0 0 0
     0 0 0 0 0 0 0 0 0 0 0
     0 0 0 0 0 0 0 0
1995 1 9 0 0 224.5                                  0 0 2 3 3 12
     9  22 18 32 33 41 32 42 60 72 84
     73 50 36 30 34 17 17 7                                     8 8 5
     0 0 0 0 0 0 0 0 0 0 0
     0 0 0 0 0 0 0 0 0 0 0
     0 0 0 0 0 0 0 0
1996 1 9 0 0 185                                    1 0 0 0 1 4
     5  7  18 22 24 26 24 41 43 53 51
     53 45 32 38 25 22 17 13 5                                  10 0
     0 0 0 0 0 0 0 0 0 0 0
     0 0 0 0 0 0 0 0 0 0 0
     0 0 0 0 0 0 0 0
1997 1 9 0 0 257.5                                  0 0 0 1 5 4
     9  3  12 24 29 33 49 35 75 63 63
     86 83 82 76 67 52 47 29 16 28 11
     0 0 0 0 0 0 0 0 0 0 0
     0 0 0 0 0 0 0 0 0 0 0
     0 0 0 0 0 0 0 0
1998 1 9 0 0 124.7                                  0 0 0 0 0 1
     5  7  15 15 8                                  10 18 30 33 39 37
     36 32 33 29 27 21 10 10 6                                  3  7
     1 0 0 0 0 0 0 0 0 0 0
     0 0 0 0 0 0 0 0 0 0 0
     0 0 0 0 0 0 0 0

#Year Seas  Flt/Svy Gender Part  NSamp  16 18 20 22 24 26
     28 30 32 34 36 38 40 42 44 46 48
     50 52 54 56 58 60 62 64 66 68 72
     76 16 18 20 22 24 26 28 30 32 34
     36 38 40 42 44 46 48 50 52 54 56
     58 60 62 64 66 68 72 76
2004 1 10        3 0 57                             0 0 0 0 0 2
     0 13        5 1 2 5 9 12                                   20 50 57
     108  106  42  24  11  6 7 3 1 2 0
     0 0 0 0 0 1 4 7 20                                         7 4
     3  6  7  20 24 51 59 35 26 7                                11
     4 3 1 1 0 0 0 0
```

```
2005    1 10            3 0 65                  0 0 0 0 0 0
        0 2 4 4 8 14                                    6 7 2 2 10
        26 56 79 72 50 14 11 8                                  7       11 2
        2 0 0 0 0 0 0 1 1 3 3
        10 20 14 6                      6       11 16 48 43 35 18
        11      10      6 1 0 0 1 0
2006    1 10            3 0 70                  0 0 0 1 1 8
        20      7 2 3 1 5 18                                    33      38      44      25
        22 37 52 59 45 18 4                                     7       2       3       1
        0 0 0 1 1 6 13                                          15      13      1 2
        10 12 25 17 23 21 6                                     14 24 36 22
        12      3 2 2 0 1 0 0
2007    1 10            3 0 78                  0 0 0 0 0 0
        0       2       4       25 40 18 12 14 21 26 27
        30 28 30 43 27 20 8                                     3       3       4       1
        1 0 0 0 0 0 0 0 2 6 15
        16 22 10 11 15 14 28 32 35 16 24
        6 2 2 0 1 0 0 0
2008    1 10            3 0 90                  0 0 0 0 1 2
        4 8 4 9 8 21                                    39      28      20      24      21
        34 28 31 35 39 29 15 7                                          4       2       0
        0 0 0 0 0 0 1 8 5 4 6
        11 24 35 17 13 24 19 22 18 18 11
        7 6 1 1 1 0 0 0
2009    1 10            3 0 80                  0 0 0 0 1 2
        3       3       4       7       14 16 15 18 35 25 24
        29 17 38 31 42 17 13 2                                          3       3       1
        1 0 0 0 0 0 2 2 4 3 8
        5       15 11 24 15 18 18 21 21 28 21
        5 5 0 0 0 0 0 0
2010    1 10            3 0 64                  0 0 0 0 0 1
        3 3 5 2 4 5 4 6 13                                                      18      2
        15 11 4                 12 13 18 3                      3       5       2       1
        0 2 1 0 0 0 0 5 5 3 3
        2 5 6 8 9 9 11                                          10      10      10      5
        10      0 1 1 0 0 0 0

#year   Seas    Flt/Svy  Gender  Part    Nsamp   16 18 20 22 24 26
        28 30 32 34 36 38 40 42 44 46 48
        50 52 54 56 58 60 62 64 66 68 72
        76 16 18 20 22 24 26 28 30 32 34
        36 38 40 42 44 46 48 50 52 54 56
        58 60 62 64 66 68 72 76
2003    1 11            3 0 38.454              0 0 0 0 0 14677
        0 0 0 0 0 0 19773                                       12373   12590   31816   33936
        82649 55254 12159 11412 19250.5         13105 20986 12487 14788 6029            5077
        3832    0 0 0 0 0 27911                                 12487   0 0 9024
        30739 0         59320 45082 38462 99249 39067 33419 21508 47151 33186
        28779.5 0 0 0 6029                      0 0 0
2004    1 11            3 0 96.516              0 0 0 9015                      38855   151044
        257610 316953 22193     150585 119209 169096 63290      71791   176752 217938 83366
        279525 250018 840875 204934 131428 58799        34468   11301   44503   12658   0
        0 0 0 0 25368                           23409   165924  320652  358702  232678  74084
        171619 96158    168656 135720 169682 542970 452187 266385 820258 429010 52210
        12013 11301 21430 22378 0               20332 0         0
2005    1 11            3 0 71.054              0 0 0 6099                      0 19905
        93519 11484 143365      95153 213206    44473 0         39619 10022 21842 36056
        82164 114577    135087  77615 46055 18435 18435 17562 10022 70913 13884
        0 0 0 6099                      0 43348         26004   28896   0 137041        186601
        103421  80779 11389 21363 44058 32670 150622            248487  191348  167876  62870
        16232   33745   34131   0 0 0 0 0
```

2006 1 11 3 0 64.256 0 0 22460 11717 34763 82996
20114 11369 0 35756 18325 11150 114592 178976 30919 22877 0
18668 33384 34315 34315 66592 0 16465 0 16465 39661 13721
6462 0 0 23434 46601 229159 335595 20963 12159 0 0
33647 23597 252133 213932 35560 11438 22877 33620 35036 20395 25396
22068 7259 18957 5235 10342 8442 0 0
2007 1 11 3 0 47.424 0 0 0 0 0 0
0 32757 34745 112013 32559 22146 0 23370 11375 124584 97164
11685 11685 33342 22115 68650 27640 45602 11682 0 0 0
0 0 0 0 0 0 0 0 0 98696 135710
38700 0 20002 70111 56177 61278 46741 30433 97274 113547 63830
35380 32807 0 0 0 0 0 0
2008 1 11 3 0 34.938 0 0 0 0 44005 20487
0 0 0 0 12235 12235 12235 0 0 0 11621
9830 19264 16848 46848 22030 26727 32181 39130 31938 14466 19560
0 0 0 7464 10244 10244 0 0 0 10244 0
10244 22479 12235 0 31800 17194 7944 15887 45376 34191 108031
66513 49869 18143 15887 15887 0 0 0
2009 1 11 3 0 35.972 0 0 11385 9159 23220 23285
30916 7935 31479 31018 24075 0 7783 7783 29543 7783 6592
15878 16203 28984 9897 36217 16717 9785 0 8606 11416 0
0 0 0 31929 16726 16139 18415 0 0 0 23069
25929 33705 7783 21902 22597 15566 7783 17568 21313 51157 9785
9159 24354 5301 0 0 0 0 0
2010 1 11 3 0 32.798 0 0 64452.5 9072 36288 43555
0 9072 9057 9057 0 0 0 0 0 0 0
7267 0 0 7267 25618 7267 15878 0 0 0 8101
0 0 0 82932.5 36287 70194 17082 0 9072 15408 27171
9072 0 0 0 7615 0 0 36403 0 60028 29069
9874 16723 12059 0 0 0 0 0

this is the Gotshall and Miller LF data from Central California sampling programs
#year Seas Flt/Svy Gender Part #_samp 16 18 20 22 24 26
28 30 32 34 36 38 40 42 44 46 48
50 52 54 56 58 60 62 64 66 68 72
76 16 18 20 22 24 26 28 30 32 34
36 38 40 42 44 46 48 50 52 54 56
58 60 62 64 66 68 72 76
1959 1 14 0 0 -10 9 0 0 0 0 0
0 0 0 3 3 4 5 12 19 28 24
40 24 24 15 14 5 4 6 3 1 0
3 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
1960 1 14 0 0 -95 0 1 2 1 0 0
0 0 1 5 4 5 25 42 121 123 166
122 103 105 58 26 20 14 5 5 2 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
1961 1 14 0 0 -25 0 0 0 0 0 0
0 0 6 2 2 2 1 5 22 44 51
57 25 10 13 2 6 3 0 1 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
1966 1 14 0 0 -30 140 3 2 1 1 3
5 2 10 28 40 35 14 6 1 10 12
28 30 25 15 13 21 3 4 3 3 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0

```
# this is the observer LF data
#Yr     Seas     Flt/Svy    Gender    Part     Neff     16 18 20 22 24 26
        28 30 32 34 36 38 40 42 44 46 48
        50 52 54 56 58 60 62 64 66 68 72
        76 16 18 20 22 24 26 28 30 32 34
        36 38 40 42 44 46 48 50 52 54 56
        58 60 62 64 66 68 72 76
2002    1 15             0 0 24.38                0 0 0 0 0 0
        0 0 0 0 1 1 8 19                                                  10       16       9
        15       11       11       7 7 3 3 1 0 3 1
        0 0 0 0 0 0 0 0 0 0 0 0
        0 0 0 0 0 0 0 0 0 0 0 0
        0 0 0 0 0 0 0 0
2003    1 15             0 0 8.83                 0 0 0 0 0 0
        0 0 0 0 0 0 0 0 0 3 5
        6 4 6 2 4 0 0 0 0 5 0
        0 0 0 0 0 0 0 0 0 0 0
        0 0 0 0 0 0 0 0 0 0 0
        0 0 0 0 0 0 0 0
2004    1 15             0 0 60.36                0 0 12                   4 7 0
        2 0 0 0 0 0 2 3 7 9 24
        28 45 40 21 26 24 18 14 11 9                                                        1
        0 0 0 0 0 0 0 0 0 0 0
        0 0 0 0 0 0 0 0 0 0 0
        0 0 0 0 0 0 0 0
2005    1 15             0 0 123.2                0 0 0 0 0 2
        1 0 0 2 6 8 5 8 21                                                34       49
        66 85 88 88 56 50 35 32 16 22 8
        1 0 0 0 0 0 0 0 0 0 0
        0 0 0 0 0 0 0 0 0 0 0
        0 0 0 0 0 0 0 0
2006    1 15             0 0 38.80                0 0 0 0 0 0
        0 0 0 0 1 2 5 11                                                  20       19       13
        10 14 27 14 11 13 9                                        7      4        5        2
        0 0 0 0 0 0 0 0 0 0 0
        0 0 0 0 0 0 0 0 0 0 0
        0 0 0 0 0 0 0 0
2007    1 15             0 0 44.46                0 1 0 0 1 1
        0 1 0 1 2 1 1 0 3 2 8
        23 13 17 21 15 14 12 12 10 8                                                        1
        2 0 0 0 0 0 0 0 0 0 0
        0 0 0 0 0 0 0 0 0 0 0
        0 0 0 0 0 0 0 0
2008    1 15             0 0 2.828                0 0 0 0 1 2
        0 0 0 0 0 0 0 0 0 0 0
        0 0 1 0 0 0 1 0 0 1 0
        0 0 0 0 0 0 0 0 0 0 0
        0 0 0 0 0 0 0 0 0 0 0
        0 0 0 0 0 0 0 0

#Yr     Seas     Flt/Svy    Gender    Part     Neff     16 18 20 22 24 26
        28 30 32 34 36 38 40 42 44 46 48
        50 52 54 56 58 60 62 64 66 68 72
        76 16 18 20 22 24 26 28 30 32 34
        36 38 40 42 44 46 48 50 52 54 56
        58 60 62 64 66 68 72 76
1975    1 16             0 0 400                  3 8 18                   22       124      435
        1059 2645 3183 2660 2729 2587 1969 910                            662      705      717
        495      354      236      129      69 57 41 19 10 12 7
        1 0 0 0 0 0 0 0 0 0 0
```

0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0
1976 1 16 0 0 400 7 5 9 35 91 160
381 1136 2293 2505 2364 3574 3567 2634 1841 1329 1140
895 687 463 292 154 131 87 43 31 31 14
1 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0
1977 1 16 0 0 0 400 35 86 114 66 36 48
126 252 276 290 438 1081 1428 1372 1514 1256 815
587 485 389 279 162 96 77 49 41 25 8
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0
1978 1 16 0 0 400 24 26 293 978 1346 1444
1622 1729 1059 343 261 389 669 863 1218 1390 1348
1042 752 625 464 295 189 106 41 34 21 6
2 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0
1986 1 16 0 0 400 3 1 17 23 25 60
139 373 629 701 610 497 335 133 68 58 86
91 79 72 47 38 13 8 2 1 1 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0
1987 1 16 0 0 400 1 0 0 1 3 15
36 100 134 171 305 548 596 382 191 110 66
57 54 48 45 31 29 13 6 3 3 0
1 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0
1988 1 16 0 0 341 7 6 7 14 1 17
38 89 106 80 49 103 137 186 260 239 178
93 69 73 26 22 30 12 11 7 8 1
1 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0
1989 1 16 0 0 400 9 11 33 167 289 286
390 715 679 318 117 120 134 183 260 340 290
207 190 113 65 33 33 16 16 7 4 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0

21 #_N_age_bins
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
0 #_N_ageerror_definitions
0 #_N_Agecomp_obs
1 #_Lbin_method: 1=poplenbins; 2=datalenbins; 3=lengths
1 #_combine males into females at or below this bin number
#Yr Seas Flt/Svy Gender Part Ageerr Lbin_lo Lbin_hi Nsamp datavector(female-male)

0 #_N_MeanSize-at-Age_obs
#Yr Seas Flt/Svy Gender Part Ageerr Ignore datavector(female-male)

1 #_N_environ_variables
0 #_N_environ_obs
1 # N sizefreq methods to read

```
25 #Sizefreq N bins per method
1 #Sizetfreq units(bio/num) per method
1 #Sizefreq scale(kg/lbs/cm/inches) per method
1e-005 #Sizefreq mincomp per method
20 #Sizefreq N obs per method
#_Sizefreq bins
0.2 0.4 0.6 0.8 1 1.2 1.4 1.6 1.8 2 2.2 2.4
2.6 2.8 3 3.2 3.4 3.6 3.8 4 4.5 5 5.5
6 6.5
#_Year season Fleet Partition Gender SampleSize <data>
# southern California RecFIN
# #Yr Seas Flt/Svy Gender Part Nsamp 0.2 0.4 0.6 0.8 1
1.2 1.4 1.6 1.8 2 2.2 2.4 2.6 2.8 3 3.2
3.4 3.6 3.8 4 4.5 5 5.5 6 6.5 0.2 0.4
0.6 0.8 1 1.2 1.4 1.6 1.8 2 2.2 2.4 2.6
2.8 3 3.2 3.4 3.6 3.8 4 4.5 5 5.5 6
6.5
1 1980 1 4 0 0 -176 253 258 821 536 209
121 81 81 66 55 41 35 21 10 5 4
4 2 0 3 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0
1 1981 1 4 0 0 -148 211 395 367 302 316
240 110 72 58 60 31 33 16 8 3 3
4 0 0 0 2 2 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0
1 1982 1 4 0 0 -135 40 82 313 320 268
306 174 115 71 54 39 19 9 6 1 4
3 0 1 2 0 1 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0
1 1983 1 4 0 0 -99 8 58 123 103 79
80 41 39 36 42 33 17 7 12 3 9
8 0 1 4 2 1 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0
1 1984 1 4 0 0 -181 127 13 30 63 79
102 47 45 30 19 8 14 4 3 2 3
3 0 0 2 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0
1 1985 1 4 0 0 -147 669 281 30 29 49
63 55 50 42 26 21 8 13 1 1 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0
1 1986 1 4 0 0 -119 253 567 266 41 24
20 32 16 18 20 21 2 7 2 5 2
1 0 1 0 1 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0
1 1987 1 4 0 0 -32 37 20 33 10 12
6 1 4 1 5 2 1 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
```

0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0
1 1988 1 4 0 0 -39 12 12 13 11 12
8 4 2 3 1 0 1 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0
1 1989 1 4 0 0 -50 139 105 42 41 49
28 26 14 7 6 4 8 5 1 4 1
4 2 0 1 0 2 0 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0

Northern California RecFIN
#use YEAR Seas Flt/Sv y Gender Part Nsamp 0.2 0.4 0.6 0.8 1
1.2 1.4 1.6 1.8 2 2.2 2.4 2.6 2.8 3 3.2
3.4 3.6 3.8 4 4.5 5 5.5 6 6.5 0.2 0.4
0.6 0.8 1 1.2 1.4 1.6 1.8 2 2.2 2.4 2.6
2.8 3 3.2 3.4 3.6 3.8 4 4.5 5 5.5 6
6.5
1 1980 1 5 0 0 -70 24 4 27 42 16
16 22 14 11 14 3 6 9 6 3 3
5 1 3 12 2 5 0 1 3 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0
1 1981 1 5 0 0 -34 2 12 12 16 46
48 21 6 6 13 10 12 6 8 5 3
4 6 1 4 7 2 1 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0
1 1982 1 5 0 0 -50 1 7 13 22 18
48 44 50 31 26 15 7 4 5 7 4
4 1 0 4 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0
1 1983 1 5 0 0 -46 3 9 6 11 21
33 47 44 46 48 29 17 13 8 7 6
5 1 2 1 0 0 1 0 1 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0
1 1984 1 5 0 0 -69 6 8 16 15 21
17 18 17 16 9 8 5 6 9 1 5
2 1 4 1 0 1 1 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0
1 1985 1 5 0 0 -99 301 37 13 21 21
20 17 18 17 11 12 16 9 13 10 8
2 4 1 3 3 1 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0
1 1986 1 5 0 0 -105 84 365 266 45 5
10 12 14 16 18 14 19 16 17 6 6
10 7 3 6 3 1 0 1 0 0 0

```
        0 0 0 0 0 0 0 0 0 0 0
        0 0 0 0 0 0 0 0 0 0 0
0
1 1987          1 5 0 0 -37                     9 55        50      19      8
        5 2 2 5 4 4 7 5 11                                          7 8
        2 3 5 6 4 2 0 0 2 0 0
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999

ENDDATA
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BOCACCIONOMICS: THE EFFECTIVENESS OF PRE-RECRUIT INDICES FOR ASSESSMENT AND MANAGEMENT OF BOCACCIO

JOHN C. FIELD, ALEC D. MACCALL, STEPHEN RALSTON
Fisheries Ecology Division
Southwest Fishery Science Center
National Marine Fisheries Service

MILTON S. LOVE
University of California, Santa Barbara

ERIC F. MILLER
MBC Applied Environmental Sciences

ABSTRACT

Bocaccio (*Sebastes paucispinis*) has been one of the most important species of rockfish to both commercial and recreational fisheries in California Current waters over the last century. Actions taken to rebuild the stock of bocaccio residing off of California have been responsible for dramatic changes on both commercial and recreational groundfish management and total allowable yields of most groundfish species in California waters over the last decade, including a virtual cessation of commercial and recreational fishing in 2003. In retrospect, it was determined that a strong 1999 year class was moving through the fishery at that time, resulting in high catch rates during a period in which management sought to drastically reduce catch. This results in a paradox, in which rebuilding requires strong year classes, which requires further constraints on fishing during periods in which the condition of the stock seems to be improving. Although this paradox exists for all stocks undergoing rebuilding, it is particularly pronounced for bocaccio as they have among the greatest variability in recruitment observed in any species of West Coast rockfish, as well as very rapid growth and very young age at recruitment to the recreational fishery. Consequently, accurate indices of the strength of incoming year classes both improve stock assessment estimates of future (near term) abundance trends, as well as aid regulators in making management decisions during those infrequent periods of high abundance of young fish. We discuss several indices of recruitment strength based on data on young bocaccio, evaluate their relative performance in the early detection of strong year classes, and consider both the oceanographic factors that may drive recruitment variability, as well as the spatial patterns of recruitment events which may aid in interpreting these indices.

INTRODUCTION

Bocaccio (*Sebastes paucispinis*) have long been one of the most important targets of both commercial and recreational fisheries in California waters, accounting for between 25 and 30% of the commercial and recreational rockfish (*Sebastes* spp.) catch over the past century. However, this percentage has declined in recent years as a result of stock declines, restrictive management actions and the development of alternative fisheries. Catches and abundance began to fall during the 1980s and declined rapidly in the 1990s, due to a combination of high harvest rates and poor ocean conditions (MacCall 2003; Field et al. 2009). More recently, since the southern sub-stock of bocaccio (currently representing the population of bocaccio south of Cape Blanco, OR)[1] was declared overfished by the Pacific Fishery Management Council (PFMC) in 1999,[2] management measures have been responsible for even more significant reductions of both commercial and recreational catches. Management measures included a virtual cessation of most commercial and recreational fishing in 2003, following a very pessimistic assessment of stock status in 2002 (MacCall et al. 2002).

The landings limitations and area closures that followed the 2002 assessment led to considerable economic hardships during a period in which many fishermen complained bitterly that bocaccio were "more abundant than ever before." Management constraints implemented to rebuild bocaccio, as well as six other species of rockfishes that were declared overfished, have substantially reduced rockfish landings coastwide since then (Berkeley et al. 2004, Punt and Ralston 2007). Although the stock is still estimated to have been in an overfished condition throughout the 1990s, the most recent assessment indicates that the population was not as depleted as estimated in the 2002 assessment (MacCall 2003, Field et al. 2009). Additionally, it is now clear that a relatively strong (relative to parental biomass) 1999 year class had indeed been moving through the fishery at that time, following a decade of record-low recruitment

[1]This paper investigates the recruitment and abundance trends of the southern sub-stock of bocaccio only, currently defined as waters south of Cape Blanco, Oregon to the U.S./Mexico border (Field et al. 2009). Bocaccio in U.S. waters north of Cape Blanco are likely to be more connected from a population perspective to bocaccio off of British Columbia, Canada, for which abundance has also been estimated to be at very low levels (Stanley et al. 2009).

[2]The PFMC is the management body charged with implementing the requirements of federal law for west coast groundfish fisheries, and defines a stock or population as being "overfished" if the stock is at or below the minimum stock size threshold (MSST). The MSST for West Coast rockfish is currently defined as 25% of the estimated spawning biomass or spawning potential that would occur in an unfished condition.

levels that began in 1990. Thus, the fishermen's complaints had validity, in that the bocaccio population was undergoing a significant increase in abundance during a period in which management sought to drastically reduce catch.

Consequently, management of bocaccio in recent years has been complicated by both changes in management regimes and objectives, and variable population trajectories driven (to a large extent) by highly variable recruitment. Despite the significant socio-economic hardships, management actions have been effective at reducing mortality. This combined with several recent strong year classes (1999, 2003, 2005), have resulted in an increase in abundance and spawning output over the past decade. Although the current estimate of abundance is substantially higher than those of the 1990s, the population will remain in "rebuilding" status until it has recovered to the target level of abundance, currently set to 40% of the unfished abundance for West Coast groundfish (Punt and Ralston 2007; Field and He 2009). In an analysis of the likely time to rebuild to this target level, recruitment variability remains among the most significant factors contributing to rebuilding success or failure by the currently adopted management target of 2026 (Field and He 2009). Rebuilding plans and targets are developed by simulating forward projections of the population under a variety of harvest rates to determine the probability of recovering to target abundance levels (40% of the unfished spawning potential) by target years that are defined by law (Punt 2003; Punt and Ralston 2007). For bocaccio, the current target is the year 2026, and while the most recent assessment projects that this rebuilding target has a greater than 75% probability of being met (at current harvest rates), this leaves an approximately 25% probability of not achieving this target. Most of the uncertainty regarding the probability of rebuilding is a consequence of recruitment stochasticity and the inability to accurately forecast future recruitment events.

Information regarding the magnitude and the determinants of impending year class strength can be of utility for tactical management actions, such as short-term catch projections and consideration of seasonal and area closures, particularly with respect to avoiding the mismatch between stock trends and management actions that took place following the 1999 year class and the overfishing declaration. In this manuscript, we will first briefly describe the early life history of bocaccio and introduce four fishery-independent sources of information regarding recruitment success as indexed by the abundance of young-of-the-year (YOY) bocaccio, and describe the methods typically used to develop recruitment indices from these data. Next we will provide a short overview of the structure and results of the most recent bocaccio assessment, including biomass trends and exploitation rates, but with a focus on the estimation of recruitment in either the most recent or in past stock assessments. Then we will evaluate the relative performance of the recruitment indices in predicting impending strong year classes (assuming that the stock assessment estimates of recruitment based on length composition data represent "true" recruitment). Finally, we will consider the performance of recruitment indices, including the spatial patterns of recruitment events and how these indices may relate to climate variables, and discuss how these indices could or should be used in future assessments and management.

DATA AND METHODS

Life history

Like all rockfish, bocaccio are primitively viviparous and bear live young at parturition. Copulation typically takes place during September–October, although fertilization is often delayed, and parturition occurs during the winter months (Moser 1967; Wyllie Echeverria, 1987). Figure 1 provides a conceptual overview of early life history stages of bocaccio following parturition. Early stage larvae (pre-flexion, approximately 0 to 20 days) are weak swimmers, however post-flexion late-stage larvae do have some swimming capabilities. Bocaccio are one of a very few number of *Sebastes* species for which data on larval abundance and distribution are available from 1951 to the present from California Cooperative Oceanic Fisheries Investigation research collections, as the larvae of most *Sebastes* species cannot be distinguished using morphological characteristics (Moser et al. 1977). These data have long been used as an indicator of population abundance in stock assessments (MacCall 2003; Field et al. 2009), under the assumption that larval abundance is a reflection of the female reproductive effort and thus spawning biomass. More recently, Ralston and MacFarlane 2010 have used these data to estimate total (rather than relative) spawning biomass. However, as year class strength for most California Current fish populations is thought to be set following parturition (Lasker 1977, Hollowed 1992), larval abundance data are not considered a reliable indicator of recruitment.

Both larval and juvenile stages are typically found in the mixed layer from 10 to 100 meters depth, (Ahlstrom 1959; Ross and Larson 2003). Pelagic juveniles are capable swimmers, and there is some evidence that both larval and juvenile stages of bocaccio tend to occur in the shallower sections of the water column (Ross and Larson 2003), which would imply greater dispersal relative to more deeply oriented larval and juvenile rockfish based on the propagule dispersal models

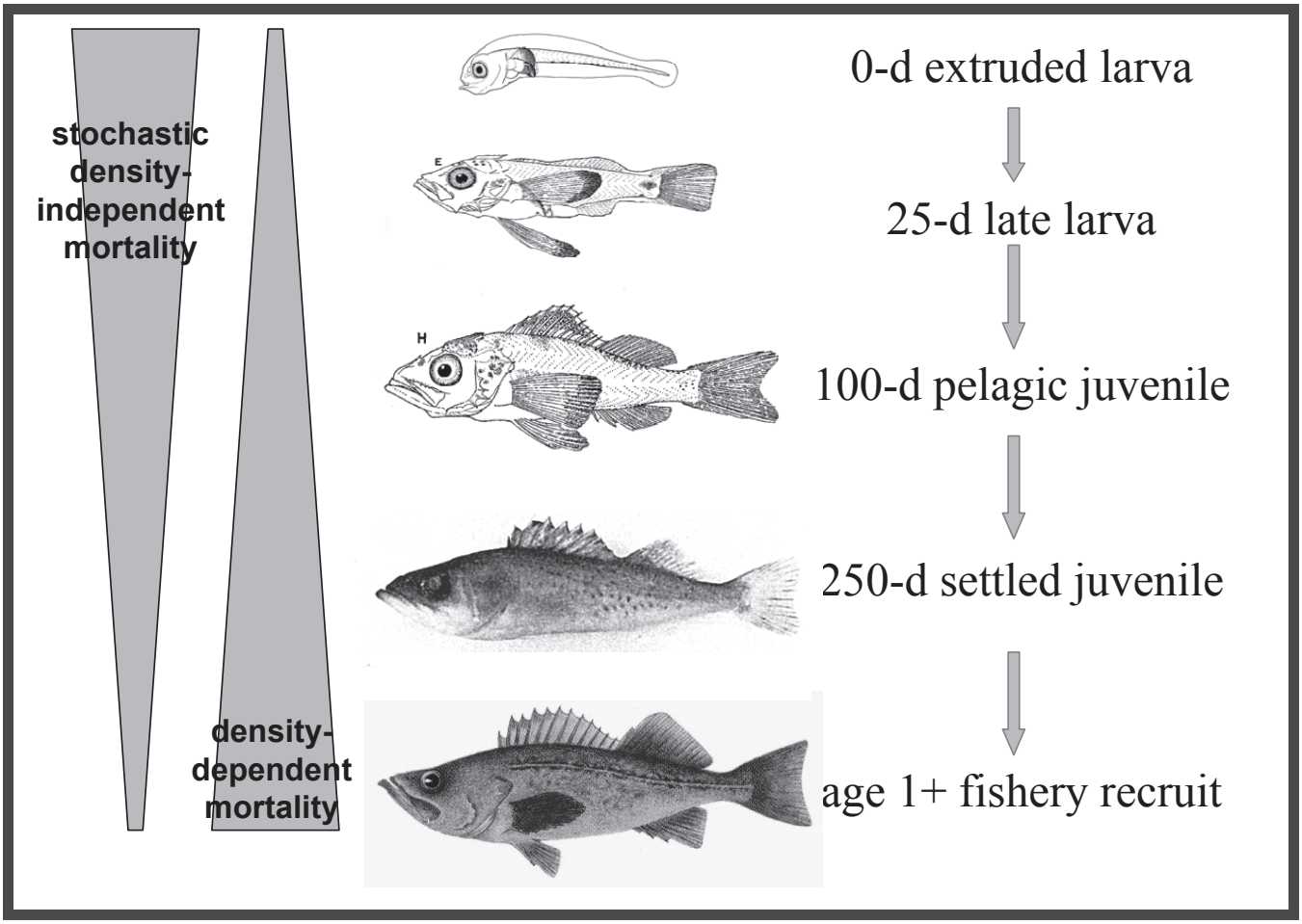

Figure 1. Ontogenetic sequence of bocaccio life history stages, as related to a conceptual model of the nature of density dependent and density independent mortality sources for each stage.

of Peterson et al. (2010). This may also lead to relatively greater dispersal to nearshore habitats immediately prior to settlement to benthic habitats, as bocaccio are entrained in surface waters that are pushed closer to the coastline than waters at depth. Settlement to nearshore and demersal habitats begins in late spring and extends throughout the summer months. Pelagic YOY typically recruit to shallow habitats, and subadult bocaccio are more common in shallower water than adults, with an apparent ontogenetic movement of adults to deeper water with size and/or age. Adult bocaccio occur in a broad range of habitats and depths, including midwater, although high densities tend to be more associated with more complex (e.g., rocky, high relief) substrates.

The rapid growth of bocaccio is also initiated at the juvenile stage; Woodbury and Ralston (1991) describe linear species-specific growth rates (and interannual variability in the same) for juvenile rockfish in approximately the first 50 to 150 days of life. Bocaccio growth rates ranged from 0.56 to 0.97 mm/day, the highest rate amongst the *Sebastes* species. This rapid growth continues into the settled juvenile and young adult stages, with fish growing to a mean size of 27 and 36 cm (fork length) by ages 1.5 and 2.5 respectively, the most rapid growth of any West Coast *Sebastes*. As bocaccio have been proven to be very difficult to age (Andrews et al. 2005; Piner et al. 2006), and age data are consequently not routinely developed or used in assessments, this rapid growth provides the primary means of estimating recruitment variability and year-class (cohort) strength from length frequency data (Ralston and Ianelli 1998). Such rapid growth is fueled by almost exclusive piscivory; Phillips (1964) reported that recently settled YOY typically preyed on other YOY rockfishes, surfperches (Embiotocidae), jack mackerel (*Trachurus symetricus*) and other small inshore species, and that such patterns of piscivory are retained throughout their life.[3]

[3]Juvenile rockfish appear to dominate the prey spectrum of juvenile bocaccio, as the original food habits notes of Phillips report that *Sebastes jordani, S. goodei, S. mystinus* and other species represented more than 60% of all prey, while the *Sebastes* genus, primarily *S. jordani*, represented 40% of the prey of adult *S. paucispinis.* Access to Phillip's original notes was graciously provided by Tim Thomas of the Monterey Maritime Museum.

Stock assessment results

The most recent bocaccio assessment was adopted as the scientific basis for management actions by the PFMC in September 2009 (Field et al. 2009). The resulting abundance trends and recruitment estimates were highly consistent with previous assessments (MacCall 2003; MacCall 2007), although changes in the estimated catch history resulted in a generally more optimistic perception of the stock status and productivity. The modeling framework used in this assessment (and most other West Coast groundfish assessments) is the age structured model Stock Synthesis III (Methot 2009a, 2009b). The model treats a cohort, or year class, as a collection of fish whose size-at-age is characterized by a mean and a variance, such that the numbers at age are distributed across defined length bins. Several sources of both fishery-dependent (catch per unit effort data) and fishery independent (surveys of larval abundance, trawl surveys, and juvenile abundance indices) information are available for this species, and there are hundreds of thousands of length observations across various fisheries and surveys which inform population structure and estimates of recruitment. In order to evaluate the performance of the recruitment indices independently from their effect in the assessment model, the adopted stock assessment model was re-run with the recruitment indices removed. This is done to avoid contaminating the estimated "true" recruitment time series,[4] based exclusively on fishery and survey abundance and length frequency data, to recruitment indices derived solely from the suite of juvenile (age-0) abundance data explored in this manuscript.

Juvenile abundance data

We evaluate four sources of juvenile abundance data for consideration as indices of impending recruitment for bocaccio assessment and management. The first is an index of pelagic juvenile abundance based on data from a standardized midwater trawl survey specifically designed to estimate the abundance of pelagic juvenile rockfishes, and to develop indices of year-class strength for use in groundfish stock assessments (Ralston and Howard 1995). The remaining three indices reflect a slightly later life history stage for YOY rockfish, as settling or recently settled juveniles from power plant impingement studies, recreational pier fisheries, and submersible (*in situ*) surveys of fish abundance at both oil platforms and natural reef habitats in the Southern California Bight. We develop these data sources into relative recruitment indices, and subsequently contrast them with the recruitment estimates from the statistical catch-at-age model in order evaluate their performance in early detection of recruitment events. Each of these four datasets represents a different region of the range of the population of bocaccio subpopulation (fig. 2), although most of the data overlap spatially. Although the southern subpopulation is currently considered to range from the U.S./Mexico border to Cape Blanco, Oregon, recruitment of YOY bocaccio is rarely observed north of 38°N, the approximate northern boundary of the midwater trawl survey. Recruits are rarely observed between this region and the apparent center of the northern subpopulation off of Vancouver Island, Canada.

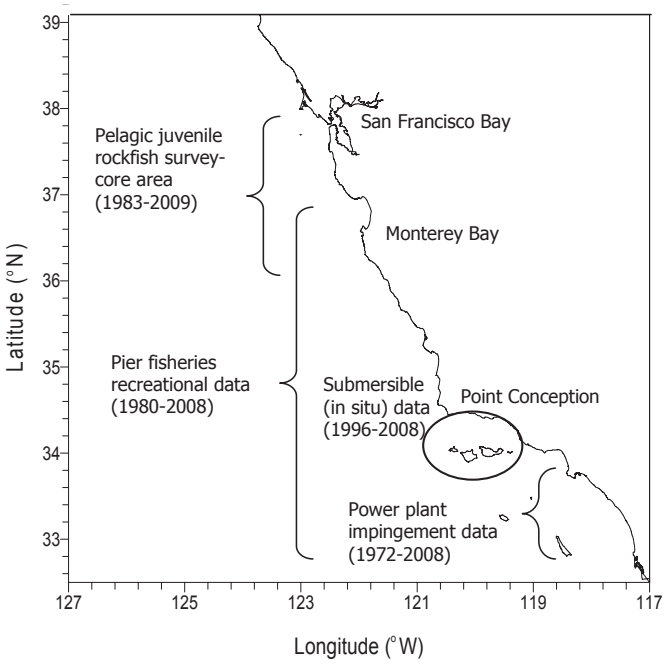

Figure 2. Spatial distribution of the four sources of data on juvenile abundance used to develop recruitment indices.

The midwater trawl survey samples YOY rockfish when they are ~100 days old, an ontogenetic stage that occurs after year-class strength is established from the larval stage, but well before cohorts recruit to commercial and recreational fisheries. This survey has encountered strong interannual variability in the abundance of the rockfishes that are routinely indexed, as well as high apparent synchrony in abundance among the ten most frequently encountered species. This synchronicity appears to be related to physical climate indicators (S. Ralston and J. Field, unpublished data). Several past assessments have used this survey as an index of year-class strength, including assessments for widow rockfish (*Sebastes entomelas*, He et al. 2005), Pacific hake (*Mer-*

[4]In most age structured stock assessment models, annual recruitment estimates are estimated with parameters that represent lognormally distributed deviations around the "expected" recruitment based on the spawner recruit relationship (Maunder and Deriso 2003, Methot 2009). The standard deviation of these parameters, σ_R, defines the magnitude of recruitment variability. For bocaccio this value is fixed at 1 and estimated to be (effectively) slightly greater (1.1).

luccius productus, Helser et al. 2006[5]), shortbelly rockfish (*S. jordani*, Field et al. 2007) and chilipepper rockfish (*S. goodei*, Field 2008). The midwater trawl survey has taken place during May–June every year since 1983, with a historical range (1983–2003) between 36°30' to 38°20' N latitude (approximately Carmel to just north of Point Reyes, CA). Beginning in 2004, the spatial coverage expanded to effectively cover a broader range of the California Current, from Cape Mendocino in the north to the U.S./Mexico border in the south (Sakuma et al. 2006). Although the expanded survey frame is considered to be a more appropriate index for use in stock assessments[6], the time series of the expanded survey is thus far insufficient to accurately assess performance relative to the time series from the core area. Consequently, we focus on the long-term data for this evaluation, in order to address the long-term performance of the index. The survey index is calculated after the raw catch data are adjusted to a common age of 100 days to account for interannual differences in age structure (Ralston and Howard 1995).

The power plant impingement index represents data collected from coastal cooling water intakes at five Southern California electrical generating stations from 1972 to 2008 (and ongoing). These data have been previously described and published by Love et al. (1998) and Miller et al. (2009) with respect to trends in abundance of *Sebastes* species and queenfish (*Seriphus politus*), respectively (See either of these manuscripts for additional information, and the precise location of the facilities). The dataset includes observations on over 13 million fish encountered in three basic types of power plant impingement surveys (E. Miller unpublished data). The three principle "types" of survey data include fish sampled off of intake screens during normal operations (typically over a 24 hour period, however we aggregated normal operations data by month for any given plant), fish abundances estimated during heat treatments (a periodic event in which a given volume of water is treated at high temperatures to kill off biofouling organisms [mussels, barnacles, etc.; Graham et al. 1977], and all fishes are subsequently enumerated), and a third set of impingement survey data that are unique to the San Onofre power plant but were not used in this analysis due to the low frequency of occurrence of bocaccio in those data (Miller et al. 2009). Fish are identified to the lowest possible taxon, and standardized length measurements are obtained for all species. The frequency of all of these sampling methods is irregular, as a result of changes in operating schedules, regulatory requirements and changes in ownership over time, however the time series is uninterrupted at the annual scale from 1972–2008.

Recreational fisheries catch, and often target, bocaccio of all sizes throughout their range, including high catches of YOY bocaccio in pier fisheries in central and southern California during good recruitment years. Since 1980 (but excluding 1990–1992), these pier fisheries have been sampled, first by the Marine Recreational Fisheries Statistics Survey (MRFSS) and then by the California Recreational Fisheries Survey (CRFS), with data analyzed and made available on the RecFIN internet site. The stock assessment also incorporated data from studies in the 1950s and 1960s that were insightful with respect to several large historical recruitment events.[7] Catches of bocaccio typically take place during infrequent strong recruitment years from San Mateo county (south of the entrance to San Francisco Bay) through Ventura county (somewhat north of Palos Verdes peninsula in the Southern California Bight), with the highest catch rates being observed in San Luis Obispo county. Juveniles were rarely observed at piers south of Los Angeles County, and in analyzing spatial patterns of recruitment, MacCall (2003) concluded that there was no evidence of separate recruitment events north and south of Point Conception in these data. For this analysis, RecFIN records of bocaccio catch per angler hour were summarized by years, 2-month sampling periods ("waves," using only waves 3, 4 and 5, corresponding to data from May through October, as bocaccio catches in other waves were very infrequent), and counties, such that each combination constitutes a single record.

In southern California, settling juvenile bocaccio recruit to a variety of habitats, including both natural reefs and oil platforms, often in large numbers during strong recruitment years. Observational data collected from submersible (*in situ*) surveys have been used to assess the abundance of rockfish and other species on both natural reefs and oil platforms to develop absolute abundance indices for other species of rockfishes (e.g., Love et al. 2005; Yoklavich et al. 2007) and to characterize assemblages of rockfish communities (Love et al. 2009); details of the survey methods and results can be found in those publications. Over the course of these

[5]The index evolved to a coastwide index following the 2006 assessment, but has not been used on the most recent assessment (Hamel and Stewart 2009), although it continues to be reported in the assessment documentation.

[6]See discussion in J. Hastie and S. Ralston, 2006, "Summary Report of Pre-Recruit Survey Workshop, September 13-15, 2006, Southwest Fisheries Science Center Santa Cruz, California," prepared for the PFMC (reported in April 2007 in the NWFSC Supplemental Science Report, Agenda Item E.1.b) and available online at http://www.pcouncil.org/bb/2007/0407/E1b_NWFSC3_sup.pdf.

[7]URL for recfin: http://www.recfin.org/data.htm. Historical data are from Miller and Gotschall (1965), who reported large numbers of YOY bocaccio in piers throughout central California in 1956 and 1957; an event also observed by one of the coauthors (M. Love). Large numbers of bocaccio were also observed in pier fisheries in the Central California region during the fall of 1966, for which bocaccio accounted for 26% of the 1.3 million fish estimated to have been caught in pier fisheries in that year (Miller and Odemar 1968).

surveys, bocaccio catches have been shown to be very patchily distributed, with the highest catch (observation) rates at oil platforms relative to natural reef habitats (Love et al. 2006). For all of the submersible data, we obtained dive-specific "catch" (observation) rates, which were standardized to reflect observations per 100 square meters. Only bocaccio smaller than 30 cm were included in developing the catch rate index.

All of the recruitment indices were developed using a Delta-GLM (generalized linear model) approach, consistent with the approach used in past assessments (MacCall 2003; Field et al. 2009). The Delta-GLM approach combines a binomial model for presence/absence information with a model of catch per unit effort for positive observations (Stefansson 1996, Maunder and Punt 2004). Akaike's Information Criterion (AIC) was used to determine the appropriate error distributions and to assess the most parsimonious model with respect to the number of covariates (Dick 2004). Year effects are independently estimated covariates which reflect a relative index of abundance for each year, error estimates for these parameters are developed with a jackknife routine. Seasonal (or temporal) effects are estimated using month, two-month periods, or season as covariates depending upon the resolution of the original data. For the midwater trawl survey, which takes place over an approximate 50 day period in May and June, bins of 10 Julian day periods are used, while two month periods ("waves") were used for the recreational pier fisheries data, one month periods were used for the impingement data, and no temporal effects were used for the submersible data (which only takes place during weather windows in late fall). Similarly, spatial effects are described by spatial covariates, represented by individual trawl stations for the midwater trawl survey data, counties for the recreational pier fishery data, individual power plants for the impingement data, and habitat types (oil rig base, oil rig midwater, and natural reef) as well as depth for the submersible data. For the impingement data, "survey type" was also included as a factor, with only two types estimated, these being the "normal operations" and "heat treatment" types described previously.

The resulting recruitment indices were compared to the estimated recruitments from the stock assessment. The natural logarithm of both the predictor (indices) and response (assessment recruits) values were used for the regression, to best mimic the behavior of stock assessment models which perform maximum likelihood parameter estimations (Maunder and Punt 2004, Methot 2009). In addition to comparing the results of the recruitment indices to the results of the assessment, we evaluate the extent to which the recruitment indices improve the predictive ability of the stock assessment model. This is done by retrospectively estimating the magnitude and confidence in estimates of one of the strongest recruitment events in recent years, the 1999 year class, when data are sequentially removed from the model going backwards in time. By sequentially removing entire years of data for two models with and without the recruitment indices we can compare both the absolute recruitment estimates and the confidence in those estimates. The estimated precision of the absolute values of annual recruitment are provided by the asymptotic approximation used in the stock synthesis model (Methot 2009a, b). This allows us to better evaluate how well the recruitment indices may, or may not, perform with respect to predicting strong incoming year classes of bocaccio.

RESULTS

The bocaccio stock assessment model that was re-run without the recruitment indices suggested a biomass trend and recruitment estimates nearly identical to those from the adopted assessment model (fig. 3). As with bocaccio assessments done over the past 10 years, the results indicate that the spawning output (a reflection of the spawning biomass, accounting for the greater fecundity of larger fish) fluctuated significantly through the 1960s and 1970s, peaking near 1970 and declined rapidly through the rest of the 1980s and 1990s. These declines were primarily a result of high exploitation rates, although a period of anomalously poor recruitment appears to have taken place throughout most of the 1990s. The estimated recruitment time series illustrates that recruitment has a high degree of interannual variability, but that the relative size of the strong recruitment events have declined in concert with the decline of spawning output through the year 2000. Since that time, fishing mortality has declined markedly due to severe management restrictions, and the stock has been increasing at a fairly rapid rate coincident with a series of several relatively strong year classes (1999, 2003, 2005). Note that the differences in the magnitude of recruitment events in the late 1950s and early 1960s, shown in Figure 3, results from exclusion of the recreational pier fishery time series in the model used for evaluating the performance of recruitment indices, as there were a mix of qualitative and quantitative data used in the full assessment.

For all of the models, several alternative model structures were explored and evaluated using AIC, and the most parsimonious model (explaining the greatest amount of relative variance with the lowest number of parameters) was used. Similarly, for each of the recruitment data sources, the year effects from the delta-GLM models led to an improvement in the AIC, indicating that the year effects provided information potentially usable as a recruitment index. We provide a summary

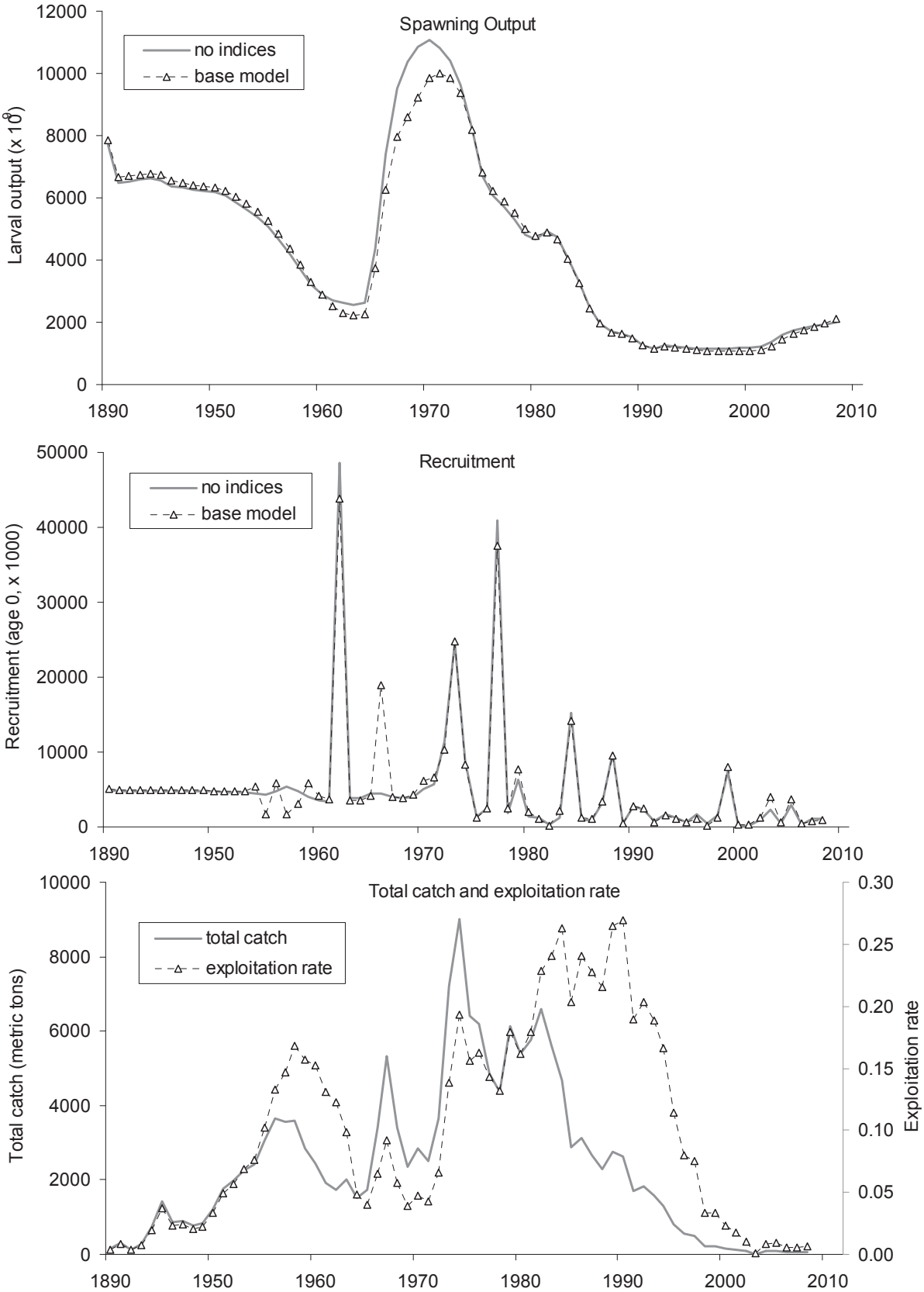

Figure 3. Estimated reproductive potential (spawning output) and recruitment of bocaccio from the base 2009 model (dashed lines) relative to the same model in which all juvenile indices are removed (solid lines), to avoid confounding the performance of the various indices.

TABLE 1
Summary of data availability, the number of parameter estimated, and GLM model performance for the four recruitment indices.

	Pelagic trawl	Recreational Pier	Power Plant Impingement	Delta Submersible
Time period	1983–2008	1980–2008	1972–2008	1995–2008
Number of years*	17	19	31	13
Temporal parameters	6	0	12	0
Spatial parameters	34	6	6	7
Data points	2225	312	2628	914
Coefficients of variation				
average	0.56	0.73	0.60	0.41
maximum	0.87	1.11	0.83	0.63
minimum	0.34	0.40	0.37	0.30
Change to AIC				
Remove year				
binomial	123.3	0.2	36.7	6.4
positive	75.4	3.9	78.2	5.0
Remove spatial				
binomial	18.9	45.6	25.5	41.3
positive	–9.0	66.2	–5.7	87.6
Remove temporal				
binomial	0.5	n/a	5.8	n/a
positive	7.6	n/a	14.3	n/a
Null model				
binomial	142.7	66.2	71.6	51.3
positive	93.1	49.6	167.4	92.8

of available data for each index, listing the time period for which data are available, the number of observations, the number of covariates used in the GLM, and both the null and final model AIC (tab. 1). The mean, and range, of the estimated coefficients of variation that result from the jackknife routine are also reported in this table. We focus subsequent discussion on the year effects (covariates) for each model, although the intra-annual (seasonal) and spatial covariates are also relevant.

All four of the resulting indices tracked most of the strong recruitment events estimated from the assessment model (fig. 4a-d). All of the indices were significantly correlated to the assessment estimates of recruitment (at the $p<0.05$ level), with coefficients of determination (R^2) values ranging from 0.28 for the pier fishery index to 0.58 for the power plant impingement data, with the juvenile trawl survey and submersible survey having coefficients of 0.35 and 0.41 respectively. One particular challenge with this type of model is how to deal with missing data. Many indices have years with insufficient numbers of positive observations to estimate a year effect (generally speaking, two positive observations in a given year are necessary), despite having fairly comprehensive sampling coverage (and data) overall. For the correlations shown here, those years have been dropped, although one approach to including that information is to use some fraction of the minimum estimated value for years with insufficient numbers of positive observations (for example, half). This is consistent with the practice frequently used in stock assessments. Although admittedly ad-hoc, this approach recognizes that there is information in the data regarding the relative strength of a given year class when data are collected and no juveniles are observed (the year class is presumably weak in such circumstances, although differences in sampling intensity are also relevant). The juvenile trawl survey index, the pier fishery index and the impingement survey index have eight, ten, and five years that meet this criteria respectively (there are no years of submersible data with this problem); if half of the minimum estimated values are used for these years and added to the regressions, the resulting R^2 values are 0.21, 0.45 and 0.46 respectively. Thus, the information content of the juvenile survey and the impingement survey are slightly degraded, that of the pier fishery is slightly improved, if this approach is adopted.

Another challenge is how to address the problem of errors in variables (EIV). In ordinary regression models, the independent variables are assumed to be measured without error, such that all error is a function of the dependent variable. This issue has a deep history in fisheries science and in the fisheries literature (Ricker 1975, Hilborn and Walters 1992), a comprehensive review of which is beyond the scope of this manuscript, but it is worth noting that the issue remains generally unresolved (Kimura 2000). We explored several approaches to addressing the issue, ultimately settling upon reporting both the "standard" linear regression relationship and the geometric mean estimate of the functional regression (GM regression; Ricker 1975), both of which are presented in Figure 4. Note that the coefficients of variation are unchanged among the two models, it is

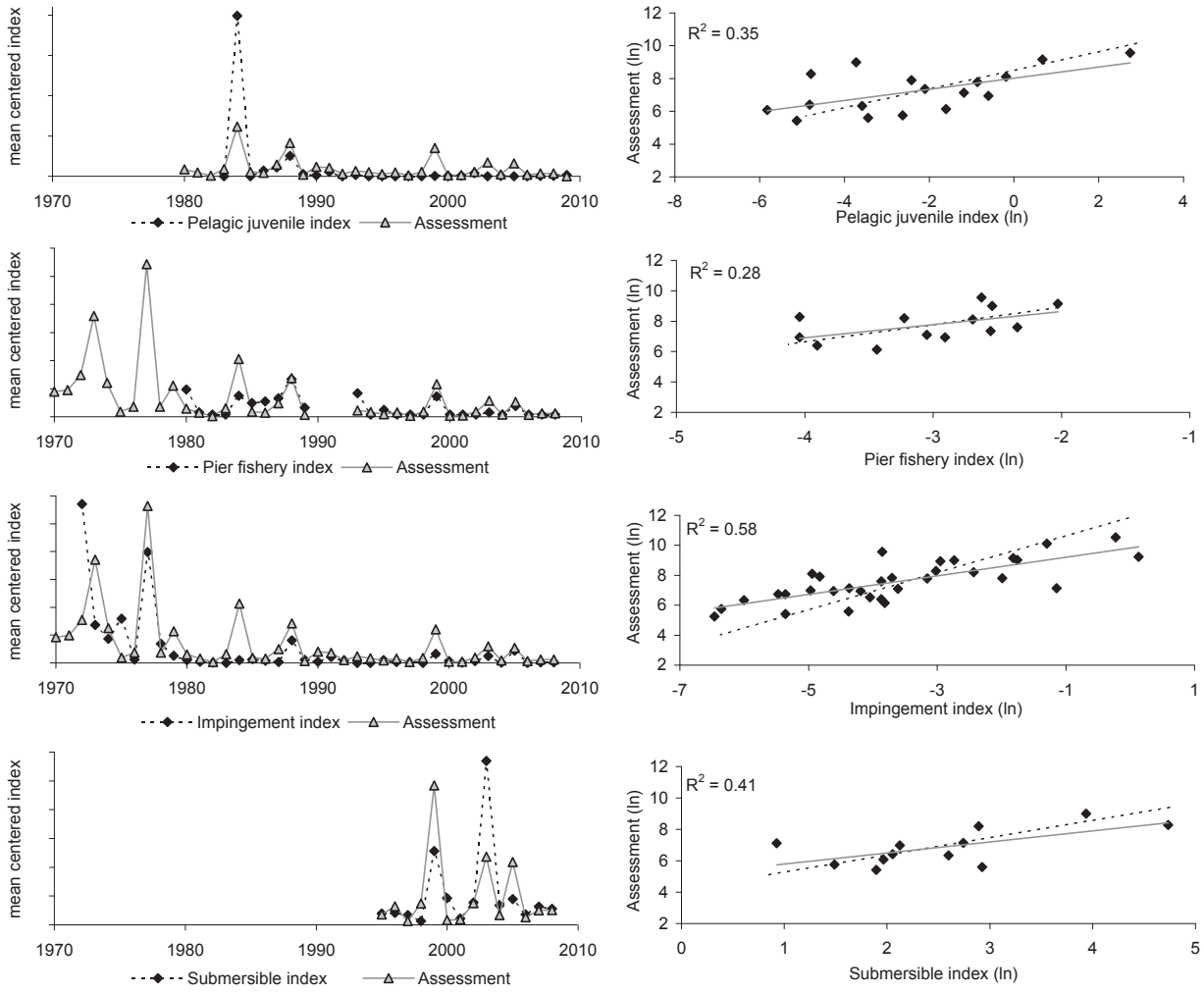

Figure 4. Mean-centered estimates of recruitment from the base stock assessment model (absent recruitment index data) relative to mean-centered indices of juvenile abundance from the data sources reported here (left panels). Corresponding regression results for each index (right panels), with both ordinary least squares regression (solid grey line) and geometric mean regression (dotted black line).

only the slope and intercept parameters that differ, and neither of these parameters are utilized further for the purposes of this manuscript.

While the recreational pier fishery index has a relatively modest correlation to assessment estimates of recruitment, this index does capture the magnitude of the 1984, 1988 and importantly the 1999 year class. The midwater trawl survey was among the noisier of indices ($R^2 = 0.35$), although this index captured the magnitude of the 1984 and (perhaps to a lesser extent) the 1988 year classes, there have been very few bocaccio juveniles observed in the catches since that time. Consequently, this index did not detect the strong year classes observed in 1999, 2003 and 2005, which may be an artifact of changes in the relative distribution of spawning biomass (and subsequent recruitment) over recent years. In fact, the failure of the juvenile survey to capture the magnitude of the 1999 year class for bocaccio or any other species contributed to the decision to expand the geographic range of the juvenile rockfish survey, under the assumption that expanding the survey accross space would lead to more effective predictions of coastwide recruitment events (Sakuma et al. 2006). The power plant impingement index also compares favorably with the stock assessment estimates of recruitment ($R^2 = 0.58$), and as the only index that precedes the 1980s it is reassuring to observe that the index does particularly well with respect to capturing the magnitude of the 1973, 1977 and 1988 year classes. This index also captures apparently strong recruitment in 2005 and 2007, which are now showing up in fishery data. Interestingly, this index appears to miss the magnitude of the 1984 and 1999 year classes, although it does recognize some recruitment in both of those years. Finally, although it is the shortest of the time series evaluated here, the submersible index also performs fairly

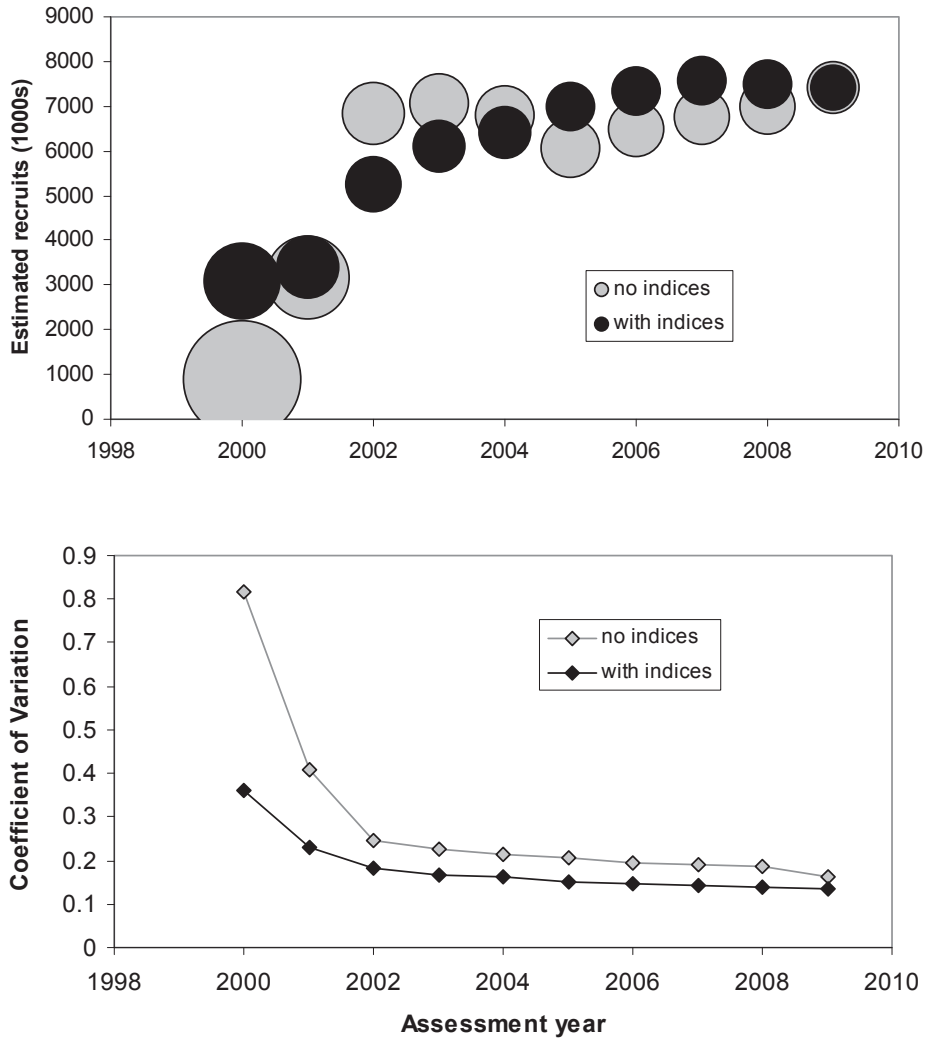

Figure 5a (top). Relative information content of the 1999 recruitment from retrospective bocaccio assessment models with (black) and without (grey) the juvenile indices developed in this manuscruipt. Size of bubbles corresponds to the CV of the estimates, which are also shown in Figure 5b (bottom).

well in capturing the magnitude of large year classes ($R^2 = 0.41$), although it overestimates the 2003 and underestimates the 1999 year class.

The comparison of estimates of the magnitude of the 1999 year class with retrospective model runs with and without all of the recruitment indices is shown (fig. 5a), along with the estimates of the CV of that recruitment point estimate in subsequent years. Here, we can see that the information content of informative indices is limited to the first 1–2 years before fish show up in fishery and survey data. For example, an assessment done in 2000 using data through 1999 would predict considerably greater recruitment with the recruitment indices than without them, due to the limited information available on that cohort available in length frequency data and the statistical "penalties" imposed on data with low information content in the model (thus the first two years represent primarily a recruitment estimation drawn from the spawner recruit curve), with considerably greater confidence (CV of 0.38 versus 0.85). However, by 2001 fishery-based length frequency data for bocaccio have already demonstrated the presence of the 1999 year class, and although the recruitment indices lead to a smaller variance estimate of that year class strength, the magnitude is generally well established based on simply the recreational fishery length composition data alone. As this example includes all of the recruitment indices in the model simultaneously, which would not necessarily be an optimal approach in a typical assessment, the difference among the estimated recruitments after the second year is negligible. That these recruitment events appear so strongly defined so early in the fishery reflects the unique life history of bocaccio, which grow very rapidly and are encountered by sport fisheries in particular at very young ages, whereas other *Sebastes* species are typically not vulner-

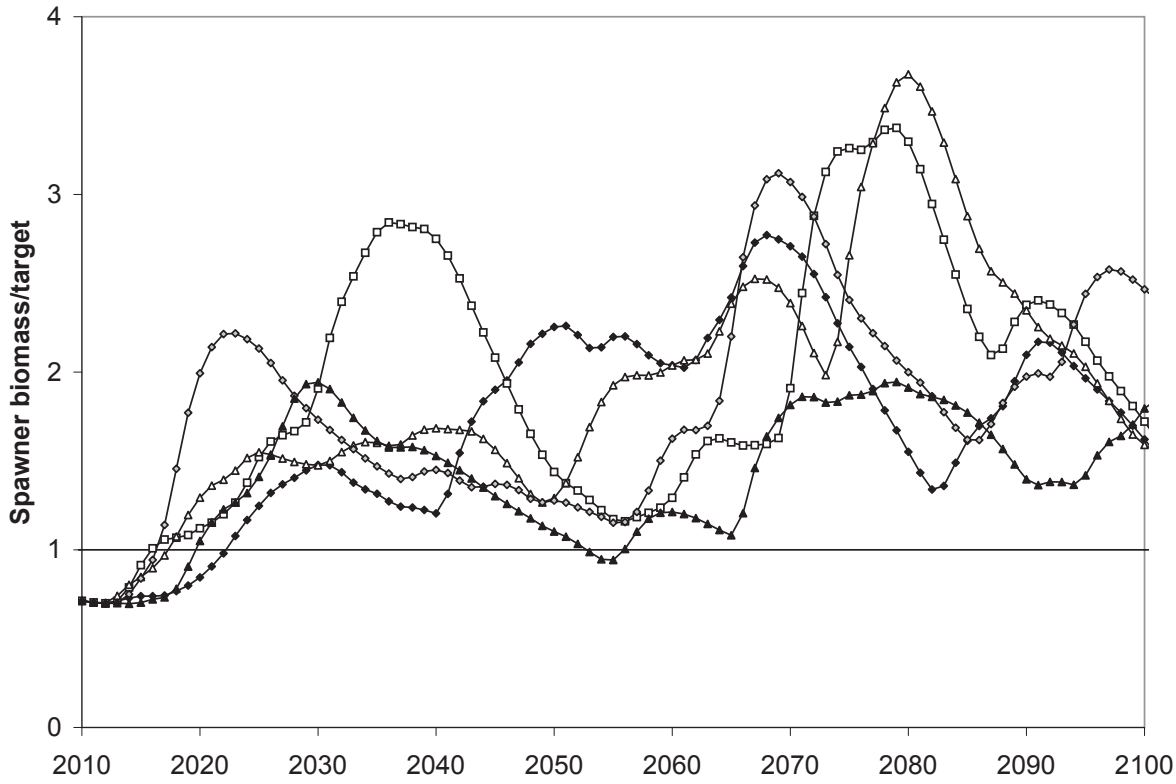

Figure 6. Five example trajectories, of the thousands simulated in the rebuilding analysis for bocaccio rockfish, illustrating the significance of highly variable recruitment events on population trends (harvest rates are constant set to current level in all scenarios). These individual trajectories are used to assess the probability of rebuilding by management targets.

able to fisheries until individuals reach ages of 3–10 years. For such slower-growing species, recruitment indices would be more useful in assessing abundance and productivity in the long term. For bocaccio, the period in which recruitment indices are useful in forecasting productivity is relatively brief (one to two years), although given the significance of changing bocaccio bycatch rates on other fisheries, improved forecasting of such recruitment events is still of great importance to resource management activities.

DISCUSSION

The southern bocaccio population is fortunate to have multiple sources of informative data that can provide estimates of the magnitude of recruitment events. As such, bocaccio are a good case study for evaluating the effectiveness of pre-recruit indices for West Coast groundfish, particularly as the correlation coefficients from this evaluation are comparable to or considerably greater than the correlations between the spawner recruit curve and subsequent recruitments. Currently, only two of these indices (the midwater trawl survey, albeit an index based on greater spatial resolution and shorter duration, and the recreational pier fishery index) are used are used in the stock assessment. Both of the other indices described here hold considerable potential for future assessments, and should be evaluated accordingly in the future. Moreover, the performance of most these indices is consistent with what DeOliveira and Butterworth (2005) describe as a reasonable threshold for the application of indicators (albeit, environmental indicators in their case) for improving stock assessment models, for which indicators should be able to explain approximately 50% or more of the total variation in recruitment.

Moreover, the data from these recruitment indices could provide insights into the physical and biological conditions that either enable or repress strong recruitment events. The high recruitment variability exhibited by this species leads to considerable uncertainty with respect to the estimated time to rebuild to target levels for this stock, as illustrated by five equally plausible trajectories of stock biomass developed as a part of a comprehensive rebuilding analysis (fig. 6, from Field and He 2009). Essentially, thousands of these individual trajectories are used to assess the probability of rebuilding by management targets, using the methods developed in Punt (2003). The rebuilding analysis also indicates that upon rebuilding to target biomass levels, the chance of returning to an overfished condition in the future remains significant if the default harvest policies are followed, simply due to the highly vari-

able nature of recruitment for this stock. Comparable results have been described for Pacific hake (*Merluccius productus*), another species with highly variable recruitment and population trajectories (Haltuch et al. 2008). Consequently, for stocks with such high variability in recruitment, such that harvest policies based on constant harvest rates may not be optimal for either ecological or socio-economic stability.

The potential for bocaccio recruitment indices to provide insights beyond just the bocaccio stock should also be explored. Several other commercially and ecologically important species have recruitment trends that covary with bocaccio rockfish, including chilipepper and Pacific hake. There is also some synchrony in recruitment variability of other species, for example nearly all of the assessed groundfish stocks on the U.S. west coast experienced good to excellent recruitment in 1999, and most also experienced strong recruitment in 1980 and 1984. Similarly, there tends to be poor recruitment during strong El Niño events, such as those 1982–83, 1986–87 and 1997–98 El Niño events (it is noteworthy to consider that many of the strongest recruitment events for West Coast groundfish have taken place in years that immediately followed these El Niño events). However, thus far the degree of synchrony in groundfish recruitment has been relatively modest; the leading principal components explain 25–45% of the variance for groundfish recruitment deviations for well-informed stocks (range reflects the subset of stocks evaluated), which is comparable to results for other regions (Mueter et al. 2007). While suggestive of some generalized response to ocean conditions, this fraction of the total variance is relatively modest in comparison to the high amount of synchrony observed in juvenile rockfish abundance in the pelagic stage, where the leading principle component explains 85% of the variance for the ten most abundant rockfish species (J. Field and S. Ralston, unpublished data). The spatial component of recruitment for shelf rockfish has also been shown to be strongly coherent over broad spatial scales (Field and Ralston 2005), although this reflects post-settlement and recruitment based primarily on fishery data and may not reflect the patchy nature of recruitment prior to dispersal. All of these observations suggest that many of the processes contributing to variable year class strength for rockfish, and perhaps other groundfish, occur at the post settlement stage, and vary considerably among species, again consistent with expectations for most marine species more generally (Ralston and Howard 1995, Houde 2008). For bocaccio, a closer evaluation of both the synchrony and the spatial structure of strong recruitment events using the different indices could lead to insights regarding the nature of the physical and biological ocean conditions that lead to strong year classes.

The geographic frame of the various indices also appears to be informative with respect to stock structure trends. The data used in the most recent assessment suggest that the stock biomass south of Point Conception appears to be rebuilding at a more rapid rate than to the north, based on the relative influence of data from these respective regions. The patterns observed in the recruitment index time series are consistent with this, in that the strong recruitment in 1984 seemed to be a "northern" recruitment event. This recruitment event was strongest in the central California data, including both the midwater trawl survey and the recreational pier fishery index (particularly Santa Cruz and San Luis Obispo counties). Since the 1990s however, the signal from the pier survey index has been dominated by San Luis Obispo and Santa Barbara Counties, and both the impingement index and the visual survey index suggest that recruitment south of Point Conception is strongly correlated with the model estimates of recruitment for the entire stock. This too is consistent with the abundance indices that suggest greater population increases in the southern part of the stock range relative to the central portion (Field et al. 2009), indicating that both recruitment and rebuilding may have a regional component.

With respect to further utility of these recruitment indicators, it may be that they are also useful for managers contemplating the duration of fishing seasons and seasonal depth restrictions. As one of several rebuilding species of rockfish on the West Coast, bocaccio is a constraining species for fisheries on healthy populations, and regulations focus on minimizing the catch of bocaccio while allowing opportunities to exploit more productive stocks. Thus, effective forecasting catches of this constraining species is key for maintaining fishing opportunities, while avoiding the chance of exceeding the allowable catch of bocaccio. Given the dramatic spikes in both catch rates and the percentage of the total southern California rockfish catch that is bocaccio following strong recruitment events (fig. 7)[8], improved predictions of future catch rates of constraining species could be of considerable value not only in assessments that include future year projections, but in year-to-year management activities as well. The latter point may be particularly true in a management regime in which the bocaccio stock assessment is performed every two years at most, and with a greater lag between the data and the time period in which the results are applied to management, making "fine tuning" of management measures

[8]There are statistically significant relationships among these variables, the R^2 between the assessment recruitment and a one-year lagged change in the percentage of all southern California rockfish (with an arcsine transform to account for proportionality) is 0.34, while the R^2 between recruits and one year lagged catch per angler hour is 0.35. However, a linear regression may be too simplistic, as both relationships show signs of non-linearity.

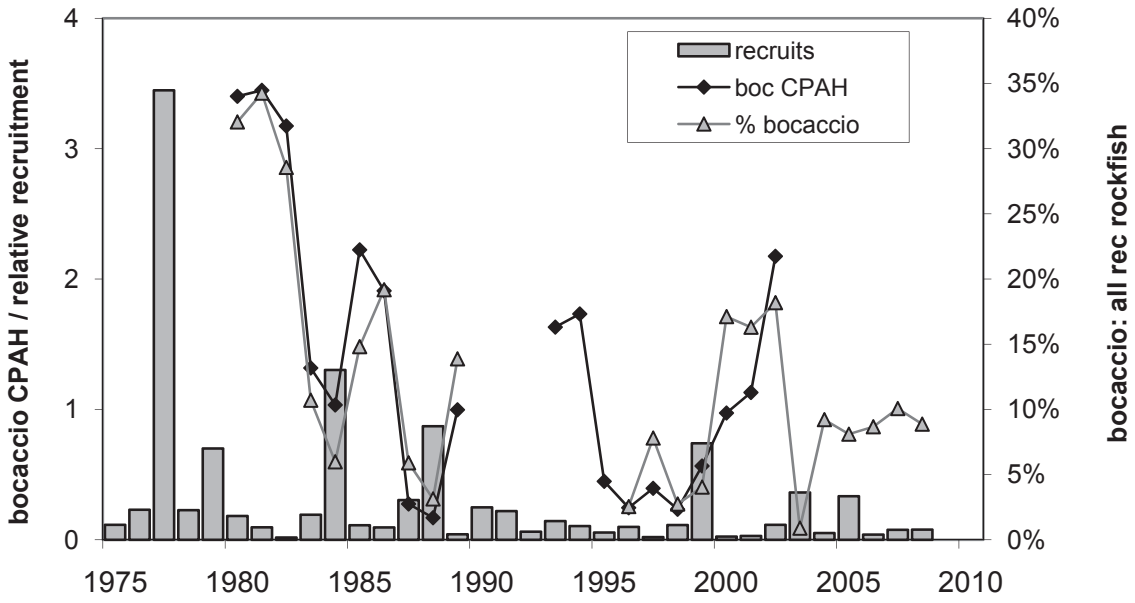

Figure 7. Estimated annual recruitment (grey bars) relative to Southern California recreational fishery catch rates (catch per angler hour, black line) and to the percentage of the total recreational catch represented by bocaccio (grey line).

in response to changing conditions even more important. In such a scenario, integrating all of the indices into a single indicator of impending recruitment, using principle components analysis or comparable means, might be more useful for management with respect to predicting spikes in bocaccio catches in recreational fisheries.

We have shown that there are several sources of information that could improve the prediction of strong year classes in stock assessment of bocaccio. Such information is useful to assessing stock status and productivity, to tracking rebuilding success, and likely to improving real time management of commercial and recreational fisheries that routinely encounter large numbers of young bocaccio during strong recruitment events. Additionally, these data could be informative with respect to recruitment trends for species of groundfish that tend to covary with bocaccio, and could ultimately lead to an improved understanding of the oceanographic processes that drive variable recruitment. In the long term, such information should aid both scientists and managers, by improving the ability to monitor and respond to the variable abundance and catch rates of bocaccio, as well as by leading to a greater appreciation for the connectivity between environmental changes in coastal ecosystems and fisheries productivity.

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Agenda Item E.1.a
Attachment 2 (Full Electronic Document)
November 2011

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Status and Future Prospects for the Darkblotched Rockfish Resource in Waters off Washington, Oregon, and California in 2011

by

Andi Stephens
Owen Hamel
Ian Taylor
Chantel Wetzel

September, 2011

Northwest Fisheries Science Center
U. S. Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
2725 Montlake Blvd East
Seattle, Washington 98112-2097

DRAFT

Status and Future Prospects for the Darkblotched Rockfish Resource in Waters off Washington, Oregon, and California in 2011

Executive Summary

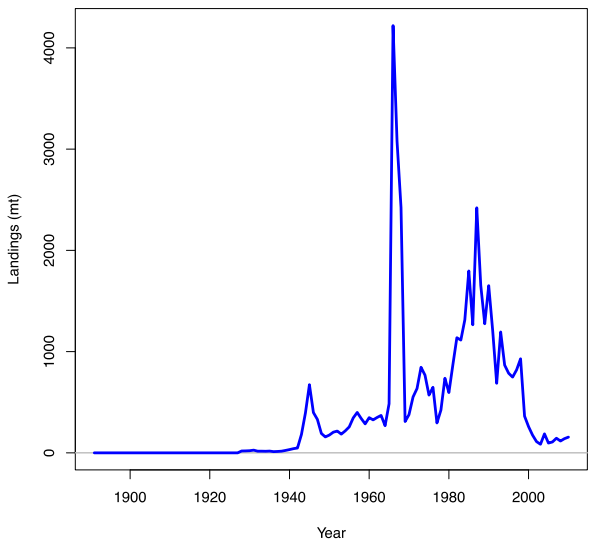
Stock

This updated assessment applies to the darkblotched rockfish (*Sebastes crameri*) resource in the combined US Vancouver, Columbia, Eureka and Monterey INPFC areas. The darkblotched rockfish (*Sebastes crameri*) population in these areas was modeled as a single stock as there are no clear stock delineations for darkblotched rockfish in U.S. waters. However, management actions on a coast-wide stock should account for problems in effort concentration because areas of high concentration do exist. In addition, with the stock extending northwards into Canadian waters, management and assessment of stock status might be improved through greater cooperation with British Columbia.

Catches

Darkblotched rockfish is primarily caught by bottom trawl gear. The largest landings (removals between 2,300 and 4,200 metric tons (mt)) of darkblotched were taken from 1966-1968, primarily by foreign vessels. From 1969 to 1981, the fishery proceeded with more moderate landings of between 200 and 1000 mt per year, with the foreign fishery ending in 1977. A second peak in landings occurred between 1982 and 1993, with landings exceeding 1,100 mt in 10 of 12 years, reaching over 2,400 mt in 1987. Management measures reduced landings to below 950 mt since 1994, below 400 mt since 1999, and below 200 mt in recent years.

Landings history from 1892-2010



Landings estimates for the past 10 years

Year	*Landings(mt)*
2001	*175*
2002	*112*
2003	*84*
2004	*188*
2005	*97*
2006	*107*
2007	*144*
2008	*116*
2009	*140*
2010	*155*

Data and Assessment

The last full assessment of darkblotched rockfish was conducted in 2007, and it was subsequently updated in 2009. This updated assessment used the Stock Synthesis (SS) model, version 3.21d. New data and updates to the data used in the previous assessment were included in this new assessment.

Recently reconstructed Oregon historical landings replaced data used previously for the period 1928-86. Landings data for 1983-2008 were checked and new landings data were added for 2009 and 2010. Fishery length compositions for 1983-2008 were updated by the addition of new 2009 and 2010 length compositions. The fishery conditional age-at-length data were updated to include otoliths collected and aged in 2009 and 2010. New discard estimates and discard length compositions for 2008 and 2009 were added.

Four fishery independent surveys were included in this updated assessment as in the previous assessment. The NWFSC Bottom Trawl Survey was again treated as two separate survey indices (Shelf and Slope) and each index was updated with data from the 2009 and 2010 surveys. Two included historical surveys had no new data: the AFSC Slope Survey (1997 and 1999-2001) and the NMFS Triennial Survey (1980-2004). The "super years" from the AFSC Slope Survey continue to be excluded, as is the 1977 data from Triennial Shelf Survey. GLMM-based biomass indices and CV's were recalculated for all four surveys with updated software using a gamma distribution rather than the lognormal previously modeled. All length compositions for the NWFSC Slope and Shelf Survey were reconstructed for 2003-2010, as were the conditional age-at-length compositions. The AFSC Slope Survey conditional age-at-length compositions from 2001 and the fishery discard age data from 2004 and 2005 remain unchanged.

A number of sources of uncertainty were explicitly included in this assessment. For example, allowance was made for uncertainty in natural mortality and the parameters of the stock-recruitment relationship. There were additional sources of uncertainty that were not included in the current model, including the degree of connection between the stocks of darkblotched rockfish off British Columbia and those in US waters; the effect of the PDO, ENSO and other climatic variables on recruitment, growth and survival of darkblotched rockfish; and gender-based differences in survival.

The reference case, on which this update is based, was selected (in 2007) by extensive model testing with an attempt to balance the sources of uncertainty. In this assessment, the steepness has been updated to 0.76 from 0.6 based upon information from a new meta-analytic prior (Martin Dorn, pers.com.) and the model fit.

Reference Points and Management Performance

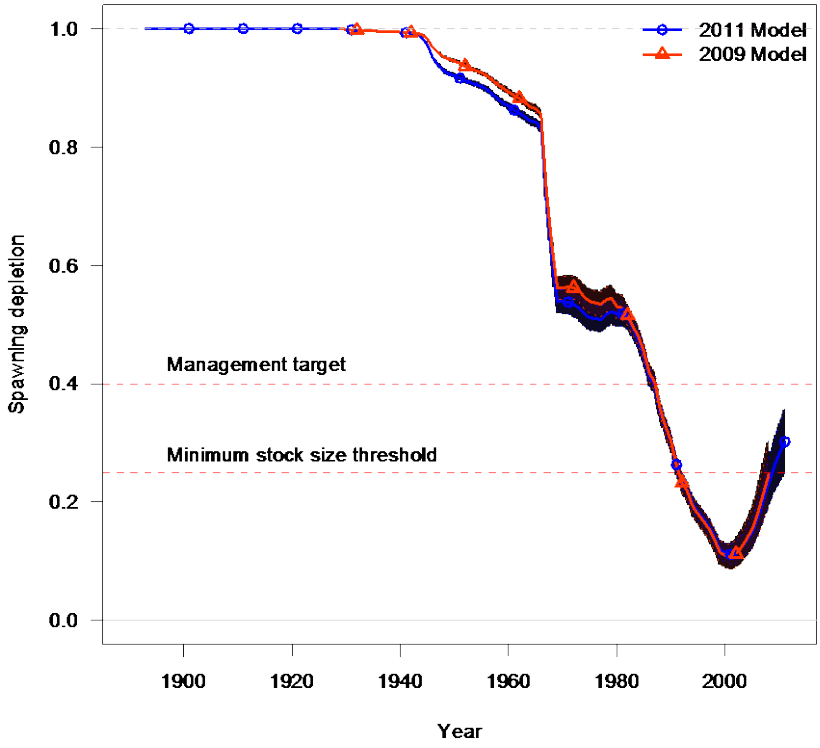
For West Coast rockfish, a stock is considered overfished when it is below 25% of unfished spawning biomass (or output), and recovered when it reaches 40% of unfished spawning biomass. Overfishing is considered to be occurring when catch exceeds the OFL specified for a particular year. The point estimate for the depletion of the spawning output at the start of 2011 is 30.2%. This assessment suggests that darkblotched rockfish on the West Coast is above the overfished threshold, but below the management target of 40% of unfished spawning biomass. The spawning output appears to have increased steadily over the past 10 years (which is essentially the same period in which a formal rebuilding plan has been in place). Since 2003, overfishing is estimated to have occurred once, with estimated catch barely exceeding the OFL by 1 mt in 2004.

Summary of past 10 years

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
OFL (previously ABC)	302-349	187	205	240	269	294	456	487	437	440	508
ACL (previously OY	130	168	172	240	269	200	290	330	285	291	298
Landings(mt)	175	112	84	188	97	107	144	116	140	155	NA
*Discards(mt)**	95	151	115	54	26	104	137	111	133	147	NA
*Catch (mt)**	270	263	199	242	123	211	281	227	273	302	NA
F (%)	4.23	3.66	2.47	2.70	1.26	1.98	2.46	1.88	2.15	2.26	2.14
Expl. Rate (%)	4.23	3.66	2.47	2.70	1.26	1.98	2.46	1.88	2.15	2.26	2.14
1+ Biomass	6,382	7,172	8,046	8,959	9,778	10,670	11,420	12,035	12,722	13,344	13,926
Sp. Output	3,262	3,383	3,610	3,947	4,363	5,058	5,911	6,766	7,568	8,231	8,808
Sp. Out. sd	292	314	344	382	431	499	587	681	768	847	918
Sp. Out. cv	0.053	0.057	0.062	0.069	0.078	0.090	0.106	0.123	0.139	0.153	0.166
Recruits(10^3)	1,162	1,034	1,997	2,682	2,792	2,100	2,002	5,330	841	2,505	2,544
Rec. sd	186	147	240	319	347	303	329	844	367	2,007	2,038
Rec. cv	0.082	0.065	0.105	0.140	0.153	0.133	0.145	0.372	0.161	0.883	0.897
Depletion	0.112	0.116	0.124	0.135	0.150	0.173	0.203	0.232	0.259	0.282	0.302
Depl. sd	0.009	0.009	0.010	0.011	0.013	0.015	0.017	0.020	0.023	0.025	0.027
Depl. cv	0.045	0.049	0.054	0.060	0.067	0.078	0.092	0.106	0.120	0.132	0.144

* The *discard* reported in this table is a model estimate, and *catch* is equal to landings plus the model-based discard estimates.

Estimated depletion level, 1892-2011for the base model (open circles) and 1928 to 2009 for the 2009 update assessment (triangles).



Summary of major quantities from assessment

	Value	*sd*	*cv*
$SpOut_0$ (10^8 eggs)	29,168	643	0.022
B_0 (mt)(1+ Biomass)	32,710	724	0.022
R_0 (10^3 fish)	3,008	71	0.024
$SpOut_{msy}$ (10^8 eggs)	13,334	294	0.022
F_{msy}	0.036	1.5e-4	0.004
Basis for above	$F_{50\%SPR}$		
Exploitation rate at MSY	0.036		
MSY	657		

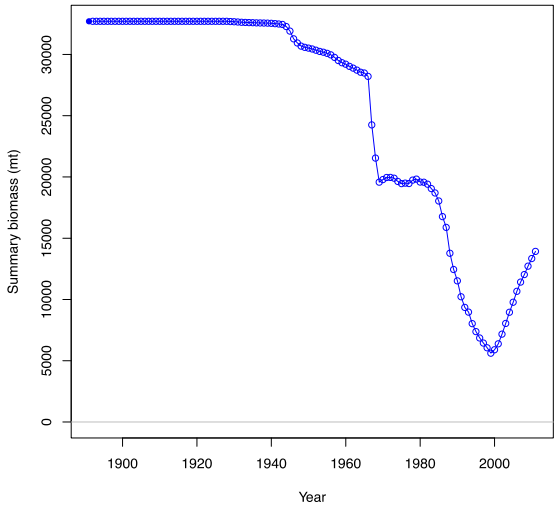
Summary of Darkblotched rockfish reference points

	$F_{msy}=F_{spr}$ (0.5)	$F_{msy} = F_{Btarg}(B_{40})$	Calculated F_{msy}
SPR	0.5	0.45	0.30
F	0.036	0.043	0.068
Exploitation Rate	0.036	0.043	0.068
MSY (mt)	657	704	774
Sp. Out. msy	13,334	11,667	7,068
B/B0 (Sp. Out.)	0.46	0.40	0.24

Stock Biomass

The point estimates of summary (age 1+) biomass show an upward trend over the past ten years, nearly doubling during that time.

1+ Biomass Levels from 1892 to 2010



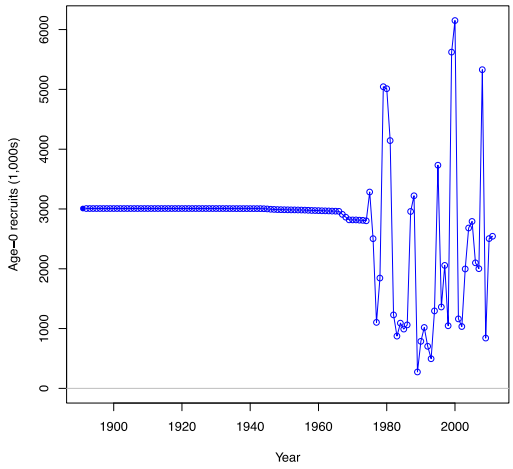
Biomass estimates for the past 10 years

Year	*Total 1+ biomass(mt)*
2002	7,172
2003	8,046
2004	8,959
2005	9,778
2006	10,670
2007	11,420
2008	12,035
2009	12,722
2010	13,344
2011	13,926

Recruitment

The first year for which recruitment appears to be reliably estimated is 1975. The recruitment pattern for darkblotched rockfish is similar to that of many rockfish species, with highly variable recruitment from year to year. With a few exceptions, the 1980's and 1990's provided rather poor year-classes compared with average historical recruitment levels, however there appear to be very high recruitments in 1999, 2000 and 2008.

Recruitment estimates (1892-2010)



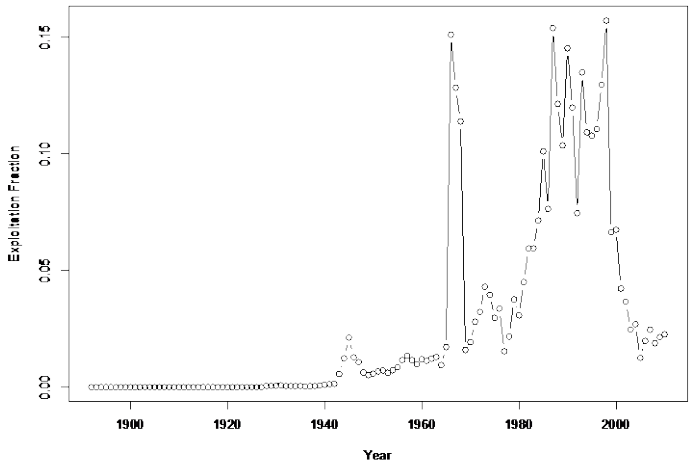
Recruitment estimates for the past 10 years (Thousands of age-0 recruits)

Year	*Recruitment*
2002	1,162
2003	1,034
2004	1,997
2005	2,682
2006	2,792
2007	2,100
2008	2,002
2009	5,330
2010	841
2011	2,505

Exploitation Status

The exploitation rate (percent of biomass taken) on fully-selected animals peaked near 15% in the mid-1960's when foreign fishing was intensive. The exploitation rate dropped by the late 1960's, but increased slowly and steadily from the late 1970's to 1987 at 15% and stayed high until 1998 with the continuing decline in exploitable biomass. Over the past 10 years the exploitation rate has fallen from over 6% to below 4%.

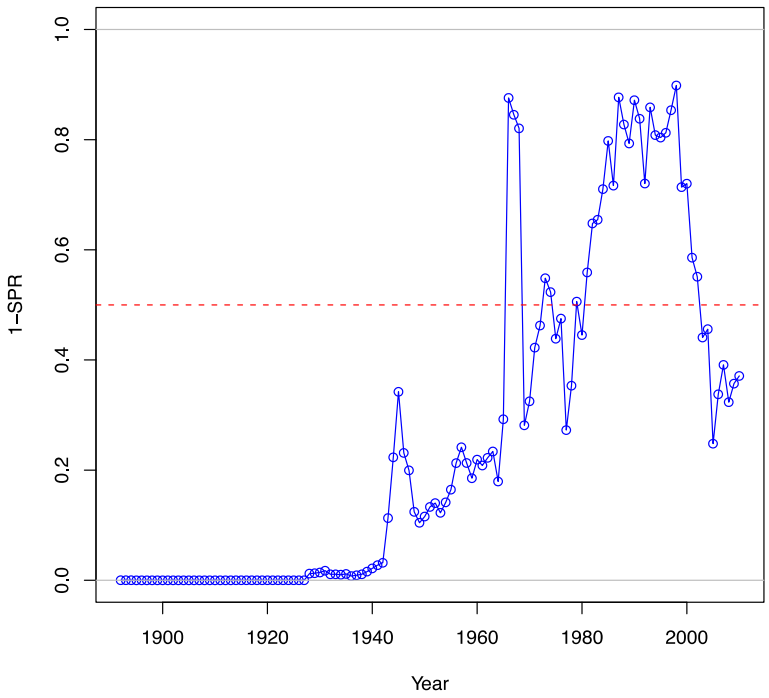
Exploitation Fraction (1892-2010)



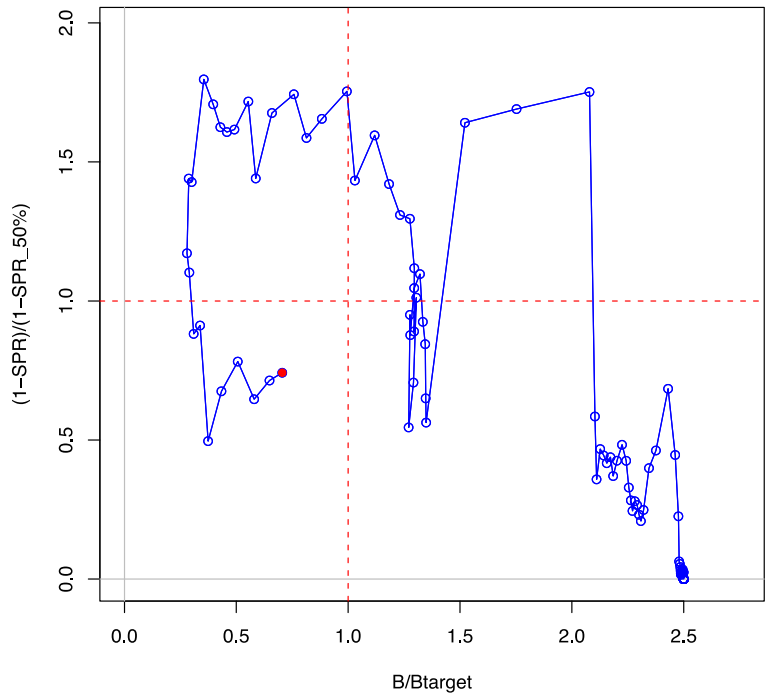
Exploitation Fraction the past 10 years

Year	*Exploitation rate*
2002	4.23 %
2003	3.66 %
2004	2.47 %
2005	2.70 %
2006	1.26 %
2007	1.98 %
2008	2.46 %
2009	1.88 %
2010	2.15 %
2011	2.26 %

One minus SPR for 1892-2010



Relative Fishing Intensity versus B/Btarget for 1892-2010



Decision table

The major axes of uncertainty in the model are steepness and natural mortality. The decision table below uses steepness (h) as the major axis of uncertainty. In the base model, steepness was fixed at the level of 0.76 (Dorn prior). The decision table was developed to bracket model uncertainty in darkblotched rockfish productivity (rather than continue to use the decision table from 2007 full assessment based on natural mortality). Alternative steepness values were calculated as the 12.5% and 87.5% quantiles from the prior distribution on *h*, which resulted in steepness values of 0.54 and 0.95 for the low and the high states of nature, respectively. The three catch series are based upon SPR = 71.9% ("Low Catch"), SPR = 64.9% (Medium Catch), and 40:10 rule catches ("High Catch").

Decision table

			Low State h = 0.54		Medium State h = 0.76		High State h = 0.95	
	YEAR	Catch	Sp. Out	% Depl	Sp. Out	% Depl	Sp. Out	% Depl
	2013	236	3821	12.7	9863	33.8	13767	47.8
	2014	247	3922	13.0	10422	35.7	14628	50.7
Low Catch	2015	255	4019	13.4	11001	37.7	15524	53.9
calculated from	2016	262	4099	13.6	11555	39.6	16379	56.8
71.9%SPR	2017	269	4164	13.8	12054	41.3	17129	59.4
applied to base	2018	276	4224	14.0	12503	42.9	17763	61.6
model	2019	282	4288	14.3	12917	44.3	18297	63.5
	2020	288	4358	14.5	13305	45.6	18749	65.0
	2021	295	4433	14.7	13672	46.9	19134	66.4
	2022	300	4512	15.0	14021	48.1	19462	67.5
	2013	317	3821	12.7	9863	33.8	13852	48.1
	2014	330	3859	12.8	10359	35.5	14653	50.8
Medium Catch	2015	339	3888	12.9	10869	37.3	15483	53.7
calculated from	2016	346	3896	13.0	11349	38.9	16266	56.4
64.9% SPR	2017	354	3888	12.9	11771	40.4	16939	58.8
applied to base	2018	361	3875	12.9	12143	41.6	17493	60.7
model	2019	368	3866	12.9	12479	42.8	17947	62.3
	2020	375	3864	12.9	12791	43.9	18320	63.6
	2021	381	3866	12.9	13084	44.9	18626	64.6
	2022	388	3871	12.9	13360	45.8	18879	65.5
	2013	485	3821	12.7	9863	33.8	13852	48.1
	2014	506	3729	12.4	10227	35.1	14521	50.4
High Catch	2015	521	3613	12.0	10590	36.3	15202	52.7
Buffered	2016	533	3468	11.5	10910	37.4	15823	54.9
40-10 Rule	2017	543	3301	11.0	11165	38.3	16325	56.6
	2018	551	3130	10.4	11366	39.0	16705	58.0
	2019	559	2965	9.9	11532	39.5	16985	58.9
	2020	566	2807	9.3	11676	40.0	17187	59.6
	2021	571	2654	8.8	11805	40.5	17328	60.1
	2022	575	2502	8.3	11924	40.9	17424	60.4

Future Research Needs

Future research needs include:

- Reconstruction of Washington historical catch.
- Investigation into the best available methods and data for constructing and using conditional age at length compositions from data taken across space and time within years.
- A thorough investigation of historical darkblotched rockfish mortality in the shrimp fishery.
- Mapping of “trawlable” and “untrawlable” habitat and construction of a prior on survey q.
- New full assessment.

1. Introduction

This assessment used combined data from the International North Pacific Fisheries Commission (INPFC) U.S. Vancouver, Columbia, Eureka and Monterey areas. The darkblotched rockfish (*Sebastes crameri*) population in these areas was modeled as a single stock.

Darkblotched rockfish (*Sebastes crameri*) are found from the Bering Sea to near Santa Catalina I., California at depths of 29-549 m (16-300 fm; Eschmeyer et al.1983). Commercially important concentrations are found from Northern CA through the Canadian border, on or near the bottom, in depths of approximately 183-366 m (100-200 fm) (Figure 1). This species co-occurs with an assemblage of slope rockfish, including Pacific ocean perch (*Sebastes alutus*), splitnose rockfish (*Sebastes diploproa*), yellowmouth rockfish (*Sebastes reedi*), and sharpchin rockfish (*Sebastes zacentrus)*. Pacific ocean perch and darkblotched rockfish are the most abundant members of that assemblage off the coasts of Oregon and Washington, but splitnose rockfish and darkblotched rockfish dominate off the northern coast of California. In the early years of the fishery, darkblotched rockfish were designated as part of the "Pacific ocean perch" market category for red-colored northern slope rockfish.

There are no clear stock delineations for darkblotched rockfish in U.S. waters. No distinct breaks are seen in the fishery landings and catch distributions (Figure 1). Survey catches imply a continuous distribution over most of the range, with the largest catches occurring over a swath of latitude and depth. For the purpose of this assessment, the species is treated as a unit stock from the Mexican border to the U.S.-Canadian border. However, management actions on a coast-wide stock should account for problems in effort concentration because areas of high concentration do exist.

Additional information on stock genetics, sexually dimorphic growth, migration to deeper waters, and historical fishing practices can be found in the last full assessment (Hamel, 2007).

2. Data

The last full assessment of darkblotched rockfish was conducted in 2007, and it was subsequently updated in 2009. This update assessment differs from the traditional update paradigm in that input data used in the previous update have been reanalyzed, and time series they represent were reconstructed. As these reconstructed time series are considered to reflect better practice and information, they were incorporated in this assessment. We first note changes to datasets used in the 2009 update assessment, and then describe each data source.

2.1 Changes to data used for previous assessments

Catch Data

Landed catch for the Oregon historical fishery had been reconstructed by NWFSC and Oregon Fish and Wildlife scientists, and these data were used in place of the Oregon catch stream that had been used in the 2009 update assessment. In addition, there were two new years of data added to all catch streams.

Discard Rates

The discard rates from the West Coast Groundfish Observer Program had been recalculated, and the new ones were used for this assessment.

Survey Data

The darkblotched rockfish assessment uses fishery data from the Alaska Fisheries Science Center (AFSC) triennial and slope surveys, as well as slope and shelf surveys performed by the Northwest Fisheries Science Center (NWFSC). As the former two surveys ended some time ago, their results were not updated for the present assessment. The NWFSC surveys had undergone data review, and as a result the length- and age-at-length-compositions were reconstructed for the assessment, as well as the weighting factors (effective sample sizes) for each year of survey.

Abundance Indices

The software previously used for generating the survey abundance indices is no longer functional, and a new GLMM was used to construct new CPUE timeseries for all four surveys. The model for deriving CPUEs used in the previous update modeled the zero catches as a lognormal distribution; the new model uses a gamma distribution, as that distribution is determined to be more appropriate for the observed data than the lognormal distribution. This is considered an improvement to the previous GLMM model.

Stock-Recruit Steepness

The 2007 full assessment assumed a steepness of 0.6 (estimated and then fixed in the model). In the 2009 update assessment, the value of steepness was kept unchanged (fixed at 0.6). In the 2011 assessment, when steepness is estimated within the model, estimated values tends to be high (hitting the upper bound). It is clear from the current data and model that it is not possible to consistently estimate a realistic value for steepness; therefore we adopted the mean of the current meta-analytic prior for steepness provided by Martin Dorn (Personal Communication), h = 0.76.

2.2. Fishery removals and regulations

Darkblotched landings information was obtained for the fishery off the West Coast of the continental United States from 1892 through 2010 (Figure 2; Tables 4-5). Reconstructed Oregon historical landings were updated for 1892-1986 (Karnowski, Mark: personal communication, 2011). For Washington, darkblotched landings during the period 1928-1962 were estimated by apportioning combined rockfish landings using the earliest available species proportions in a given area. Since the fleet fished shallower than 100 fm in years before 1945-1948, the available darkblotched proportions were reduced for those years. Landings from 1963-1977 were mainly available in the literature, but some estimation was required. The 1978-1980 landings were taken from CalCom and Tagart (1985). Landings from 1983-2010 were extracted from PacFIN on May 6, 2011 and darkblotched bycatch information from the At-Sea-Hake Observer Program was taken from the Northwest Regional office website (NWR, 2011) for 2005-2010.

Discards

The new discard rates for 2002-2010 (Table 3) were obtained from the West Coast Groundfish Observer Program. Additional information on past discards can be found in Hamel (2007).

Fishery Length compositions

Fishery length compositions (Figures 3-6) were estimated from PacFIN for the years 1977-1978 and 1981-2010. Fishery length compositions were constructed using BDS data retrieved from PacFIN on May 6, 2011. Length, age and sex data were acquired at the trip level, and then aggregated to the state level as was done in the 2007 assessment, and 2009 update. For each trip, the length composition of the sampled individuals was scaled up to represent the length composition of the trip landings through use of an expansion factor. In this assessment, the expansion factor was calculated as:

$$\text{Expansion Factor} = (WT_{total}/WT_{sampled})^{0.9}$$

with total weight divided by sample weight being the equivalent of total estimated number over sampled number. The exponent 0.9 was used in acknowledgment of the reduced information that occurs with any expansion to the trip level. The initial effective N value (input N) for each state was calculated via Stewart's Method (Ian Stewart, pers. com.), which for fisheries is:

$$N_{effective} = N_{trips} + 0.138N_{fish} \quad \text{if } N_{fish}/N_{trips} < 44$$
$$N_{effective} = 7.06N_{trips} \quad \text{if } N_{fish}/N_{trips} \geq 44$$

The geometric mean was adjusted to account for the lack of proportional sampling in each state as in Hamel (2007).

The length composition of discarded darkblotched rockfish in 1986 was estimated using data from observed groundfish trawls in that year (Rogers, 2005). The length compositions of discards in more recent years (2002-2010) were calculated with observer data from boats using bottom trawl gear. Individual lengths were scaled up by a straight expansion factor to the total discard for each observed tow. Due to significant missing sex data across the full range of length bins, all discard length-, age- and conditional age-at-length compositions were developed as combined-sex length compositions (Figures 7-8). Input N values for discard length compositions were calculated via Stewart's Method (Table 6B).

Fishery conditional age-at-length compositions

Conditional age-at-length compositions were constructed from age and length data available from PacFIN for the years 2003-2010. These years were used because all of the ages in PacFIN for those years were from otoliths aged between 2004 and 2010, a period in which ageing methods have been invariant, with three agers doing all of the ageing. Double-read analysis indicates minimal or no bias between agers and relatively good precision. In constructing conditional age-at-length compositions, instead of expanding samples up to trips, as with the length data, each age-at-length data point was considered independent for the purposes of creating each composition, although total input N (across all length bins) was still based on Stewart's method as described above. This total input N was spread among the length bins according to the number of fish contributing to data in that bin. For the early years, in keeping with the 2007 assessment (Hamel, 2007), this update only uses data from the years 1991 and 1998 (Table 7).

Since rockfish grow significantly in a single year and fishing occurs throughout the year, length bins were pooled according to estimated growth for each age. The bins were 0-10 cm, 11-15 cm, 16-20 cm, 21-24 cm, 25-27 cm, and 28-30 cm, with two-centimeter bins for length from 31 cm to 50 cm, and a plus group at 51 cm and above. The compositions and input sample sizes (Table 7)

were developed by the same method as described above for the PacFIN data. Residuals for the age-at-length compositions are shown in Figures 26-30.

2.3. Surveys

NMFS Cruises

The results from four fishery-independent surveys are used in this assessment:

1. The NMFS Triennial Shelf Survey that was conducted every third year from 1977-2004
2. The AFSC Slope Survey for the years 1997 and 1999-2001.
3. The NWFSC Slope Survey for the years 1999-2010.
4. The shelf portion of the NWFSC survey for the years 2003-2010.

Neither the 1977 Triennial Shelf Survey, due to concerns about the first year of the survey's implementation, nor the AFSC Slope Survey "super years", consisting of combined data from multiple years of partial coastal coverage, were used in this assessment. The "POP" survey from 1979 and 1985 was not used, as selectivity likely changed between the two survey years which used separate methods. The previous solution of mirroring the AFSC Slope Survey was unlikely to produce realistic selectivities for the POP survey. These two years of data were also relatively insignificant given the other data available.

Indices

In the 2007 and 2009 assessments, indices of abundance were derived for the four surveys based on a Generalized Linear Mixed Model (GLMM) following the methods of Helser et al (2004, Table 8), including vessel-specific differences in catchability (via inclusion of random effects) .. The GLMM approach explicitly models both the zero and positive catches, as well as allowing for skewness in the distribution of catch rates through the use of a Gamma or lognormal error structure. Coefficients of variation (CVs) about the indices were produced using an MCMC technique.

The GLMM indices for this update were generated for all four surveys using the same basic method but using software reprogrammed by John Wallace (John.Wallace@noaa.gov) to use OpenBUGS (http://www.openbugs.info/) from the statistical language R. Although point estimates and confidence intervals differed slightly between the two implementations applied to data through 2008, the basic trends were largely unchanged. Any discrepancies may likely be attributed to the use of the Gamma rather than the lognormal error structure, as in past assessments.

GLMM results are reported coastwide, combining the U.S. Vancouver and Columbia INPFC areas with the Eureka and Monterey INPFC areas. While darkblotched rockfish are occasionally seen in the Conception INPFC area, the numbers there are negligible compared to those further north. Depth ranges were limited to those which were covered in all years of each survey.

Length compositions

Length compositions were derived for each survey, except for the 1999 NWFSC Slope Survey, for which length data were not available and the 2004 Triennial Survey where age compositions, instead of length compositions, were used (Figures 9-24).

Length, age, and sex data were acquired at the tow level, and then aggregated within INPFC areas and depth strata. For each trip, the length composition of the sampled individuals was scaled up to represent the length composition of the trip landings through use of an expansion factor. In this assessment, the expansion factor was calculated as:

$$\text{Expansion Factor} = (WT_{total}/WT_{sampled})$$

with total weight divided by sample weight being the equivalent of total estimated number over sampled number. No down weighting exponent was used, as the survey data are taken at the tow level rather than the trip level. The initial effective N (input N) were calculated via Stewart's Method (Ian Stewart, pers. Comm.), which for surveys is

$$N_{effective} = N_{trips} + 0.0707 N_{fish} \quad \text{if } N_{fish}/N_{trips} < 55$$
$$N_{effective} = 4.89 N_{trips} \quad \text{if } N_{fish}/N_{trips} \geq 55$$

where N_{fish} is the total number of fish sampled across all trips (Table 6C).

Age compositions

The 2004 Triennial Survey age composition is included in this assessment as derived in the 2005 assessment (Figures 25).

Conditional-age-at length compositions

Conditional age-at-length compositions were constructed from age and length data using the same methods as for survey length compositions. These compositions were constructed for the 2001 AFSC Slope Survey and the 2003-2010 NWFSC Slope and Shelf Surveys (see Figures 31-35 for the residuals for the survey compositions). These years and surveys were used because all of the ages were from otoliths aged between 2004 and 2010, a period in which ageing methods have been invariant, with three agers doing all of the ageing. Total input N for each year was based on Stewart's method as described above (Table 7). This total input N was distributed among the length bins according to the number of fish contributing to data in that bin.

A summary of data sources and years included in the base model is given in Table 9.

2.4. Biology and life history

Natural mortality

In the 2000 and 2003 assessments, M = 0.05 was selected based on fit to the data (Rogers et al. 2000). Lenarz (1993) suggested a range of natural morality estimates (0.025-0.05) based on a maximum age range of 60-105 years, using Hoenig's method. In 2005, indirect estimates of M for darkblotched rockfish from Gunderson et al. (2003) were considered in selecting a value for M. Gunderson estimated M based on a meta-analysis of the relationship of the Gonadosomatic Index or GSI (ovary weight/somatic body weight). This method produced a value of M = 0.107 for darkblotched rockfish with a 95% confidence interval of 0.07-0.14. The 2005 and 2007 assessments used 0.07 based on balancing the estimates using GSI and Hoenig's method.

However, the correct interval to use when conducting meta-analyses and predicting an unobserved point is a prediction interval, not a confidence interval. The prediction interval for

both Hoenig's method and the GSI method are quite large ((0.005 - 0.375) for Hoenig's (using log-log regression), and either (-0.186 - 0.323) (untransformed) or (0.062-0.205) (log-log) for Gunderson's method). In addition, the values of both maximum age and GSI for darkblotched are towards the edge of the data used in constructing the meta-analyses, so assuming a linear relationship in either space is somewhat suspect. Therefore it is hard to define what the correct prediction interval is for either method. However, observation error in the data used in the meta-analysis can cause prediction intervals to be too wide, and therefore the situation may not be quite as dire. In any case, M continues to be a very difficult parameter to pin down. In this updated assessment, M was not changed from the value used in the last assessment. In so far as this value does balance the point estimates well, there is support for using this value.

Sex ratio, maturation and fecundity

In this assessment, the sex ratio at birth is assumed to be 1:1. Maturity-at-length for females was based on the work of Nichol (1990) with 50% maturity occurring at 34.5 cm (Figure 36):

$$P_{Mat} = \frac{1}{-e^{(-0.6449L+22.2)}}$$

Fecundity-at-weight was derived by converting Nichol's (1990) fecundity-at-length equation (Figure 37) using his length-weight relationship:

$$Eggs = 14{,}580W + 132{,}500W^2,$$

where W = weight is in kg.

Length-weight relationship

The length-weight relationship was estimated by Rogers (2005) using available survey data. Sexes were combined because means did not differ substantially. The equation was fit to mean weight at length from 6374 fish measured in West Coast surveys:

$$W = 0.000021L^{2.96142}$$

where W is weight (kg) and L is fork length (cm). This equation differs slightly from Nichol's (1990) equation, but this difference in the weight-length relationship results in quite minimal changes to the resultant weight and fecundity-at-age estimates.

Length at age

Length at age was estimated within the assessment model. No latitudinal or temporal changes in length at age were assumed, although male and female growth rate and L_{∞} were estimated separately. The CV of length at age was also estimated and allowed to change linearly with mean length at age (Figure 38).

3. Assessment model

3.1 History of Modeling approaches

There have been eight previous assessments of darkblotched rockfish off of the U. S. West Coast (Lenarz 1993, Rogers et al. 1996, Rogers et al. 2000, Methot and Rogers 2001, Rogers 2003, Rogers 2005, Hamel 2007, Wallace and Hamel 2009). These assessments began with life-history-based analyses of sustainable catch rates and have progressed to statistical age-based modeling. The first full assessment of the darkblotched rockfish stock was conducted in 2000. That assessment was updated twice in 2001 and 2003. The 2005 and 2007 assessments were the second and third full assessments for this species. Hamel (2007) gives a detailed history on each of the assessments prior to 2007.

3.2 Current Model

Model

This assessment uses Stock Synthesis (SS) version 3.21d, released by Dr. Richard Methot in May 2011. The modeling period begins in 1892, assuming the stock was in an unfished equilibrium condition prior to that. Assessment includes one bottom trawl fishery. The base model's parameters, both those that were estimated and those that were fixed, are given in Table 10.

Length and age bins

The length frequency bins were the same as in the 2007 and 2009 assessments. The first bin contained all fish less than 7 cm, followed 1 cm length bins up to 32 cm, and then 2 cm bins from 33-34 cm to 49-50 cm, and a maximum bin of all fish $\geq$ 51cm in length.

Growth

Growth parameters were estimated within the model, including the size at age 1.7, the size at age 29, the von Bertalanffy growth rate parameter (K) and the CV of length at age 1.7. Exponential offsets were also estimated for the CV at age 29, for male size at age 29 and for von Bertalanffy K. Table 11 gives the estimates of these values for the current model and those arrived at in the previous assessment.

Recruitment, stock-recruitment steepness and natural mortality

R_0 is estimated in the model, along with recruitment deviations from 1975 through 2009, with σ_r = 0.8. Stock-recruitment steepness is fixed at 0.76following the PFMC request to revisit steepness and consider the recent estimates of much higher values than previously assumed (0.6 in the previous update). Natural mortality is set at 0.07 which is the value used in the 2005, 2007, and

2009 assessments. This value balances the estimates from various meta-analyses. See Hamel (2007) for more details.

Selectivity and Retention

In the previous update assessment, the double normal selectivity function was used for the fishery and each survey, along with the inflection point and slope of the logistic retention function. Various blocking schemes on fishery selectivity were tested in an effort to account for changes in depth of fishing and codend mesh size. However, these blocks resulted either in unrealistic selectivity patterns due to the sparseness or vagaries of the data, or almost no change at all.

During the course of this (enhanced) update, a time block on fishery selectivity corresponding to the implementation of Rockfish Conservation Areas (2003) was considered, allowing fishery selectivity to be domed shaped. However, this resulted in negligible change in the selectivity pattern. Therefore, as in 2007 full assessment and 2009 update assessment, a single selectivity pattern was assumed for all years of the fishery.

The pattern of retention has changed in recent years due to regulations (Table 1 & 3; Figure 39), so retention was blocked to reflect these changes. The length at the inflection point was allowed to change in 2000 and the asymptotic retention was allowed to change at 2000, 2004, and 2006. Modeled and observed discards reflecting this new approach to retention are shown in Figures 45 and 46.

Unlike the final runs for the 2007 and 2009 assessments, the NWFSC Slope Survey selectivity was found to be domed shaped. With only four years of data in 2007, the model found the selectivity to be asymptotic, but with eight years of data, a moderately strong dome was found. The other surveys were assumed to be domed shaped (Figures 41-44), as in the 2007 and 2009 assessments.

Weighting

Iterative re-weighting was applied as was done for the 2007 base model and the details can be found there (Hamel, 2007). That single re-weighting scheme was used for this update using the new reweighting parameters. .

4. Results

4.1. Reference model results

Figures 48-51 show the time trajectories of the estimates of summary biomass, fishery exploitation rate, recruitment, and depletion in spawning output. The fit to the stock-recruitment relationship (Figure 50) indicates a substantial amount of variability. The exploitation rate first peaked at 11-14% in 1966-1968 due to fishing by foreign fleets. The two highest exploitation rates were attained in 1987 (15%) and 1998 (16%), averaging 11-12% in the intervening years. The fishing mortality rate has been less than 4% over the past 7 years.

Figure 52 provide a comparison of the time trajectories of spawning output, depletion, and summary (1+) biomass for the current and the 2009 update assessments. The fits of the base model to the various indices are summarized in Figures 53 and 54 (survey biomass indices), and

Figures 3-8 and 11-28 (composition data). The estimated growth parameters are given in Table 11.

4.2. Retrospective analysis

Retrospective analyses were conducted as if the assessment were carried out in the years from 2006 to 20010 (without the last 1-5 years of data). The retrospective pattern seen in Figure 55 suggests that the most recent years data drive the model results.

5. Future research

Future research needs include:

- Reconstruction of Washington historical catch
- Investigation into the best available methods and data for constructing and using conditional age at length compositions from data taken across space and time within years.

- A thorough investigation of historical darkblotched rockfish mortality in the shrimp fishery.

- Mapping of "trawlable" and "untrawlable" habitat and construction of a prior on survey q.

- New full assessment.

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Table 1. Recent management regulations affecting darkblotched rockfish landings.

Area	Year	Period	2-mo landing limit for slope rockfish (lbs)	RCA Depth (fm)		Small footrope required
				min	max	
N of 40° 10’	2003	Jan-Dec	1,800	0-100	200-250	shoreward of RCA
	2004	Jan-Apr	4,000	60-75	200	shoreward of RCA
		May-Sep	8,000	60-75	150	shoreward of RCA
		Oct	8,000	0	250	shoreward of RCA
		Nov-Dec	1,800	0	250	shoreward of RCA
	2005	Jan-Dec	4,000	75-100	200	[*] shoreward of RCA
	2006	Jan-Feb	2,000	75	200	[*] shoreward of RCA
		Mar-Jun	4,000	75	200	[*] shoreward of RCA
		Jul-Dec	1,000	75-100	200	[*] shoreward of RCA
	2007	Jan-Apr	4,000	75 (Jan-Mar)	250 (Jan-Mar)	[*] shoreward of RCA
		Mar-Dec	1,500	[#] 60-75	150-200	[*] shoreward of RCA
	2008	Jan-Apr	4,000	[#] 75 (Jan-Mar)	250 (Jan-Mar)	[*] shoreward of RCA
		May-Dec	1,500	[#] 60-75	150-200	[*] shoreward of RCA
	2009	Jan-Aug	1,500	[#] 75-100	150-200	[*] shoreward of RCA
		Sep-Dec	4,000	[#] 75	200	[*] shoreward of RCA
	2010	Jan-Apr	6,000	[#] 75	200	[*] shoreward of RCA
		May-Aug	2,000	[#] 75-100	150-200	[*] shoreward of RCA
		Sep-Oct	4,000	[#] 75	200	[*] shoreward of RCA
		Nov	4,000 (mo)	[#] 75	200	[*] shoreward of RCA
		Dec	0	[#] 75	250	[*] shoreward of RCA
40 °10’ to 38°	2003	Jan-Dec	1,800	0-60	200-250	shoreward of RCA
	2004	Jan-Apr	7,000	75	150	shoreward of RCA
		May-Sep	50,000	75-100	150	shoreward of RCA
		Oct	50,000	75	150	shoreward of RCA
		Nov-Dec	10,000	0	200	shoreward of RCA
	2005	Jan-Feb	4,000	75	200	shoreward of RCA
		Mar-Oct	8,000	100	200	shoreward of RCA
		Nov-Dec	1,000	75	200	shoreward of RCA
	2006	Jan-Feb	4,000	75	200	shoreward of RCA
		Mar-Jun	8,000	100	200	shoreward of RCA
		Jul-Dec	1,000	75	200	shoreward of RCA
	2007	Jan-Jun	15,000	100	150-200	shoreward of RCA
		Jul-Oct	10,000	100	150	shoreward of RCA
		Nov-Dec	15,000	100	200	shoreward of RCA
	2008	Jan-Dec	15,000	100	150	shoreward of RCA
	2009	Jan-Jun	15,000	100	150	shoreward of RCA
		Jul-Aug	10,000	100	150	shoreward of RCA
		Sep-Oct	15,000	100	150	shoreward of RCA
		Nov-Dec	16,000	100	150	shoreward of RCA
	2010	Jan-Dec	15,000	100	150	shoreward of RCA

[*] Use of selective flatfish gear (which is a type of small footrope gear) was required.

[#] During these periods, the RCA extended to the shore north of 48°10’ N. lat. This was also the case during April-September 2007 and all of 2008 in the area between 42°40.5’ N. lat. and 43°20.83’ N. lat.

Table 2. Management performance (Bold indicates overfishing).

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
OFL (previously ABC)	302-349	187	205	240	269	294	456	487	437	440	508
ACL (previously OY	130	168	172	240	269	200	290	330	285	291	298
Landings(mt)	175	112	84	188	97	107	144	116	140	155	NA
*Modeled Discards(mt)**	95	151	115	54	26	104	137	111	133	147	NA
*Modeled total Catch (mt)**	270	263	199	242	123	211	281	227	273	302	NA

* These total catch values are based on model-based estimates of discard. These are not the estimates which are used to determine whether overfishing has occurred.

Table 3. Input discard rates used in the assessment.

Year	Discard %	CV
1986	5	0.3
2000	32	0.2
2001	41	0.2
2002	56	0.1
2003	60.2	0.1
2004	16	0.1
2005	22.4	0.1
2006	49.4	0.1
2007	48.6	0.1
2008	53.1	0.1
2009	54.3	0.1

Table 4. Estimates of darkblotched rockfish landings from 1928-1977 for Oregon, Washington, and foreign fleets.

Year	California	Oregon	Washington	Foreign	Total
1928	18	0			18
1929	19	0			19
1930	21	0	0		21
1931	26	0	0		26
1932	16	0	0		16
1933	16	0	0		16
1934	15	0	0		15
1935	17	0	0		17
1936	11	0	0		11
1937	13	1	0		14
1938	16	0	0		16
1939	23	1	0		24
1940	20	13	0		33
1941	22	19	0		41
1942	12	36	0		48
1943	57	125	0		182
1944	177	218	0		395
1945	334	337	2		673
1946	189	209	1		399
1947	199	130	1		330
1948	99	89	3		191
1949	70	86	1		157
1950	73	101	2		176
1951	106	96	2		204
1952	78	136	2		216
1953	87	96	2		185
1954	79	136	2		217
1955	131	123	2		256
1956	149	189	7		345
1957	190	205	4		399
1958	180	153	6		339
1959	139	142	5		286
1960	151	189	7		347
1961	120	197	8		325
1962	107	235	7		349
1963	136	225	8		369
1964	85	175	8		268
1965	97	380	8		485
1966	84	320	8	3807	4219
1967	102	262	8	2706	3078
1968	110	17	8	2288	2423
1969	65	80	11	153	309
1970	77	145	6	149	377
1971	91	174	9	278	552
1972	111	148	3	374	636
1973	1	67	9	768	845
1974	253	144	24	346	767
1975	66	102	109	293	570
1976	136	322	72	118	648
1977	120	130	45		295

Table 5. Estimated landings for 1978-2010. State values from PacFIN (extracted May 6, 2011) except for 1978-1982 Oregon landings (Mark Karnowski, ODFW, pers. comm.). At-Sea Hake "landings" (including discards) from Vanessa Tuttle, At-Sea Hake Observer Program (pers. comm.) for 1991-2010, and extended back to 1981 using a ratio estimator from years with data.

Year	California	Oregon	Washington	Other	At Sea Hake	Total
1978	78	156	189			423
1979	159	497	81			737
1980	164	334	98			596
1981	522	266	37		46	870
1982	170	941	24		3	1137
1983	510	582	22		0	1114
1984	596	625	82		11	1314
1985	802	848	111		36	1797
1986	417	622	215		10	1264
1987	1647	686	68		19	2420
1988	750	789	108		8	1655
1989	441	737	91		6	1275
1990	870	764	16		0	1651
1991	333	774	54		45	1206
1992	187	451	20		29	687
1993	285	892	9		8	1194
1994	292	550	9		15	866
1995	366	342	28		49	787
1996	408	309	19		6	748
1997	452	342	22		4	820
1998	497	395	20		14	929
1999	113	227	10		11	362
2000	114	129	9		8	259
2001	87	66	8	2	12	175
2002	50	52	7	0	3	112
2003	11	61	2	5	4	84
2004	39	134	7	1	7	188
2005	18	65	1	2	11	97
2006	23	71	2	1	11	107
2007	41	87	3	1	12	144
2008	34	72	3	1	6	116
2009	47	88	2	1	1	140
2010	17	152	7	1	13	183

Table 6A. Raw numbers of fish and trips sampled and input Ns used for fisheries length compositions. Any input 'N' that was greater than 500 was capped at 500.

Year	WA fish	OR fish	CA fish	Total Fish	WA trips	OR trips	CA trips	Total Trips	Input N	ReWt N
1977	0	304	0	0	5	0	304	5	22	13.86
1978	0	200	0	0	2	0	200	2	9	5.67
1981	0	0	199	0	0	31	199	31	44	27.72
1982	0	300	459	0	2	57	759	59	89	56.07
1983	0	0	792	792	0	0	115	115	165	103.95
1984	0	70	1925	1995	0	1	161	162	332	209.16
1985	0	201	2967	3168	0	2	207	209	485	305.55
1986	0	0	2437	2437	0	0	145	145	267	168.21
1987	0	0	2704	2704	0	0	124	124	410	258.3
1988	0	0	1343	1343	0	0	93	93	185	116.55
1989	0	0	1107	1107	0	0	92	92	135	85.05
1990	0	100	873	973	0	1	91	92	179	112.77
1991	0	200	764	964	0	2	75	77	143	90.09
1992	0	0	429	429	0	0	49	49	57	35.91
1993	0	0	566	566	0	0	56	56	66	41.58
1994	0	200	595	795	0	2	51	53	118	74.34
1995	0	188	793	981	0	7	55	62	182	114.66
1996	370	833	1044	2247	28	23	81	132	426	268.38
1997	586	802	947	2335	32	22	58	112	405	255.15
1998	456	541	1353	2350	28	13	80	121	413	260.19
1999	342	430	773	1545	26	9	41	76	250	157.5
2000	653	224	906	1783	20	7	53	80	275	173.25
2001	892	1005	897	2794	25	30	60	115	471	296.73
2002	1129	610	994	2733	48	20	48	116	440	277.2
2003	580	1447	590	2617	28	60	38	126	456	287.28
2004	616	1305	562	2483	20	58	33	111	430	270.9
2005	117	1275	571	1963	9	54	34	97	360	226.8
2006	505	1457	1309	3271	10	62	73	145	500	315
2007	579	2155	1840	4574	22	79	89	190	500	315
2008	350	2689	2188	5227	12	102	104	218	500	315
2009	359	2829	1464	4652	11	137	69	217	482	303.66
2010	209	2856	1099	4164	5	136	62	203	466	293.58

Table 6B. Raw numbers of fish and hauls sampled and input Ns used for discard length composition data.

Year	Fish	Hauls	Input N	ReWt N
1986			100	63
2002	674	70	127	80.01
2003	856	93	159	100.17
2004	783	123	177	111.51
2005	1529	255	319	200.97
2006	1159	296	276	173.88
2007	574	170	188	118.44
2008	263	73	76	47.88
2009	1167	324	367	231.21
2010	115	31	40	25.2

Table 6C. Raw numbers of fish and hauls sampled and input Ns used for survey length composition data.

Survey	Year	Fish	Hauls	Input N	ReWt N
Triennial	1980	656	11	54	38.34
	1983	4438	43	210	149.1
	1986	1834	38	168	119.28
	1989	6054	85	416	295.36
	1992	1445	33	135	95.85
	1995	2389	106	275	195.25
	1998	2943	110	318	225.78
	2001	2980	184	395	280.45
	2004	3578	152	405	287.55
AFSC slope	1997	313	20	42	24.36
	1999	228	26	42	24.36
	2000	223	20	36	20.88
	2001	324	14	37	21.46
NW slope	2000	296	25	46	40.48
	2001	494	45	79	69.52
	2002	1027	54	123	108.24
	2003	1742	64	183	161.04
	2004	557	53	82	72.16
	2005	1023	49	117	102.96
	2006	1133	66	144	126.72
	2007	1074	65	137	120.56
	2008	1130	60	139	122.32
	2009	1401	64	163	143.44
	2010	992	51	121	106.48
NW shelf	2003	633	36	80	80
	2004	505	37	71	71
	2005	960	61	129	129
	2006	792	64	120	120
	2007	1012	67	138	138
	2008	517	51	88	88
	2009	897	62	125	125
	2010	1247	66	154	154

Table 7. Number of trips (fishery) or hauls, number of fish, and total input N's for conditional age-at-length and age compositions used in the assessment.

Fleet	Year	Trips/Hauls	Fish	Total input N	ReWT N
Fishery	1991	33	354	46	46
	1998	51	854	44	44
	2003	85	1900	633	633
	2004	38	1168	432	432
	2005	51	1121	416	416
	2006	61	1421	523	523
	2007	78	1991	817	817
	2008	69	1815	678	678
	2009	46	1186	1186	1186
	2010	29	783	783	783
Discard					
	2004	47	246	81	81
	2005	80	504	150	150
Triennial	(Age composition)				
	2004	134	1121	213	106.5
AFSC slope					
	2001	18	191	32	32
NWFSC					
slope	2003	64	465	465	116.25
	2004	53	349	349	87.25
	2005	49	401	401	100.25
	2006	66	491	491	122.75
	2007	65	515	515	128.75
	2008	60	492	492	123
	2009	64	610	610	152.5
	2010	51	428	428	107
NWFSC					
shelf	2003	36	280	280	42
	2004	37	238	238	35.7
	2005	61	394	394	59.1
	2006	63	442	442	66.3
	2007	67	452	452	67.8
	2008	51	256	256	38.4
	2009	62	521	521	78.15
	2010	66	469	469	70.35

Table 8. GLMM-based biomass indices used in the assessment model.

Triennial Shelf Survey

	Total Biomass	
Year	Median	SD of the log
1980	6809	0.113
1983	15998	0.083
1986	8969	0.095
1989	4275	0.088
1992	7588	0.103
1995	6152	0.096
1998	3193	0.095
2001	3917	0.096
2004	8891	0.101

AFSC Slope Survey

	Total Biomass	
Year	Median	SD of the log
1997	1606.293	0.248
1999	2756.346	0.227
2000	934.142	0.245
2001	1992.919	0.283

NWFSC Slope Survey

	Total Biomass	
Year	Median	SD of the log
1999	2205.061	0.193
2000	10663.288	0.228
2001	2153.85	0.205
2002	3025.156	0.206
2003	29534.603	0.22
2004	3359.529	0.233
2005	21951.282	0.265
2006	4921.375	0.163
2007	4954.338	0.157
2008	4144.408	0.172
2009	7452.022	0.162
2010	3570.572	0.18

NWFSC Shelf Survey

	Total Biomass	
Year	Median	SD of the log
2003	2329.28	0.227
2004	3684.936	0.217
2005	2346.148	0.164
2006	1518.052	0.168
2007	2053.659	0.158
2008	4203.075	0.18
2009	1494.096	0.155
2010	1894.938	0.163

Table 9. Data sources and years included in the Base Model.

Indices	Years
Triennial Shelf	1980 1983 1986 19891992 1995 1998 2001 2004
AFSC Slope	1997 1999-2001
NWFSC Slope	2000-2010
NWFSC Shelf	2003-2010
Discard	1986, 2000-2009
Length Comps	
Fishery landings	1977-1978, 1981-2010
Fishery discard	1986, 2002-2010
Triennial Shelf	1980 1983 1986 19891992 1995 1998 2001
AFSC Slope	1997 1999-2001
NWFSC Slope	2000-2010
NWFSC Shelf	2003-2010
Age Comps	
Triennial Shelf	2004
Age-at-length	
Fishery landings	1991, 1998, 2003-2010
Fishery discard	2004 2005
AFSC Slope	2001
NWFSC Slope	2003-2010
NWFSC Shelf	2003-2010

Table 10. Parameters in the base model.

Mortality and growth			
1	0.07	Fixed	Natural mortality (M)
2	0	Fixed	Old offset
3	14.9483	Estimated	Size at age 1.7 (in cm)
4	42.9753	Estimated	Size at age 29 (females)
5	0.189212	Estimated	Von-Bertalanffy K (females)
6	0.0637649	Estimated	cv of size at age (young)
7	-0.160972	Estimated	cv of size at age offset (old)
8	0	Fixed	M offset Male
9	0	Fixed	M offset old male
10	0	Fixed	Male offset for size at age 1.7
11	-0.10074	Estimated	Male offset for size at age 29
12	0.195935	Estimated	Male offset for K
13	0	Fixed	offsest for cv of young Male
14	0	Fixed	offset for cv of old Male
biology_parms			
15	0.000021	Fixed	scalar for weight at length
16	2.96142	Fixed	Exponent for weight at length
17	34.59	Fixed	size at 50% maturity
18	-0.6429	Fixed	logistic parameter for maturity ogive
19	0.1458	Fixed	eggs/kg intercept
20	1.325	Fixed	Fecundity slope
21	2.10E-05	Fixed	scalar for weight at length
22	2.96142	Fixed	Exponent for weight at length
#_size_sel:	Fishery		Fishery selectivity
1	34.1483	Estimated	Peak
2	1.27053	Estimated	Width of peak
3	3.23256	Estimated	VarAscend
4	0.6	Fixed	Var Descending
5	-2.18071	Estimated	Initial
6	9	Fixed	Final
#_retention	Fishery		
7	25.1436	Estimated	size at 50% selectivity through 1999
8	1.90246	Estimated	logarithmic slope
9	1	Fixed	final
10	0	Fixed	intial
#_size_sel:	Triennial		
11	20.3275	Estimated	Peak
12	-6	Fixed	Width of peak (Low Bound)
13	0.964574	Estimated	VarAscend
14	4.39938	Estimated	Var Descending
15	-0.757411	Estimated	Initial
16	-2.76084	Estimated	Final

Table 10 continued. Parameters in the base model.

#_size_sel:	AFSC sl		
17	22.9088	Estimated	Peak
18	-0.91626	Estimated	Width of peak
19	2.2367	Estimated	VarAscend
20	2.10759	Estimated	Var Descending
21	-5	Fixed	Initial
22	-3.99523	Estimated	Final
#_size_sel:	NWFSC sl		
23	24.8894	Estimated	Peak
24	-0.3	Estimated	Width of peak
25	3.13663	Estimated	VarAscend
26	0.1	Estimated	Var Descending
27	-5	Fixed	Initial
28	0.319545	Fixed	Final
#_size_sel:	NWFSC sh		
29	16.3307	Estimated	Peak
30	-1.33176	Estimated	Width of peak
31	-0.5	Fixed	VarAscend
32	3.11801	Estimated	Var Descending
33	-1.24347	Estimated	Initial
34	-5	Fixed	Final
sel_parm_blockparms			
35	26.3846	Estimated	size at 50% selectivity 2000 - 2003
36	0.68443	Estimated	final retention 2000 - 2001
37	0.449862	Estimated	final retention 2002-2003
38	0.821107	Estimated	final retention 2004 - 2005
39	0.527161	Estimated	final retention 2006 - 2010

Table 11. Growth parameters estimated in the model. All length units are in centimeters.

Update model year	2009	2011
Female length at age 1.7	14.8	14.9483
Female length at age 29	42.73	42.9753
Female VBK	0.2	0.189212
Female CV of length at age, at age 1.7	0.066	0.0637649
Female CV of length at age, exponential offset (old)	-0.179	-0.160972
Male offset at age 1.7	0	0
Male offset at age 29	-0.098	-0.10074
Male offset for K	0.187	0.195935
Male offsest for CV at age 1.7	0	0
Male CV of length at age, exponential offset (old)	0	0

Table 12. Time series of total and summary biomass, spawning output, depletion, recruitment and F.

Year	Total Biom.	Sum. Biom.	Sp. Out.	Depletion (%)	Recruit	F (%)
1928	32,726	32,709	29,167	100.0	3,008	0.06
1929	32,708	32,691	29,150	99.9	3,008	0.06
1930	32,689	32,673	29,131	99.9	3,008	0.07
1931	32,670	32,653	29,111	99.8	3,008	0.08
1932	32,646	32,630	29,087	99.7	3,008	0.05
1933	32,633	32,617	29,072	99.7	3,008	0.05
1934	32,621	32,605	29,059	99.6	3,007	0.05
1935	32,611	32,595	29,047	99.6	3,007	0.05
1936	32,599	32,583	29,033	99.5	3,007	0.04
1937	32,594	32,577	29,026	99.5	3,007	0.04
1938	32,587	32,570	29,017	99.5	3,007	0.05
1939	32,577	32,561	29,007	99.4	3,007	0.07
1940	32,561	32,545	28,989	99.4	3,007	0.10
1941	32,537	32,521	28,964	99.3	3,007	0.13
1942	32,505	32,489	28,931	99.2	3,006	0.15
1943	32,468	32,452	28,892	99.1	3,006	0.57
1944	32,300	32,283	28,724	98.5	3,005	1.23
1945	31,928	31,912	28,354	97.2	3,002	2.13
1946	31,295	31,278	27,719	95.0	2,996	1.29
1947	30,957	30,940	27,358	93.8	2,993	1.08
1948	30,702	30,686	27,073	92.8	2,990	0.63
1949	30,599	30,583	26,934	92.3	2,989	0.52
1950	30,538	30,521	26,839	92.0	2,988	0.58
1951	30,464	30,448	26,737	91.7	2,987	0.68
1952	30,369	30,353	26,617	91.3	2,986	0.72
1953	30,268	30,252	26,496	90.8	2,985	0.62
1954	30,203	30,187	26,413	90.6	2,984	0.73
1955	30,112	30,095	26,306	90.2	2,983	0.86
1956	29,986	29,969	26,167	89.7	2,981	1.16
1957	29,779	29,762	25,950	89.0	2,979	1.35
1958	29,526	29,510	25,688	88.1	2,976	1.16
1959	29,344	29,328	25,489	87.4	2,974	0.99
1960	29,222	29,206	25,347	86.9	2,973	1.20
1961	29,047	29,031	25,155	86.2	2,971	1.13
1962	28,902	28,886	24,992	85.7	2,969	1.22
1963	28,741	28,725	24,814	85.1	2,967	1.30
1964	28,568	28,552	24,624	84.4	2,965	0.95
1965	28,504	28,488	24,538	84.1	2,964	1.72
1966	28,230	28,214	24,255	83.2	2,961	15.11
1967	24,270	24,254	20,449	70.1	2,910	12.83
1968	21,560	21,545	17,759	60.9	2,863	11.39
1969	19,594	19,579	15,734	53.9	2,818	1.60
1970	19,807	19,791	15,711	53.9	2,818	1.93
1971	19,974	19,959	15,686	53.8	2,817	2.80
1972	19,983	19,967	15,563	53.4	2,814	3.23
1973	19,918	19,903	15,413	52.8	2,810	4.30
1974	19,654	19,638	15,114	51.8	2,803	3.96
1975	19,479	19,461	14,908	51.1	3,284	2.97
1976	19,513	19,499	14,892	51.1	2,504	3.37
1977	19,473	19,467	14,823	50.8	1,104	1.54
1978	19,757	19,747	15,073	51.7	1,845	2.17

Table 12 continued. Time series of total and summary biomass, spawning output, depletion, recruitment and F.

Year	Total Biom.	Sum. Biom.	Sp. Out.	Depletion (%)	Recruit	F (%)
1979	19,854	19,827	15,223	52.1	5,045	3.76
1980	19,616	19,588	15,106	51.7	5,012	3.08
1981	19,594	19,572	15,117	51.6	4,144	4.50
1982	19,421	19,414	14,888	50.7	1,229	5.95
1983	19,061	19,056	14,374	48.8	875	5.95
1984	18,705	18,700	13,801	46.7	1,091	7.15
1985	18,048	18,043	13,049	44.0	991	10.11
1986	16,773	16,768	12,019	40.3	1,061	7.64
1987	15,902	15,886	11,602	38.8	2,959	15.39
1988	13,793	13,776	10,296	34.2	3,221	12.13
1989	12,450	12,449	9,493	31.3	274	10.36
1990	11,526	11,522	8,836	29.0	787	14.52
1991	10,231	10,225	7,695	25.0	1,018	11.98
1992	9,360	9,356	6,848	22.1	704	7.46
1993	8,975	8,972	6,461	20.7	496	13.49
1994	8,037	8,030	5,735	18.2	1,296	10.92
1995	7,400	7,379	5,345	16.7	3,733	10.78
1996	6,864	6,857	5,002	15.4	1,361	11.06
1997	6,456	6,445	4,630	14.1	2,057	12.96
1998	6,065	6,059	4,138	12.3	1,047	15.71
1999	5,649	5,618	3,506	10.1	5,624	6.64
2000	5,931	5,898	3,354	9.5	6,152	6.74
2001	6,389	6,382	3,262	9.1	1,162	4.23
2002	7,177	7,172	3,383	9.3	1,034	3.66
2003	8,057	8,046	3,610	9.9	1,997	2.47
2004	8,974	8,959	3,947	10.8	2,682	2.70
2005	9,793	9,778	4,363	11.9	2,792	1.26
2006	10,681	10,670	5,058	13.9	2,100	1.98
2007	11,431	11,420	5,911	16.3	2,002	2.46
2008	12,064	12,035	6,766	18.7	5,330	1.88
2009	12,727	12,722	7,568	21.0	841	2.15
2010	13,358	13,344	8,231	22.9	2,505	2.26
2011	13,940	13,926	8,808	24.5	2,544	NA

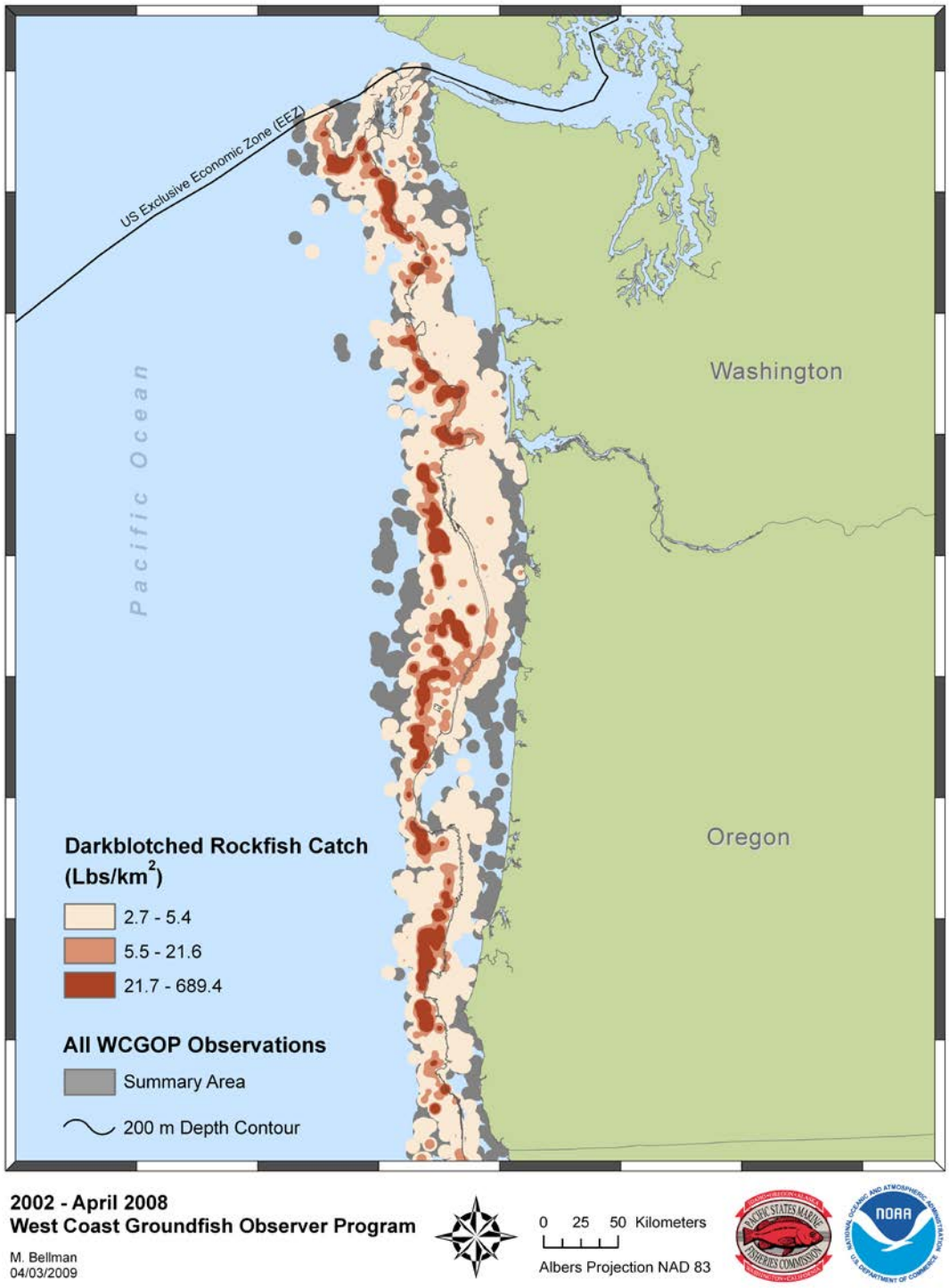


Figure 1. Map of density of occurrence of darkblotched rockfish off of (A) Washington and Oregon and (B) Northern and Central California (next page) from 2002 – April 2008.

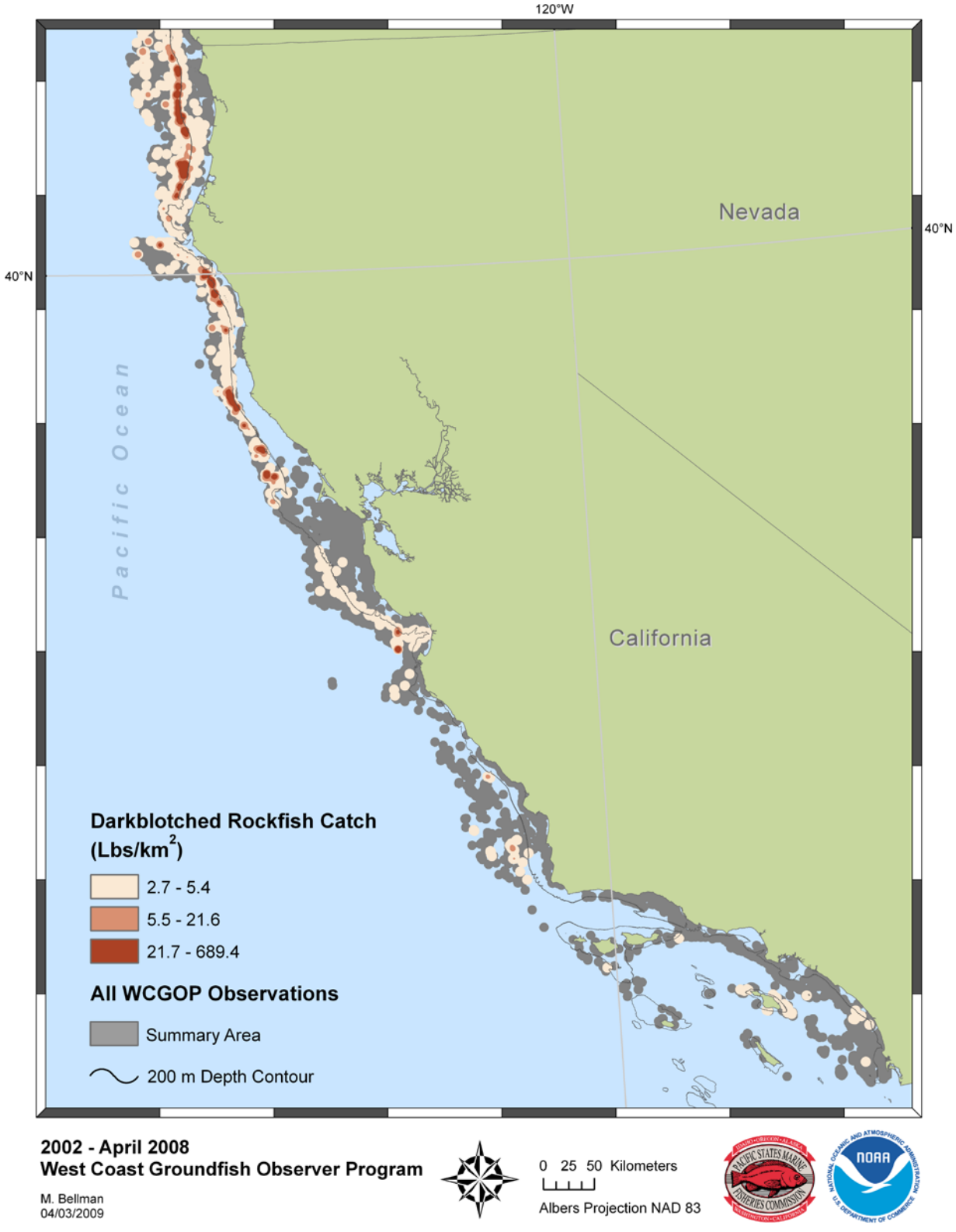


Figure 1 (cont.)

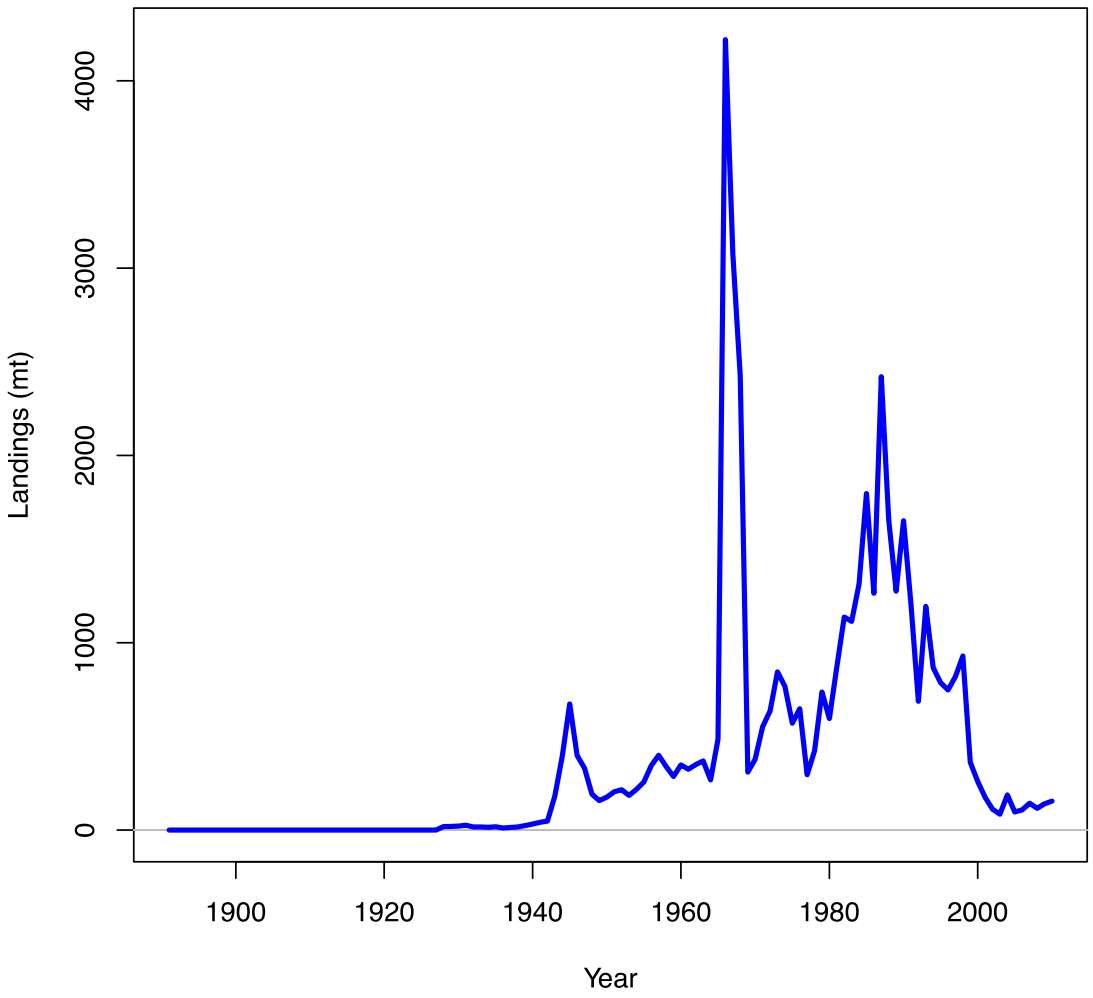


Figure 2. Time series of estimated fishery landings.



Figure 3. Female fishery length compositions and model fits.

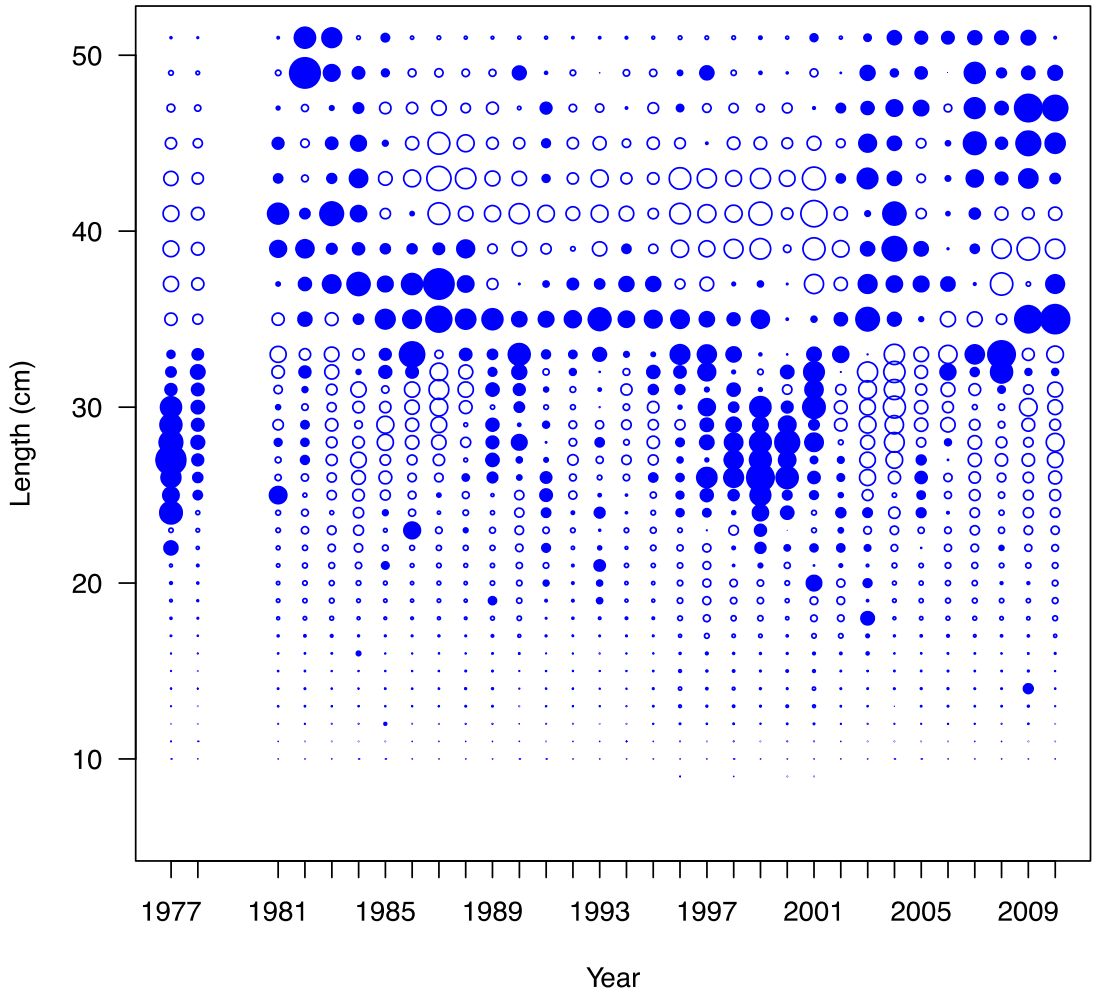


Figure 4. Pearson residuals for female length-composition fits to fishery data.



Figure 5. Male fishery lengths compositions and model fits

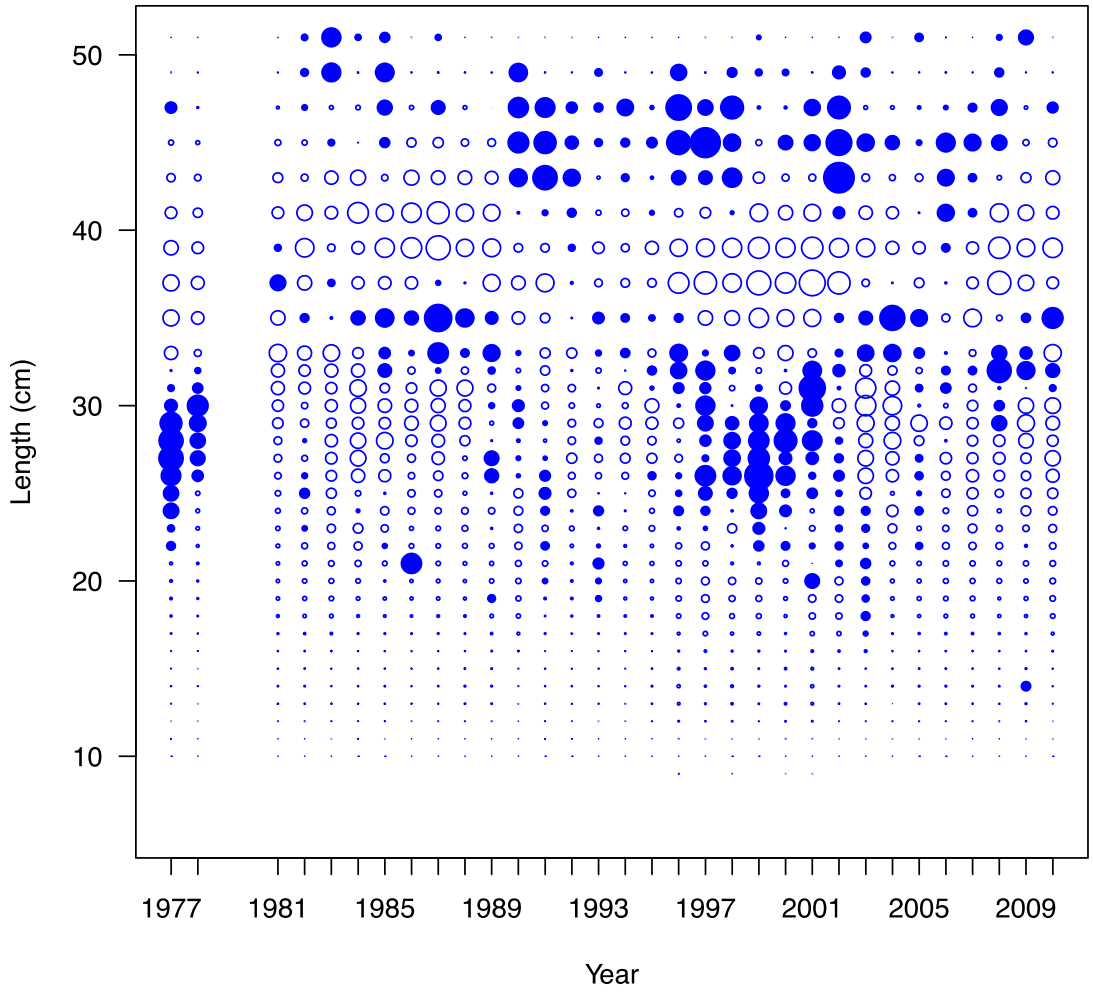


Figure 6. Pearson residuals for male length-composition fits to fishery data.

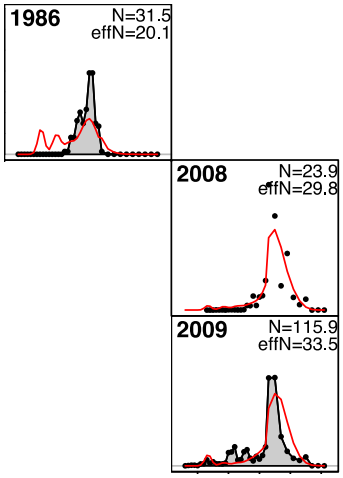


Figure 7. Combined-sex fishery discard length compositions and model fits.

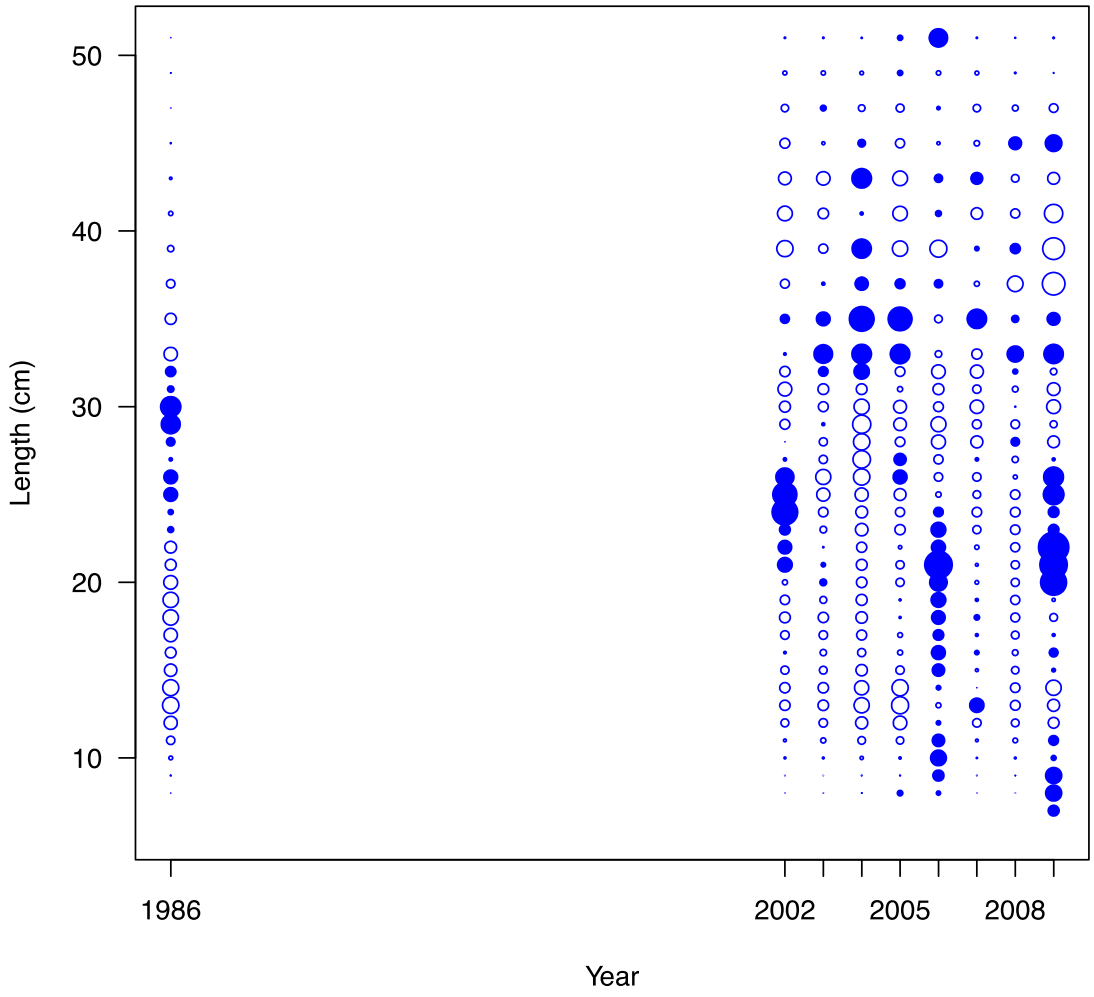


Figure 8. Pearson residuals for length-composition fits to fishery discard data.

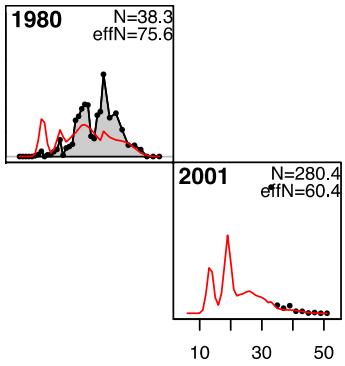


Figure 9. Triennial Shelf Survey female length compositions and model fits.

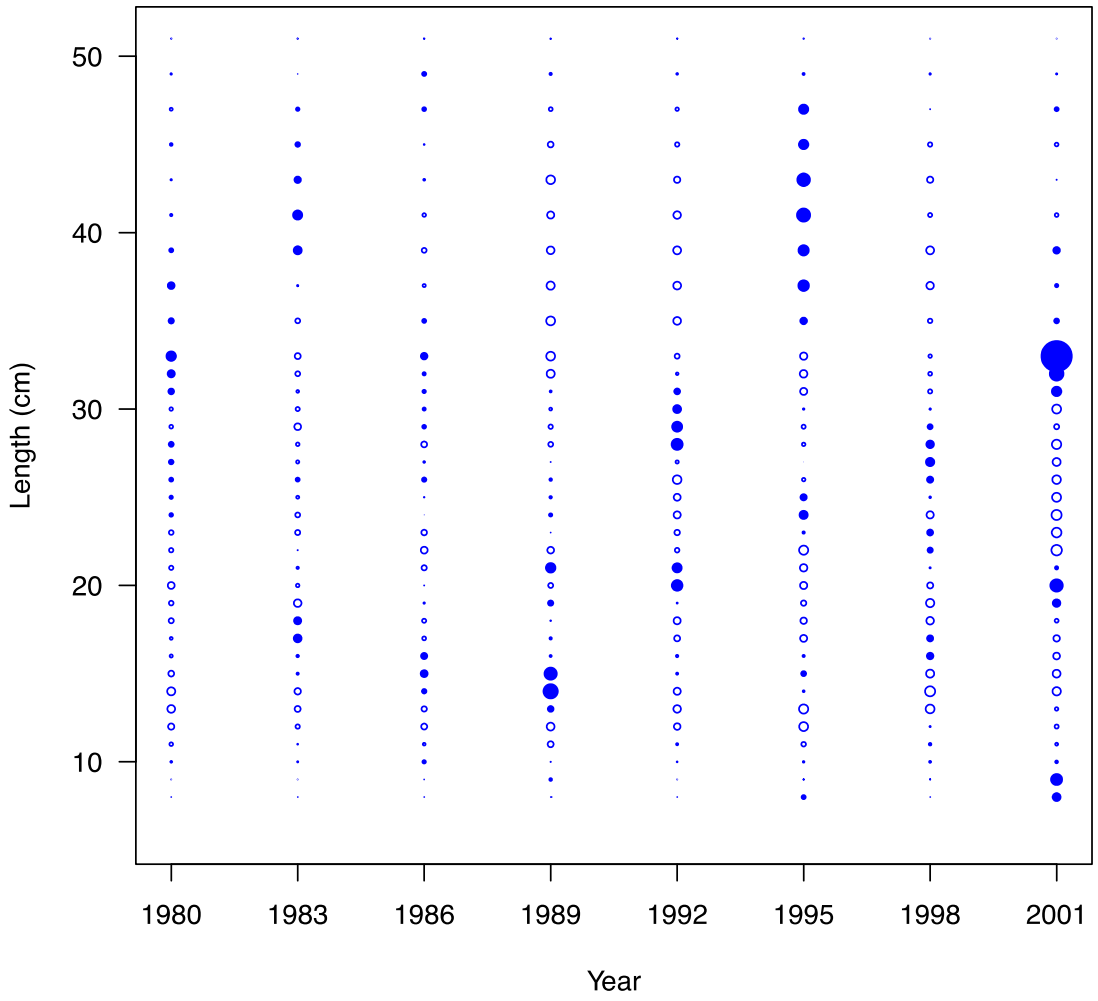


Figure 10. Pearson residuals for female length-composition fits to Triennial Survey data.

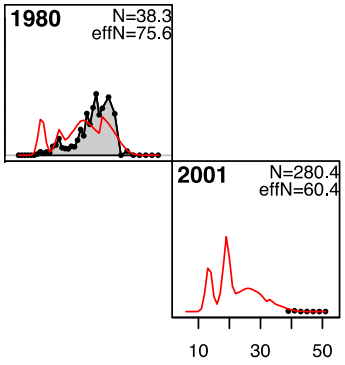


Figure 11. Triennial Shelf Survey male length compositions and model fits

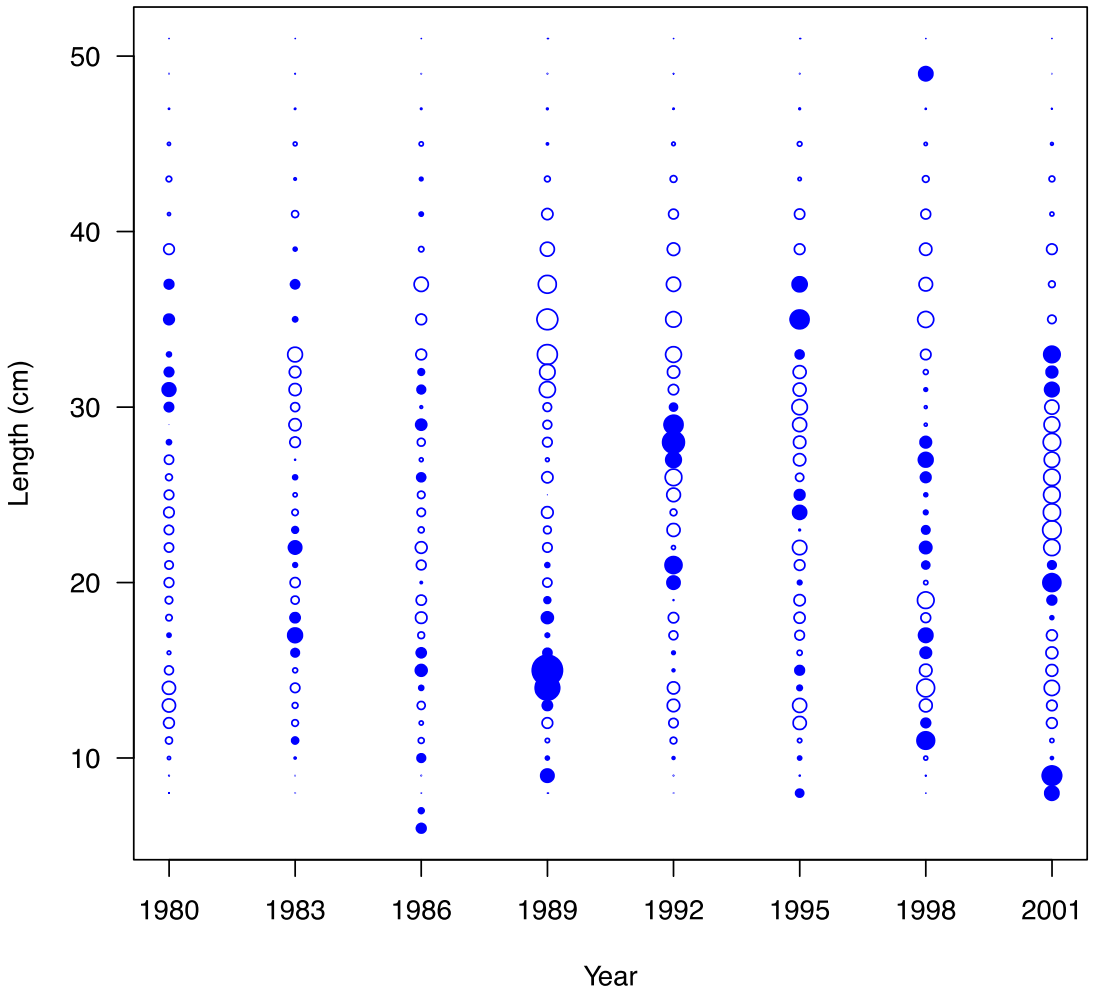


Figure 12. Pearson residuals for male length-composition fits to Triennial Survey data.



Figure 13. AFSC Slope Survey female length compositions and model fits

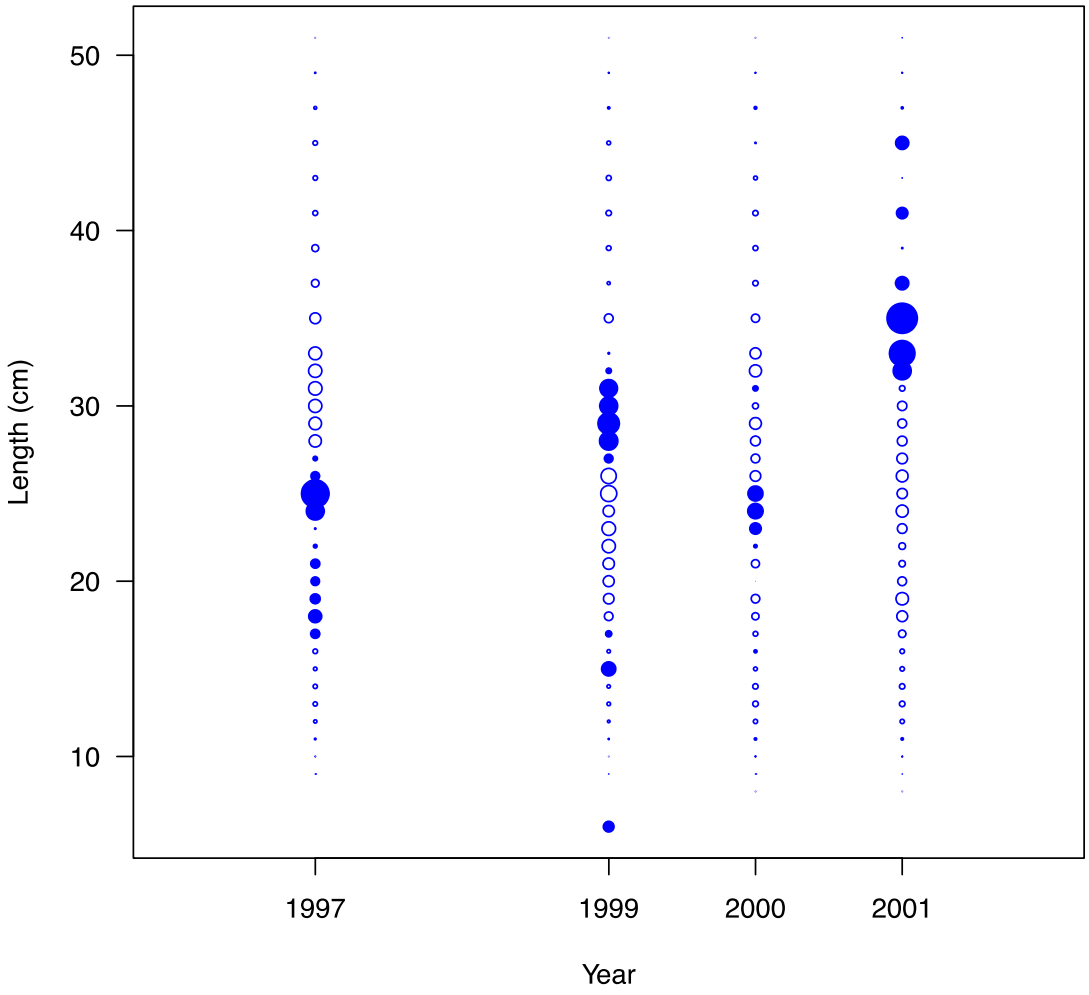


Figure 14. Pearson residuals for female length-composition fits to AFSC Slope Survey data.



Figure 15. AFSC Slope Survey male length compositions and model fits

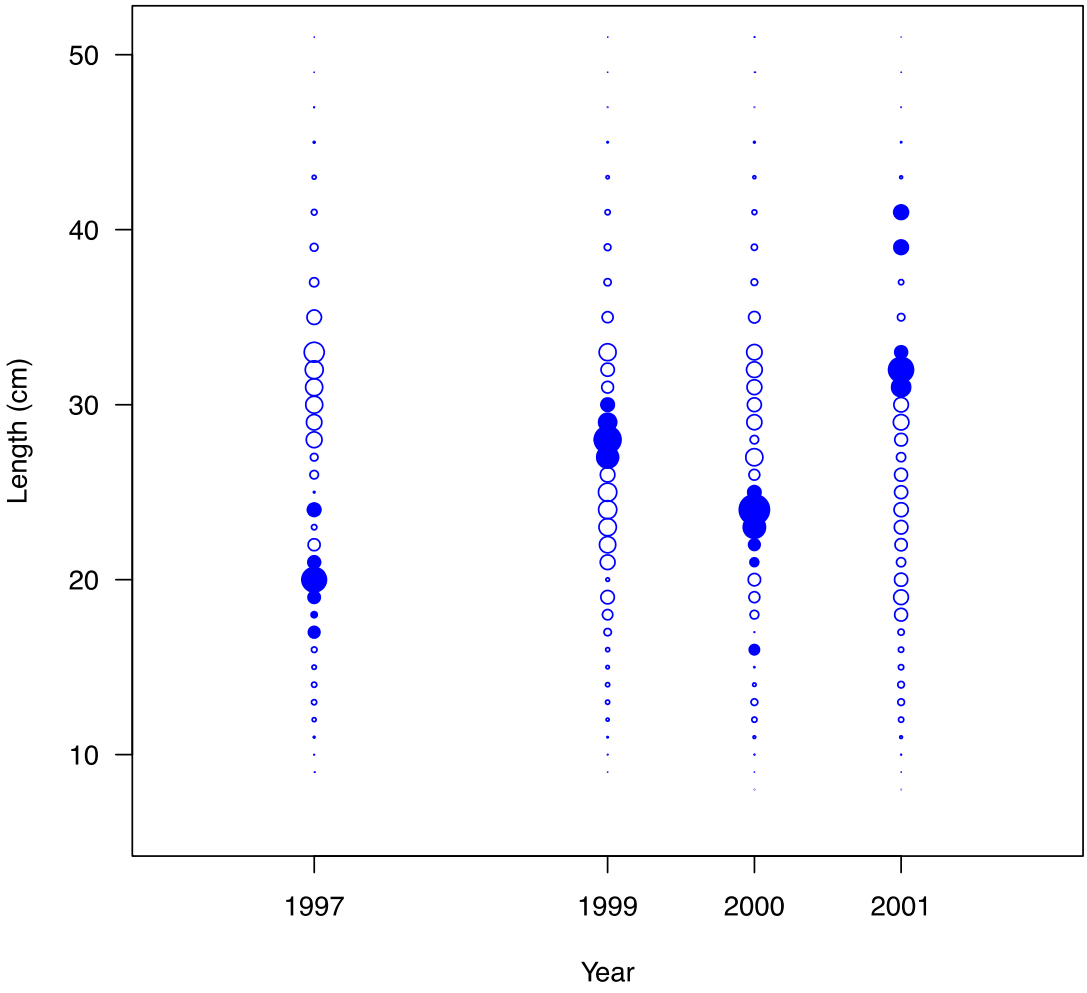


Figure 16. Pearson residuals for male length-composition fits to AFSC Slope Survey data.

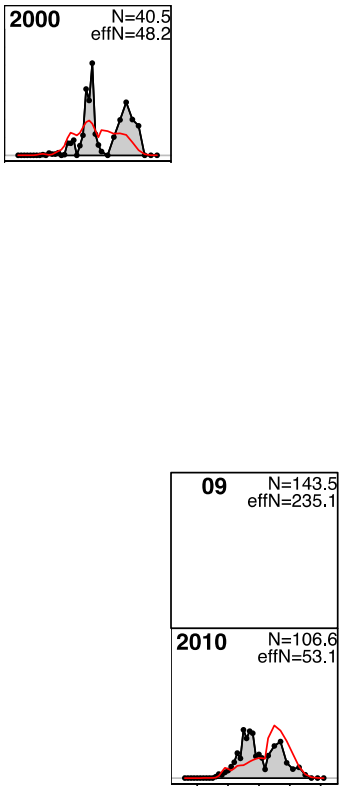


Figure 17. NWFSC Slope Survey female length compositions and model fits

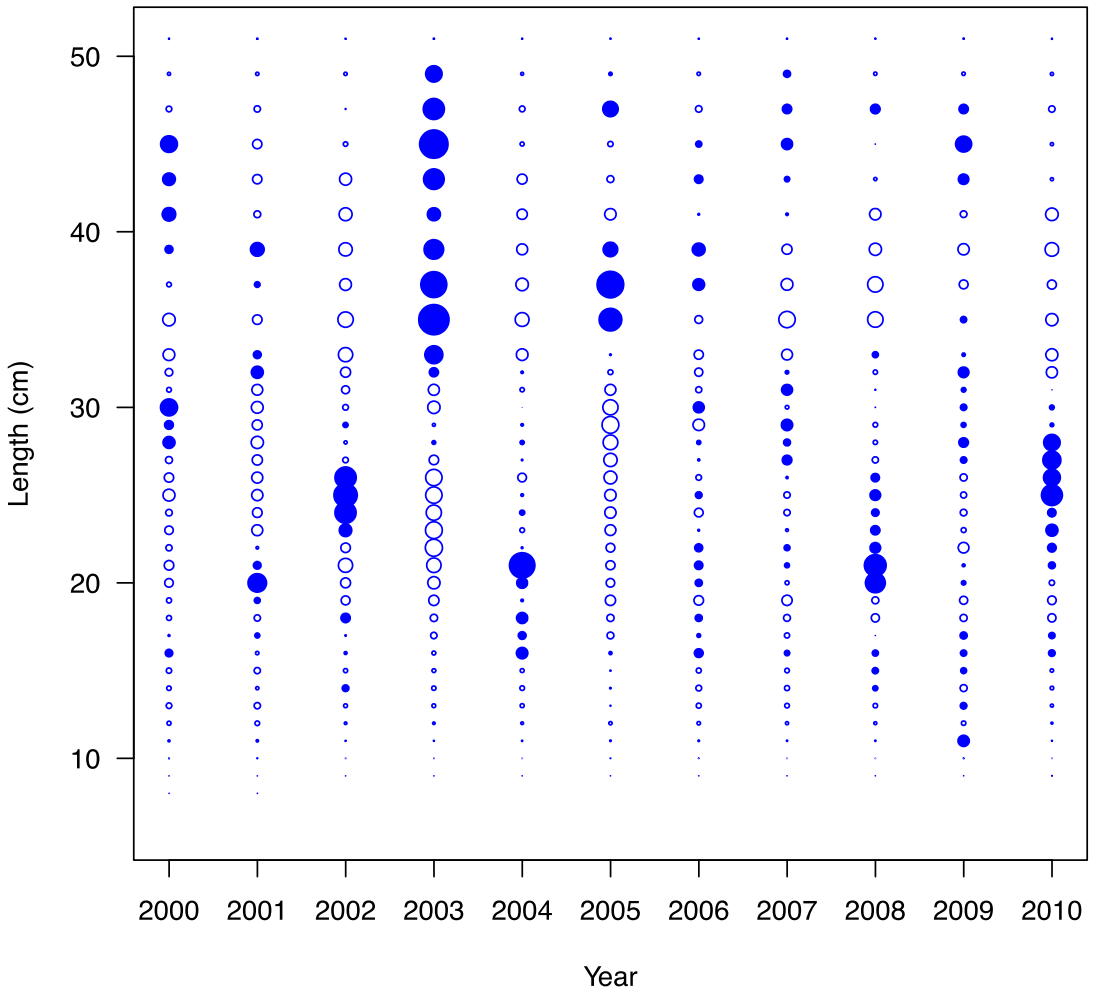


Figure 18. Pearson residuals for female length-composition fits to NWFSC Slope Survey data.



Figure 19. NWFSC Slope Survey male length compositions and model fits

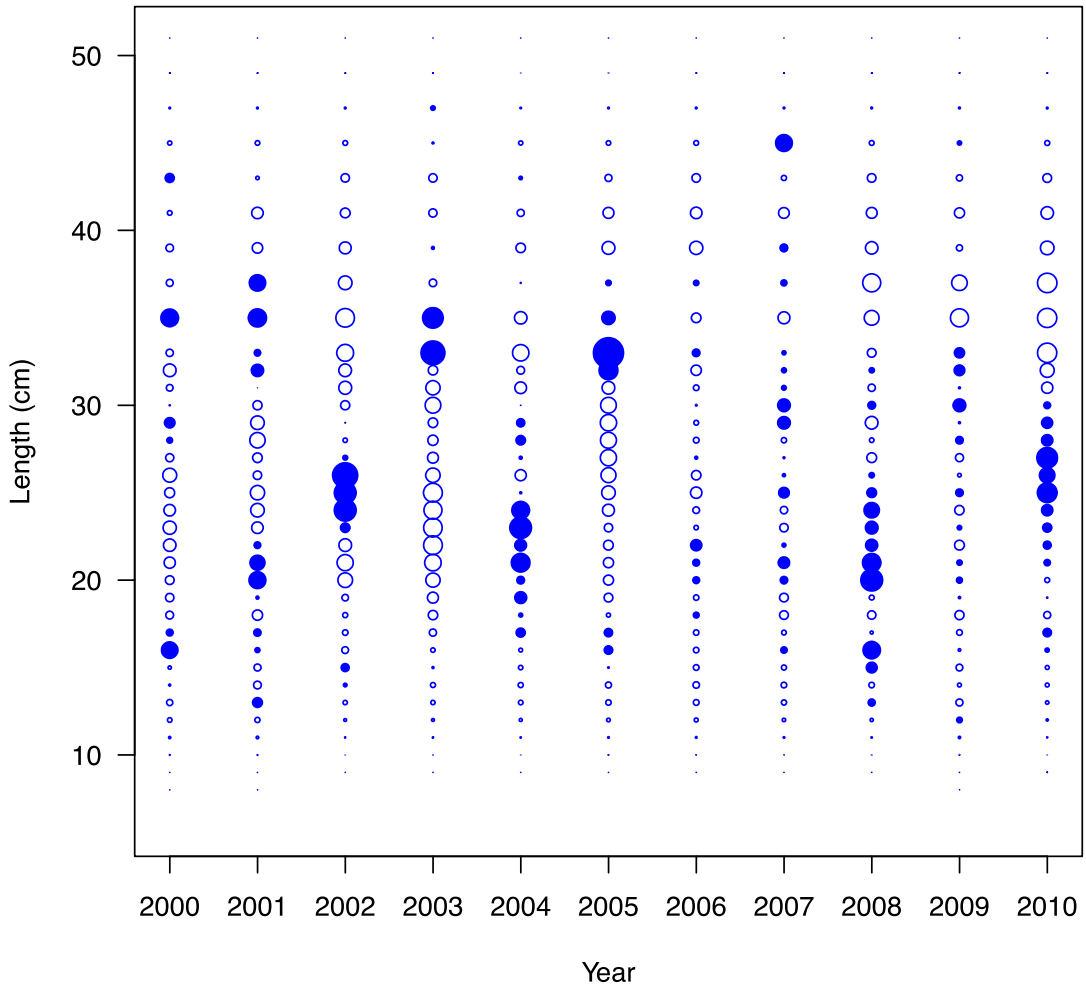


Figure 20. Pearson residuals for male length-composition fits to NWFSC Slope Survey data.

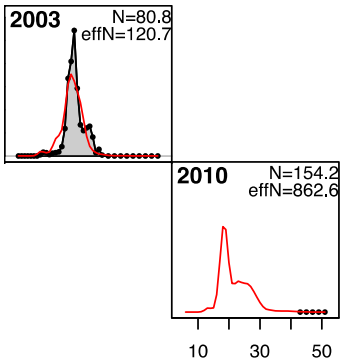


Figure 21. NWFSC Shelf Survey female length compositions and model fits

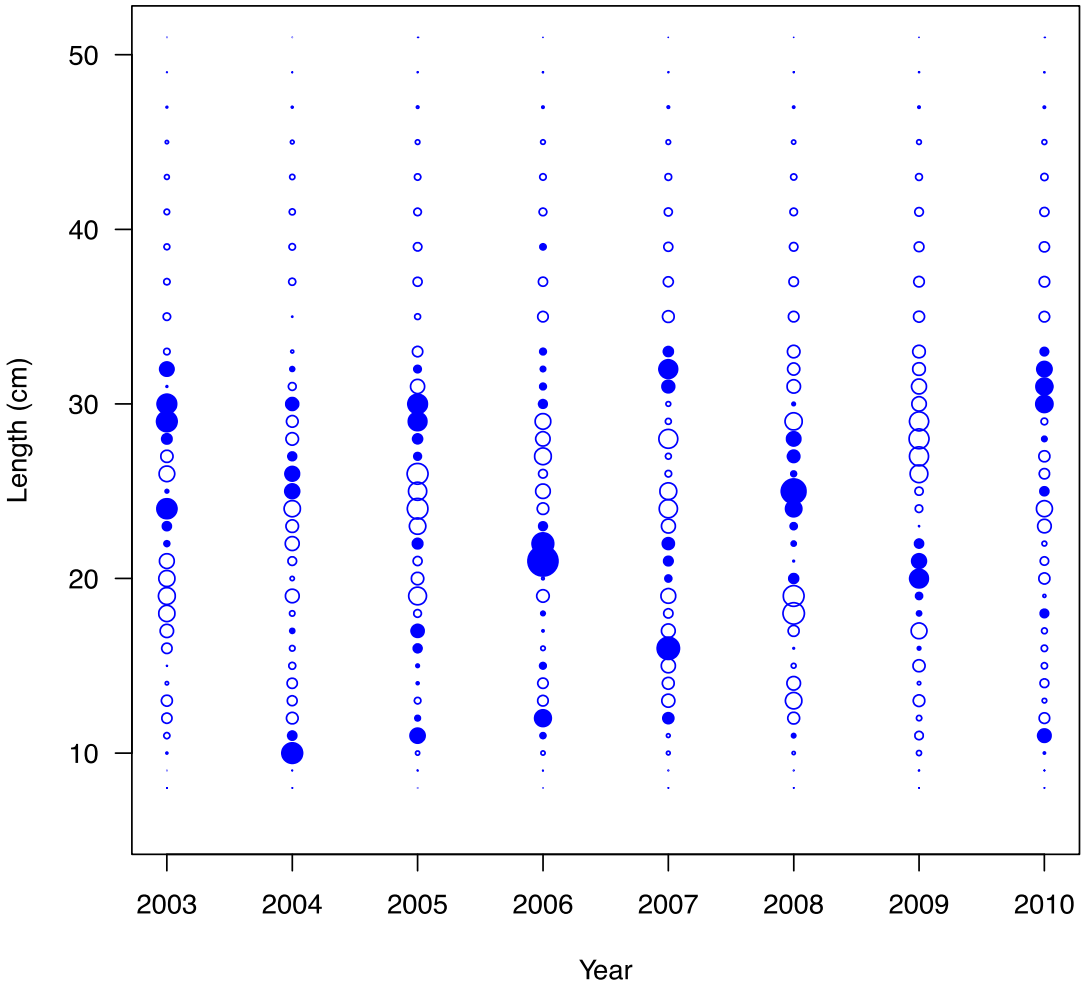


Figure 22. Pearson residuals for female length-composition fits to NWFSC Shelf Survey data.

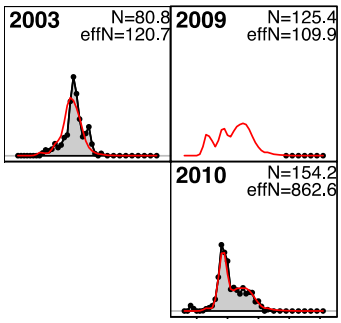


Figure 23. NWFSC Shelf Survey male length compositions and model fits

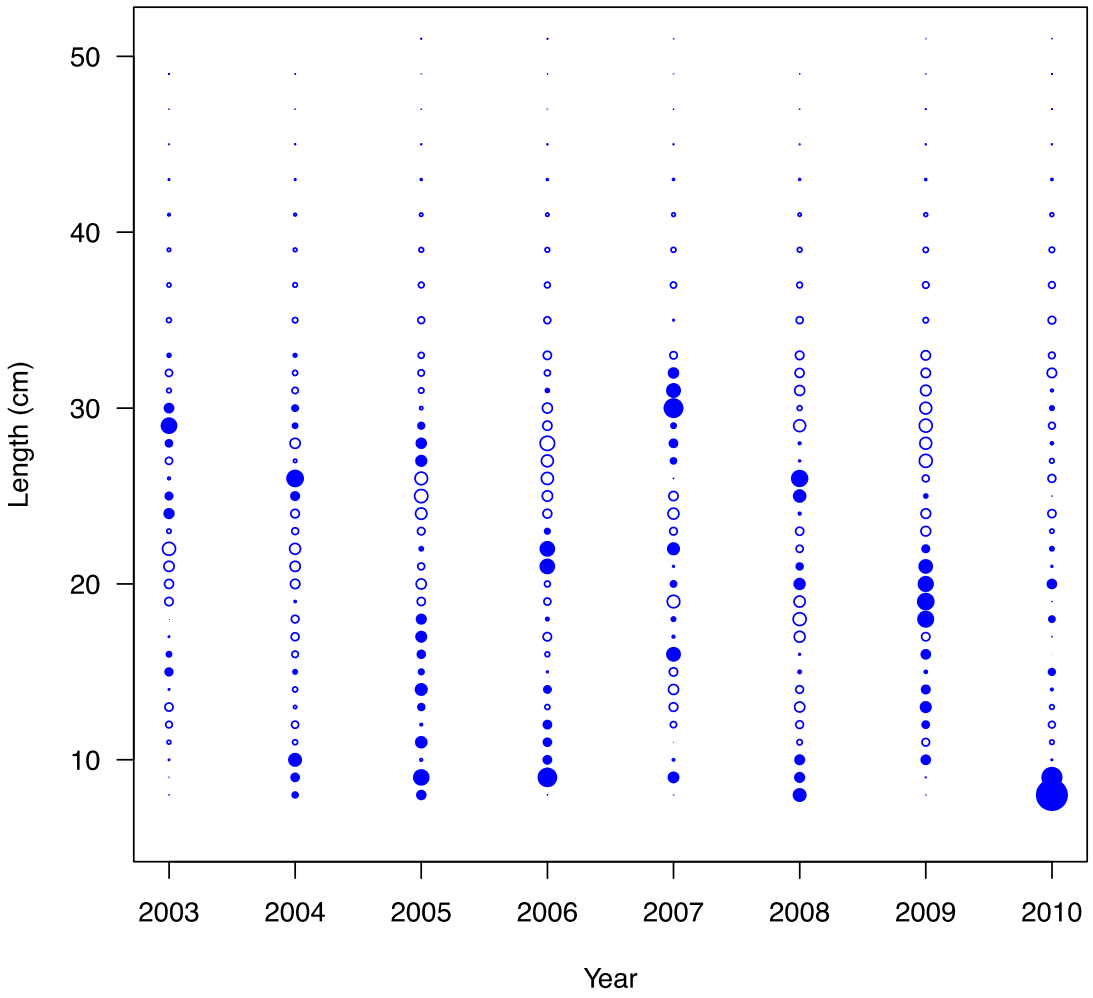


Figure 24. Pearson residuals for male length-composition fits to NWFSC Shelf Survey data.

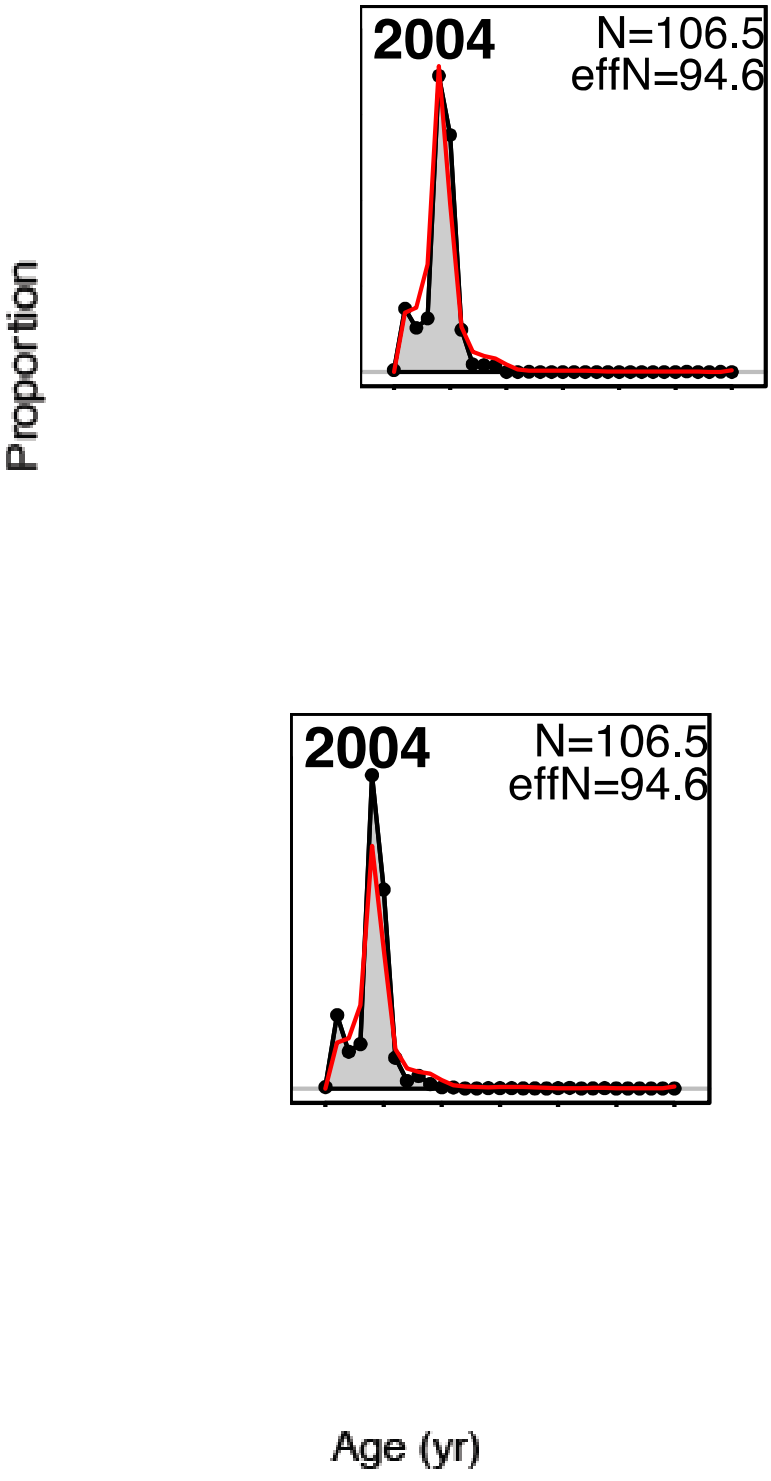


Figure 25. Triennial female (top) and male 2004 age composition and model fit.

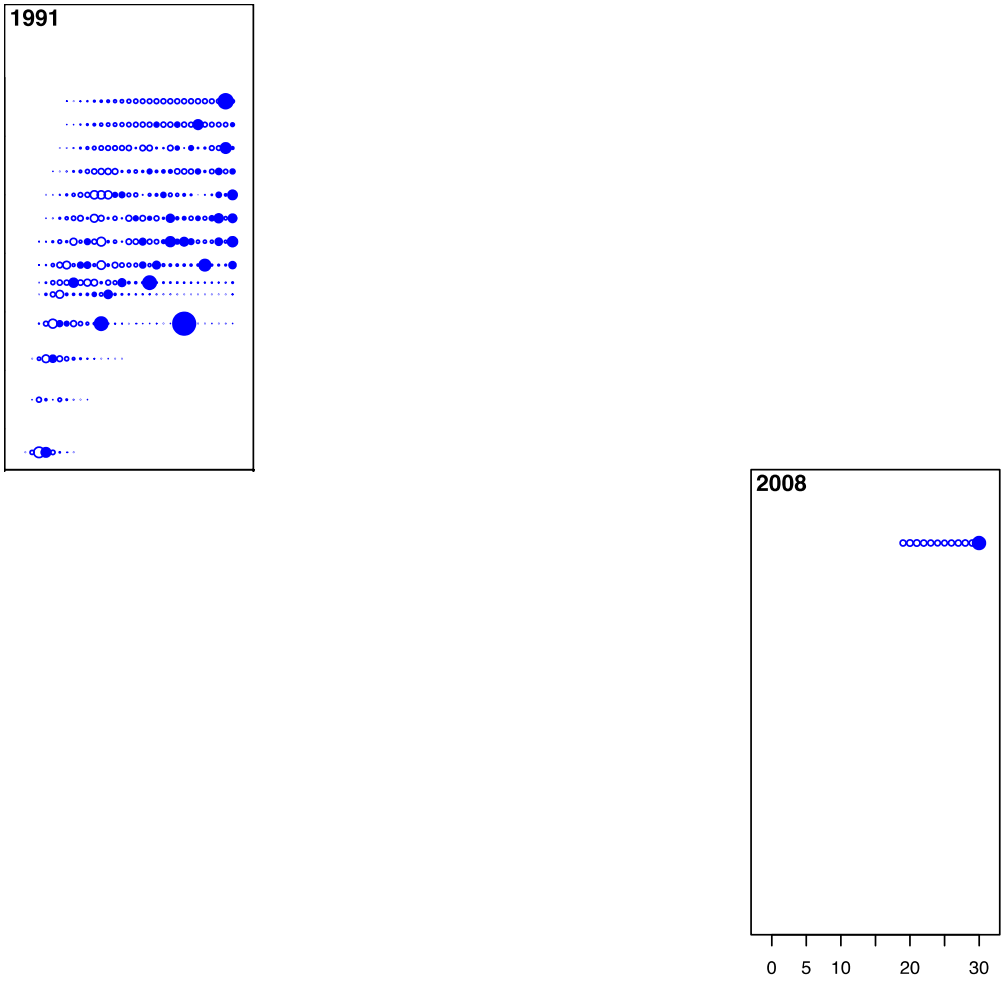


Figure 26. Pearson residuals for the conditional Age-at-Length fits for females in the fishery (whole catch).

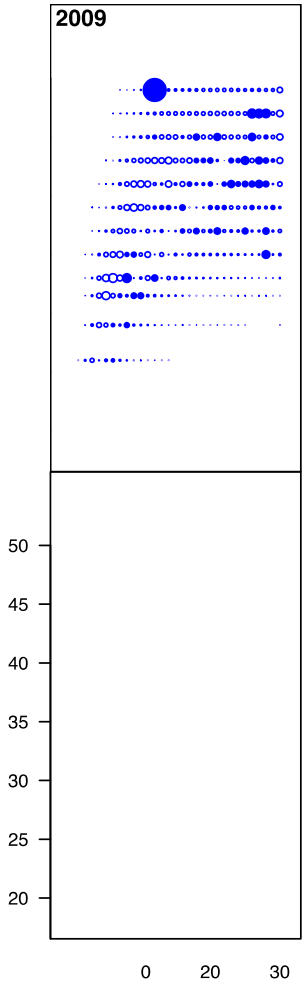


Figure 26. Pearson residuals for the conditional Age-at-Length fits for females in the fishery (cont'd).

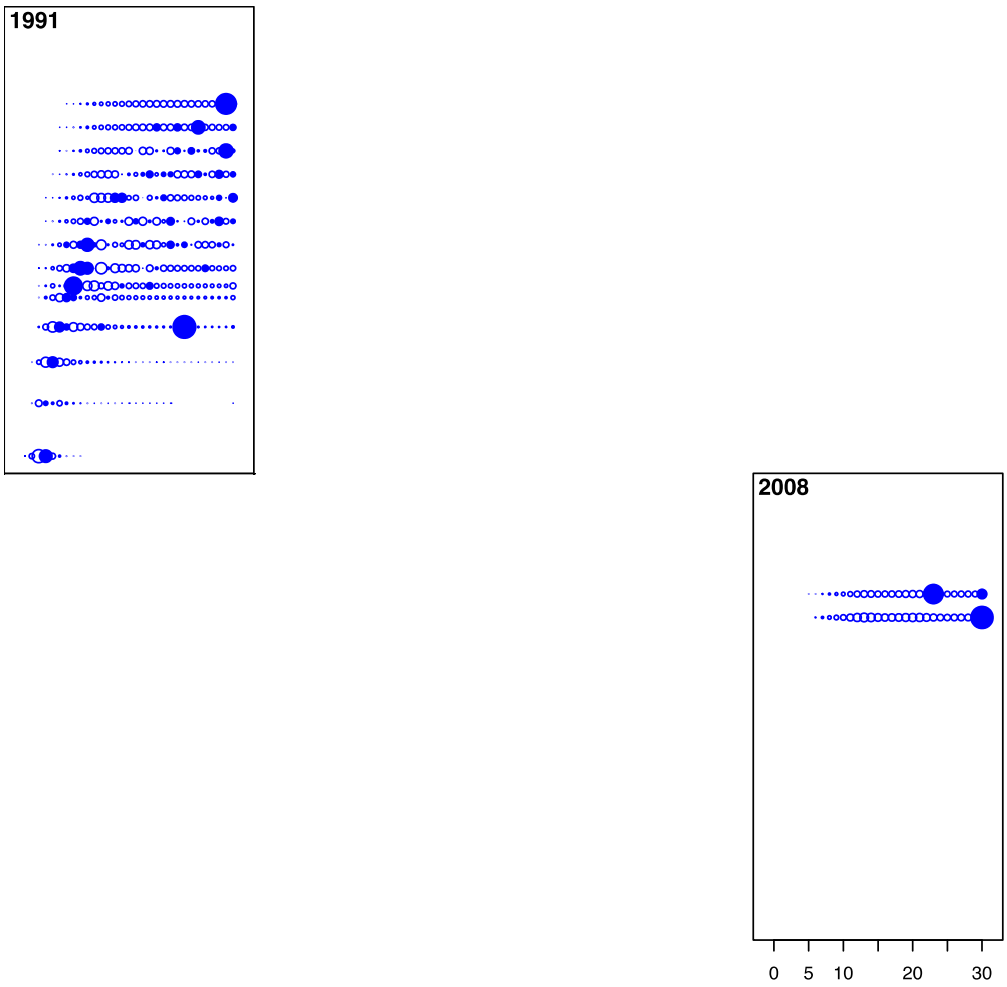


Figure 27. Pearson residuals for the conditional Age-at-Length fits for males in the fishery (whole catch).

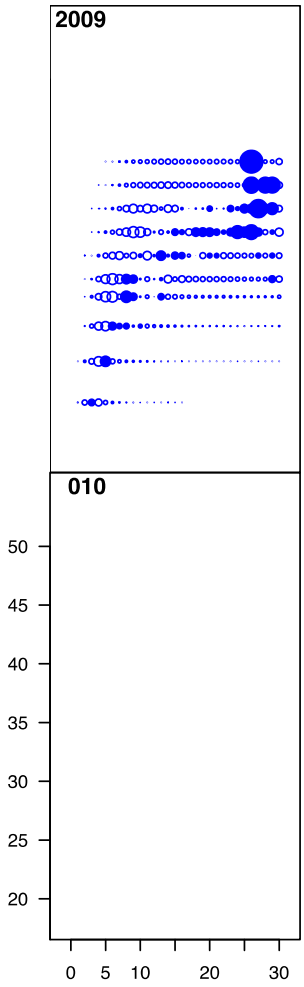


Figure 27. Pearson residuals for the conditional Age-at-Length fits for males in the fishery (cont'd).

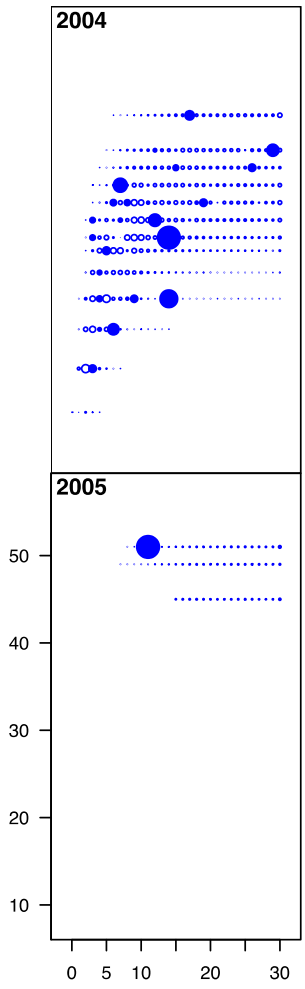


Figure 30. Pearson residuals, sexes combined, for fishery discards.

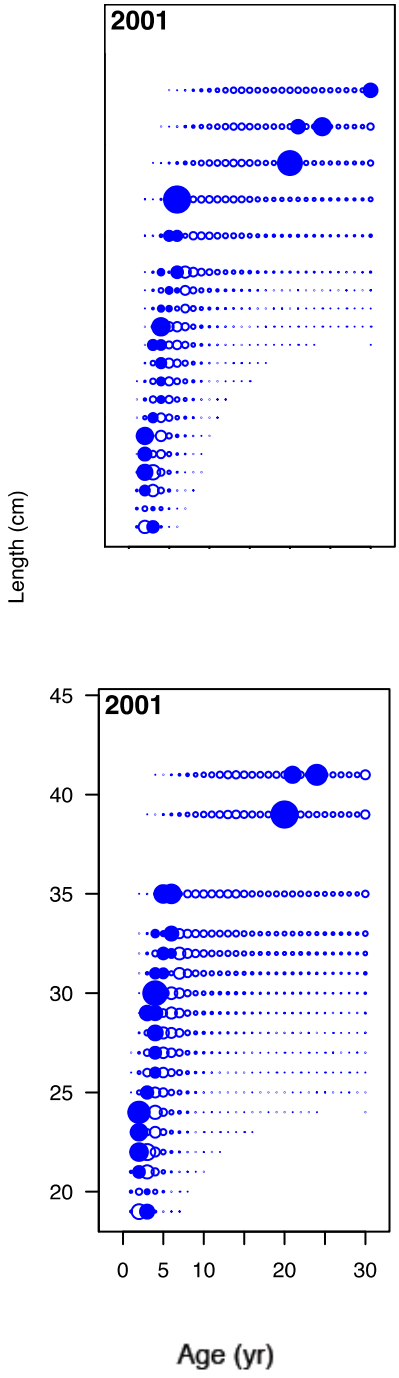


Figure 31. Pearson residuals for the conditional Age-at-Length fits for females (top) and males in the AFSC Slope survey.

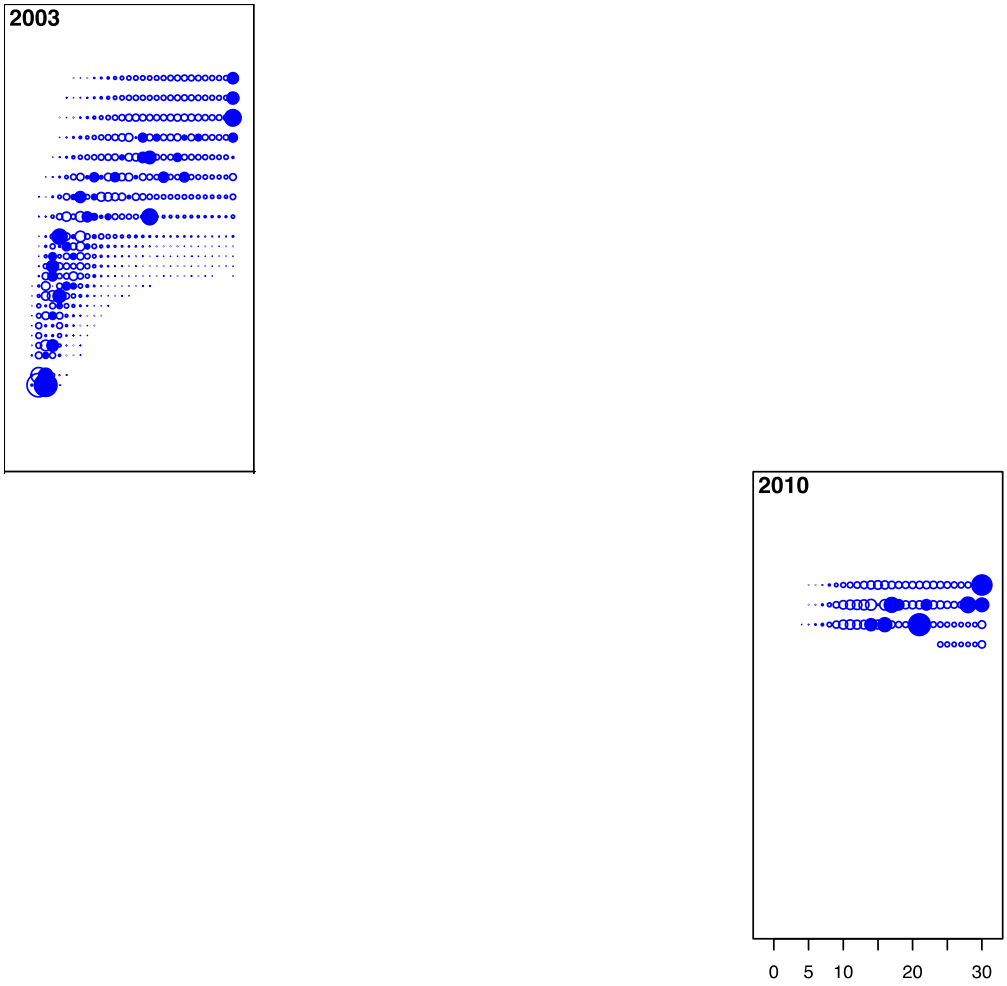


Figure 32. Pearson residuals for the conditional Age-at-Length fits for females in the NWFSC Slope survey.

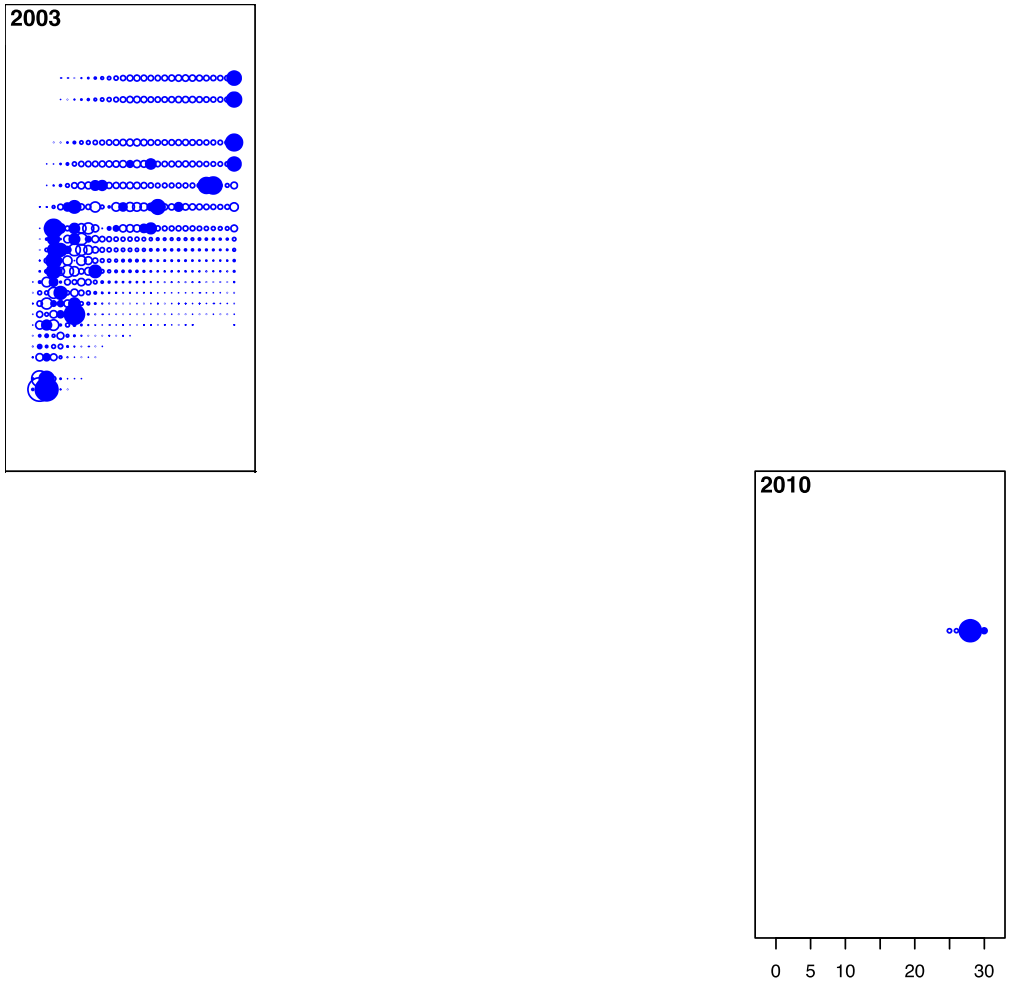


Figure 33. Pearson residuals for the conditional Age-at-Length fits for males in the NWFSC Slope survey.

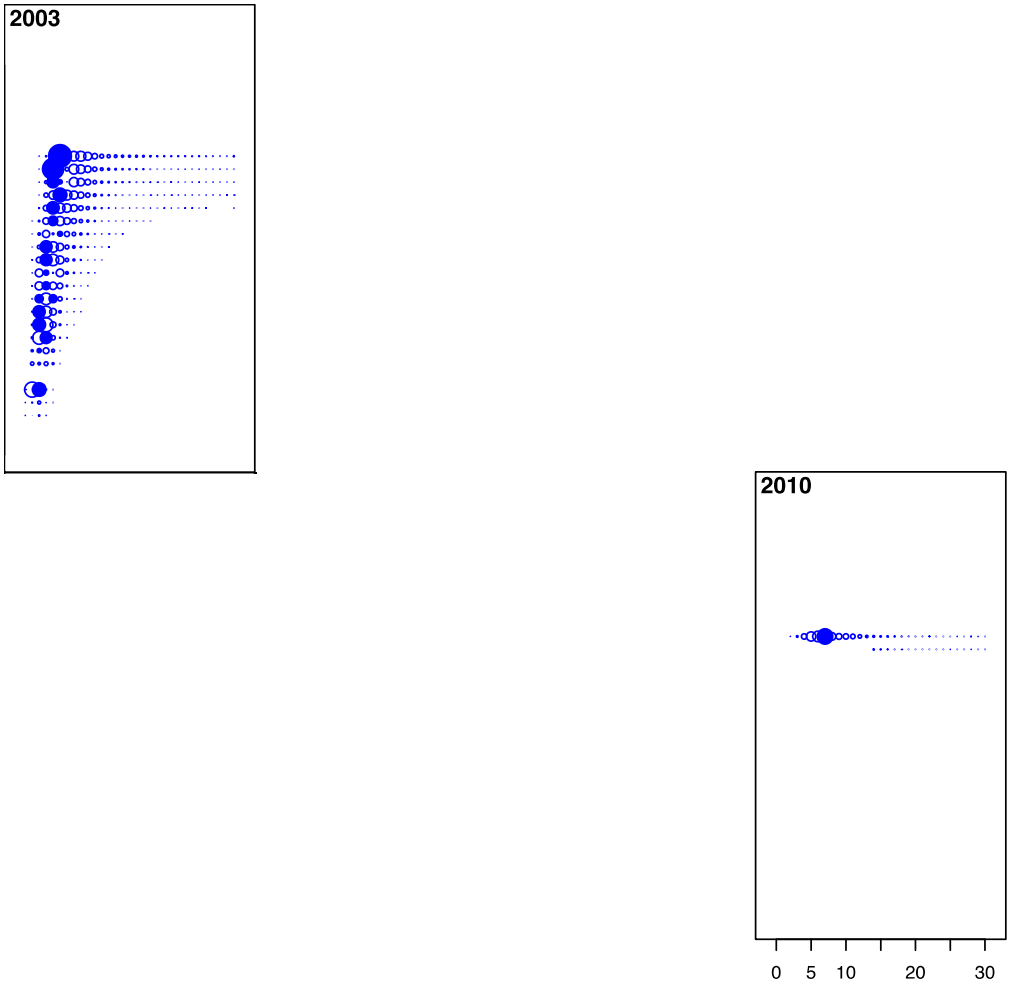


Figure 34. Pearson residuals for the conditional Age-at-Length fits for females in the NWFSC Shelf survey.

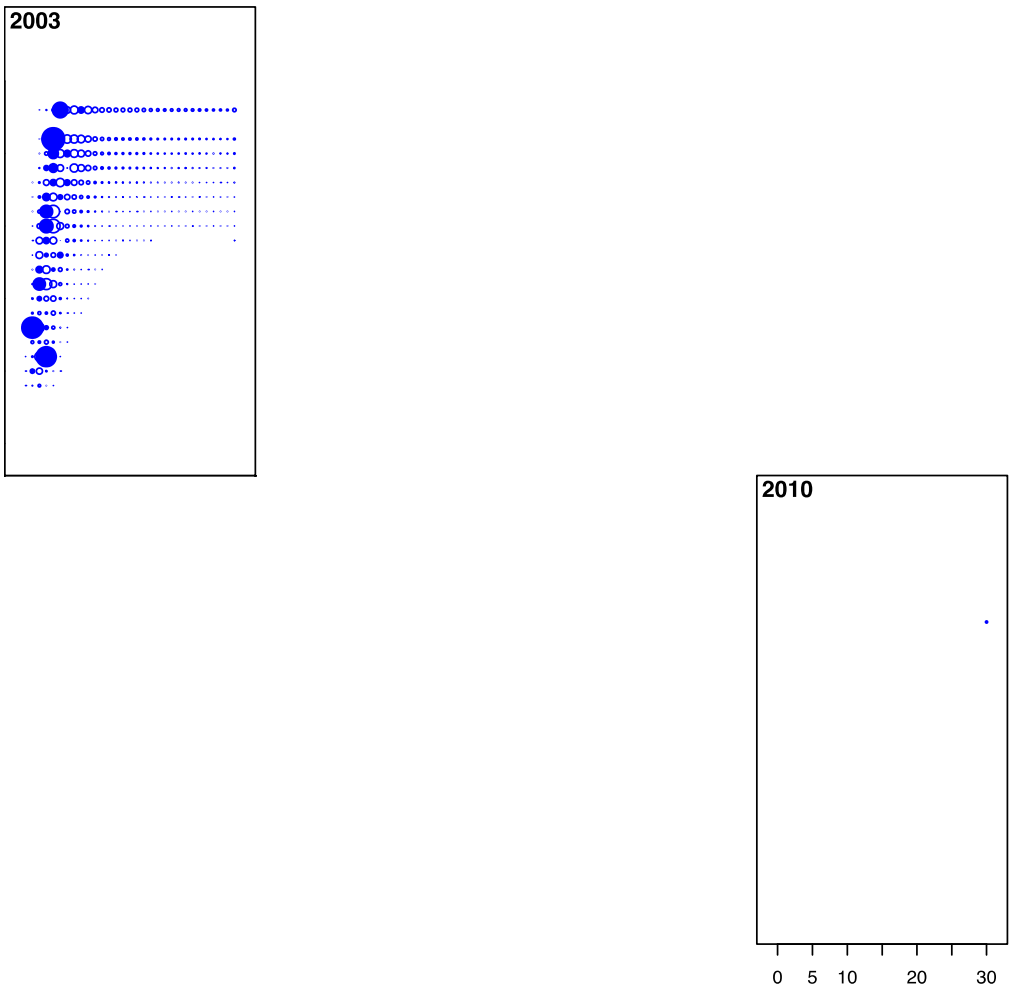


Figure 35. Pearson residuals for the conditional Age-at-Length fits for males in the NWFSC Shelf survey.

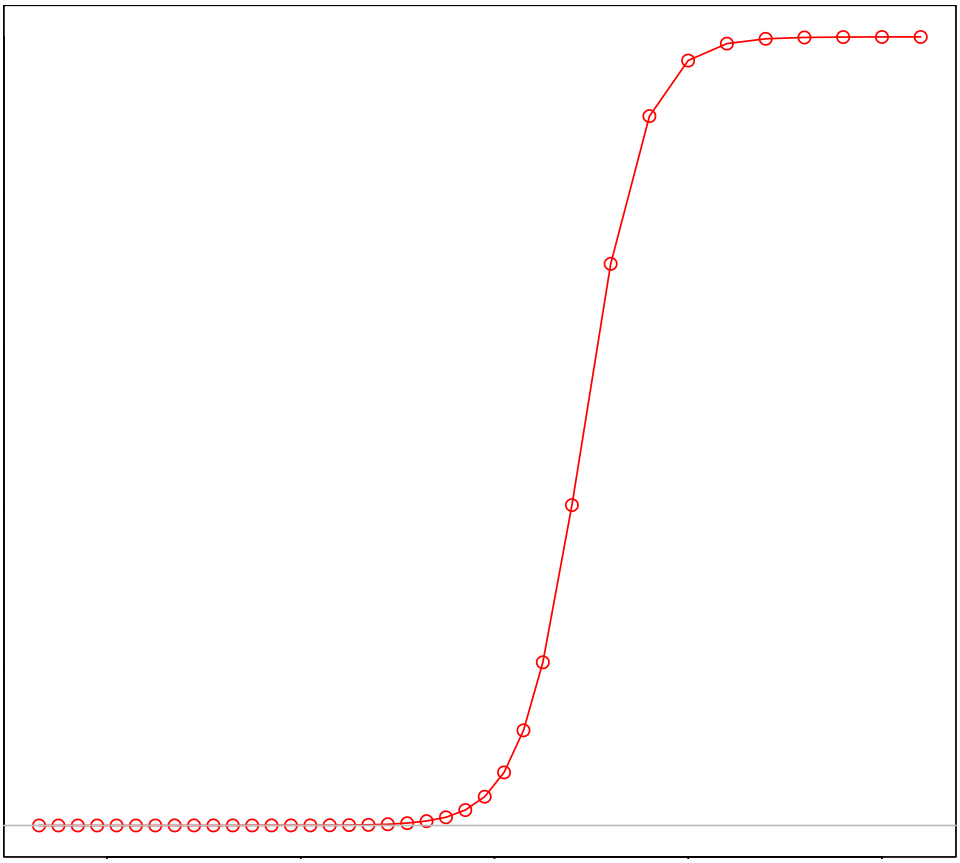


Figure 36. Maturity ogive for female darkblotched rockfish.

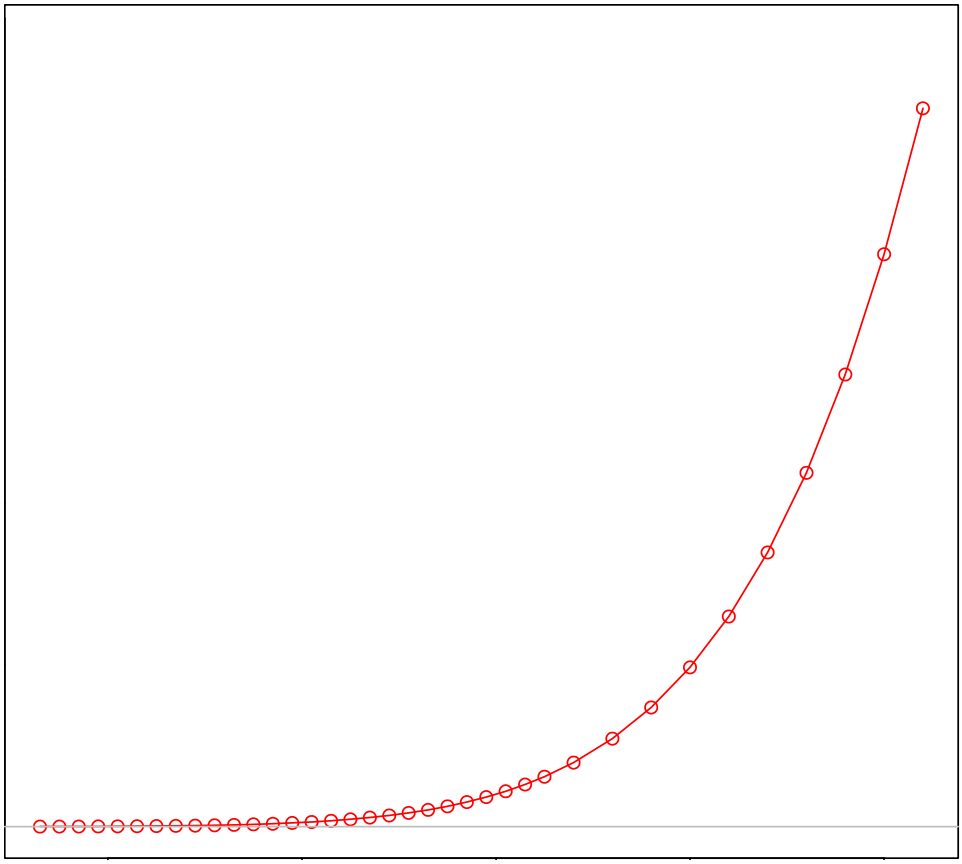


Figure 37. Length-to-spawning output relationship.

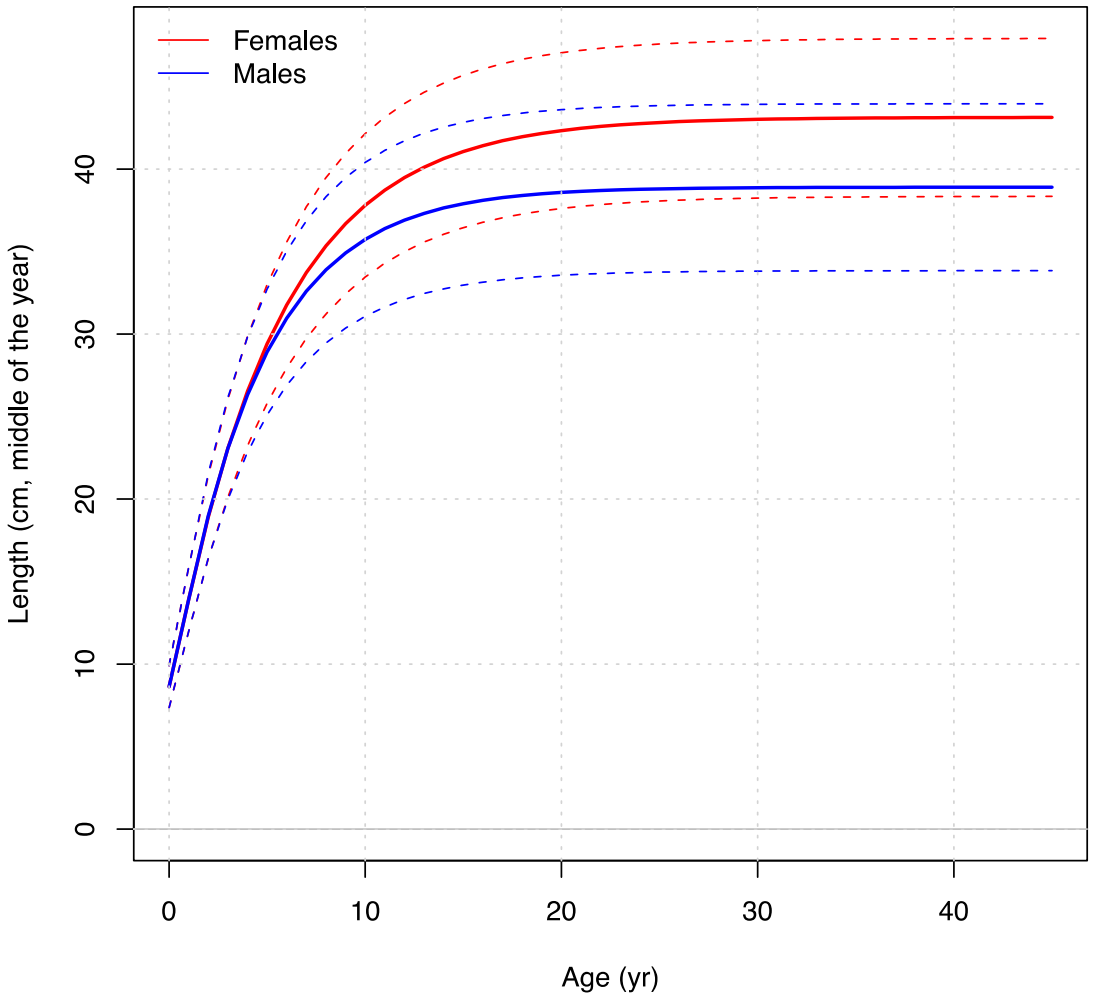


Figure 38. Growth curve for female (upper) and male darkblotched rockfish estimated in the model (ending year).

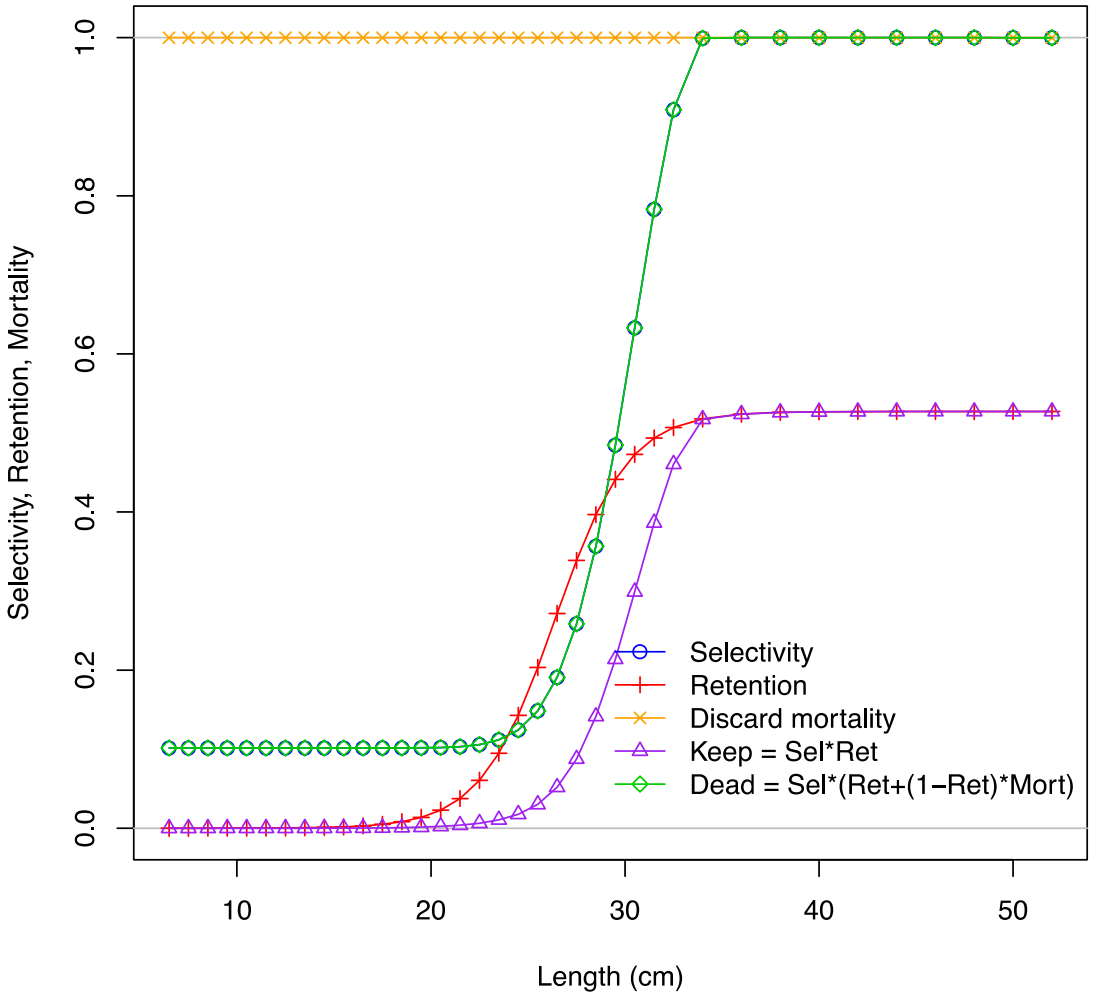


Figure 39. Female ending year fishery mortality, selectivity and 2003-2008 retention (as the proportion retained at length).

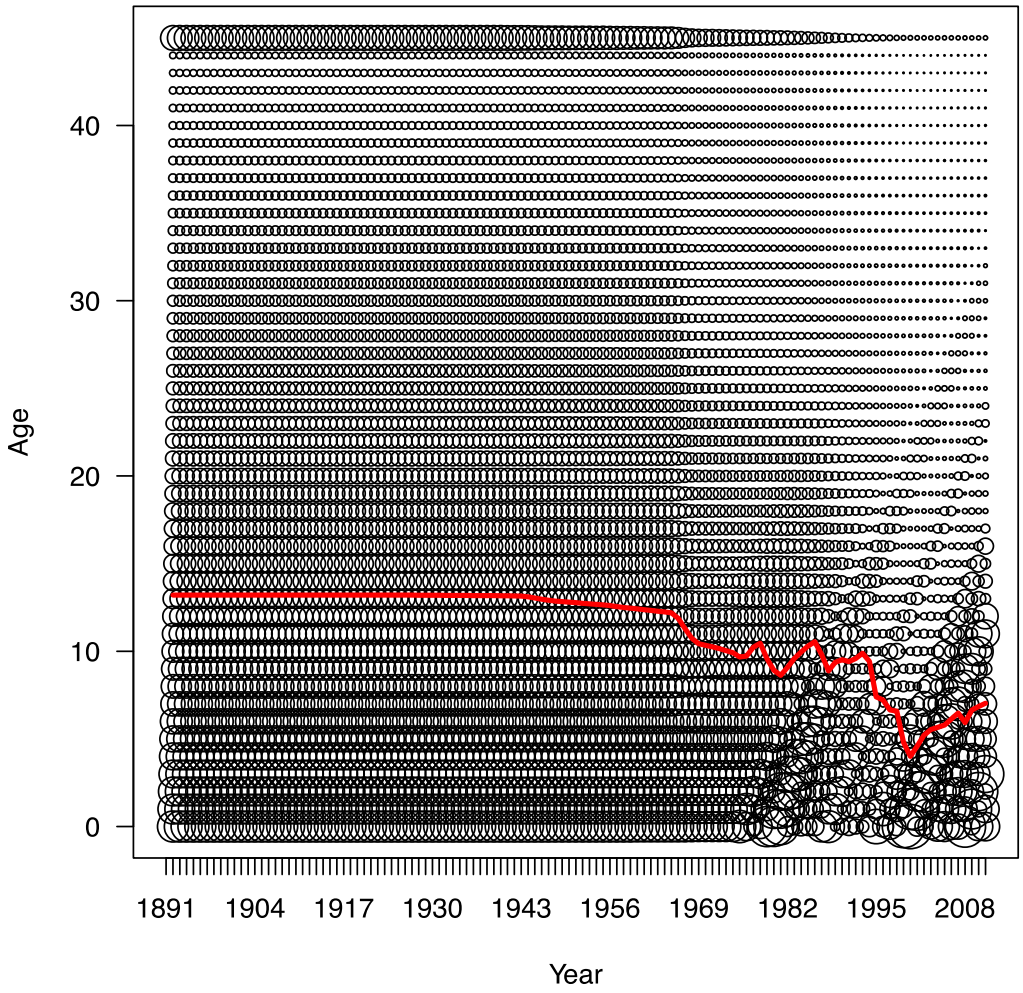


Figure 40. Proportion at age, by year, using the mean age of females in the population.

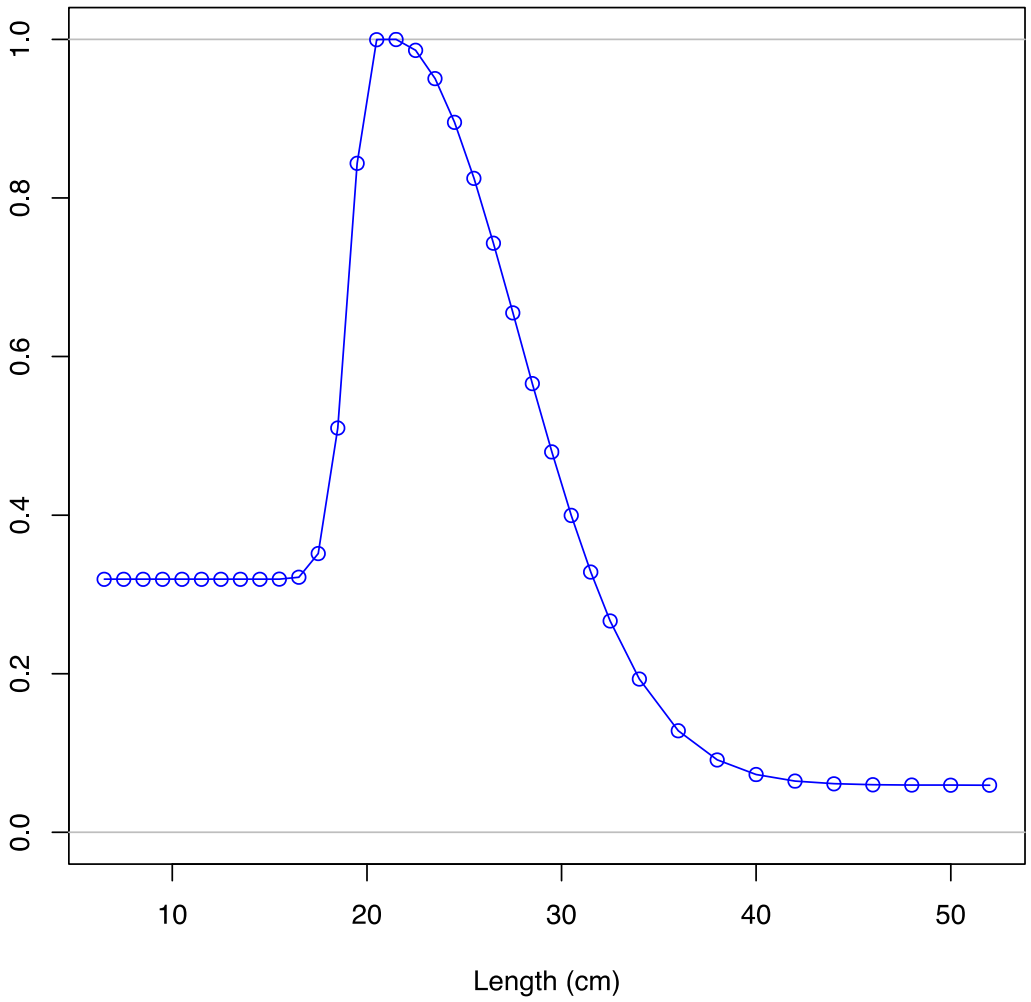


Figure 41. Female ending year selectivity for the Triennial Shelf Survey.

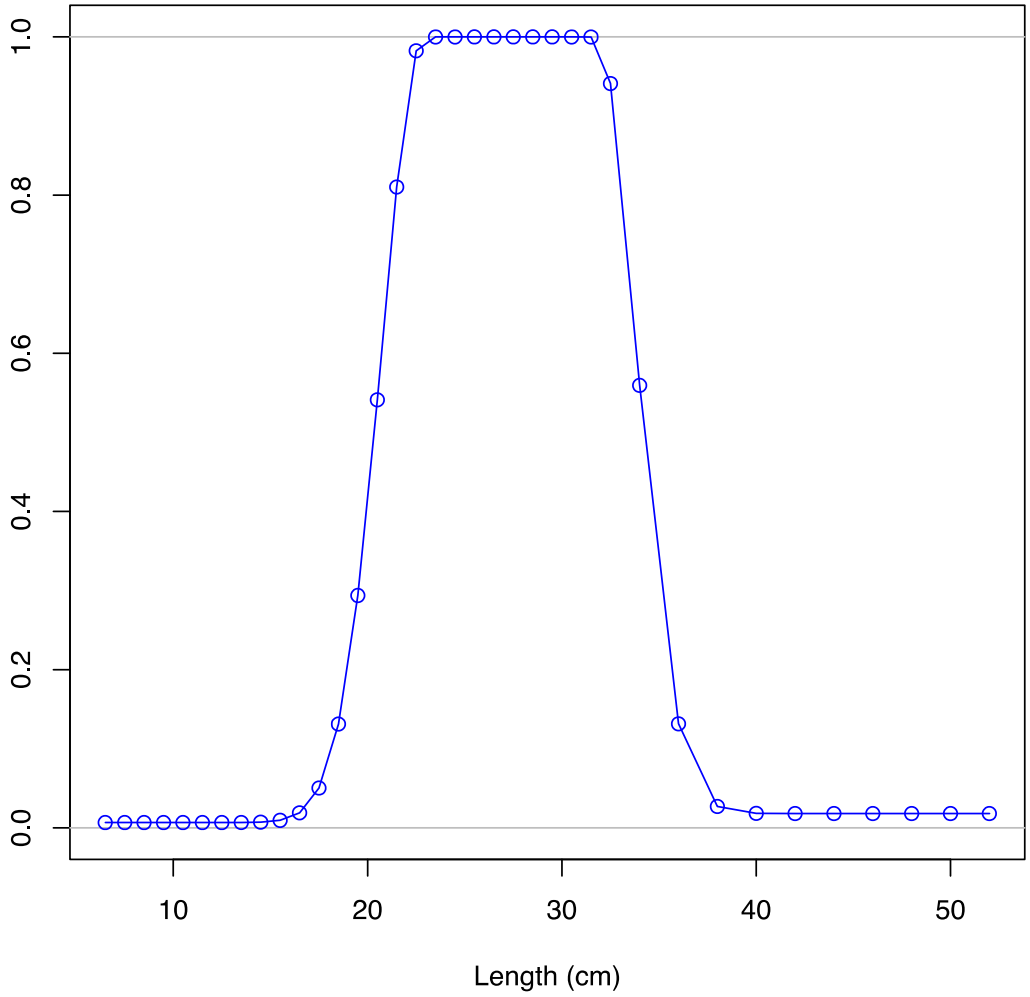


Figure 42. Female ending year selectivity for the AFSC Slope Survey.

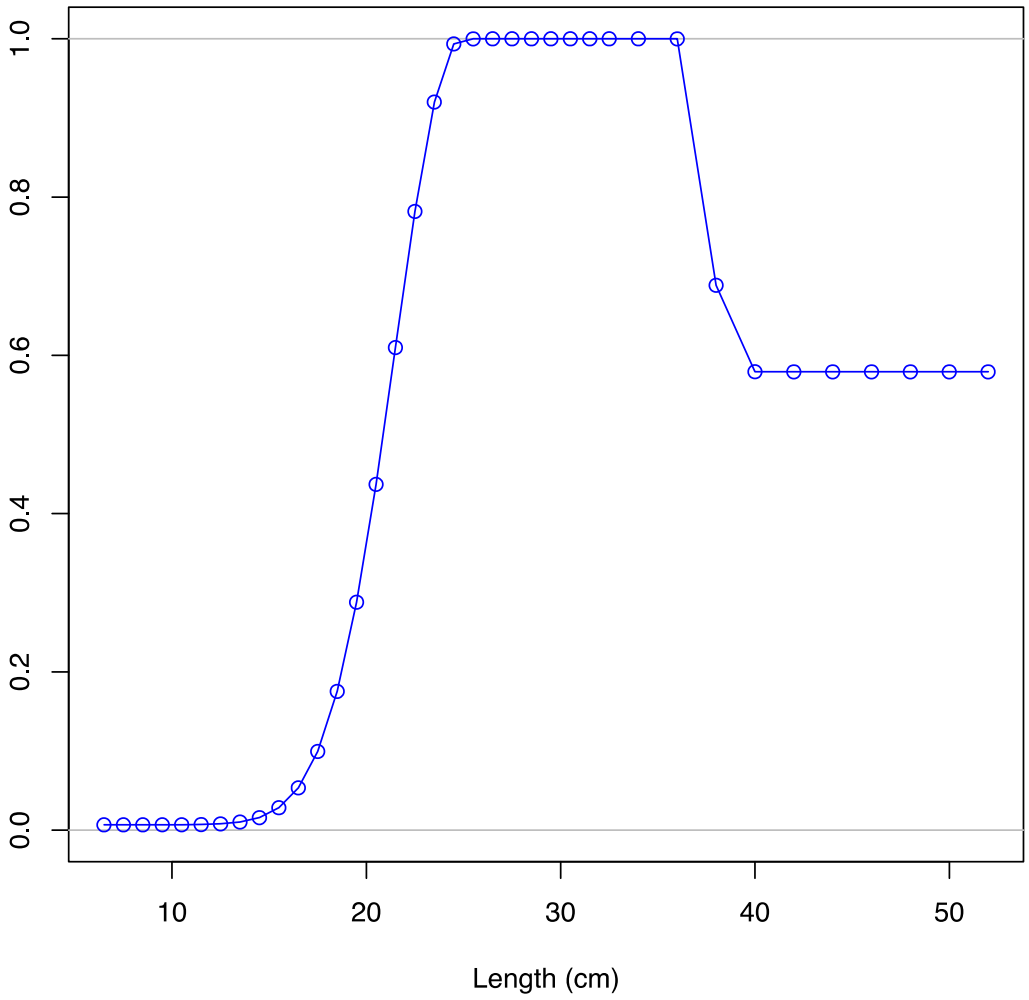


Figure 43. Female ending year selectivity for the NWFSC Slope Survey.

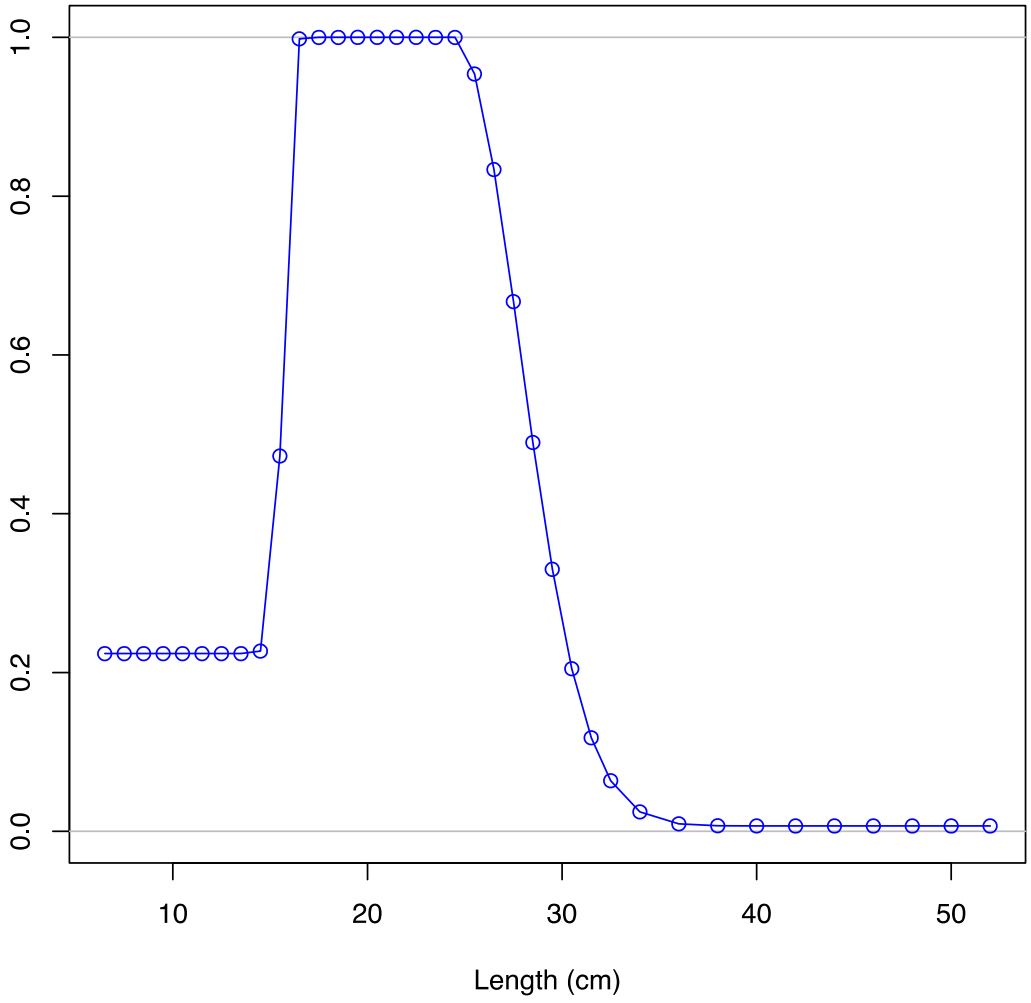


Figure 44. Female ending year selectivity for the NWFSC Shelf Survey.

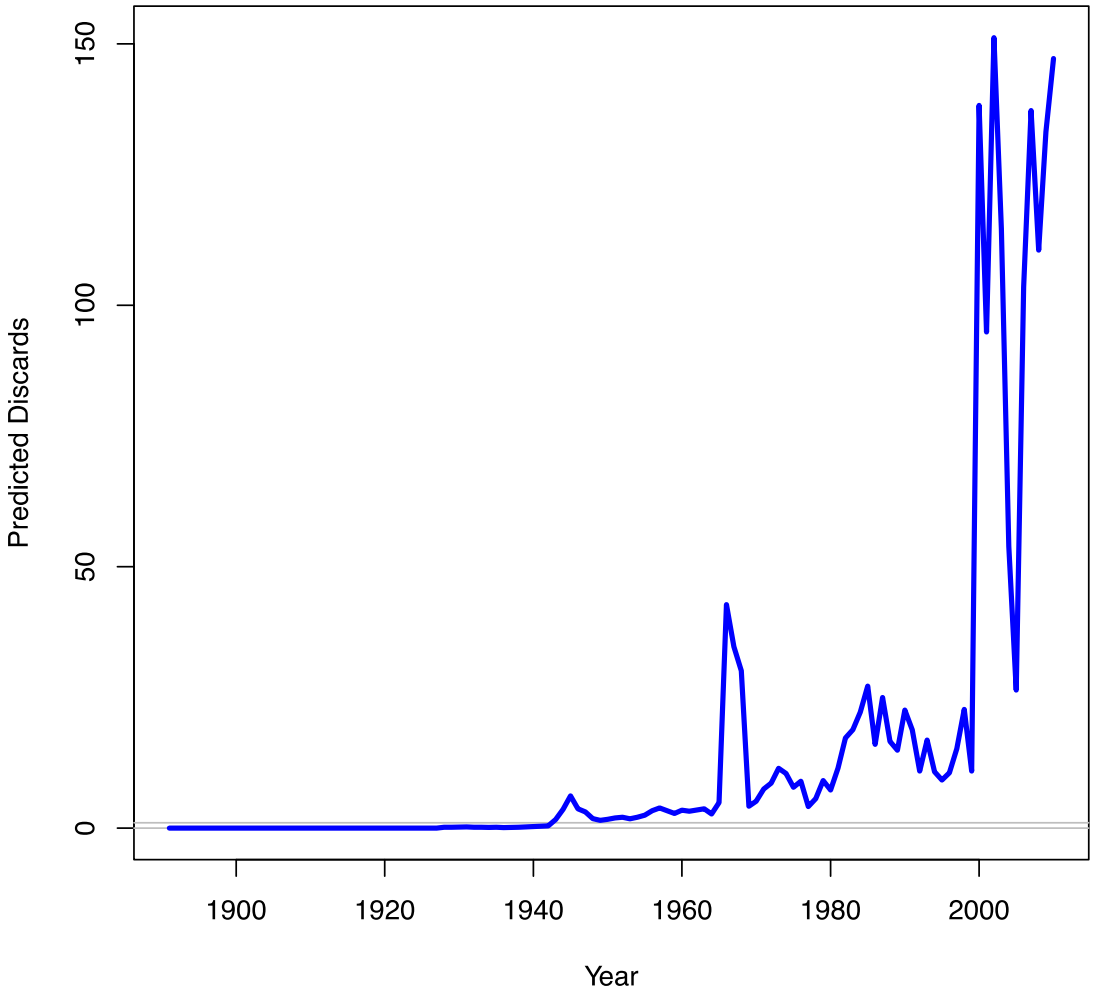


Figure 45. Time series of estimated discards (mt).

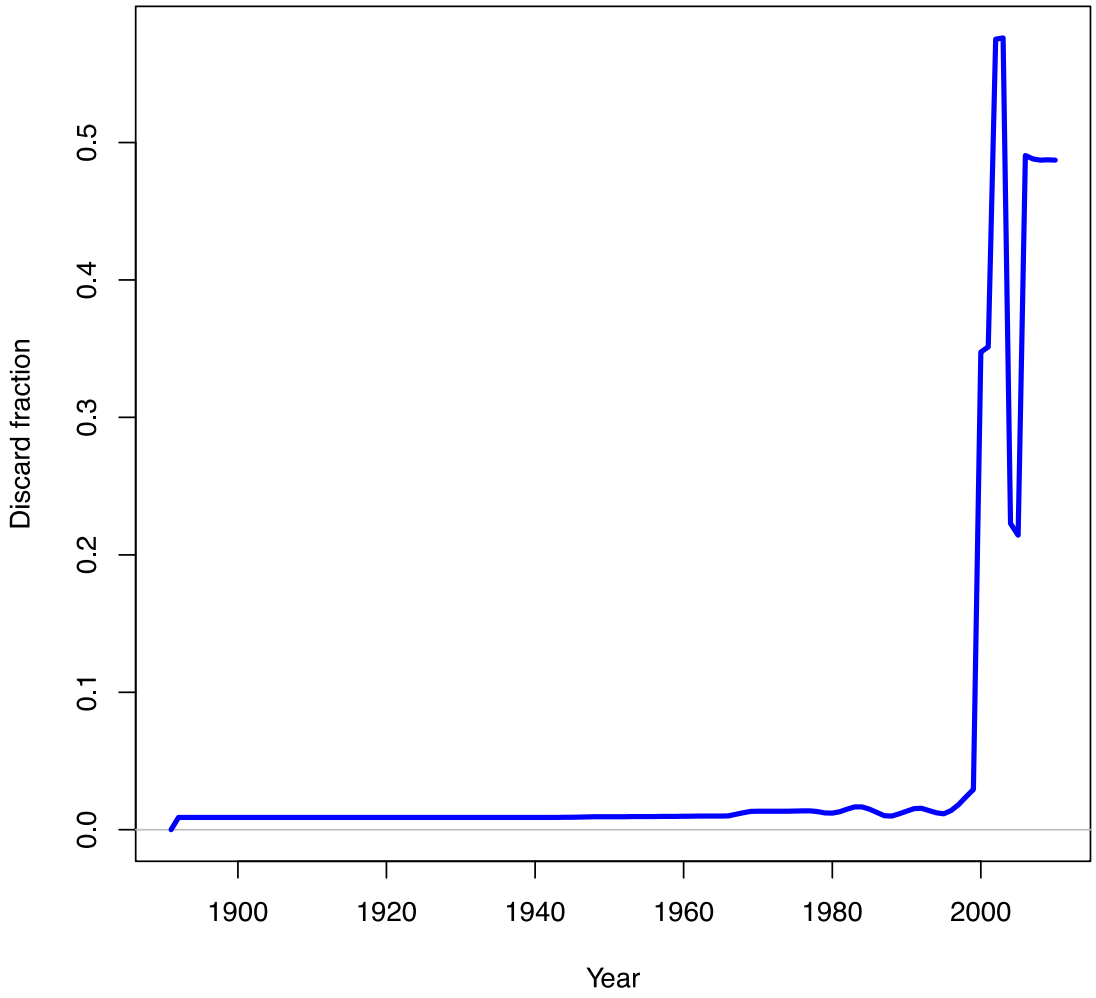


Figure 46. Time series of estimated discard fraction by weight.

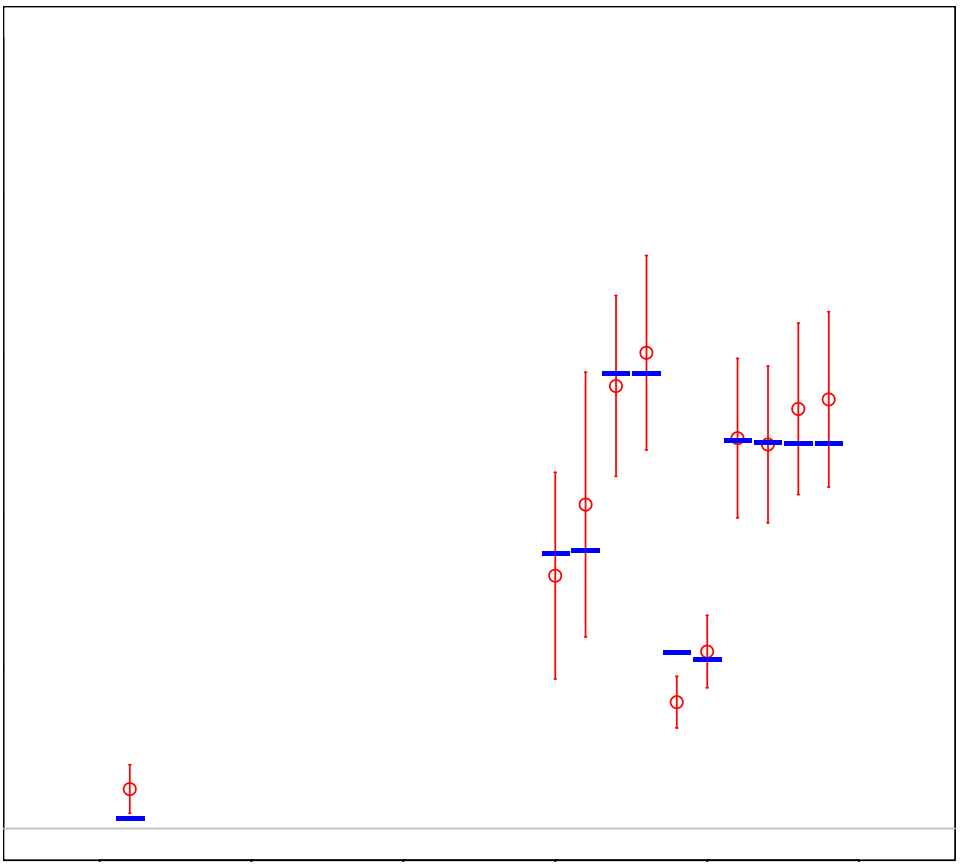


Figure 47. Fit to discard fraction data.

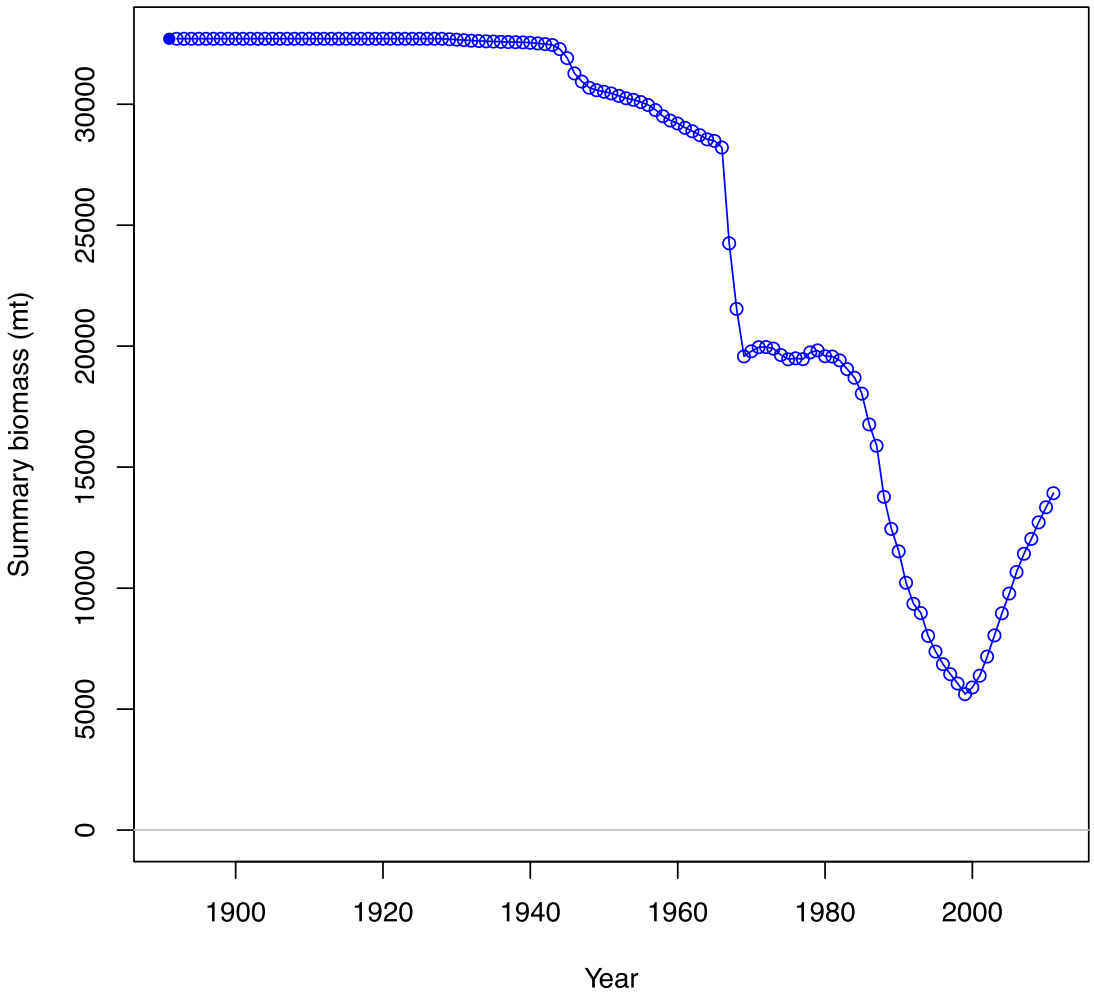


Figure 48. Time series of summary biomass.

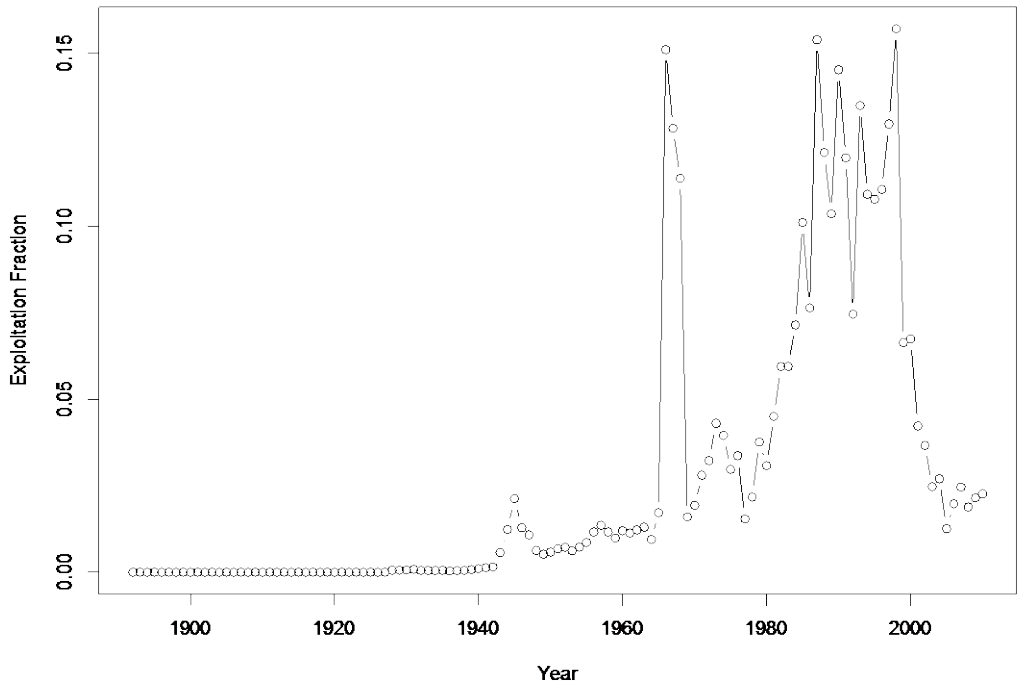


Figure 49. Time series of exploitation fraction (catch/summary biomass).

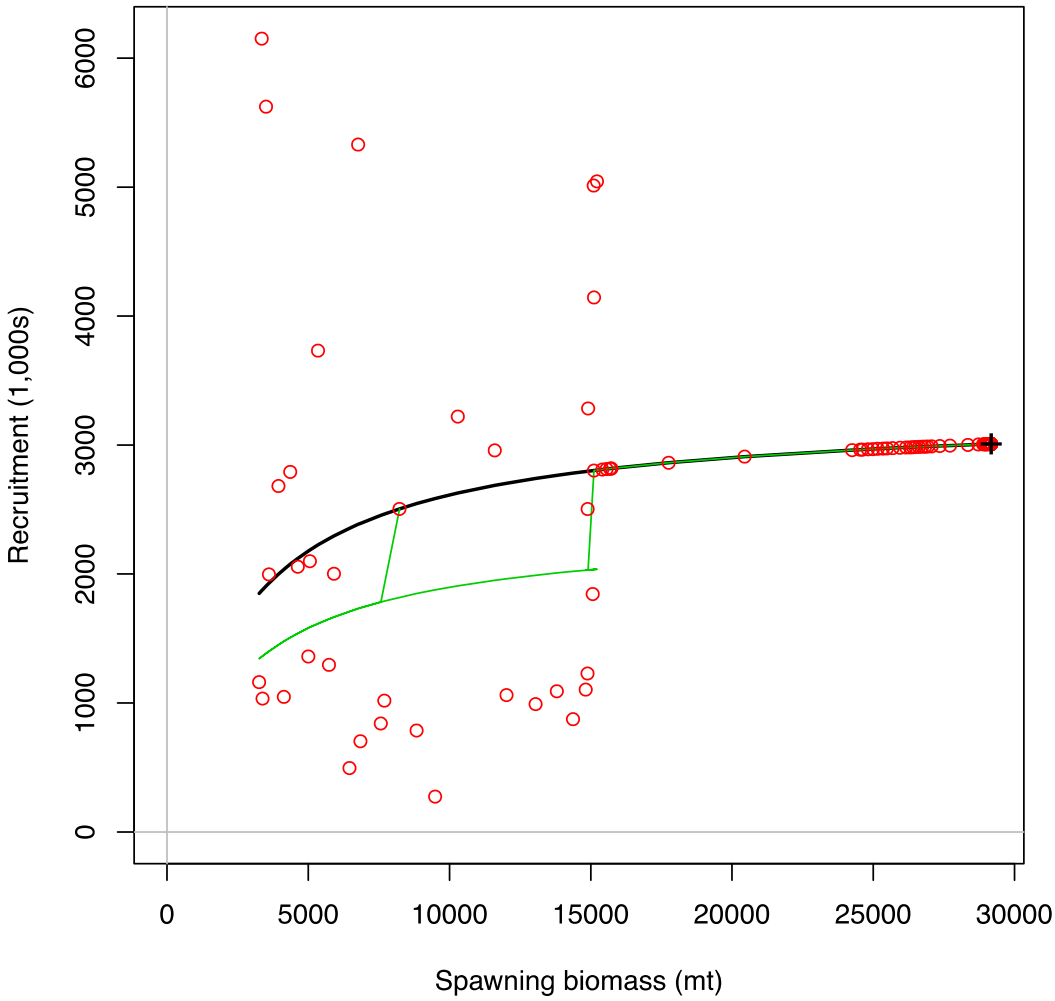


Figure 50. Time series of recruitment and spawner-recruit curve. The top line is the expected-mean recruitment curve and the bottom line is bias-adjusted.

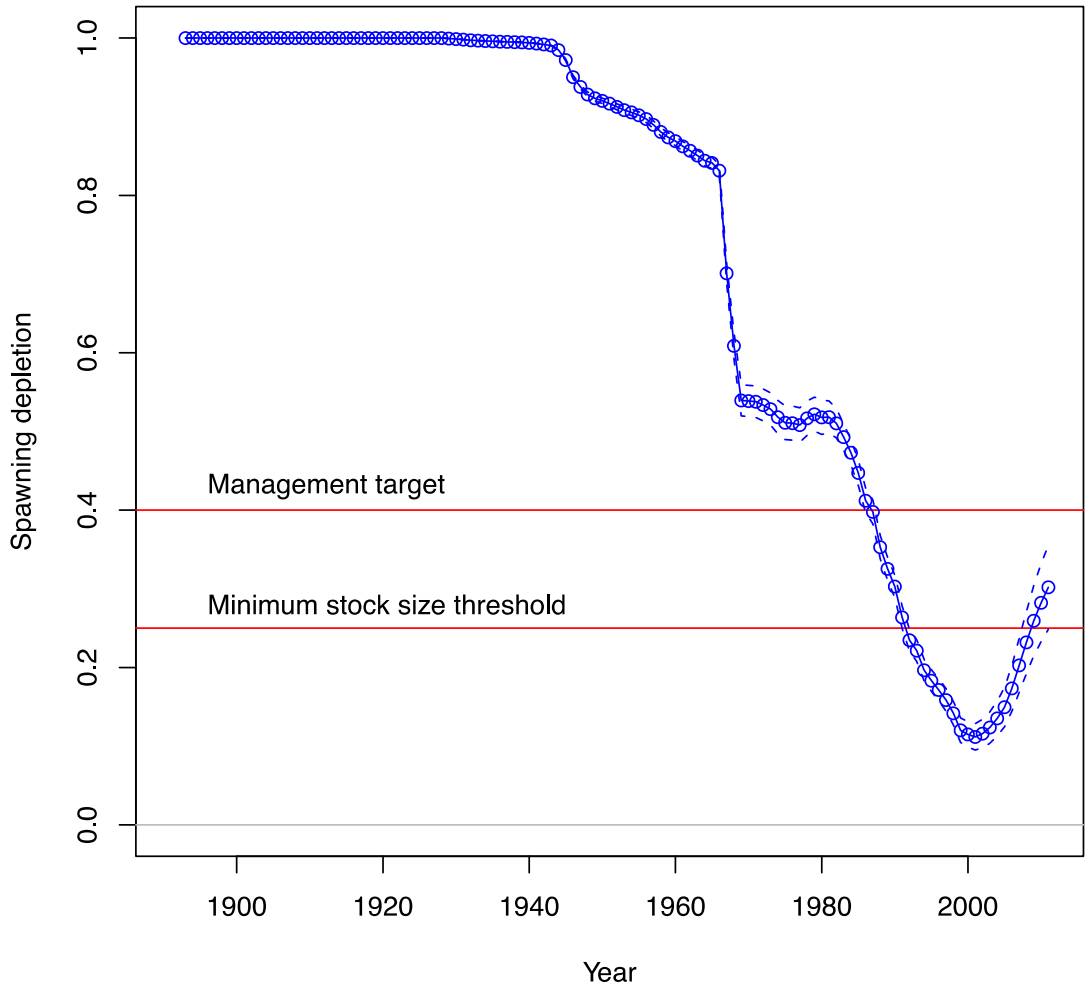
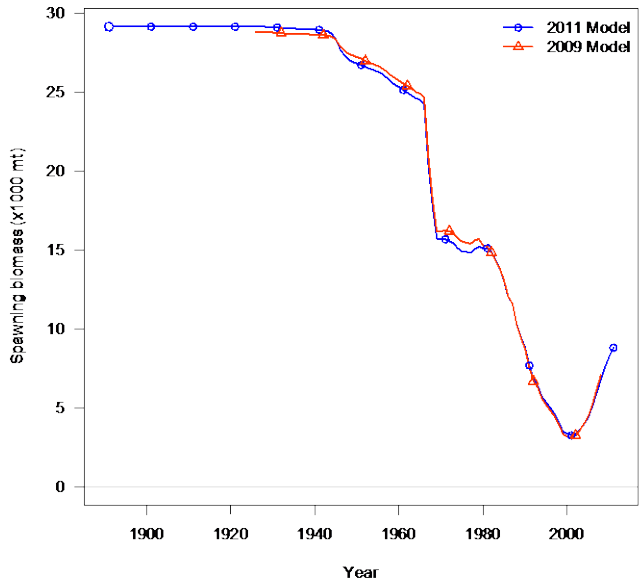


Figure 51. Time series of spawning output depletion level with 95% confidence intervals.

(A)



(B)

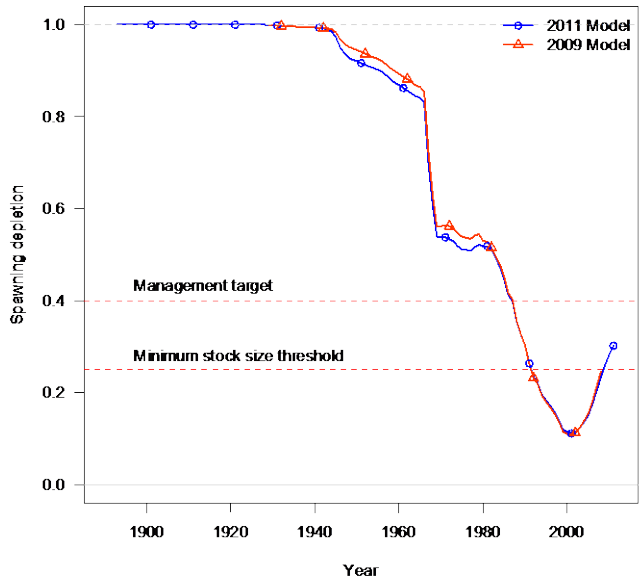


Figure 52. Comparison of histories of spawning output (A) and depletion (B) between the 2009 (triangles) and 2011 (open circles) assessments.

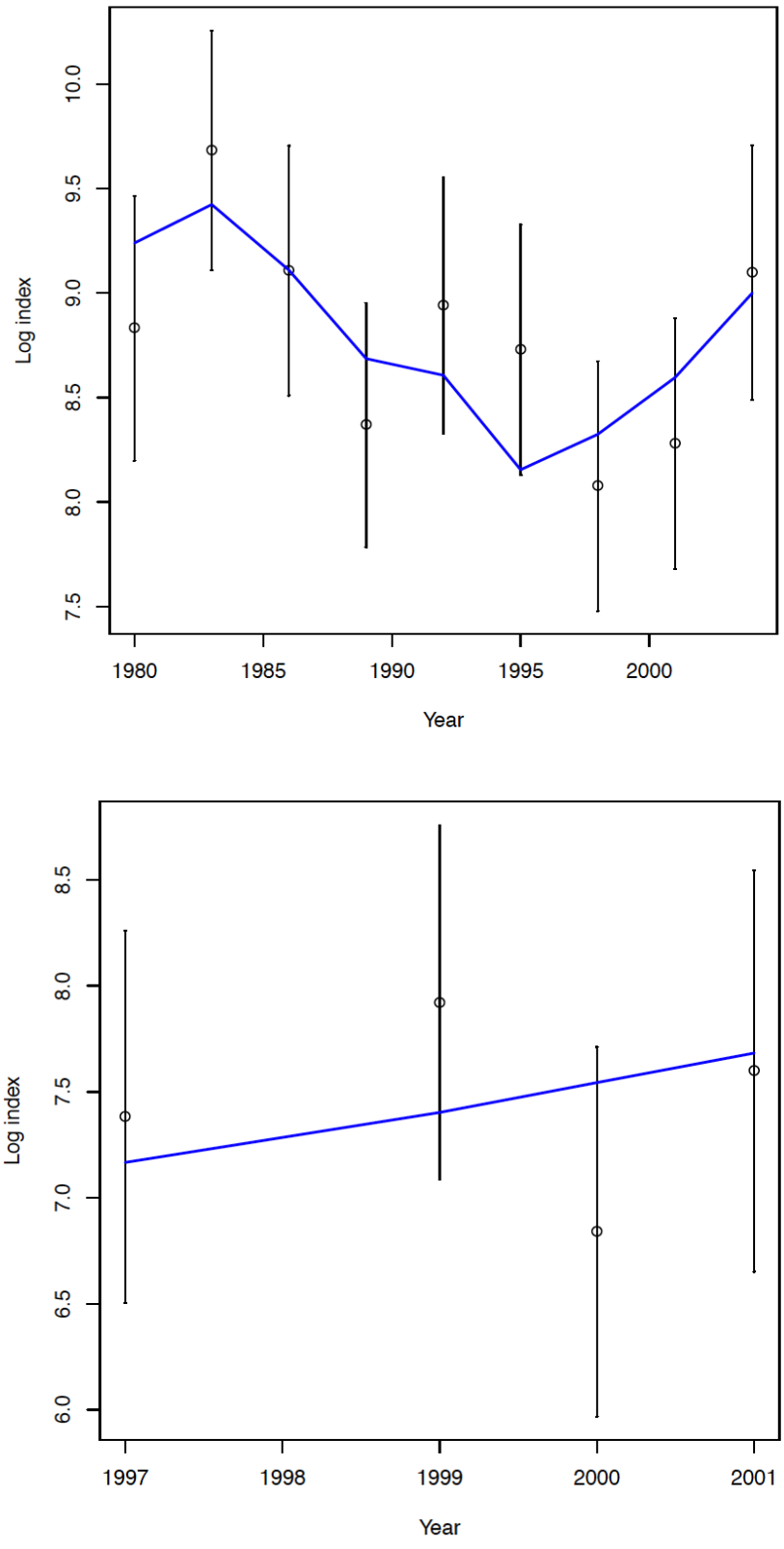


Figure 53. Model fits to Triennial shelf (top) and AFSC Slope Survey indices.

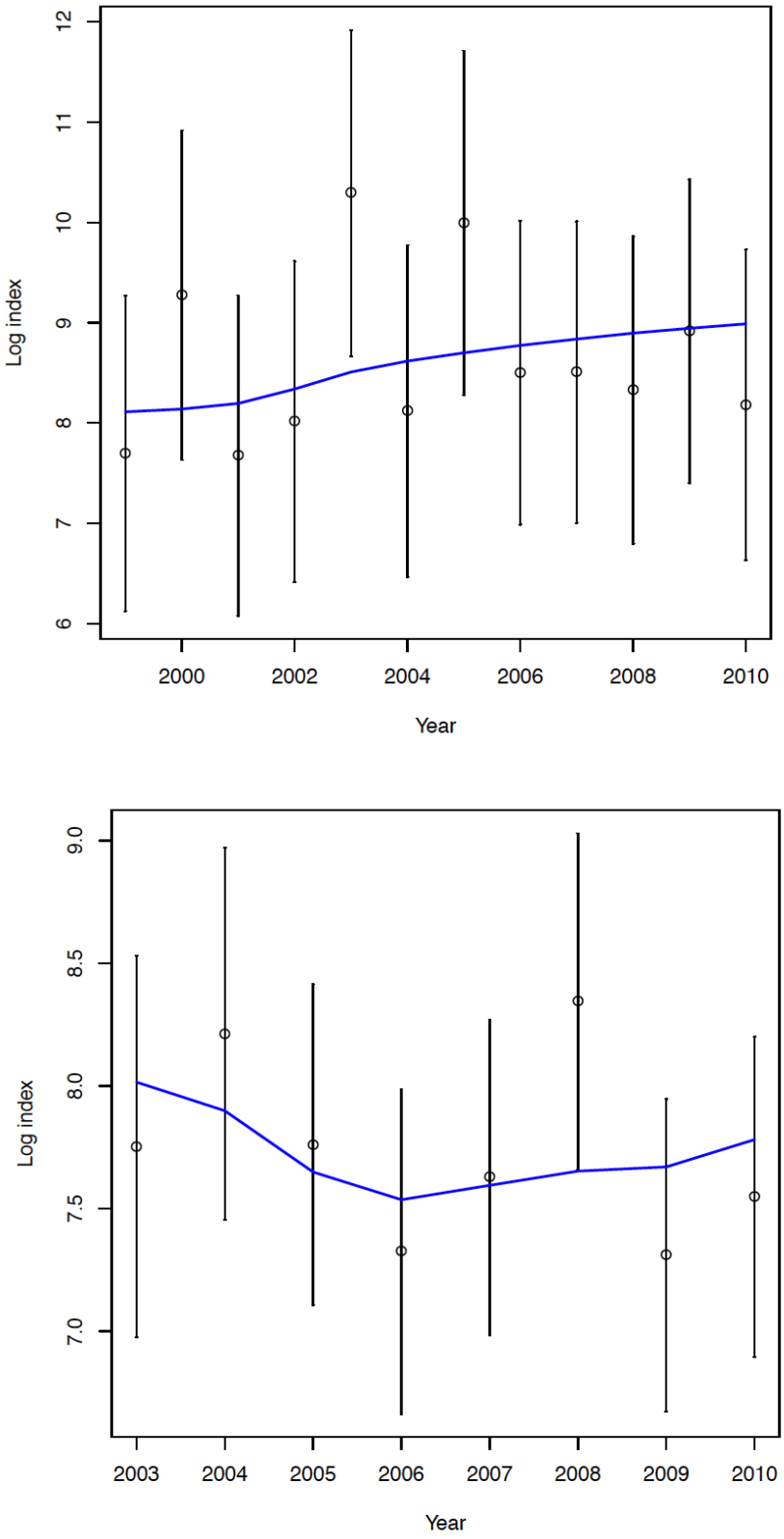


Figure 54. Model fits to NWFSC slope (top) and NMFSC shelf survey indices.

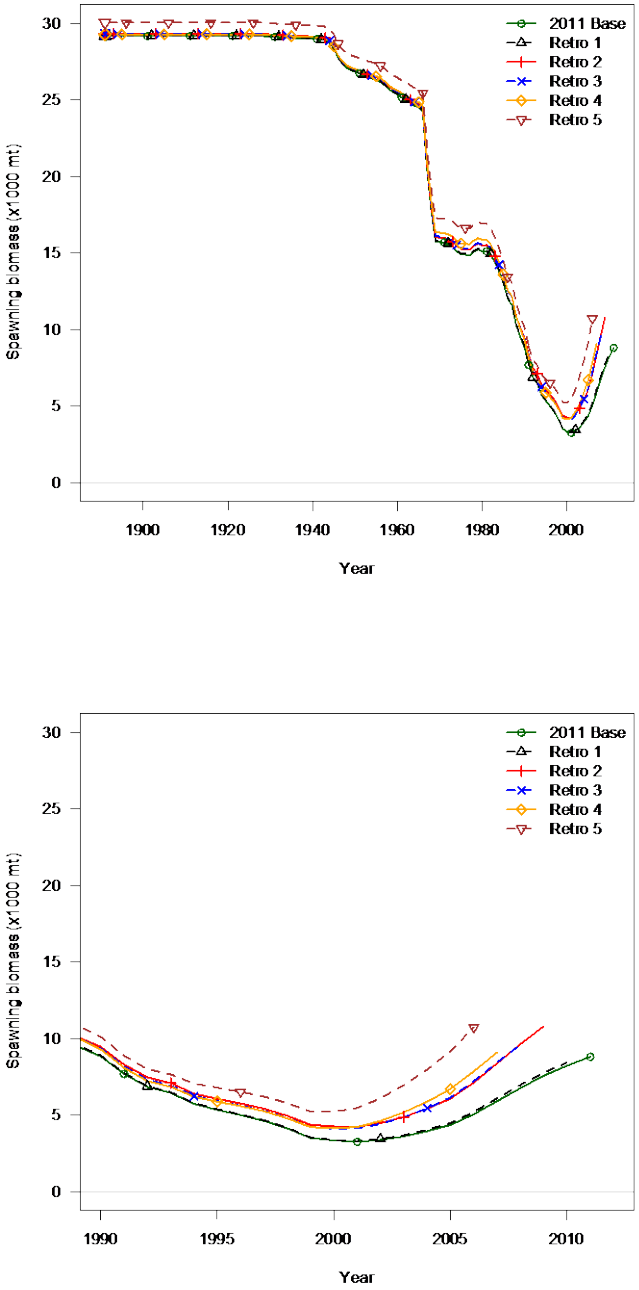


Figure 55. Retrospective pattern showing spawning output estimates from current assessment ("2011") and retrospective assessments as if conducted in 2006-2010. Top panel shows the timeseries 1920-2011, bottom panel covers the last 2 decades.

Appendix A. Stock Synthesis Data file for Darkblotched Rockfish

```
# data file for darkblothced rockfish in SS v3.x 2008
# Annotated by Ian Stewart, NWFSC
# updated to run in SSv3.20

### Global model specifications ###
1892  # Start year
2010  # End year
1     # N seasons per year
12    # Months per season
1     # Spawning Season
1     # N fishing fleets
4     # N surveys
1     # Number of areas
FISHERY%TRIENNIAL%SLOPE%NWSLOPE%NWSHELF #Names divided by "%"
0.5  0.7  0.92  0.6  0.6 #Timing of each fishery/survey (.42 POP)
1 1 1 1 1  # Area of each fleet
1     # Units for catch by fishing fleet:
1=Biomass(mt),2=Numbers(1000s)
0.01  # SE of log(catch) by fleet for equilibrium and continuous
options
2     # Number of Genders
45    # Accumulator age

### Catch section ###
# Initial equilibrium catch (landings + discard) by fishing fleet
0     # Fleet 1

119 # Number of lines catch data
# Landed catch (only) time series by fleet
# Catch(by fleet) Year Season
0.103   1892   1
0.103   1893   1
0.103   1894   1
0.027   1895   1
0.006   1896   1
0.007   1897   1
0.004   1898   1
0.006   1899   1
0.009   1900   1
0.011   1901   1
0.014   1902   1
0.016   1903   1
0.019   1904   1
0.021   1905   1
0.024   1906   1
0.027   1907   1
0.029   1908   1
0.032   1909   1
0.034   1910   1
0.037   1911   1
0.039   1912   1
```

```
0.042   1913   1
0.044   1914   1
0.047   1915   1
0.049   1916   1
0.052   1917   1
0.055   1918   1
0.057   1919   1
0.06   1920   1
0.062   1921   1
0.065   1922   1
0.067   1923   1
0.07   1924   1
0.072   1925   1
0.075   1926   1
0.078   1927   1
18.13   1928   1
19.205   1929   1
21.172   1930   1
26.14   1931   1
16.161   1932   1
16.143   1933   1
15.09   1934   1
17.136   1935   1
11.373   1936   1
13.555   1937   1
16.166   1938   1
23.588   1939   1
32.52   1940   1
41.298   1941   1
48.025   1942   1
182.23   1943   1
394.78   1944   1
673.248   1945   1
398.577   1946   1
330.246   1947   1
190.923   1948   1
157.017   1949   1
175.594   1950   1
204.303   1951   1
215.539   1952   1
185.185   1953   1
216.832   1954   1
256.433   1955   1
344.554   1956   1
398.876   1957   1
339.386   1958   1
286.141   1959   1
347.326   1960   1
325.201   1961   1
349.46   1962   1
369.317   1963   1
267.8   1964   1
484.686   1965   1
4219.407   1966   1
```

```
3077.582   1967   1
2423.12   1968   1
308.846   1969   1
376.998   1970   1
551.678   1971   1
635.514   1972   1
844.921   1973   1
766.883   1974   1
570.162   1975   1
647.629   1976   1
295.275   1977   1
423.066   1978   1
736.711   1979   1
595.541   1980   1
870.186   1981   1
1137.168   1982   1
1114.261   1983   1
1313.935   1984   1
1796.87   1985   1
1264.466   1986   1
2420.255   1987   1
1654.791   1988   1
1274.667   1989   1
1650.953   1990   1
1206.03   1991   1
686.875   1992   1
1193.669   1993   1
866.285   1994   1
786.537   1995   1
748.065   1996   1
819.843   1997   1
929.04   1998   1
361.984   1999   1
259.455   2000   1
175.149   2001   1
111.604   2002   1
84.322   2003   1
187.919   2004   1
96.728   2005   1
107.482   2006   1
143.911   2007   1
116.296   2008   1
140.069   2009   1
154.928   2010   1  # Total from Scorecard

33   # number of Survey data points    (#_N_cpue)
#_Units:  0=numbers; 1=biomass; 2=F
#_Errtype:  -1=normal; 0=lognormal; >0=T
#_Fleet Units Errtype
1 1 0 # fleet (fishery or survey) # 1
2 1 0 # fleet (fishery or survey) # 2
3 1 0 # fleet (fishery or survey) # 3
4 1 0 # fleet (fishery or survey) # 4
5 1 0 # fleet (fishery or survey) # 4
```

```
#
1980  1  2  6842.61  0.113  # Triennial
1983  1  2  16026.402  0.083
1986  1  2  9014.588  0.095
1989  1  2  4306.441  0.088
1992  1  2  7622.88  0.103
1995  1  2  6173.616  0.096
1998  1  2  3216.884  0.095
2001  1  2  3942.592  0.096
2004  1  2  8932.481  0.101
1997  1  3  1606.293  0.248  #AFSC
1999  1  3  2756.346  0.227
2000  1  3  934.142  0.245
2001  1  3  1992.919  0.283
1999  1  4  2205.061  0.193  #NW Slope
2000  1  4  10663.288  0.228
2001  1  4  2153.85  0.205
2002  1  4  3025.156  0.206
2003  1  4  29534.603  0.22
2004  1  4  3359.529  0.233
2005  1  4  21951.282  0.265
2006  1  4  4921.375  0.163
2007  1  4  4954.338  0.157
2008  1  4  4144.408  0.172
2009  1  4  7452.022  0.162
2010  1  4  3570.572  0.18
2003  1  5  2329.28  0.227  # NW Shelf
2004  1  5  3684.936  0.217
2005  1  5  2346.148  0.164
2006  1  5  1518.052  0.168
2007  1  5  2053.659  0.158
2008  1  5  4203.075  0.18
2009  1  5  1494.096  0.155
2010  1  5  1894.938  0.163


1 #_N_fleets_with_discard
#_discard_units (1=same_as_catchunits(bio/num); 2=fraction;
3=numbers)
#_discard_errtype:  >0 for DF of T-dist(read CV below); 0 for normal
with CV; -1 for normal with se; -2 for lognormal
#_Fleet units errtype
1     2     30 # FISHERY1
# fill in this table
11   # Discards N observations #_N_discard_obs
1986  1  1  0.05  0.3
2000  1  1  0.32  0.2
2001  1  1  0.41  0.2
2002  1  1  0.56  0.1
2003  1  1  0.602  0.1
2004  1  1  0.16  0.1
2005  1  1  0.224  0.1
2006  1  1  0.494  0.1
2007  1  1  0.486  0.1
```

```
2008  1  1  0.531  0.1
2009  1  1  0.543  0.1
0   # Mean Body Weight #N_meanbodywt_obs
30 #_DF_meanwt

## Population size structure
3  # Length bin method: 1=Use data bins,
  # 2=generate from min/max/width read below
  # 3=Read count and vector below
37 # Count of population bins
# Lower edge of bins
6  7  8  9  10  11  12  13  14  15  16  17  18  19  20  21  22  23
24  25  26  27  28  29  30  31  32  33  35  37  39  41  43  45  47
49  51

-1    # Minimum proportion for compressing tails of observed
compositional data
0.0001     # Constant added to expected frequencies

0     # Combine males and females at and below this bin number

37 # Number of Length Bins
6  7  8  9  10  11  12  13  14  15  16  17  18  19  20  21  22  23
24  25  26  27  28  29  30  31  32  33  35  37  39  41  43  45  47
49  51

72   # Length Composition Observations - 1983-2008 Updated
11.May.2009 -JRW
#Year Seas  Fleet Gender      Part  effn  6     7     8     9     10
      11    12    13    14    15    16    17    18    19    20    21
      22    23    24    25    26    27    28    29    30    31    32
      33    35    37    39    41    43    45    47    49    51    6
      7     8     9     10    11    12    13    14    15    16    17
      18    19    20    21    22    23    24    25    26    27    28
      29    30    31    32    33    35    37    39    41    43    45
      47    49    51
1977  1     1     3     2     22    0.00  0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0.006578947 0     0.023026316 0.016447368 0.029605263 0.078947368
      0.065789474 0.072368421 0.082236842 0.046052632 0.046052632
      0.075657895 0.016447368 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0.003289474 0.003289474
      0.013157895 0.016447368 0.032894737 0.0625      0.078947368
      0.085526316 0.049342105 0.036184211 0.032894737 0.019736842 0
      0     0.003289474 0     0     0     0.003289474 0     0
1978  1     1     3     2     9     0.00  0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.01  0.015 0.025 0.04  0.045 0.06  0.065 0.09  0.12
      0.015 0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0.02  0.04  0.055 0.08
      0.145 0.065 0.05  0.055 0.005 0     0     0     0     0     0
      0     0
```

```
1981  1     1     3     2     44    0.00  0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0.017071936 0.009914631 0.002308139 0.004315309 0.029660242
      0.079223767 0.163936007 0.201138023 0.07768508  0.045483208
      0.007295434 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0.001580486 0     0.001576187 0
      0.004283547 0.007270873 0.046535231 0.184208021 0.087405632
      0.009173651 0     0     0     0     0
1982  1     1     3     2     89    0.00  0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0.000209381 0     0.000276902 0.001000681 0.00038614  0.005672158
      0.006879098 0.010054919 0.006879155 0.01852027  0.035607596
      0.035969079 0.09680007  0.106453931 0.150588258 0.107370175
      0.050012385 0.016759029 0.003351308 0.018290696 0.003854013 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0.002052348 0.000400223 0.00490636
      0.003430074 0.001632034 0.005899893 0.004138135 0.010646879
      0.008556366 0.01623941  0.049246598 0.12613895  0.064697219
      0.015629436 0.004155975 0.005121676 0.000582645 0.000582645
      0.000582645 0.000425247
1983  1     1     3     2     165   0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0.001436253 0.000640144 0.001623491 0.001550364 0.002568905
      0.001631408 0.005490415 0.006200823 0.004880457 0.02629336
      0.043581878 0.11995565  0.105118332 0.161450797 0.069672418
      0.036127869 0.006750827 0.004831328 0.002521959 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     2.894e-05   0.000508026 0.000200907 0.000619296
      0.00087674  0.001105158 0.004593141 0.004854462 0.010252466
      0.013841374 0.046059499 0.107873795 0.116588641 0.065169305
      0.018075785 0.000642701 0.002397549 0     0.001992768 0.001992768
1984  1     1     3     2     332   0     0     0     0     0     0
      0     0     0     0     0.000123029 0     0     0     0     0
      0     0     0.000229561 0.000387029 0.000594001 0.000822722
      0.006404647 0.011997875 0.011162728 0.007756905 0.018850844
      0.031464026 0.06305443  0.118815542 0.10033663  0.108346922
      0.082382059 0.036430253 0.008618094 0.002385729 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0.002142319 0.002291479 0.000710311
      0.000651822 0.002990391 0.009200048 0.007620995 0.007943567
      0.016599816 0.063568776 0.123856417 0.087160378 0.056576816
      0.005849984 0.001224734 0.001247875 0     0     0.000201245
1985  1     1     3     2     485   0     0     0     0     0     0
      5.3584e-05  0     0     0     0     0     0     0     0
      0.000357638 4.3009e-05  0.000319699 0.001269967 0.000735044
      0.001171229 0.004361312 0.003897284 0.006913197 0.017094358
      0.023591055 0.034986178 0.056976028 0.071982767 0.081785821
      0.088103246 0.069949645 0.041359911 0.023224914 0.002611598
      0.001255309 0.000363115 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     3.1286e-05  0
      0.000411222 0.00010021  0.000356477 0.002282826 0.001589442
      0.005602972 0.004021602 0.01323916  0.016109365 0.024100215
```

```
      0.041991327 0.085148054 0.122832404 0.082271629 0.041210365
      0.014892136 0.00637586  0.002400775 0.001131825 0.001131825
      0.000363115
1986  1     1     3     2     267   0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.002336091 0     0.000126758 0.000621894 0.001640218 0.00208535
      0.00672149  0.011036079 0.015074762 0.045183599 0.126151576
      0.084583946 0.100371265 0.085564688 0.076254721 0.028088509
      0.011719856 0.001699998 5.0139e-05  0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.002336091 0     0.000126758 5.0139e-05  0.000296866 0.001435623
      0.003141301 0.004869212 0.007668502 0.015612004 0.025412968
      0.034391943 0.088043782 0.115193453 0.073064835 0.024754509
      0.004291074 0     0     0     0     0
1987  1     1     3     2     410   0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      4.1431e-05  4.1431e-05  0.000330214 0.000820605 0.000308121
      0.000313303 0.000196718 0.001589481 0.003966118 0.006879617
      0.017025068 0.070754205 0.120441187 0.131445907 0.083398876
      0.037759342 0.013432351 0.001293588 0.000611052 9.8283e-05  0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     6.1606e-05  0.000155231 0.000147465
      0.000224129 0.000296763 0.000230189 0.002043342 0.003611713
      0.012226573 0.017828825 0.043823948 0.138174013 0.170389614
      0.093054994 0.019980372 0.003507247 0.00228702  0     0.001033204
      0     0.00017685
1988  1     1     3     2     185   0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0.011305879 0.003530126 0.002174828 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0.000582841 0.00079032  0.001916613
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      0.114279354 0.160855833 0.094558388 0.03031777  0.005411952 0
      0.000249688 0     0     0
1989  1     1     3     2     135   0     0     0     0     0     0
      0     0     0     0     0     0     0     0.000880136 0     0
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      0.009078429 0.01231198  0.006565148 0.0215359   0.022136969
      0.069202458 0.145445632 0.069490923 0.070972882 0.042012125
      0.026856672 0.011252273 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0.000880136
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      0.00933858  0.004528414 0.006255233 0.014922144 0.015230329
      0.037842581 0.14781916  0.148776411 0.057694405 0.025100248
      0.004153434 0     0     9.7385e-05  0     0
1990  1     1     3     2     179   0     0     0     0     0     0
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      0     0     0     0.00259181  0.003859105 0.011520278 0.006322889
      0.013098289 0.018055826 0.026792846 0.087766574 0.097510064
      0.090205401 0.066591828 0.033612053 0.032885332 0.013565733
      0.004619517 0.003377364 0     0     0     0     0     0     0
```

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      0     0     0     0.00259181  0.003859105 0.005332824 0.012510343
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      0.084017947 0.061951237 0.030518326 0.022057287 0.008925143
      0.003072653 0.001830501 0
1991  1     1     3     2     143   0     0     0     0     0     0
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      0.000452421 0     0.00221914  0.000660687 0.004588875 0.007958897
      0.00966071  0.007431082 0.007223661 0.011229918 0.008498161
      0.013591667 0.011570672 0.045651443 0.087068102 0.090413418
      0.080171553 0.047294787 0.061924478 0.02851248  0.010901837
      0.000923142 0     0     0     0     0     0     0     0     0
      0     0     0     6.1898e-05  6.1898e-05  0     0.000452421 0
      0.00221914  0.000660687 0.004588875 0.007958897 0.00966071
      0.007431082 0.007223661 0.011229918 0.009421304 0.013591667
      0.017569165 0.064340245 0.096295661 0.060420953 0.062865532
      0.034604477 0.037007363 0.010976639 0.003286879 0     0
1992  1     1     3     2     57    0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0.010303436 0.015781925 0.015141792 0.024788256 0.049146609
      0.099610034 0.10300208  0.08527745  0.044195291 0.030892303
      0.007023758 0.001892367 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.001593168 0     0.002622574 0.001100646 0.007628311
      0.010303436 0.015781925 0.015141792 0.024788256 0.049146609
      0.099610034 0.10300208  0.08527745  0.044195291 0.030892303
      0.007023758 0.001892367 0     0
1993  1     1     3     2     66    0     0     0     0     0     0
      0     0     0     0     0     0     0     0.000631702 0.000631702
      0.0017728   0.000593859 0.000291456 0.002888005 0.001140241
      0.00094086  0.001973107 0.017324776 0.011251648 0.024815141
      0.032329211 0.029534349 0.08474358  0.127818176 0.082980239
      0.04186255  0.024871842 0.006435325 0.003274328 0.001263403
      0.000631702 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0.000631702 0.000631702 0.0017728
      0.000593859 0.000291456 0.002888005 0.001140241 0.00094086
      0.001973107 0.017324776 0.011251648 0.024815141 0.032329211
      0.029534349 0.08474358  0.127818176 0.082980239 0.04186255
      0.024871842 0.006435325 0.003274328 0.001263403 0.000631702 0
1994  1     1     3     2     118   0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
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      0.031306079 0.079808668 0.093285611 0.089740561 0.089687212
      0.045390788 0.034948283 0.014104074 0.004227847 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0.001182532 0.000584972 0.000108868 0.003049058 0.003939803
      0.01977914  0.016554972 0.041874976 0.1076652   0.108180226
      0.078933885 0.054874164 0.022573309 0.01094191  0.003059619
      0.002548163 0     0
1995  1     1     3     2     182   0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0.07812888  0.113716017 0.092757198 0.06313496  0.061395171
      0.036907142 0.010958689 0.001263698 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.000133531 9.5118e-05  0.000425522 0.00060939
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      0.028974464 0.047846212 0.090431485 0.110694086 0.083150362
      0.044604438 0.030286025 0.007920012 0.003232916 0.000287128 0
      0
1996  1     1     3     2     426   0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
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      0.003049893 0.000926796 0
1997  1     1     3     2     405   0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0.000213475 4.7134e-05  0.001119278
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      0.092304855 0.057852098 0.043065035 0.022371714 0.013003364
      0.011384431 0.001276246 0     0
1998  1     1     3     2     413   0     0     0     0     0     0
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      0.013243921 0.014736572 0.014193339 0.013773672 0.020740638
      0.018831027 0.06262017  0.074695358 0.081250383 0.058642014
      0.05486104  0.03417459  0.013779083 0.002991611 0.000394304 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0.000640209 0.001719577 0.001309351
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      0.004628395 0.002550408 0.000394304 0
1999  1     1     3     2     250   0     0     0     0     0     0
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      0.023356861 0.015750712 0.010739085 0.002810879 0.000748465
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      0     0     0     0     0     0     0     0     2.4194e-05  0
      4.8388e-05  0     0     0     0     0     0.001407317 0.000926306
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      0.050440962 0.039982529 0.023798923 0.033773881 0.049319235
      0.056268047 0.04287132  0.026253559 0.012722841 0.004625115
      0.003823301 0.00017926  0.000244331 0
2001  1     1     3     2     471   0     0     0     0     0     0
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      0.006934874 0.008559135 0.022109286 0.023688143 0.055037687
      0.060861913 0.072840025 0.093798775 0.052626359 0.029321933
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      0     0     0     0     0     0     0     0.001822252 0.000265276
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2002  1     1     3     2     440   0     0     0     0     0     0
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      0.040971525 0.039136811 0.010906269 0.004851177 0.000438473 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0.001050441 0.002030145 0.002801501
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      0.091905537 0.032273957 0.023523879 0.026040429 0.025566311
      0.006839737 0.002200282 0.000595861 0
2003  1     1     3     2     456   0     0     0     0     0     0
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      0.005072991 0.00280281  0.001959858 0.004803839 0.007812889
      0.00631773  0.010347258 0.012853647 0.014979635 0.085495582
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      0.022515293 0.005705496 0.001857224 0.000261071 0     0     0
      0     0     0     0     0     0     0     5.9307e-05  0.000139372
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      0.008015649 0.007336594 0.00675156  0.013592299 0.03607883
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      0.003216542 0.003326932 0     0.000324227 0.000413273
```

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2004  1     1     3     2     430   0     0     0     0     0     0
      0     1.0212e-05  0     0     0     0     0     0     0     0
      0     6.3314e-05  6.5358e-05  0.003311848 0.00437655  0.005341742
      0.006193434 0.013228205 0.009556716 0.013503421 0.010763691
      0.041366328 0.090878746 0.08578879  0.090882711 0.071946447
      0.035671553 0.016762704 0.00661227  0.000788894 0.00075066  0
      0     0     0     0     0     0     1.0212e-05  0     0     0
      0     0     0     0     0     0     2.0424e-05  6.5358e-05
      0.003769013 0.004375148 0.008571534 0.010391343 0.019032098
      0.015669576 0.025874675 0.035906514 0.119714202 0.142393596
      0.064246359 0.027347028 0.009405462 0.002982051 0.002361814 0
      0     0
2005  1     1     3     2     360   0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0.000134112 3.7885e-05  0.001350752 0.00191949  0.005319015
      0.009661229 0.011657174 0.018751979 0.029831504 0.040164833
      0.037804737 0.063658879 0.069373578 0.08304808  0.066464513
      0.030687786 0.018471032 0.005984545 0.005826327 0.001304693
      0.000668552 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0.000520108 0.000153767
      0.001350752 0.001786406 0.005181985 0.010746105 0.013606973
      0.015346904 0.041196376 0.053956701 0.047167212 0.106098735
      0.107433571 0.052581164 0.024679277 0.012717445 0.002062593
      0.000847783 0.000137449 0     0.000307999
2006  1     1     3     2     500   0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.000149666 0.000665147 0.00039911  0.000641807 0.00265252
      0.006994549 0.006734521 0.020236915 0.031373256 0.071320441
      0.083663425 0.064626266 0.079011365 0.052615338 0.03828512
      0.022316193 0.008813746 0.001122067 0.000225883 0.000552475 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0.000149666 0.000365815 0.000299332
      0.000774755 0.001580278 0.009132527 0.013038615 0.032207533
      0.056530838 0.064473846 0.114356447 0.0813114   0.061520167
      0.038168702 0.022696643 0.007830448 0.002980889 0.000155959
      2.6328e-05  0
2007  1     1     3     2     500   0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0.000110748 0.000103064 0.000444043 0.000571913 0.001320021
      0.004646295 0.011874818 0.01783044  0.042889971 0.142415177
      0.087756652 0.079047158 0.064864578 0.047789974 0.034209035
      0.020919026 0.007116702 0.002514457 0.000662877 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     2.9237e-05  0     0     0     0     0.000132301 0.001525587
      0.003624163 0.007764166 0.017138902 0.033463368 0.058378047
      0.121350723 0.078230425 0.059434081 0.02848038  0.016026962
      0.004492846 0.002478623 0.000363241 0     0
2008  1     1     3     2     500   0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0.00014154
      5.1044e-05  0.000520408 0.000310173 0.000664839 0.001017032
      0.001524311 0.001654559 0.003897288 0.007448754 0.01037049
      0.018365575 0.04476795  0.138069608 0.100277558 0.060251414
      0.046134947 0.036271929 0.030863331 0.012237088 0.00420151
      0.000800815 0.000639582 0     0     0     0     0     0     0
```

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      0     0     0     0     0     0     3.1859e-05  0     4.5964e-05
      4.5964e-05  0.000305452 0.000788478 0.000804498 0.001062131
      0.001909855 0.003938387 0.018523387 0.021955691 0.028409813
      0.076763026 0.142091285 0.1147318   0.041662195 0.016188562
      0.003686465 0.002892181 0.002242789 0.000987472 0.000309306
      0.000141696
2009  1     1     3     2     482   0     0     0     0     0     0
      0     0     0.000371652 0     0     0     0     0     0.000129068
      0     0     0     0     0.000437844 0.001136122 0.001840645
      0.005423222 0.006390016 0.005084748 0.014829899 0.023870322
      0.050872247 0.152954607 0.103261874 0.047188512 0.04373399
      0.042793084 0.024917094 0.011320703 0.001252033 0.000732242 0
      0     0     0     0     0     0     0     0.000371652 0     0
      0     0     0     0     0     0.000329512 0.000180756 0
      0.0003812   0.001519417 0.002894099 0.002923002 0.003797808
      0.009290591 0.025682764 0.054631747 0.11974403  0.129280791
      0.072037806 0.028157977 0.00742735  0.001853998 0.000223333 0
      0     0.000732242
2010  1     1     3     2     466   0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     9.01E-05    0.007887184 0.009040126
      0.012501908 0.027292607 0.039631607 0.139877237 0.130303199
      0.063424753 0.048943609 0.034340013 0.020916103 0.010249135
      0.001465377 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
      9.83E-05    0.000104093 0     9.83E-05    0.005006614 0.007131646
      0.009980167 0.02980445  0.04692023  0.071180238 0.158777545
      0.084261454 0.028049743 0.011714869 0.000357131 0     0.000552359
      0     0
# 2006-2008 above, capped at 500. Original values were 2006:560,
2007:798, 2008:927 .
#
# Discard: effective N cut by half for proper re-weighting
1986  1     1     0     1     50    0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0.006756757
      0.006756757 0.040540541 0.040540541 0.081081081 0.101351351
      0.074324324 0.108108108 0.195945946 0.195945946 0.074324324
      0.067567568 0.006756757 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2002  1     1     0     1     64    0     0     0     0     0
      0.00041424  0.00041424  0.00041424  0     0.00041424  0.006253056
      0.0108097   0.015760858 0.019903261 0.020060936 0.050030254
      0.052840082 0.044758088 0.106417853 0.078939885 0.047944158
      0.018276196 0.02329974  0.018635895 0.02497316  0.022490632
      0.047450852 0.147400774 0.140001816 0.068056168 0.015385119
      0.011358431 0.005472095 0.001824032 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0
```

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2003  1     1     0     1     80    0     0     0     0     0     0
      0     0.000159518 0     0.000159518 0.000239277 0.000239277
      7.98e-05    0.004341226 0.014743057 0.019828823 0.02629995
      0.024196474 0.018065404 0.008267206 0.003283008 0.025905685
      0.025627316 0.037638259 0.026243917 0.032938354 0.086507537
      0.251770105 0.18890752  0.102759684 0.054014741 0.030278445
      0.004763829 0.008754163 0.003987948 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0
2004  1     1     0     1     89    0     0     0     0     0     0
      0.000276003 0.000276003 0.00185588  0.000138001 0.000414004
      0.000414004 0.000552005 0.001551674 0.000751266 0.000414004
      0.003730114 0.003538167 0.012179536 0.017373038 0.013803292
      0.013706765 0.021865287 0.009471137 0.021798839 0.035470092
      0.093270332 0.191551429 0.23113931  0.111632928 0.113682272
      0.033110814 0.055456389 0.010439413 0.000138001 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0
2005  1     1     0     1     160   0     0     0.000272538 0
      0.000272538 0.000817614 0.002316572 0.004921714 0.005714552
      0.006745522 0.003732086 0.008784993 0.016621945 0.016408976
      0.006897648 0.004148586 0.00698651  0.003582724 0.005470468
      0.005090898 0.041261323 0.05589004  0.044983846 0.051031259
      0.057880738 0.07685997  0.060261066 0.191349634 0.188997867
      0.092902313 0.024045815 0.011390572 0.001372423 0.002169634 0
      0.000545076 0.000272538 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2006  1     1     0     1     138   0     0     0.000200323 0.000924567
      0.00221896  0.004807747 0.008045894 0.013035963 0.015937219
      0.012973469 0.009842171 0.01277015  0.023765952 0.025781913
      0.024328604 0.040716146 0.017457473 0.019727798 0.011803636
      0.004669062 0.003713676 0.006333282 0.005034445 0.013050924
      0.046932145 0.065521584 0.068953686 0.180782107 0.127503982
      0.119578898 0.02923694  0.046906327 0.026658341 0.006302463
      0.002080275 0     0.002403874 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2007  1     1     0     1     94    0     0     0     0     0.000124014
      0.00062007  0.001279462 0.028796534 0.010066219 0.003458168
      0.003820077 0.007375606 0.014055948 0.01232497  0.006820771
      0.006305378 0.007267222 0.00511489  0.003186612 0.004979368
      0.004967861 0.013572875 0.003017675 0.013655258 0.013101592
      0.045856035 0.050625537 0.175849797 0.291182956 0.117633473
      0.08570034  0.025932864 0.038112241 0.005196188 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     1     0     1     38    0     0     0     0     0     0
      0     0     0     0     0.000283681 0.00014184  0.000340417 0
      0.000538994 0.000765938 0.000482258 0.000283681 0.00014184
      0.000936147 0.011035187 0.010382721 0.033706169 0.011035187
      0.031351618 0.03467999  0.07105276  0.301971187 0.226593083
      0.058381701 0.136223569 0.030438961 0.012964217 0.026127011 0
      0.00014184  0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2009  1     1     0     1     184   0     0.00075317  0.001506341
      0.001552689 0.000428728 0.004557084 0.005053602 0.01423956
      0.006026428 0.009607638 0.005070182 0.004826237 0.004557113
      0.006687281 0.031852782 0.033500535 0.045810134 0.013862431
      0.015203414 0.033726876 0.038868807 0.018538749 0.011877807
      0.022798977 0.016248423 0.024954556 0.045570018 0.211786159
      0.21243818  0.070312746 0.034936237 0.018138178 0.013087157
      0.0213321   5.79e-05    0.000231745 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
#Triennial
1980  1     2     3     0     54    0     0     0     0     0
      0.0006      0.0016      0.0044      0     0.0014      0.0016
      0.004 0.0059      0.0141      0.0011      0.0071      0.0084
      0.0103      0.0305      0.0339      0.0402      0.044 0.0434
      0.0171      0.0151      0.0348      0.0378      0.0692
      0.0327      0.0365      0.0226      0.0096      0.0094
      0.0058      0     0     0     0     0     0     0     0     0
      0.001 0.003 0.0016      0.0028      0.0023      0.0078      0.009
      0.0147      0.0066      0.0059      0.0056      0.0079
      0.0074      0.0132      0.0227      0.0171      0.0368
      0.0272      0.042 0.0541      0.0356      0.0414      0.0513
      0.0366      0     0.0036      0     0     0     0     0
1983  1     2     3     0     210   0     0     0     0     0
      0.0006      0.0011      0.0019      0.001 0.0019      0.0043
      0.0205      0.038 0.0223      0.0293      0.031 0.0442
      0.0396      0.0352      0.034 0.0398      0.0232      0.0151
      0.005 0.0062      0.0061      0.004 0.0072      0.0075      0.009
      0.0205      0.0212      0.011 0.0044      0.0013      0.0001
      0     0     0     0     0     0.0001      0.0012      0.0013
      0.0043      0.002 0.0017      0.0055      0.0207      0.0315
      0.0316      0.026 0.0377      0.0656      0.0553      0.0402
      0.0369      0.0365      0.0256      0.0112      0.0053
      0.0074      0.0036      0.0043      0.0063      0.0216
      0.0197      0.0085      0.0015      0.0006      0     0     0
      0
1986  1     2     3     0     168   0     0     0     0     0.0005
      0.0003      0.0004      0.0044      0.0125      0.009 0.0057
      0.0029      0.0082      0.0173      0.0148      0.0073
      0.0063      0.0105      0.0169      0.0201      0.0325
      0.0332      0.0256      0.0458      0.0418      0.0375
```

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      0.0304      0.0492      0.0233      0.0116      0.0092
      0.0096      0.007 0.0036      0.002 0.0008      0     0.0007
      0.0003      0     0     0.0007      0.0001      0.003 0.0052
      0.0097      0.0082      0.0047      0.0026      0.0032
      0.0106      0.0163      0.0069      0.0061      0.0153
      0.0148      0.0197      0.0424      0.0378      0.0378      0.064
      0.0412      0.0459      0.0343      0.0282      0.0184
      0.0048      0.0096      0.0056      0.0016      0     0     0
      0
1989  1     2     3     0     416   0     0     0     0.0002
      0.0002      0.0005      0.0061      0.0384      0.0657
      0.0285      0.0049      0.015 0.0332      0.0615      0.0318
      0.0374      0.0136      0.0204      0.0206      0.0175
      0.0168      0.0141      0.0097      0.0087      0.0086
      0.0101      0.0033      0.0097      0.0088      0.0071
      0.0055      0.0047      0.0004      0.0008      0.0002      0
      0     0     0     0     0.0008      0.0003      0.0018
      0.0083      0.0378      0.0647      0.0453      0.0079
      0.0139      0.0419      0.0571      0.0333      0.0246
      0.0157      0.0177      0.0125      0.0172      0.011 0.0151
      0.0111      0.0114      0.012 0.0053      0.0069      0.0105
      0.0039      0.0033      0.0028      0.0009      0.0005
      0.0002      0     0     0
1992  1     2     3     0     135   0     0     0     0     0.0002
      0.0016      0     0.0015      0.0022      0.0035      0.0014
      0.0004      0.0021      0.019 0.0399      0.0247      0.0061
      0.0108      0.0161      0.0287      0.025 0.0466      0.0958
      0.0707      0.0447      0.0256      0.0084      0.0078
      0.0005      0.0007      0.0004      0.0002      0.0006
      0.0007      0     0     0     0     0     0     0     0.0002
      0     0.0013      0.0015      0.0016      0.0048      0.0025
      0.0011      0.0038      0.0179      0.0288      0.0287
      0.0109      0.007 0.0312      0.0263      0.0188      0.0929
      0.111 0.0769      0.0313      0.0085      0.0031      0.0016
      0.0009      0.0013      0.0002      0     0     0     0     0
      0
1995  1     2     3     0     275   0     0     0.0004      0
      0.0003      0.0006      0.0007      0.0082      0.023 0.0121
      0.002 0.0006      0.0056      0.0132      0.0085      0.0089
      0.0096      0.0264      0.0454      0.0386      0.0243
      0.0237      0.0172      0.0134      0.0164      0.0086
      0.0083      0.0215      0.0327      0.0337      0.03  0.037
      0.0262      0.0101      0.0043      0     0     0     0
      0.0004      0     0.0003      0.0013      0.0027      0.0107
      0.0239      0.0122      0.0017      0.0016      0.005 0.0108
      0.0195      0.0121      0.0111      0.0287      0.047 0.0403
      0.024 0.0162      0.0141      0.0108      0.0093      0.0147
      0.0147      0.0529      0.0599      0.0354      0.0055
      0.0011      0.0008      0     0     0     0
1998  1     2     3     0     318   0     0     0     0     0.0003
      0.0022      0.0093      0.0078      0.0032      0.0009
      0.0067      0.0116      0.0079      0.0155      0.0246
      0.0465      0.0765      0.0818      0.0362      0.0321
      0.0294      0.0271      0.0189      0.0111      0.0055
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      0.0036      0.0034      0.0064      0.0047      0.0013
      0.0003      0.0029      0.0004      0.0003      0.0003      0
      0     0     0     0     0     0     0.007 0.0129      0.0106
      0.0012      0.0016      0.0061      0.0139      0.0107
      0.0105      0.0327      0.0535      0.0817      0.0745
      0.0525      0.0337      0.0293      0.0277      0.0181
      0.0084      0.0075      0.0084      0.0064      0.0087
      0.0008      0.0016      0.0003      0     0     0     0     0.001
      0
2001  1     2     3     0     395   0     0     0.0009      0.0016
      0.0005      0.0023      0.0143      0.0359      0.0226
      0.0063      0.003 0.0117      0.0386      0.0867      0.0836
      0.0232      0.0022      0.0044      0.0039      0.0076      0.009
      0.0093      0.0049      0.0111      0.0045      0.0246
      0.0304      0.1062      0.0068      0.0043      0.0064
      0.0017      0.0016      0.0002      0.0006      0     0     0
      0     0.0009      0.0016      0.0003      0.0024      0.0113
      0.0307      0.0198      0.0076      0.0025      0.011 0.0422
      0.0774      0.0761      0.0275      0.0043      0.0015
      0.0045      0.0064      0.0071      0.0083      0.0042
      0.0059      0.0066      0.0224      0.0149      0.0225
      0.0044      0.0033      0.0004      0.0007      0     0     0
      0     0
#AFSC
1997  1     3     3     0     42    0     0     0     0     0     0
      0     0     0     0     0     0.0099      0.0396      0.0556
      0.0545      0.0484      0.039 0.0366      0.085 0.1285      0.03
      0.0226      0.0009      0.0009      0.0004      0     0.0009
      0.0084      0.0003      0     0     0.0008      0.0005      0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0.0099      0.0198      0.0561      0.1236
      0.0567      0.0178      0.0315      0.0533      0.0232
      0.0138      0.0164      0     0.0033      0.0009      0.0032
      0.0021      0.0038      0.0013      0.0004      0     0.0001
      0     0     0     0     0
1999  1     3     3     0     42    0.0014      0     0     0     0
      0     0     0     0     0.0034      0     0.0034      0.0005
      0.0014      0.0014      0.0018      0.0005      0.0034
      0.0189      0     0.0098      0.0772      0.116 0.113 0.0734
      0.0615      0.0199      0.0194      0.0001      0.0011
      0.0004      0.0001      0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0.0005      0     0.0152      0     0     0.0015      0.0028
      0.0074      0.0277      0.1335      0.1448      0.0736
      0.0469      0.0092      0.0058      0.0005      0.0024
      0.0005      0     0     0     0     0     0     0
2000  1     3     3     0     36    0     0     0     0     0     0
      0     0     0     0.0001      0.0006      0     0     0.0007
      0.0101      0.01  0.0366      0.0676      0.0821      0.0756
      0.0131      0.026 0.0282      0.021 0.0385      0.0448
      0.0022      0.0034      0     0.0002      0.0002      0
      0.0002      0.0002      0.0003      0     0     0     0     0
      0     0     0     0     0     0.0007      0.0006      0.0019
      0.0007      0     0     0     0.0299      0.0533      0.1108
```

```
      0.1628      0.0624      0.0239      0.0041      0.0416
      0.0169      0.0173      0.0078      0     0.0027      0.0002
      0.0005      0     0     0     0.0001      0     0     0
2001  1     3     3     0     37    0     0     0     0     0     0
      0     0     0     0     0     0     0     0.003 0.0162
      0.0138      0.0121      0.0074      0.0013      0.0101
      0.0068      0.0126      0.0159      0.0213      0.0238
      0.0368      0.1106      0.1632      0.0754      0.0084
      0.0008      0.0058      0.0006      0.0039      0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.0014      0     0.0037      0.0106      0.0135      0.0053
      0.0034      0.0042      0.0101      0.0129      0.0261
      0.0185      0.0104      0.0163      0.1051      0.1296      0.064
      0.0046      0.0008      0.0058      0.0039      0     0     0
      0     0
#NWFSC Slope and Shelf
2000  1     4     3     0     46    0     0     0     0     0     0
      0     0     0.000719347 0     0.002472138 0.001406115 0.001406115
      0.002819034 0     0.00071448  0.013552271 0.013446374 0.016939868
      0     0.010745129 0.022304662 0.073931755 0.061157049 0.1028647
      0.023696561 0.0115264   0.004181701 0     0.020293282 0.039464483
      0.059196724 0.039909532 0.032887032 0     0     0     0     0
      0     0     0     0     0     0     0.002125462 0.00070917
      0.006690594 0.002812286 0     0.000698439 0.001406115 0
      0.001373314 0.002095344 0.008094524 0.012508235 0.002230945
      0.025701386 0.049054231 0.062974307 0.035100691 0.021124224
      0.002457977 0.033610445 0.119811842 0.027476135 0.013154791
      0.006577395 0.006577395 0     0     0     0
2001  1     4     3     0     79    0     0     0     0     0     0
      0     0     0.001230496 0     0.000717904 0.006849279 0.00949804
      0.027383138 0.061277025 0.018617255 0.010225538 0.002640537
      0.007275526 0.006000075 0.008308387 0.011524563 0.005988288
      0.013767361 0.011677244 0.01628674  0.057666125 0.061119135
      0.016837983 0.026615893 0.047780213 0.014559002 0.004852909 0
      0     0     0     0     0     0     0     0     0     0
      0.004068122 0     0     0.001973619 0.007672991 0.005199115
      0.02290083  0.049420236 0.032377764 0.016325665 0.004542887
      0.002786092 0.002769371 0.018230207 0.01827242  0.004205179
      0.011811012 0.025400473 0.034766939 0.052916008 0.060207707
      0.099753544 0.066273569 0.007931206 0     0.001496387 0     0
      0     0
2002  1     4     3     0     123   0     0     0     0     0     0
      0     0     0.001044436 0     0.001068986 0.004077679 0.019285241
      0.011193339 0.010209487 0.003424601 0.02519036  0.070657637
      0.097064281 0.079620477 0.056097769 0.012345736 0.01589208
      0.023109528 0.017606678 0.016315885 0.014008219 0.019262343
      0.006875332 0.005770886 0.001066832 0.001565721 0.000478359
      0.002972802 0.000997777 0     0     0     0     0     0     0
      0     0     0     0.000497453 0.001044436 0     0.00256436
      0.009344938 0.015279632 0.00461289  0.003429626 0.020434336
      0.055651928 0.087920621 0.065948487 0.066459435 0.020870487
      0.019036012 0.023715372 0.01889618  0.013316523 0.013919496
      0.01829055  0.006051125 0.009022778 0.004658974 0.00183189  0
      0     0     0     0
```

```
2003  1     4     3     0     187.1594    0     0     0     0     0
      0     0     0     0     0     0     0     0.059886393 0.019961129
      0.032416177 0.259596847 0.584645045 1.409220281 1.918125415
      1.2793242   1.125596761 2.410771378 2.64783796  1.705223728
      0.574566823 0.830533827 2.634424369 7.987150117 13.9799962
      7.568924942 4.151428139 2.474852523 3.119711488 3.0111828
      0.855564116 0.246624968 0     0     0     0     0     0     0
      0     0     0     0.019961129 0     0     0.019961129 0.059886393
      0.020724358 0.235942773 0.703077674 1.541829729 1.832758007
      1.26250613  2.170114016 2.361504077 1.850225122 1.554651367
      0.57957889  0.942827575 1.787270791 10.5875387  8.267254974
      1.803896552 1.193944774 0.259879302 0.011971269 0.026223209
      0.018906432 0     0
2004  1     4     3     0     92.3799     0     0     0     0     0
      0     0     0     0     0     0.214326928 0.214326928 0.642968557
      0.321667683 0.913136154 3.867238352 0.863702428 1.216732344
      2.867021567 3.394555101 3.269949834 4.68282757  4.964133955
      3.77560928  3.181108516 2.259095567 2.225018943 1.945509925
      1.246920785 0.627440278 0.487918082 0.376603555 0.131574652
      0.245028903 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0.214326928 0.225233404 0.81505123
      0.601445695 2.091182297 1.874287701 5.770773016 6.362278167
      4.041962055 3.170373218 5.208844956 6.065052239 5.036664467
      3.298719944 1.440253969 2.000604747 1.601968154 2.759631904
      2.471343907 0.588130502 0.254089103 0.173366508 0     0     0
      0
2005  1     4     3     0     121.3261    0     0     0     0     0
      0     0     0.040484114 0.040484114 0.040484114 0.05330201  0
      0.115098931 0     0.129009791 0.075067997 0.212235035 0.129574045
      0.119253084 0.22791863  0.322340096 0.796606692 1.058438321
      0.711191076 1.593635464 2.820412524 3.43335676  5.743439303
      12.57850128 11.66605369 4.368570004 0.419609488 0.553333244
      0.221707394 0.631768993 0.033064396 0     0     0     0     0
      0     0     0     0     0     0.040484114 0.121447899 0.264875046
      0.242891355 0.207432212 0.126939379 0.099655254 0.231233067
      0.536418953 0.333740692 0.365632151 0.617644871 0.965691846
      1.692228854 1.998778723 2.193424139 2.765928691 8.078735559
      19.25726935 8.06496243  3.233113233 0.334744798 0.061743605
      0.030043193 0     0     0     0
2006  1     4     3     0     146.1031    0     0     0     0     0
      0     0     0     0     0     0.160473795 0.201802715 0.686336739
      0.20570432  1.016071049 1.227384602 1.678468573 1.458303454
      0.738116774 1.397131466 0.788221604 1.127045249 1.838175017
      1.180078985 5.023117283 3.77143681  3.80839939  7.004343968
      5.190464822 5.202774874 4.1352156   1.692950988 1.458433148
      0.552677026 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0.074108891 0.553617302 0.536876063
      0.977238725 1.060588261 1.911721904 1.26445526  1.068942668
      0.50861374  0.803655102 1.832814362 2.217873655 3.245833253
      4.504506354 4.636523287 3.893964519 9.812667811 5.448392295
      3.566521457 0.463815526 0.074141314 0     0     0     0     0
2007  1     4     3     0     140.9318    0     0     0     0     0
      0     0     0     0     0     0.088089872 0.071968357 0.219061466
      0.141019247 0.612303206 1.115628992 1.841587625 1.782848468
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      1.439027598 1.23242824  1.560253347 2.249529873 1.749901221
      2.486951255 1.584750002 3.812612659 3.562226157 6.505735713
      3.626511015 2.428639658 1.594508423 1.901747789 1.23266717
      0.924195427 0.291960394 0.073854649 0     0     0     0     0
      0     0     0     0     0     0     0.088089872 0.088089872
      0.165792559 0.372932655 1.09723135  1.710012417 1.615848682
      1.411626052 1.503765166 2.582535997 1.709698035 1.64047109
      1.520854979 3.514704155 4.546041011 4.182451793 5.00828334
      10.19507285 6.111965811 4.158671929 2.115892318 0.149117731
      0.08422926  0.296613249 0     0     0
2008  1     4     3     0     139.891     0     0     0     0     0
      0     0     0     0.088986442 0.088986442 0.088986442 0.104451624
      0.072405701 0.285465877 2.678541233 3.86274904  2.560209697
      2.945641473 2.644898299 3.131235392 2.785576258 1.579844019
      1.595755424 1.42503955  1.557368425 1.697928957 1.873377154
      7.078414693 4.316194734 1.934181034 1.504819688 0.867142232
      0.952476684 0.370448046 0.307154707 0     0     0     0     0
      0     0     0     0     0.088986442 0     0.1518453   0.335031959
      0.078535409 0.104451624 0.417031474 2.692151062 2.686620234
      2.564742393 3.378783979 4.132409196 2.926172019 2.407295808
      1.396704331 1.833968537 0.917659476 2.919549117 2.422514392
      4.048965324 8.047295977 5.956079355 1.116393515 0.799774164
      0.178759648 0     0     0     0     0
2009  1     4     3     0     163.0507    0     0     0     0     0
      0.108545223 0     0.160338986 0     0.133144683 0.100227977
      0.23540901  0.126674759 0.212699834 0.645505976 0.751241551
      0.435469723 1.365712512 1.358495066 1.543682686 1.632878282
      2.702082671 3.163406315 2.44230619  2.503405302 2.201527057
      3.053503524 5.038584549 8.106600294 4.596790969 2.386078854
      1.94950933  2.033231696 1.488821509 0.28886966  0     0     0
      0     0     0     0     0     0.05932912  0     0.059200237 0
      0.022932574 0.044851268 0.073944446 0.514818661 0.733515849
      0.879282469 0.686121291 1.824071847 1.32197823  2.566712609
      2.151417365 1.92979883  2.975855841 2.36889446  3.905454215
      2.800764053 4.359311239 9.959834057 5.117838973 2.571696083
      1.845526563 0.325979358 0.086858518 0.049267657 0     0     0
2010  1     4     3     0     121.1344    0     0     0     0     0
      0     0     0     0     0     0.151268146 0.445201174 0.34679689
      0.633631631 0.838462803 1.280748821 1.7680183   2.786663802
      2.19948506  5.387480496 4.427576568 5.235619839 5.001566007
      2.433064882 2.641036364 2.243461252 0.972524419 2.505931927
      3.585084688 4.073468089 1.700957866 1.001095316 1.196884765
      0.368174699 0     0     0     0     0     0     0     0     0
      0     0     0     0     0.085357184 0.484650579 0.479673484
      1.194123662 0.973282834 1.2326606   1.595881904 2.120301844
      2.630335609 4.662009607 3.924013027 5.876764514 3.659788518
      3.844450604 3.266929797 1.755788865 1.348496568 2.422447079
      3.449103335 0.820414907 0.864023742 0.085297933 0     0     0
      0     0
2003  1     5     3     0     80.7531     0     0     0     0     0
      0     0     0.101899283 0.328826032 0.282074766 0.113298409
      0.239761077 0.2895972   0.356408289 0.816200551 2.390269798
      6.757817887 8.237477292 10.93827843 5.888663363 2.710913534
      2.202439908 2.442349454 2.593144555 1.647891376 0.27931984
```

```
      0.582048306 0.083010716 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0.345025659 0.718590375 0.608162368 0.810179304 1.490332683
      1.010975495 1.328814814 2.255525854 2.5761201   6.768474668
      9.820817609 7.719666611 4.554536654 2.357837551 2.765170736
      3.595888264 1.445528012 0.255267848 0     0.291395326 0     0
      0     0     0     0     0     0     0
2004  1     5     3     0     72.7035     0     0     0     0
      0.241958655 0.1993424   0.069000045 0.577869342 0.487118758
      0.518602341 0.419791832 1.16732181  1.525883945 0.727010147
      1.146013683 0.918356972 0.857875352 1.877705344 2.353240975
      9.039174779 9.823127258 7.081344762 2.918199956 1.629512714
      2.182478332 0.37822932  0.334478883 0.167247485 0.083623743 0
      0     0     0     0     0     0     0     0     0     0.055526616
      0.091353871 0.231429271 0     0.091353871 0.859540427 0.655436074
      0.966941755 0.208335411 0.367064472 0.932514127 1.891605096
      0.38508267  0.225114858 0.500463486 2.633657221 3.677578509
      9.608775055 15.56720804 6.000671178 2.282077138 3.189052079
      1.974762297 0.334478883 0.167239442 0.37822932  0     0     0
      0     0     0     0     0     0
2005  1     5     3     0     128.872     0     0     0     0     0
      0.402328574 0.79693333  1.396909311 1.50460693  1.196876963
      1.385965218 3.268663915 3.535619874 1.98394366  1.644253068
      1.274720453 2.335861612 0.864280661 0.261241786 0.946567163
      0.958189208 4.536943819 4.939066585 5.637151998 4.201877832
      0.534299319 0.724767692 0.127334034 0.063667017 0     0     0
      0     0     0     0     0     0     0     0.080518982 0.201182446
      0     0.511648437 0.768023492 2.192571479 2.907036713 1.505514903
      1.683320089 3.712141793 5.450775554 2.901637304 1.366946225
      1.262129904 2.145732215 1.56139757  1.077956806 1.071661531
      2.103372282 7.574655903 7.009110231 4.701080995 2.187172071
      0.968043734 0.334981243 0.199318076 0     0     0     0     0
      0     0     0     0
2006  1     5     3     0     118.9237    0     0     0     0     0
      0.176123618 1.546015764 1.13782704  1.053084893 1.376894558
      1.221272445 3.094417535 5.359671737 3.960512105 3.27514459
      7.642029978 6.100877    3.925007284 2.087807907 1.167470582
      1.500370415 0.587476394 0.882446497 0.731959486 1.9379563
      1.334957893 0.785981795 0.602985439 0     0     0.109458067 0
      0     0     0     0     0     0     0     0     0.293141695
      0.101962893 0.360235172 1.271962124 1.34223262  2.171395953
      1.126519442 1.046367765 1.97466709  5.356663294 4.263859166
      3.087350286 5.887588731 6.426541007 4.061256059 1.942741281
      1.231672322 0.696701047 0.883354217 0.182983388 1.52858754
      0.96897815  1.592491029 0.484489075 0.118509332 0     0     0
      0     0     0     0     0     0
2007  1     5     3     0     138.5484    0     0     0     0     0
      0.065919188 0.793734057 0.584624986 0.604769443 0.309976601
      2.955134842 2.002803688 4.39304461  3.53752528  3.801626595
      3.678592342 4.947514361 3.172400016 1.95451509  1.69821235
      2.395291001 1.814051356 0.153189489 0.831855459 0.683671359
      1.067734423 1.257168293 0.70399458  0     0     0     0     0
      0     0     0     0     0     0     0     0.09972791  0
      0.080410236 0.281687214 0.55454796  0.320791817 0.377795155
```

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      2.748159765 2.979837778 5.330035586 2.576557595 4.471656034
      3.379084601 6.295986315 3.520687955 2.354599869 2.307383854
      2.842960496 2.864367472 2.689435824 1.911365954 4.360152052
      2.482661857 1.367331545 0.242236256 0.153189489 0     0     0
      0     0     0     0     0
2008  1     5     3     0     87.5519     0     0     0     0     0
      0.114538916 0.110108257 0.043886066 0.317349708 0.698404603
      0.959411209 1.554502856 0.608316583 0.791381388 3.666604361
      3.074962167 4.438958906 5.244954763 6.756187091 8.878649145
      3.927306244 3.988628505 3.151173146 0     0.776133098 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0.171960734 0.11133324  0.133638892 0     0.105543521
      0.151416375 0.467077924 0.964067361 0.992906254 0.621785297
      0.88243233  1.764943888 5.442993609 4.27763297  3.270453537
      3.535683589 5.027645296 7.57316513  8.957261334 3.202134858
      2.375040048 0     0.822779946 0     0     0.046646848 0     0
      0     0     0     0     0     0     0
2009  1     5     3     0     125.4179    0     0     0     0     0
      0.093313797 1.038601275 1.974954951 2.364312033 1.231543338
      1.236431203 0.933418618 3.579765172 3.727909596 4.284798855
      3.421903485 3.553712147 3.457942723 3.214555081 3.239473841
      1.777464133 1.118315581 0.422905614 0.128721589 0.269651149 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0.134427997 0     1.737788229 4.381608996
      3.551396842 2.046741092 1.999990645 1.181413482 7.039812718
      7.526728322 5.619431721 4.808256517 4.077333517 2.385500579
      2.605653319 4.489960581 3.203504763 1.107253569 0.854288985
      0.089887614 0     0     0     0     0.089326328 0     0     0
      0     0     0     0     0
2010  1     5     3     0     154.1629    0     0     0     0     0
      0.141392361 0.028646942 0.317278195 0.206854351 0.297725859
      1.374297112 4.201739647 8.195432208 7.125314504 3.617054494
      2.197720981 2.37444812  1.871997795 1.480557033 3.000591469
      2.013922627 1.722085898 1.963817102 1.150137452 1.719327698
      1.141223887 0.652074688 0.326032019 0     0     0     0     0
      0     0     0     0     0     0     0.677931482 0.297140141 0
      0     0.030073964 0.267928779 0.396414042 0.642607353 1.455573492
      4.21105789  8.243109665 7.29401198  6.221806989 2.697029727
      2.926801632 2.601632215 2.131875612 2.884523431 2.150618593
      2.339219836 2.291063155 1.150637975 1.23568425  0.570564021 0
      0.163021334 0     0     0     0     0     0     0     0     0
#
#
31 # Number of Age Bins
0  1  2  3  4  5  6  7  8  9  10  11  12  13  14  15  16  17  18  19
20  21  22  23  24  25  26  27  28  29  30

1 # Number of Aging Error Matrices
0.5  1.5  2.5  3.5  4.5  5.5  6.5  7.5  8.5  9.5  10.5  11.5  12.5
13.5  14.5  15.5  16.5  17.5  18.5  19.5  20.5  21.5  22.5  23.5
24.5  25.5  26.5  27.5  28.5  29.5  30.5  31.5  32.5  33.5  34.5
35.5  36.5  37.5  38.5  39.5  40.5  41.5  42.5  43.5  44.5  45.5
0.05  0.1   0.158113883  0.324442842  0.376192055  0.484366512
0.719693812  0.737838276  0.758854932  0.781541625  0.83763068
```

```
0.907620383  0.977610085  1.047599788  1.117589491  1.187579194
1.257568896  1.327558599  1.397548302  1.467538004  1.537527707
1.60751741  1.677507113  1.747496815  1.817486518  1.887476221
1.957465924  2.027455626  2.097445329  2.167435032  2.237424735
2.307414437  2.37740414  2.447393843  2.517383546  2.587373248
2.657362951  2.727352654  2.797342356  2.867332059  2.937321762
3.007311465  3.077301167  3.14729087  3.217280573  3.5

1003   # Number of age comp observations using restricted length
ranges ***
2   # Length bin refers to: 1=population length bin indices; 2=data
length bin indices; 3= actual pop? data? lengths match bins?
0 #_combine males into females at or below this bin number
#Year Seas  Fleet Gender      Part
1991  1     1     1     0     1     11    15    0.1   0     0     0
      1     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
1991  1     1     1     0     1     16    19    0.3   0     0     0
      0.8   0.2   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
1991  1     1     1     0     1     20    22    1.4   0     0     0
      0     0.95  0.05  0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
1991  1     1     1     0     1     23    25    1.4   0     0     0
      0     0.047619048 0.571428571 0.285714286 0     0     0     0
      0.047619048 0     0     0     0     0     0     0     0     0
      0     0     0.047619048 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
1991  1     1     1     0     1     26    27    1     0     0     0
      0     0     0     0.357142857 0.285714286 0.142857143 0.071428571
      0.071428571 0     0.071428571 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
1991  1     1     1     0     1     27    28    1.7   0     0     0
      0     0     0.041666667 0.125 0.583333333 0.083333333 0     0
      0.083333333 0     0     0.041666667 0     0     0     0.041666667
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
1991  1     1     1     0     1     28    29    2.8   0     0     0
      0     0     0     0     0.125 0.25  0.275 0.15  0     0.1   0
      0     0     0     0.025 0     0.025 0     0     0     0     0
      0     0.025 0     0     0     0.025 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
1991  1     1     1     0     1     29    30    4.1   0     0     0
      0     0     0     0.016949153 0     0.06779661  0.220338983
      0.152542373 0.050847458 0.118644068 0.050847458 0.033898305 0
      0     0.050847458 0     0     0.016949153 0.050847458 0.016949153
      0.033898305 0.016949153 0     0     0     0.016949153 0
      0.084745763 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
1991  1     1     1     0     1     30    31    2.6   0     0     0
      0     0     0     0     0     0     0.078947368 0.026315789
      0.105263158 0.131578947 0.052631579 0.052631579 0     0.078947368
      0     0.052631579 0     0.026315789 0.078947368 0.026315789
      0.026315789 0     0.026315789 0     0.026315789 0.052631579 0
      0.157894737 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
1991  1     1     1     0     1     31    32    3.9   0     0     0
      0     0     0     0     0     0     0.01754386  0     0.01754386
      0.01754386  0.122807018 0.105263158 0.035087719 0.035087719
      0.052631579 0.035087719 0.052631579 0.070175439 0.01754386
      0.01754386  0.01754386  0.01754386  0.01754386  0.01754386
      0.01754386  0.035087719 0.01754386  0.263157895 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
1991  1     1     1     0     1     32    33    1.7   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.04  0.04  0.04  0.08  0.12  0.04  0.08  0.08  0     0     0
      0.08  0.04  0     0.08  0     0.28  0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
1991  1     1     1     0     1     33    34    1.4   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.05  0     0     0.05  0.05  0     0.1   0.05  0.1
      0.05  0.05  0     0     0.2   0.3   0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
1991  1     1     1     0     1     34    35    0.5   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0.142857143 0     0     0.142857143
      0     0     0.285714286 0     0     0     0     0.428571429 0
      0     0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
1991  1     1     1     0     1     35    36    0.1   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0.5   0.5   0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
1991  1     1     2     0     1     11    15    0.1   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     1     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
1991  1     1     2     0     1     16    19    0.3   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0.8   0.2
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
1991  1     1     2     0     1     20    22    1.4   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0.95
      0.05  0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
1991  1     1     2     0     1     23    25    1.4   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0.047619048 0.571428571 0.285714286 0     0     0     0
      0.047619048 0     0     0     0     0     0     0     0     0
      0     0     0.047619048 0     0     0     0     0     0     0
1991  1     1     2     0     1     26    27    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0.357142857 0.285714286 0.142857143 0.071428571 0.071428571
      0     0.071428571 0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
1991  1     1     2     0     1     27    28    1.7   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.041666667 0.125 0.583333333 0.083333333 0     0     0.083333333
      0     0     0.041666667 0     0     0     0.041666667 0     0
      0     0     0     0     0     0     0     0     0     0
1991  1     1     2     0     1     28    29    2.8   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.125 0.25  0.275 0.15  0     0.1   0     0     0
      0     0.025 0     0.025 0     0     0     0     0     0     0.025
      0     0     0     0.025
1991  1     1     2     0     1     29    30    4.1   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0.016949153 0     0.06779661  0.220338983 0.152542373
      0.050847458 0.118644068 0.050847458 0.033898305 0     0
      0.050847458 0     0     0.016949153 0.050847458 0.016949153
      0.033898305 0.016949153 0     0     0     0.016949153 0
      0.084745763
1991  1     1     2     0     1     30    31    2.6   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0.078947368 0.026315789 0.105263158
      0.131578947 0.052631579 0.052631579 0     0.078947368 0
      0.052631579 0     0.026315789 0.078947368 0.026315789 0.026315789
      0     0.026315789 0     0.026315789 0.052631579 0     0.157894737
1991  1     1     2     0     1     31    32    3.9   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0.01754386  0     0.01754386  0.01754386
      0.122807018 0.105263158 0.035087719 0.035087719 0.052631579
      0.035087719 0.052631579 0.070175439 0.01754386  0.01754386
      0.01754386  0.01754386  0.01754386  0.01754386  0.01754386
      0.035087719 0.01754386  0.263157895
1991  1     1     2     0     1     32    33    1.7   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0.04  0.04
      0.04  0.08  0.12  0.04  0.08  0.08  0     0     0     0.08  0.04
      0     0.08  0     0.28
1991  1     1     2     0     1     33    34    1.4   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.05  0     0     0.05  0.05  0     0.1   0.05  0.1   0.05  0.05
      0     0     0.2   0.3
1991  1     1     2     0     1     34    35    0.5   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0.142857143 0     0     0.142857143 0     0
      0.285714286 0     0     0     0     0.428571429
1991  1     1     2     0     1     35    36    0.1   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.5   0.5
1998  1     1     1     0     1     16    19    1     0     0     0
      0.785714286 0.214285714 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
1998  1     1     1     0     1     20    22    3.3   0     0     0
      0.020833333 0.8125      0.145833333 0.020833333 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
1998  1     1     1     0     1     23    25    2.6   0     0     0
      0     0.243243243 0.594594595 0.081081081 0     0.027027027 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0.027027027 0     0
      0.027027027 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
1998  1     1     1     0     1     26    27    1.9   0     0     0
      0     0     0.142857143 0.428571429 0.25  0.035714286 0.071428571
      0.035714286 0     0     0     0     0     0.035714286 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
1998  1     1     1     0     1     27    28    3.7   0     0     0
      0     0     0.092592593 0.444444444 0.185185185 0.074074074
      0.055555556 0.074074074 0.037037037 0     0     0.018518519 0
      0     0     0.018518519 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0
1998  1     1     1     0     1     28    29    0     0     0     0
      0     0     0.076923077 0.05982906  0.196581197 0.153846154
      0.213675214 0.076923077 0.034188034 0.034188034 0     0.025641026
      0.025641026 0.025641026 0.017094017 0.008547009 0.008547009 0
      0.008547009 0.025641026 0     0     0     0     0.008547009 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
1998  1     1     1     0     1     29    30    0     0     0     0
      0     0     0.032520325 0.016260163 0.040650407 0.130081301
      0.162601626 0.048780488 0.073170732 0.073170732 0.016260163
      0.06504065  0.032520325 0.073170732 0.024390244 0.016260163
      0.040650407 0.032520325 0.024390244 0.024390244 0.016260163 0
      0.008130081 0     0.008130081 0.016260163 0     0.024390244 0
```

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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
1998  1     1     1     0     1     30    31    0     0     0     0
      0     0     0.0078125   0.015625    0.0234375   0.03125
      0.1015625   0.1328125   0.0859375   0.046875    0.046875
      0.03125     0.046875    0.0703125   0.09375     0.0234375
      0.0390625   0.0234375   0.0234375   0.0078125   0.0234375   0
      0.015625    0.015625    0     0.015625    0.0234375   0.0546875
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
1998  1     1     1     0     1     31    32    0     0     0     0
      0     0     0     0     0     0.010416667 0     0.020833333
      0.083333333 0.052083333 0.03125     0.0625      0.114583333
      0.083333333 0.072916667 0.052083333 0.03125     0.03125
      0.020833333 0.020833333 0.041666667 0.020833333 0.020833333 0
      0.041666667 0     0.041666667 0.145833333 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0
1998  1     1     1     0     1     32    33    5.3   0     0     0
      0     0     0     0     0.038961039 0.012987013 0.012987013
      0.025974026 0     0.025974026 0.025974026 0.051948052 0.051948052
      0.064935065 0.064935065 0.103896104 0.025974026 0.038961039
      0.025974026 0.051948052 0.064935065 0.051948052 0.012987013
      0.012987013 0     0.025974026 0     0.207792208 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
1998  1     1     1     0     1     33    34    3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0.045454545 0.022727273 0.090909091 0     0.068181818
      0.022727273 0     0.068181818 0.022727273 0.045454545 0.022727273
      0     0.045454545 0.159090909 0     0.386363636 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
1998  1     1     1     0     1     34    35    0.8   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0.090909091 0     0     0.090909091 0     0     0.818181818 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
1998  1     1     1     0     1     35    36    0.5   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.142857143 0     0     0     0     0     0.142857143
      0.142857143 0     0     0     0     0     0     0.571428571 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
1998  1     1     1     0     1     36    37    0.1   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     1     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
1998  1     1     2     0     1     16    19    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0.785714286
      0.214285714 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
1998  1     1     2     0     1     20    22    3.3   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0.020833333
      0.8125      0.145833333 0.020833333 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
1998  1     1     2     0     1     23    25    2.6   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0.243243243 0.594594595 0.081081081 0     0.027027027 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0.027027027 0     0     0.027027027
1998  1     1     2     0     1     26    27    1.9   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.142857143 0.428571429 0.25  0.035714286 0.071428571 0.035714286
      0     0     0     0     0     0.035714286 0     0     0     0
      0     0     0     0     0     0     0     0     0     0
1998  1     1     2     0     1     27    28    3.7   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.092592593 0.444444444 0.185185185 0.074074074 0.055555556
      0.074074074 0.037037037 0     0     0.018518519 0     0     0
      0.018518519 0     0     0     0     0     0     0     0     0
      0     0     0
1998  1     1     2     0     1     28    29    0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.076923077 0.05982906  0.196581197 0.153846154 0.213675214
      0.076923077 0.034188034 0.034188034 0     0.025641026 0.025641026
      0.025641026 0.017094017 0.008547009 0.008547009 0     0.008547009
      0.025641026 0     0     0     0     0.008547009 0     0     0
1998  1     1     2     0     1     29    30    0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.032520325 0.016260163 0.040650407 0.130081301 0.162601626
```

```
      0.048780488 0.073170732 0.073170732 0.016260163 0.06504065
      0.032520325 0.073170732 0.024390244 0.016260163 0.040650407
      0.032520325 0.024390244 0.024390244 0.016260163 0     0.008130081
      0     0.008130081 0.016260163 0     0.024390244
1998  1     1     2     0     1     30    31    0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.0078125   0.015625    0.0234375   0.03125     0.1015625
      0.1328125   0.0859375   0.046875    0.046875    0.03125
      0.046875    0.0703125   0.09375     0.0234375   0.0390625
      0.0234375   0.0234375   0.0078125   0.0234375   0     0.015625
      0.015625    0     0.015625    0.0234375   0.0546875
1998  1     1     2     0     1     31    32    0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0.010416667 0     0.020833333 0.083333333
      0.052083333 0.03125     0.0625      0.114583333 0.083333333
      0.072916667 0.052083333 0.03125     0.03125     0.020833333
      0.020833333 0.041666667 0.020833333 0.020833333 0     0.041666667
      0     0.041666667 0.145833333
1998  1     1     2     0     1     32    33    5.3   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.038961039 0.012987013 0.012987013 0.025974026 0
      0.025974026 0.025974026 0.051948052 0.051948052 0.064935065
      0.064935065 0.103896104 0.025974026 0.038961039 0.025974026
      0.051948052 0.064935065 0.051948052 0.012987013 0.012987013 0
      0.025974026 0     0.207792208
1998  1     1     2     0     1     33    34    3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0.045454545 0.022727273 0.090909091 0     0.068181818 0.022727273
      0     0.068181818 0.022727273 0.045454545 0.022727273 0
      0.045454545 0.159090909 0     0.386363636
1998  1     1     2     0     1     34    35    0.8   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0.090909091 0
      0     0.090909091 0     0     0.818181818
1998  1     1     2     0     1     35    36    0.5   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.142857143 0     0     0     0     0     0.142857143 0.142857143
      0     0     0     0     0     0     0.571428571
```

```
1998  1     1     2     0     1     36    37    0.1   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     1
2003  1     1     1     0     1     11    15    2.6   0     0
      0.647058824 0.294117647 0.058823529 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2003  1     1     1     0     1     16    19    7.8   0     0     0
      0.762711864 0.220338983 0.016949153 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2003  1     1     1     0     1     20    22    3.9   0     0     0
      0.173913043 0.695652174 0.086956522 0.043478261 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2003  1     1     1     0     1     23    25    6.4   0     0     0
      0     0.648648649 0.054054054 0.189189189 0.108108108 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2003  1     1     1     0     1     26    27    13.5  0     0     0
      0     0.096153846 0.211538462 0.269230769 0.25  0.096153846
      0.057692308 0.019230769 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2003  1     1     1     0     1     27    28    18.4  0     0     0
      0     0.037037037 0.234567901 0.222222222 0.296296296 0.074074074
      0.024691358 0.037037037 0.012345679 0.012345679 0     0
      0.024691358 0.012345679 0     0     0     0     0.012345679 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2003  1     1     1     0     1     28    29    42.4  0     0     0
      0     0.025089606 0.078853047 0.150537634 0.365591398 0.150537634
      0.05734767  0.010752688 0.003584229 0.025089606 0.003584229
      0.021505376 0.003584229 0.017921147 0.025089606 0.014336918
```

```
      0.007168459 0.017921147 0.003584229 0.003584229 0     0.003584229
      0     0.007168459 0.003584229 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2003  1     1     1     0     1     29    30    46.6  0     0     0
      0     0.007672634 0.025575448 0.145780051 0.301790281 0.217391304
      0.076726343 0.043478261 0.046035806 0.002557545 0.007672634
      0.007672634 0.007672634 0.007672634 0.010230179 0.00511509
      0.017902813 0.012787724 0.010230179 0.00511509  0.002557545
      0.002557545 0.00511509  0.002557545 0.007672634 0     0
      0.020460358 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2003  1     1     1     0     1     30    31    43.8  0     0     0
      0     0.006896552 0.006896552 0.044827586 0.186206897 0.275862069
      0.075862069 0.089655172 0.062068966 0.031034483 0.037931034
      0.006896552 0.04137931  0.020689655 0.020689655 0.027586207
      0.013793103 0     0     0     0.003448276 0.003448276 0.020689655
      0.006896552 0.003448276 0     0     0.013793103 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2003  1     1     1     0     1     31    32    36.2  0     0     0
      0     0.005102041 0     0     0.06122449  0.030612245 0.06122449
      0.081632653 0.020408163 0.035714286 0.12755102  0.020408163
      0.06122449  0.076530612 0.081632653 0.066326531 0     0.015306122
      0.045918367 0.040816327 0.010204082 0.025510204 0.045918367 0
      0.005102041 0     0     0.081632653 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     1     1     0     1     32    33    29.4  0     0     0
      0     0.005882353 0     0     0     0.011764706 0.023529412
      0.023529412 0.023529412 0.035294118 0.070588235 0.011764706
      0.035294118 0.082352941 0.094117647 0.058823529 0.064705882
      0.035294118 0.082352941 0.070588235 0.058823529 0.052941176
      0.035294118 0     0.011764706 0.017647059 0     0.094117647 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2003  1     1     1     0     1     33    34    23.1  0     0     0
      0     0     0     0     0     0     0     0.013422819 0     0
      0     0     0     0.026845638 0.040268456 0.013422819 0.026845638
      0.013422819 0.053691275 0.174496644 0.026845638 0.080536913
      0.067114094 0.013422819 0.026845638 0.013422819 0.067114094
      0.342281879 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2003  1     1     1     0     1     34    35    15    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0.03125     0
      0.09375     0.03125     0.03125     0.0625      0     0.03125
      0.71875     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2003  1     1     1     0     1     35    36    10    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0.076923077 0     0.076923077 0     0     0     0.846153846 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2003  1     1     1     0     1     36    37    2.8   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     1     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     1     2     0     1     11    15    2.3   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0.473684211
      0.473684211 0.052631579 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2003  1     1     2     0     1     16    19    9.9   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0.070588235
      0.788235294 0.129411765 0.011764706 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2003  1     1     2     0     1     20    22    2.3   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0.105263158
      0.842105263 0     0.052631579 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2003  1     1     2     0     1     23    25    12.1  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0.033898305
      0.576271186 0.13559322  0.220338983 0.033898305 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2003  1     1     2     0     1     26    27    18.7  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0.014705882 0.25  0.441176471 0.161764706 0.102941176 0.014705882
      0.014705882 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2003  1     1     2     0     1     27    28    39    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0
      0.018867925 0.194968553 0.364779874 0.176100629 0.150943396
      0.025157233 0.018867925 0.006289308 0.006289308 0.012578616 0
      0     0.018867925 0     0     0     0     0.006289308 0     0
      0     0     0     0     0     0     0
2003  1     1     2     0     1     28    29    76.9  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0.013435701 0.042226488 0.211132438 0.307101727 0.184261036
      0.076775432 0.013435701 0.013435701 0.009596929 0.013435701
      0.011516315 0.009596929 0.032629559 0.021113244 0.011516315 0
      0.013435701 0.001919386 0.005758157 0     0.001919386 0
      0.003838772 0.001919386 0     0     0
2003  1     1     2     0     1     29    30    71.8  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0.006711409 0.004474273 0.082774049 0.161073826 0.149888143
      0.067114094 0.060402685 0.058165548 0.024608501 0.03803132
      0.03803132  0.020134228 0.042505593 0.035794183 0.017897092
      0.020134228 0.024608501 0.031319911 0.026845638 0.020134228
      0.006711409 0.008948546 0.002237136 0.011185682 0.008948546 0
      0.031319911
2003  1     1     2     0     1     30    31    57    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0.007246377 0     0.010869565 0.028985507 0.028985507 0.036231884
      0.014492754 0.036231884 0.018115942 0.047101449 0.050724638
      0.014492754 0.072463768 0.043478261 0.057971014 0.028985507
      0.043478261 0.065217391 0.065217391 0.06884058  0.061594203
      0.043478261 0.028985507 0.018115942 0.028985507 0     0.079710145
2003  1     1     2     0     1     31    32    25.9  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0.011627907 0     0     0     0.023255814 0     0     0
      0.011627907 0.011627907 0.023255814 0     0.034883721 0
      0.034883721 0     0.011627907 0.058139535 0.023255814 0
      0.034883721 0.058139535 0.069767442 0.034883721 0.046511628 0
      0.511627907
2003  1     1     2     0     1     32    33    11.5  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0.027777778 0     0     0     0     0     0     0     0     0
      0     0     0     0.055555556 0     0.027777778 0     0
      0.055555556 0     0.138888889 0     0     0.055555556 0.027777778
      0     0.611111111
2003  1     1     2     0     1     33    34    3.6   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0.222222222 0     0     0     0     0
      0     0     0     0     0.777777778
2003  1     1     2     0     1     34    35    0.3   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     1
2003  1     1     2     0     1     36    37    0.2   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.666666667 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0.333333333
2004  1     1     1     0     1     23    25    7.1   0     0     0
      0     0.064516129 0.64516129  0.161290323 0     0.064516129
      0.064516129 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
2004  1     1     1     0     1     26    27    13    0     0     0
      0     0.148148148 0.518518519 0.111111111 0.185185185 0     0
      0     0.037037037 0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2004  1     1     1     0     1     27    28    15    0     0     0
      0     0.111111111 0.444444444 0.148148148 0.148148148 0.148148148
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2004  1     1     1     0     1     28    29    26    0     0     0
      0     0.044444444 0.133333333 0.277777778 0.311111111 0.155555556
      0.055555556 0.011111111 0     0.011111111 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0
2004  1     1     1     0     1     29    30    29    0     0     0
      0     0     0     0.131147541 0.270491803 0.360655738 0.163934426
      0.049180328 0.008196721 0     0     0     0.008196721 0     0
      0     0     0     0.008196721 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0
```

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2004  1     1     1     0     1     30    31    27    0     0     0
      0     0     0.01010101  0.01010101  0.171717172 0.242424242
      0.272727273 0.151515152 0.050505051 0.03030303  0.03030303
      0.01010101  0     0     0     0.01010101  0     0     0     0
      0.01010101  0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2004  1     1     1     0     1     31    32    24    0     0     0
      0     0     0     0     0.014705882 0.161764706 0.220588235
      0.117647059 0.073529412 0.073529412 0.058823529 0.044117647
      0.044117647 0.029411765 0.058823529 0.029411765 0     0.014705882
      0.014705882 0     0.014705882 0.014705882 0     0     0     0
      0     0.014705882 0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0
2004  1     1     1     0     1     32    33    16    0     0     0
      0     0     0     0     0     0.022727273 0     0     0.068181818
      0.045454545 0.045454545 0.068181818 0.068181818 0.045454545
      0.068181818 0.045454545 0.068181818 0.068181818 0.090909091
      0.090909091 0     0.045454545 0.068181818 0     0     0.022727273
      0.022727273 0.045454545 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0
2004  1     1     1     0     1     33    34    19    0     0     0
      0     0     0     0     0     0     0.021276596 0     0
      0.042553191 0     0     0.021276596 0.106382979 0.106382979
      0.021276596 0     0.042553191 0.063829787 0     0.021276596
      0.063829787 0.063829787 0.063829787 0     0.021276596 0.021276596
      0.319148936 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2004  1     1     1     0     1     34    35    15    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.05  0     0     0     0     0     0     0     0.1
      0     0     0     0     0.05  0.8   0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     1     1     0     1     35    36    4     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     1     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     1     1     0     1     36    37    2.7   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0.2   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0.8   0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     1     2     0     1     23    25    13.9  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0.035087719
      0.140350877 0.631578947 0.122807018 0.070175439 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2004  1     1     2     0     1     26    27    24.9  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0.046511628 0.348837209 0.418604651 0.139534884 0.023255814 0
      0     0     0.023255814 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2004  1     1     2     0     1     27    28    31.3  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0.037735849 0.169811321 0.320754717 0.301886792 0.056603774
      0.037735849 0.037735849 0     0     0     0.018867925 0     0
      0     0     0.018867925 0     0     0     0     0     0     0
      0     0     0     0
2004  1     1     2     0     1     28    29    57.8  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.037433155 0.165775401 0.219251337 0.278074866 0.181818182
      0.064171123 0.016042781 0.021390374 0.005347594 0     0
      0.005347594 0     0     0     0.005347594 0     0     0     0
      0     0     0     0     0     0
2004  1     1     2     0     1     29    30    53    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.013157895 0.039473684 0.164473684 0.197368421 0.184210526
      0.131578947 0.039473684 0.026315789 0.026315789 0.006578947
      0.013157895 0.013157895 0.026315789 0.026315789 0.006578947
      0.019736842 0.013157895 0.019736842 0.006578947 0     0
      0.006578947 0     0.006578947 0     0.013157895
2004  1     1     2     0     1     30    31    35.5  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.057971014 0.086956522 0.072463768 0.072463768
      0.057971014 0.086956522 0.057971014 0.014492754 0.043478261 0
      0.130434783 0.072463768 0.014492754 0.014492754 0     0
      0.028985507 0.028985507 0.028985507 0.028985507 0     0.014492754
      0.014492754 0.072463768
2004  1     1     2     0     1     31    32    14.2  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0.043478261 0     0     0     0     0.043478261 0
      0.086956522 0     0     0     0.086956522 0.086956522 0.043478261
      0.086956522 0     0.043478261 0.130434783 0     0.043478261 0
      0.043478261 0.043478261 0.217391304
2004  1     1     2     0     1     32    33    2.6   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0.25  0     0.25
      0     0     0     0.5
2004  1     1     2     0     1     33    34    0.1   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     1
2004  1     1     2     0     1     34    35    1.3   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0.5   0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0.5
2005  1     1     1     0     1     16    19    0.1   0     0     0
      0.8   0.2   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     1     1     0     1     20    22    2.9   0     0     0
      0     0.818181818 0.181818182 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2005  1     1     1     0     1     23    25    13.8  0     0     0
      0     0.135416667 0.6875    0.15625   0.020833333 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2005  1     1     1     0     1     26    27    11.7  0     0     0
      0     0     0.459459459 0.486486486 0.027027027 0.027027027 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
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2005  1     1     1     0     1     27    28    12    0     0     0
      0     0     0.164179104 0.671641791 0.074626866 0.029850746
      0.029850746 0.029850746 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2005  1     1     1     0     1     28    29    25.4  0     0     0
      0     0     0.125 0.383928571 0.214285714 0.116071429 0.116071429
      0.017857143 0.017857143 0     0     0     0     0.008928571 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2005  1     1     1     0     1     29    30    29.3  0     0     0
      0     0     0     0.115853659 0.280487805 0.323170732 0.158536585
      0.06097561  0     0.012195122 0     0.012195122 0.024390244 0
      0     0     0     0     0     0     0     0.012195122 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0
2005  1     1     1     0     1     30    31    22.5  0     0     0
      0     0     0     0.012738854 0.21656051  0.152866242 0.25477707
      0.21656051  0.031847134 0.025477707 0.012738854 0     0.012738854
      0.025477707 0.012738854 0     0     0.012738854 0     0
      0.006369427 0     0     0     0     0     0     0.006369427 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2005  1     1     1     0     1     31    32    24.3  0     0     0
      0     0     0     0     0.043478261 0.108695652 0.065217391
      0.152173913 0.02173913  0.130434783 0.02173913  0.054347826
      0.086956522 0.152173913 0.032608696 0.043478261 0.02173913
      0.02173913  0     0     0     0.02173913  0     0     0     0
      0     0.02173913  0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0
2005  1     1     1     0     1     32    33    17.1  0     0     0
      0     0     0     0     0     0.071428571 0.035714286 0.071428571
      0     0.035714286 0.035714286 0.035714286 0.071428571 0.035714286
      0.142857143 0.071428571 0.017857143 0     0.035714286 0.107142857
      0.035714286 0.107142857 0     0     0.035714286 0.035714286 0
      0.017857143 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2005  1     1     1     0     1     33    34    17    0     0     0
      0     0     0     0     0     0     0     0     0     0.057142857
      0.028571429 0.028571429 0     0     0.057142857 0.085714286
      0.057142857 0.085714286 0.028571429 0     0.142857143 0.028571429
      0     0     0.085714286 0.057142857 0     0.257142857 0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2005  1     1     1     0     1     34    35    9     0     0     0
      0     0     0     0     0     0     0     0.055555556 0     0
      0     0     0     0     0.055555556 0     0.055555556 0.055555556
      0.055555556 0     0     0.055555556 0.055555556 0.055555556
      0.055555556 0     0.055555556 0.444444444 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0
2005  1     1     1     0     1     35    36    5     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0.076923077 0.076923077 0
      0.076923077 0.076923077 0     0     0.153846154 0     0
      0.538461538 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2005  1     1     1     0     1     36    37    4.8   0     0     0
      0     0     0     0     0.166666667 0     0     0     0     0
      0     0     0     0     0     0     0     0     0.166666667 0
      0     0     0     0     0     0     0     0.666666667 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2005  1     1     2     0     1     16    19    1.3   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0.8   0.2
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     1     2     0     1     20    22    4.3   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0.060606061
      0.757575758 0.181818182 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2005  1     1     2     0     1     23    25    22.3  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0.066037736 0.754716981 0.160377358 0.018867925 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2005  1     1     2     0     1     26    27    18.1  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.318181818 0.545454545 0.090909091 0.045454545 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2005  1     1     2     0     1     27    28    20.3  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.194805195 0.480519481 0.142857143 0.103896104 0.077922078 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2005  1     1     2     0     1     28    29    44.3  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.036036036 0.220720721 0.252252252 0.112612613 0.121621622
      0.108108108 0.018018018 0.009009009 0     0.027027027 0
      0.022522523 0.009009009 0.027027027 0.009009009 0     0.009009009
      0.009009009 0.009009009 0     0     0     0     0     0     0
2005  1     1     2     0     1     29    30    47.4  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.015873016 0.05952381  0.111111111 0.234126984 0.103174603
      0.079365079 0.047619048 0.015873016 0.055555556 0.015873016
      0.031746032 0.031746032 0.007936508 0.031746032 0.03968254
      0.03968254  0.007936508 0.015873016 0.023809524 0.015873016
      0.007936508 0     0     0.007936508 0     0
2005  1     1     2     0     1     30    31    32.5  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.016260163 0.016260163 0.113821138 0.048780488
      0.024390244 0.048780488 0.016260163 0     0.06504065  0.016260163
      0.048780488 0.032520325 0.032520325 0.048780488 0.032520325
      0.048780488 0.056910569 0.06504065  0.097560976 0.06504065
      0.016260163 0.048780488 0.016260163 0.024390244
2005  1     1     2     0     1     31    32    20.4  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.0625      0.03125     0     0.09375     0.03125
      0     0.03125     0.046875    0     0     0.015625    0.0625
      0.0625      0     0.0625      0     0.0625      0     0.0625
      0.03125     0     0.03125     0     0.3125
2005  1     1     2     0     1     32    33    8.1   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0.066666667
      0     0     0.066666667 0     0.1   0     0     0.066666667 0
      0.066666667 0.066666667 0     0     0     0     0.566666667
2005  1     1     2     0     1     33    34    1.7   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0.2   0
      0     0     0.2   0     0.2   0     0     0     0     0     0
      0     0     0     0.4
```

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2005  1     1     2     0     1     34    35    0.4   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.333333333 0.333333333 0     0     0     0     0
      0     0.333333333 0     0     0     0
2005  1     1     2     0     1     35    36    0.1   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     1     0
2005  1     1     2     0     1     36    37    0.1   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     1
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     1     1     0     1     20    22    0.1   0     0     0
      0     0     1     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     1     1     0     1     23    25    8.6   0     0     0
      0     0     0.228571429 0.6   0.114285714 0.057142857 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2006  1     1     1     0     1     26    27    19.4  0     0     0
      0     0     0.048780488 0.597560976 0.280487805 0.073170732 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2006  1     1     1     0     1     27    28    23.8  0     0     0
      0     0     0.037974684 0.35443038  0.443037975 0.126582278
      0.012658228 0.012658228 0     0     0     0     0     0
      0.012658228 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0
2006  1     1     1     0     1     28    29    40.6  0     0     0
      0     0     0.006329114 0.186708861 0.386075949 0.208860759
      0.088607595 0.047468354 0.041139241 0.003164557 0     0
      0.006329114 0.006329114 0     0.006329114 0     0.006329114 0
```

```
      0     0.006329114 0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2006  1     1     1     0     1     29    30    40.1  0     0     0
      0     0     0     0.083333333 0.148148148 0.296296296 0.115740741
      0.12037037  0.074074074 0.046296296 0.027777778 0     0.023148148
      0     0.018518519 0.018518519 0.013888889 0.00462963  0     0
      0     0     0.009259259 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2006  1     1     1     0     1     30    31    40.7  0     0     0
      0     0     0     0.008547009 0.064102564 0.094017094 0.158119658
      0.162393162 0.141025641 0.132478632 0.025641026 0.02991453
      0.047008547 0.021367521 0.034188034 0.008547009 0.008547009
      0.025641026 0.004273504 0     0     0     0.008547009 0.004273504
      0     0     0     0.021367521 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0
2006  1     1     1     0     1     31    32    31.3  0     0     0
      0     0     0     0.013422819 0.013422819 0.053691275 0
      0.10738255  0.127516779 0.093959732 0.060402685 0.020134228
      0.053691275 0.040268456 0.073825503 0.127516779 0.053691275
      0.006711409 0.033557047 0.020134228 0.020134228 0     0.026845638
      0.013422819 0     0     0     0.040268456 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0
2006  1     1     1     0     1     32    33    22.5  0     0     0
      0     0     0     0     0     0     0     0.018348624 0.036697248
      0.027522936 0.036697248 0.064220183 0.100917431 0.036697248
      0.110091743 0.064220183 0.055045872 0     0.073394495 0.027522936
      0.036697248 0.064220183 0.027522936 0.055045872 0.036697248
      0.018348624 0.036697248 0.073394495 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     1     1     0     1     33    34    14.5  0     0     0
      0     0     0     0     0     0     0     0     0     0.028985507
      0     0     0.028985507 0.014492754 0.028985507 0.028985507
      0.057971014 0.072463768 0     0.072463768 0     0.057971014
      0.144927536 0.057971014 0.057971014 0.101449275 0.057971014
      0.188405797 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2006  1     1     1     0     1     34    35    6.2   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.095238095 0     0     0.095238095 0     0     0
      0.095238095 0     0.095238095 0.095238095 0.095238095 0.047619048 0
      0.142857143 0.333333333 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

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      0     0     0     0     0     0     0     0     0     0     0
      0     0
2006  1     1     1     0     1     35    36    3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0.2
      0     0     0     0     0.2   0.6   0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     1     1     0     1     36    37    0.2   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     1     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     1     2     0     1     20    22    0.3   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.5   0.5   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     1     2     0     1     23    25    14.5  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.31372549  0.333333333 0.352941176 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2006  1     1     2     0     1     26    27    34.2  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.027027027 0.371621622 0.304054054 0.189189189 0.054054054
      0.013513514 0.013513514 0.013513514 0.013513514 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0
2006  1     1     2     0     1     27    28    40.9  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.00990099  0.297029703 0.356435644 0.227722772 0.02970297
      0.00990099  0.04950495  0     0.00990099  0.00990099  0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0
2006  1     1     2     0     1     28    29    65.3  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0.122159091 0.306818182 0.215909091 0.079545455 0.133522727
      0.059659091 0.042613636 0     0.005681818 0.011363636 0
      0.005681818 0.005681818 0     0     0.005681818 0.005681818 0
      0     0     0     0     0     0     0
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2006  1     1     2     0     1     29    30    55.6  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.007042254 0.056338028 0.035211268 0.133802817 0.116197183
      0.154929577 0.126760563 0.077464789 0.042253521 0.028169014
      0.031690141 0.021126761 0.007042254 0.035211268 0.045774648
      0.01056338  0     0.021126761 0.014084507 0.007042254 0.007042254
      0.014084507 0     0.007042254 0     0
2006  1     1     2     0     1     30    31    35.1  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.022727273 0.015151515 0.037878788 0.060606061
      0.159090909 0.022727273 0.060606061 0.007575758 0.068181818
      0.083333333 0.090909091 0.045454545 0.03030303  0.015151515
      0.037878788 0     0.03030303  0.015151515 0.075757576 0.022727273
      0.015151515 0     0     0.083333333
2006  1     1     2     0     1     31    32    18.8  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0.028985507 0     0.028985507 0.043478261
      0.028985507 0.072463768 0.014492754 0.086956522 0.028985507
      0.014492754 0.072463768 0.057971014 0.043478261 0.043478261
      0.101449275 0.072463768 0     0.057971014 0.028985507 0.057971014
      0     0.028985507 0.086956522
2006  1     1     2     0     1     32    33    6.4   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0.095238095 0.047619048 0
      0.047619048 0.047619048 0     0     0.047619048 0.095238095 0
      0     0.047619048 0.095238095 0.047619048 0.047619048 0.095238095
      0     0.19047619  0     0.095238095
2006  1     1     2     0     1     33    34    0.6   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.111111111 0     0     0     0.111111111 0     0.111111111 0
      0     0     0     0     0.333333333 0     0.333333333
2006  1     1     2     0     1     34    35    0.3   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0.4   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.2   0     0.2   0.2
2006  1     1     2     0     1     36    37    0.1   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     1
2007  1     1     1     0     1     20    22    0     0     0     0
      0     0     1     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     1     1     0     1     23    25    5     0     0     0
      0     0     0.2   0.6   0.2   0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     1     1     0     1     26    27    23    0     0     0
      0     0     0.03030303  0.242424242 0.363636364 0.242424242
      0.060606061 0.03030303  0.03030303  0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0
2007  1     1     1     0     1     27    28    33    0     0     0
      0     0     0.04109589  0.328767123 0.246575342 0.287671233
      0.04109589  0.04109589  0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0.01369863  0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0
2007  1     1     1     0     1     28    29    64    0     0     0
      0     0     0     0.116666667 0.46  0.27  0.093333333 0.04  0
      0.013333333 0     0.003333333 0     0.003333333 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2007  1     1     1     0     1     29    30    62    0     0     0
      0     0     0     0.026315789 0.271929825 0.337719298 0.171052632
      0.070175439 0.057017544 0.035087719 0.01754386  0     0
      0.004385965 0     0.004385965 0     0     0.004385965 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0
2007  1     1     1     0     1     30    31    46    0     0     0
      0     0     0     0.008403361 0.067226891 0.12605042  0.218487395
      0.201680672 0.12605042  0.12605042  0.042016807 0.025210084
      0.008403361 0.025210084 0.008403361 0     0     0     0.008403361
      0     0.008403361 0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2007  1     1     1     0     1     31    32    50    0     0     0
      0     0     0     0     0.008130081 0.073170732 0.048780488
      0.105691057 0.138211382 0.105691057 0.06504065  0.048780488
      0.040650407 0.048780488 0.040650407 0.040650407 0.032520325
      0.048780488 0.032520325 0.024390244 0.024390244 0.008130081
      0.024390244 0.008130081 0.008130081 0.008130081 0.016260163 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2007  1     1     1     0     1     32    33    38    0     0     0
      0     0     0     0     0     0.011363636 0.011363636 0.011363636
      0.034090909 0.079545455 0.034090909 0.068181818 0.102272727
      0.045454545 0.102272727 0.102272727 0.068181818 0.056818182
      0.034090909 0.056818182 0.045454545 0     0.011363636 0.034090909
      0.045454545 0.034090909 0.011363636 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0
2007  1     1     1     0     1     33    34    35    0     0     0
      0     0     0     0     0     0.041666667 0     0.013888889 0
      0.013888889 0.013888889 0.013888889 0     0.027777778 0.055555556
      0.055555556 0.083333333 0.069444444 0.083333333 0.013888889
      0.027777778 0.069444444 0.069444444 0.027777778 0.069444444
      0.055555556 0.027777778 0.166666667 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     1     1     0     1     34    35    26    0     0     0
      0     0     0     0     0     0     0     0     0     0.01754386
      0     0     0     0.01754386  0     0.035087719 0     0.035087719
      0.01754386  0.035087719 0     0.105263158 0.035087719 0.105263158
      0.035087719 0.070175439 0.070175439 0.421052632 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2007  1     1     1     0     1     35    36    6     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0.071428571 0     0     0
      0.071428571 0.071428571 0.071428571 0     0.285714286 0.071428571
      0.357142857 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2007  1     1     1     0     1     36    37    9.2   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0.111111111 0.111111111 0     0     0.777777778 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2007  1     1     2     0     1     23    25    15    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0.181818182 0.590909091 0.136363636 0.045454545 0.045454545 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2007  1     1     2     0     1     26    27    49.8  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.042253521 0.23943662  0.422535211 0.197183099 0.028169014
      0.056338028 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0.014084507 0     0
      0
2007  1     1     2     0     1     27    28    64.3  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0.189189189 0.405405405 0.261261261 0.081081081 0.036036036
      0.027027027 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
2007  1     1     2     0     1     28    29    95.9  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0.064935065 0.277056277 0.333333333 0.125541126 0.086580087
      0.038961039 0.038961039 0.008658009 0.008658009 0.004329004
      0.004329004 0.004329004 0.004329004 0     0     0     0     0
      0     0     0     0     0     0     0
2007  1     1     2     0     1     29    30    85.3  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0.023668639 0.071005917 0.112426036 0.124260355 0.136094675
      0.106508876 0.088757396 0.023668639 0.041420118 0.023668639
      0.023668639 0.029585799 0.029585799 0.035502959 0.029585799
      0.029585799 0.01183432  0.00591716  0.00591716  0.017751479
      0.01183432  0     0     0.00591716  0.01183432
2007  1     1     2     0     1     30    31    57.7  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.024793388 0.033057851 0.05785124  0.090909091
      0.05785124  0.090909091 0.082644628 0.049586777 0.024793388
      0.033057851 0.066115702 0.05785124  0.024793388 0.049586777
      0.024793388 0.049586777 0.05785124  0.008264463 0.041322314
      0.008264463 0.016528926 0.016528926 0.016528926 0.016528926
2007  1     1     2     0     1     31    32    29.9  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.01754386  0     0.01754386  0     0.070175439
      0.01754386  0.01754386  0     0.035087719 0.01754386  0.052631579
      0.052631579 0.035087719 0.052631579 0     0.070175439 0.01754386
      0.052631579 0.140350877 0.01754386  0.035087719 0.052631579
      0.01754386  0.210526316
```

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2007  1     1     2     0     1     32    33    19.4  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.04  0.04  0.04  0.04  0     0     0     0.08  0.04
      0.04  0     0     0.68
2007  1     1     2     0     1     33    34    2.4   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.333333333 0.666666667
2007  1     1     2     0     1     34    35    0.1   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     1
2008  1     1     1     0     1     16    19    1     0     0     0
      0.125 0.875 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     1     1     0     1     20    22    2     0     0     0
      0     0.5   0.375 0     0.125 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     1     1     0     1     23    25    7     0     0     0
      0     0     0.1   0.5   0.3   0.1   0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     1     1     0     1     26    27    16    0     0     0
      0     0     0     0.125 0.375 0.25  0.208333333 0.041666667 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2008  1     1     1     0     1     27    28    28    0     0     0
      0     0     0     0.066666667 0.3   0.416666667 0.15  0.016666667
      0.033333333 0.016666667 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2008  1     1     1     0     1     28    29    53    0     0.007874016
      0     0     0     0     0.019685039 0.216535433 0.42519685
      0.216535433 0.086614173 0.023622047 0     0     0     0.003937008
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0
2008  1     1     1     0     1     29    30    53    0     0     0
      0     0     0     0.00456621  0.118721461 0.296803653 0.264840183
      0.159817352 0.063926941 0.03196347  0.02283105  0.01826484  0
      0.00456621  0     0.00456621  0     0     0.00456621  0.00456621
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2008  1     1     1     0     1     30    31    47    0     0     0
      0     0     0     0     0.035714286 0.125 0.151785714 0.142857143
      0.098214286 0.142857143 0.133928571 0.071428571 0.035714286 0
      0.008928571 0     0.008928571 0.026785714 0     0     0.008928571
      0     0     0     0     0.008928571 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2008  1     1     1     0     1     31    32    32    0     0     0
      0     0     0     0     0     0.011111111 0.011111111 0.155555556
      0.066666667 0.088888889 0.177777778 0.044444444 0.044444444
      0.077777778 0.033333333 0.033333333 0.011111111 0.044444444
      0.022222222 0.022222222 0.011111111 0.011111111 0.011111111
      0.033333333 0.022222222 0.011111111 0.022222222 0.033333333 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2008  1     1     1     0     1     32    33    28    0     0     0
      0     0     0     0     0     0     0.013888889 0.055555556
      0.041666667 0.027777778 0.041666667 0.013888889 0.027777778
      0.041666667 0.097222222 0.041666667 0.069444444 0.069444444
      0.055555556 0.083333333 0.041666667 0.041666667 0.027777778
      0.013888889 0.013888889 0.041666667 0.013888889 0.125 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2008  1     1     1     0     1     33    34    28    0     0     0
      0     0     0     0     0     0     0     0     0     0
      0.02739726  0.02739726  0.068493151 0.02739726  0     0.02739726
      0.04109589  0.02739726  0.04109589  0.082191781 0.082191781
      0.02739726  0.082191781 0.054794521 0.095890411 0.054794521
      0.054794521 0.178082192 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0
```

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2008  1     1     1     0     1     34    35    17    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.027027027 0.027027027 0.081081081 0     0.027027027
      0.027027027 0.027027027 0.027027027 0.054054054 0.027027027 0.054054054
      0.081081081 0.027027027 0.054054054 0.081081081 0.405405405 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2008  1     1     1     0     1     35    36    12    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0.055555556 0.055555556 0
      0     0.055555556 0.166666667 0     0     0     0     0.666666667
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2008  1     1     1     0     1     36    37    2.4   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     1     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     1     2     0     1     11    15    0.1   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     1     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     1     2     0     1     16    19    0.4   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0.333333333
      0.666666667 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2008  1     1     2     0     1     20    22    2.4   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0.6
      0.4   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     1     2     0     1     23    25    9.9   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.285714286 0.571428571 0     0.142857143 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2008  1     1     2     0     1     26    27    33.2  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

```
      0.019230769 0.173076923 0.326923077 0.288461538 0.192307692 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2008  1     1     2     0     1     27    28    51.4  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0.048076923 0.326923077 0.375 0.182692308 0.048076923
      0.019230769 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
2008  1     1     2     0     1     28    29    89.2  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0.024193548 0.161290323 0.370967742 0.189516129 0.112903226
      0.032258065 0.048387097 0.016129032 0.008064516 0.004032258
      0.012096774 0     0     0     0.004032258 0.004032258 0     0
      0.004032258 0     0.004032258 0     0.004032258 0     0
2008  1     1     2     0     1     29    30    71.2  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0.00621118  0.01863354  0.080745342 0.167701863 0.093167702
      0.155279503 0.111801242 0.093167702 0.062111801 0.049689441
      0.02484472  0.01242236  0.00621118  0.01863354  0.00621118
      0.01863354  0.01863354  0.01863354  0.01242236  0.00621118
      0.00621118  0     0.00621118  0     0.00621118
2008  1     1     2     0     1     30    31    54.2  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.009708738 0.029126214 0.077669903 0.038834951
      0.048543689 0.155339806 0.058252427 0.019417476 0.048543689
      0.067961165 0.009708738 0.067961165 0.048543689 0.048543689
      0.019417476 0.029126214 0.019417476 0.038834951 0.009708738
      0.019417476 0.029126214 0.029126214 0.009708738 0.067961165
2008  1     1     2     0     1     31    32    22.6  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0.041666667 0.020833333 0.041666667
      0.020833333 0.041666667 0.020833333 0.020833333 0.020833333
      0.020833333 0.041666667 0.083333333 0.041666667 0     0.041666667
      0.083333333 0.083333333 0     0.020833333 0.020833333 0.0625
      0.041666667 0.229166667
2008  1     1     2     0     1     32    33    12.9  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.047619048 0     0     0     0     0     0.095238095
      0     0     0     0     0     0     0     0.047619048 0.047619048
      0     0.047619048 0.047619048 0.047619048 0.047619048 0.095238095
      0.095238095 0.380952381
```

```
2008  1     1     2     0     1     33    34    2.6   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     1
2008  1     1     2     0     1     34    35    1.3   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0.5   0     0     0
      0     0     0     0.5
2004  1     1     0     1     1     6     10    0.3   0     1     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     1     0     1     1     11    15    2.0   0     0
      0.360267704 0.639732296 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2004  1     1     0     1     1     16    19    6.9   0     0     0
      0.18687718  0.633465624 0.015283836 0.16437336  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2004  1     1     0     1     1     20    22    23.5  0     0     0
      0.028177033 0.815321692 0.079759691 0.031086902 0     0.006389873
      0.012065037 0     0     0     0     0.027199771 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2004  1     1     0     1     1     23    25    11.9  0     0     0
      0     0.459105107 0.433720654 0.094300618 0.012873622 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2004  1     1     0     1     1     26    27    6.6   0     0     0
      0     0     0.855328304 0.019638039 0.007517975 0.109997706 0
      0.007517975 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2004  1     1     0     1     1     28    28    9.6   0     0     0
      0.008361935 0     0.008361935 0.111673272 0.206642815 0.082251627
      0.025085806 0     0     0     0     0.55762261  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2004  1     1     0     1     1     29    29    9.3   0     0     0
      0.006191144 0     0     0.071905774 0.241350402 0.153387248
      0.089539286 0     0     0.412861571 0     0.006191144 0
      0.006191144 0.012382288 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     1     0     1     1     30    30    5.6   0     0     0
      0     0     0     0.112206577 0     0.416327063 0     0
      0.15298569  0.014413174 0     0.014413174 0     0.014413174 0
      0.079015935 0.167398864 0     0.014413174 0     0     0     0
      0     0.014413174 0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     1     0     1     1     31    31    2.0   0     0     0
      0     0     0     0     0.683483227 0.129163295 0     0
      0.129163295 0     0     0     0     0     0.037691579 0     0
      0.010249302 0     0     0.010249302 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2004  1     1     0     1     1     32    32    1.3   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0.499759277 0     0     0     0     0     0     0     0
      0     0     0.420927421 0     0     0     0.079313303 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2004  1     1     0     1     1     33    33    1.7   0     0     0
      0     0     0     0     0     0     0     0     0     0.135301967
      0     0     0.039482925 0     0     0     0     0     0     0
      0     0     0.039482925 0     0     0     0.715966752 0.06976543
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2004  1     1     0     1     1     35    35    0.3   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     1     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
```

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2005  1     1     0     1     1     1     5     0.6   0     0.5   0
      0     0.5   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     1     0     1     1     6     10    6.5   0     0.902615215
      0.097384785 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2005  1     1     0     1     1     11    15    28.0  0     0.027508021
      0.925548717 0.041075355 0     0.005867908 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2005  1     1     0     1     1     16    19    12.5  0     0
      0.181179359 0.694366592 0.058753328 0.015530433 0.050170288 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
2005  1     1     0     1     1     20    22    14.6  0     0     0
      0     0.108146403 0.837391598 0.003658727 0     0     0
      0.050803272 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2005  1     1     0     1     1     23    25    28.3  0     0     0
      0     0.235490856 0.656550272 0.064892281 0.022111163 0.014317768
      0.00319436  0     0     0     0.0034433   0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2005  1     1     0     1     1     26    27    17.0  0     0     0
      0     0     0.525418748 0.251239335 0.136687013 0.062880344 0
      0.003728904 0     0     0     0     0     0     0.010022829 0
      0     0.010022829 0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2005  1     1     0     1     1     28    28    14.6  0     0     0
      0     0     0.008942898 0.425634874 0.042357471 0.315330958
      0.178824073 0.006614778 0.022294948 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0
2005  1     1     0     1     1     29    29    15.8  0     0     0
      0     0     0     0.021200933 0.28160237  0.27102761  0.015048084
      0.077760663 0.003762021 0.263111014 0.057176617 0.003762021 0
      0.003667656 0     0     0     0     0     0     0     0
      0.001881011 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0
2005  1     1     0     1     1     30    30    8.0   0     0     0
      0     0     0     0.004005645 0.295551827 0     0.028039518
      0.324406324 0.017602319 0     0     0.004005645 0.008011291 0
      0.299557472 0     0.010808667 0.004005645 0     0     0
      0.004005645 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2005  1     1     0     1     1     31    31    1.8   0     0     0
      0     0     0     0     0     0     0.138378637 0.16724949
      0.083624745 0     0     0     0     0.145475333 0     0     0
      0     0     0     0     0     0     0.465271795 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
2005  1     1     0     1     1     32    32    0.6   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0.5   0     0     0     0     0.5   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     1     0     1     1     33    33    1.2   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0.776895387 0     0     0.223104613 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2005  1     1     0     1     1     34    34    0.3   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     1     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     1     0     1     1     36    36    0.3   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     1     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
```

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2005  1     1     0     1     1     37    37    0.3   0     0     0
      0     0     0     0     0     0     0     0     1     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     1     1     0     1     20    22    1.062 0     0     0
      0     4     1     1     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     1     1     0     1     23    25    1.24  0     0     0
      0     0     2     3     1     1     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     1     1     0     1     26    27    6.198 0     0     0
      0     0     0     7     10    5     7     5     1     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     1     1     0     1     28    28    20.542      0     0
      0     0     0     0     0     10    47    28    21    3     6
      1     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0
2009  1     1     1     0     1     29    29    30.989      0     0
      0     0     0     0     1     4     39    68    38    10    7
      2     3     1     1     0     0     0     0     0     0     0
      0     0     0     0     1     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0
2009  1     1     1     0     1     30    30    15.406      0     0
      0     0     0     0     0     0     7     19    21    9     7
      7     4     3     3     0     2     0     1     2     0     0
      0     1     0     0     1     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0
2009  1     1     1     0     1     31    31    11.156      0     0
      0     0     0     0     0     0     0     1     5     5     9
      10    10    5     6     1     1     1     2     2     2     0
      0     0     1     0     0     1     1     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0
2009  1     1     1     0     1     32    32    12.573      0     0
      0     0     0     0     0     0     0     0     0     1     5
      7     2     5     1     5     3     3     4     2     4     6
      3     3     3     4     3     1     2     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0
2009  1     1     1     0     1     33    33    10.094      0     0
      0     0     0     0     0     0     0     0     0     0     0
      1     0     2     1     0     4     4     5     3     2     4
      3     5     0     4     3     2     2     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0
2009  1     1     1     0     1     34    34    3.01  0     0     0
      0     0     0     0     0     0     0     0     0     1     0
      0     0     1     0     2     0     0     3     0     0     0
      0     2     0     1     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     1     1     0     1     35    35    2.479 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     1     1     1     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     1     1     0     1     36    36    0.354 0     0     0
      0     0     0     0     0     0     0     0     0     1     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     1     2     0     1     16    19    0.177 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     1     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     1     2     0     1     20    22    0.885 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      5     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     1     2     0     1     23    25    2.656 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      1     7     3     2     1     1     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     1     2     0     1     26    27    8.854 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     5     18    15    7     2     1     2     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     1     2     0     1     28    28    31.344      0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     6     42    59    37    14    8     7     1
      2     0     0     0     0     0     0     0     0     0     0
      0     0     0     1     0
2009  1     1     2     0     1     29    29    24.26 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     1     13    25    32    8     10    17    8     9
      5     1     1     0     2     2     0     0     0     0     0
      1     0     1     1
2009  1     1     2     0     1     30    30    14.521      0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     1     2     4     5     7     5     7
      8     4     0     4     4     4     3     2     3     5     3
      5     2     0     1     0
2009  1     1     2     0     1     31    31    7.969 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     2     0     1     3     1     1
      2     1     1     1     2     1     1     2     1     2     2
      6     2     3     1
2009  1     1     2     0     1     32    32    1.948 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     1
      0     1     1     0
2009  1     1     2     0     1     33    33    0.708 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     1
      0     0     0     0
```

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2010  1     1     1     0     1     23    25    2.801 0     0     0
      0     0     3     9     4     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     1     1     0     1     26    27    3.326 0     0     0
      0     0     0     10    6     0     1     1     0     1     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     1     1     0     1     28    28    10.152      0     0
      0     0     0     0     5     7     9     19    11    5     1
      1     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0
2010  1     1     1     0     1     29    29    21.179      0     0
      0     0     0     0     1     3     9     30    48    17    5
      3     0     1     1     2     0     0     0     1     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0
2010  1     1     1     0     1     30    30    11.552      0     1
      0     0     0     0     0     0     3     10    24    11    7
      4     3     2     0     1     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0
2010  1     1     1     0     1     31    31    8.227 0     1     0
      0     0     0     0     0     0     1     6     14    3     6
      4     0     4     0     2     1     1     1     1     0     0
      0     0     1     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     1     1     0     1     32    32    7.177 0     0     0
      0     0     0     0     0     0     0     0     1     1     3
      0     1     1     1     1     0     6     4     2     1     6
      3     1     1     0     0     1     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     1     1     0     1     33    33    6.651 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     1     0     1     4     5     1     3     1
      1     2     2     0     6     1     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     1     1     0     1     34    34    4.201 0     0     1
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     1     0     0     1     0     1
      1     1     0     1     4     2     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     1     1     0     1     35    35    1.4   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     2     0     1     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
#2010 1     1     1     0     1     36    36    0.7   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     1     2     0     1     23    25    3.326 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     1
      2     8     4     2     2     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     1     2     0     1     26    27    6.826 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     4     12    11    5     3     2     1     1     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     1     2     0     1     28    28    14.353      0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     2     6     11    20    19    9     5     5     2
      2     0     0     0     0     1     0     0     0     0     0
      0     0     0     0     0
2010  1     1     2     0     1     29    29    18.029      0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     1     3     20    24    15    9     5     5
      5     3     2     3     1     1     0     0     1     2     1
      1     0     0     0     0
2010  1     1     2     0     1     30    30    12.253      0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     1     2     3     1     2     5     7
      4     4     2     3     4     5     3     4     3     1     2
      3     0     2     2     2
2010  1     1     2     0     1     31    31    4.026 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     1
      0     0     1     2     0     2     1     1     2     0     0
      2     0     0     2
2010  1     1     2     0     1     32    32    0.525 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     1     0     0
2010  1     1     2     0     1     35    35    0.35  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     1     0     0     0     1     0     0     0     0     0
      0     0     0     0
2004  1     2     3     0     1     1     -1    213   0.00110392
      0.037170243 0.02591038  0.031416999 0.173777906 0.13906161
      0.024789484 0.004510081 0.003999326 0.003803302 0     0
      0.000139717 0     0     0     0     0.00E+00    0.00E+00    0
      0     0     0     0.00E+00    0     0     0.000275636 0     0
      0.000132646 0     0.00110392  0.055804462 0.027995229 0.033750929
      0.238206031 0.151271425 0.023363925 0.005680731 0.009593011
      0.003336342 0.000902929 0.000810247 0     0     0.000255318
      0.000252794 0.000252794 9.31E-05    9.31E-05    0     0.000255318
      0.000524036 0     9.31E-05    0.000269875 0     0     0     0
      0     0
2001  1     3     1     0     1     14    14    1.0   0     0
      0.833333333 0.166666667 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2001  1     3     1     0     1     15    15    1.5   0     0
      0.888888889 0.111111111 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2001  1     3     1     0     1     16    16    2.6   0     0     1
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2001  1     3     1     0     1     17    17    1.4   0     0     1
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2001  1     3     1     0     1     18    18    0.7   0     0     0.5
      0.5   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2001  1     3     1     0     1     19    19    0.3   0     0     0.5
      0.5   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2001  1     3     1     0     1     20    20    0.5   0     0     0
      0.666666667 0.333333333 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2001  1     3     1     0     1     21    21    0.2   0     0     0
      0     1     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2001  1     3     1     0     1     22    22    0.3   0     0     0
      0     1     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2001  1     3     1     0     1     23    23    0.3   0     0     0
      0     1     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2001  1     3     1     0     1     24    24    1.0   0     0     0
      0.166666667 0.666666667 0.166666667 0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2001  1     3     1     0     1     25    25    0.2   0     0     0
      0     1     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2001  1     3     1     0     1     26    26    1.0   0     0     0
      0     0.166666667 0.5   0.333333333 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2001  1     3     1     0     1     27    27    1.5   0     0     0
      0     0     0.444444444 0.555555556 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2001  1     3     1     0     1     28    28    3.1   0     0     0
      0     0.055555556 0.166666667 0.777777778 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2001  1     3     1     0     1     29    29    1.2   0     0     0
      0     0     0.285714286 0.571428571 0.142857143 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2001  1     3     1     0     1     30    30    0.2   0     0     0
      0     0     0     1     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2001  1     3     1     0     1     31    31    0.2   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     1     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
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2001  1     3     1     0     1     32    32    0.3   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0.5   0     0     0.5
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2001  1     3     1     0     1     33    33    0.2   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     1     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2001  1     3     2     0     1     14    14    0.3   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0.833333333
      0.166666667 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2001  1     3     2     0     1     15    15    1.9   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0.888888889
      0.111111111 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2001  1     3     2     0     1     16    16    2.2   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     1     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2001  1     3     2     0     1     17    17    1.2   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     1     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2001  1     3     2     0     1     18    18    0.2   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0.5   0.5   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2001  1     3     2     0     1     19    19    0.3   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0.5   0.5   0
      0     0     0     0     0     0     0     0     0     0     0
```

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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2001  1     3     2     0     1     20    20    0.2   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0.666666667
      0.333333333 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2001  1     3     2     0     1     21    21    0.2   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     1
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2001  1     3     2     0     1     22    22    0.9   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     1
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2001  1     3     2     0     1     23    23    0.9   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     1
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2001  1     3     2     0     1     24    24    0.3   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0.166666667
      0.666666667 0.166666667 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2001  1     3     2     0     1     25    25    0.5   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     1
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2001  1     3     2     0     1     26    26    1.5   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0.166666667 0.5   0.333333333 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2001  1     3     2     0     1     27    27    2.0   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0.444444444 0.555555556 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2001  1     3     2     0     1     28    28    1.0   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0.055555556 0.166666667 0.777777778 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2001  1     3     2     0     1     29    29    0.3   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.285714286 0.571428571 0.142857143 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2001  1     3     2     0     1     31    31    0.2   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     1     0     0     0     0     0     0
      0     0     0     0
2001  1     3     2     0     1     32    32    0.2   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0.5   0     0     0.5   0     0
      0     0     0     0
2003  1     4     1     0     1     13    13    1     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     4     1     0     1     14    14    1     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     4     1     0     1     16    16    2     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
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2003  1     4     1     0     1     17    17    2     0     0     0
      50    50    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     4     1     0     1     18    18    5     0     0     0
      80    20    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     4     1     0     1     19    19    8     0     0     0
      62.5  37.5  0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     4     1     0     1     20    20    6     0     0     0
      16.66666667 83.33333333 0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2003  1     4     1     0     1     21    21    11    0     0     0
      18.18181818 63.63636364 18.18181818 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2003  1     4     1     0     1     22    22    12    0     0     0
      0     50    50    0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     4     1     0     1     23    23    18    0     0     0
      0     61.11111111 16.66666667 16.66666667 5.555555556 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2003  1     4     1     0     1     24    24    16    0     0     0
      0     62.5  25    12.5  0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     4     1     0     1     25    25    10    0     0     0
      0     50    20    20    10    0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     4     1     0     1     26    26    5     0     0     0
      0     20    20    20    40    0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     4     1     0     1     27    27    7     0     0     0
      0     0     14.28571429 57.14285714 14.28571429 0     14.28571429
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2003  1     4     1     0     1     28    28    19    0     0     0
      0     0     31.57894737 10.52631579 31.57894737 10.52631579
      10.52631579 5.263157895 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2003  1     4     1     0     1     29    29    23    0     0     0
      0     0     0     0     17.39130435 17.39130435 39.13043478
      13.04347826 4.347826087 4.347826087 0     0     0     0     0
      4.347826087 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0
2003  1     4     1     0     1     30    30    19    0     0     0
      0     0     0     0     15.78947368 47.36842105 15.78947368
      15.78947368 0     0     0     0     5.263157895 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
2003  1     4     1     0     1     31    31    9     0     0     0
      0     0     0     0     0     0     11.11111111 22.22222222
      11.11111111 0     22.22222222 0     0     11.11111111 0     0
      0     11.11111111 0     0     11.11111111 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0
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2003  1     4     1     0     1     32    32    7     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      14.28571429 0     0     28.57142857 28.57142857 0     0     0
      14.28571429 0     0     0     0     0     0     0     14.28571429
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2003  1     4     1     0     1     33    33    10    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     10    20    0     10    0     0     0     10    0
      10    0     0     0     0     40    0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     4     1     0     1     34    34    9     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     100   0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     4     1     0     1     35    35    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     100   0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     4     1     0     1     36    36    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     100   0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     1     0     1     11    11    1     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     1     0     1     12    12    1     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     1     0     1     13    13    3     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     1     0     1     14    14    2     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     1     0     1     15    15    4     0     0     50
      50    0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     1     0     1     16    16    4     0     0     25
      75    0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     1     0     1     18    18    2     0     0     0
      0     100   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     1     0     1     19    19    2     0     0     0
      50    0     50    0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     1     0     1     20    20    9     0     0     0
      11.11111111 66.66666667 22.22222222 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2004  1     4     1     0     1     21    21    7     0     0     0
      14.28571429 71.42857143 14.28571429 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2004  1     4     1     0     1     22    22    23    0     0     0
      4.347826087 73.91304348 21.73913043 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2004  1     4     1     0     1     23    23    13    0     0     0
      0     69.23076923 30.76923077 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2004  1     4     1     0     1     24    24    12    0     0     0
      0     83.33333333 16.66666667 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2004  1     4     1     0     1     25    25    17    0     0     0
      0     41.17647059 47.05882353 11.76470588 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2004  1     4     1     0     1     26    26    11    0     0     0
      0     27.27272727 54.54545455 9.090909091 9.090909091 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2004  1     4     1     0     1     27    27    14    0     0     0
      0     21.42857143 78.57142857 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2004  1     4     1     0     1     28    28    13    0     0     0
      0     0     46.15384615 23.07692308 30.76923077 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2004  1     4     1     0     1     29    29    5     0     0     0
      0     0     20    0     0     20    60    0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
```

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2004  1     4     1     0     1     30    30    4     0     0     0
      0     0     0     0     25    25    25    0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     25    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     1     0     1     31    31    3     0     0     0
      0     0     0     0     0     33.33333333 0     0     0     0
      0     0     33.33333333 0     33.33333333 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2004  1     4     1     0     1     32    32    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     100   0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     1     0     1     33    33    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     100   0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     1     0     1     34    34    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     100   0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     1     0     1     9     9     1     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     1     0     1     11    11    1     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     1     0     1     13    13    3     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     1     0     1     15    15    1     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     1     0     1     16    16    2     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     1     0     1     17    17    4     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     1     0     1     18    18    3     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     1     0     1     19    19    1     0     0     0
      0     100   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     1     0     1     20    20    3     0     0     0
      33.33333333 33.33333333 33.33333333 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2005  1     4     1     0     1     21    21    7     0     0     0
      0     57.14285714 42.85714286 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2005  1     4     1     0     1     22    22    12    0     0     0
      8.333333333 16.66666667 66.66666667 8.333333333 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2005  1     4     1     0     1     23    23    14    0     0     0
      0     7.142857143 64.28571429 28.57142857 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2005  1     4     1     0     1     24    24    8     0     0     0
      0     12.5  87.5  0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     1     0     1     25    25    18    0     0     0
      0     5.555555556 66.66666667 27.77777778 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2005  1     4     1     0     1     26    26    13    0     0     0
      0     0     46.15384615 53.84615385 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2005  1     4     1     0     1     27    27    13    0     0     0
      0     7.692307692 23.07692308 61.53846154 7.692307692 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2005  1     4     1     0     1     28    28    18    0     0     0
      0     0     5.555555556 83.33333333 11.11111111 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2005  1     4     1     0     1     29    29    25    0     0     0
      0     0     4     28    28    28    0     12    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
```

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2005  1     4     1     0     1     30    30    10    0     0     0
      0     0     0     0     0     30    40    10    20    0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     1     0     1     31    31    7     0     0     0
      0     0     0     0     0     14.28571429 0     0     42.85714286
      0     0     14.28571429 0     0     0     0     14.28571429 0
      0     0     0     0     14.28571429 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2005  1     4     1     0     1     32    32    6     0     0     0
      0     0     0     0     0     0     0     0     0     16.66666667
      33.33333333 0     0     0     0     0     0     0     0     0
      0     0     16.66666667 16.66666667 0     0     0     16.66666667
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2005  1     4     1     0     1     33    33    8     0     0     0
      0     0     0     0     0     0     0     12.5  0     0     12.5
      12.5  0     0     12.5  0     0     0     12.5  12.5  0     12.5
      0     0     0     0     0     12.5  0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     1     0     1     34    34    3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     33.33333333 33.33333333 33.33333333 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2005  1     4     1     0     1     35    35    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     1     0     1     36    36    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     100   0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     1     0     1     11    11    2     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     1     0     1     12    12    1     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     1     0     1     13    13    6     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     1     0     1     14    14    2     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     1     0     1     15    15    5     0     0     40
      60    0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     1     0     1     16    16    9     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     1     0     1     17    17    10    0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     1     0     1     18    18    9     0     0     0
      55.55555556 44.44444444 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2006  1     4     1     0     1     19    19    8     0     0     0
      37.5  62.5  0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     1     0     1     20    20    13    0     0     0
      15.38461538 84.61538462 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2006  1     4     1     0     1     21    21    8     0     0     0
      0     75    25    0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     1     0     1     22    22    4     0     0     0
      0     25    75    0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     1     0     1     23    23    9     0     0     0
      0     11.11111111 66.66666667 11.11111111 11.11111111 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2006  1     4     1     0     1     24    24    4     0     0     0
      0     0     75    25    0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     1     0     1     25    25    24    0     0     0
      0     0     29.16666667 66.66666667 4.166666667 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2006  1     4     1     0     1     26    26    16    0     0     0
      0     0     18.75 75    6.25  0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
```

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2006  1     4     1     0     1     27    27    18    0     0     0
      0     0     0     88.88888889 11.11111111 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2006  1     4     1     0     1     28    28    43    0     0     0
      0     0     0     13.95348837 69.76744186 16.27906977 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2006  1     4     1     0     1     29    29    24    0     0     0
      0     0     0     4.166666667 25    50    20.83333333 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2006  1     4     1     0     1     30    30    14    0     0     0
      0     0     0     0     7.142857143 0     21.42857143 57.14285714
      14.28571429 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2006  1     4     1     0     1     31    31    8     0     0     0
      0     0     0     0     0     0     0     25    37.5  37.5  0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     1     0     1     32    32    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     50    0     0     0     0     0     0     0     50
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     1     0     1     33    33    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     100   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     1     0     1     34    34    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     100   0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     4     1     0     1     12    12    1     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     4     1     0     1     13    13    2     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     4     1     0     1     14    14    1     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     4     1     0     1     15    15    3     0     0     0
      66.66666667 33.33333333 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2007  1     4     1     0     1     16    16    8     0     0     0
      75    25    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     4     1     0     1     17    17    14    0     0     0
      78.57142857 21.42857143 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2007  1     4     1     0     1     18    18    11    0     0     0
      18.18181818 81.81818182 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2007  1     4     1     0     1     19    19    7     0     0     0
      14.28571429 85.71428571 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2007  1     4     1     0     1     20    20    9     0     0     0
      0     66.66666667 33.33333333 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2007  1     4     1     0     1     21    21    9     0     0     0
      0     88.88888889 0     11.11111111 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2007  1     4     1     0     1     22    22    12    0     0     0
      0     41.66666667 50    8.333333333 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2007  1     4     1     0     1     23    23    6     0     0     0
      0     0     83.33333333 16.66666667 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2007  1     4     1     0     1     24    24    12    0     0     0
      0     0     50    33.33333333 8.333333333 8.333333333 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2007  1     4     1     0     1     25    25    12    0     0     0
      0     0     33.33333333 33.33333333 25    8.333333333 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2007  1     4     1     0     1     26    26    19    0     0     0
      0     0     10.52631579 47.36842105 26.31578947 15.78947368 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
```

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2007  1     4     1     0     1     27    27    18    0     0     0
      0     0     0     33.33333333 44.44444444 11.11111111 11.11111111
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2007  1     4     1     0     1     28    28    40    0     0     0
      0     0     0     12.5  52.5  30    5     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     4     1     0     1     29    29    24    0     0     0
      0     0     0     12.5  20.83333333 45.83333333 16.66666667
      4.166666667 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2007  1     4     1     0     1     30    30    15    0     0     0
      0     0     0     6.666666667 26.66666667 33.33333333 13.33333333
      6.666666667 13.33333333 0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2007  1     4     1     0     1     31    31    9     0     0     0
      0     0     0     0     0     0     0     33.33333333 22.22222222
      22.22222222 11.11111111 0     0     0     0     0     0     0     0
      0     0     0     0     0     11.11111111 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2007  1     4     1     0     1     32    32    8     0     0     0
      0     0     0     0     0     0     0     0     0     12.5  0
      12.5  0     25    12.5  0     12.5  12.5  0     0     0     0
      0     0     0     12.5  0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     4     1     0     1     34    34    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     50    50    0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     4     1     0     1     35    35    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      50    0     0     0     0     50    0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     4     1     0     1     14    14    1     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     4     1     0     1     15    15    16    0     0     0
      93.75 6.25  0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     4     1     0     1     16    16    18    0     0     0
      94.44444444 5.555555556 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2008  1     4     1     0     1     17    17    11    0     0     0
      72.72727273 27.27272727 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2008  1     4     1     0     1     18    18    14    0     0     0
      7.142857143 85.71428571 7.142857143 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2008  1     4     1     0     1     19    19    10    0     0     0
      0     90    10    0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     4     1     0     1     20    20    15    0     0     0
      0     86.66666667 13.33333333 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2008  1     4     1     0     1     21    21    12    0     0     0
      0     33.33333333 58.33333333 8.333333333 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2008  1     4     1     0     1     22    22    8     0     0     0
      0     37.5  50    12.5  0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     4     1     0     1     23    23    9     0     0     0
      0     22.22222222 55.55555556 22.22222222 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2008  1     4     1     0     1     24    24    5     0     0     0
      0     0     60    40    0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     4     1     0     1     25    25    4     0     0     0
      0     0     25    75    0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     4     1     0     1     26    26    9     0     0     0
      0     0     0     44.44444444 55.55555556 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2008  1     4     1     0     1     27    27    8     0     0     0
      0     0     0     25    62.5  12.5  0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     4     1     0     1     28    28    38    0     0     0
      0     0     0     0     26.31578947 47.36842105 23.68421053
      2.631578947 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
```

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2008  1     4     1     0     1     29    29    16    0     0     0
      0     0     0     0     12.5  18.75 31.25 31.25 6.25  0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     4     1     0     1     30    30    15    0     0     0
      0     0     0     0     6.666666667 6.666666667 13.33333333
      13.33333333 26.66666667 6.666666667 20    0     0     0     0
      0     0     0     0     6.666666667 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0
2008  1     4     1     0     1     31    31    11    0     0     0
      0     0     0     0     0     9.090909091 0     18.18181818 0
      18.18181818 0     0     0     0     0     0     18.18181818 0
      18.18181818 9.090909091 9.090909091 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2008  1     4     1     0     1     32    32    5     0     0     0
      0     0     0     0     0     0     0     0     0     20    20
      0     0     20    0     0     0     0     40    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     4     1     0     1     33    33    8     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     12.5  0     0     0     0     0     12.5  12.5  12.5  0
      0     12.5  12.5  12.5  0     12.5  0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     4     1     0     1     34    34    3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      66.66666667 0     0     0     0     33.33333333 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2008  1     4     1     0     1     35    35    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     100   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     1     0     1     6     6     1     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     1     0     1     8     8     3     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     1     0     1     10    10    2     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     1     0     1     11    11    1     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     1     0     1     12    12    4     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     1     0     1     13    13    2     0     0     50
      50    0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     1     0     1     14    14    3     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     1     0     1     15    15    7     0     0
      42.85714286 57.14285714 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2009  1     4     1     0     1     16    16    9     0     0
      22.22222222 55.55555556 22.22222222 0     0     0     0     0
```

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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2009  1     4     1     0     1     17    17    7     0     0     0
      57.14285714 42.85714286 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2009  1     4     1     0     1     18    18    11    0     0     0
      54.54545455 45.45454545 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2009  1     4     1     0     1     19    19    9     0     0     0
      0     100   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     1     0     1     20    20    12    0     0     0
      8.333333333 83.33333333 8.333333333 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2009  1     4     1     0     1     21    21    20    0     0     0
      0     60    40    0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     1     0     1     22    22    18    0     0     0
      0     27.77777778 55.55555556 16.66666667 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2009  1     4     1     0     1     23    23    19    0     0     0
      0     10.52631579 78.94736842 5.263157895 5.263157895 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
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2009  1     4     1     0     1     24    24    10    0     0     0
      0     0     80    20    0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     1     0     1     25    25    12    0     0     0
      0     0     33.33333333 50    16.66666667 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2009  1     4     1     0     1     26    26    10    0     0     0
      0     0     0     70    0     0     20    10    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     1     0     1     27    27    11    0     0     0
      0     0     0     36.36363636 18.18181818 18.18181818 18.18181818
      9.090909091 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2009  1     4     1     0     1     28    28    24    0     0     0
      0     0     0     8.333333333 62.5  16.66666667 4.166666667
      4.166666667 4.166666667 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
2009  1     4     1     0     1     29    29    44    0     0     0
      0     0     0     0     15.90909091 40.90909091 36.36363636
      2.272727273 2.272727273 2.272727273 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2009  1     4     1     0     1     30    30    16    0     0     0
      0     0     0     0     0     6.25  37.5  12.5  25    6.25  0
      6.25  0     6.25  0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     1     0     1     31    31    16    0     0     0
      0     0     0     0     0     6.25  0     6.25  12.5  31.25 18.75
      6.25  12.5  0     0     0     0     0     0     0     0     0
      0     6.25  0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     1     0     1     32    32    12    0     0     0
      0     0     0     0     0     0     0     0     0     8.333333333
      0     25    8.333333333 0     8.333333333 8.333333333 16.66666667
      0     8.333333333 0     0     0     0     0     0     0     0
      16.66666667 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2009  1     4     1     0     1     33    33    8     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     12.5  12.5  0     12.5  12.5  12.5
      0     12.5  12.5  0     0     12.5  0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     1     0     1     34    34    6     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     50    0     0     50    0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     1     0     1     35    35    3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     33.33333333 0     0     0     66.66666667 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2010  1     4     1     0     1     12    12    3     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     4     1     0     1     13    13    4     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     4     1     0     1     14    14    5     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     4     1     0     1     15    15    5     0     0     60
      40    0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     4     1     0     1     16    16    7     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     4     1     0     1     17    17    5     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     4     1     0     1     18    18    8     0     0     0
      37.5  50    12.5  0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     4     1     0     1     19    19    14    0     0     0
      28.57142857 64.28571429 7.142857143 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2010  1     4     1     0     1     20    20    12    0     0     0
      16.66666667 58.33333333 25    0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2010  1     4     1     0     1     21    21    15    0     0     0
      0     60    40    0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     4     1     0     1     22    22    9     0     0     0
      0     0     77.77777778 22.22222222 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
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2010  1     4     1     0     1     23    23    13    0     0     0
      0     7.692307692 61.53846154 30.76923077 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2010  1     4     1     0     1     24    24    7     0     0     0
      0     0     28.57142857 71.42857143 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2010  1     4     1     0     1     25    25    13    0     0     0
      0     0     23.07692308 69.23076923 7.692307692 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2010  1     4     1     0     1     26    26    8     0     0     0
      0     0     12.5  62.5  25    0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     4     1     0     1     27    27    6     0     0     0
      0     0     0     50    50    0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     4     1     0     1     28    28    15    0     0     0
      0     0     0     13.33333333 46.66666667 26.66666667 0
      13.33333333 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2010  1     4     1     0     1     29    29    24    0     0     0
      0     0     0     0     12.5  12.5  8.333333333 66.66666667 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2010  1     4     1     0     1     30    30    18    0     0     0
      0     0     0     0     0     5.555555556 5.555555556 27.77777778
      22.22222222 22.22222222 5.555555556 0     11.11111111 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2010  1     4     1     0     1     31    31    10    0     0     0
      0     0     0     0     0     0     0     20    10    0     10
      10    10    0     20    0     10    10    0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     4     1     0     1     32    32    3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      33.33333333 0     33.33333333 0     0     0     0     33.33333333
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2010  1     4     1     0     1     33    33    9     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     11.11111111 0     22.22222222 11.11111111 0     0     0
      11.11111111 0     0     0     0     0     11.11111111 0
      33.33333333 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2010  1     4     1     0     1     34    34    3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     100   0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     4     2     0     1     13    13    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     4     2     0     1     14    14    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     4     2     0     1     16    16    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     4     2     0     1     17    17    10    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

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      0     0     0     0     0     0     0     0     10    80    10
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     4     2     0     1     18    18    21    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     4.761904762
      76.19047619 19.04761905 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2003  1     4     2     0     1     19    19    20    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     75    20
      5     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     4     2     0     1     20    20    13    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     30.76923077
      46.15384615 15.38461538 0     7.692307692 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2003  1     4     2     0     1     21    21    23    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     4.347826087
      73.91304348 17.39130435 0     4.347826087 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2003  1     4     2     0     1     22    22    24    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     8.333333333
      50    37.5  4.166666667 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2003  1     4     2     0     1     23    23    23    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      65.2173913  21.73913043 8.695652174 4.347826087 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2003  1     4     2     0     1     24    24    23    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     4.347826087
      60.86956522 17.39130435 4.347826087 4.347826087 4.347826087 0
      4.347826087 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

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2003  1     4     2     0     1     25    25    10    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     50
      20    10    20    0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     4     2     0     1     26    26    11    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      18.18181818 45.45454545 36.36363636 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2003  1     4     2     0     1     27    27    10    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     10
      10    10    50    0     20    0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     4     2     0     1     28    28    33    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      6.060606061 9.090909091 9.090909091 33.33333333 18.18181818
      6.060606061 3.03030303  3.03030303  3.03030303  3.03030303  0
      0     0     3.03030303  3.03030303  0     0     0     0     0
      0     0     0     0     0     0     0
2003  1     4     2     0     1     29    29    24    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     8.333333333 29.16666667 16.66666667 12.5  0     4.166666667
      4.166666667 0     8.333333333 0     0     0     4.166666667
      8.333333333 0     0     4.166666667 0     0     0     0     0
      0     0     0
2003  1     4     2     0     1     30    30    4     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     25    25    0     0     0     0
      0     0     0     0     0     0     0     0     0     0     25
      25    0     0     0
2003  1     4     2     0     1     31    31    5     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     20
      0     0     20    0     0     0     0     0     0     0     0
      0     0     0     60
2003  1     4     2     0     1     32    32    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0   100
2003  1     4     2     0     1    34    34     1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0   100
2003  1     4     2     0     1    35    35     1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0   100
2004  1     4     2     0     1    12    12     1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0   100     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     2     0     1    13    13     1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0   100     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     2     0     1    14    14     4     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0    75    25     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     2     0     1    15    15     3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0   100     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     2     0     1    16    16     4     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0    25    50    25
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
```

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2004  1     4     2     0     1     17    17    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     2     0     1     18    18    6     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     50    50
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     2     0     1     19    19    12    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     25
      66.66666667 0     0     8.333333333 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2004  1     4     2     0     1     20    20    15    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     26.66666667
      46.66666667 20    6.666666667 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2004  1     4     2     0     1     21    21    12    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     75
      25    0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     2     0     1     22    22    15    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     80
      20    0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     2     0     1     23    23    25    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     88
      12    0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     2     0     1     24    24    21    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      76.19047619 23.80952381 0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2004  1     4     2     0     1     25    25    15    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      53.33333333 46.66666667 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2004  1     4     2     0     1     26    26    8     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     25
      75    0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     2     0     1     27    27    8     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     12.5
      87.5  0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     2     0     1     28    28    10    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     30    40    10    0     0     0     0     10    0     0
      10    0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     2     0     1     29    29    15    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     6.666666667 20    26.66666667 0     26.66666667 0     0
      0     0     6.666666667 0     6.666666667 0     0     0     0
      6.666666667 0     0     0     0     0     0     0     0
2004  1     4     2     0     1     30    30    12    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     8.333333333 0     0     0     0     0
      8.333333333 8.333333333 16.66666667 8.333333333 0     0
      8.333333333 0     0     0     0     0     8.333333333 8.333333333
      0     8.333333333 16.66666667
2004  1     4     2     0     1     31    31    4     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     25    25    0     0     0     0     25    0     0     0
      0     0     0     25
2004  1     4     2     0     1     32    32    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0   100
      0     0     0     0
2004  1     4     2     0     1    33    33     1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0   100
2005  1     4     2     0     1    10    10     1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0   100     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     2     0     1    11    11     2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0   100     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     2     0     1    12    12     5     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0   100     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     2     0     1    13    13     3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0   100     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     2     0     1    14    14     4     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0    75    25     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     2     0     1    15    15     2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0    50    50     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
```

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2005  1     4     2     0     1     16    16    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     2     0     1     17    17    3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     2     0     1     18    18    4     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     2     0     1     19    19    4     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     25    75
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     2     0     1     20    20    3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     2     0     1     21    21    5     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     60
      40    0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     2     0     1     22    22    15    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     20
      73.33333333 6.666666667 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2005  1     4     2     0     1     23    23    17    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      5.882352941 82.35294118 11.76470588 0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2005  1     4     2     0     1     24    24    21    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      57.14285714 42.85714286 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2005  1     4     2     0     1     25    25    24    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      58.33333333 41.66666667 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2005  1     4     2     0     1     26    26    19    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      5.263157895 26.31578947 63.15789474 5.263157895 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2005  1     4     2     0     1     27    27    16    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      12.5  37.5  50    0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     2     0     1     28    28    20    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      10    25    30    10    10    5     10    0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     2     0     1     29    29    21    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     4.761904762 4.761904762 14.28571429 4.761904762 23.80952381
      4.761904762 23.80952381 0     0     9.523809524 4.761904762
      4.761904762 0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     2     0     1     30    30    16    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     12.5  25    6.25  0     12.5  0
      6.25  6.25  12.5  0     0     6.25  0     0     0     0     0
      6.25  0     0     6.25
2005  1     4     2     0     1     31    31    10    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     10    0
      0     10    0     0     10    10    10    10    10    10    0
      0     0     0     20
2005  1     4     2     0     1     32    32    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     100   0
      0     0     0     0
2006  1     4     2     0     1     13    13    6     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     83.33333333
      16.66666667 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2006  1     4     2     0     1     14    14    4     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     2     0     1     15    15    5     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     40    60    0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     2     0     1     16    16    4     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     2     0     1     17    17    10    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     2     0     1     18    18    9     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     88.88888889
      11.11111111 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
```

```
2006  1     4     2     0     1     19    19    7     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     42.85714286
      57.14285714 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2006  1     4     2     0     1     20    20    4     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     50    50
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     2     0     1     21    21    6     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     2     0     1     22    22    14    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      42.85714286 42.85714286 14.28571429 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2006  1     4     2     0     1     23    23    12    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      16.66666667 50    33.33333333 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2006  1     4     2     0     1     24    24    16    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      68.75 18.75 12.5  0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     2     0     1     25    25    18    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      5.555555556 88.88888889 5.555555556 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2006  1     4     2     0     1     26    26    20    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     90    10    0     0     0     0     0     0     0     0
```

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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     2     0     1     27    27    15    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     40    53.33333333 6.666666667 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2006  1     4     2     0     1     28    28    54    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     7.407407407 40.74074074 42.59259259 5.555555556 1.851851852
      1.851851852 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2006  1     4     2     0     1     29    29    32    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     6.25  46.875      21.875      3.125 6.25  6.25
      0     3.125 0     0     0     3.125 0     3.125 0     0     0
      0     0     0     0     0     0
2006  1     4     2     0     1     30    30    11    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     18.18181818 18.18181818
      9.090909091 18.18181818 0     0     0     0     18.18181818 0
      0     0     9.090909091 0     0     0     9.090909091 0     0
      0
2006  1     4     2     0     1     31    31    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     50    0
      50    0     0     0
2006  1     4     2     0     1     32    32    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     100
2007  1     4     2     0     1     12    12    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     4     2     0     1     13    13    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0   100     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     4     2     0     1    14    14     2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0   100     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     4     2     0     1    15    15     5     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0    60    20
     20     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     4     2     0     1    16    16    13     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0 69.23076923
     30.76923077 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2007  1     4     2     0     1    17    17     7     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0 71.42857143
     28.57142857 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2007  1     4     2     0     1    18    18    10     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0    20    70
     10     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     4     2     0     1    19    19    11     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0 9.090909091
     81.81818182 9.090909091 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2007  1     4     2     0     1    20    20    13     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0 7.692307692
     61.53846154 30.76923077 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
```

```
2007  1     4     2     0     1     21    21    13    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      46.15384615 46.15384615 7.692307692 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2007  1     4     2     0     1     22    22    6     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     4     2     0     1     23    23    7     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      42.85714286 42.85714286 0     14.28571429 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2007  1     4     2     0     1     24    24    15    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      26.66666667 40    13.33333333 20    0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2007  1     4     2     0     1     25    25    14    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      21.42857143 14.28571429 42.85714286 21.42857143 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2007  1     4     2     0     1     26    26    21    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     28.57142857 52.38095238 19.04761905 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2007  1     4     2     0     1     27    27    23    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     4.347826087 56.52173913 21.73913043 13.04347826 4.347826087
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2007  1     4     2     0     1     28    28    55    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     12.72727273 38.18181818 32.72727273 7.272727273 1.818181818
```

```
      3.636363636 1.818181818 1.818181818 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0
2007  1     4     2     0     1     29    29    27    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     3.703703704 22.22222222 22.22222222 11.11111111 3.703703704
      11.11111111 11.11111111 3.703703704 3.703703704 0     7.407407407
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0
2007  1     4     2     0     1     30    30    18    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     16.66666667 5.555555556 5.555555556 11.11111111
      11.11111111 11.11111111 0     11.11111111 5.555555556 5.555555556
      0     0     11.11111111 0     0     0     0     5.555555556 0
      0     0     0     0
2007  1     4     2     0     1     31    31    8     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      12.5  0     12.5  0     12.5  12.5  12.5  0     0     0     25
      0     0     0     12.5
2007  1     4     2     0     1     32    32    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     100
2008  1     4     2     0     1     11    11    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     4     2     0     1     14    14    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     4     2     0     1     15    15    11    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
```

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2008  1     4     2     0     1     16    16    14    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     71.42857143
      28.57142857 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2008  1     4     2     0     1     17    17    10    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     70    30
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     4     2     0     1     18    18    19    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     5.263157895
      94.73684211 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2008  1     4     2     0     1     19    19    23    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     4.347826087
      82.60869565 13.04347826 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2008  1     4     2     0     1     20    20    19    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      78.94736842 15.78947368 0     5.263157895 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2008  1     4     2     0     1     21    21    14    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      28.57142857 71.42857143 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2008  1     4     2     0     1     22    22    5     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     20
      60    20    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     4     2     0     1     23    23    7     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      71.42857143 0     28.57142857 0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2008  1     4     2     0     1     24    24    9     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      33.33333333 22.22222222 11.11111111 33.33333333 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2008  1     4     2     0     1     25    25    10    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      30    20    20    20    0     0     0     0     0     10    0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     4     2     0     1     26    26    10    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      10    10    50    20    10    0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     4     2     0     1     27    27    19    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     5.263157895 36.84210526 31.57894737 21.05263158 0
      5.263157895 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2008  1     4     2     0     1     28    28    34    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     8.823529412 32.35294118 26.47058824 26.47058824 5.882352941
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2008  1     4     2     0     1     29    29    33    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     6.060606061 15.15151515 24.24242424 12.12121212
      3.03030303  21.21212121 9.090909091 0     0     0     3.03030303
      0     3.03030303  0     0     0     3.03030303  0     0     0
      0     0     0     0
2008  1     4     2     0     1     30    30    7     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     14.28571429 0     0     0
      42.85714286 0     0     14.28571429 0     0     0     0     0
      28.57142857 0     0     0     0     0     0     0
2008  1     4     2     0     1     31    31    7     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      14.28571429 14.28571429 0     0     0     14.28571429 0     0
      0     0     14.28571429 0     0     14.28571429 28.57142857
2008  1     4     2     0     1     32    32    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     50    0     0     0     0     0     0     0
      0     0     50    0
2009  1     4     2     0     1     7     7     1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     2     0     1     9     9     1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     2     0     1     13    13    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     2     0     1     14    14    8     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     75    25    0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     2     0     1     15    15    8     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     37.5  62.5  0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     2     0     1     16    16    9     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     11.11111111
      88.88888889 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
```

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2009  1     4     2     0     1     17    17    3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     2     0     1     18    18    13    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     38.46153846
      53.84615385 7.692307692 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2009  1     4     2     0     1     19    19    11    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     2     0     1     20    20    15    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     13.33333333
      66.66666667 20    0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2009  1     4     2     0     1     21    21    18    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      33.33333333 61.11111111 5.555555556 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2009  1     4     2     0     1     22    22    15    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      13.33333333 80    6.666666667 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2009  1     4     2     0     1     23    23    17    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      82.35294118 17.64705882 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2009  1     4     2     0     1     24    24    17    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      29.41176471 52.94117647 5.882352941 11.76470588 0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2009  1     4     2     0     1     25    25    20    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      15    60    15    5     5     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     2     0     1     26    26    17    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      5.882352941 41.17647059 41.17647059 11.76470588 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2009  1     4     2     0     1     27    27    16    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     43.75 25    25    6.25  0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     2     0     1     28    28    43    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     2.325581395 18.60465116 32.55813953 23.25581395 18.60465116
      2.325581395 2.325581395 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2009  1     4     2     0     1     29    29    31    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     3.225806452 22.58064516 29.03225806 16.12903226
      3.225806452 9.677419355 9.677419355 3.225806452 3.225806452 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0
2009  1     4     2     0     1     30    30    26    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     3.846153846 0     7.692307692 0     11.53846154
      7.692307692 7.692307692 23.07692308 3.846153846 0     0     0
      3.846153846 15.38461538 0     0     0     0     0     0
      7.692307692 0     7.692307692
2009  1     4     2     0     1     31    31    13    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     15.38461538
      7.692307692 0     0     0     15.38461538 0     0     15.38461538
      0     0     7.692307692 7.692307692 7.692307692 0     0
      23.07692308
```

```
2009  1     4     2     0     1     32    32    5     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     20    0
      0     0     0     0     0     0     0     20    20    0     0
      0     0     0     40
2009  1     4     2     0     1     33    33    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     100
2009  1     4     2     0     1     34    34    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     100   0     0     0     0     0     0     0
      0     0     0     0
2010  1     4     2     0     1     12    12    3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     4     2     0     1     13    13    3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     66.66666667
      33.33333333 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2010  1     4     2     0     1     14    14    15    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     4     2     0     1     15    15    6     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     66.66666667
      33.33333333 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2010  1     4     2     0     1     16    16    9     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     33.33333333
      55.55555556 11.11111111 0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2010  1     4     2     0     1     17    17    10    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     60    40
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     4     2     0     1     18    18    10    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     60    30
      10    0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     4     2     0     1     19    19    11    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     36.36363636
      63.63636364 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2010  1     4     2     0     1     20    20    11    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     9.090909091
      72.72727273 18.18181818 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2010  1     4     2     0     1     21    21    17    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      47.05882353 41.17647059 11.76470588 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2010  1     4     2     0     1     22    22    13    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      15.38461538 61.53846154 23.07692308 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2010  1     4     2     0     1     23    23    11    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      63.63636364 36.36363636 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2010  1     4     2     0     1     24    24    14    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

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      0     0     0     0     0     0     0     0     0     0     0
      28.57142857 35.71428571 35.71428571 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2010  1     4     2     0     1     25    25    15    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      20    60    20    0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     4     2     0     1     26    26    10    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      20    50    30    0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     4     2     0     1     27    27    6     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     33.33333333 66.66666667 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2010  1     4     2     0     1     28    28    12    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     16.66666667 16.66666667 8.333333333 41.66666667
      16.66666667 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
2010  1     4     2     0     1     29    29    24    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     12.5  33.33333333 16.66666667 12.5  12.5
      0     8.333333333 4.166666667 0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2010  1     4     2     0     1     30    30    5     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     60    0     0     0     0     20
      20    0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     4     2     0     1     31    31    7     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      14.28571429 14.28571429 0     28.57142857 0     0     0     0
      0     0     0     0     0     28.57142857 0     14.28571429
```

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2003  1     5     1     0     1     8     8     1     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     1     0     1     9     9     2     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     1     0     1     10    10    2     0     50    50
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     1     0     1     12    12    3     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     1     0     1     13    13    2     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     1     0     1     14    14    3     0     0
      33.33333333 66.66666667 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2003  1     5     1     0     1     15    15    4     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     1     0     1     16    16    4     0     0     50
      50    0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     1     0     1     17    17    20    0     0     15
      65    20    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     1     0     1     18    18    21    0     0     0
      90.47619048 9.523809524 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2003  1     5     1     0     1     19    19    24    0     0     0
      66.66666667 33.33333333 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2003  1     5     1     0     1     20    20    14    0     0     0
      71.42857143 28.57142857 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2003  1     5     1     0     1     21    21    5     0     0     0
      60    40    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     1     0     1     22    22    4     0     0     0
      0     75    25    0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     1     0     1     23    23    5     0     0     0
      0     100   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     1     0     1     24    24    3     0     0     0
      0     100   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     1     0     1     25    25    2     0     0     0
      0     0     100   0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     1     0     1     26    26    3     0     0     0
      0     33.33333333 33.33333333 33.33333333 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2003  1     5     1     0     1     27    27    4     0     0     0
      0     50    25    25    0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     1     0     1     28    28    1     0     0     0
      0     0     100   0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     1     0     1     5     5     2     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     1     0     1     6     6     1     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     1     0     1     7     7     1     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
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2004  1     5     1     0     1     8     8     5     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     1     0     1     9     9     6     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     1     0     1     10    10    7     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     1     0     1     11    11    5     0     80    20
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     1     0     1     12    12    3     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     1     0     1     13    13    10    0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     1     0     1     14    14    9     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     1     0     1     15    15    10    0     0     90
      10    0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     1     0     1     16    16    4     0     0     75
      25    0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     1     0     1     17    17    3     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     1     0     1     18    18    1     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     1     0     1     19    19    4     0     0     0
      50    50    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     1     0     1     20    20    6     0     0     0
      33.33333333 66.66666667 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2004  1     5     1     0     1     21    21    12    0     0     0
      16.66666667 83.33333333 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2004  1     5     1     0     1     22    22    9     0     0     0
      11.11111111 88.88888889 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2004  1     5     1     0     1     23    23    3     0     0     0
      0     100   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     1     0     1     24    24    1     0     0     0
      0     100   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     1     0     1     25    25    5     0     0     0
      0     100   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     1     0     1     26    26    1     0     0     0
      0     100   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     1     0     1     27    27    1     0     0     0
      0     0     100   0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     1     0     1     28    28    1     0     0     0
      0     0     100   0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     1     0     1     6     6     3     33.33333333
      66.66666667 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2005  1     5     1     0     1     7     7     5     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
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2005  1     5     1     0     1     8     8     12    16.66666667
      83.33333333 0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2005  1     5     1     0     1     9     9     15    0     100   0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     1     0     1     10    10    8     0     75    25
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     1     0     1     11    11    5     0     0     100
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     1     0     1     12    12    14    0     7.142857143
      92.85714286 0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2005  1     5     1     0     1     13    13    24    0     0
      95.83333333 4.166666667 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2005  1     5     1     0     1     14    14    14    0     0     100
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     1     0     1     15    15    7     0     0
      71.42857143 28.57142857 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
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```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2005  1     5     1     0     1     16    16    9     0     0
      11.11111111 88.88888889 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2005  1     5     1     0     1     17    17    12    0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     1     0     1     18    18    4     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     1     0     1     19    19    3     0     0     0
      66.66666667 33.33333333 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2005  1     5     1     0     1     20    20    5     0     0     0
      40    60    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     1     0     1     21    21    2     0     0     0
      50    50    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     1     0     1     22    22    8     0     0     0
      0     50    50    0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     1     0     1     23    23    4     0     0     0
      0     25    75    0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     1     0     1     24    24    10    0     0     0
      0     10    90    0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     1     0     1     25    25    8     0     0     0
      0     0     100   0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     1     0     1     27    27    2     0     0     0
      0     0     100   0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     1     0     1     6     6     1     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     1     0     1     7     7     11    0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     1     0     1     8     8     10    0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     1     0     1     9     9     9     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
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2006  1     5     1     0     1     10    10    11    0     90.90909091
      9.090909091 0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2006  1     5     1     0     1     11    11    10    0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     1     0     1     12    12    23    0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     1     0     1     13    13    34    0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     1     0     1     14    14    30    0     0
      93.33333333 6.666666667 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2006  1     5     1     0     1     15    15    11    0     0
      36.36363636 63.63636364 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2006  1     5     1     0     1     16    16    11    0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     1     0     1     17    17    24    0     0
      4.166666667 87.5  8.333333333 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2006  1     5     1     0     1     18    18    10    0     0     0
      80    20    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     1     0     1     19    19    5     0     0     0
      60    40    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     1     0     1     20    20    2     0     0     0
      50    50    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     1     0     1     21    21    6     0     0     0
      16.66666667 83.33333333 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2006  1     5     1     0     1     23    23    3     0     0     0
      0     33.33333333 66.66666667 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2006  1     5     1     0     1     24    24    1     0     0     0
      0     0     100   0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     1     0     1     25    25    3     0     0     0
      0     0     0     100   0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     1     0     1     26    26    3     0     0     0
      0     0     0     100   0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     1     0     1     27    27    3     0     0     0
      0     0     0     100   0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     1     0     1     28    28    2     0     0     0
      0     0     0     0     100   0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     1     0     1     31    31    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     1     0     1     7     7     3     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     1     0     1     8     8     2     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     1     0     1     9     9     5     0     60    40
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     1     0     1     10    10    1     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
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2007  1     5     1     0     1     11    11    25    0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     1     0     1     12    12    13    0     0
      92.30769231 0     7.692307692 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2007  1     5     1     0     1     13    13    43    0     0
      97.6744186  2.325581395 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2007  1     5     1     0     1     14    14    21    0     0
      61.9047619  33.33333333 4.761904762 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2007  1     5     1     0     1     15    15    16    0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     1     0     1     16    16    22    0     0     0
      95.45454545 4.545454545 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2007  1     5     1     0     1     17    17    18    0     0     0
      88.88888889 11.11111111 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2007  1     5     1     0     1     18    18    16    0     0     0
      56.25 31.25 12.5  0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     1     0     1     19    19    11    0     0     0
      45.45454545 45.45454545 9.090909091 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2007  1     5     1     0     1     20    20    7     0     0     0
      0     85.71428571 14.28571429 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2007  1     5     1     0     1     21    21    10    0     0     0
      0     40    40    20    0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     1     0     1     22    22    3     0     0     0
      0     33.33333333 33.33333333 33.33333333 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2007  1     5     1     0     1     24    24    1     0     0     0
      0     0     100   0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     1     0     1     26    26    1     0     0     0
      0     0     0     100   0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     1     0     1     27    27    3     0     0     0
      0     0     0     33.33333333 66.66666667 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2007  1     5     1     0     1     28    28    3     0     0     0
      0     0     0     33.33333333 33.33333333 33.33333333 0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2008  1     5     1     0     1     6     6     2     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     5     1     0     1     7     7     1     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     5     1     0     1     8     8     1     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     5     1     0     1     9     9     6     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     5     1     0     1     10    10    10    0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     5     1     0     1     11    11    11    0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     5     1     0     1     12    12    9     0     0
      88.88888889 11.11111111 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
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2008  1     5     1     0     1     13    13    11    0     0
      90.90909091 9.090909091 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2008  1     5     1     0     1     14    14    7     0     0
      28.57142857 71.42857143 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2008  1     5     1     0     1     15    15    14    0     0
      7.142857143 92.85714286 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2008  1     5     1     0     1     16    16    11    0     0     0
      90.90909091 9.090909091 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2008  1     5     1     0     1     17    17    11    0     0     0
      63.63636364 36.36363636 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2008  1     5     1     0     1     18    18    7     0     0     0
      0     100   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     5     1     0     1     19    19    7     0     0     0
      0     85.71428571 14.28571429 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2008  1     5     1     0     1     20    20    3     0     0     0
      0     100   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     5     1     0     1     21    21    2     0     0     0
      0     50    50    0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     5     1     0     1     6     6     1     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     5     1     0     1     7     7     5     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     5     1     0     1     8     8     11    0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     5     1     0     1     9     9     18    0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     5     1     0     1     10    10    10    0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     5     1     0     1     11    11    12    0     75    25
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     5     1     0     1     12    12    6     0     33.33333333
      66.66666667 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2009  1     5     1     0     1     13    13    14    0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     5     1     0     1     14    14    19    0     5.263157895
      73.68421053 21.05263158 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2009  1     5     1     0     1     15    15    22    0     0
      68.18181818 31.81818182 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2009  1     5     1     0     1     16    16    25    0     0     20
      80    0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     5     1     0     1     17    17    20    0     0     0
      90    10    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     5     1     0     1     18    18    16    0     0     0
      75    25    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     5     1     0     1     19    19    11    0     0     0
      18.18181818 81.81818182 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
```

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2009  1     5     1     0     1     20    20    13    0     0     0
      0     100   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     5     1     0     1     21    21    9     0     0     0
      0     88.88888889 11.11111111 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2009  1     5     1     0     1     22    22    3     0     0     0
      0     33.33333333 66.66666667 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2009  1     5     1     0     1     23    23    3     0     0     0
      0     0     100   0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     5     1     0     1     25    25    1     0     0     0
      0     0     100   0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     1     0     1     6     6     1     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     1     0     1     8     8     3     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     1     0     1     9     9     2     0     50    50
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     1     0     1     10    10    2     0     50    50
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     1     0     1     11    11    10    0     10    90
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     1     0     1     12    12    29    0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     1     0     1     13    13    47    0     0
      97.87234043 2.127659574 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2010  1     5     1     0     1     14    14    41    0     0
      90.24390244 7.317073171 2.43902439 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2010  1     5     1     0     1     15    15    15    0     0     80
      20    0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     1     0     1     16    16    10    0     0     20
      60    20    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     1     0     1     17    17    10    0     0     0
      80    20    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     1     0     1     18    18    8     0     0     0
      50    50    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     1     0     1     19    19    4     0     0     0
      0     100   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     1     0     1     20    20    8     0     0     0
      12.5  75    12.5  0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     1     0     1     21    21    7     0     0     0
      0     100   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     1     0     1     22    22    3     0     0     0
      0     66.66666667 33.33333333 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2010  1     5     1     0     1     23    23    9     0     0     0
      0     22.22222222 77.77777778 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2010  1     5     1     0     1     24    24    3     0     0     0
      0     0     66.66666667 33.33333333 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
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2010  1     5     1     0     1     25    25    6     0     0     0
      0     0     33.33333333 50    16.66666667 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2010  1     5     1     0     1     26    26    4     0     0     0
      0     0     25    25    50    0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     1     0     1     27    27    1     0     0     0
      0     0     0     0     100   0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     2     0     1     9     9     1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     2     0     1     10    10    3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     2     0     1     11    11    4     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     25    50    25    0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     2     0     1     12    12    3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     2     0     1     13    13    9     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     11.11111111 77.77777778
      11.11111111 0     0     0     0     0     0     0     0     0
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```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2003  1     5     2     0     1     14    14    7     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     71.42857143
      28.57142857 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2003  1     5     2     0     1     15    15    6     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     50    50    0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     2     0     1     16    16    12    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     50    50    0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     2     0     1     17    17    12    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     16.66666667
      66.66666667 16.66666667 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2003  1     5     2     0     1     18    18    19    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     78.94736842
      15.78947368 5.263157895 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2003  1     5     2     0     1     19    19    23    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     69.56521739
      26.08695652 4.347826087 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2003  1     5     2     0     1     20    20    12    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     2     0     1     21    21    8     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     75    12.5
      12.5  0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     2     0     1     22    22    7     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     28.57142857
      42.85714286 28.57142857 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2003  1     5     2     0     1     23    23    8     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     75
      0     25    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     2     0     1     24    24    14    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     7.142857143
      57.14285714 14.28571429 21.42857143 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2003  1     5     2     0     1     25    25    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     50
      0     50    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     2     0     1     26    26    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     2     0     1     28    28    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      50    0     0     50    0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     2     0     1     5     5     2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
```

```
2004  1     5     2     0     1     7     7     1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     2     0     1     8     8     7     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     2     0     1     9     9     8     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     2     0     1     10    10    9     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     2     0     1     11    11    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     2     0     1     12    12    4     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     25    75    0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     2     0     1     13    13    9     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     2     0     1     14    14    16    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     87.5  12.5  0
      0     0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     2     0     1     15    15    5     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     2     0     1     16    16    3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     2     0     1     17    17    6     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     66.66666667
      33.33333333 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2004  1     5     2     0     1     18    18    3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     33.33333333
      66.66666667 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2004  1     5     2     0     1     19    19    3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     33.33333333
      66.66666667 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2004  1     5     2     0     1     20    20    9     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     22.22222222
      55.55555556 22.22222222 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2004  1     5     2     0     1     21    21    15    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     13.33333333
      73.33333333 13.33333333 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2004  1     5     2     0     1     22    22    13    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0
      69.23076923 30.76923077 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2004  1     5     2     0     1     23    23    6     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
      83.33333333 16.66666667 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2004  1     5     2     0     1     24    24    4     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     75
      0     25    0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     2     0     1     25    25    2     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     100
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     2     0     1     4     4     1     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     2     0     1     6     6     3     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     2     0     1     7     7     10    0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     2     0     1     8     8     22    0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0     0     0     0
```

```
2005  1     5     2     0     1     9     9     27    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     88.88888889 11.11111111
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2005  1     5     2     0     1     10    10    12    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     75    25    0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     2     0     1     11    11    7     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     2     0     1     12    12    16    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     2     0     1     13    13    25    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     2     0     1     14    14    21    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     2     0     1     15    15    12    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     66.66666667 25
      8.333333333 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2005  1     5     2     0     1     16    16    7     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     14.28571429
      85.71428571 0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2005  1     5     2     0     1     17    17    14    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     2     0     1     18    18    7     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     57.14285714
      42.85714286 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2005  1     5     2     0     1     19    19    5     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     20    80
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     2     0     1     20    20    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     2     0     1     21    21    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     2     0     1     22    22    10    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     40
      60    0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     2     0     1     23    23    12    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      33.33333333 66.66666667 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2005  1     5     2     0     1     24    24    5     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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```
      0     0     0     0     0     0     0     0     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     2     0     1     26    26    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     2     0     1     27    27    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     100   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     2     0     1     5     5     1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     100   0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     2     0     1     6     6     3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     2     0     1     7     7     10    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     2     0     1     8     8     9     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     2     0     1     9     9     18    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
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2006  1     5     2     0     1     10    10    11    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     72.72727273 27.27272727
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2006  1     5     2     0     1     11    11    7     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     2     0     1     12    12    12    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     83.33333333
      16.66666667 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2006  1     5     2     0     1     13    13    34    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     97.05882353
      2.941176471 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2006  1     5     2     0     1     14    14    28    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     89.28571429
      10.71428571 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2006  1     5     2     0     1     15    15    13    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     69.23076923
      30.76923077 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2006  1     5     2     0     1     16    16    16    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     6.25  93.75 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     2     0     1     17    17    17    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     5.882352941
      94.11764706 0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2006  1     5     2     0     1     18    18    15    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     6.666666667 80
      13.33333333 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2006  1     5     2     0     1     19    19    6     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     16.66666667
      83.33333333 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2006  1     5     2     0     1     20    20    5     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     2     0     1     21    21    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     2     0     1     22    22    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     50
      50    0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     2     0     1     23    23    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     2     0     1     24    24    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     2     0     1     25    25    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

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      0     0     0     0     0     0     0     0     0     0     0
      50    50    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     2     0     1     26    26    4     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     100   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     2     0     1     28    28    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     100   0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     2     0     1     7     7     1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     2     0     1     8     8     2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     2     0     1     9     9     2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     2     0     1     10    10    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     2     0     1     11    11    23    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
```

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2007  1     5     2     0     1     12    12    24    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     2     0     1     13    13    40    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     90    7.5   0
      2.5   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     2     0     1     14    14    12    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     75    25    0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     2     0     1     15    15    24    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     20.83333333
      79.16666667 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2007  1     5     2     0     1     16    16    20    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     5     95    0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     2     0     1     17    17    21    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     80.95238095
      19.04761905 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2007  1     5     2     0     1     18    18    16    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     31.25 50
      18.75 0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     2     0     1     19    19    10    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     40    30
      30    0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     2     0     1     20    20    6     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      66.66666667 33.33333333 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2007  1     5     2     0     1     21    21    9     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     11.11111111 0
      33.33333333 55.55555556 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2007  1     5     2     0     1     22    22    6     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      33.33333333 50    16.66666667 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2007  1     5     2     0     1     23    23    3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      33.33333333 33.33333333 33.33333333 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2007  1     5     2     0     1     24    24    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      50    50    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     2     0     1     25    25    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      50    0     50    0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     2     0     1     26    26    3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     33.33333333 33.33333333 33.33333333 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2008  1     5     2     0     1     5     5     1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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```
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     5     2     0     1     8     8     3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     33.33333333 66.66666667
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2008  1     5     2     0     1     9     9     8     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     50    50    0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     5     2     0     1     10    10    16    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     6.25  93.75 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     5     2     0     1     11    11    17    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     5     2     0     1     12    12    10    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     5     2     0     1     13    13    11    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     81.81818182
      18.18181818 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2008  1     5     2     0     1     14    14    13    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     46.15384615
      53.84615385 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
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```
2008  1     5     2     0     1     15    15    15    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     13.33333333
      86.66666667 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2008  1     5     2     0     1     16    16    14    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     7.142857143
      78.57142857 14.28571429 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2008  1     5     2     0     1     17    17    7     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     85.71428571
      14.28571429 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2008  1     5     2     0     1     18    18    6     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     33.33333333
      66.66666667 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2008  1     5     2     0     1     19    19    5     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     5     2     0     1     20    20    9     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      88.88888889 11.11111111 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2008  1     5     2     0     1     21    21    6     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      66.66666667 33.33333333 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2008  1     5     2     0     1     22    22    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     5     2     0     1     28    28    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     5     2     0     1     5     5     1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     5     2     0     1     7     7     7     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     5     2     0     1     8     8     34    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     5     2     0     1     9     9     27    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     5     2     0     1     10    10    14    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     92.85714286 7.142857143
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2009  1     5     2     0     1     11    11    15    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     73.33333333 26.66666667
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2009  1     5     2     0     1     12    12    6     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     16.66666667 83.33333333
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2009  1     5     2     0     1     13    13    21    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     95.23809524
      4.761904762 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2009  1     5     2     0     1     14    14    29    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     75.86206897
      20.68965517 3.448275862 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2009  1     5     2     0     1     15    15    27    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     62.96296296
      37.03703704 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2009  1     5     2     0     1     16    16    29    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     24.13793103
      72.4137931  3.448275862 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2009  1     5     2     0     1     17    17    30    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     6.666666667 90
      3.333333333 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2009  1     5     2     0     1     18    18    17    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     47.05882353
      52.94117647 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2009  1     5     2     0     1     19    19    9     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     11.11111111
      88.88888889 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
```

```
2009  1     5     2     0     1     20    20    16    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     5     2     0     1     21    21    12    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      91.66666667 8.333333333 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2009  1     5     2     0     1     22    22    4     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     25
      75    0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     5     2     0     1     23    23    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     50
      50    0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     5     2     0     1     24    24    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     5     2     0     1     29    29    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     100   0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     2     0     1     8     8     4     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     2     0     1     9     9     4     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     2     0     1     10    10    6     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     50    50    0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     2     0     1     11    11    16    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     6.25  93.75 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     2     0     1     12    12    31    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     2     0     1     13    13    47    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     95.74468085
      4.255319149 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2010  1     5     2     0     1     14    14    29    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     93.10344828
      6.896551724 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2010  1     5     2     0     1     15    15    38    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     89.47368421
      7.894736842 2.631578947 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2010  1     5     2     0     1     16    16    13    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     53.84615385
      38.46153846 7.692307692 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2010  1     5     2     0     1     17    17    17    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     11.76470588
      58.82352941 23.52941176 5.882352941 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2010  1     5     2     0     1     18    18    6     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     2     0     1     19    19    11    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     27.27272727
      63.63636364 9.090909091 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2010  1     5     2     0     1     20    20    6     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      83.33333333 16.66666667 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2010  1     5     2     0     1     21    21    4     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     50
      50    0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     2     0     1     22    22    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     2     0     1     23    23    6     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      16.66666667 66.66666667 16.66666667 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2010  1     5     2     0     1     24    24    4     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      50    50    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
```

```
2010  1     5     2     0     1     25    25    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
#
#
0       # Mean Size at Age Observations
0       # Total number of environmental variables
0       # Total number of environmental observations
0       # No Weight frequency data
0       # No tagging data
0       # No morph composition data

999 # End data file
```

Appendix B. Stock Synthesis control file for darkblotched rockfish

```
# darkblotched control file
# updated to run in SSv3.20

# Morph setup
1     # Number of growth patterns
1     # N sub morphs within growth patterns

# Note:  these control the retention function.
# First block is ascending part of the curve.
# Second block controls asymptote.
# Block for 2009-10 added for 2011 update.

2 # Blocks
1 4  # blocks in each design
2000 2010
2000 2001 2002 2003 2004 2005 2006 2010

# Mortality and growth specifications
0.5   # Fraction female at birth
1     # M setup: 0=single
Par,1=N_breakpoints,2=Lorenzen,3=agespecific;_4=agespec_withseasinte
rpolate
2     # Number of M breakpoints
4 15  # Ages at M breakpoints
1       # Growth model: 1=VB with L1 and L2, 2=VB with A0 and Linf,
3=Richards, 4=Read vector of L@A
1.7   # Age for growth Lmin
29    # Age for growth Lmax or 999 = Linf
0.1   # SD constant added to LAA (0.1 mimics v1.xx for compatibility
only)
0     # Variability about growth: 0=CV~f(LAA) [mimic v1.xx],
1=CV~f(A), 2=SD~f(LAA), 3=SD~f(A)
1     # Maturity option: 1=length logistic, 2=age logistic, 3=read
age-maturity matrix by growth_pattern
2     # First age allowed to mature
1       # fecundity option
0       # hermaphro
3     # mg parm offset option:
#old key: 1=direct assignment, 2=each pat. x gender offset from pat.
1 gender 1, 3=offsets as SS2 V1.xx with M old and CV old offset from
young values
#new key: 1=none, 2= M, G, CV_G as offset from female-GP1, 3=like
SS2 V1.x)

1     # mg parm adjust method 1=do V1.23 approach, 2=use logistic
transform between bounds approach

# Maturity & Growth Parameters
# min       max   init       prior pr_type    sd    phase       env
      UseDev      Minyr Maxyr DevSD use_bl bl_type
0.01  0.15  0.07  0.08  0     0.8   -3    0     0     0     0     0
      0     0     # natM Young
```

```
-3    3     0     0     0     0.8   -3    0     0     0     0     0
      0     0     # natM old exp offset
12    16    14.5  14.6  0     5     2     0     0     0     0     0
      0     0     # Lmin
40    60    42.44 42.5  0     10    2     0     0     0     0     0
      0     0     # Lmax
0.05  0.25  0.215 0.2   0     0.8   3     0     0     0     0     0
      0     0     # VBK
0.05  0.25  0.065 0.07  0     0.8   3     0     0     0     0     0
      0     0     # CV Young
-3    3     0     0     0     0.8   4     0     0     0     0     0
      0     0     # CV old offset
-3    3     0     0     0     0.8   -3    0     0     0     0     0
      0     0     # Male natmort offset
-3    3     0     0     0     0.8   -3    0     0     0     0     0
      0     0     # male natmore offset
-3    3     0     0     0     0.8   -5    0     0     0     0     0
      0     0     # Male Lmin offset
-3    3     -0.12 0     0     0.8   3     0     0     0     0     0
      0     0     # Male Lmax offset *
-3    3     0.233 0     0     0.8   3     0     0     0     0     0
      0     0     # Male VBK offset *
-3    3     0     0     0     0.8   -6    0     0     0     0     0
      0     0     # Male cv Y offset
-3    3     0     0     0     0.8   -6    0     0     0     0     0
      0     0     # Male cv old offset

-3    3     2.10E-05 0   0    0.8   -3    0     0     0     0     0
      0     0     # F L to wt coeff
-3    3     2.96142     2.64694     0     0.8   -3    0     0     0
      0     0     0     0     # F L to Wt exp
0     60    34.59 55    0     0.8   -3    0     0     0     0     0
      0     0     # Mat infl
-3    3     -0.6429     -0.25 0     0.8   -3    0     0     0     0
      0     0     0     # Mat logistic slope (negative)
-3    3     0.1458      1     0     0.8   -3    0     0     0     0
      0     0     0     # fecund intercept
0     2     1.325 1     0     0.8   -3    0     0     0     0     0
      0     0     # fecund multiplier
-3    3     2.10E-05 0  0     0.8   -3    0     0     0     0     0
      0     0     # Male L to wt coeff
-3    3     2.96142     2.64694     0     0.8   -3    0     0     0
      0     0     0     0     # Male L to wt exp

0     1     1     1     0     50    -50   0     0     0     0     0
      0     0     # Recruitment apportionment by growth pattern
0     1     1     1     0     50    -50   0     0     0     0     0
      0     0     # Rec app by Area
0     1     1     1     0     50    -50   0     0     0     0     0
      0     0     # Rec app by Season
0     1     1     1     0     50    -50   0     0     0     0     0
      0     0     # Cohort growth deviation

# Seasonal effects on biology parameters (0=none)
```

```
 0 0 0 0 0 0 0 0 0 0

3 #Recruitment Function 1 BH w/flat top, 2 Ricker, 3 BH, 4 none
# Recruitment Parms
# Low High  Init  Prior PrType     SD    phase
3     31    8.2   8     0     10    1     # R0
0.2   0.95  0.76  0.753 2     0.15  -2    # h
0     2     0.8   0.8   0     0.8   -1    # sigma R
-5    5     0     0     0     1     -3    # Env link coeff
-5    5     0     0     0     1     -3    # Init Equilb offset to
virgin
-1    1     0     0     0     100   -1    # placeholder for
Autocorrelation

0 # index of environmental variable to be used
0 # env target parameter: 0=none, 1=rec devs, 2=R0, 3=steepness

# Recruitment residuals
1       # rec dev type: 0=none, 1=devvector (zero-sum), 2=simple
deviations (no sum constraint)
1975  # Start year recruitment residuals
2009  # End year recruitment residuals
3     # Phase

1 # Read 11 advanced recruitment options: 0=no, 1=yes
0     # first year for early rec devs
-4    # phase for early rec devs
5     # Phase for forecast recruit deviations
1     # Lambda for forecast recr devs before endyr+1
1974  #_last_yr_nobias_adj_in_MPD
1975  # first year of full bias correction (linear ramp up from this
year minus the plus-age to this year)
2009  # last year for full bias correction in_MPD
2010  #_first_recent_yr_nobias_adj_in_MPD
1.0     # Max bias correction
0     # placeholder
-15   # Lower bound rec devs
15    # Upper bound rec devs
0       # read intitial values for rec devs

# Fishing mortality setup
0.06  # F ballpark for tuning early phases
1999  # F ballpark year
1     # F method:  1=Pope's; 2=Instan. F; 3=Hybrid (recommended)
0.9   # max F or harvest rate, depends on F_Method

# Initial Fishing Mortality Parameters
0  1  0  0.01  0  99  -1

# Catchability Specification (Q_setup)
#_Den-dep  env-var  extra_se  Q_type
0          0        0         0 # 1 FISHERY
0          0        0         0 # 2 TRIENNIAL
0          0        0         0 # 3 SLOPE
```

```
0          0        0         0 # 4 NWSLOPE
0          0        0         0 # 5 NWSHELF

# Selectivity Specification
#Type Retent      Moffset    Special
#Length
24    1     0     0 #Fishery
24    0     0     0 #Triennial
24    0     0     0 #AFSC slope
24    0     0     0 #NW slope
24    0     0     0 #NW shelf

10    0     0     0 #Age selects 10 = flat
10    0     0     0
10    0     0     0
10    0     0     0
10    0     0     0

# Selectivity Parameter

#Low  High  Init  Prior PrType      SD    Phase env   usedev      minyr
      maxyear     sd    block blswitch
20    45    36    32    0     50    2     0     0     0     0     0.5
      0     0     # 1 = baseparm*exp(blockparm)
-6    4     1     0     0     50    2     0     0     0     0     0
      0     0
-1    9     4     4     0     50    3     0     0     0     0     0
      0     0

-1    9     0.6   5.5   0     50    -3    0     0     0     0     0
      0     0

-5    9     -2    -2    0     50    2     0     0     0     0     0
      0     0

-5    9     9     5     0     50    -3    0     0     0     0     0
      0     0


15    70    27    35    0     99    2     0     0     0     0     0.5
      1     2
0.1   10    2     1     0     99    2     0     0     0     0     0.5
      0     0     # 1 means that parmí = baseparm + blockparm
0.001 1     1     1     0     99    -3    0     0     0     0     0.5
      2     2     # 2 means that parmí = blockparm
0     0     0     0     0     99    -3    0     0     0     0     0.5
      0     0


10    45    21    23    0     50    2     0     0     0     0     0
      0     0
-6    4     -6    -1    0     50    -2    0     0     0     0     0
      0     0
```

```
-1    90    4     4     0     50    3     0     0     0     0     0
      0     0

-1    90    4     6     0     50    4     0     0     0     0     0
      0     0

-5    90    -2    -4    0     50    2     0     0     0     0     0
      0     0

-5    90    -3    -1    0     50    3     0     0     0     0     0
      0     0

10    450   230   28    0     50    2     0     0     0     0     0
      0     0
-6    40    -1    -1    0     50    2     0     0     0     0     0
      0     0
-1    90    2     4     0     50    3     0     0     0     0     0
      0     0

-1    90    2     4     0     50    3     0     0     0     0     0
      0     0

-5    90    -5    -4    0     50    -4    0     0     0     0     0
      0     0

-5    90    -4    -2    0     50    3     0     0     0     0     0
      0     0



10    450   250   28    0     50    2     0     0     0     0     0
      0     0
-6    40    -.3   1     0     50    -5    0     0     0     0     0
      0     0
-1    90    3     4     0     50    4     0     0     0     0     0
      0     0

-1    90    .1    4     0     50    -4    0     0     0     0     0
      0     0

-5    90    -5    -4    0     50    -5    0     0     0     0     0
      0     0

-5    90    .2    1     0     50    4     0     0     0     0     0
      0     0

8     450   180   20    0     50    2     0     0     0     0     0
      0     0
-6    40    -1    -1    0     50    3     0     0     0     0     0
      0     0
#-1   90    0     2     0     50    3     0     0     0     0     0
      0     0
```

```
-1    9     -0.5  2     0     50    -3    0     0     0     0     0
      0     0

-1    9     3     4     0     50    4     0     0     0     0     0
      0     0

-5    9     -1    -3    0     50    4     0     0     0     0     0
      0     0

-5    9     -5    -4    0     50    -3    0     0     0     0     0
      0     0

1     # Selex block setup: 0=Read one line apply all, 1=read one
line each parameter
# Lo  Hi    Init  Prior P_type      SD    Phase
15  70      25  30      0  99  4
0.3  1  .7  .7  0  99  3
0.3  1  .8  .8  0  99  3
0.3  1  .6  .6  0  99  3
0.3  1  .6  .6  0  99  3

1 #_env/block/dev_adjust_method (1=standard; 2=logistic trans to
keep in base parm bounds)
0 # Tagging flag: 0=none,1=read parameters for tagging

### Likelihood related quantities ###
# variance/sample size adjustment by fleet
1 # Do variance adjustments
0  .21  .20  .61  .17   # const added to survey cv
0  0  0  0  0   # const added to discard sd
0  0  0  0  0   # const added to body weight sd
.63  .71  .58  .88  1   # mult scalar for length comps
1 .50  1  .25  .15   # mult scalar for age comps
1  1  1  1  1   # mult scalar for length at age obs

# removed for SSv3.20: 30    # DF discard fraction data t-
distribution (discard_like)
# removed for SSv3.20: 30    # DF mean body weight data t-
distribution (DF_for_meanbodywt_like)

1     # Max N lambda phases: read this N values for each item below
0     # SD offset (CPUE, discard, mean body weight, recruitment
devs): 0=omit log(s) term, 1=include

0 # N changes to default Lambdas = 1.0
# Component codes:
#  1=survey
#  2=discard
#  3=mean body weight
#  4=length frequency
#  5=age frequency
#  6=Weight frequency
#  7=size at age
#  8=catch
```

```
#  9=initial equilibrium catch
#  10=rec devs
#  11=parameter priors
#  12=parameter deviations
#  13=Crash penalty
#  14=Morph composition
#  15=Tag composition
#  16=Tag return
# Component fleet/survey  phase  value  wtfreq_method

0 # extra SD pointer

999 # end of control file
```

Appendix C. Stock Synthesis Starter file for darkblotched rockfish

```
# darkblotched starter file for SS v3.x

darkblotched_data.SS   # Data file
darkblotched_control.SS # Control file

0     # Read initial values from .par file: 0=no,1=yes
1     # DOS display detail: 0,1,2
2     # Report file detail: 0,1,2
0     # Detailed checkup.sso file (0,1)
0     # Write parameter iteration trace file during minimization
2     # Write cumulative report: 0=skip,1=short,2=full
0     # Include prior likelihood for non-estimated parameters
0     # Use Soft Boundaries to aid convergence (0,1) (recommended)
0     # N bootstrap datafiles to create
25    # Last phase for estimation
1     # MCMC burn-in
1     # MCMC thinning interval
0     # Jitter initial parameter values by this fraction
-1    # Min year for spbio sd_report (neg val = styr-2, virgin
state)
-2    # Max year for spbio sd_report (-1=endyr+1, -2=entire
forecast)
0     # N individual SD years
0.0001     # Ending convergence criteria
0     # Retrospective year relative to end year (i.e. -4)
1     # Min age for summary biomass
1     # Depletion basis: denom is: 0=skip; 1=rel X*B0; 2=rel X*Bmsy;
3=rel X*B_styr
1     # Fraction (X) for Depletion denominator (e.g. 0.4)
1     # (1-SPR)_reporting:  0=skip; 1=rel(1-SPR); 2=rel(1-SPR_MSY);
3=rel(1-SPR_Btarget); 4=notrel
1     # F_std reporting: 0=skip; 1=exploit(Bio); 2=exploit(Num);
3=sum(frates)
#0 45    #_min and max age over which average F will be calculated
0     # F_report_basis: 0=raw; 1=rel Fspr; 2=rel Fmsy ; 3=rel Fbtgt

999 # end of file marker
```

Appendix D. Stock Synthesis forecast file for darkblotched rockfish

```
#V3.21d
#C  generic forecast file
# for all year entries except rebuilder; enter either: actual year,
-999 for styr, 0 for endyr, neg number for rel. endyr
1 # Benchmarks: 0=skip; 1=calc F_spr,F_btgt,F_msy
2 # MSY: 1= set to F(SPR); 2=calc F(MSY); 3=set to F(Btgt); 4=set to
F(endyr)
#0.4 # SPR target (e.g. 0.40)
#0.342 # Biomass target (e.g. 0.40)
0.5 # SPR target (e.g. 0.40)
0.4 # Biomass target (e.g. 0.40)
#_Bmark_years: beg_bio, end_bio, beg_selex, end_selex, beg_relF,
end_relF (enter actual year, or values of 0 or -integer to be rel.
endyr)
 0 0 0 0 0 0
#  2010 2010 2010 2010 2010 2010 # after processing
1 #Bmark_relF_Basis: 1 = use year range; 2 = set relF same as
forecast below
#
1 # Forecast: 0=none; 1=F(SPR); 2=F(MSY) 3=F(Btgt); 4=Ave F (uses
first-last relF yrs); 5=input annual F scalar
12 # N forecast years
0.20 # F scalar (only used for Do_Forecast==5)
#_Fcast_years:  beg_selex, end_selex, beg_relF, end_relF  (enter
actual year, or values of 0 or -integer to be rel. endyr)
 0 0 0 0
#  1180659524 1667592815 7631713 0 # after processing
1 # Control rule method (1=catch=f(SSB) west coast; 2=F=f(SSB) )
0.40 # Control rule Biomass level for constant F (as frac of Bzero,
e.g. 0.40); (Must be > the no F level below)
0.10 # Control rule Biomass level for no F (as frac of Bzero, e.g.
0.10)
1 # Control rule target as fraction of Flimit (e.g. 0.75)
3 #_N forecast loops (1=OFL only; 2=ABC; 3=get F from forecast ABC
catch with allocations applied)
3 #_First forecast loop with stochastic recruitment
0 #_Forecast loop control #3 (reserved for future bells&whistles)
0 #_Forecast loop control #4 (reserved for future bells&whistles)
#-65534 #_Forecast loop control #5 (reserved for future
bells&whistles)
0 #_Forecast loop control #5 (reserved for future bells&whistles)
2013  #FirstYear for caps and allocations (should be after years
with fixed inputs)
0 # stddev of log(realized catch/target catch) in forecast (set
value>0.0 to cause active impl_error)
1 # Do West Coast gfish rebuilder output (0/1)
2001 # Rebuilder:  first year catch could have been set to zero
(Ydecl)(-1 to set to 1999)
2011 # Rebuilder:  year for current age structure (Yinit) (-1 to set
to endyear+1)
```

```
1 # fleet relative F:  1=use first-last alloc year; 2=read seas(row)
x fleet(col) below
# Note that fleet allocation is used directly as average F if
Do_Forecast=4
2 # basis for fcast catch tuning and for fcast catch caps and
allocation  (2=deadbio; 3=retainbio; 5=deadnum; 6=retainnum)
# Conditional input if relative F choice = 2
# Fleet relative F:  rows are seasons, columns are fleets
#_Fleet:  FISHERY
#  0
# max totalcatch by fleet (-1 to have no max) must enter value for
each fleet
-1
# max totalcatch by area (-1 to have no max); must enter value for
each fleet
-1
# fleet assignment to allocation group (enter group ID# for each
fleet, 0 for not included in an alloc group)
0
#_Conditional on >1 allocation group
# allocation fraction for each of: 0 allocation groups
# no allocation groups
2 # Number of forecast catch levels to input (else calc catch from
forecast F)
2 # basis for input Fcast catch:  2=dead catch; 3=retained catch;
99=input Hrate(F) (units are from fleetunits; note new codes in
SSV3.20)
# Input fixed catch values
# Proportion caught each fleet 2009/2010 or total limit council has
ACL for 2011 and 2012.
# ACLs:  298 296
#Year Seas Fleet Catch(or_F)
2011 1 1 298
2112 1 1 296
#
999 # verify end of input
```

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DRAFT: Status of the widow rockfish resource in 2011

Xi He, Donald E. Pearson, E.J. Dick, John C. Field,
Stephen Ralston, and Alec D. MacCall

National Marine Fisheries Service
Southwest Fisheries Science Center
Fisheries Ecology Division
110 Shaffer Road
Santa Cruz, CA 95060

Email: *xi.he@noaa.gov*

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Executive summary

Stock

This assessment applies to widow rockfish (*Sebastes entomelas*) located in the territorial waters of the U.S., including the Vancouver, Columbia, Eureka, Monterey, and Conception areas designated by the International North Pacific Fishery Commission (INPFC). The stock is assumed to be a single mixed stock and subject to five major fisheries.

Catches

The earliest records of landings of widow rockfish were in 1916. Major U.S. commercial catches of widow rockfish began in the late 1970s, reaching their peak of 29,068 mt in 1981 (Figure ES1). Since the 1981 peak there has been a steady decline in the landings of widow rockfish to 52 mt in 2003 and to 254 mt in 2006 (Table ES1). Catches were mostly from commercial fisheries. Catches from recreational fisheries ranged from less than 2 mt in 2003 to 375 mt in 1982, and has been minimal in recent years. The dominant gears historically have been midwater and bottom trawls. During the early 1990s, bottom trawl catches nearly matched the midwater trawl catches, but the midwater trawl has been the dominant gear in recent years.

Table ES1. Recent catches (mt) of widow rockfish by five fisheries from 2001 to 2010.

Year	Washington fishery	Oregon Midwater Trawl	Oregon Bottom Trawl	California (EM fishery)	At-sea whiting fishery (ASP)	Total
2001	349.5	1297.8	35.0	402.5	173.5	2258.3
2002	64.8	154.7	6.8	50.4	154.9	431.6
2003	14.4	7.6	1.7	4.8	14.5	43.0
2004	31.6	12.3	10.1	25.5	21.2	100.7
2005	42.8	59.0	5.6	11.9	80.1	199.4
2006	44.9	11.3	3.0	12.6	143.3	215.1
2007	37.1	44.6	9.7	19.4	147.7	258.5
2008	49.2	34.7	1.7	36.4	115.0	237.0
2009	105.2	52.8	2.4	8.2	26.0	194.6
2010	62.1	36.6	3.0	11.4	39.0	152.1

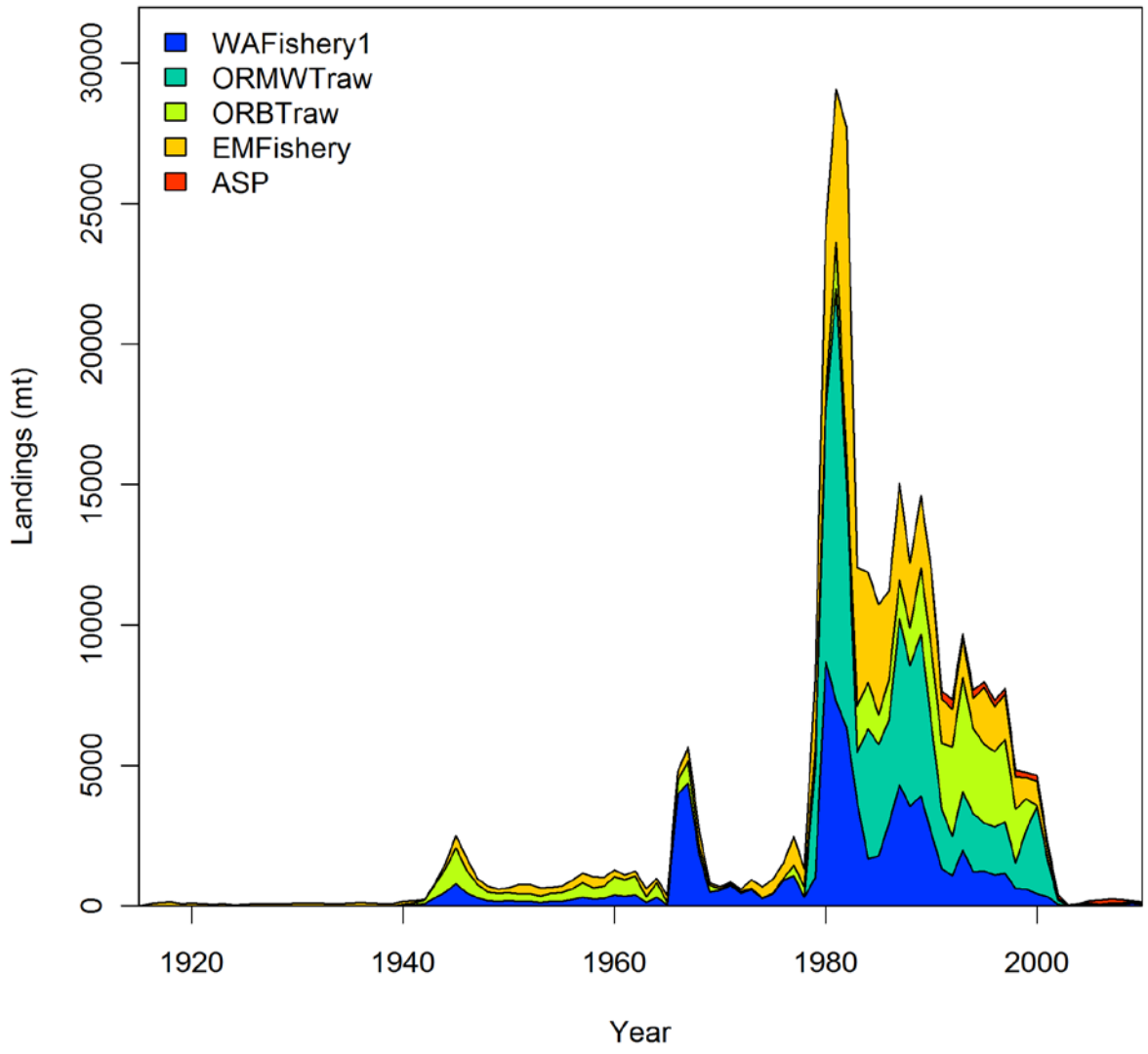

Figure ES1. Total catches of widow rockfish by five fisheries from 1916 to 2010.

Data and assessment

The last full assessment of widow rockfish was conducted in 2009 (He *et al*. 2009a) using the Stock Synthesis (SS) program. A new version (3.22b) of the SS (Methot 2011) was used in this assessment. All fishery data, including landings, length and age composition, and logbook catch rates, were downloaded from the PacFIN, CALCOM, and NORPAC databases, or provided by state and federal agencies. Survey data, including the Alaska Fisheries Science Center (AFSC) triennial survey, the Northwest Fisheries Science Center (NWFSC) trawl survey, and Southwest Fisheries Science Center (SWFSC) mid-water trawl pelagic juvenile survey were also used in the assessment. Catch data from at-sea processing vessels (ASP fishery) were also included in the assessment.

Stock spawning biomass

Stock spawning biomass has shown a steady decline between 1980 and 2001, soon after major commercial fisheries for widow rockfish began. Since 2002, stock spawning biomass has shown an increasing trend. Table ES2 and Figure ES2 show time series of estimated spawning biomass, depletion, and their 95% asymptotic intervals from the base assessment model.

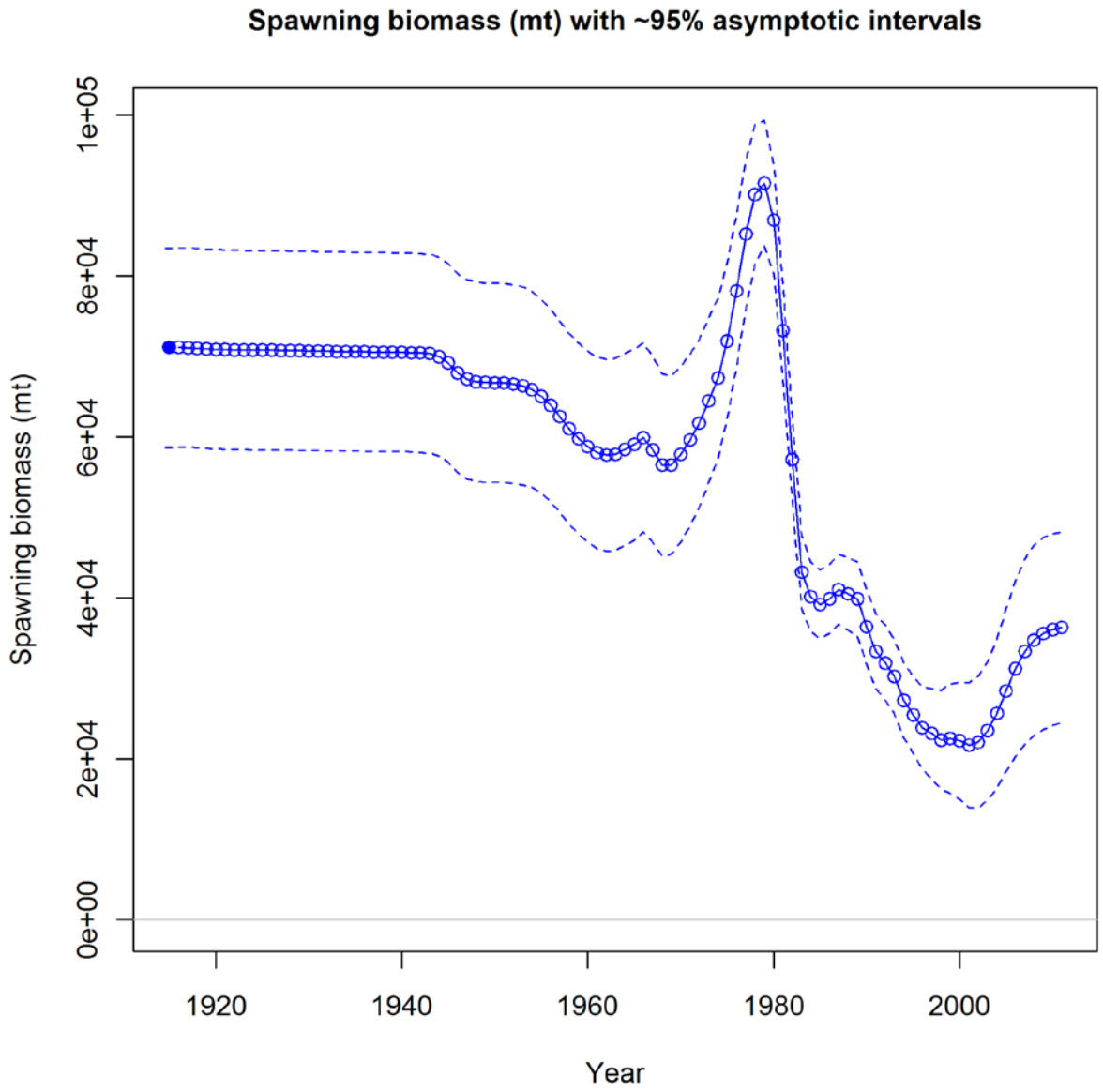

Figure ES2. Estimated spawning biomass of widow rockfish from 1916 to 2011 with 95% asymptotic intervals from the base model.

Table ES2. Estimated stock spawning biomass (mt) and depletion levels (%) of widow rockfish from 2001 to 2011 with 95% asymptotic intervals.

Year	Spawning output (SO)	95% asymptotic interval (SO)	Depletion	95% asymptotic interval (depletion)
2001	21732	±7767	30.6	±7.9
2002	22074	±8176	31.0	±8.2
2003	23491	±8625	33.0	±8.6
2004	25652	±9247	36.1	±9.0
2005	28441	±10085	40.0	±9.7
2006	31178	±10898	43.8	±10.3
2007	33350	±11494	46.9	±10.7
2008	34728	±11812	48.8	±10.8
2009	35545	±11921	50.0	±10.7
2010	36063	±11914	50.7	±10.4
2011	36342	±11814	51.1	±10.1

Recruitment

The model estimated time series of recruitment of age-0 fish from 1948 to 2009. The highest recruitment occurred in 1970 (Figure ES3). Recruitments remained generally low in the early 1990s and have been very low since 2001 as compared to the long-term average (Figure ES3). As in the past assessments, uncertainties in estimation of recruitment remain high.

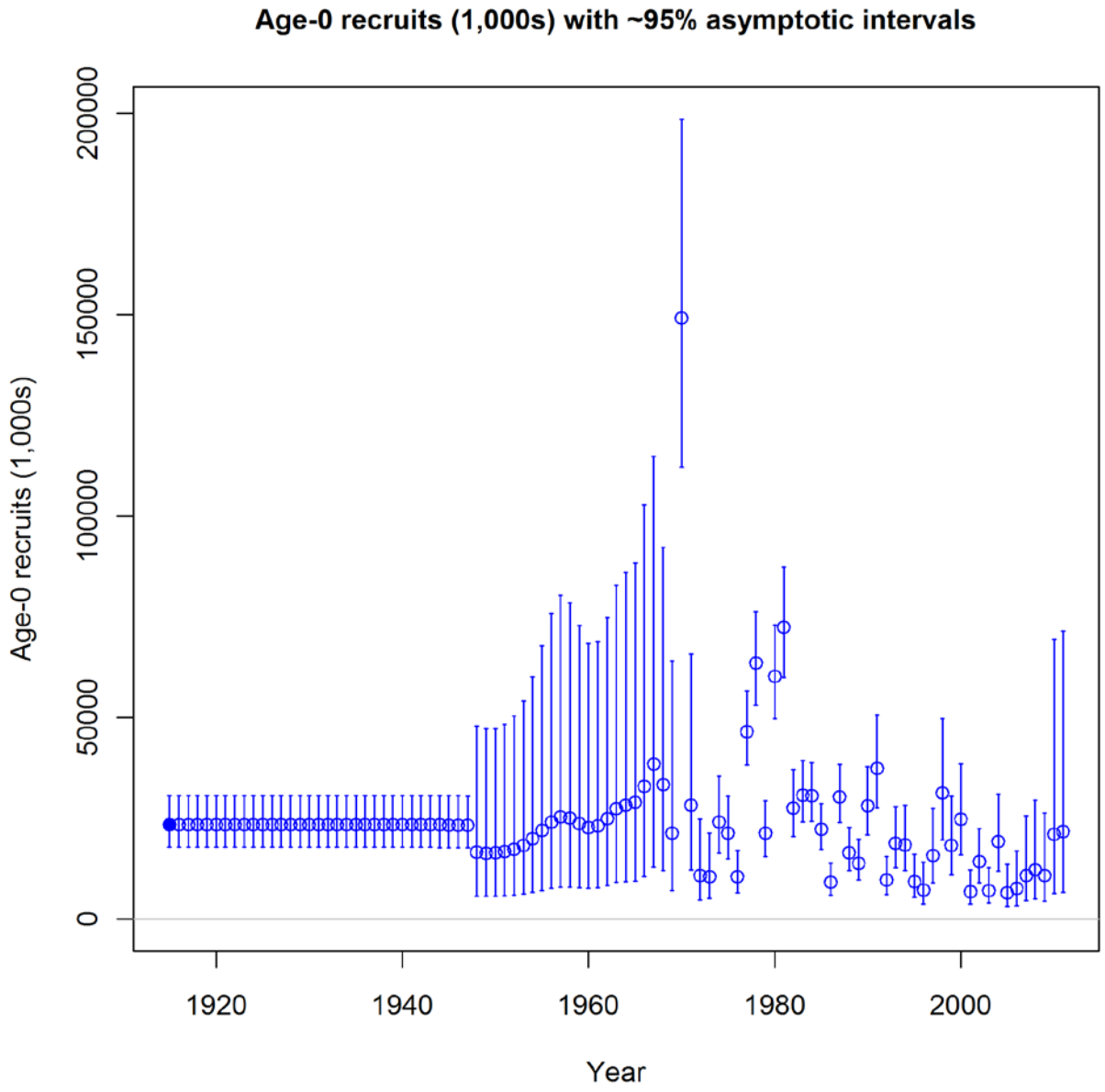

Figure ES3. Estimated recruitment of widow rockfish and 95% of asymptotic confidence intervals from 1916 to 2009.

Reference points

A stock that has declined to less than 25% of its unfished spawning biomass is considered "overfished" until it rebuilds to 40% of its unfished spawning biomass. Such a stock is managed under the rebuilding plan while it is in the precautionary zone and not under the normal control rules specified for a stock in the precautionary zone (i.e. the 40-10 rule).

The spawning biomass in 2011 as a percentage of unfished spawning biomass is the population status (depletion). The estimated depletion in 2011 is 51.1% with 95% of asymptotic intervals of 41.0% and 61.2% (Table ES2 and Figure ES4). The management target for widow rockfish is 40% of unfished spawning biomass. A summary of reference points is listed in Table ES4.

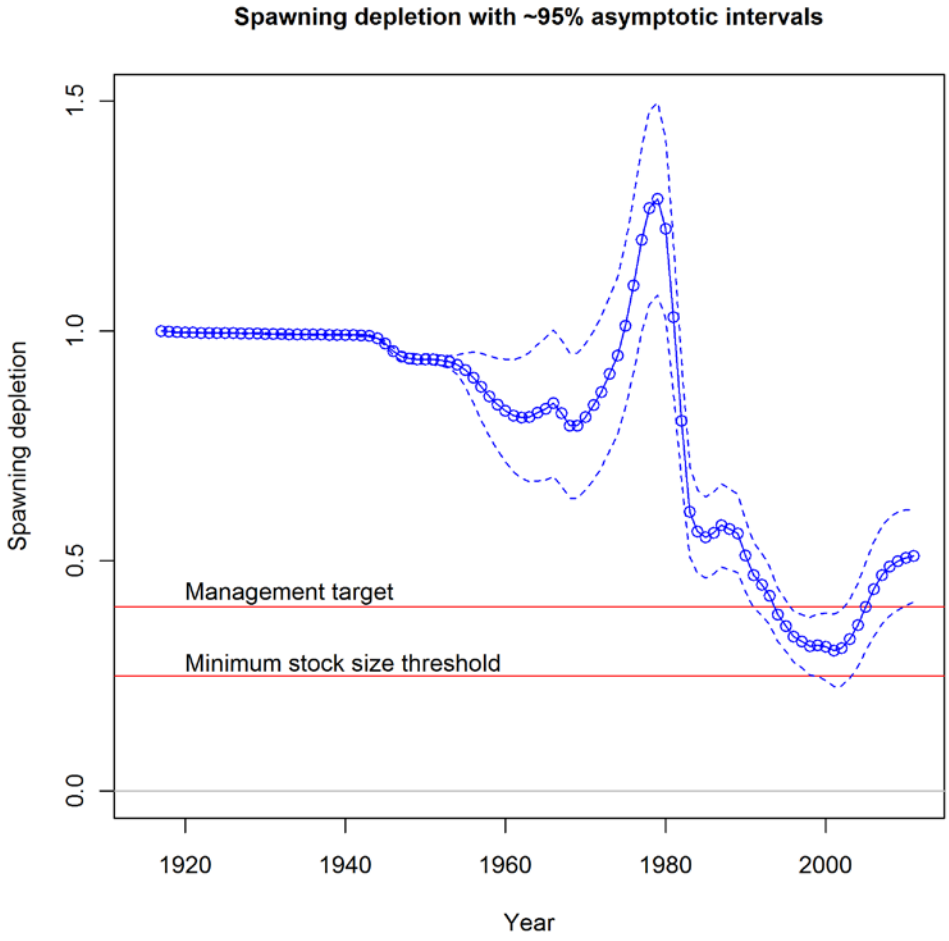

Figure ES4. Time series of depletion from 1916 to 2011 with 95% asymptotic intervals. Levels of management target and minimum stock size threshold are also shown.

Table ES4. Summary of reference points for widow rockfish from the base case model.

Reference term	Estimated value	Asymptotic interval (95%)
Unfished spawning biomass (mt)	71126	58761-83491
Unfished recruitment (*1000)	23392	17024-29760
Reference points based on $SB_{40\%}$		
MSY Proxy Spawning output ($SB_{40\%}$)	28451	23504-33396
SPR resulting in $B_{40\%}$ ($SPR_{SB40\%}$)	0.447	0.447-0.447
Exploitation rate resulting in $SB_{40\%}$	0.079	0.075-0.086
Yield with $SPR_{SB40\%}$ at $SB_{40\%}$ (mt)	5077	4050-6130
Reference points based on SPR proxy for MSY		
Spawning biomass at SPR (SB_{SPR}) (mt)	32315	26862-38167
$SPR_{MSY\text{-}proxy}$	0.5	NA
Exploitation rate corresponding to SPR	0.067	0.063-0.071
Yield with $SPR_{MSY\text{-}proxy}$ at SB_{SPR} (mt)	4758	3797-5718
Reference points based on estimated MSY values		
Spawning biomass at *MSY* (SB_{MSY}) (mt)	18161	15030-21292
SPR_{MSY}	0.314	0.312-0.316
Exploitation Rate corresponding to SPR_{MSY}	0.121	0.115-0.128
MSY (mt)	5490	4374-6606

Exploitation status

This assessment indicates that the widow rockfish population is at 51.1% of virgin spawning biomass in 2010 with an exploitation rate below 1% (Table ES5) and an equilibrium SPR of 97.5% (Figure ES5). However, the population is considered to be rebuilt (Figures ES4 and ES6).

Table ES5. Time series of SPR (spawning potential ratio) and total exploitation rate of widow rockfish from 2001 to 2010.

Year	Spawning potential ratio (SPR)	Exploitation rate
2001	0.6081	0.0482
2002	0.8965	0.0089
2003	0.9888	0.0008
2004	0.9770	0.0018
2005	0.9589	0.0033
2006	0.9590	0.0034
2007	0.9543	0.0040
2008	0.9598	0.0036
2009	0.9676	0.0029
2010	0.9746	0.0022

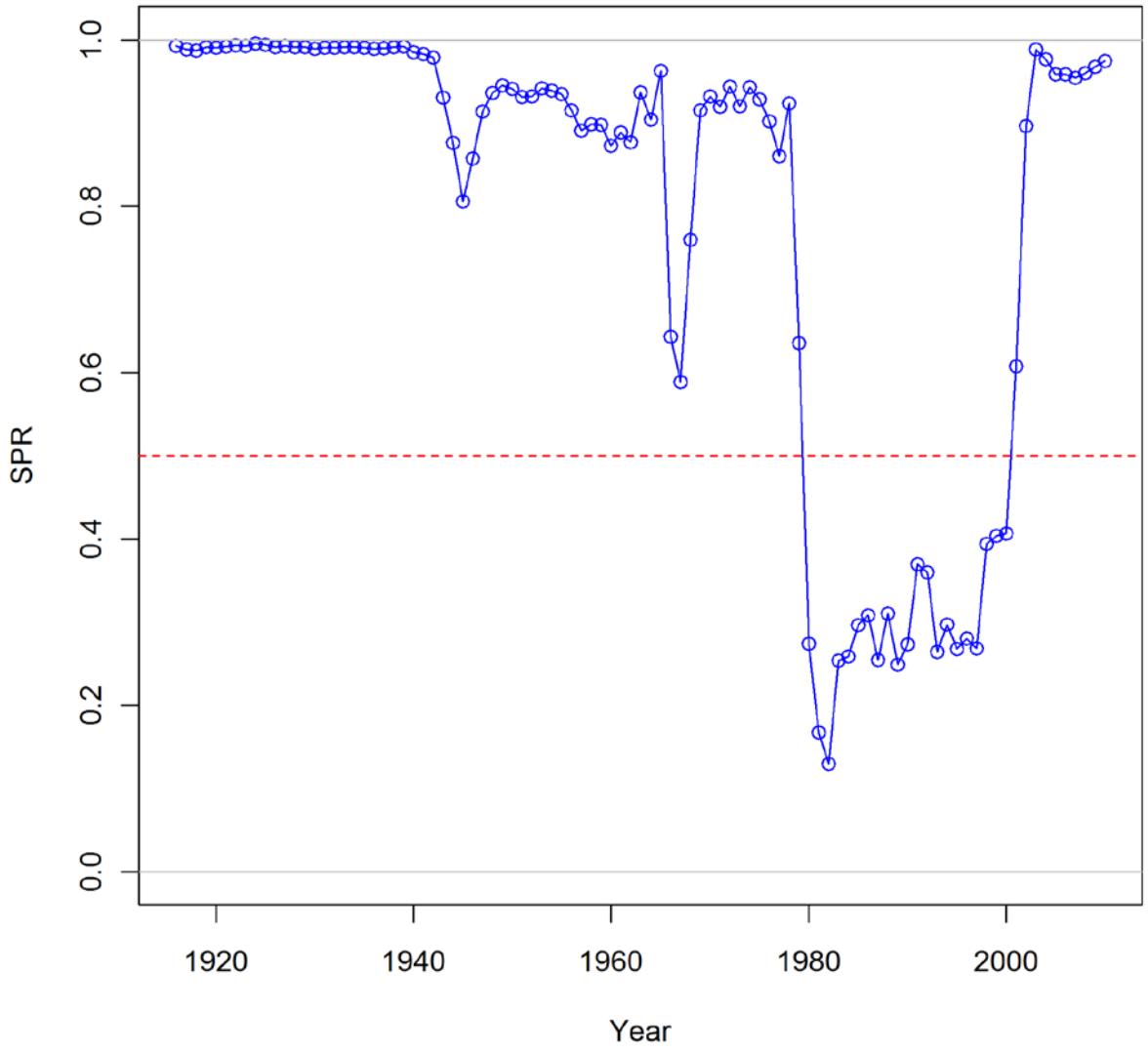

Figure ES5. Time series of estimated equilibrium spawning potential ratios (SPR) from 1916 to 2011. The target SPR level of 0.5 is also shown. Values below the target level indicate that overfishing occurred.

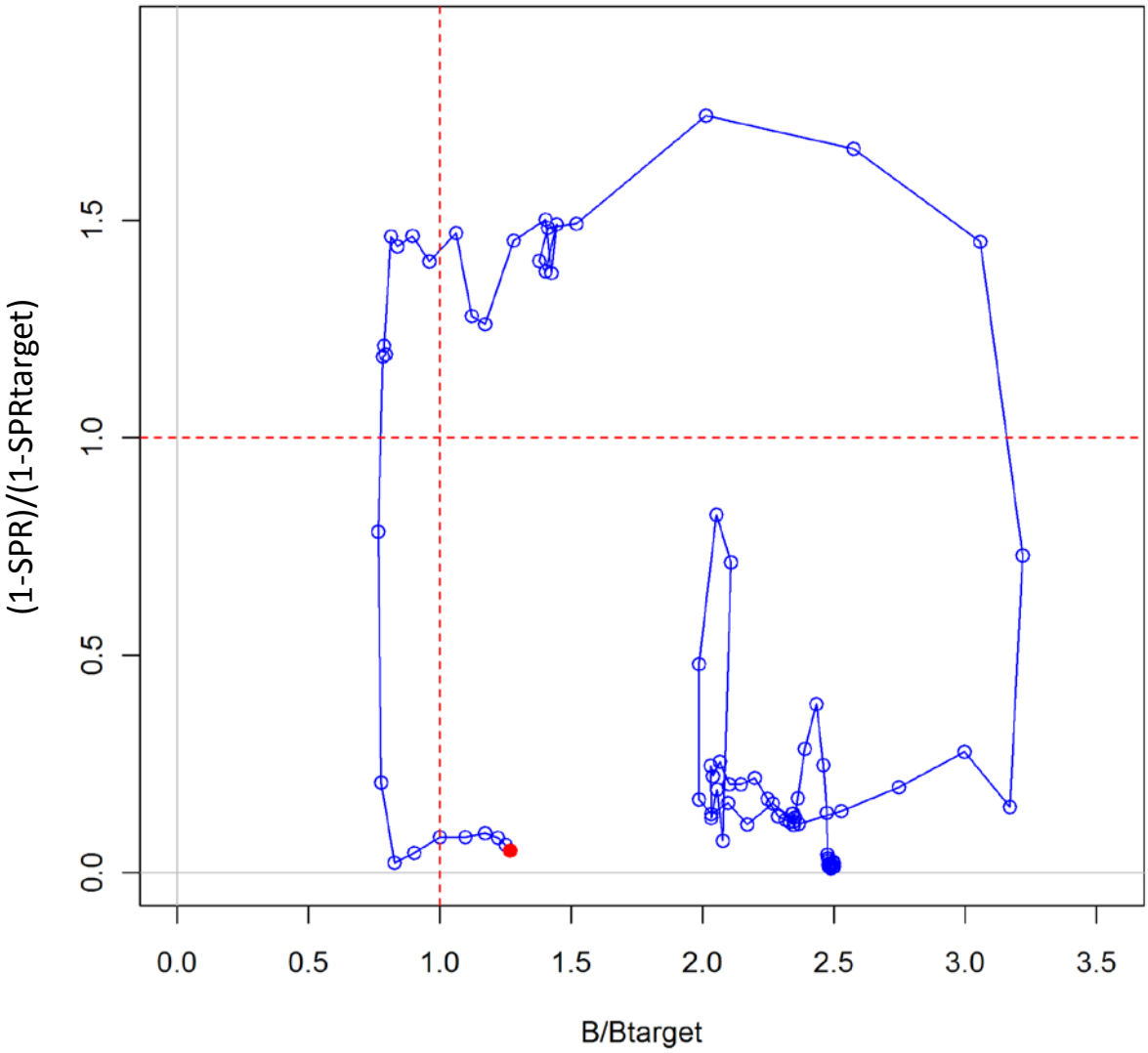

Figure ES6. Phase plot of estimated annual spawning potential ratios relative to the target of 0.5 and estimated spawning output relative to the target of SB40%. The last point on the lower-left quadrant corresponds to the estimated value in 2011 (red).

Management performance

Widow rockfish was declared overfished in 2001. Optimal yield (OY), allowable biological catch (ABC), and catches of recent years are listed in Table ES6.

Table ES6. Management performance in obtaining the harvest guideline for widow rockfish. Harvest guideline and allowable biological catch (ABC) are taken from Council documents.

Year	Harvest Guideline or OY (mt)	Allowable Biological Catch (mt)	Catches (mt)
1999	5,090	5,750	4,770
2000	5,090	5,750	4,661
2001	2,300	3,727	2,258
2002	856	3,727	432
2003	832	3,871	43
2004	284	3,460	101
2005	285	3,218	199
2006	289	3,059	215
2007	368	5,334	259
2008	368	5,144	237
2009	522	7,728	195
2010	509	6,937	152
2011	600	4,872	
2012	600	4,705	

Unresolved problems and major uncertainties

1. As in the past assessments, there exist great uncertainties in estimating the stock-recruitment relationship. The sensitivity analysis in this assessment shows that small changes in the steepness parameter (h) can lead to large changes in point estimates for stock status and management reference points.
2. Estimates of recruitment in recent years are highly uncertain and they are key factors in determining future trajectory of the stock (He *et al*. 2003a, 2006b, 2007b, 2009a).
3. The primary source of information on trends in abundance of widow rockfish is the Oregon bottom trawl logbook data, which is a questionable source of information for widow rockfish. In addition, no information after 1999 in the Oregon bottom trawl logbook data can be used in the assessment because the catch rates were very low due to trip limits and other management regulations. Based on a recommendation by the 2003 STAR panel, triennial survey indices have been used since 2005, but catches in the survey were low and the survey was discontinued in 2004. The NWFSC survey provided abundance indices in recent years, but the time series is short. Also, it is a bottom trawl survey, and does not adequately sample mid-water habitat of widow rockfish.

Forecasts

Widow rockfish was declared to be overfished in 2001. Forecasts based on uncertainties in stock-recruitment estimate and a set of future catch streams are provided in the next section (Decision Table).

Decision table

As in the past assessments, stock-recruit steepness is the single greatest source of uncertainty in the assessment. In the base model, steepness was fixed at the level of 0.76 (Dorn's prior). The decision table was developed to bracket model uncertainty in widow rockfish productivity with alternative values of steepness. The 12.5% and 87.5% quantiles from prior distribution on *h* translate into steepness of 0.54 and 0.95 respectively. This range was considered reasonable to account for uncertainty associated with steepness. It was, however, agreed to shift this range to lower steepness values to (a) take account of the data which, while not greatly informative, did provide some evidence for a lower steepness value, and (b) provide continuity by considering the value of steepness used in the 2009 assessment (0.41). As a result, steepness values of 0.41 and 0.90 were used for the low and high states of nature. Future catch scenarios at OFL and two catch streams between 2011 and 2022 were used as alternative management decisions (Table ES7). Constant catch streams requested by the GMT along with two states of nature were also presented (Table ES8).

Table ES7. Decision table based on three states of nature (determined by *h* values) and three catch streams.

			State of nature					
			h = 0.41		Base case (h=0.76)		*h* = 0.90	
Management decision	Year	Catch (mt)	Depletion (%)	Spawning biomass (mt)	Depletion (%)	Spawning biomass (mt)	Depletion (%)	Spawning biomass (mt)
40/10 adjustment (*h*=0.41)	2011	600	30.0	22765	51.1	36342	55.6	39240
	2012	600	29.4	22288	50.7	36053	55.2	38978
	2013	2584	28.6	21686	49.9	35514	54.5	38429
	2014	2280	26.4	19996	47.6	33847	52.0	36732
	2015	2072	24.8	18807	46.0	32742	50.4	35593
	2016	1985	23.9	18154	45.4	32277	49.7	35091
	2017	2008	23.8	18045	45.7	32515	50.0	35296
	2018	2096	24.2	18346	46.9	33339	51.1	36096
	2019	2200	24.8	18787	48.4	34420	52.7	37165
	2020	2289	25.3	19202	50.0	35562	54.3	38308
	2021	2354	25.7	19530	51.6	36696	55.9	39460
	2022	2394	26.0	19751	53.1	37779	57.5	40576
Constant catch (3500mt)	2011	600	30.0	22765	51.1	36342	55.6	39240
	2012	600	29.4	22288	50.7	36053	55.2	38978
	2013	3500	28.6	21686	49.9	35514	54.5	38429
	2014	3500	25.7	19472	46.8	33319	51.3	36204
	2015	3500	23.2	17618	44.3	31540	48.7	34389
	2016	3500	21.4	16233	42.6	30327	47.0	33137
	2017	3500	20.3	15407	41.9	29827	46.2	32601
	2018	3500	19.8	15050	42.1	29973	46.4	32721
	2019	3500	19.7	14910	42.8	30466	47.0	33201
	2020	3500	19.5	14815	43.7	31111	48.0	33853
	2021	3500	19.3	14675	44.7	31826	49.0	34596
	2022	3500	19.0	14439	45.8	32548	50.1	35370
OFL from base model	2011	600	30.0	22765	51.1	36342	55.6	39240
	2012	600	29.4	22288	50.7	36053	55.2	38978
	2013	4841	28.6	21686	49.9	35514	54.5	38429
	2014	4435	24.7	18704	45.8	32546	50.2	35429
	2015	4137	21.6	16363	42.6	30270	46.9	33117
	2016	3990	19.4	14702	40.4	28769	44.7	31575
	2017	3961	18.1	13716	39.5	28095	43.7	30863
	2018	4023	17.4	13227	39.5	28100	43.7	30842
	2019	4126	17.0	12916	40.0	28425	44.1	31156
	2020	4217	16.6	12576	40.6	28849	44.8	31591
	2021	4296	16.0	12108	41.2	29293	45.4	32075
	2022	4361	15.1	11468	41.8	29703	46.1	32553

Table ES8a. Decision table based on two states of nature (determined by *h* values) and four future catch streams requested by the GMT.

			State of nature			
			h = 0.41		Base case (h=0.76)	
Management decision	Year	Catch (mt)	Depletion (%)	Spawning biomass (mt)	Depletion (%)	Spawning biomass (mt)
Constant catch (1500mt)	2011	600	30.0	22765	51.1	36342
	2012	600	29.4	22288	50.7	36053
	2013	1500	28.6	21686	49.9	35514
	2014	1500	27.2	20619	48.5	34473
	2015	1500	26.1	19839	47.5	33785
	2016	1500	25.6	19443	47.2	33585
	2017	1500	25.7	19515	47.8	34014
	2018	1500	26.4	19993	49.2	35022
	2019	1500	27.2	20655	51.1	36325
	2020	1500	28.1	21354	53.1	37737
	2021	1500	29.0	22029	55.1	39182
	2022	1500	29.9	22648	57.1	40603
Constant catch (2000mt)	2011	600	30.0	22765	51.1	36342
	2012	600	29.4	22288	50.7	36053
	2013	2000	28.6	21686	49.9	35514
	2014	2000	26.8	20332	48.1	34184
	2015	2000	25.4	19283	46.7	33223
	2016	2000	24.6	18639	46.1	32770
	2017	2000	24.4	18486	46.3	32967
	2018	2000	24.7	18755	47.5	33759
	2019	2000	25.3	19217	49.0	34860
	2020	2000	26.0	19720	50.7	36082
	2021	2000	26.6	20197	52.5	37347
	2022	2000	27.2	20609	54.3	38596
Constant catch (2500mt)	2011	600	30.0	22765	51.1	36342
	2012	600	29.4	22288	50.7	36053
	2013	2500	28.6	21686	49.9	35514
	2014	2500	26.4	20046	47.7	33896
	2015	2500	24.7	18729	45.9	32663
	2016	2500	23.5	17838	44.9	31957
	2017	2500	23.0	17460	44.9	31922
	2018	2500	23.1	17520	45.7	32499
	2019	2500	23.4	17783	47.0	33398
	2020	2500	23.8	18089	48.4	34429
	2021	2500	24.2	18364	49.9	35513
	2022	2500	24.5	18565	51.4	36589

Table ES8b. Decision table based on two states of nature (determined by *h* values) and four future catch streams requested by the GMT.

			State of nature			
			h = 0.41		Base case (h=0.76)	
Management decision	Year	Catch (mt)	Depletion (%)	Spawning biomass (mt)	Depletion (%)	Spawning biomass (mt)
Constant catch (2000mt)	2011	600	30.0	22765	51.1	36342
	2012	600	29.4	22288	50.7	36053
	2013	3000	28.6	21686	49.9	35514
	2014	3000	26.0	19758	47.2	33607
	2015	3000	24.0	18171	45.1	32100
	2016	3000	22.4	17032	43.8	31140
	2017	3000	21.7	16430	43.4	30871
	2018	3000	21.5	16281	43.9	31232
	2019	3000	21.5	16341	44.9	31928
	2020	3000	21.7	16447	46.1	32765
	2021	3000	21.8	16516	47.3	33665
	2022	3000	21.7	16500	48.6	34565

Research and data needs

1. More studies on the feasibility of estimating stock-recruitment relationships for given model structures and data availability will be very beneficial.
2. The long-term recruitment index is a key time series in the stock assessment. Continuation of the NMFS/PWCC mid-water juvenile trawl survey should provide key information on the recruitment strength of widow rockfish.
3. Re-ageing of widow rockfish otoliths from California and possibly from Oregon and Washington fisheries in 1980's and 1990's. The conditional age-at-length data from these fisheries showed that ages-at-length were highly variable in these years. For example, fish from the same length groups could range over 20 years in age. Re-ageing these data could improve the precision of growth estimates for assessment models. It will be useful to derive a separate ageing error vector from the re-aged data from the early years.
4. Additional research to determining the magnitude of spatial and temporal differences in biological traits (growth, maturity, fecundity, etc.)

1. Introduction

Widow rockfish (*Sebastes entomelas*) is an important commercial groundfish species belonging to the scorpionfish family (Scorpaenidae). It ranges from southeastern Alaska to northern Baja California, where it frequents rocky banks at depths of 25-370m (Eschemeyer *et al*. 1983, Wilkins 1986). In those habitats it feeds on small pelagic crustaceans and fishes, including especially *Sergestes similis*, myctophids, and euphausiids (Adams 1987). There is no evidence that separate genetic stocks of widow rockfish occur along the Pacific coast and the species has been treated as one stock with several separate fisheries (Hightower and Lenarz 1990; Rogers and Lenarz 1993; Ralston and Pearson 1997, Williams *et al*. 2000, Field and Ralston 2005).

A mid-water trawl fishery for widow rockfish developed in the late 1970s and increased rapidly in 1980-82 (Gunderson 1984, Quirollo 1987, Figure 1). Large concentrations of widow rockfish had evidently gone undetected because aggregations of this species form at night and disperse at dawn, an atypical pattern for rockfish. Since the fishery first developed, substantial landings of widow rockfish have been made in all three west-coast states.

Management of the fishery began in 1982 when 75,000 lbs. trip limits were introduced in an effort to curb the rapid expansion of the fishery (Appendix A). These were reduced to 30,000 lbs. in 1983 and the fishery was managed by altering trip limits within the fishing season. A 10,500 mt/yr Allowable Biological Catch (ABC) for widow rockfish was instituted in 1983, but no harvest guideline was established. This form of management continued with alterations in ABC and trip limits until 1989 when a 12,100 mt/yr harvest guideline was implemented (Appendix A). From 1994 to 1997 the harvest guideline was changed to 6,500 mt and then reduced to 5,090 mt for 1998 to 2000. Based on the 2000 stock assessment, the population was declared overfished (Williams *et al*. 2000), and a series of management actions were taken by the Pacific Fishery Management Council to protect the stock (Appendix A). As consequence, stock assessments for the population were conducted in 2002, 2004, 2006 and 2009 along with rebuilding analyses of the stock (He *et al*. 2003a, 2003b, 2006a, 2006b, 2007a, 2007b, 2009a, and 2009b). Table 1 shows the management performance and harvest guidelines for widow rockfish from 1989 to 2010.

This assessment employs an age-based population model similar to those used in previous assessments (Ralston and Pearson 1997, Williams *et al*. 2000, He *et al*. 2003b, He *et al*. 2006a, He *et al*. 2007a, He *et al*. 2009a). As in the 2009 assessment model, this assessment used the Stock Synthesis program developed by Richard Methot (V3.22b, Methot 8/3/2011).

This assessment employed major modifications of model structures and utilized new data that were not available or not used in the previous assessments. Unlike all previous assessments that used two-area assessment models, this assessment uses a one-area model by assuming that there are no significant differences in biological characteristics, such as growth, maturity, and fecundity, along the entire fishing region. A new fishery, the at-sea whiting processor (ASP) fishery whose catches were combined into other fisheries, is separated from other fisheries and treated as an independent fishery in this assessment because new age and length composition data become available recently. Inclusion of recently assembled length composition data also allows the assessment to internally estimate growth and natural mortality rates. Overall, modifications to this assessment result in a more parsimonious model with increased potential to utilize available data for future assessments.

2. Data

A summary of data available to the assessment is plotted in Figure 2, including all fisheries and surveys, time frames of annual catches, abundance indices, and length and age composition data.

2.1 Biological data and parameters

2.1.1 Growth and fecundity

Growth in length of widow rockfish has been described using von Bertalanffy growth equations in published papers by Lenarz (1987) and Pearson and Hightower (1991). In their analyses it was determined that females attain a larger size than males, and, therefore, we chose to use sex-specific estimates of length-at-age. The one-area base model assumes that sex-specific growth does not change from north to south. In all previous assessments, we chose to use the estimates listed in Pearson and Hightower (1991). The growth parameters were then transformed to the format of the Schnute parameterization, expressed as *L1*, *L2*, and *K*. In this assessment, growth parameters for both sexes, including growth CVs, were estimated internally in the assessment model. Estimated growth curves are presented in Figure 3.

Sex-specific weight-at-age estimates were computed using the length-at-age estimates above in combination with sex-specific length-weight regressions for widow rockfish that were developed by Barss and Echeverria (1987). The length-weight regression equation is $W = \alpha L^{\beta}$, where *W* is the weight (kg) and *L* is the length (cm) and is the same for both areas. The sex-specific parameter values used in this assessment are listed below:

Parameter	Females	Males
α	0.00000545	0.00001188
β	3.28781	3.06631

Estimates of maturity and fecundity of female widow rockfish were obtained from Barss and Echeverria (1987) and Boehlert *et al*. (1982), respectively. Age-specific maturity estimates were taken directly from the literature instead of fitting a parametric model (Figure 4). A recent meta-analysis of rockfish fecundity found no significant relationship between body weight and weight-specific fecundity in widow rockfish (Dick 2009). For this reason, this assessment used spawning biomass as measurement of stock abundance, which is different from spawning outputs (millions of eggs) that have been used in the past assessments. This measurement is more comparable to catch specifications that are used in the management decisions.

2.1.2 Natural mortality

In previous assessments, natural mortality (*M*) was assumed to be constant (0.125 yr^{-1} or 0.15 yr^{-1}) for both sexes and all ages in all years. Many test runs were conducted in an attempt to estimate *M* in the models in previous assessment and STAR Panel reviews. These runs, however, failed to adequately estimate *M*, probably due to dome-shaped selectivity functions that were implemented in the models. A recent study has shown that there is strong interaction between age-dependent *M* and dome-shaped selectivity functions in stock assessment models (He *et al*. 2011).

In this assessment, *M* is still assumed to be constant for all ages and all years, but it is assumed to be sex-specific and is estimated in the models. Internal estimation of *M* is feasible in

this assessment because selectivity functions for one fishery and surveys are set to be asymptotic. Sex-specific prior distributions for *M* were provided by Owen Hamel (NWFSC, personal communication). The priors are derived from information on maximum ages, mean temperature where widow rockfish reside, and gonadosomatic indices. The estimated natural mortality values are 0.124 yr^{-1} for females and 0.129 yr^{-1} for males, respectively.

2.2 Fishery catches

In all previous assessments, four fisheries were identified and used in assessment models (Ralston and Pearson 1997, He *et al*. 2009a). They were: (1) Vancouver-Columbia fishery in Washington State (WAFishery1); (2) Oregon mid-water trawl (ORMWTraw); (3) Oregon bottom trawl (ORBTraw); and (4) Eureka, Monterey, and Conception (EMFishery). In this assessment, landings from the at-sea whiting fishery (at sea processor, ASP) was separated from these fisheries (primarily from the Oregon mid-water trawl fishery) and treated as a separated fishery. The main reason to separate the ASP fishery from other fisheries was that for the first time, age and length data from the at-sea whiting fishery (ASP) became available to the assessment.

Total fishery catches from 1916 to 2011 were presented in Figure 1 and Table 2. These catch statistics were derived from the following sources:

1. Landings from all fisheries, except the ASP fishery, between 1981 and 2001, and between 2008 and 2010, were extracted from the PacFIN database, and landings between 2002 and 2007 were the same as in the 2009 assessments, which were constructed from the West Coast Groundfish Observer Program.
2. The very small annual recreational catches of widow rockfish from 1980 to 2010 were extracted from the Marine Recreational Fishing Statistics Survey (MRFSS) database. Because there were no estimates in the database between 1990 and 1992, catches for these three years were linearly interpolated. These catches were lumped into another fisheries by state.
3. All foreign landings from 1966 to 1972, and some landings from 1973 to 1976 were taken directly from Rogers (2003), who compiled summaries of foreign catches in that period.
4. Some landings from 1973 to 1976 and all landings from 1977 to 1979 were directly copied from the 2000 assessment (Williams *et al*. 2000).
5. Historical California landing data from 1916 to 1968 recently reconstructed by Ralston *et al*. (2010).
6. Historical Oregon landing data from 1915 to 1986 were recently reconstructed by Gertseva *et al*. (2010).
7. Historical Washington landings before 1972 were assumed to be 72% of all Oregon historical catches. The 72% is an average ratio of Washington catches over all Oregon catches from 1981 to 2010.
8. Landings from the ASP fishery from 1991 to 2007 were provided by the NWFSC (Jim Hastie and Eliza Heery, personal communication), and landings from 2008 to 2010 were downloaded from the NWRO NOAA website (NWRO 2010).

The ASP fishery, which was folded into other fisheries in previous assessments, was treated as a distinct fishery in this assessment. In previous assessment, landing data from these fisheries were pooled over states into INPFC area blocks. These in turn were collapsed into northern and southern areas. Within the southern area, widow rockfish landings were further

condensed by summing over gears (i.e., trawl, other commercial, and recreational), providing annual estimates of landings from the southern area fishery (EMFishery). In the northern area, however, landings were partitioned into three separate fisheries (in addition to the ASP fishery): the Oregon midwater trawl fishery (ORMWTraw), the Oregon bottom trawl fishery (ORBTraw), and the remaining catch of widow rockfish from the Washington fisheries (WAFishery1) in the Vancouver-Columbia area. In this assessment, because it is a one-area assessment model, allocations of these four fisheries and their landings were summarized by landing port in each state.

Oregon historical commercial groundfish landings were recently reconstructed by Gertseva *et al*. (2010), which included historical landings of widow rockfish from 1916 to 1986. Summaries of these landings were again grouped into two Oregon fisheries (mid-water and bottom trawl fisheries).

2.2 Fishery discards

The discards of widow rockfish are virtually unknown in most years. Age compositions of discards and landings can be very different (typically smaller fish are discarded) and can be important in determining discard rates (Williams *et al*. 1999). In past assessments, a value of 6% of total weight was assumed discarded for the years 1958-1982 and 16% of total weight for the years 1983-2006 (Hightower and Lenarz 1990, Williams *et al*. 2000, He *et al*. 2003b). The 16% estimate of discards is based on an outdated study by Pikitch *et al*. (1988), which indicated most of the discards of widow rockfish were induced by regulations. The earlier 6% estimated is based on an ad hoc adjustment of the 16% estimate by previous assessment authors (Hightower and Lenarz 1990). The 16% assumed discard rate has become more uncertain in recent years due to changes in regulations. Discard rates since 2007 are considered to be very low (WCGOP 2011). In the 2009 STAR meeting, it was agreed to use WCGOP total mortality estimates for the most recent years.

Total catches for all fisheries were the sum of total landings plus discards. One exception was for the foreign catches from 1966 to 1976 estimated by Rogers (2003), in which estimated catches were assumed to include discards. This was done in a consistent way with the previous assessment. Historical discard rates used in the previous assessments were also used in this assessment. Values of discard rates varied between years. The discard rates were set to be 0.06 between 1916 and 1983, and 0.16 between 1984 and 2006. WCGOP total mortality estimates were used for 2007-2010 period.

2.3 Abundance indices

Four fishery-dependent abundance indices (CPUE) and three fishery-independent survey indices were used in this assessment.

2.3.1 Oregon bottom trawl logbook

Oregon logbook data from 1984 to 1986 were provided by the Oregon Department of Fish and Wildlife, and data from 1987 to 2002 were extracted from the PacFIN database. Catch per unit effort (CPUE) was computed as pounds of fish caught per hour trawled. The data were filtered before the analysis. Only records meeting the following criteria were used in the analysis: (1) the fishing gear code corresponded to bottom trawl or roller gear, (2) hauls were conducted during the months of January, February, or March, and (3) the location of the reported haul fell in the range of 42°30’ N to 46°30’ N latitude and 124°36’ W to 124°54’ W longitude. In

addition, records associated with any vessel code or spatial unit that had less than 1000 pounds of widow catch over the entire period (1984 to 2002) were also deleted. Data from 2000 to 2002 were not used in the analysis because widow catches in those three years were very low due to trip limits and other management regulations that had been implemented.

Annual CPUE indices were derived using the Delta-GLM (Generalized Linear Model) method with an additional factor (vessel) included:

$$\log(CPUE) = \mu + Y_i + V_j + L_k + \varepsilon_{ijkl}$$

where μ is the average $\log(CPUE)$, Y_i is a year effect, V_j is a vessel effect, L_k is a spatial (latitude and longitude) effect, and ε_{ijkl} is a normal error term with mean zero and variance σ_ε^2. The back-transformed year-specific CPUE, with bias-correction, was then calculated as:

$$CPUE_i = \exp\left(\mu + Y_i + \bar{V} + \bar{L} + \frac{\sigma_\varepsilon^2}{2}\right)\pi_i$$

where $\bar{V}$ and $\bar{L}$ are the mean effects of vessel and spatial unit, respectively, and π_i is the probability of a positive tow:

$$\pi_i = \frac{\exp(\mu' + y_i' + \bar{V}' + \bar{L}')}{1 + \exp(\mu' + y_i' + \bar{V}' + \bar{L}')}$$

where μ' is the average, y' is year effect, $\bar{V}'$ is average vessel effect, and $\bar{L}'$ is average spatial effect. Derived annual CPUE indices are presented in Table 3, and are identical to those used in the past assessments. Time series of scaled CPUE index, along with the triennial survey indices, are presented in Figure 5. Because there were no new data since the 2003 assessment, the same Oregon bottom trawl logbook indices from the 2002 assessment are used in this assessment. Selectivity for this index was assumed to be same as the Oregon bottom trawl fishery.

2.3.2. Pacific whiting bycatch indices

As in previous assessments (Rogers and Lenarz 1993, Ralston and Pearson 1997, Williams et al. 2000), CPUE indices were computed that measured the incidental catch rate of widow rockfish in the at-sea Pacific whiting fishery. Data from the foreign fishery, joint-venture fishery and domestic fishery were extracted from the NORPAC database.

Full descriptions of how the CPUE indices were derived are in Appendix A of the 2005 Assessment (He *et al*. 2006a). An approach similar to the Delta-GLM analysis of Oregon bottom trawl logbook was used for estimation of the bycatch indices. Three annual CPUE indices for the whiting bycatch in the foreign fishery (ForWBycatch), joint-venture whiting fishery (JVWBycatch), and domestic whiting fisheries (DomWBycatch) were derived and are presented in Table 4. Time series of scaled CPUE index, along with the NWFSC survey indices, are presented in Figure 6. The indices used in this assessment were the same as in previous assessments (He *et al*. 2009a). As recommended by the 2003 STAR Panel, annual CPUE indices from the domestic fishery after 1998 were excluded from the analysis because changes in management measures are expected to have more influence on the CPUE statistic than changes in stock size. Selectivity functions for these three indices were assumed to be same as Oregon mid-water trawl fishery.

2.3.3 Midwater trawl pelagic juvenile survey (SCJuvSurvey)

Every year since 1983 the Groundfish Analysis Branch at NMFS Fisheries Ecology Division in Santa Cruz/Tiburon Laboratory has conducted a midwater trawl survey, which is designed to assess the reproductive success of rockfish spawning, including widow rockfish. Since 2001, the survey was expanded to a coast wide, combined industry and NMFS survey (PWCC/NWFSC: Pacific Whiting Conservation Cooperative and Northwest Fisheries Science Center) (Sakuma et al. 2006). An ANOVA analysis was used to fit all data from the combined survey (Steve Ralston, personal communication). Annual indices along with CVs from 2001 to 2009 are presented in Table 5. The index shows relatively high age-0 abundance in 2002 and 2004. No data from 2010 were available because the northern portion of the survey area was not sampled in that year.

2.3.4 NWFSC bottom trawl survey

Since 2003 the NWFSC has conducted an annual shelf and slope, combined trawl survey. Widow rockfish has rarely been caught in this survey. Total annual catches ranged from as low as 29kg in 2008 to high of 942 kg in 2003. Even so, the survey was kept in the assessment because it is the only available index since 1999 and it thus has potential in the future to detect stock recovery. The survey data were first used in the 2009 assessment, and were updated for this assessment. The survey is based on a stratified random-grid design, covering coastal waters from a depth of 55 m to 1,280 m from Washington to California. Detailed survey information can be found in Keller *et al*. (2007).

The analysis was conducted using a GLMM method developed by the NWFSC staff (John Wallace, personal communication). The CVs were generated from MCMC sampling. Derived index values and associated CVs are presented in Table 6. A time series of the scaled NWFSC survey index, along with other indices, is plotted in Figure 6. Summary of annual numbers of hauls, fish measured for length compositions and fish aged for age compositions from the survey is presented in Table 7.

2.3.5 Triennial bottom trawl survey

The AFSC/NWFSC triennial trawl survey index was not used in the 2003 assessment because of very limited widow catches taken in the survey and very poor fit of the index in the assessment model (He *et al*. 2003a). The 2003 STAR panel recommended the index be analyzed further and be considered for inclusion in the assessment. In the 2005 and 2007 assessments, the analysis of the triennial survey data uses the same Delta-GLM method as for the Pacific whiting bycatch indices. Detailed description of the analysis is in Appendix B of the 2005 assessment (He *et al*. 2006a). In the 2009 assessment, separate and distinct indices were developed for northern and southern areas, delineated by 43° N latitude. In this assessment, because a one-area model was employed, the survey data were re-analyzed by pooling all data together. The analysis used a GLMM method developed by staff at the NWFSC (John Wallace, personal communication). The CVs were generated from MCMC sampling. The derived index values and associated CVs are presented in Table 8. Time series of scaled CPUE index, along with the Oregon bottom trawl logbook indices, are presented in Figure 5. Numbers of samples and fish measured for length compositions for the survey are presented in Table 9.

Although the mean dates of the triennial survey shifted from the middle of August (1980-1992) to the middle of July (1995-2004), this assessment assumed this change had no effect on the index, i.e., all data from 1980 to 2004 were treated collectively. This is because there is no

evidence to support a seasonal migration of widow rockfish that would affect availability. In addition, too few data, both in catches and length compositions, would be available if the time series were broken in two.

2.4 Age and length composition data

2.4.1 Age composition data

Widow rockfish otolith samples have been collected coast wide since 1989 and aged at the NMFS SWFSC Fisheries Ecology Division in Santa Cruz (formerly the Tiburon Laboratory) using the break-and-burn aging method (Pearson and Hightower 1991). Most fish were aged by Fisheries Ecology Division staff (Don Pearson). Prior to 1989, the ages of all Vancouver-Columbia fish were obtained by researchers in the State of Washington, who used surface readings. Prior to 1982, Oregon widow rockfish were aged by investigators in Oregon, who used the break-and-burn ageing method. At the 2009 widow rockfish STAR Panel, it was requested that a comparison be conducted to see if significant bias exists between the break-and-burn and surface ageing methods. The study was completed in 2010, showing no significant bias between these two ageing methods (see report in Appendix B).

Age validation of widow rockfish was conducted by marginal increment analysis (Lenarz 1987). Hyaline-zone formation, the measure of annual growth, appears to occur between December and April (Pearson 1996). For consistency all widow rockfish are assumed to be born on January 1, which is early in the spawning season. Variation in the timing of hyaline-zone formation occurs between fish sampled from Washington and California, which could affect age determination. Knowledge of this timing variation can be used to avoid mis-ageing. Ultimately, variation in hyaline-zone formation is unlikely to result in major age discrepancies (Pearson 1996).

Washington provided ageing data from samples collected during commercial market sampling. The data were then expanded using relative catches from US Vancouver and Columbia areas. Oregon provided raw sample data which were expanded using methods described in Sampson and Crone (1997). California age data were extracted and expanded from the CALCOM database (Pearson and Erwin 1997). For the first time, otolith samples from the ASP fishery became available to the assessment. Otolith samples from 2008 and 2010 were aged using the same methods as the other fisheries, and age composition data were also similarly compiled. Complete age and length compositions of both sexes for the five fisheries from 1978 to 2010 are presented in Figures 8 to 20.

In the past assessments, ageing errors were determined by a simple method of determining age-reading agreements between age 5 and age 20 (Rogers and Lenarz 1993; Ralston and Pearson 1997; He *et al*. 2009a). Ageing errors for other age groups were then linearly interpolated. For this assessment, a new ageing error vector was developed using a recently developed program (Punt 2011). Two sets of double reads on otolith samples were conducted. The first set of double reads, with otoliths from the NWFSC bottom trawl survey from 2004 to 2008, was conducted between the NWFSC's Newport office (Patrick McDonald) and the SWFSC's Santa Cruz office (Don Pearson). The second set of double reads, with otoliths from the Oregon and California fisheries, was conducted between Don Pearson and an ageing technician at the SWFSC's Santa Cruz Lab (Lyndsey Lefebvre). A new ageing error vector was then computed using Punt's program (Punt *et al*. 2008, Punt 2011), which was used in this

assessment (Table 10). Sensitivity runs from using this ageing error vector (with SD halved and doubled) were also conducted in this assessment.

The age and length data are modeled as multinomial random variables, with the year-specific sample sizes (N_{eff}) computed using a method developed by Ian Stewart of NWFSC that has been commonly used in west coast ground fish assessments. The computation used the following equations for fishery samples:

$$N_{eff} = N_{sample} + 0.138N_{fish} \qquad if \ \frac{N_{fish}}{N_{sample}} < 44$$

$$N_{eff} = 7.06N_{sample} \qquad if \ \frac{N_{fish}}{N_{sample}} \geq 44$$

and used the following equation for survey samples:

$$N_{eff} = N_{sample} + 0.0707N_{fish} \qquad if \ \frac{N_{fish}}{N_{sample}} < 55$$

$$N_{eff} = 4.89N_{sample} \qquad if \ \frac{N_{fish}}{N_{sample}} \geq 55$$

where N_{sample} is the number of samples or trips and N_{fish} is the number of fish that were aged or measured for length. The effective sample sizes for all fisheries and surveys that have age samples are presented in Table 11. Age composition data from three fisheries (Washington fishery, Oregon bottom trawl fishery, and ASP fishery) and from the NWFSC survey are plotted in Figures 7 to 10.

2.4.2 Conditional age-at-length composition data

Age and length data from two fisheries (Oregon mid-water trawl and California fisheries) were used to generate conditional age-at-length (CAAL) compositions by sex and by year. Ideally, CAAL data would be better if they were derived from a fishery-independent survey since survey season is usually shorter than that of any fishery. CAAL data from fishery are more variable because fishing season is long (typically last for more than 6 months) so within-year variations of growth are embedded in the data. Nevertheless, fishery CAAL data were used in this assessment because there were no sufficient survey data available.

In construction of the CAAL data, it was assumed that each fish sample was a random sample of the length group. Sample size for each length group was a proportion of number of fish in that length group divided by total number of fish that had length measurements in that year and then multiplied by N_{eff} of the sampling year. This approach was used instead of using total number of length measurements because it reduced effects of large numbers of length measurements. Conditional age-at-length data from the two fisheries by sex and by year are given in Figures 11 and 12.

2.4.3 Length composition data

Length composition data were compiled using the similar approach as in age composition data. In general, there were larger sample sizes in length composition data that those in age composition data. The annual effective sample sizes for each fishery and survey, which were calculated using the same method as in age composition data, are listed in Table 12. Length composition data from five fisheries and two surveys are plotted in Figures 13 to 19.

3. Stock assessment models

3.1 History of modeling approaches

Previous assessments of widow rockfish were performed in 1989, 1990, 1993, 1997, 2000, 2003, 2005, 2007, and 2009 (Hightower and Lenarz 1989, 1990; Rogers and Lenarz 1993; Ralston and Pearson 1997, Williams *et al.* 2000, He *et al*. 2003a, He *et al*. 2006a, He *et al*. 2007a, He *et al*. 2009a). In 1989 the assessment involved the use of both cohort analysis and the Stock Synthesis program (Methot 1998). In 1993 and 1997, the age-based version of the stock synthesis program was used to assess the status of widow rockfish. In 2000, 2003, and 2005, the assessment of widow rockfish was implemented using ADMB software (Otter Research, Ltd. 2001), and applied an age-based analysis of the population with methods very similar to those used in the Stock Synthesis program. A full description of the ADMB model can be found in the previous assessment documents (He *et al*. 2003a and He *et al*. 2006a). In 2007, an update of the 2005 assessment was conducted (He *et al*. 2007a). The 2009 assessment was implemented using the Stock Synthesis (SS) program (Version 3.03a).

In the 2000 assessment, a starting year of 1968 was chosen based on the assertion that the 1965 year class was the earliest recruitment which could be well estimated, given a starting year of 1980 for the age composition information. The model tracked numbers and catches of male and female widow rockfish in age classes 3-20 (age 20 is an age-plus group). In 2003, the assessment starting year was extended backward to 1958 because the new landing data from 1966 to 1972 were added. Recruitment estimates prior to 1958 are assumed equal to the 1958 estimate in the model, so that the model estimates recruitment at age 3 for the years 1958-1999. The same time frame was used in the 2005 and 2007 assessments. In the 2009 and in this assessment, the assessment starting year was extended backward to 1916 because historical catch estimates from Oregon and California became available.

3.2 Model description

3.2.1 General

In all previous assessments, the widow assessment models were assumed to be a two-area model (northern and southern areas delineated by the 43° N. latitude line) (Ralston and Pearson 1997, Williams *et al*. 2000, He *et al*. 2009). The main reason for using two-area models were that growth, maturity, and fecundity were assumed different between the two areas. In all of these assessments, double-logistic (dome-shaped) age based selectivity function were used. Natural mortality was assumed to be constant for both sexes and for all ages. Annual recruitments for the population were estimated using pooled total biomass from both areas and then distributed proportionally to each area. Alternative definitions of periods of early recruitment and late recruitment were evaluated according to the guidelines recently developed by Methot and Taylor (Methot and Taylor 2011).

The initial assessment model (PreSTAR model) for the 2011 assessment cycle was completed in July 2011 and was submitted to the STAR Panel for review. During the STAR Panel review, it was recommended that more model evaluations be conducted, including using simple one-area assessment model and further evaluation of dome-shaped and asymptotic selectivity functions. After the STAR Panel review, a conference call was initiated by the SSC and procedures for modifications on the PreSTAR models were proposed. The procedures include the following steps:

1. One area model;
2. Length-based vs. age based selectivity;
3. Asymptotic vs. dome-shaped selectivity;
4. Compare model runs with and without the prior for natural mortality.

These steps were used as general guidelines for construction of new (post STAR) models. These models were reviewed again at the SSC's Groundfish Subcommittee meeting (a.k.a. Mop-up Panel) in September 2011. Details of these models and review results are in the Panel review report. One of the overall goals for these review processes is to construct assessment models that are more parsimonious (simple and stable) and that have high capacities to utilize available data for future assessments. The main structure of the current base model has the following characteristics: (1) one-area model; (2) length-based selectivity functions; and (3) inclusions of both asymptotic and dome-shaped selectivity functions with time varying final selectivity for fisheries.

3.2.2 Model tuning

Model tuning in this assessment included sequential and alternating estimation of key parameters, as well as iterative weighting of index CVs and composition data sample sizes. The key parameters considered in this procedure were natural mortality (M) and steepness (h). Early test runs indicated that it was impractical to estimate both M and h simultaneously in the current models. In the final base model for this assessment, two steps were used in the model tuning procedure: (1) h was fixed at the expectation of the prior distribution (h=0.76) while two M values (one for each sex) were estimated; and (2) the model was tuned by adding extra CVs to each index and by multiplying effective sample sizes for composition data by scalar values less than 1. Extra CVs for each index and down-weighting factors for each composition data were taken from the SS outputs in Step 1.

3.3 Model selection and evaluation

A wide range of model runs were explored for model selection and evaluation. These model runs were selected based on the recommendations of the STAR Panel and the SSC conference meeting (details see the STAR Panel report, the SSC meeting note, and the Mop-up Panel report). Our selection criteria for the models include that the model needs to be parsimonious and stable, and that the models have adequate flexibility to allow moderate structure changes while maintaining stability of model runs. Among key parameters (growth, natural mortality, and steepness) that are important in determining assessment outputs, steepness (h) is the most influential and yet most uncertain parameter. Model explorations indicated that simultaneously estimating all of these parameters were impractical with highly unstable results. We selected a model with h fixed at the expectation of the prior distribution while estimating both growth and natural mortality (M) (see Model tuning Section) as the base model for this assessment.

Shapes of selectivity functions are also important in determining model stability. Models with dome-shaped selectivity functions were less stable than those with asymptotic selectivity functions, but fitted composition data better than models with asymptotic selectivity functions. In the Mop-up Panel review, it was determined that fishery operations were markedly different from proceeding years as widow rockfish were declared to be overfished in 2001 and many fishery regulations were in place starting in 2003. Time varying selectivity was imposed on all fishery selectivity (except the ASP fishery) functions from 2003 to account for implementation

of the Rockfish Conservation Area (RCA).Specifically, time varying function was placed on the final selectivity parameter for four fisheries (Washington, Oregon mid-water trawl, Oregon bottom trawl, and California).

3.4 Responses to STAR panel requests

3.4.1 Responses to the 2009 STAR Panel requests

1. Comparisons of two ageing methods (surface and break-burn). A study was conducted in 2010 to compare these two methods of otolith ageing for widow rockfish. It showed no significant difference between these two methods. A brief report describing this study is in Appendix B.
2. Comparisons of one- and two-area models. A simulation study was conducted in 2010 to compare widow rockfish-like assessment models with two different area configurations. Details of the methods and results are presented in Appendix E. The simulation models used in the study were similar to those used in the paper by He *et al*. (2011). The study showed that the assessment results were generally similar between the one- and two- area models, but the one-area model had higher (and somewhat unstable) estimates on spawning outputs in pre-fishing years (Appendix E). This study provided a base to use two-area models for the 2011 PreSTAR assessment. The results of the one-area model from this simulation study were not directly comparable to the one-area model in the current assessment because the operating model used in the simulation study was still based on a two-area population dynamics.
3. Assessment of uncertainties in key parameters using the delta method. A brief report on using the delta method (MacCall 2011) to evaluate uncertainties on key model parameter, such as h, M, and σ_R, are presented in Appendix E of the 2011 PreSTAR assessment report. Analysis using the Delta method was not conducted for the current assessment report because of limit of time available in preparing the assessment document.

3.4.2 Responses to the 2011 STAR Panel and the 2011 Mop-up Panel requests

Our current assessment was based on the recommendation from the 2011 STAR Panel and from the SSC conference meetings. Detailed responses to the 2011 STAR Panel and the SSC conference meeting are presented the draft version of the assessment submitted to the review by the SSC Mop-up Panel. Main responses to the 2011 STAR Panel and the SSC conference meeting include:

1. Evaluation and comparisons of the one-area and the two-area models. The one-area model was much more stable than the two-area model, and estimated virgin spawning outputs and selectivity functions were similar between the two models. One exception was that in the one-area model, the California fishery selected smaller fish than in the two-area model. It resulted in more small fish (faster growth fish from the southern area) were removed from the population in the one-area model, therefore potentially reduced the population production.
2. Comparison of length-based and age-based selectivity functions. The models with length-based selectivity function appeared to fit data better and be more stable than the models age-based models.
3. Comparison of asymptotic and dome-shaped selectivity functions. Models with dome-shaped selectivity functions fitted the composition data better than models

with asymptotic selectivity functions. However, they were less stable models with the steepness parameter estimated in the models. The results also showed that the stock was more depleted in the dome-shaped selectivity model than that in the asymptotic selectivity model, and estimated h value was lower in the dome-shaped selectivity model than that in the asymptotic selectivity model.

4. Comparison of model runs with and without the prior for natural mortality. The results showed that key parameters and model outputs between these two models were very small and insignificant.

Responses to the SSC Mop-up Panel requests are in the Mop-up Panel report. Main requests and responses during the SSC Mop-up Panel review include:

1. Comparisons of asymptotic and dome-shaped selectivity functions for four major fisheries. Results showed that models with dome shaped selectivity functions fit data better than those with asymptotic selectivity functions.
2. Change spawning stock abundance from spawning output (expressed in number of eggs) to spawning biomass (spawner biomass). This abundance indicator is more comparable to catch specifications used in management decision.
3. Removal of male offsets in selectivity functions. The pre-Mop-up report used male offset in selectivity function as they gave better fits to composition data. Since all selectivity functions are length-based, there are no strong biological or fisheries reasons for different length-based selectivity between two sexes.
4. Apply block functions on the final selectivity on four fisheries between 2002 and 2003. This allows the final selectivity for four fisheries to be estimated independent of the early time periods. The results showed that shapes of the selectivity functions for both Oregon fisheries were more asymptotic than dome-shaped.

4 Assessment results and uncertainty analysis

4.1 Base model results

The base model was from a two-step selection process (see Model tuning section). Comparisons of key parameter and time series of spawning outputs, recruits, and depletion, are presented in Table 13 and Figures 20 to 22. In the first step (*h* fixed at prior and *M* estimated), stock depletion was 50.8%. In the second step, the model was tuned and stock depletion increased slightly to 51.1% (Table 13). The model from the second step was selected as the base model for this assessment. Results from the base model run are presented in Tables 14 and 15 and Figures 23 to 63. Input files for the base model in the SS program are listed in Appendix D. Overall, time series patterns of biomass, spawning biomass, recruitment, and depletion are similar to those in the 2009 assessment. Spawning biomass showed a steep decline in the early 1980s and almost continuous decline until the early 2000s (Figure 23). However, spawning biomass has shown an increasing trend in recent years. Depletion estimates from the mid-1990s to mid-2000s indicated the stock was in the precautionary zone, and has been above 40% in recent years (Table 14 and Fig. 24).

The stock-recruit relationship, time series of recruitment and recruitment deviations are presented in Table 14 and Figures 25 to 27. The input value of the standard deviation of log recruitment (σ_R) is 0.65, which is slightly higher than the estimated RMSE value (=0.638) in the

base model. Like many other rockfish species, recruitment of widow rockfish has been highly variable. It is also important to point out that recruitment of widow rockfish has been very low in recent years (Figure 26).

Time series of estimated SPR (spawning potential ratio) and a phase plot of relative exploitation rates versus relative spawning output are plotted in Figures 28 and 29. Model fits to indices are presented in Figures 30 to 36. The fits to these indices were generally acceptable. The CVs for most indices were large, suggesting that these indices were poor indicators of stock abundance.

Estimated selectivity curves for the five fisheries and all surveys are presented in Figures 37 to 42. For all years and fisheries that have composition data, expected numbers of fish, aggregated model fits to length and age compositions, length and age composition residuals, and residuals for the fits to age-at-length composition for both sexes, are presented in Figures 43 to 63. Detailed model fits to composition data by fishery and survey and by year are presented in Appendix C.

4.2 Profile and sensitivity analyses

A set of profile and sensitivity analyses was conducted to test model assumptions and to explore uncertainty in estimates of key model parameters. The analysis includes:

1. Profile analysis on fixed values of steepness from 0.25 to 0.95 while estimating natural mortality (Table 16 and Figures 64 and 65a). (Additional runs at finer *h* interval (0.02) were conducted after the Mop up Panel meeting were also conducted and presented in Figure 65b),
2. Profile analysis on fixed values of natural mortality from 0.09 to 0.15 while estimating steepness (Table 17 and Figures 66 to 67);
3. Profile analysis on steepness from 0.25 to 0.95 with natural mortality fixed at the base model values (Table 18 and Figures 68 to 69);
4. Profile analysis on natural mortality from 0.09 to 0.15 with steepness fixed at the base model value (Table 19 and Figures 70 to 71);
5. Profile analysis on natural mortality from 0.09 to 0.15 with steepness fixed at 0.41 (Table 20 and Figures 72 to 73);
6. Profile analysis on natural mortality from 0.09 to 0.16 with steepness fixed at 0.9 (Table 21 and Figures 74 to 75);
7. Profile analysis on steepness from 0.25 to 0.95 with natural mortality fixed at 0.11 (Tables 22 and Figures 76 and 77);
8. Profile analysis on steepness from 0.25 to 0.95 with natural mortality fixed at 0.13 (Table 23 and Figures 78 and 79);
9. Sensitivity analysis of ageing error vector with half and twice of inputted values (Table 24 and Figures 80 and 81).

In general, the analysis showed that the assessment results were highly sensitive to steepness and the current model structure and/or availability of data were probably not sufficient for estimating steepness.

The analysis showed that there were strong negative correlations between steepness and natural mortality (Tables 16 and 17), suggesting again that simultaneously estimating both parameters were very difficult in the assessment model. The analysis also showed that natural mortality was an important parameter in determining the stock depletion. If steepness is fixed, higher values of natural mortality results in less depleted stocks (Tables 19 and 20).

The sensitivity analysis on ageing error vector showed small effects of ageing errors on the assessment results (Table 24, Figures 81 and 81). Reduction of ageing errors by half had resulted in stock depletion changed from 51.1% to 49.3%, while increases of ageing errors by two times resulted in stock depletion changed from 51.1% to 50.6%.

4.3 Retrospective analysis

Retrospective analysis of the base model was performed by using the data only through 2009, 2008, and 2007, respectively (Table 25 and Figures 82 to 83). The results indicated that data from the most recent years (2009 and 2010) had a moderate effect on model outputs. If data from the last three years (2008, 2009 and 2010) were not used, the model would estimate that the population would be about 2.5% more depleted.

4.4 Comparisons between this assessment and the past assessments

Figures 84 and 85 compare time series of spawning output and recruitment between the base model from this assessment and the previous five assessments (2000, 2003, 2005, 2007, and 2009). Overall patterns of spawning outputs among all assessments were similar, which showed steep declines in early 1980s and increasing trends in recent years. One main difference between this assessment and the 2009 assessment was that estimated spawning outputs in recent years increased more than that in the 2009 assessment. Patterns of recruitments were, however, similar among all assessments (Figure 85).

5 Management references and research needs

5.1 Decision table

Two decision tables were presented in the Executive Summary Sections. As in the past assessments, stock-recruit steepness is the single greatest source of uncertainty in the assessment. In the base model, steepness was fixed at the level of 0.76 (Dorn's prior). The decision table was developed to bracket model uncertainty in widow rockfish productivity with alternative values of steepness. The 12.5% and 87.5% quantiles from prior distribution on h translate into steepness of 0.54 and 0.95 respectively. This range was considered reasonable to account for uncertainty associated with steepness. It was, however, agreed to shift this range to lower steepness values to (a) take account of the data which, while not greatly informative, did provide some evidence for a lower steepness value, and (b) provide continuity by considering the value of steepness used in the 2009 assessment (0.41). As a result, steepness values of 0.41 and 0.90 were used for the low and high states of nature. Future catch scenarios at OFL and two catch streams between 2011 and 2022 were used as alternative management decisions (Table ES7). Constant catch streams requested by the GMT along with two states of nature were also presented (Table ES8).

5.2 Research needs

1. More studies on the feasibility of estimating stock-recruitment relationships for given model structures and data availability will be very beneficial.
2. The long-term recruitment index is a key time series in the stock assessment. Continuation of the NMFS/PWCC mid-water juvenile trawl survey should provide key information on the recruitment strength of widow rockfish.
3. Re-ageing of widow rockfish otoliths from California and possibly from Oregon and Washington fisheries in 1980's and 1990's. The conditional age-at-length data from these

fisheries showed that ages-at-length were highly variable in these years. For example, fish from the same length groups could range over 20 years in age. Re-ageing these data could improve the precision of growth estimates for assessment models. It will be useful to derive a separate ageing error vector from the re-aged data from the early years.

4. Additional research to determining the magnitude of spatial and temporal differences in biological traits (growth, maturity, fecundity, etc.).

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8 Tables

Table 1. Management performance in obtaining the harvest guideline for widow rockfish. Harvest guideline and allowable biological catch (ABC) are taken from Council documents.

Year	Harvest Guideline or OY (mt)	Allowable Biological Catch (mt)	Catches (mt)
1989	12,100	12,400	14,610
1990	12,400	8,900	11,940
1991	7,000	7,000	7,660
1992	7,000	7,000	7,368
1993	7,000	7,000	9,706
1994	6,500	6,500	7,704
1995	6,500	7,700	7,977
1996	6,500	7,700	7,314
1997	6,500	7,700	7,761
1998	5,090	5,750	4,854
1999	5,090	5,750	4,770
2000	5,090	5,750	4,661
2001	2,300	3,727	2,258
2002	856	3,727	432
2003	832	3,871	43
2004	284	3,460	101
2005	285	3,218	199
2006	289	3,059	215
2007	368	5,334	259
2008	368	5,144	237
2009	522	7,728	195
2010	509	6,937	152
2011	600	4,872	
2012	600	4,705	

Table 2. U.S. total catches (mt) of widow rockfish by five fisheries from 1916 to 2010.

Year	Washington fishery	Oregon mid-water trawl	Oregon bottom trawl	California fishery (EMfishery)	At-sea whiting fishery (ASP)	Total
1916	0.2	0.0	0.3	82.7	0.0	83.2
1917	0.2	0.0	0.3	128.8	0.0	129.4
1918	0.2	0.0	0.3	148.1	0.0	148.7
1919	0.2	0.0	0.4	102.1	0.0	102.7
1920	0.2	0.0	0.4	104.5	0.0	105.1
1921	0.2	0.0	0.4	86.6	0.0	87.2
1922	0.3	0.0	0.4	75.1	0.0	75.8
1923	0.3	0.0	0.4	82.5	0.0	83.2
1924	0.3	0.0	0.4	52.8	0.0	53.5
1925	0.3	0.0	0.5	65.5	0.0	66.2
1926	0.3	0.0	0.5	99.9	0.0	100.6
1927	0.3	0.0	0.5	82.8	0.0	83.6
1928	0.5	0.0	0.8	95.0	0.0	96.3
1929	0.9	0.0	1.4	92.6	0.0	94.9
1930	0.8	0.0	1.2	120.2	0.0	122.2
1931	0.6	0.0	1.0	108.1	0.0	109.7
1932	0.5	0.0	0.7	109.3	0.0	110.5
1933	0.5	0.0	0.8	95.0	0.0	96.2
1934	0.4	0.0	0.6	101.3	0.0	102.2
1935	0.4	0.0	0.7	108.9	0.0	110.0
1936	1.2	0.0	1.9	121.2	0.0	124.4
1937	1.8	0.0	2.8	114.3	0.0	118.9
1938	0.9	0.0	1.4	94.9	0.0	97.2
1939	1.7	0.0	2.8	84.5	0.0	89.0
1940	29.6	0.0	48.1	89.2	0.0	167.0
1941	45.5	0.0	73.8	71.9	0.0	191.2
1942	84.4	0.0	137.0	21.6	0.0	243.1
1943	292.0	0.0	473.9	54.0	0.0	819.8
1944	504.6	0.0	819.0	201.7	0.0	1525.4
1945	788.7	0.0	1280.0	450.8	0.0	2519.5
1946	489.6	0.0	794.7	457.4	0.0	1741.7
1947	297.7	0.0	483.2	208.6	0.0	989.5
1948	195.8	0.0	317.8	205.2	0.0	718.7
1949	178.3	0.0	289.3	145.9	0.0	613.5
1950	188.2	0.0	305.4	166.8	0.0	660.4
1951	165.6	0.0	268.7	343.7	0.0	778.0
1952	173.0	0.0	280.7	317.5	0.0	771.2
1953	138.3	0.0	224.5	293.4	0.0	656.1
1954	174.8	0.0	283.7	216.4	0.0	674.9
1955	181.5	0.0	294.6	232.4	0.0	708.5
1956	236.2	0.0	383.3	294.8	0.0	914.3

Table 2 (continued). U.S. total catches (mt) of widow rockfish by five fisheries from 1916 to 2010.

Year	Washington fishery	Oregon mid-water trawl	Oregon bottom trawl	California fishery (EMfishery)	At-sea whiting fishery (ASP)	Total
1957	320.1	0.0	519.6	324.2	0.0	1163.9
1958	248.5	0.0	403.3	393.9	0.0	1045.7
1959	269.8	0.0	437.8	319.7	0.0	1027.3
1960	397.6	0.0	645.3	249.1	0.0	1292.0
1961	355.0	0.0	576.1	171.0	0.0	1102.1
1962	407.7	0.0	661.7	175.4	0.0	1244.8
1963	124.4	0.0	202.0	288.6	0.0	615.0
1964	315.3	0.0	511.7	154.9	0.0	981.9
1965	54.4	0.0	88.3	230.1	0.0	372.9
1966	3969.8	0.0	486.6	317.9	0.0	4774.3
1967	4389.1	0.0	793.9	495.0	0.0	5678.0
1968	1853.7	0.0	260.8	585.5	0.0	2700.1
1969	510.3	0.0	250.4	79.6	0.0	840.3
1970	576.1	0.0	35.8	74.8	0.0	686.7
1971	738.3	0.0	60.5	61.8	0.0	860.6
1972	457.5	0.0	65.9	88.6	0.0	612.1
1973	592.3	0.0	33.8	314.4	0.0	940.5
1974	277.0	0.0	20.5	393.5	0.0	691.1
1975	450.1	0.0	17.8	482.9	0.0	950.7
1976	911.6	0.0	68.9	555.1	0.0	1535.6
1977	1078.3	0.0	372.5	1046.6	0.0	2497.4
1978	312.3	0.0	384.5	632.7	0.0	1329.4
1979	1024.0	3970.7	582.9	2583.6	0.0	8161.2
1980	8705.7	8968.3	464.1	6006.0	0.0	24144.2
1981	7278.4	14693.6	1642.2	5453.8	0.0	29068.1
1982	6344.9	8675.5	846.1	11851.4	0.0	27717.8
1983	3728.1	1734.9	1646.0	4950.0	0.0	12059.0
1984	1685.1	4620.0	1664.4	3909.2	0.0	11878.6
1985	1783.0	3971.1	1045.0	3930.3	0.0	10729.5
1986	2959.9	3654.6	1441.5	3176.0	0.0	11232.0
1987	4306.0	5932.8	1387.4	3427.0	0.0	15053.2
1988	3569.6	4994.5	1339.8	2306.8	0.0	12210.7
1989	3916.1	5750.9	2355.3	2587.7	0.0	14609.9
1990	2588.8	3889.2	2670.0	2791.8	0.0	11939.8
1991	1332.4	2108.7	2343.1	1602.7	271.7	7658.6
1992	1085.4	1409.1	3175.0	1350.7	348.1	7368.3
1993	1993.3	2084.5	4070.6	1406.9	151.1	9706.4
1994	1234.0	2059.2	3035.3	1085.8	288.2	7702.5
1995	1255.6	1711.3	2780.5	2034.7	195.1	7977.0
1996	1109.0	1708.4	2679.5	1605.3	212.3	7314.5
1997	1166.8	1838.2	2927.4	1623.6	205.4	7761.5

Table 2 (continued). U.S. total catches (mt) of widow rockfish by five fisheries from 1916 to 2010.

Year	Washington fishery	Oregon mid-water trawl	Oregon bottom trawl	California fishery (EMfishery)	At-sea whiting fishery (ASP)	Total
1998	636.8	894.7	1935.7	1125.4	258.8	4851.3
1999	599.8	2088.7	1120.4	774.6	186.1	4769.6
2000	454.1	3103.8	28.2	868.1	207.3	4661.5
2001	349.5	1297.8	35.0	402.5	173.5	2258.3
2002	64.8	154.7	6.8	50.4	154.9	431.6
2003	14.4	7.6	1.7	4.8	14.5	43.0
2004	31.6	12.3	10.1	25.5	21.2	100.7
2005	42.8	59.0	5.6	11.9	80.1	199.4
2006	44.9	11.3	3.0	12.6	143.3	215.1
2007	37.1	44.6	9.7	19.4	147.7	258.5
2008	49.2	34.7	1.7	36.4	115.0	237.0
2009	105.2	52.8	2.4	8.2	26.0	194.6
2010	62.1	36.6	3.0	11.4	39.0	152.1

Table 3. Abundance indices for Oregon bottom trawl (ORBTrawCPUE) from 1984 to 1999.

Year	Index	Input CV
1984	331.47	0.2121
1985	100.88	0.1875
1986	227.08	0.2928
1987	169.08	0.2730
1988	93.97	0.2897
1989	164.10	0.1749
1990	78.49	0.1348
1991	73.59	0.1275
1992	83.16	0.1179
1993	53.58	0.1314
1994	100.34	0.1128
1995	109.96	0.1387
1996	94.81	0.1357
1997	97.23	0.1502
1998	56.56	0.1718
1999	84.46	0.1684

Table 4. Abundance indices of widow rockfish catches derived from bycatch in three sectors of the Pacific whiting fisheries.

Year	Index	Input CV
Foreign (ForWBycatch)		
1977	0.770	0.115
1978	1.205	0.112
1979	0.703	0.119
1980	1.993	0.131
1981	0.728	0.126
1982	0.243	0.247
1984	2.937	0.125
1985	0.407	0.107
1986	1.111	0.103
1987	0.390	0.088
1988	0.513	0.124
Joint venture (JVWBycatch)		
1983	2.889	0.120
1985	0.776	0.117
1986	0.823	0.081
1987	0.320	0.087
1988	0.659	0.077
1989	0.824	0.064
1990	0.710	0.074
Domestic (DomWBycatch)		
1991	1.264	0.125
1992	0.781	0.125
1993	0.801	0.104
1994	1.465	0.068
1995	0.455	0.106
1996	1.018	0.082
1997	0.886	0.077
1998	1.330	0.079

Table 5. Yearly indices from the pelagic juvenile trawl survey (SCJuvSurvey) from 2001 to 2009. No data from 2010 were available because survey area was not comparable to previous years. A fixed CV of 0.6 was used in the assessment model as in previous assessments.

Year	Index	Input CV
2001	4.97	0.6
2002	11.87	0.6
2003	5.81	0.6
2004	10.34	0.6
2005	4.79	0.6
2006	2.72	0.6
2007	2.72	0.6
2008	4.29	0.6
2009	3.44	0.6

Table 6. Abundance indices of widow rockfish catches derived from the NWFSC combo surveys from 2003 to 2010 for northern and southern areas.

Year	Index	Input CV
2003	8551.7	0.3563
2004	447.1	0.4666
2005	1404.0	0.3398
2006	1337.6	0.2869
2007	842.9	0.2870
2008	256.9	0.3926
2009	1306.3	0.2589
2010	2142.3	0.2819

Table 7. Summary of annual number of hauls, fish measured for length compositions and number of fish aged for age compositions from the NWFSC survey from 2003 to 2010. For age composition data, only data with number of fish aged > 30 in each year were used in the assessment model.

Year	Number of haul for length	Number of Length	Number of haul for age	Number of fish aged
2003	18	216	6	10
2004	12	84	12	58
2005	20	78	18	81
2006	26	172	26	89
2007	27	92	27	82
2008	17	26	15	20
2009	32	142	0	0
2010	28	240	0	0

Table 8. Abundance indices of widow rockfish catches derived from triennial surveys from 1980 to 2004 for northern and southern areas.

Year	Index	Input CV
1980	2808.2	0.2205
1983	4324.8	0.1652
1986	3891.0	0.2218
1989	11294.5	0.2304
1992	10337.8	0.1800
1995	3441.7	0.2178
1998	5152.7	0.1793
2001	286.3	0.2524
2004	1012.2	0.2487

Table 9. Numbers of samples and fish measured for length compositions from the triennial survey that were used in the assessment model.

	Number of sample	Number of fish
1980	40	166
1983	76	385
1986	46	317
1989	40	713
1992	57	713
1995	44	491
1998	70	912
2001	29	144
2004	36	214

Table 10. Vectors of ageing errors estimated using Punt's program.

Age	Ageing error (SD)
0.5	0.086
1.5	0.086
2.5	0.152
3.5	0.221
4.5	0.293
5.5	0.368
6.5	0.447
7.5	0.529
8.5	0.614
9.5	0.704
10.5	0.797
11.5	0.895
12.5	0.997
13.5	1.103
14.5	1.215
15.5	1.331
16.5	1.452
17.5	1.579
18.5	1.712
19.5	1.850
20.5	1.994
21.5	2.145
22.5	2.303
23.5	2.468
24.5	2.640
25.5	2.819
26.5	3.007
27.5	3.203
28.5	3.408
29.5	3.622
30.5	3.845
31.5	4.078
32.5	4.322
33.5	4.576
34.5	4.842
35.5	5.120

Table 11. Number of effective sample sizes of age samples for five fisheries and one survey used in the assessment. Effective sample sizes were calculated using Ian Stewart's equations.

Year	Vancouver, Columbia (WA fishery)	Oregon Midwater Trawl	Oregon Bottom Trawl	Eureka, Monterey (EM fishery)	At-sea whiting fishery (ASP)	NWFSC survey
1978				21.8		
1979				48.1		
1980	127.1			81.3		
1981	218.9			154.8		
1982	282.4			500.0		
1983	176.5			500.0		
1984	155.3	174.6	138.6	500.0		
1985	113.0	280.5	126.6	500.0		
1986	190.6	328.4	136.3	468.5		
1987	254.2	310.4	143.2	481.6		
1988	141.2	197.6	161.5	337.0		
1989	211.8	304.8	197.5	405.0		
1990	289.5	266.3	202.0	426.9		
1991	240.0	258.0	285.7	353.0		
1992	218.9	101.0	341.9	134.6		
1993	254.2	203.8	255.6	87.8		
1994	197.7	105.8	267.5	102.0		
1995	233.0	153.9	186.7	43.4		
1996	190.6	143.5	134.7	172.1		
1997	211.8	214.4	201.2	203.4		
1998	155.3	214.9	173.5	193.8		
1999	204.7	326.8	127.9	190.8		
2000	148.3	390.9		88.5		
2001	70.6	241.2		36.1		
2002	84.7	174.6		58.3		
2003	33.7			15.0		
2004	106.6	28.2		19.3		15.0
2005	73.0					22.6
2006	67.6	85.5				32.3
2007	103.9	42.4	48.6			32.9
2008	118.1	117.2	50.2	30.2	184.7	
2009	98.8	84.7	71.9	33.4	96.7	
2010	84.7	170.7	43.4		61.4	

Table 12. Number of effective sample sizes of length samples for five fisheries and two surveys used in the assessment. Effective sample sizes were calculated using Ian Stewart's equations.

Year	Vancouver, Columbia (WA fishery)	Oregon Midwater Trawl	Oregon Bottom Trawl	Eureka, Monterey (EM fishery)	At-sea whiting fishery (ASP)	NWFSC survey	Triennial survey
1978				102.7			
1979				93.4			
1980	127.1			193.5			51.7
1981	218.9			356.5			
1982	282.4			500.0			
1983	176.5			500.0			103.2
1984	155.3	240.0	190.6	500.0			
1985	113.0	402.4	176.5	500.0			
1986	190.6	395.4	155.3	500.0			68.4
1987	254.2	346.5	179.2	500.0			
1988	141.2	202.7	166.7	459.6			
1989	211.8	312.6	197.5	500.0			90.4
1990	289.5	267.2	202.7	500.0			
1991	240.0	262.0	286.1	466.9			
1992	218.9	266.9	359.7	460.6	187.6		107.4
1993	254.2	203.9	264.4	442.7	171.5		
1994	197.7	105.9	267.6	442.9	373.9		
1995	233.0	157.6	194.1	374.1	219.3		78.7
1996	190.6	148.1	138.2	353.5	271.7		
1997	211.8	240.5	214.6	458.2	304.9		
1998	155.3	215.1	178.1	351.9	235.3		134.5
1999	204.7	358.9	131.8	275.3	277.6		
2000	148.3	444.2		171.5	260.0		
2001	70.6	258.1		88.1	166.8		39.2
2002	84.7	68.5		78.9	112.1		
2003	35.3			43.1	65.5	33.3	
2004	87.7	28.2		22.8	147.8	17.9	51.1
2005	72.8			6.2	500.0	25.5	
2006	67.7	88.1		24.2	500.0	38.2	
2007	104.3	63.5	48.6	18.0	500.0	33.5	
2008	127.1	131.2	50.2	33.8	500.0	18.8	
2009	98.8	94.8	71.9	58.9	184.6	42.0	
2010	84.7	189.3	131.8	59.2	442.7	44.9	

Table 13. Comparisons of key parameters and model outputs between pre-weighted and weighted models. The weighted model is the base model for this assessment. Likelihood values are not directly comparable between these two models. Unit of B_0 is spawning biomass (mt).

Description	Pre-weighted	Weighted (Base)
Management quantities		
B_0	65319	71126
2011 depletion (%)	50.8	51.1
2010 SPR (%)	97.2	97.5
No. of parameters estimated	116	116
Negative log-likelihoods		
Total	8116.27	3560.10
Catch	6.93E-8	6.93E-8
Indices	433.448	-1.5550
Length composition	3042.77	1278.57
Age composition	4625.08	2274.02
Recruitment	14.9521	9.0522
Priors	0.00686	0.00591
Parameter soft bound	0.00680	0.00530
Other parameter values		
Steepness (h)	0.7600	0.7600
Steepness estimated	No	No
Female M	0.1195	0.1198
Male M	0.1295	0.1294
Ms estimated	Yes	Yes

Table 14. Estimated age 1+ biomass, spawning outputs, recruits, total catch, depletion, and SPR 1916 to 2010 from the base assessment model.

Year	Total biomass (mt)	Spawning biomass (mt)	Recruit (*1000)	Total catch (mt)	Depletion (%)	SPR
1916	134050	71127	23392	83	100.0	0.9929
1917	133968	71082	23391	129	99.9	0.9890
1918	133846	71015	23390	149	99.8	0.9873
1919	133713	70941	23388	103	99.7	0.9912
1920	133635	70895	23386	105	99.7	0.9910
1921	133562	70852	23385	87	99.6	0.9925
1922	133513	70823	23385	76	99.6	0.9935
1923	133480	70803	23384	83	99.5	0.9929
1924	133444	70781	23383	54	99.5	0.9954
1925	133442	70778	23383	66	99.5	0.9943
1926	133427	70769	23383	101	99.5	0.9914
1927	133381	70743	23382	84	99.5	0.9928
1928	133355	70727	23382	96	99.4	0.9917
1929	133319	70706	23381	95	99.4	0.9919
1930	133288	70687	23381	122	99.4	0.9895
1931	133232	70655	23380	110	99.3	0.9906
1932	133193	70632	23380	111	99.3	0.9905
1933	133156	70611	23379	96	99.3	0.9917
1934	133137	70598	23379	102	99.3	0.9912
1935	133114	70584	23378	110	99.2	0.9906
1936	133085	70568	23378	124	99.2	0.9893
1937	133045	70545	23377	119	99.2	0.9898
1938	133014	70526	23377	97	99.2	0.9916
1939	133006	70520	23377	89	99.1	0.9923
1940	133008	70520	23377	167	99.1	0.9856
1941	132934	70478	23375	191	99.1	0.9834
1942	132842	70425	23374	243	99.0	0.9789
1943	132705	70345	23372	820	98.9	0.9311
1944	132013	69957	23362	1525	98.4	0.8766
1945	130674	69203	23341	2520	97.3	0.8059
1946	128449	67944	23306	1742	95.5	0.8573
1947	127133	67171	23284	990	94.4	0.9142
1948	126554	66865	16600	719	94.0	0.9365
1949	126200	66754	16422	614	93.9	0.9454
1950	125791	66731	16435	660	93.8	0.9414

Table 14. (continued). Estimated age 1+ biomass, spawning outputs, recruits, total catch, depletion, and SPR 1916 to 2010 from the base assessment model.

Year	Total biomass (mt)	Spawning biomass (mt)	Recruit (*1000)	Total catch (mt)	Depletion (%)	SPR
1951	125093	66688	16750	778	93.8	0.9318
1952	123975	66572	17343	771	93.6	0.9323
1953	122526	66335	18362	656	93.3	0.9418
1954	120875	65892	19946	675	92.6	0.9394
1955	119045	65068	21991	709	91.5	0.9352
1956	117205	63905	24089	914	89.8	0.9153
1957	115368	62516	25297	1164	87.9	0.8909
1958	113648	61033	25025	1046	85.8	0.8987
1959	112520	59770	23752	1027	84.0	0.8982
1960	111924	58781	22777	1292	82.6	0.8726
1961	111569	58006	23086	1102	81.6	0.8892
1962	111855	57749	24983	1245	81.2	0.8770
1963	112358	57803	27506	615	81.3	0.9373
1964	113735	58472	28309	982	82.2	0.9045
1965	114940	59044	28947	373	83.0	0.9629
1966	117000	59930	32914	4774	84.3	0.6433
1967	115086	58402	38577	5678	82.1	0.5888
1968	112834	56486	33422	2700	79.4	0.7599
1969	114048	56478	21314	840	79.4	0.9155
1970	119610	57837	149199	687	81.3	0.9324
1971	125301	59630	28281	861	83.8	0.9195
1972	132297	61697	10844	612	86.7	0.9443
1973	140343	64503	10479	941	90.7	0.9204
1974	148480	67315	24102	691	94.6	0.9435
1975	156799	71892	21361	951	101.1	0.9289
1976	163923	78168	10544	1536	109.9	0.9019
1977	168131	85235	46567	2497	119.8	0.8607
1978	169150	90150	63603	1330	126.7	0.9242
1979	169410	91555	21404	8161	128.7	0.6355
1980	162826	86939	60263	24144	122.2	0.2745
1981	141103	73220	72447	29068	102.9	0.1675
1982	116443	57224	27625	27718	80.5	0.1298
1983	96743.3	43208	30792	12059	60.7	0.2542
1984	95191.4	40132	30657	11879	56.4	0.2587
1985	94611.7	39207	22270	10729	55.1	0.2969

Table 14. (continued). Estimated age 1+ biomass, spawning outputs, recruits, total catch, depletion, and SPR 1916 to 2010 from the base assessment model.

Year	Total biomass (mt)	Spawning biomass (mt)	Recruit (*1000)	Total catch (mt)	Depletion (%)	SPR
1986	95223.3	39871	9139	11232	56.1	0.3085
1987	94838.9	41065	30350	15053	57.7	0.2547
1988	88896	40482	16520	12211	56.9	0.3104
1989	84081.1	39853	13824	14610	56.0	0.2493
1990	75746	36407	28153	11940	51.2	0.2734
1991	69340.4	33343	37388	7659	46.9	0.3696
1992	66572.7	31908	9694	7368	44.9	0.3603
1993	64277.1	30207	18881	9706	42.5	0.2643
1994	59646.4	27255	18482	7703	38.3	0.2972
1995	57027.8	25465	9269	7977	35.8	0.2679
1996	54218.5	23851	7239	7315	33.5	0.2803
1997	51937.1	23145	15792	7761	32.5	0.2687
1998	48890.2	22363	31276	4851	31.4	0.3942
1999	48250.5	22545	18250	4770	31.7	0.4039
2000	47640.6	22270	24765	4662	31.3	0.4068
2001	46845.2	21732	6805	2258	30.6	0.6081
2002	48671.1	22074	14301	432	31.0	0.8965
2003	52402.7	23491	7107	43	33.0	0.9888
2004	56651.5	25652	19301	101	36.1	0.9770
2005	60272.8	28441	6587	199	40.0	0.9589
2006	63185	31178	7577	215	43.8	0.9590
2007	65277.6	33350	10833	259	46.9	0.9543
2008	66634.7	34728	12194	237	48.8	0.9598
2009	67403.8	35545	10787	195	50.0	0.9676
2010	67937.4	36063	21124	152	50.7	0.9746
2011	68238.4	36342	21749		51.1	0.9054

Table 15. Fixed and estimated parameter values with standard deviations for the base model.

Parameter	Estimated (yes/no)	Value	Standard deviation
Natural mortality female	Yes	0.1197	0.0005
Female length at age 5	Yes	28.78	0.184
Female length at age 15	Yes	48.14	0.067
Female VB K	Yes	0.2087	0.0046
Female CV of length at young age	Yes	0.078	0.0029
Female CV of length at old age	Yes	0.044	0.0013
Natural mortality male	Yes	0.1294	0.0006
Male length at age 5	Yes	30.26	0.155
Male length at age 15	Yes	44.18	0.081
Male VB K	Yes	0.2326	0.0073
Male CV of length at young age	Yes	0.055	0.0021
Male CV of length at old age	Yes	0.054	0.0018
Female weight-length a	No	5.45E-06	NA
Female weight-length b	No	3.2878	NA
Maturity	No	Input vector	NA
Fecundity a	No	0	NA
Fecundity b	No	1	NA
Male weight-length a	No	1.19E-5	NA
Male weight-length b	No	3.0663	NA
R_0 (virgin recruit)	Yes	10.0602	0.1389
Steepness	No	0.76	NA
Sigma R	No	0.65	NA
Double normal selectivity (Washington fishery)			
Peak	Yes	39.08	0.260
Width of peak	Yes	-11.47	57.79
Ascending width	Yes	3.328	0.745
Descending with	Yes	2.33	0.367
Initial	No	-999	NA
Final	Yes	0.064	0.151
Block on final	Yes	0.066	0.052

Table 15 (continued). Fixed and estimated parameter values with standard deviations for the base model.

Parameter	Estimated (yes/no)	Value	Standard deviation
Double normal selectivity (Oregon mid-water trawl)			
Peak	Yes	39.08	0.298
Width of peak	Yes	-12.16	49.12
Ascending width	Yes	3.314	0.089
Descending with	Yes	3.167	0.271
Initial	No	-999	NA
Final	Yes	-1.420	0.302
Block on final	Yes	3.620	23.800
Double normal selectivity (Oregon mid-water trawl)			
Peak	Yes	40.09	0.336
Width of peak	Yes	-11.52	57.19
Ascending width	Yes	3.325	0.092
Descending with	Yes	2.431	0.578
Initial	No	-999	NA
Final	Yes	0.299	0.227
Block on final	Yes	3.823	21.253
Double normal selectivity (California fishery)			
Peak	Yes	41.04	0.366
Width of peak	Yes	-11.44	58.23
Ascending width	Yes	3.644	0.088
Descending with	Yes	4.233	0.171
Initial	No	-999	NA
Final	Yes	-8.345	32.06
Block on final	Yes	1.350	10.890

Table 15 (continued). Fixed and estimated parameter values with standard deviations for the base model.

Parameter	Estimated (yes/no)	Value	Standard deviation
Double normal selectivity (ASP, at-sea whiting processor)			
Peak	Yes	43.64	0.424
Width of peak	No	12	NA
Ascending width	Yes	3.879	0.085
Descending with	No	12	NA
Initial	No	-999	NA
Final	No	12	NA
Double normal selectivity (all surveys)			
Peak	Yes	46.66	1.571
Width of peak	No	12	NA
Ascending width	Yes	5.387	0.143
Descending with	No	12	NA
Initial	No	-999	NA
Final	No	12	NA

Table 16. Key parameters and model outputs for sensitivity analysis with steepness fixed from 0.25 to 0.95 whiling estimating *M*. The model with *h*=0.76 (bold) is the base model. Unit of B_0 is spawning biomass (mt).

Description	*h*=0.25	*h*=0.35	*h*=0.45	*h*=0.55	*h*=0.65	***h*=0.76**	*h*=0.85	*h*=0.95
Management quantities								
B_0	85669	78419	74689	72833	71811	**71126**	70742	70423
2011 depletion (%)	15.2	24.6	33.4	40.7	46.3	**51.1**	54.2	56.9
2010 SPR (%)	94.2	95.7	96.5	97.0	97.3	**97.5**	97.6	97.7
Negative log-likelihoods								
Total	3557.28	3557.09	3558.07	3558.95	3559.59	**3560.10**	3560.41	3560.68
Catch	6.93E-8	6.93E-8	6.93E-8	6.93E-8	6.93E-8	**6.93E-8**	6.93E-8	6.93E-8
Indices	-0.4734	-0.9462	-1.2170	-1.3896	-1.4916	**-1.5550**	-1.5852	-1.6006
Length composition	1281.43	1279.52	1278.82	1278.61	1278.57	**1278.57**	1278.59	1278.62
Age composition	2270.22	2271.67	2272.65	2273.28	2273.70	**2274.02**	2274.21	2274.37
Recruitment	5.8562	6.9773	7.7946	8.4311	8.8059	**9.0522**	9.1832	9.2865
Priors	0.2406	0.0555	0.0124	0.0039	0.0038	**0.0059**	0.0080	0.0102
Parameter soft bound	0.0052	0.0053	0.0053	0.0053	0.0053	**0.0053**	0.0053	0.0053
Other parameter values								
Steepness (*h*)	0.25	0.35	0.45	0.55	0.76	**0.76**	0.85	0.95
Steepness estimated	No	No	No	No	No	**No**	No	No
Female *M*	0.1416	0.1307	0.1254	0.1226	0.1209	**0.1198**	0.1190	0.1185
Male *M*	0.1508	0.1399	0.1347	0.1320	0.1305	**0.1294**	0.1288	0.1283
*M*s estimated	Yes	Yes	Yes	Yes	Yes	**Yes**	Yes	Yes

Table 17. Key parameters and model outputs for sensitivity analysis on steepness with natural mortality fixed at a range of values from 0.09 to 0.15 while estimating steepness. The model with M=0.12 (bold) is the base model. Unit of B_0 is spawning biomass (mt).

Description	M=0.09	M=0.10	M=0.11	**M=0.12**	M=0.13	M=0.14	M=0.15
Management quantities							
B_0	66541	68491	69977	**71126**	78553	83749	90446
2011 depletion (%)	40.5	48.1	52.6	**51.1**	27.2	21.7	18.2
2010 SPR (%)	95.7	96.7	97.3	**97.5**	96.0	95.7	95.6
Negative log-likelihoods							
Total	3574.48	3566.05	3561.53	**3560.10**	3559.11	3559.72	3561.88
Catch	6.93E-8	6.93E-8	6.93E-8	**6.93E-8**	6.93E-8	6.93E-8	6.93E-8
Indices	-1.5590	-1.7917	-1.7564	**-1.5550**	-1.1333	-0.9725	-0.8568
Length composition	1277.21	1276.96	1277.66	**1278.57**	1280.11	1281.52	1283.00
Age composition	2278.54	2276.05	2274.55	**2274.02**	2271.53	2271.29	2271.98
Recruitment	20.5366	15.1073	11.3775	**9.0522**	6.7264	5.2235	4.1251
Priors	-0.2517	-0.2876	-0.3005	**0.0059**	1.7666	2.6451	3.6274
Parameter soft bound	0.0052	0.0052	0.0053	**0.0053**	0.0053	0.0053	0.0053
Other parameter values							
Steepness (h)	0.9871	0.9764	0.9379	**0.76**	0.3595	0.2956	0.2506
Steepness estimated	Yes	Yes	Yes	**No**	Yes	Yes	Yes
Female M	0.09	0.10	0.11	**0.1198**	0.13	0.14	0.15
Male M	0.10	0.11	0.12	**0.1294**	0.14	0.15	0.16
Ms estimated	No	No	No	**Yes**	No	No	No

Table 18. Key parameters and model outputs for sensitivity analysis on steepness with natural mortality fixed at the base model values. The model with h=0.76 (bold) is the base model. Unit of B_0 is spawning biomass (mt).

Description	h=0.25	h=0.35	h=0.45	h=0.55	h=0.65	**h=0.76**	h=0.85	h=0.95
Management quantities								
B_0	74315	77111	74732	72917	71819	**71126**	70649	70305
2011 depletion (%)	8.9	19.3	30.3	39.2	45.8	**51.1**	54.4	57.3
2010 SPR (%)	89.9	94.0	96.0	96.8	97.2	**97.5**	97.6	97.7
Negative log-likelihoods								
Total	3568.09	3559.86	3558.75	3559.10	3559.61	**3560.10**	3560.42	3560.71
Catch	6.93E-8	6.93E-8	6.93E-8	6.93E-8	6.93E-8	**6.93E-8**	6.93E-8	6.93E-8
Indices	1.6613	-0.5528	-1.1835	-1.4103	-1.5071	**-1.5550**	-1.5678	-1.5734
Length composition	1284.17	1279.40	1278.46	1278.36	1278.43	**1278.57**	1278.62	1278.70
Age composition	2267.63	2270.73	2272.24	2273.10	2273.64	**2274.02**	2274.29	2274.50
Recruitment	14.6188	10.2860	9.2255	9.0505	9.0403	**9.0522**	9.0690	9.0821
Priors	0	0	0	0	0	**0.0059**	0	0
Parameter soft bound	0.0051	0.0052	0.0053	0.0053	0.0053	**0.0053**	0.0053	0.0053
Other parameter values								
Steepness (h)	0.25	0.35	0.45	0.55	0.65	**0.76**	0.85	0.95
Steepness estimated	No	No	No	No	No	**No**	No	No
Female M	0.1198	0.1198	0.1198	0.1198	0.1198	**0.1198**	0.1198	0.1198
Male M	0.1294	0.1294	0.1294	0.1294	0.1294	**0.1294**	0.1294	0.1294
Ms estimated	No	No	No	No	No	**Yes**	No	No

Table 19. Key parameters and model outputs for sensitivity analysis on natural mortality with steepness fixed at value from the base model (h=0.76). The model with M=0.12 (bold) is the base model. Unit of B_0 is spawning biomass (mt).

Description	M=0.09	M=0.10	M=0.11	**M=0.12**	M=0.13	M=0.14	M=0.15
Management quantities							
B_0	67067	69236	70727	**71126**	72009	72322	72849
2011 depletion (%)	32.5	39.7	46.0	**51.1**	51.4	59.6	62.5
2010 SPR (%)	94.6	96.1	96.9	**97.5**	97.9	98.4	98.4
Negative log-likelihoods							
Total	3576.57	3567.05	3561.76	**3560.10**	3561.57	3565.62	3571.84
Catch	6.93E-8	6.93E-8	6.93E-8	**6.93E-8**	6.93E-8	6.93E-8	6.93E-8
Indices	-0.9915	-1.5153	-1.6633	**-1.5550**	-1.3334	-1.0365	-0.7076
Length composition	1278.01	1277.27	1277.67	**1278.57**	1280.78	1283.05	1285.61
Age composition	2277.98	2275.63	2274.18	**2274.02**	2274.60	2276.46	2279.29
Recruitment	21.5632	15.6680	11.5734	**9.0522**	7.5183	7.1415	7.6383
Priors	0	0	0	**0.0059**	0	0	0
Parameter soft bound	0.0052	0.0052	0.0053	**0.0053**	0.0053	0.0054	0.0054
Other parameter values							
Steepness (h)	0.76	0.76	0.76	**0.76**	0.76	0.76	0.76
Steepness estimated	Yes	No	No	**No**	No	No	No
Female M	0.09	0.10	0.11	**0.1198**	0.13	0.14	0.15
Male M	0.10	0.11	0.12	**0.1294**	0.14	0.15	0.16
Ms estimated	No	No	No	**Yes**	No	No	No

Table 20. Key parameters and model outputs for sensitivity analysis on natural mortality (*M*) with steepness fixed at 0.41. The model with *M*=0.12 with *h*=0.76 (bold) is the base model. The likelihood values from the base model are not directly comparable to other models. Unit of B_0 is spawning biomass (mt).

Description	***M*=0.12**	*M*=0.09	*M*=0.10	*M*=0.11	*M*=0.12	*M*=0.13	*M*=0.14	*M*=0.15
Management quantities								
B_0	**71126**	37507	71155	74219	76210	76935	73311	75720
2011 depletion (%)	**51.1**	10.1	15.0	20.7	26.5	32.1	37.5	42.7
2010 SPR (%)	**97.5**	84.2	90.4	93.7	95.5	96.6	97.2	97.7
Negative log-likelihoods								
Total	**3560.10**	3589.55	3574.36	3564.32	3558.97	3557.83	3560.28	3565.70
Catch	**6.93E-8**	6.93E-8	6.93E-8	6.93E-8	6.93E-8	6.93E-8	6.93E-8	6.93E-8
Indices	**-1.5550**	2.02574	0.5907	-0.4963	-1.0791	-1.2289	-1.1079	-0.8523
Length composition	**1278.57**	1285.76	1281.45	1279.39	1279.11	1280.09	1281.92	1284.29
Age composition	**2274.02**	2274.37	2272.99	2271.96	2271.58	2272.19	2273.91	2776.69
Recruitment	**9.0522**	27.3954	19.3216	13.4577	9.3560	6.7733	5.5586	5.5664
Priors	**0.0059**	0	0	0	0	0	0	0
Parameter soft bound	**0.0053**	0.0051	0.0051	0.0052	0.0052	0.0053	0.0053	0.0054
Other parameter values								
Steepness (*h*)	**0.76**	0.41	0.41	0.41	0.41	0.41	0.41	0.41
Steepness estimated	**No**	No	No	No	No	No	No	No
Female *M*	**0.1198**	0.09	0.10	0.11	0.12	0.13	0.14	0.15
Male *M*	**0.1294**	0.10	0.11	0.12	0.13	0.14	0.15	0.16
*M*s estimated	**Yes**	No	No	No	No	No	No	No

Table 21. Key parameters and model outputs for sensitivity analysis on natural mortality (*M*) with steepness fixed at 0.9. The model with *M*=0.12 with *h*=0.76 (bold) is the base model. The likelihood values from the base model are not directly comparable to other models. Unit of B_0 is spawning biomass (mt).

Description	***M*=0.12**	*M*=0.09	*M*=0.10	*M*=0.11	*M*=0.12	*M*=0.13	*M*=0.14	*M*=0.15
Management quantities								
B_0	**71126**	66720	38714	70108	70974	71528	72048	72819
2011 depletion (%)	**51.1**	38.7	45.5	51.4	56.3	60.2	63.4	65.8
2010 SPR (%)	**97.5**	95.4	96.5	97.2	97.7	98.0	98.3	98.4
Negative log-likelihoods								
Total	**3560.10**	3575.27	3566.52	3561.81	3560.58	3562.29	3566.49	3572.79
Catch	**6.93E-8**	6.93E-8	6.93E-8	6.93E-8	6.93E-8	6.93E-8	6.93E-8	6.93E-8
Indices	**-1.5550**	-1.3944	-1.7213	-1.7434	-1.5765	-1.3100	-0.9955	-0.6556
Length composition	**1278.57**	1277.43	1277.03	1277.65	1279.03	1280.95	1283.26	1285.85
Age composition	**2274.02**	2278.37	2275.93	2274.49	2274.17	2274.98	2276.87	2279.72
Recruitment	**9.0522**	20.8549	15.2651	11.4100	8.9502	7.6562	7.3491	7.8698
Priors	**0.0059**	0	0	0	0	0	0	0
Parameter soft bound	**0.0053**	0.0052	0.0052	0.0053	0.0053	0.0053	0.0054	0.0054
Other parameter values								
Steepness (*h*)	**0.76**	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Steepness estimated	**No**	No	No	No	No	No	No	No
Female *M*	**0.1198**	0.09	0.10	0.11	0.12	0.13	0.14	0.15
Male *M*	**0.1294**	0.10	0.11	0.12	0.13	0.14	0.15	0.16
*M*s estimated	**Yes**	No	No	No	No	No	No	No

Table 22. Key parameters and model outputs for sensitivity analysis on steepness with natural mortality fixed (M_{female}=0.11, M_{male}=0.12). The model with M=0.12 with h=0.76 (bold) is the base model. The likelihood values from the base model are not directly comparable to other models. Unit of B_0 is spawning biomass (mt).

Description	***h*=0.76**	*h*=0.25	*h*=0.35	*h*=0.45	*h*=0.55	*h*=0.65	*h*=0.76	*h*=0.85	*h*=0.95
Management quantities									
B_0	**71126**	69188	74501	73702	72397	71455	70727	70302	69939
2011 depletion (%)	**51.1**	6.2	14.7	24.4	33.0	39.7	45.4	49.0	53.0
2010 SPR (%)	**97.5**	82.3	91.3	94.6	95.9	96.5	96.9	97.1	97.3
Negative log-likelihoods									
Total	**3560.10**	3580.2	3567.27	3563.27	3562.13	3561.82	3561.76	3561.79	3561.84
Catch	**6.93E-8**	6.93E-8	6.93E-8	6.93E-8	6.93E-8	6.93E-8	6.93E-8	6.93E-8	6.93E-8
Indices	**-1.5550**	3.1350	0.3047	-0.8285	-1.3049	-1.5345	-1.6633	-1.7215	-1.7601
Length composition	**1278.57**	1288.83	1281.18	1278.75	1278.00	1277.75	1277.67	1277.65	1277.66
Age composition	**2274.02**	2267.40	2270.85	2272.47	2273.31	2273.81	2274.18	2274.39	2274.57
Recruitment	**9.0522**	20.8381	14.9744	12.8739	12.1230	11.7839	11.5734	11.4594	11.3679
Priors	**0.0059**	0	0	0	0	0	0	0	0
Parameter soft bound	**0.0053**	0.0051	0.0051	0.0052	0.0052	0.0052	0.0053	0.0053	0.0053
Other parameter values									
Steepness (h)	**0.76**	0.25	0.35	0.45	0.55	0.65	0.76	0.85	0.95
Steepness estimated	**No**	No	No	No	No	No	No	No	No
Female M	**0.1198**	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Male M	**0.1294**	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
Ms estimated	**Yes**		No	No	No	No	No	No	No

Table 23. Key parameters and model outputs for sensitivity analysis on steepness with natural mortality fixed (M_{female}=0.13, M_{male}=0.14). The model with M=0.12 with h=0.76 (bold) is the base model. The likelihood values from the base model are not directly comparable to other models. Unit of B_0 is spawning biomass (mt).

Description	***h*=0.76**	*h*=0.25	*h*=0.35	*h*=0.45	*h*=0.55	*h*=0.65	*h*=0.76	*h*=0.85	*h*=0.95
Management quantities									
B_0	**71126**	69762	76072	75691	73688	72655	72009	71672	71407
2011 depletion (%)	**51.1**	9.1	22.4	36.5	45.1	51.1	55.9	58.9	61.5
2010 SPR (%)	**97.5**	88.3	95.1	96.9	97.4	97.7	97.9	98.0	98.0
Negative log-likelihoods									
Total	**3560.10**	3575.36	3573.74	3558.41	3559.76	3560.77	3561.57	3562.06	3562.49
Catch	**6.93E-8**	6.93E-8	6.93E-8	6.93E-8	6.93E-8	6.93E-8	6.93E-8	6.93E-8	6.93E-8
Indices	**-1.5550**	2.1203	-0.7526	-1.2822	-1.3377	-1.3451	-1.3334	-1.3187	-1.3013
Length composition	**1278.57**	1285.58	1299.87	1280.15	1280.38	1280.59	1280.78	1280.90	1281.01
Age composition	**2274.02**	2277.12	2267.22	2272.70	2273.59	2274.17	2274.60	2274.86	2275.09
Recruitment	**9.0522**	10.5233	7.3982	6.8436	7.1247	7.3507	7.5183	7.6139	7.6927
Priors	**0.0059**	0	0	0	0	0	0	0	0
Parameter soft bound	**0.0053**	0.0054	0.0054	0.0053	0.0053	0.0053	0.0053	0.0053	0.0053
Other parameter values									
Steepness (*h*)	**0.76**	0.25	0.35	0.45	0.55	0.65	0.76	0.85	0.95
Steepness estimated	**No**	No	No	No	No	No	No	No	No
Female *M*	**0.1198**	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Male *M*	**0.1294**	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
*M*s estimated	**Yes**	No	No	No	No	No	No	No	No

Table 24. Comparisons of key parameters and model outputs from the sensitivity analysis on ageing errors (age errors * 0.5 and 2.0, respectively). Likelihood values are not directly comparable among these three models because weighting factors were readjusted in the last two models. Unit of B_0 is spawning biomass (mt).

Description	Base model	Base model with ageing error*0.5	Base model with ageing error*2
Management quantities			
B_0	71126	73134	76041
2011 depletion (%)	51.1	49.3	50.6
2010 SPR (%)	97.5	97.5	97.7
Negative log-likelihoods			
Total	3560.10	3536.01	3882.58
Catch	6.93E-8	6.93E-8	6.93E-8
Indices	-1.5550	-2.1182	-1.1512
Length composition	1278.57	1276.08	1264.56
Age composition	2274.02	2258.19	2615.53
Recruitment	9.0522	3.8417	3.6125
Priors	0.0059	0.0060	0.0117
Parameter soft bound	0.0053	0.0055	0.0051
Other parameter values			
Steepness (h)	0.76	0.76	0.76
Steepness estimated	No	No	No
Female M	0.1198	0.1233	0.1248
Male M	0.1294	0.1330	0.1346
Ms estimated	Yes	Yes	Yes

Table 25. Comparisons of key parameters and model outputs from the retrospective analysis. Likelihood values are not directly comparable among these models. Unit of B_0 is spawning biomass (mt).

Description	Base model	Retro-1	Retro-2	Retro-3
Management quantities				
B_0	71126	72627	73840	74745
2011 depletion (%)	51.1	49.3	49.2	48.6
2010 SPR (%)	97.5	97.5	97.6	97.6
Negative log-likelihoods				
Total	3560.10	3447.88	3340.45	3204.71
Catch	6.93E-8	6.93E-8	6.93E-8	6.93E-8
Indices	-1.5550	-2.1868	-2.3805	-3.3396
Length composition	1278.57	1215.52	1173.66	1117.25
Age composition	2274.02	2227.34	2163.19	2084.98
Recruitment	9.0522	7.1907	5.9709	5.8079
Priors	0.0059	0.0049	0.0090	0.0110
Parameter soft bound	0.0053	0.0045	0.0047	0.0042
Other parameter values				
Steepness (h)	0.76	0.76	0.76	0.76
Steepness estimated	No	No	No	No
Female M	0.1198	0.1219	0.1238	0.1240
Male M	0.1294	0.1322	0.1340	0.1346
Ms estimated	Yes	Yes	Yes	Yes

9 Figures

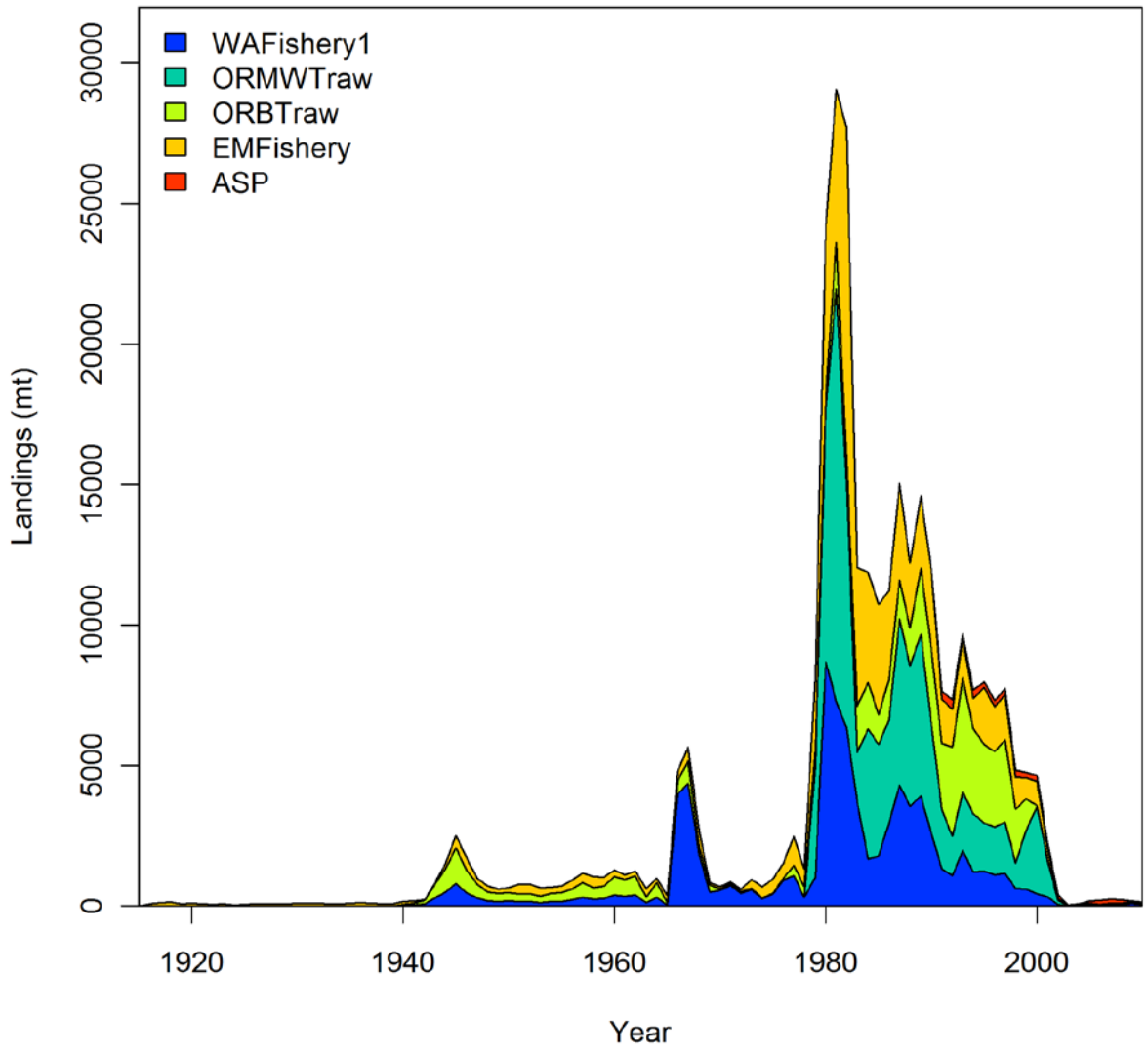

Figure 1. Landings of widow rockfish by five fisheries from 1916 to 2010. Detail numbers are presented in Table 1.

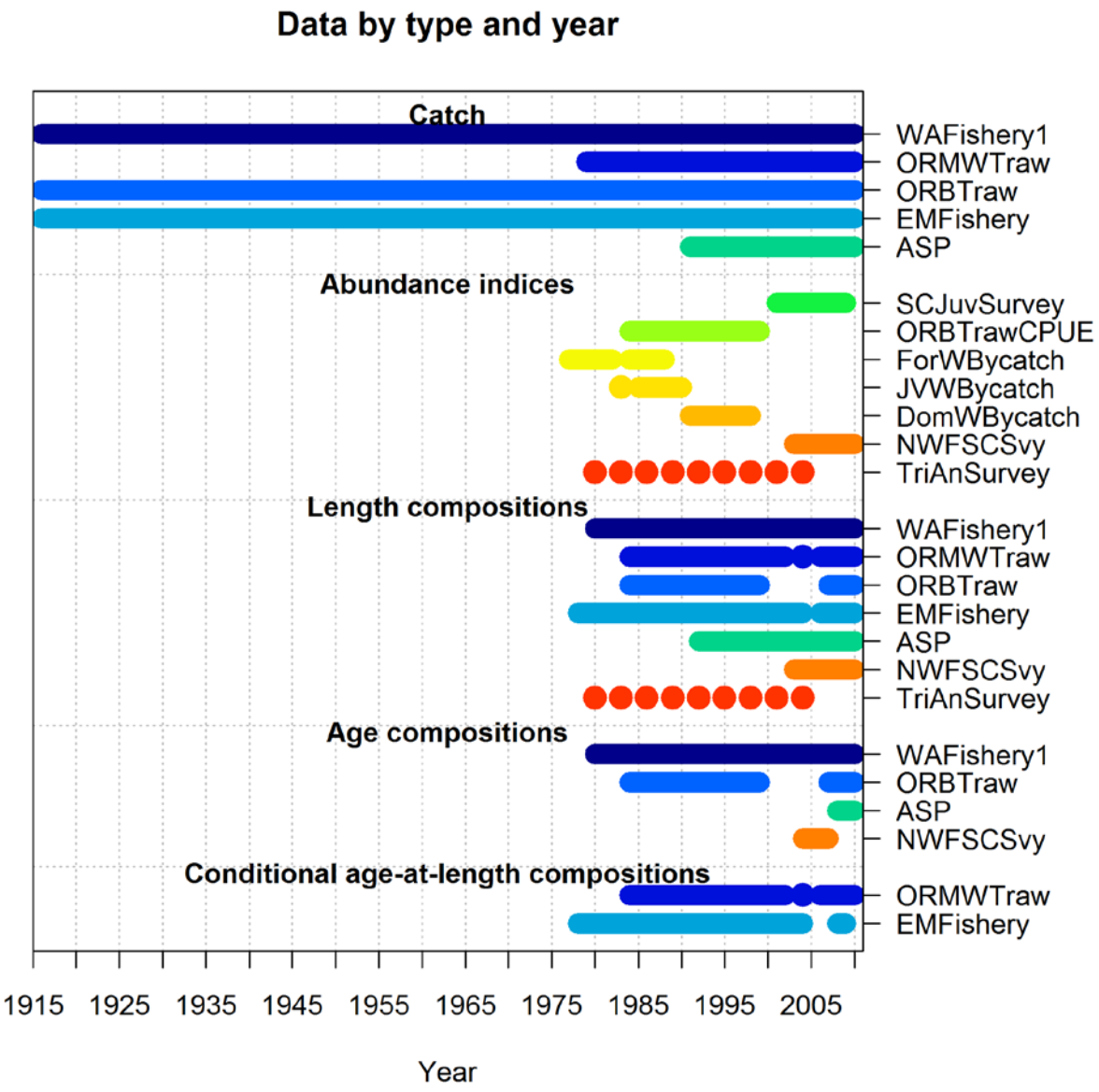

Figure 2. Ranges of annual catch, abundance index, length and age composition data used in the assessment models.

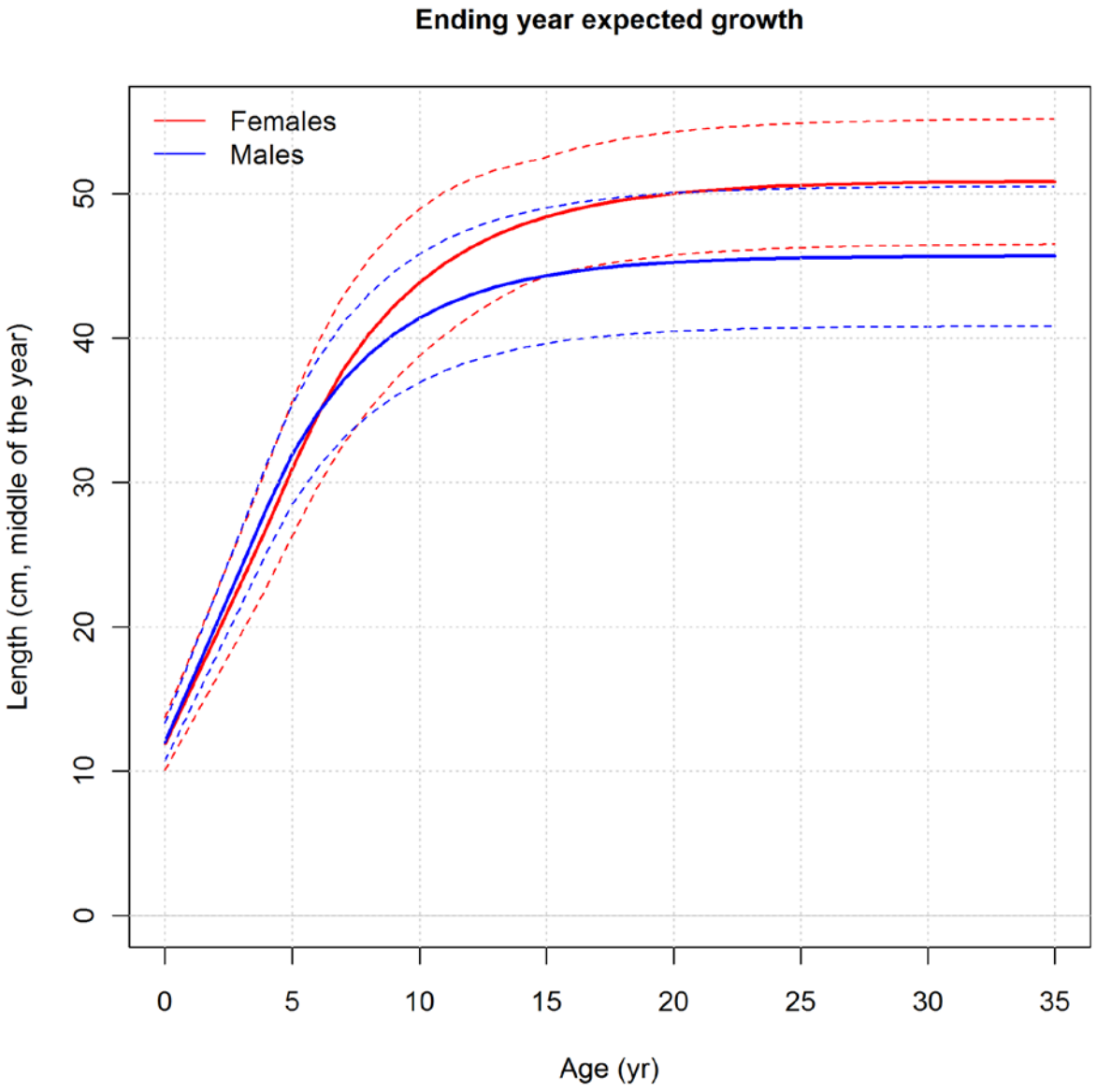

Figure 3. Estimated growth functions for both sexes of widow rockfish from the base model.

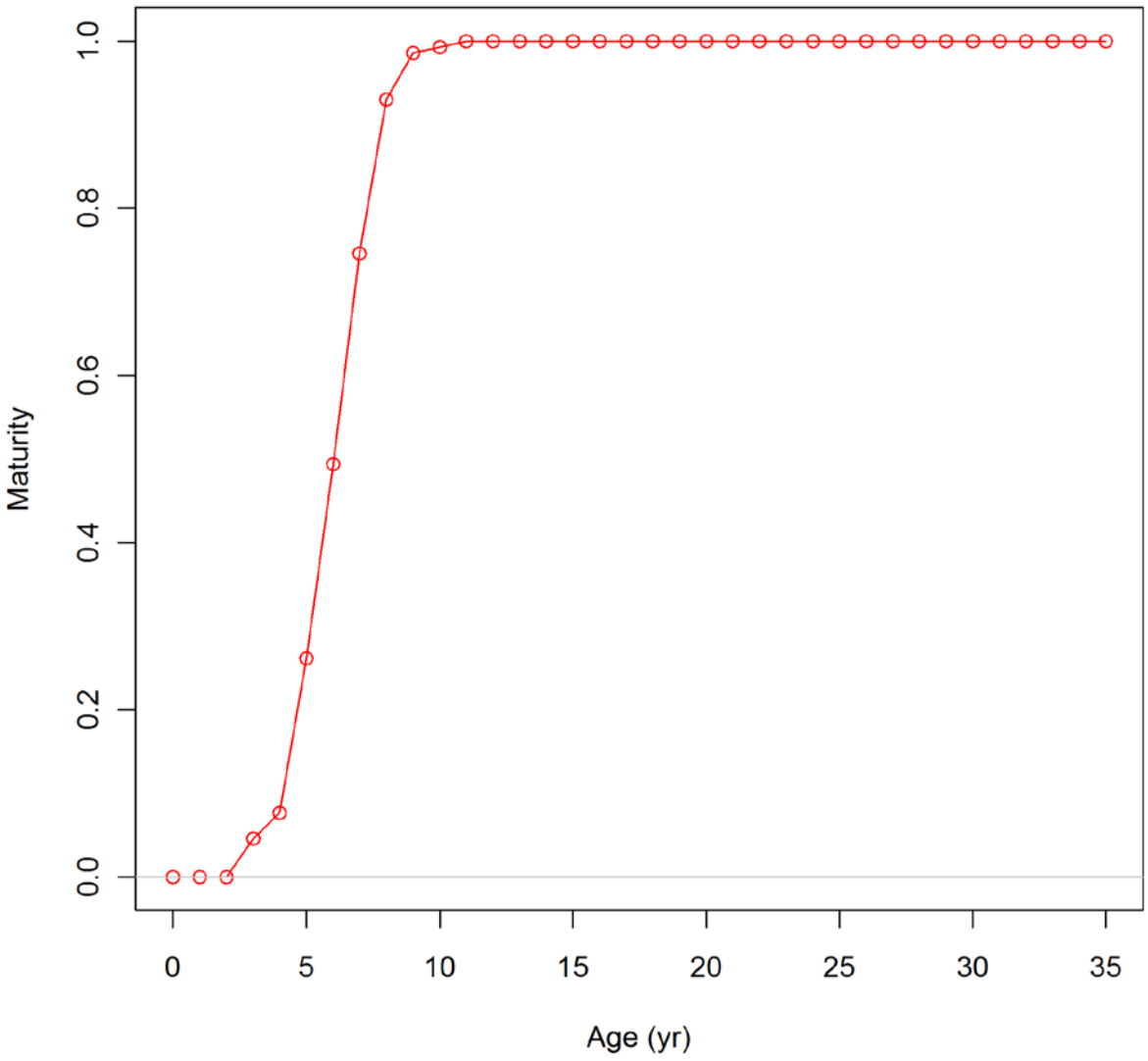

Figure 4. Maturity by age of widow rockfish.

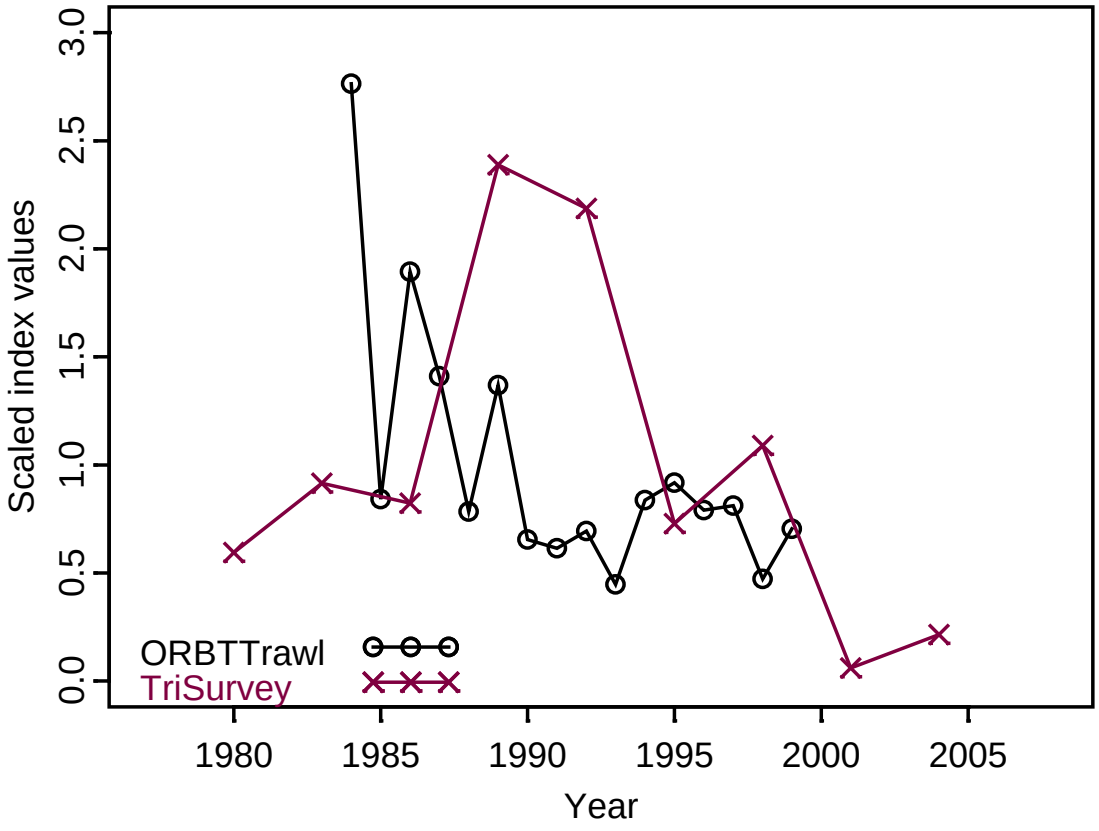

Figure 5. Time series of scaled abundance indices of the Oregon bottom trawl logbook and triennial survey.

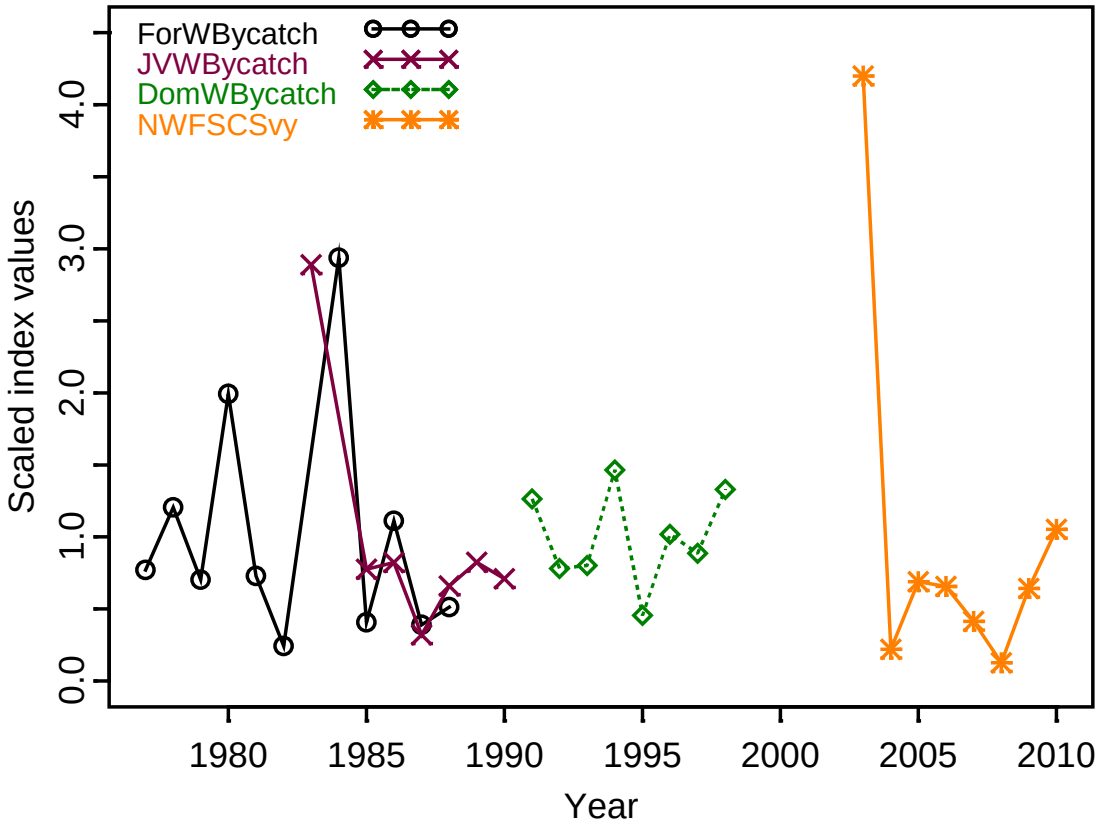

Figure 6. Time series of scaled abundance indices of three whiting bycatch fisheries (foreign, joint venture, and domestic), and the NWFSC survey.

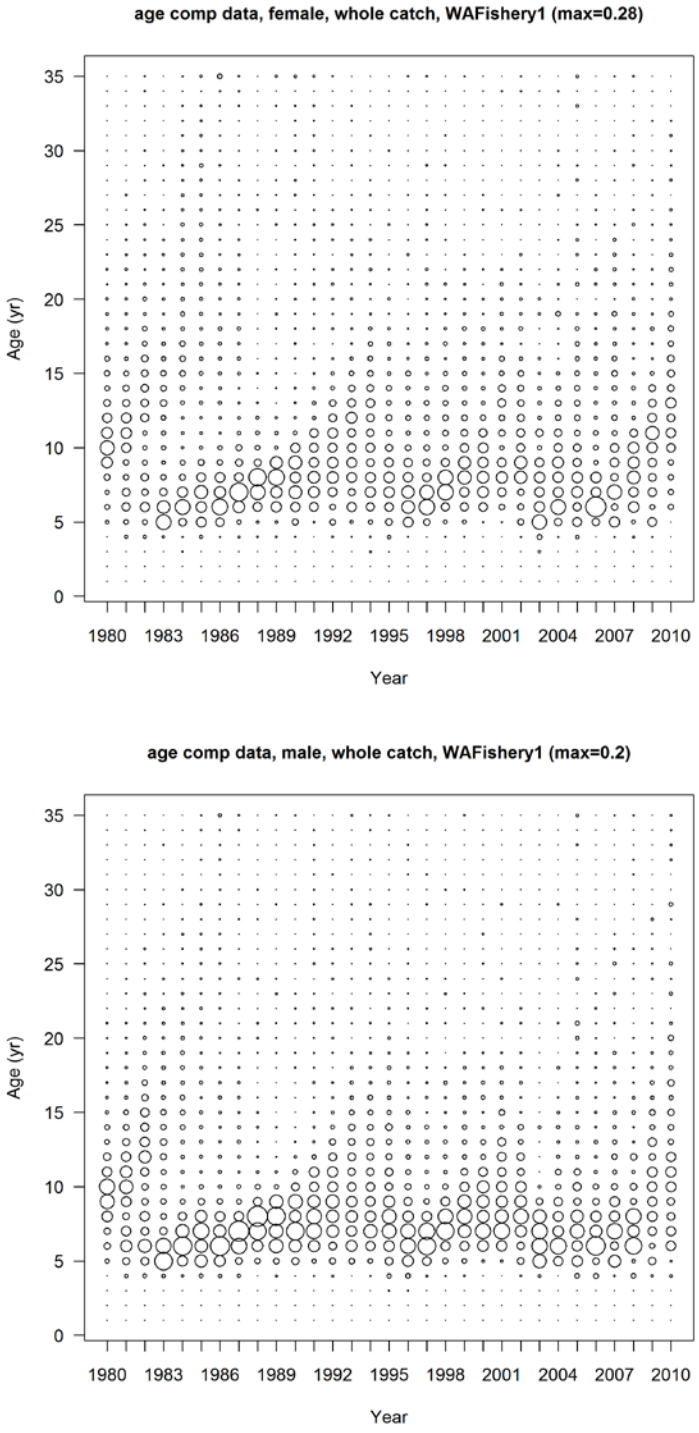

Figure 7. Age composition data from the Washington (WA) fisheries (Vancouver-Columbia area) from 1980 to 2010 for females (upper panel) and male (lower panel).

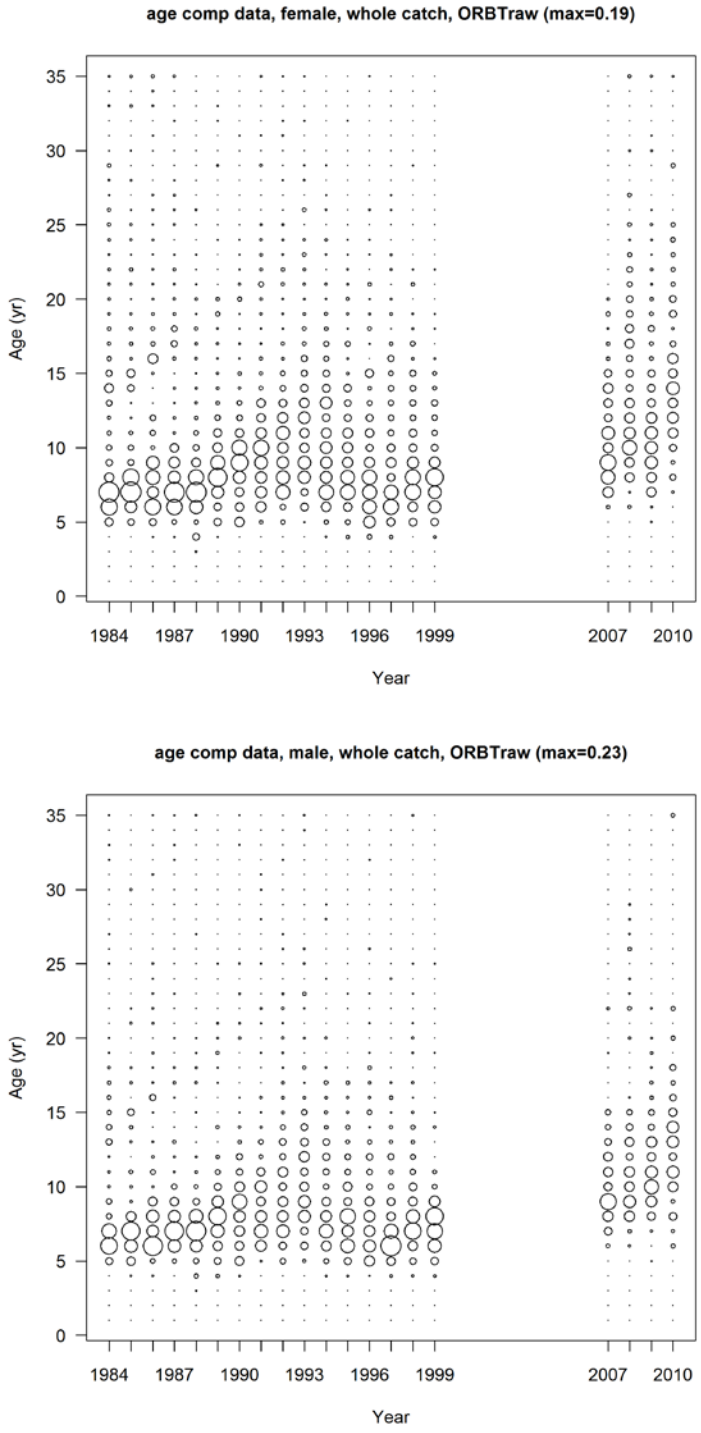

Figure 8. Age composition data from the Oregon bottom trawl fisher from 1984 to 2010 for females (upper panel) and male (lower panel).

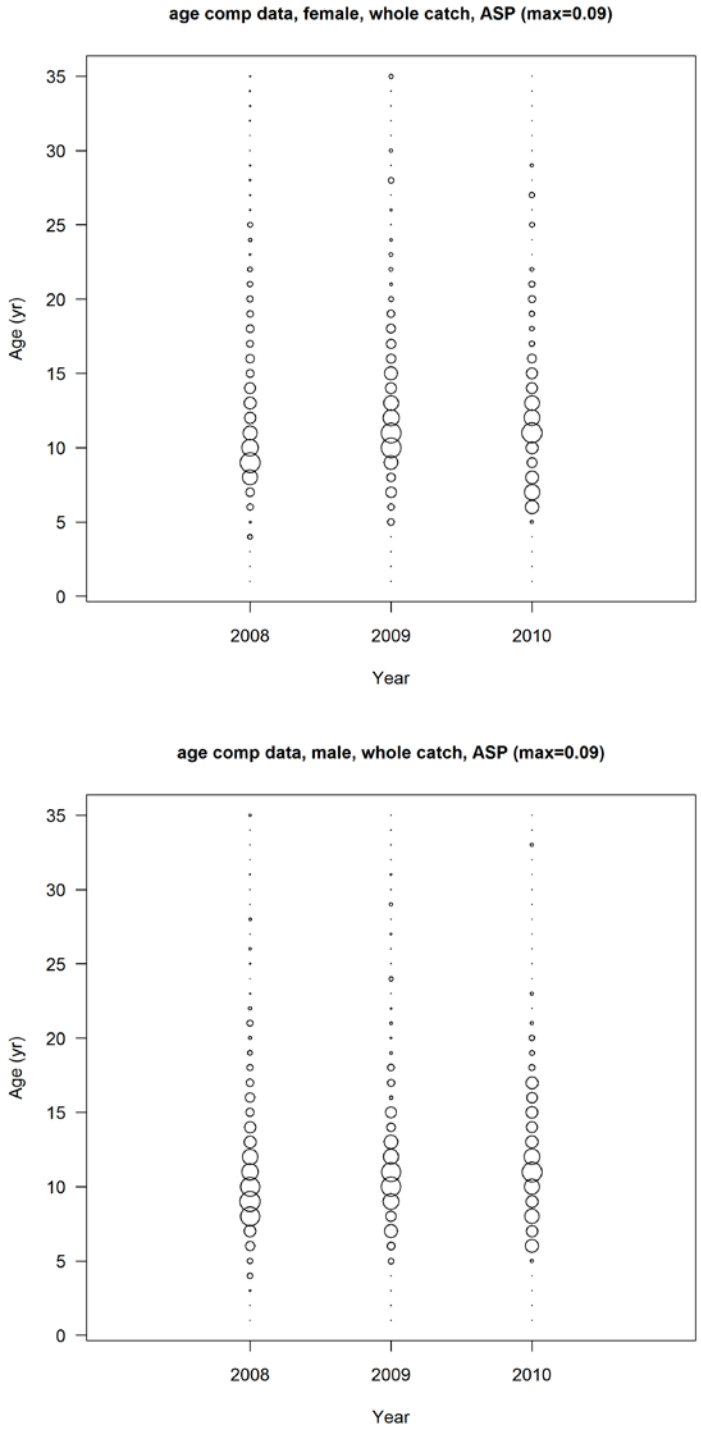

Figure 9. Age composition data from the at-sea whiting fishery from 2008 to 2010 for females (upper panel) and male (lower panel).

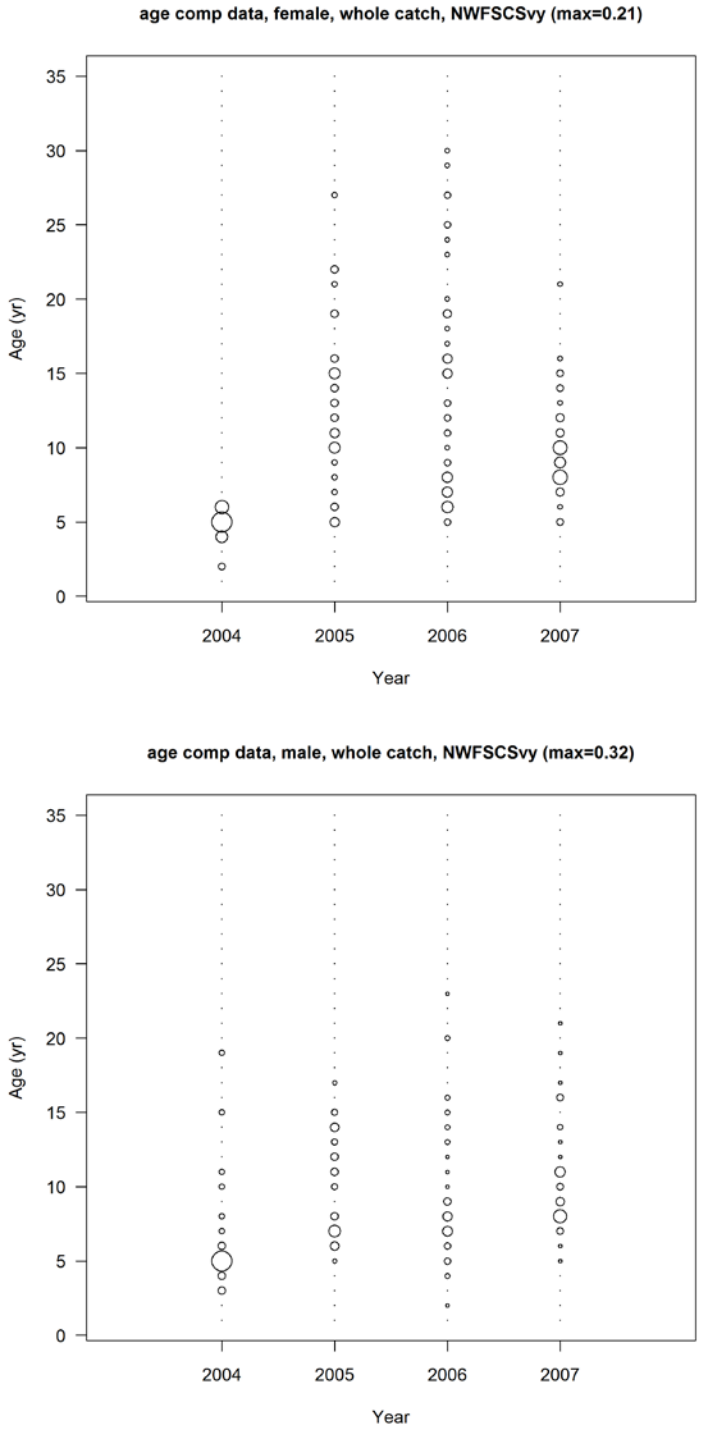

Figure 10. Age composition data from the NWFSC survey from 2004 to 2007 for females (upper panel) and male (lower panel).

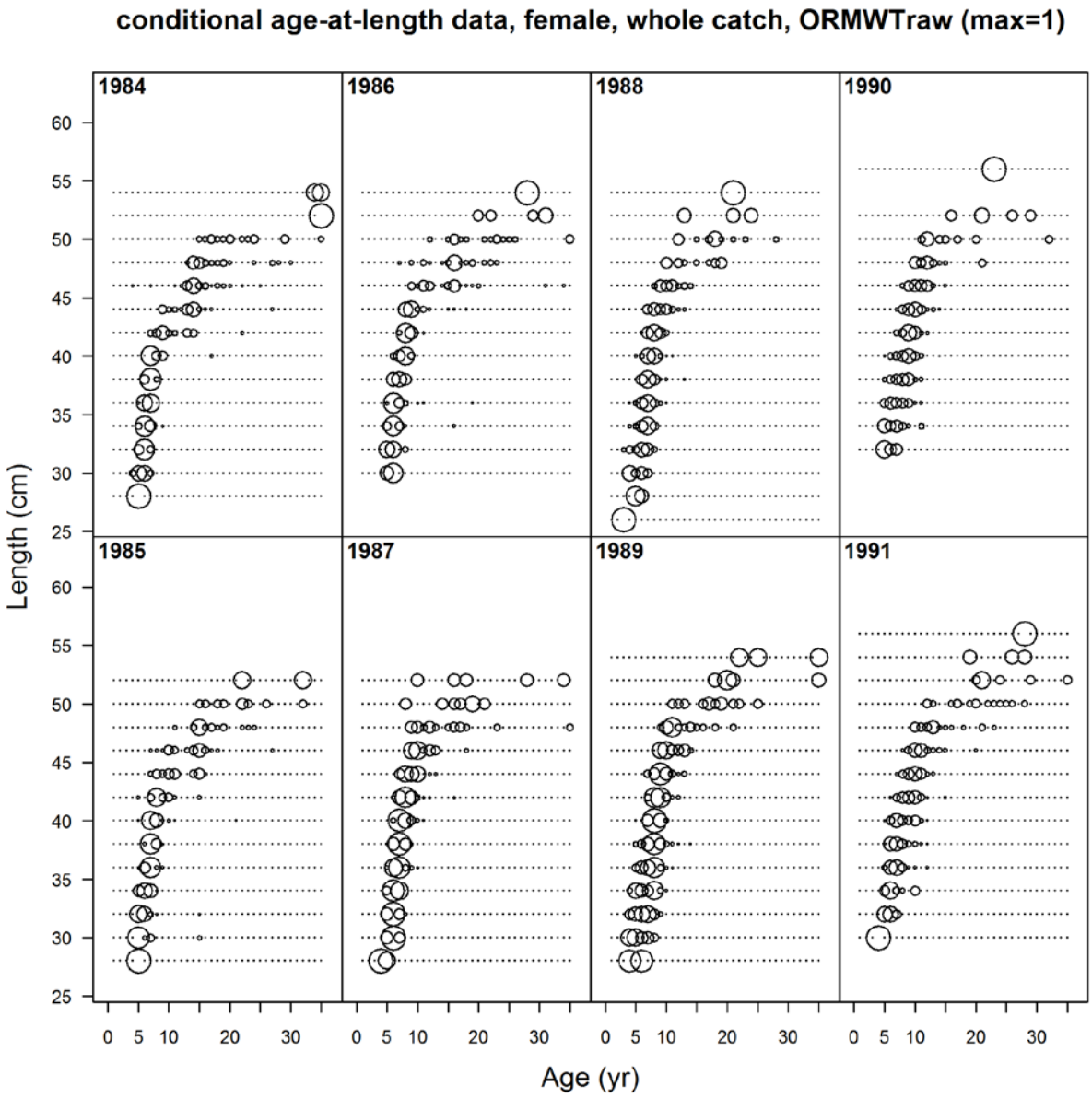

Figure 11a. Conditional age-at-length data for female from the Oregon mid-water trawl fisheries from 1984 to 1991.

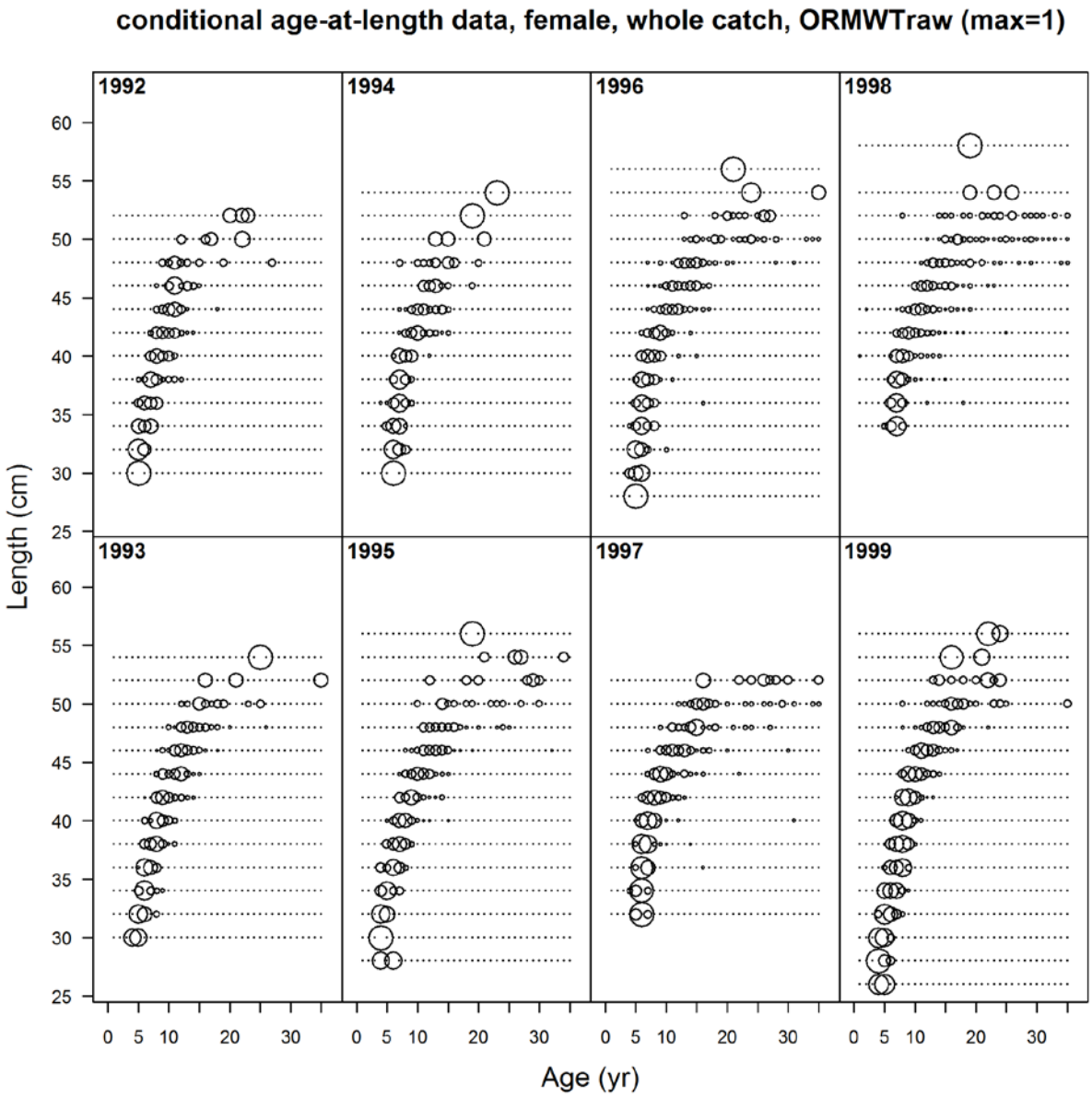

Figure 11b. Conditional age-at-length data for female from the Oregon mid-water trawl fisheries from 1992 to 199.

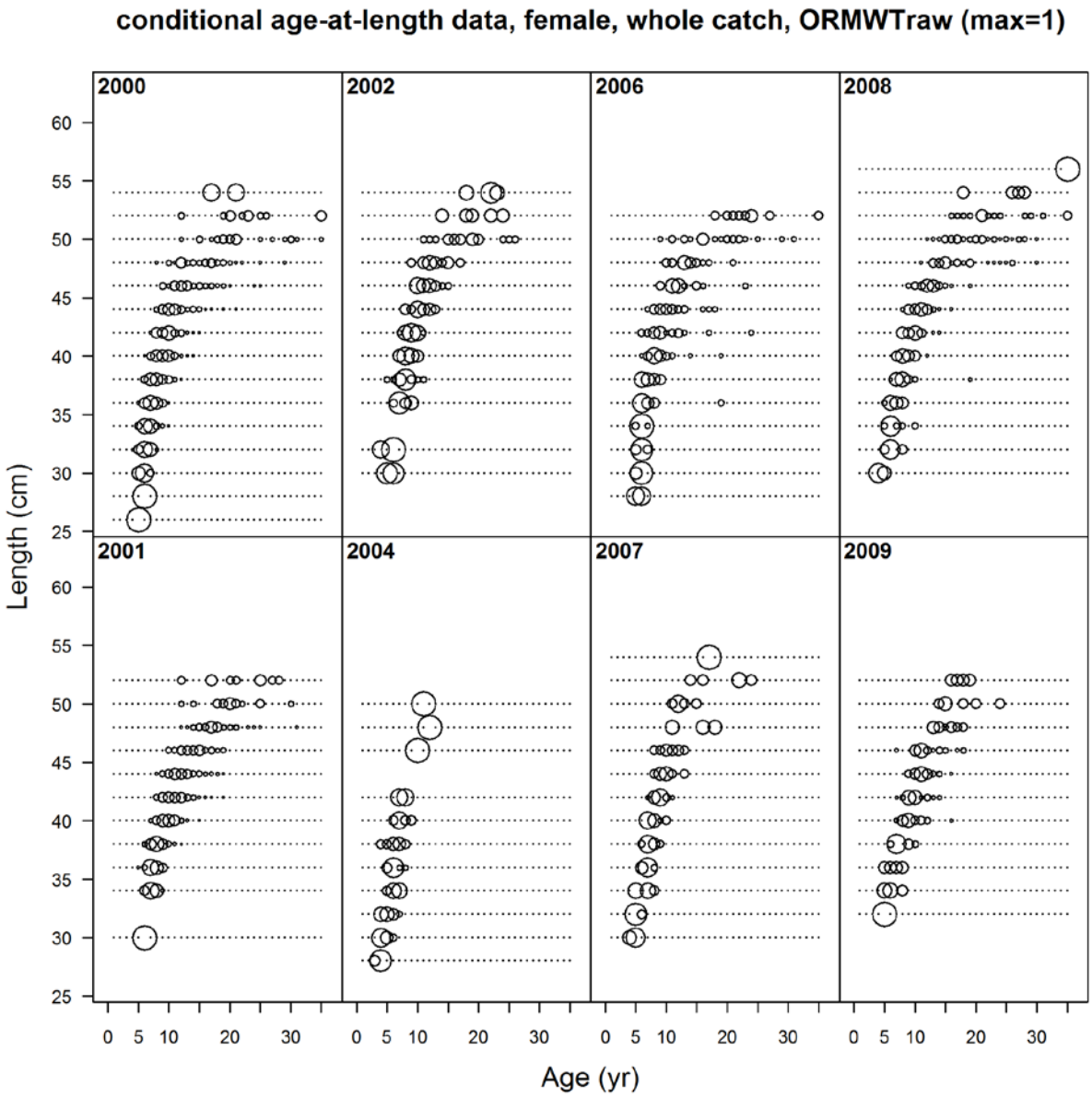

Figure 11c. Conditional age-at-length data for female from the Oregon mid-water trawl fisheries from 2000 to 2009.

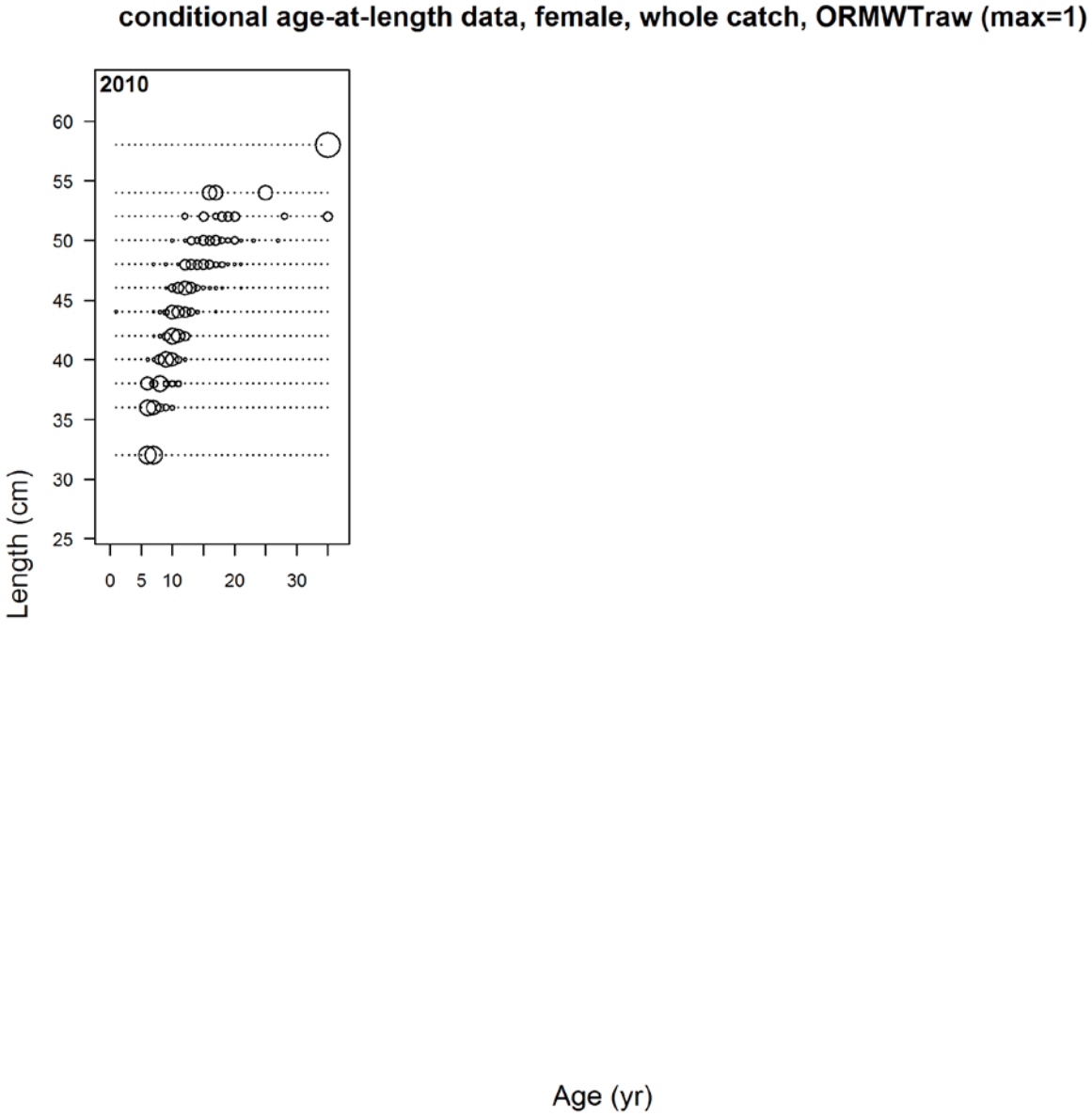

Figure 11d. Conditional age-at-length data for female from the Oregon mid-water trawl fisheries from 2010.

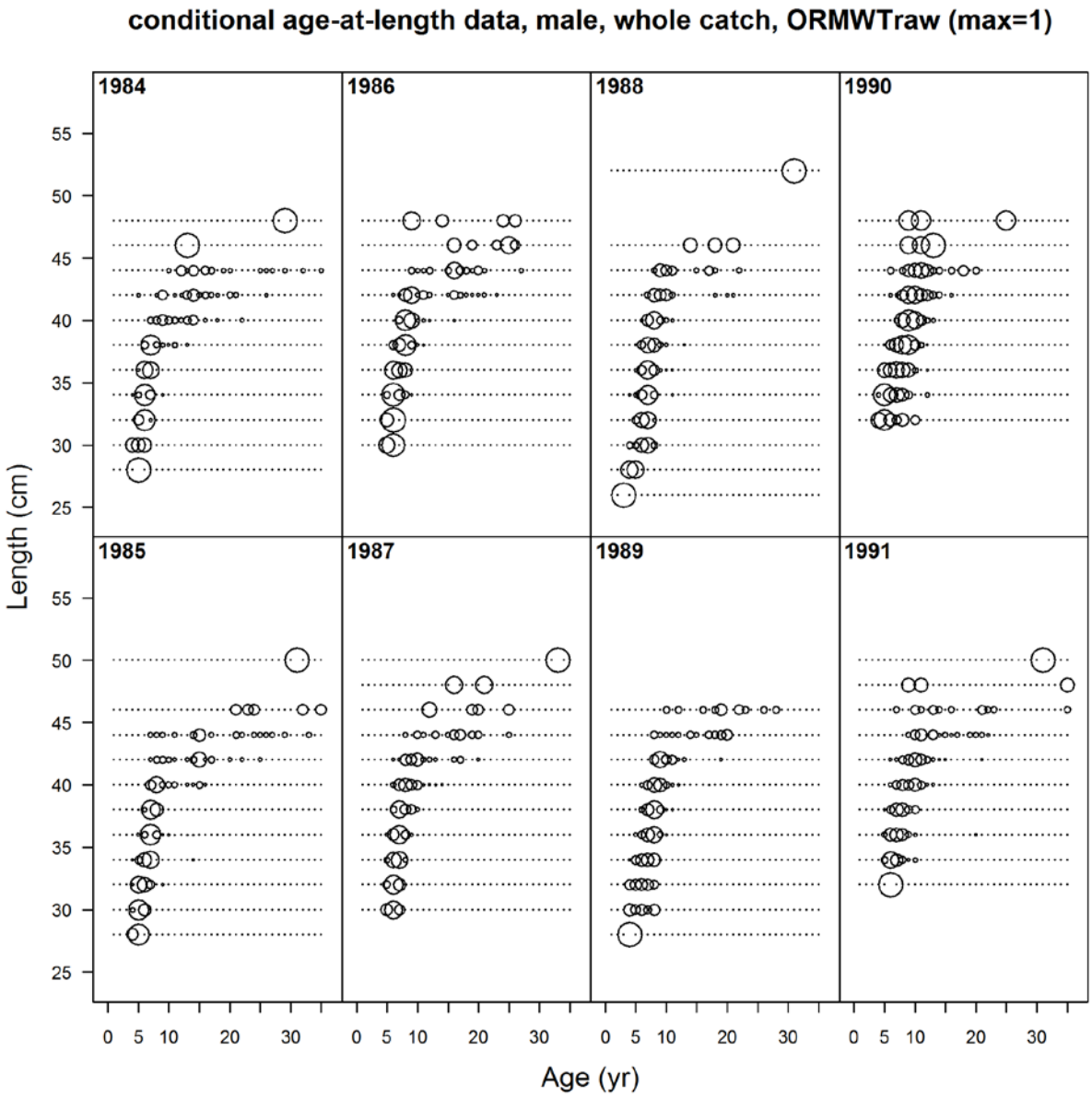

Figure 11e. Conditional age-at-length data for male from the Oregon mid-water trawl fisheries from 1984 to 1991.

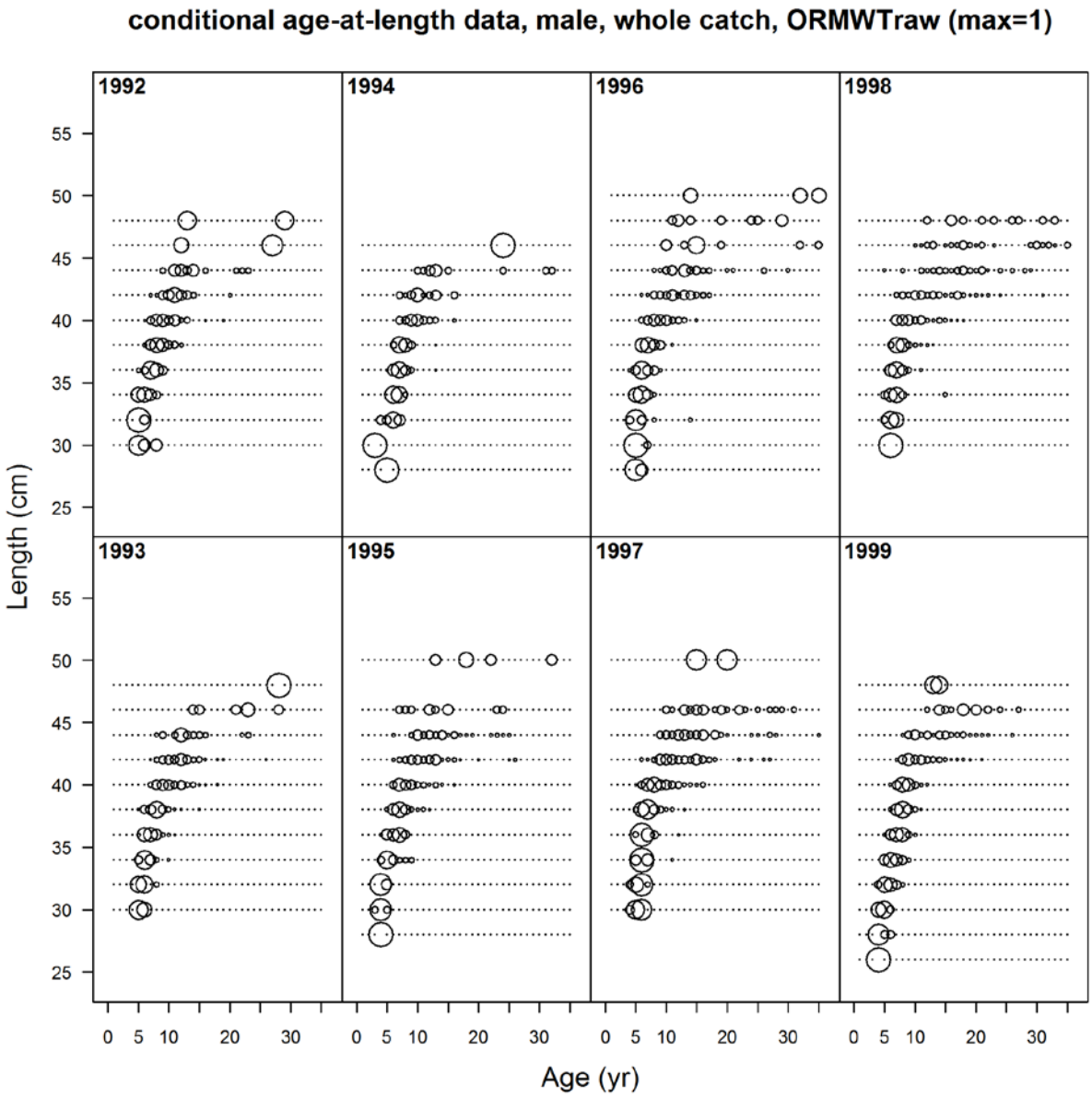

Figure 11f. Conditional age-at-length data for male from the Oregon mid-water trawl fisheries from 1992 to 1999.

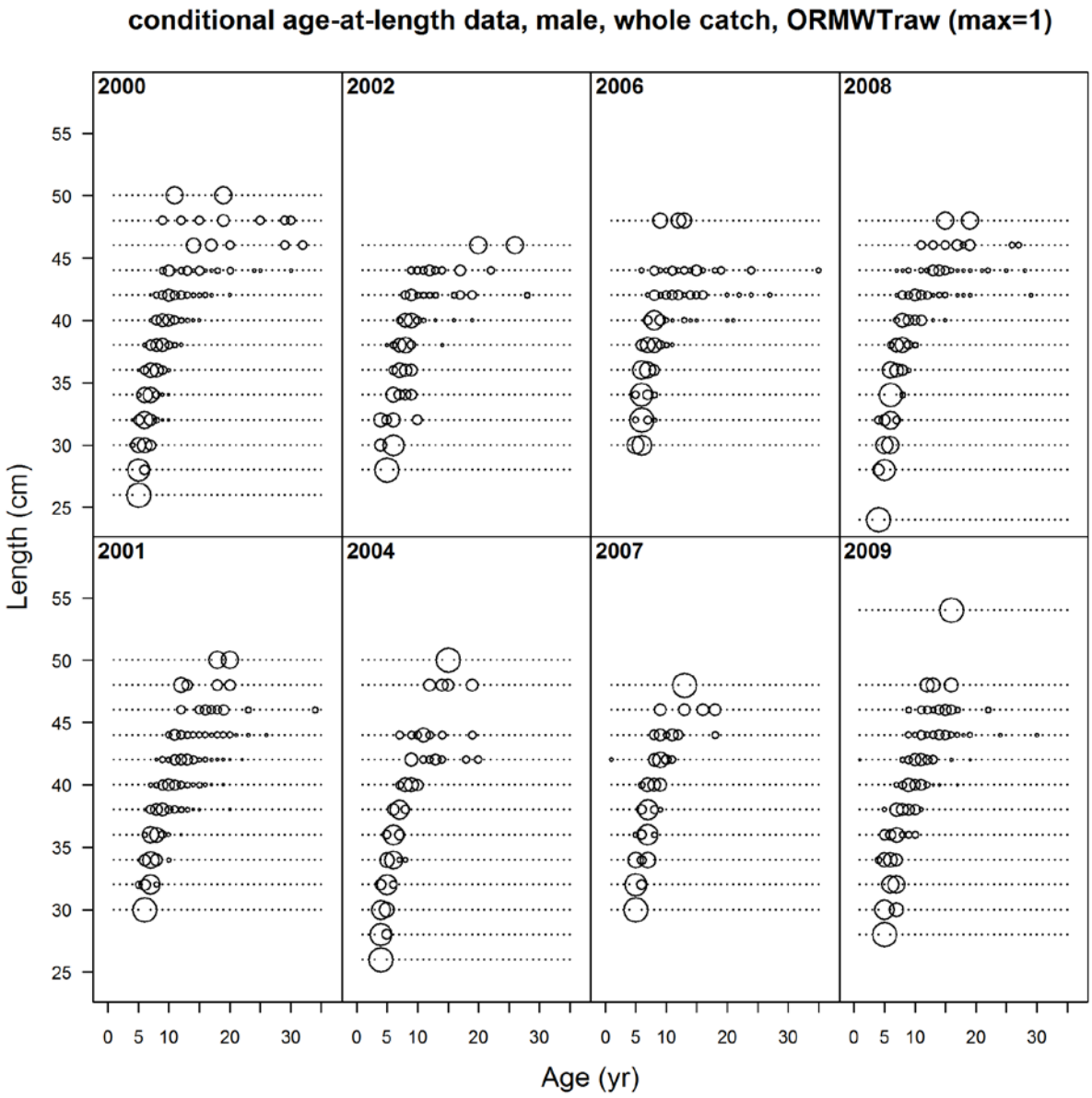

Figure 11g. Conditional age-at-length data for male from the Oregon mid-water trawl fisheries from 2000 to 2009.

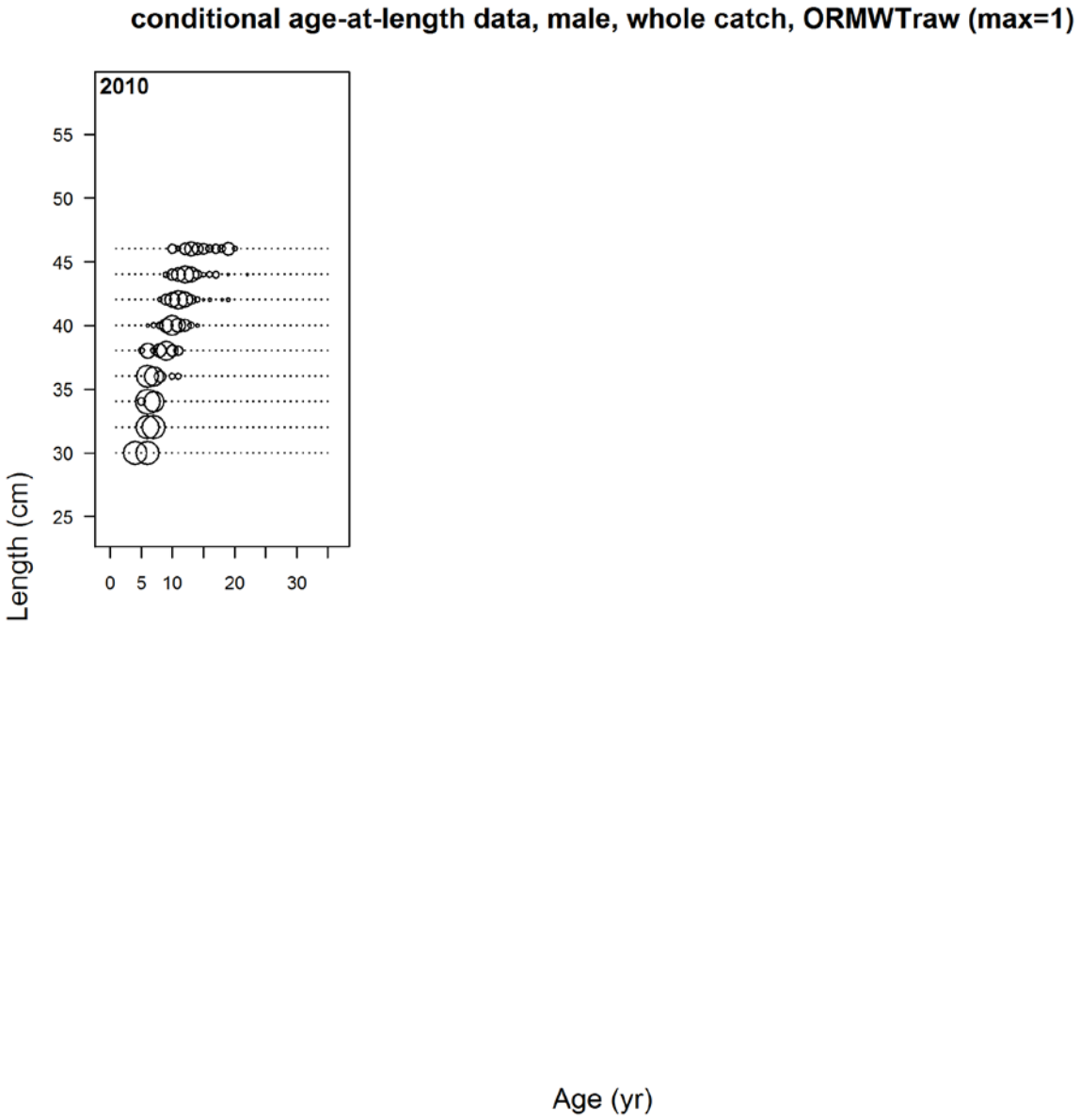

Figure 11h. Conditional age-at-length data for male from the Oregon mid-water trawl fisheries from 2010.

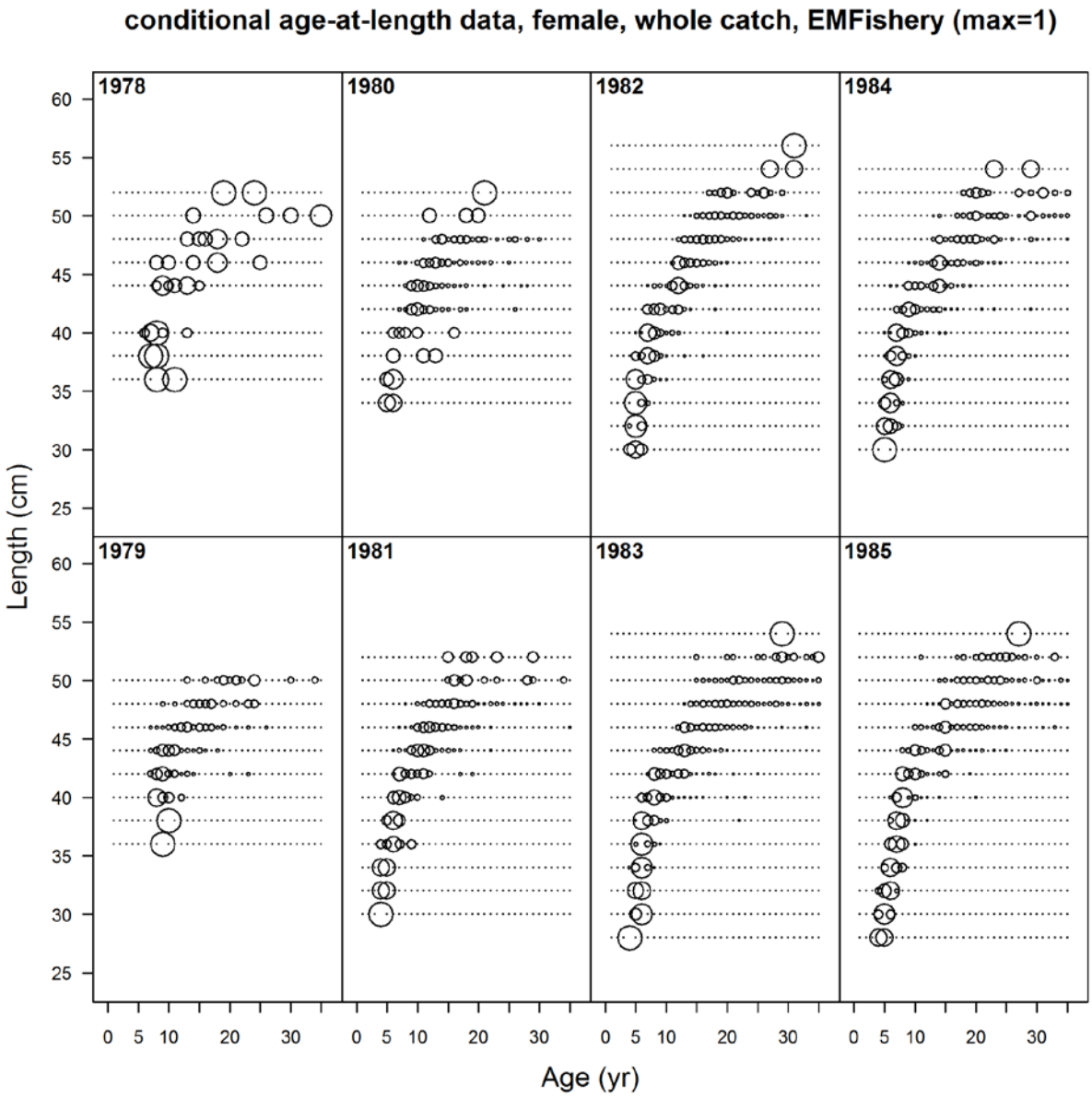

Figure 12a. Conditional age-at-length data for female from California (EMFishery1) fisheries from 1978 to 1985.

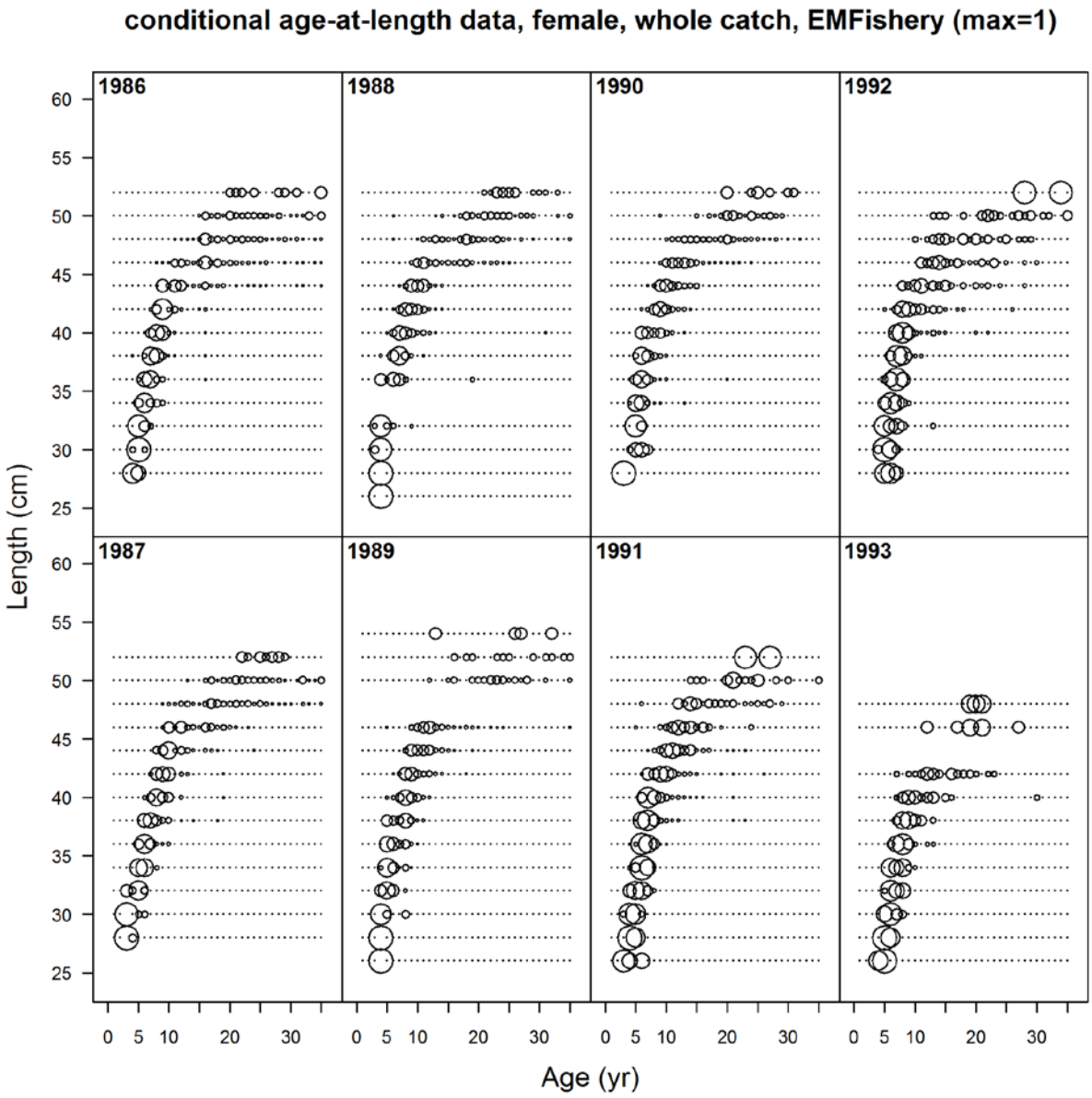

Figure 12b. Conditional age-at-length data for female from California (EMFishery1) fisheries from 1986 to 1993.

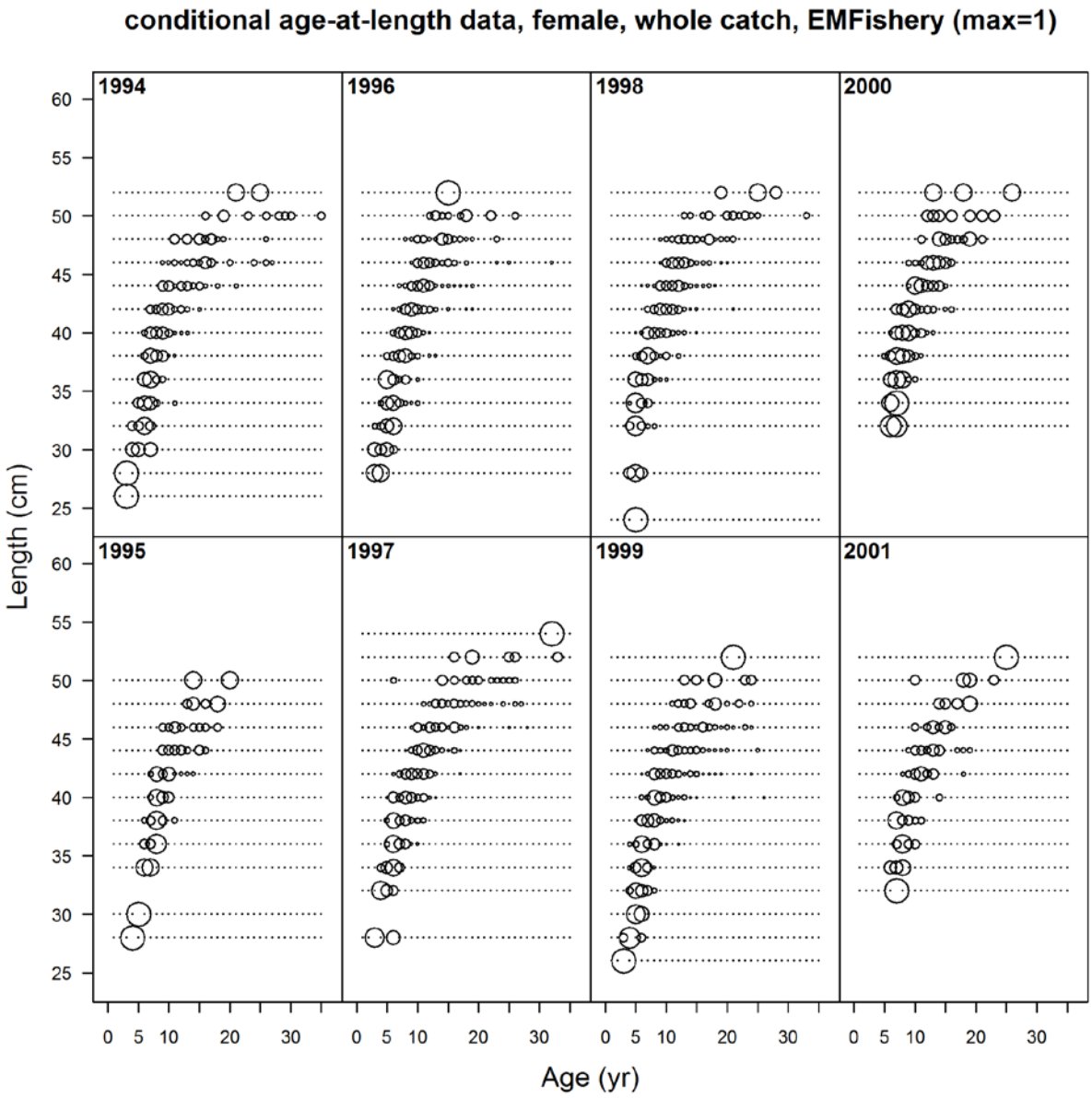

Figure 12c. Conditional age-at-length data for female from California (EMFishery1) fisheries from 1994 to 2001.

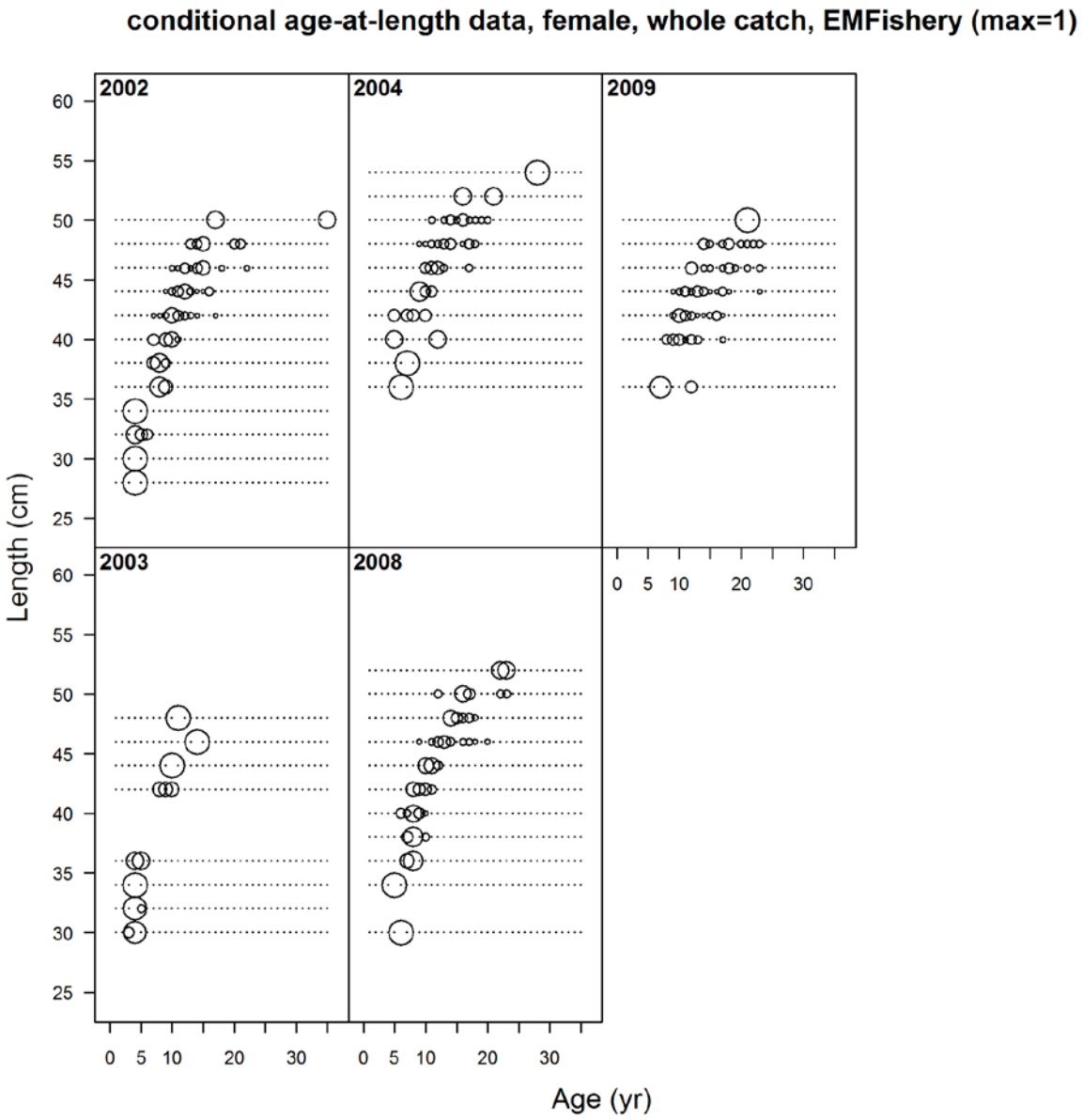

Figure 12d. Conditional age-at-length data for female from California (EMFishery1) fisheries from 2002 to 2008.

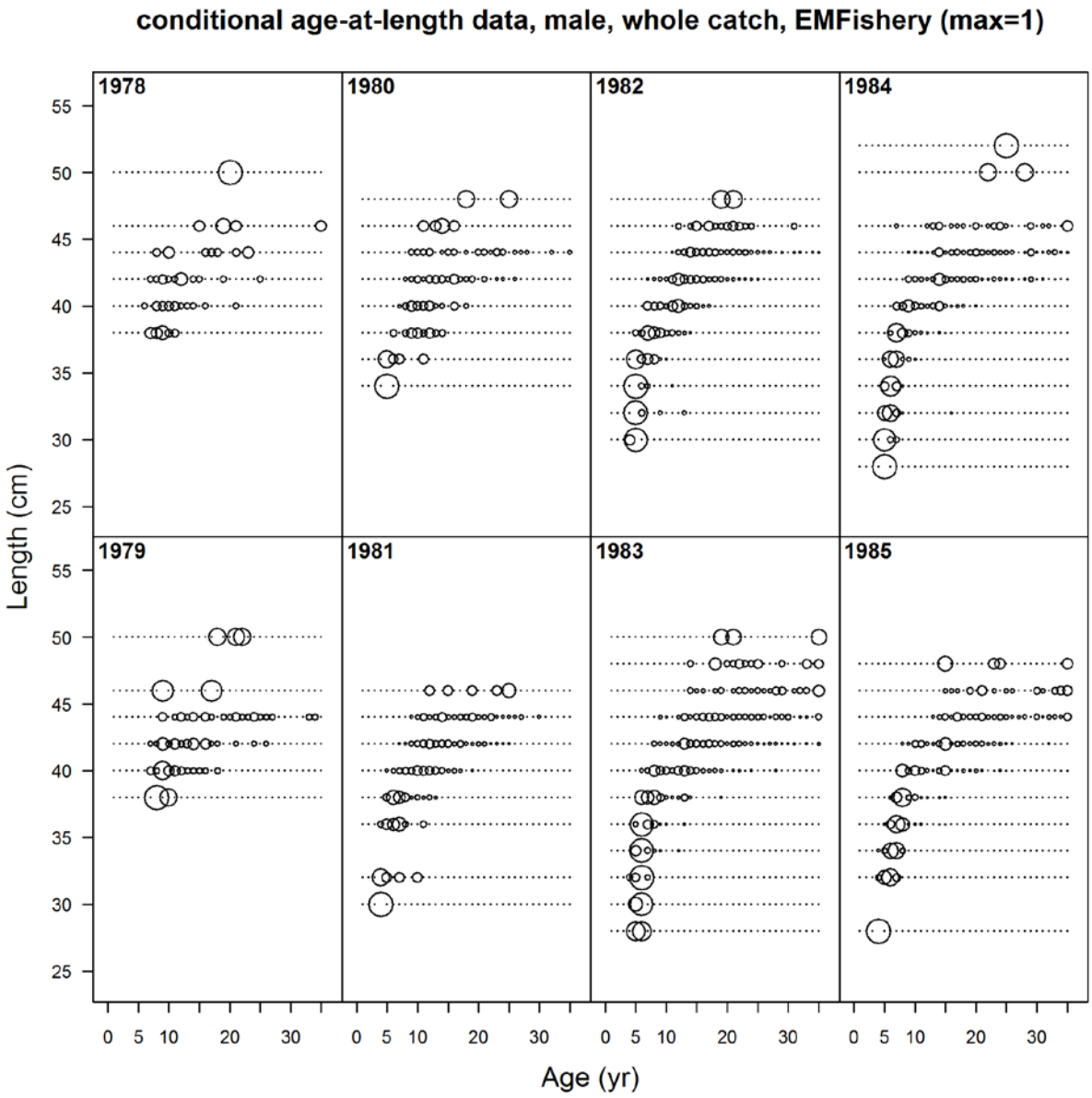

Figure 12e. Conditional age-at-length data for male from California (EMFishery1) fisheries from 1978 to 1985.

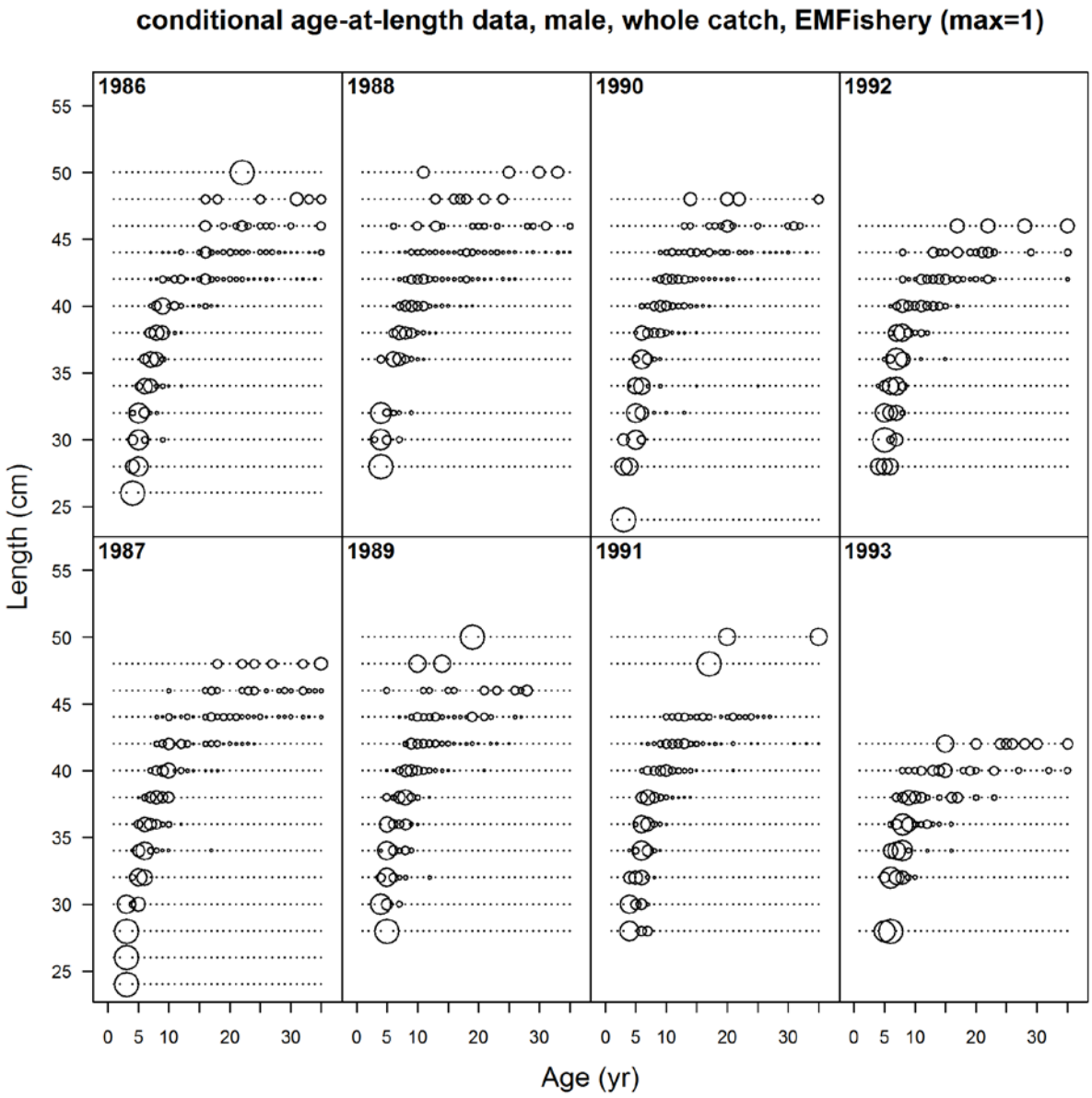

Figure 12f. Conditional age-at-length data for male from California (EMFishery1) fisheries from 1986 to 1993.

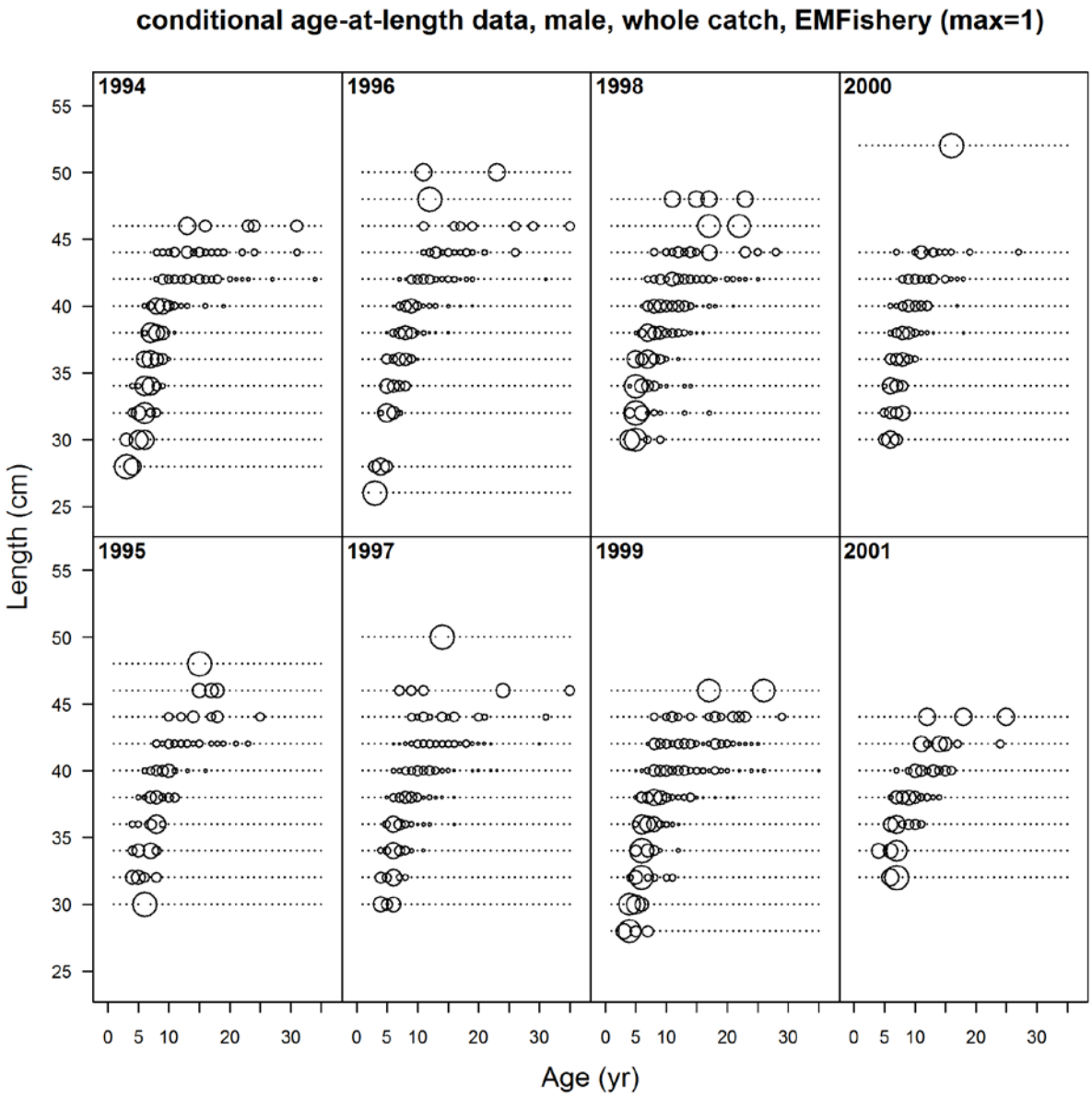

Figure 12g. Conditional age-at-length data for male from California (EMFishery1) fisheries from 1994 to 2001.

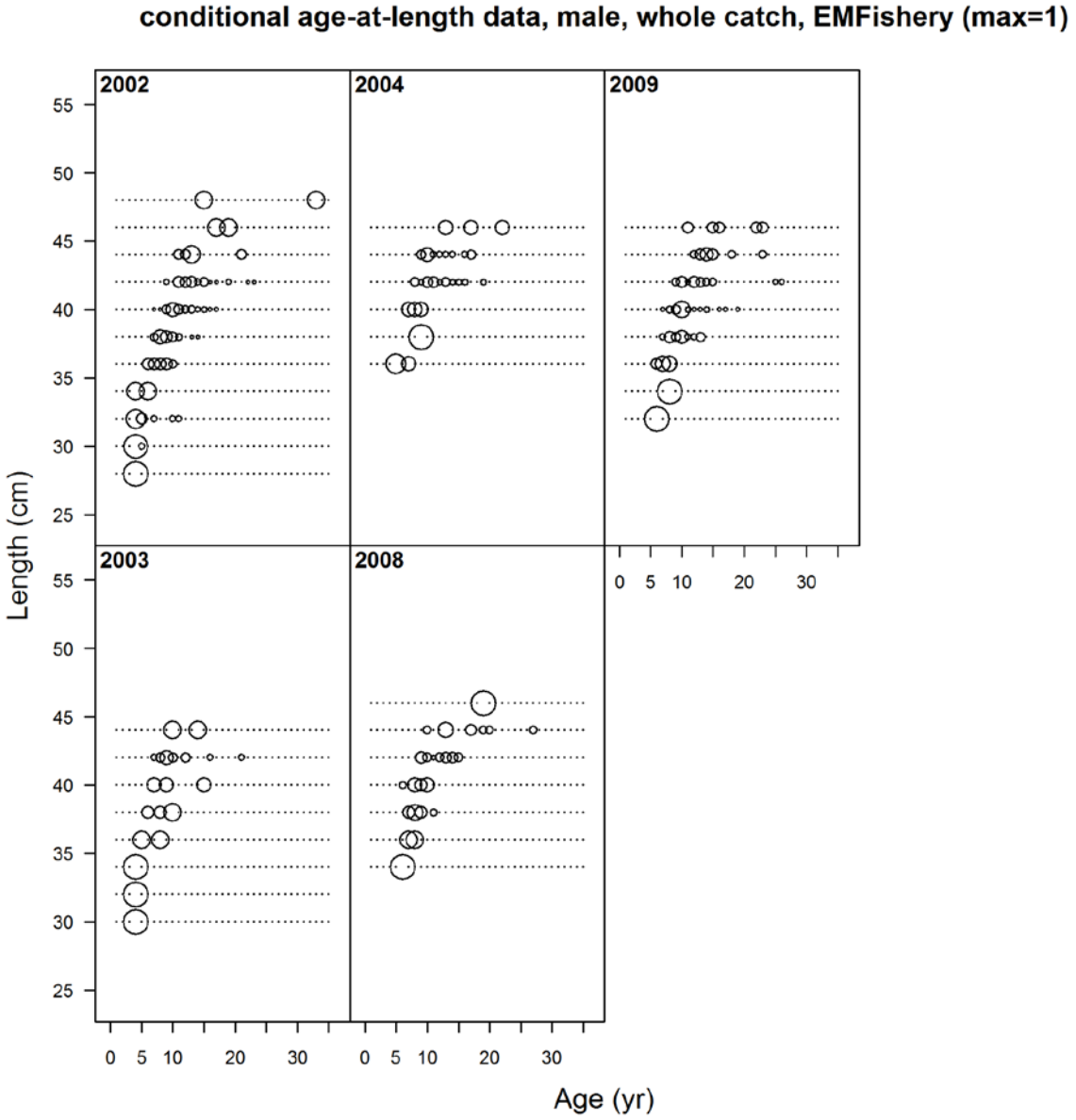

Figure 12h. Conditional age-at-length data for male from California (EMFishery1) fisheries from 2002 to 2008.

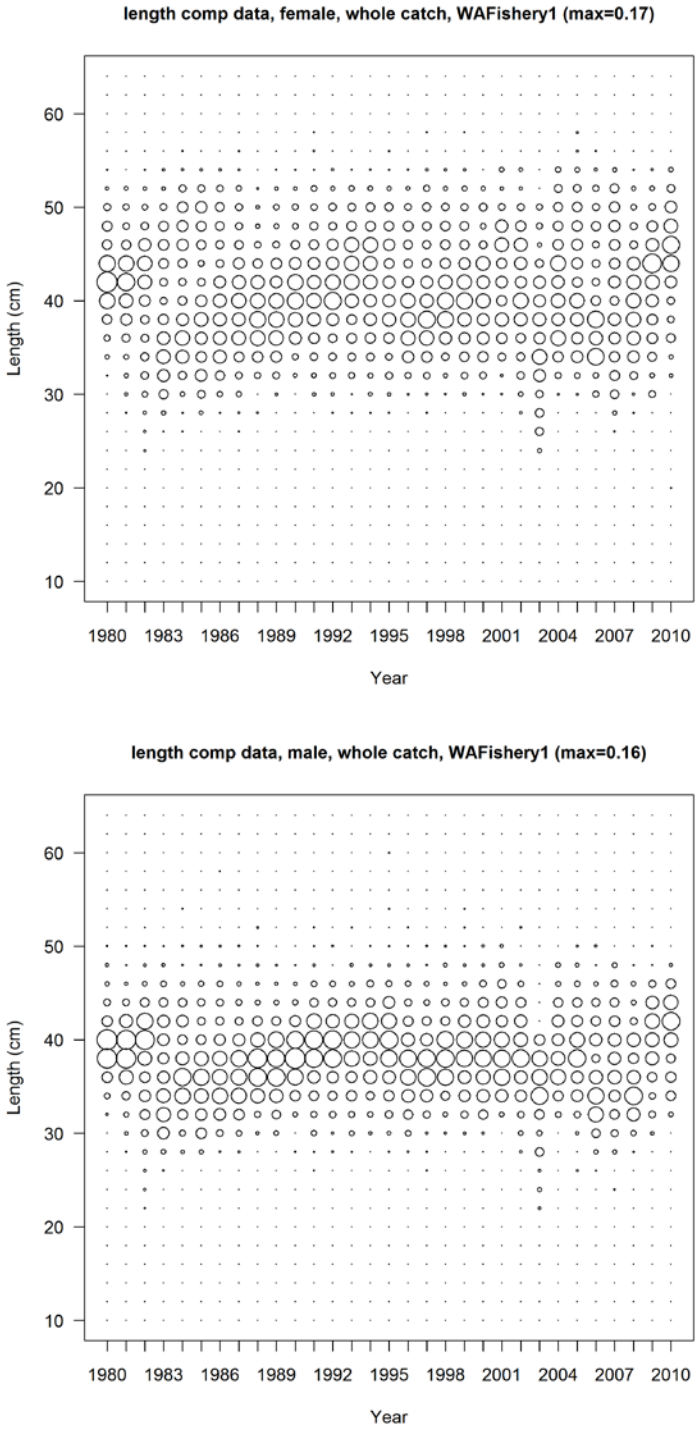

Figure 13. Length composition data from the Washington (WA) fisheries (Vancouver-Columbia area) from 1980 to 2010 for females (upper panel) and male (lower panel).

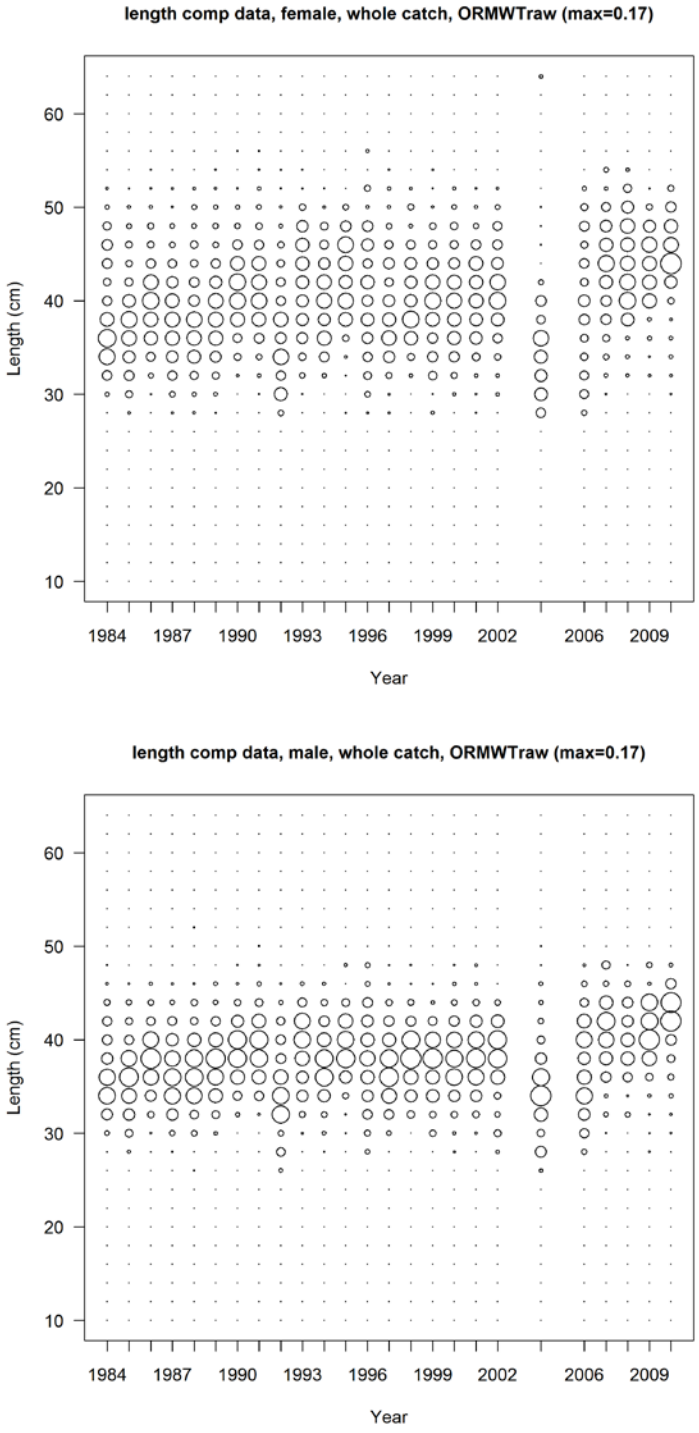

Figure 14. Length composition data from the Oregon mid-water trawl fishery from 1984 to 2010 for females (upper panel) and male (lower panel).

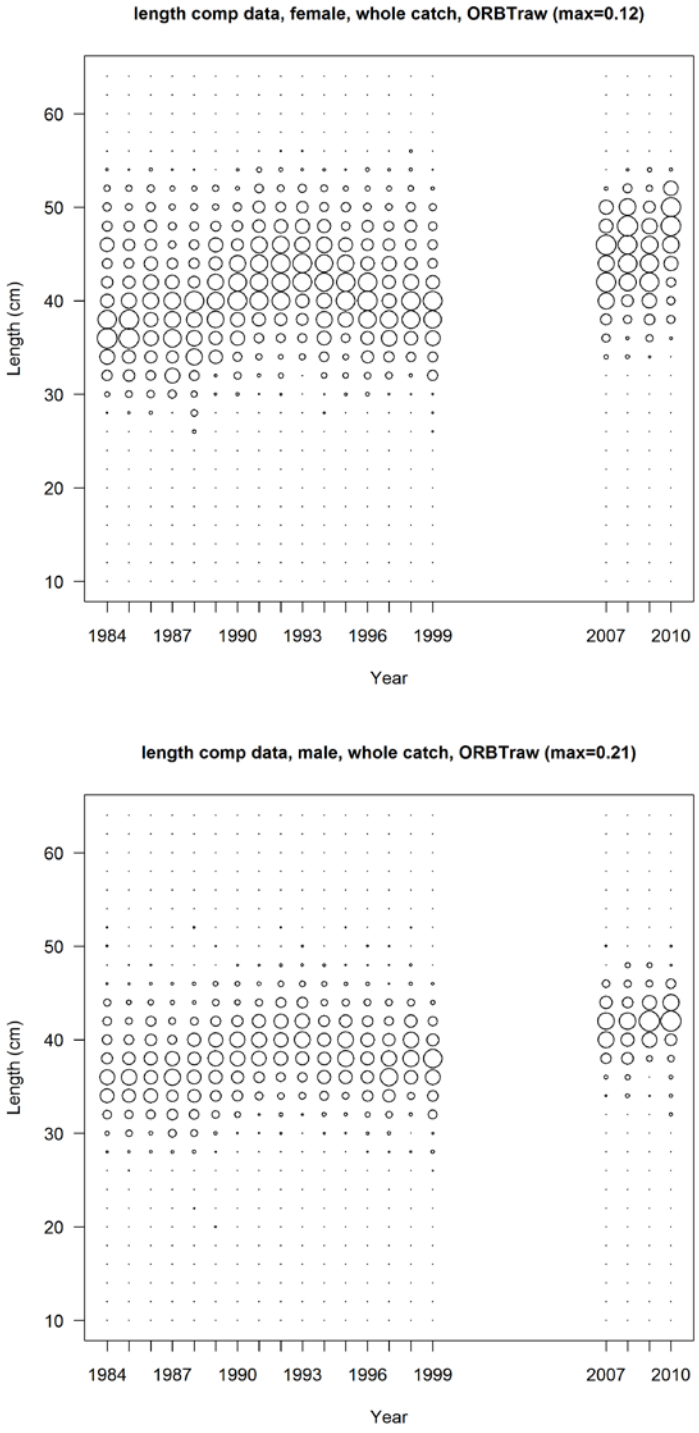

Figure 15. Length composition data from the Oregon bottom trawl fisheries from 1984 to 2010 for females (upper panel) and male (lower panel).

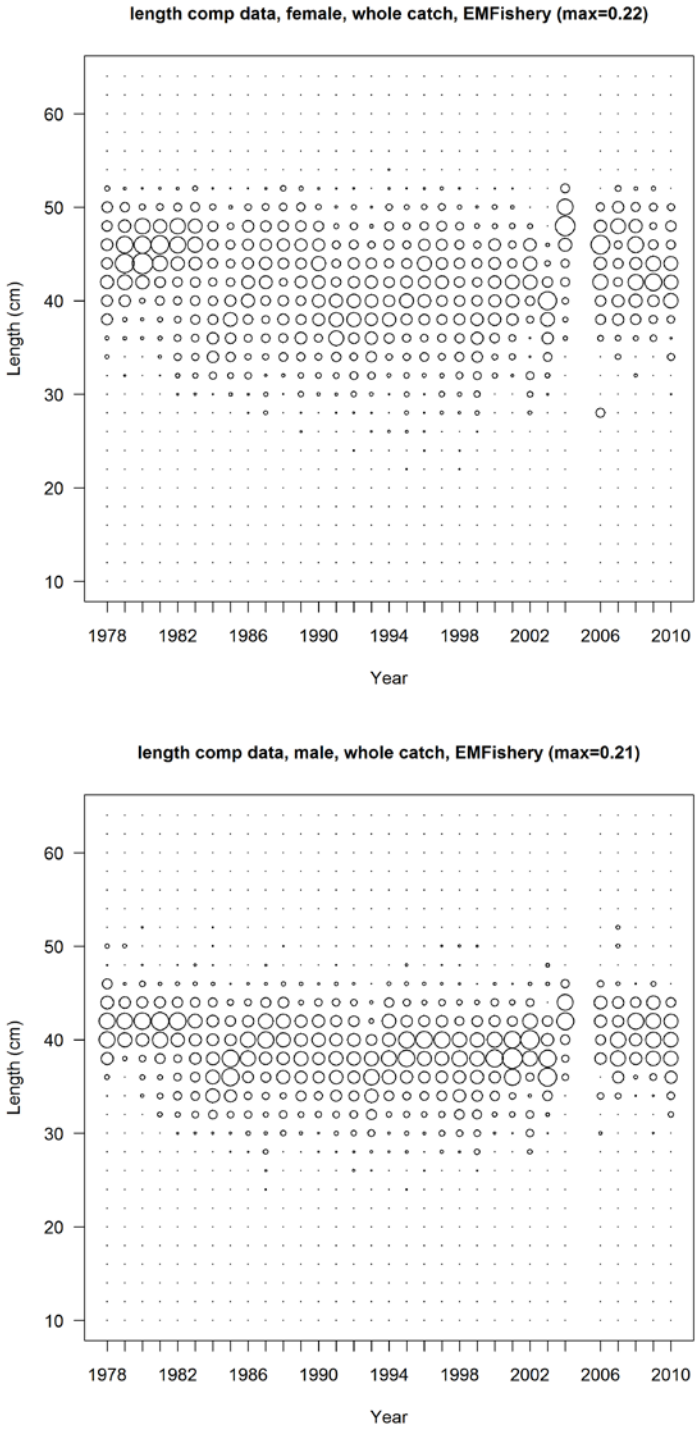

Figure 16. Length composition data from the California fisheries (EMFishery1) from 1978 to 2010 for females (upper panel) and male (lower panel).

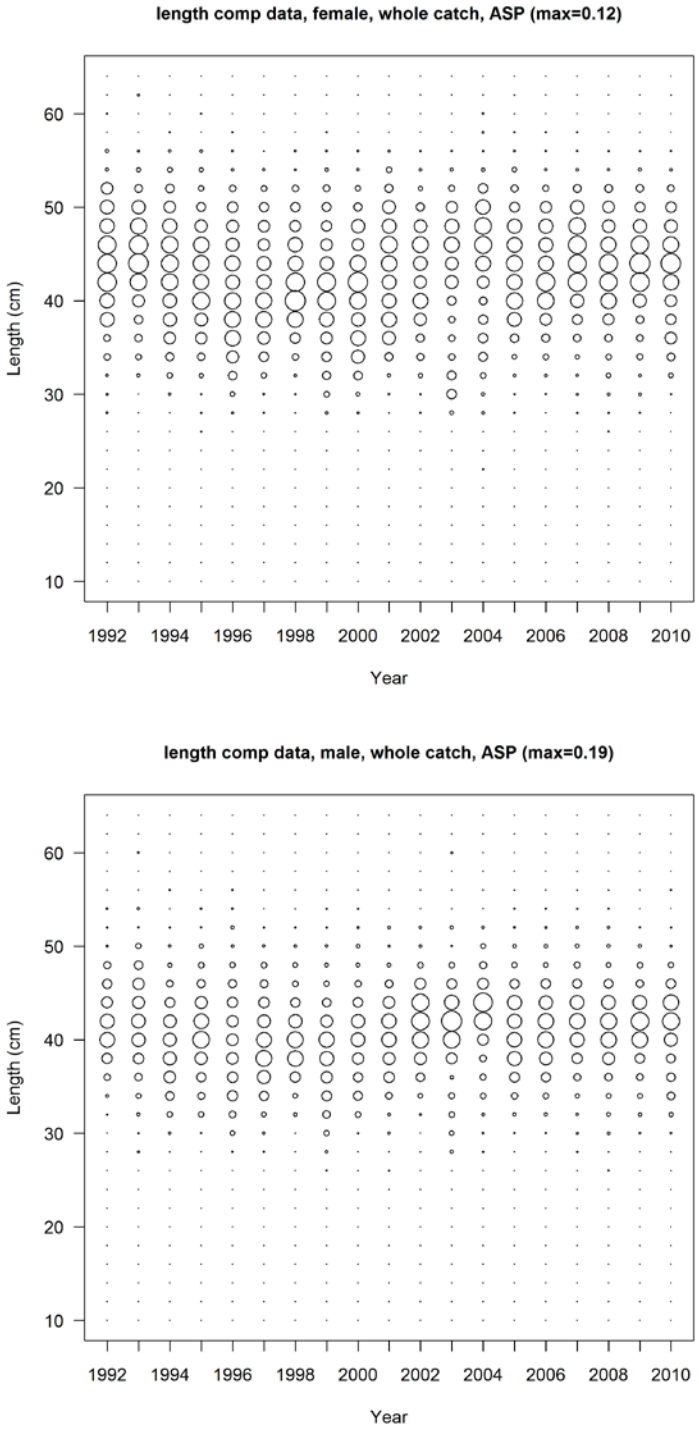

Figure 17. Length composition data from the at-sea whiting fishery from 1992 to 2010 for females (upper panel) and male (lower panel).

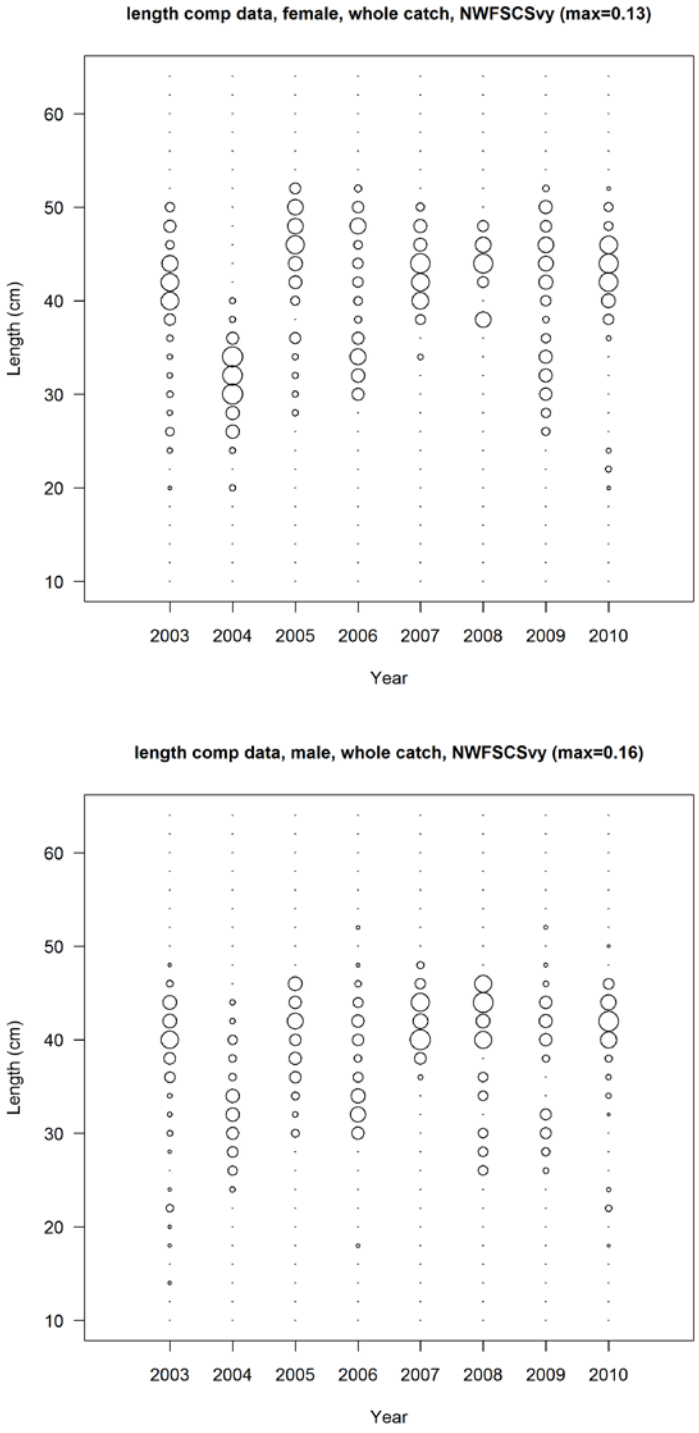

Figure 18. Length composition data from the NWFSC survey from 2003 to 2010 for females (upper panel) and male (lower panel).

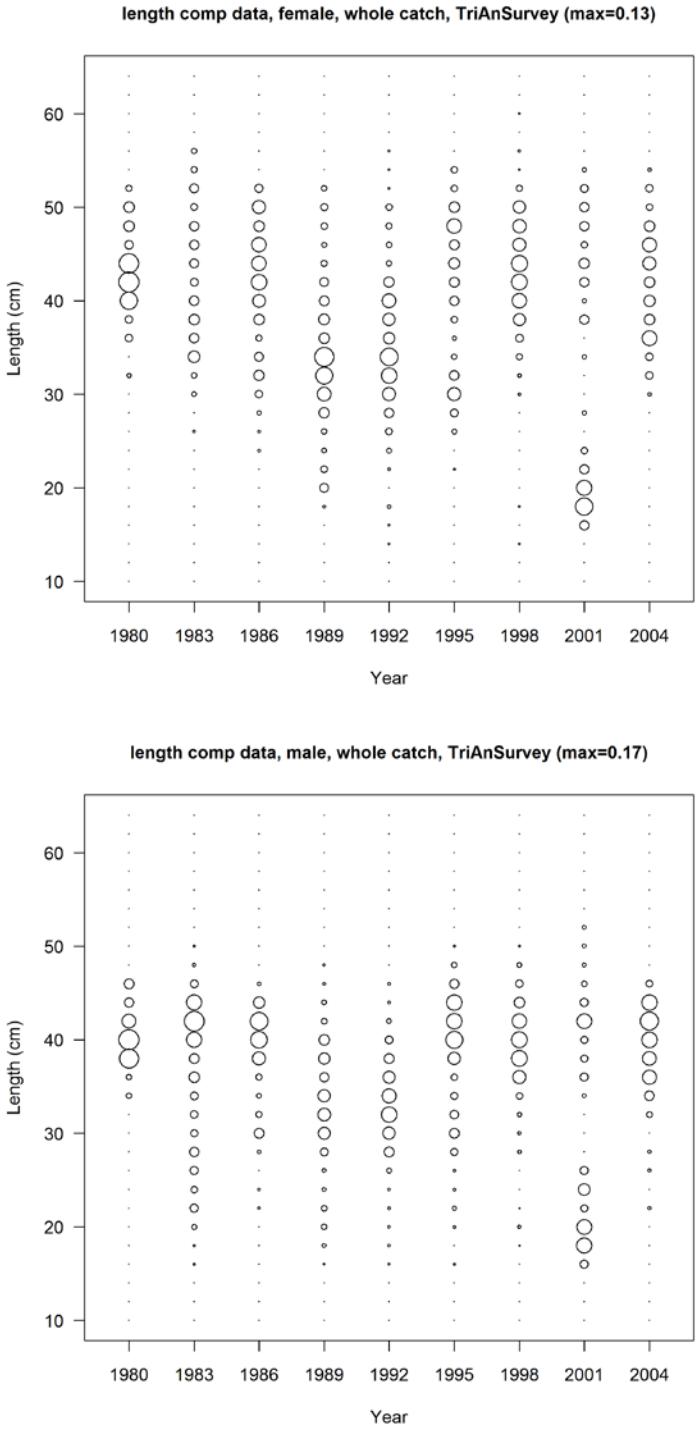

Figure 19. Length composition data from the triennial survey from 1980 to 2004 for females (upper panel) and male (lower panel).

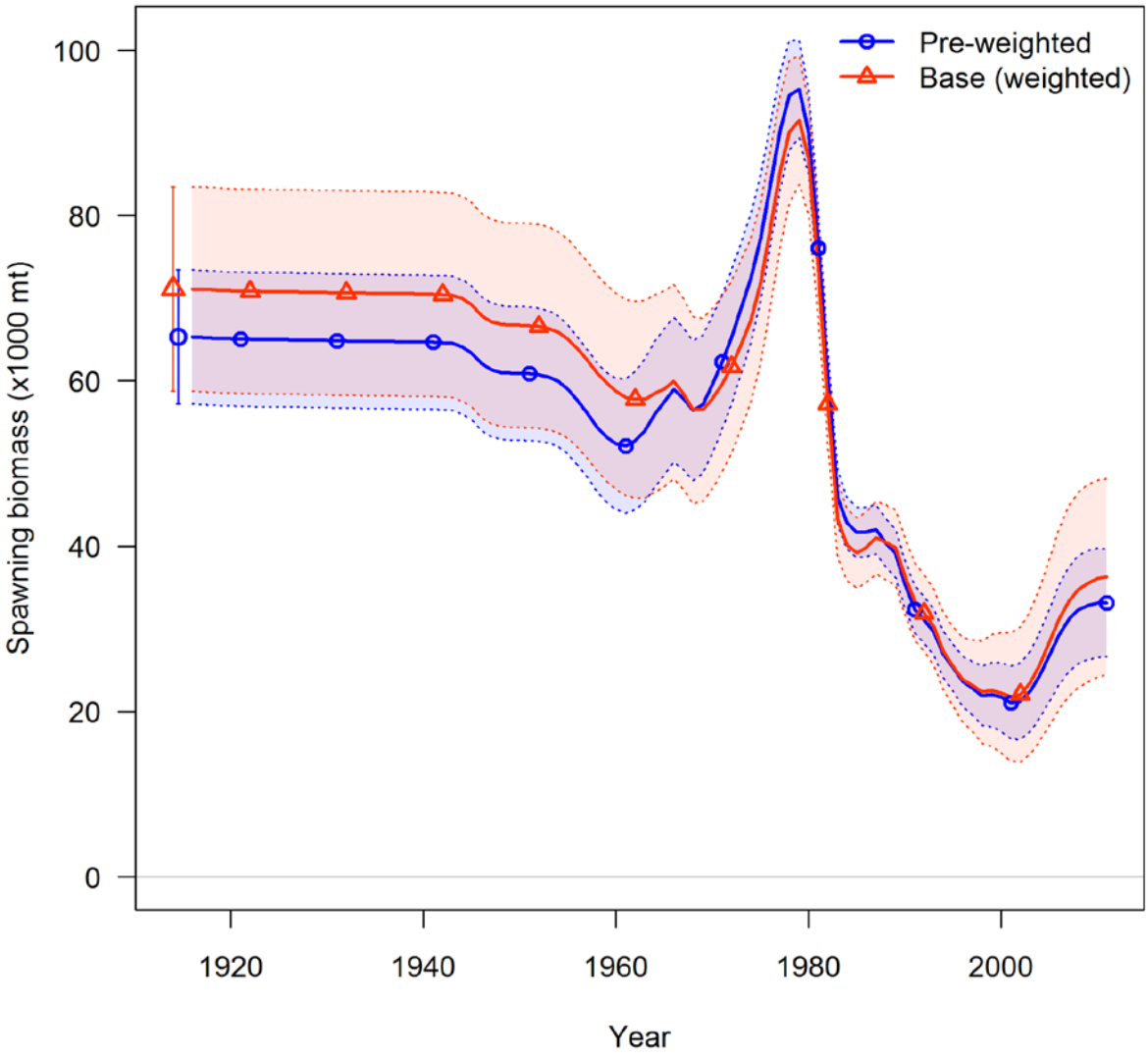

Figure 20. Comparisons of time series of spawning biomass with 95% asymptotic intervals between the pre-weighted and weighted (base) models. Two models are: Pre-weighted = model before weighting; and Base (weighted) = model with data weighted, which is the base model for this assessment.

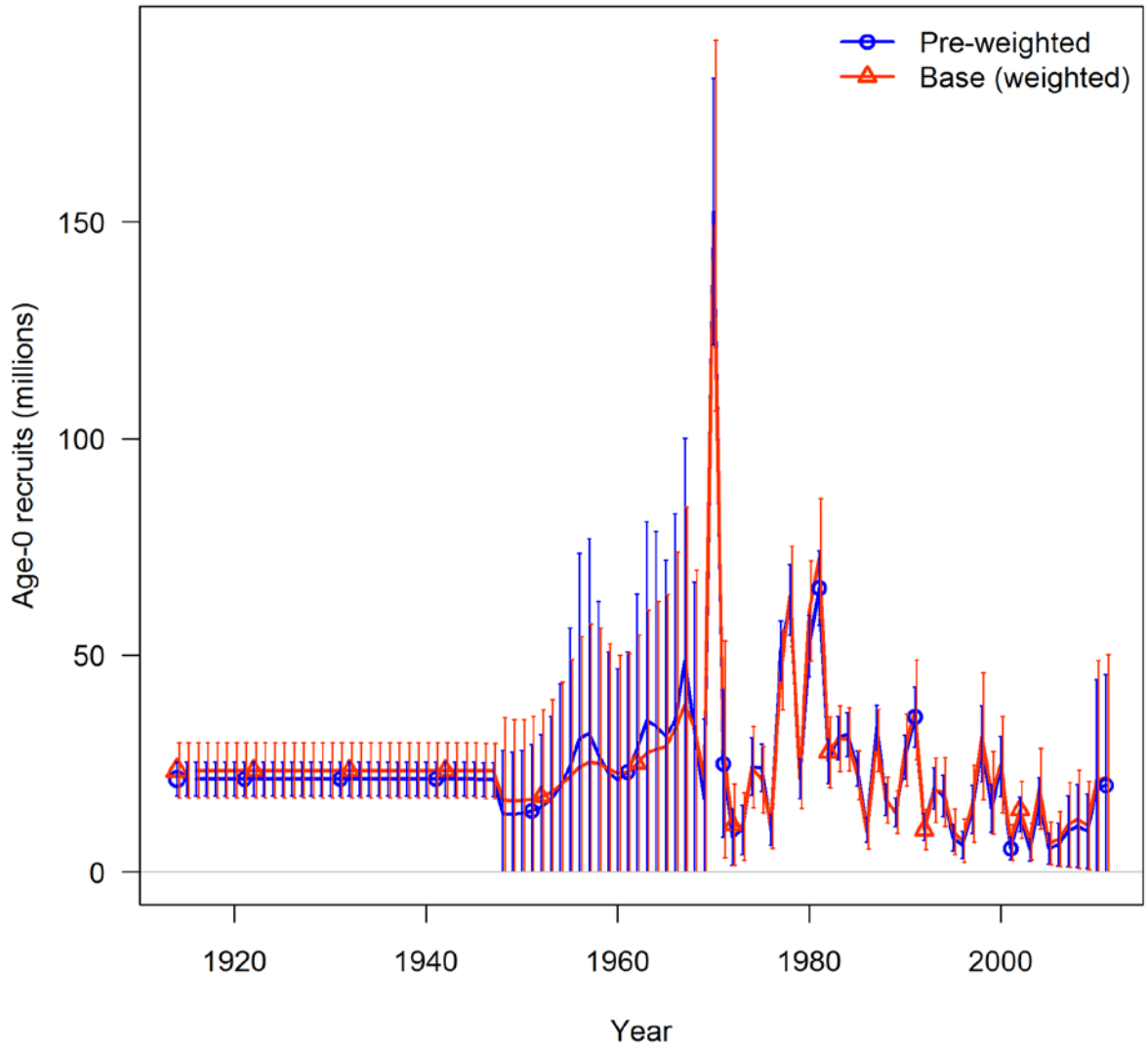

Figure 21. Comparisons of time series of recruits with 95% asymptotic intervals between the pre-weighted and weighted (base) models. Two models are: Pre-weighted = model before weighting; and Base (weighted) = model with data weighted, which is the base model for this assessment.

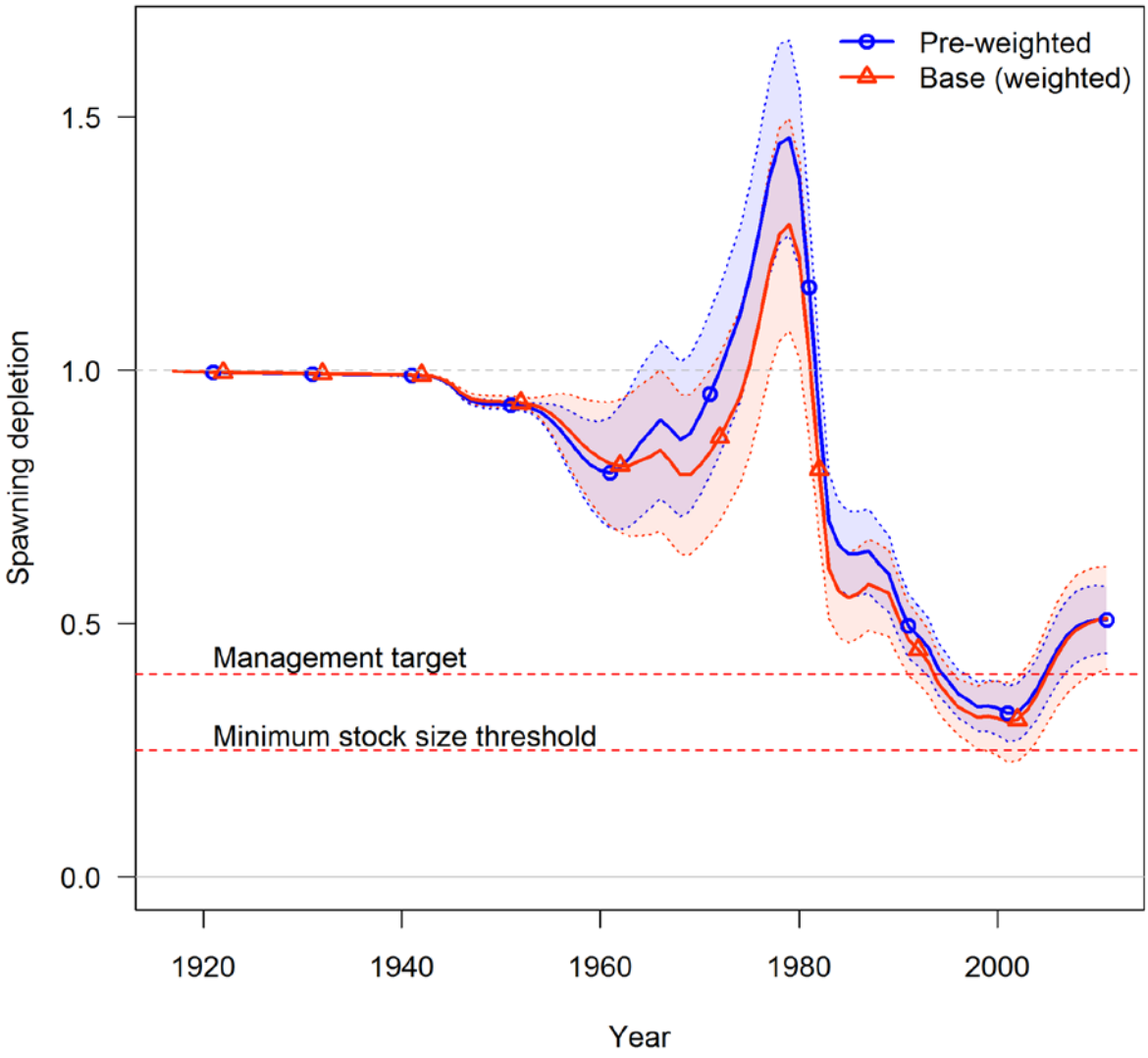

Figure 22. Comparisons of time series of stock depletion with 95% asymptotic intervals between the pre-weighted and weighted (base) models. Two models are: Pre-weighted = model before weighting; and Base (weighted) = model with data weighted, which is the base model for this assessment.

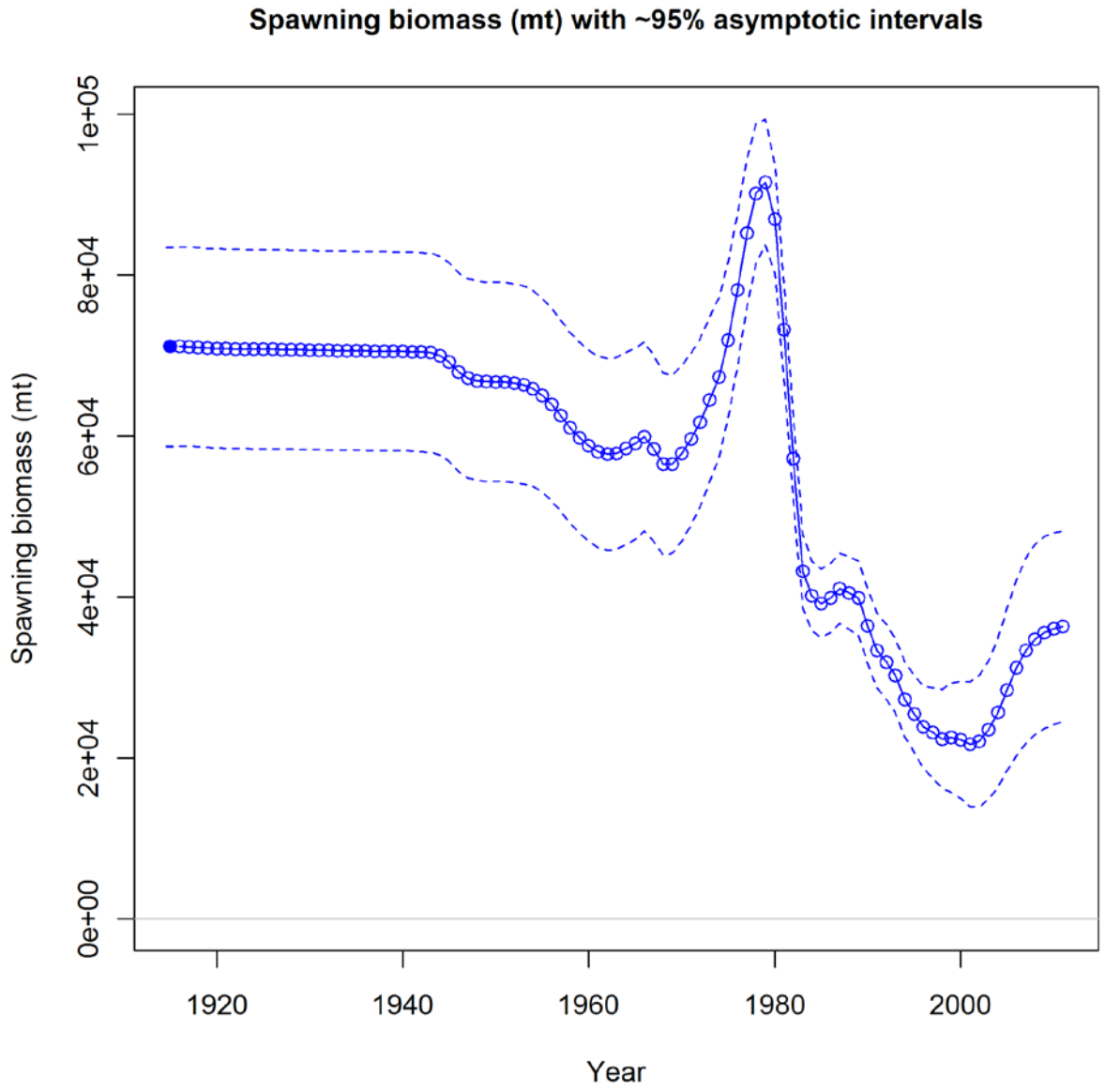

Figure 23. Time series of spawning biomass (mt) with 95% of asymptotic intervals from the base model.

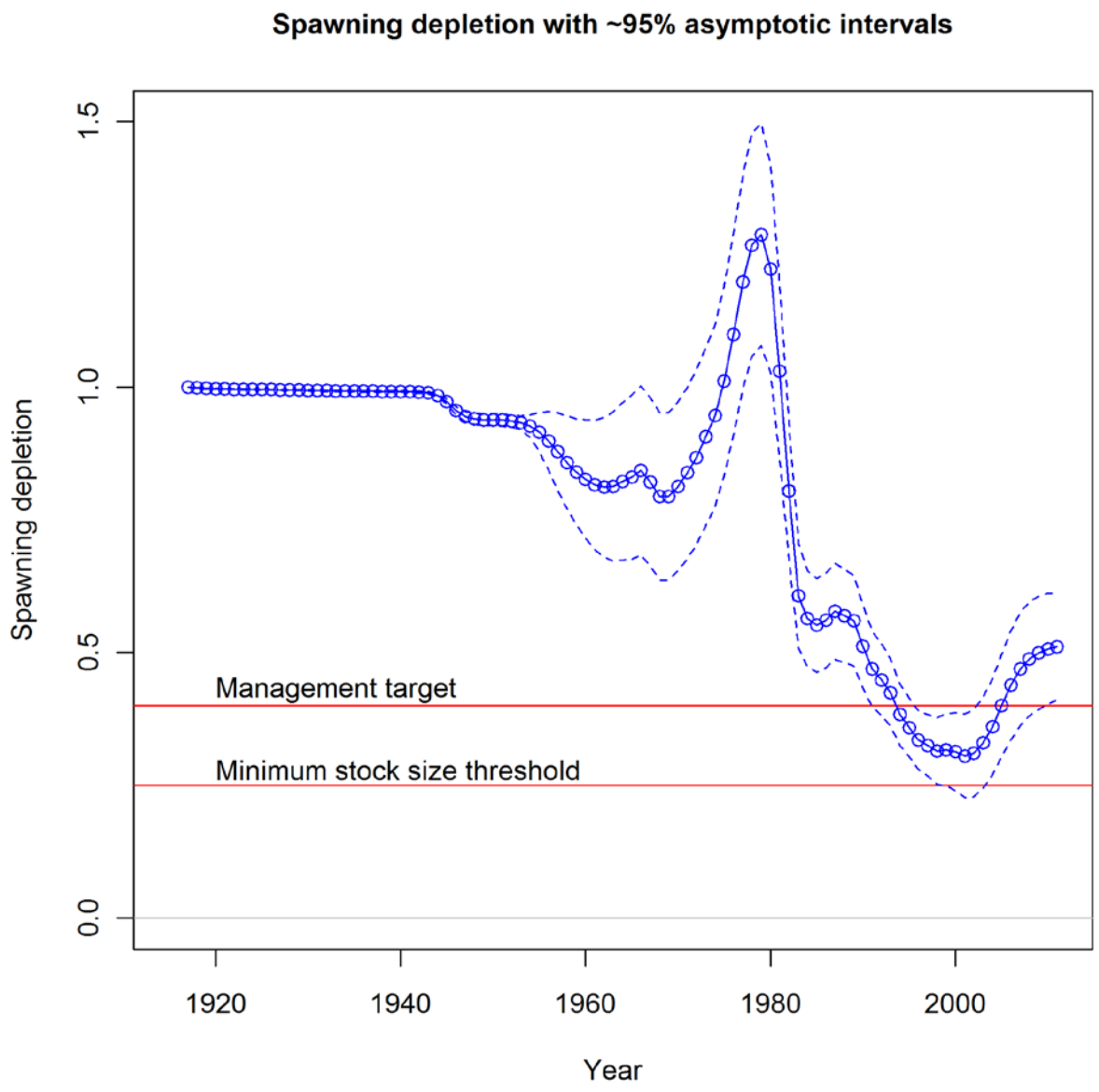

Figure 24. Time series of depletion with 95% of asymptotic intervals from the base model.

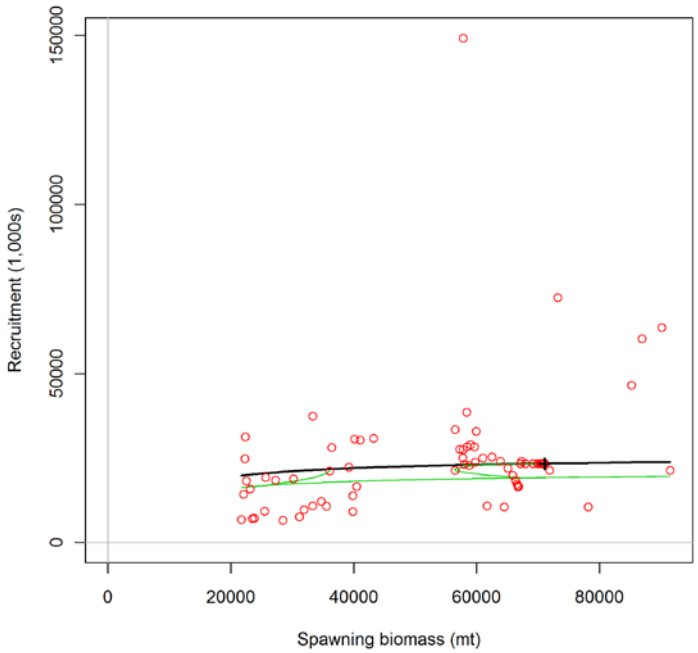

Figure 25. Estimated stock-recruit relationship from the base model (dark line). The expected recruits are bias-adjusted (green line). Open circles are estimated annual recruitments.

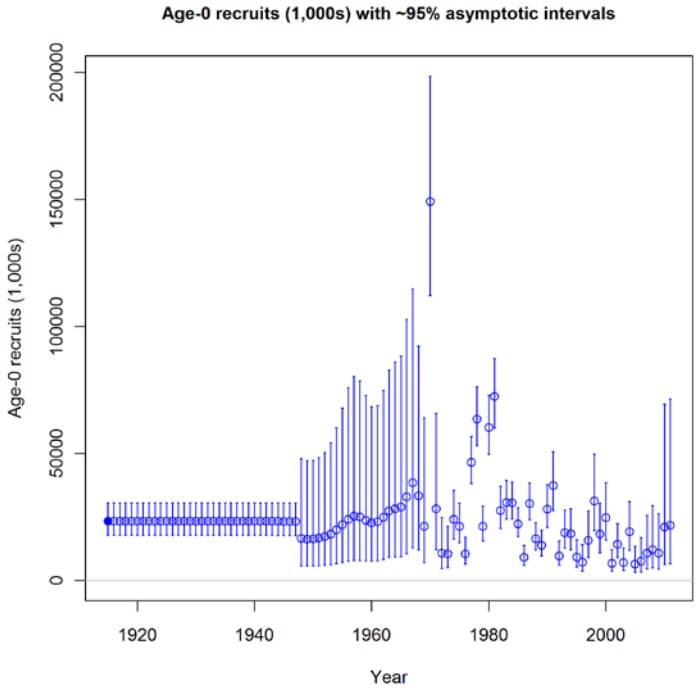

Figure 26. Estimated total recruitment and their 95% of asymptotic confidence intervals from 1915 to 2011 from the base model.

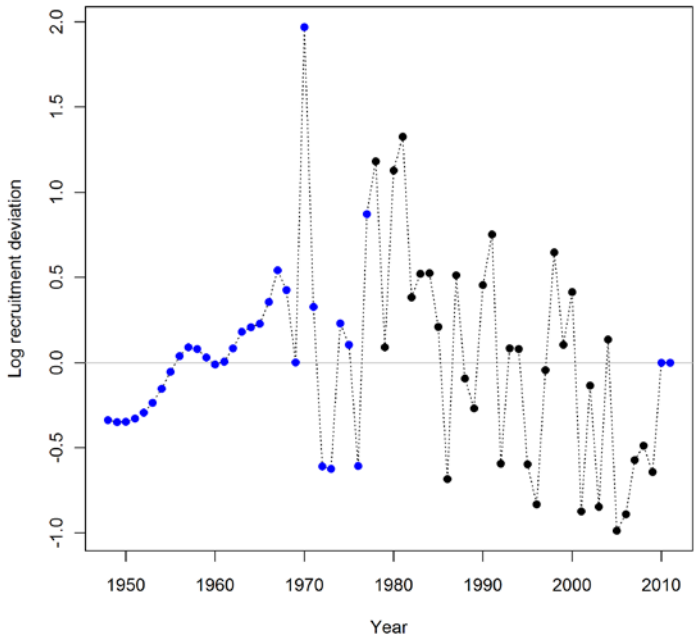

Figure 27. Time series of recruitment deviations estimated from the base model from 1948 to 2011.

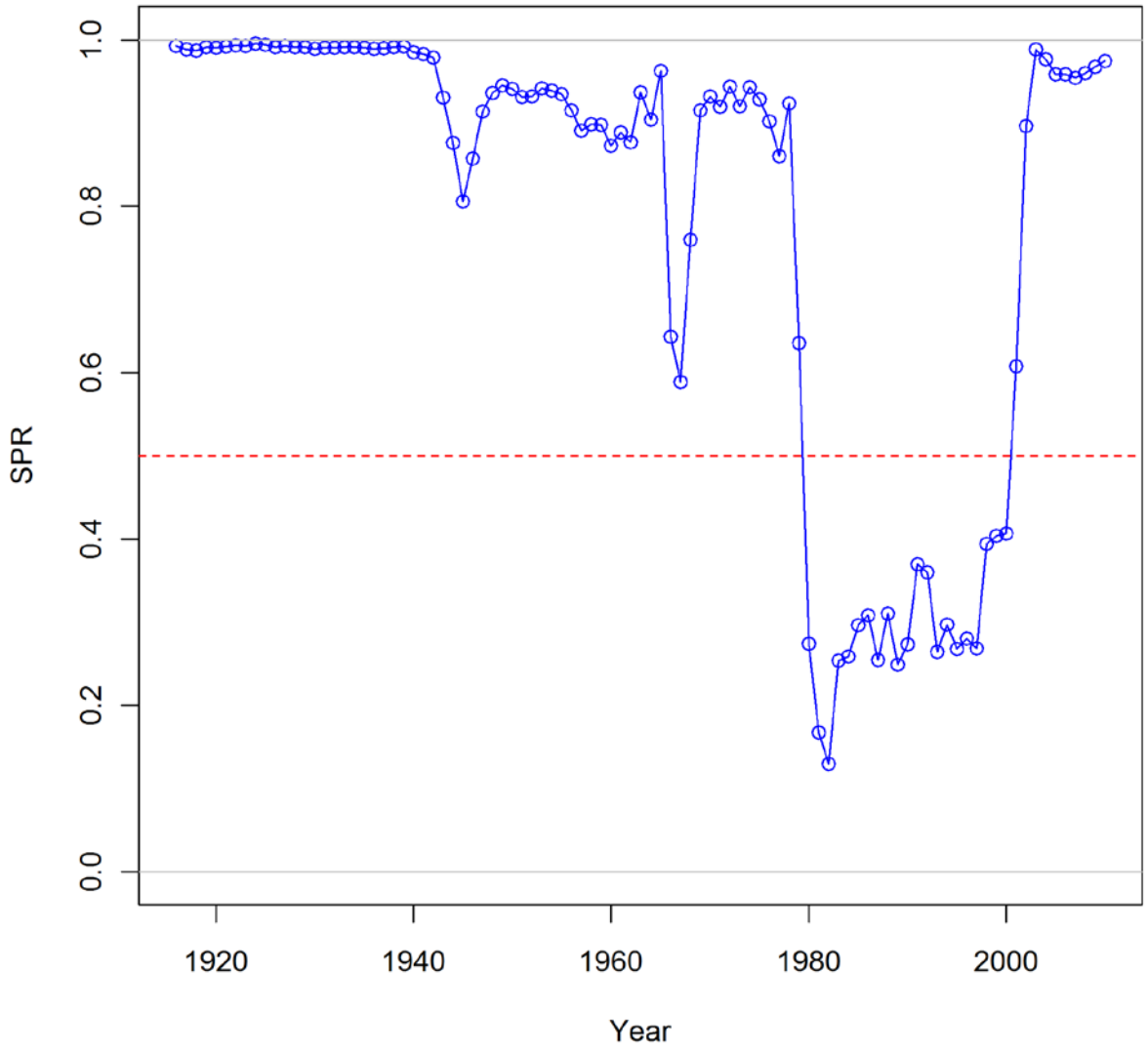

Figure 28. Time series of estimated spawning potential ratios (SPR) from 1916 to 2011. The target SPR level of 0.5 is also shown. Values below the target level indicate that overfishing occurred.

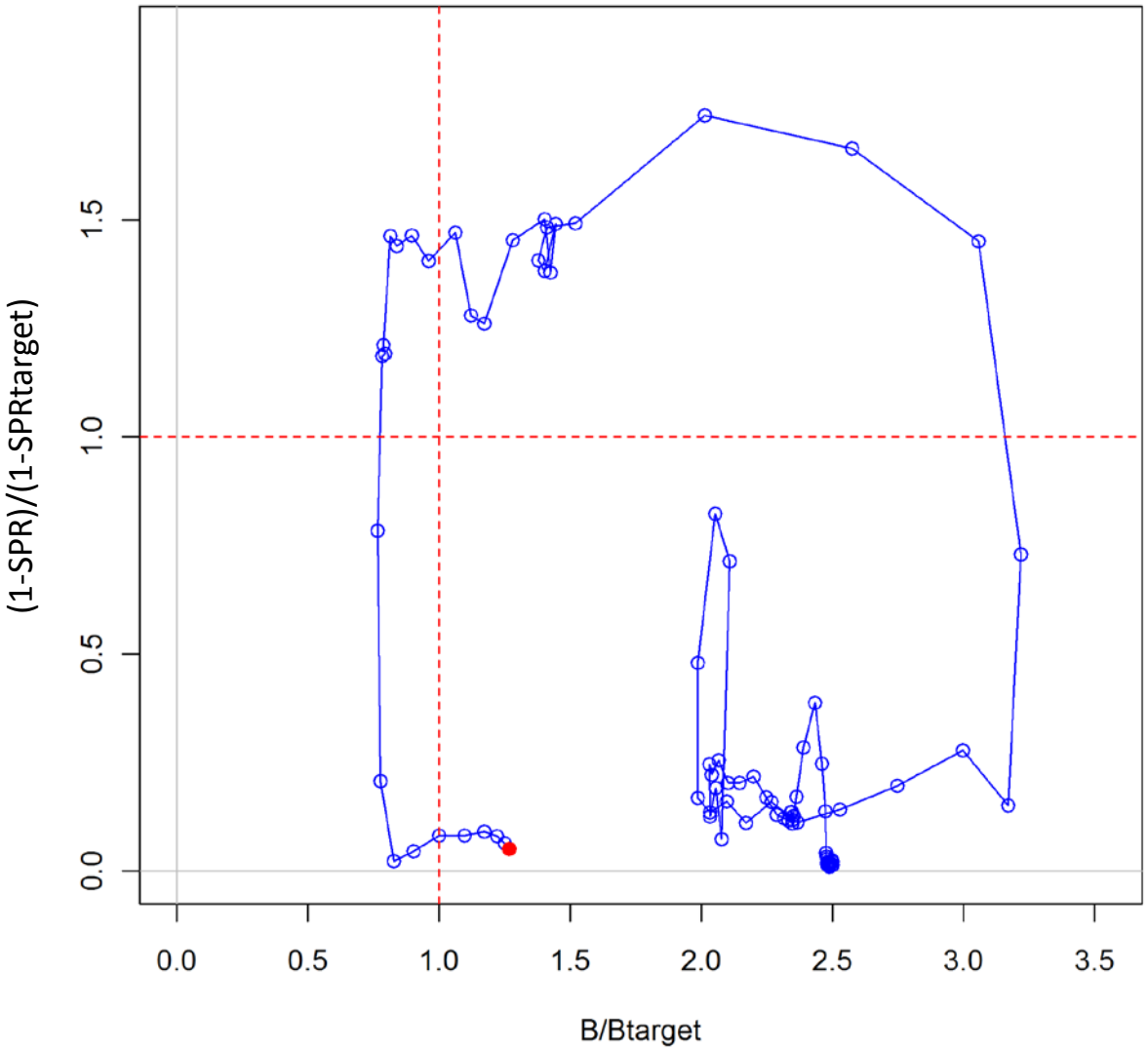

Figure 29. Phase plot of estimated annual spawning potential ratios (SPR) to the target of 0.5 and estimated spawning output relative to the target of SB40%. The last point on the lower-left quadrant corresponds to the estimated value in 2011 (red).

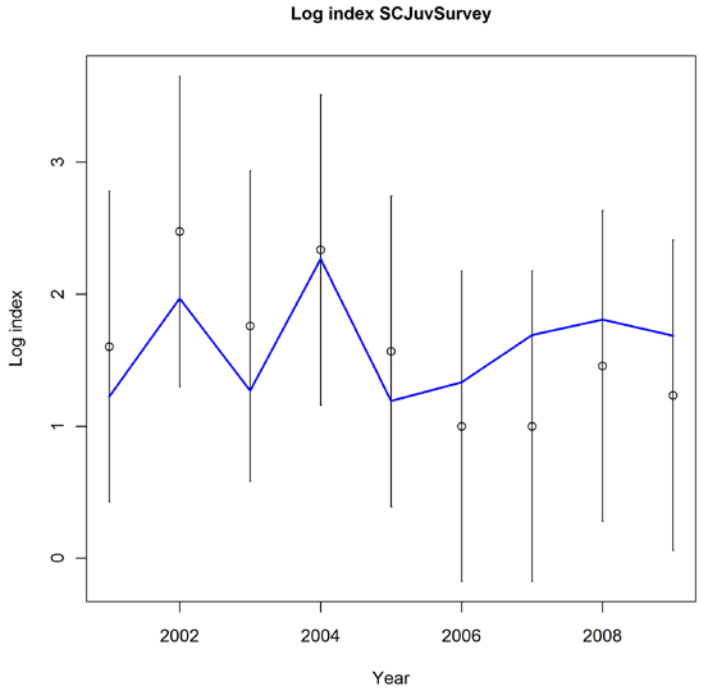

Figure 30. Model fit to the index of the juvenile fish survey from 2001 to 2009.

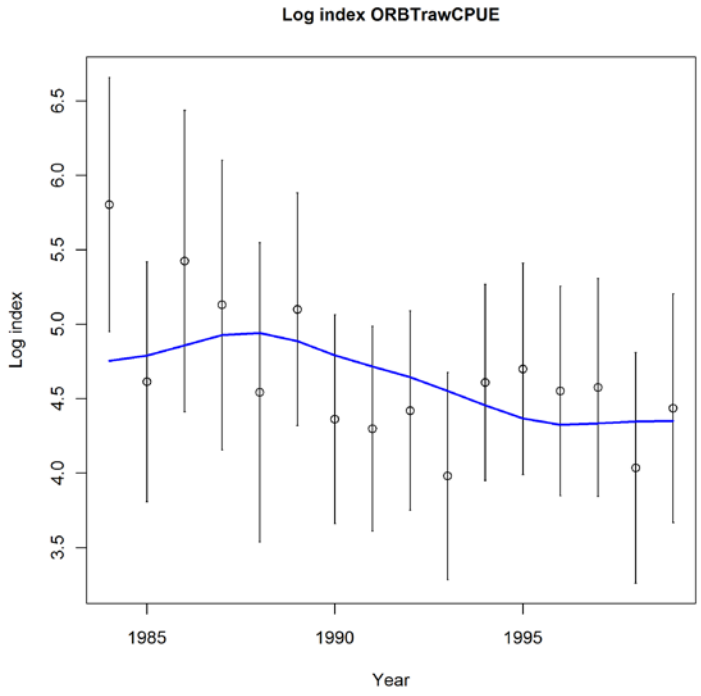

Figure 31. Model fits to the Oregon bottom trawl logbook index.

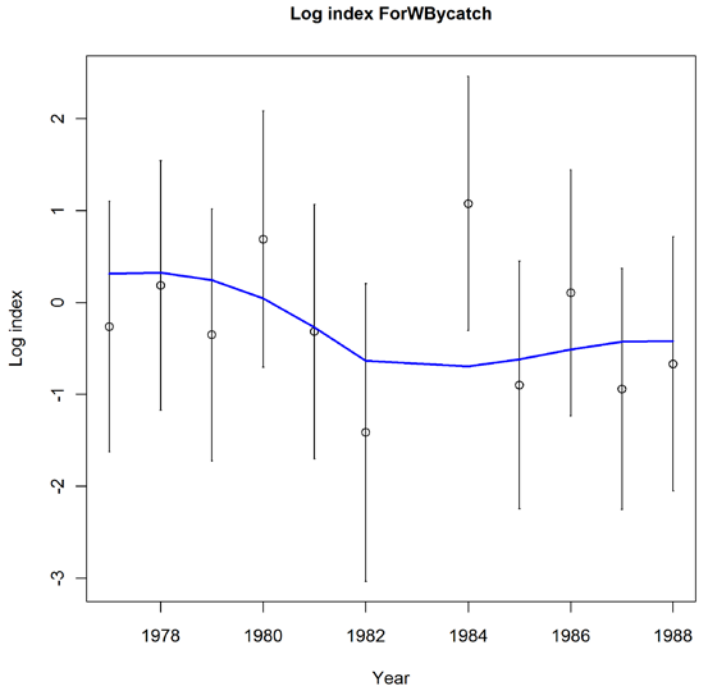

Figure 32. Model fits to the Pacific whiting foreign fishery bycatch index.

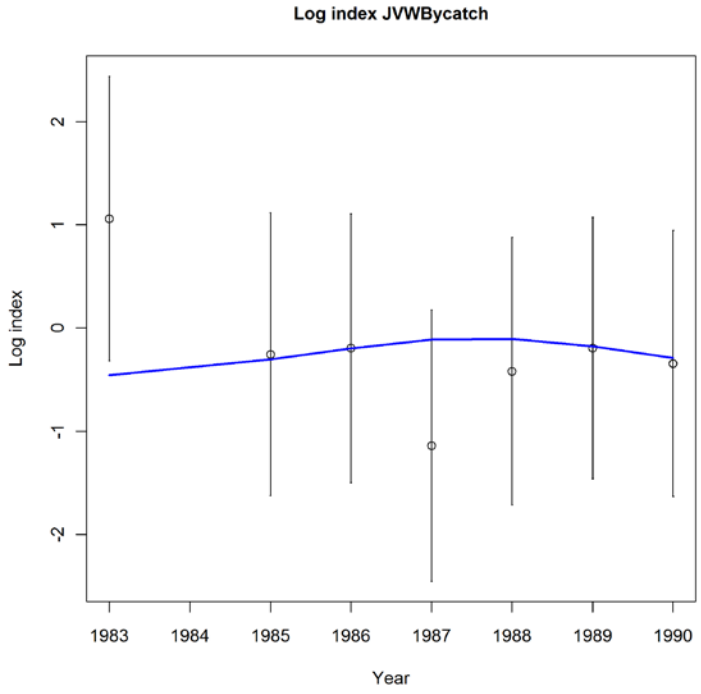

Figure 33. Model fits to the Pacific whiting joint venture fishery bycatch index.

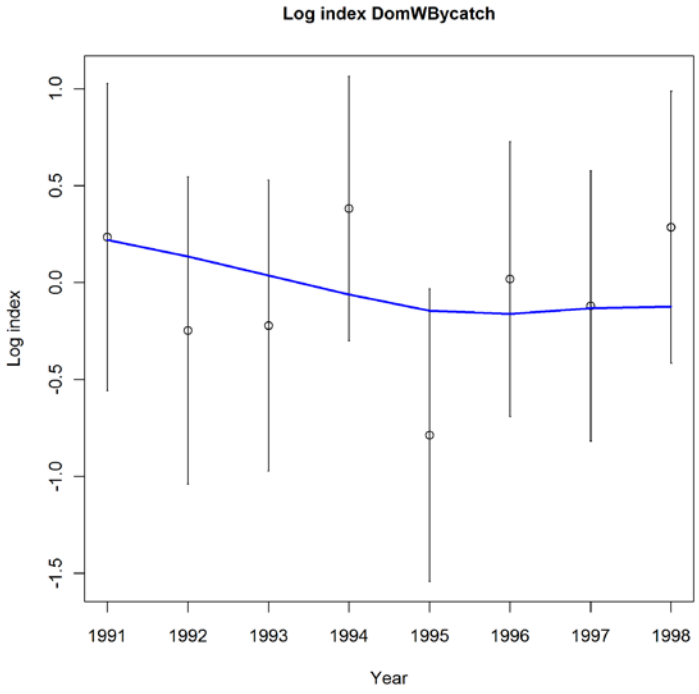

Figure 34. Model fits to the Pacific whiting domestic fishery bycatch index.

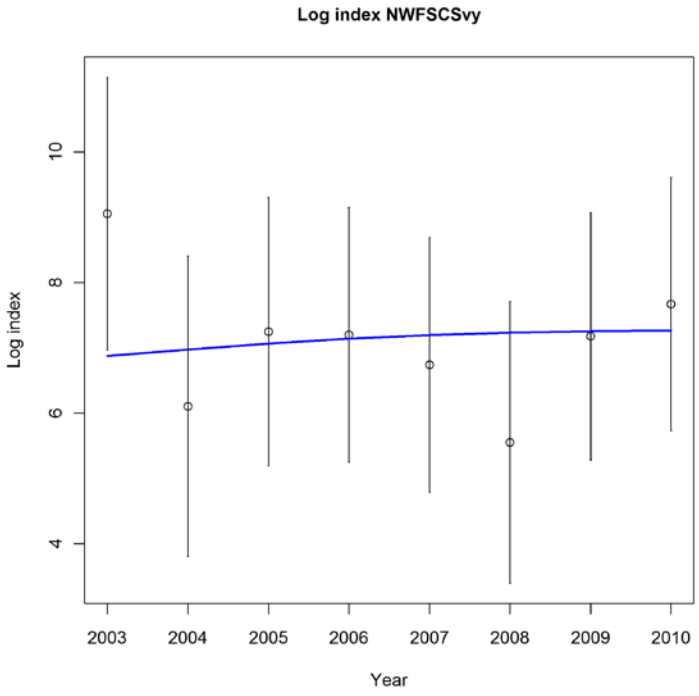

Figure 35. Model fits to the NWFSC survey index.

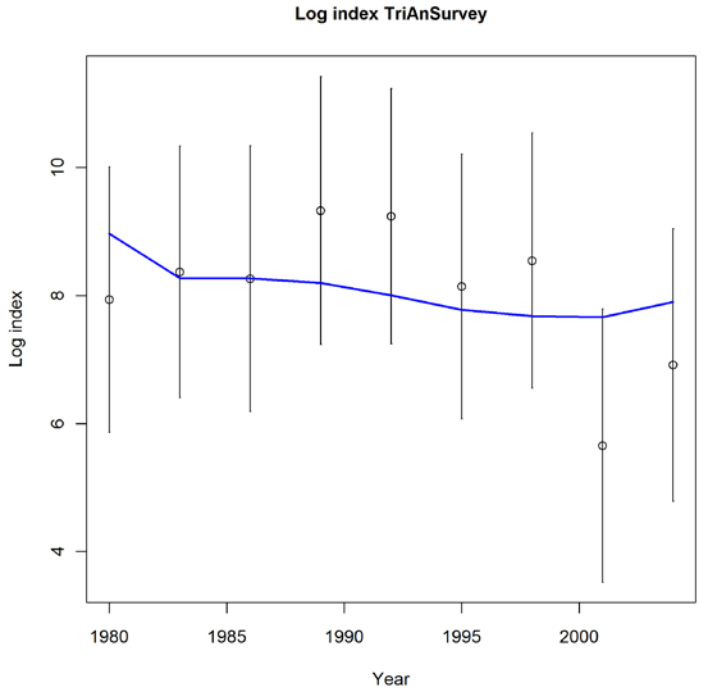

Figure 36. Model fits to the triennial survey index.

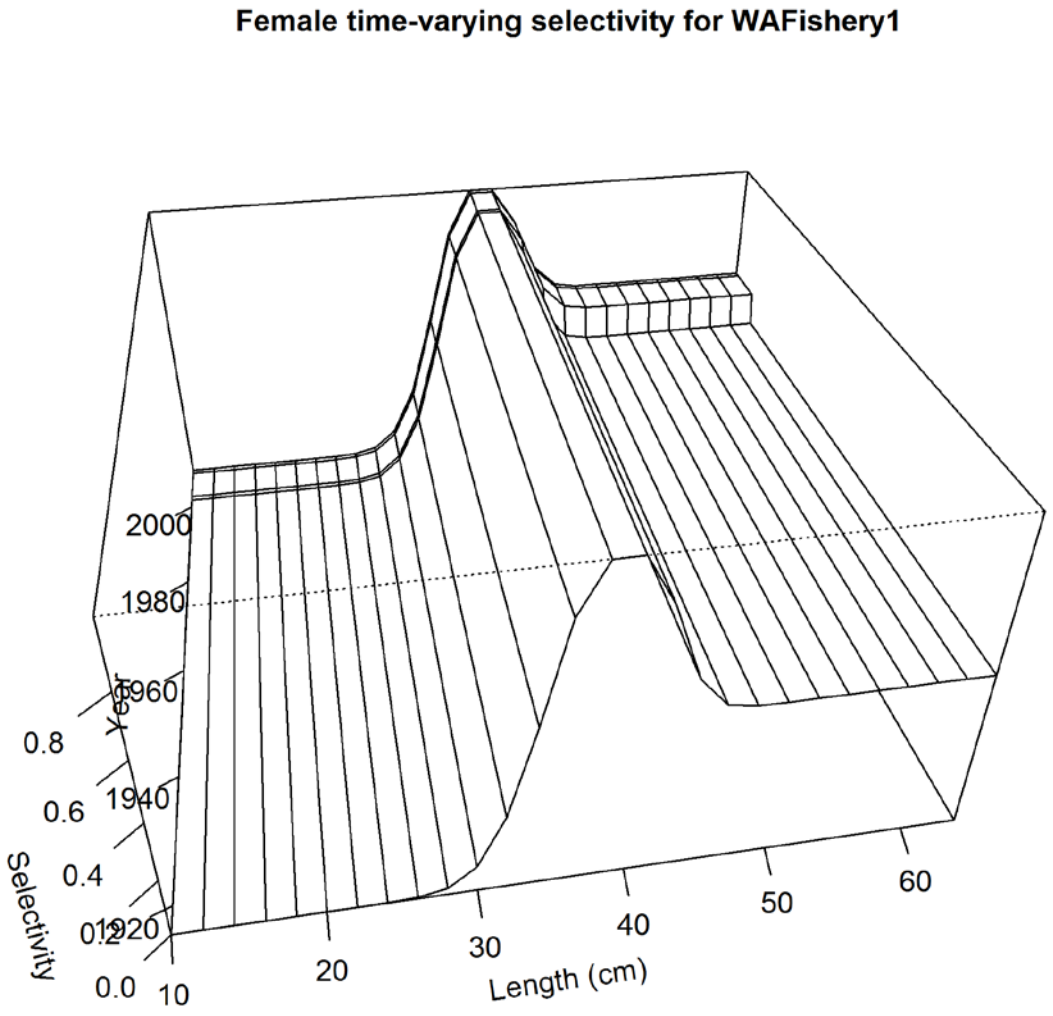

Figure 37. Estimated length selectivity curves for the Washington fishery for females (same for males). Selectivity varies between two time periods (1916-2002, and 2003-2010).

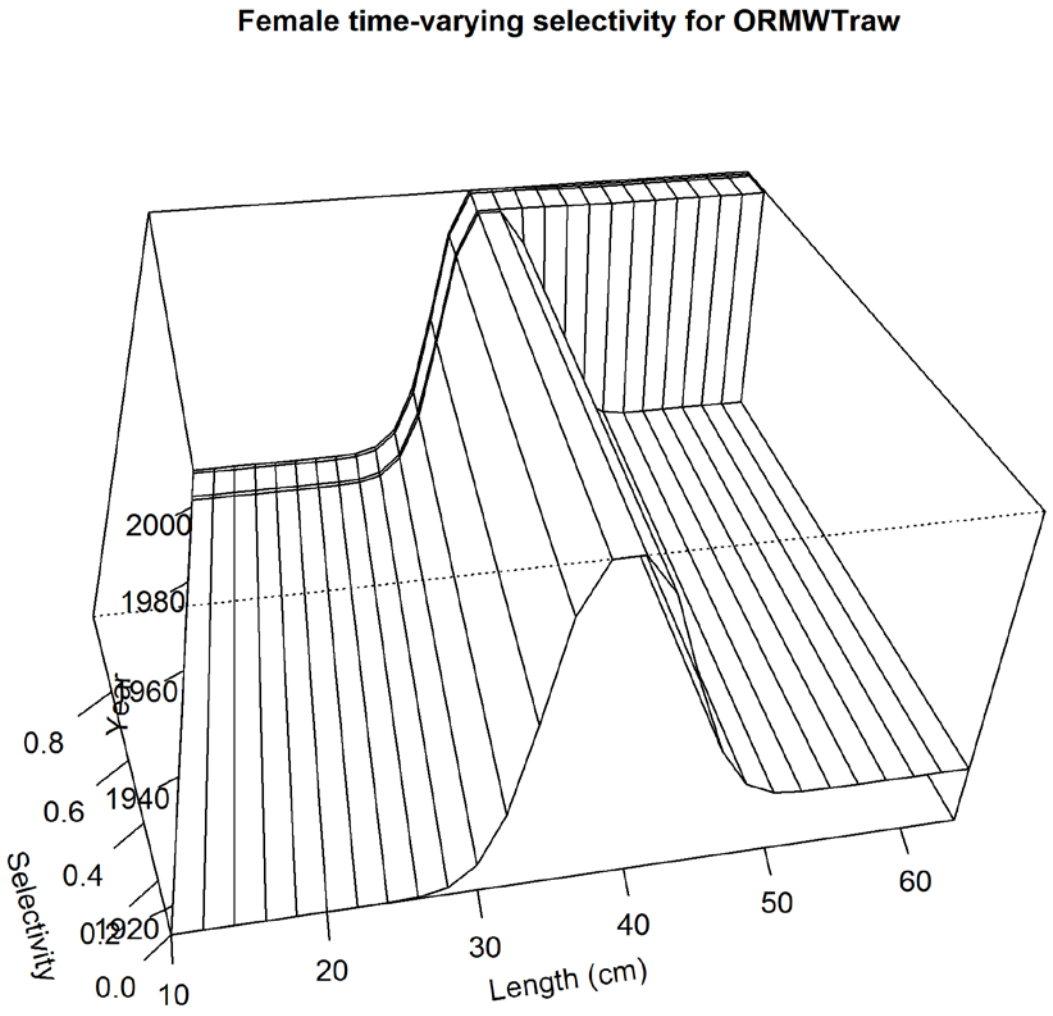

Figure 38. Estimated length selectivity curves for the Oregon mid-water trawl fishery for females (same for males). Selectivity varies between two time periods (1916-2002, and 2003-2010).

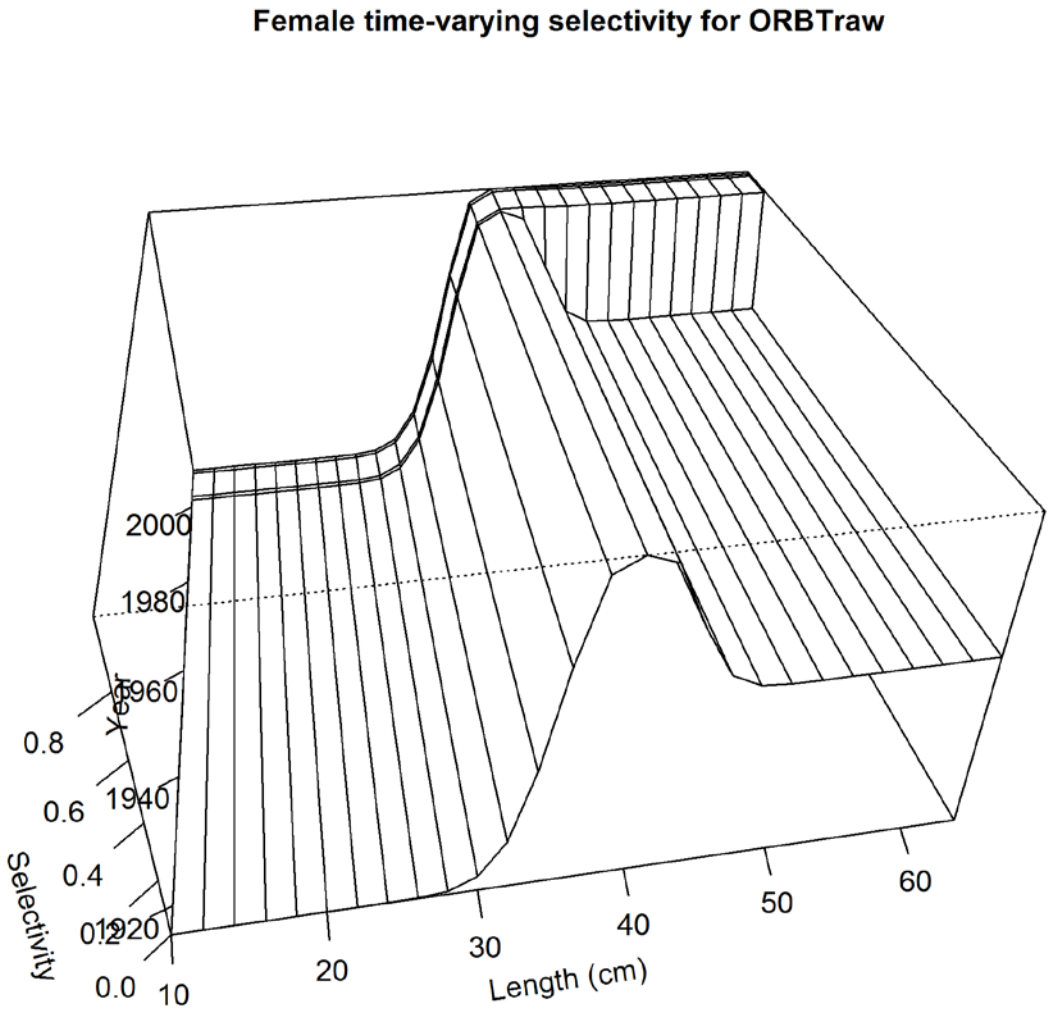

Figure 39. Estimated length selectivity curves for the Oregon bottom fishery for females (same for males). Selectivity varies between two time periods (1916-2002, and 2003-2010).

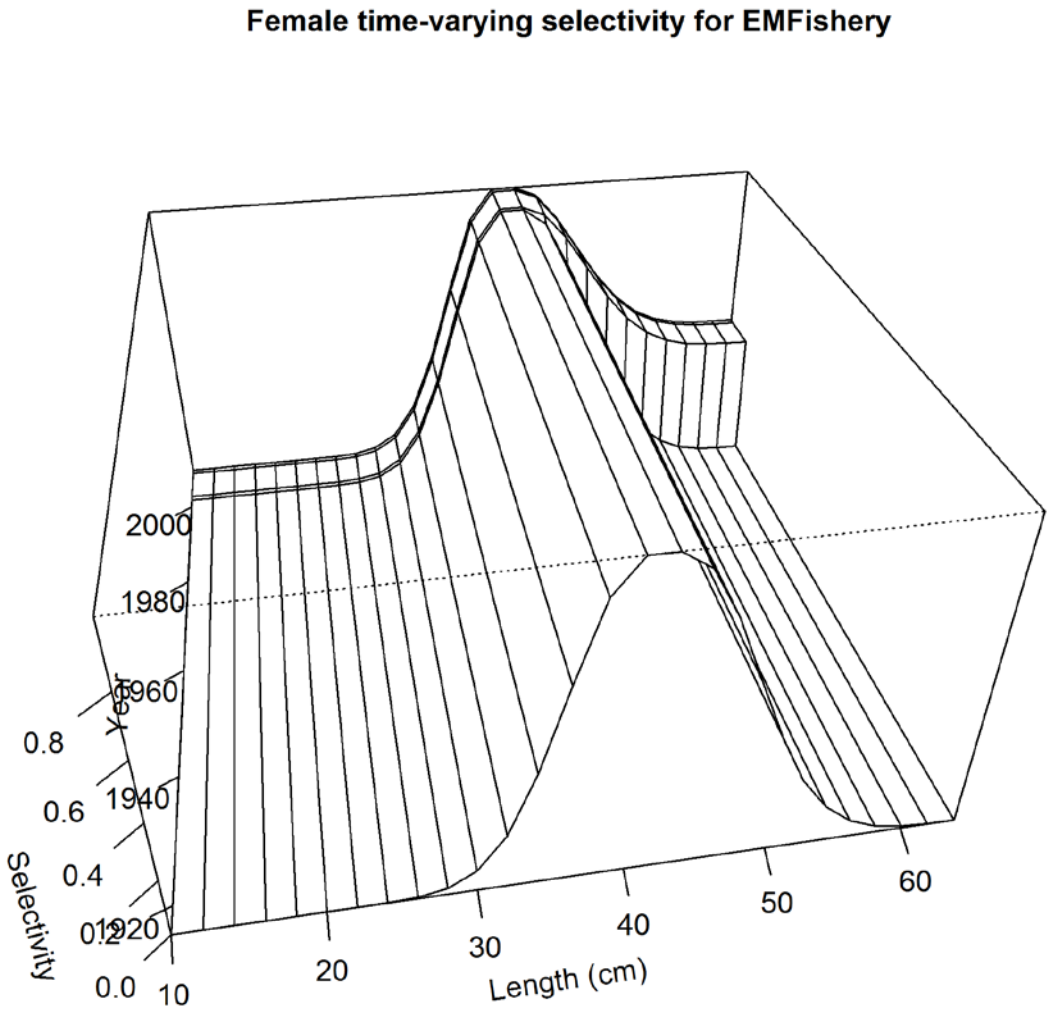

Figure 40. Estimated length selectivity curves for the California fishery for females (same for males). Selectivity varies between two time periods (1916-2002, and 2003-2010).

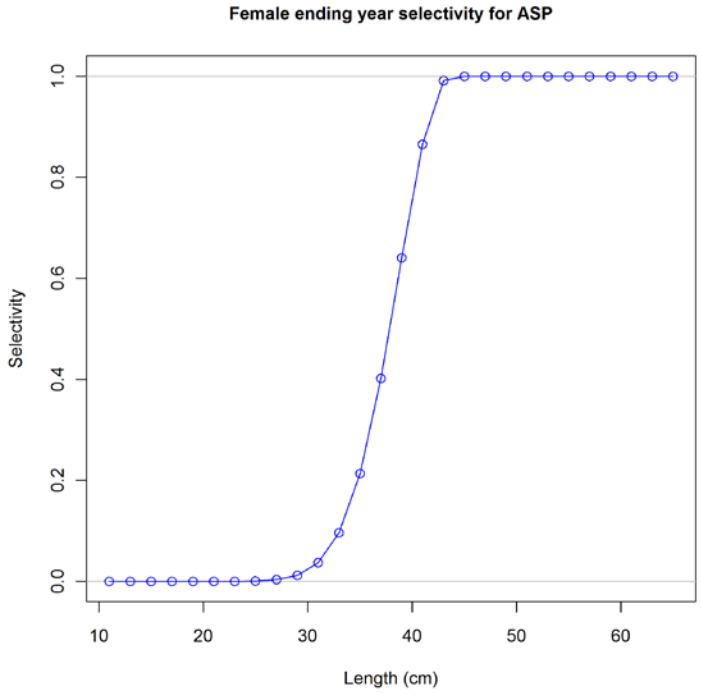

Figure 41. Estimated length selectivity curves for the at-sea processor whiting fishery for females (same for males).

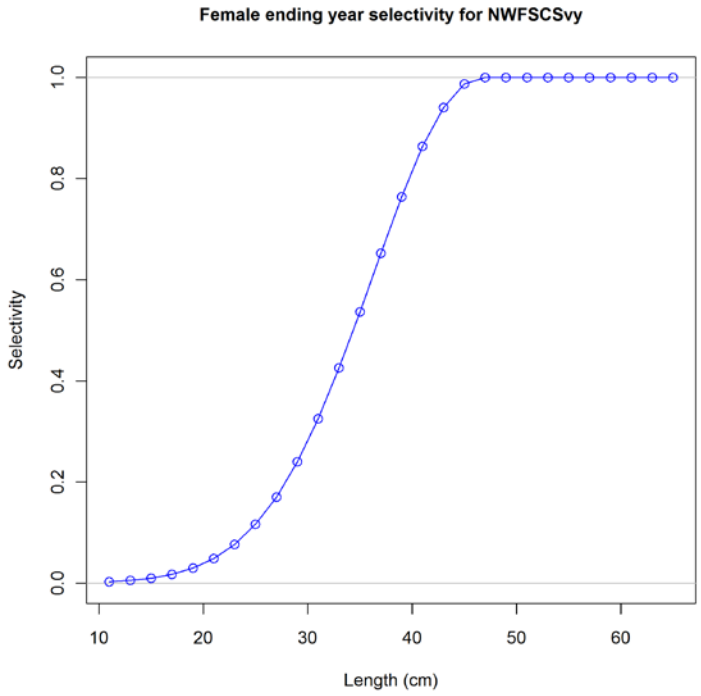

Figure 42. Estimated length selectivity curves for the all surveys for females (same for males).

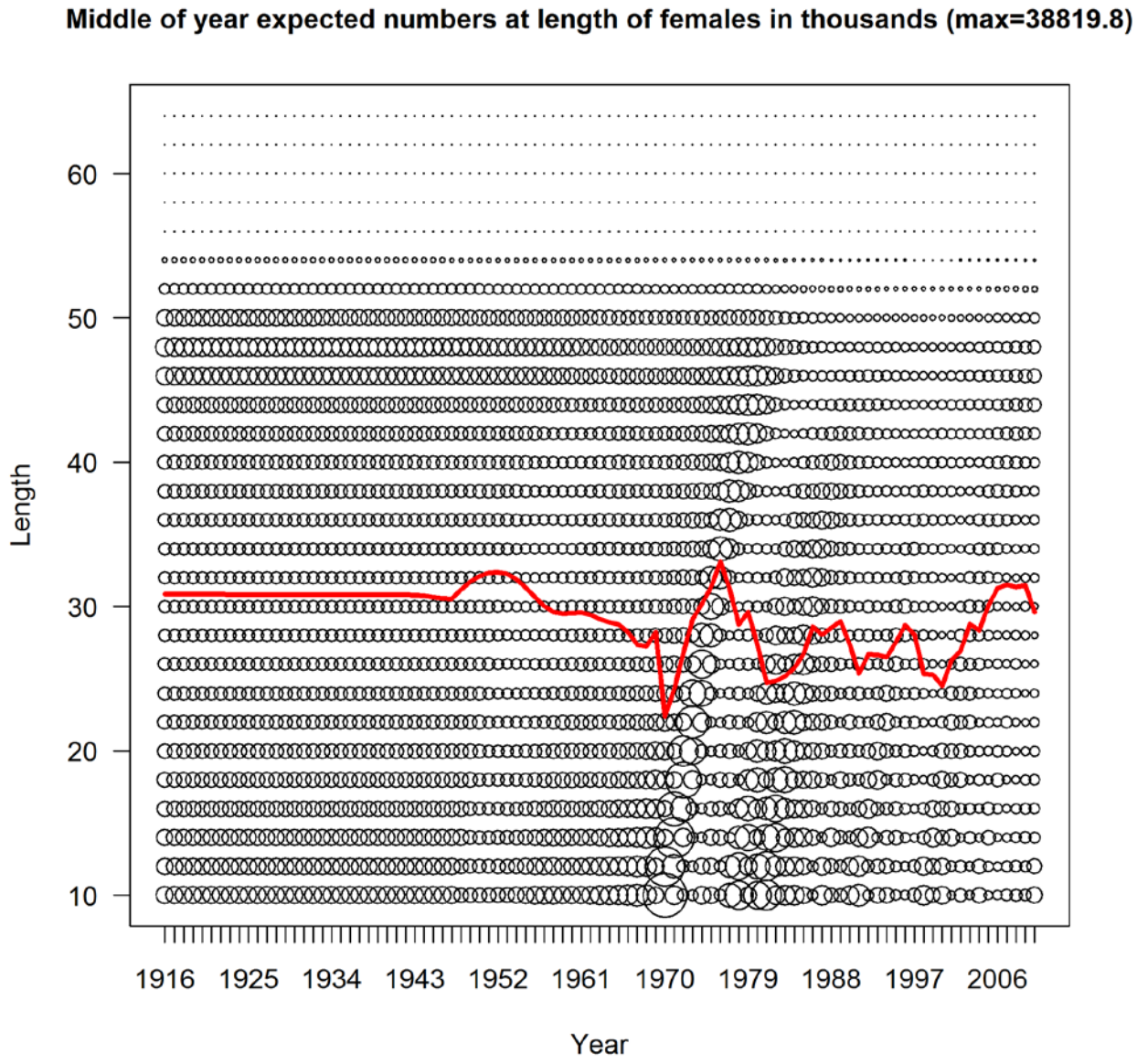

Figure 43. Scaled expected numbers of fish at length of females from the base model.

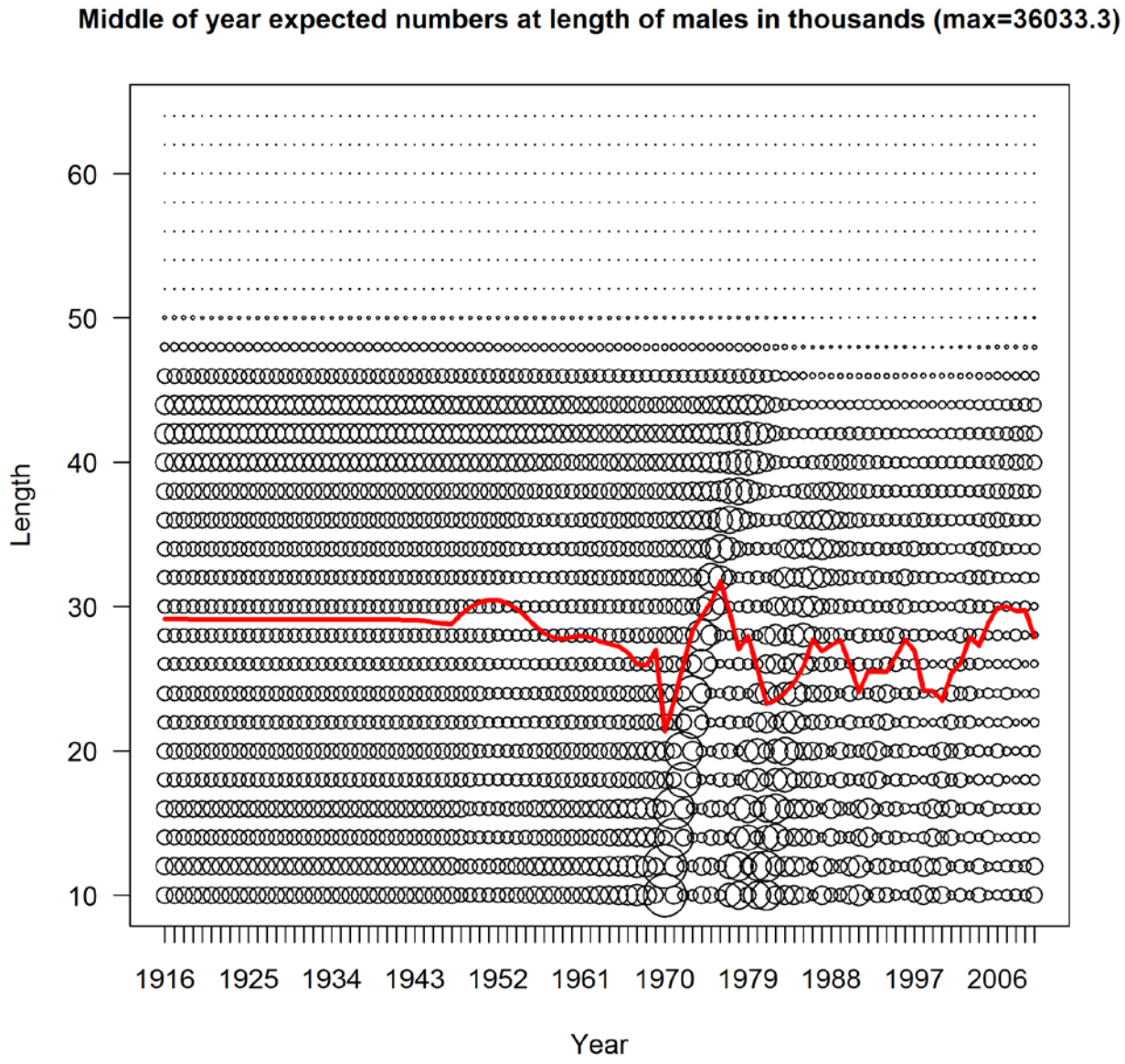

Figure 44. Scaled expected numbers of fish at length for males from the base model.

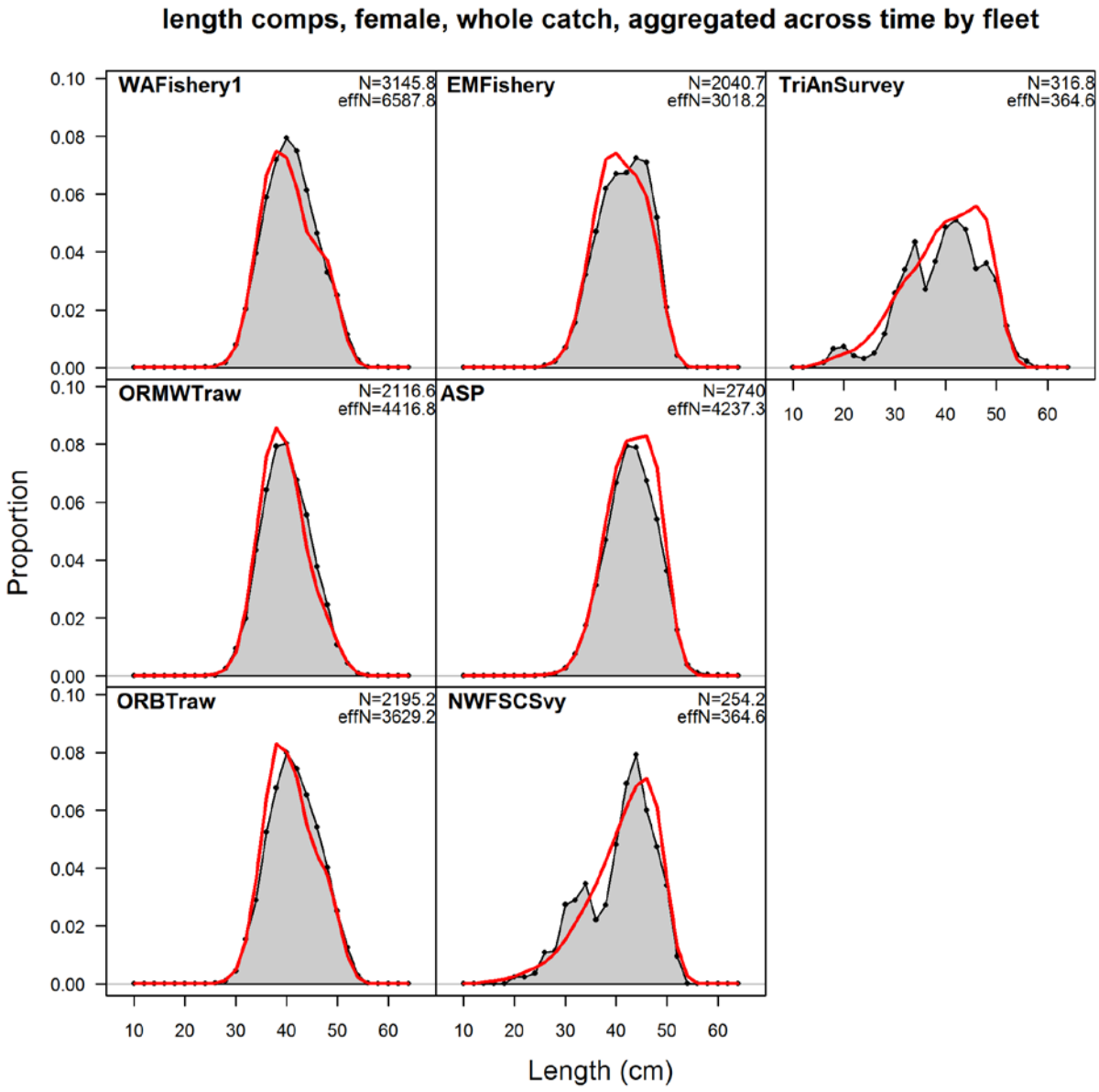

Figure 45. Aggregated model fists to female length composition data for all fleets and surveys across all years.

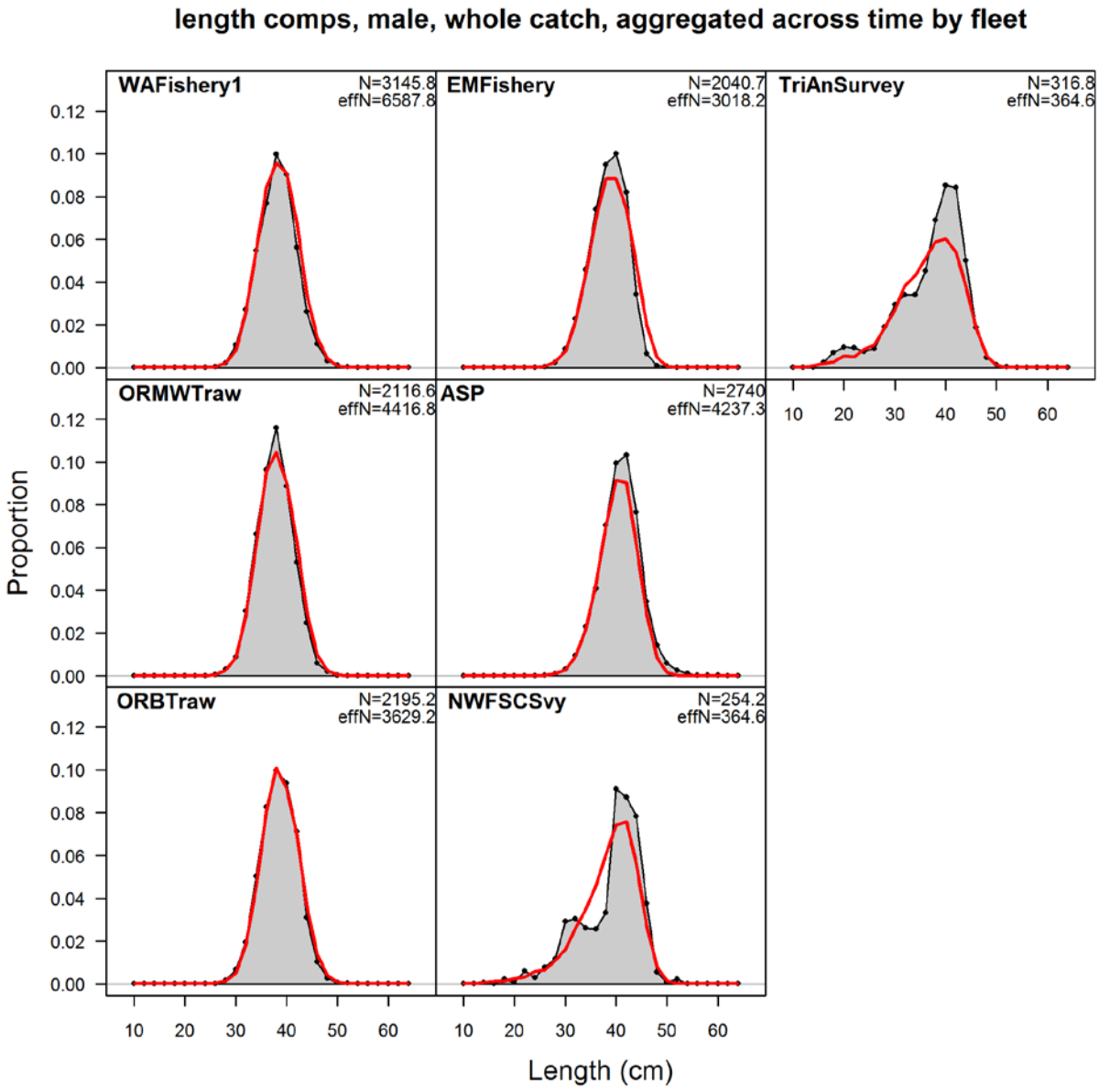

Figure 46. Aggregated model fists to male length composition data for all fleets and surveys across all years.

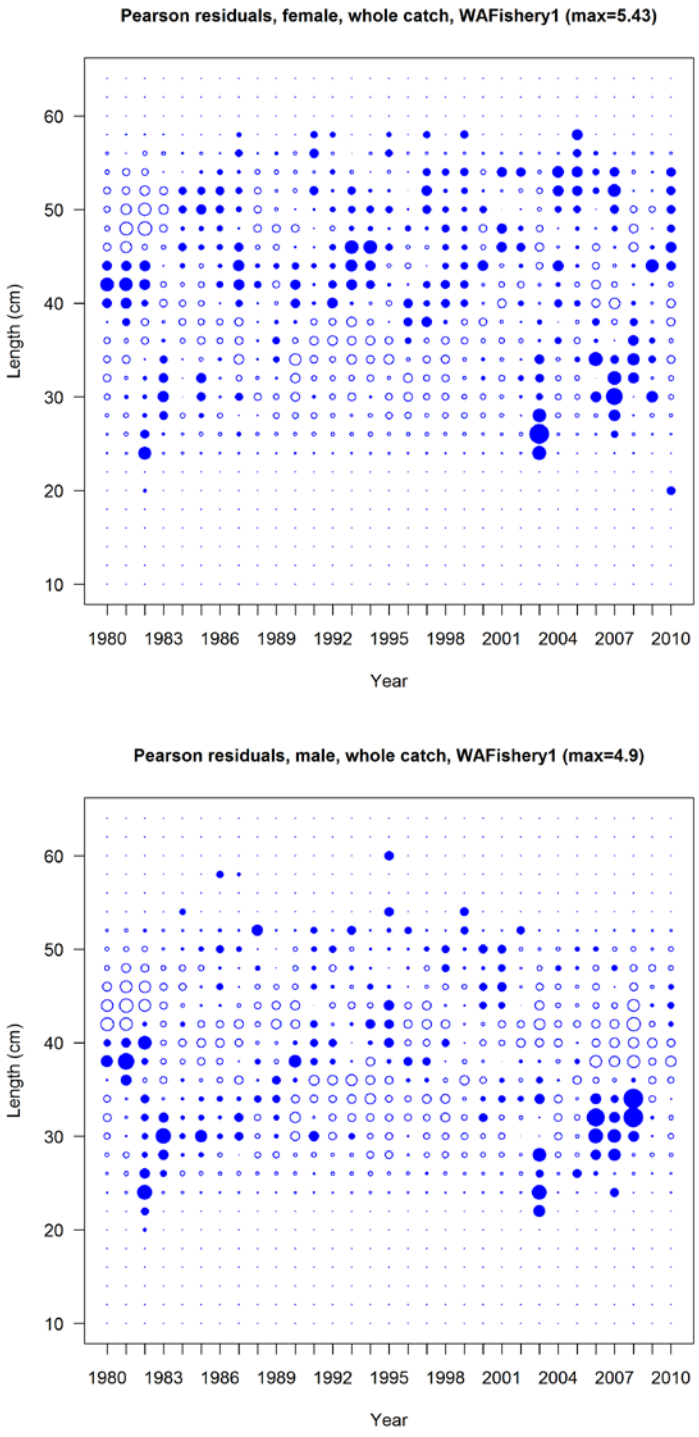

Figure 47. Length composition residuals of females (upper panel) and male (lower panel) for the Washington fishery from the base model. Residuals are standardized differences (observed – estimated). Dark circles are positive residuals and open circles are negative residuals.

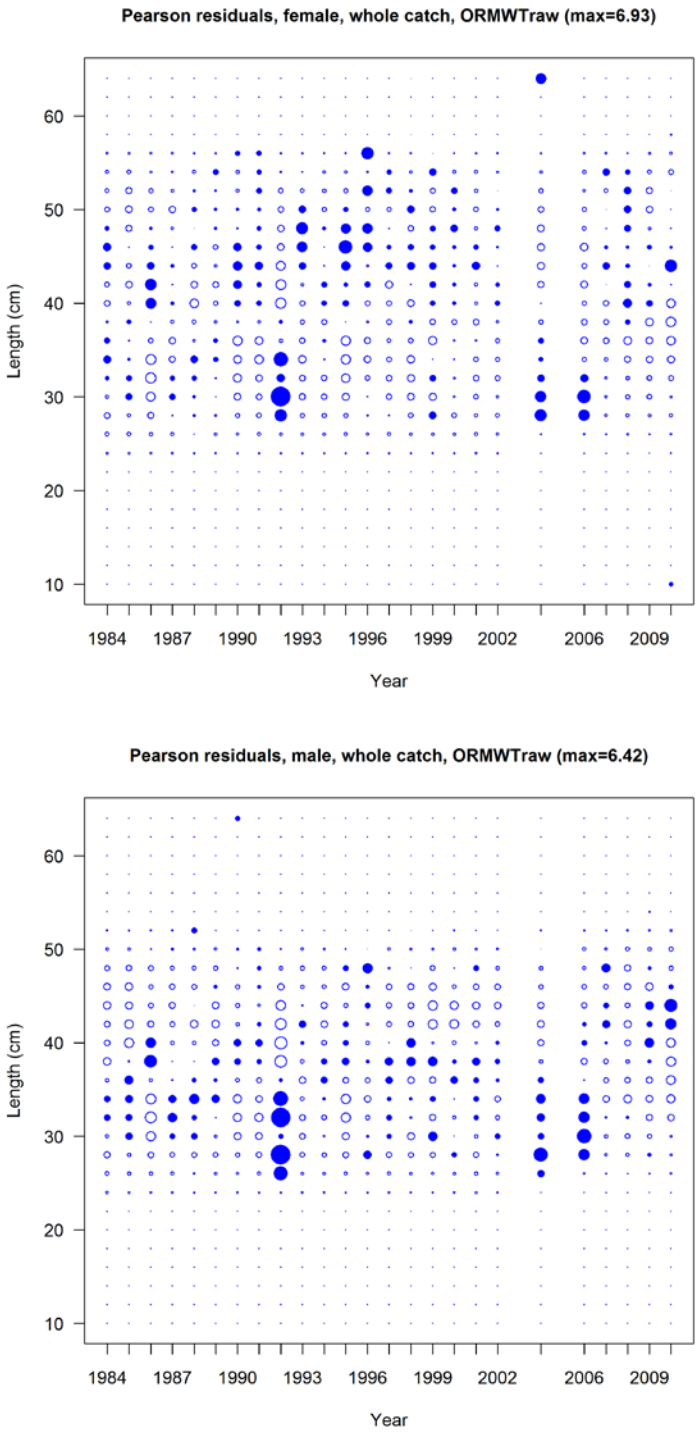

Figure 48. Length composition residuals of females (upper panel) and male (lower panel) for the Oregon mid-water trawl fishery from the base model. Residuals are standardized differences (observed – estimated). Dark circles are positive residuals and open circles are negative residuals.

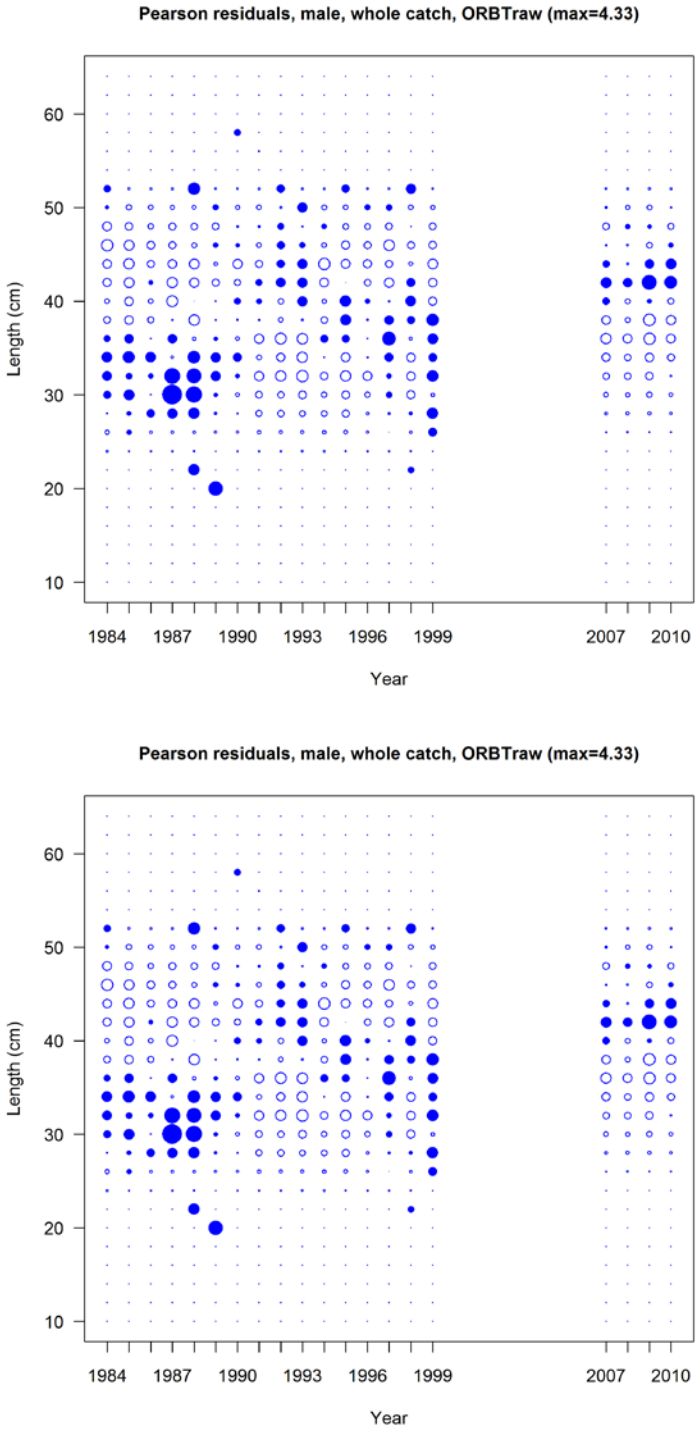

Figure 49. Length composition residuals of females (upper panel) and male (lower panel) for the Oregon bottom trawl fishery from the base model. Residuals are standardized differences (observed – estimated). Dark circles are positive residuals and open circles are negative residuals.

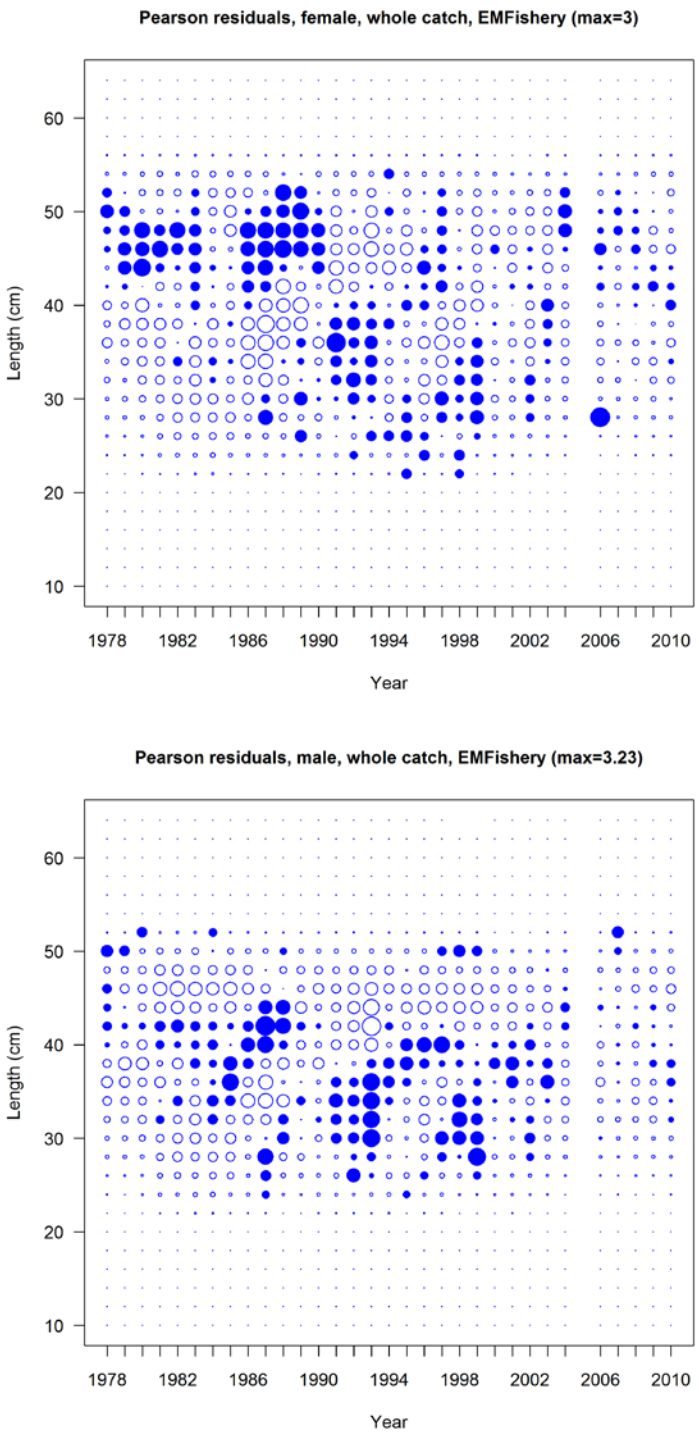

Figure 50. Length composition residuals of females (upper panel) and male (lower panel) for the California (EMFishery1) fishery from the base model. Residuals are standardized differences (observed – estimated). Dark circles are positive residuals and open circles are negative residuals.

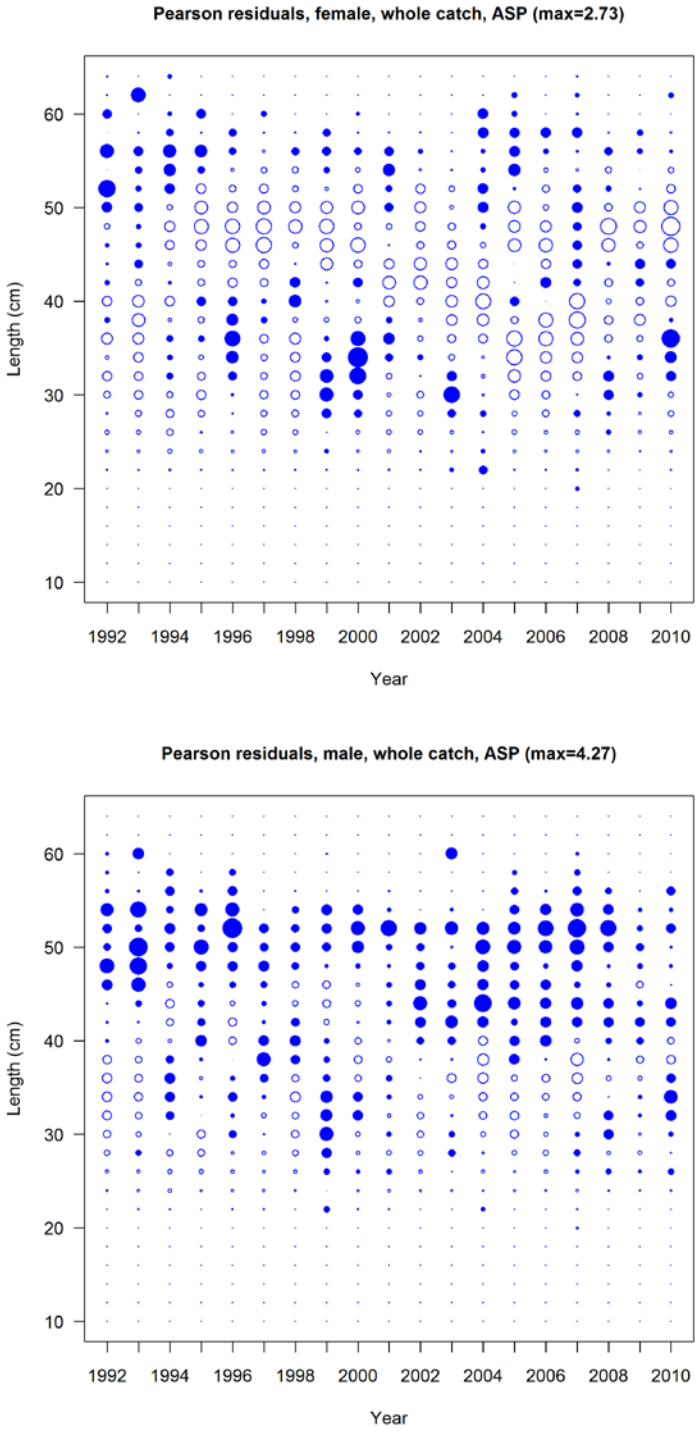

Figure 51. Length composition residuals of females (upper panel) and male (lower panel) for the ASP (at-sea processor whiting fishery) fishery from the base model. Residuals are standardized differences (observed – estimated). Dark circles are positive residuals and open circles are negative residuals.

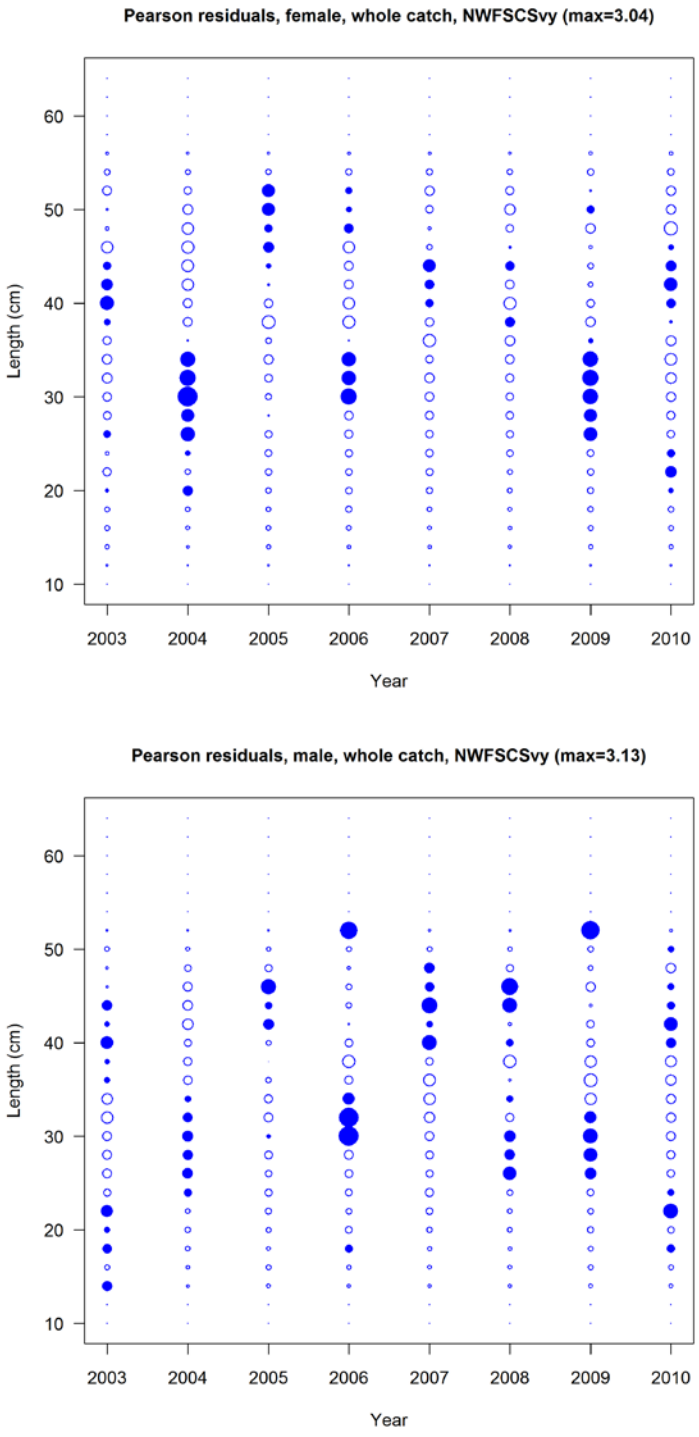

Figure 52. Length composition residuals of females (upper panel) and male (lower panel) for the NWFSC survey from the base model. Residuals are standardized differences (observed – estimated). Dark circles are positive residuals and open circles are negative residuals.

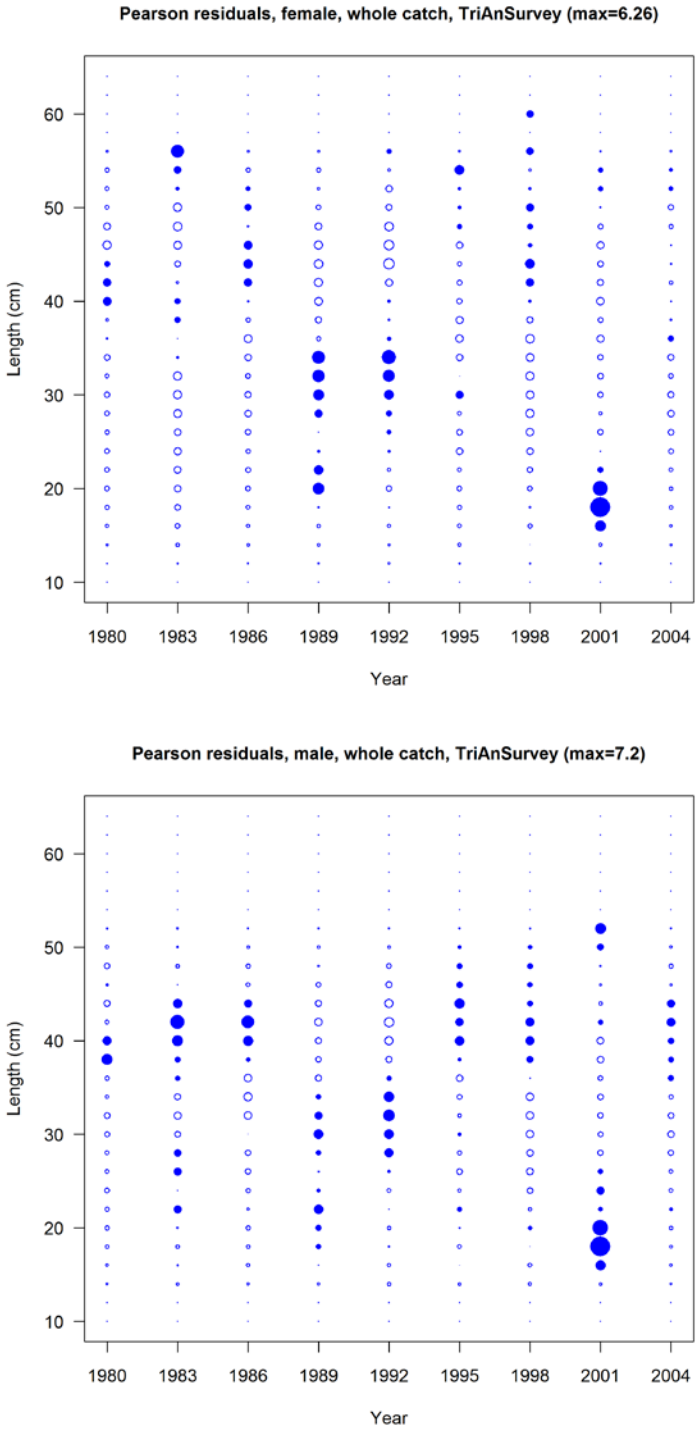

Figure 53. Length composition residuals of females (upper panel) and male (lower panel) for the triennial survey from the base model. Residuals are standardized differences (observed – estimated). Dark circles are positive residuals and open circles are negative residuals.

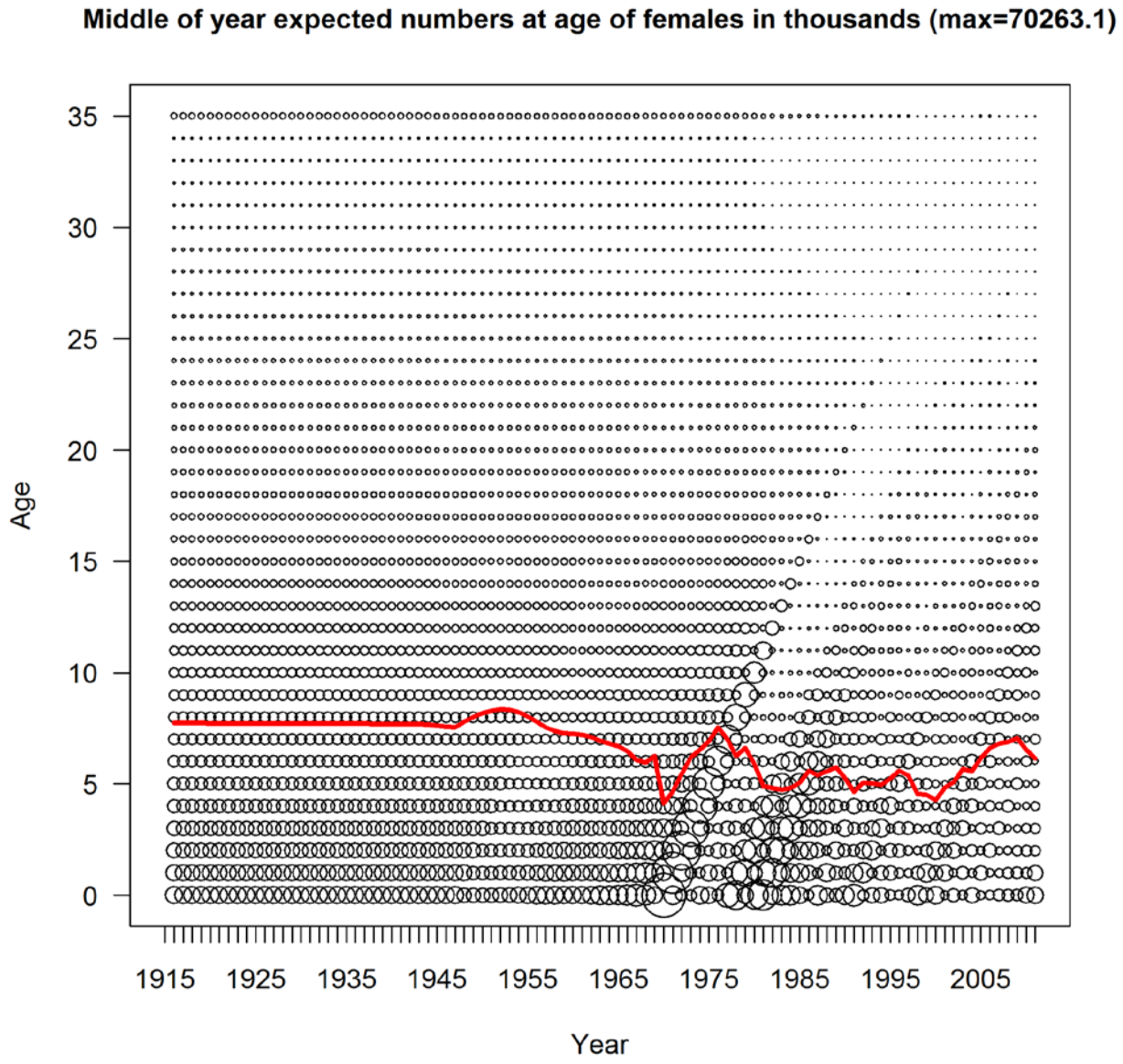

Figure 54. Scaled expected numbers of fish at age of females from the base model.

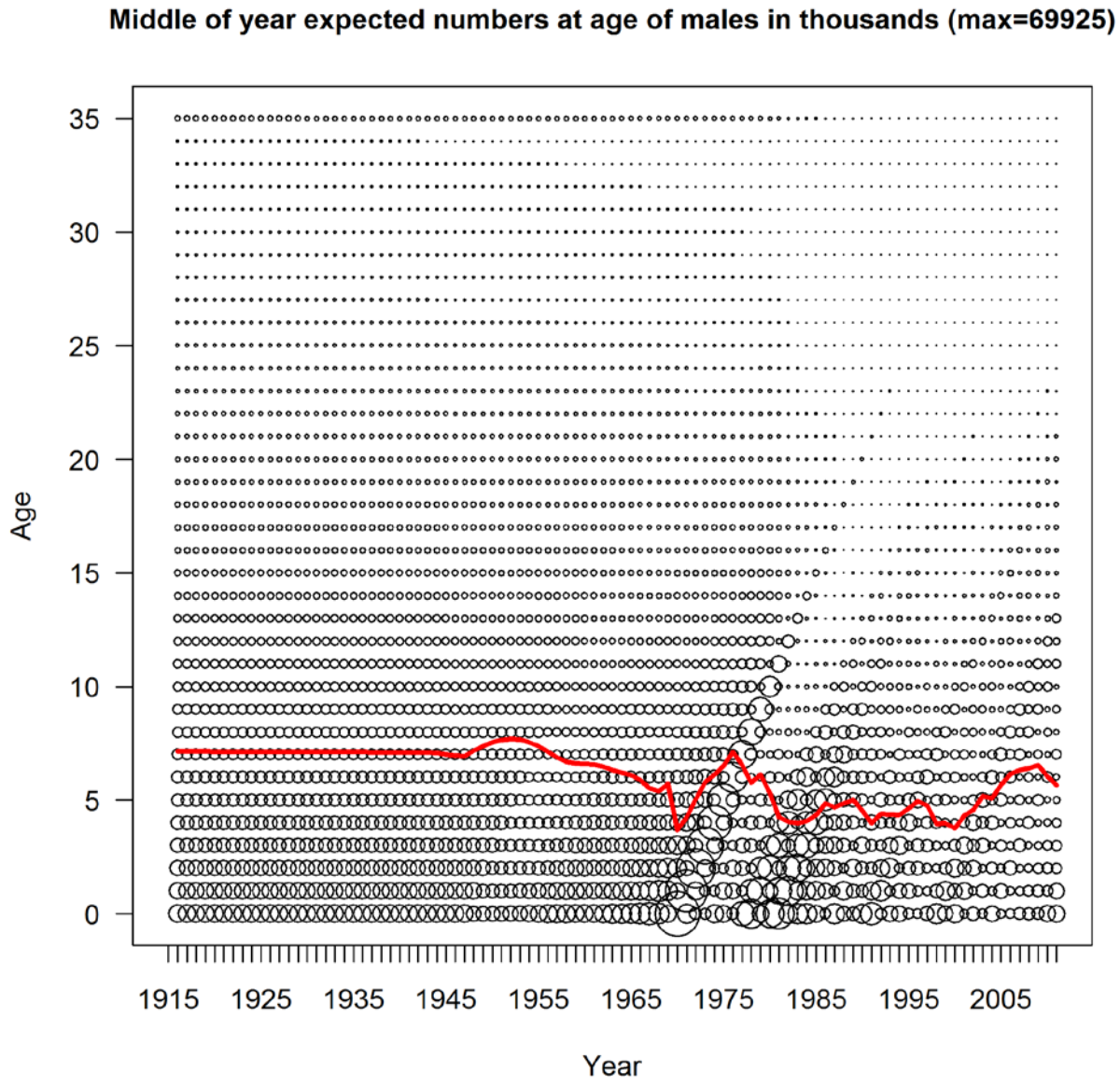

Figure 55. Scaled expected numbers of fish at age of males from the base model.

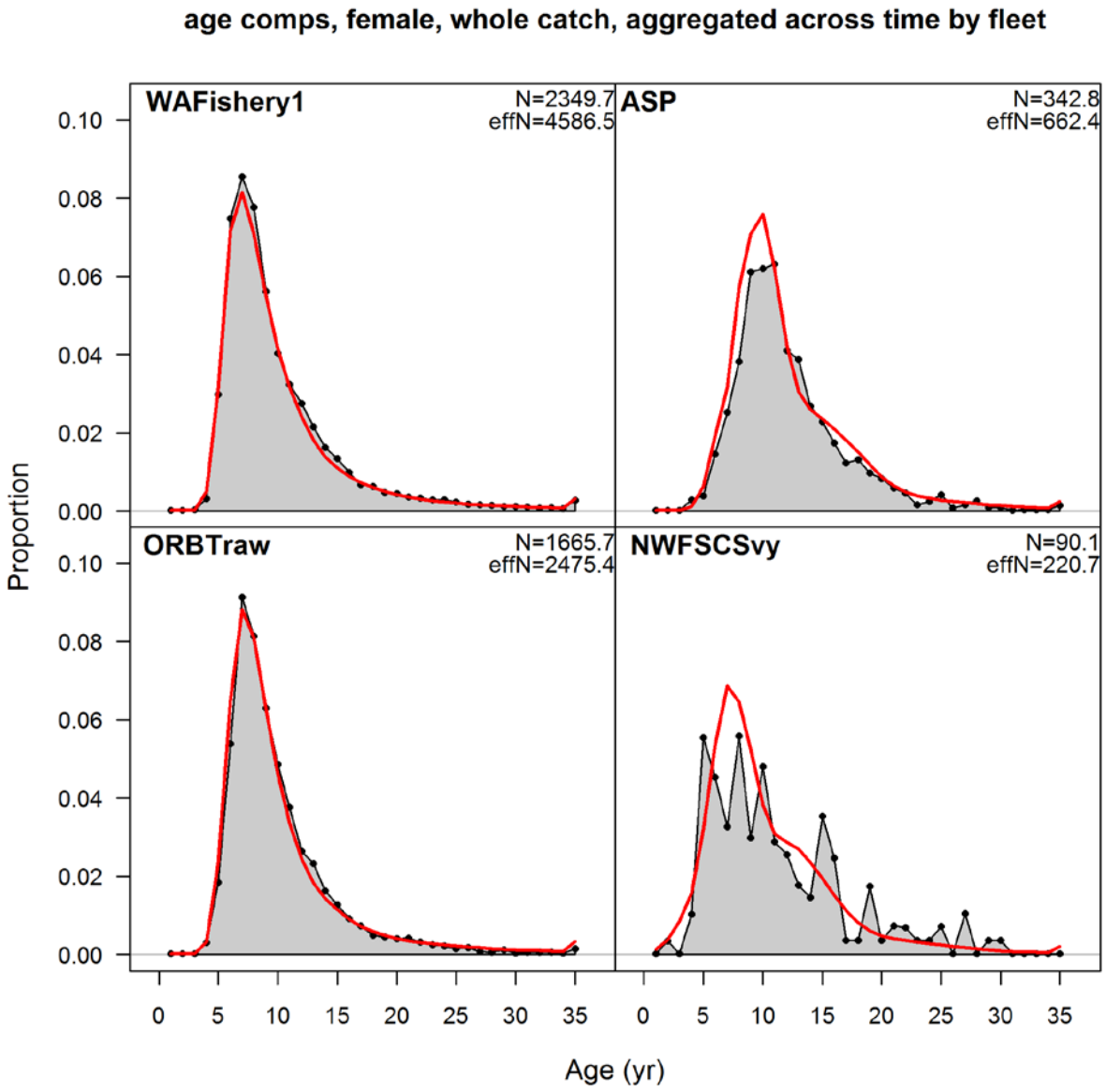

Figure 56. Aggregated model fists to female age composition data for three fishing fleets and the NWFSC survey across all years.

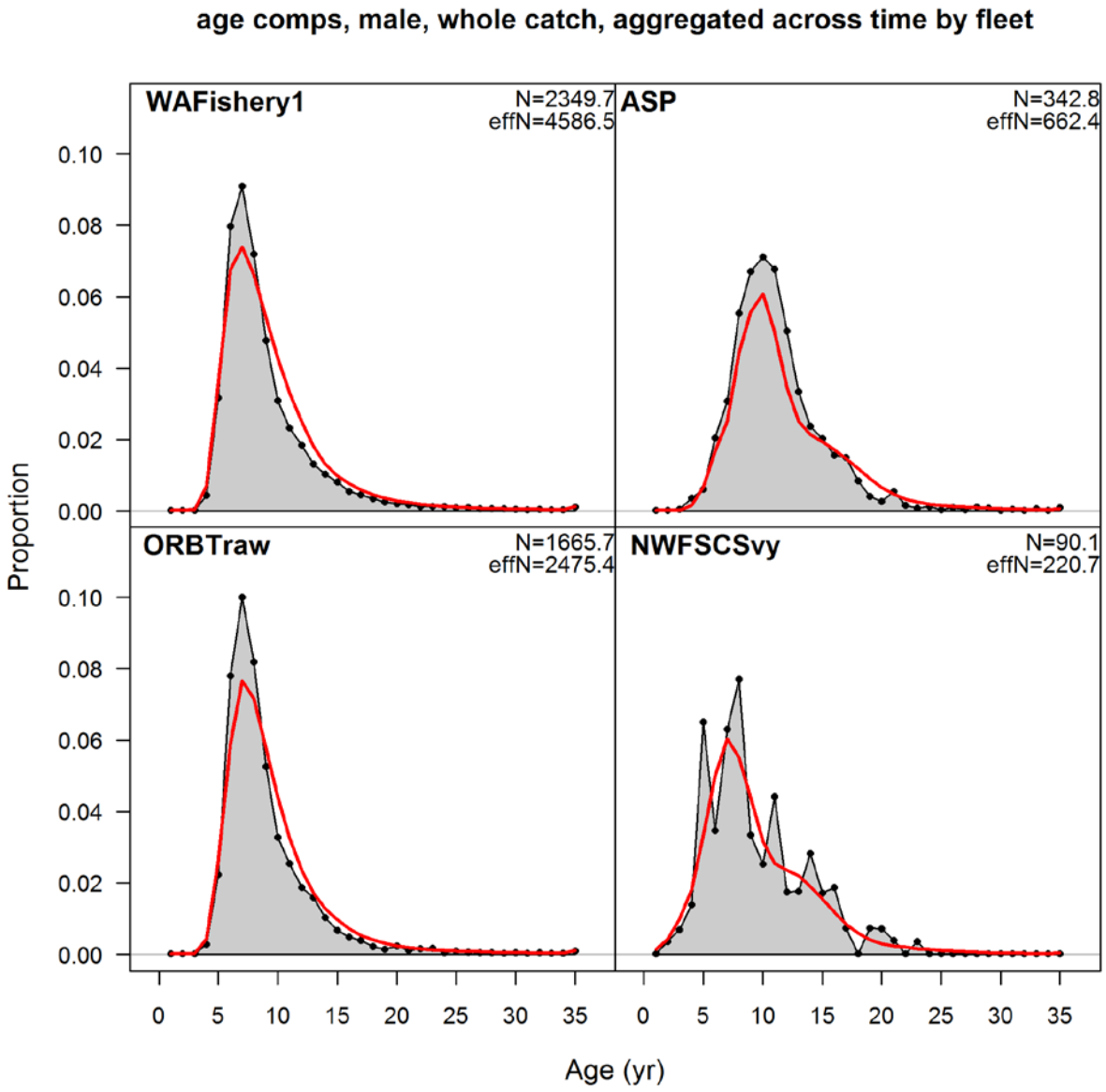

Figure 57. Aggregated model fists to female age composition data for three fleets and the NWFSC survey across all years.

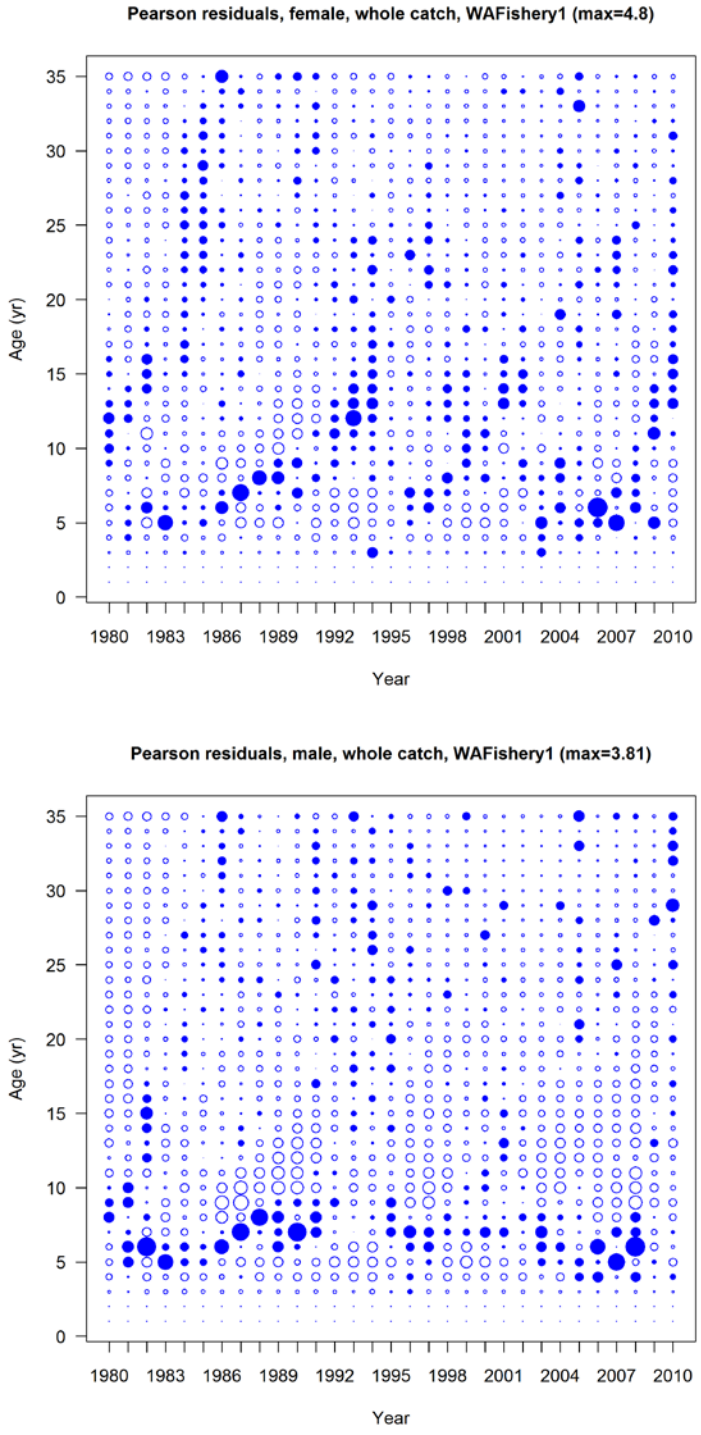

Figure 58. Age composition residuals of females (upper panel) and male (lower panel) for the Washington fishery from the base model. Residuals are standardized differences (observed – estimated). Dark circles are positive residuals and open circles are negative residuals.

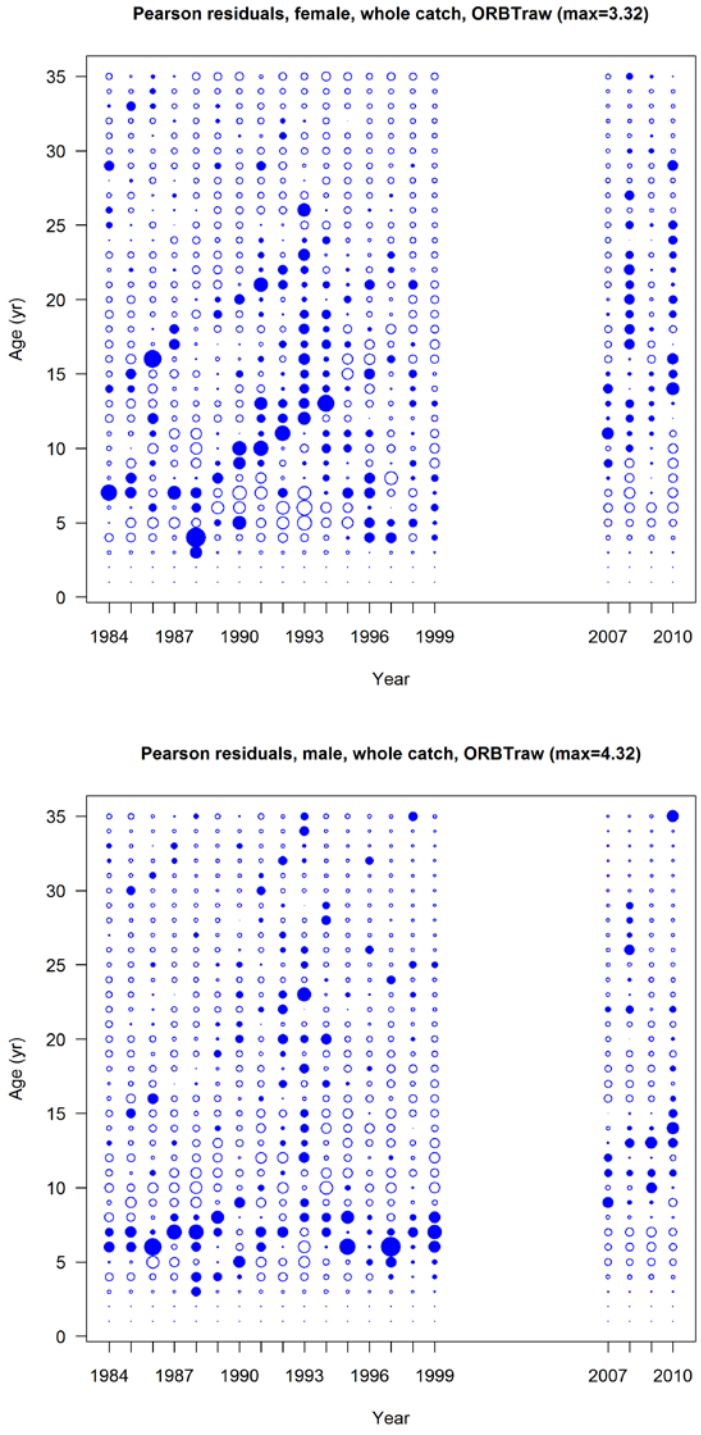

Figure 59. Age composition residuals of females (upper panel) and male (lower panel) for the Oregon bottom trawl fishery from the base model. Residuals are standardized differences (observed – estimated). Dark circles are positive residuals and open circles are negative residuals.

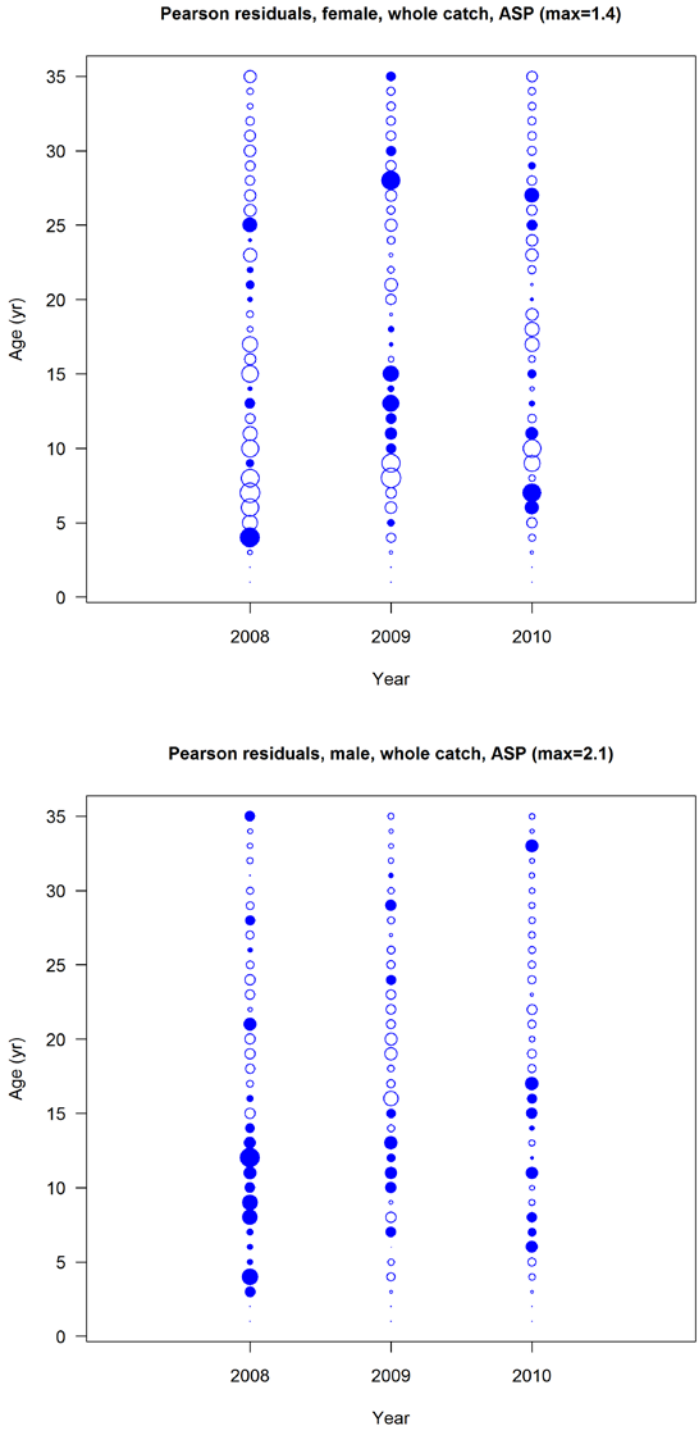

Figure 60. Age composition residuals of females (upper panel) and male (lower panel) for the ASP (at-sea processor) whiting fishery from the base model. Residuals are standardized differences (observed – estimated). Dark circles are positive residuals and open circles are negative residuals.

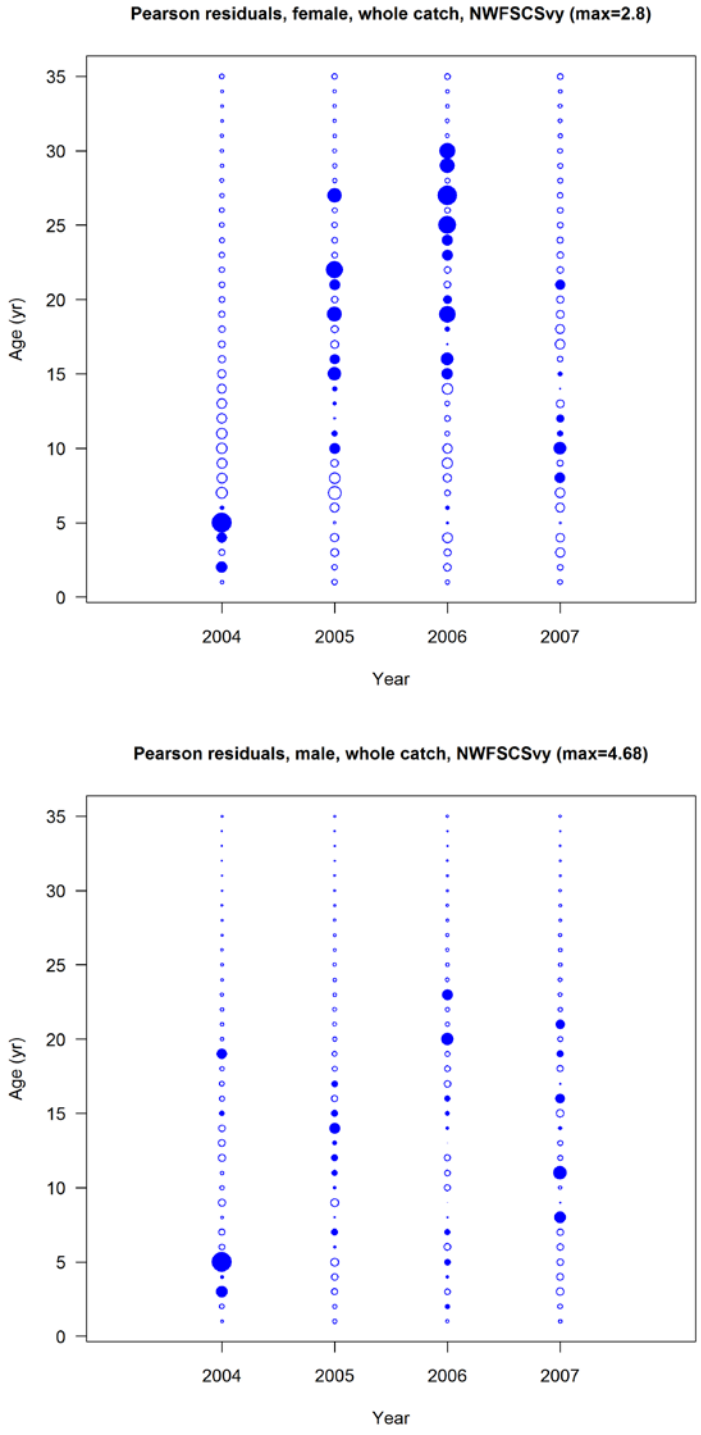

Figure 61. Age composition residuals of females (upper panel) and male (lower panel) for the NWFSC survey from the base model. Residuals are standardized differences (observed – estimated). Dark circles are positive residuals and open circles are negative residuals.

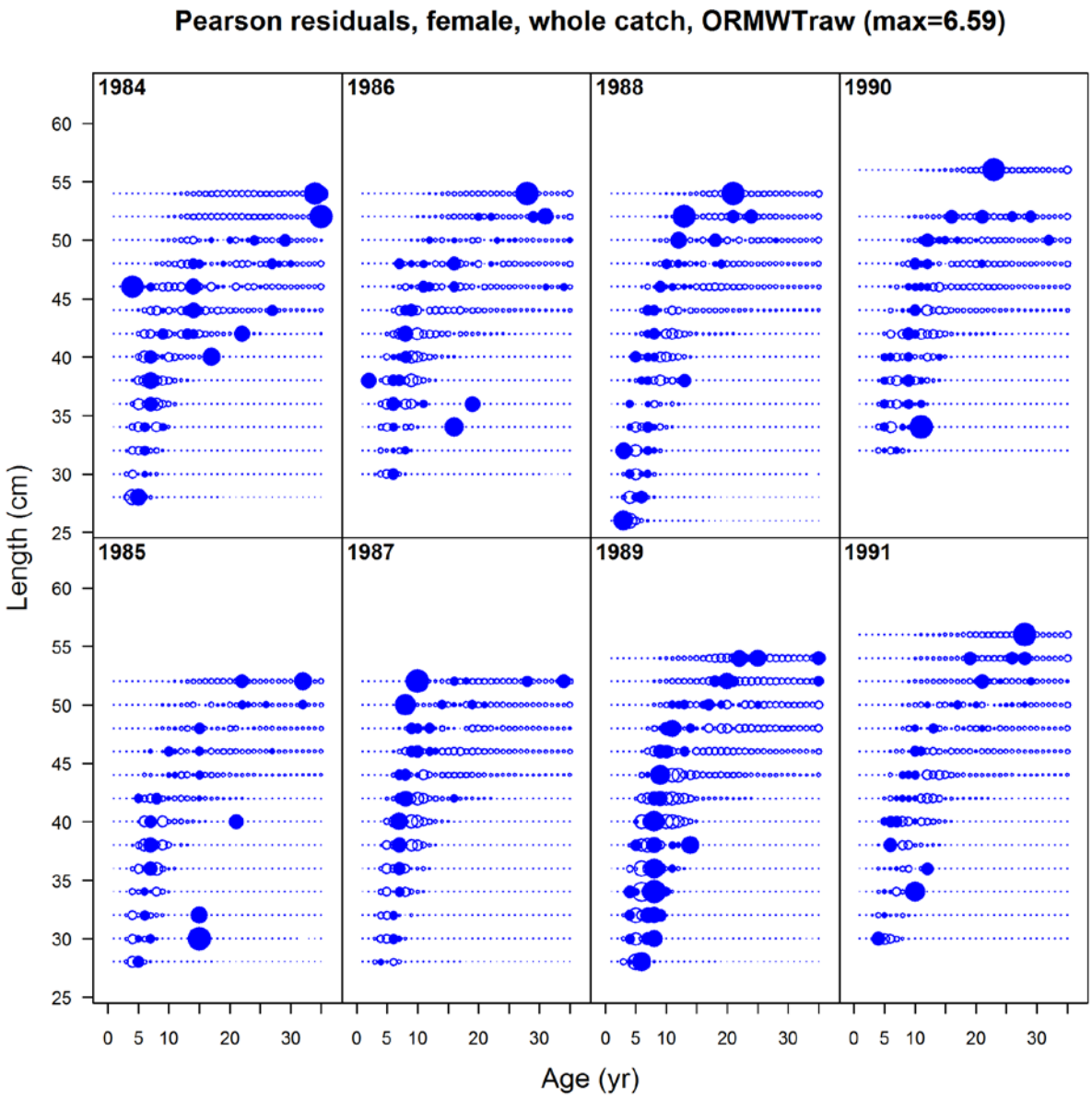

Figure 62a. Residuals for the fit to female age-at-length composition data from the Oregon mid-water trawl fishery from 1984 to 1991. Residuals are standardized differences of Pearson residuals (observed – estimated). Dark circles are positive residuals and open circles are negative residuals.

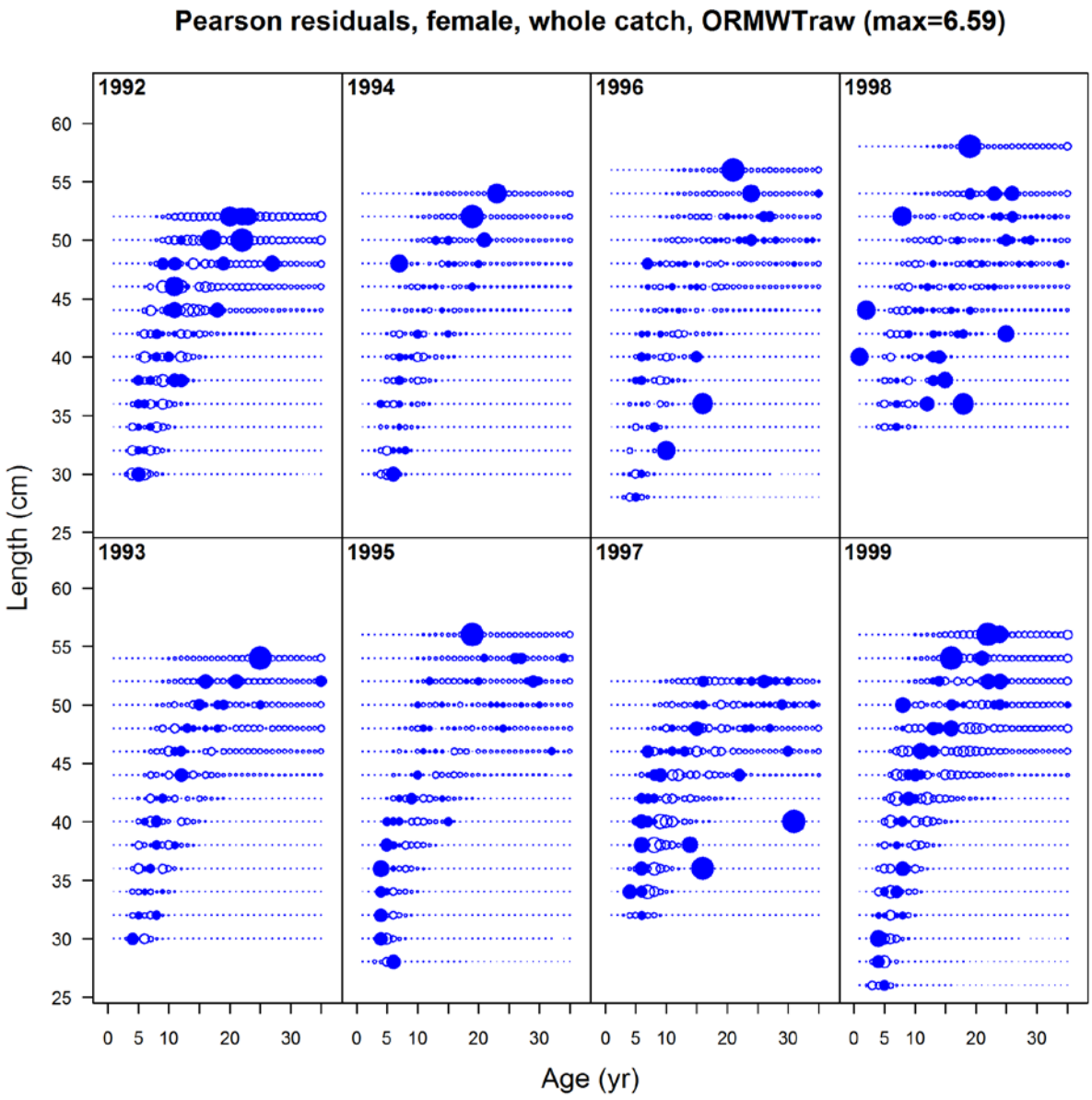

Figure 62b. Residuals for the fit to female age-at-length composition data from the Oregon mid-water trawl fishery from 1992 to 1999. Residuals are standardized differences of Pearson residuals (observed – estimated). Dark circles are positive residuals and open circles are negative residuals.

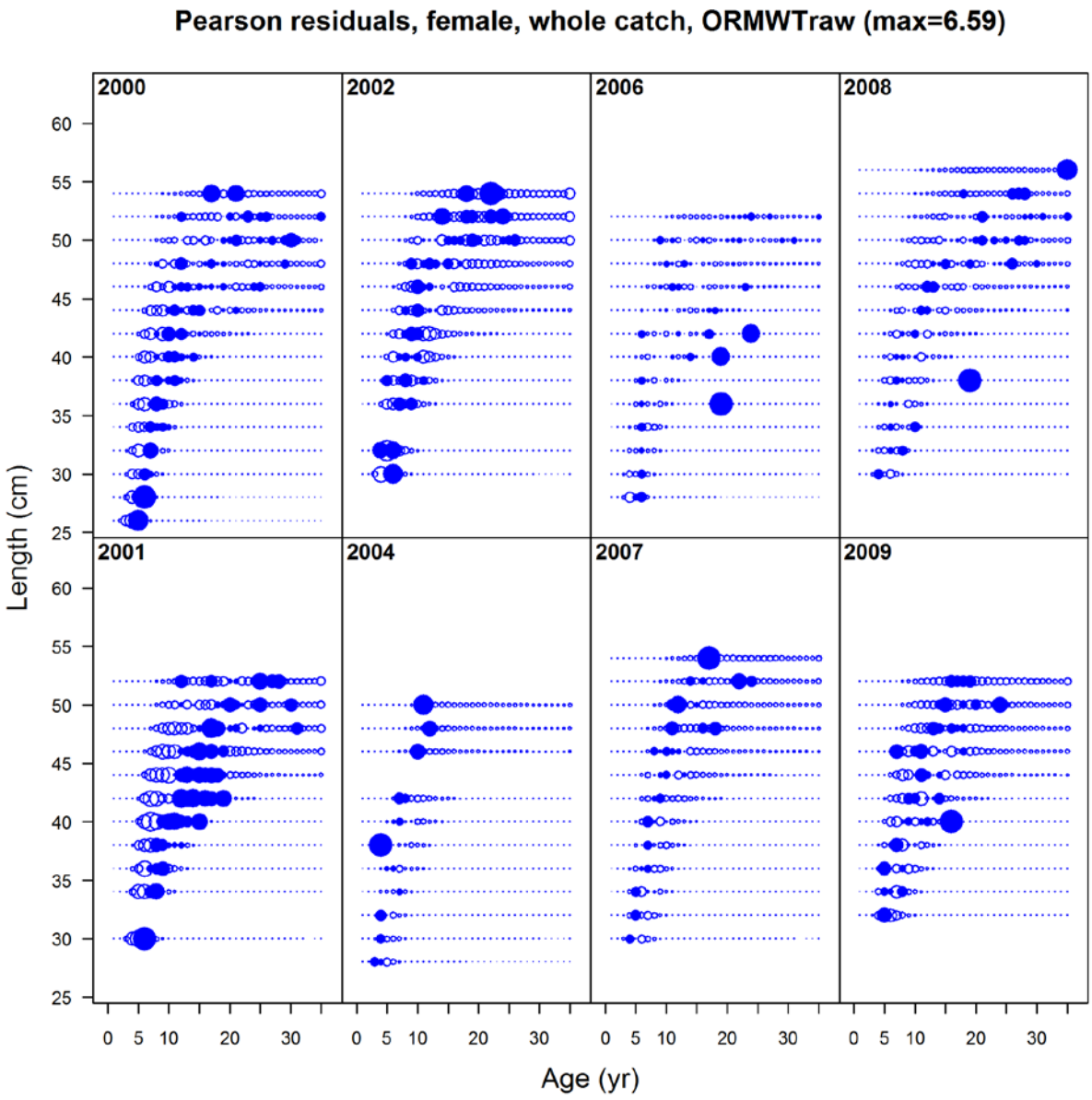

Figure 62c. Residuals for the fit to female age-at-length composition data from the Oregon mid-water trawl fishery from 2000 to 2009. Residuals are standardized differences of Pearson residuals (observed – estimated). Dark circles are positive residuals and open circles are negative residuals.

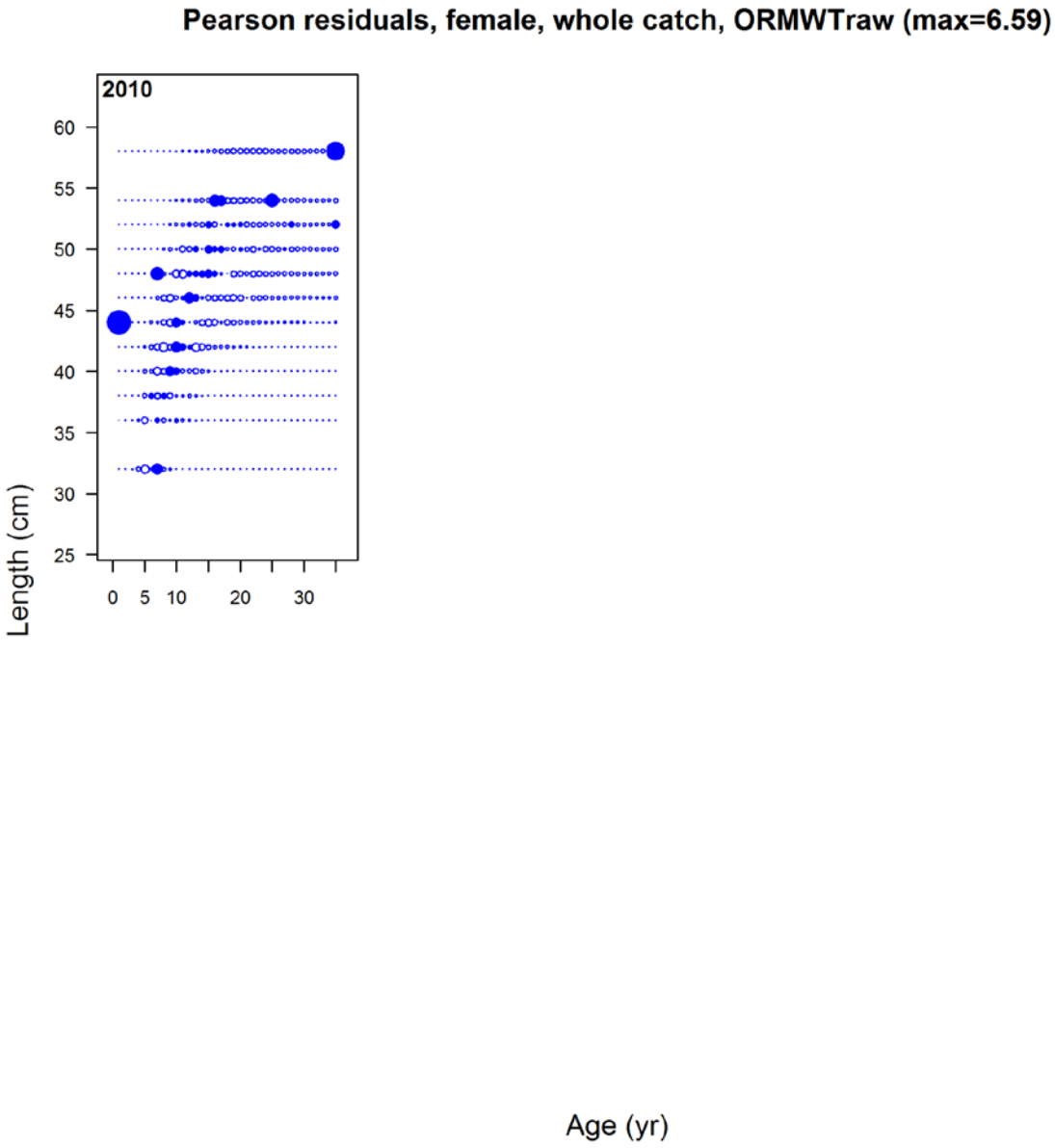

Figure 62d. Residuals for the fit to female age-at-length composition data from the Oregon mid-water trawl fishery from 2010. Residuals are standardized differences of Pearson residuals (observed – estimated). Dark circles are positive residuals and open circles are negative residuals.

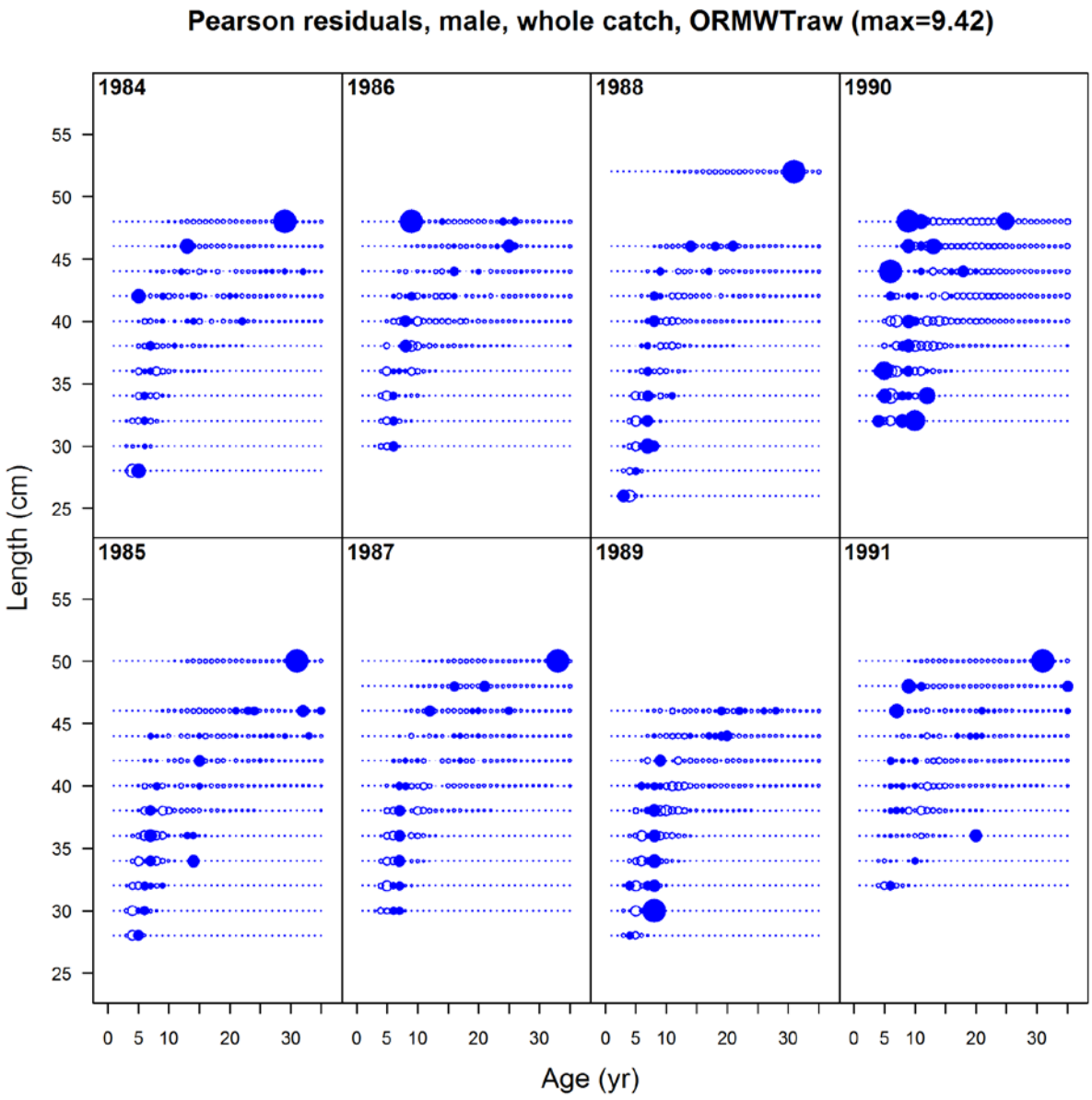

Figure 62e. Residuals for the fit to male age-at-length composition data from the Oregon mid-water trawl fishery from 1984 to 1991. Residuals are standardized differences of Pearson residuals (observed – estimated). Dark circles are positive residuals and open circles are negative residuals.

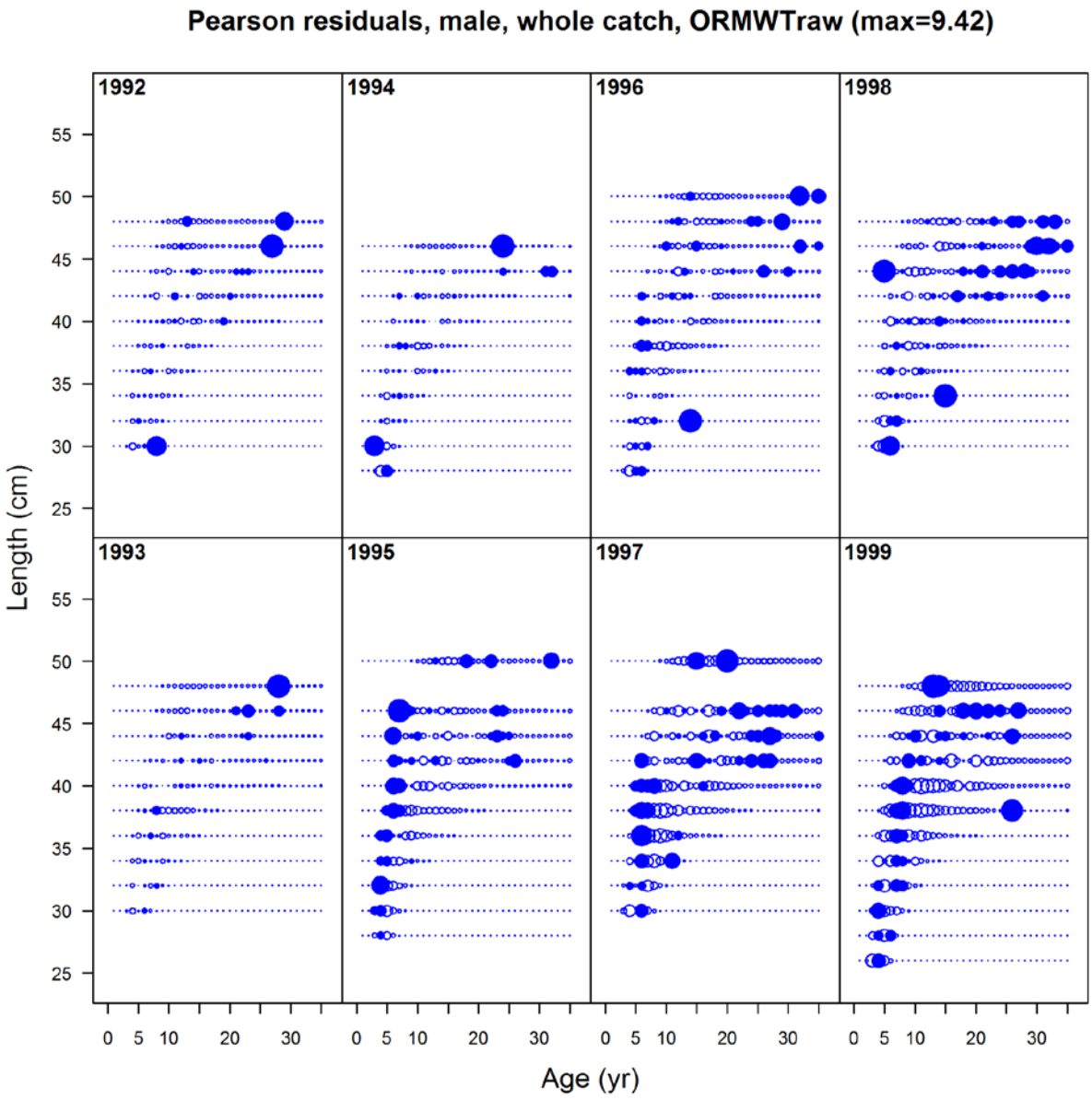

Figure 62f. Residuals for the fit to male age-at-length composition data from the Oregon mid-water trawl fishery from 1992 to 1999. Residuals are standardized differences of Pearson residuals (observed – estimated). Dark circles are positive residuals and open circles are negative residuals.

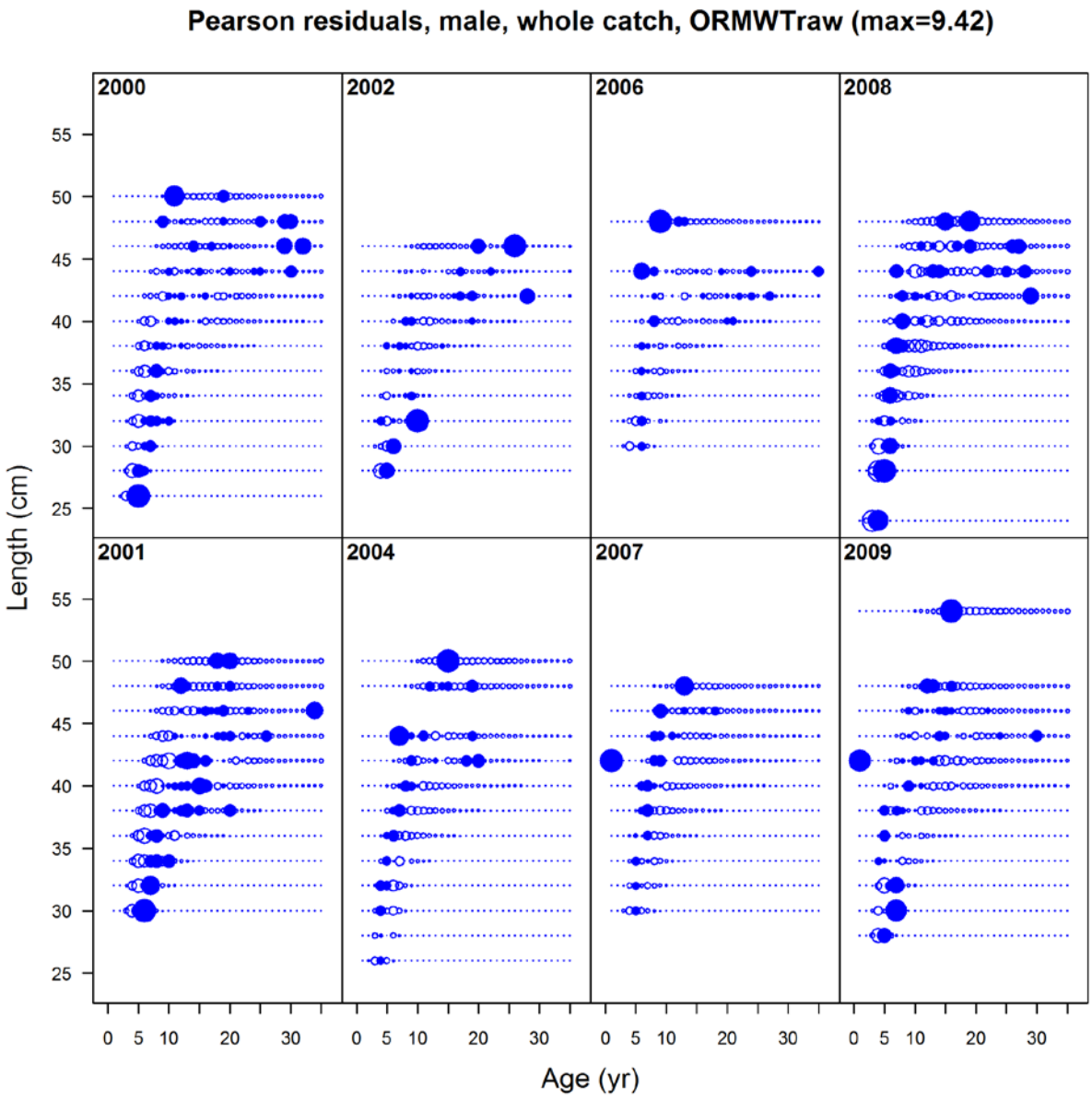

Figure 62g. Residuals for the fit to male age-at-length composition data from the Oregon mid-water trawl fishery from 2000 to 2009. Residuals are standardized differences of Pearson residuals (observed – estimated). Dark circles are positive residuals and open circles are negative residuals.

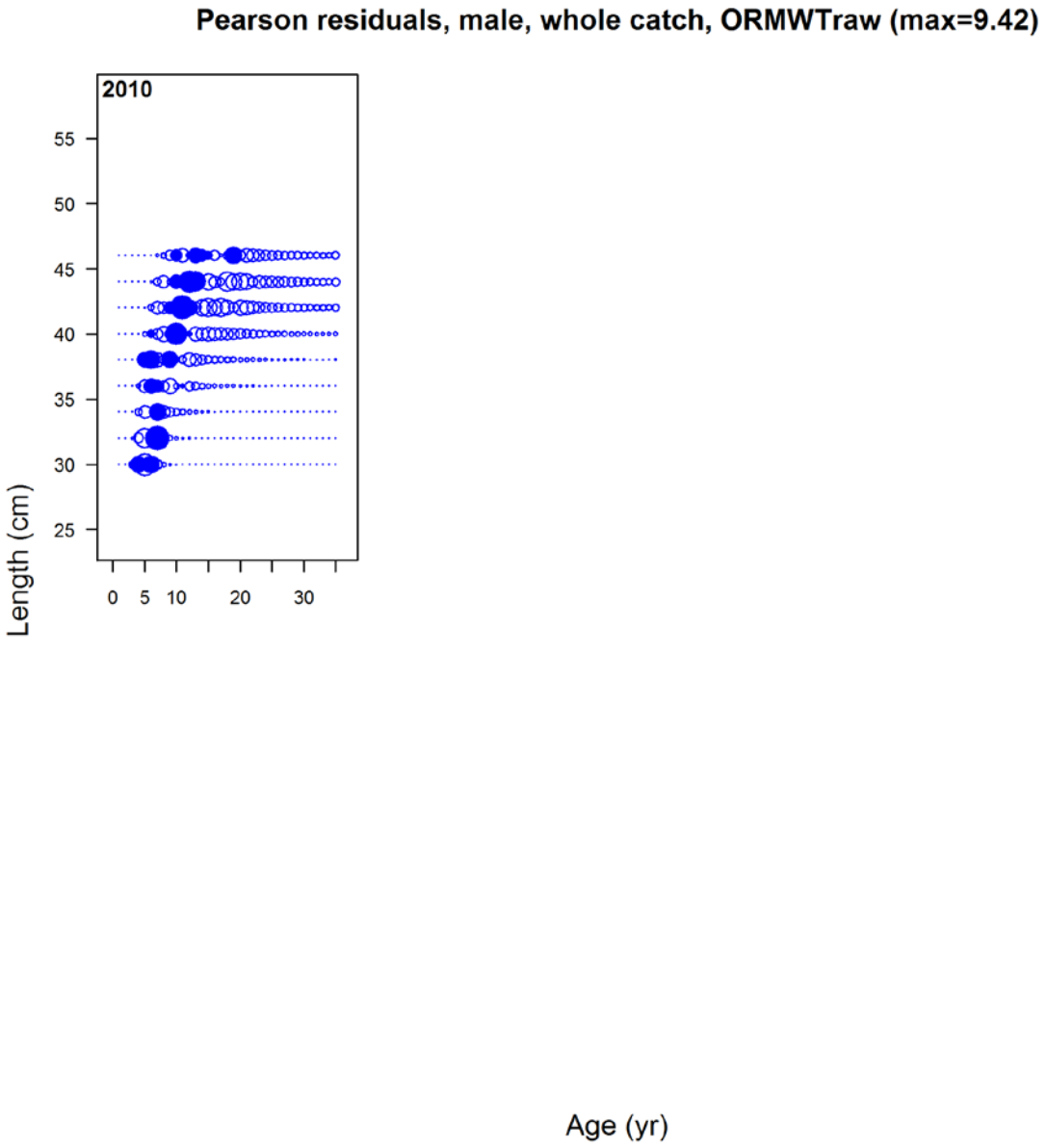

Figure 62h. Residuals for the fit to male age-at-length composition data from the Oregon mid-water trawl fishery from 2010. Residuals are standardized differences of Pearson residuals (observed – estimated). Dark circles are positive residuals and open circles are negative residuals.

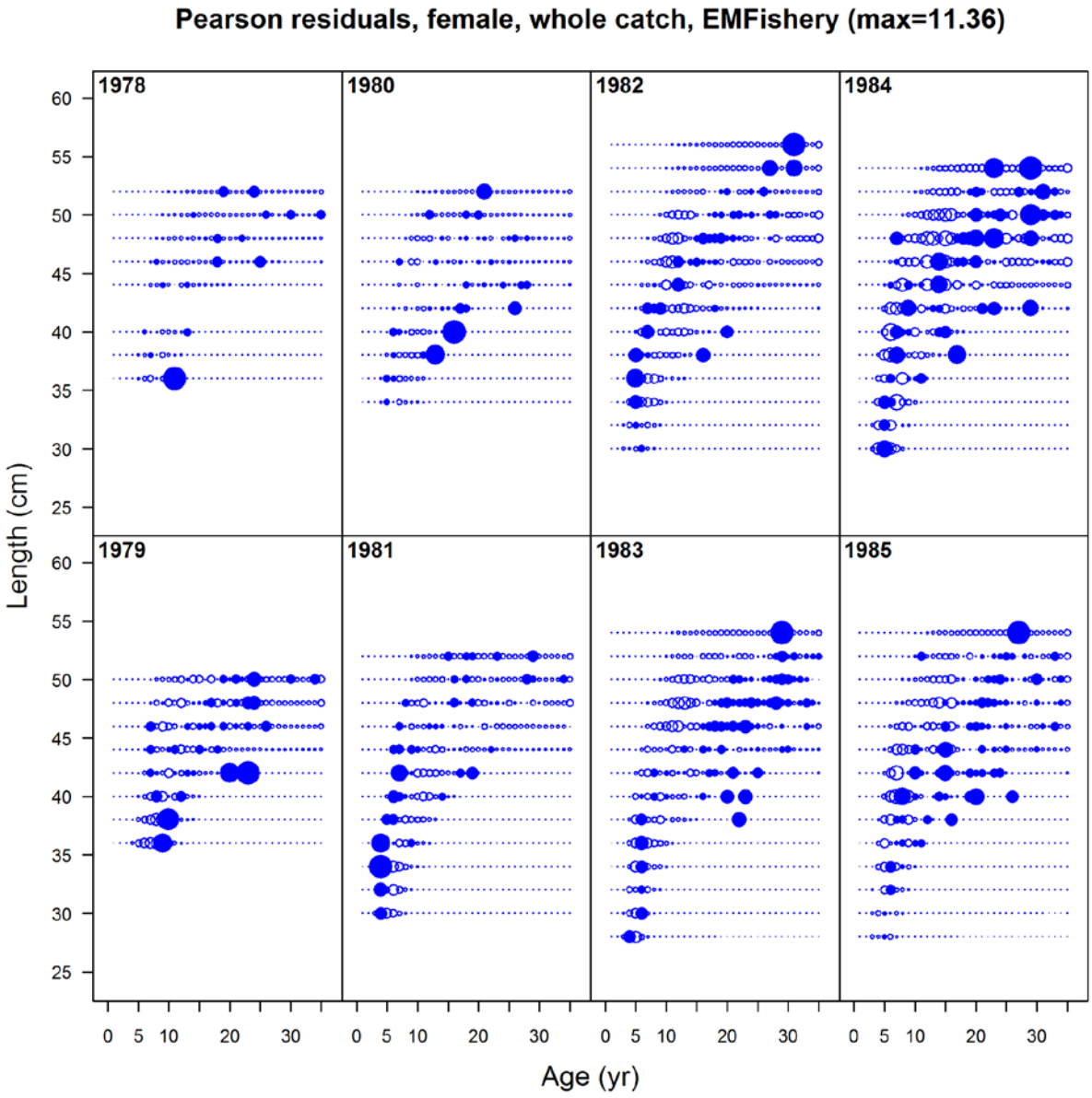

Figure 63a. Residuals for the fit to female age-at-length composition data from the California (EMFishery1) fishery from 1978 to 1985. Residuals are standardized differences of Pearson residuals (observed – estimated). Dark circles are positive residuals and open circles are negative residuals.

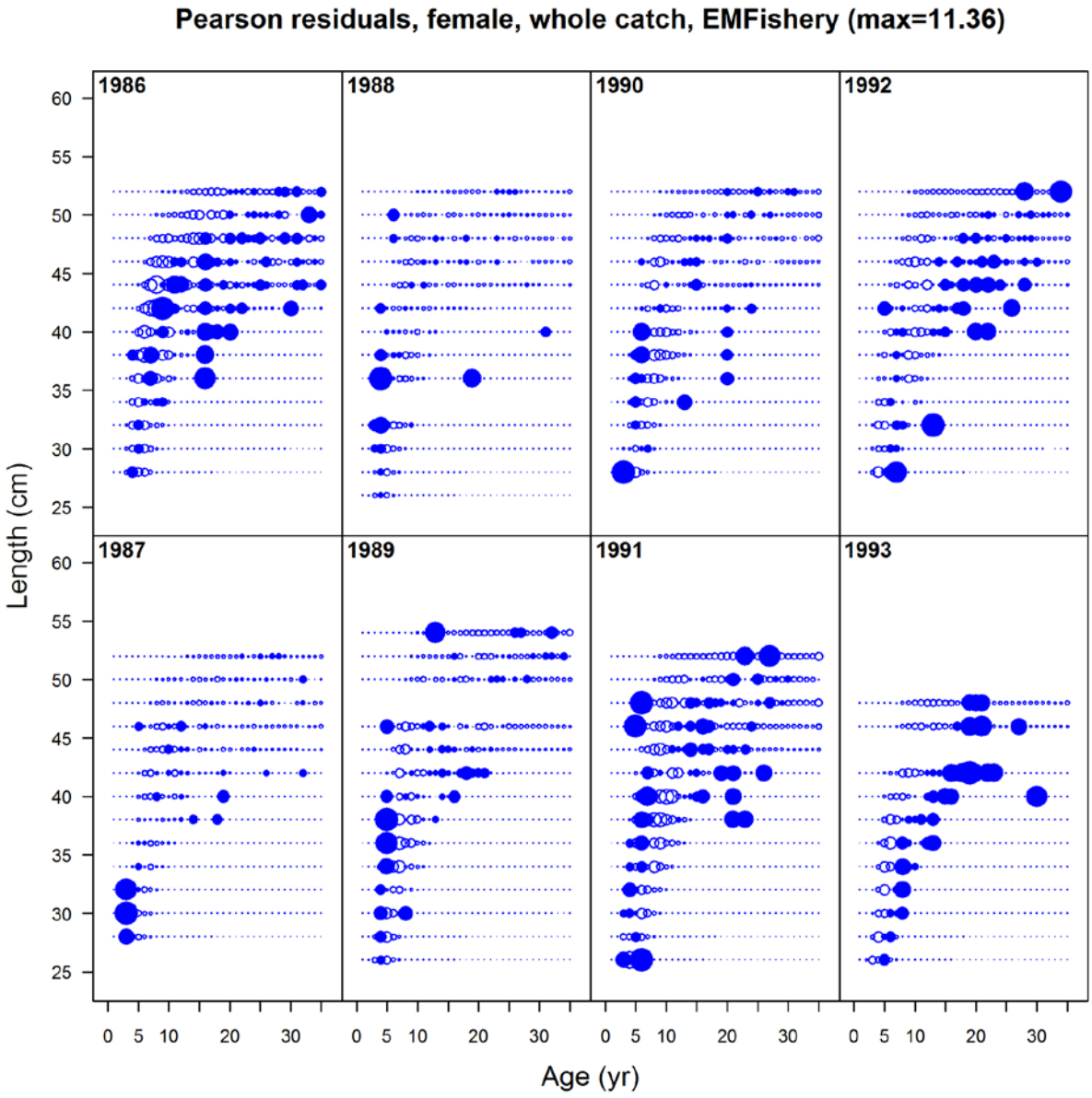

Figure 63b. Residuals for the fit to female age-at-length composition data from the California (EMFishery1) fishery from 1986 to 1993. Residuals are standardized differences of Pearson residuals (observed – estimated). Dark circles are positive residuals and open circles are negative residuals.

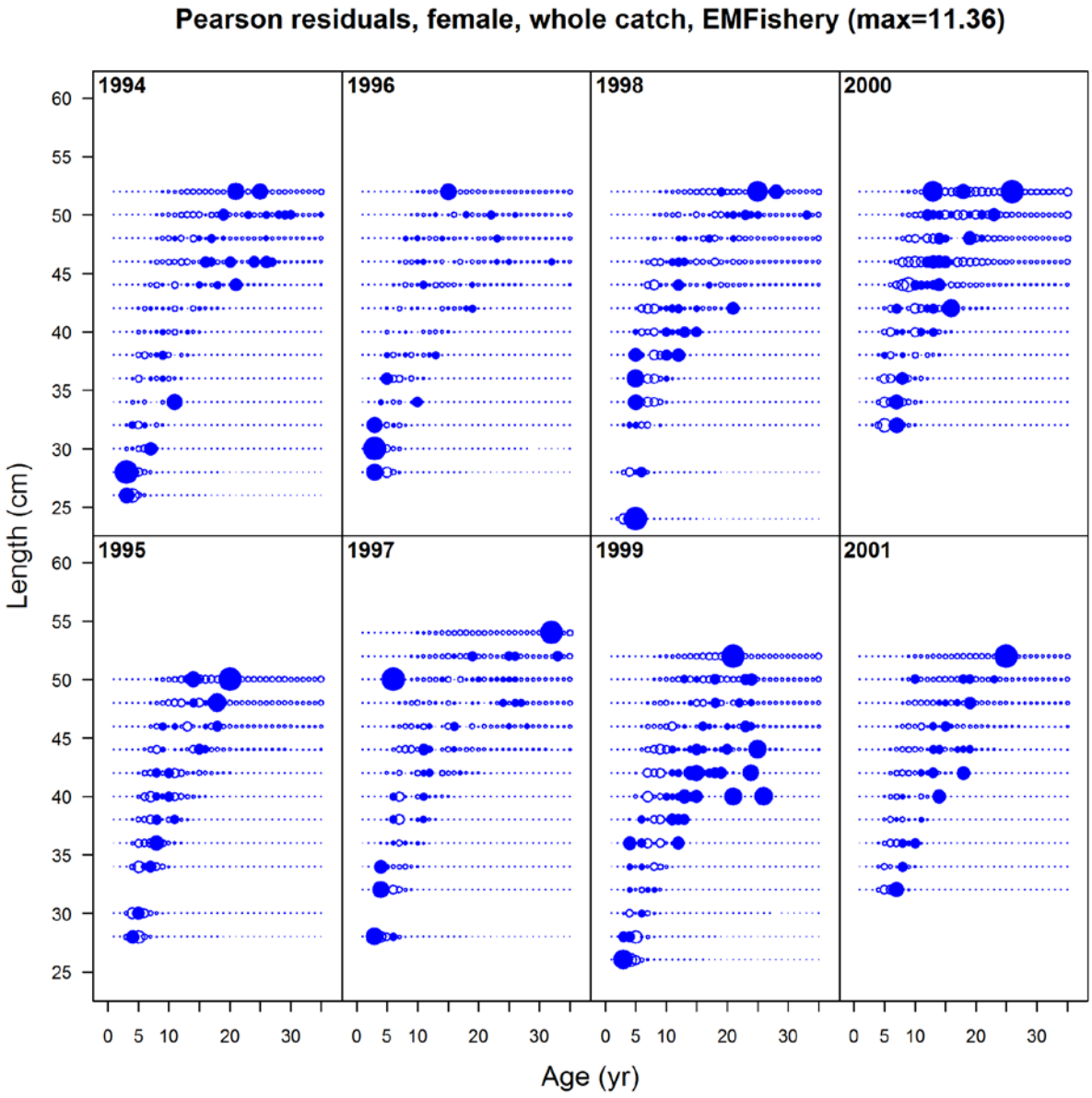

Figure 63c. Residuals for the fit to female age-at-length composition data from the California (EMFishery1) fishery from 1994 to 2001. Residuals are standardized differences of Pearson residuals (observed – estimated). Dark circles are positive residuals and open circles are negative residuals.

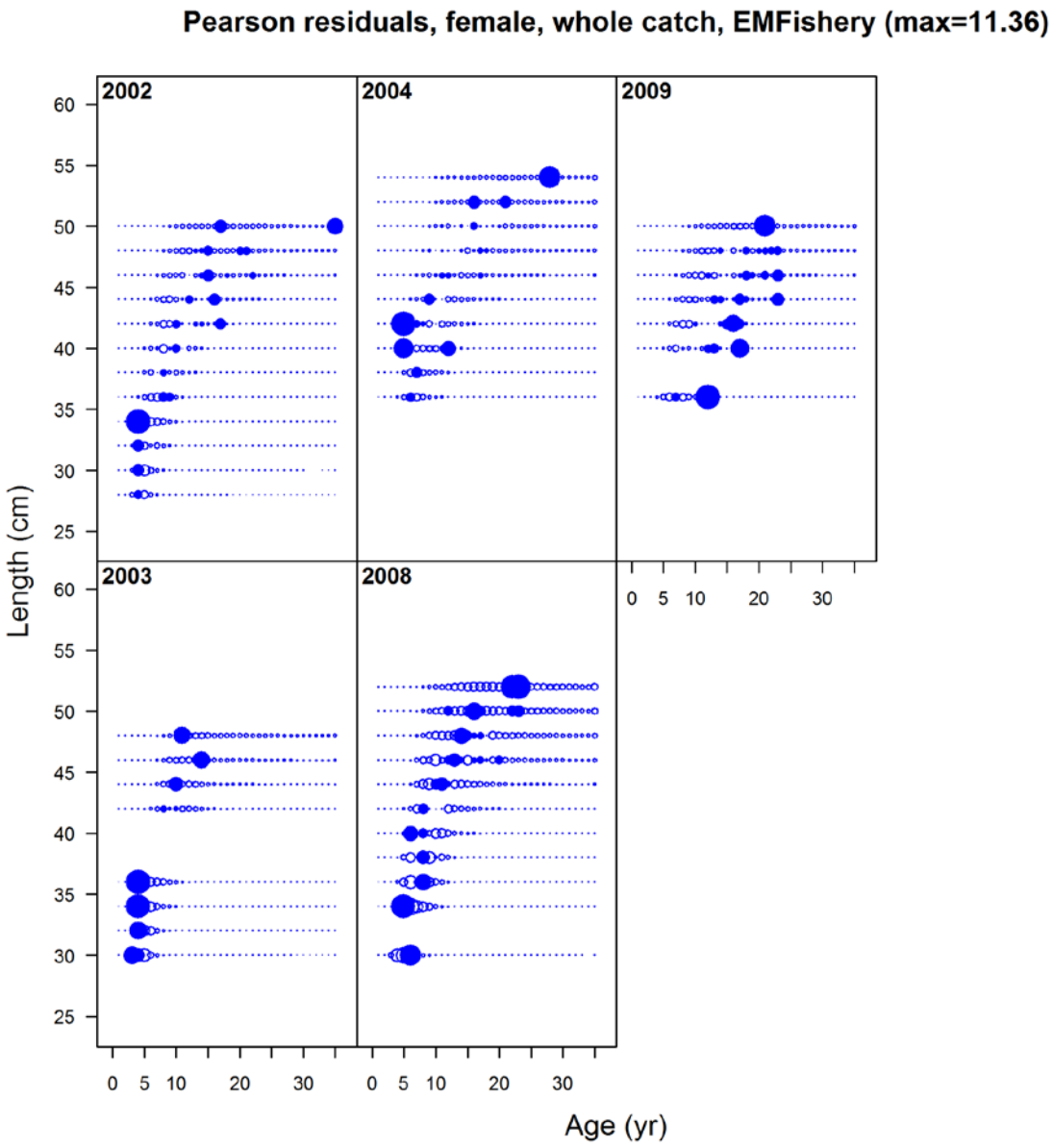

Figure 63d. Residuals for the fit to female age-at-length composition data from the California (EMFishery1) fishery from 2002 to 2009. Residuals are standardized differences of Pearson residuals (observed – estimated). Dark circles are positive residuals and open circles are negative residuals.

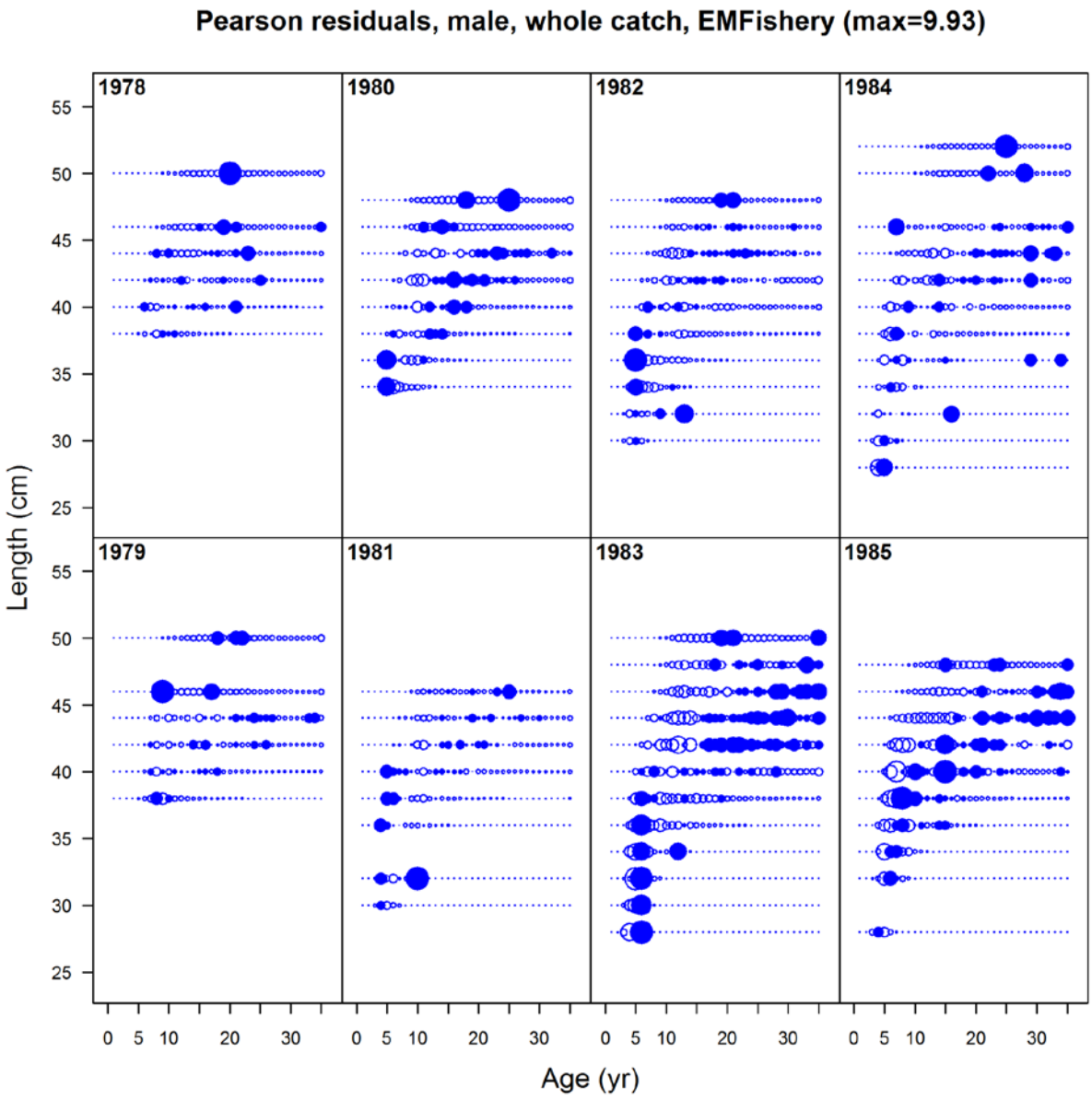

Figure 63e. Residuals for the fit to male age-at-length composition data from the California (EMFishery1) fishery from 1978 to 1985. Residuals are standardized differences of Pearson residuals (observed – estimated). Dark circles are positive residuals and open circles are negative residuals.

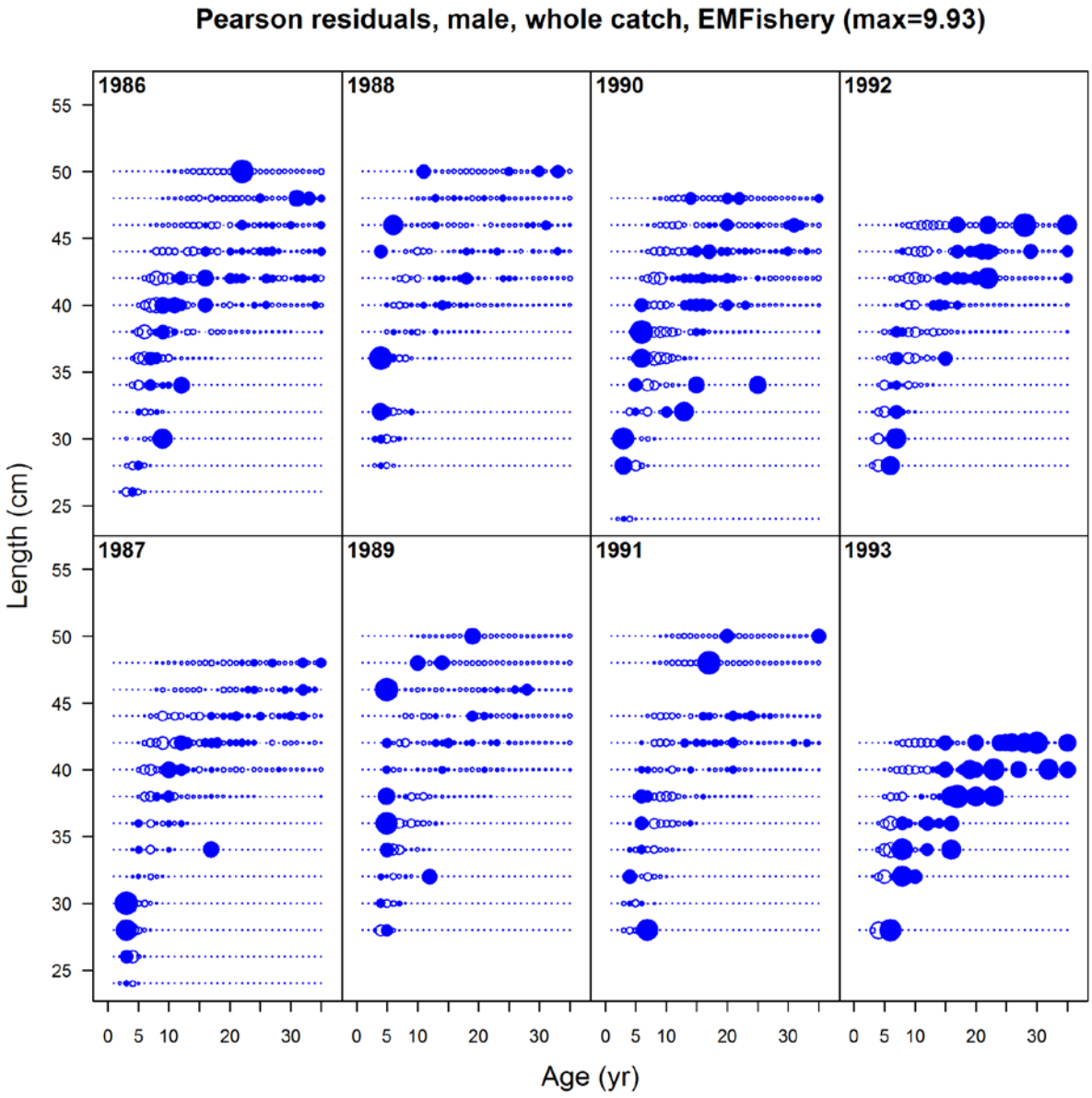

Figure 63f. Residuals for the fit to female age-at-length composition data from the California (EMFishery1) fishery from 1986 to 1993. Residuals are standardized differences of Pearson residuals (observed – estimated). Dark circles are positive residuals and open circles are negative residuals.

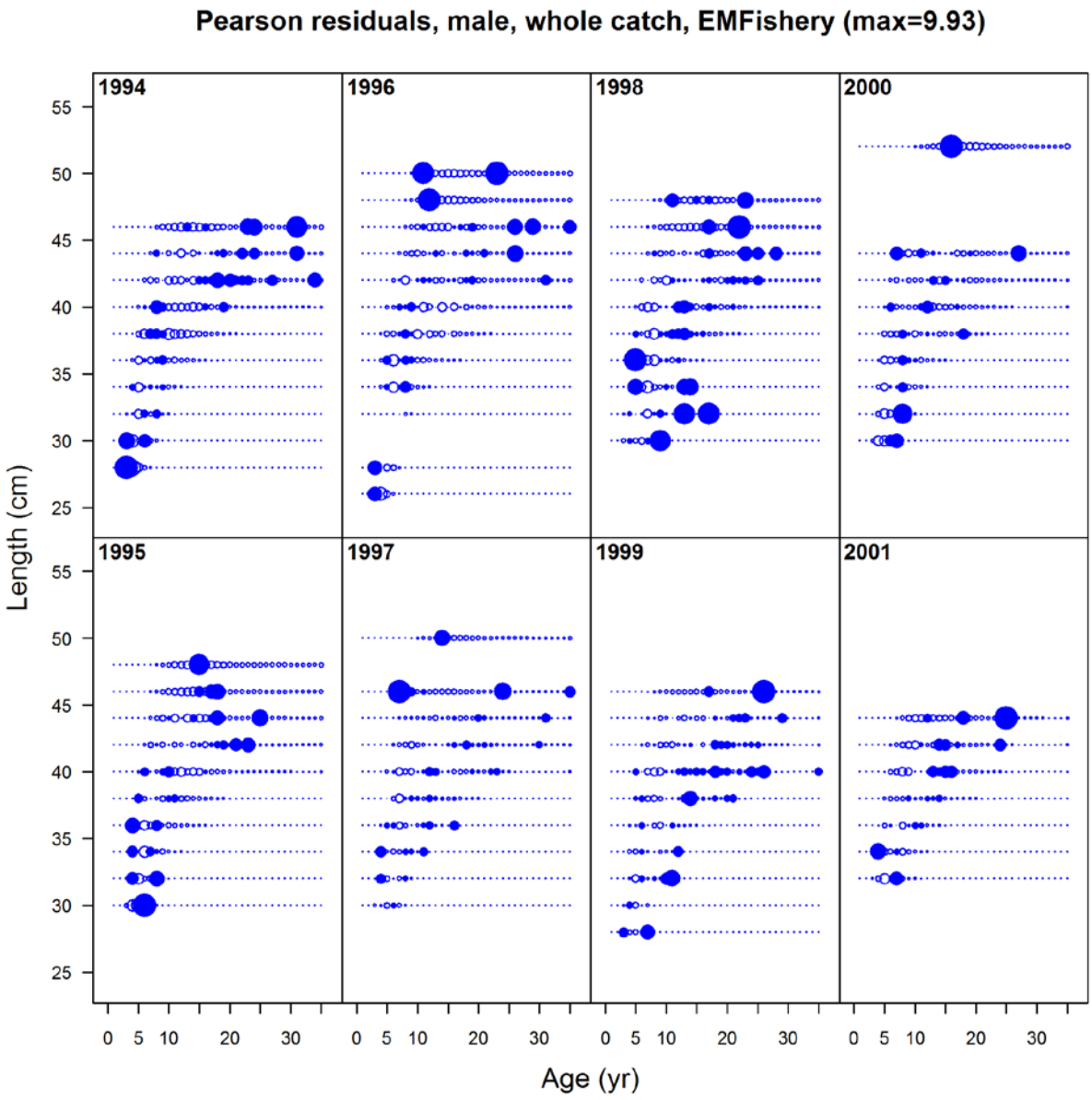

Figure 63g. Residuals for the fit to female age-at-length composition data from the California (EMFishery1) fishery from 1994 to 2001. Residuals are standardized differences of Pearson residuals (observed – estimated). Dark circles are positive residuals and open circles are negative residuals.

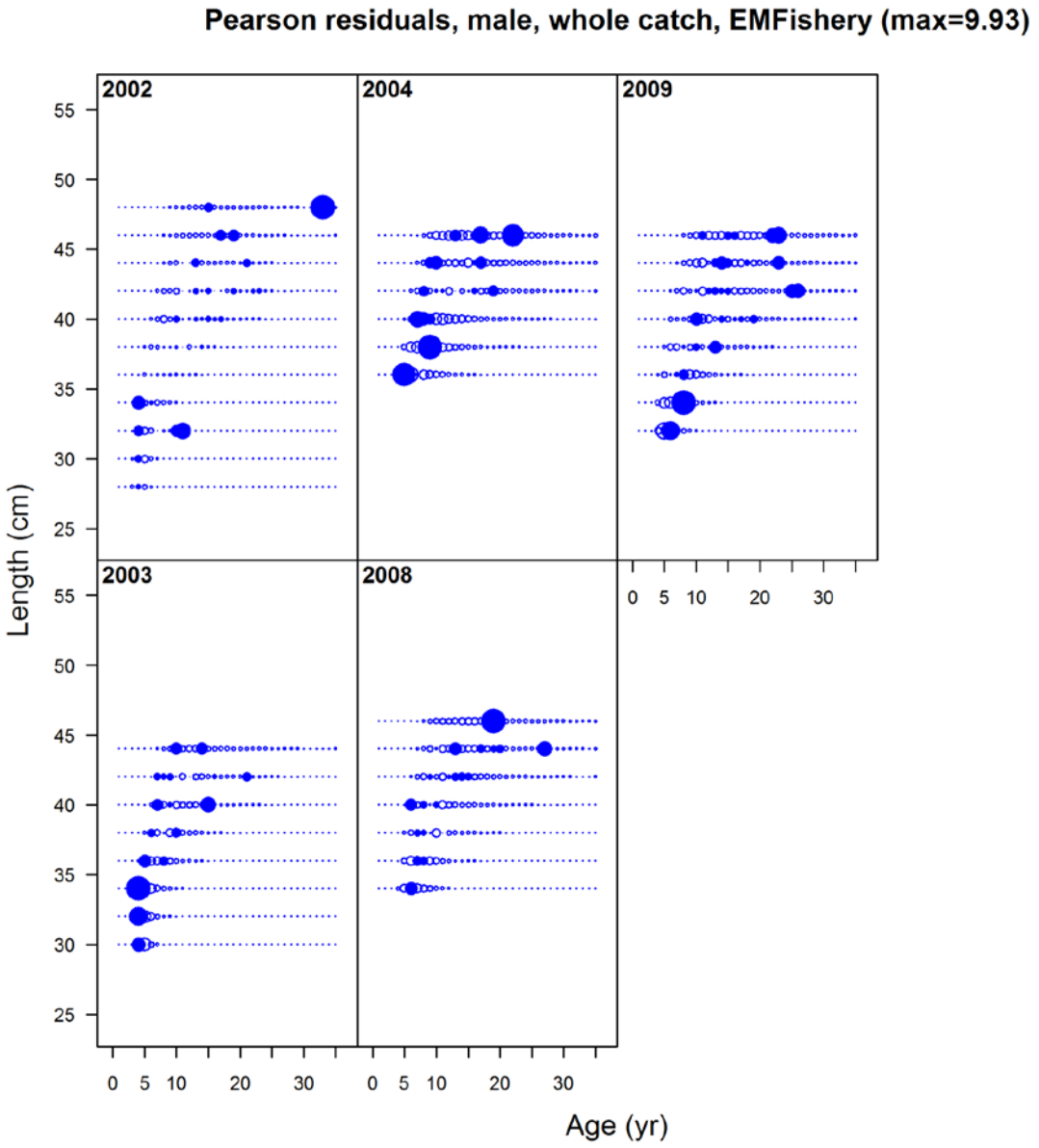

Figure 63h. Residuals for the fit to female age-at-length composition data from the California (EMFishery1) fishery from 2002 to 2009. Residuals are standardized differences of Pearson residuals (observed – estimated). Dark circles are positive residuals and open circles are negative residuals.

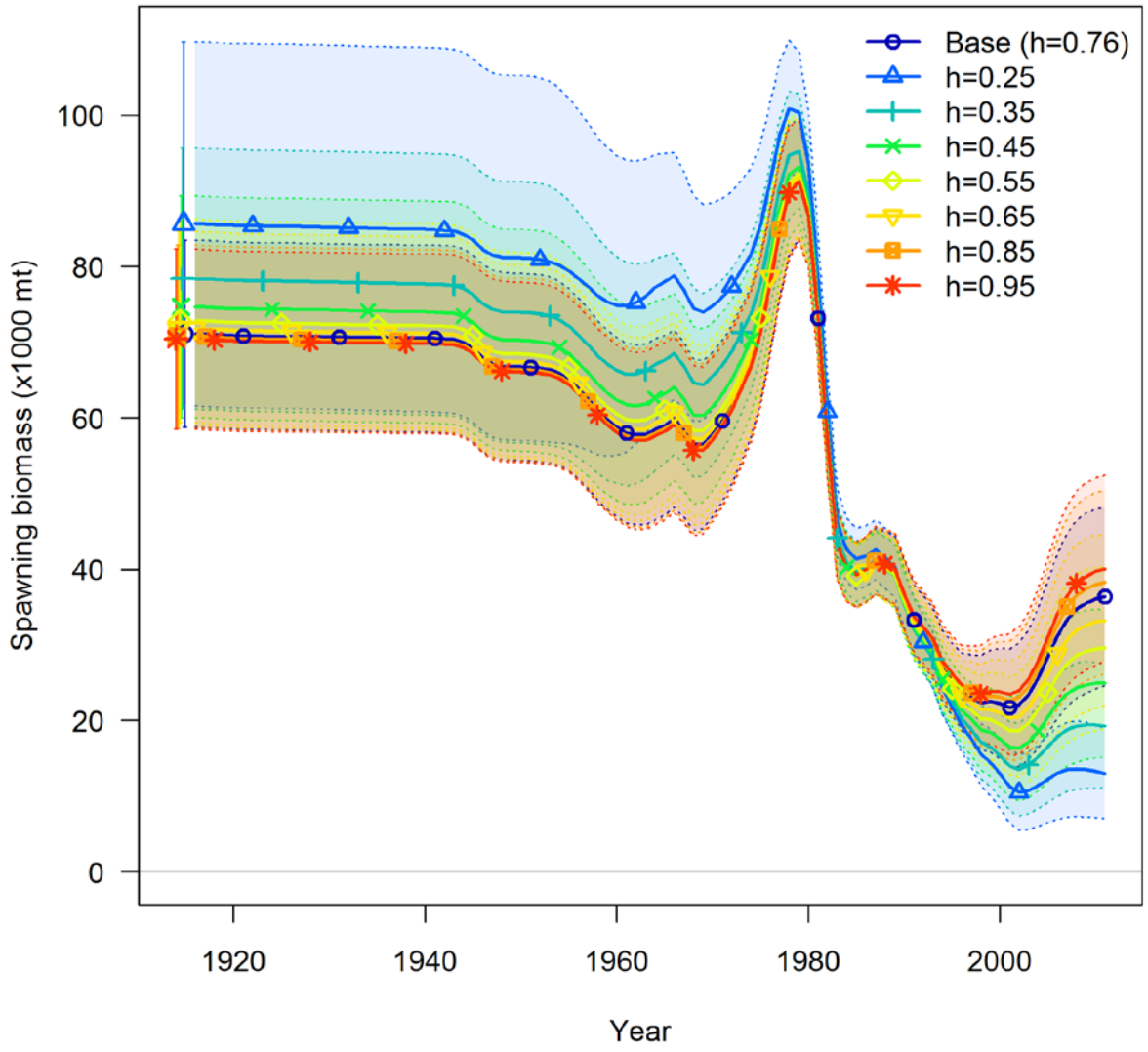

Figure 64. Comparisons of time series of spawning outputs with 95% asymptotic intervals from the sensitivity analysis on steepness (*h)* while estimating natural mortality (*M).* The results from the base model is also included for comparisons.

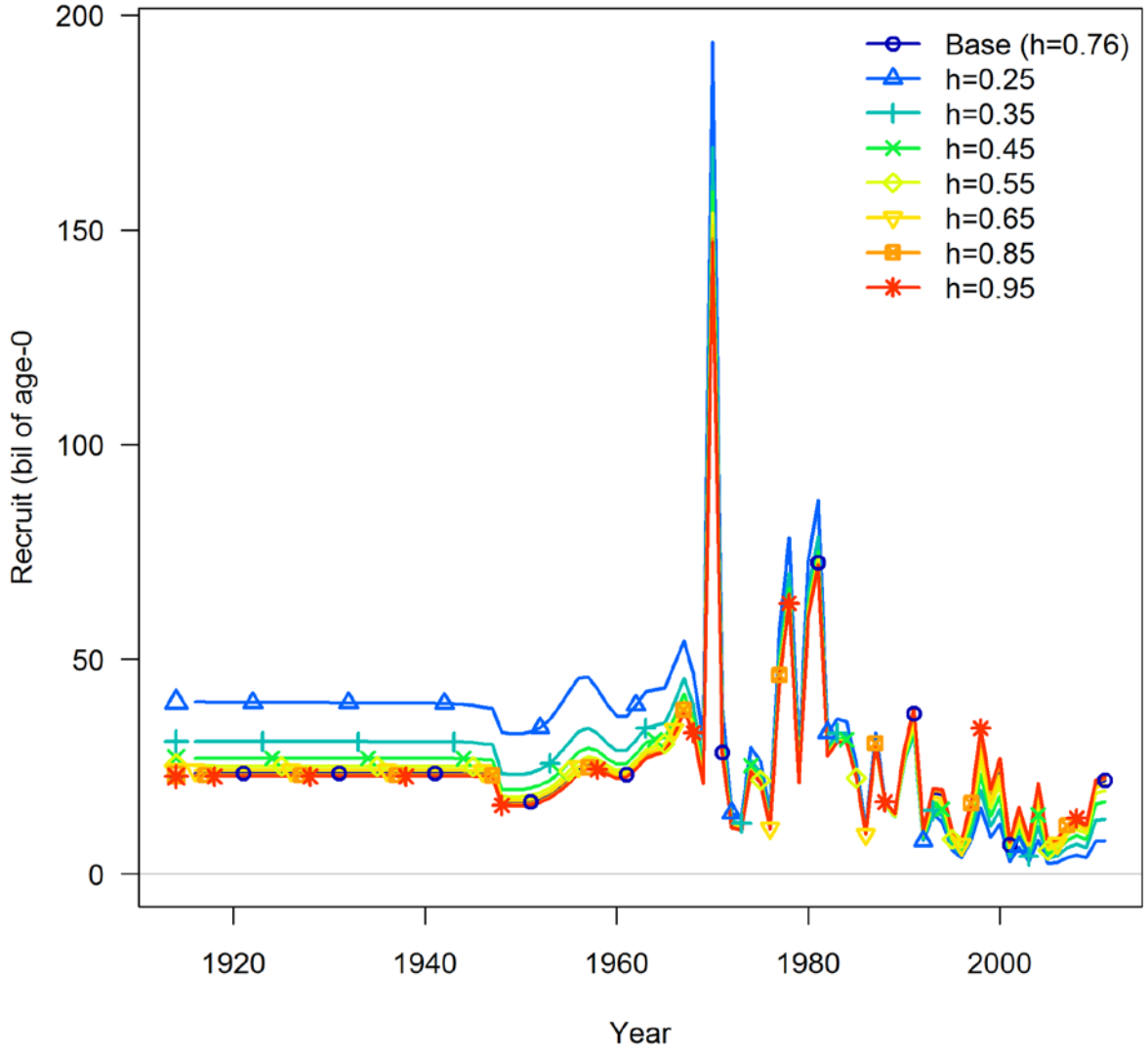

Figure 65. Comparisons of time series of recruits from the sensitivity analysis on steepness (*h*) while estimating natural mortality (*M*). The results from the base model is also included for comparisons.

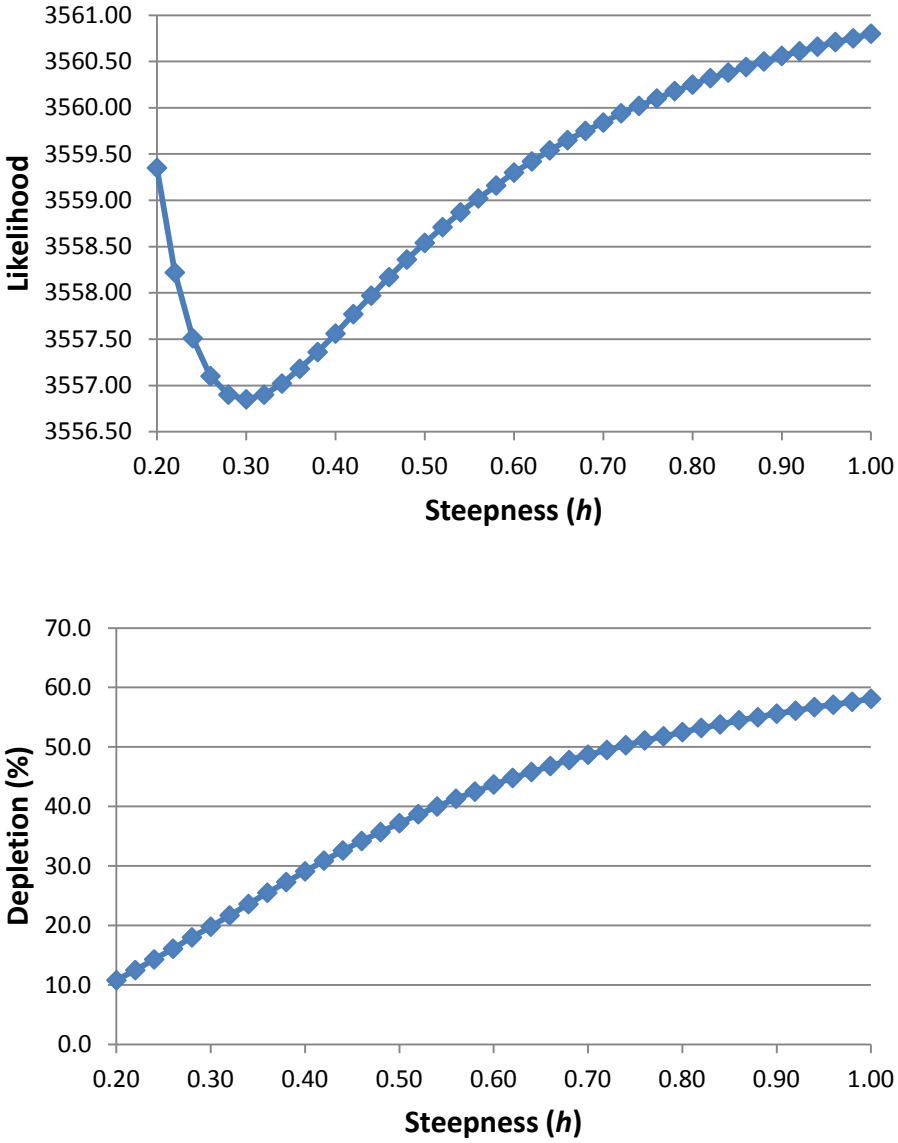

Figure 65b. Plots of likelihood profile for steepness (*h*, at interval of 0.02) (upper panel) and 2011 depletion levels (bottom panel) from the sensitivity analysis on steepness while estimating natural mortality (*M*).

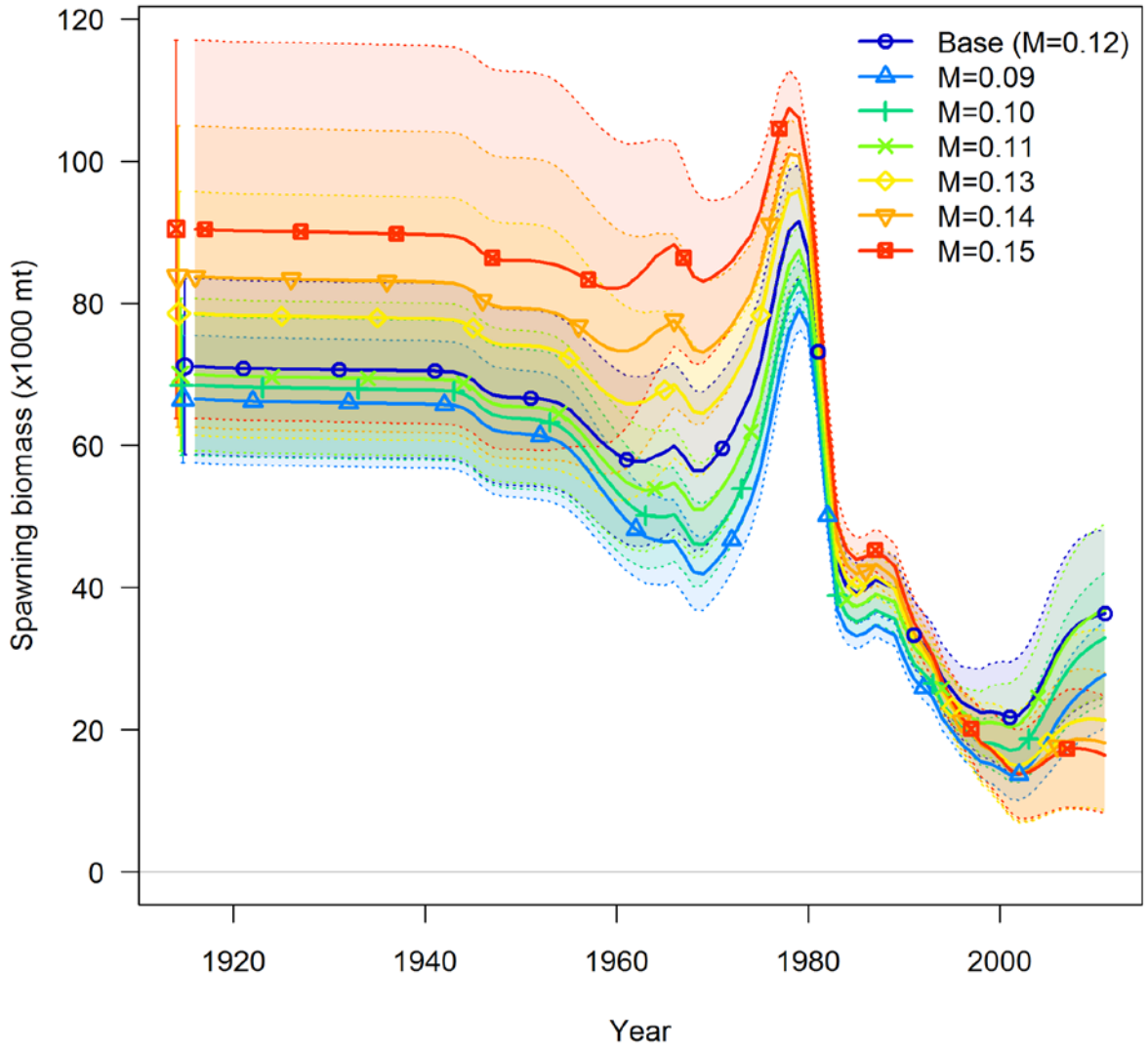

Figure 66. Comparisons of time series of spawning outputs with 95% asymptotic intervals from the sensitivity analysis on natural mortality (*M)* while estimating *h*. The results from the base model is also included for comparisons.

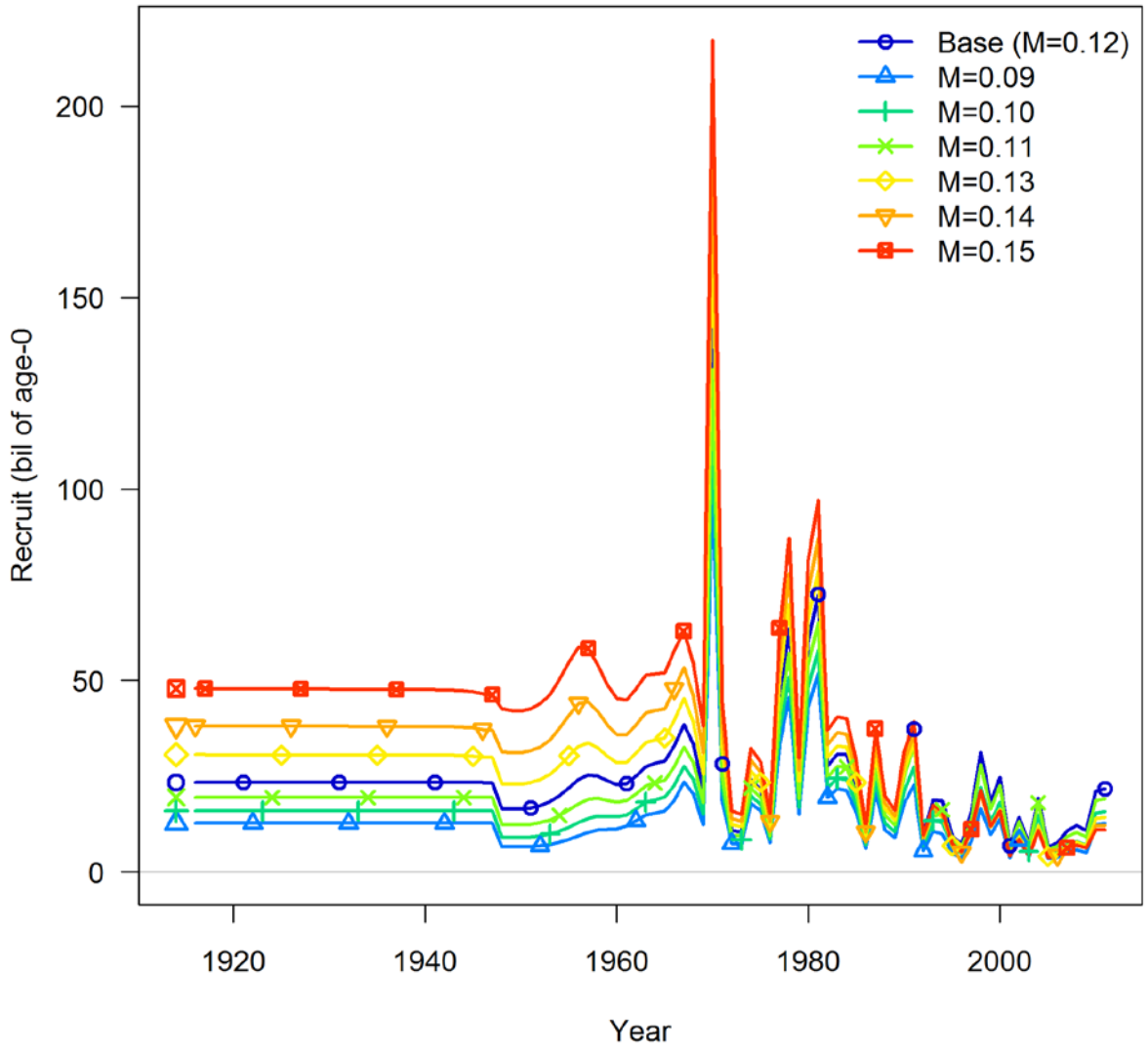

Figure 67. Comparisons of time series of recruits from the sensitivity analysis on natural morality (*M*) while estimating *h*. The results from the base model is also included for comparisons.

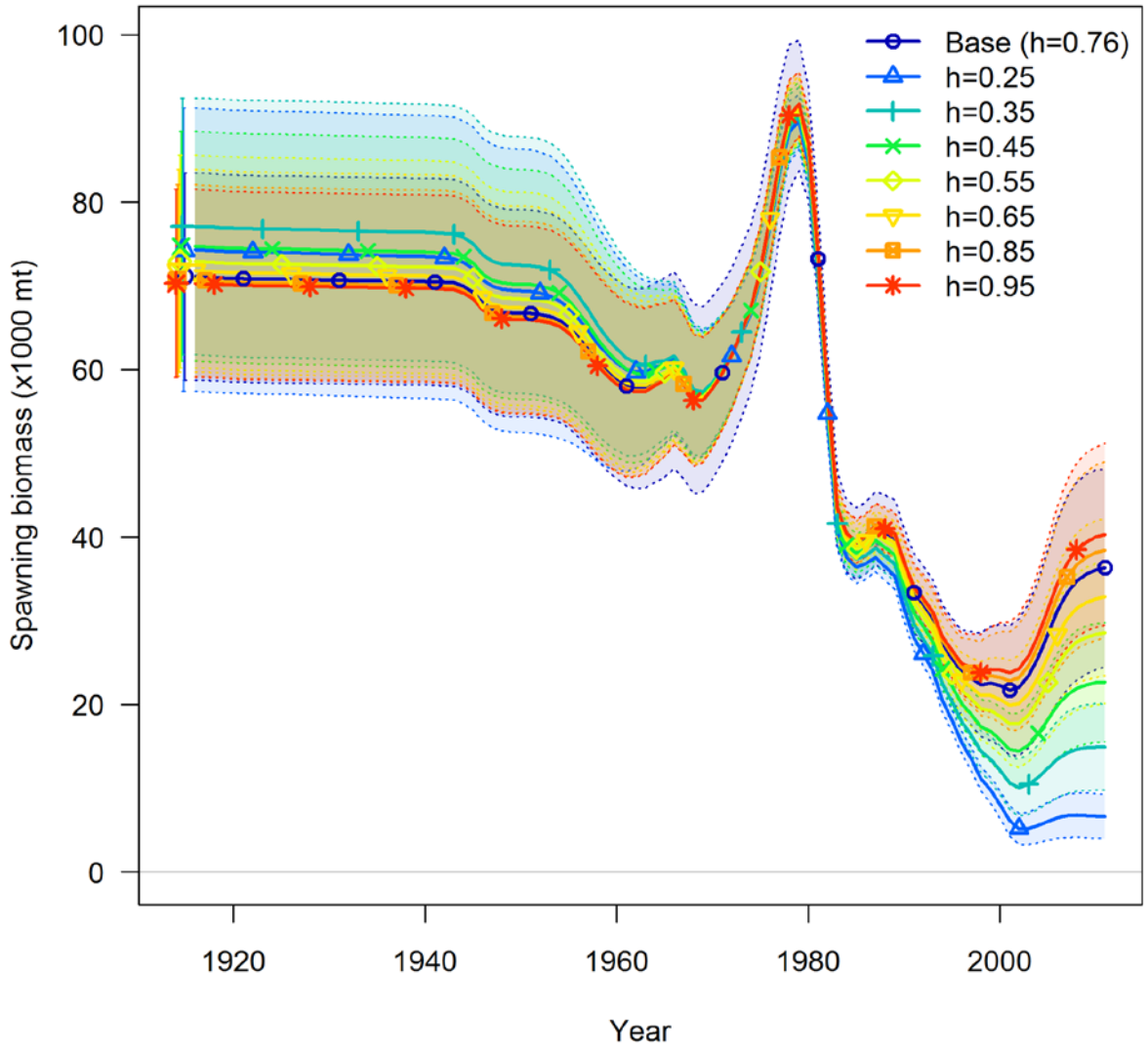

Figure 68. Comparisons of time series of spawning outputs with 95% asymptotic intervals from the sensitivity analysis on steepness (h) with M fixed at the base model value (M_{female}=0.1198, M_{male}=0.1294). The results from the base model is also included for comparisons.

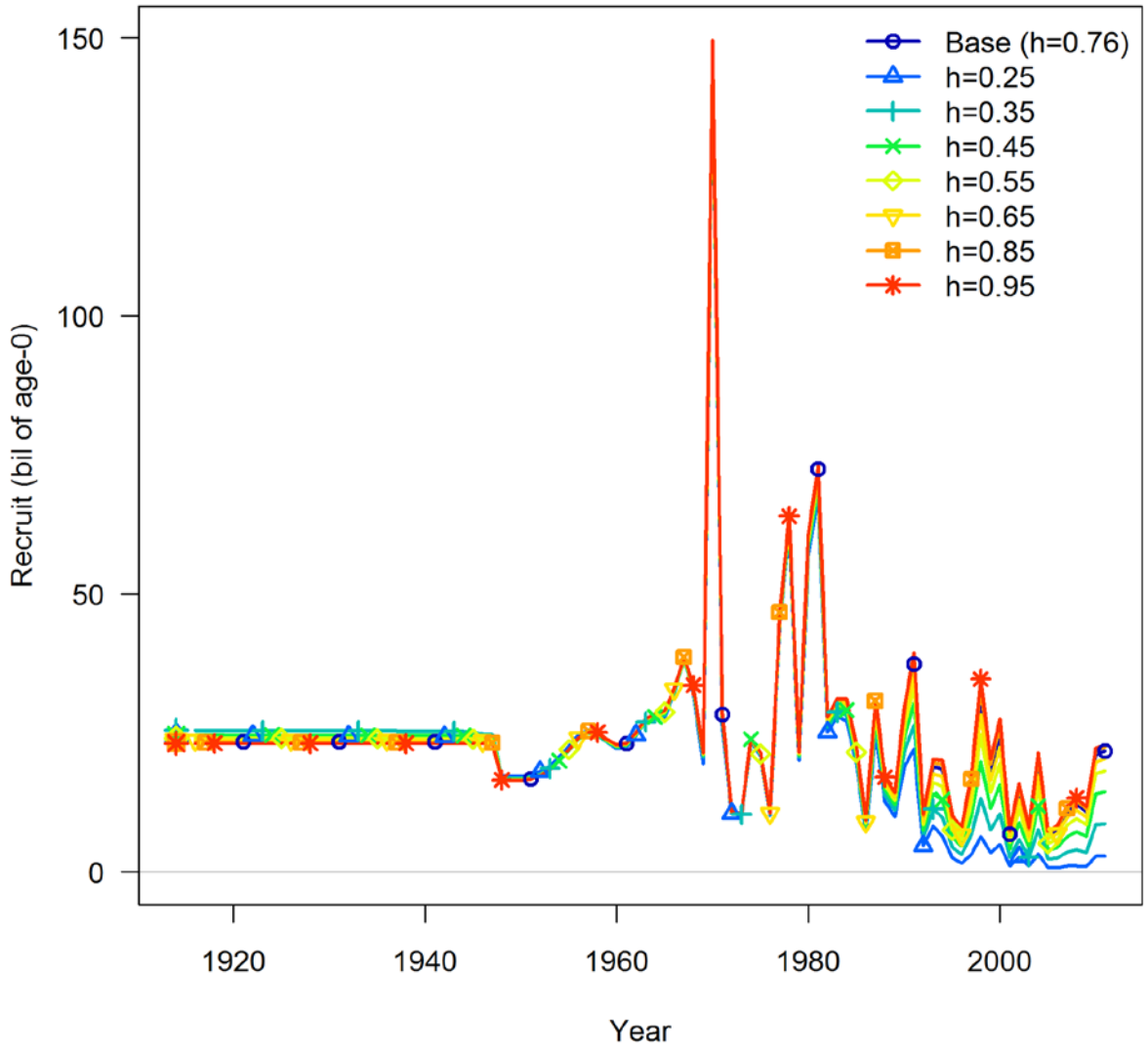

Figure 69. Comparisons of time series of recruits from the sensitivity analysis on steepness (h) with M fixed at the base model values (M_{female}=0.1198, M_{male}=0.1294). The results from the base model is also included for comparisons.

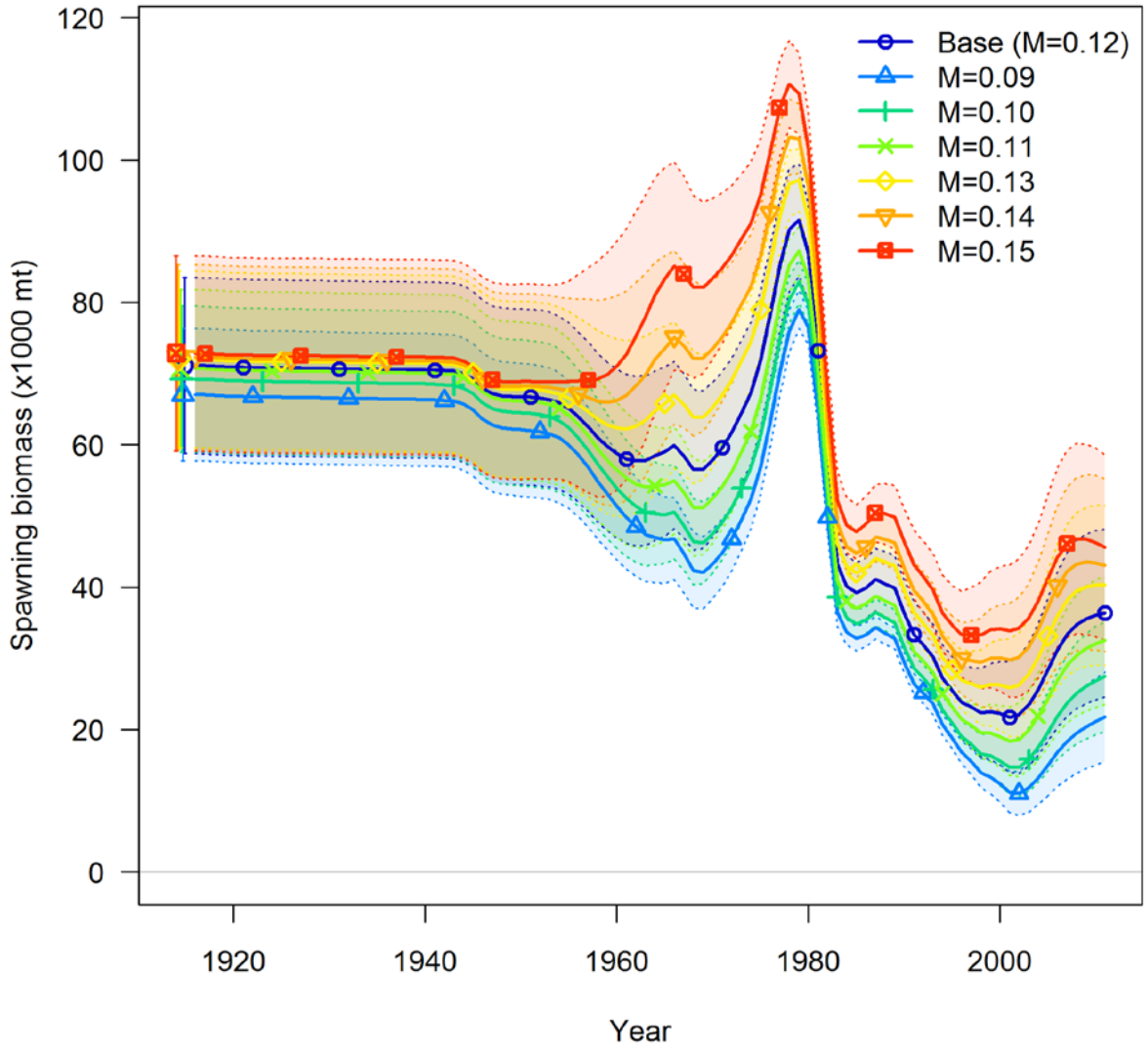

Figure 70. Comparisons of time series of spawning outputs with 95% asymptotic intervals from the sensitivity analysis on natural mortality (*M)* with *h* fixed at the base model value (*h*=0.76). The results from the base model is also included for comparisons.

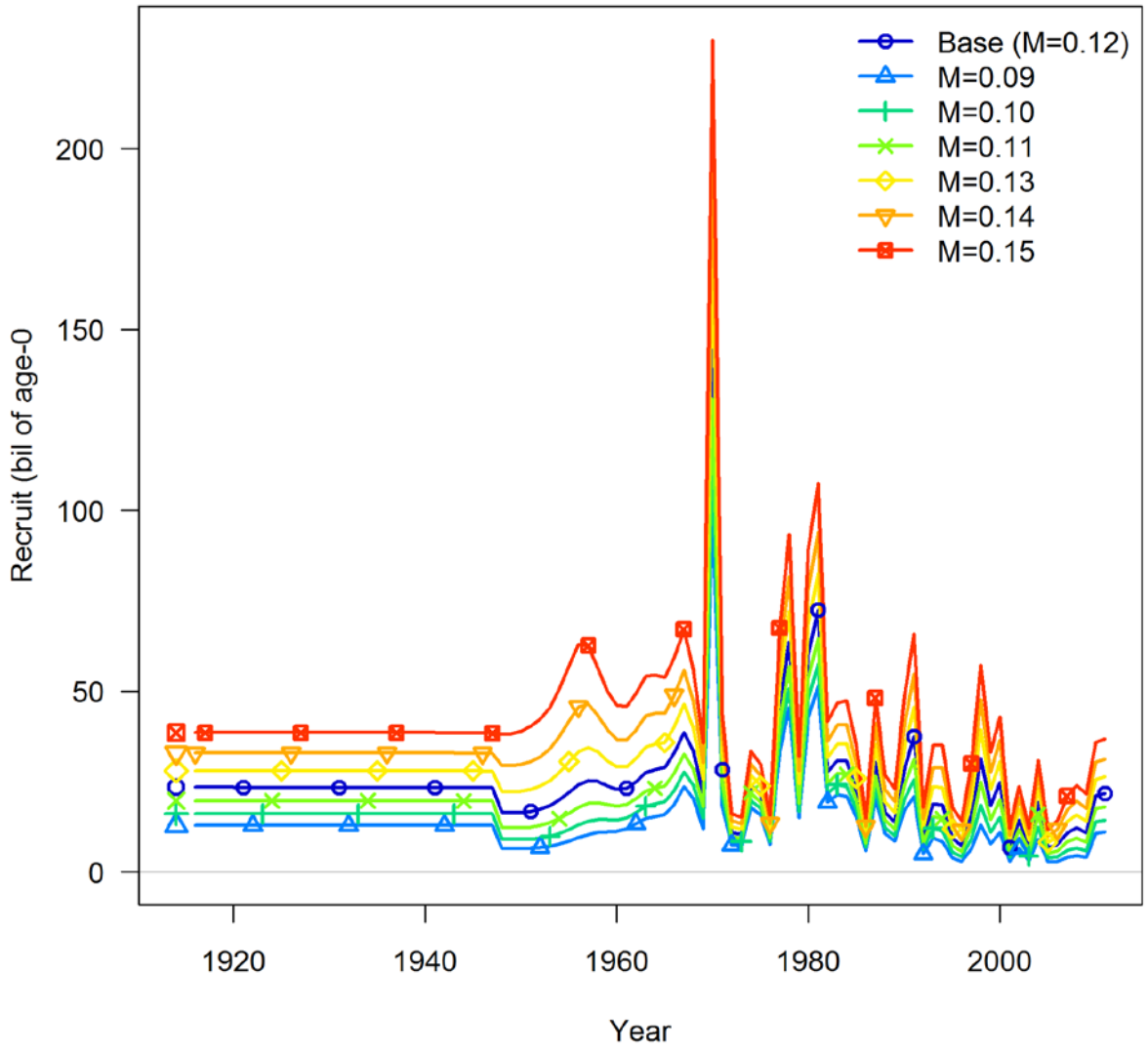

Figure 71. Comparisons of time series of recruits from the sensitivity analysis on natural mortality (*M*) with *h* fixed at the base model value (*h*=0.76). The results from the base model is also included for comparisons.

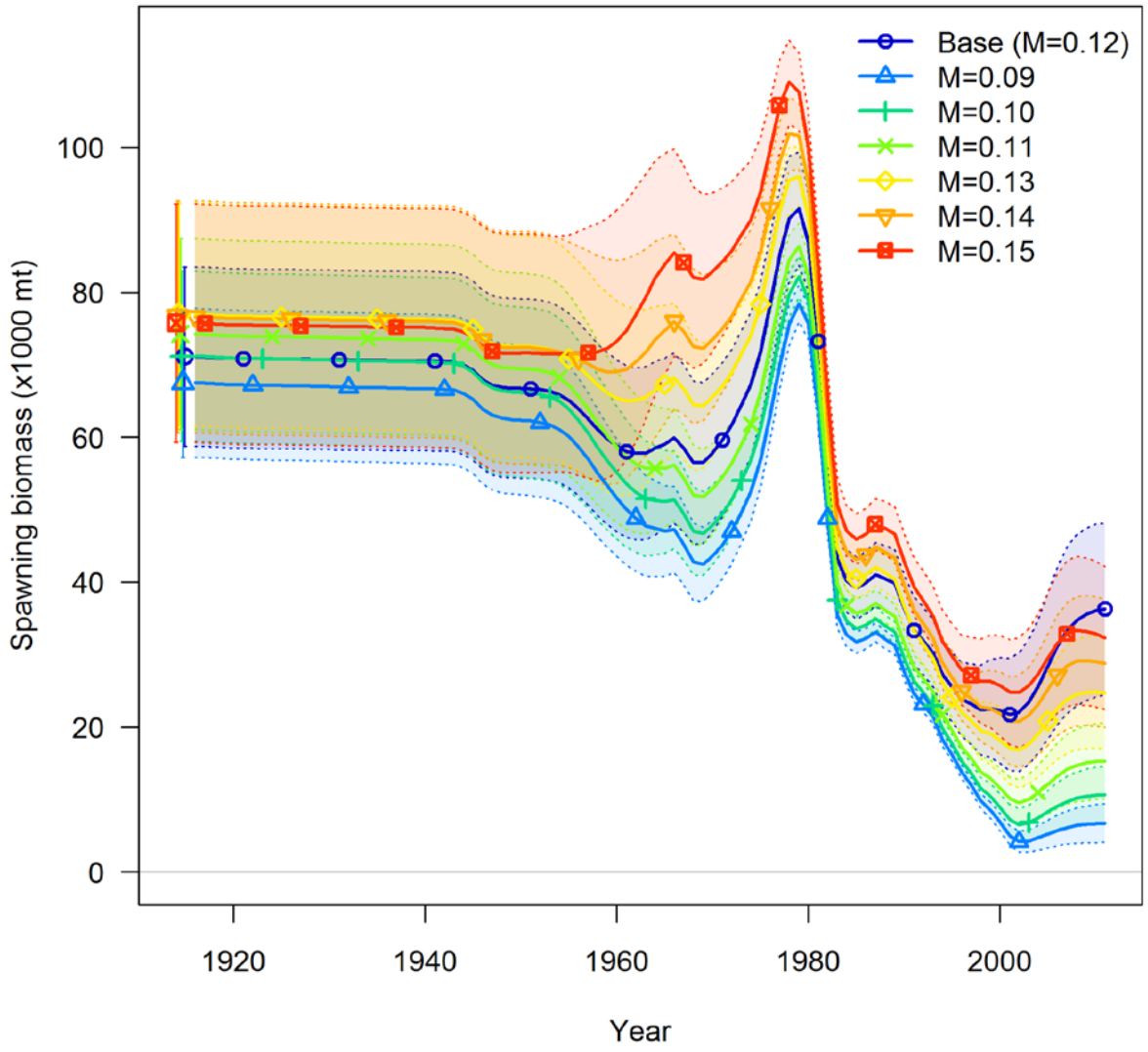

Figure 72. Comparisons of time series of spawning outputs with 95% asymptotic intervals from the sensitivity analysis on natural mortality (*M)* with *h* fixed at 0.41. The results from the base model is also included for comparisons.

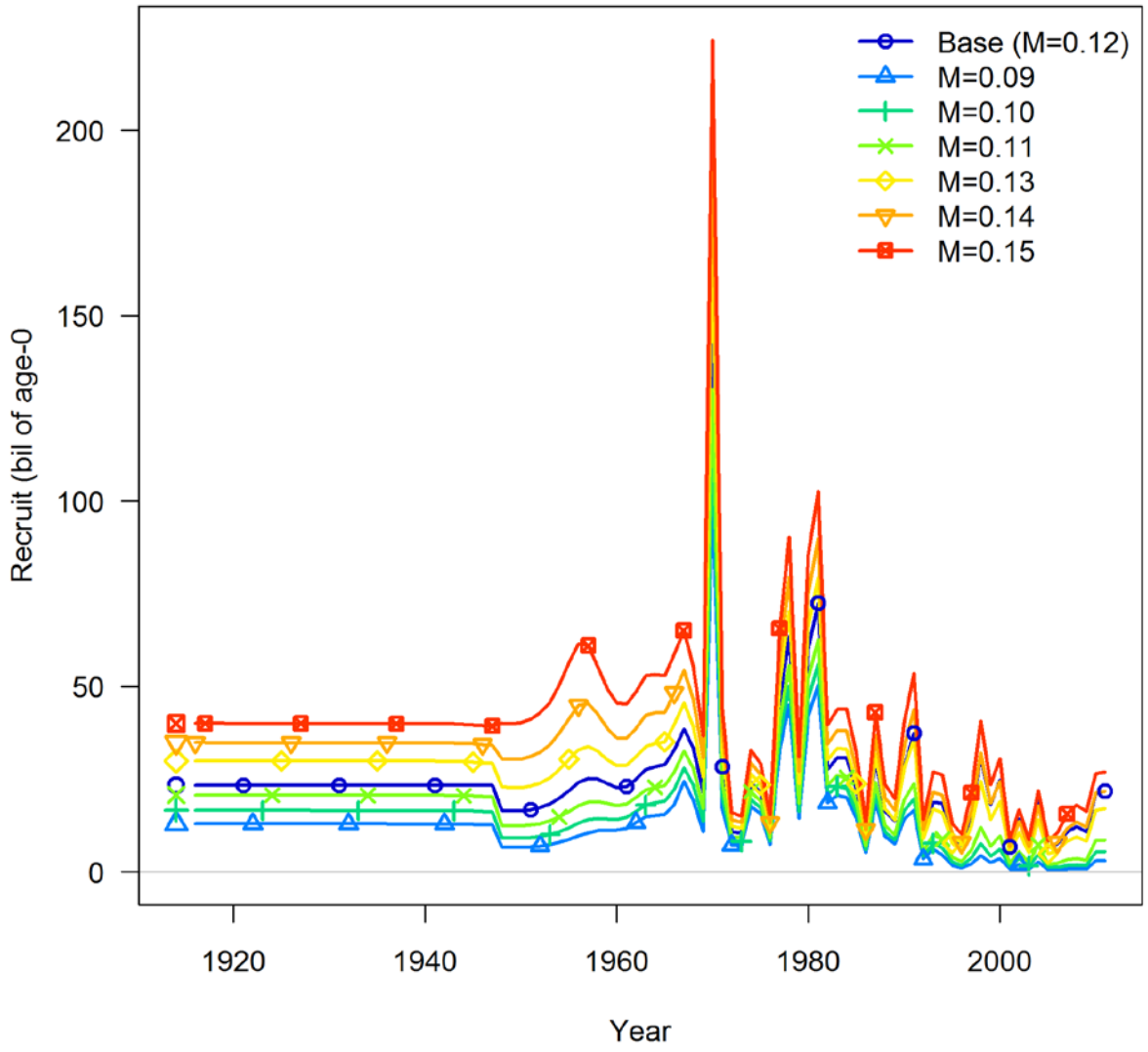

Figure 73. Comparisons of time series of recruits from the sensitivity analysis on natural mortality (*M*) with *h* fixed at 0.41. The results from the base model is also included for comparisons.

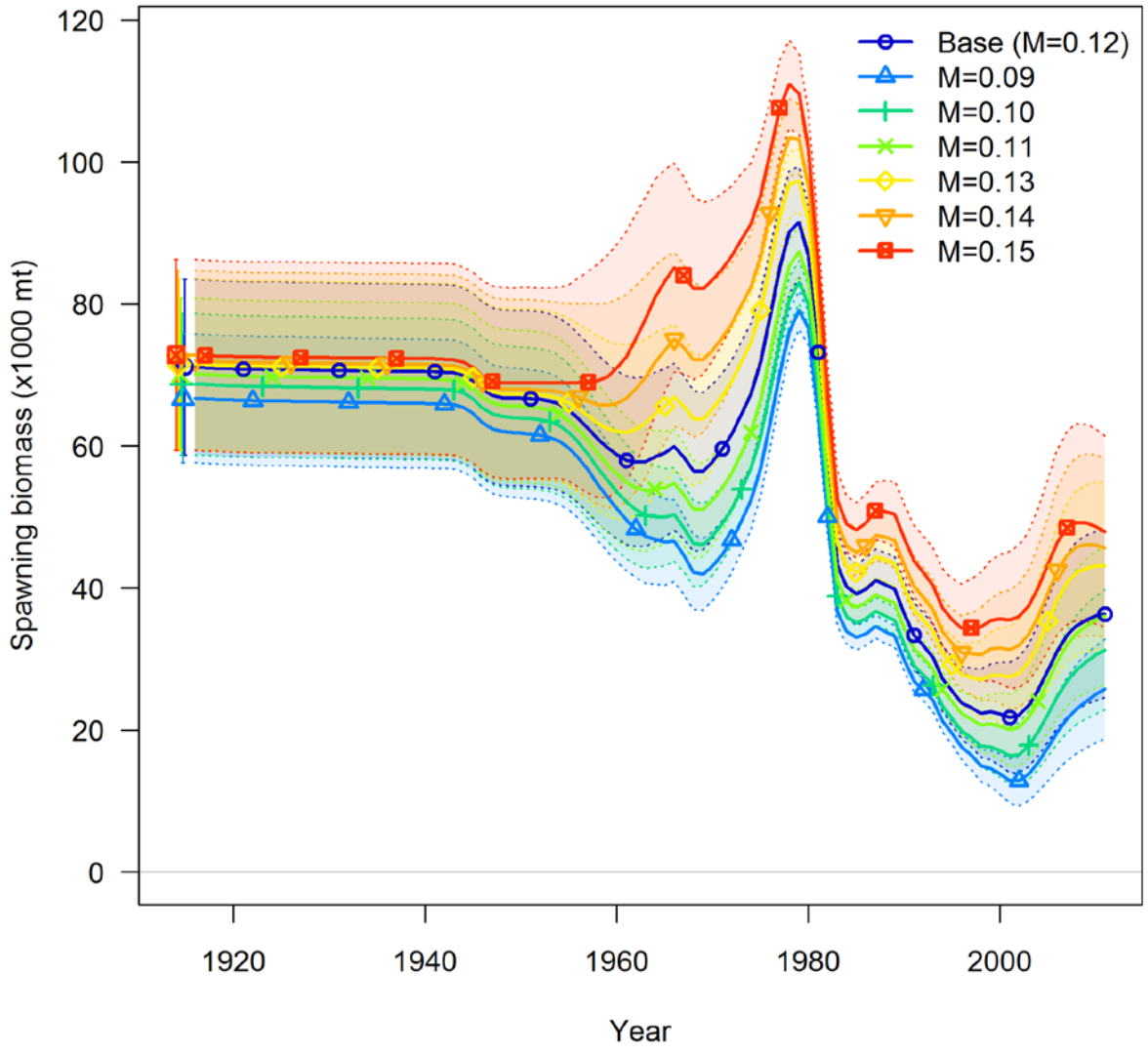

Figure 74. Comparisons of time series of spawning outputs with 95% asymptotic intervals from the sensitivity analysis on natural mortality (*M)* with *h* fixed at 0.9. The results from the base model is also included for comparisons.

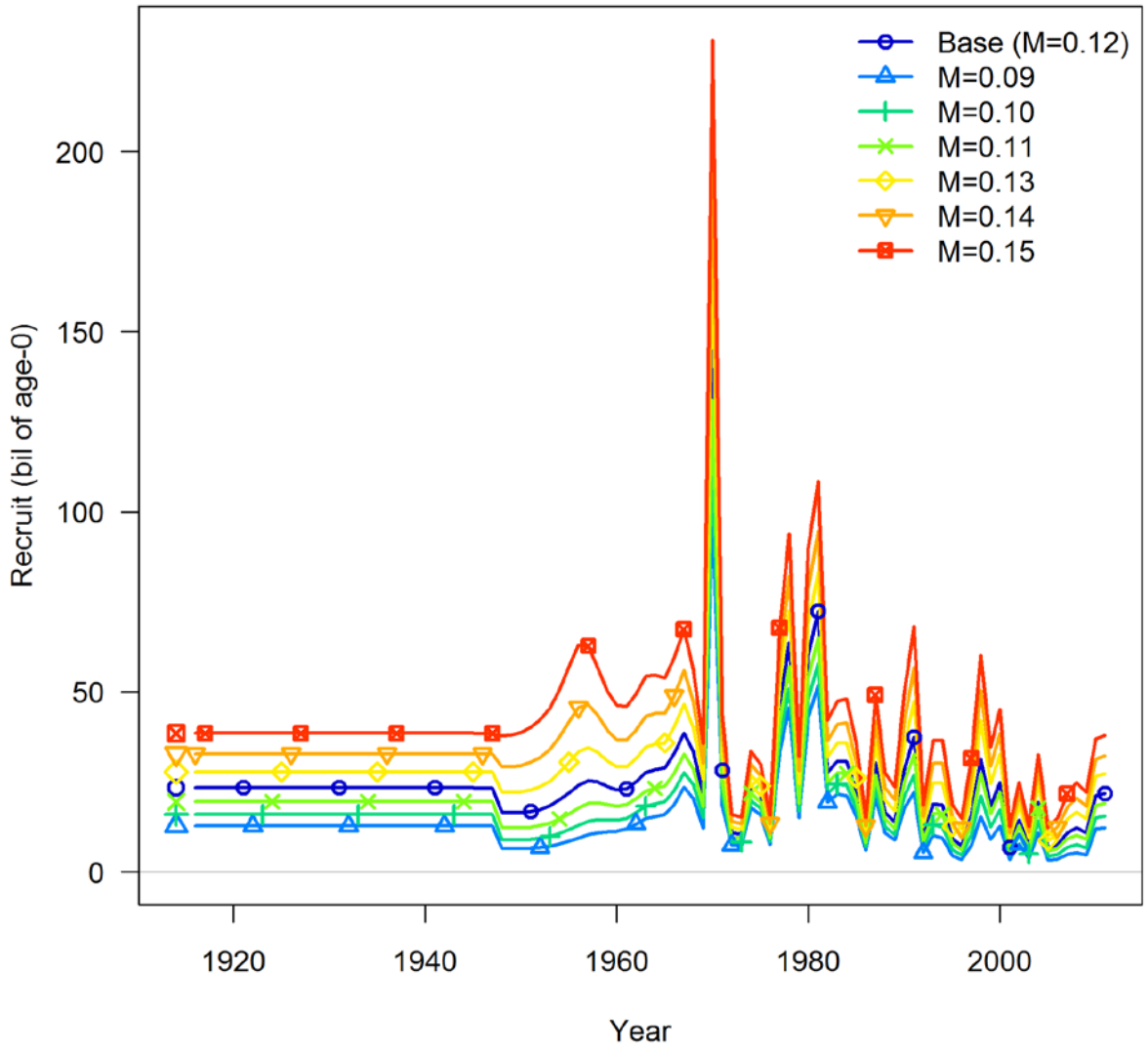

Figure 75. Comparisons of time series of recruits from the sensitivity analysis on natural mortality (*M*) with *h* fixed at 0.9. The results from the base model is also included for comparisons.

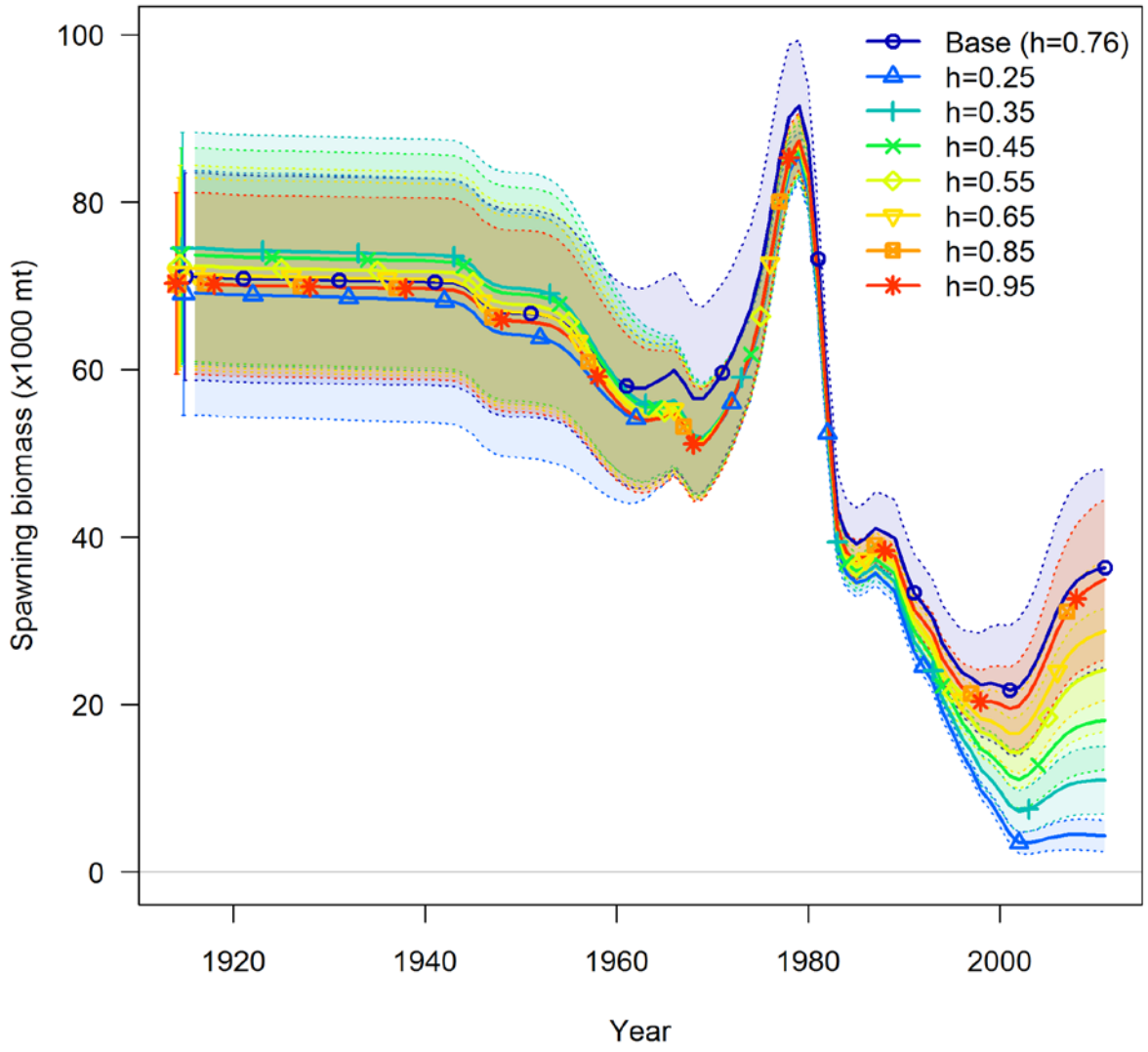

Figure 76. Comparisons of time series of spawning outputs with 95% asymptotic intervals from the sensitivity analysis on steepness (*h)* with *M* fixed at M_{female}=0.11 and M_{male}=0.12. The results from the base model is also included for comparisons.

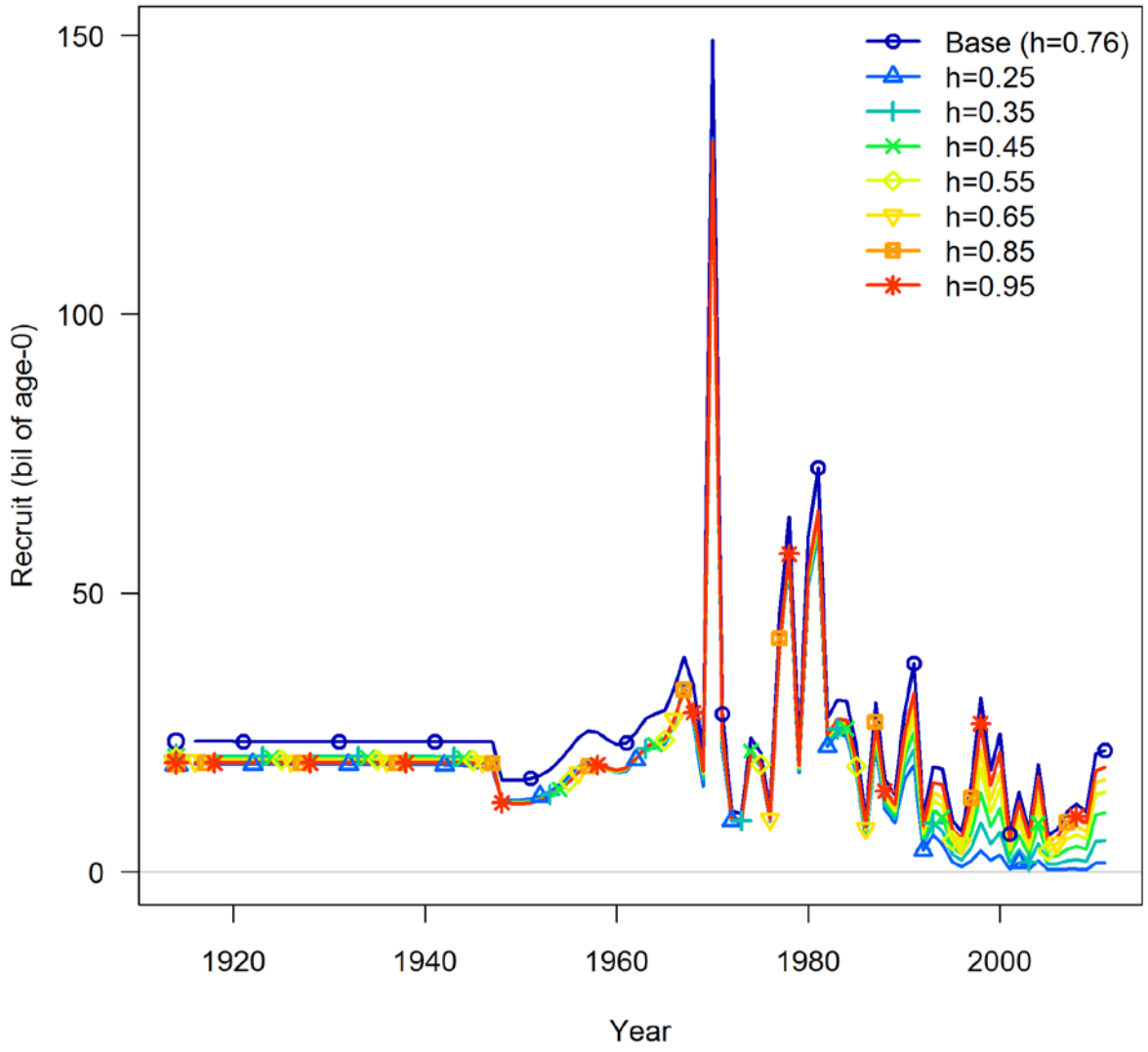

Figure 77. Comparisons of time series of recruits from the sensitivity analysis on steepness (*h)* with *M* fixed at M_{female}=0.11 and M_{male}=0.12. The results from the base model is also included for comparisons.

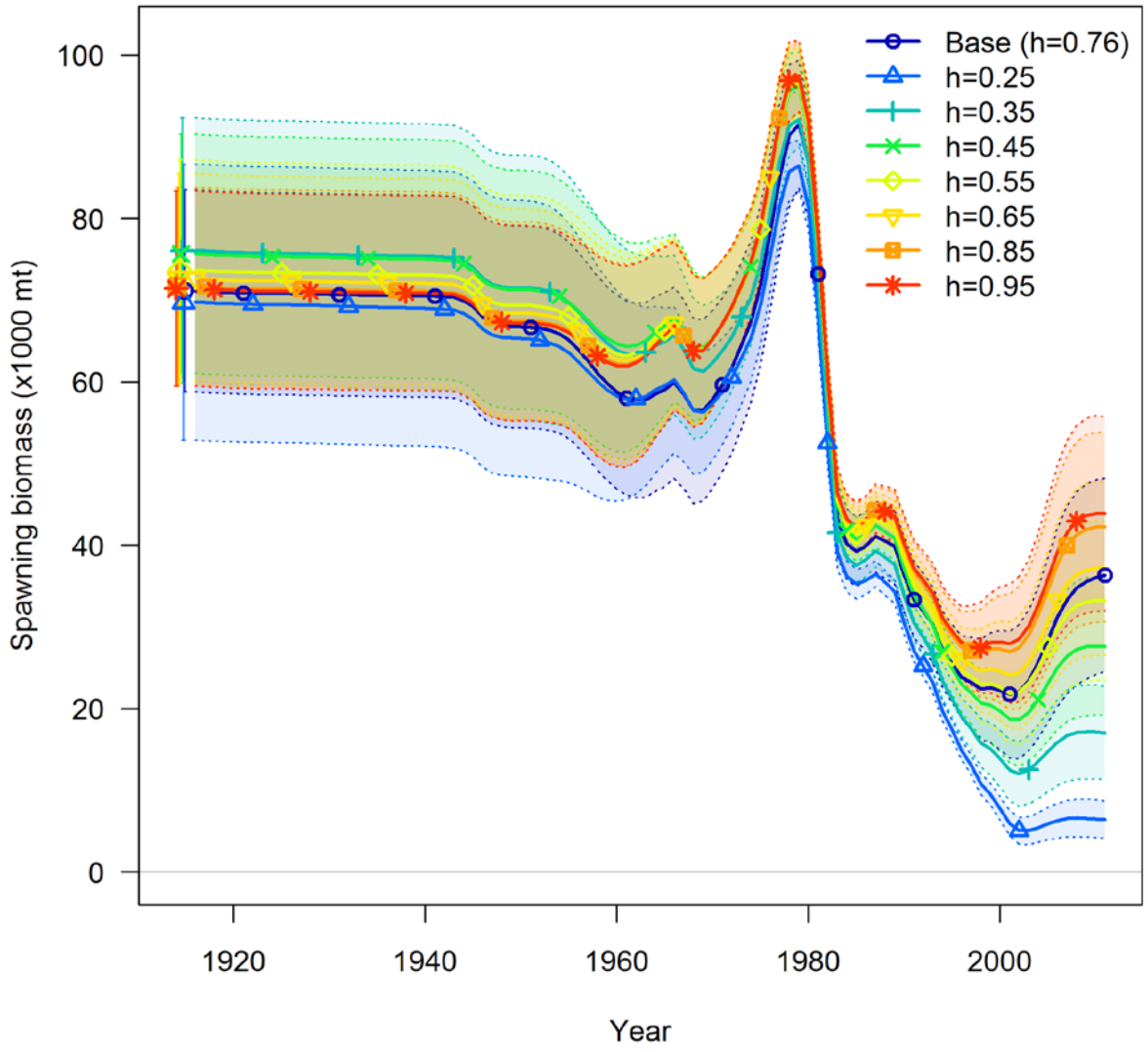

Figure 78. Comparisons of time series of spawning outputs with 95% asymptotic intervals from the sensitivity analysis on steepness (*h)* with *M* fixed at M_{female}=0.13 and M_{male}=0.14. The results from the base model is also included for comparisons.

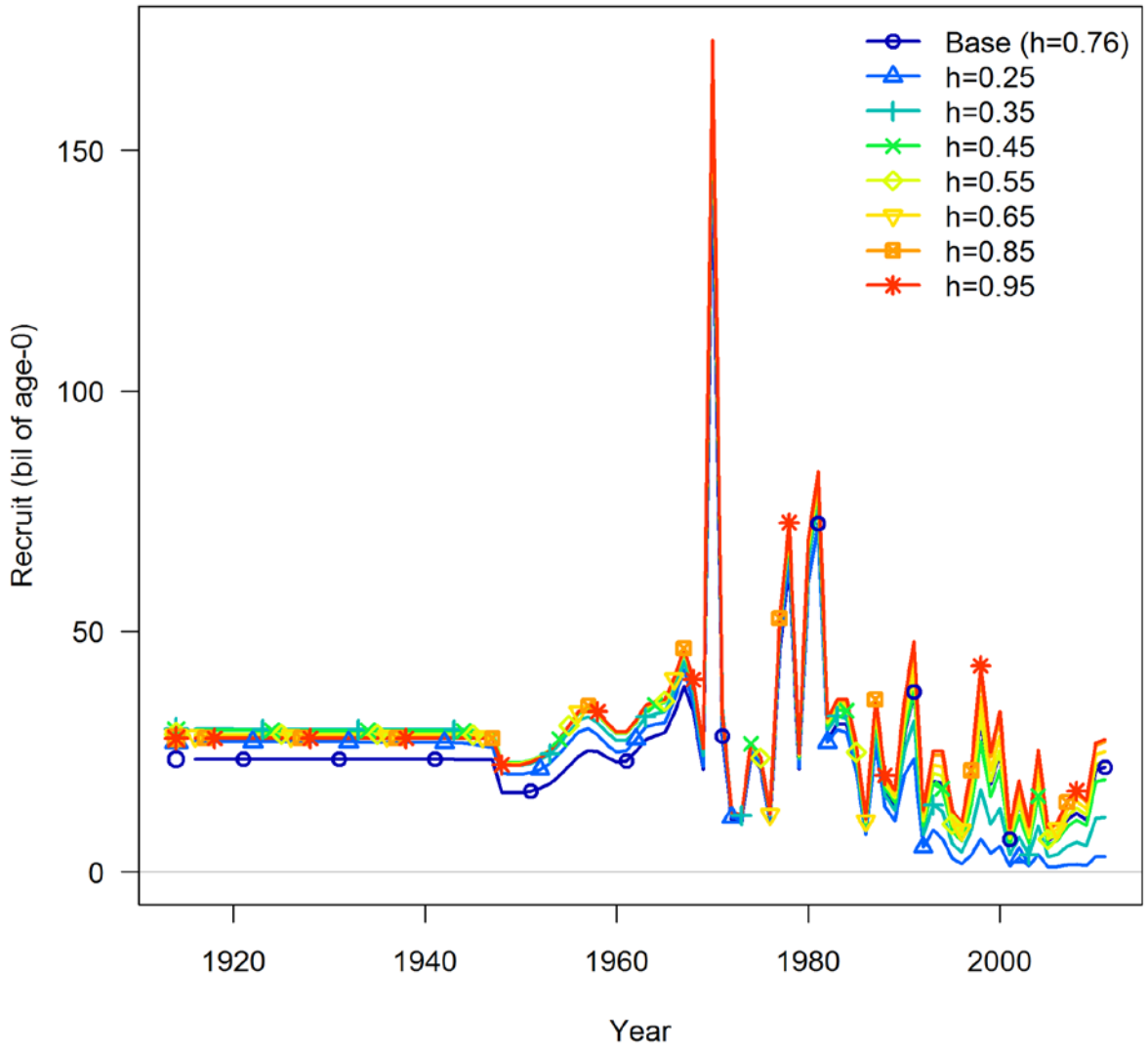

Figure 79. Comparisons of time series of recruits from the sensitivity analysis on steepness (*h)* with *M* fixed at M_{female}=0.13 and M_{male}=0.14. The results from the base model is also included for comparisons.

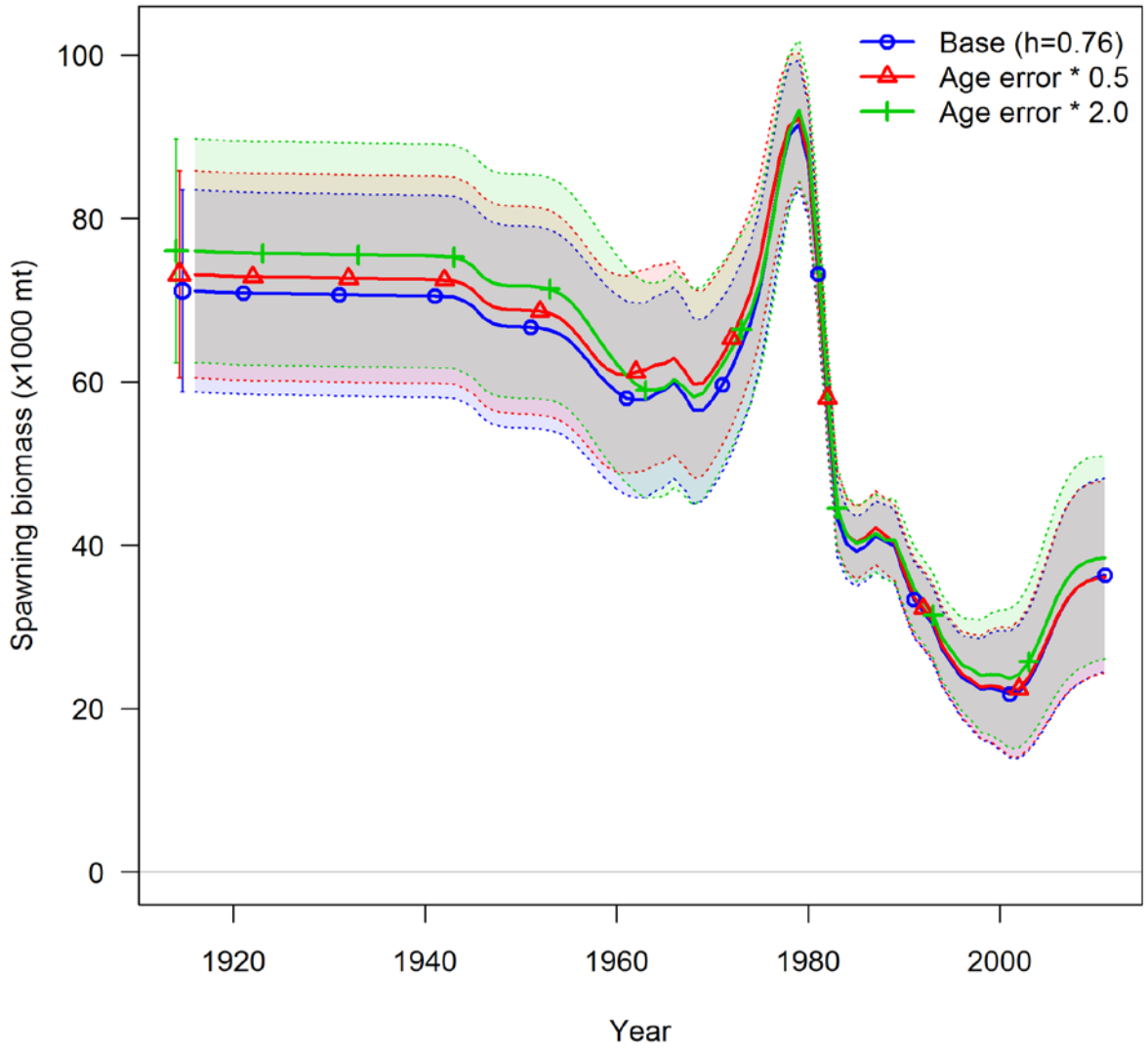

Figure 80. Comparisons of time series of spawning outputs with 95% asymptotic intervals from the sensitivity analysis on ageing error (age errors * 0.5 and 2.0, respectively). The results from the base model is also included for comparisons.

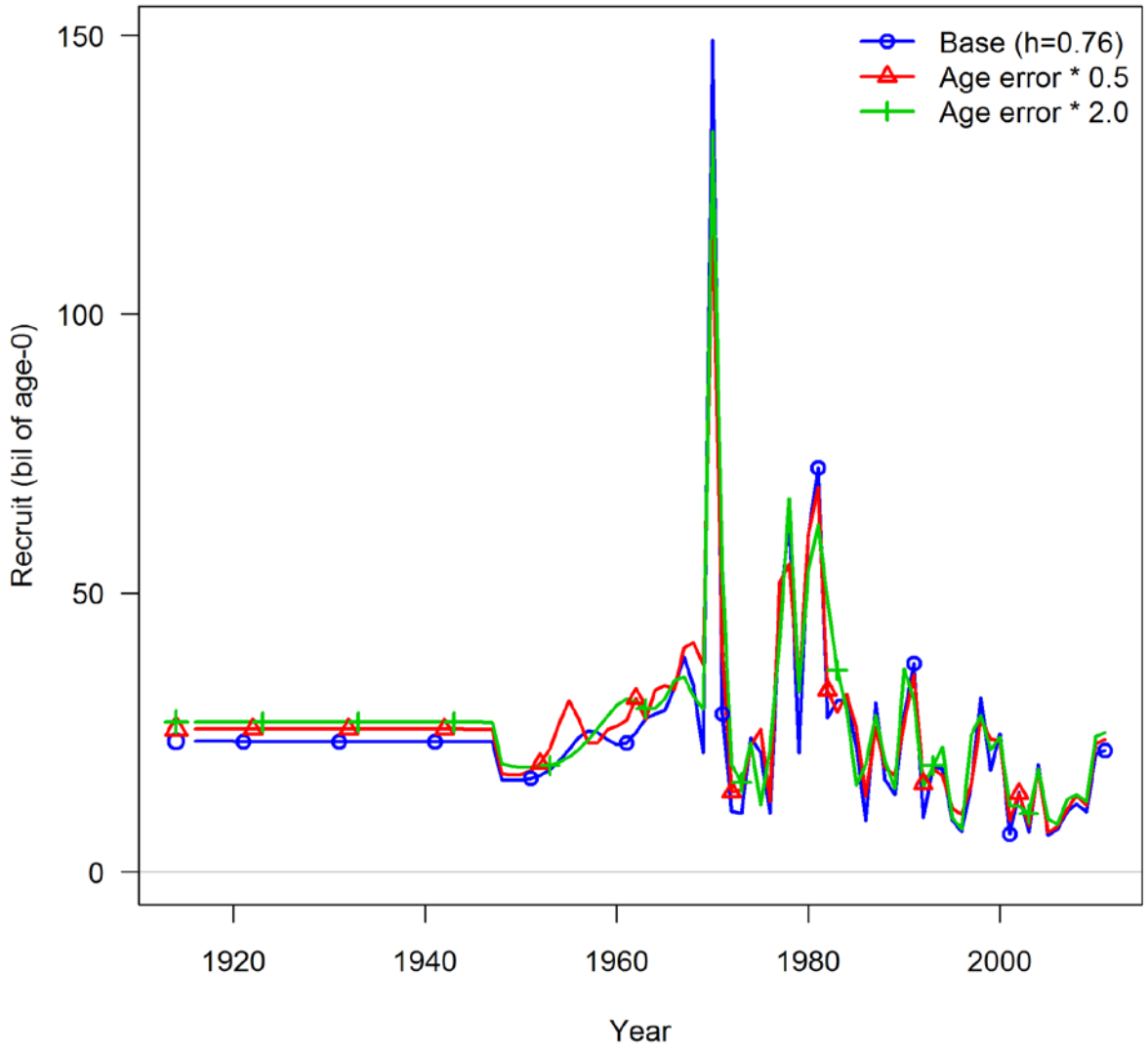

Figure 81. Comparisons of time series of recruits from the sensitivity analysis on ageing error (age erros * 0.5 and 2.0, respectively). The results from the base model is also included for comparisons.

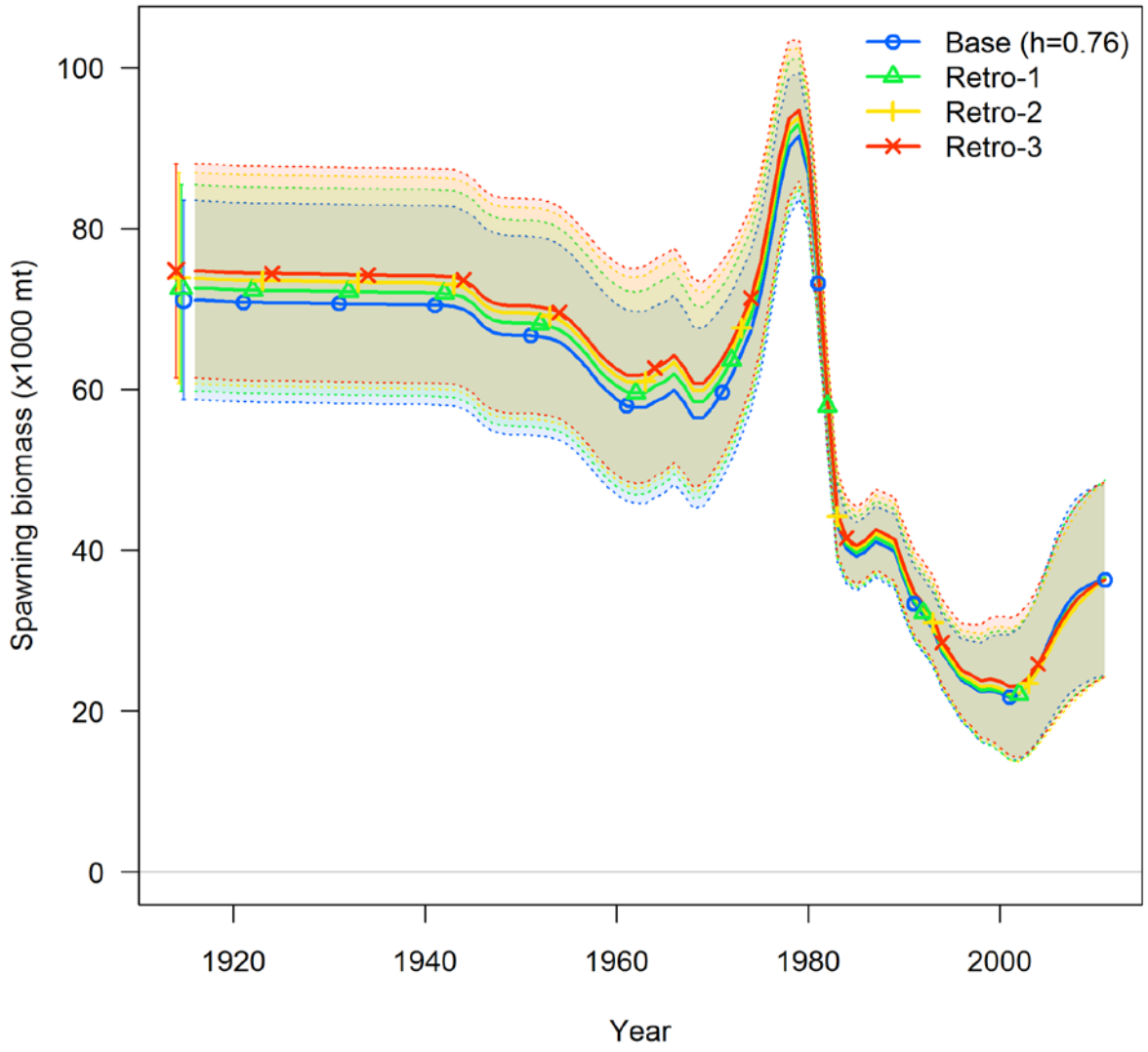

Figure 82. Comparisons of time series of spawning outputs with 95% asymptotic intervals from the retrospective analysis to previous three years. The results from the base model is also included for comparisons.

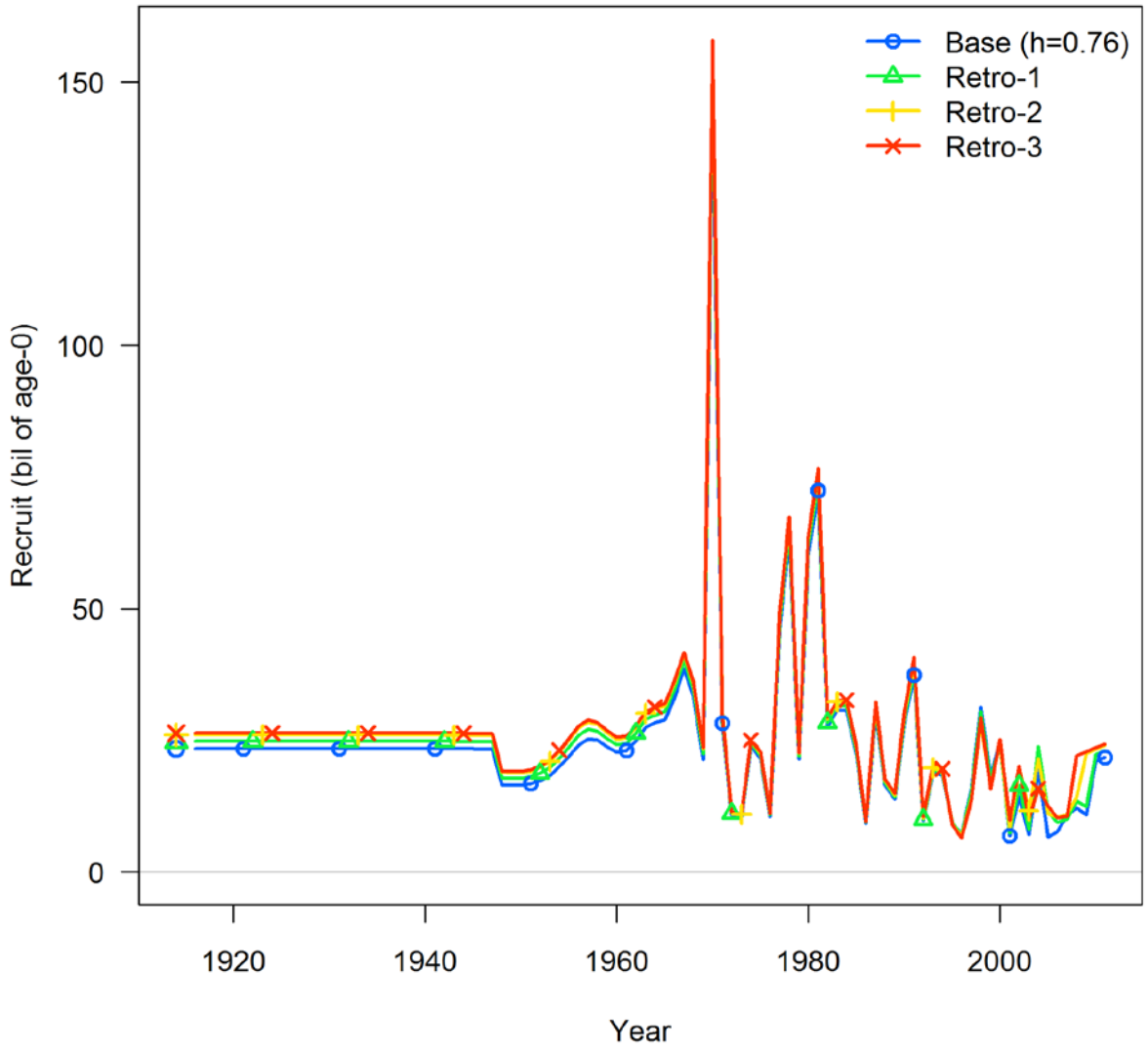

Figure 83. Comparisons of time series of recruits from the retrospective analysis to previous three years. The results from the base model is also included for comparisons.

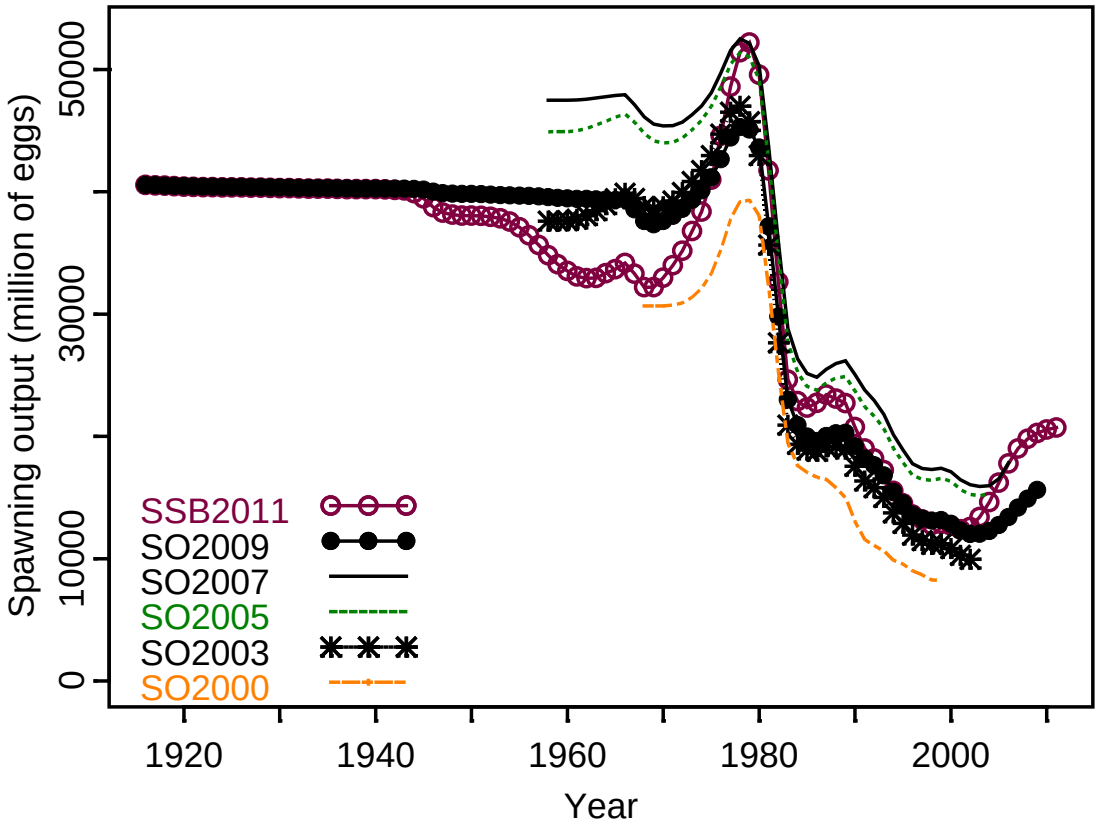

Figure 84. Comparisons of time series of spawning outputs (SO) between the 2011 base model and five previous assessments (2000, 2003, 2005, 2007, and 2009). Note that stock abundance in the 2011 assessment is expressed as spawning stock biomass (SSB) which is different from spawning outputs that were used in all previous assessment. The 2011 outputs were scaled to the 2009 outputs for purpose of comparisons only.

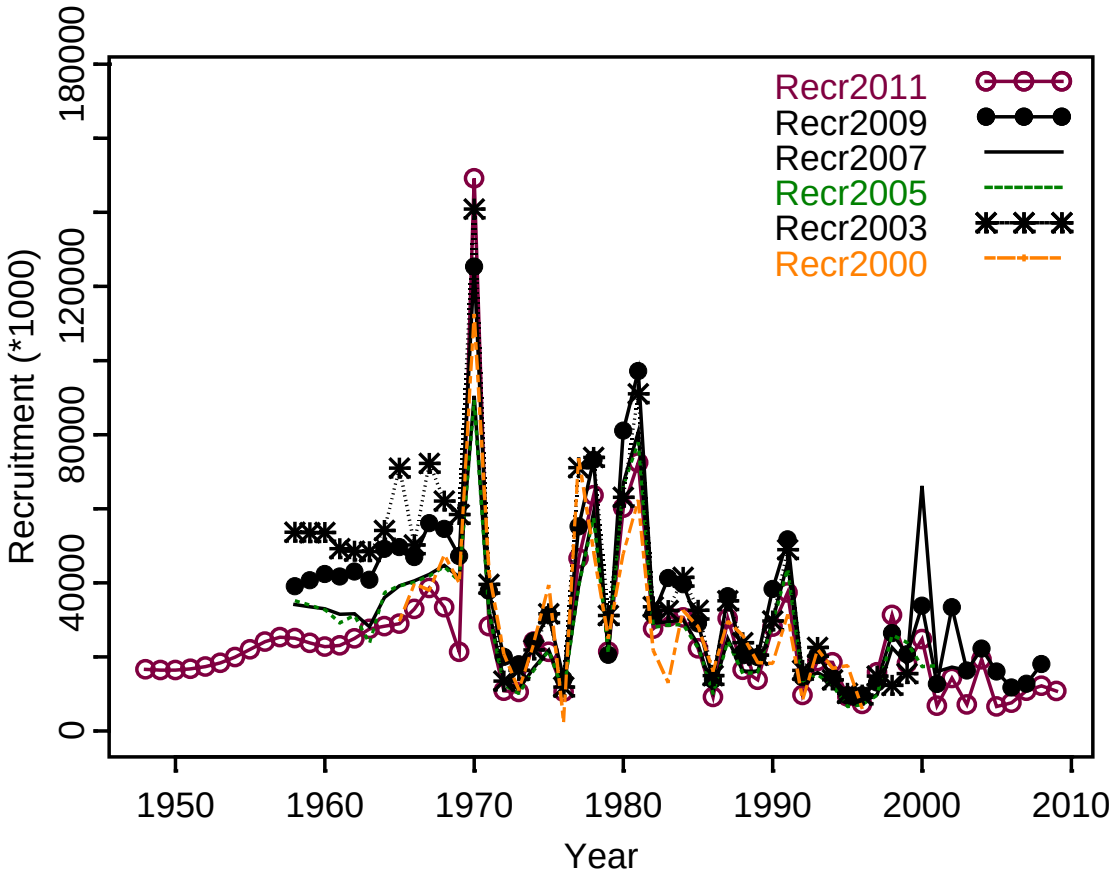

Figure 85. Comparisons of time series of recruits between the 2011 base model and five previous assessments (2000, 2003, 2005, 2007, and 2009)

10 Appendixes

10.1 Appendix A. Chronology of the regulatory history of widow rockfish by the Pacific Fishery Management Council.

Date	Regulation
10/13/82	75,000 lb trip limit.
1/30/83	30,000 lb trip limit.
9/10/83	1,000 lb trip limit.
1/1/84	50,000 lb trip limit once per week.
5/6/84	40,000 lb trip limit once per week.
8/1/84	Closed fishery with 1,000 trip limit for incidental catch.
9/9/84	Closed fishery.
1/10/85	30,000 lb trip limit once a week or 60,000 lb trip limit once per two weeks, unlimited trips of less than 3,000 lbs.
4/28/85	Dropped 60,000 lb biweekly option.
7/21/85	3,000 lb trip limit, unlimited number of trips.
1/1/86	30,000 lb trip limit, only one weekly landing greater than 3,000 lbs.
9/28/86	3,000 lb trip limit, unlimited number of trips.
1/1/87	30,000 lb trip limit, only one weekly landing greater than 3000 lbs.
11/25/87	Closed fishery.
1/1/88	30,000 lb trip limit, only one weekly landing greater than 3000 lbs, unlimited number of trips less than 3,000 lbs.
9/21/88	3,000 lb trip limit, unlimited number of trips.
1/1/89	30,000 lb trip limit, only one weekly landing greater than 3,000 lbs.
4/26/89	10,000 lb trip limit once per week.
10/11/89	3,000 lb trip limit with unlimited number of trips.
1/1/90	15,000 lb trip limit once per week or 25,000 lb trip limit once per two weeks with only one landing greater than 3,000 lbs each week.
12/12/90	Closed fishery.
1/1/91	10,000 lb trip limit per week or 20,000 lb trip limit every two weeks with only one landing greater than 3,000 lbs per week.
9/25/91	3,000 lb trip limit with unlimited number of trips.
1/1/92	30,000 lbs cumulative landings every 4 weeks
5/9/92	Change from 3" mesh to 4.5" mesh in codend for roller gear north of Point Arena.
8/12/92	3,000 lb trip limit with unlimited number of trips.
12/2/92	30,000 lb cumulative trip limit per 4 weeks.
12/1/93	3,000 lb trip limit with unlimited number of trips.
1/1/94	30,000 lb cumulative limit per calendar month.
12/1/94	3,000 lb trip limit with unlimited number of trips.
1/1/95	30,000 lb cumulative limit per calendar month.

4/14/95	45,000 lb cumulative limit per calendar month.
9/8/95	4.5" mesh applies to entire net and bottom trawl.
1/1/96	70,000 lb cumulative limit per two months.
9/1/96	50,000 lb cumulative limit per two months.
11/1/96	25,000 lb cumulative limit per two months.
1/1/97	70,000 lb cumulative limit per two months.
5/1/97	60,000 lb cumulative limit per two months.
1/1/98	Limited entry: 25,000 lb cumulative per two month period.
	Open access: 12,500 lb cumulative per two month period.
5/1/98	Limited entry: 30,000 lb cumulative per two month period
7/1/98	Open access: 3,000 lb cumulative per month
10/1/98	Limited entry: 19,000 lb cumulative per month
1/1/99	Limited entry: cumulative limits: phase 1 - 70,000 lbs per period, phase 2 - 16,000 lbs per period, phase 3 - 30,000 lbs per period.
	Open access: 2,000 lbs per month.
5/1/99	Limited entry: decrease phase 2 and phase 3 limits to 11,000 lbs.
7/2/99	Open access: 8,000 lb cumulative limit per month.
10/1/99	Limited entry: vessels in Oregon and Washington using 30,000 lb cumulative monthly limit must have midwater trawl gear aboard or a state cumulative limit will be imposed.
1/1/00	Widow rockfish classified as a shelf species for regulatory purposes.
	Limited entry trawl: 30,000 lbs/2 months.
	Limited entry fixed gear: 3,000 lbs/month.
	Open access: 3,000 lbs/month.
1/1/01	Limited entry trawl: 20,000 lbs/2 months for months of Jan-Apr and Sep-Oct; otherwise 10,000 lbs/2 months for midwater trawls; 1,000 lbs/months for small footrope trawls.
	Limited entry fixed gear: 3,000 lbs/month.
	Open access: north - 3,000 lbs/month; south - 3,000 lbs per month with some monthly closures in some areas.
7/1/01	Limited entry midwater trawl in the north: 1,000 lbs/month.
10/1/01	Closed fishery for all except midwater, which may land 2,000 lbs/month in north for October, then 25,000 lbs/2 months.
1/1/02	Limited entry trawl in the north: closed through November to midwater trawl except for small bycatch in whiting fishery, in November 13,000 lbs/2 month with no more than 2 trips, small footrope trawl 1000 lbs/month through September, then closed Sept-Oct, then 500 lbs/month Nov-Dec.
	Limited entry trawl in the south: midwater closed year round except for a small bycatch in the whiting fishery; small footrope trawl 1,000 lbs/month through July, then closed.
1/1/03	Limited entry trawl RCA in the north: 75-200 fm during Jan-Aug, 50-200 fm during Sep-Oct, and shoreline to 200 fm (petrale areas open) during Nov-Dec.
	Limited entry trawl RCA in the south: between 34 [illegible] 60' N

	200 fm during Jan-Oct, and shoreline to 200 fm (petrale areas open) during Nov-Dec; south of 34 [illegible] 27'-200 fm during Jan-Oct, and shoreline to 200 fm (petrale areas open) during Nov-Dec.
	Limited entry and open access fixed gear RCA established as follows (seaward boundaries held static until Jan 2009; shoreward boundaries south of the OR-WA border vary): shoreline to 100 fm north of the OR-WA border (46 [illegible] 16' N. Canada border; seaward boundary of 100 fm north of 40 [illegible] of 150 fm south of 40 [illegible] 10' N. lat.
	Limited entry trawl in the north: midwater trawl closed through November except for small amount of bycatch in whiting fishery, 12,000 lbs/2 months for Nov-Dec; small footrope trawl - 300 lbs/month Jan-Apr and Nov-Dec, 1000 lbs/month May-Oct.
	Limited entry fixed gear in the north: 200 lbs/month.
	Open access in the north: 200 lbs/month.
	Limited entry trawl in the south: same as north for midwater and small footrope trawl.
	Limited entry fixed gear in the south: closed Mar-Apr, then variable 100 lbs/2 months to 250 lbs/2 months.
	Open access in the south: same as limited entry fixed gear.
1/1/04	Limited entry trawl RCA in the north: 75-200 fm during Jan-Feb (petrale areas open), 60-200 fm during Mar-Apr, 60-150 fm during May-Jun, 75-150 fm during Jul-Sep, and shoreline to 250 fm during Oct-Dec.
	Limited entry trawl RCA in the south: 75-150 fm during Jan-Apr and Sep, and 100-150 fm May-Aug; between 38 [illegible] N. lat. and 40 [illegible] 10' N. lat. shoreline to 250 fm during Oct-Dec; between 36 [illegible] N. lat. and 38 [illegible] N. lat. shoreline to 200 fm during Oct-Dec; south of 36 [illegible] N. lat. - shoreline to 150 fm during Oct-Dec.
	Limited entry trawl in the north: midwater trawl closed through November except for small amount of bycatch in whiting fishery (500 lbs/month during primary whiting season; combined widow and yellowtail trip limit of 500 lbs/trip with trips of at least 10,000 lbs of whiting), 12,000 lbs/2 months for Nov-Dec; small footrope trawl - 300 lbs/month Jan-Apr and Nov-Dec, 1000 lbs/month May-Oct.
	Limited entry fixed gear in the north: 200 lbs/month.
	Open access in the north: 200 lbs/month.
	Limited entry trawl in the south: closed.
	Limited entry fixed gear in the south: between 40°10’ and 34°27’ N lat. - 300 lbs/2 months Jan-Feb and Sep-Dec, closed Mar-Apr, 200 lbs/2 months May-Aug; south of 34°27’ N lat.: closed Jan-Feb, 2,000 lbs/2 months Mar-Dec.
	Open access in the south: between 40°10’ and 34°27’ N lat. - same as limited entry fixed gear; south of 34°27’ N lat. - closed Jan-Feb, 500 lbs/2 months Mar-Dec.
1/1/05 (regs. for 2005 and 2006)	Limited entry trawl RCA in the north: 75-200 fm during Jan-Feb and Nov-Dec (petrale areas open), and 100-200 fm during Mar-Oct.
	Selective flatfish trawls required shoreward of the RCA in the north (new permanent reg. implemented from 2005 to present).
	Limited entry trawl in the north: large and small footrope trawl- 300 lbs/2 months; midwater trawl- closed except for small amount of bycatch in whiting fishery (500

	lbs/month during primary whiting season; combined widow and yellowtail trip limit of 500 lbs/trip with trips of at least 10,000 lbs of whiting); selective flatfish trawl - 300 lbs/month Jan-Apr and Nov-Dec, 1,000 lbs/month May-Oct.
	Limited entry fixed gear in the north: 200 lbs/month.
	Open access in the north: 200 lbs/month.
	Limited entry trawl in the south: large footrope and midwater trawl- closed; small footrope trawl- 300 lbs/month.
	Limited entry fixed gear in the south: between 40°10’ and 34°27’ N lat. - 300 lbs/2 months Jan-Feb and Sep-Dec, closed Mar-Apr, 200 lbs/2 months May-Aug; south of 34°27’ N lat.: 2,000 lbs/2 months Jan-Feb and May-Dec, closed Mar-Apr.
	Open access in the south: between 40°10’ and 34°27’ N lat. - same as limited entry fixed gear; south of 34°27’ N lat. - 500 lbs/2 months Jan-Feb and May-Dec, closed Mar-Apr.
7/1/05	Limited entry fixed gear south of 34°27’ N lat.: 3,000 lbs of shelf rockfish, shortbelly rockfish, and widow rockfish/2 months Jul-Dec.
	Open access south of 34°27’ N lat.: 750 lbs of shelf rockfish, shortbelly rockfish, and widow rockfish /2 months Jul-Dec.
10/1/05	Limited entry trawl RCA north of 38° N lat. extended from shoreline to 250 fm; 36° N lat. to 38° N lat.: limited entry trawl RCA extended from shoreline to 200 fm; south of 36° N lat.: limited entry trawl RCA extended from 50 fm to 200 fm.
1/1/06	Limited entry fixed gear south of 34°27’ N lat.: 3,000 lbs of shelf rockfish, shortbelly rockfish, and widow rockfish /2 months Jan-Feb.
	Open access south of 34°27’ N lat.: 750 lbs of shelf rockfish, shortbelly rockfish, and widow rockfish /2 months Jan-Feb.
3/1/06	Limited entry fixed gear south of 34°27’ N lat.: 3,000 lbs of shelf rockfish, shortbelly rockfish, and widow rockfish /2 months Mar.-Dec.
	Open access south of 34°27’ N lat.: 750 lbs of shelf rockfish, shortbelly rockfish, and widow rockfish /2 months Mar.-Dec.
10/1/06	Widow bycatch cap in the non-tribal limited entry whiting trawl fishery increased from 200 mt to 220 mt.
1/1/07 (regs. for 2007 and 2008)	Widow bycatch cap of 200 mt adopted for the limited entry whiting trawl fishery.
	Limited entry trawl RCA: 75-250 fm in Jan-Apr and Nov-Dec; 75-200 fm in May-Jun and Sep-Oct; 100-200 fm in Jul-Aug.
	Limited entry trawl in the north: large and small footrope trawl- 300 lbs/2 months; midwater trawl- closed except for small amount of bycatch in whiting fishery (500 lbs/month during primary whiting season; combined widow and yellowtail trip limit of 500 lbs/trip with trips of at least 10,000 lbs of whiting; cumulative widow limit of 1,500 lbs/month); selective flatfish trawl - 300 lbs/month Jan-Apr and Nov-Dec, 1,000 lbs/month May-Oct.
	Limited entry fixed gear in the north: 200 lbs/month.
	Open access in the north: 200 lbs/month.
	Limited entry trawl in the south: large footrope and midwater trawl- closed; small footrope trawl- 300 lbs/month.
	Limited entry fixed gear in the south: between 40°10’ and 34°27’ N lat. - 300 lbs/2

	months Jan-Feb and Sep-Dec, closed Mar-Apr, 200 lbs/2 months May-Aug; south of 34°27’ N lat.: 3,000 lbs/2 months Jan-Feb and May-Dec, closed Mar-Apr.
	Open access in the south: between 40°10’ and 34°27’ N lat. - same as limited entry fixed gear; south of 34°27’ N lat. - 750 lbs/2 months Jan-Feb and May-Dec, closed Mar-Apr.
	Widow bycatch cap in the limited entry whiting trawl fishery increased from 200 mt to 220 mt.
5/1/07	Limited entry trawl in the north: RCA extended to the shore from Cape Alava (48°10’ N lat.) to U.S.-Canada border and from Cape Arago (43°20.83' N. lat.) to Humbug Mountain (42°40.50' N. lat.); the shoreward boundary of the trawl RCA is shifted shoreward to 60 fm from April 17 through October 31, 2007 between Leadbetter Point (46°38.17' N. lat.) and the Oregon/Washington border (46°16’ N. lat.); shoreward boundary of the trawl RCA shifted shoreward to 75 fm in all other areas through Dec.; the seaward boundary of the trawl RCA is shifted shoreward to 150 fm from the U.S.-Canada Border to Cascade Head (45°03.83’ N. lat.) from April 17 through August 31, 2007; the seaward boundary of the trawl RCA is shifted shoreward to 200 fm between Cascade Head (45°03.83’ N. lat.) and 40°10 N. lat. from April 17 through April 30, 2007.
7/26/07	Limited entry whiting trawl fishery closed due to attainment of 220 mt widow bycatch cap.
9/1/07	Limited entry fixed gear in the south between 40°10' N. lat. and 34°27' N. lat.: combined the trip limit for bocaccio and the trip limit for minor shelf rockfish, shortbelly rockfish, and widow rockfish into a single cumulative trip limit of 500 lb/2 months from Sep-Dec.
10/1/07	Limited entry trawl RCA north of Cape Alava (48°10’ N lat.) to U.S.-Canada border and from Cape Arago (43°20.83' N. lat.) to Humbug Mountain (42°40.50' N. lat.): shoreward boundary moved to the 75 fm line.
10/7/07	Limited entry whiting trawl fishery re-opened after widow bycatch cap is increased to 275 mt; shoreside whiting sector required to fish seaward of the 150 fm line; at-sea sectors voluntarily fish seaward of the 150 fm line.
1/1/08	Limited entry trawl RCA in the north: the seaward boundary north of 40 □ 1 the U.S.-Canada border is shifted to the modified petrale 200 fm line in Jan-Feb and Nov-Dec; the seaward boundary from the OR-WA border (46 -□16 Canada border is shifted to 150 fm from May-Oct; all other areas and times will have a seaward boundary of 200 fm; the shoreward boundary is shifted to the shoreline from north of Cape Alava (48°10’ N lat.) to the U.S.-Canada border and from Cape Arago (43°20.83' N. lat.) to Humbug Mountain (42°40.50' N. lat.) for the entire year; the shoreward boundary from the OR-WA border (46 □ 60 fm in Mar-Oct; all other times and areas will have a shoreward boundary of 75 fm for the year.
	Limited entry trawl RCA in the south: 100-150 fm for the year.
	Limited entry fixed gear in the south between 40°10' N. lat. and 34°27' N. lat.: modify the chilipepper rockfish limit of 2,000 lb/2 months by recombining it into a single combined cumulative limit with minor shelf rockfish, shortbelly, widow rockfish and bocaccio, and increase the trip limit from 500 lb/2 months to 2,500 lb/2 months of which no more than 500 lb/2 months may be any species other than chilipepper rockfish.
3/08	Widow bycatch cap of 275 mt adopted for the limited entry whiting trawl fishery.

5/1/08	Limited entry trawl RCA in the north: the seaward boundary is shifted to the 200 fm line from the OR-WA border (46 N. lat.) from May-Jun; the seaward boundary is shifted to the 150 fm line from Cape Falcon (45°46’ N. lat.) to the OR-WA border from May-Aug; the shoreward boundary is shifted to the 60 fm line from north of Cape Alava (48°10’ N lat.) to the U.S.-Canada border and from Cape Arago (43°20.83' N. lat.) to Humbug Mountain (42°40.50' N. lat.) from May-Oct; no other changes to the trawl RCA for all other times and areas.
	Darkblotched rockfish bycatch cap in the limited entry whiting trawl fishery increased to 40 mt to decrease impacts on widow rockfish.
8/19/08	Limited entry whiting trawl fishery closed due to attainment of 4.7 mt canary bycatch cap.
10/10/08	Limited entry trawl RCA in the north: the shoreward boundary of the is shifted from 60 fm to 75 fm, with the exception of the areas north of Cape Alava (48°10’N. lat.) and between Cape Arago (43°20.83’ N. lat.) and Humbug Mountain (42°40.50’N. lat.).
10/12/08	Limited entry whiting trawl fishery reopened after the canary bycatch cap is increased from 4.7 mt to 6.4 mt and the widow bycatch cap is increased from 275 mt to 284 mt.
10/26/08	Canary bycatch cap in the limited entry whiting trawl fishery is increased from 6.4 mt to 6.7 mt.
11/1/08	Open access south of 34 27’ N. lat. shelf rockfish cap increased from 750 lb/2 months to 1,000 lb/2 months in period 6 (Nov-Dec).
1/1/09 (regs. for 2009 and 2010)	Sector-specific bycatch caps adopted for the limited entry whiting trawl fishery for canary, darkblotched, and widow rockfish distributed on a pro rata basis in relation to the sectors' whiting allocation. Additionally, NMFS has the authority to restrict fishing depths by sector of the limited entry whiting trawl fishery if a bycatch cap is attained inseason.
	Limited entry trawl RCA: north of Cape Alava (48°10’N. lat.) - shoreline to 200 fm during Jan-Mar (petrale areas open) and Sep-Dec (petrale areas open Nov-Dec), and shoreline to 150 fm during Apr-Aug; north of Cape Falcon (45 46’ Alava - 75-200 fm during Jan-Apr (petrale areas open Jan-Mar) and Sep-Dec (petrale areas open Nov-Dec), and 75-150 fm during May-Aug; north of 40 Falcon - 75-200 fm year-round (petrale areas open during Jan-Mar and Nov-Dec); south of 40 at 10’N. - 150 fm year-round.
	Limited entry and open access fixed gear RCA: seaward boundary shifted from 100 fm to 125 fm between Cascade Head (45°03.83’ N. lat.) and Cape Blanco (43 on days when the directed fishery for Pacific halibut is open; otherwise, seaward boundary of 100 fm north of 40 10’ N. la
	Limited entry trawl in the north (combined limits of widow, yelloweye, shortbelly, and minor shelf rockfish): large and small footrope trawl- 300 lbs/2 months; midwater trawl- closed except for small amount of bycatch in whiting fishery (500 lbs/month during primary whiting season; combined widow and yellowtail trip limit of 500 lbs/trip with trips of at least 10,000 lbs of whiting; cumulative widow limit of 1,500 lbs/month); selective flatfish trawl - 300 lbs/month Jan-Apr and Nov-Dec, 1,000 lbs/month of which no more than 200 lbs/month can be yelloweye during May-Oct.; multiple bottom trawl gear - 300 lbs/ month Jan-Apr and Nov-Dec, 300 lbs/2 months of which no more than

	200/lbs/month can be yelloweye during May-Oct.
	Limited entry trawl in the south: large footrope and midwater trawl - closed; small footrope trawl for minor shelf rockfish, shortbelly, widow, and yelloweye - 300 lbs/ month year-round.
	Limited entry and open access fixed gear in the north: 200 lbs/ month (combined limit for minor shelf rockfish, shortbelly, widow, and yellowtail) year-round.
	Limited entry fixed gear in the south: between 34 - 2,300 N. lbs/2 months (combined limit for minor shelf rockfish, shortbelly, widow, bocaccio, and chilipepper) of which no more than 500 lb/2 months may be any species but chilipepper; south of 34 27' N. lat. (combined limit for minor shelf rockfish, shortbelly, widow, and bocaccio) - 3,000 lbs/2 months during Jan-Feb and May-Dec, and closed during Mar-Apr.
	Open access in the south (combined limit for minor shelf rockfish, shortbelly, widow, and chilipepper):: between 34 - 300 N. lbs/2 months during Jan-Feb and Sep-Dec, closed during Mar-Apr, and 200 lbs/2 months during May-Aug; south of 34 - 250 N. lbs/2 months during Jan-Feb and May-Dec, and closed during Mar-Apr.
3/09	Widow bycatch caps for sectors of the limited entry whiting trawl fishery are adopted as follows: 105 mt to shoreside whiting, 85 mt to catcher-processors, and 60 mt to motherships.

10.2 Appendix B: Comparisons of surface and break-and-burn ageing methods for widow rockfish

Donald E. Pearson
Fisheries Ecology Division
Southwest Fisheries Science Center
Santa Cruz, California 95060

August 2010

In response to a request from the previous STAR panel, we compared ages derived from surface ages versus break and burn for smaller (and presumably younger fish). When the primary ager was trained in widow rockfish aging (1986), it was known from previous studies that surface ages agreed well with break-and-burn ages for smaller and younger fish. The primary question has been at what size to make the cutoff between surface and break-and-burning methods. Typically that has been at about 40 cm (fork length) based on previous examinations. It was always understood that if the ager was not comfortable with the age from a surface read, that the otolith would be broken and burned.

We selected 100 otoliths from fish between 30 and 40 cm and read them twice, first using surface aging and then using the break-and-burn method. The break-and-burn ages were obtained without reference to the surface ages. Table C1 shows the results of this comparison. The results showed very comparable ages between two methods, with 88% of fish aged having the same ages.

Table B1. Summary of differences between surface and break-and-burn ageing methods for widow rockfish for 100 otoliths.

	(Surface age) – (break-n-burn age)			
Surface age	-1	0	1	Total
4		5		5
5		5		5
6	3	14		17
7	3	12		15
8	1	41	4	46
9		9	1	10
10		2		2
Total	***7***	***88***	***5***	***100***

10.3 Appendix C. Model fits to age and length composition data.

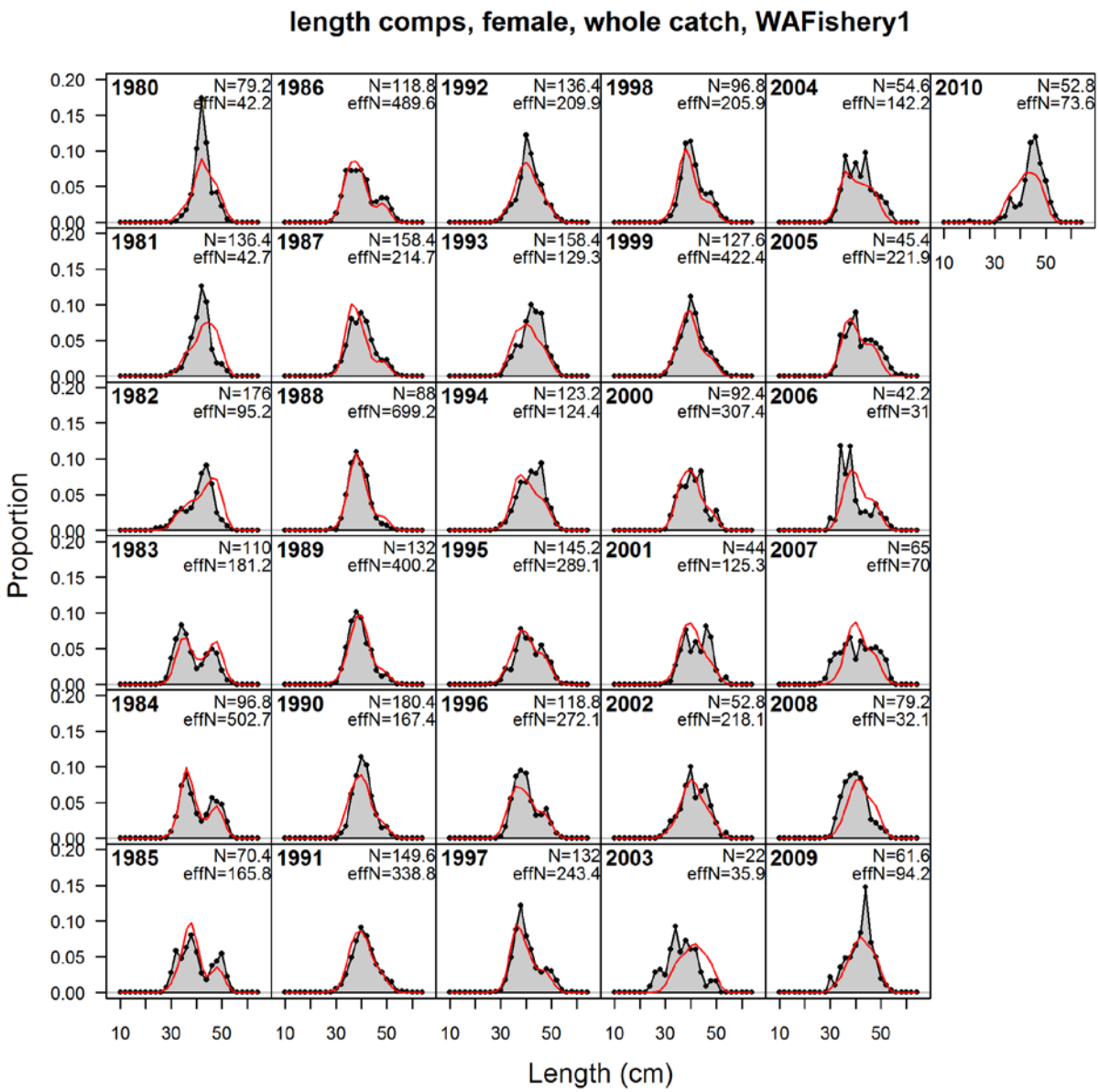

Figure C1. Model fits to the Washington fishery female length composition data. Note that N is not the actual sample size, but the effective sample size from the previous iteration.

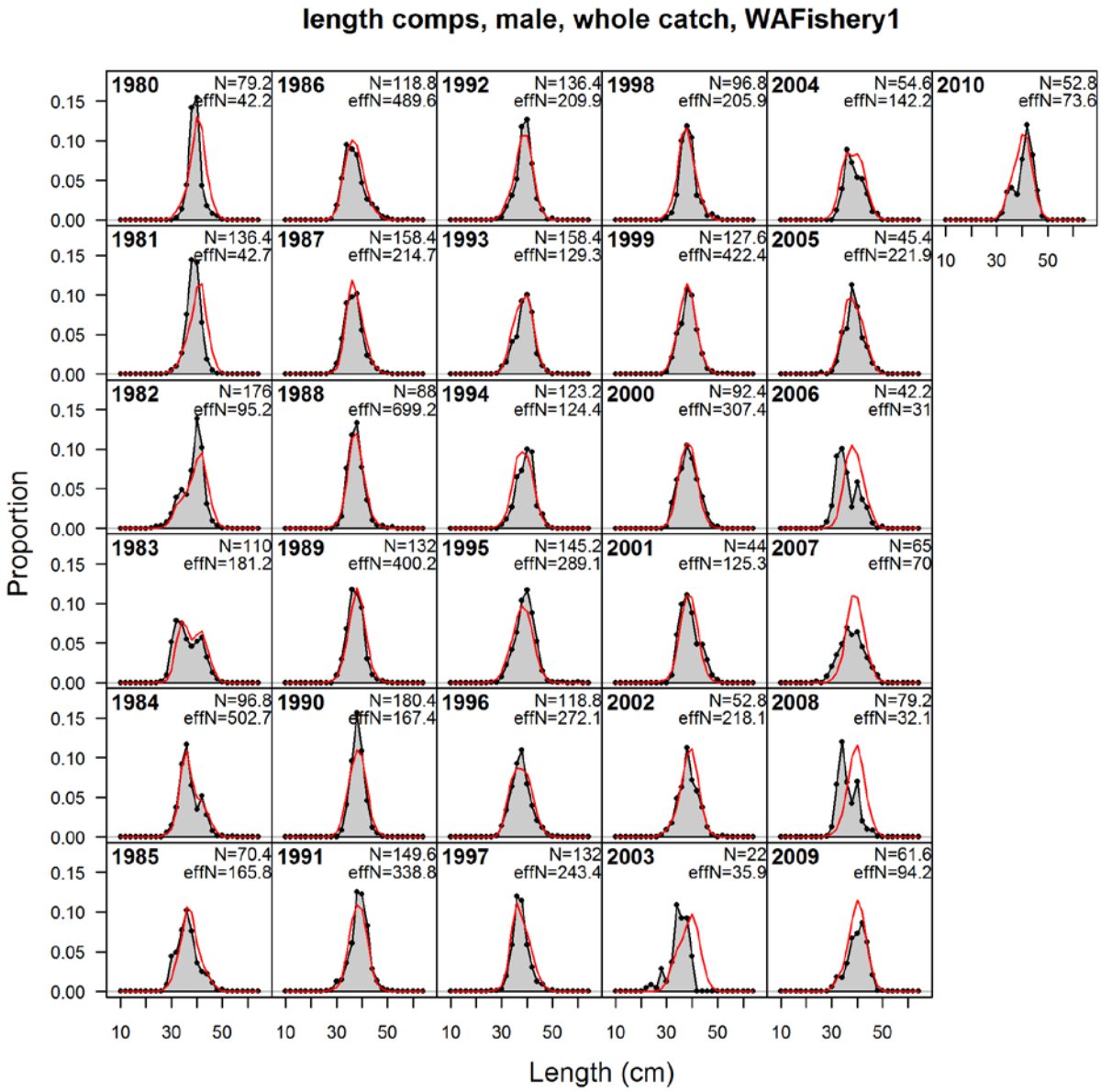

Figure C2. Model fits to the Washington fishery male length composition data. Note that N is not the actual sample size, but the effective sample size from the previous iteration.

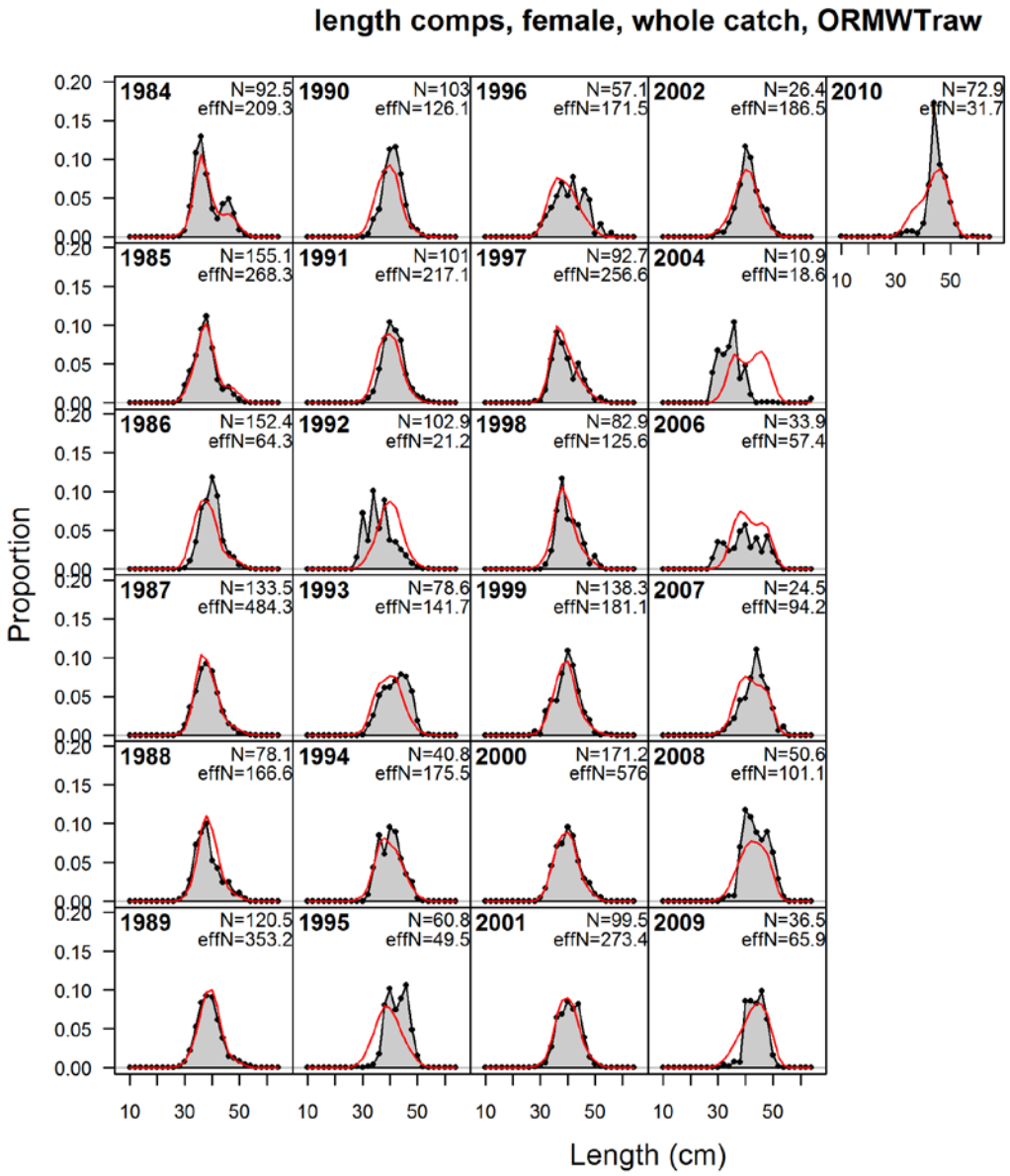

Figure C3. Model fits to the Oregon mid-water trawl fishery female length composition data. Note that N is not the actual sample size, but the effective sample size from the previous iteration.

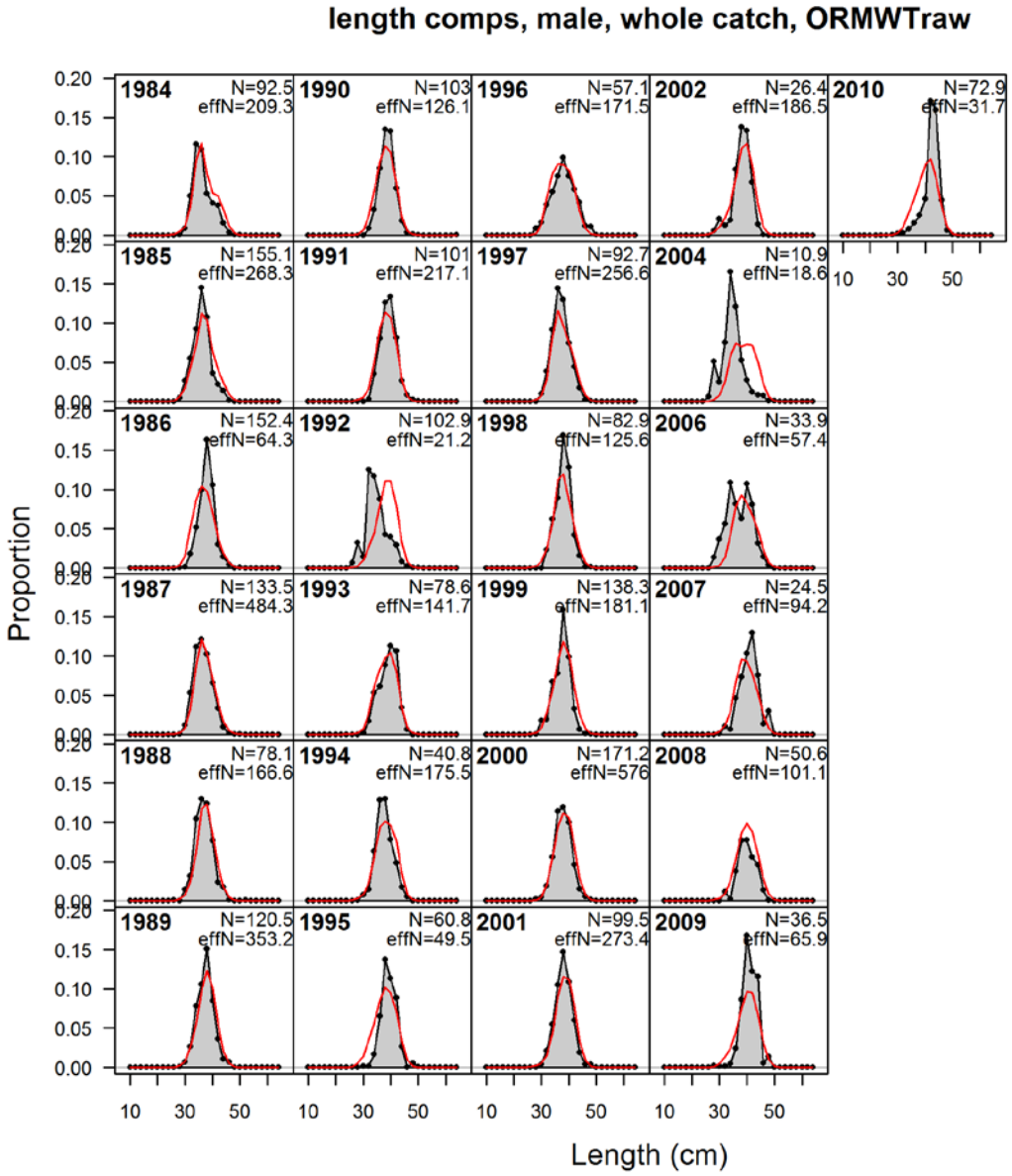

Figure C4. Model fits to the Oregon mid-water trawl fishery male length composition data. Note that N is not the actual sample size, but the effective sample size from the previous iteration.

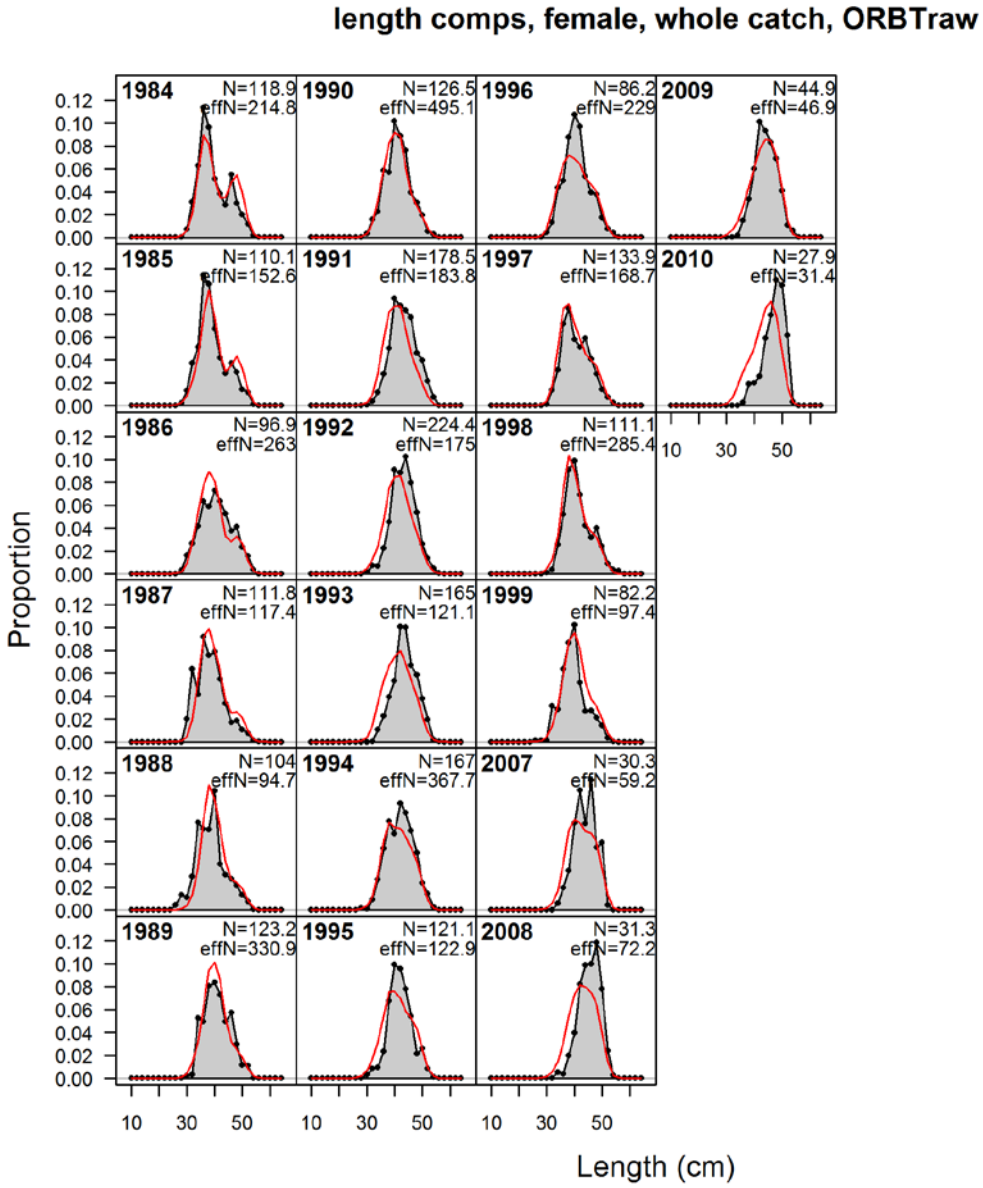

Figure C5. Model fits to the Oregon bottom trawl fishery female length composition data. Note that N is not the actual sample size, but the effective sample size from the previous iteration.

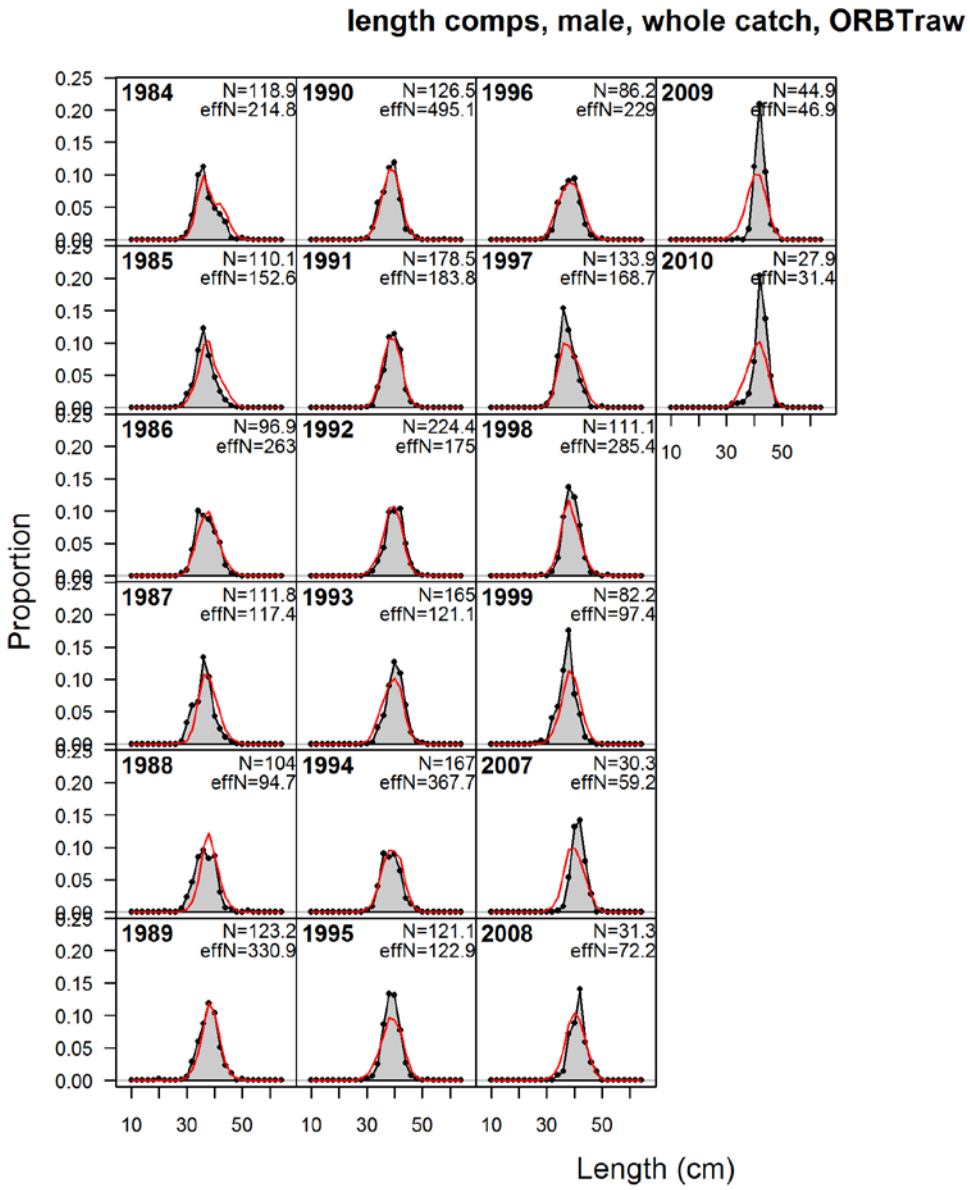

Figure C6. Model fits to the Oregon bottom trawl fishery male length composition data. Note that N is not the actual sample size, but the effective sample size from the previous iteration.

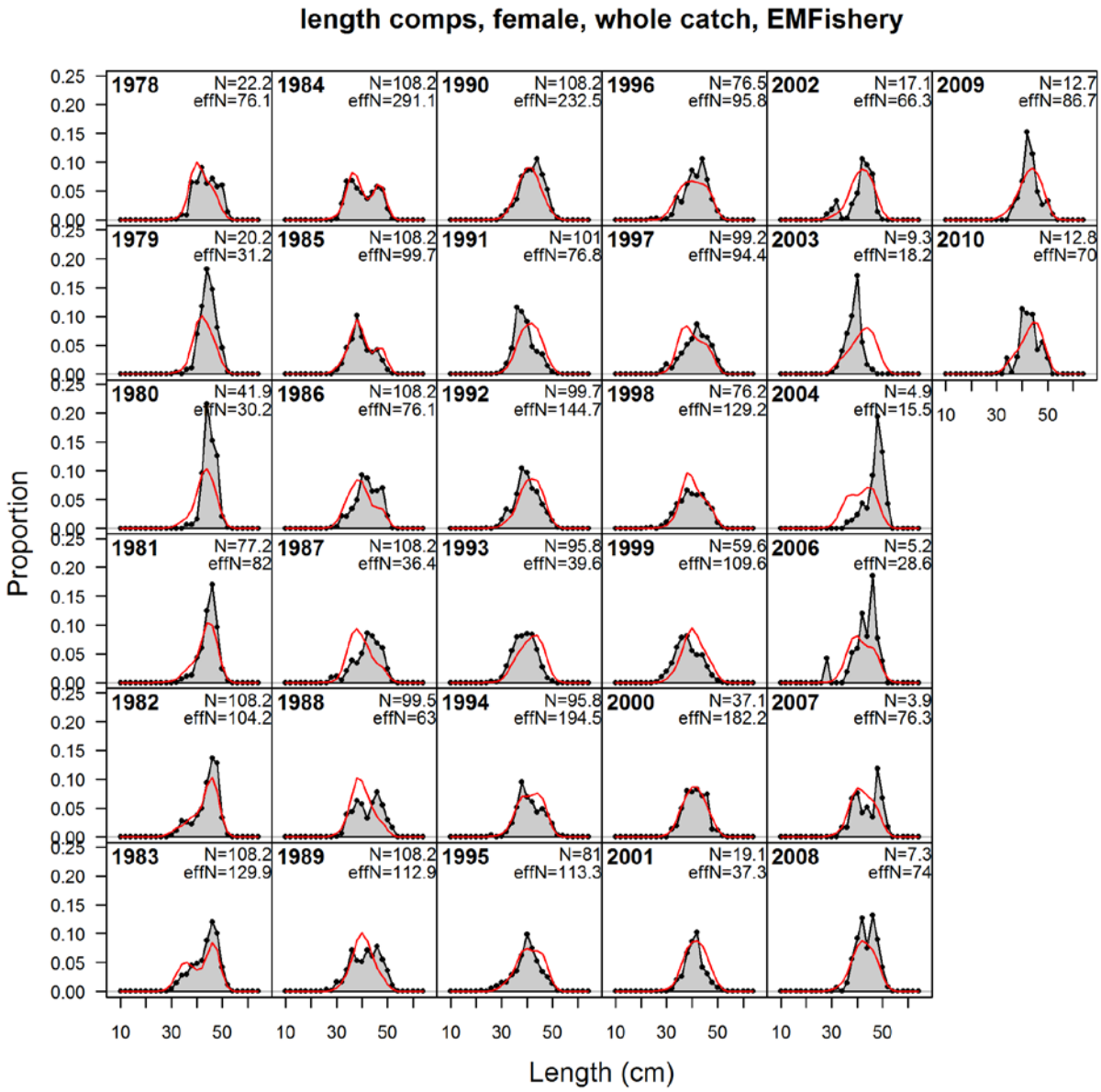

Figure C7. Model fits to the California (EMFishery) fishery female length composition data. Note that N is not the actual sample size, but the effective sample size from the previous iteration.

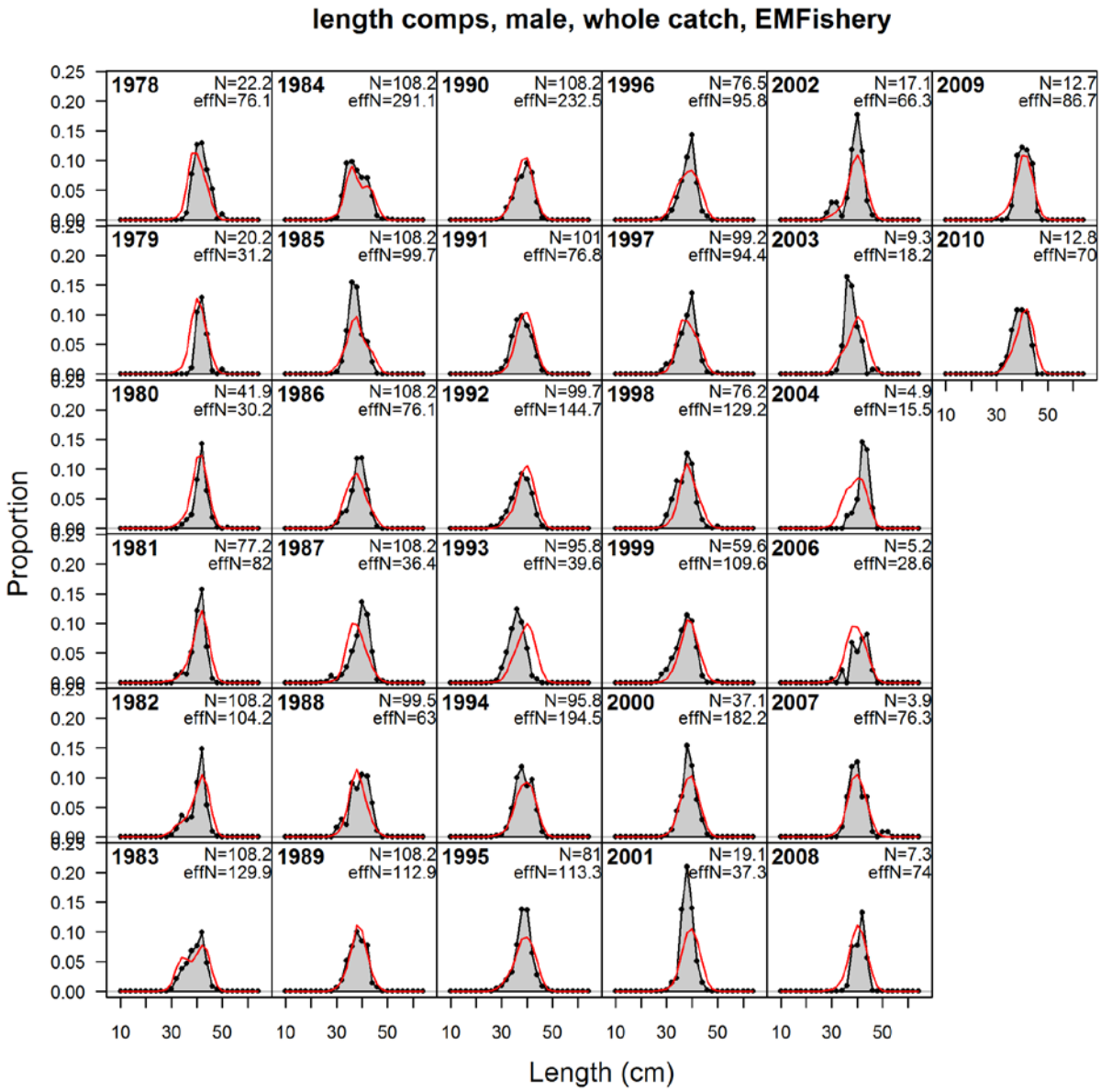

Figure C8. Model fits to the California fishery (EMFishery) male length composition data. Note that N is not the actual sample size, but the effective sample size from the previous iteration.

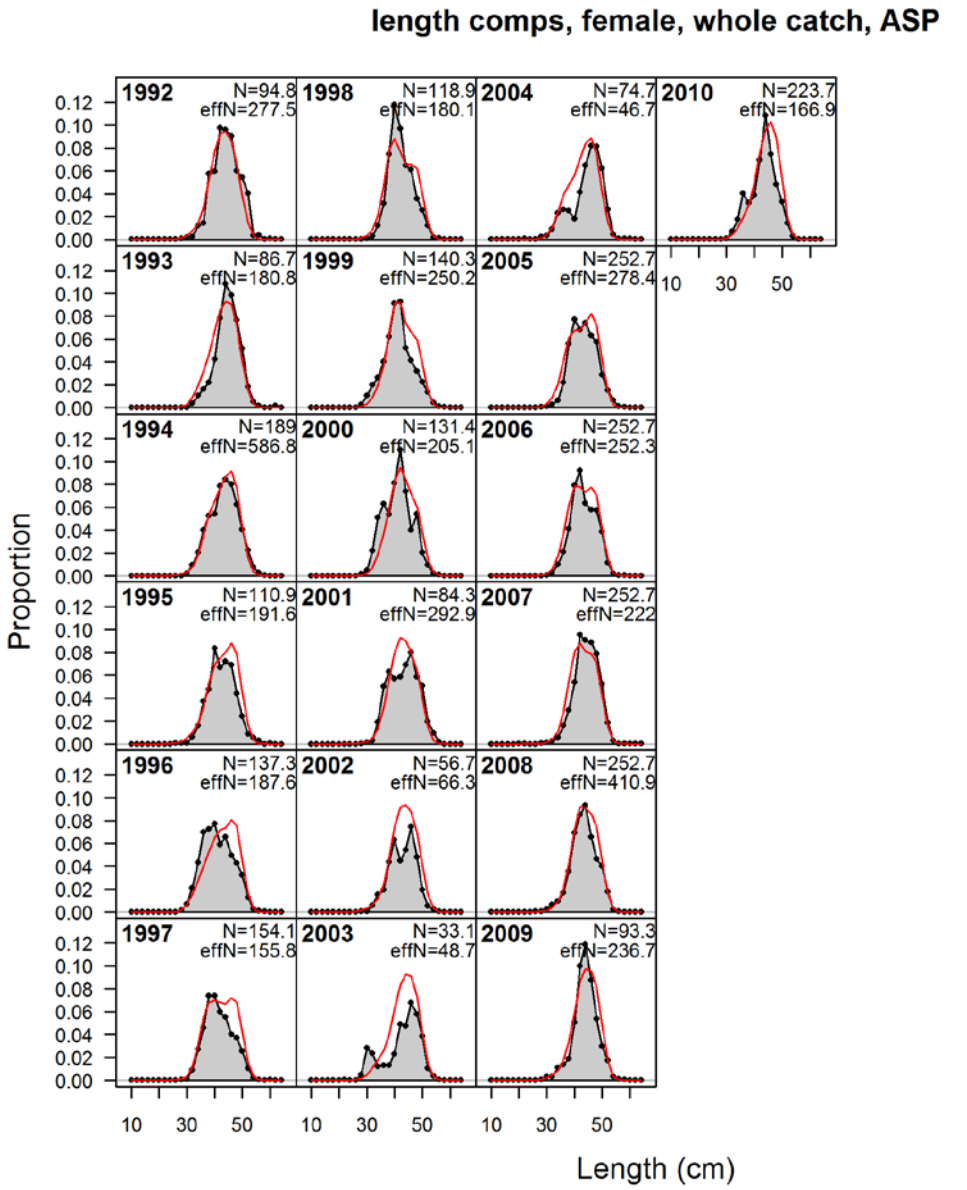

Figure C9. Model fits to the at-sea whiting processor (ASP) fishery female length composition data. Note that N is not the actual sample size, but the effective sample size from the previous iteration.

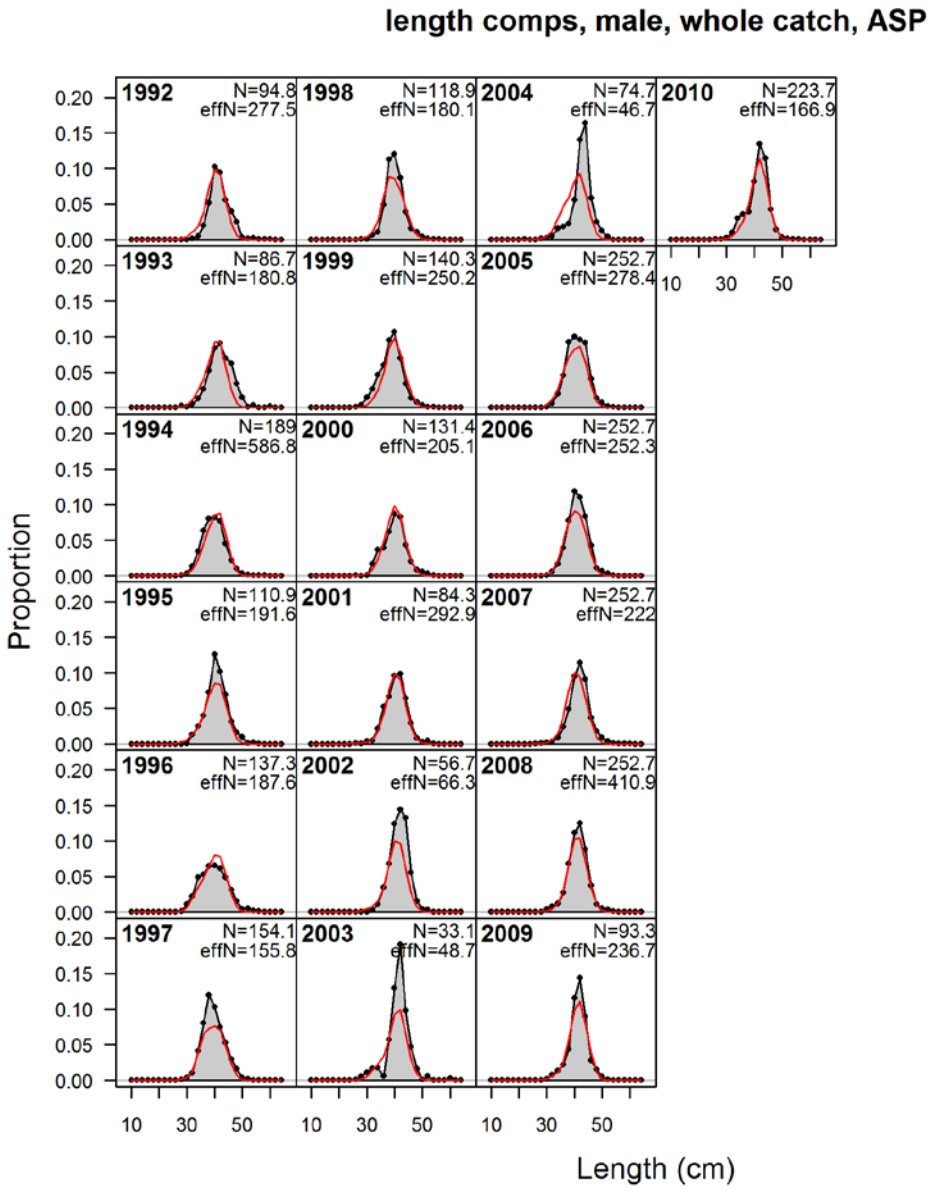

Figure C10. Model fits to the at-sea whiting processor (ASP) fishery male length composition data. Note that N is not the actual sample size, but the effective sample size from the previous iteration.

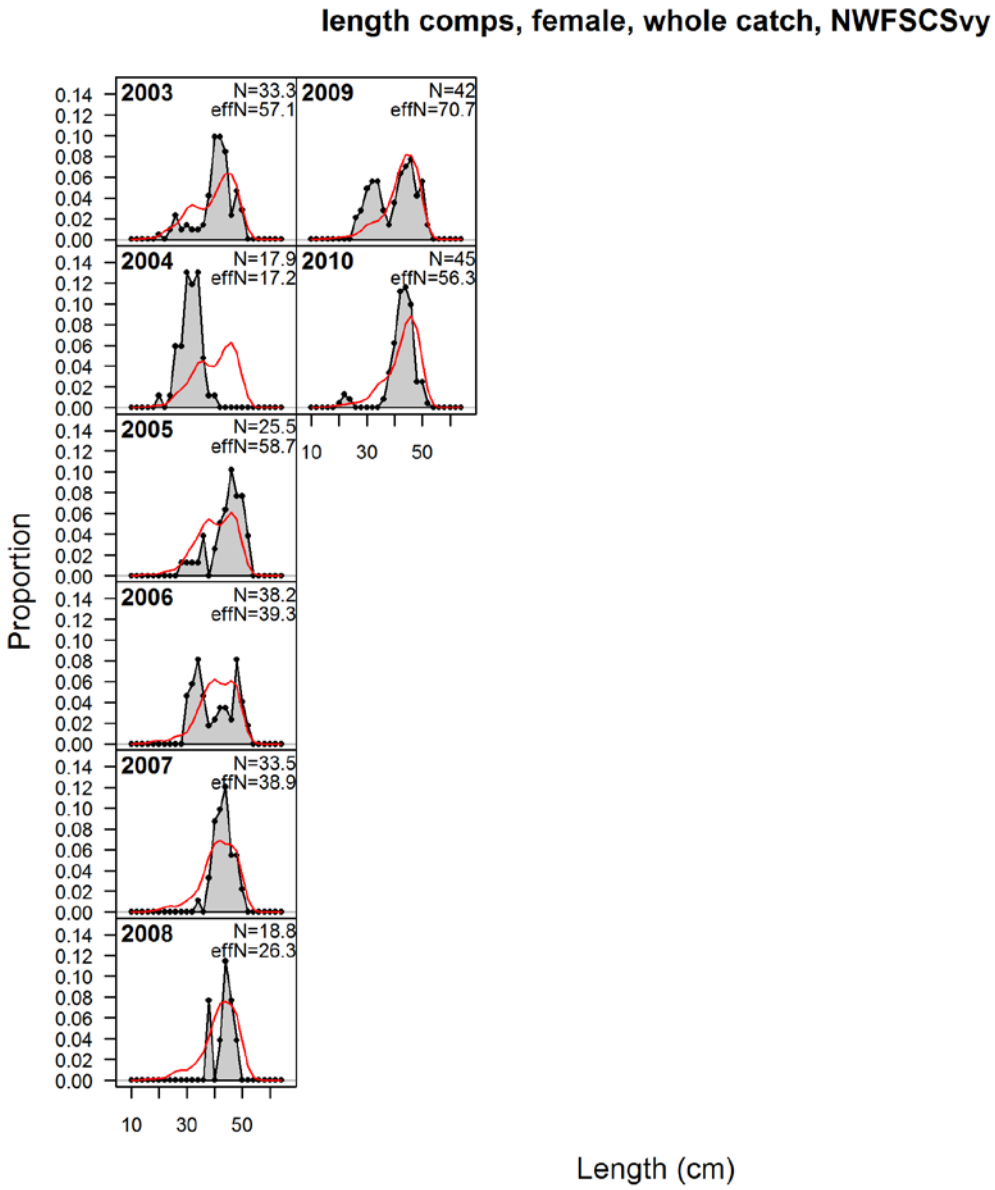

Figure C11. Model fits to the NWFSC survey female length composition data. Note that N is not the actual sample size, but the effective sample size from the previous iteration.

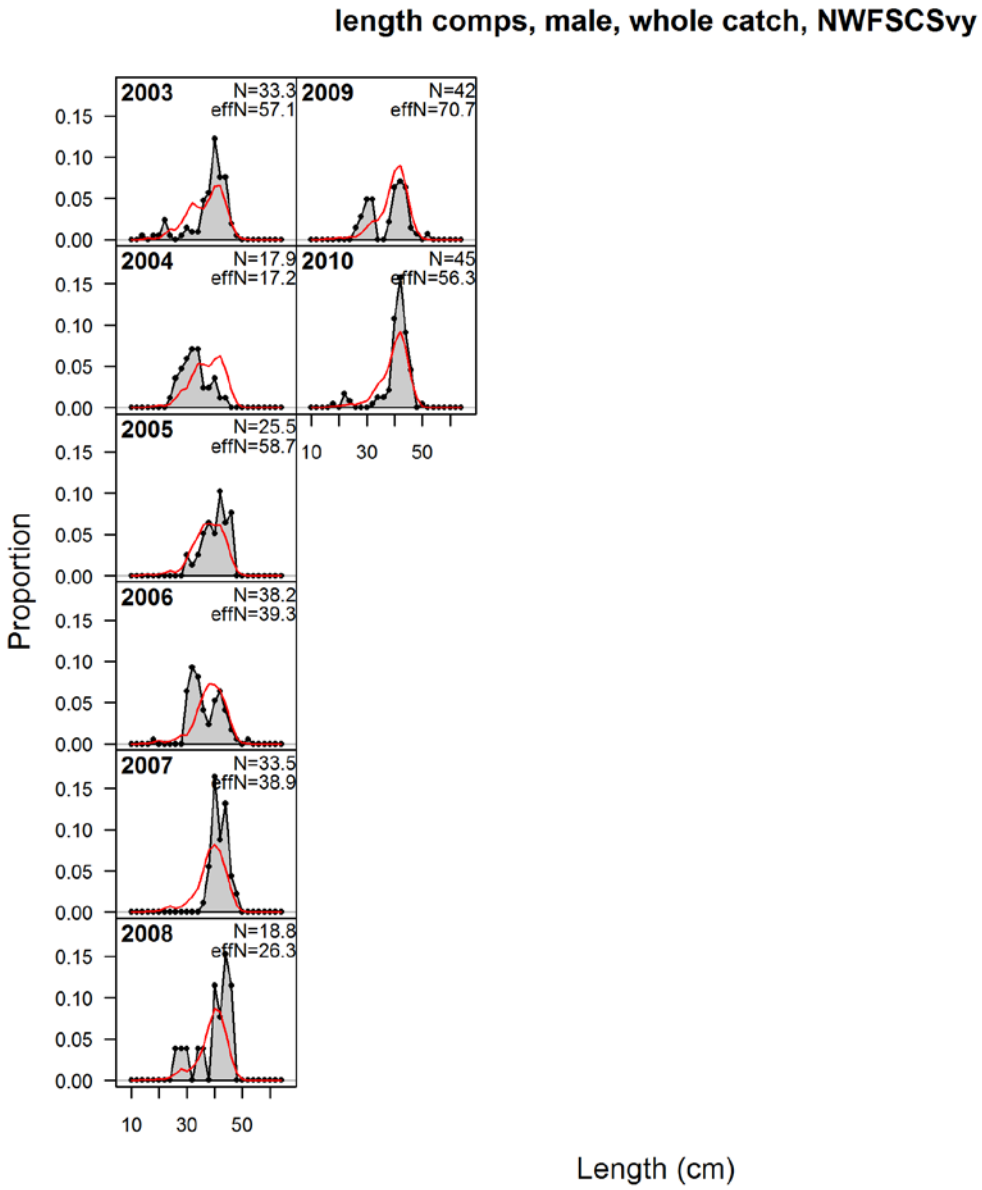

Figure C12. Model fits to the NWFSC survey male length composition data. Note that N is not the actual sample size, but the effective sample size from the previous iteration.

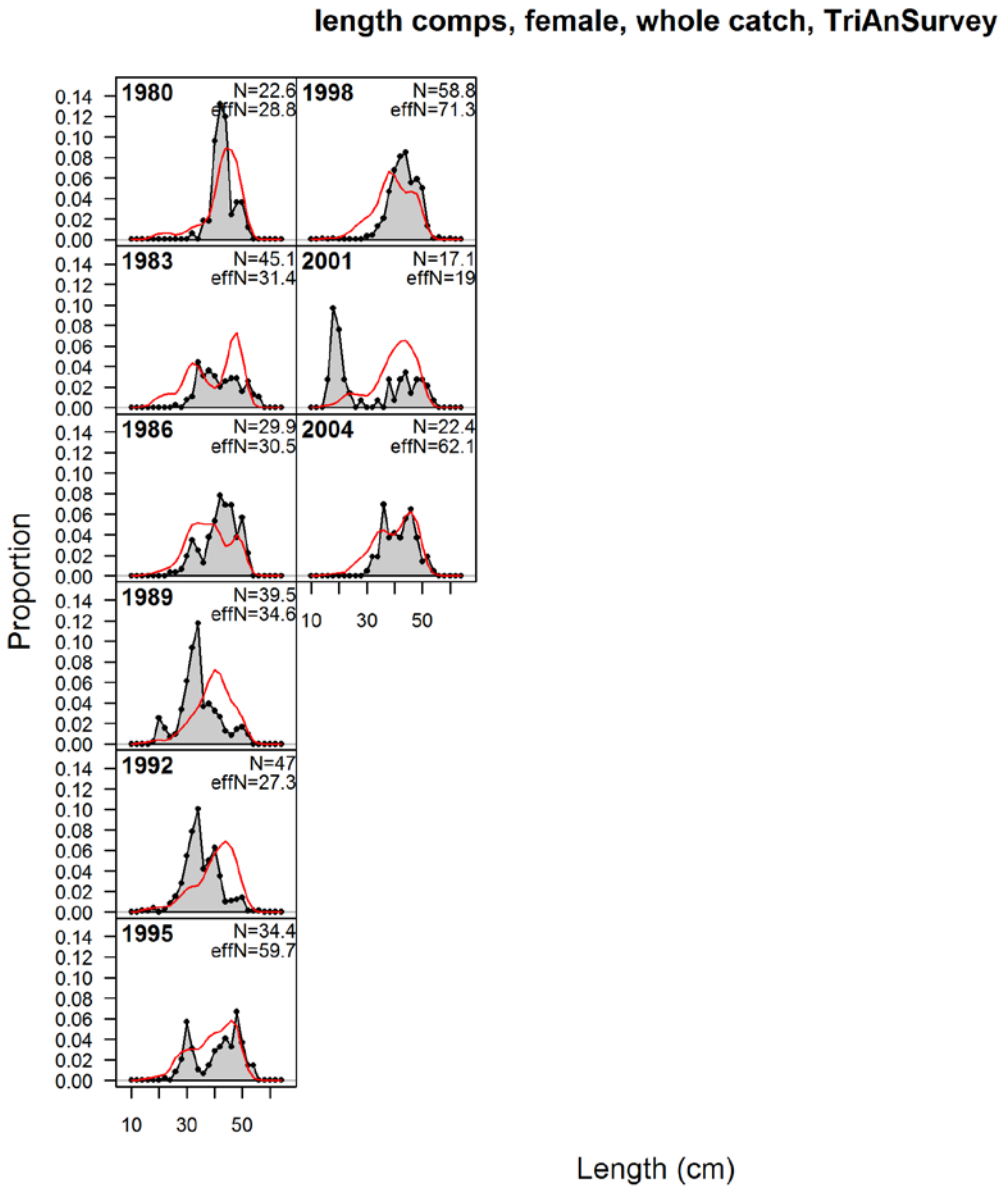

Figure C13. Model fits to the triennial survey female length composition data. Note that N is not the actual sample size, but the effective sample size from the previous iteration.

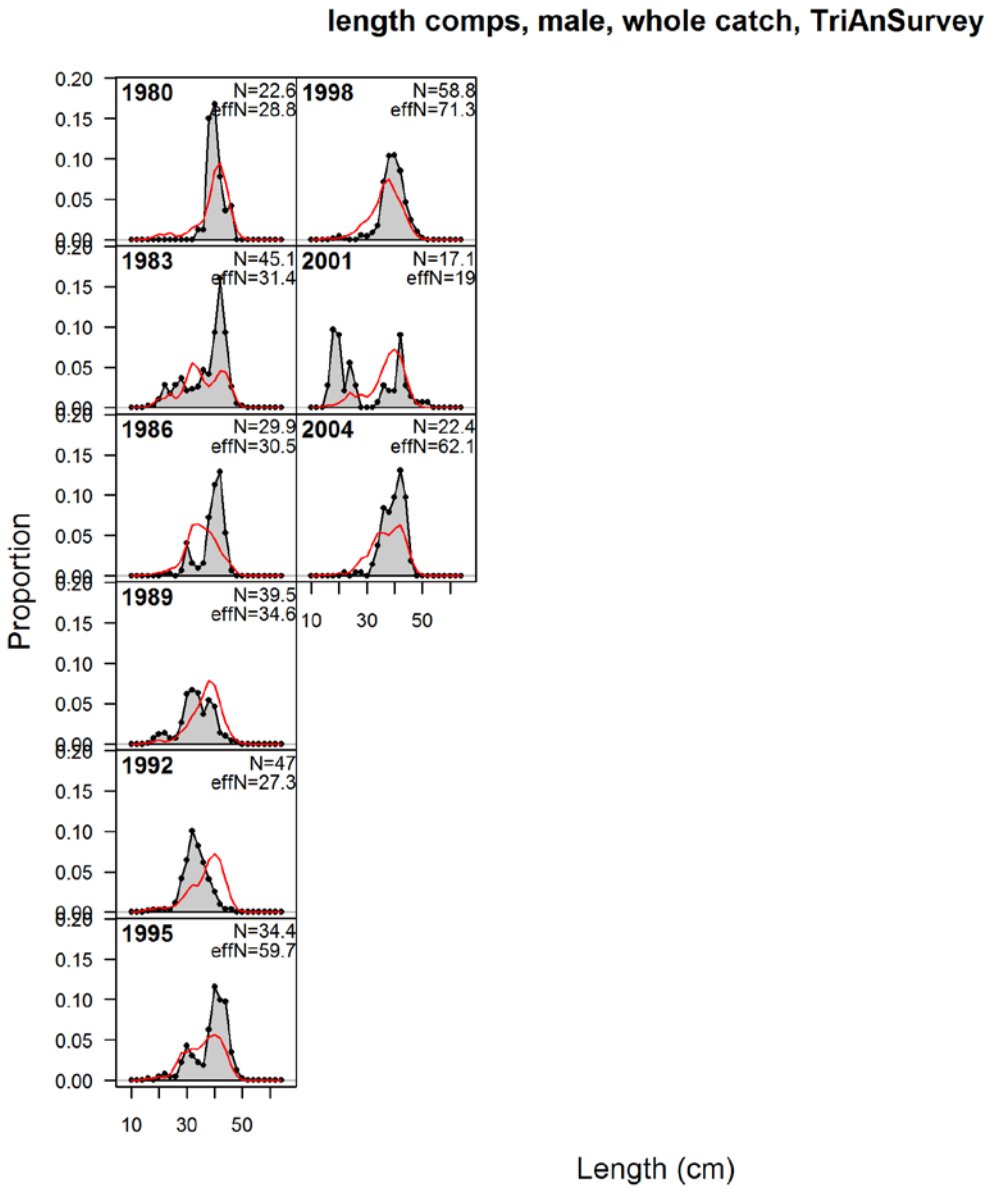

Figure C14. Model fits to the triennial survey male length composition data. Note that N is not the actual sample size, but the effective sample size from the previous iteration.

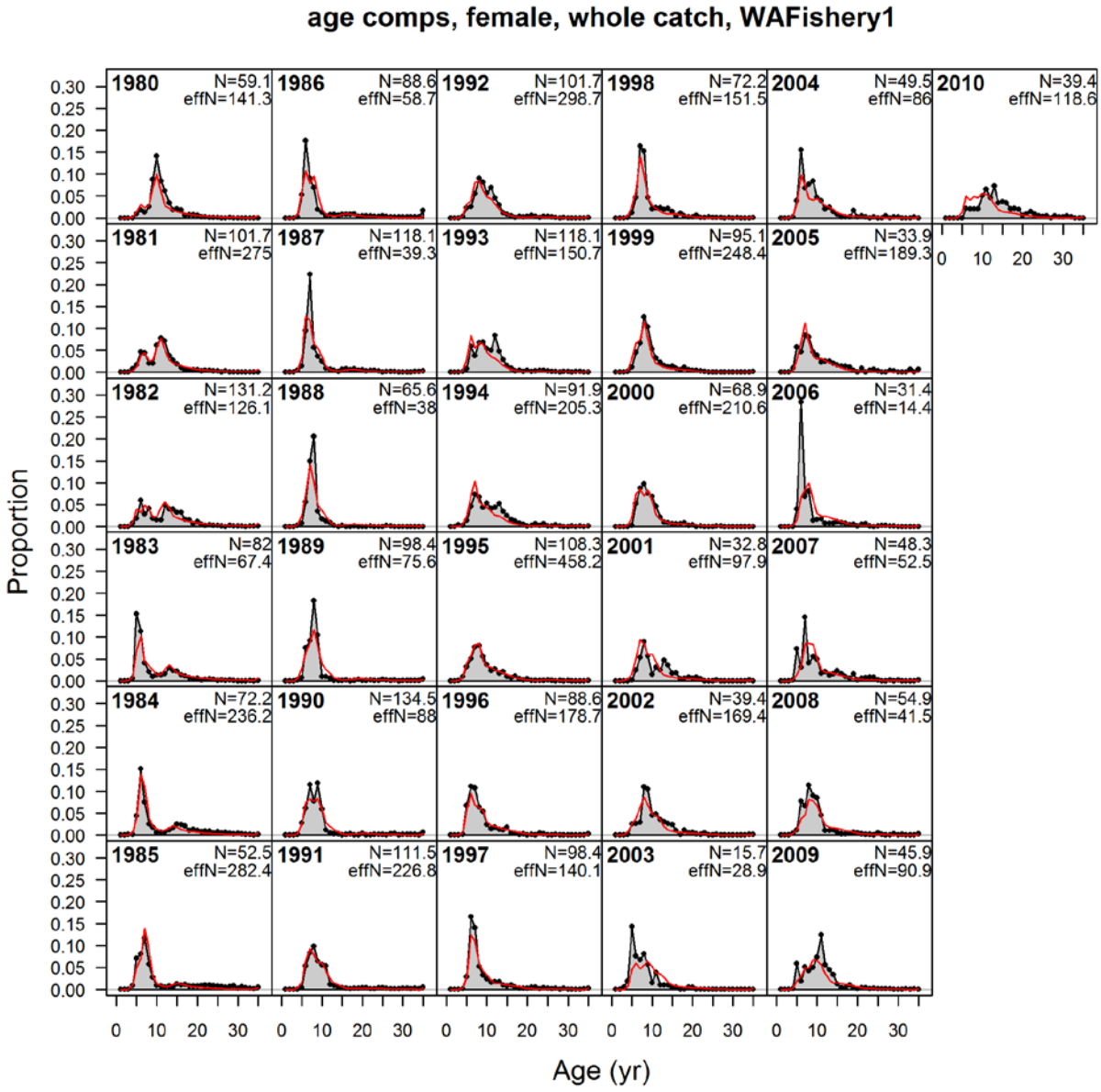

Figure C15. Model fits to the Washington fishery female age composition data. Note that N is not the actual sample size, but the effective sample size from the previous iteration.

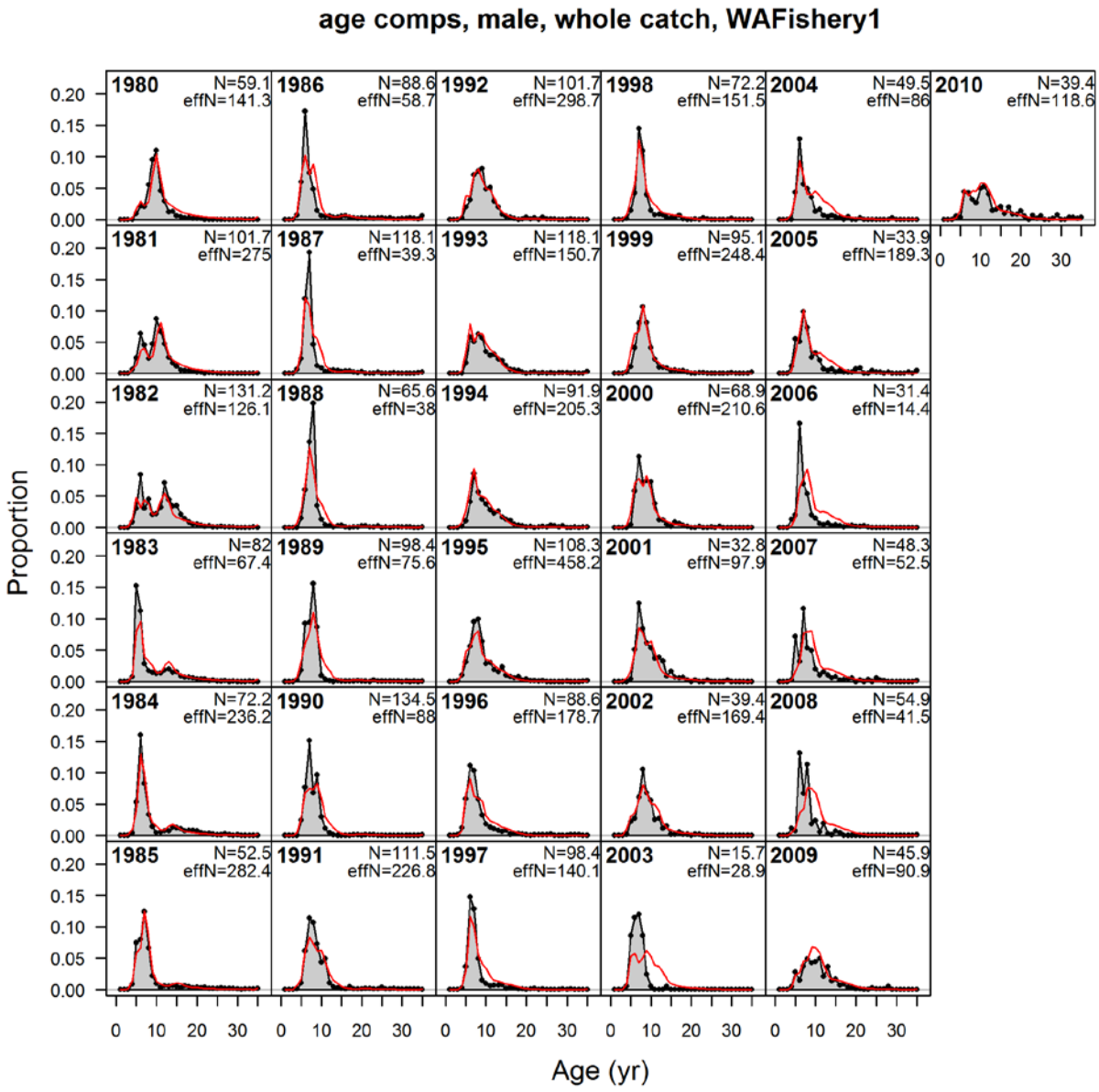

Figure C16. Model fits to the Washington fishery male age composition data. Note that N is not the actual sample size, but the effective sample size from the previous iteration.

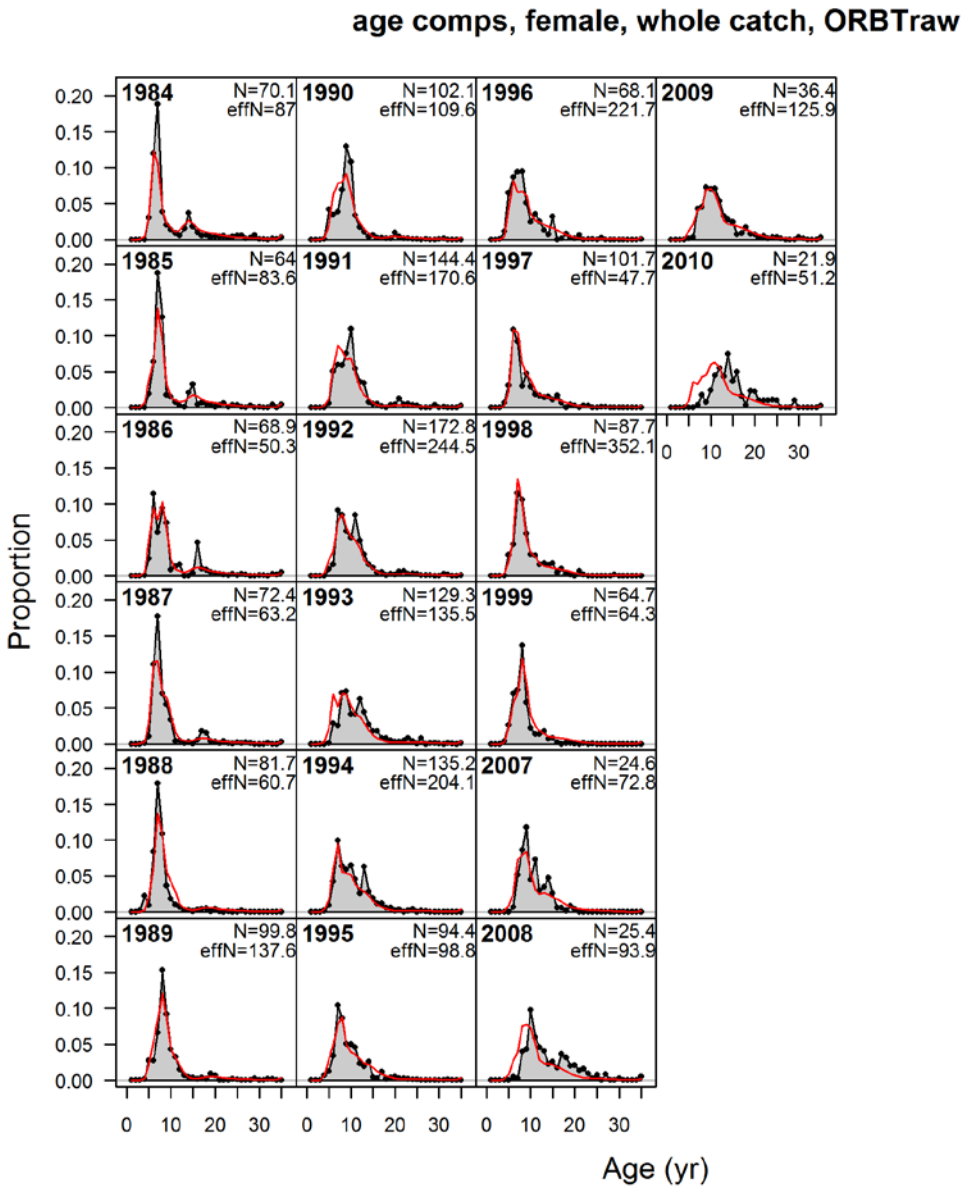

Figure C17. Model fits to the Oregon bottom trawl fishery female age composition data. Note that N is not the actual sample size, but the effective sample size from the previous iteration.

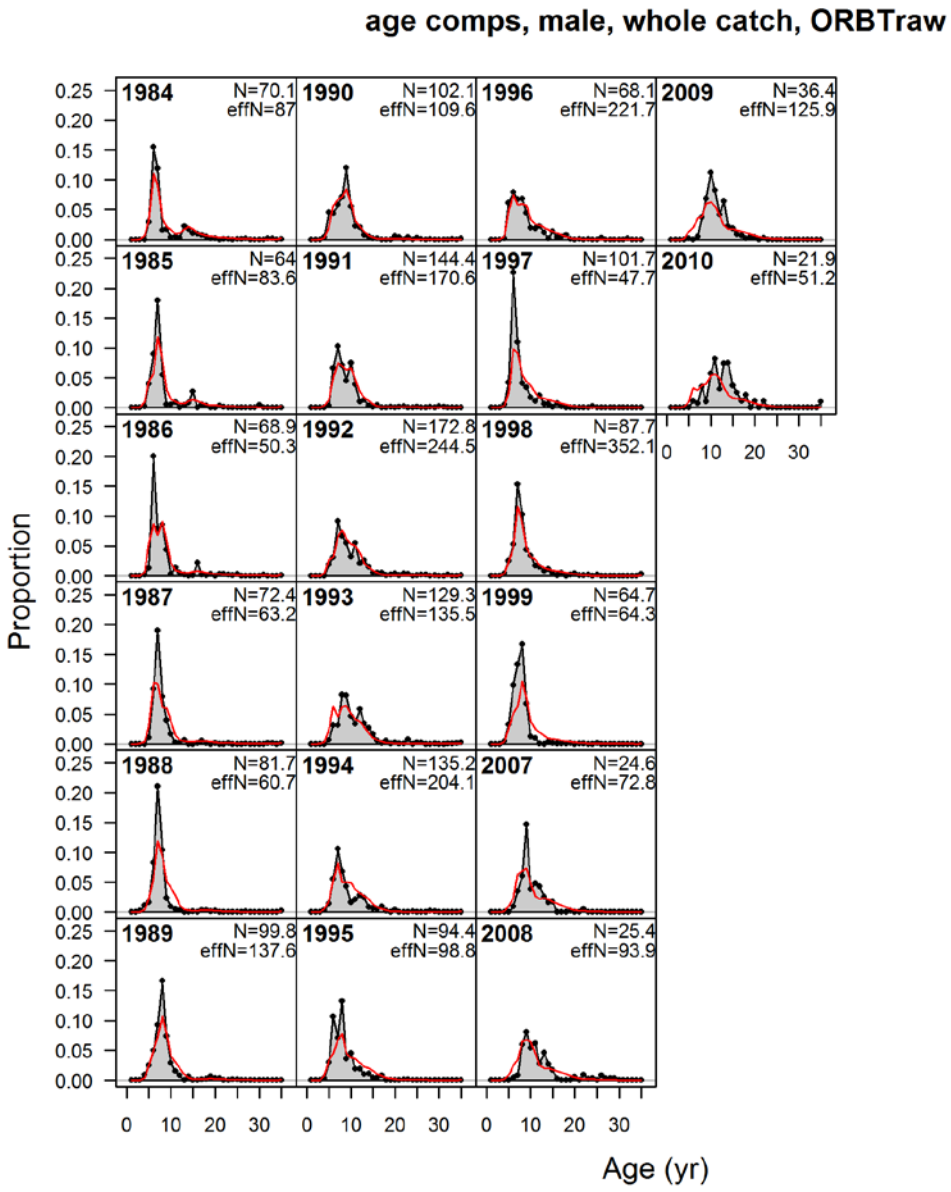

Figure C18. Model fits to the Oregon bottom trawl fishery male age composition data. Note that N is not the actual sample size, but the effective sample size from the previous iteration.

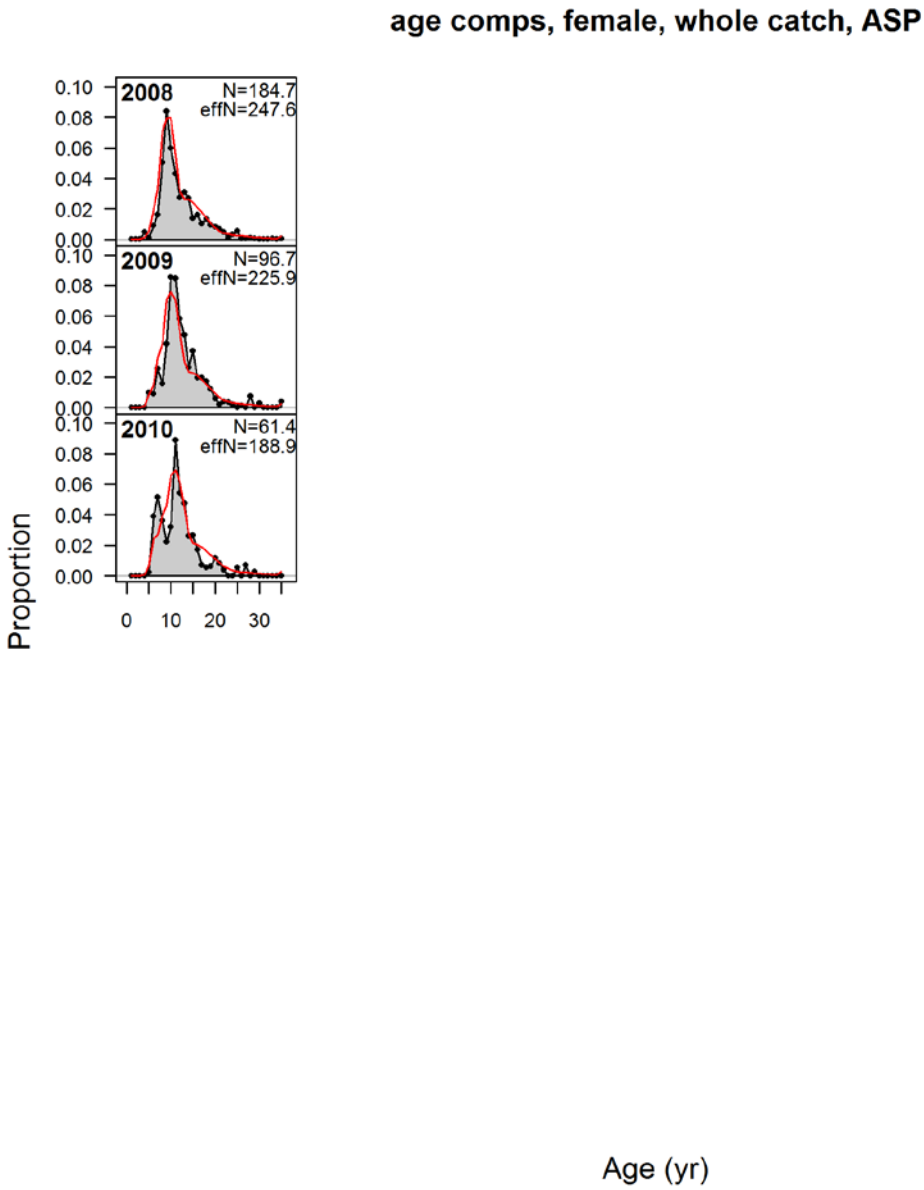

Figure C19. Model fits to the at-sea whiting processor (ASP) fishery female age composition data. Note that N is not the actual sample size, but the effective sample size from the previous iteration.

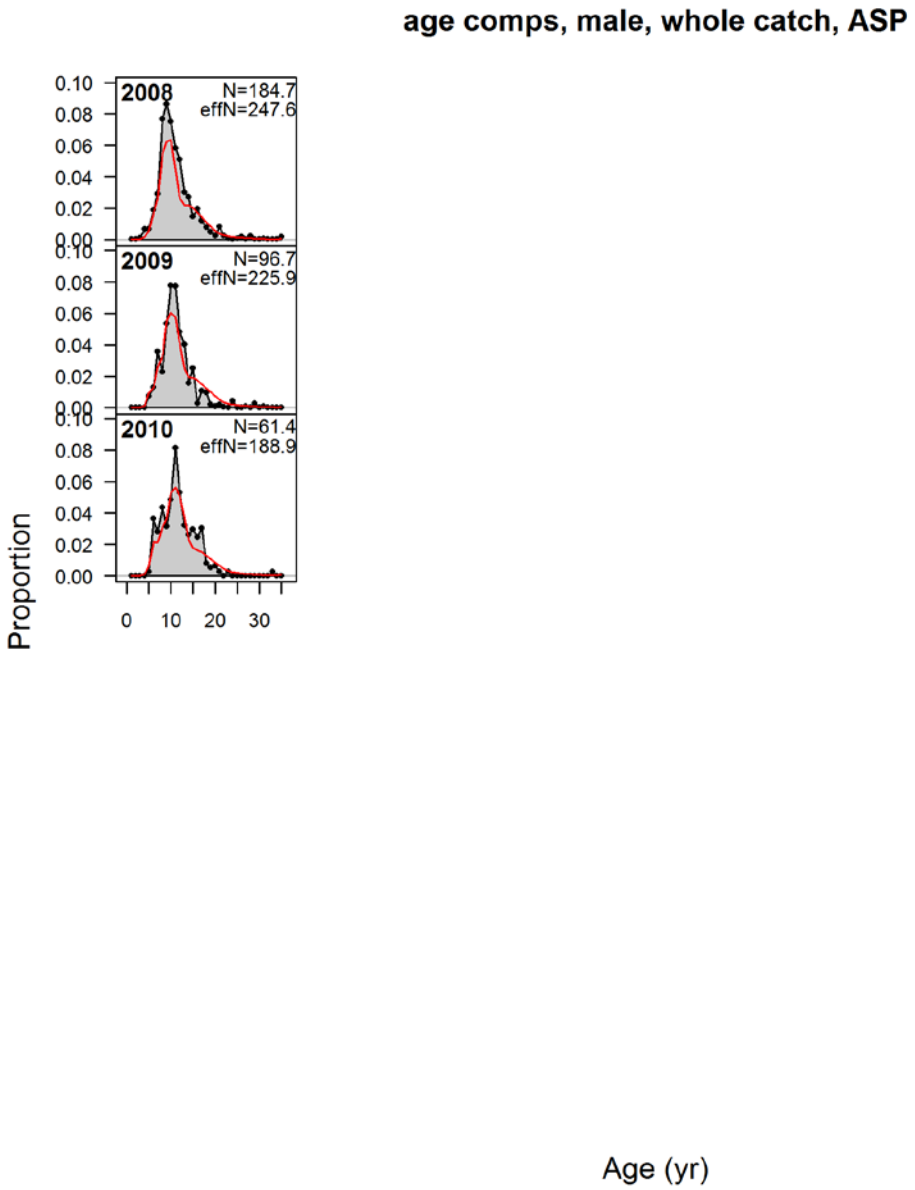

Figure C20. Model fits to the at-sea whiting processor (ASP) fishery male age composition data. Note that N is not the actual sample size, but the effective sample size from the previous

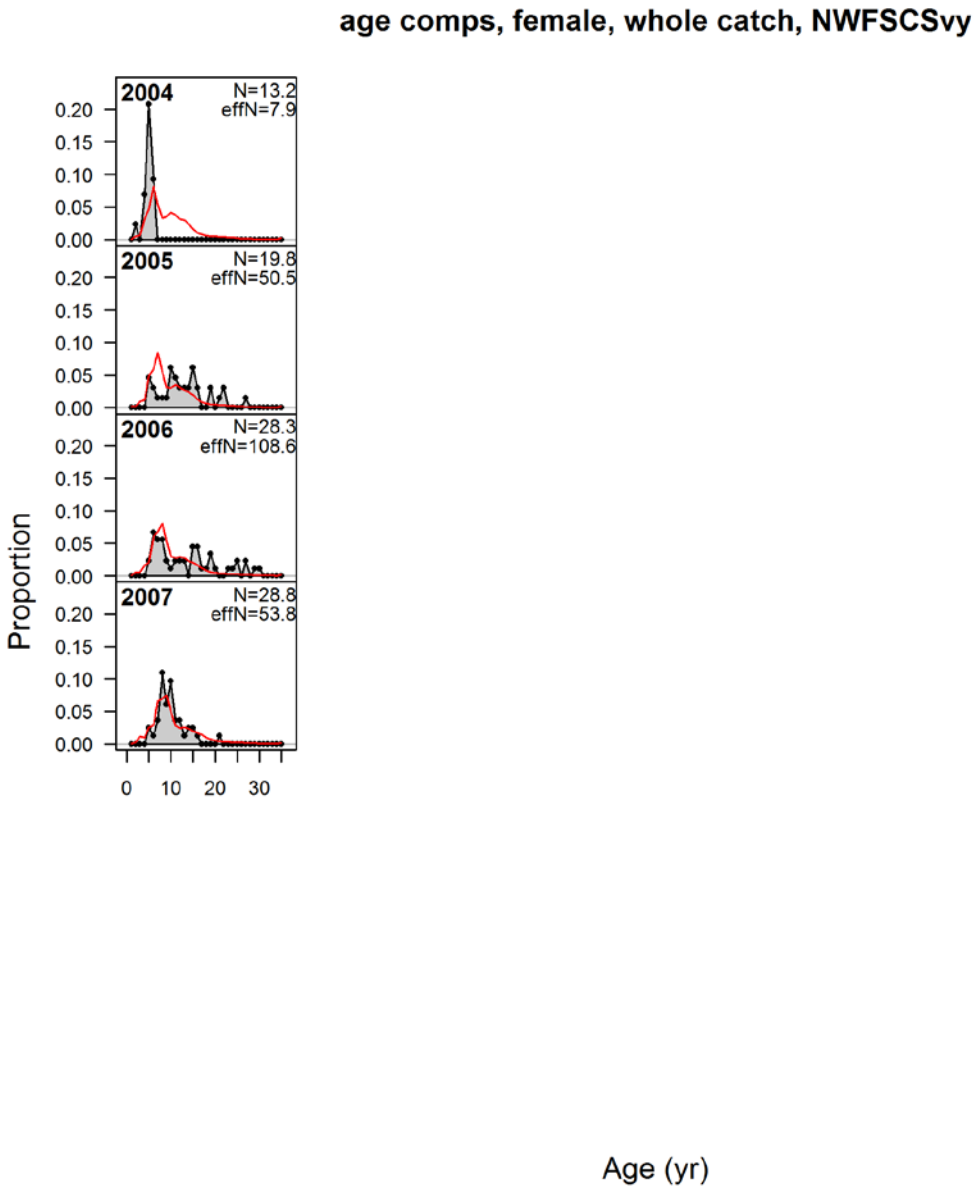

Figure C21. Model fits to the NWFSC survey female age composition data. Note that N is not the actual sample size, but the effective sample size from the previous

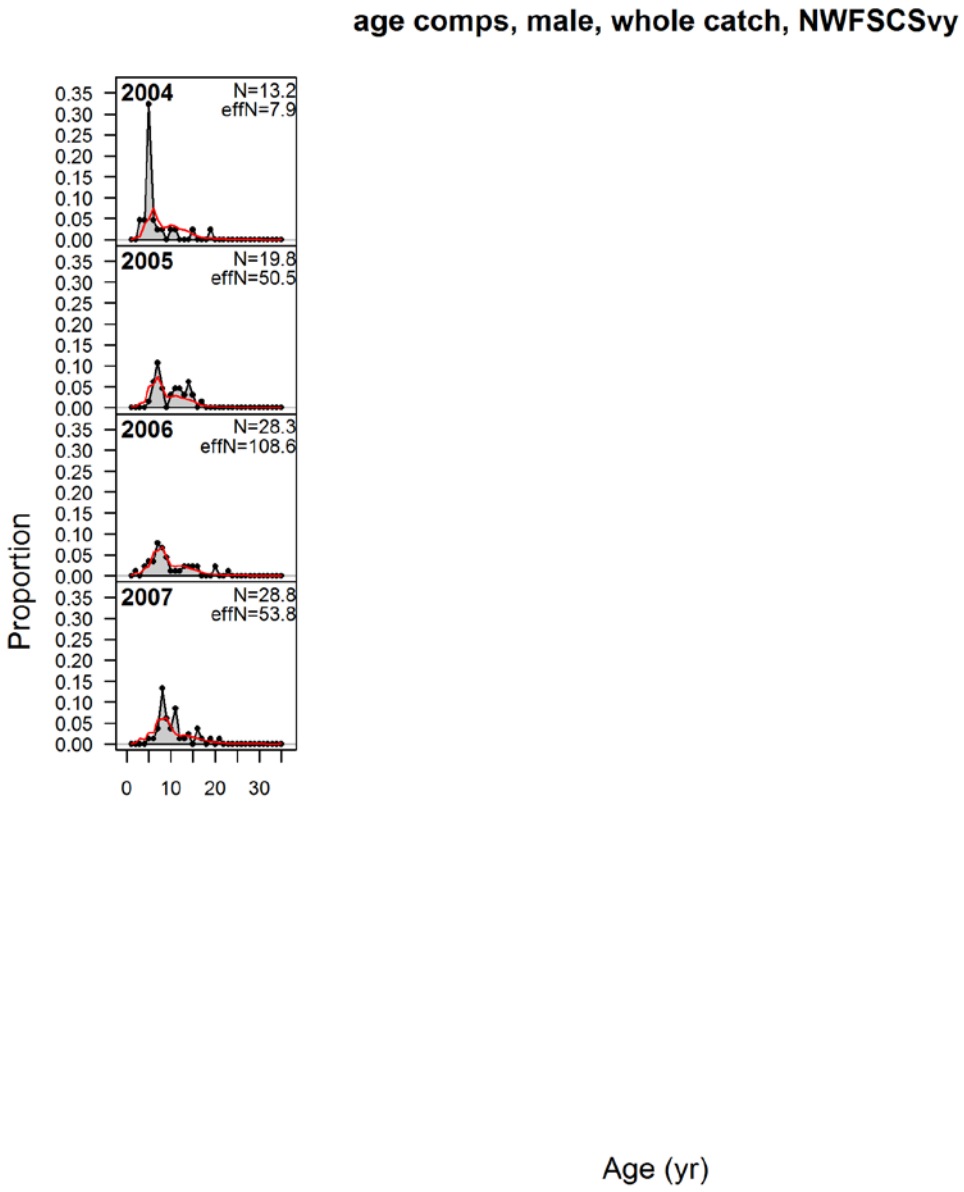

Figure C22. Model fits to the NWFSC survey male age composition data. Note that N is not the actual sample size, but the effective sample size from the previous

10.4 Appendix D. Input SS3 files for widow rockfish stock assessment base model.

There were four input files for the SS3 program: (1) Starter.SS; (2) Forecast.SS; (3) control file (wdw1.ctl); and (4) data file (wdw1.dat).

10.4.1 Starter.SS

```
#C 2011_Widow_rockfish_ stockassessment__Xi_He__NMFS_SWFSC__Santa_Cruz_CA
#C SS-V3.21e;_06/9/2011;_Stock_Synthesis_by_Richard_Methot_(NOAA)_using_ADMB

wdw1.dat
wdw1.ctl

0               # 0=use init values in control file; 1=use ss3.par
1               # run display detail (0,1,2)
1               # detailed age-structured reports in SS2.rep (0,1)
0               # write detailed checkup.sso file (0,1)
1               # write parm values to ParmTrace.sso (0=no,1=good,active; 2=good,all; 3=every_iter,all_parms)
2               # write to cumreport.sso (0=no,1=like&timeseries; 2=add survey fits)
0               # Include prior_like for non-estimated parameters (0,1)
1               # Use Soft Boundaries to aid convergence (0,1) (recommended)
1               # Number of bootstrap datafiles to produce
9               # Turn off estimation for parameters entering after this phase
10              # MCMC burn interval
2               # MCMC thin interval
0.1             # jitter initial parm value by this fraction
-1              # begin annual SD report in start year
-2              # end annual SD report in end year (-2=end of annual SD report in last forecast year
0               # N individual STD years (0=none)

#vector of year values

0.0001  # final convergence criteria (e.g. 1.0e-04)
0               # retrospective year relative to end year (e.g. -4)
0               # min age for calc of summary biomass
1               # Depletion basis:  denom is: 0=skip; 1=rel X*B0; 2=rel X*Bmsy; 3=rel X*B_styr
1               # Fraction (X) for Depletion denominator (e.g. 0.4)
4               # (1-SPR)_reporting:  0=skip; 1=rel(1-SPR); 2=rel(1-SPR_MSY); 3=rel(1-SPR_Btarget); 4=no denominator (report actural 1-SPR values)
```

```
1                    # F_report_units: 0=skip; 1=exploitation(Bio); 2=exploitation(Num); 3=sum(Frates); 4=true F for range of ages
#COND 10 15 #_min and max age over which average F will be calculated with F_reporting=4

#1                   # F_std reporting: 0=skip; 1=exploit(Bio); 2=exploit(Num); 3=sum(frates) -> old
1                    # F_report_basis: 0=raw; 1=rel Fspr; 2=rel Fmsy ; 3=rel Fbtgt

999                  # check value for end of file
```

10.4.2 forecast.SS

```
#C 2011_Widow_rockfish_ stockassessment__Xi_He__NMFS_SWFSC__Santa_Cruz_CA
#C SS-V3.21e;_06/9/2011;_Stock_Synthesis_by_Richard_Methot_(NOAA)_using_ADMB
#C  generic forecast file

# for all year entries except rebuilder; enter either: actual year, -999 for styr, 0 for endyr, neg number for rel. endyr
1          # Benchmarks: 0=skip; 1=F(SPR); 2=F(MSY);3=F(Btarget); 4=F(endyr); 5=Ave recent F (not implemented); 6= read Fmult (not implemented)
2          # MSY: 1= set to F(SPR); 2=calc F(MSY); 3=set to F(Btgt); 4=set to F(endyr)
0.5 # SPR target (e.g. 0.40), 0.5 for west coast groundfish
0.4 # Biomass target (e.g. 0.40)
#_Bmark_years: beg_bio, end_bio, beg_selex, end_selex, beg_relF, end_relF (enter actual year, or values of 0 or -integer to be rel. endyr)
2010 2010 2010 2010 2010 2010
#  2008 2008 2008 2008 2008 2008 # after processing
2 #Bmark_relF_Basis: 1 = use year range; 2 = set relF same as forecast below

#
1          # Forecast: 0=none; 1=F(SPR); 2=F(MSY) 3=F(Btgt); 4=Ave F (uses first-last relF yrs); 5=input annual F scalar
12         # N forecast years
1          # F scalar (only used for Do_Forecast==5)
#_Fcast_years:  beg_selex, end_selex, beg_relF, end_relF  (enter actual year, or values of 0 or -integer to be rel. endyr)
0 0 -10 0

1                    # Control rule method (1=catch=f(SSB) west coast; 2=F=f(SSB) )
0.4                  # Control rule Biomass level for constant F (as frac of Bzero, e.g. 0.40)
0.1        # Control rule Biomass level for no F (as frac of Bzero, e.g. 0.10)
0.75       # Control rule target as fraction of Flimit (e.g. 0.75)

3                    #_N forecast loops (1-3) (fixed at 3 for now)
```

```
3                   #_First forecast loop with stochastic recruitment
0                   #_Forecast loop control #3 (reserved for future bells&whistles)
0                   #_Forecast loop control #4 (reserved for future bells&whistles)
0                   #_Forecast loop control #5 (reserved for future bells&whistles)

2023    #FirstYear for caps and allocations (should be after years with fixed inputs)
0.0                 # stddev of log(realized catch/target catch) in forecast (set value>0.0 to cause active impl_error) (if=0, there will be N_forecase_years less
parameters estimated)
0                   # Do West Coast gfish rebuilder output (0/1)
-1                  # Rebuilder:  first year catch could have been set to zero (Ydecl)(-1 to set to 1999)
-1                  # Rebuilder:  year for current age structure (Yinit) (-1 to set to endyear+1)
1                   # fleet relative F:  1=use first-last alloc year; 2=read seas(row) x fleet(col) below

# Note that fleet allocation is used directly as average F if Do_Forecast=4
2                   # basis for fcast catch tuning and for fcast catch caps and allocation  (2=deadbio; 3=retainbio; 5=deadnum; 6=retainnum)
# Conditional input if relative F choice = 2
# Fleet relative F:  rows are seasons, columns are fleets
#_Fleet:  WAFishery1 ORMWTraw ORBTraw EMFishery
#  0 0 0 0
# max totalcatch by fleet (-1 to have no max) must enter value for each fleet
-1 -1 -1 -1 -1

# max totalcatch by area (-1 to have no max); must enter value for each fleet
-1

# fleet assignment to allocation group (enter group ID# for each fleet, 0 for not included in an alloc group)
0 0 0 0 0

#_Conditional on >1 allocation group
# allocation fraction for each of: 0 allocation groups
# no allocation groups
60                  # Number of forecast catch levels to input (else calc catch from forecast F)
2                   # basis for input Fcast catch:  2=dead catch; 3=retained catch; 99=input Hrate(F) (units are from fleetunits; note new codes in SSV3.20)
# Input fixed catch values
# Setting 2011 and 2012 OYs are both 600mt and cathc allocations are average of 2001 to 2010, see C:\XiHe1\Widow2011\ForecastFiles\ALLLanging4.xlsx
#Year Seas Fleet Catch(or_F)
2011    1       1       117.7
2011    1       2       225.4
```

2011	1	3	9.2
2011	1	4	113.4
2011	1	5	134.3
2012	1	1	117.7
2012	1	2	225.4
2012	1	3	9.2
2012	1	4	113.4
2012	1	5	134.3
2013	1	1	58.9
2013	1	2	112.7
2013	1	3	4.6
2013	1	4	56.7
2013	1	5	67.1
2014	1	1	58.9
2014	1	2	112.7
2014	1	3	4.6
2014	1	4	56.7
2014	1	5	67.1
2015	1	1	58.9
2015	1	2	112.7
2015	1	3	4.6
2015	1	4	56.7
2015	1	5	67.1
2016	1	1	58.9
2016	1	2	112.7
2016	1	3	4.6
2016	1	4	56.7
2016	1	5	67.1
2017	1	1	58.9
2017	1	2	112.7
2017	1	3	4.6
2017	1	4	56.7
2017	1	5	67.1
2018	1	1	58.9
2018	1	2	112.7
2018	1	3	4.6
2018	1	4	56.7
2018	1	5	67.1

```
2019    1       1       58.9
2019    1       2       112.7
2019    1       3       4.6
2019    1       4       56.7
2019    1       5       67.1
2020    1       1       58.9
2020    1       2       112.7
2020    1       3       4.6
2020    1       4       56.7
2020    1       5       67.1
2021    1       1       58.9
2021    1       2       112.7
2021    1       3       4.6
2021    1       4       56.7
2021    1       5       67.1
2022    1       1       58.9
2022    1       2       112.7
2022    1       3       4.6
2022    1       4       56.7
2022    1       5       67.1

#
999 # verify end of input
```

10.4.3 Control file (wdw1.ctl)

```
#C 2011_Widow_rockfish_ stockassessment__Xi_He__NMFS_SWFSC__Santa_Cruz_CA
#C SS-V3.21e;_06/9/2011;_Stock_Synthesis_by_Richard_Methot_(NOAA)_using_ADMB

#_data_and_control_files: wdw1.dat wdw1.ctl

1          #_N_Growth_Patterns
1          #_N_Morphs_Within_GrowthPattern

#_Recruit_Setup
#2         # N recruitment designs goes here if N_GP*nseas*pop>1
#0         # placeholder for recruitment interaction request

# GP seas area for each recruitment assignment
#1 1 1
#2 1 2

# 1 1 1  # example recruitment design element for GP=1, seas=1, pop=1

# N_movement_definitions goes here if pop > 1
#0

# 0 # N_movement_definitions goes here if pop > 1
# 1.0 # first age that moves (real age at begin of season, not integer)
# 1 1 1 2 4 10 # example move definition for seas=1, morph=1, source=1 dest=2, age1=4, age2=10

2                    #_Nblock_Designs
1          3         #_blocks_per_pattern
2003 2010                                    # begin and end years of first blocks
1916 1979 1980 2000 2001 2010    # begin and end years of second blocks

0.5        #_fracfemale
0          #_natM_type:_0=1Parm; 1=N_breakpoints;_2=Lorenzen;_3=agespecific;_4=agespec_withseasinterpolate
#1         #_natM_type:_0=1Parm; 1=N_breakpoints;_2=Lorenzen;_3=agespecific;_4=agespec_withseasinterpolate
#4         #_N_breakpoints
#3 4 25 26          # age(real) at M breakpoints
1          # GrowthModel: 1=vonBert with L1&L2; 2=vonBert with A0&Linf; 3=Richards; 4=readvector
```

```
5          #_Growth_Age_for_L1
15         #_Growth_Age_for_L2 (999 to use as Linf)
0          #_SD_add_to_LAA (set to 0.1 for SS2 V1.x compatibility)
1          #_CV_Growth_Pattern:  0 CV=f(LAA); 1 CV=F(A); 2 SD=F(LAA); 3 SD=F(A)
3          #_maturity_option:  1=length logistic; 2=age logistic; 3=read age-maturity for each femlae GP; 4=read age-fecundity for each female GP

#_Age_Maturity by growth pattern (Muturity by age for GP1 and GP2)
0.000000  0.000000  0.000000  0.046000  0.077000  0.262000  0.494000  0.746000  0.930000
        0.986000  0.993000  1.000000  1.000000  1.000000  1.000000  1.000000  1.000000
        1.000000  1.000000  1.000000  1.000000  1.000000  1.000000  1.000000  1.000000
        1.000000  1.000000  1.000000  1.000000  1.000000  1.000000  1.000000  1.000000
        1.000000  1.000000  1.000000
#0.000000  0.000000  0.000000  0.000000  0.000000  0.262000  0.494000  0.746000  0.930000
        0.986000  0.993000  1.000000  1.000000  1.000000  1.000000  1.000000  1.000000
        1.000000  1.000000  1.000000  1.000000  1.000000  1.000000  1.000000  1.000000
        1.000000  1.000000  1.000000  1.000000  1.000000  1.000000  1.000000  1.000000
        1.000000  1.000000  1.000000

# for MaxAge=35
# Combined for one area model
# new growth parameters
#0.000000  0.000000  0.000000  0.000000  0.000305  0.022925  0.085323  0.191593  0.314121
        0.408335  0.481675  0.550139  0.609215  0.662401  0.709951  0.752218  0.789607
        0.822546  0.851465  0.876781  0.898888  0.918153  0.934912  0.949467  0.962093
        0.973033  0.982503  0.990694  0.997774  1.003890  1.009170  1.013727  1.017658
        1.021048  1.023971  1.026491

# Old growth parameters (sheet CombinedMat$fec in "OneArea Widow AgeLengthWeight maturity fecundity2.xls")
#0.000000  0.000000  0.000000  0.000000  0.000000  0.005061  0.057423  0.158923  0.275324
        0.367611  0.440086  0.507405  0.565337  0.617227  0.663401  0.704271  0.740292
        0.771932  0.799646  0.823867  0.844996  0.863401  0.879413  0.893330  0.905416
        0.915907  0.925008  0.932900  0.939742  0.945672  0.950812  0.955265  0.959124
        0.962467  0.965364  0.967874

# for two-area model: north and south
#0.000000  0.000000  0.000000  0.000000  0.000000  0.007230  0.048819  0.158084  0.279150
        0.376601  0.449400  0.518599  0.578021  0.632178  0.681194  0.725300  0.764794
        0.800010  0.831301  0.859020  0.883513  0.905106  0.924107  0.940800  0.955444
```

```
        0.968275        0.979507        0.989329        0.997911        1.005406        1.011947        1.017652        1.022626
        1.026962        1.030739        1.034029
#0.000000       0.000000        0.000000        0.000650        0.002100        0.019200        0.077500        0.160883        0.266395
        0.346636        0.418351        0.481285        0.535740        0.582344        0.621884        0.655201        0.683122
        0.706418        0.725787        0.741843        0.755124        0.766088        0.775126        0.782566        0.788685
        0.793714        0.797843        0.801233        0.804013        0.806293        0.808163        0.809695        0.810951
        0.811980        0.812822        0.813513

0       #_First_Mature_Age
5       #_fecundity option:(1)eggs=Wt*(a+b*Wt);(2)eggs=a*L^b;(3)eggs=a*Wt^b;(4)eggs=a+b*L;(5)eggs=a+B*W !!! No used if maturity_option = 4
0       # no gender Change
1       #_parameter_offset_approach (1=none, 2= M, G, CV_G as offset from female-GP1, 3=like SS2 V1.x)
1       #_env/block/dev_adjust_method (1=standard; 2=with logistic trans to keep within base parm bounds)

# growth parameter see: (sheet CombinedMat$fec in "OneArea Widow AgeLengthWeight maturity fecundity2.xls")
#_growth_parms
#_LO    HI              INIT    PRIOR   PR_type SD              PHASE   env     usdev   dminyr  dmaxyr  dev_std Block   Block_Fxn
0.01    0.3             0.124   -2.09    3              0.3             3               0       0               0               0
        0               0               0       # NatM_p_1_Fem_GP_1
10              50              30.3608 29.55   -1              99              2               0       0               0               0
        0               0               0       # L_at_Amin_Fem_GP_1
40              60              47.5490 47.37   -1              99              2               0       0               0               0
        0               0               0       # L_at_Amax_Fem_GP_1
0.01    0.4             0.1855  0.2005  -1              99              2               0       0               0               0
        0               0               0       # VonBert_K_Fem_GP_1
0.01    0.4             0.06475 0.069   -1              99              6               0       0               0               0
        0               0               0       # CV_young_Fem_GP_1
0.01    0.4             0.04621 0.046   -1              99              6               0       0               0               0
        0               0               0       # CV_old_Fem_GP_1

0.01    0.3             0.129   -2.05    3              0.3             3               0       0               0               0
        0               0               0       # NatM_p_1_Fem_GP_1
10              50              30.2180 30.67   -1              99              2               0       0               0               0
        0               0               0       # L_at_Amin_Fem_GP_2
40              60              43.4792 43.53   -1              99              2               0       0               0               0
        0               0               0       # L_at_Amax_Fem_GP_2
0.01    0.4             0.2679  0.2505  -1              99              2               0       0               0               0
        0               0               0       # VonBert_K_Fem_GP_2
```

```
0.01    0.4             0.05270 0.052   -1              99              6               0       0               0               0
        0               0               0       # CV_young_Fem_GP_2
0.01    0.6             0.05194 0.052   -1              99              6               0       0               0               0
        0               0               0       # CV_old_Fem_GP_2

-3              3 0.00000545 0.00000545 -1              99              -1              0       0               0               0
        0               0               0       # Wtlen1_Fem
-3              10              3.28781 3.28781 -1              99              -1              0       0               0               0
        0               0               0       # Wtlen2_Fem
-3              50              7               7               -1              99              -1              0       0               0
        0               0               0               0       # Mat50_Fem                                     !! ignored if maturity option=4
-3              3               -1              -1              -1              99              -1              0       0               0
        0               0               0               0       # Mat_slope_Fem                 !! ignored if maturity option=4
-1              1               0               0               -1              99              -1              0       0               0
        0               0               0               0       # Eggs/kg_inter_Fem             !! ignored if maturity option=4
0               1               1               1               -1              99              -1              0       0               0
        0               0               0               0       # Eggs/kg_slope_wt_Fem  !! ignored if maturity option=4

-3              3 0.00001188 0.00001188 -1              99              -1              0       0               0               0
        0               0               0       # Wtlen1_Mal
-3              10              3.06631 3.06631 -1              99              -1              0       0               0               0
        0               0               0       # Wtlen2_Mal

-4    4   0               0               -1    99    -1    0  0     0     0     0               0     0  # RecrDist_GP_1
-4    4     0     0     -1    99    -3    0  0     0     0     0               0     0  # RecrDist_Area_1
-4    4     0     0     -1    99    -3    0  0     0     0     0               0     0  # RecrDist_Seas_1
-4              4               0               0               -1              99              -3              0       0               0
        0               0               0               0       # CohortGrowDev

# 0  #custom_MG-env_setup (0/1)
# -2 2 0 0 -1 99 -2 #_placeholder for no MG-environ parameters

# 1  #custom_MG-block_setup (0/1)
# -2 2 0 0 -1 99 6 #_placeholder for no MG-block parameters
# -2 2 0 0 -1 99 6 #_placeholder for no MG-block parameters
# -2 2 0 0 -1 99 6 #_placeholder for no MG-block parameters

#_seasonal_effects_on_biology_parms
```

```
#_femwtlen1     femwtlen2       mat1    mat2    fec1    fec2    Malewtlen1      malewtlen2      L1      K
0                       0                       0               0               0               0                       0
                0       0

# -2 2 0 0 -1 99 -2 #_placeholder for no seasonal MG parameters
# -2 2 0 0 -1 99 -2 #_placeholder for no MG dev parameters
# if use Rick's recruit dist dev, active next line (phase for MGparm_dev)
#7  # placeholder for #_MGparm_Dev_Phase

#_Spawner-Recruitment
#_SR functions: 1=Beverton Holt with flat-top beyond Bzero; 2=Ricker; 3= Standard BH; 4=SCAA; 5=Hockey; 6=Shepard_3Parm
3       #_SR_function

#_LO    HI      INIT    PRIOR   PR_type         SD              PHASE
1               20      9.97    9.97    -1                      99              1               # SR_R0
0.2             1       0.76    0.76    -1                      99              -2              # SR_steep: Martin's new prior (see email
5/18/2010)
#0.2            1       0.76    0.76    2                       0.17    2               # SR_steep: Martin's new prior (see email 5/18/2010)
0               2       0.65    0.65    -1                      99              -3              # SR_sigmaR
-5              5       0               0               -1                      1               -3              # SR_envlink
-5              5       0               0               -1                      1               -3              # SR_R1_offset
0               0.5     0               0               -1                      99              -2              # SR_autocorr

0               #_SR_env_link
0               #_SR_env_target_0=none;1=devs;_2=R0;_3=steepness

1               # do_recdev:  0=none; 1=devvector; 2=simple deviations
1978    # first year of main recr_devs; early devs can preceed this era
2009    # last year of main recr_devs; forecast devs start in following year
3               #_recdev phase

1               # (0/1) to read 13 advanced options: Mark all lines in next section if = 0

#_start of advanced SR options
-30             #_recdev_early_start (0=none; neg value makes relative to recdev_start)
3               #_recdev_early_phase
0               #_forecast_recruitment phase (incl. late recr) (0 value resets to maxphase+1)
1               #_lambda for forecast recr dev occurring before endyr+1
```

```
1966    #_last_early_yr_nobias_adj_in_MPD
1974    #_first_yr_fullbias_adj_in_MPD
2004    #_last_yr_fullbias_adj_in_MPD
2011    #_first_recent_yr_nobias_adj_in_MPD

0.93    # Max bias adjustment
0               # future use
-5              #min rec_dev
5               #max rec_dev
0               #_read_recdevs
#_end of advanced SR options

#Fishing Mortality info
0.05    # F ballpark for tuning early phases
1982    # F ballpark year (neg value to disable)
3               # F_Method:  1=Pope; 2=instan. F; 3=hybrid (hybrid is recommended)
2.9             # max F or harvest rate, depends on F_Method

# no additional F input needed for Fmethod 1
# read overall start F value; overall phase; N detailed inputs to read for Fmethod 2
# read N iterations for tuning for Fmethod 3 (recommend 3 to 7)

# if F_Method=2 (instan.), active next line
# 0.01  1       0       # overall start F value; overall phase; N detailed inputs to read

# Number of tuning iterations in hybrid F: 4 or 5 may be good - check how catches data match estimated catches
# if F_Method=3 (hybrid), activate next line
5

#Fleet Year Seas F_value se phase (for detailed setup of F_Method=2)

#_initial_F_parms
#_LO    HI      INIT    PRIOR   PR_type SD      PHASE
0               0.5     0               0               -1      1000    -1      # InitF_1WAFishery1
0               0.5     0               0               -1      1000    -1      # InitF_2ORMWTraw
0               0.5     0               0               -1      1000    -1      # InitF_3ORBTraw
0               0.5     0               0               -1      1000    -1      # InitF_4EMFishery
```

```
0                    0.5      0                    0                    -1         1000     -1         # InitF_5ASP

#_Q_setup - no Q parameters - median unbiased, also Extra SDs added to each survey ==========
# A=do power: 0=skip, index is linear proportiona to abundance, 1= add power parameter (non-linear)
# B=env link: 0=skip, 1= add para for env effect on Q
# C=extra SD: 0=skip, 1= add para for additive constant to input SE (in log space)
# D=type: <0=mirror lower abs(#) fleet, 0=no para Q is median unbiased, 1=no para Q is mean unbiased, 2=estimate par for ln(Q)
#    3=ln(Q) + set of devs about ln(Q) for all years. 4=ln(Q) + set of devs about Q for indexyr-1
#A B C D
 0 0 0 0 # 1 WAFishery1
 0 0 0 0 # 2 ORMWTraw
 0 0 0 0 # 3 ORBTraw
 0 0 0 0 # 4 EMFishery
 0 0 0 0 # 5 ASP
 0 0 0 0 # 6 SCJuvSurvey
 0 0 0 0 # 7 ORBTrawCPUE
 0 0 0 0 # 8 ForWBycatch
 0 0 0 0 # 9 JVWBycatch
 0 0 0 0 # 10 DomWBycatch
 0 0 0 0 # 11 NWFSCSvy
 0 0 0 0 # 12 TriAnSurvey
# Q =======

#_size_selex_Setup
#_SelPattern       Do_retain          Do_male            Special
24 0 0 0  # 1 WAFishery1
24 0 0 0  # 2 ORMWTraw
24 0 0 0  # 3 ORBTraw
24 0 0 0  # 4 EMFishery
24 0 0 0  # 5 ASP
 0 0 0 0   # 6 SCJuvSurvey
 5 0 0 3   # 7 ORBTrawCPUE
 5 0 0 2   # 8 ForWBycatch
 5 0 0 2   # 9 JVWBycatch
 5 0 0 2   # 10 DomWBycatch
24 0 0 0  # 11 NWFSCSvy
 5 0 0 11             # 12 TriAnSurvey
```

```
#_age_selex_Setup
#_SelPattern	Do_retain	Do_male	Special
 10 0 0 0	# 1 WAFishery1
 10 0 0 0	# 2 ORMWTraw
 10 0 0 0	# 3 ORBTraw
 10 0 0 0	# 4 EMFishery
 10 0 0 0 # 5 ASP
 11 0 0 0	# 6 SCJuvSurvey
 10 0 0 0	# 7 ORBTrawCPUE
 10 0 0 0	# 8 ForWBycatch
 10 0 0 0	# 9 JVWBycatch
 10 0 0 0	# 10 DomWBycatch
 10 0 0 0	# 11 NWFSCSvy
 10 0 0 0 # 12 TriAnSurvey

# double normal parameter comments
# P1=PEAL: beginning size for the plateau; P2=TOP: width of plateau, as logistic between PEAK and MAXLENG
# P3=ASC-WIDTH: ln(width); P4=DESC-WIDTH: ln(width); P5=INIT: logistive between 0 and 1; P6=FINAL: logistic between 0 and 1
# for initial P5 parameter: -999 or -1000: ignore the inital selectivity algorithm and simply decay small fish according to P3

#LO	HI	INI	PRIOR	PR_ty	SD	PHA	envar	usdev dvminyr	dvmaxyr devstdv	Block
	Block_Fxn
18	60	38.9579	40	-1	99	3	0 0 0 0 0.5 0 0 # SizeSel_1P_1_WAFishery1
-15 3	-11.8234-3	-1	99	3	0 0 0 0 0.5 0 0 # SizeSel_1P_2_WAFishery1
-8	12	3.25239	3	-1	99	1	0 0 0 0 0.5 0 0 # SizeSel_1P_3_WAFishery1
-20	18	2.35537	-0.5	-1	99	1	0 0 0 0 0.5 0 0 # SizeSel_1P_4_WAFishery1
-18	5	-999	-999	-1	99	-1	0 0 0 0 0.5 0 0 # SizeSel_1P_5_WAFishery1
-10	5	0.131888	1	-1	99	1	0 0 0 0 0.5 1 1 # SizeSel_1P_6_WAFishery1

18	60	38.9969	40	-1	99	3	0 0 0 0 0.5 0 0 # SizeSel_2P_1_ORMWTraw
-15	3	-12.6273-3	-1	99	3	0 0 0 0 0.5 0 0 # SizeSel_2P_2_ORMWTraw
-8	12	3.33304	3	-1	99	1	0 0 0 0 0.5 0 0 # SizeSel_2P_3_ORMWTraw
-12	18	3.30179	-0.5	-1	99	1	0 0 0 0 0.5 0 0 # SizeSel_2P_4_ORMWTraw
-18	5	-999	-999	-1	99	-1	0 0 0 0 0.5 0 0 # SizeSel_2P_5_ORMWTraw
-10	5	-1.2824	1	-1	99	1	0 0 0 0 0.5 1 1 # SizeSel_2P_6_ORMWTraw

18	60	40.0244	40	-1	99	3	0 0 0 0 0.5 0 0 # SizeSel_3P_1_ORBTraw
-15	3	-11.8043-3	-1	99	3	0 0 0 0 0.5 0 0 # SizeSel_3P_2_ORBTraw
```

```
-8      12      3.30539         3               -1              99              1               0 0 0 0 0.5 0 0 # SizeSel_3P_3_ORBTraw
-12     18      2.59535         -0.5    -1              99              1               0 0 0 0 0.5 0 0 # SizeSel_3P_4_ORBTraw
-18     5       -999            -999    -1              99              -1              0 0 0 0 0.5 0 0 # SizeSel_3P_5_ORBTraw
-10     5       0.331688        1               -1              99              1               0 0 0 0 0.5 1 1 # SizeSel_3P_6_ORBTraw

18      60      41.1932         40              -1              99              3               0 0 0 0 0.5 0 0 # SizeSel_4P_1_EMFishery
-15     3       -12.0046-3              -1              99              3               0 0 0 0 0.5 0 0 # SizeSel_4P_2_EMFishery
-8      12      3.69497         3               -1              99              1               0 0 0 0 0.5 0 0 # SizeSel_4P_3_EMFishery
-12     18      4.28579         -0.5    -1              99              1               0 0 0 0 0.5 0 0 # SizeSel_4P_4_EMFishery
-18     5       -999            -999    -1              99              -1              0 0 0 0 0.5 0 0 # SizeSel_4P_5_EMFishery
-10     5       -9.175591               -1              99              1               0 0 0 0 0.5 1 1 # SizeSel_4P_6_EMFishery

18      63      43.9574         50              -1              99              1               0 0 0 0 0.5 0 0 # SizeSel_5P_1_ASP
-15     20      12                      12              -1              99              -1              0 0 0 0 0.5 0 0 # SizeSel_5P_2_ASP
-2      9       3.93639         4               -1              99              2               0 0 0 0 0.5 0 0 # SizeSel_5P_3_ASP
-5      20      12                      12              -1              99              -2              0 0 0 0 0.5 0 0 # SizeSel_5P_4_ASP
-20     1       -999            -999    -1              99              -3              0 0 0 0 0.5 0 0 # SizeSel_5P_5_ASP
-9      19      12                      12              -1              99              -2              0 0 0 0 0.5 0 0 # SizeSel_5P_6_ASP

-5      40      -1                      -1              -1              99              -2              0 0 0 0 0.5 0 0 #
SizeSel_7P_1_ORBTrawCPUE
-5      40      -1                      -1              -1              99              -2              0 0 0 0 0.5 0 0 #
SizeSel_7P_2_ORBTrawCPUE
-5      40      -1                      -1              -1              99              -2              0 0 0 0 0.5 0 0 # SizeSel_8P_1_ForWBycatch
-5      40      -1                      -1              -1              99              -2              0 0 0 0 0.5 0 0 # SizeSel_8P_2_ForWBycatch
-5      40      -1                      -1              -1              99              -2              0 0 0 0 0.5 0 0 # SizeSel_9P_1_JVWBycatch
-5      40      -1                      -1              -1              99              -2              0 0 0 0 0.5 0 0 # SizeSel_9P_2_JVWBycatch
-5      40      -1                      -1              -1              99              -2              0 0 0 0 0.5 0 0 #
SizeSel_10P_1_DomWBycatch
-5      40      -1                      -1              -1              99              -2              0 0 0 0 0.5 0 0 #
SizeSel_10P_2_DomWBycatch

18      63 46.3784              45              -1              99              5               0 0 0 0 0.5 0 0 # SizeSel_11P_1_NWFSCSvy
-10     20      12                      12              -1              99              -1              0 0 0 0 0.5 0 0 # SizeSel_11P_2_NWFSCSvy
-2      9       5.40119         5               -1              99              6               0 0 0 0 0.5 0 0 # SizeSel_11P_3_NWFSCSvy
-15     15      12                      12              -1              99              -2              0 0 0 0 0.5 0 0 # SizeSel_11P_4_NWFSCSvy
-20     5       -999            -999    -1              99              -3              0 0 0 0 0.5 0 0 # SizeSel_11P_5_NWFSCSvy
-9      19      12                      12              -1              99              -2              0 0 0 0 0.5 0 0 # SizeSel_11P_6_NWFSCSvy
```

```
-5      40      -1      -1      -1      99      -2      0 0 0 0 0.5 0 0 # SizeSel_12P_1_TriAnSurvey
-5      40      -1      -1      -1      99      -2      0 0 0 0 0.5 0 0 # SizeSel_12P_2_TriAnSurvey
0       6       0       0       -1      99      -2      0 0 0 0 0.5 0 0 # AgeSel_6P_1_SCJuvSurvey
0       6       0       0       -1      99      -2      0 0 0 0 0.5 0 0 # AgeSel_6P_2_SCJuvSurvey

#_Cond 0 #_custom_sel-env_setup (0/1)
#_Cond -2 2 0 0 -1 99 -2 #_placeholder when no enviro fxns
#_Cond 0 #_custom_sel-blk_setup (0/1)
#_Cond -2 2 0 0 -1 99 -2 #_placeholder when no block usage
#_Cond No selex parm trends
#_Cond -4 # placeholder for selparm_Dev_Phase
#_Cond 0 #_env/block/dev_adjust_method (1=standard; 2=logistic trans to keep in base parm bounds; 3=standard w/ no bound check)
#

#_Cond 0 #_custom_sel-env_setup (0/1)
#_Cond -2 2 0 0 -1 99 -2 #_placeholder when no enviro fxns

1 #_custom_sel-blk_setup (0/1)
-5 5 0 0 -1 99 5 #_placeholder when no block usage
-5 5 0 0 -1 99 5 #_placeholder when no block usage
-5 5 0 0 -1 99 5 #_placeholder when no block usage
-5 5 0 0 -1 99 5 #_placeholder when no block usage
2

#_Cond No selex parm trends
#_Cond -4 # placeholder for selparm_Dev_Phase
#_Cond 0 #_env/block/dev_adjust_method (1=standard; 2=logistic trans to keep in base parm bounds; 3=standard w/ no bound check)
#

# Tag loss and Tag reporting parameters go next
0  # TG_custom:  0=no read; 1=read if tags exist
#_Cond -6 6 1 1 2 0.01 -4 0 0 0 0 0 0 0  #_placeholder if no parameters

1 #_Variance_adjustments_to_input_values
#_fleet: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
```

```
#_1 2 3 4 5 6 7 8 9 10 11 12 13 14

0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.2233  0.5802  0.5832  0.2792  0.7080  0.8382
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000

0.6231  0.3854  0.6239  0.2164  0.5054  1.0000  1.0000  1.0000  1.0000  1.0000  1.0000  0.4372
0.4647  0.4434  0.5056  0.3272  1.0000  1.0000  1.0000  1.0000  1.0000  1.0000  0.8760  1.0000
1.0000  1.0000  1.0000  1.0000  1.0000  1.0000  1.0000  1.0000  1.0000  1.0000  1.0000  1.0000

#_Default

# 0 0 0 0 0 0 0 0 0 0 0 0 0
# 0 0 0 0 0 0 0 0 0 0 0 0 0
# 0 0 0 0 0 0 0 0 0 0 0 0 0
# 1 1 1 1 1 1 1 1 1 1 1 1 1
# 1 1 1 1 1 1 1 1 1 1 1 1 1
# 1 1 1 1 1 1 1 1 1 1 1 1 1

#
1 #_maxlambdaphase
1 #_sd_offset
#

0           # number of changes to make to default Lambdas (default value is 1.0)
#12         # number of changes to make to default Lambdas (default value is 1.0)
# Like_comp codes:  1=surv; 2=disc; 3=mnwt; 4=length; 5=age; 6=SizeFreq; 7=sizeage; 8=catch;
# 9=init_equ_catch; 10=recrdev; 11=parm_prior; 12=parm_dev; 13=CrashPen; 14=Morphcomp; 15=Tag-comp; 16=Tag-negbin
#like_comp fleet/survey  phase  value  sizefreq_method

# 4  1 1 0.5 1
# 4  2 1 0.5 1
# 4  3 1 0.5 1
# 4  4 1 0.5 1
# 4  5 1 0.5 1
# 4 11 1 0.5 1
# 5  1 1 0.5 1
# 5  2 1 0.5 1
```

```
# 5  3 1 0.5 1
# 5  4 1 0.5 1
# 5  5 1 0.5 1
# 5 11 1 0.5 1

0 # (0/1) read specs for more stddev reporting
 # 0 1 -1 5 1 5 1 -1 5 # placeholder for selex type, len/age, year, N selex bins, Growth pattern, N growth ages, NatAge_area(-1 for all), NatAge_yr, N Natages
 # placeholder for vector of selex bins to be reported
 # placeholder for vector of growth ages to be reported
 # placeholder for vector of NatAges ages to be reported
999

# END of Control file
# Below are alternative setups

# Length asymptotic setup
14      63      44              50              -1              10              1               0 0 0 0 0.5 0 0 # SizeSel_5P_1_ASP
-15     20      12              12              -1              10              -1              0 0 0 0 0.5 0 0 # SizeSel_5P_2_ASP
-2      9       4               4               -1              10              2               0 0 0 0 0.5 0 0 # SizeSel_5P_3_ASP
-5 20   12              12              -1              10              -2              0 0 0 0 0.5 0 0 # SizeSel_5P_4_ASP
-20     1       -12             -12             -1              10              3               0 0 0 0 0.5 0 0 # SizeSel_5P_5_ASP
-9      19      12              12              -1              10              -2              0 0 0 0 0.5 0 0 # SizeSel_5P_6_ASP

# two parameter sex offsets
-10 15  0               0               -1              5               3               0 0 0 0 0.5 0 0 # SzSel_5Fem_Peak_ASP
-15 10  0               0               -1              5               3               0 0 0 0 0.5 0 0 # SzSel_5Fem_Ascend_ASP
-10     20      0               0               -1              5               -3              0 0 0 0 0.5 0 0 # SzSel_5Fem_Descend_ASP
-5      9       0               0               -1              5               -3              0 0 0 0 0.5 0 0 # SzSel_5Fem_Final_ASP
0.5     1.5     1               1               -1              5               -3              0 0 0 0 0.5 0 0 # SzSel_5Fem_Scale_ASP

# double normal dome-shaped
18      40      40              40              -1              99              3               0 0 0 0 0.5 0 0 # AgeSel_1P_1_WAFishery1
-15     3       -3              -3              -1              99              3               0 0 0 0 0.5 0 0 # AgeSel_1P_2_WAFishery1
(logistic width of plateau)
-8      12      3               3               -1              99              1               0 0 0 0 0.5 0 0 # AgeSel_1P_3_WAFishery1
-12     18      -0.5    -0.5    -1              99              1               0 0 0 0 0.5 0 0 # AgeSel_1P_4_WAFishery1 (ln(desc width))
-18     5       -999    -999    -1              99              -1              0 0 0 0 0.5 0 0 # AgeSel_1P_5_WAFishery1
```

```
-10     5       1                       1               -1              99              1               0 0 0 0 0.5 0 0 # AgeSel_1P_6_WAFishery1
(final- logistic)

# Age asymptotic (P5 set to -999?)
0       40      6.82196         7               -1              99              3               0 0 0 0 0.5 0 0 # AgeSel_1P_1_WAFishery1
-15     20      12                      12              -1              99              -3              0 0 0 0 0.5 0 0 # AgeSel_1P_2_WAFishery1
-8      12      0.605793        1               -1              99              1               0 0 0 0 0.5 0 0 # AgeSel_1P_3_WAFishery1
-12     18      14                      12              -1              99              -1              0 0 0 0 0.5 0 0 # AgeSel_1P_4_WAFishery1
-18     5       -15.6933-10             -1              99              1               0 0 0 0 0.5 0 0 # AgeSel_1P_5_WAFishery1
-10     15      12                      12              -1              99              -1              0 0 0 0 0.5 0 0 # AgeSel_1P_6_WAFishery1

# Age double normal with sex offsets setup
0       40      6.82196         7               -1              99              3               0 0 0 0 0.5 0 0 # AgeSel_1P_1_WAFishery1
-15     3       -1                      -1              -1              99              3               0 0 0 0 0.5 0 0 # AgeSel_1P_2_WAFishery1
(logistic width of plateau)
-8      12      0.605793        1               -1              99              1               0 0 0 0 0.5 0 0 # AgeSel_1P_3_WAFishery1
-12     18      1                       1               -1              99              1               0 0 0 0 0.5 0 0 # AgeSel_1P_4_WAFishery1
(ln(desc width))
-18     5       -15.6933-10             -1              99              1               0 0 0 0 0.5 0 0 # AgeSel_1P_5_WAFishery1
-10     5       -5                      -5              -1              99              1               0 0 0 0 0.5 0 0 # AgeSel_1P_6_WAFishery1
(final- logistic(
-5      5       -0.311834       0               -1              5               2               0 0 0 0 0.5 0 0 # AgeSel_1Male_Peak_WAFishery1
-15 10 -0.279212 0              -1              5               2               0 0 0 0 0.5 0 0 # AgeSel_1Male_Ascend_WAFishery1
-10     10      -9.181140               -1              5               2               0 0 0 0 0.5 0 0 # AgeSel_1Male_Descend_WAFishery1
-5      7       0                       0               -1              5               -2              0 0 0 0 0.5 0 0 #
AgeSel_1Male_Final_WAFishery1
0.5     1.5     1                       1               -1              5               -2              0 0 0 0 0.5 0 0 #
AgeSel_1Male_Scale_WAFishery1

#_Q_setup - with estimated ln(Q) ========
 # Q_type options:  <0=mirror, 0=median_float, 1=mean_float, 2=parameter, 3=parm_w_random_dev, 4=parm_w_randwalk,
5=mean_unbiased_float_assign_to_parm
 #_Den-dep  env-var  extra_se  Q_type
 0 0 0 0 # 1 WAFishery1
 0 0 0 0 # 2 ORMWTraw
 0 0 0 0 # 3 ORBTraw
 0 0 0 0 # 4 EMFishery
 0 0 0 0 # 5 ASP
```

```
 0 0 0 2 # 6 SCJuvSurvey
 0 0 0 2 # 7 ORBTrawCPUE
 0 0 0 2 # 8 ForWBycatch
 0 0 0 2 # 9 JVWBycatch
 0 0 0 2 # 10 DomWBycatch
 0 0 0 2 # 11 NWFSCSvy
 0 0 0 2 # 12 TriAnSurvey

#_Cond 0 #_If q has random component, then 0=read one parm for each fleet with random q; 1=read a parm for each year of index
#_Q_parms(if_any)
# LO       HI          INIT        PRIOR     PR_type              SD                    PHASE
 -25 0 -6.645 -6 -1 10 2 # Q_base_6_SCJuvSurvey
 -25 0 -5.847 -6 -1 10 2 # Q_base_7_ORBTrawCPUE
 -25 0 -11.55 -11 -1 10 4 # Q_base_8_ForWBycatch
 -25 0 -11.21 -11 -1 10 6 # Q_base_9_JVWBycatch
 -25 0 -10.35 -11 -1 10 4 # Q_base_10_DomWBycatch
 -25 0 -2.771 -8 -1 10 4 # Q_base_11_NWFSCSvy
 -25 0 -2.092 -8 -1 10 4 # Q_base_12_TriAnSurvey
# Q ========

#_Q_setup - alternative no Q parameters - median unbiased ==========
# A=do power: 0=skip, index is linear proportiona to abundance, 1= add power parameter (non-linear)
# B=env link: 0=skip, 1= add para for env effect on Q
# C=extra SD: 0=skip, 1= add para for additive constant to input SE (in log space)
# D=type: <0=mirror lower abs(#) fleet, 0=no para Q is median unbiased, 1=no para Q is mean unbiased, 2=estimate par for ln(Q)
#    3=ln(Q) + set of devs about ln(Q) for all years. 4=ln(Q) + set of devs about Q for indexyr-1
#A B C D
 0 0 0 0 # 1 WAFishery1
 0 0 0 0 # 2 ORMWTraw
 0 0 0 0 # 3 ORBTraw
 0 0 0 0 # 4 EMFishery
 0 0 0 0 # 5 ASP
 0 0 0 0 # 6 SCJuvSurvey
 0 0 0 0 # 7 ORBTrawCPUE
 0 0 0 0 # 8 ForWBycatch
 0 0 0 0 # 9 JVWBycatch
 0 0 0 0 # 10 DomWBycatch
 0 0 0 0 # 11 NWFSCSvy
```

```
 0 0 0 0 # 12 TriAnSurvey
# Q =======

#_Q_setup - no Q parameters - median unbiased, also Extra SDs added to each survey ==========
# A=do power: 0=skip, index is linear proportiona to abundance, 1= add power parameter (non-linear)
# B=env link: 0=skip, 1= add para for env effect on Q
# C=extra SD: 0=skip, 1= add para for additive constant to input SE (in log space)
# D=type: <0=mirror lower abs(#) fleet, 0=no para Q is median unbiased, 1=no para Q is mean unbiased, 2=estimate par for ln(Q)
#    3=ln(Q) + set of devs about ln(Q) for all years. 4=ln(Q) + set of devs about Q for indexyr-1
#A B C D
 0 0 0 0 # 1 WAFishery1
 0 0 0 0 # 2 ORMWTraw
 0 0 0 0 # 3 ORBTraw
 0 0 0 0 # 4 EMFishery
 0 0 0 0 # 5 ASP
 0 0 1 0 # 6 SCJuvSurvey
 0 0 1 0 # 7 ORBTrawCPUE
 0 0 1 0 # 8 ForWBycatch
 0 0 1 0 # 9 JVWBycatch
 0 0 1 0 # 10 DomWBycatch
 0 0 1 0 # 11 NWFSCSvy
 0 0 1 0 # 12 TriAnSurvey


#LO     HI      INI             PRIOR   PR_ty   SD      PHA
-2      0.8     -0.16   0       -1      99      -6      # 6 SCJuvSurvey
-2      2       0.20    0       -1      99      -6      # 7 ORBTrawCPUE
-2      2       0.56    0       -1      99      -6      # 8 ForWBycatch
-2      2       0.55    0       -1      99      -6      # 9 JVWBycatch
-2      2       0.28    0       -1      99      -6      # 10 DomWBycatch
-2      2       0.70    0       -1      99      -6      # 11 NWFSCSvy
-2      2       0.82    0       -1      99      -6      # 12 TriAnSurvey
# Q =======
```

10.4.4 Data file (wdw1.dat)

```
#C 2011_Widow_rockfish_ stockassessment__Xi_He__NMFS_SWFSC__Santa_Cruz_CA
#C SS-V3.21e;_06/9/2011;_Stock_Synthesis_by_Richard_Methot_(NOAA)_using_ADMB

1916    #_styr
2010    #_endyr
1               #_nseas
12              #_months/season
1               #_spawn_seas
5               #_Nfleet
7               #_Nsurveys
1               #_N_areas

#_SCJuvSurvey: assigned to area 1 or 2?
WAFishery1%ORMWTraw%ORBTraw%EMFishery%ASP%SCJuvSurvey%ORBTrawCPUE%ForWBycatch%JVWBycatch%DomWBycatch%NWFSCSvy%TriAnSurvey

#WA     ORMWT  ORBT    EM      ASP     SJSurv  ORBTCPUE        ForBy   JVBy    DomBy   NWFSCSvy        TriAnSurvey
0.5     0.5             0.5             0.5     0.5     0.5             0.5             0.5             0.5             0.5
        0.5                     0.5                     #_surveytiming_in_season
1       1               1               1       1       1               1               1               1               1
        1                       1                       #_area_assignments_for_each_fishery_and_survey

#_Fishery information (4 Fisheries)
#       WA              ORMWT  ORBT    EM              ASP
        1               1               1               1               1               #_units of catch:  1=biomass (mt); 2=numbers
        0.05    0.05    0.05    0.05    0.05    #_stderr of log(catch)

2                       #_Ngenders
35                      #_Nages
0 0 0 0 0  #_init_equil_catch_for_each_fishery

95                      #_N_lines_of_catch_to_read

# Note: Number F_Rate parameters estimated = number of yearly non-zero catches

#_catch_biomass(mt):_columns_are_fisheries,year,season
#  Fish1   Fish2   Fish3   Fish4   Fish5       Fish6       Year  Season
     0.2     0.0     0.3    82.7     0.0    1916  1
```

0.2	0.0	0.3	128.8	0.0	1917	1
0.2	0.0	0.3	148.1	0.0	1918	1
0.2	0.0	0.4	102.1	0.0	1919	1
0.2	0.0	0.4	104.5	0.0	1920	1
0.2	0.0	0.4	86.6	0.0	1921	1
0.3	0.0	0.4	75.1	0.0	1922	1
0.3	0.0	0.4	82.5	0.0	1923	1
0.3	0.0	0.4	52.8	0.0	1924	1
0.3	0.0	0.5	65.5	0.0	1925	1
0.3	0.0	0.5	99.9	0.0	1926	1
0.3	0.0	0.5	82.8	0.0	1927	1
0.5	0.0	0.8	95.0	0.0	1928	1
0.9	0.0	1.4	92.6	0.0	1929	1
0.8	0.0	1.2	120.2	0.0	1930	1
0.6	0.0	1.0	108.1	0.0	1931	1
0.5	0.0	0.7	109.3	0.0	1932	1
0.5	0.0	0.8	95.0	0.0	1933	1
0.4	0.0	0.6	101.3	0.0	1934	1
0.4	0.0	0.7	108.9	0.0	1935	1
1.2	0.0	1.9	121.2	0.0	1936	1
1.8	0.0	2.8	114.3	0.0	1937	1
0.9	0.0	1.4	94.9	0.0	1938	1
1.7	0.0	2.8	84.5	0.0	1939	1
29.6	0.0	48.1	89.2	0.0	1940	1
45.5	0.0	73.8	71.9	0.0	1941	1
84.4	0.0	137.0	21.6	0.0	1942	1
292.0	0.0	473.9	54.0	0.0	1943	1
504.6	0.0	819.0	201.7	0.0	1944	1
788.7	0.0	1280.0	450.8	0.0	1945	1
489.6	0.0	794.7	457.4	0.0	1946	1
297.7	0.0	483.2	208.6	0.0	1947	1
195.8	0.0	317.8	205.2	0.0	1948	1
178.3	0.0	289.3	145.9	0.0	1949	1
188.2	0.0	305.4	166.8	0.0	1950	1
165.6	0.0	268.7	343.7	0.0	1951	1
173.0	0.0	280.7	317.5	0.0	1952	1
138.3	0.0	224.5	293.4	0.0	1953	1
174.8	0.0	283.7	216.4	0.0	1954	1
181.5	0.0	294.6	232.4	0.0	1955	1
236.2	0.0	383.3	294.8	0.0	1956	1
320.1	0.0	519.6	324.2	0.0	1957	1
248.5	0.0	403.3	393.9	0.0	1958	1

269.8	0.0	437.8	319.7	0.0	1959	1
397.6	0.0	645.3	249.1	0.0	1960	1
355.0	0.0	576.1	171.0	0.0	1961	1
407.7	0.0	661.7	175.4	0.0	1962	1
124.4	0.0	202.0	288.6	0.0	1963	1
315.3	0.0	511.7	154.9	0.0	1964	1
54.4	0.0	88.3	230.1	0.0	1965	1
3969.8	0.0	486.6	317.9	0.0	1966	1
4389.1	0.0	793.9	495.0	0.0	1967	1
1853.7	0.0	260.8	585.5	0.0	1968	1
510.3	0.0	250.4	79.6	0.0	1969	1
576.1	0.0	35.8	74.8	0.0	1970	1
738.3	0.0	60.5	61.8	0.0	1971	1
457.5	0.0	65.9	88.6	0.0	1972	1
592.3	0.0	33.8	314.4	0.0	1973	1
277.0	0.0	20.5	393.5	0.0	1974	1
450.1	0.0	17.8	482.9	0.0	1975	1
911.6	0.0	68.9	555.1	0.0	1976	1
1078.3	0.0	372.5	1046.6	0.0	1977	1
312.3	0.0	384.5	632.7	0.0	1978	1
1024.0	3970.7	582.9	2583.6	0.0	1979	1
8705.7	8968.3	464.1	6006.0	0.0	1980	1
7278.4	14693.6	1642.2	5453.8	0.0	1981	1
6344.9	8675.5	846.1	11851.4	0.0	1982	1
3728.1	1734.9	1646.0	4950.0	0.0	1983	1
1685.1	4620.0	1664.4	3909.2	0.0	1984	1
1783.0	3971.1	1045.0	3930.3	0.0	1985	1
2959.9	3654.6	1441.5	3176.0	0.0	1986	1
4306.0	5932.8	1387.4	3427.0	0.0	1987	1
3569.6	4994.5	1339.8	2306.8	0.0	1988	1
3916.1	5750.9	2355.3	2587.7	0.0	1989	1
2588.8	3889.2	2670.0	2791.8	0.0	1990	1
1332.4	2108.7	2343.1	1602.7	271.7	1991	1
1085.4	1409.1	3175.0	1350.7	348.1	1992	1
1993.3	2084.5	4070.6	1406.9	151.1	1993	1
1234.0	2059.2	3035.3	1085.8	288.2	1994	1
1255.6	1711.3	2780.5	2034.7	195.1	1995	1
1109.0	1708.4	2679.5	1605.3	212.3	1996	1
1166.8	1838.2	2927.4	1623.6	205.4	1997	1
636.8	894.7	1935.7	1125.4	258.8	1998	1
599.8	2088.7	1120.4	774.6	186.1	1999	1
454.1	3103.8	28.2	868.1	207.3	2000	1

```
  349.5   1297.8    35.0    402.5    173.5   2001  1
   64.8    154.7     6.8     50.4    154.9   2002  1
   14.4      7.6     1.7      4.8     14.5   2003  1
   31.6     12.3    10.1     25.5     21.2   2004  1
   42.8     59.0     5.6     11.9     80.1   2005  1
   44.9     11.3     3.0     12.6    143.3   2006  1
   37.1     44.6     9.7     19.4    147.7   2007  1
   49.2     34.7     1.7     36.4    115.0   2008  1
  105.2     52.8     2.4      8.2     26.0   2009  1
   62.1     36.6     3.0     11.4     39.0   2010  1

68 #_N_cpue_and_surveyabundance_observations

#_Units:  0=numbers; 1=biomass; 2=F
#_Errtype:  -1=normal; 0=lognormal; >0=T
#_Fleet Units Errtype
1 1 0       # 1 WAFishery1
2 1 0       # 2 ORMWTraw
3 1 0       # 3 ORBTraw
4 1 0       # 4 EMFishery
5 1         0           # 5 ASP
6 0 0       # 6 SCJuvSurvey
7 1 0       # 7 ORBTrawCPUE
8 1 0       # 8 ForWBycatch
9 1 0       # 9 JVWBycatch
10 1 0      # 10 DomWBycatch
11 1 0      # 11 NWFSCSvyN
12 1 0      # 12 NWFSCSvyS

#_NO BLANK LINE ALLOWED IN cpue DATA and DO NOT delete this line
#_year seas index obs se(log)
# Juvenile survey indices copied from Ralston report (11/29/2010) - updated for 2011
 2001 1  6   4.9700   0.6000
 2002 1  6  11.8700   0.6000
 2003 1  6   5.8100   0.6000
 2004 1  6  10.3400   0.6000
 2005 1  6   4.7900   0.6000
 2006 1  6   2.7200   0.6000
 2007 1  6   2.7200   0.6000
 2008 1  6   4.2900   0.6000
 2009 1  6   3.4400   0.6000
```

Oregon bottom trawl survey same as in previous assessments
1984 1 7 331.4700 0.2121
1985 1 7 100.8800 0.1875
1986 1 7 227.0800 0.2928
1987 1 7 169.0800 0.2730
1988 1 7 93.9700 0.2897
1989 1 7 164.1000 0.1749
1990 1 7 78.4900 0.1348
1991 1 7 73.5900 0.1275
1992 1 7 83.1600 0.1179
1993 1 7 53.5800 0.1314
1994 1 7 100.3400 0.1128
1995 1 7 109.9600 0.1387
1996 1 7 94.8100 0.1357
1997 1 7 97.2300 0.1502
1998 1 7 56.5600 0.1718
1999 1 7 84.4600 0.1684

ForWBycatch
1977 1 8 0.7700 0.1153
1978 1 8 1.2050 0.1118
1979 1 8 0.7030 0.1186
1980 1 8 1.9930 0.1311
1981 1 8 0.7280 0.1257
1982 1 8 0.2430 0.2467
1984 1 8 2.9370 0.1254
1985 1 8 0.4070 0.1074
1986 1 8 1.1110 0.1027
1987 1 8 0.3900 0.0881
1988 1 8 0.5130 0.1243

JVWBycatch
1983 1 9 2.8890 0.1202
1985 1 9 0.7760 0.1165
1986 1 9 0.8230 0.0809
1987 1 9 0.3200 0.0875
1988 1 9 0.6590 0.0774
1989 1 9 0.8240 0.0635
1990 1 9 0.7100 0.0740

DomWBycatch
1991 1 10 1.2640 0.1251

1992 1 10 0.7810 0.1251
1993 1 10 0.8010 0.1038
1994 1 10 1.4650 0.0685
1995 1 10 0.4550 0.1057
1996 1 10 1.0180 0.0824
1997 1 10 0.8860 0.0767
1998 1 10 1.3300 0.0786

new 2011 John Wallace's program Run - One area 100K MCMC (data from
"C:\XiHe1\Widow2011\CPUE\NWFSCSurvey\OneAreaFinal10KRun\CPUE1AreasOut2_10KRunFinalForAssessment.csv")
2003 1 11 8551.726986 0.356317
2004 1 11 447.085872 0.466576
2005 1 11 1404.009079 0.339829
2006 1 11 1337.594810 0.286944
2007 1 11 842.947020 0.286992
2008 1 11 256.862916 0.392575
2009 1 11 1306.339551 0.258935
2010 1 11 2142.273642 0.281881

new 2011 John Wallace's program run - one area MCMC (data from "C:\XiHe1\Widow2011\CPUE\TriSurveyOneArea\Run1\CPUE1AreasOut2_50000UpdateToUse.csv")
1980 1 12 2808.2215 0.2205
1983 1 12 4324.7890 0.1652
1986 1 12 3890.9995 0.2218
1989 1 12 11294.5465 0.2304
1992 1 12 10337.8437 0.1800
1995 1 12 3441.7335 0.2178
1998 1 12 5152.6905 0.1793
2001 1 12 286.3295 0.2524
2004 1 12 1012.2409 0.2487

0 #_N_fleets_with_discard
0 #_N_discard_obs

0 #_N_meanbodywt_obs
30 #_DF_for_meanbodywt_T-distribution_like

#1 # length bin method: 1=use databins; 2=generate from width, min,max below; 3=read nbins, then vector
no additional input for option 1
read binwidth, minsize, lastbin size for option 2
read N poplen bins, then vector of bin lower boundaries, for option 3

2 # length bin method: 1=use databins; 2=generate from width, min,max below; 3=read nbins, then vector

2 10 64
no additional lines to read

-1 #_comp_tail_compression
0.0001 #_add_to_comp
0 #_combine males into females at or below this bin number

28 #_N_LengthBins
10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64

144 #_N_Length_obs

#New length comp groups: grouped by 2cm interval and length range 10-64cm
#Year Seas Flt Gend PartNSmp 10 12 14 16 18 20 22 24 26 28 30 32 34 6 38 40 42 44 46 48 50 52 54 56 58 60 62 64 10 12 14 16 18 20 22 24 26 28 30 32 34 6 38 40 42 44 46 48 50 52 54 56 58 60 62 64

1980 1 1 3 0 127.08 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000180 0.000000 0.001086 0.008543 0.017077 0.038914 0.103459 0.174565 0.112002 0.041276 0.042187 0.022548 0.004545 0.001091 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.002542 0.013793 0.043983 0.142548 0.154740 0.043278 0.018003 0.008183 0.004910 0.000546 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000
1981 1 1 3 0 218.86 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000601 0.005027 0.008033 0.011365 0.030489 0.053880 0.082239 0.126827 0.104593 0.037870 0.018529 0.017168 0.007818 0.000000 0.000437 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000765 0.005082 0.009836 0.026665 0.075952 0.145294 0.141307 0.065192 0.018747 0.004864 0.000929 0.000492 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000
1982 1 1 3 0 282.40 0.000000 0.000000 0.000000 0.000000 0.000000 0.000153 0.000000 0.002757 0.003522 0.005522 0.013868 0.024988 0.029973 0.026327 0.031198 0.052739 0.079892 0.091538 0.065442 0.024324 0.014583 0.006210 0.001129 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000153 0.000613 0.002757 0.003628 0.007618 0.018729 0.039237 0.049273 0.043093 0.073714 0.139439 0.102301 0.031213 0.009445 0.003646 0.000565 0.000411 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000
1983 1 1 3 0 176.50 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000902 0.009021 0.036722 0.063751 0.083001 0.070265 0.044662 0.021691 0.027032 0.041997 0.049934 0.043203 0.019515 0.005865 0.003873 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.001804 0.009321 0.051983 0.078446 0.075293 0.055377 0.046243 0.052146 0.056925 0.031962 0.013162 0.004888 0.001015 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000
1984 1 1 3 0 155.32 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000530 0.001061 0.009317 0.029769 0.073907 0.089241 0.062402 0.034386 0.024076 0.033097 0.056760 0.051266 0.047755 0.023288 0.002813 0.000530 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.005465 0.014781 0.037657 0.092334 0.117263 0.065273 0.034945 0.052406 0.028146 0.007659 0.001753 0.001591 0.000000 0.000530 0.000000 0.000000 0.000000 0.000000 0.000000
1985 1 1 3 0 112.96 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.007076 0.027714 0.057929 0.047905 0.062598 0.080307 0.056696 0.026603 0.017310 0.037237 0.043767 0.054308 0.021930 0.003655 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.008255 0.044367 0.048943 0.077388 0.102198 0.076204 0.035848 0.025093 0.022027 0.010989 0.001462 0.002193 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000
1986 1 1 3 0 190.62 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.001126 0.012723 0.036498 0.072364 0.072842 0.072245 0.073251 0.059437 0.027493 0.028891 0.034417 0.033751 0.018112 0.003923 0.000171 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000

0.000000 0.000000 0.000000 0.000000 0.000000 0.001296 0.018471 0.052308 0.094996 0.089897 0.082341 0.046765 0.025821 0.019749 0.013797 0.003923 0.002490
0.000341 0.000000 0.000000 0.000563 0.000000 0.000000 0.000000
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1991 1 3 3 0 286.11 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000438 0.003712 0.011683 0.027580 0.050372
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2000 1 5 3 0 260.02 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.001571 0.004808 0.021861 0.051262 0.063425 0.053524
0.081332 0.110767 0.074128 0.040145 0.054114 0.020323 0.009219 0.002239 0.000976 0.000000 0.000096 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000472 0.000237 0.001098 0.016924 0.036913 0.039503 0.061843 0.087597 0.083624 0.043347 0.019884 0.008602 0.006212
0.002913 0.001041 0.000000 0.000000 0.000000 0.000000 0.000000
2001 1 5 3 0 166.77 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000132 0.001286 0.003117 0.019135 0.050247 0.063616
0.057269 0.059080 0.069099 0.080094 0.058914 0.051034 0.019476 0.009677 0.001626 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.001222 0.000132 0.003665 0.004403 0.021311 0.052747 0.066595 0.096594 0.099028 0.064648 0.029490 0.008356 0.002841
0.004845 0.000246 0.000076 0.000000 0.000000 0.000000 0.000000
2002 1 5 3 0 112.12 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000196 0.000000 0.000406 0.000812 0.006086 0.015141 0.019674 0.044263
0.063555 0.045146 0.054384 0.074685 0.048429 0.019525 0.005569 0.002767 0.000844 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000 0.000250 0.000000 0.002631 0.010929 0.034310 0.068420 0.124380 0.144927 0.133098 0.056022 0.015670 0.004419
0.003460 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000
2003 1 5 3 0 65.55 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000324 0.000000 0.000000 0.004881 0.028093 0.023212 0.012019 0.012780 0.013059
0.022811 0.049055 0.047460 0.068169 0.058162 0.038369 0.010627 0.003591 0.000432 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000466 0.005347 0.011262 0.016507 0.017627 0.006075 0.056874 0.130141 0.191365 0.098490 0.046914 0.016266 0.000898
0.005568 0.000323 0.000000 0.000000 0.002836 0.000000 0.000000

2004 1 5 3 0 147.76 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000615 0.000307 0.000307 0.002459 0.003365 0.009392 0.023185 0.026395 0.025210
0.017880 0.041484 0.065061 0.082456 0.081571 0.062269 0.026263 0.004228 0.000661 0.000977 0.000977 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000307 0.000000 0.000000 0.001230 0.001844 0.004594 0.015683 0.018061 0.022709 0.056094 0.141005 0.164732 0.058243 0.024623 0.012239
0.003574 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000
2005 1 5 3 0 500.00 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000458 0.000891 0.002869 0.006532 0.021829 0.055911
0.077398 0.068510 0.074324 0.063513 0.057446 0.028734 0.015083 0.006567 0.001264 0.000456 0.000162 0.000162 0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000 0.000057 0.000167 0.000683 0.005913 0.019924 0.045496 0.093081 0.100685 0.095820 0.092080 0.040182 0.013593 0.007130
0.001934 0.000645 0.000334 0.000167 0.000000 0.000000 0.000000
2006 1 5 3 0 500.00 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000065 0.000043 0.000489 0.002618 0.009825 0.020683 0.041210
0.079194 0.092594 0.063583 0.057732 0.057173 0.038859 0.011632 0.002265 0.000547 0.000499 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000133 0.001026 0.005601 0.016993 0.039537 0.078327 0.119263 0.111312 0.084001 0.043116 0.011032 0.006648
0.002981 0.000955 0.000065 0.000000 0.000000 0.000000 0.000000
2007 1 5 3 0 500.00 0.000000 0.000000 0.000000 0.000000 0.000000 0.000092 0.000060 0.000000 0.000000 0.000918 0.001527 0.002158 0.005665 0.016152 0.029522
0.054047 0.095899 0.091247 0.089166 0.079011 0.052536 0.018339 0.002632 0.000362 0.000510 0.000045 0.000092 0.000031 0.000000 0.000000 0.000000 0.000000
0.000000 0.000060 0.000000 0.000000 0.000315 0.001107 0.002417 0.003300 0.008699 0.024068 0.048968 0.095570 0.114674 0.091178 0.036665 0.018282 0.008540
0.003894 0.001374 0.000514 0.000276 0.000092 0.000000 0.000000
2008 1 5 3 0 500.00 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000429 0.000778 0.002817 0.006426 0.009737 0.016917 0.035824
0.069814 0.085200 0.093574 0.065808 0.046539 0.040165 0.017842 0.002132 0.000888 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000069 0.000607 0.000492 0.004063 0.008095 0.011898 0.027100 0.068101 0.112431 0.125464 0.088879 0.037172 0.011316 0.005008
0.003246 0.000849 0.000317 0.000000 0.000000 0.000000 0.000000
2009 1 5 3 0 184.60 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000377 0.002881 0.002851 0.010824 0.013520 0.018516
0.050455 0.100478 0.118909 0.087688 0.053562 0.029822 0.017043 0.003325 0.000873 0.000325 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000325 0.000000 0.001666 0.007286 0.013303 0.021689 0.044061 0.116081 0.144731 0.089922 0.027450 0.015487 0.005319
0.000990 0.000241 0.000000 0.000000 0.000000 0.000000 0.000000
2010 1 5 3 0 442.66 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000668 0.007026 0.017627 0.040631 0.032050
0.039091 0.069740 0.108846 0.074996 0.048475 0.033015 0.014306 0.002678 0.000497 0.000000 0.000000 0.000153 0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000532 0.000429 0.001805 0.010039 0.029726 0.035516 0.038939 0.082064 0.134966 0.115041 0.042382 0.013987 0.002590
0.001431 0.000167 0.000586 0.000000 0.000000 0.000000 0.000000

2003 1 11 3 0 33.27 0 0 0 0 0 1 0 2 5 2 3 2 2 3 9 21 21 18 5 10 6 0 0 0 0 0 0 0 0 0 1 0 1 1 5 1 0 1 3 2 2 10
12 26 16 16 4 1 0 0 0 0 0 0 0 0
2004 1 11 3 0 17.94 0 0 0 0 0 1 0 1 5 5 11 10 11 4 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 3 4 5 6 6 2
2 3 1 1 0 0 0 0 0 0 0 0 0 0 0
2005 1 11 3 0 25.51 0 0 0 0 0 0 0 0 0 1 1 1 1 3 0 2 4 5 8 6 6 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 1 2 4 5
4 8 5 6 0 0 0 0 0 0 0 0 0 0
2006 1 11 3 0 38.16 0 0 0 0 0 0 0 0 0 0 8 10 14 8 3 4 6 6 4 14 7 3 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 11 16 14 7
4 9 11 7 3 1 0 1 0 0 0 0 0 0 0
2007 1 11 3 0 33.50 0 0 0 0 0 0 0 0 0 0 0 0 1 0 3 8 9 11 5 5 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 5
15 8 12 4 2 0 0 0 0 0 0 0 0 0
2008 1 11 3 0 18.84 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 1 3 2 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 0 1 1 0
3 2 4 3 0 0 0 0 0 0 0 0 0 0

2009 1 11 3 0 42.04 0 0 0 0 0 0 0 0 3 4 7 8 8 4 2 5 9 10 11 6 8 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 4 7 7 0 0
3 9 10 9 2 1 0 1 0 0 0 0 0 0
2010 1 11 3 0 44.97 0 0 0 0 0 1 3 2 0 0 0 0 0 2 8 15 27 28 24 6 6 1 0 0 0 0 0 0 0 0 0 0 1 0 4 2 0 0 0 1 3 3
5 26 38 22 11 0 1 0 0 0 0 0 0 0

1980 1 12 3 0 51.74 0 0 0 0 0 0 0 0 0 0 0 1 0 3 3 16 22 20 4 6 6 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 2
25 28 13 6 7 0 0 0 0 0 0 0 0 0
1983 1 12 3 0 103.22 0 0 0 0 0 0 0 0 1 0 3 4 17 12 14 12 8 10 11 11 6 10 5 4 0 0 0 0 0 0 0 1 1 4 11 7 11 14 8 9
10 18 16 36 62 36 10 2 1 0 0 0 0 0 0 0
1986 1 12 3 0 68.41 0 0 0 0 0 0 0 1 1 2 6 11 8 4 12 17 25 22 22 12 18 7 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 2 13 5 3
5 23 36 41 17 2 0 0 0 0 0 0 0 0 0
1989 1 12 3 0 90.41 0 0 0 0 2 18 11 5 7 24 44 67 84 26 28 23 19 9 6 10 12 7 0 0 0 0 0 0 0 0 0 1 5 9 10 5 5 19 44 48
45 26 39 33 10 7 3 2 0 0 0 0 0 0 0 0 0
1992 1 12 3 0 107.41 0 0 1 1 3 0 2 6 11 20 39 56 72 30 36 45 25 7 8 9 10 1 1 1 0 0 0 0 0 0 0 1 2 2 3 2 8 30 46 72
59 44 29 18 7 3 3 0 0 0 0 0 0 0 0 0 0
1995 1 12 3 0 78.71 0 0 0 0 0 0 1 0 4 10 28 15 5 3 7 14 16 20 16 33 18 7 7 0 0 0 0 0 0 0 0 1 0 2 4 2 2 11 21 15
11 9 31 57 49 48 17 6 1 0 0 0 0 0 0 0 0
1998 1 12 3 0 134.48 0 0 1 0 1 0 0 0 0 0 3 4 12 19 43 62 74 78 51 54 46 12 1 2 0 1 0 0 0 0 0 0 1 4 1 0 0 5 4 8
16 65 95 96 78 42 22 9 2 0 0 0 0 0 0 0 0
2001 1 12 3 0 39.18 0 0 0 4 14 11 4 2 0 1 0 0 1 0 4 1 4 5 2 4 4 3 1 0 0 0 0 0 0 0 0 4 14 13 3 8 4 0 0 0 1 4
3 3 13 4 2 1 1 1 0 0 0 0 0 0 0
2004 1 12 3 0 51.13 0 0 0 0 0 0 0 0 0 0 1 4 4 15 8 9 8 12 14 8 3 4 1 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 1 0 3 8 18
17 21 28 21 4 0 0 0 0 0 0 0 0 0 0

35 #_N_age_bins
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35

1 #_N_ageerror_definitions
0.5 1.5 2.5 3.5 4.5 5.5 6.5 7.5 8.5 9.5 10.5 11.5 12.5 13.5 14.5 15.5 16.5 17.5 18.5 19.5 20.5 21.5 22.5 23.5 24.5 25.5 26.5 27.5
28.5 29.5 30.5 31.5 32.5 33.5 34.5 35.5

Old age Error SD, MaxAge=35
#0.5150 0.5190 0.5230 0.5270 0.5310 0.5359 0.5408 0.5457 0.5506 0.5555 0.5604 0.5653 0.5702 0.5751 0.5800 0.5849 0.5898 0.5947
0.5996 0.6045 0.6106 0.6166 0.6227 0.6287 0.6348 0.6408 0.6469 0.6529 0.6590 0.6639 0.6688 0.6737 0.6786 0.6835 0.6884
0.6933

Mean SD, MaxAge=35
#0.2575 0.2595 0.2615 0.2635 0.2655 0.2680 0.2704 0.2729 0.2753 0.2778 0.2802 0.2827 0.2851 0.2876 0.2900 0.2925 0.2949 0.2974
0.2998 0.3023 0.3053 0.3083 0.3113 0.3144 0.3174 0.3204 0.3234 0.3265 0.3295 0.3319 0.3344 0.3368 0.3393 0.3417 0.3442
0.3466

New Age Error SD (from Punt's program, run files are in "C:\XiHe1\Widow2011\AgeingError\FinalRun"

```
# MaxAge=35
0.08620  0.08620  0.15216  0.22106  0.29303  0.36820  0.44672  0.52873  0.61440  0.70388  0.79735  0.89497  0.99695  1.10346  1.21472  1.33093  1.45231  1.57910
         1.71154  1.84987  1.99436  2.14529  2.30294  2.46760  2.63960  2.81925  3.00691  3.20292  3.40766  3.62151  3.84489 4.07821 4.32192 4.57649 4.84238
5.12012

#112       #_N_Agecomp_obs - if not use any CAAL
#1331      #_N_Agecomp_obs - if use ORMWT and CA CAAL
#1276      #_N_Agecomp_obs
#984
#1252
1276
3          #_Lbin_method: 1=poplenbins; 2=datalenbins; 3=lengths
0          #_combine males into females at or below this bin number

#_NO BLANK LINE ALLOWED IN AGE COMP DATA and DO NOT delete this line
#Yr Seas Flt/Svy Gend Part Agerr Lbin_lo Lbin_hi Nsamp datavector(female-male)

1980  1   1   3   0   1  -1  -1 127.08  0.00000  0.00000  0.00000  0.00000  0.00915  0.01848  0.01356  0.02572  0.08794  0.14181  0.08461  0.06275  0.03471  0.01774
0.02125  0.01851  0.00527  0.00702  0.00644  0.00585  0.00234  0.00253  0.00117  0.00019  0.00059  0.00000  0.00000  0.00059  0.00000  0.00000  0.00000  0.00000
0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00936  0.02151  0.02034  0.05554  0.09555  0.11058  0.04602  0.02920  0.01189  0.01306  0.00585
0.00410  0.00234  0.00234  0.00117  0.00117  0.00176  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
0.00000  0.00000
1981  1   1   3   0   1  -1  -1 218.86  0.00000  0.00000  0.00000  0.00749  0.01721  0.04658  0.04392  0.02038  0.02043  0.06235  0.07845  0.07129  0.03738  0.02832
0.01854  0.01016  0.00539  0.00578  0.00517  0.00489  0.00272  0.00472  0.00367  0.00339  0.00234  0.00083  0.00272  0.00067  0.00033  0.00017  0.00033  0.00000
0.00017  0.00033  0.00000  0.00000  0.00000  0.00044  0.00661  0.02443  0.06374  0.04552  0.02404  0.04774  0.08777  0.06757  0.04708  0.02576  0.01710  0.01166
0.00533  0.00428  0.00339  0.00289  0.00211  0.00200  0.00033  0.00100  0.00145  0.00050  0.00061  0.00000  0.00000  0.00000  0.00017  0.00000  0.00017  0.00017
0.00000  0.00000
1982  1   1   3   0   1  -1  -1 282.40  0.00000  0.00000  0.00031  0.00756  0.01837  0.05959  0.02884  0.04157  0.01882  0.01498  0.01468  0.04925  0.03998  0.04034
0.03274  0.03228  0.01656  0.01511  0.00593  0.01120  0.00511  0.00218  0.00349  0.00291  0.00255  0.00130  0.00016  0.00187  0.00084  0.00115  0.00057  0.00042
0.00084  0.00125  0.00125  0.00000  0.00000  0.00016  0.00849  0.03050  0.08438  0.03069  0.04496  0.02057  0.02149  0.03265  0.07169  0.04494  0.03431  0.03486
0.02110  0.01407  0.00881  0.00547  0.00526  0.00302  0.00146  0.00255  0.00042  0.00084  0.00167  0.00042  0.00042  0.00042  0.00000  0.00000  0.00000  0.00000
0.00042  0.00000
1983  1   1   3   0   1  -1  -1 176.50  0.00000  0.00000  0.00000  0.00557  0.15331  0.11397  0.04033  0.02055  0.00918  0.01352  0.01333  0.01629  0.02928  0.02280
0.02159  0.01315  0.01031  0.00688  0.00452  0.00639  0.00254  0.00361  0.00483  0.00380  0.00072  0.00163  0.00030  0.00193  0.00103  0.00000  0.00000  0.00000
0.00072  0.00000  0.00030  0.00000  0.00000  0.00000  0.00757  0.15372  0.11349  0.02842  0.01747  0.01426  0.01310  0.01359  0.01836  0.02014  0.01478  0.01532
0.00881  0.00634  0.00669  0.00567  0.00361  0.00434  0.00434  0.00163  0.00247  0.00030  0.00030  0.00145  0.00000  0.00072  0.00000  0.00000  0.00000  0.00072
0.00000  0.00000
1984  1   1   3   0   1  -1  -1 155.32  0.00000  0.00000  0.00106  0.00194  0.04400  0.15202  0.07538  0.02555  0.01816  0.00527  0.00650  0.00701  0.01138  0.01683
0.02513  0.02372  0.02010  0.01089  0.01354  0.01005  0.00742  0.00864  0.00901  0.00601  0.00850  0.00582  0.00707  0.00372  0.00282  0.00407  0.00264  0.00194
0.00106  0.00053  0.00212  0.00000  0.00000  0.00000  0.00335  0.05370  0.16103  0.08334  0.03342  0.01385  0.00439  0.00560  0.00680  0.00752  0.01293  0.01279
0.01068  0.00680  0.00768  0.00768  0.00682  0.00474  0.00280  0.00386  0.00157  0.00104  0.00104  0.00317  0.00104  0.00000  0.00088  0.00053  0.00053  0.00000
0.00053  0.00000
```

1985 1 1 3 0 1 -1 -1 112.96 0.00000 0.00000 0.00000 0.00830 0.07081 0.08146 0.11726 0.05756 0.02751 0.00857 0.00695 0.00532 0.00753 0.00546
0.01239 0.00959 0.01092 0.00722 0.00753 0.00796 0.00826 0.00988 0.00957 0.00884 0.00796 0.00589 0.00487 0.00589 0.00929 0.00295 0.00575 0.00354
0.00295 0.00074 0.00501 0.00000 0.00000 0.00000 0.00830 0.07482 0.08042 0.12478 0.06645 0.02161 0.00947 0.00356 0.00591 0.00532 0.00605 0.00546
0.00266 0.00591 0.00472 0.00251 0.00325 0.00280 0.00384 0.00207 0.00207 0.00207 0.00295 0.00192 0.00133 0.00192 0.00059 0.00000 0.00074 0.00059
0.00074 0.00147
1986 1 1 3 0 1 -1 -1 190.62 0.00000 0.00000 0.00000 0.00202 0.05331 0.17762 0.09124 0.06975 0.02015 0.01325 0.00395 0.00697 0.00765 0.00614
0.00888 0.00840 0.00772 0.00916 0.00350 0.00484 0.00494 0.00484 0.00322 0.00322 0.00449 0.00322 0.00161 0.00137 0.00247 0.00213 0.00230 0.00223
0.00137 0.00189 0.01652 0.00000 0.00000 0.00000 0.00700 0.06018 0.17364 0.07517 0.04895 0.01438 0.00597 0.00529 0.00522 0.00346 0.00312 0.00463
0.00607 0.00322 0.00230 0.00154 0.00230 0.00161 0.00230 0.00171 0.00230 0.00213 0.00171 0.00189 0.00069 0.00086 0.00120 0.00154 0.00189 0.00120
0.00069 0.00548
1987 1 1 3 0 1 -1 -1 254.16 0.00000 0.00000 0.00015 0.00447 0.01390 0.09509 0.22405 0.05680 0.03697 0.02557 0.00942 0.00674 0.00375 0.00196
0.00706 0.00754 0.00483 0.00752 0.00422 0.00527 0.00333 0.00407 0.00436 0.00272 0.00091 0.00183 0.00122 0.00196 0.00076 0.00076 0.00076 0.00076
0.00150 0.00181 0.00335 0.00000 0.00000 0.00000 0.00626 0.02405 0.12001 0.19421 0.04619 0.01287 0.00853 0.00284 0.00419 0.00554 0.00421 0.00301
0.00405 0.00375 0.00211 0.00150 0.00314 0.00030 0.00061 0.00015 0.00194 0.00015 0.00046 0.00030 0.00105 0.00015 0.00000 0.00015 0.00015 0.00000
0.00089 0.00179
1988 1 1 3 0 1 -1 -1 141.20 0.00000 0.00000 0.00000 0.00245 0.00735 0.05615 0.15087 0.20625 0.03527 0.01727 0.01207 0.00820 0.00296 0.00034
0.00262 0.00052 0.00034 0.00086 0.00017 0.00052 0.00017 0.00069 0.00000 0.00034 0.00052 0.00262 0.00103 0.00052 0.00034 0.00017 0.00000 0.00000
0.00000 0.00000 0.00052 0.00000 0.00000 0.00000 0.00000 0.01486 0.06014 0.13687 0.19886 0.03497 0.01327 0.00455 0.00245 0.00086 0.00262 0.00314
0.00086 0.00017 0.00052 0.00069 0.00262 0.00279 0.00052 0.00052 0.00245 0.00017 0.00052 0.00000 0.00103 0.00052 0.00086 0.00052 0.00052 0.00034
0.00017 0.00052
1989 1 1 3 0 1 -1 -1 211.80 0.00000 0.00000 0.00000 0.00256 0.00710 0.07590 0.09290 0.18362 0.10439 0.00897 0.00979 0.00582 0.00070 0.00105
0.00105 0.00151 0.00000 0.00093 0.00361 0.00128 0.00023 0.00151 0.00070 0.00023 0.00326 0.00198 0.00128 0.00151 0.00000 0.00093 0.00023 0.00023
0.00128 0.00023 0.00511 0.00000 0.00000 0.00000 0.00256 0.01760 0.09336 0.09497 0.15702 0.08737 0.00920 0.00372 0.00116 0.00000 0.00128 0.00023
0.00093 0.00023 0.00046 0.00151 0.00093 0.00070 0.00000 0.00244 0.00093 0.00046 0.00023 0.00023 0.00046 0.00070 0.00000 0.00023 0.00000 0.00023
0.00000 0.00093
1990 1 1 3 0 1 -1 -1 289.46 0.00000 0.00000 0.00000 0.00144 0.02760 0.06205 0.11559 0.07780 0.11935 0.05906 0.01220 0.00551 0.00252 0.00293
0.00046 0.00103 0.00247 0.00098 0.00093 0.00407 0.00098 0.00051 0.00149 0.00149 0.00154 0.00051 0.00247 0.00355 0.00046 0.00206 0.00149 0.00103
0.00103 0.00000 0.00664 0.00000 0.00000 0.00000 0.00046 0.02508 0.07734 0.15250 0.06807 0.09741 0.02997 0.01148 0.00453 0.00098 0.00046 0.00000
0.00046 0.00051 0.00098 0.00103 0.00000 0.00149 0.00144 0.00149 0.00000 0.00051 0.00051 0.00000 0.00000 0.00046 0.00000 0.00000 0.00000 0.00000
0.00000 0.00154
1991 1 1 3 0 1 -1 -1 240.04 0.00000 0.00000 0.00000 0.00000 0.00385 0.05429 0.08432 0.09903 0.06562 0.05673 0.05360 0.01080 0.00933 0.00466
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2000 1 4 2 0 1 30 30 0.6300 0 0 0 0 1 2 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2000 1 4 2 0 1 32 32 1.2601 0 0 0 0 1 2 2 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2000 1 4 2 0 1 34 34 3.7802 0 0 0 0 1 11 7 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2000 1 4 2 0 1 36 36 6.4579 0 0 0 0 0 8 11 13 6 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2000 1 4 2 0 1 38 38 11.0256 0 0 0 0 0 4 12 22 18 7 3 2 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2000 1 4 2 0 1 40 40 8.9780 0 0 0 0 0 3 3 8 14 10 9 9 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2000 1 4 2 0 1 42 42 4.7253 0 0 0 0 0 0 0 3 5 5 3 3 5 0 3 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2000 1 4 2 0 1 44 44 2.2051 0 0 0 0 0 0 1 0 0 1 4 1 2 1 1 1 0 0 1 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2000 1 4 2 0 1 52 52 0.1575 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2001 1 4 1 0 1 32 32 0.1712 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2001 1 4 1 0 1 34 34 1.1982 0 0 0 0 0 2 2 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2001 1 4 1 0 1 36 36 1.1982 0 0 0 0 0 0 1 4 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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2001 1 4 1 0 1 40 40 2.0541 0 0 0 0 0 0 1 5 3 2 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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2001 1 4 1 0 1 52 52 0.1712 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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0 4 6 1 2 2 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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2001 1 4 2 0 1 42 42 2.3965 0 0 0 0 0 0 0 0 0 0 4 1 0 4 3 0 1 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 4 1 0 4 3 0 1 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0
2001 1 4 2 0 1 44 44 0.5135 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 1 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2002 1 4 1 0 1 30 30 2.1008 0 0 0 12 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 12
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4 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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2002 1 4 1 0 1 42 42 4.7269 0 0 0 0 0 0 1 1 2 11 5 3 2 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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2002 1 4 2 0 1 28 28 1.0504 0 0 0 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 6
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2002 1 4 2 0 1 30 30 2.4510 0 0 0 13 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 13
1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2002 1 4 2 0 1 32 32 2.6260 0 0 0 9 3 0 1 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 9
3 0 1 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2002 1 4 2 0 1 34 34 0.3501 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1
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0 2 2 2 2 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2002 1 4 2 0 1 38 38 6.3025 0 0 0 0 0 0 4 12 9 6 3 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 4 12 9 6 3 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2002 1 4 2 0 1 40 40 11.3795 0 0 0 0 0 0 1 1 8 21 11 6 6 3 4 2 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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0 0 0 0 2 0 8 7 8 3 5 1 1 0 2 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2002 1 4 2 0 1 44 44 1.0504 0 0 0 0 0 0 0 0 0 0 1 1 3 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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2002 1 4 2 0 1 48 48 0.3501 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0
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2003 1 4 1 0 1 30 30 0.8624 0 0 1 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 4
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2003 1 4 1 0 1 32 32 3.1047 0 0 0 16 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 16
2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2003 1 4 1 0 1 34 34 1.7248 0 0 0 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 10
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2003 1 4 1 0 1 36 36 0.3450 0 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1
1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2003 1 4 1 0 1 42 42 0.5174 0 0 0 0 0 0 0 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2003 1 4 1 0 1 44 44 0.3450 0 0 0 0 0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2003 1 4 1 0 1 46 46 0.1725 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2003 1 4 1 0 1 48 48 0.1725 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2003 1 4 2 0 1 34 34 0.5174 0 0 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

2003 1 4 2 0 1 36 36 0.3450 0 0 0 0 1 0 0 1 0 0 0 0

2008 1 4 1 0 1 30 30 0.1788 0 0 0 0 0 1 0 0 0 0 0

2009 1 4 1 0 1 44 44 4.1310 0 0 0 0 0 0 0 0 1 2 4 2 5 3 1 1 3 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 4 2 5 3 1 1 3 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0

2009 1 4 1 0 1 46 46 1.8934 0 0 0 0 0 0 0 0 0 0 0 3 0 1 1 0 1 2 1 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 0 1 1 0 1 2 1 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0

2009 1 4 1 0 1 48 48 1.7212 0 0 0 0 0 0 0 0 0 0 0 0 0 2 1 0 1 2 0 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 1 0 1 2 0 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0

2009 1 4 1 0 1 50 50 0.1721 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

2004 1 11 3 0 1 -1 -1 15.04 0 1 0 3 9 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 2
14 2 1 1 0 1 1 0 0 0 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2005 1 11 3 0 1 -1 -1 22.60 0 0 0 0 3 2 1 1 1 4 3 2 2 2 4 2 0 0 2 0 1 2 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 1
4 7 3 0 2 3 3 2 4 2 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2006 1 11 3 0 1 -1 -1 32.29 0 0 0 0 2 6 5 5 2 1 2 2 2 0 4 4 1 1 3 1 0 0 1 1 2 0 2 0 1 1 0 0 0 0 0 0 1 0 2 3
3 7 6 4 1 1 1 2 2 2 2 0 0 0 2 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2007 1 11 3 0 1 -1 -1 32.87 0 0 0 0 2 1 3 9 5 8 3 3 1 2 2 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1
1 3 11 5 3 7 1 1 2 0 3 1 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

-1 #_N_MeanSize-at-Age_obs
#Yr Seas Flt/Svy Gender Part Ageerr Ignore datavector(female-male)
samplesize(female-male)

0 #_N_environ_variables
0 #_N_environ_obs
0 # no wtfreq data
0 # no tag data
0 # no morphcomp data

999

ENDDATA

OR MWT Age composition data - 25 lines
1984 1 2 3 0 1 -1 -1 174.62 0.00000 0.00000 0.00000 0.00136 0.02102 0.17033 0.18341 0.01418 0.02705 0.00650 0.00684 0.00338 0.02539 0.05573
0.01481 0.00805 0.00617 0.00523 0.00530 0.00390 0.00000 0.00241 0.00043 0.00160 0.00083 0.00000 0.00250 0.00101 0.00129 0.00077 0.00000 0.00000
0.00000 0.00083 0.00198 0.00000 0.00000 0.00000 0.00208 0.01809 0.18382 0.11316 0.01030 0.01751 0.00700 0.00782 0.00684 0.01399 0.02038 0.00167
0.00701 0.00319 0.00170 0.00072 0.00301 0.00171 0.00155 0.00000 0.00000 0.00093 0.00154 0.00113 0.00000 0.00136 0.00000 0.00000 0.00043 0.00000
0.00000 0.00074
1985 1 2 3 0 1 -1 -1 280.53 0.00000 0.00000 0.00000 0.00000 0.05048 0.06449 0.25084 0.08734 0.01138 0.01254 0.00912 0.00000 0.00119 0.00666
0.01813 0.00307 0.00139 0.00124 0.00213 0.00000 0.00090 0.00171 0.00145 0.00076 0.00000 0.00063 0.00045 0.00000 0.00000 0.00000 0.00000 0.00071
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00228 0.06399 0.06823 0.22314 0.06609 0.00705 0.00531 0.00305 0.00000 0.00156 0.00497 0.01330
0.00237 0.00208 0.00000 0.00000 0.00083 0.00123 0.00169 0.00035 0.00119 0.00101 0.00120 0.00031 0.00000 0.00031 0.00000 0.00038 0.00038 0.00045
0.00000 0.00063
1986 1 2 3 0 1 -1 -1 328.41 0.00000 0.00059 0.00000 0.00000 0.00920 0.13125 0.08195 0.16787 0.06738 0.00486 0.01185 0.00416 0.00000 0.00037
0.00467 0.01643 0.00133 0.00262 0.00203 0.00100 0.00129 0.00187 0.00145 0.00013 0.00049 0.00013 0.00000 0.00054 0.00049 0.00000 0.00063 0.00000
0.00000 0.00056 0.00089 0.00000 0.00000 0.00000 0.00000 0.00549 0.09908 0.07423 0.19626 0.06320 0.00508 0.00667 0.00400 0.00000 0.00045 0.00111
0.01246 0.00388 0.00269 0.00137 0.00151 0.00048 0.00000 0.00140 0.00068 0.00197 0.00118 0.00077 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000
1987 1 2 3 0 1 -1 -1 310.37 0.00000 0.00000 0.00000 0.00128 0.01640 0.11295 0.19489 0.07868 0.03665 0.02047 0.00193 0.00503 0.00253 0.00013
0.00091 0.00185 0.00237 0.00144 0.00026 0.00000 0.00013 0.00000 0.00091 0.00000 0.00000 0.00000 0.00000 0.00040 0.00000 0.00000 0.00000 0.00000
0.00000 0.00056 0.00059 0.00000 0.00000 0.00000 0.00000 0.01455 0.12880 0.21860 0.07163 0.04194 0.02295 0.00256 0.00317 0.00296 0.00042 0.00023

0.00276 0.00403 0.00000 0.00176 0.00143 0.00042 0.00000 0.00000 0.00000 0.00099 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00046
0.00000 0.00000
1988 1 2 3 0 1 -1 -1 197.56 0.00000 0.00000 0.00097 0.00459 0.01423 0.07529 0.18931 0.09825 0.02774 0.01987 0.01060 0.00610 0.00503 0.00128
0.00103 0.00000 0.00199 0.00590 0.00328 0.00000 0.00214 0.00000 0.00079 0.00051 0.00000 0.00000 0.00000 0.00087 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00045 0.00110 0.01334 0.07551 0.23948 0.12714 0.03319 0.02046 0.00824 0.00000 0.00141 0.00043 0.00083
0.00000 0.00258 0.00200 0.00000 0.00064 0.00176 0.00096 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00070 0.00000 0.00000
0.00000 0.00000
1989 1 2 3 0 1 -1 -1 304.84 0.00000 0.00000 0.00000 0.00478 0.02574 0.03561 0.07754 0.19318 0.08746 0.02617 0.01417 0.00609 0.00497 0.00256
0.00074 0.00148 0.00115 0.00230 0.00131 0.00126 0.00220 0.00120 0.00000 0.00000 0.00154 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00088 0.00000 0.00000 0.00000 0.00562 0.01865 0.05443 0.11940 0.19610 0.06753 0.01791 0.00953 0.00278 0.00077 0.00110 0.00051
0.00067 0.00215 0.00167 0.00402 0.00226 0.00000 0.00120 0.00000 0.00000 0.00000 0.00058 0.00000 0.00078 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000
1990 1 2 3 0 1 -1 -1 266.27 0.00000 0.00000 0.00000 0.00000 0.01894 0.03586 0.05346 0.07960 0.15158 0.10093 0.04005 0.02150 0.00806 0.00276
0.00190 0.00057 0.00083 0.00000 0.00000 0.00043 0.00277 0.00000 0.00069 0.00000 0.00000 0.00043 0.00000 0.00000 0.00043 0.00000 0.00000 0.00084
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00323 0.03335 0.03168 0.05600 0.09611 0.12970 0.06685 0.03099 0.01445 0.00786 0.00350 0.00000
0.00145 0.00000 0.00176 0.00000 0.00054 0.00000 0.00000 0.00000 0.00000 0.00092 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000
1991 1 2 3 0 1 -1 -1 257.99 0.00000 0.00000 0.00000 0.00013 0.01118 0.06441 0.09321 0.06451 0.06790 0.09763 0.04669 0.01322 0.01052 0.00423
0.00301 0.00156 0.00070 0.00046 0.00228 0.00292 0.00467 0.00081 0.00172 0.00137 0.00086 0.00161 0.00000 0.00222 0.00082 0.00000 0.00000 0.00000
0.00000 0.00000 0.00048 0.00000 0.00000 0.00000 0.00000 0.00817 0.06444 0.09797 0.10318 0.06131 0.08846 0.03831 0.00944 0.01063 0.00298 0.00233
0.00158 0.00126 0.00000 0.00077 0.00182 0.00400 0.00128 0.00094 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00060 0.00000 0.00000
0.00000 0.00141
1992 1 2 3 0 1 -1 -1 101.04 0.00000 0.00000 0.00000 0.00000 0.02431 0.02249 0.05846 0.08384 0.05013 0.07008 0.09314 0.02794 0.01443 0.00739
0.00206 0.00226 0.00231 0.00253 0.00071 0.00208 0.00000 0.00503 0.00124 0.00000 0.00000 0.00000 0.00071 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.03366 0.02849 0.07010 0.09049 0.09169 0.04985 0.08262 0.03197 0.02227 0.01361 0.00000
0.00244 0.00000 0.00000 0.00136 0.00071 0.00071 0.00253 0.00183 0.00000 0.00000 0.00000 0.00332 0.00000 0.00124 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000
1993 1 2 3 0 1 -1 -1 203.80 0.00000 0.00000 0.00000 0.00063 0.01040 0.06543 0.03792 0.08433 0.06525 0.03731 0.04577 0.06767 0.03230 0.02290
0.01994 0.01031 0.00404 0.00510 0.00180 0.00123 0.00008 0.00000 0.00123 0.00000 0.00264 0.00116 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00008 0.00000 0.00000 0.00000 0.00000 0.01570 0.07184 0.05470 0.08538 0.04974 0.03879 0.03281 0.05731 0.02508 0.01753 0.01434
0.00651 0.00000 0.00239 0.00116 0.00000 0.00131 0.00110 0.00434 0.00000 0.00000 0.00118 0.00000 0.00125 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000
1994 1 2 3 0 1 -1 -1 105.80 0.00000 0.00000 0.00000 0.00006 0.00792 0.04598 0.15649 0.06016 0.06315 0.04432 0.03196 0.02595 0.02689 0.01406
0.01918 0.00427 0.00000 0.00000 0.00218 0.00262 0.00054 0.00000 0.00006 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00006 0.00156 0.00793 0.07639 0.16237 0.08515 0.04656 0.04062 0.01106 0.01828 0.02946 0.00000 0.00151
0.00506 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00653 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00006 0.00165 0.00000
0.00000 0.00000
1995 1 2 3 0 1 -1 -1 153.89 0.00000 0.00000 0.00000 0.00393 0.00455 0.02518 0.07270 0.09226 0.09331 0.05066 0.04302 0.03582 0.02656 0.04190
0.01031 0.00609 0.01150 0.00101 0.00012 0.00002 0.00001 0.00118 0.00082 0.00013 0.00431 0.00001 0.00013 0.00038 0.00002 0.00013 0.00000 0.00001
0.00000 0.00003 0.00000 0.00000 0.00000 0.00003 0.00338 0.01385 0.02846 0.14418 0.10232 0.06417 0.03559 0.02620 0.01847 0.02419 0.00570 0.00114
0.00048 0.00016 0.00436 0.00008 0.00001 0.00000 0.00001 0.00005 0.00001 0.00064 0.00002 0.00000 0.00000 0.00000 0.00000 0.00000 0.00038 0.00001
0.00000 0.00000

1996 1 2 3 0 1 -1 -1 143.54 0.00000 0.00000 0.00000 0.00341 0.07448 0.06571 0.06427 0.06737 0.04584 0.02588 0.04343 0.01946 0.01611 0.02524
0.02222 0.00710 0.00085 0.00107 0.00070 0.00345 0.01065 0.00841 0.00294 0.00044 0.00049 0.00121 0.00057 0.00030 0.00000 0.00000 0.00011 0.00000
0.00001 0.00004 0.00003 0.00000 0.00000 0.00000 0.00891 0.08825 0.10065 0.06597 0.05824 0.03213 0.03581 0.01125 0.00356 0.02913 0.01132 0.02088
0.00985 0.00071 0.00000 0.00547 0.00004 0.00020 0.00000 0.00000 0.00527 0.00002 0.00003 0.00000 0.00000 0.00031 0.00001 0.00000 0.00021 0.00000
0.00000 0.00002
1997 1 2 3 0 1 -1 -1 214.36 0.00000 0.00000 0.00000 0.00239 0.01884 0.17365 0.08317 0.03964 0.03140 0.01726 0.01314 0.01069 0.01204 0.01222
0.00636 0.01529 0.00136 0.00224 0.00000 0.00029 0.00000 0.00160 0.00031 0.00001 0.00000 0.00024 0.00001 0.00001 0.00001 0.00180 0.00001 0.00000
0.00000 0.00000 0.00001 0.00000 0.00000 0.00000 0.00229 0.02770 0.24734 0.12211 0.04518 0.02153 0.02620 0.01492 0.01020 0.00811 0.00280 0.01279
0.01181 0.00022 0.00029 0.00058 0.00172 0.00000 0.00002 0.00004 0.00000 0.00004 0.00000 0.00001 0.00004 0.00004 0.00000 0.00000 0.00000 0.00000
0.00000 0.00001
1998 1 2 3 0 1 -1 -1 214.95 0.00001 0.00001 0.00000 0.00003 0.00402 0.03721 0.15404 0.09475 0.04939 0.03323 0.03433 0.01309 0.01621 0.01077
0.00347 0.00170 0.00593 0.00069 0.00241 0.00004 0.00043 0.00036 0.00026 0.00134 0.00035 0.00017 0.00017 0.00026 0.00033 0.00006 0.00004 0.00002
0.00010 0.00005 0.00006 0.00000 0.00000 0.00000 0.00000 0.01303 0.07795 0.19019 0.11696 0.05418 0.01589 0.02563 0.01338 0.00273 0.00654 0.00052
0.00074 0.01060 0.00200 0.00046 0.00027 0.00166 0.00009 0.00006 0.00077 0.00000 0.00010 0.00005 0.00020 0.00006 0.00012 0.00014 0.00011 0.00003
0.00000 0.00022
1999 1 2 3 0 1 -1 -1 326.79 0.00000 0.00000 0.00000 0.00121 0.02244 0.04220 0.08279 0.17452 0.09207 0.04842 0.03014 0.00876 0.01478 0.01237
0.00291 0.00852 0.00310 0.00042 0.00001 0.00002 0.00002 0.00019 0.00022 0.00010 0.00001 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00018 0.00000 0.00000 0.00000 0.00232 0.02215 0.04419 0.09588 0.16422 0.08003 0.02558 0.00524 0.00486 0.00068 0.00214 0.00095
0.00050 0.00057 0.00082 0.00228 0.00047 0.00072 0.00089 0.00000 0.00001 0.00000 0.00011 0.00001 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000
2000 1 2 3 0 1 -1 -1 390.95 0.00000 0.00000 0.00000 0.00005 0.01216 0.05725 0.08608 0.08519 0.07798 0.08811 0.03242 0.02706 0.00807 0.00601
0.00923 0.00395 0.00493 0.00120 0.00413 0.00246 0.00283 0.00001 0.00001 0.00001 0.00235 0.00064 0.00000 0.00000 0.00001 0.00007 0.00004 0.00000
0.00000 0.00000 0.00013 0.00000 0.00000 0.00000 0.00011 0.01052 0.05783 0.09548 0.09055 0.09569 0.06133 0.02785 0.02117 0.00490 0.00555 0.00677
0.00249 0.00300 0.00082 0.00007 0.00217 0.00000 0.00000 0.00000 0.00001 0.00001 0.00000 0.00000 0.00000 0.00128 0.00006 0.00000 0.00000 0.00000
0.00000 0.00000
2001 1 2 3 0 1 -1 -1 241.20 0.00000 0.00000 0.00000 0.00000 0.00148 0.01771 0.06415 0.06650 0.07684 0.05964 0.04727 0.05074 0.02937 0.01525
0.01277 0.00720 0.00971 0.00679 0.00346 0.00032 0.00171 0.00007 0.00008 0.00000 0.00021 0.00000 0.00005 0.00007 0.00000 0.00007 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00443 0.03469 0.11022 0.11069 0.09838 0.04800 0.03990 0.03355 0.01641 0.00779 0.00617
0.00508 0.00091 0.00587 0.00397 0.00235 0.00004 0.00005 0.00001 0.00000 0.00000 0.00002 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000
2002 1 2 3 0 1 -1 -1 64.58 0.00000 0.00000 0.00000 0.00300 0.00973 0.01905 0.06932 0.11975 0.08891 0.08068 0.03819 0.03520 0.01524 0.00497
0.00997 0.00005 0.00492 0.00005 0.00166 0.00005 0.00000 0.00007 0.00002 0.00005 0.00159 0.00002 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00926 0.00935 0.04649 0.08824 0.13925 0.11554 0.02821 0.01369 0.00912 0.01002 0.00678 0.00000
0.00699 0.00499 0.00000 0.00791 0.00002 0.00000 0.00159 0.00000 0.00000 0.00000 0.00002 0.00000 0.00002 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000
2004 1 2 3 0 1 -1 -1 28.24 0.00000 0.00000 0.00542 0.11051 0.07520 0.15198 0.07073 0.02258 0.00587 0.00056 0.00056 0.00056 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.08001 0.14015 0.20279 0.08066 0.02610 0.01455 0.00168 0.00224 0.00168 0.00112 0.00168 0.00112
0.00000 0.00000 0.00056 0.00112 0.00056 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000
2006 1 2 3 0 1 -1 -1 85.45 0.00000 0.00000 0.00000 0.00000 0.01624 0.13520 0.02794 0.04297 0.03728 0.01421 0.02105 0.00944 0.02370 0.00465
0.00418 0.00823 0.01052 0.01104 0.01103 0.00492 0.00616 0.00847 0.00429 0.00187 0.00032 0.00000 0.00032 0.00000 0.00032 0.00000 0.00089 0.00000

0.00000 0.00032 0.00035 0.00000 0.00000 0.00000 0.00000 0.01851 0.20614 0.11221 0.11128 0.01657 0.00907 0.01924 0.00728 0.02350 0.01296 0.00810
0.01434 0.00000 0.00047 0.00187 0.01056 0.00958 0.00069 0.00000 0.00116 0.00000 0.00000 0.00990 0.00035 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00035
2007 1 2 3 0 1 -1 -1 42.36 0.00000 0.00000 0.00000 0.00095 0.01155 0.01196 0.07210 0.08650 0.10573 0.07188 0.05367 0.02753 0.00518 0.01010
0.00017 0.02020 0.00061 0.00593 0.00000 0.00000 0.00000 0.00122 0.00000 0.00017 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.01010 0.00000 0.00000 0.00000 0.01541 0.02511 0.10327 0.09252 0.15198 0.03322 0.02196 0.02020 0.03031 0.00000 0.00000
0.00017 0.00000 0.01027 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000
2008 1 2 3 0 1 -1 -1 117.18 0.00000 0.00000 0.00000 0.00050 0.00068 0.01612 0.04254 0.11205 0.05953 0.09809 0.05845 0.04748 0.03714 0.03045
0.03030 0.01613 0.02069 0.00803 0.02144 0.01081 0.01853 0.01253 0.00434 0.00256 0.00342 0.00352 0.00275 0.01392 0.00007 0.00171 0.00085 0.00000
0.00000 0.00000 0.00141 0.00000 0.00000 0.00000 0.00088 0.00080 0.03033 0.04480 0.07863 0.03551 0.02752 0.02188 0.01327 0.01585 0.00984 0.01390
0.00591 0.00982 0.00036 0.00641 0.00000 0.00013 0.00017 0.00000 0.00000 0.00379 0.00006 0.00013 0.00021 0.00379 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000
2009 1 2 3 0 1 -1 -1 84.69 0.00000 0.00000 0.00000 0.00000 0.00445 0.00537 0.01175 0.01219 0.11789 0.05116 0.06424 0.07142 0.01835 0.00959
0.00271 0.01503 0.02639 0.03915 0.00075 0.00013 0.00000 0.00000 0.00000 0.00018 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00013 0.00000 0.00000 0.00015 0.00529 0.01682 0.03901 0.06681 0.11356 0.08038 0.09513 0.02200 0.02107 0.01529 0.02871
0.02724 0.01352 0.00027 0.00084 0.00000 0.00000 0.00127 0.00000 0.00127 0.00000 0.00000 0.00000 0.00000 0.00000 0.00045 0.00000 0.00000 0.00000
0.00000 0.00000
2010 1 2 3 0 1 -1 -1 170.69 0.00638 0.00000 0.00000 0.00000 0.00030 0.01246 0.02750 0.02119 0.04240 0.10102 0.07891 0.09525 0.06415 0.03881
0.02059 0.00956 0.01321 0.01897 0.00270 0.01550 0.00730 0.00000 0.00030 0.00000 0.00017 0.00000 0.00052 0.00017 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00093 0.00000 0.00000 0.00000 0.00054 0.00117 0.03772 0.00602 0.00367 0.03359 0.07403 0.09906 0.07120 0.04090 0.01722 0.00242
0.01158 0.00563 0.00083 0.00429 0.00580 0.00000 0.00030 0.00575 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000

CA age composition data - 29 lines
1978 1 4 3 0 1 -1 -1 21.77 0.00000 0.00000 0.00000 0.00000 0.00013 0.01219 0.05735 0.13228 0.03156 0.01912 0.00851 0.00000 0.07505 0.00025
0.01232 0.01219 0.00000 0.02463 0.00013 0.00000 0.00000 0.01219 0.00000 0.00007 0.00826 0.00013 0.00000 0.00000 0.00000 0.00013 0.00000 0.00000
0.00000 0.00000 0.02305 0.00000 0.00000 0.00000 0.00000 0.00000 0.00007 0.03992 0.05103 0.09615 0.06438 0.09887 0.02944 0.02889 0.01232 0.02896
0.03975 0.00013 0.01086 0.00032 0.01086 0.02913 0.00000 0.00034 0.00000 0.02889 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00017
1979 1 4 3 0 1 -1 -1 48.12 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.02318 0.11903 0.19699 0.08239 0.06537 0.04040 0.05493 0.00722
0.01269 0.02365 0.00760 0.01283 0.01603 0.00179 0.01822 0.00089 0.02261 0.01988 0.00000 0.00075 0.00000 0.00000 0.00000 0.00753 0.00000 0.00000
0.00000 0.00152 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.01997 0.01856 0.06760 0.01788 0.02035 0.01557 0.00616 0.01382 0.00113
0.02206 0.01419 0.00867 0.00001 0.00753 0.00819 0.00225 0.00152 0.00165 0.00441 0.01205 0.00089 0.00000 0.00000 0.00000 0.00000 0.00000 0.00001
0.00001 0.00000
1980 1 4 3 0 1 -1 -1 81.34 0.00000 0.00000 0.00000 0.00000 0.00096 0.00565 0.00370 0.02415 0.06337 0.09760 0.09741 0.03950 0.05137 0.06189
0.01753 0.01350 0.02912 0.04035 0.00678 0.00889 0.01104 0.00272 0.00005 0.01220 0.01756 0.00548 0.00128 0.00530 0.00000 0.00173 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00182 0.01406 0.00292 0.00664 0.03952 0.03231 0.05084 0.03128 0.02539 0.02879 0.00984
0.05279 0.00375 0.01624 0.00465 0.00323 0.02100 0.00303 0.00925 0.00393 0.00000 0.01429 0.00089 0.00050 0.00000 0.00000 0.00000 0.00065 0.00000
0.00000 0.00325
1981 1 4 3 0 1 -1 -1 154.81 0.00000 0.00051 0.00000 0.00332 0.00486 0.01377 0.03572 0.01938 0.02490 0.05469 0.07273 0.09072 0.02676 0.05571
0.04581 0.03900 0.02538 0.03965 0.01080 0.00295 0.00108 0.00378 0.00378 0.00062 0.00000 0.00101 0.00007 0.00235 0.00098 0.00101 0.00000 0.00000

0.00000 0.00161 0.01578 0.00000 0.00000 0.00080 0.00836 0.01000 0.02705 0.02502 0.02770 0.02556 0.03020 0.04292 0.04668 0.02382 0.03282 0.01591
0.02886 0.01230 0.00437 0.01354 0.00582 0.00692 0.00334 0.00200 0.00075 0.00434 0.00007 0.00144 0.00000 0.00000 0.00066 0.00000 0.00000 0.00000
0.00000 0.00000
1982 1 4 3 0 1 -1 -1 586.53 0.00000 0.00000 0.00000 0.00030 0.03215 0.00908 0.03545 0.03110 0.02421 0.00784 0.03601 0.10164 0.05117 0.03645
0.03426 0.03231 0.02329 0.02493 0.01669 0.01265 0.00955 0.00668 0.00313 0.00320 0.00355 0.00443 0.00341 0.00161 0.00315 0.00022 0.00047 0.00000
0.00027 0.00000 0.00000 0.00000 0.00000 0.00000 0.00011 0.04365 0.00734 0.03696 0.03348 0.03032 0.01354 0.04316 0.07627 0.03598 0.02955 0.01965
0.01377 0.01696 0.01042 0.00809 0.00534 0.00666 0.00490 0.00167 0.00141 0.00579 0.00059 0.00220 0.00006 0.00077 0.00000 0.00145 0.00052 0.00000
0.00000 0.00018
1983 1 4 3 0 1 -1 -1 546.97 0.00000 0.00000 0.00000 0.00959 0.07535 0.16741 0.04727 0.04811 0.01505 0.00882 0.00231 0.00804 0.03732 0.02182
0.01205 0.02824 0.01969 0.01613 0.02575 0.01023 0.00488 0.00489 0.00783 0.00672 0.00616 0.00081 0.00114 0.01781 0.00389 0.00108 0.00047 0.00095
0.00114 0.00084 0.00235 0.00000 0.00000 0.00000 0.00009 0.02289 0.14035 0.03192 0.03322 0.01280 0.00538 0.00774 0.00947 0.01969 0.02003 0.01247
0.01245 0.00471 0.02325 0.00212 0.00174 0.00290 0.00496 0.00573 0.00143 0.00148 0.00139 0.00022 0.00074 0.00373 0.00026 0.00027 0.00063 0.00037
0.00000 0.00142
1984 1 4 3 0 1 -1 -1 557.99 0.00000 0.00000 0.00000 0.00000 0.02540 0.12438 0.11309 0.02675 0.02946 0.01160 0.00714 0.00334 0.01995 0.04521
0.00956 0.01060 0.00694 0.00713 0.01024 0.01505 0.00673 0.00332 0.00648 0.00278 0.00025 0.00008 0.00062 0.00000 0.00685 0.00099 0.00132 0.00180
0.00259 0.00063 0.00064 0.00000 0.00000 0.00000 0.00000 0.02218 0.13687 0.14488 0.02753 0.03580 0.01445 0.01381 0.00172 0.01016 0.03036 0.01416
0.00413 0.00505 0.00381 0.00425 0.00635 0.00315 0.00052 0.00332 0.00294 0.00052 0.00109 0.00040 0.00174 0.00386 0.00063 0.00052 0.00044 0.00143
0.00065 0.00235
1985 1 4 3 0 1 -1 -1 545.48 0.00000 0.00000 0.00000 0.00015 0.00156 0.03865 0.15256 0.14410 0.01994 0.03876 0.00648 0.00196 0.00298 0.01013
0.02275 0.00172 0.00637 0.00668 0.00945 0.00614 0.00813 0.00412 0.00230 0.00265 0.00139 0.00138 0.00095 0.00017 0.00044 0.00188 0.00007 0.00021
0.00055 0.00024 0.00008 0.00000 0.00000 0.00000 0.00023 0.00862 0.06224 0.16279 0.14485 0.01274 0.02543 0.01133 0.00227 0.00257 0.01016 0.02167
0.00227 0.00480 0.00306 0.00326 0.00537 0.00515 0.00112 0.00453 0.00234 0.00033 0.00037 0.00170 0.00012 0.00000 0.00058 0.00016 0.00051 0.00158
0.00153 0.00136
1986 1 4 3 0 1 -1 -1 468.45 0.00000 0.00000 0.00000 0.00109 0.03235 0.02704 0.07344 0.08185 0.10038 0.00709 0.02113 0.00935 0.00476 0.00177
0.00155 0.02771 0.00334 0.00377 0.00363 0.00510 0.00172 0.00383 0.00094 0.00288 0.00162 0.00129 0.00008 0.00171 0.00239 0.00001 0.00288 0.00008
0.00044 0.00018 0.00117 0.00000 0.00000 0.00000 0.00267 0.04161 0.04581 0.08210 0.12392 0.12913 0.01376 0.02179 0.01739 0.00102 0.00089 0.00846
0.02910 0.00558 0.00866 0.00371 0.00734 0.00696 0.00155 0.00485 0.00059 0.00101 0.00584 0.00138 0.00076 0.00004 0.00183 0.00119 0.00019 0.00192
0.00120 0.00121
1987 1 4 3 0 1 -1 -1 481.60 0.00000 0.00000 0.00118 0.00010 0.04721 0.09536 0.02129 0.05076 0.05089 0.05541 0.01145 0.01017 0.00402 0.00234
0.00079 0.00449 0.00282 0.00599 0.00087 0.00014 0.00109 0.00108 0.00059 0.00089 0.00145 0.00089 0.00012 0.00213 0.00016 0.00123 0.00004 0.00028
0.00000 0.00016 0.00100 0.00000 0.00000 0.00118 0.00015 0.05500 0.11420 0.04355 0.05967 0.09087 0.11202 0.01994 0.02995 0.02110 0.00284 0.00000
0.01867 0.01465 0.00281 0.01109 0.01229 0.00698 0.00047 0.00073 0.00174 0.00000 0.00020 0.00000 0.00016 0.00097 0.00077 0.00000 0.00007 0.00000
0.00094 0.00060
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SCIENTIFIC AND STATISTICAL COMMITTEE GROUNDFISH SUBCOMMITTEE REPORT ON STOCK ASSESSMENTS AND REBUILDING ANALYSES FOR 2013-2014 GROUNDFISH FISHERIES

The Groundfish Subcommittee of the Pacific Fishery Management Council's Scientific and Statistical Committee (SSCGS) met on September 26-30, 2011 at the Alaska Fisheries Science Center in Seattle, WA to review stock assessments for three groundfish species (i.e., widow rockfish, bocaccio and darkblotched rockfish), and rebuilding analyses for six overfished groundfish stocks (i.e., Pacific ocean perch (POP), petrale sole, canary rockfish, yelloweye rockfish, bocaccio and darkblotched rockfish), all managed by the Council. One reviewer from the Center for Independent Experts (CIE) was also in attendance and participated in the review.

WIDOW ROCKFISH ASSESSMENT REVIEW REPORT

Overview
This year, a full assessment was conducted of widow rockfish (*Sebastes entomelas*) in the waters of the U.S. west coast. The widow rockfish STAR Panel, which met on July 11-15, 2011, did not endorse the base assessment model for management use and instead recommended alternative model configurations be investigated. The issues raised by the 2011 STAR Panel were similar to concerns expressed by the 2009 widow rockfish STAR Panel.

The SSC reviewed both the widow rockfish assessment document and the STAR Panel report and agreed that it would be beneficial to explore alternative model configurations prior to endorsing a base model for use in this management cycle. Further, the SSC developed a list of analyses for the widow rockfish stock assessment team (STAT) to perform. These requested analyses focused on the set of issues identified by the 2011 widow rockfish STAR Panel. The STAT conducted the requested runs and developed a revised draft of the assessment document. This revised draft assessment was reviewed by the SSCGS. During the SSCGS review, a number of additional analyses were requested to better understand model performance and to converge on a single base case model, which both the STAT and SSCGS agreed upon.

The new base model estimates that the stock of widow rockfish off the U.S. west coast is currently at 51.1% of its unexploited level, which is above the management target of $SB_{40\%}$ and, therefore, successfully rebuilt. The SSCGS agreed that this widow rockfish assessment constitutes the best available scientific information on the status of the species in the assessed area and recommends it to be used for status determination and management decision-making in the Council process.

Summary of data and assessment models
The last full assessment of widow rockfish was conducted in 2009, which estimated the stock to be at 38.5% of its unfished level. Major changes made in this assessment, compared with the previous one, are listed below:

- This is a one-area assessment. Previously, the assessment area was divided into two sub-areas to reflect differences in growth. The results of the growth variability study (conducted in the early1990s) were re-evaluated and found insufficient to support the two-area assumption for the assessment.
- Selectivity curves are assumed to be length-based (instead of the previously used age-based assumption).
- Survey selectivities are assumed to be asymptotic (instead of dome-shaped as in the previous assessment).
- Selectivities of fishing fleets are blocked between 2002 and 2003 to account for implementation of the Rockfish Conservation Areas (RCAs).
- Steepness of the stock-recruitment curve (h) is fixed at 0.76 (based on the most recent meta-analysis of rockfish productivity, Martin Dorn, pers. com.) since the assessment is unable to estimate this parameter reliably. In the previous assessment, h was estimated.
- Natural mortality (M) is estimated for females and males separately using the M prior (Owen Hamel, pers. com.), instead of being fixed as in the previous assessment.

The assessment uses the Stock Synthesis (SS) modeling framework (version 3.22b) and incorporates a variety of fishery-dependent and fishery-independent data sources. The resource is assumed to be a single stock within the assessment area. The fishery-dependent data are distributed among five fisheries, including a Washington fishery (all gears combined), an Oregon bottom trawl fishery, an Oregon midwater trawl fishery, a California fishery (all gears combined) and the domestic at-sea Pacific hake fishery (where widow rockfish is a bycatch species). Fishery-independent data sources include two bottom trawl surveys: the Northwest Fishery Science Center's (NWFSC) shelf-slope survey (which has operated annually since 2003) and the Alaska Fishery Science Center (AFSC) triennial survey (which operated historically, but is now discontinued). The assessment also utilizes data from the Southwest Fisheries Science Center's (SWFSC) pelagic juvenile survey, performed with midwater trawl gear, and uses three CPUE indices from the at-sea Pacific hake fishery as well as an Oregon bottom trawl logbook CPUE index.

Requests by the SSC and Responses by the STAT

The following analyses were requested by the SSC prior to the SSCGS meeting to be conducted by the STAT.

Request 1: Develop a one-area model and provide a detailed comparison of results assuming a one-area model with results from the pre-STAR two-area model. The one-area model should use the assumptions of the pre-STAR model with respect to fishery delineation, selectivity, and natural mortality. Growth parameters should be representative of the population as a whole, rather than of northern and/or southern areas. Fishery-independent data (i.e., the NWFSC slope-shelf and AFSC triennial surveys) should be reanalyzed using the GLMM approach to provide appropriate stock-level indices.

Rationale: The two-area assumption was based on results of a dated and noisy study of widow rockfish (Pearson and Hightower 1991), which found significant differences in growth between genders, area, and among years. The age data used in the study were generated by different readers, labs, and ageing methods. Although everything tested in the study produced significant differences, those differences among years were dismissed, but those among areas were embraced, while common reasons existed to doubt the biological significance of both. No other information on spatial variability in life history parameters in widow rockfish is currently available.

STAT Response: The STAT compared models with one- and two- area assumptions following the SSC suggestions. While the model outputs are not drastically different, the one-area model is simpler and more stable. The use of all length and age data within a one-area model allowed (for the first time) the estimation of growth parameters within the model (instead of fixing two sets of growth parameters at externally estimated values in the two-area model). The use of a one-area model relieved the need to (subjectively) assign a percentage of recruits between two areas in the two-area model. Combining relatively sparse survey biological samples (previously divided between two areas) allowed more reliable estimation of selectivity parameters. Both the STAT and the SSC GS agreed to retain one area model for the "new" base case.

Request 2: Explore the use of length-based vs. age-based selectivity. Compile length compositions for all fisheries and surveys. Evaluate the relative merits of assuming that the

selection process for fisheries and surveys is primarily length- or age-based from a theoretical perspective, considering the characteristics of widow rockfish biology and relevant features of the fishery. Compare models with length-based and age-based selectivity (for each individual fishery and survey, then for all fisheries and surveys at the same time). Evaluate differences in model fit, overall plausibility of the selectivity patterns, and whether parameters are robustly estimated.
Rationale: Currently, there is no information available that would suggest the presence of age-specific aggregations in widow rockfish. The use of length-based selectivity is considered a simpler and more realistic way to model selectivity.
STAT Response: The model with length-based selectivity produced reasonable selectivity curves (unlike the model with age-based selectivity). Also, the model with length-based selectivity was found by the STAT to be more stable. This change was retained for the "new" base case model.

Request 3: Explore asymptotic vs. dome-shaped selectivity assumptions. Provide results from a structured stepwise approach, beginning with an asymptotic selectivity assumption for all surveys and fisheries, and moving incrementally to more complex models with dome-shaped selectivity. Survey selectivity patterns should be considered asymptotic unless a plausible biological justification can be provided. Criteria for evaluating fishery selectivity patterns are less rigorous, but should include improvements in model fit, overall plausibility, and whether parameters are robustly estimated. A common rule of thumb is that at least one fishery should be assumed asymptotic to ensure stable model behavior.
Rationale: The pre-STAR model assumed all fishery selectivities to be dome-shaped without explaining why that would be the most appropriate assumption. The STAR Panel requested to provide more information on population distributions and fishing locations to justify the use of a particular selectivity pattern.
STAT Response: The STAT provided a comparison between two models – one with all selectivities allowed to be dome-shaped (pre-STAR model) and one with all selectivities fixed asymptotic. At the SSCGS meeting, selectivity assumptions were explored further.

Request 4: Compare model runs with and without the prior for natural mortality (M), developed by Owen Hamel. The value of M (when estimated) is confounded with the downward slope of (dome-shaped) selectivity, and therefore sensitivities should include estimating M in models with one or more asymptotic selectivity patterns.
Rationale: To utilize the most up-to date information available to inform natural mortality.
STAT Response: Priors for natural mortality (M) were provided by Owen Hamel (pers. com.) for females and males. Comparison of models with natural mortality estimated with and without M priors were conducted using the model with stock-recruit steepness (h) fixed at 0.76. The estimated M values were very close when priors were and were not used. Differences of estimated B_0 and depletion differ between the runs by less than 0.3%. In the "new" base model, it was agreed to estimate naturally mortality (for each gender separately) using the Hamel priors.

SSCGS panel requests
At the meeting, the SSCGS requested a number of additional model runs to further explore model behavior and identify the major axes of uncertainty to formulate alternative states of nature. The runs requested, the rationale, and the STAT responses are listed below.

Request 5: For the model with fishery selectivities estimated (before re-weighting) plot length-based selectivity patterns for all fisheries.
Rationale: To evaluate which selectivity pattern (asymptotic or dome-shaped) is more reasonable for widow rockfish fisheries.
STAT Response: When selectivity parameters were freed up, the selectivity curves are estimated to be dome-shaped for all fisheries, except for the at-sea Pacific whiting fleet (ASP), which is estimated to have an asymptotic selectivity pattern. The start of the descending limb for dome-shaped selectivity curves corresponds to sizes much smaller than asymptotic length (≈51cm). The analysis did not provide evidence for asymptotic selectivity in Washington, Oregon and California trawl fisheries. For the "new" base mode, it was agreed to allow selectivity curves to be estimated for all fisheries, except for ASP (fixed asymptotic). ASP is an offshore fishery, which might explain the fact that it tends to be asymptotic (due to possible ontogenetic movement of larger (older) organisms to deeper waters observed in many rockfish).

Request 6: Plot the likelihood profiles by component (age composition, length composition, etc.) as detailed as reasonable (by fleet) across h and M (with one of these two parameters being estimated) for two model configurations: 1) with fishery selectivities fixed asymptotic, and 2) with fishery selectivities estimated, without reweighting.
Rationale: Evaluate whether the model has data to inform steepness and natural mortality (which is confounded with selectivity).
STAT Response: The model consistently estimates the natural mortality of females and males (treated in the model separately) to be close to the Hamel priors. The model, however, is very uninformative about the level of stock-recruit steepness. Model runs with steepness fixed at values from 0.25 to 0.95 differ in less than 2 likelihood points (even though the depletion varies considerably in those runs). It was agreed to fix the steepness at the mean of the prior (0.76) from the meta-analysis of rockfish steepness (Martin Dorn, pers. com.) for the "new" base model and define low and high states of nature (for the decision table) based on alternative values for stock-recruit steepness.

Request 7: Use spawning stock biomass as a measure of a productive portion of the stock (instead of spawning output).
Rationale: A recent meta-analysis of rockfish fecundity (Dick 2009) found no significant relationship between body weight and fecundity in widow rockfish.
STAT Response: The switch to spawning stock biomass (from spawning output) did not produce noticeable changes in model output.

Request 8: Remove the male offset in fishery selectivities.
Rationale: There is no *a priori* biological reason for differences in selectivity between sexes.
STAT Response: Male selectivity offsets were removed.

Request 9: Block fishery selectivities (all but ASP) between 2002 and 2003.
Rationale: To account for changes in selectivities due to implementation of the Rockfish Conservation Areas (RCAs).
STAT Response: For the early time block (≤ 2002), all selectivities were estimated to be strongly dome-shaped. Between 2003 and 2010, Washington and California fisheries were

estimated to be much less domed while Oregon fisheries went asymptotic, possibly due to the shift of fishing efforts to more offshore areas after implementations of the RCA (offshore ASP fishery is consistently estimated asymptotic). The time block in fishery selectivities was retained for the "new" base model.

Request 10: Provide details on what ageing methods were employed to generate age data from different sources (especially for the early time period).
Rationale: To explore the reliability of a signal in the age data for the extremely high year class in 1970.
STAT Response: All California widow rockfish were aged using the break and burn technique for all years going back to the 1978 sample year. All Oregon ages from at least 1982 forward were aged using the break and burn technique. It is possible that 1979, 1980 and 1981 otoliths were surface-aged given the lack of older fish. For Washington samples, ages were determined using the break and burn technique since the late 1980's. Prior to about 1988, they were surface read. The strong year class can be tracked in age composition data through time in every fishery indicating that the data from different sources are in agreement in regards to a strong 1970 recruitment event.

Request 11: Evaluate the reliability of the discard rate used in the assessment for the mid-1980s.
Rationale: The GMT provided recent discard estimates from the Pikitch study (Pikitch et al. 1988) suggesting that, under a particular range of trip limits, discard rates of widow rockfish might have been much higher (up to 54% of total catch) than assumed in the assessment (16%).
STAT Response: When averaged within a year, the discard rates in bottom and midwater trawl fisheries were consistent with the rate used in the model (16% of the total removals for the period of 1984-2006). It was agreed to retain the current discard assumption in the model, but explore it further for the next assessment.

Description of the base model and alternative models used to bracket uncertainty
Start year of the model =1916; unfished equilibrium in 1915;
One area; two genders; plus group age =35 years.
Discard incorporated with landings into total removals (for all fisheries, discard rate of 6% is assumed for 1916-1983, 16% for 1983-2006, and WCGOP total mortality estimates are used for 2007-2010).
M = 0.119 yr^{-1} (for females) and M=0.12 yr^{-1} (for males), both estimated using the Hamel priors;
Von Bertalanffy growth model, all parameters are estimated for both genders;
Beverton-Holt stock-recruitment model, h fixed at 0.76 (Dorn prior), R_0 estimated, recruitments deviations estimated;
Length-based selectivity for all fleets, selectivity for all fisheries, except ASP, is blocked between 2002 and 2003 to account for implementation of the Rockfish Conservation Areas (RCAs).

Fisheries:
- Washington fishery (all gears combined)
- Oregon bottom trawl
- Oregon midwater trawl
- California fishery (all gears combined)

Abundance indices:

NWFSC shelf-slope bottom trawl survey (2003-2010)
AFSC triennial shelf bottom trawl survey (1980-2004)
Midwater trawl pelagic juvenile survey (2001-2009)
Oregon bottom trawl logbook CPUE index (1984-2002)
At-sea Pacific whiting foreign fishery CPUE bycatch index (1977-1988)
At-sea Pacific whiting joint venture fishery CPUE bycatch index (1983-1990)
At-sea Pacific whiting domestic fishery CPUE bycatch index (1991-1998)

Length data:

Washington fishery (all gears combined)
Oregon bottom trawl
Oregon midwater trawl
California fishery (all gears combined)
At-sea Pacific whiting fishery
NWFSC shelf-slope bottom trawl survey
AFSC triennial shelf bottom trawl survey

Age data:

Washington fishery (all gears combined)
Oregon bottom trawl
Oregon midwater trawl
California fishery (all gears combined)
At-sea Pacific whiting fishery
NWFSC shelf-slope bottom trawl survey

The SSCGS and the STAT agreed that stock-recruit steepness is the single greatest source of uncertainty in the assessment (see *Request 6*). In the base model, steepness was fixed at the level of 0.76 (i.e., the Dorn prior). The decision table was developed to bracket model uncertainty in widow rockfish productivity with alternative values of steepness. The 12.5% and 87.5% quantiles from the prior distribution on h translate into steepness values of 0.54 and 0.95 respectively. This range was considered reasonable to account for the uncertainty associated with steepness. It was, however, agreed to shift this range to lower steepness values to (a) take account of the data which, while not greatly informative, did provide some evidence for a lower steepness value, and (b) provide continuity by considering the value of steepness used in the 2009 assessment (0.41). As a result, steepness values of 0.41 and 0.90 were used for the low and the high states of nature.

Technical merits

This assessment has a simplified model structure (one area) and a reduced number of parameters, compared to previous assessments for this stock. The assessment also uses the most up-to-date external analyses to inform key life history parameters (such as steepness and natural mortality), including the most recent Dorn prior on h and sex-specific Hamel priors on M.

Technical deficiencies

The assessment is unable to produce a reliable estimate of stock-recruit steepness. The model, therefore, uses a fixed value that represents an average value for all rockfish and therefore the extent of uncertainty in model results is underestimated.

Areas of disagreement regarding SSCGS recommendations
There were no disagreements among SSCGS members, and the SSCGS and the STAT.

Unresolved problems and major uncertainties
Stock-recruit steepness is the single greatest source of uncertainty in the assessment, since no data currently exist to reliably estimate widow rockfish productivity. In the assessment, steepness was used as the major axis of uncertainty, and the decision table was developed based on the alternative assumptions about this parameter.

Discard assumptions in the assessment are based on the very limited discard data, which contributes to the uncertainty in the time series of fishery removals. Also, the assessment does not include removals by the foreign and joint-venture at-sea Pacific hake (ASP) fisheries, even though it utilizes ASP data to develop CPUE indices.

Recommendations for future research and data collection (not prioritized)
The SSCGS recommends devoting additional efforts to reconstructing historical landings. This recommendation also applies to most groundfish species on the U.S. West Coast (and not only widow rockfish). In addition to providing the best reconstructed catch histories by species, this effort should develop alternative catch streams that would reflect differences in data quantity and quality available for different time periods. Such (more realistic) alternative catch streams would be very useful while exploring model sensitivity to uncertainty in catch history (rather than applying a simple multiplier to the entire catch time series, which is currently the case for most groundfish assessments).

The SSCGS also recommends further exploration of historical discards, especially given that more detailed (trip limit specific) historical discard information (GMT discard rate estimates from the Pikitch study) has become available.

The SSCGS suggests revisiting the fleet structure used in the assessment, particular exploring the option of splitting bottom and midwater trawl fisheries in Washington and California, and/or evaluating the need of treating bottom and midwater Oregon trawl fisheries separately.

The assessment includes a number of “legacy” data sources (for example, Oregon bottom trawl logbook CPUE index); however, those sources lack proper documentation on the how the data were collected and analyzed. The SSCGS recommends revisiting those “legacy” sources and considering whether these data sources still contribute to the assessment. If the “legacy” data sources are still considered valuable, detailed information should be provided for each.

The assessment utilizes age data from six different sources (state agencies and NOAA Fisheries’ science centers). These data were generated by different age readers, labs, and through different methods in some cases. However, only one ageing error matrix is used in the assessment (developed based on double reads form the most recently collected otoliths). The SSCGS recommends generating additional double reads (and age error matrices) to more accurately account for ageing error associated with data from different sources.

At the review meeting, efforts were devoted to exploring different assumptions regarding fishery selectivity patterns (dome-shaped and asymptotic). The SSCGS recommends further investigation of the theoretical basis for selecting particular patterns for different fisheries and evaluation of data (biological and fishery-related) which would provide information on this issue.

References

Dick, E.. 2009. Modeling the reproductive potential of rockfishes (Sebastes spp.). Doctoral dissertation, University of California, Santa Cruz, USA.

Pearson, D.E., Hightower, J.E. 1991. Spatial and temporal variability in growth of widow rockfish (*Sebastes entomelas*). NOAA Tech. Memo. NMFS, NOAA-TM-NMFS-SWFSC-167.

Pikitch, E.K., Erickson, D.L., Wallace, J.R. 1988. An evaluation of the effectiveness of trip limits as a management tool. Northwest and Alaska Fisheries Center, NWAFC Processed Rep. 88-27.

BOCACCIO ASSESSMENT REVIEW REPORT

The update assessment of bocaccio rockfish (*Sebastes paucispinis*) in the Conception, Monterey and Eureka INPFC areas was conducted this year. This update assessment was reviewed by the SSC at the June 2011 Council meeting in Spokane, WA. The assessment was found by the SSC not to meet the terms of reference for an update, as significant changes in the model structure and data were made (in order to avoid what the STAT found to be unrealistic results from the traditional update assessment). The unrealistic result was an extremely strong 2010 year class, inferred from the length frequency data collected in the NWFSC shelf-slope trawl survey. Although other data sources also suggest that the 2010 year class may be well above average, the magnitude of the 2010 recruitment estimate (from the traditional update assessment) was unprecedented. A year class of this magnitude has a large influence on bocaccio stock dynamics, and would result in the stock reaching the rebuilding target in 2013 (regardless of catch levels (up to OFL)), when this year class would become mature.

The STAT proposed a base model that uses a time series of pre-recruit (age 0) abundance data from the power plant impingement dataset. This index was not included in the 2009 base model; however, it was re-evaluated following the 2009 stock assessment, when updated data became available. It was subsequently found to have a strong correlation with the model estimates of recruitments. The STAT considered this index a more reliable indicator of impending year class strength than the NWFSC shelf-slope trawl dataset.

In a full assessment, alternative approaches would typically be evaluated to deal with sensitivity to exceptional data, but this is not possible with an update assessment where no changes in the model or data sets used in the full assessment are allowed. At its June 2011 meeting, the SSC recommended that the bocaccio assessment be revisited at the SSCGS meeting in September to consider a narrow set of data issues related to the estimated strength of the 2010 year class. The SSC developed a list of analyses for the STAT to undertake prior to the SSCGS meeting. These requested analyses (listed below) as well as STAT responses to these requests were reviewed by the SSCGS.

Request 1a: Evaluate models with time-varying selectivity for the NWFSC trawl survey.
Response: Estimating separate year-specific selectivity for 2010 did not reduce the size of the 2010 year-class to any great extent.

Request 1b: Evaluate models where the selectivity of the NWFSC trawl survey for young-of-the-year bocaccio is decoupled from that for the older fish.
STAT Response: This was done and became part of the new base case.

Request 2: Evaluate models in which the abundance of young-of-the-year bocaccio is modeled as a separate recruitment index with an estimated catchability coefficient.
Response: A recruitment index was developed but was not used in any model testing. There were several years with no observations of young-of-the-year bocaccio and abundance in 2010 far exceeded any previous value, so it was not feasible to develop a recruitment index that would be useful for stock assessment.

Request 3: Evaluate models where the newly updated power plant impingement data set is included as a recruitment index (as the STAT proposed within the current update).
Response: This was done and became part of the new base case.

Request 4: Consider other time series (e.g. sport fishery length data) that may be informative about bocaccio recruitment strength.
Response: Length data from the sport fishery through April 2011 were examined. No indication of a strong 2010 year class was yet apparent as of April 2011.

The SSCGS agreed that the assessment model presented at the SSCGS meeting (STAT model in the revised assessment document) constitutes the best available scientific information on the status of the species in the assessed area, and recommends it to be used for status determination and management decision-making in the Council process.

The SSCGS requested the STAT revise the decision table using potential recruitment levels as the major axis of uncertainty (rather than continue to use the decision table from the 2009 full assessment, based on uncertainty in indices of abundance). Alternative states of nature for the revised decision table were defined by up-weighting and down-weighting the influence of the impingement survey. For the low state of nature, the weight given to the impingement survey was increased ($\lambda = 10$) relative to the base case ($\lambda = 1$), leading to a more optimistic estimate of the strength of the 2010 year class. For the high state of nature, the weight given to the impingement survey was decreased ($\lambda=0.1$), leading to a more pessimistic estimate of the strength of the 2010 year class. The choice of the optimistic and pessimistic levels for the strength of the 2010 year class is data-driven to a reasonable extent, and is generally consistent with the weighting scheme used by the STAT to develop the states of nature for the decision table used in 2009.

The SSCGS noted that this year's bocaccio assessment could be considered neither an update nor a full assessment according to strict compliance with the groundfish terms of reference for stock assessments.

Finally, it should be noted that by the March or April 2012 Council meetings, additional fishery and survey data will be available that may help to better evaluate the strength of the 2010 year class. If the Council would like to incorporate this information in the assessment to set 2013-14 harvest specifications, the SSC would be willing to discuss at the March 2012 meeting the potential for a process – short of an assessment update – that could analyze and interpret the new data, and advise the Council as to whether these data qualitatively change the perception of the strength of the 2010 year class presented in the bocaccio assessment.

DARKBLOTCHED ROCKFISH ASSESSMENT REVIEW REPORT

The SSCGS reviewed the revised assessment document for darkblotched rockfish (*Sebastes crameri*) in the waters off Washington, Oregon, and California. The last full assessment of darkblotched rockfish was conducted in 2007, and it was subsequently updated in 2009. Another update assessment was conducted this year, and this update was reviewed by the SSC at the June 2011 Council meeting in Spokane, WA. In 2011, the update assessment that was presented at the June 2011 Council meeting estimated the 2009 depletion to be 15.1%, which is lower than the depletion of 27.5% reported in the 2009 update assessment. Such magnitude of change in perceived stock status is greater than would normally be expected for an update assessment. Therefore, the Council recommended the darkblotched assessment be revisited at the SSCGS meeting in September. Following the Council recommendation, the SSC developed a list of analyses for the STAT to undertake prior to the SSCGS meeting. These requested runs focused on the narrow set of issues related to the data and methods used in the 2011 update assessment, to allow investigation of factors that caused the changes in stock status. The STAT conducted the requested runs and developed a revised draft of the assessment document. This revised draft assessment was reviewed by the SSCGS. The SSC requests and the STAT responses (presented at the SSCGS meeting) are listed below.

***Request 1*:** Conduct a thorough step-wise evaluation of new and modified data used in the assessment.
Response: Results from nine model runs were presented to demonstrate the impacts of incremental additions of data to the model. None of the data sources was identified as a single source contributing to the difference in stock status caused by adding 2009 and 2010 data.

***Request 2*:** Evaluate models with the NWFSC shelf and slope surveys combined, rather than modeling them separately.
Response: A more depleted status of the stock was estimated from this run, which suggests that the treatment of survey data is influential. It was agreed to retain the survey structure as in the latest full assessment, but explore an alternative option (such as combining slope and shelf portions of the survey) for the next assessment.

***Request 3*:** Reconsider the assumed value of stock-recruit steepness given the results of more recent meta-analysis suggesting higher steepness for rockfish (Martin Dorn, pers. com.).
Response: Steepness of 0.7 was used in the revised 2011 assessment (instead of the value of 0.6 used in the 2007 full assessment and 2009 update).

***Request 4*:** Conduct an analysis of the spatial pattern of large (>30 cm) darkblotched rockfish in the NWFSC slope-shelf survey. Compare patchiness for different survey years.
Response: Results of the requested analysis indicated that darkblotched rockfish exhibit a highly patchy distribution, and the NWFSC slope trawl survey might not be very effective in sampling darkblotched rockfish. However, in the assessment survey data were properly weighted to account for patchiness of the species distribution.

At the meeting, the SSCGS decided on a number of additional model runs for the STAT to undertake. These runs were designed to further explore data sources that drive the change in

estimated stock status and identify the major source of uncertainty in the assessment. The runs requested by the SSCGS and the STAT responses are listed below.

***Request 5*:** Explore the incremental effect of adding 2009-2010 composition data (by source) from fishery and NWFSC surveys:

a) Remove age composition data from fishery and discard sampling, and then those from survey sampling;
b) Remove length composition data from fishery and discard sampling, and then those from survey sampling.

Response: Removal of age composition data (by source) has little effect on recruitment estimates of and spawning output depletion. Removal of length compositions together with age data (due to the use of conditional age composition data) in NWFSC slope survey accounted for about 30% of the difference in recruitment estimates and depletion status.

***Request 6*:** Explore the effects of recent survey indices on model outputs:

a) Remove 2008-2010 CPUE estimates from the NWFSC shelf survey;
b) Remove 2009-2010 CPUE estimates from the NWFSC slope survey

Response: Removal of latter yeas from NWFSC shelf and slope surveys has no effect on model outputs.

***Request 7*:** Explore fishery and NWFSC slope survey selectivities:

a) For fishery selectivity, evaluate the use of time blocks to account for implementation of the Rockfish Conservation Areas (RCAs) at the end of 2002. Use asymptotic selectivity prior to 2003 and allow a dome-shaped selectivity curve for the recent period starting in 2003;
b) For the NWFSC slope survey, allow dome-shaped selectivity (in the 2007 full assessment, the survey selectivity was estimated and then fixed to be asymptotic).

Response: a) Post 2002 fishery selectivity has only a slight drop at the descending limb and had little impact on the model outputs; b) NWFSC slope selectivity estimated to be dome-shaped and not asymptotic as in the 2007 assessment and had a modest effect on model output. It was agreed not to use time blocks for fishery selectivity, but allow dome-shaped selectivity for the NWFSC slope survey in the "new" base model.

***Request 8*:** Provide a likelihood profile on stock-recruit steepness with and without selectivity patterns specified in the previous request (*Request 7).*

Response: Changing survey and fishery selectivity patterns has little effects on likelihood and stock depletion levels. About 90% of the change in depletion is due to the changes in stock-recruit steepness. The 2007 full assessment assumed a steepness of 0.6 (estimated and then fixed in the model). In the 2009 update assessment, the value of steepness was kept unchanged (fixed at 0.6). In the 2011 assessment, when steepness is estimated within the model, estimated values tends to be high (hitting the upper bound). It was agreed to fix the steepness at the mean of the most recent Dorn prior (0.76) from the meta-analysis of rockfish productivity for the "new" base model, to take into account new data in the model that suggest higher steepness than used in the last full assessment (based on the estimate from the data through 2006).

The new base model estimates that the stock of darkblotched rockfish off the U.S. west coast is currently at 30% of its unexploited level. Depletion for 2009 estimated by the base model (26%) is comparable to the depletion level estimated by the 2009 update (28%). The SSCGS agreed that the revised darkblotched rockfish assessment constitutes the best available scientific information on the status of the species in the assessed area and recommends it to be used for status determination and management decision-making in the Council process.

The SSCGS recommended the STAT revise the decision table using alternative values of stock-recruit steepness as major axis of uncertainty rather than continue to use the decision table from the 2007 full assessment based on natural mortality. Alternative steepness values were calculated as the 12.5% and 87.5% quantiles from the prior distribution on *h*, which resulted in steepness values of 0.54 and 0.95 for the low and the high states of nature, respectively.

The SSCGS suggests conducting a full assessment next time the species is assessed to allow further exploration of survey data treatment (use of the combined shelf-slope survey vs. treating shelf and slope portions of the survey separately), as well as changes in selectivity assumptions.

REBUILDING ANALYSES

The SSCGS reviewed rebuilding analyses for six overfished groundfish stocks managed by the Council, including Pacific ocean perch (POP), petrale sole, canary rockfish, yelloweye rockfish, bocaccio, and darkblotched rockfish.

Current rebuilding harvest rates, expressed as spawning potential ratio (SPR), and median times to rebuild (T_{TARGET}) for the overfished stocks are directly linked to one another and individually they reflect specific decisions the Council has previously made concerning rebuilding in as short a time as possible, while taking into account the appropriate factors from the Magnuson-Stevens Fishery Conservation and Management Act. Amendment 16-4 to the groundfish FMP adopted specific SPRs and T_{TARGET} values for each stock. From a regulatory basis, maintaining stability in current harvest rates (SPRs) would be desirable, presuming there have been no fundamental changes in perceptions about stock productivity. However, all SPRs and T_{TARGET} values were modified last year by the Council given the results of the 2009 rebuilding analyses.

The SSCGS reviewed: (a) whether cumulative catches during the period of rebuilding exceeded the cumulative OY/ACL that was available, (b) whether the proper data and software were used to satisfy all the technical requirements for accuracy, (c) whether the biological parameters in the stock assessment had been revised to such an extent as to warrant a change in T_{TARGET}, (d) whether progress towards rebuilding is deemed to be adequate, (e) whether there is a discrepancy between the current T_{TARGET} and the median time to rebuild under the currently adopted rebuilding harvest rate (T_{REBUID}), and if so, what a new maximum time to rebuild ($T_{MAX(NEW)}$) should be, given the National Standard 1 guidelines and, secondarily, if the currently adopted SPR harvest rate will likely rebuild the stock before this $T_{MAX(NEW)}$.

Figure 1 (below) shows relative population trajectories of overfished groundfish stocks since 1980. Table 1 summarizes the deliberations of the Panel in regard to issues (a) – (e). Based on this table, the Panel notes the following:

a) Catches of five of the six overfished species stocks have been lower than what was available as a cumulative OY/ACL during the period of rebuilding. The only exception is canary rockfish, which exceeded its cumulative OY/ACL by 18.5% over the period of 2001-2010. However, the percentage has steadily decreased (which is evident from changes in the running four year average), reflecting active management. In four of the six other cases, catches have been below the available OY/ACL. The estimate of the 2007 POP catch from the 2007 West Coast Groundfish Observer Program (WCGOP) total mortality report indicated the rebuilding OY in 2007 was exceeded by 4%, but the cumulative catch estimated in the assessment model for 2000-2010 is only 52.2% of the cumulative rebuilding plan OYs for this period, indicating that in-season management has been successful in implementing the POP rebuilding plan. In general, management has been quite effective at curtailing fishing mortality on the overfished stocks in order to rebuild them as quickly as possible.
b) All rebuilding analyses met the appropriate technical requirements by utilizing the latest version of the rebuilding program and by using the appropriate outputs from the rebuilding program.

c) In three cases (yelloweye rockfish, bocaccio and darkblotched rockfish) rebuilding is one to eight years ahead of schedule. For these stocks, progress towards rebuilding is considered adequate, and the Panel recommends that no redefinition of T_{TARGET} or adjustment to the rebuilding harvest rate is necessary.

d) Two stocks are behind schedule and are very unlikely to rebuild by the current T_{TARGET}: canary rockfish and POP. Canary rockfish rebuilding is three years behind schedule. Although this deviation is relatively minor due to the sensitivity in the estimated median time to rebuild at different SPR rates, results indicate that even if all harvest is eliminated from 2013 onwards, there is slightly less than 50% probability that the stock will rebuild by the current T_{TARGET} (2027). For POP, if the current SPR rate in the rebuilding plan (0.864) is maintained, the stock would not rebuild with a 50% probability until 2051, which is 31 years later than the current T_{TARGET}. The change is primarily due to revised estimates of B_0 and the depletion arising from the change in the modeling platform used in this year's assessment. These changes represent fundamental revisions to our understanding of the status of these species, which in turn warrants revisions to T_{TARGET}.

e) Given the results of the 2011 assessments, new maximum times to rebuild ($T_{MAX(NEW)}$) were calculated for each stock based on the most recent assessment models and National Standard 1 Guidelines. These are needed for the two stocks which are behind schedule (canary rockfish and Pacific ocean perch). Rebuilding will occur for these stocks well before ($T_{MAX(NEW)}$) if the current target SPR harvest rates are maintained. For this reason the SSCGS suggests that considering status quo harvest rates for all overfished stocks is a reasonable starting point for the Council's deliberative process when developing ACLs for the 2013-2014 biennial cycle.

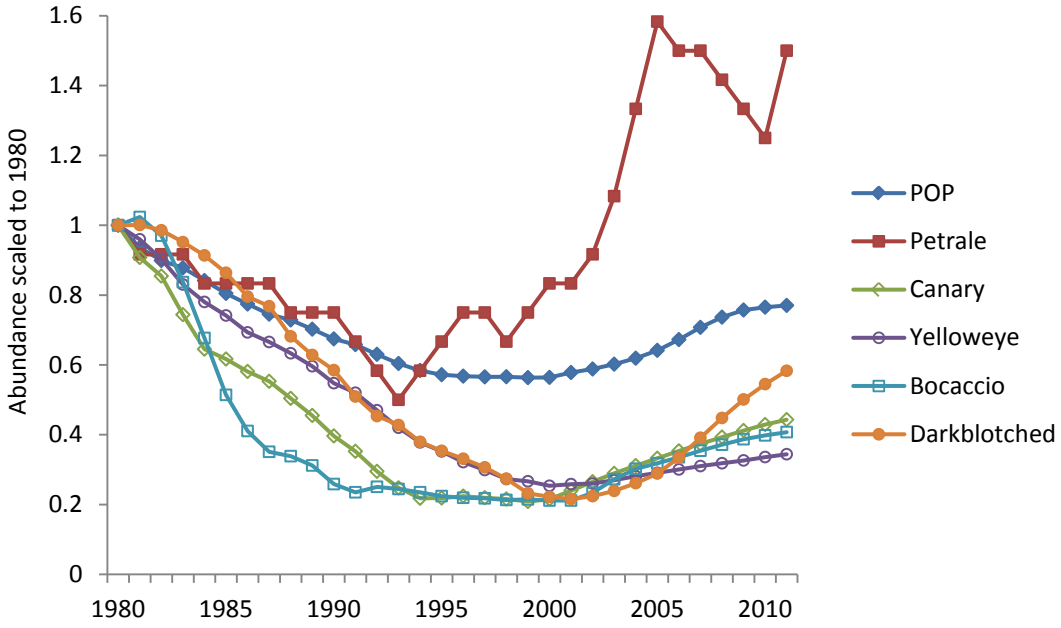

Figure 1. Relative population trajectories of overfished groundfish stocks, 1980-2011.

Table 1. Projected rebuilding target dates for overfished groundfish at current harvest rates

Species	2009 Assessment Depletion	2011 Assessment Depletion	Total Catch/ Total OY During Rebuilding[1]	Adopted SPR Harvest Rate	T_{TARGET} Specified in Amendment 16-4	Current T_{TARGET}[2]	New $T_{F=0}$	New $T_{REBUILD}$ At Current SPR[3]	Difference between Current T_{TARGET} and New $T_{REBUILD}$[4]	$T_{MAX(NEW)}$[5]
Pacific ocean perch (POP)	28.6%	19%	52.2% (2000-2010)	86.4%	2017	2020	2043	2051	**-31**	2071
Petrale sole	11.6%	18%	NA	30% 25-5 rule	2016	2016	2013	2013	3	2021
Canary	23.7%	23%	118.5% (2001-2010)	88.7%	2063	2027	2028	2030	**-3**	2050
Yelloweye	20.3%	21.4%	63.7% (2003-2010)	76%	2084	2074	2045	2067	7	2083
Bocaccio	28.12%	26%	35% (2000-2010)	77.7%	2026	2022	2018	2021	1	2031
Darkblotched	27.5%	30%	94% (2002-2010)	64.9%	2011	2025	2016	2017	8	2037

1. The years considered are the years since the stock has been under rebuilding.
2. Current T_{TARGET} is the value adopted, or not modified, by the Council in 2009.
3. $T_{REBUILD}$ is the new time to rebuild at the adopted SPR harvest rate.
4. Positive values reflect rebuilding being ahead of schedule, while negative values reflect delays. Values which are bolded and underlined indicate a substantial difference indicating a low probability of rebuilding by T_{TARGET} (<40%).
5. $T_{MAX(NEW)}$ is the new maximum time to rebuild based on the NEW stock assessment and rebuilding analysis. In the case of petrale sole, the maximum rebuilding time is defined by the 10-year rule which is interpreted here as being 10 years beyond the year the stock was declared overfished (i.e., 2011).

Pacific Ocean Perch (POP)

The new POP rebuilding analysis was based on the full assessment prepared in 2011. The new assessment used the stock synthesis (SS) modeling framework, while previous POP assessments since 2003 used a standalone model built in AD model builder. Assessment improvements included use of length-based selectivity, and estimation of growth, natural mortality, and stock-recruit steepness, with estimation of the last two quantities facilitated by the use of Bayesian priors. The new assessment resulted in a substantial increase (~40%) in the estimate of unfished stock size, a result driven primarily by the change in the modeling platform and a concomitant change in weighting of the various data components, such that what was previously estimated to be a single large recruitment event in the early 1950s is now considered to be a larger initial biomass. Since estimates of stock size in recent years are similar to those estimated in previous assessments, the net result is that the stock is now estimated to be more depleted than previously estimated (19% of unfished biomass in 2011 compared to 29% in 2009 in the previous assessment). In addition, the estimate of stock-recruit steepness in this assessment is 0.4, which is lower than the value used in the 2009 assessment (0.51). This change implies that the stock is less productive, which will result in a slower rate of stock rebuilding.

POP was declared overfished in 1999, and a rebuilding plan was implemented in 2000. The cumulative catch estimated in the assessment model during 2000-2010 is 52.2% of the rebuilding plan OYs during this period, indicating that in-season management has been successful in implementing the rebuilding plan. The estimate of annual POP catch from the total mortality reports for 2004-2009 indicate the rebuilding OY was only exceeded in 2007 (by 4%). The stock is estimated to have increased by 36% since 2000. However, because the rebuilding target is now higher, it is impossible to rebuild by the existing T_{TARGET} of 2020 even if fishing mortality is set to zero. If the current SPR rate in the rebuilding plan (0.864) is maintained, the stock would not rebuild with 50% probability until 2051, which is 31 years later than the current T_{TARGET}. These results indicate a revision of rebuilding plan is needed to reflect the current estimates of stock status relative to the rebuilding target. The SSCGS notes that the current SPR rate of 0.864 is still a viable rebuilding harvest rate because the new $T_{REBUILD}$ associated with this rate (2051) is less than $T_{MAX(NEW)}$ of 2071.

Note to author: Include a table with OFLs, ACLs, and total estimated catches. Also include the total mortality estimates in the table for comparison.

Petrale Sole

A full assessment for petrale sole was completed in 2011. The new assessment used the latest version of SS to implement an annual model with seasonal fleets and included standardized commercial winter CPUE index (1987 – 2009), use of a new prior on natural mortality, revised age composition data, and aging error following new inter-lab ageing-error analysis. The major axis of uncertainty was identified as natural mortality. The assessment estimates that petrale sole was at 18% of the unexploited equilibrium spawning biomass at the start of 2011, which is below the rebuilding target of $SB_{25\%}$ set for this species under Amendment 16-5. The assessment also estimates a large 2007 year class and, as this year class ages and matures, the spawning biomass is expected to increase rapidly.

From 2004 to 2009, the cumulative catch was on average 9% less than the cumulative OY/ACL. The OY was exceeded by less than one tenth of one per cent in 2005 but catches have otherwise been below the OY/ACL. A variety of rebuilding analyses were conducted assuming catches of 976 mt and 1160 mt in 2011 and 2012, respectively. The current T_{TARGET} for petrale sole is 2016. Because of the incoming large year class, and the use of the standardized winter commercial CPUE data in the assessment, the spawning biomass is expected to exceed the rebuilding target with a probability of 75% by the start of 2013. From 2014 onwards, applying a wide range of SPRs from 0.300 to 0.600, as well as application of the 25-5 rule or the OFL rule, is expected to maintain the spawning biomass above the $SB_{25\%}$ target with a probability of 100%.

Canary Rockfish

An update assessment for canary rockfish was completed in 2011. The assessment included the revised Oregon historical catch from 1916 to 1981, an update to the NWFSC trawl survey index (2009 and 2010) and new data from the WGCOP (2009 and 2010). Of these additions, the revised Oregon catch series had the most effect, resulting in an estimated increase in SB_0 from 25,993 mt (in the 2009 assessment) to 33,512 mt (in the 2011 assessment). The updated estimate of depletion at the beginning of 2011 is 23.0%, which is marginally less than the 2009 estimate of 23.7%.

Canary rockfish was declared overfished in 2000, and a rebuilding plan was implemented in 2001. As previously reported in 2009, canary rockfish management performance under rebuilding has not been as successful as that for other overfished rockfish stocks. From 2001 to 2010, the cumulative catch was 18.5% over the cumulative OY/ACL. However, the percentage has steadily decreased; the running four year mean in 2003 was 135% of OYs, rising to about 170% in 2004 through 2006, before steadily decreasing to a cumulative level of 118.5%. In 2008 and 2009 the running four year cumulative catches were 77% and 70%, respectively of the four year running cumulative OY/ACL, reflecting improved active management. As in 2009, the 2011 rebuilding analysis integrates over three states of nature relating to stock productivity; specifically, values of stock-recruit steepness of 0.345, 0.511, and 0.720. A variety of analyses were conducted assuming catches of 102 mt and 107 mt in 2011 and 2012 respectively. Results show that, even if all harvest is eliminated from 2013 onwards, there is slightly less than 50% probability that the stock will rebuild by the current T_{TARGET} (2027). Eliminating all harvest from 2013 on would result in greater than a 50% chance of rebuilding to the target level by 2028, one year later than the current T_{TARGET}. Further rebuilding runs illustrate the effects of maintaining the current SPR_{TARGET} or of varying SPR to achieve rebuilding in 2029, 2030, 2031 or 2032. If the current SPR_{TARGET} of 0.887 is maintained, the stock will rebuild by 2030.

Yelloweye Rockfish

An update assessment for yellow rockfish was completed in 2011(the last full assessment was conducted in 2009). The assessment is based on a spatially-explicit model that tracks fishery removals and stock dynamics in waters off each of the three west coast states separately. The 2011 update assessment retained all the model assumptions of the 2009 assessment, but added additional age and length composition data and extended and recalculated the indices of abundance. Estimated quantities from the update assessment were very similar to the those estimated in the 2009 assessment, with very small increases in the estimated equilibrium

spawning output (from 994 to 1028 million eggs), in the stock-recruit steepness parameter (from 0.417 to 0.441) and in the stock status (from 20.3% to 21.3% in 2009). The estimated current (2011) status from the 2011 update assessment is a depletion of 21.4%.

As in the 2009 assessment, uncertainty in this year's update was expressed jointly along two independent dimensions (the time series of historical catch, which scales population size, and spawner-recruit steepness, which governs rebuilding rate), which together result in nine states of nature integrated in the rebuilding analysis.

For the rebuilding analysis, which pre-specifies the 2011 and 2012 ACLs of 17 mt to be removed, various management options for 2013 and beyond were considered ranging from zero fishing mortality to the largest removal that could occur without overfishing (OFL catches). In the absence of any future fishing mortality (beginning in 2013 and assuming a 2011 and 2012 ACL of 17 mt) the yelloweye rockfish stock is projected to have a 50% probability of recovery to the rebuilding target ($SB_{40\%}$) by 2045, slightly sooner than the estimate of 2047 from the 2009 rebuilding analysis. The current NMFS-preferred alternative rebuilding harvest rate (SPR = 76%) would produce an ACL of 17.8 mt in 2013 and 18.1 mt in 2014 and has a 50% probability of rebuilding by 2067. This is a slightly faster rebuilding rate under the updated model parameters than the current T_{TARGET} of 2074, which has an associated SPR of 72.7% and would produce ACLs of 21.0 mt and 21.4 mt in 2013 and 2014, respectively.

In the yelloweye assessment model, recruits are taken deterministically from the stock-recruit curve (year-specific recruitment deviations are not estimated), which makes yelloweye rockfish fit a definition of a Category 2 species.

Bocaccio

The new bocaccio rebuilding analysis was based on the new assessment conducted in 2011 (the last full assessment was completed in 2009). The section on the SSCGS review of the bocaccio assessment (above) provides assessment details, including an in-depth discussion of the strength of the 2010 year-class, which is the major axis of uncertainty in the assessment. The assessment results are generally consistent with those from the previous full assessment, albeit slightly more pessimistic with respect to spawning output depletion. Depletion in 2011 is now estimated to be 27% compared to 30% as projected from the last full assessment.

Bocaccio was declared overfished in 1999, and a rebuilding plan was implemented in 2000. The estimated total catch of bocaccio has been well below the OY since 2004. Rebuilding is projected to continue at a rate somewhat greater than previously estimated. The rebuilding analysis indicates that the median time to rebuild if the current SPR rate (77.7%) is maintained is 2021, which is one year earlier than the current T_{TARGET} of 2022. Given these results, the Panel concludes that progress to rebuilding is adequate and that existing management measures are effective and do not need to be changed. Further, the magnitude of the 2010 year class will have a strong influence on progress towards rebuilding in the near future. Rebuilding could potentially take place at a considerably faster pace if this year class is larger than currently estimated.

Note to author: Several modifications should be made when preparing the final document:

1. *The rebuilding analysis shows T_{TARGET}=2026. While the computations are correct, T_{TARGET} is a management-determined quantity, and the Council has set T_{TARGET} =2022 for bocaccio rebuilding. To avoid potential confusion, the final document should reflect the Council decision (i.e. T_{TARGET} =2022).*
2. *Compute and show the SPR corresponding to T_{TARGET} =2022.*
3. *The catch stream used in the analysis is different than the GMT total mortality reports. The differences are not large, and both catch streams are well below the ACLs established for the respective years. However, to avoid confusion, both should be shown in the final rebuilding document.*
4. *The catch south of 40°10' N latitude (~94% of the total assessed area catch) should be displayed in the final document so as to conform to the established Council management area.*

Darkblotched Rockfish

The new darkblotched rockfish rebuilding analysis was based on the new assessment completed in 2011 (the last full assessment was conducted in 2007). The section on the SSCGS review of the darkblotched assessment (above) provides details on the new assessment, including a change in assumed stock productivity and the selectivity assumption. The new assessment results are generally consistent with those from the previous full assessment. Depletion in 2011 is now estimated to be 30% of the unexploited equilibrium spawning output compared to 32% as projected from the last full assessment; however productivity is estimated to be higher than in the previous assessment.

Darkblotched rockfish was declared overfished in 2001, and a rebuilding plan was implemented a year later, in 2002. The current adopted T_{TARGET} for this species is 2025 and the SPR_{TARGET} is 64.9%. This assessment estimated the SPR_{TARGET} of 64.9% would yield a 50% probability of rebuilding by 2017. This is a faster rebuilding rate under the new model parameters than in the currently adopted rebuilding plan.

Notes for the SSC

Revisions to Rebuilding Terms of Reference

1) *List of rebuilding runs is overly long and several scenarios are no longer germane. New runs that reflect the OFL/ABC/ACL framework may be needed. Overall the list needs to be shortened.*
2) *Rebuilding analyses settled on a standard approach for generating future recruitments and defining rebuilding targets. There is considerable discussion in the TOR concerning alternative approaches that are no longer best practice and can be deleted.*
3) *It needs to be made clear that the rebuilding SPR and the T_{TARGET} are Council policy decisions and are not established by the rebuilding analysis. The term $T_{REBUILD}$ should be used rather than T_{TARGET} for rebuilding scenarios that have not yet been formally adopted by the council.*
4) *A required element of rebuilding analyses is a table showing a comparison of actual catches with OYs since the stock was first declared overfished. In many cases, rebuilding species are discarded, placing greater emphasis on discard rates to produce estimates of total removals. Recent catches can be obtained in several ways: a) from total mortality estimates produced by the observer program, b) using landed catch from PacFIN and applying a discard rate or model-based estimates for models where discard is explicitly modeled. It is not necessary to be prescriptive about which method is best to use, but whatever estimates are used, they need to be justified as being the most reliable. The table should include both model estimates and estimates from the total mortality report.*
5) *The rebuilding analysis TOR should clarify the rebuilding plans with non-constant fishing mortality are viable alternatives as long as catch is below the ABC. There is no scientific reason why flexibility in designing rebuilding plans should not be allowed.*
6) *The TOR should include an example of a rebuilding analysis that represents best current practice. Tables in the rebuilding analysis should be standardized to the extent possible.*
7) *The rebuilding software should be expanded to provide economic information such as revenue streams and net present value of rebuilding scenarios. The rebuilding analyses should extend long enough so that potential future benefits of rebuilding are adequately measured.*

Issues with respect to Stock Assessment Updates

There were pervasive issues with data and model changes that are permissible for an assessment to be considered an update. Often these problems occurred because the TOR for assessment updates sets out general principles, but are not specific about what changes cross the line. The SSC should discuss whether it is worthwhile to include additional specificity in TOR. Examples from this year's updates included:

1) *Changing the error assumptions in GLIM analysis for survey indices.*
2) *Using the latest version of SS rather than using the version used in the assessment. There are advantages and disadvantages to using the latest SS version. An advantage is that errors in the computer code can be corrected, while a disadvantage is that inexplicable changes in results can occur when the most recent version of SS is used.*

3) *Use of an updated steepness prior, rather than the prior that was used in the original assessment. It is unclear why this is not allowed in the TOR.*
4) *Nearly all updates used the revised historical catches for Oregon and California that have recently become available. While an update assessment should incorporate the latest catch information, extensive revision to historical catch streams was not anticipated as being appropriate for an update. The TOR are vague about this issue, probably because it had not been anticipated. This may not be as important next time, since further revisions are likely to be more incremental.*
5) *In all cases where potentially questionable changes are made to data inputs, "bridgework" needs to be done to evaluate the impact of the change. Typically this involves an incremental approach, where the changes are evaluated one by one, rather than making a single before and after comparison.*

All Stock Assessments

A better approach is need for dealing with assessment data issues, since there is insufficient time during the STAR panel review to adequately address them. Data issues are often broader than single assessments and can be dealt with more effectively prior to and independently of the review of individual stock assessments. We need to think more carefully about how to ensure that assessment data inputs receive adequate review. Examples from this year include GLIM survey indices, historical catch revision, and historical discard estimates.

The SSC should also discuss whether projections in assessments and rebuilding analyses should be done based on OFLs rather than ABCs.

List of Participants

Technical Reviewers

Vladlena Gertseva	NMFS Northwest Fisheries Science Center, SSC, Meeting Chair
Martin Dorn	NMFS Alaska Fisheries Science Center, SSC
Owen Hamel	NMFS Northwest Fisheries Science Center, SSC, POP STAT
Tien-Shui Tsou	Washington Department of Fish and Wildlife, SSC
Dave Sampson	Oregon State University, SSC
Ray Conser	NMFS Southwest Fisheries Science Center, SSC
Vidar Wespestad	Research Analysts International, SSC
Kevin Stokes	Center for Independent Experts

Stock Assessment Team (STAT) Members

Xi He	NMFS Southwest Fisheries Science Center, Widow STAT
John Wallace	NMFS Northwest Fisheries Science Center, Canary STAT
John Field	NMFS Southwest Fisheries Science Center, Bocaccio STAT
Andi Stephens	NMFS Northwest Fisheries Science Center, Darkblotched STAT
Kotaro Ono	University of Washington, POP STAT
Melissa Haltuch	NMFS Northwest Fisheries Science Center, Petrale STAT
Ian Taylor	NMFS Northwest Fisheries Science Center, Yelloweye STAT

Others in Attendance

John DeVore	Pacific Fishery Management Council
Jim Hastie	NMFS Northwest Fisheries Science Center
Gerry Richter	Point Conception Groundfishermen's Association, GAP
Corey Niles	Washington Department of Fish and Wildlife, GMT
Jim Likes	
Richard Carroll	Ocean Gold Seafoods

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Rebuilding analysis for bocaccio, based on the 2011 stock assessment

John C. Field
National Marine Fisheries Service
Southwest Fisheries Science Center
Fishery Ecology Division
110 Shaffer Rd.
Santa Cruz, CA 95060

email: John.Field@noaa.gov

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Introduction

In 1998, the PFMC adopted Amendment 11 of the Groundfish Management Plan, which established a minimum stock size threshold of 25% of unfished biomass. Based on the 1996 stock assessment, bocaccio rockfish (*Sebastes paucispinis*) was declared formally to be overfished, thereby requiring development of a rebuilding plan for consideration by the Council in the fall of 1999. Rebuilding was initiated by catch restrictions beginning in 2000. A number of bocaccio stock assessments have been conducted since that time (see overview in Field et al. 2009, or Field and He 2009). In 2004, a formal rebuilding plan for bocaccio was enacted by the Pacific Fishery Management Council (PFMC) as part of Amendment 16-3 to the Pacific Coast Groundfish Fishery Management Plan. That plan was revised by Amendment 16-4, which was based on the 2005 rebuilding analysis (MacCall 2005). Since 1999, catches have typically been well below the OY/ACL value (40% when catches and OYs are summed over the 2000-2010 period), and even further below the ABC/OFL value (18% over the 2000-2010 period, Table 1).

The most recent bocaccio stock assessment update is pending SSC review (Field, in review), as a traditional update adhering to the terms of reference provided a result that was considered by the STAT team to be unrealistically optimistic. Essentially, that model suggested an essentially unprecedented strong recruitment in 2010, based almost entirely on length composition data from the 2010 NWFSC trawl survey, which is dominated by small (Young-of-the-Year, YOY) individuals and has an overly strong influence on the model results. Based on this observation, and the guidance provided by the SSC in June of 2011, the STAT developed an alternative model for consideration. In this model, it is assumed that the bottom trawl survey does not provide an accurate index of age 0 abundance. Consequently, these fish (fish smaller than 20 cm) are removed from the CPUE and compositional data, the index is recalculated with age selectivity fixed to be non-selective for age 0 fish, and fully selected for age 1+ fish (for which a length-based selectivity curve continues to be estimated). Additionally, in order to account for what is expected to be one or several strong year classes, we also include the southern California power plant impingement survey for YOY bocaccio, which predicts strong recruitment in recent years.

Simulation Model

This analysis uses the SSC Default Rebuilding Analysis (Version 3.12b, January 2010, Punt 2009). All data and parameters, including reference points (unfished spawning output and recruitment) were taken from STAT base model in the 2011 assessment update (Field, in revision), and the input file is given in Appendix A. Recruitments are pre-specified from 2000 through 2010 for the re-estimation of reference parameters, and future recruitments were simulated by drawing off of the spawner-recruit relationship, estimated in the base model (using the Dorn prior) with a steepness of 0.60 and σ_R of 1. Probability distributions are based on 5000 simulations. The key model parameters are given in Table 2. The rebuilding target is based on the PFMC proxy value for MSY of 40% of estimated unfished spawning output. The mean generation time of bocaccio is estimated at 13 years, unchanged from the last rebuilding analysis.

Twelve scenarios are examined (Table 3). The scenarios include cases of no fishing, of fishing at the current Council adopted SPR rate of 0.777, fishing at the SPR rate associated with catches

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which average 269 tons in 2011 and 2012 (average of 263 and 274 ACLs for 2011 and 2012; that SPR rate is 0.800 in the current model), of fishing at a rate comparable to recent catches (SPR of 0.92 and 0.95), of fishing at a rate that achieves a 50% probability of rebuilding by T_{target}, a 40-10 harvest policy scenario, an F_{msy} proxy (SPR=0.50) scenario, and several alternative SPR rate scenarios to explore the full range of results.

Results

The individual rebuilding trajectories from these simulations are erratic due to rare large recruitments (Figure 1), which lead to a wide range of variability in future population trajectories that is not necessarily captured by the estimates of median rebuilding times under alternative harvest rates. This is a consequence of the very high recruitment variability in bocaccio, and indicates a wide spread of probable outcomes around the median point estimates for any given harvest rate or scenario. This range is captured in Figure 2, which shows the estimated 5th, 25th, 50th, 75th and 95th percentiles of estimated spawning output (relative to target) under continuation of the SPR 0.777 strategy into the future. Both the probability that the stock will not be rebuilt within 50 years, as well as the probability that the stock will be at or above (mean) unfished abundance levels, are non-trivial (approximately 5% each) due to the magnitude of recruitment variability observed for this species.

Table 3, and Figure 3 shows the median probabilities of recovery under a range of adopted harvest rate strategies, from no harvest (SPR 1) to the ABC rule (SPR 0.5). Under the SPR rate adopted in the most recent rebuilding plan (0.777), the population would be expected to be rebuilt by 2021, consistent with the 2009 rebuilding plan (Field and He 2009). If harvest rates approximate the status quo over recent years (approximately 0.92 to 0.95), the stock is expected to rebuild faster, by 2019, only a year later than the expected rebuilding year under the F=0 alternative. Alternatively, if the rebuilding policy were to seek a policy of maintaining a 50% probability of rebuilding by T_{target} (2022), a greater optimal yield could be sustained. Figure 4 shows the trade-off between higher harvest rates and the probabilities of recovery by 2022, as well as the associated median rebuilding times. Table 4 shows the median probability of rebuilding by year for each of these scenarios as well.

The estimated 2013 and 2014 ACLs and OFLs are also reported in Table 3, those values are 340 and 358 mt for the ACL, with OFL estimates of 940 and 989 mt. Under the fishing rates that are consistent with recent ACL targets and catches, the probability of further long-term decline in bocaccio abundance is negligible in the near term (particularly if the magnitude of the 2009 and 2010 year classes are as great or greater than currently anticipated), and rebuilding is projected to continue at a rate somewhat greater than previously estimated. However, as with past assessments and rebuilding analyses, recruitment variability remains a key factor determining future abundance and rebuilding success. In particular, the exact magnitude of the 2010 year class will have a strong influence on progress towards rebuilding in the near future; rebuilding could potentially take place at a considerably faster pace if this year class is larger than currently estimated.

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Table 1. Recent catches of bocaccio rockfish south of Cape Blanco (in metric tons), as a total and as a percentage of the ACL/OY or OFL/ABC value.

	Catch	ACL	OFL	% OY/ACL	% OFL/ABC
1999	213	230	230	93%	93%
2000	160	164	100	160%	98%
2001	131	100	122	131%	108%
2002	90	100	122	90%	73%
2003	13	20	244	64%	5%
2004	85	199	400	43%	21%
2005	107	307	566	35%	19%
2006	60	306	549	20%	11%
2007	63	218	602	29%	10%
2008	39	218	618	18%	6%
2009	58	288	793	20%	7%
2010	75	288	793	26%	10%
2011		263	737		
2012		274	732		

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Table 2. Parameters and re-estimated reference points for rebuilding from this analysis

Parameter	2011	2009	2007 (Stat C)
Year declared overfished	2000	2000	2000
Current year	2009	2009	"2007"
First OY year	2013	2011	2009
T_{MIN}	2018	2018	2019
Mean generation time	13	13	14
T_{MAX} (estimated)	2031	2031	2033
$T_{F=0}$ (beginning year)	2019 (2013)	2018 (2011)	2020 (2007)
Bunfished (billion eggs)	7812	7946	13554
Rebuilding target ($B_{40\%}$)	3125	3178	5421
Current SPR (2010)	0.93	0.95 (2008)	0.939 (2006)
Target SPR	0.777	0.777	0.777
Current T_{TARGET}	2022	2026	2026
Spawning output $_{(end\ year)}$	2029 (2011)	2249 (2009)	1727 (2007)

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Table 3: Results of the suite of rebuilding alternatives considered for this analysis.

	SPR= .600	SPR= .70	SPR= .777	SPR= .900	SPR= .92	SPR= .950	50% T_{target} (2022)	50% Tmax (2031)	SPR for 2011-12 OY	F=0	40-10 rule	ABC Rule
Rationale	range	range	target	range	current	range	min	max	target	F=0	40:10	ABC
SPR (target)	0.600	0.700	0.777	0.900	0.920	0.950	0.708	0.539	0.800	1.000	0.553	0.500
ACL (2013)	691	482	340	142	112	69	466.3	837	301	0	803	940
OFL (2013)	940	940	940	940	940	940	939.9	940	940	940	940	940
ACL (2014)	705	501	358	152	120	74	485.3	843	318	0	824	937
OFL (2014)	959	977	989	1006	1009	1013	978.2	946	992	1019	949	937
50% Prob Yr	2027	2023	2021	2019	2019	2019	2022	2031	2021	2019	2032	2037
P > SSB2011 in 100 years	98.2	99.7	99.9	100	100.0	100	97.5	91.8	99.9	100	91.9	83.2
<5th %tile, output/target in T_{max}	0.63	0.758	0.85	1.00	1.027	1.06	0.71	0.56	0.88	1.13	0.58	0.51
Median, output/target in T_{max}	1.04	1.238	1.39	1.63	1.664	1.72	0.99	0.92	1.43	1.82	0.90	0.85
>95th %tile, output/target in T_{max}	1.82	2.135	2.38	2.76	2.827	2.93	1.64	1.63	2.45	3.09	1.54	1.50
Percent probability of recovery by pre-specified years												
2020	23	35	45	62	65	70	36	16	48	77	16	13
2021	27	42	53	71	74	77	43	19	56	83	18	16
2022	33	49	60	77	80	83	50	23	64	88	21	18
2023	37	55	66	82	84	87	56	27	69	90	25	21
2024	42	59	71	86	88	90	60	31	74	93	29	24
2025	47	63	75	89	91	93	64	35	79	94	32	27
2026	49	67	79	91	93	94	68	39	82	96	36	30
2031	63	70	90	97	98	98	65	51	92	99	48	41

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Table 4: Year specific probabilities of rebuilding to target levels for Table 3 scenarios.

	SPR= .600	SPR= .700	SPR= .777	SPR= .900	SPR= 0.92	SPR= .950	50% Ttarget (2022)	50% Tmax (2031)	SPR for 2011-12 OY	F=0	40-10 rule	ABC Rule
2011	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
2012	*0*	*0*	*0*	*0*	*0*	*0*	0	*0*	*0*	*0*	*0*	*0*
2013	0	0	0	0	0	0	0	0	0	0	0	0
2014	0	0	0	0	0	0	0	0	0	0	0	0
2015	0.002	0.002	0.003	0.003	0.003	0.003	0.002	0.002	0.003	0.003	0.002	0.001
2016	0.024	0.031	0.035	0.057	0.058	0.063	0.031	0.018	0.037	0.071	0.018	0.012
2017	0.055	0.097	0.128	0.203	0.217	0.234	0.100	0.044	0.134	0.275	0.045	0.036
2018	0.114	0.187	0.251	0.369	0.392	0.429	0.189	0.083	0.272	0.49	0.08	0.07
2019	0.171	0.274	0.361	0.513	0.543	0.588	0.279	0.118	0.389	0.653	0.115	0.101
2020	0.228	0.349	0.454	0.617	0.654	0.695	0.359	0.162	0.483	0.769	0.156	0.129
2021	0.269	0.424	0.527	0.713	0.736	0.774	0.430	0.193	0.562	0.834	0.182	0.157
2022	0.326	0.487	0.604	0.773	0.796	0.828	0.500	0.228	0.641	0.876	0.213	0.179
2023	0.373	0.55	0.664	0.818	0.843	0.867	0.560	0.271	0.695	0.904	0.25	0.214
2024	0.421	0.593	0.709	0.857	0.877	0.902	0.601	0.310	0.746	0.928	0.288	0.243
2025	0.465	0.631	0.754	0.892	0.911	0.927	0.642	0.349	0.789	0.943	0.323	0.273
2026	0.493	0.669	0.787	0.911	0.934	0.941	0.679	0.388	0.818	0.958	0.361	0.299
2027	0.527	0.701	0.824	0.93	0.943	0.95	0.713	0.409	0.853	0.964	0.387	0.328
2028	0.567	0.737	0.851	0.941	0.953	0.961	0.750	0.442	0.873	0.982	0.416	0.35
2029	0.59	0.769	0.864	0.954	0.964	0.972	0.778	0.460	0.887	0.987	0.432	0.375
2030	0.616	0.793	0.883	0.965	0.974	0.981	0.802	0.482	0.900	0.989	0.452	0.387
2031	0.633	0.808	0.901	0.972	0.978	0.983	0.818	0.508	0.917	0.991	0.483	0.409
2032	0.663	0.825	0.918	0.977	0.983	0.988	0.835	0.526	0.929	0.995	0.504	0.43
2033	0.681	0.837	0.92	0.981	0.988	0.991	0.850	0.553	0.940	0.996	0.525	0.45
2034	0.702	0.855	0.935	0.988	0.991	0.992	0.864	0.566	0.948	0.996	0.54	0.47
2035	0.719	0.878	0.944	0.989	0.992	0.993	0.886	0.586	0.956	0.997	0.559	0.48
2036	0.731	0.889	0.952	0.99	0.992	0.993	0.897	0.611	0.962	0.997	0.584	0.494
2037	0.747	0.9	0.96	0.99	0.992	0.993	0.907	0.624	0.969	0.998	0.595	0.511
2038	0.764	0.91	0.963	0.992	0.993	0.994	0.917	0.636	0.971	0.999	0.611	0.529
2039	0.783	0.921	0.971	0.993	0.993	0.997	0.928	0.648	0.978	0.999	0.623	0.539
2040	0.797	0.93	0.975	0.996	0.997	0.999	0.935	0.663	0.980	0.999	0.64	0.549
2041	0.815	0.935	0.98	0.999	0.999	0.999	0.941	0.682	0.985	0.999	0.656	0.565
2042	0.825	0.942	0.984	0.999	0.999	0.999	0.947	0.696	0.987	0.999	0.671	0.577
2043	0.833	0.946	0.986	0.999	0.999	0.999	0.952	0.713	0.990	0.999	0.683	0.592
2044	0.844	0.95	0.99	0.999	0.999	0.999	0.958	0.727	0.992	0.999	0.702	0.605
2045	0.849	0.955	0.992	0.999	0.999	0.999	0.962	0.740	0.993	0.999	0.71	0.623
2046	0.859	0.961	0.994	0.999	0.999	0.999	0.967	0.750	0.995	1	0.719	0.633
2047	0.865	0.963	0.994	0.999	1	1	0.969	0.762	0.996	1	0.735	0.644
2048	0.872	0.967	0.994	1	1	1	0.972	0.773	0.996	1	0.747	0.656
2049	0.88	0.97	0.995	1	1	1	0.974	0.781	0.996	1	0.754	0.665
2050	0.886	0.974	0.995	1	1	1	0.976	0.789	0.997	1	0.761	0.672
2051	0.893	0.976	0.996	1	1	1	0.978	0.799	0.997	1	0.776	0.686
2052	0.896	0.978	0.996	1	1	1	0.979	0.804	0.997	1	0.781	0.696
2053	0.901	0.981	0.996	1	1	1	0.982	0.808	0.997	1	0.787	0.702
2054	0.905	0.981	0.996	1	1	1	0.983	0.815	0.997	1	0.789	0.713
2055	0.91	0.984	0.996	1	1	1	0.984	0.816	0.998	1	0.796	0.717
2056	0.917	0.984	0.997	1	1	1	0.984	0.822	0.998	1	0.802	0.726
2057	0.925	0.985	0.998	1	1	1	0.985	0.830	0.999	1	0.807	0.736
2058	0.929	0.985	0.998	1	1	1	0.985	0.838	0.999	1	0.815	0.743
2059	0.934	0.987	0.998	1	1	1	0.987	0.844	0.999	1	0.823	0.751
2060	0.942	0.988	0.998	1	1	1	0.988	0.848	0.999	1	0.828	0.757

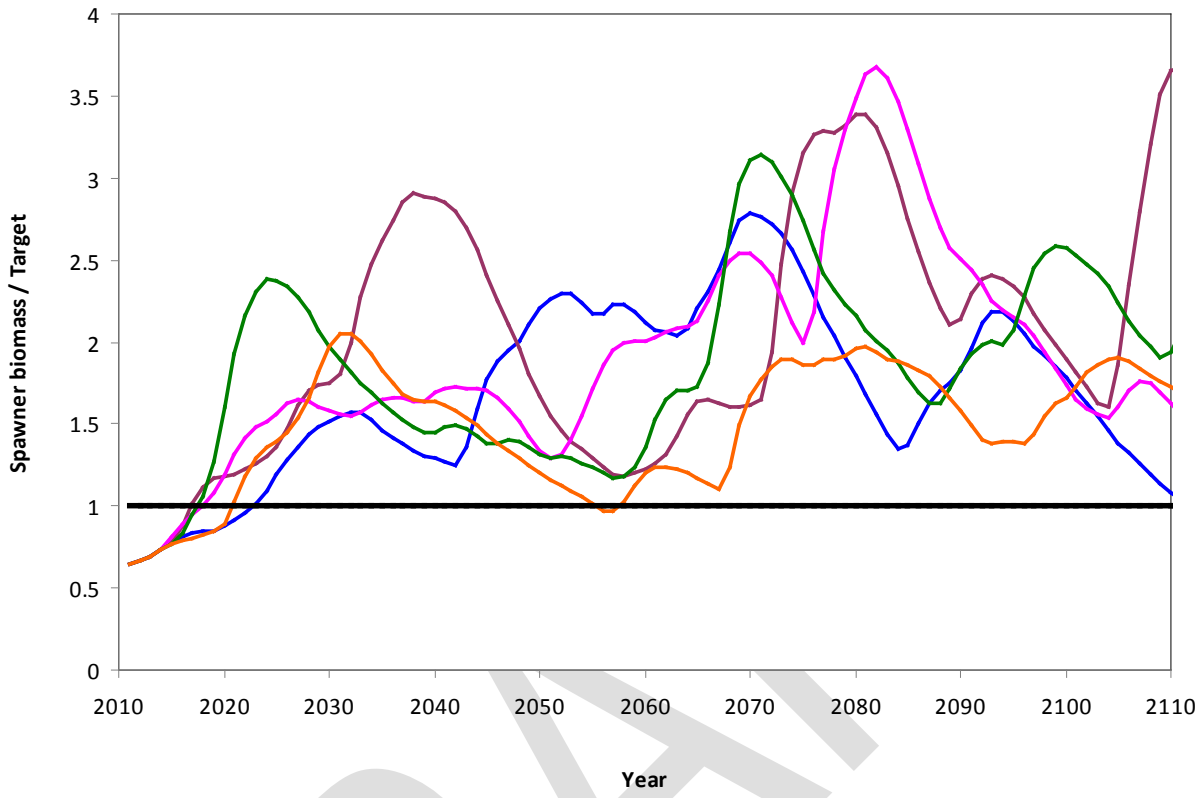

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Figure 1. Examples of individual rebuilding trajectories for bocaccio (based on the rebuilding plan SPR rate of 0.777)

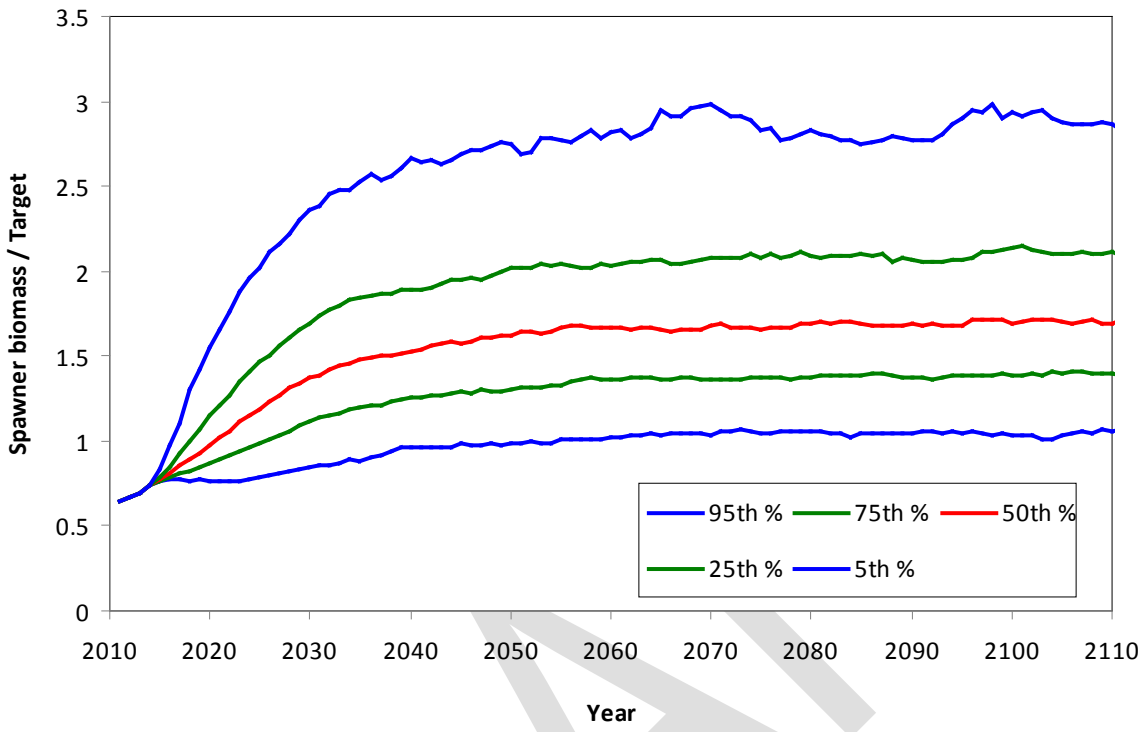

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Figure 2. Estimated 5th, 25th, 50th, 75th and 95th percentiles of spawning output (relative to target) under continuation of the SPR 0.777 strategy into the future.

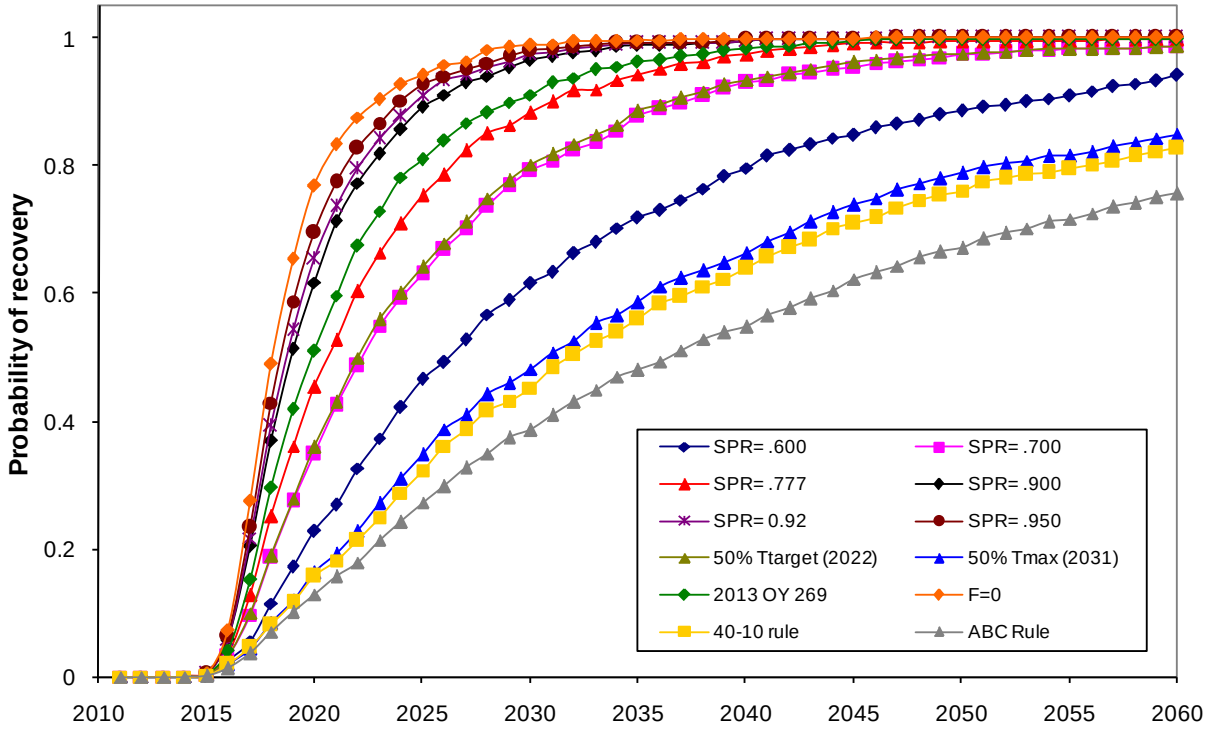

Figure 3: Probability of recovery for a suite of the rebuilding alternatives described in Table 3.

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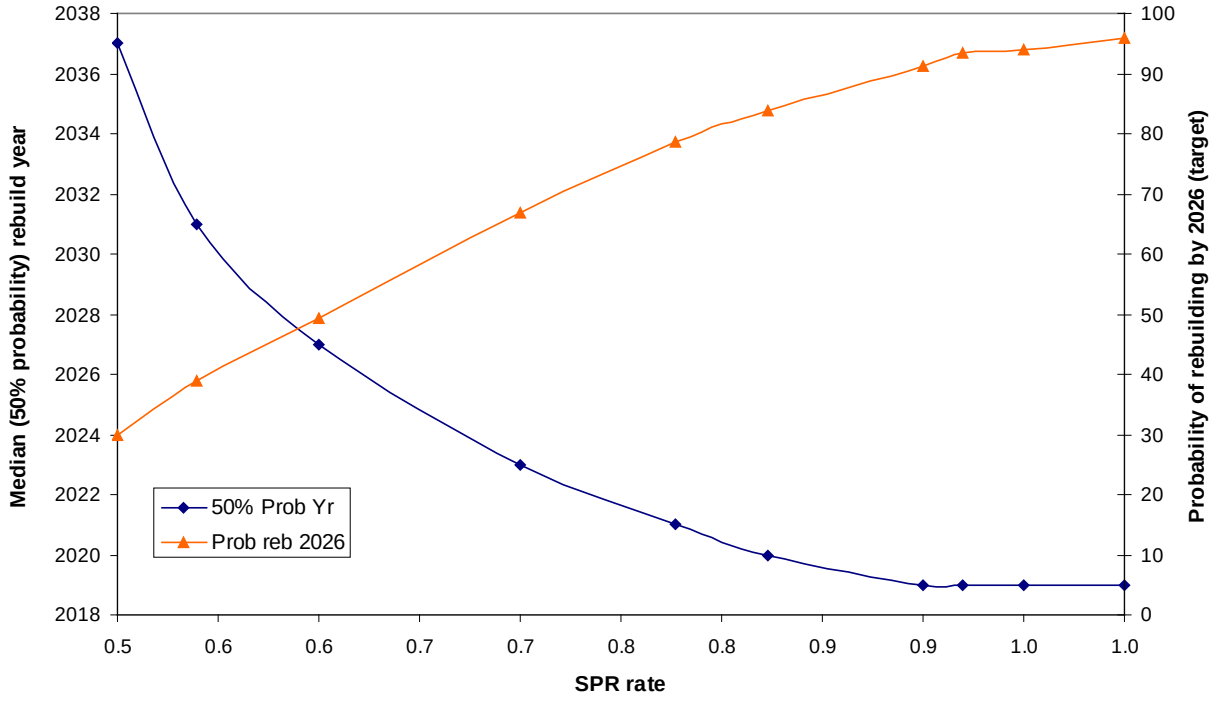

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Figure 4: Probability of recovery by the target year (2026, left y axis) and estimated median year of rebuilding (right y axis) under alternative SPR harvest rates.

Appendix A. Projection data file for base run.

#Title, #runnumber: 1058 boc10.dat boc6.ctl 3303.81 7.81206e+006 2.02872e+006 StartTime: Mon Sep 12 08:18:24 2011
SSv3_default_rebuild.dat
Number of sexes
2
Age range to consider (minimum age; maximum age)
0 21
Number of fleets
6
First year of projection (Yinit)
2011
First Year of rebuilding period (Ydecl)
2000
Number of simulations
1000
Maximum number of years
500
Conduct projections with multiple starting values (0=No;else yes)
0
Number of parameter vectors
1000
Is the maximum age a plus-group (1=Yes;2=No)
1
Generate future recruitments using historical recruitments (1) historical recruits/spawner (2) or a stock-recruitment (3)
3
Constant fishing mortality (1) or constant Catch (2) projections
1
Fishing mortality based on SPR (1) or actual rate (2)
1
Pre-specify the year of recovery (or -1) to ignore
-1
Fecundity-at-age
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 #runnumber: 1058 boc10.dat boc6.ctl 3303.81 7.81206e+006
2.02872e+006
 0 0.0320825 4.54013 61.4275 190.476 331.761 467.901 598.212 720.679 832.77 932.782 1020.1 1095.01 1158.36 1211.33
1255.23 1291.35 1320.89 1344.95 1364.47 1380.26 1412.67 #female fecundity; weighted by N in year Y_init across morphs and
areas
Age specific selectivity and weight adjusted for discard and discard mortality
 #wt and selex for gender,fleet: 1 1
 0.0509727 0.263362 0.544146 0.838294 1.14467 1.44513 1.73046 2.00044 2.25163 2.47859 2.67751 2.84752 2.99015 3.10822
3.20507 3.28399 3.34801 3.39975 3.44147 3.47504 3.50202 3.55736
 3.35367e-005 0.0305682 0.380303 0.830179 0.922681 0.826163 0.697022 0.591561 0.517352 0.467588 0.434418 0.412034
0.396631 0.385806 0.37804 0.372368 0.368158 0.36499 0.362581 0.36073 0.359299 0.356576
 #wt and selex for gender,fleet: 1 2
 0.0397567 0.287442 0.616104 0.946246 1.25332 1.53823 1.79547 2.02765 2.24118 2.43801 2.61635 2.77395 2.90988 3.02485
3.12066 3.19962 3.26421 3.31672 3.35925 3.39359 3.42125 3.47817
 6.89948e-005 0.00149117 0.0687717 0.384436 0.741303 0.883479 0.858237 0.770434 0.679948 0.606851 0.552814 0.514067
0.486412 0.466534 0.452074 0.441417 0.433464 0.427459 0.42288 0.419359 0.416632 0.411436
 #wt and selex for gender,fleet: 1 3
 0.0397053 0.194662 0.702259 1.01749 1.27084 1.51128 1.73378 1.93903 2.13205 2.31455 2.48441 2.63825 2.77367 2.89001
2.98809 3.06962 3.13671 3.1915 3.23601 3.27203 3.3011 3.36107
 0.00194768 0.00240969 0.0201079 0.286251 0.697782 0.826254 0.746641 0.616962 0.504661 0.422432 0.365441 0.326369
0.299363 0.280404 0.266855 0.257001 0.249722 0.24427 0.240137 0.236975 0.234535 0.229917
 #wt and selex for gender,fleet: 1 4
 0.0418485 0.230526 0.48774 0.785015 1.09171 1.37863 1.63808 1.86966 2.07521 2.25671 2.41571 2.55353 2.67155 2.77143
2.85507 2.92446 2.9816 3.02837 3.06646 3.09735 3.12234 3.17415
 0.00822552 0.241504 0.79666 0.942072 0.805145 0.612528 0.452719 0.339958 0.264548 0.214532 0.180971 0.158006 0.141949
0.130483 0.122139 0.115967 0.111336 0.107821 0.105127 0.103046 0.101427 0.0983199
 #wt and selex for gender,fleet: 1 5
 0.0430448 0.230548 0.505319 0.823989 1.17416 1.5289 1.865 2.16927 2.43632 2.6656 2.85929 3.02094 3.15461 3.26437
3.35398 3.42684 3.48586 3.53356 3.57201 3.60297 3.62785 3.67887
 0.00808596 0.132424 0.535422 0.836838 0.945386 0.979254 0.990734 0.99519 0.997165 0.998144 0.998678 0.998993 0.999189
0.999318 0.999406 0.999468 0.999513 0.999546 0.999571 0.99959 0.999604 0.999631
 #wt and selex for gender,fleet: 1 6
 0.0477974 0.279318 0.616483 0.905532 1.21128 1.54221 1.86918 2.17035 2.43637 2.66531 2.85889 3.02053 3.15421 3.26398
3.35362 3.42649 3.48552 3.53323 3.57169 3.60265 3.62754 3.67857

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1.0597e-005 0.00269629 0.120172 0.563768 0.866183 0.962562 0.988349 0.99571 0.998126 0.999046 0.999447 0.999643 0.999749 0.999811 0.999849 0.999874 0.99989 0.999902 0.999911 0.999917 0.999922 0.99993
#wt and selex for gender,fleet: 2 1
0.0509727 0.263362 0.521574 0.772631 1.01176 1.23019 1.41907 1.57839 1.71084 1.81941 1.9072 1.9773 2.03271 2.07612 2.10992 2.13609 2.15628 2.17181 2.18372 2.19285 2.19983 2.21171
3.35367e-005 0.0305682 0.339622 0.76314 0.921722 0.907751 0.83961 0.767574 0.70724 0.660684 0.625869 0.600097 0.581041 0.56691 0.556391 0.548527 0.542627 0.538187 0.534836 0.532302 0.530382 0.527242
#wt and selex for gender,fleet: 2 2
0.0397567 0.287442 0.5896 0.874603 1.12152 1.33294 1.51111 1.65741 1.77568 1.87053 1.94616 2.00609 2.05329 2.09022 2.11898 2.14127 2.15847 2.17171 2.18188 2.18968 2.19564 2.20579
6.89948e-005 0.00149117 0.0561195 0.297491 0.609118 0.807102 0.883506 0.890742 0.868737 0.838518 0.809231 0.784064 0.763601 0.747425 0.734835 0.725119 0.717659 0.711949 0.707585 0.704254 0.701713 0.697508
#wt and selex for gender,fleet: 2 3
0.0397053 0.194662 0.665514 0.956802 1.16112 1.33703 1.48834 1.61463 1.71807 1.8019 1.86932 1.9231 1.9657 1.99918 2.02535 2.04569 2.06142 2.07356 2.08289 2.09005 2.09554 2.10491
0.00194768 0.00240969 0.0148015 0.195297 0.544258 0.769738 0.832044 0.810359 0.761553 0.711065 0.667512 0.632523 0.605296 0.584418 0.568517 0.556438 0.547272 0.540316 0.535034 0.531022 0.527973 0.522958
#wt and selex for gender,fleet: 2 4
0.0418485 0.230526 0.466482 0.718019 0.96194 1.17632 1.35673 1.50516 1.62541 1.7217 1.79808 1.85819 1.90518 1.94172 1.97 1.99182 2.00861 2.02149 2.03136 2.03891 2.04468 2.05456
0.00822552 0.241504 0.765079 0.946648 0.881161 0.751715 0.629672 0.533686 0.46288 0.411703 0.374796 0.348049 0.32852 0.314153 0.30351 0.29558 0.289644 0.285182 0.281818 0.279276 0.277352 0.274206
#wt and selex for gender,fleet: 2 5
0.0430448 0.230548 0.482511 0.75087 1.02062 1.27294 1.49508 1.68259 1.83641 1.96012 2.05821 2.13521 2.1952 2.24167 2.27753 2.30511 2.32628 2.34249 2.35489 2.36437 2.37161 2.38383
0.00808596 0.132424 0.503074 0.79293 0.914239 0.959655 0.977991 0.986306 0.990513 0.992845 0.994236 0.995115 0.995694 0.99609 0.996367 0.996565 0.996709 0.996815 0.996893 0.996951 0.996995 0.997065
#wt and selex for gender,fleet: 2 6
0.0477974 0.279318 0.592072 0.841934 1.0736 1.3001 1.50878 1.68977 1.84039 1.96245 2.05965 2.13613 2.1958 2.24208 2.2778 2.3053 2.3264 2.34257 2.35494 2.3644 2.37162 2.38381
1.0597e-005 0.00269629 0.0978591 0.463173 0.772632 0.908703 0.95975 0.979668 0.988257 0.99238 0.99456 0.995807 0.996569 0.997059 0.997386 0.997611 0.99777 0.997885 0.997968 0.998029 0.998074 0.998146
M and current age-structure in year Yinit: 2011
gender = 1
0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15
1720.43 1477.09 1384.88 464.724 414.19 162.173 605.172 67.8134 453.604 124.269 27.9318 27.7433 547.715 70.9507 12.2363 42.279 21.2638 30.7965 33.1208 11.4298 28.2171 95.9771
gender = 2
0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15
1720.43 1477.09 1384.88 464.921 414.377 162.126 604.265 67.5976 451.509 123.456 27.6611 27.3975 540.106 69.8904 12.0372 41.4691 20.8448 30.2174 32.431 11.2006 27.5552 82.2794
Age-structure at Ydeclare= 2000
154.651 3104.11 410.27 71.0048 243.312 121.068 173.766 185.649 63.7727 156.94 123.278 17.3224 217.064 47.115 9.60269 7.95676 59.5434 5.60479 0.339728 1.22872 1.70762 40.4542
154.651 3104.11 410.27 71.1364 244.083 121.801 175.332 187.104 64.3379 157.765 122.554 16.9437 207.116 43.6024 8.49474 6.50806 44.583 3.88767 0.216451 0.70021 0.852578 13.1678
Year for Tmin Age-structure (set to Ydecl by SS)
2000
recruitment and biomass
Number of historical assessment years
121
Historical data
year recruitment spawner in B0 in R project in R/S project
1891 1892 1893 1894 1895 1896 1897 1898 1899 1900 1901 1902 1903 1904 1905 1906 1907 1908 1909 1910 1911 1912 1913 1914 1915 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932 1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950 1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 #years (with first value representing R0)
5106.28 5074.64 5074.36 5074.27 5074.3 5074.4 5074.55 5074.77 5075.09 5075.51 5075.67 5075.56 5075.2 5074.62 5073.81 5072.81 5071.63 5070.28 5068.78 5066.83 5064.46 5061.67 5058.49 5054.94 5051.04 5046.81 5041.19 5029.98 5017.8 5011.87 5006.07 5002.72 5000.88 4997.77 4995.98 4993.01 4985.57 4980.63 4975.29 4971.07 4964.39 4958.42 4956.16 4957.34 4957.27 4956.29 4953.06 4950.87 4951.85 4954.97 4957.96 4962.69 4971.68 4976 4968.53 4943.22 4933.03 4923.11 4917.96 4911.47 4894.92 4862.51 4823.71 5185.25 1304.29 5535.8 1317.68 3013.03 15885.5 4663.61 3981.3 3878.74 82499.4 3804.66 3733.67 16595.4 3740.92 3763.02 4263.64 6137.57 4342.58 11958.8 23622.2 8306.33 1838.98 2263.86 37478.9 2838.99 7376.35 1981 1027.84 190.472 2047.8 14188.8 1271.18 1026.61 3230.34 9600.12 516.416 2569.24 2343.01 690.242 1485.25 1076.02 591.912

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961.175 232.078 1118.98 7215.65 309.302 267.124 1023.1 3186.96 405.302 3090.07 707.436 1542.45 1475.24 3749.74 3432.6
3440.87 #recruits; first value is R0 (virgin)
7.81206e+006 7.53538e+006 7.53304e+006 7.53224e+006 7.5325e+006 7.53332e+006 7.53459e+006 7.53651e+006
7.53922e+006 7.5428e+006 7.5441e+006 7.54319e+006 7.54017e+006 7.53517e+006 7.52835e+006 7.51987e+006
7.50988e+006 7.4985e+006 7.48586e+006 7.46956e+006 7.44974e+006 7.42659e+006 7.40032e+006 7.37116e+006
7.33934e+006 7.30505e+006 7.25995e+006 7.17135e+006 7.07706e+006 7.03193e+006 6.98814e+006 6.96314e+006
6.94938e+006 6.92633e+006 6.91315e+006 6.89134e+006 6.8371e+006 6.80149e+006 6.76333e+006 6.73339e+006
6.68647e+006 6.64499e+006 6.6294e+006 6.6375e+006 6.63702e+006 6.63029e+006 6.60809e+006 6.59313e+006
6.59984e+006 6.62121e+006 6.6418e+006 6.67459e+006 6.73774e+006 6.76839e+006 6.7155e+006 6.5412e+006 6.47311e+006
6.40787e+006 6.37441e+006 6.33265e+006 6.22813e+006 6.0312e+006 5.80814e+006 5.53512e+006 5.24878e+006
4.86333e+006 4.37667e+006 3.829e+006 3.2534e+006 2.80678e+006 2.43997e+006 2.43227e+006 2.67424e+006 2.8203e+006
3.09976e+006 4.62126e+006 6.95258e+006 8.30251e+006 9.31441e+006 1.01362e+007 1.04117e+007 1.03547e+007
9.87057e+006 8.66472e+006 7.23332e+006 6.62581e+006 6.22482e+006 5.78792e+006 5.24732e+006 4.98772e+006
5.09892e+006 4.83193e+006 4.17449e+006 3.37392e+006 2.55995e+006 2.04745e+006 1.75044e+006 1.68595e+006
1.55236e+006 1.29138e+006 1.17334e+006 1.25228e+006 1.22097e+006 1.17047e+006 1.12053e+006 1.09042e+006
1.08623e+006 1.06306e+006 1.06725e+006 1.05458e+006 1.05177e+006 1.16088e+006 1.35724e+006 1.50529e+006
1.58797e+006 1.67156e+006 1.76429e+006 1.84965e+006 1.93217e+006 1.98715e+006 2.02872e+006 #spbio; first value is
SPB_virgin (virgin)
1 0 0 0

```
10
# Random number seed
-99004
# File with multiple parameter vectors
rebuild.SSO
# User-specific projection (1=Yes); Output replaced (1->9)
0  5
# Catches and Fs (Year; 1/2/3 (F or C or SPR); value); Final row is -1
2013 2 1
-1 -1 -1
# Fixed catch project (1=Yes); Output replaced (1->9); Approach (-1=Read in else 1-9)
0 2 -1
# Split of Fs
2011  0.0919157 0.0255689 0.00212542 0.782009 0.0585863 0.0397944
-1  1 1 1 1 1 1
# Yrs to define T_target for projection type 4 (a.k.a. 5 pre-specified inputs)
0.50 0.60 0.777 0.9 0.95
# Year for probability of recovery
2020 2021 2022 2023 2024 2025 2026 2027
# Time varying weight-at-age (1=Yes;0=No)
0
# File with time series of weight-at-age data
none
# Use bisection (0) or linear interpolation (1)
1
# Target Depletion
0.4
# CV of implementation error
0
```

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Agenda Item E.1.a
Attachment 6
November 2011

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Rebuilding analysis for canary rockfish based on the 2011 updated stock assessment

John R. Wallace
National Marine Fisheries Service
Northwest Fisheries Science Center
2725 Montlake Blvd. E.
Seattle WA, 98112
206-860-3456 (phone)
206-860-6792 (fax)
John.Wallace@noaa.gov

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11 October, 2011

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Summary

Based on the 2011 stock assessment, this rebuilding analysis compares the results of applying a suite of potential future management actions to the U.S. canary rockfish stock. The base case model for the 2011 assessment estimated that the canary rockfish resource is at 23.2% of the unexploited equilibrium spawning biomass at the beginning of 2011. This represents a slight reduction from the 2009 assessment which estimated depletion in 2009 to be 23.7%; the change is largely due to a revised historical catch time-series for Oregon. As in 2007 and 2009, uncertainty about the base case results is included through integration or rebuilding trajectories over two alternate (and less likely) states of nature corresponding to lower and higher stock-recruitment steepness (h), the parameter largely governing productivity and recent rebuilding trajectory. Based on the 2009 rebuilding analysis the 2011 ACL was set at 102 and 2012 is pending but probably will be set at 107 (John DeVore, personal communication).

Because there was only a slight reduction in estimated relative depletion in the 2011 stock assessment compared to the 2009 assessment, the only management alternatives presented are the 2011-2012 ACL's set at 102 and 107 mt respectively. Starting from these values for the 2011-2012 ACL's, various management options for 2013 and subsequent years are considered ranging from zero fishing mortality to the largest removal that could occur without overfishing (ABC catches). In the absence of any future fishing mortality (beginning in 2013 and assuming 2011, 2012 ACL's of 102 and 107 mt) the canary rockfish stock is projected to have a 50% probability of recovery to the rebuilding target ($SB_{40\%}$) by 2028. In contrast, the stock is not projected to reach this level until 2174 if the ABC catches are removed. The current rebuilding harvest rate (SPR = 88.7%) would produce an ACL of 115.7 mt in 2013 and has a 50% probability of rebuilding by 2030. The harvest rate that is consistent with the current 2011, 2012 ACL's (102 and 107 mt) is SPR = 89.5%, and if continued, results in an ACL of 106.9 mt in 2013 and a 50% probability of recovery also by 2030. That is slightly less fishing mortality than the target rebuilding SPR rate of 88.7%. These levels of harvest are estimated to be far below those which would result in overfishing based on the 2011 assessment. A range of additional management approaches to recovery based on historical and recalculated reference points as well as harvest rates corresponding to short-term ACL's are presented.

Introduction

The stock assessments conducted in 1999 for canary rockfish documented that the stock had declined below the overfished level in the northern (Columbia and U.S. Vancouver INPFC areas) and southern regions (Conception, Monterey and Eureka areas; Crone et al. 1999, Williams et al. 1999). Canary rockfish was determined to be in an "overfished" state on Jan. 1, 2000 and development of a rebuilding plan was initiated while preliminary rebuilding estimates were implemented through adjustments of annual management measures. The first rebuilding analysis for canary rockfish was conducted in 2000 based on the 1999 stock assessment (Methot 2000). This analysis has subsequently been updated on the basis of the 2002 (Methot and Piner), 2005 (Methot and Stewart), 2007 (Stewart, 2008b) and now the 2009 updated stock assessment results.

The first rebuilding analysis used results from the northern area assessment to project rates of potential stock recovery (Methot 2000). The stock was found to have long recovery times based on extremely low productivity. The initial rebuilding OY for 2001 and 2002 was set at 93 mt based upon a 50% probability of rebuilding by the year 2057 and maintaining a constant catch throughout the rebuilding period.

The rebuilding analysis was updated in 2002 (Methot and Piner, 2002) to incorporate the coast-wide assessment results. This analysis was the basis of a change from a constant catch to a constant harvest rate rebuilding strategy, as was done for other west coast groundfish rebuilding plans. The results of the 2002 assessment and rebuilding analysis indicated that the relative spawning biomass had reached a low of 6.6% in 2000 (compared to the unfished equilibrium level), the year of the overfished declaration. By 2002 it had increased to 7.9%. The rate of rebuilding was based on the model-estimated stock-recruitment relationship with a steepness of 0.33 and stochastic projections sampling lognormal deviations about this relationship. The time to rebuild from the year of declaration with no fishing, T_{MIN}, was estimated to be year 2057. The mean generation time was calculated to be 19 years. The maximum allowable time to rebuild, T_{MAX}, was therefore calculated to be the year 2076 (2057 plus one mean generation time). The year with a 50% probability of recovery, T_{TARGET}, was 2074 on the basis of a harvest rate that would achieve a 60% probability of rebuilding by 2076 (T_{MAX}). This rebuilding harvest rate produced an OY in 2003 of 41 mt. The 2002 analysis demonstrated the sensitivity of the target harvest rate (and short-term OYs) to the commercial vs. recreational allocation, because of the difference in selectivity between the two gear groups. Final calculations were based upon a 50:50 division of rebuilding OYs.

The 2005 rebuilding analysis (Methot 2005) recalculated all rebuilding reference points on the basis of two alternate models for selectivity (sex-specific or not) and a profile of values for stock-recruitment steepness for each model. Rebuilding projections therefore included uncertainty in selectivity, steepness and future recruitment strength. The stock was estimated to be at 9.4% of unexploited spawning biomass in 2005. The time to rebuild from the year of declaration (2000) with no fishing, T_{MIN}, was estimated to be year 2048. Mean generation time was estimated to be 23 years. The maximum allowable time to rebuild, T_{MAX}, was therefore calculated to be the year 2071 (2048 plus one mean generation time). The year with a 50% probability of recovery, T_{TARGET}, was 2063 on the basis of the same harvest rate selected in 2002 (SPR= 88.7%). This harvest rate was projected to achieve a 55.4% probability of rebuilding by 2071 (T_{MAX}). Because of slightly below-average recruitments since the stock had been declared overfished, the projected year with a 50% probability of rebuilding to target stock size if fishing

mortality were zero beginning in 2007 ($T_{F=0}$) was 2053. A list of reference points from the 2005 rebuilding analysis is presented in Table 1. The 2005 rebuilding analysis projected OYs based on three fishing fleets (trawl, non-trawl and recreational) maintaining a 50:50 split between commercial and recreation sectors, although this had not been realized in the actual removals during the intervening years since 2002.
The 2009 assessment revised both the estimated reference points and rebuilding trajectories (Stewart 2009b). That analysis estimated that the canary rockfish resource was at 23.7% of the unexploited equilibrium spawning biomass at the beginning of 2009. Uncertainty in that result was included through the integration over two alternate (and less likely) states of nature corresponding to lower and higher stock-recruitment steepness (*h*), the parameter largely governing productivity and recent rebuilding trajectory. Conditioned on the 2007-2008 OYs of 44 mt (based on the rebuilding SPR rate of 88.7% used in the 2002 and 2005 rebuilding analyses), various management options were presented. In the absence of any future fishing mortality, the canary rockfish stock was projected to have a 50% probability of recovery to the rebuilding target ($SB_{40\%}$) by 2024. In contrast, the stock was not projected to reach this level until 2180 if the ABC catches are removed. Application of the previous rebuilding harvest rate (SPR = 88.7%) was estimated to produce an OY of 101.5 mt in 2011 and had a 50% probability of rebuilding by 2027. The council set the 2011 ACL at 102 and 2012 is pending but probably will be set at 107 (John DeVore, personal communication), these values corresponding to an SPR of 89.5%, resulting in an estimated median year to rebuild of 2030.

2011 Assessment summary

The 2011 canary rockfish stock assessment estimated the unexploited spawning biomass (SB_0) to be 27,846 mt, somewhat higher than the estimate from the 2009 assessment of 25, 993 mt for the base case model (Stewart 2009a). The stock was estimated to be at 23.2% of this level at the beginning of 2011 (Wallace 2011). The steepness of the spawner-recruitment relationship, which largely determines the rate of increase in recruitment as the stock rebuilds, was 0.511 in the base model (as in 2007 and 2009), with the degree of recruitment variability (σ_r) set at 0.50. Two alternative states of nature were presented, representing lower stock-recruitment steepness (0.345) and higher steepness (0.72); each of these states was assigned a probability equal to half that of the base case model (0.5), based on a meta-analysis of West Coast rockfish (M. Dorn, Alaska Fisheries Science Center, personal communication). These alternate models estimated the stock to be at a much lower (5%) or higher (58%) relative stock size.

Updates in the 2011 assessment included:

- Addition of the revised Oregon historical catch history which produced a 36.5% increase in estimated cumulative catch over the period 1916-1981 as compared to the 2009 assessment.
- Addition of recent NWFSC trawl survey data (2009-2010).
- Addition of recent fishery port and observer sampling (2009-2010).

Changes in the results of the 2011 assessment compared to those in 2009 were due primarily to the revised Oregon historical catch history.

Management performance under rebuilding

Following the 1999 declaration that the canary rockfish stock was overfished the canary OY was reduced by over 70% in 2000 and by the same margin again over the next three years. Managers employed several tools in an effort to constrain catches to these dramatically lower targets. These included: reductions in trip/bag limits for canary and co-occurring species, the institution of spatial closures, and new gear restrictions intended to reduce trawling in rocky shelf habitats and the coincident catch of rockfish in shelf flatfish trawls. Table 1 summarizes the coast-wide ABC's and catch in recent years. In recent years, the total mortality has been slightly above the OY (higher in retrospect based on current methods used for total mortality estimates), but well below the ABC.

Rebuilding calculations

This rebuilding analysis was conducted using software developed by A. Punt (version 3.12b, January 2010). The steps followed were:

1. Define how virgin biomass (SB_0) will be calculated.
2. Define how future recruitment will be generated.
3. Define the fishery selectivity and allocation to be applied during rebuilding.
4. Decide how to include uncertainty in input parameters from the stock assessment in the rebuilding analysis.
5. Recalculate rebuilding reference points from the most current assessment results
   a) Calculate the projected year in which the stock would rebuild with a 50% probability if all future fishing mortality was eliminated ($T_{F=0}$).
   b) Calculate the projected year for a 50% probability of rebuilding from the year in which the stock was first declared overfished (T_{MIN}).
   c) Calculate the mean generation time.
   d) Calculate the maximum allowable rebuilding time ($T_{MAX} = T_{MIN}$ + one mean generation time).
6. Identification and analysis of alternative harvest strategies for rebuilding.

1. Definition of SB_0

The equilibrium spawning biomass level (SB_0) used in this rebuilding analysis is calculated via the stock-recruitment relationship in order to be consistent with assessment model results. This level is estimated to be 27,846 mt in the base case assessment model, which dictates that the rebuilding target ($SB_{40\%}$) is 11,138 mt (Table 2).

2. Generation of future recruitment

The parameters of the stock recruitment relationship (unexploited equilibrium recruitment [natural log of R_0], steepness [h], and the degree of recruitment variability [σ_r]) from the 2011 stock assessment are used to generate future recruitments in the rebuilding analysis. These values are provided in Table 3.

3. Fishery selectivity and allocation

In order to project the effect of fishing on the canary rockfish rebuilding trajectory, it is necessary to specify the fishery selectivity and relative allocation among fleets. Unlike the method employed in 2007 and 2009, this analysis projects forward using selectivity based on council allocation to major sectors such as trawl and fixed gear. When necessary, catch averaged over the three most recent years (2008-2010) was

used to split the major sectors into the fisheries used in the stock assessment. For most rebuilding species, differences in sector allocations and harvest shares are less of a factor, than for canary, and do not have a comparable impact on the specification of OFLs. The Council allocation percentages for canary provide the best measure of the distribution of future catches, if ACLs are assumed to be fully caught. In recent fisheries, ACLs/OYs have not been fully harvested, but the sector percentages from these recent years would only be appropriately applied to amounts of catch below those obtained using the rebuilding SPR, which is not consistent with how rebuilding analyses have been conducted. Additionally, even those recent fishery shares do not reflect a trawl fishery managed under individual quotas. The resulting selectivity and weight at age are included in the basic input data files (Appendices A and B).

4. Inclusion of uncertainty

Uncertainty is included in this rebuilding analysis via integration of the three states of nature for stock-recruitment steepness reported in the 2011 assessment as well as stochastic future recruitment strengths. Specifically, the model using a low value for steepness is given a probability of 25%, the base case 50% and the model using a high value for steepness 25%. This is achieved through the use of multiple parameter vectors in the rebuilding input files. Because these three states are discrete levels from a continuous probability distribution, it is expected that there will be a reasonably high degree of 'stair-stepping' (Figures 1 and 2) in reported probabilities. This means that interpretation of the relative difference between 60% and 70% probabilities are probably not as meaningful as those between 70% and 80% where the upper tail is actually informing the difference. A similar pattern should exist in the lower tail as well. Addition of more parameter vectors would tend to smooth this pattern in the results, but is unlikely to substantially change the median values upon which decisions are generally made.

5. Recalculate reference points

The median year of recovery in the absence of fishing ($T_{F=0}$) was calculated by setting fishing mortality to zero in 2013. This value for $T_{F=0}$ (starting in 2013) is equal to 2028. The value for T_{MIN}, the median year for rebuilding to the target level in the absence of fishing since the year of declaration (2000) is 2027 (revised upward from 2024 in the 2009 analysis). That T_{MIN} is one year less than $T_{F=0}$ indicates that harvest rates during this ten-year period have delayed the stock trajectory by one year.

The estimated generation time of 23 years has increased by one year from the 2007 and 2009 analyses value of 22 years. In conjunction with T_{MIN}, the mean generation time dictates the revised estimate of T_{MAX}, 2050 (increased from 2046 in the 2009 analysis). Applying the same harvest rate (SPR_{TARGET} = 88.7%) used to find T_{TARGET} in the 2007 rebuilding analysis leads to a $T_{REBUILD}$ of 2030. This harvest rate generates a P_{MAX} (probability of recovery by T_{MAX}) of 75%.

All reference points from the 2009 rebuilding analysis and those recalculated here are summarized in Table 2.

6. Alternate rebuilding strategies

Assuming that a constant rate of harvest will be applied throughout a rebuilding period, the basis for rebuilding alternatives can be divided into two approaches: 1) strategies based on selection of a harvest rate, and 2) strategies based selection of a T_{TARGET} (year for 50% probability of recovery). The result of each of these strategies is

contingent on the actual ACL's removed in 2011 and 2012. This rebuilding analysis therefore presents 18 alternate strategies. Specifically, the alternatives are:

Based on the current OY for 2011 and 2012 (102 and107 mt, respectively), calculate the results of the following strategies (in decreasing SPR order for easier interpretation).

1. Eliminate all harvest beginning in 2013 (F=0).
2. Apply the harvest rate that would currently generate 102 mt taken in 2011 and 107 mt in 2012. (SPR=89.5%)
3. Apply the current rebuilding harvest rate target (SPR_{TARGET}=88.7%).
4. Apply the 2009 harvest rate (SPR=87.2%) starting in 2013.
5. Apply the harvest rate that estimated to generate a 50% probability of recovery by the T_{MAX} from 2007 (2041, SPR=67.9%)
6. Apply the harvest rate that estimated to generate a 50% probability of recovery by the T_{MAX} from 2011 (2050, SPR=62.8%)
7. Apply a 40:10 harvest policy.
8. Apply the ABC harvest rate ($SPR_{50\%}$).

Apply the harvest rate that achieves a 50% probability of recovery for years near the current T_{TARGET} (2027) and $T_{F=0}$ from 2013 (2028) (in decreasing SPR order for easier interpretation):

9) 2028
10) 2029
11) 2030
12) 2031
13) 2032

Apply the harvest rate that achieves a 50% probability of recovery for years distributed between $T_{F=0}$ (2028) and the current T_{MAX} of 2050 (in decreasing SPR order for easier interpretation):

14) 2030
15) 2035
16) 2040
17) 2045
18) 2050

Results

Summary results from alternatives 1-18 are presented in Table 4. Detailed results are presented in Tables 5 and 6 and Figures 1 and 2. In the absence of any future fishing mortality, the canary rockfish stock is projected to have a 50% probability of recovery to the rebuilding target ($SB_{40\%}$) by 2028 (alternative 1). In contrast, the stock is not projected to reach this level until 2174 if the ABC catches are removed (alternative 8). These two scenarios bound the range of fishing mortality between none and the overfishing level; all other scenarios lie within this range.

Fishing at the current SPR target (alternative 3) results in a modest increase from the 107 mt ACL in 2012 to 115.7 mt in 2013. This current rebuilding harvest rate (SPR = 88.7%) results in a median year to rebuild (T_{TARGET}) of 2030. The harvest rate that is consistent with the 2011 and 2012 ACL (102 and 107 mt) is SPR = 89.5% (alternate 2), and if continued, also results in a 50% probability of recovery achieved by 2030. Because the estimate of the year with 50% probability of recovery under no fishing is 2028, it is not possible to rebuild by the 2009 T_{TARGET} of 2027. This suggests the need to consider 'resetting' the reference points from the 2009 rebuilding analysis in light of the changes to the stock assessment results and estimated current status.

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Tables

Table 1. Canary rockfish management performance under rebuilding.

Year	ABC (mt)[2]	OY (mt)[2]	Commercial landings (mt)[1]	Total Catch (mt)	NWFSC Total Mortality Reports (mt)
2000	287	200	55.7	199.8	
2001	228	93	42.6	133.0	
2002	228	93	69.9	120.5	
2003	272	44	75.8	127.5	
2004	256	47.3	49.3	85.0	47.3
2005	270	46.8	10.9	59.0	48.7
2006	279	47	7.7	60.0	57.0
2007	172	44	12.1	46.2	45.8
2008	179	44	8.2	41.9	41.2
2009	937	105	11.7	38.0	38.1
2010	940	105	14.3	81.8	

[1] Excludes all at-sea whiting, recreational and research catches.
[2] The terms ABC and OY from this period have been replaced by OFL and ACL, respectively.

Table 2. Summary of rebuilding reference points for canary rockfish from Amendment 16-4 (for comparison), the 2009 rebuilding analysis, and recalculated values based on the 2011 assessment results.

	Source		
Parameter	Amendment 16-4	2009 Rebuilding analysis	2011 Rebuilding analysis
SB_0	34,155	25,993	27,846
Rebuilding target ($SB_{40\%}$)	13,662	10,397	11,138
SB_{2011}	-	6,548	6,459
T_{MIN}	2048	2024	2027
Mean generation time	23	22	23
T_{MAX}	2071	2046	2050
$T_{F=0}$ (begin in 2007)	2053	-	-
$T_{F=0}$ (begin in 2011, 105 mt removed in 2010)	-	2024	-
$T_{F=0}$ (begin in 2013, 102 mt removed in 2011)	-	-	2028
P_{MAX}	55.4%	-	-
P_{MAX} (105 mt removed in 2010)	-	75%	-
P_{MAX} (102 mt removed in 2011)	-	-	75%
T_{TARGET}	2063	-	-
T_{TARGET} (105 mt removed in 2010)	-	2027	-
$T_{REBUILD}$ (102 mt removed in 2011)	-	-	2029

SPR_{TARGET}	88.7%	88.7%	88.7%

Table 3. Stock-recruitment parameters for the three states of nature included in this rebuilding analysis.

	State of nature		
Parameter	Low steepness	Base case	High steepness
R_0 (1000s)	3,459	3,350	3,222
Steepness (h)	0.345	0.511	0.72
σ_r	0.50	0.50	0.50

Table 4. Results of rebuilding alternatives based on selection of an SPR target or year for 50% probability of recovery and 2011, 2012 ACL's of 102 and 107 mt, respectively.

Run	1	2	3	4	5	6	7	8
Basis	F=0 after 2011: 102 & 2012: 107mt	SPR from 2011: 102 & 2012: 107mt	SPR = 0.887 after 2011: 102 & 2012: 107mt	2009 SPR after 2011: 102 & 2012: 107mt	SPR that achieves 50% prob. recovery by 2007 T_{MAX}	SPR that achieves 50% prob. recovery by 2011 T_{MAX}	40:10 Harvest policy	ABC harvest rate SPR = 0.50
2013 ACL (mt)	0.0	106.9	115.7	132.6	394.7	493.4	586.6	751.7
2013 OFL (mt)	751.7	751.8	751.7	751.7	751.7	751.7	751.7	751.7
2014 ACL (mt)	0.0	109.5	118.5	135.7	397.7	494.2	578.0	741.3
2014 OFL (mt)	775.3	770.6	770.1	769.3	757.4	753.0	748.7	741.3
50% prob. recovery by:	2028	2030	2030	2030	2041	2050	2115	2174
SPR_{TARGET}	1.000	0.895	0.887	0.872	0.679	0.622	≥ 0.500	0.500
Probability of recovery by reference points based on the 2009 rebuilding analysis:								
2024 (T_{MIN} and $T_{F=0}$ from 2011)	27.2%	25.6%	25.5%	25.4%	25.0%	25.0%	25.0%	25.0%
2027 (T_{TARGET})	48.2%	35.5%	34.4%	32.7%	25.0%	25.0%	25.0%	25.0%
2046 (T_{MAX})	75.0%	75.0%	75.0%	75.0%	61.3%	43.0%	27.0%	25.4%
Probability of recovery by recalculated 2011 reference points:								
2027(T_{TARGET}; and T_{MIN} from 2013)	48.2%	35.5%	34.4%	32.7%	25.0%	25.0%	25.0%	25.0%
2028($T_{F=0}$ from 2013)	56.8%	41.0%	40.3%	39.2%	25.6%	25.0%	25.0%	25.0%
2050 (T_{MAX})	75.0%	75.0%	75.0%	75.0%	66.3%	50.0%	27.5%	25.6%

Table 4 (cont). Results of rebuilding alternatives based on a year for 50% probability of recovery and 2011, 2012 ACL's of 102 and 107 mt, respectively.

Run	9	10	11	12	13
Basis	SPR that achieves 50% prob. recovery by 2028	SPR that achieves 50% prob. recovery by 2029	SPR that achieves 50% prob. recovery by 2030	SPR that achieves 50% prob. recovery by 2031	SPR that achieves 50% prob. recovery by 2032
2013 ACL (mt)	47.5	100.9	147.2	183.6	216.1
2013 OFL (mt)	751.7	751.7	751.7	751.7	751.7
2014 ACL (mt)	48.9	103.5	150.5	187.3	220.1
2014 OFL (mt)	773.2	770.7	768.6	767.0	765.5
50% prob. recovery by:	2028	2029	2030	2031	2032
SPR_{TARGET}	0.951	0.900	0.859	0.829	0.803
Probability of recovery by reference points based on the 2007 rebuilding analysis:					
2024 (T_{MIN} and $T_{F=0}$ from 2011)	26.0%	25.6%	25.3%	25.1%	25.0%
2027 (T_{TARGET})	41.2%	36.4%	31.7%	29.9%	27.9%
2046 (T_{MAX})	75.0%	75.0%	75.0%	74.8%	74.5%
Probability of recovery by recalculated 2009 reference points:					
2027(T_{TARGET}; and T_{MIN} from 2013)	41.2%	36.4%	31.7%	29.9%	27.9%
2028($T_{F=0}$ from 2013)	50.0%	41.7%	37.4%	33.4%	31.1%
2050 (T_{MAX})	75.0%	75.0%	75.0%	75.0%	74.9%

Table 4 (cont). Results of rebuilding alternatives based on a year for 50% probability of recovery and 2011, 2012 ACL's of 102 and 107 mt, respectively.

Run	14	15	16	17	18
Basis	SPR that achieves 50% prob. recovery by 2030	SPR that achieves 50% prob. recovery by 2035	SPR that achieves 50% prob. recovery by 2040	SPR that achieves 50% prob. recovery by 2045	SPR that achieves 50% prob. recovery by 2050
2013 ACL (mt)	147.2	301.8	394.2	449.0	493.4
2013 OFL (mt)	751.7	751.7	751.7	751.7	751.7
2014 ACL (mt)	150.5	305.8	397.2	451.0	494.2
2014 OFL (mt)	768.6	761.6	757.5	755.0	753.0
50% prob. recovery by:	2030	2035	2040	2045	2050
SPR_{TARGET}	0.859	0.740	0.679	0.647	0.622
Probability of recovery by reference points based on the 2007 rebuilding analysis:					
2024 (T_{MIN} and $T_{F=0}$ from 2011)	25.3%	25.0%	25.0%	25.0%	25.0%
2027 (T_{TARGET})	31.7%	26.1%	25.1%	25.0%	25.0%
2046 (T_{MAX})	75.0%	71.9%	61.5%	52.7%	43.0%
Probability of recovery by recalculated 2009 reference points:					
2027(T_{TARGET}; and T_{MIN} from 2013)	31.7%	26.1%	25.1%	25.0%	25.0%
2028($T_{F=0}$ from 2013)	37.4%	27.4%	25.6%	25.0%	25.0%
2050 (T_{MAX})	75.0%	73.6%	66.3%	59.4%	50.0%

Table 5. Median spawning biomass (mt) for rebuilding alternatives based on selection of an SPR target or year for 50% probability of recovery and 2011, 2012 ACL's of 102 and 107 mt, respectively. Note that after 25 years the table is compressed.

Run	1	2	3	4	5	6	7	8
Basis	F=0 after 2011: 102 & 2012: 107mt	SPR from 2011: 102 & 2012: 107mt	SPR = 0.887 after 2011: 102 & 2012: 107mt	2009 SPR after 2011: 102 & 2012: 107mt	SPR that achieves 50% prob. recovery by 2007 T_{MAX}	SPR that achieves 50% prob. recovery by 2011 T_{MAX}	40:10 Harvest policy	ABC harvest rate SPR = 0.50
2011	6,458	6,458	6,458	6,458	6,458	6,458	6,458	6,458
2012	6,603	6,603	6,603	6,603	6,603	6,603	6,603	6,603
2013	6,714	6,715	6,714	6,714	6,714	6,714	6,714	6,714
2014	6,860	6,816	6,811	6,804	6,694	6,653	6,614	6,545
2015	7,020	6,930	6,922	6,907	6,688	6,607	6,533	6,395
2016	7,207	7,071	7,058	7,037	6,709	6,588	6,483	6,279
2017	7,427	7,243	7,227	7,198	6,762	6,603	6,469	6,201
2018	7,682	7,449	7,429	7,393	6,849	6,652	6,490	6,161
2019	7,972	7,689	7,665	7,621	6,968	6,736	6,547	6,158
2020	8,293	7,960	7,932	7,880	7,119	6,850	6,632	6,188
2021	8,643	8,257	8,224	8,165	7,295	6,989	6,743	6,247
2022	9,004	8,566	8,530	8,462	7,479	7,138	6,858	6,314
2023	9,389	8,895	8,854	8,778	7,683	7,305	6,988	6,397
2024	9,787	9,237	9,191	9,107	7,893	7,478	7,122	6,490
2025	10,202	9,591	9,542	9,449	8,112	7,651	7,241	6,577
2026	10,610	9,935	9,880	9,777	8,319	7,824	7,361	6,662
2027	11,039	10,302	10,241	10,130	8,543	8,003	7,510	6,760
2028	11,485	10,690	10,626	10,507	8,772	8,203	7,656	6,881
2029	11,969	11,090	11,018	10,883	9,010	8,391	7,776	6,969
2030	12,427	11,477	11,401	11,258	9,252	8,586	7,883	7,068
2031	12,852	11,818	11,738	11,586	9,431	8,720	7,971	7,119
2032	13,276	12,172	12,082	11,915	9,632	8,888	8,069	7,222
2033	13,710	12,533	12,442	12,272	9,877	9,089	8,185	7,320
2034	14,173	12,934	12,835	12,651	10,060	9,219	8,276	7,369
2035	14,559	13,239	13,134	12,933	10,246	9,389	8,357	7,457
2040	16,566	14,865	14,738	14,483	11,117	10,054	8,678	7,709
2045	18,200	16,170	16,010	15,707	11,743	10,524	8,896	7,884
2050	19,762	17,420	17,237	16,896	12,396	11,054	9,089	8,100
2055	21,104	18,527	18,355	17,972	13,041	11,522	9,276	8,301
2060	22,383	19,573	19,353	18,941	13,578	11,950	9,444	8,495
2065	23,236	20,239	20,024	19,601	13,919	12,219	9,507	8,600
2070	23,988	20,862	20,634	20,209	14,322	12,547	9,615	8,755

Table 5 (cont.). Median spawning biomass (mt) for rebuilding alternatives based on selection of a year for 50% probability of recovery and 2011, 2012 ACL's of 102 and 107 mt, respectively. Note that after 25 years the table is compressed.

Run	9	10	11	12	13
Basis	SPR that achieves 50% prob. recovery by 2028	SPR that achieves 50% prob. recovery by 2029	SPR that achieves 50% prob. recovery by 2030	SPR that achieves 50% prob. recovery by 2031	SPR that achieves 50% prob. recovery by 2032
2011	6,458	6,458	6,458	6,458	6,458
2012	6,603	6,603	6,603	6,603	6,603
2013	6,714	6,714	6,714	6,714	6,714
2014	6,840	6,817	6,798	6,783	6,769
2015	6,979	6,934	6,895	6,864	6,837
2016	7,145	7,077	7,018	6,972	6,931
2017	7,344	7,252	7,173	7,112	7,057
2018	7,577	7,461	7,362	7,284	7,216
2019	7,845	7,704	7,584	7,490	7,408
2020	8,143	7,977	7,836	7,727	7,630
2021	8,468	8,277	8,114	7,989	7,878
2022	8,806	8,589	8,405	8,262	8,137
2023	9,166	8,921	8,713	8,553	8,413
2024	9,537	9,265	9,035	8,857	8,702
2025	9,923	9,623	9,370	9,176	9,005
2026	10,304	9,970	9,690	9,474	9,287
2027	10,705	10,341	10,034	9,798	9,593
2028	11,121	10,732	10,404	10,146	9,922
2029	11,574	11,137	10,768	10,487	10,242
2030	11,995	11,527	11,136	10,838	10,578
2031	12,381	11,872	11,454	11,136	10,856
2032	12,771	12,228	11,774	11,433	11,138
2033	13,172	12,593	12,128	11,764	11,448
2034	13,607	12,999	12,492	12,095	11,753
2035	13,956	13,308	12,763	12,363	12,011
2040	15,781	14,965	14,267	13,757	13,311
2045	17,256	16,274	15,451	14,830	14,311
2050	18,688	17,541	16,609	15,918	15,325
2055	19,929	18,654	17,652	16,899	16,239
2060	21,083	19,720	18,600	17,771	17,049
2065	21,856	20,396	19,231	18,346	17,567
2070	22,538	21,022	19,819	18,871	18,100

Table 5 (cont.). Median spawning biomass (mt) for rebuilding alternatives based on selection of a year for 50% probability of recovery and 2011, 2012 ACL's of 102 and 107 mt, respectively. Note that after 25 years the table is compressed.

Run	14	15	16	17	18
Basis	SPR that achieves 50% prob. recovery by 2030	SPR that achieves 50% prob. recovery by 2035	SPR that achieves 50% prob. recovery by 2040	SPR that achieves 50% prob. recovery by 2045	SPR that achieves 50% prob. recovery by 2050
2011	6,458	6,458	6,458	6,458	6,458
2012	6,603	6,603	6,603	6,603	6,603
2013	6,714	6,714	6,714	6,714	6,714
2014	6,798	6,733	6,694	6,671	6,653
2015	6,895	6,765	6,689	6,643	6,607
2016	7,018	6,824	6,709	6,642	6,588
2017	7,173	6,914	6,763	6,674	6,603
2018	7,362	7,038	6,850	6,740	6,652
2019	7,584	7,194	6,970	6,839	6,736
2020	7,836	7,381	7,121	6,970	6,850
2021	8,114	7,593	7,296	7,125	6,989
2022	8,405	7,815	7,481	7,289	7,138
2023	8,713	8,055	7,685	7,473	7,305
2024	9,035	8,304	7,895	7,662	7,478
2025	9,370	8,566	8,114	7,855	7,651
2026	9,690	8,811	8,322	8,043	7,824
2027	10,034	9,073	8,545	8,241	8,003
2028	10,404	9,352	8,775	8,453	8,203
2029	10,768	9,633	9,013	8,664	8,391
2030	11,136	9,919	9,255	8,879	8,586
2031	11,454	10,143	9,434	9,032	8,720
2032	11,774	10,388	9,635	9,215	8,888
2033	12,128	10,668	9,881	9,435	9,089
2034	12,492	10,922	10,064	9,588	9,219
2035	12,763	11,129	10,250	9,765	9,389
2040	14,267	12,214	11,122	10,519	10,054
2045	15,451	13,020	11,749	11,052	10,524
2050	16,609	13,861	12,403	11,637	11,054
2055	17,652	14,634	13,048	12,182	11,522
2060	18,600	15,287	13,587	12,660	11,950
2065	19,231	15,730	13,928	12,961	12,219
2070	19,819	16,168	14,331	13,326	12,547

Table 6. Median catches (mt) for rebuilding alternatives based on selection of an SPR target or year for 50% probability of recovery and 2011, 2012 ACL's of 102 and 107 mt, respectively. Note that after 25 years the table is compressed.

Run	1	2	3	4	5	6	7	8
Basis	F=0 after 2011: 102 & 2012: 107mt	SPR from 2011: 102 & 2012: 107mt	SPR = 0.887 after 2011: 102 & 2012: 107mt	2009 SPR after 2011: 102 & 2012: 107mt	SPR that achieves 50% prob. recovery by 2007 T_{MAX}	SPR that achieves 50% prob. recovery by 2011 T_{MAX}	40:10 Harvest policy	ABC harvest rate SPR = 0.50
2011	102	102	102	102	102	102	102	102
2012	107	104	107	107	107	107	107	107
2013	0	107	116	133	395	493	587	752
2014	0	110	119	136	398	494	578	741
2015	0	112	122	139	402	496	572	733
2016	0	116	125	143	407	500	571	729
2017	0	119	129	147	414	506	575	728
2018	0	124	134	153	423	515	584	732
2019	0	128	138	158	433	524	597	737
2020	0	133	143	163	443	535	613	743
2021	0	138	149	169	454	546	631	752
2022	0	143	155	176	468	560	652	763
2023	0	149	160	182	480	573	671	773
2024	0	154	166	189	492	586	692	782
2025	0	160	173	196	506	599	711	794
2026	0	166	179	203	520	614	735	807
2027	0	172	185	210	533	627	757	817
2028	0	178	192	217	547	641	775	829
2029	0	184	198	224	559	653	793	837
2030	0	189	204	231	571	666	808	847
2031	0	195	210	238	584	679	827	857
2032	0	201	216	245	596	691	838	865
2033	0	207	222	251	606	700	854	869
2034	0	211	227	257	617	711	866	876
2035	0	217	233	263	627	721	873	882
2040	0	242	260	293	675	767	922	911
2045	0	262	281	317	717	808	960	938
2050	0	283	304	341	757	847	986	957
2055	0	302	323	363	792	881	1,022	986
2060	0	315	338	379	823	911	1,040	1,005
2065	0	327	350	393	845	934	1,058	1,021
2070	0	337	361	405	862	948	1,062	1,030

Table 6 (cont.). Median catches (mt) for rebuilding alternatives based on selection of a year for 50% probability of recovery and 2011, 2012 ACL's of 102 and 107 mt, respectively. Note that after 25 years the table is compressed.

Run	9	10	11	12	13
Basis	SPR that achieves 50% prob. recovery by 2028	SPR that achieves 50% prob. recovery by 2029	SPR that achieves 50% prob. recovery by 2030	SPR that achieves 50% prob. recovery by 2031	SPR that achieves 50% prob. recovery by 2032
2011	102	102	102	102	102
2012	107	107	107	107	107
2013	48	101	147	184	216
2014	49	103	150	187	220
2015	50	106	154	191	224
2016	52	109	158	196	230
2017	54	113	163	202	236
2018	56	117	169	208	243
2019	58	121	174	215	251
2020	60	126	180	222	259
2021	63	131	187	230	267
2022	65	136	194	238	277
2023	68	141	201	246	286
2024	71	146	208	255	295
2025	74	152	216	264	305
2026	76	157	224	273	315
2027	79	163	231	282	326
2028	82	169	239	291	336
2029	85	174	247	300	346
2030	88	180	254	308	355
2031	91	185	261	317	365
2032	94	191	269	326	374
2033	96	196	275	334	383
2034	99	200	281	341	391
2035	101	206	288	349	399
2040	114	230	320	386	440
2045	124	249	346	416	473
2050	135	269	373	446	506
2055	144	287	396	473	536
2060	151	300	413	493	560
2065	157	312	429	511	578
2070	161	321	441	526	594

Table 6 (cont.). Median catches (mt) for rebuilding alternatives based on selection of a year for 50% probability of recovery and 2011, 2012 ACL's of 102 and 107 mt, respectively. Note that after 25 years the table is compressed.

Run	14	15	16	17	18
Basis	SPR that achieves 50% prob. recovery by 2030	SPR that achieves 50% prob. recovery by 2035	SPR that achieves 50% prob. recovery by 2040	SPR that achieves 50% prob. recovery by 2045	SPR that achieves 50% prob. recovery by 2050
2011	102	102	102	102	102
2012	107	107	107	107	107
2013	147	302	394	449	493
2014	150	306	397	451	494
2015	154	310	401	454	496
2016	158	316	407	459	500
2017	163	323	414	466	506
2018	169	332	423	474	515
2019	174	341	432	484	524
2020	180	350	443	495	535
2021	187	361	454	506	546
2022	194	372	467	520	560
2023	201	383	479	532	573
2024	208	395	492	545	586
2025	216	407	505	559	599
2026	224	419	520	574	614
2027	231	432	533	587	627
2028	239	444	546	601	641
2029	247	456	559	613	653
2030	254	466	571	626	666
2031	261	478	584	638	679
2032	269	490	596	651	691
2033	275	499	606	660	700
2034	281	509	616	671	711
2035	288	519	626	681	721
2040	320	565	675	729	767
2045	346	604	716	770	808
2050	373	641	756	810	847
2055	396	677	792	845	881
2060	413	706	823	877	911
2065	429	727	845	899	934
2070	441	743	862	914	948

Figures

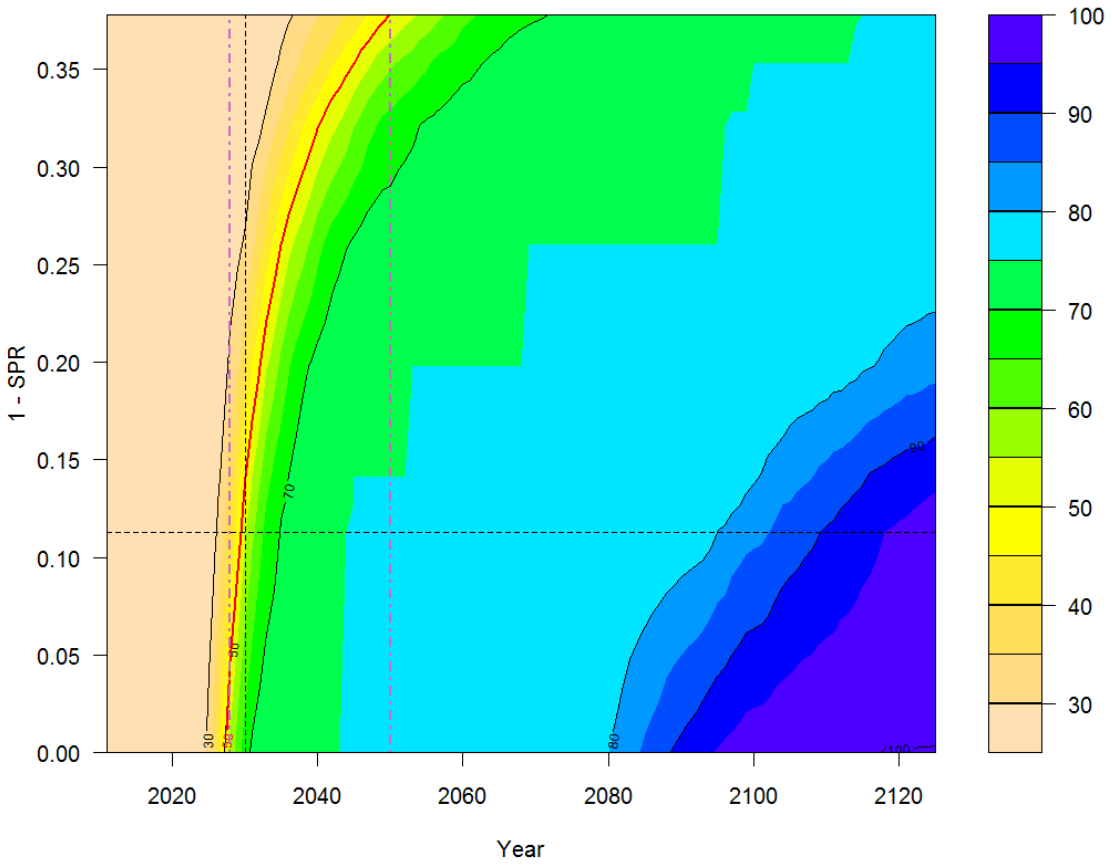

Figure 1. Estimated percent probability of rebuilding for canary by year and 1 – SPR. Fishing increases as 1 – SPR increases. The black dashed lines show a (one minus) SPR of 0.887 intersecting with the 50% median year to rebuild of 2030. The violet dashed–dotted lines show the current assessment's F = 0 (2028) and the new T_{MAX} of 2050.

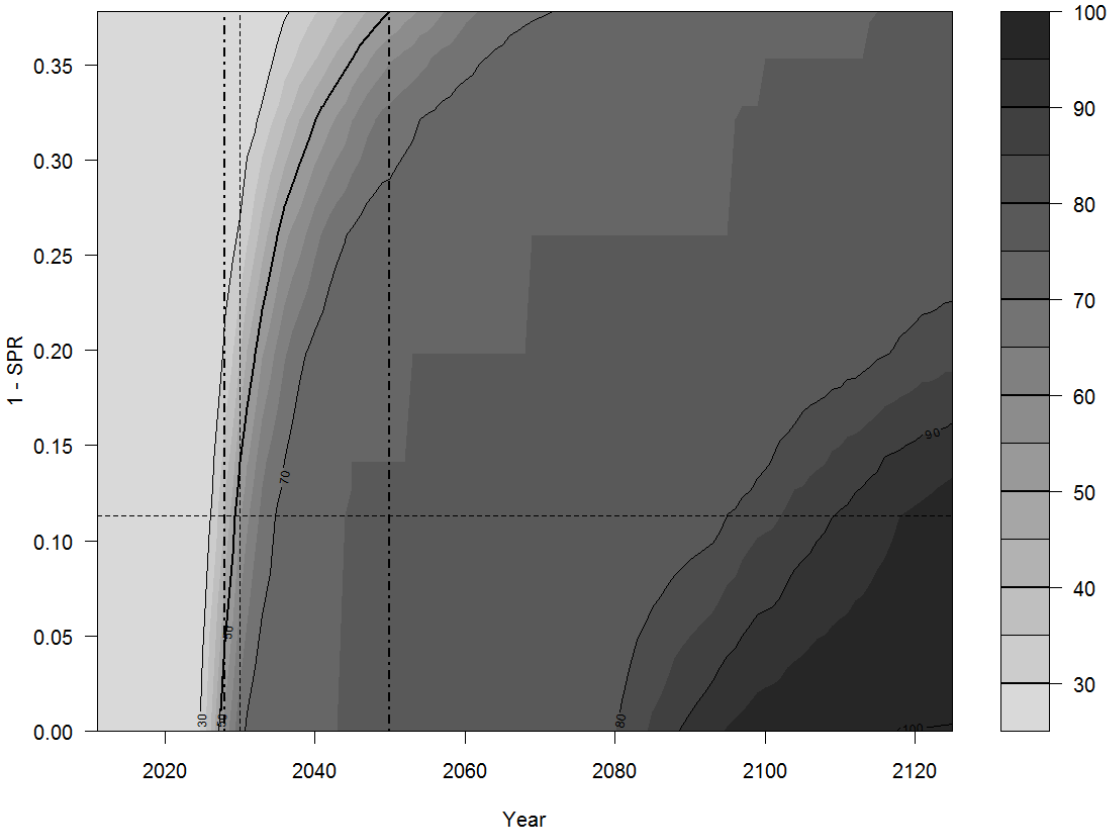

Figure 2. (Same as Figure 1 in grey scale.) Estimated percent probability of rebuilding for canary by year and 1 – SPR. Fishing increases as 1 – SPR increases. The dashed lines show a (one minus) SPR of 0.887 intersecting with the 50% median year to rebuild of 2030. The dashed–dotted lines show the current assessment's F = 0 (2028) and the new T_{MAX} of 2050.

Appendix A. Basic input file for rebuilding analyses

#Title, #runnumber: 52 Canary_data.SS Canary_control.SS 6256.15 27840.3 6415.64 StartTime: Tue Aug 23 14:02:45 2011
SSv3_default_rebuild.dat
Number of sexes
2
Age range to consider (minimum age; maximum age)
0 40
Number of fleets
12
First year of projection (Yinit)
2011
First Year of rebuilding period (Ydecl)
2000
Number of simulations
1000
Maximum number of years
300
Conduct projections with multiple starting values (0=No;else yes)
1
Number of parameter vectors
4
Is the maximum age a plus-group (1=Yes;2=No)
1
Generate future recruitments using historical recruitments (1) historical recruits/spawner (2) or a stock-recruitment (3)
3
Constant fishing mortality (1) or constant Catch (2) projections
1
Fishing mortality based on SPR (1) or actual rate (2)
1
Pre-specify the year of recovery (or -1) to ignore
-1
Fecundity-at-age
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 #runnumber: 54
Canary_data.SS Canary_control.SS 6256.28 27846.4 6458.11
0 0 8.74216e-005 0.000949417 0.00618432 0.027655 0.0896757 0.219323 0.424625 0.686754 0.974452 1.26108 1.53104 1.7779
2.00058 2.20032 2.37917 2.53923 2.68245 2.81056 2.9251 3.02744 3.1188 3.2003 3.27293 3.3376 3.39515 3.44631 3.49175 3.5321
3.5679 3.59965 3.62779 3.65272 3.6748 3.69434 3.71164 3.72694 3.74048 3.75245 3.77163 #female fecundity; weighted by N in
year Y_init across morphs and areas
Age specific selectivity and weight adjusted for discard and discard mortality
#wt and selex for gender,fleet: 1 1
0.01241 0.0267992 0.110833 0.272076 0.434135 0.603395 0.77442 0.94592 1.11621 1.28229 1.45333 1.64563 1.85831 2.06981
2.26216 2.43205 2.58288 2.7182 2.8403 2.95061 3.05016 3.13983 3.22043 3.29271 3.35742 3.41525 3.46685 3.51285 3.55379
3.5902 3.62255 3.65128 3.67676 3.69936 3.71939 3.73713 3.75284 3.76675 3.77905 3.78994 3.80729
0 9.26815e-005 0.000244509 0.00538603 0.0556411 0.231821 0.522906 0.784469 0.901086 0.86457 0.740046 0.61029 0.520519
0.472411 0.45071 0.441979 0.438705 0.437522 0.437099 0.436947 0.43689 0.436868 0.43686 0.436856 0.436855 0.436854
0.436853 0.436853 0.436853 0.436853 0.436853 0.436853 0.436853 0.436853 0.436853 0.436853 0.436853 0.436853 0.436853
0.436853 0.436853
#wt and selex for gender,fleet: 1 2
0.01241 0.0267695 0.0884437 0.271896 0.463873 0.648375 0.832668 1.01394 1.19222 1.37076 1.55227 1.73552 1.91709 2.09394
2.26357 2.42368 2.57244 2.70892 2.83301 2.94519 3.04622 3.13697 3.21834 3.29116 3.35625 3.41435 3.46615 3.51229 3.55333
3.58982 3.62224 3.651 3.67653 3.69915 3.7192 3.73696 3.75269 3.7666 3.77892 3.78981 3.80719
0 9.25937e-005 0.000129452 0.00063021 0.00936405 0.0617611 0.208757 0.443953 0.686147 0.857583 0.941507 0.963201
0.952558 0.929825 0.906126 0.886377 0.871776 0.861737 0.855127 0.850875 0.848165 0.846435 0.845321 0.844594 0.844112
0.843785 0.843561 0.843403 0.84329 0.843207 0.843146 0.843099 0.843064 0.843036 0.843014 0.842997 0.842983 0.842971
0.842962 0.842954 0.842935
#wt and selex for gender,fleet: 1 3
0.01241 0.03395 0.109974 0.228196 0.382871 0.560942 0.752651 0.950839 1.15059 1.34918 1.54469 1.73426 1.91482 2.0849
2.24454 2.39429 2.53446 2.66506 2.78599 2.8972 2.99881 3.09111 3.17453 3.24964 3.31702 3.37731 3.43115 3.47913 3.52183
3.55979 3.5935 3.62341 3.64994 3.67344 3.69426 3.71269 3.72901 3.74344 3.75621 3.7675 3.7862
0 0.000120953 0.00639141 0.0384194 0.124085 0.274789 0.467722 0.659734 0.813424 0.912682 0.961912 0.97425 0.961575
0.93264 0.894549 0.853222 0.812982 0.776395 0.744572 0.717664 0.695304 0.676903 0.661829 0.649495 0.639389 0.631084
0.624232 0.618556 0.61383 0.609876 0.606554 0.603749 0.601372 0.599348 0.59762 0.596138 0.594864 0.593765 0.592816
0.591993 0.590376
#wt and selex for gender,fleet: 1 4
0.01241 0.026774 0.0958475 0.277065 0.449708 0.626111 0.803383 0.979494 1.15815 1.34537 1.54115 1.73867 1.93061 2.11266
2.28296 2.44083 2.58617 2.71922 2.84043 2.95042 3.04986 3.13951 3.2201 3.2924 3.35712 3.41497 3.46659 3.5126 3.55355
3.58998 3.62234 3.65107 3.67656 3.69917 3.7192 3.73695 3.75266 3.76657 3.77888 3.78977 3.80713
0 9.26069e-005 0.000151419 0.0018301 0.0240073 0.126739 0.350738 0.626193 0.837962 0.946629 0.985983 0.996438 0.998271
0.998083 0.997518 0.996937 0.996416 0.995971 0.995599 0.995292 0.995039 0.994833 0.994663 0.994524 0.994409 0.994314

0.994235 0.994168 0.994113 0.994066 0.994026 0.993992 0.993963 0.993938 0.993917 0.993898 0.993883 0.993869 0.993857 0.993846 0.993827
#wt and selex for gender,fleet: 1 5
0.01241 0.0276725 0.141155 0.233606 0.34064 0.480329 0.631914 0.787058 0.945132 1.10734 1.27798 1.4648 1.67431 1.90177 2.12889 2.33726 2.51942 2.67664 2.81301 2.93238 3.03768 3.13105 3.21406 3.28796 3.35377 3.41238 3.46454 3.51094 3.55219 3.58883 3.62136 3.65022 3.67582 3.6985 3.7186 3.7364 3.75216 3.76611 3.77845 3.78936 3.80679
0 9.51379e-005 0.0166977 0.399156 0.889314 0.884074 0.653023 0.401793 0.22084 0.114818 0.0593918 0.0321309 0.019081 0.0128602 0.00986041 0.00838128 0.00763026 0.00723587 0.00702115 0.00689986 0.00682878 0.00678563 0.00675852 0.00674093 0.00672917 0.00672109 0.00671539 0.00671127 0.00670824 0.00670596 0.00670422 0.00670286 0.00670179 0.00670094 0.00670025 0.00669969 0.00669923 0.00669885 0.00669853 0.00669826 0.00669764
#wt and selex for gender,fleet: 1 6
0.01241 0.0292629 0.12616 0.246108 0.380797 0.526008 0.687967 0.856324 1.02235 1.18941 1.36389 1.55172 1.75459 1.96572 2.17216 2.36293 2.53343 2.68397 2.81677 2.9343 3.03866 3.13154 3.2143 3.28807 3.35381 3.41238 3.46453 3.51091 3.55216 3.5888 3.62133 3.65019 3.67579 3.69847 3.71857 3.73638 3.75213 3.76608 3.77842 3.78934 3.80677
0 0.00010063 0.00626296 0.108781 0.460696 0.826541 0.939173 0.844947 0.650275 0.45115 0.298853 0.199818 0.141143 0.108104 0.0899271 0.0799726 0.0744752 0.0713872 0.0696126 0.0685657 0.0679304 0.0675336 0.0672787 0.0671102 0.0669959 0.0669164 0.0668598 0.0668187 0.0667881 0.066765 0.0667473 0.0667334 0.0667225 0.0667138 0.0667067 0.0667009 0.0666962 0.0666922 0.0666889 0.0666861 0.0666797
#wt and selex for gender,fleet: 1 7
0.01241 0.0267747 0.0882909 0.232774 0.431347 0.636063 0.847601 1.06137 1.27271 1.47824 1.67563 1.8633 2.04026 2.20598 2.36026 2.50317 2.63491 2.75574 2.86598 2.96599 3.05621 3.1372 3.20959 3.27408 3.33137 3.38219 3.42719 3.46701 3.50223 3.53336 3.56087 3.58518 3.60665 3.62562 3.64237 3.65717 3.67024 3.68178 3.69197 3.70097 3.71788
0 9.26089e-005 0.000132384 0.000310907 0.00183127 0.0088944 0.0297813 0.0738666 0.146073 0.243621 0.357284 0.475324 0.587241 0.685836 0.767576 0.831913 0.880232 0.914859 0.938341 0.953031 0.960923 0.963636 0.962466 0.958445 0.952404 0.945002 0.936766 0.928104 0.919332 0.910682 0.902322 0.894366 0.886887 0.879925 0.873497 0.8676 0.862221 0.857337 0.852919 0.848935 0.84399
#wt and selex for gender,fleet: 1 8
0.01241 0.0289001 0.131414 0.244304 0.365564 0.502801 0.64917 0.789221 0.924959 1.06314 1.21575 1.4056 1.65246 1.93103 2.18541 2.39345 2.56383 2.70864 2.83534 2.94794 3.04866 3.13896 3.21989 3.29237 3.35719 3.41509 3.46674 3.51276 3.55373 3.59015 3.62251 3.65125 3.67674 3.69934 3.71937 3.73711 3.75283 3.76673 3.77904 3.78993 3.80728
0 9.92788e-005 0.00902077 0.187405 0.661946 0.918129 0.815393 0.54012 0.287818 0.133782 0.0589486 0.0271135 0.0145284 0.00971708 0.00788801 0.00718268 0.00690288 0.00678761 0.00673798 0.00671557 0.00670493 0.00669963 0.00669686 0.00669534 0.00669447 0.00669395 0.00669363 0.00669342 0.00669329 0.00669319 0.00669313 0.00669308 0.00669304 0.00669302 0.006693 0.00669298 0.00669297 0.00669296 0.00669295 0.00669295 0.00669293
#wt and selex for gender,fleet: 1 9
0.01241 0.0276778 0.135927 0.249455 0.368605 0.506713 0.666413 0.832988 1.00645 1.19356 1.39934 1.62032 1.8432 2.054 2.24578 2.41784 2.572 2.7104 2.83486 2.94682 3.04749 3.13792 3.21901 3.29164 3.35659 3.41459 3.46632 3.51241 3.55342 3.58988 3.62228 3.65103 3.67654 3.69916 3.71921 3.73696 3.75268 3.7666 3.77891 3.7898 3.80718
0 9.52967e-005 0.00591211 0.163556 0.641962 0.924601 0.883359 0.69257 0.484005 0.325202 0.22517 0.168539 0.13829 0.122562 0.114431 0.110191 0.107938 0.106711 0.106022 0.105624 0.105386 0.105239 0.105145 0.105084 0.105042 0.105014 0.104993 0.104979 0.104968 0.10496 0.104953 0.104948 0.104944 0.104941 0.104939 0.104937 0.104935 0.104934 0.104932 0.104931 0.104929
#wt and selex for gender,fleet: 1 10
0.01241 0.0283955 0.127999 0.249344 0.384122 0.527923 0.683117 0.835478 0.980801 1.13307 1.31433 1.54116 1.79641 2.03848 2.24665 2.42399 2.57851 2.71578 2.83894 2.94984 3.04972 3.13957 3.22026 3.2926 3.35735 3.4152 3.46682 3.51282 3.55377 3.59019 3.62254 3.65127 3.67676 3.69936 3.71938 3.73713 3.75284 3.76674 3.77905 3.78994 3.80729
0 9.76642e-005 0.00471284 0.0944871 0.434006 0.809689 0.917903 0.773572 0.521213 0.303756 0.170705 0.104249 0.0748306 0.0626549 0.0577675 0.0558148 0.0550238 0.0546945 0.0545525 0.0544887 0.0544586 0.0544438 0.0544362 0.054432 0.0544297 0.0544283 0.0544275 0.054427 0.0544266 0.0544264 0.0544262 0.0544261 0.054426 0.054426 0.0544259 0.0544259 0.0544258 0.0544258 0.0544258 0.0544258 0.0544257
#wt and selex for gender,fleet: 1 11
0.01241 0.0267686 0.0856624 0.194113 0.467528 0.721876 0.926252 1.11971 1.30442 1.48068 1.64998 1.81493 1.97778 2.13882 2.29617 2.447 2.58886 2.72029 2.84076 2.95041 3.04968 3.13924 3.21979 3.29206 3.35677 3.4146 3.46622 3.51223 3.55319 3.58961 3.62198 3.65072 3.67621 3.69882 3.71886 3.73661 3.75233 3.76624 3.77855 3.78944 3.80682
0 9.25907e-005 0.000123287 0.000128689 0.000414276 0.00461417 0.0294734 0.106207 0.253075 0.448633 0.644033 0.798313 0.898437 0.953665 0.980313 0.991799 0.996236 0.997696 0.997987 0.99785 0.997575 0.99727 0.996978 0.996712 0.996476 0.996268 0.996087 0.99593 0.995794 0.995676 0.995573 0.995484 0.995407 0.99534 0.995282 0.995231 0.995187 0.995148 0.995114 0.995085 0.995031
#wt and selex for gender,fleet: 1 12
0.01241 0.0267696 0.0857813 0.189442 0.334108 0.513866 0.717813 0.933455 1.15122 1.3652 1.57188 1.76922 1.95604 2.13184 2.29645 2.44984 2.59198 2.7229 2.84278 2.95195 3.05091 3.14025 3.22067 3.29285 3.3575 3.41529 3.46687 3.51285 3.55378 3.59018 3.62252 3.65124 3.67671 3.6993 3.71932 3.73706 3.75276 3.76666 3.77896 3.78984 3.80719
0 0.22148 0.296419 0.304582 0.32716 0.372751 0.443363 0.532813 0.629896 0.723189 0.804363 0.869212 0.917152 0.950099 0.971251 0.984025 0.991352 0.99539 0.997556 0.998698 0.999298 0.999614 0.999781 0.999872 0.999921 0.999948 0.999962 0.999969 0.999971 0.99997 0.999968 0.999965 0.999961 0.999956 0.999951 0.999946 0.999942 0.999937 0.999932 0.999928 0.99993
#wt and selex for gender,fleet: 2 1
0.0129428 0.0302637 0.15626 0.332128 0.494352 0.650929 0.800961 0.945473 1.08391 1.21437 1.33772 1.4583 1.57969 1.7009 1.81699 1.92273 2.01535 2.09465 2.16189 2.21878 2.26696 2.30782 2.34255 2.37209 2.39725 2.41868 2.43694 2.4525 2.46576 2.47705 2.48668 2.49488 2.50186 2.50781 2.51287 2.51718 2.52085 2.52398 2.52664 2.5289 2.53199
0 9.67166e-005 0.00045483 0.0111137 0.0849782 0.279114 0.545127 0.769353 0.885225 0.894176 0.831567 0.739085 0.64879 0.576783 0.526032 0.492892 0.472169 0.459461 0.451686 0.446883 0.443865 0.441926 0.440649 0.439787 0.439191 0.438768

0.438462 0.438236 0.438066 0.437936 0.437835 0.437756 0.437693 0.437642 0.437601 0.437568 0.437541 0.437518 0.4375
0.437484 0.437446
#wt and selex for gender,fleet: 2 2
0.0129428 0.0300909 0.111515 0.349579 0.537576 0.708546 0.868986 1.01968 1.16205 1.2978 1.42784 1.55169 1.66788 1.77491
1.87196 1.95892 2.03613 2.1042 2.16385 2.21586 2.26101 2.30006 2.33373 2.3627 2.38757 2.40888 2.42713 2.44274 2.45607
2.46745 2.47717 2.48545 2.49251 2.49853 2.50366 2.50803 2.51175 2.51492 2.51762 2.51992 2.52311
0 9.62501e-005 0.000144216 0.00144782 0.0170845 0.0842477 0.231682 0.436269 0.640149 0.797753 0.896517 0.947059
0.966317 0.968131 0.961346 0.951002 0.939806 0.92912 0.919551 0.91129 0.904309 0.898485 0.893658 0.889671 0.886381
0.883662 0.881413 0.879548 0.877998 0.876706 0.875627 0.874724 0.873967 0.873331 0.872795 0.872344 0.871963 0.871641
0.871368 0.871138 0.870732
#wt and selex for gender,fleet: 2 3
0.012944 0.0476593 0.135179 0.270508 0.432622 0.605547 0.780071 0.950672 1.11404 1.2683 1.41237 1.54537 1.66654 1.77549
1.87239 1.95788 2.03288 2.09841 2.15549 2.20507 2.24804 2.28518 2.31722 2.34481 2.36853 2.38888 2.40634 2.42128 2.43407
2.44499 2.45433 2.4623 2.4691 2.4749 2.47984 2.48406 2.48765 2.4907 2.49331 2.49553 2.49878
0 0.000222775 0.00928941 0.0513573 0.150869 0.305237 0.484035 0.651723 0.785366 0.878285 0.935151 0.965188 0.977297
0.978125 0.972096 0.962086 0.950005 0.937147 0.924371 0.912218 0.900996 0.89085 0.881814 0.873857 0.866905 0.86087
0.855654 0.851162 0.847303 0.843995 0.841163 0.838742 0.836674 0.834909 0.833404 0.83212 0.831027 0.830095 0.829301
0.828625 0.827704
#wt and selex for gender,fleet: 2 4
0.0129428 0.0301182 0.133825 0.344224 0.516471 0.679803 0.834629 0.982344 1.12592 1.26773 1.40731 1.54154 1.6668 1.78072
1.88252 1.97245 2.05132 2.1201 2.17985 2.23157 2.27622 2.31468 2.34775 2.37613 2.40046 2.42129 2.43911 2.45434 2.46735
2.47846 2.48793 2.49601 2.50289 2.50876 2.51377 2.51803 2.52165 2.52474 2.52737 2.52961 2.53264
0 9.63221e-005 0.000209529 0.00411692 0.0401023 0.162148 0.376447 0.613989 0.800688 0.912597 0.9665 0.98826 0.995854
0.998137 0.998639 0.998588 0.998384 0.998151 0.997929 0.997729 0.997553 0.997401 0.99727 0.997157 0.997062 0.99698
0.996911 0.996852 0.996801 0.996759 0.996722 0.996691 0.996665 0.996643 0.996624 0.996608 0.996594 0.996583 0.996573
0.996564 0.996552
#wt and selex for gender,fleet: 2 5
0.0129429 0.0378032 0.17075 0.261219 0.368848 0.499818 0.636484 0.772399 0.906648 1.03879 1.16879 1.29701 1.42365 1.54798
1.66793 1.78062 1.88342 1.97479 2.0544 2.12283 2.18119 2.23074 2.27271 2.30825 2.33834 2.36383 2.38542 2.40373 2.41925
2.43243 2.44362 2.45312 2.46119 2.46805 2.47387 2.47883 2.48304 2.48662 2.48966 2.49225 2.49624
0 0.000116252 0.0446532 0.508252 0.888695 0.844053 0.630568 0.413296 0.252842 0.151044 0.0911087 0.0568875 0.0374216
0.0262041 0.019589 0.0155745 0.0130613 0.0114374 0.0103555 0.00961366 0.00909127 0.00871442 0.00843662 0.00822786
0.0080683 0.00794452 0.00784725 0.00776994 0.0077079 0.0076577 0.00761677 0.0075832 0.00755552 0.00753258 0.00751351
0.0074976 0.00748428 0.00747311 0.00746372 0.00745581 0.00744019
#wt and selex for gender,fleet: 2 6
0.0129432 0.0402986 0.159238 0.288197 0.419625 0.556411 0.701959 0.847259 0.986215 1.11962 1.24946 1.37663 1.5008 1.62055
1.73371 1.83813 1.93227 2.01552 2.08809 2.15074 2.20448 2.2504 2.28955 2.32288 2.35124 2.37536 2.39588 2.41332 2.42816
2.44078 2.45151 2.46063 2.4684 2.475 2.48062 2.48539 2.48946 2.49292 2.49586 2.49836 2.50211
0 0.000136863 0.0129498 0.164877 0.53568 0.842566 0.924265 0.844143 0.6907 0.529018 0.393672 0.293416 0.223834 0.176997
0.145761 0.124846 0.110673 0.100909 0.0940547 0.08915 0.085573 0.082917 0.0809117 0.0793746 0.0781802 0.0772409
0.0764941 0.0758949 0.0754101 0.075015 0.0746911 0.0744242 0.0742032 0.0740194 0.0738662 0.0737379 0.0736304 0.0735401
0.073464 0.0733999 0.0732767
#wt and selex for gender,fleet: 2 7
0.0129428 0.0301146 0.105912 0.294994 0.505372 0.703323 0.893252 1.07311 1.24108 1.39616 1.53798 1.66653 1.78215 1.8854
1.97703 2.05787 2.12884 2.19087 2.24488 2.29175 2.33231 2.36733 2.39749 2.42343 2.4457 2.46479 2.48114 2.49513 2.50709
2.5173 2.52602 2.53347 2.53981 2.54523 2.54984 2.55377 2.55712 2.55997 2.5624 2.56447 2.56698
0 9.63214e-005 0.000141678 0.000480142 0.00289056 0.0119734 0.0340599 0.0736315 0.130722 0.201196 0.278852 0.357596
0.432719 0.50126 0.561807 0.614069 0.658455 0.695743 0.726847 0.752685 0.774105 0.791854 0.806568 0.818781 0.828936
0.837394 0.844454 0.850359 0.855306 0.859458 0.86295 0.86589 0.868368 0.870461 0.872229 0.873724 0.87499 0.876063
0.876972 0.877743 0.879006
#wt and selex for gender,fleet: 2 8
0.0129431 0.0401676 0.164552 0.281075 0.398535 0.526229 0.655195 0.776441 0.891592 1.00428 1.1179 1.2367 1.36521 1.5046
1.64905 1.78761 1.91095 2.01527 2.10134 2.17189 2.22985 2.27777 2.31762 2.35095 2.37894 2.40253 2.42245 2.43931 2.45359
2.46571 2.47599 2.48473 2.49214 2.49845 2.50381 2.50837 2.51224 2.51553 2.51834 2.52072 2.52412
0 0.000132907 0.0206139 0.272318 0.71833 0.89838 0.785281 0.55095 0.333788 0.185853 0.100431 0.0552116 0.0321605
0.0204783 0.0144692 0.0112909 0.00954939 0.00855709 0.00796861 0.00760567 0.00737335 0.00721943 0.00711418 0.00704015
0.00698674 0.00694734 0.0069177 0.00689501 0.00687739 0.00686352 0.00685248 0.00684362 0.00683643 0.00683057
0.00682576 0.00682178 0.00681849 0.00681575 0.00681346 0.00681155 0.00680732
#wt and selex for gender,fleet: 2 9
0.0129429 0.0355551 0.171001 0.28672 0.402025 0.533163 0.676865 0.822009 0.967061 1.1139 1.26283 1.41136 1.55475 1.68797
1.80767 1.91269 2.00352 2.0815 2.1482 2.20516 2.25378 2.29527 2.33067 2.36087 2.38662 2.40858 2.4273 2.44326 2.45685
2.46844 2.47831 2.48671 2.49387 2.49997 2.50516 2.50957 2.51333 2.51654 2.51926 2.52158 2.52482
0 0.000112208 0.0150839 0.247812 0.703155 0.913955 0.861799 0.698562 0.523822 0.383191 0.284924 0.221062 0.180888
0.155819 0.140064 0.129999 0.123431 0.119041 0.116034 0.113925 0.112412 0.111303 0.110475 0.109846 0.109362 0.108983
0.108683 0.108444 0.108251 0.108094 0.107966 0.10786 0.107773 0.107701 0.10764 0.10759 0.107548 0.107513 0.107483
0.107458 0.107409
#wt and selex for gender,fleet: 2 10
0.012943 0.037553 0.162324 0.292389 0.423395 0.557511 0.694803 0.825543 0.947633 1.06752 1.19327 1.33055 1.47861 1.62852
1.76835 1.89047 1.9933 2.07879 2.14988 2.20928 2.25918 2.30128 2.33692 2.36716 2.39286 2.41471 2.43331 2.44914 2.46261
2.47409 2.48386 2.49217 2.49926 2.50528 2.51042 2.51478 2.5185 2.52167 2.52436 2.52665 2.52981
0 0.00012239 0.0102217 0.147553 0.510962 0.825874 0.897145 0.774253 0.572075 0.383801 0.248476 0.164459 0.116296
0.0896706 0.075063 0.0669592 0.0623597 0.0596705 0.0580455 0.0570296 0.0563729 0.0559349 0.0556338 0.0554214 0.0552678

0.0551543 0.0550688 0.0550033 0.0549525 0.0549124 0.0548806 0.0548549 0.0548342 0.0548173 0.0548034 0.0547919 0.0547824 0.0547745 0.0547679 0.0547624 0.0547501
#wt and selex for gender,fleet: 2 11
0.0129428 0.0300849 0.0978443 0.245219 0.586591 0.80395 0.978091 1.13508 1.27873 1.41061 1.53183 1.6433 1.74578 1.83979 1.92566 2.00359 2.07373 2.13632 2.19172 2.24041 2.28293 2.31989 2.35189 2.3795 2.40326 2.42367 2.44117 2.45615 2.46897 2.47992 2.48928 2.49726 2.50407 2.50988 2.51483 2.51905 2.52264 2.5257 2.52831 2.53053 2.53351
0 9.62344e-005 0.000123208 0.000146707 0.000908744 0.00798131 0.0371024 0.106774 0.221355 0.365649 0.515121 0.648959 0.75636 0.835785 0.891146 0.928206 0.952404 0.968014 0.978061 0.984563 0.988817 0.99164 0.993545 0.994854 0.99577 0.996422 0.996895 0.997243 0.997504 0.997701 0.997854 0.997972 0.998065 0.998139 0.998198 0.998246 0.998285 0.998316 0.998343 0.998364 0.998425
#wt and selex for gender,fleet: 2 12
0.0129428 0.0300892 0.0980359 0.214029 0.368745 0.549702 0.741332 0.93092 1.11113 1.27855 1.43183 1.57067 1.69535 1.80648 1.90493 1.99166 2.0677 2.13411 2.19188 2.242 2.28535 2.32276 2.35498 2.38267 2.40644 2.42682 2.44427 2.45919 2.47195 2.48285 2.49215 2.50009 2.50685 2.51262 2.51754 2.52173 2.5253 2.52834 2.53093 2.53313 2.53607
0 0.23022 0.296755 0.307896 0.335039 0.383735 0.45145 0.53018 0.610755 0.685969 0.751633 0.806216 0.849991 0.884196 0.910435 0.930318 0.945276 0.956494 0.964912 0.97125 0.976047 0.979706 0.982518 0.984698 0.986403 0.987749 0.98882 0.989678 0.990372 0.990935 0.991396 0.991775 0.992088 0.992347 0.992563 0.992743 0.992894 0.99302 0.993127 0.993216 0.993397
M and current age-structure in year Yinit: 2011
gender = 1
0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.0639724 0.0679448 0.0719172 0.0758896 0.079862 0.0838344 0.0878068 0.0917792
934.412 487.766 992.187 274.048 863.528 300.233 121.79 150.097 403.955 276.86 474.42 226.287 278.299 233.421 146.787 206.303 167.668 194.128 140.866 116.262 150.405 112.658 106.095 75.5903 53.1511 30.3501 19.5422 46.3559 9.64158 9.84551 14.1162 4.36269 3.59728 5.94163 4.15107 1.6603 3.52871 1.49113 1.55704 1.5167 7.89958
gender = 2
0.06 0.06 0.06 0.06 0.06 0.06 0.06

```
# Number of years with pre-specified catches
2
# catches for years with pre-specified catches go next
2011 102
2012 107
# Number of future recruitments to override
11
# Process for overiding (-1 for average otherwise index in data list)
2001 1 2001
2002 1 2002
2003 1 2003
2004 1 2004
2005 1 2005
2006 1 2006
2007 1 2007
2008 1 2008
2009 1 2009
2010 1 2010
2011 1 2011
# Which probability to product detailed results for (1=0.5; 2=0.6; etc.)
1
# Steepness sigma-R Auto-correlation
0.511 0.5 0
# Target SPR rate (FMSY Proxy); manually change to SPR_MSY if not using SPR_target
0.5
# Discount rate (for cumulative catch)
0.1
# Truncate the series when 0.4B0 is reached (1=Yes)
0
# Set F to FMSY once 0.4B0 is reached (1=Yes)
0
# Maximum possible F for projection (-1 to set to FMSY)
-1
# Defintion of recovery (1=now only;2=now or before)
2
# Projection type
11
# Definition of the 40-10 rule
10 40
# Calculate coefficients of variation (1=Yes)
0
# Number of replicates to use
10
# Random number seed
-99004
# File with multiple parameter vectors
blend.dat
# User-specific projection (1=Yes); Output replaced (1->9)
0  5
# Catches and Fs (Year; 1/2/3 (F or C or SPR); value); Final row is -1
2013 1 3
-1 -1 -1
# Fixed catch project (1=Yes); Output replaced (1->9); Approach (-1=Read in else 1-9)
0 2 -1
# Split of Fs
2011 0.018660 0.044578 0.180326 0.115599 0.000177 0.000163 0.107902 0.056306 0.122046 0.110701 0.154982 0.088561
-1  1 1 1 1 1 1 1 1 1 1 1
# SPR to define T_target for projection type 11 (a.k.a. 5 pre-specified inputs)
0.887 0.872 0.802 0.679 0.628
# Year for probability of recovery
2024 2027 2046 2027 2028 2029 2050 2026
# Time varying weight-at-age (1=Yes;0=No)
0
# File with time series of weight-at-age data
none
# Use bisection (0) or linear interpolation (1)
0
# Target Depletion
0.4
# CV of implementation error
0
```

Appendix B. Parameter vector input file for rebuilding analyses

base steepness vector 1
0 0 8.74216e-005 0.000949417 0.00618432 0.027655 0.0896757 0.219323 0.424625 0.686754 0.974452 1.26108 1.53104 1.7779 2.00058 2.20032 2.37917 2.53923 2.68245 2.81056 2.9251 3.02744 3.1188 3.2003 3.27293 3.3376 3.39515 3.44631 3.49175 3.5321 3.5679 3.59965 3.62779 3.65272 3.6748 3.69434 3.71164 3.72694 3.74048 3.75245 3.77163 #female fecundity; weighted by N in year Y_init across morphs and areas
0.01241 0.0267992 0.110833 0.272076 0.434135 0.603395 0.77442 0.94592 1.11621 1.28229 1.45333 1.64563 1.85831 2.06981 2.26216 2.43205 2.58288 2.7182 2.8403 2.95061 3.05016 3.13983 3.22043 3.29271 3.35742 3.41525 3.46685 3.51285 3.55379 3.5902 3.62255 3.65128 3.67676 3.69936 3.71939 3.73713 3.75284 3.76675 3.77905 3.78994 3.80729 #bodywt for gender,fleet: 1 / 1
0 9.26815e-005 0.000244509 0.00538603 0.0556411 0.231821 0.522906 0.784469 0.901086 0.86457 0.740046 0.61029 0.520519 0.472411 0.45071 0.441979 0.438705 0.437522 0.437099 0.436947 0.43689 0.436868 0.43686 0.436856 0.436855 0.436854 0.436853 0.436853 0.436853 0.436853 0.436853 0.436853 0.436853 0.436853 0.436853 0.436853 0.436853 0.436853 0.436853 0.436853 #selex for gender,fleet: 1 / 1
0.01241 0.0267695 0.0884437 0.271896 0.463873 0.648375 0.832668 1.01394 1.19222 1.37076 1.55227 1.73552 1.91709 2.09394 2.26357 2.42368 2.57244 2.70892 2.83301 2.94519 3.04622 3.13697 3.21834 3.29116 3.35625 3.41435 3.46615 3.51229 3.55333 3.58982 3.62224 3.651 3.67653 3.69915 3.7192 3.73696 3.75269 3.7666 3.77892 3.78981 3.80719 #bodywt for gender,fleet: 1 / 2
0 9.25937e-005 0.000129452 0.00063021 0.00936405 0.0617611 0.208757 0.443953 0.686147 0.857583 0.941507 0.963201 0.952558 0.929825 0.906126 0.886377 0.871776 0.861737 0.855127 0.850875 0.848165 0.846435 0.845321 0.844594 0.844112 0.843785 0.843561 0.843403 0.84329 0.843207 0.843146 0.843099 0.843064 0.843036 0.843014 0.842997 0.842983 0.842971 0.842962 0.842954 0.842935 #selex for gender,fleet: 1 / 2
0.01241 0.03395 0.109974 0.228196 0.382871 0.560942 0.752651 0.950839 1.15059 1.34918 1.54469 1.73426 1.91482 2.0849 2.24454 2.39429 2.53446 2.66506 2.78599 2.8972 2.99881 3.09111 3.17453 3.24964 3.31702 3.37731 3.43115 3.47913 3.52183 3.55979 3.5935 3.62341 3.64994 3.67344 3.69426 3.71269 3.72901 3.74344 3.75621 3.7675 3.7862 #bodywt for gender,fleet: 1 / 3
0 0.000120953 0.00639141 0.0384194 0.124085 0.274789 0.467722 0.659734 0.813424 0.912682 0.961912 0.97425 0.961575 0.93264 0.894549 0.853222 0.812982 0.776395 0.744572 0.717664 0.695304 0.676903 0.661829 0.649495 0.639389 0.631084 0.624232 0.618556 0.61383 0.609876 0.606554 0.603749 0.601372 0.599348 0.59762 0.596138 0.594864 0.593765 0.592816 0.591993 0.590376 #selex for gender,fleet: 1 / 3
0.01241 0.026774 0.0958475 0.277065 0.449708 0.626111 0.803383 0.979494 1.15815 1.34537 1.54115 1.73867 1.93061 2.11266 2.28296 2.44083 2.58617 2.71922 2.84043 2.95042 3.04986 3.13951 3.2201 3.2924 3.35712 3.41497 3.46659 3.5126 3.55355 3.58998 3.62234 3.65107 3.67656 3.69917 3.7192 3.73695 3.75266 3.76657 3.77888 3.78977 3.80713 #bodywt for gender,fleet: 1 / 4
0 9.26069e-005 0.000151419 0.0018301 0.0240073 0.126739 0.350738 0.626193 0.837962 0.946629 0.985983 0.996438 0.998271 0.998083 0.997518 0.996937 0.996416 0.995971 0.995599 0.995292 0.995039 0.994833 0.994663 0.994524 0.994409 0.994314 0.994235 0.994168 0.994113 0.994066 0.994026 0.993992 0.993963 0.993938 0.993917 0.993898 0.993883 0.993869 0.993857 0.993846 0.993827 #selex for gender,fleet: 1 / 4
0.01241 0.0276725 0.141155 0.233606 0.34064 0.480329 0.631914 0.787058 0.945132 1.10734 1.27798 1.4648 1.67431 1.90177 2.12889 2.33726 2.51942 2.67664 2.81301 2.93238 3.03768 3.13105 3.21406 3.28796 3.35377 3.41238 3.46454 3.51094 3.55219 3.58883 3.62136 3.65022 3.67582 3.6985 3.7186 3.7364 3.75216 3.76611 3.77845 3.78936 3.80679 #bodywt for gender,fleet: 1 / 5
0 9.51379e-005 0.0166977 0.399156 0.889314 0.884074 0.653023 0.401793 0.22084 0.114818 0.0593918 0.0321309 0.019081 0.0128602 0.00986041 0.00838128 0.00763026 0.00723587 0.00702115 0.00689986 0.00682878 0.00678563 0.00675852 0.00674093 0.00672917 0.00672109 0.00671539 0.00671127 0.00670824 0.00670596 0.00670422 0.00670286 0.00670179 0.00670094 0.00670025 0.00669969 0.00669923 0.00669885 0.00669853 0.00669826 0.00669764 #selex for gender,fleet: 1 / 5
0.01241 0.0292629 0.12616 0.246108 0.380797 0.526008 0.687967 0.856324 1.02235 1.18941 1.36389 1.55172 1.75459 1.96572 2.17216 2.36293 2.53343 2.68397 2.81677 2.9343 3.03866 3.13154 3.2143 3.28807 3.35381 3.41238 3.46453 3.51091 3.55216 3.5888 3.62133 3.65019 3.67579 3.69847 3.71857 3.73638 3.75213 3.76608 3.77842 3.78934 3.80677 #bodywt for gender,fleet: 1 / 6
0 0.00010063 0.00626296 0.108781 0.460696 0.826541 0.939173 0.844947 0.650275 0.45115 0.298853 0.199818 0.141143 0.108104 0.0899271 0.0799726 0.0744752 0.0713872 0.0696126 0.0685657 0.0679304 0.0675336 0.0672787 0.0671102 0.0669959 0.0669164 0.0668598 0.0668187 0.0667881 0.066765 0.0667473 0.0667334 0.0667225 0.0667138 0.0667067 0.0667009 0.0666962 0.0666922 0.0666889 0.0666861 0.0666797 #selex for gender,fleet: 1 / 6
0.01241 0.0267747 0.0882909 0.232774 0.431347 0.636063 0.847601 1.06137 1.27271 1.47824 1.67563 1.8633 2.04026 2.20598 2.36026 2.50317 2.63491 2.75574 2.86598 2.96599 3.05621 3.1372 3.20959 3.27408 3.33137 3.38219 3.42719 3.46701 3.50223 3.53336 3.56087 3.58518 3.60665 3.62562 3.64237 3.65717 3.67024 3.68178 3.69197 3.70097 3.71788 #bodywt for gender,fleet: 1 / 7
0 9.26089e-005 0.000132384 0.000310907 0.00183127 0.0088944 0.0297813 0.0738666 0.146073 0.243621 0.357284 0.475324 0.587241 0.685836 0.767576 0.831913 0.880232 0.914859 0.938341 0.953031 0.960923 0.963636 0.962466 0.958445 0.952404 0.945002 0.936766 0.928104 0.919332 0.910682 0.902322 0.894366 0.886887 0.879925 0.873497 0.8676 0.862221 0.857337 0.852919 0.848935 0.84399 #selex for gender,fleet: 1 / 7
0.01241 0.0289001 0.131414 0.244304 0.365564 0.502801 0.64917 0.789221 0.924959 1.06314 1.21575 1.4056 1.65246 1.93103 2.18541 2.39345 2.56383 2.70864 2.83534 2.94794 3.04866 3.13896 3.21989 3.29237 3.35719 3.41509 3.46674 3.51276 3.55373 3.59015 3.62251 3.65125 3.67674 3.69934 3.71937 3.73711 3.75283 3.76673 3.77904 3.78993 3.80728 #bodywt for gender,fleet: 1 / 8
0 9.92788e-005 0.00902077 0.187405 0.661946 0.918129 0.815393 0.54012 0.287818 0.133782 0.0589486 0.0271135 0.0145284 0.00971708 0.00788801 0.00718268 0.00690288 0.00678761 0.00673798 0.00671557 0.00670493 0.00669963

0.00669686 0.00669534 0.00669447 0.00669395 0.00669363 0.00669342 0.00669329 0.00669319 0.00669313 0.00669308 0.00669304 0.00669302 0.006693 0.00669298 0.00669297 0.00669296 0.00669295 0.00669295 0.00669293 #selex for gender,fleet: 1 / 8
0.01241 0.0276778 0.135927 0.249455 0.368605 0.506713 0.666413 0.832988 1.00645 1.19356 1.39934 1.62032 1.8432 2.054 2.24578 2.41784 2.572 2.7104 2.83486 2.94682 3.04749 3.13792 3.21901 3.29164 3.35659 3.41459 3.46632 3.51241 3.55342 3.58988 3.62228 3.65103 3.67654 3.69916 3.71921 3.73696 3.75268 3.7666 3.77891 3.7898 3.80718 #bodywt for gender,fleet: 1 / 9
0 9.52967e-005 0.00591211 0.163556 0.641962 0.924601 0.883359 0.69257 0.484005 0.325202 0.22517 0.168539 0.13829 0.122562 0.114431 0.110191 0.107938 0.106711 0.106022 0.105624 0.105386 0.105239 0.105145 0.105084 0.105042 0.105014 0.104993 0.104979 0.104968 0.10496 0.104953 0.104948 0.104944 0.104941 0.104939 0.104937 0.104935 0.104934 0.104932 0.104931 0.104929 #selex for gender,fleet: 1 / 9
0.01241 0.0283955 0.127999 0.249344 0.384122 0.527923 0.683117 0.835478 0.980801 1.13307 1.31433 1.54116 1.79641 2.03848 2.24665 2.42399 2.57851 2.71578 2.83894 2.94984 3.04972 3.13957 3.22026 3.2926 3.35735 3.4152 3.46682 3.51282 3.55377 3.59019 3.62254 3.65127 3.67676 3.69936 3.71938 3.73713 3.75284 3.76674 3.77905 3.78994 3.80729 #bodywt for gender,fleet: 1 / 10
0 9.76642e-005 0.00471284 0.0944871 0.434006 0.809689 0.917903 0.773572 0.521213 0.303756 0.170705 0.104249 0.0748306 0.0626549 0.0577675 0.0558148 0.0550238 0.0546945 0.0545525 0.0544887 0.0544586 0.0544438 0.0544362 0.054432 0.0544297 0.0544283 0.0544275 0.054427 0.0544266 0.0544264 0.0544262 0.0544261 0.054426 0.054426 0.0544259 0.0544259 0.0544258 0.0544258 0.0544258 0.0544258 0.0544257 #selex for gender,fleet: 1 / 10
0.01241 0.0267686 0.0856624 0.194113 0.467528 0.721876 0.926252 1.11971 1.30442 1.48068 1.64998 1.81493 1.97778 2.13882 2.29617 2.447 2.58886 2.72029 2.84076 2.95041 3.04968 3.13924 3.21979 3.29206 3.35677 3.4146 3.46622 3.51223 3.55319 3.58961 3.62198 3.65072 3.67621 3.69882 3.71886 3.73661 3.75233 3.76624 3.77855 3.78944 3.80682 #bodywt for gender,fleet: 1 / 11
0 9.25907e-005 0.000123287 0.000128689 0.000414276 0.00461417 0.0294734 0.106207 0.253075 0.448633 0.644033 0.798313 0.898437 0.953665 0.980313 0.991799 0.996236 0.997696 0.997987 0.99785 0.997575 0.99727 0.996978 0.996712 0.996476 0.996268 0.996087 0.99593 0.995794 0.995676 0.995573 0.995484 0.995407 0.99534 0.995282 0.995231 0.995187 0.995148 0.995114 0.995085 0.995031 #selex for gender,fleet: 1 / 11
0.01241 0.0267696 0.0857813 0.189442 0.334108 0.513866 0.717813 0.933455 1.15122 1.3652 1.57188 1.76922 1.95604 2.13184 2.29645 2.44984 2.59198 2.7229 2.84278 2.95195 3.05091 3.14025 3.22067 3.29285 3.3575 3.41529 3.46687 3.51285 3.55378 3.59018 3.62252 3.65124 3.67671 3.6993 3.71932 3.73706 3.75276 3.76666 3.77896 3.78984 3.80719 #bodywt for gender,fleet: 1 / 12
0 0.22148 0.296419 0.304582 0.32716 0.372751 0.443363 0.532813 0.629896 0.723189 0.804363 0.869212 0.917152 0.950099 0.971251 0.984025 0.991352 0.99539 0.997556 0.998698 0.999298 0.999614 0.999781 0.999872 0.999921 0.999948 0.999962 0.999969 0.999971 0.99997 0.999968 0.999965 0.999961 0.999956 0.999951 0.999946 0.999942 0.999937 0.999932 0.999928 0.99993 #selex for gender,fleet: 1 / 12
0.0129428 0.0302637 0.15626 0.332128 0.494352 0.650929 0.800961 0.945473 1.08391 1.21437 1.33772 1.4583 1.57969 1.7009 1.81699 1.92273 2.01535 2.09465 2.16189 2.21878 2.26696 2.30782 2.34255 2.37209 2.39725 2.41868 2.43694 2.4525 2.46576 2.47705 2.48668 2.49488 2.50186 2.50781 2.51287 2.51718 2.52085 2.52398 2.52664 2.5289 2.53199 #bodywt for gender,fleet: 2 / 1
0 9.67166e-005 0.00045483 0.0111137 0.0849782 0.279114 0.545127 0.769353 0.885225 0.894176 0.831567 0.739085 0.64879 0.576783 0.526032 0.492892 0.472169 0.459461 0.451686 0.446883 0.443865 0.441926 0.440649 0.439787 0.439191 0.438768 0.438462 0.438236 0.438066 0.437936 0.437835 0.437756 0.437693 0.437642 0.437601 0.437568 0.437541 0.437518 0.4375 0.437484 0.437446 #selex for gender,fleet: 2 / 1
0.0129428 0.0300909 0.111515 0.349579 0.537576 0.708546 0.868986 1.01968 1.16205 1.2978 1.42784 1.55169 1.66788 1.77491 1.87196 1.95892 2.03613 2.1042 2.16385 2.21586 2.26101 2.30006 2.33373 2.3627 2.38757 2.40888 2.42713 2.44274 2.45607 2.46745 2.47717 2.48545 2.49251 2.49853 2.50366 2.50803 2.51175 2.51492 2.51762 2.51992 2.52311 #bodywt for gender,fleet: 2 / 2
0 9.62501e-005 0.000144216 0.00144782 0.0170845 0.0842477 0.231682 0.436269 0.640149 0.797753 0.896517 0.947059 0.966317 0.968131 0.961346 0.951002 0.939806 0.92912 0.919551 0.91129 0.904309 0.898485 0.893658 0.889671 0.886381 0.883662 0.881413 0.879548 0.877998 0.876706 0.875627 0.874724 0.873967 0.873331 0.872795 0.872344 0.871963 0.871641 0.871368 0.871138 0.870732 #selex for gender,fleet: 2 / 2
0.012944 0.0476593 0.135179 0.270508 0.432622 0.605547 0.780071 0.950672 1.11404 1.2683 1.41237 1.54537 1.66654 1.77549 1.87239 1.95788 2.03288 2.09841 2.15549 2.20507 2.24804 2.28518 2.31722 2.34481 2.36853 2.38888 2.40634 2.42128 2.43407 2.44499 2.45433 2.4623 2.4691 2.4749 2.47984 2.48406 2.48765 2.4907 2.49331 2.49553 2.49878 #bodywt for gender,fleet: 2 / 3
0 0.000222775 0.00928941 0.0513573 0.150869 0.305237 0.484035 0.651723 0.785366 0.878285 0.935151 0.965188 0.977297 0.978125 0.972096 0.962086 0.950005 0.937147 0.924371 0.912218 0.900996 0.89085 0.881814 0.873857 0.866905 0.86087 0.855654 0.851162 0.847303 0.843995 0.841163 0.838742 0.836674 0.834909 0.833404 0.83212 0.831027 0.830095 0.829301 0.828625 0.827704 #selex for gender,fleet: 2 / 3
0.0129428 0.0301182 0.133825 0.344224 0.516471 0.679803 0.834629 0.982344 1.12592 1.26773 1.40731 1.54154 1.6668 1.78072 1.88252 1.97245 2.05132 2.1201 2.17985 2.23157 2.27622 2.31468 2.34775 2.37613 2.40046 2.42129 2.43911 2.45434 2.46735 2.47846 2.48793 2.49601 2.50289 2.50876 2.51377 2.51803 2.52165 2.52474 2.52737 2.52961 2.53264 #bodywt for gender,fleet: 2 / 4
0 9.63221e-005 0.000209529 0.00411692 0.0401023 0.162148 0.376447 0.613989 0.800688 0.912597 0.9665 0.98826 0.995854 0.998137 0.998639 0.998588 0.998384 0.998151 0.997929 0.997729 0.997553 0.997401 0.99727 0.997157 0.997062 0.99698 0.996911 0.996852 0.996801 0.996759 0.996722 0.996691 0.996665 0.996643 0.996624 0.996608 0.996594 0.996583 0.996573 0.996564 0.996552 #selex for gender,fleet: 2 / 4
0.0129429 0.0378032 0.17075 0.261219 0.368848 0.499818 0.636484 0.772399 0.906648 1.03879 1.16879 1.29701 1.42365 1.54798 1.66793 1.78062 1.88342 1.97479 2.0544 2.12283 2.18119 2.23074 2.27271 2.30825 2.33834 2.36383 2.38542 2.40373 2.41925 2.43243 2.44362 2.45312 2.46119 2.46805 2.47387 2.47883 2.48304 2.48662 2.48966 2.49225 2.49624 #bodywt for gender,fleet: 2 / 5

0 0.000116252 0.0446532 0.508252 0.888695 0.844053 0.630568 0.413296 0.252842 0.151044 0.0911087 0.0568875 0.0374216 0.0262041 0.019589 0.0155745 0.0130613 0.0114374 0.0103555 0.00961366 0.00909127 0.00871442 0.00843662 0.00822786 0.0080683 0.00794452 0.00784725 0.00776994 0.0077079 0.0076577 0.00761677 0.0075832 0.00755552 0.00753258 0.00751351 0.0074976 0.00748428 0.00747311 0.00746372 0.00745581 0.00744019 #selex for gender,fleet: 2 / 5

0.0129432 0.0402986 0.159238 0.288197 0.419625 0.556411 0.701959 0.847259 0.986215 1.11962 1.24946 1.37663 1.5008 1.62055 1.73371 1.83813 1.93227 2.01552 2.08809 2.15074 2.20448 2.2504 2.28955 2.32288 2.35124 2.37536 2.39588 2.41332 2.42816 2.44078 2.45151 2.46063 2.4684 2.475 2.48062 2.48539 2.48946 2.49292 2.49586 2.49836 2.50211 #bodywt for gender,fleet: 2 / 6

0 0.000136863 0.0129498 0.164877 0.53568 0.842566 0.924265 0.844143 0.6907 0.529018 0.393672 0.293416 0.223834 0.176997 0.145761 0.124846 0.110673 0.100909 0.0940547 0.08915 0.085573 0.082917 0.0809117 0.0793746 0.0781802 0.0772409 0.0764941 0.0758949 0.0754101 0.075015 0.0746911 0.0744242 0.0742032 0.0740194 0.0738662 0.0737379 0.0736304 0.0735401 0.073464 0.0733999 0.0732767 #selex for gender,fleet: 2 / 6

0.0129428 0.0301146 0.105912 0.294994 0.505372 0.703323 0.893252 1.07311 1.24108 1.39616 1.53798 1.66653 1.78215 1.8854 1.97703 2.05787 2.12884 2.19087 2.24488 2.29175 2.33231 2.36733 2.39749 2.42343 2.4457 2.46479 2.48114 2.49513 2.50709 2.5173 2.52602 2.53347 2.53981 2.54523 2.54984 2.55377 2.55712 2.55997 2.5624 2.56447 2.56698 #bodywt for gender,fleet: 2 / 7

0 9.63214e-005 0.000141678 0.000480142 0.00289056 0.0119734 0.0340599 0.0736315 0.130722 0.201196 0.278852 0.357596 0.432719 0.50126 0.561807 0.614069 0.658455 0.695743 0.726847 0.752685 0.774105 0.791854 0.806568 0.818781 0.828936 0.837394 0.844454 0.850359 0.855306 0.859458 0.86295 0.86589 0.868368 0.870461 0.872229 0.873724 0.87499 0.876063 0.876972 0.877743 0.879006 #selex for gender,fleet: 2 / 7

0.0129431 0.0401676 0.164552 0.281075 0.398535 0.526229 0.655195 0.776441 0.891592 1.00428 1.1179 1.2367 1.36521 1.5046 1.64905 1.78761 1.91095 2.01527 2.10134 2.17189 2.22985 2.27777 2.31762 2.35095 2.37894 2.40253 2.42245 2.43931 2.45359 2.46571 2.47599 2.48473 2.49214 2.49845 2.50381 2.50837 2.51224 2.51553 2.51834 2.52072 2.52412 #bodywt for gender,fleet: 2 / 8

0 0.000132907 0.0206139 0.272318 0.71833 0.89838 0.785281 0.55095 0.333788 0.185853 0.100431 0.0552116 0.0321605 0.0204783 0.0144692 0.0112909 0.00954939 0.00855709 0.00796861 0.00760567 0.00737335 0.00721943 0.00711418 0.00704015 0.00698674 0.00694734 0.0069177 0.00689501 0.00687739 0.00686352 0.00685248 0.00684362 0.00683643 0.00683057 0.00682576 0.00682178 0.00681849 0.00681575 0.00681346 0.00681155 0.00680732 #selex for gender,fleet: 2 / 8

0.0129429 0.0355551 0.171001 0.28672 0.402025 0.533163 0.676865 0.822009 0.967061 1.1139 1.26283 1.41136 1.55475 1.68797 1.80767 1.91269 2.00352 2.0815 2.1482 2.20516 2.25378 2.29527 2.33067 2.36087 2.38662 2.40858 2.4273 2.44326 2.45685 2.46844 2.47831 2.48671 2.49387 2.49997 2.50516 2.50957 2.51333 2.51654 2.51926 2.52158 2.52482 #bodywt for gender,fleet: 2 / 9

0 0.000112208 0.0150839 0.247812 0.703155 0.913955 0.861799 0.698562 0.523822 0.383191 0.284924 0.221062 0.180888 0.155819 0.140064 0.129999 0.123431 0.119041 0.116034 0.113925 0.112412 0.111303 0.110475 0.109846 0.109362 0.108983 0.108683 0.108444 0.108251 0.108094 0.107966 0.10786 0.107773 0.107701 0.10764 0.10759 0.107548 0.107513 0.107483 0.107458 0.107409 #selex for gender,fleet: 2 / 9

0.012943 0.037553 0.162324 0.292389 0.423395 0.557511 0.694803 0.825543 0.947633 1.06752 1.19327 1.33055 1.47861 1.62852 1.76835 1.89047 1.9933 2.07879 2.14988 2.20928 2.25918 2.30128 2.33692 2.36716 2.39286 2.41471 2.43331 2.44914 2.46261 2.47409 2.48386 2.49217 2.49926 2.50528 2.51042 2.51478 2.5185 2.52167 2.52436 2.52665 2.52981 #bodywt for gender,fleet: 2 / 10

0 0.00012239 0.0102217 0.147553 0.510962 0.825874 0.897145 0.774253 0.572075 0.383801 0.248476 0.164459 0.116296 0.0896706 0.075063 0.0669592 0.0623597 0.0596705 0.0580455 0.0570296 0.0563729 0.0559349 0.0556338 0.0554214 0.0552678 0.0551543 0.0550688 0.0550033 0.0549525 0.0549124 0.0548806 0.0548549 0.0548342 0.0548173 0.0548034 0.0547919 0.0547824 0.0547745 0.0547679 0.0547624 0.0547501 #selex for gender,fleet: 2 / 10

0.0129428 0.0300849 0.0978443 0.245219 0.586591 0.80395 0.978091 1.13508 1.27873 1.41061 1.53183 1.6433 1.74578 1.83979 1.92566 2.00359 2.07373 2.13632 2.19172 2.24041 2.28293 2.31989 2.35189 2.3795 2.40326 2.42367 2.44117 2.45615 2.46897 2.47992 2.48928 2.49726 2.50407 2.50988 2.51483 2.51905 2.52264 2.5257 2.52831 2.53053 2.53351 #bodywt for gender,fleet: 2 / 11

0 9.62344e-005 0.000123208 0.000146707 0.000908744 0.00798131 0.0371024 0.106774 0.221355 0.365649 0.515121 0.648959 0.75636 0.835785 0.891146 0.928206 0.952404 0.968014 0.978061 0.984563 0.988817 0.99164 0.993545 0.994854 0.99577 0.996422 0.996895 0.997243 0.997504 0.997701 0.997854 0.997972 0.998065 0.998139 0.998198 0.998246 0.998285 0.998316 0.998343 0.998364 0.998425 #selex for gender,fleet: 2 / 11

0.0129428 0.0300892 0.0980359 0.214029 0.368745 0.549702 0.741332 0.93092 1.11113 1.27855 1.43183 1.57067 1.69535 1.80648 1.90493 1.99166 2.0677 2.13411 2.19188 2.242 2.28535 2.32276 2.35498 2.38267 2.40644 2.42682 2.44427 2.45919 2.47195 2.48285 2.49215 2.50009 2.50685 2.51262 2.51754 2.52173 2.5253 2.52834 2.53093 2.53313 2.53607 #bodywt for gender,fleet: 2 / 12

0 0.23022 0.296755 0.307896 0.335039 0.383735 0.45145 0.53018 0.610755 0.685969 0.751633 0.806216 0.849991 0.884196 0.910435 0.930318 0.945276 0.956494 0.964912 0.97125 0.976047 0.979706 0.982518 0.984698 0.986403 0.987749 0.98882 0.989678 0.990372 0.990935 0.991396 0.991775 0.992088 0.992347 0.992563 0.992743 0.992894 0.99302 0.993127 0.993216 0.993397 #selex for gender,fleet: 2 / 12

0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.0639724 0.0679448 0.0719172 0.0758896 0.079862 0.0838344 0.0878068 0.0917792 #mean M for year Yinit: 2011 sex: 1

934.412 487.766 992.187 274.048 863.528 300.233 121.79 150.097 403.955 276.86 474.42 226.287 278.299 233.421 146.787 206.303 167.668 194.128 140.866 116.262 150.405 112.658 106.095 75.5903 53.1511 30.3501 19.5422 46.3559 9.64158 9.84551 14.1162 4.36269 3.59728 5.94163 4.15107 1.6603 3.52871 1.49113 1.55704 1.5167 7.89958 #numbers for year Yinit: 2011 sex: 1

0.06 0.06 0.06 0.06 0.06 0.06 0.06

934.412 487.766 992.186 274.007 862.377 299.711 121.697 150.043 405.137 279.713 484.867 234.85 294.554 252.803 163.146 236.397 198.261 236.346 176.515 150.161 201.266 157.473 155.869 116.801 85.8277 50.789 33.7971 83.4855 18.2947 19.7769 29.8652 9.59625 8.08362 13.4693 9.4163 3.74692 7.90557 3.31921 3.45029 3.34836 17.432 #numbers for year Yinit: 2011 sex: 2
470.913 594.076 514.783 338.462 502.837 427.953 512.018 381.161 320.897 422.345 321.216 306.417 220.474 156.022 89.3369 57.4667 136.206 28.3108 28.8937 41.4084 12.7927 10.545 17.4127 12.1626 4.86378 10.3356 4.36692 4.55943 4.44086 3.13699 1.82362 1.41383 1.51109 2.97952 1.18511 0.883247 0.765479 0.753858 0.843861 0.976072 6.84925 #numbers for year Ydeclare: 2000 sex: 1
470.913 594.076 514.783 338.363 501.255 425.326 507.324 376.964 318.585 424.552 330.74 326.385 244.074 179.093 105.868 70.3935 173.778 38.0621 41.1288 62.0877 19.9443 16.7965 27.9814 19.5583 7.7815 16.4161 6.89171 7.16326 6.95111 4.88082 2.80698 2.14262 2.24823 4.34925 1.70023 1.24921 1.07088 1.04704 1.16856 1.35391 12.1618 #numbers for year Ydeclare: 2000 sex: 2
#R0 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932 1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950 1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 #years
3349.5 3349.5 3349.04 3348.34 3347.61 3347.16 3346.71 3346.34 3346.02 3345.65 3345.28 3344.85 3344.25 3343.75 3343.15 3342.36 3341.57 3340.74 3340.35 3340.04 3339.74 3339.32 3338.99 3338.59 3338.2 3337.74 3336.03 3333.77 3329.36 3313.28 3287.98 3235.06 3203.6 3189.43 3178.32 3168.91 3159.98 3151.82 3145.01 3141.36 3133.89 3126.47 3111.67 3096.31 3087.4 3167.57 3873.35 3042.54 2468.73 2270.65 2360.34 2831.41 6306.5 2802.23 2261.24 2466.01 3509.33 4029.95 3311.2 2520 4714.53 1739.62 3366.1 3662.62 1658.09 1481.25 3441.54 1681.87 1144.7 3875.95 1188.98 1391.3 1868.06 2041.43 2207.66 1835.54 1975.22 1270.74 1314.76 1569.7 1187.72 1285.59 810.663 1160.85 1261.62 941.826 1825.4 990.078 1347.53 468.716 356.383 819.685 2201.4 656.299 2237.45 1035.86 1868.82 #Recruits
27846.4 27846.4 27830.5 27806 27780.9 27765.4 27749.6 27736.8 27725.9 27713.1 27700.3 27685.5 27665 27647.8 27627 27600 27572.8 27544.5 27531.3 27520.5 27510.3 27496.1 27485 27471 27458 27442.2 27384.2 27307.8 27159.5 26629.8 25826.5 24259.4 23393.2 23017.7 22729.3 22489.3 22264.6 22062.3 21895.5 21806.8 21626.9 21450.4 21104 20753 20553.1 20331.1 20057.5 19835 19504 19429.7 19243.2 19034.1 18704.5 18867.5 18590.6 18554.8 18366.2 18023.5 17767.5 17373.7 17100.6 16909.3 16832.1 16387.9 15208.2 14475.8 13138.1 12368.1 10768.7 9338.03 8928.69 8413.31 8004.6 7297.56 6588.28 5739.7 5103.36 4272.31 3588.71 3157.26 3167.83 3246.35 3181.32 3129.71 3026.42 3124.5 3482.63 3848.53 4196.35 4520.21 4833.89 5138.43 5431.38 5719.56 5996.58 6253.78 6458.11 #SpawnBio
0.511 0.5 0 # spawn-recr steepness, sigmaR, autocorr
base steepness vector 2
0 0 8.74216e-005 0.000949417 0.00618432 0.027655 0.0896757 0.219323 0.424625 0.686754 0.974452 1.26108 1.53104 1.7779 2.00058 2.20032 2.37917 2.53923 2.68245 2.81056 2.9251 3.02744 3.1188 3.2003 3.27293 3.3376 3.39515 3.44631 3.49175 3.5321 3.5679 3.59965 3.62779 3.65272 3.6748 3.69434 3.71164 3.72694 3.74048 3.75245 3.77163 #female fecundity; weighted by N in year Y_init across morphs and areas
0.01241 0.0267992 0.110833 0.272076 0.434135 0.603395 0.77442 0.94592 1.11621 1.28229 1.45333 1.64563 1.85831 2.06981 2.26216 2.43205 2.58288 2.7182 2.8403 2.95061 3.05016 3.13983 3.22043 3.29271 3.35742 3.41525 3.46685 3.51285 3.55379 3.5902 3.62255 3.65128 3.67676 3.69936 3.71939 3.73713 3.75284 3.76675 3.77905 3.78994 3.80729 #bodywt for gender,fleet: 1 / 1
0 9.26815e-005 0.000244509 0.00538603 0.0556411 0.231821 0.522906 0.784469 0.901086 0.86457 0.740046 0.61029 0.520519 0.472411 0.45071 0.441979 0.438705 0.437522 0.437099 0.436947 0.43689 0.436868 0.43686 0.436856 0.436855 0.436854 0.436853 0.436853 0.436853 0.436853 0.436853 0.436853 0.436853 0.436853 0.436853 0.436853 0.436853 0.436853 0.436853 0.436853 0.436853 0.436853 0.436853 0.436853 #selex for gender,fleet: 1 / 1
0.01241 0.0267695 0.0884437 0.271896 0.463873 0.648375 0.832668 1.01394 1.19222 1.37076 1.55227 1.73552 1.91709 2.09394 2.26357 2.42368 2.57244 2.70892 2.83301 2.94519 3.04622 3.13697 3.21834 3.29116 3.35625 3.41435 3.46615 3.51229 3.55333 3.58982 3.62224 3.651 3.67653 3.69915 3.7192 3.73696 3.75269 3.7666 3.77892 3.78981 3.80719 #bodywt for gender,fleet: 1 / 2
0 9.25937e-005 0.000129452 0.00063021 0.00936405 0.0617611 0.208757 0.443953 0.686147 0.857583 0.941507 0.963201 0.952558 0.929825 0.906126 0.886377 0.871776 0.861737 0.855127 0.850875 0.848165 0.846435 0.845321 0.844594 0.844112 0.843785 0.843561 0.843403 0.84329 0.843207 0.843146 0.843099 0.843064 0.843036 0.843014 0.842997 0.842983 0.842971 0.842962 0.842954 0.842935 #selex for gender,fleet: 1 / 2
0.01241 0.03395 0.109974 0.228196 0.382871 0.560942 0.752651 0.950839 1.15059 1.34918 1.54469 1.73426 1.91482 2.0849 2.24454 2.39429 2.53446 2.66506 2.78599 2.8972 2.99881 3.09111 3.17453 3.24964 3.31702 3.37731 3.43115 3.47913 3.52183 3.55979 3.5935 3.62341 3.64994 3.67344 3.69426 3.71269 3.72901 3.74344 3.75621 3.7675 3.7862 #bodywt for gender,fleet: 1 / 3
0 0.000120953 0.00639141 0.0384194 0.124085 0.274789 0.467722 0.659734 0.813424 0.912682 0.961912 0.97425 0.961575 0.93264 0.894549 0.853222 0.812982 0.776395 0.744572 0.717664 0.695304 0.676903 0.661829 0.649495 0.639389 0.631084 0.624232 0.618556 0.61383 0.609876 0.606554 0.603749 0.601372 0.599348 0.59762 0.596138 0.594864 0.593765 0.592816 0.591993 0.590376 #selex for gender,fleet: 1 / 3
0.01241 0.026774 0.0958475 0.277065 0.449708 0.626111 0.803383 0.979494 1.15815 1.34537 1.54115 1.73867 1.93061 2.11266 2.28296 2.44083 2.58617 2.71922 2.84043 2.95042 3.04986 3.13951 3.2201 3.2924 3.35712 3.41497 3.46659 3.5126 3.55355 3.58998 3.62234 3.65107 3.67656 3.69917 3.7192 3.73695 3.75266 3.76657 3.77888 3.78977 3.80713 #bodywt for gender,fleet: 1 / 4
0 9.26069e-005 0.000151419 0.0018301 0.0240073 0.126739 0.350738 0.626193 0.837962 0.946629 0.985983 0.996438 0.998271 0.998083 0.997518 0.996937 0.996416 0.995971 0.995599 0.995292 0.995039 0.994833 0.994663 0.994524 0.994409 0.994314 0.994235 0.994168 0.994113 0.994066 0.994026 0.993992 0.993963 0.993938 0.993917 0.993898 0.993883 0.993869 0.993857 0.993846 0.993827 #selex for gender,fleet: 1 / 4
0.01241 0.0276725 0.141155 0.233606 0.34064 0.480329 0.631914 0.787058 0.945132 1.10734 1.27798 1.4648 1.67431 1.90177 2.12889 2.33726 2.51942 2.67664 2.81301 2.93238 3.03768 3.13105 3.21406 3.28796 3.35377 3.41238 3.46454 3.51094

3.55219 3.58883 3.62136 3.65022 3.67582 3.6985 3.7186 3.7364 3.75216 3.76611 3.77845 3.78936 3.80679 #bodywt for gender,fleet: 1 / 5
0 9.51379e-005 0.0166977 0.399156 0.889314 0.884074 0.653023 0.401793 0.22084 0.114818 0.0593918 0.0321309 0.019081 0.0128602 0.00986041 0.00838128 0.00763026 0.00723587 0.00702115 0.00689986 0.00682878 0.00678563 0.00675852 0.00674093 0.00672917 0.00672109 0.00671539 0.00671127 0.00670824 0.00670596 0.00670422 0.00670286 0.00670179 0.00670094 0.00670025 0.00669969 0.00669923 0.00669885 0.00669853 0.00669826 0.00669764 #selex for gender,fleet: 1 / 5
0.01241 0.0292629 0.12616 0.246108 0.380797 0.526008 0.687967 0.856324 1.02235 1.18941 1.36389 1.55172 1.75459 1.96572 2.17216 2.36293 2.53343 2.68397 2.81677 2.9343 3.03866 3.13154 3.2143 3.28807 3.35381 3.41238 3.46453 3.51091 3.55216 3.5888 3.62133 3.65019 3.67579 3.69847 3.71857 3.73638 3.75213 3.76608 3.77842 3.78934 3.80677 #bodywt for gender,fleet: 1 / 6
0 0.00010063 0.00626296 0.108781 0.460696 0.826541 0.939173 0.844947 0.650275 0.45115 0.298853 0.199818 0.141143 0.108104 0.0899271 0.0799726 0.0744752 0.0713872 0.0696126 0.0685657 0.0679304 0.0675336 0.0672787 0.0671102 0.0669959 0.0669164 0.0668598 0.0668187 0.0667881 0.066765 0.0667473 0.0667334 0.0667225 0.0667138 0.0667067 0.0667009 0.0666962 0.0666922 0.0666889 0.0666861 0.0666797 #selex for gender,fleet: 1 / 6
0.01241 0.0267747 0.0882909 0.232774 0.431347 0.636063 0.847601 1.06137 1.27271 1.47824 1.67563 1.8633 2.04026 2.20598 2.36026 2.50317 2.63491 2.75574 2.86598 2.96599 3.05621 3.1372 3.20959 3.27408 3.33137 3.38219 3.42719 3.46701 3.50223 3.53336 3.56087 3.58518 3.60665 3.62562 3.64237 3.65717 3.67024 3.68178 3.69197 3.70097 3.71788 #bodywt for gender,fleet: 1 / 7
0 9.26089e-005 0.000132384 0.000310907 0.00183127 0.0088944 0.0297813 0.0738666 0.146073 0.243621 0.357284 0.475324 0.587241 0.685836 0.767576 0.831913 0.880232 0.914859 0.938341 0.953031 0.960923 0.963636 0.962466 0.958445 0.952404 0.945002 0.936766 0.928104 0.919332 0.910682 0.902322 0.894366 0.886887 0.879925 0.873497 0.8676 0.862221 0.857337 0.852919 0.848935 0.84399 #selex for gender,fleet: 1 / 7
0.01241 0.0289001 0.131414 0.244304 0.365564 0.502801 0.64917 0.789221 0.924959 1.06314 1.21575 1.4056 1.65246 1.93103 2.18541 2.39345 2.56383 2.70864 2.83534 2.94794 3.04866 3.13896 3.21989 3.29237 3.35719 3.41509 3.46674 3.51276 3.55373 3.59015 3.62251 3.65125 3.67674 3.69934 3.71937 3.73711 3.75283 3.76673 3.77904 3.78993 3.80728 #bodywt for gender,fleet: 1 / 8
0 9.92788e-005 0.00902077 0.187405 0.661946 0.918129 0.815393 0.54012 0.287818 0.133782 0.0589486 0.0271135 0.0145284 0.00971708 0.00788801 0.00718268 0.00690288 0.00678761 0.00673798 0.00671557 0.00670493 0.00669963 0.00669686 0.00669534 0.00669447 0.00669395 0.00669363 0.00669342 0.00669329 0.00669319 0.00669313 0.00669308 0.00669304 0.00669302 0.006693 0.00669298 0.00669297 0.00669296 0.00669295 0.00669295 0.00669293 #selex for gender,fleet: 1 / 8
0.01241 0.0276778 0.135927 0.249455 0.368605 0.506713 0.666413 0.832988 1.00645 1.19356 1.39934 1.62032 1.8432 2.054 2.24578 2.41784 2.572 2.7104 2.83486 2.94682 3.04749 3.13792 3.21901 3.29164 3.35659 3.41459 3.46632 3.51241 3.55342 3.58988 3.62228 3.65103 3.67654 3.69916 3.71921 3.73696 3.75268 3.7666 3.77891 3.7898 3.80718 #bodywt for gender,fleet: 1 / 9
0 9.52967e-005 0.00591211 0.163556 0.641962 0.924601 0.883359 0.69257 0.484005 0.325202 0.22517 0.168539 0.13829 0.122562 0.114431 0.110191 0.107938 0.106711 0.106022 0.105624 0.105386 0.105239 0.105145 0.105084 0.105042 0.105014 0.104993 0.104979 0.104968 0.10496 0.104953 0.104948 0.104944 0.104941 0.104939 0.104937 0.104935 0.104934 0.104932 0.104931 0.104929 #selex for gender,fleet: 1 / 9
0.01241 0.0283955 0.127999 0.249344 0.384122 0.527923 0.683117 0.835478 0.980801 1.13307 1.31433 1.54116 1.79641 2.03848 2.24665 2.42399 2.57851 2.71578 2.83894 2.94984 3.04972 3.13957 3.22026 3.2926 3.35735 3.4152 3.46682 3.51282 3.55377 3.59019 3.62254 3.65127 3.67676 3.69936 3.71938 3.73713 3.75284 3.76674 3.77905 3.78994 3.80729 #bodywt for gender,fleet: 1 / 10
0 9.76642e-005 0.00471284 0.0944871 0.434006 0.809689 0.917903 0.773572 0.521213 0.303756 0.170705 0.104249 0.0748306 0.0626549 0.0577675 0.0558148 0.0550238 0.0546945 0.0545525 0.0544887 0.0544586 0.0544438 0.0544362 0.054432 0.0544297 0.0544283 0.0544275 0.054427 0.0544266 0.0544264 0.0544262 0.0544261 0.054426 0.054426 0.0544259 0.0544259 0.0544258 0.0544258 0.0544258 0.0544258 0.0544257 #selex for gender,fleet: 1 / 10
0.01241 0.0267686 0.0856624 0.194113 0.467528 0.721876 0.926252 1.11971 1.30442 1.48068 1.64998 1.81493 1.97778 2.13882 2.29617 2.447 2.58886 2.72029 2.84076 2.95041 3.04968 3.13924 3.21979 3.29206 3.35677 3.4146 3.46622 3.51223 3.55319 3.58961 3.62198 3.65072 3.67621 3.69882 3.71886 3.73661 3.75233 3.76624 3.77855 3.78944 3.80682 #bodywt for gender,fleet: 1 / 11
0 9.25907e-005 0.000123287 0.000128689 0.000414276 0.00461417 0.0294734 0.106207 0.253075 0.448633 0.644033 0.798313 0.898437 0.953665 0.980313 0.991799 0.996236 0.997696 0.997987 0.99785 0.997575 0.99727 0.996978 0.996712 0.996476 0.996268 0.996087 0.99593 0.995794 0.995676 0.995573 0.995484 0.995407 0.99534 0.995282 0.995231 0.995187 0.995148 0.995114 0.995085 0.995031 #selex for gender,fleet: 1 / 11
0.01241 0.0267696 0.0857813 0.189442 0.334108 0.513866 0.717813 0.933455 1.15122 1.3652 1.57188 1.76922 1.95604 2.13184 2.29645 2.44984 2.59198 2.7229 2.84278 2.95195 3.05091 3.14025 3.22067 3.29285 3.3575 3.41529 3.46687 3.51285 3.55378 3.59018 3.62252 3.65124 3.67671 3.6993 3.71932 3.73706 3.75276 3.76666 3.77896 3.78984 3.80719 #bodywt for gender,fleet: 1 / 12
0 0.22148 0.296419 0.304582 0.32716 0.372751 0.443363 0.532813 0.629896 0.723189 0.804363 0.869212 0.917152 0.950099 0.971251 0.984025 0.991352 0.99539 0.997556 0.998698 0.999298 0.999614 0.999781 0.999872 0.999921 0.999948 0.999962 0.999969 0.999971 0.99997 0.999968 0.999965 0.999961 0.999956 0.999951 0.999946 0.999942 0.999937 0.999932 0.999928 0.99993 #selex for gender,fleet: 1 / 12
0.0129428 0.0302637 0.15626 0.332128 0.494352 0.650929 0.800961 0.945473 1.08391 1.21437 1.33772 1.4583 1.57969 1.7009 1.81699 1.92273 2.01535 2.09465 2.16189 2.21878 2.26696 2.30782 2.34255 2.37209 2.39725 2.41868 2.43694 2.4525 2.46576 2.47705 2.48668 2.49488 2.50186 2.50781 2.51287 2.51718 2.52085 2.52398 2.52664 2.5289 2.53199 #bodywt for gender,fleet: 2 / 1
0 9.67166e-005 0.00045483 0.0111137 0.0849782 0.279114 0.545127 0.769353 0.885225 0.894176 0.831567 0.739085 0.64879 0.576783 0.526032 0.492892 0.472169 0.459461 0.451686 0.446883 0.443865 0.441926 0.440649 0.439787 0.439191 0.438768 0.438462 0.438236 0.438066 0.437936 0.437835 0.437756 0.437693 0.437642 0.437601 0.437568 0.437541 0.437518 0.4375 0.437484 0.437446 #selex for gender,fleet: 2 / 1

0.0129428 0.0300909 0.111515 0.349579 0.537576 0.708546 0.868986 1.01968 1.16205 1.2978 1.42784 1.55169 1.66788 1.77491 1.87196 1.95892 2.03613 2.1042 2.16385 2.21586 2.26101 2.30006 2.33373 2.3627 2.38757 2.40888 2.42713 2.44274 2.45607 2.46745 2.47717 2.48545 2.49251 2.49853 2.50366 2.50803 2.51175 2.51492 2.51762 2.51992 2.52311 #bodywt for gender,fleet: 2 / 2
0 9.62501e-005 0.000144216 0.00144782 0.0170845 0.0842477 0.231682 0.436269 0.640149 0.797753 0.896517 0.947059 0.966317 0.968131 0.961346 0.951002 0.939806 0.92912 0.919551 0.91129 0.904309 0.898485 0.893658 0.889671 0.886381 0.883662 0.881413 0.879548 0.877998 0.876706 0.875627 0.874724 0.873967 0.873331 0.872795 0.872344 0.871963 0.871641 0.871368 0.871138 0.870732 #selex for gender,fleet: 2 / 2
0.012944 0.0476593 0.135179 0.270508 0.432622 0.605547 0.780071 0.950672 1.11404 1.2683 1.41237 1.54537 1.66654 1.77549 1.87239 1.95788 2.03288 2.09841 2.15549 2.20507 2.24804 2.28518 2.31722 2.34481 2.36853 2.38888 2.40634 2.42128 2.43407 2.44499 2.45433 2.4623 2.4691 2.4749 2.47984 2.48406 2.48765 2.4907 2.49331 2.49553 2.49878 #bodywt for gender,fleet: 2 / 3
0 0.000222775 0.00928941 0.0513573 0.150869 0.305237 0.484035 0.651723 0.785366 0.878285 0.935151 0.965188 0.977297 0.978125 0.972096 0.962086 0.950005 0.937147 0.924371 0.912218 0.900996 0.89085 0.881814 0.873857 0.866905 0.86087 0.855654 0.851162 0.847303 0.843995 0.841163 0.838742 0.836674 0.834909 0.833404 0.83212 0.831027 0.830095 0.829301 0.828625 0.827704 #selex for gender,fleet: 2 / 3
0.0129428 0.0301182 0.133825 0.344224 0.516471 0.679803 0.834629 0.982344 1.12592 1.26773 1.40731 1.54154 1.6668 1.78072 1.88252 1.97245 2.05132 2.1201 2.17985 2.23157 2.27622 2.31468 2.34775 2.37613 2.40046 2.42129 2.43911 2.45434 2.46735 2.47846 2.48793 2.49601 2.50289 2.50876 2.51377 2.51803 2.52165 2.52474 2.52737 2.52961 2.53264 #bodywt for gender,fleet: 2 / 4
0 9.63221e-005 0.000209529 0.00411692 0.0401023 0.162148 0.376447 0.613989 0.800688 0.912597 0.9665 0.98826 0.995854 0.998137 0.998639 0.998588 0.998384 0.998151 0.997929 0.997729 0.997553 0.997401 0.99727 0.997157 0.997062 0.99698 0.996911 0.996852 0.996801 0.996759 0.996722 0.996691 0.996665 0.996643 0.996624 0.996608 0.996594 0.996583 0.996573 0.996564 0.996552 #selex for gender,fleet: 2 / 4
0.0129429 0.0378032 0.17075 0.261219 0.368848 0.499818 0.636484 0.772399 0.906648 1.03879 1.16879 1.29701 1.42365 1.54798 1.66793 1.78062 1.88342 1.97479 2.0544 2.12283 2.18119 2.23074 2.27271 2.30825 2.33834 2.36383 2.38542 2.40373 2.41925 2.43243 2.44362 2.45312 2.46119 2.46805 2.47387 2.47883 2.48304 2.48662 2.48966 2.49225 2.49624 #bodywt for gender,fleet: 2 / 5
0 0.000116252 0.0446532 0.508252 0.888695 0.844053 0.630568 0.413296 0.252842 0.151044 0.0911087 0.0568875 0.0374216 0.0262041 0.019589 0.0155745 0.0130613 0.0114374 0.0103555 0.00961366 0.00909127 0.00871442 0.00843662 0.00822786 0.0080683 0.00794452 0.00784725 0.00776994 0.0077079 0.0076577 0.00761677 0.0075832 0.00755552 0.00753258 0.00751351 0.0074976 0.00748428 0.00747311 0.00746372 0.00745581 0.00744019 #selex for gender,fleet: 2 / 5
0.0129432 0.0402986 0.159238 0.288197 0.419625 0.556411 0.701959 0.847259 0.986215 1.11962 1.24946 1.37663 1.5008 1.62055 1.73371 1.83813 1.93227 2.01552 2.08809 2.15074 2.20448 2.2504 2.28955 2.32288 2.35124 2.37536 2.39588 2.41332 2.42816 2.44078 2.45151 2.46063 2.4684 2.475 2.48062 2.48539 2.48946 2.49292 2.49586 2.49836 2.50211 #bodywt for gender,fleet: 2 / 6
0 0.000136863 0.0129498 0.164877 0.53568 0.842566 0.924265 0.844143 0.6907 0.529018 0.393672 0.293416 0.223834 0.176997 0.145761 0.124846 0.110673 0.100909 0.0940547 0.08915 0.085573 0.082917 0.0809117 0.0793746 0.0781802 0.0772409 0.0764941 0.0758949 0.0754101 0.075015 0.0746911 0.0744242 0.0742032 0.0740194 0.0738662 0.0737379 0.0736304 0.0735401 0.073464 0.0733999 0.0732767 #selex for gender,fleet: 2 / 6
0.0129428 0.0301146 0.105912 0.294994 0.505372 0.703323 0.893252 1.07311 1.24108 1.39616 1.53798 1.66653 1.78215 1.8854 1.97703 2.05787 2.12884 2.19087 2.24488 2.29175 2.33231 2.36733 2.39749 2.42343 2.4457 2.46479 2.48114 2.49513 2.50709 2.5173 2.52602 2.53347 2.53981 2.54523 2.54984 2.55377 2.55712 2.55997 2.5624 2.56447 2.56698 #bodywt for gender,fleet: 2 / 7
0 9.63214e-005 0.000141678 0.000480142 0.00289056 0.0119734 0.0340599 0.0736315 0.130722 0.201196 0.278852 0.357596 0.432719 0.50126 0.561807 0.614069 0.658455 0.695743 0.726847 0.752685 0.774105 0.791854 0.806568 0.818781 0.828936 0.837394 0.844454 0.850359 0.855306 0.859458 0.86295 0.86589 0.868368 0.870461 0.872229 0.873724 0.87499 0.876063 0.876972 0.877743 0.879006 #selex for gender,fleet: 2 / 7
0.0129431 0.0401676 0.164552 0.281075 0.398535 0.526229 0.655195 0.776441 0.891592 1.00428 1.1179 1.2367 1.36521 1.5046 1.64905 1.78761 1.91095 2.01527 2.10134 2.17189 2.22985 2.27777 2.31762 2.35095 2.37894 2.40253 2.42245 2.43931 2.45359 2.46571 2.47599 2.48473 2.49214 2.49845 2.50381 2.50837 2.51224 2.51553 2.51834 2.52072 2.52412 #bodywt for gender,fleet: 2 / 8
0 0.000132907 0.0206139 0.272318 0.71833 0.89838 0.785281 0.55095 0.333788 0.185853 0.100431 0.0552116 0.0321605 0.0204783 0.0144692 0.0112909 0.00954939 0.00855709 0.00796861 0.00760567 0.00737335 0.00721943 0.00711418 0.00704015 0.00698674 0.00694734 0.0069177 0.00689501 0.00687739 0.00686352 0.00685248 0.00684362 0.00683643 0.00683057 0.00682576 0.00682178 0.00681849 0.00681575 0.00681346 0.00681155 0.00680732 #selex for gender,fleet: 2 / 8
0.0129429 0.0355551 0.171001 0.28672 0.402025 0.533163 0.676865 0.822009 0.967061 1.1139 1.26283 1.41136 1.55475 1.68797 1.80767 1.91269 2.00352 2.0815 2.1482 2.20516 2.25378 2.29527 2.33067 2.36087 2.38662 2.40858 2.4273 2.44326 2.45685 2.46844 2.47831 2.48671 2.49387 2.49997 2.50516 2.50957 2.51333 2.51654 2.51926 2.52158 2.52482 #bodywt for gender,fleet: 2 / 9
0 0.000112208 0.0150839 0.247812 0.703155 0.913955 0.861799 0.698562 0.523822 0.383191 0.284924 0.221062 0.180888 0.155819 0.140064 0.129999 0.123431 0.119041 0.116034 0.113925 0.112412 0.111303 0.110475 0.109846 0.109362 0.108983 0.108683 0.108444 0.108251 0.108094 0.107966 0.10786 0.107773 0.107701 0.10764 0.10759 0.107548 0.107513 0.107483 0.107458 0.107409 #selex for gender,fleet: 2 / 9
0.012943 0.037553 0.162324 0.292389 0.423395 0.557511 0.694803 0.825543 0.947633 1.06752 1.19327 1.33055 1.47861 1.62852 1.76835 1.89047 1.9933 2.07879 2.14988 2.20928 2.25918 2.30128 2.33692 2.36716 2.39286 2.41471 2.43331 2.44914 2.46261 2.47409 2.48386 2.49217 2.49926 2.50528 2.51042 2.51478 2.5185 2.52167 2.52436 2.52665 2.52981 #bodywt for gender,fleet: 2 / 10
0 0.00012239 0.0102217 0.147553 0.510962 0.825874 0.897145 0.774253 0.572075 0.383801 0.248476 0.164459 0.116296 0.0896706 0.075063 0.0669592 0.0623597 0.0596705 0.0580455 0.0570296 0.0563729 0.0559349 0.0556338 0.0554214

0.0552678 0.0551543 0.0550688 0.0550033 0.0549525 0.0549124 0.0548806 0.0548549 0.0548342 0.0548173 0.0548034 0.0547919 0.0547824 0.0547745 0.0547679 0.0547624 0.0547501 #selex for gender,fleet: 2 / 10
0.0129428 0.0300849 0.0978443 0.245219 0.586591 0.80395 0.978091 1.13508 1.27873 1.41061 1.53183 1.6433 1.74578 1.83979 1.92566 2.00359 2.07373 2.13632 2.19172 2.24041 2.28293 2.31989 2.35189 2.3795 2.40326 2.42367 2.44117 2.45615 2.46897 2.47992 2.48928 2.49726 2.50407 2.50988 2.51483 2.51905 2.52264 2.5257 2.52831 2.53053 2.53351 #bodywt for gender,fleet: 2 / 11
0 9.62344e-005 0.000123208 0.000146707 0.000908744 0.00798131 0.0371024 0.106774 0.221355 0.365649 0.515121 0.648959 0.75636 0.835785 0.891146 0.928206 0.952404 0.968014 0.978061 0.984563 0.988817 0.99164 0.993545 0.994854 0.99577 0.996422 0.996895 0.997243 0.997504 0.997701 0.997854 0.997972 0.998065 0.998139 0.998198 0.998246 0.998285 0.998316 0.998343 0.998364 0.998425 #selex for gender,fleet: 2 / 11
0.0129428 0.0300892 0.0980359 0.214029 0.368745 0.549702 0.741332 0.93092 1.11113 1.27855 1.43183 1.57067 1.69535 1.80648 1.90493 1.99166 2.0677 2.13411 2.19188 2.242 2.28535 2.32276 2.35498 2.38267 2.40644 2.42682 2.44427 2.45919 2.47195 2.48285 2.49215 2.50009 2.50685 2.51262 2.51754 2.52173 2.5253 2.52834 2.53093 2.53313 2.53607 #bodywt for gender,fleet: 2 / 12
0 0.23022 0.296755 0.307896 0.335039 0.383735 0.45145 0.53018 0.610755 0.685969 0.751633 0.806216 0.849991 0.884196 0.910435 0.930318 0.945276 0.956494 0.964912 0.97125 0.976047 0.979706 0.982518 0.984698 0.986403 0.987749 0.98882 0.989678 0.990372 0.990935 0.991396 0.991775 0.992088 0.992347 0.992563 0.992743 0.992894 0.99302 0.993127 0.993216 0.993397 #selex for gender,fleet: 2 / 12
0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.0639724 0.0679448 0.0719172 0.0758896 0.079862 0.0838344 0.0878068 0.0917792 #mean M for year Yinit: 2011 sex: 1
934.412 487.766 992.187 274.048 863.528 300.233 121.79 150.097 403.955 276.86 474.42 226.287 278.299 233.421 146.787 206.303 167.668 194.128 140.866 116.262 150.405 112.658 106.095 75.5903 53.1511 30.3501 19.5422 46.3559 9.64158 9.84551 14.1162 4.36269 3.59728 5.94163 4.15107 1.6603 3.52871 1.49113 1.55704 1.5167 7.89958 #numbers for year Yinit: 2011 sex: 1
0.06 0.06 0.06 0.06 0.06 0.06 0.06

0.452988 0.452987 0.452987 0.452987 0.452987 0.452987 0.452987 0.452987 0.452987 0.452987 0.452987 0.452987 0.452987 0.452987 0.452987 #selex for gender,fleet: 1 / 1
0.0124266 0.0271122 0.0887316 0.269552 0.461255 0.645724 0.830438 1.01241 1.19132 1.37026 1.55221 1.73623 1.91881 2.09661 2.26695 2.42755 2.57674 2.71368 2.83832 2.95115 3.0529 3.14443 3.2266 3.30024 3.36613 3.42501 3.47757 3.52441 3.56614 3.60326 3.63626 3.66559 3.69162 3.71472 3.7352 3.75336 3.76946 3.78371 3.79633 3.80751 3.82541 #bodywt for gender,fleet: 1 / 2
0 9.34774e-005 0.000129266 0.000603099 0.00886453 0.058907 0.201301 0.432923 0.675793 0.851232 0.93988 0.965995 0.959522 0.940659 0.920295 0.903192 0.890555 0.881907 0.876255 0.872652 0.870378 0.868942 0.868028 0.867438 0.867051 0.866792 0.866615 0.866492 0.866405 0.866341 0.866295 0.86626 0.866233 0.866213 0.866196 0.866184 0.866173 0.866165 0.866158 0.866152 0.866139 #selex for gender,fleet: 1 / 2
0.0124266 0.0342652 0.10995 0.227722 0.381905 0.559693 0.751397 0.949832 1.14996 1.34888 1.54475 1.73501 1.91663 2.08786 2.24851 2.39907 2.53991 2.67111 2.79261 2.90441 3.00665 3.09961 3.18372 3.25953 3.32762 3.38861 3.44312 3.49176 3.53509 3.57365 3.60792 3.63836 3.66537 3.68933 3.71058 3.7294 3.74607 3.76084 3.77391 3.78548 3.80468 #bodywt for gender,fleet: 1 / 3
0 0.000122393 0.00614282 0.0366739 0.118681 0.264322 0.453215 0.644317 0.800542 0.90439 0.958519 0.975377 0.96695 0.941976 0.907283 0.868571 0.830145 0.794699 0.763517 0.736914 0.714644 0.696207 0.681029 0.668558 0.658304 0.649853 0.642863 0.637059 0.632218 0.628162 0.624748 0.621863 0.619414 0.617327 0.615543 0.614012 0.612695 0.611558 0.610575 0.609722 0.608051 #selex for gender,fleet: 1 / 3
0.0124266 0.0271221 0.0987451 0.271574 0.442325 0.62001 0.800182 0.979578 1.16006 1.3469 1.5413 1.7379 1.92972 2.1122 2.28318 2.44186 2.5881 2.7221 2.8443 2.95528 3.05572 3.14634 3.22789 3.30111 3.36672 3.4254 3.47782 3.52457 3.56623 3.6033 3.63627 3.66557 3.69158 3.71467 3.73514 3.75329 3.76938 3.78363 3.79625 3.80742 3.82531 #bodywt for gender,fleet: 1 / 4
0 9.35074e-005 0.000164568 0.00207845 0.0243029 0.121689 0.332372 0.598599 0.814685 0.934051 0.981255 0.995177 0.998107 0.998192 0.997677 0.997091 0.996553 0.996088 0.995697 0.995373 0.995107 0.994888 0.994709 0.994561 0.99444 0.994339 0.994256 0.994186 0.994127 0.994078 0.994036 0.994 0.99397 0.993944 0.993921 0.993902 0.993885 0.993871 0.993858 0.993848 0.993827 #selex for gender,fleet: 1 / 4
0.0124266 0.0283787 0.139032 0.233386 0.341369 0.480892 0.631874 0.785971 0.942841 1.104 1.27436 1.46272 1.67623 1.90866 2.13898 2.348 2.52942 2.68569 2.82144 2.9406 3.04603 3.13976 3.22329 3.2978 3.36427 3.42355 3.47638 3.52344 3.56531 3.60255 3.63564 3.66504 3.69112 3.71427 3.73479 3.75298 3.7691 3.78337 3.79601 3.8072 3.82514 #bodywt for gender,fleet: 1 / 5
0 9.72199e-005 0.0171965 0.388032 0.882682 0.890899 0.66182 0.405907 0.220859 0.113184 0.0576297 0.0307674 0.0181563 0.0122689 0.00949047 0.00814996 0.00748376 0.00714113 0.0069583 0.00685697 0.00679865 0.00676383 0.00674229 0.00672852 0.00671943 0.00671326 0.00670896 0.00670589 0.00670364 0.00670197 0.0067007 0.00669971 0.00669895 0.00669834 0.00669785 0.00669745 0.00669712 0.00669685 0.00669663 0.00669644 0.006696 #selex for gender,fleet: 1 / 5
0.0124266 0.0296327 0.125952 0.24555 0.380273 0.525525 0.687634 0.856636 1.02345 1.19133 1.36667 1.55529 1.7587 1.96996 2.17626 2.36688 2.53745 2.68832 2.82167 2.93991 3.04507 3.13879 3.22241 3.29703 3.36361 3.42298 3.4759 3.52301 3.56494 3.60222 3.63535 3.66477 3.69088 3.71404 3.73458 3.75278 3.76891 3.78319 3.79584 3.80704 3.82499 #bodywt for gender,fleet: 1 / 6
0 0.000101788 0.00612238 0.106186 0.454089 0.822651 0.940705 0.8513 0.659081 0.459816 0.306223 0.205849 0.146186 0.112519 0.0939752 0.0838141 0.078203 0.0750526 0.0732438 0.0721779 0.071532 0.0711292 0.0708708 0.0707003 0.0705849 0.0705047 0.0704478 0.0704064 0.0703757 0.0703526 0.0703348 0.070321 0.0703101 0.0703013 0.0702943 0.0702885 0.0702838 0.0702799 0.0702766 0.0702738 0.0702675 #selex for gender,fleet: 1 / 6
0.0124266 0.0271169 0.0884597 0.230703 0.429135 0.633572 0.844849 1.0586 1.27017 1.47614 1.67411 1.86249 2.04025 2.20682 2.362 2.50582 2.63849 2.76029 2.87152 2.97254 3.06377 3.14574 3.21908 3.28447 3.34261 3.3942 3.43993 3.48041 3.51623 3.54791 3.57592 3.60069 3.62258 3.64193 3.65903 3.67414 3.68749 3.69929 3.70972 3.71893 3.73629 #bodywt for gender,fleet: 1 / 7
0 9.34916e-005 0.000131558 0.000294088 0.00169211 0.008267 0.0279595 0.0700366 0.139742 0.234894 0.346819 0.464067 0.576135 0.675627 0.75873 0.824636 0.874534 0.910635 0.935432 0.951266 0.960137 0.963674 0.963186 0.959718 0.954111 0.947039 0.939042 0.930542 0.921867 0.913263 0.904907 0.896924 0.889395 0.882365 0.875858 0.869876 0.864408 0.859433 0.854925 0.850855 0.845782 #selex for gender,fleet: 1 / 7
0.0124266 0.0294084 0.130781 0.24354 0.36521 0.502729 0.649587 0.789961 0.925789 1.06388 1.21626 1.40611 1.65373 1.93334 2.18812 2.39621 2.56683 2.71216 2.83959 2.95304 3.05467 3.14589 3.22775 3.30113 3.36682 3.42555 3.47799 3.52476 3.56642 3.60349 3.63646 3.66575 3.69176 3.71485 3.73532 3.75347 3.76955 3.7838 3.79642 3.80759 3.82547 #bodywt for gender,fleet: 1 / 8
0 0.000100889 0.00908913 0.184953 0.657036 0.918781 0.821637 0.546685 0.291493 0.135111 0.0592269 0.0270804 0.0144511 0.00965968 0.00785372 0.0071637 0.00689261 0.00678201 0.00673486 0.00671378 0.00670387 0.00669898 0.00669644 0.00669506 0.00669428 0.00669381 0.00669353 0.00669335 0.00669323 0.00669314 0.00669309 0.00669305 0.00669302 0.00669299 0.00669298 0.00669296 0.00669295 0.00669294 0.00669294 0.00669293 0.00669292 #selex for gender,fleet: 1 / 8
0.0124266 0.0280879 0.135152 0.248856 0.368739 0.506949 0.667041 0.834233 1.00827 1.19588 1.40194 1.62283 1.84534 2.05582 2.24757 2.41992 2.57463 2.71376 2.83906 2.95192 3.05353 3.14489 3.22691 3.30044 3.36626 3.42508 3.4776 3.52442 3.56613 3.60324 3.63624 3.66556 3.69159 3.71468 3.73517 3.75333 3.76942 3.78368 3.7963 3.80747 3.82537 #bodywt for gender,fleet: 1 / 9
0 9.64541e-005 0.00582808 0.158317 0.631278 0.922973 0.89102 0.705229 0.497016 0.33644 0.234529 0.176582 0.145558 0.129413 0.121068 0.116721 0.114416 0.113163 0.112462 0.112057 0.111816 0.111667 0.111573 0.111512 0.11147 0.111442 0.111422 0.111407 0.111396 0.111388 0.111382 0.111377 0.111373 0.11137 0.111368 0.111366 0.111364 0.111363 0.111361 0.11136 0.111358 #selex for gender,fleet: 1 / 9
0.0124266 0.0288055 0.127611 0.248523 0.383397 0.527404 0.682963 0.835924 0.981694 1.13461 1.3173 1.54599 1.80175 2.04273 2.24972 2.4266 2.58129 2.71913 2.84307 2.95486 3.05567 3.14647 3.2281 3.30135 3.36696 3.42565 3.47806 3.52481 3.56646 3.60352 3.63649 3.66577 3.69178 3.71486 3.73533 3.75348 3.76956 3.78381 3.79642 3.80759 3.82548 #bodywt for gender,fleet: 1 / 10

0 9.88867e-005 0.00468431 0.0927746 0.428345 0.806003 0.919928 0.779751 0.527302 0.307843 0.173438 0.106558 0.0771534 0.0650899 0.0602966 0.0584026 0.0576443 0.0573324 0.0571995 0.0571404 0.057113 0.0570996 0.0570928 0.0570891 0.0570871 0.0570859 0.0570851 0.0570847 0.0570844 0.0570842 0.0570841 0.057084 0.0570839 0.0570838 0.0570838 0.0570838 0.0570838 0.0570837 0.0570837 0.0570837 0.0570837 #selex for gender,fleet: 1 / 10
0.0124266 0.0271112 0.0860904 0.193603 0.460593 0.717876 0.923021 1.11726 1.30293 1.48017 1.65025 1.81562 1.97859 2.13965 2.29718 2.44845 2.59099 2.72327 2.84469 2.95531 3.05557 3.1461 3.22759 3.30078 3.36637 3.42505 3.47746 3.52421 3.56587 3.60294 3.63592 3.66522 3.69123 3.71432 3.7348 3.75296 3.76904 3.7833 3.79592 3.80709 3.825 #bodywt for gender,fleet: 1 / 11
0 9.34743e-005 0.000123302 0.000128097 0.000383975 0.0042134 0.0273396 0.100172 0.242277 0.435006 0.631042 0.788513 0.892378 0.950503 0.978891 0.991247 0.996065 0.997676 0.998023 0.997905 0.997635 0.99733 0.997035 0.996766 0.996526 0.996315 0.996131 0.99597 0.995831 0.99571 0.995605 0.995514 0.995435 0.995366 0.995306 0.995254 0.995209 0.995169 0.995134 0.995103 0.995048 #selex for gender,fleet: 1 / 11
0.0124266 0.0271123 0.0862126 0.189673 0.33394 0.513303 0.717052 0.932756 1.15081 1.36525 1.57253 1.77052 1.95797 2.1343 2.29933 2.45307 2.59559 2.727 2.84748 2.95737 3.05712 3.14732 3.22861 3.30166 3.36716 3.42578 3.47814 3.52486 3.56649 3.60354 3.63649 3.66577 3.69178 3.71485 3.73531 3.75346 3.76954 3.78378 3.79639 3.80756 3.82544 #bodywt for gender,fleet: 1 / 12
0 0.207494 0.27517 0.282894 0.304376 0.34803 0.416369 0.50412 0.600873 0.695533 0.779613 0.848427 0.900783 0.938005 0.962844 0.978494 0.987881 0.993291 0.996318 0.99798 0.998884 0.999374 0.999642 0.99979 0.999873 0.99992 0.999947 0.999963 0.999972 0.999977 0.999979 0.99998 0.99998 0.999979 0.999978 0.999977 0.999975 0.999974 0.999972 0.999971 0.999972 #selex for gender,fleet: 1 / 12
0.0129957 0.0306134 0.155364 0.332174 0.494386 0.650993 0.800996 0.945339 1.0836 1.21395 1.33718 1.45754 1.57864 1.69957 1.81549 1.9212 2.0139 2.09337 2.16084 2.21798 2.26643 2.30757 2.34257 2.37239 2.3978 2.41947 2.43796 2.45373 2.46718 2.47865 2.48843 2.49677 2.50388 2.50994 2.51511 2.51951 2.52326 2.52645 2.52917 2.53149 2.53466 #bodywt for gender,fleet: 2 / 1
0 9.73914e-005 0.000429089 0.010319 0.0799763 0.266858 0.529027 0.756433 0.879995 0.897228 0.841052 0.752429 0.663895 0.592442 0.541754 0.508565 0.487815 0.47512 0.467386 0.462635 0.459668 0.457775 0.456537 0.455707 0.455137 0.454735 0.454446 0.454233 0.454073 0.453952 0.453858 0.453785 0.453726 0.45368 0.453642 0.453612 0.453586 0.453566 0.453549 0.453535 0.453499 #selex for gender,fleet: 2 / 1
0.0129957 0.0304488 0.111409 0.348107 0.536178 0.707119 0.86765 1.01844 1.16079 1.29634 1.42613 1.54983 1.66608 1.77338 1.87084 1.95824 2.03588 2.10435 2.16437 2.21671 2.26217 2.3015 2.33544 2.36466 2.38976 2.41129 2.42974 2.44553 2.45903 2.47056 2.48042 2.48883 2.496 2.50213 2.50735 2.5118 2.51559 2.51882 2.52158 2.52393 2.52718 #bodywt for gender,fleet: 2 / 2
0 9.69436e-005 0.000143603 0.00138269 0.016228 0.0804625 0.223095 0.423795 0.627018 0.787026 0.88962 0.944043 0.966697 0.971402 0.967111 0.958938 0.949617 0.940527 0.932296 0.925143 0.919074 0.913996 0.90978 0.906293 0.903412 0.90103 0.899059 0.897423 0.896063 0.89493 0.893982 0.893189 0.892524 0.891965 0.891494 0.891097 0.890761 0.890478 0.890238 0.890035 0.889674 #selex for gender,fleet: 2 / 2
0.012997 0.0479612 0.135353 0.270222 0.431852 0.604409 0.778688 0.949137 1.11238 1.2665 1.4104 1.54331 1.66458 1.77383 1.87117 1.95717 2.03269 2.09871 2.15623 2.20622 2.24955 2.28702 2.31937 2.34724 2.37121 2.39181 2.40947 2.42461 2.43757 2.44866 2.45814 2.46624 2.47316 2.47906 2.4841 2.48839 2.49206 2.49518 2.49784 2.50011 2.50343 #bodywt for gender,fleet: 2 / 3
0 0.000225493 0.00890587 0.0489669 0.14419 0.293332 0.468283 0.63491 0.770212 0.866502 0.927275 0.960972 0.976237 0.979772 0.976121 0.968228 0.958021 0.94679 0.935399 0.924402 0.914132 0.904762 0.896355 0.888905 0.882363 0.876657 0.871708 0.86743 0.863745 0.860578 0.857861 0.855533 0.853541 0.851838 0.850383 0.849141 0.848081 0.847176 0.846405 0.845747 0.844862 #selex for gender,fleet: 2 / 3
0.0129957 0.0305067 0.137787 0.33723 0.509326 0.674692 0.832283 0.9824 1.12709 1.26849 1.40673 1.53957 1.6639 1.77743 1.87924 1.9694 2.0486 2.11777 2.17791 2.23003 2.27507 2.31391 2.34733 2.37604 2.40067 2.42178 2.43986 2.45532 2.46854 2.47983 2.48947 2.4977 2.50472 2.51071 2.51582 2.52017 2.52388 2.52705 2.52974 2.53204 2.53516 #bodywt for gender,fleet: 2 / 4
0 9.71018e-005 0.000239327 0.00446154 0.0396245 0.154417 0.355922 0.5851 0.773573 0.893633 0.955899 0.983288 0.993844 0.997455 0.998495 0.998652 0.998526 0.998322 0.99811 0.997913 0.997736 0.997581 0.997447 0.997332 0.997233 0.997148 0.997076 0.997014 0.996962 0.996917 0.996879 0.996847 0.996819 0.996796 0.996776 0.996759 0.996744 0.996732 0.996722 0.996713 0.9967 #selex for gender,fleet: 2 / 4
0.0129959 0.0400245 0.169314 0.261704 0.369527 0.499568 0.634846 0.769046 0.901529 1.03209 1.16092 1.28865 1.4157 1.54138 1.66338 1.77838 1.88333 1.97644 2.05735 2.12671 2.18571 2.2357 2.27801 2.31379 2.34407 2.36972 2.39145 2.40988 2.42552 2.4388 2.45008 2.45967 2.46782 2.47475 2.48064 2.48565 2.48992 2.49355 2.49664 2.49926 2.50328 #bodywt for gender,fleet: 2 / 5
0 0.000124544 0.0446521 0.495087 0.883136 0.851197 0.640282 0.419818 0.255627 0.151462 0.0904392 0.0558756 0.0364069 0.0253079 0.0188348 0.0149493 0.0125422 0.0110023 0.00998564 0.00929431 0.00881112 0.00846487 0.00821112 0.00802141 0.00787706 0.00776551 0.00767813 0.00760888 0.00755344 0.00750865 0.00747221 0.00744235 0.00741775 0.00739739 0.00738047 0.00736635 0.00735454 0.00734463 0.0073363 0.00732929 0.00731527 #selex for gender,fleet: 2 / 5
0.0129961 0.0408278 0.159456 0.288131 0.419349 0.555681 0.700804 0.846012 0.984993 1.11839 1.2482 1.37536 1.49954 1.6193 1.73251 1.83701 1.93129 2.01473 2.08754 2.15045 2.20447 2.25068 2.29011 2.32372 2.35234 2.37671 2.39745 2.41511 2.43014 2.44293 2.45382 2.46309 2.47099 2.4777 2.48342 2.48829 2.49244 2.49597 2.49897 2.50153 2.50537 #bodywt for gender,fleet: 2 / 6
0 0.000139018 0.0126864 0.161151 0.527765 0.837455 0.925223 0.850613 0.700691 0.54017 0.404345 0.302913 0.232066 0.184138 0.152049 0.130495 0.115854 0.105748 0.0986446 0.0935555 0.089841 0.087081 0.0849961 0.0833973 0.0821546 0.0811768 0.0803992 0.079775 0.0792698 0.078858 0.0785203 0.0782418 0.0780111 0.0778192 0.0776591 0.077525 0.0774126 0.077318 0.0772383 0.0771711 0.0770418 #selex for gender,fleet: 2 / 6
0.0129957 0.0304706 0.105611 0.292932 0.504114 0.701946 0.891593 1.07122 1.23905 1.39409 1.53593 1.66459 1.78038 1.88387 1.97577 2.05692 2.12822 2.19059 2.24495 2.29216 2.33306 2.36839 2.39886 2.42507 2.4476 2.46693 2.48351 2.4977

2.50984 2.52022 2.52909 2.53666 2.54313 2.54865 2.55335 2.55737 2.56079 2.56371 2.5662 2.56832 2.57089 #bodywt for gender,fleet: 2 / 7
0 9.70101e-005 0.000140059 0.000449828 0.00267502 0.0111464 0.0319611 0.069624 0.12446 0.192719 0.268513 0.345903 0.420203 0.488385 0.548931 0.601443 0.646236 0.684013 0.715639 0.741997 0.763913 0.782121 0.797254 0.809842 0.820329 0.829081 0.836398 0.842527 0.847669 0.851992 0.85563 0.858698 0.861287 0.863475 0.865326 0.866893 0.868221 0.869347 0.870303 0.871113 0.872437 #selex for gender,fleet: 2 / 7
0.012996 0.0411719 0.164262 0.280792 0.398287 0.525718 0.654414 0.775239 0.889737 1.0016 1.11427 1.23202 1.35951 1.49823 1.64269 1.78193 1.9063 2.01167 2.09867 2.16998 2.22857 2.27701 2.31732 2.35103 2.37937 2.40326 2.42345 2.44055 2.45505 2.46736 2.47781 2.4867 2.49425 2.50068 2.50615 2.5108 2.51476 2.51812 2.52099 2.52343 2.52692 #bodywt for gender,fleet: 2 / 8
0 0.000137539 0.0206636 0.268423 0.712183 0.898567 0.791944 0.559619 0.340854 0.190377 0.102959 0.0565217 0.0328137 0.0207982 0.0146243 0.0113651 0.00958355 0.00857132 0.00797281 0.00760479 0.00736992 0.00721474 0.00710892 0.00703465 0.0069812 0.00694184 0.00691228 0.00688968 0.00687216 0.00685837 0.00684742 0.00683862 0.00683149 0.00682568 0.00682091 0.00681697 0.00681371 0.00681099 0.00680872 0.00680682 0.00680261 #selex for gender,fleet: 2 / 8
0.0129958 0.0362957 0.170695 0.28685 0.402393 0.533098 0.676508 0.821519 0.96636 1.11291 1.26149 1.40968 1.55276 1.6858 1.80544 1.91054 2.00157 2.07981 2.14682 2.20412 2.25308 2.2949 2.33062 2.36112 2.38716 2.40939 2.42835 2.44453 2.45833 2.4701 2.48013 2.48869 2.49598 2.50219 2.50748 2.51199 2.51584 2.51911 2.5219 2.52427 2.5276 #bodywt for gender,fleet: 2 / 9
0 0.000114479 0.014802 0.240383 0.691973 0.912287 0.869885 0.712247 0.538967 0.397349 0.297319 0.231798 0.190341 0.16436 0.147981 0.137495 0.130641 0.126057 0.122915 0.12071 0.119128 0.117969 0.117104 0.116447 0.11594 0.115544 0.115231 0.11498 0.114779 0.114615 0.114481 0.114371 0.114279 0.114204 0.114141 0.114088 0.114044 0.114007 0.113975 0.113949 0.113898 #selex for gender,fleet: 2 / 9
0.012996 0.0382274 0.162297 0.292053 0.422957 0.556789 0.693793 0.824361 0.946185 1.06574 1.19131 1.32871 1.47714 1.62742 1.76746 1.88965 1.9925 2.07806 2.14927 2.20885 2.25896 2.3013 2.33719 2.36768 2.39362 2.4157 2.43451 2.45054 2.4642 2.47585 2.48577 2.49423 2.50143 2.50757 2.5128 2.51726 2.52105 2.52429 2.52704 2.52939 2.53263 #bodywt for gender,fleet: 2 / 10
0 0.000124851 0.0101491 0.144838 0.503852 0.820927 0.898486 0.780865 0.580637 0.391588 0.254572 0.16909 0.119976 0.0928154 0.0779304 0.0696902 0.0650264 0.0623085 0.0606718 0.0596522 0.0589955 0.0585588 0.0582597 0.0580492 0.0578973 0.0577854 0.0577013 0.057637 0.057587 0.0575478 0.0575166 0.0574916 0.0574713 0.0574548 0.0574412 0.05743 0.0574207 0.057413 0.0574065 0.0574011 0.0573891 #selex for gender,fleet: 2 / 10
0.0129957 0.0304426 0.0981526 0.242244 0.582453 0.802377 0.976953 1.13419 1.27805 1.4101 1.53144 1.64295 1.74537 1.83927 1.92501 2.00282 2.0729 2.13551 2.191 2.23983 2.28255 2.31974 2.35197 2.37982 2.40382 2.42446 2.44217 2.45736 2.47036 2.48148 2.49099 2.49912 2.50605 2.51197 2.51702 2.52133 2.525 2.52813 2.5308 2.53308 2.53613 #bodywt for gender,fleet: 2 / 11
0 9.69271e-005 0.000123213 0.000144482 0.000837549 0.0073475 0.0345322 0.100521 0.210617 0.351244 0.498993 0.633181 0.742413 0.82435 0.882266 0.921559 0.947538 0.964487 0.975507 0.9827 0.987441 0.990608 0.992757 0.994241 0.995283 0.996028 0.996571 0.996971 0.997272 0.997501 0.997677 0.997815 0.997923 0.998009 0.998079 0.998135 0.998181 0.998218 0.998249 0.998274 0.998345 #selex for gender,fleet: 2 / 11
0.0129957 0.0304473 0.0983607 0.21394 0.368071 0.54854 0.739887 0.929353 1.10955 1.27701 1.4304 1.5694 1.69429 1.80566 1.90437 1.99137 2.0677 2.13438 2.19243 2.24282 2.28643 2.32409 2.35655 2.38447 2.40846 2.42903 2.44667 2.46177 2.47468 2.48572 2.49515 2.50321 2.51008 2.51595 2.52096 2.52522 2.52886 2.53196 2.5346 2.53686 2.53986 #bodywt for gender,fleet: 2 / 12
0 0.215184 0.27549 0.286029 0.311828 0.358432 0.423906 0.500966 0.580902 0.656599 0.723691 0.780357 0.826565 0.863309 0.892013 0.914174 0.931166 0.944153 0.954082 0.961693 0.967554 0.972095 0.975637 0.978421 0.980626 0.982384 0.983797 0.98494 0.985869 0.98663 0.987256 0.987774 0.988203 0.98856 0.988858 0.989108 0.989317 0.989494 0.989642 0.989768 0.990013 #selex for gender,fleet: 2 / 12
0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.0637326 0.0674652 0.0711978 0.0749305 0.0786631 0.0823957 0.0861283 0.0898609 #mean M for year Yinit: 2011 sex: 1
1418.5 832.009 1776.58 482.297 1592.36 561.801 228.144 281.617 746.717 514.292 863.748 415.025 500.61 420.704 263.574 364.235 302.881 343.425 246.593 202.58 259.667 196.377 185.43 134.382 95.6913 53.6516 35.6987 78.8009 17.0381 16.8619 23.7074 7.36299 5.91203 9.52529 6.5082 2.71114 5.2414 2.32907 2.26432 2.21023 10.9126 #numbers for year Yinit: 2011 sex: 1
0.06 0.06 0.06 0.06 0.06 0.06 0.06

1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 #years
3222.52 3222.52 3222.33 3222.05 3221.75 3221.57 3221.39 3221.24 3221.11 3220.96 3220.81 3220.64 3220.4 3220.2 3219.96 3219.64 3219.33 3219 3218.85 3218.74 3218.63 3218.47 3218.35 3218.2 3218.05 3217.88 3217.21 3216.3 3214.52 3207.93 3197.52 3175.25 3161.79 3155.66 3150.8 3146.65 3142.71 3139.16 3136.26 3134.86 3131.86 3128.98 3122.93 3116.69 3113.37 3207.84 3616.49 3031.83 2527.86 2350.63 2492.73 3150.26 5373.66 3121.89 2364.93 2494.25 3435.1 4011.04 3255.68 2634.51 4638.99 1862 3422.85 3770.6 1735.4 1583.16 3658.2 1834.33 1304.78 4328.39 1459.01 1696.32 2397.91 2698.22 3010.59 2620.28 2912.42 1953.37 2080.03 2559.68 2011.27 2162.62 1406.25 2039.13 2223.12 1698.07 3273.62 1813.73 2459.21 869.153 661.265 1525.78 4054.31 1154.93 4006.25 1766.92 2836.99 #Recruits
27500.1 27500.1 27483.8 27458.7 27433.1 27417.3 27401.2 27388.1 27376.9 27363.9 27350.9 27335.9 27315.3 27298 27277.1 27249.8 27222.5 27194.2 27181.8 27171.6 27162.2 27148.8 27138.4 27125.2 27113.1 27098.6 27040.7 26964 26813.4 26270.8 25453.1 23848.6 22963.2 22579.5 22282.8 22035.2 21804.8 21600.3 21435.7 21357.2 21190.6 21032.9 20707.6 20381.5 20211.7 20021.5 19780.6 19592.1 19293.2 19256 19105.7 18928.7 18623.8 18816 18555.2 18539.2 18373.5 18055.2 17825.3 17447.6 17181.2 16995.1 16926.2 16481.6 15288.3 14555.5 13213.5 12449.2 10846.7 9420.08 9035.41 8550.7 8180.59 7518.63 6865.85 6079.7 5516.04 4768.67 4180.48 3866.64 4022.13 4274.75 4415.09 4597.78 4750.87 5126.01 5777.06 6440.11 7083 7694.44 8286.2 8861.31 9421.87 9978.07 10521.4 11033.8 11469.1 #SpawnBio
0.72 0.5 0 # spawn-recr steepness, sigmaR, autocorr
low steepness vector 1
0 0 8.51608e-005 0.000942789 0.00620469 0.0278612 0.090319 0.220384 0.425662 0.687296 0.974308 1.26029 1.52966 1.77598 1.99809 2.19723 2.37542 2.53477 2.67725 2.80461 2.91838 3.01996 3.11057 3.19135 3.26328 3.32729 3.38419 3.43475 3.47964 3.51946 3.55476 3.58605 3.61377 3.63831 3.66002 3.67923 3.69623 3.71125 3.72453 3.73627 3.755 #female fecundity; weighted by N in year Y_init across morphs and areas
0.0124106 0.0262798 0.113829 0.273754 0.435472 0.603753 0.773434 0.943657 1.11262 1.2778 1.44841 1.64015 1.85249 2.06445 2.25761 2.42795 2.57874 2.71365 2.83514 2.94474 3.04354 3.13246 3.21231 3.28387 3.34789 3.40506 3.45604 3.50145 3.54184 3.57774 3.60962 3.6379 3.66298 3.6852 3.70488 3.72231 3.73773 3.75137 3.76343 3.77409 3.79102 #bodywt for gender,fleet: 1 / 1
0 9.11692e-005 0.000277404 0.0063944 0.0625203 0.248857 0.542898 0.796205 0.900847 0.85571 0.727949 0.5974 0.506701 0.457348 0.434605 0.425224 0.421612 0.42027 0.419777 0.419594 0.419524 0.419497 0.419486 0.419481 0.419479 0.419478 0.419477 0.419477 0.419477 0.419477 0.419477 0.419476 0.419476 0.419476 0.419476 0.419476 0.419476 0.419476 0.419476 0.419476 #selex for gender,fleet: 1 / 1
0.0124106 0.0262388 0.087734 0.276885 0.47 0.65394 0.836569 1.01569 1.19206 1.36924 1.54951 1.73134 1.91155 2.08747 2.25673 2.41684 2.56573 2.70225 2.82623 2.93812 3.03873 3.12896 3.20975 3.28198 3.34646 3.40396 3.45518 3.50076 3.54128 3.57728 3.60923 3.63757 3.66269 3.68494 3.70465 3.7221 3.73753 3.75119 3.76326 3.77394 3.79089 #bodywt for gender,fleet: 1 / 2
0 9.10526e-005 0.000129539 0.000664423 0.0100242 0.065446 0.217976 0.456906 0.697606 0.863943 0.941911 0.957563 0.940848 0.912416 0.883894 0.860436 0.843189 0.831355 0.823566 0.818552 0.815352 0.813306 0.811986 0.811122 0.810548 0.810159 0.809891 0.809702 0.809566 0.809466 0.809392 0.809336 0.809294 0.80926 0.809234 0.809212 0.809195 0.809182 0.80917 0.809161 0.809137 #selex for gender,fleet: 1 / 2
0.0124106 0.0336446 0.110165 0.228925 0.3843 0.562844 0.754724 0.952837 1.15235 1.35048 1.54512 1.73332 1.91201 2.07981 2.23694 2.38417 2.52203 2.65066 2.77 2.87999 2.98068 3.0723 3.15523 3.22995 3.29703 3.35707 3.41068 3.45846 3.50096 3.53874 3.57226 3.60199 3.62834 3.65168 3.67234 3.69062 3.70679 3.72108 3.73372 3.74489 3.76354 #bodywt for gender,fleet: 1 / 3
0 0.000119342 0.00648177 0.038826 0.124452 0.274023 0.464888 0.655036 0.808168 0.908318 0.958907 0.97184 0.958306 0.926935 0.88508 0.839123 0.793908 0.752426 0.716069 0.685128 0.659274 0.637897 0.620315 0.605878 0.594011 0.584235 0.576151 0.569439 0.563842 0.559154 0.555208 0.551874 0.549045 0.546635 0.544575 0.542808 0.541289 0.539978 0.538845 0.537863 0.535931 #selex for gender,fleet: 1 / 3
0.0124106 0.0262426 0.0949521 0.28181 0.455887 0.631747 0.807388 0.981631 1.15899 1.34553 1.54094 1.73813 1.92967 2.11122 2.28092 2.43811 2.58272 2.71499 2.83542 2.9446 3.04325 3.13212 3.21196 3.28353 3.34756 3.40474 3.45574 3.50116 3.54156 3.57747 3.60936 3.63765 3.66273 3.68496 3.70465 3.72207 3.7375 3.75114 3.7632 3.77387 3.79081 #bodywt for gender,fleet: 1 / 4
0 9.10633e-005 0.000149329 0.0018146 0.024302 0.128665 0.354711 0.630014 0.839919 0.947245 0.986164 0.996567 0.998454 0.998346 0.997859 0.997337 0.996858 0.996437 0.996075 0.995768 0.99551 0.995293 0.995111 0.994958 0.99483 0.994722 0.99463 0.994552 0.994486 0.994429 0.994381 0.994339 0.994303 0.994272 0.994245 0.994222 0.994202 0.994184 0.994169 0.994156 0.994131 #selex for gender,fleet: 1 / 4
0.0124106 0.0268251 0.145195 0.233789 0.338718 0.477603 0.629276 0.785253 0.944583 1.10805 1.27907 1.46389 1.66811 1.88885 2.11154 2.31921 2.50296 2.6623 2.80041 2.92095 3.02689 3.1205 3.20348 3.27718 3.34268 3.40091 3.45266 3.49863 3.53945 3.57568 3.60781 3.63629 3.66152 3.68387 3.70366 3.72117 3.73666 3.75036 3.76247 3.77317 3.79022 #bodywt for gender,fleet: 1 / 5
0 9.25665e-005 0.0165321 0.414971 0.894565 0.873621 0.642997 0.399416 0.223671 0.119054 0.0630652 0.0347584 0.0208006 0.0139418 0.0105329 0.00880179 0.00789758 0.00740978 0.0071374 0.00697986 0.00688549 0.00682701 0.00678959 0.00676489 0.00674812 0.00673643 0.00672808 0.00672198 0.00671744 0.00671399 0.00671134 0.00670926 0.0067076 0.00670628 0.0067052 0.00670432 0.0067036 0.00670299 0.00670248 0.00670206 0.00670107 #selex for gender,fleet: 1 / 5
0.0124106 0.0289383 0.126947 0.24728 0.381486 0.525972 0.686786 0.853634 1.01829 1.18418 1.35779 1.54514 1.74803 1.95963 2.16672 2.35797 2.52861 2.67894 2.8113 2.92825 3.03194 3.12411 3.20615 3.27921 3.34428 3.4022 3.45372 3.49952 3.54022 3.57635 3.6084 3.63682 3.66201 3.68432 3.70407 3.72156 3.73702 3.7507 3.7628 3.77349 3.7905 #bodywt for gender,fleet: 1 / 6
0 9.9467e-005 0.00658919 0.112183 0.465388 0.82619 0.935542 0.839344 0.644604 0.446549 0.29527 0.196884 0.138573 0.105734 0.0876715 0.0777854 0.0723307 0.06927 0.0675132 0.0664781 0.0658508 0.0654594 0.0652083 0.0650425 0.0649301 0.064852 0.0647964 0.064756 0.064726 0.0647034 0.064686 0.0646724 0.0646617 0.0646532 0.0646463 0.0646406 0.064636 0.0646321 0.0646289 0.0646262 0.0646198 #selex for gender,fleet: 1 / 6

0.0124106 0.0262406 0.0863643 0.230714 0.442679 0.651715 0.863626 1.07581 1.28437 1.48642 1.68002 1.86387 2.0372 2.19962 2.35107 2.49161 2.62135 2.74038 2.84887 2.94709 3.03549 3.11466 3.1853 3.24815 3.30396 3.35345 3.3973 3.43613 3.4705 3.50091 3.5278 3.55158 3.57261 3.59119 3.60762 3.62213 3.63496 3.64628 3.65629 3.66513 3.68219 #bodywt for gender,fleet: 1 / 7
0 9.10574e-005 0.000128084 0.00025419 0.00154252 0.00826079 0.0295905 0.0765016 0.154931 0.261495 0.384982 0.511343 0.628419 0.728398 0.808064 0.867723 0.909731 0.937213 0.953255 0.960525 0.961197 0.957004 0.949325 0.939259 0.927679 0.915268 0.902553 0.889925 0.877668 0.865977 0.854975 0.844733 0.83528 0.826618 0.818725 0.811568 0.805105 0.799286 0.794064 0.789387 0.783056 #selex for gender,fleet: 1 / 7
0.0124106 0.028294 0.133211 0.245789 0.365481 0.501267 0.646182 0.785595 0.92132 1.0598 1.21231 1.40015 1.64266 1.91865 2.17448 2.38512 2.5572 2.70266 2.82936 2.94159 3.04175 3.1314 3.21165 3.28345 3.3476 3.40486 3.4559 3.50135 3.54176 3.57768 3.60957 3.63786 3.66294 3.68517 3.70486 3.72228 3.73771 3.75135 3.76341 3.77408 3.791 #bodywt for gender,fleet: 1 / 8
0 9.72087e-005 0.00908575 0.191889 0.667203 0.914828 0.807208 0.535337 0.287997 0.135834 0.0607857 0.0282574 0.0151368 0.0100176 0.00803234 0.00725201 0.00693681 0.00680473 0.00674696 0.00672048 0.00670774 0.00670131 0.00669791 0.00669603 0.00669494 0.00669428 0.00669387 0.0066936 0.00669343 0.0066933 0.00669322 0.00669316 0.00669311 0.00669307 0.00669305 0.00669303 0.00669301 0.006693 0.00669299 0.00669298 0.00669296 #selex for gender,fleet: 1 / 8
0.0124106 0.0271098 0.138186 0.250721 0.367624 0.504563 0.662671 0.827772 1.00021 1.18674 1.39247 1.61398 1.8378 2.04948 2.24176 2.41389 2.56778 2.7057 2.82954 2.94082 3.04077 3.13046 3.21083 3.28276 3.34702 3.40438 3.45549 3.50099 3.54146 3.57741 3.60933 3.63764 3.66275 3.68499 3.70469 3.72213 3.73756 3.75121 3.76328 3.77395 3.79089 #bodywt for gender,fleet: 1 / 9
0 9.35252e-005 0.00617393 0.173301 0.657366 0.924366 0.870038 0.673801 0.466465 0.311007 0.213802 0.158955 0.129692 0.114475 0.106601 0.10249 0.100303 0.0991098 0.0984392 0.0980505 0.0978178 0.0976739 0.0975822 0.097522 0.0974813 0.097453 0.097433 0.0974184 0.0974076 0.0973995 0.0973932 0.0973883 0.0973845 0.0973814 0.0973789 0.0973769 0.0973752 0.0973738 0.0973726 0.0973716 0.0973694 #selex for gender,fleet: 1 / 9
0.0124106 0.0279113 0.12923 0.251064 0.38509 0.527784 0.681649 0.83307 0.978268 1.13039 1.31019 1.53392 1.78715 2.03006 2.24008 2.41868 2.57365 2.7108 2.83352 2.9438 3.04299 3.13212 3.2121 3.28374 3.3478 3.405 3.456 3.50142 3.54182 3.57772 3.6096 3.63789 3.66297 3.68519 3.70488 3.7223 3.73772 3.75136 3.76342 3.77409 3.79101 #bodywt for gender,fleet: 1 / 10
0 9.60672e-005 0.00483341 0.0970005 0.439202 0.810441 0.914194 0.770077 0.522199 0.307746 0.174601 0.106755 0.0760427 0.0630354 0.0576941 0.0555128 0.0546106 0.0542277 0.0540595 0.0539826 0.0539458 0.0539274 0.0539178 0.0539125 0.0539095 0.0539077 0.0539066 0.0539059 0.0539055 0.0539052 0.0539049 0.0539048 0.0539047 0.0539046 0.0539045 0.0539044 0.0539044 0.0539044 0.0539044 0.0539043 0.0539043 #selex for gender,fleet: 1 / 10
0.0124106 0.0262379 0.0847134 0.193839 0.477322 0.732006 0.935259 1.12684 1.30933 1.48344 1.65096 1.81464 1.97665 2.13708 2.29387 2.4441 2.58529 2.716 2.83572 2.94459 3.04309 3.13188 3.21168 3.28323 3.34725 3.40443 3.45543 3.50085 3.54126 3.57717 3.60906 3.63736 3.66244 3.68468 3.70437 3.7218 3.73723 3.75087 3.76294 3.77361 3.79055 #bodywt for gender,fleet: 1 / 11
0 9.10498e-005 0.000123231 0.00012909 0.00043737 0.00491102 0.0309308 0.109926 0.259013 0.455283 0.649654 0.80211 0.900591 0.954734 0.98079 0.991989 0.996297 0.997701 0.997968 0.997822 0.997543 0.997238 0.996947 0.996682 0.996447 0.996242 0.996063 0.995907 0.995772 0.995656 0.995555 0.995467 0.995391 0.995325 0.995268 0.995218 0.995174 0.995136 0.995103 0.995074 0.995021 #selex for gender,fleet: 1 / 11
0.0124106 0.0262386 0.0847986 0.188149 0.332552 0.512319 0.716737 0.932952 1.15094 1.36464 1.57067 1.76716 1.95317 2.12833 2.29248 2.44551 2.58729 2.7178 2.83717 2.94575 3.04406 3.13272 3.21243 3.28392 3.34788 3.405 3.45594 3.5013 3.54164 3.57748 3.6093 3.63753 3.66254 3.68471 3.70433 3.72169 3.73706 3.75065 3.76266 3.77328 3.79024 #bodywt for gender,fleet: 1 / 12
0 0.240489 0.326612 0.333671 0.354027 0.397101 0.465702 0.553877 0.650029 0.742135 0.821458 0.883744 0.928689 0.958642 0.977181 0.987917 0.993794 0.996871 0.998434 0.999212 0.999596 0.999785 0.999877 0.999919 0.999933 0.999932 0.999919 0.999899 0.999872 0.999841 0.999805 0.999767 0.999728 0.999687 0.999647 0.999607 0.999567 0.99953 0.999494 0.999461 0.999479 #selex for gender,fleet: 1 / 12
0.0128709 0.0297637 0.158382 0.331426 0.493707 0.650486 0.800935 0.94611 1.08521 1.21622 1.3402 1.46158 1.58375 1.70547 1.82163 1.92707 2.01917 2.09786 2.16447 2.22073 2.2683 2.30859 2.34277 2.3718 2.39649 2.41748 2.43534 2.45053 2.46346 2.47446 2.48381 2.49177 2.49854 2.50429 2.50919 2.51335 2.51688 2.51989 2.52244 2.52461 2.52757 #bodywt for gender,fleet: 2 / 1
0 9.57109e-005 0.000532054 0.0130032 0.0952061 0.301516 0.572028 0.789308 0.892507 0.889281 0.818162 0.721333 0.629719 0.557906 0.507782 0.475201 0.454842 0.442325 0.434629 0.429844 0.426813 0.42485 0.423546 0.422658 0.422039 0.421597 0.421274 0.421034 0.420853 0.420714 0.420605 0.420519 0.420451 0.420396 0.420352 0.420316 0.420286 0.420261 0.420241 0.420224 0.420183 #selex for gender,fleet: 2 / 1
0.0128709 0.0295472 0.111612 0.353113 0.54132 0.7122 0.872253 1.02255 1.16479 1.30072 1.43107 1.55507 1.67108 1.77765 1.87408 1.96037 2.03694 2.10442 2.16353 2.21503 2.2597 2.29829 2.33152 2.36008 2.38456 2.40551 2.42342 2.43871 2.45176 2.46288 2.47236 2.48043 2.4873 2.49315 2.49813 2.50236 2.50596 2.50902 2.51162 2.51384 2.51691 #bodywt for gender,fleet: 2 / 2
0 9.51329e-005 0.000144654 0.00154046 0.0184145 0.0902529 0.245322 0.455931 0.660567 0.814087 0.90659 0.950833 0.96457 0.961682 0.950881 0.937116 0.923045 0.909986 0.898487 0.888672 0.880448 0.87363 0.868009 0.863385 0.859581 0.856447 0.85386 0.85172 0.849944 0.848466 0.847234 0.846205 0.845342 0.844619 0.844011 0.843499 0.843067 0.842703 0.842396 0.842136 0.841678 #selex for gender,fleet: 2 / 2
0.0128719 0.0470097 0.134896 0.271172 0.434607 0.608876 0.784629 0.95628 1.12047 1.27528 1.41956 1.55241 1.67308 1.78128 1.87723 1.96165 2.03554 2.09995 2.15594 2.20449 2.2465 2.28275 2.31398 2.34084 2.3639 2.38366 2.40058 2.41505 2.42741 2.43796 2.44696 2.45463 2.46117 2.46674 2.47148 2.47552 2.47895 2.48187 2.48436 2.48647 2.48959 #bodywt for gender,fleet: 2 / 3
0 0.000215244 0.00948714 0.0523268 0.152824 0.307634 0.486025 0.652803 0.785568 0.877949 0.934598 0.964517 0.976386 0.976728 0.969941 0.958944 0.945722 0.931645 0.917641 0.904303 0.891974 0.880817 0.870875 0.862117 0.854466

0.847824 0.842085 0.837144 0.832902 0.829269 0.826161 0.823506 0.821241 0.819309 0.817663 0.816261 0.815068 0.814053 0.813189 0.812454 0.811467 #selex for gender,fleet: 2 / 3
0.0128709 0.0295686 0.132955 0.347838 0.521036 0.684457 0.839036 0.986621 1.13049 1.27297 1.4133 1.54804 1.67341 1.78712 1.88847 1.97782 2.05603 2.12412 2.18316 2.23418 2.27817 2.31599 2.34846 2.37629 2.40011 2.42047 2.43786 2.4527 2.46536 2.47614 2.48533 2.49316 2.49982 2.50549 2.51032 2.51442 2.51791 2.52088 2.5234 2.52555 2.52843 #bodywt for gender,fleet: 2 / 4
0 9.5188e-005 0.000204176 0.00413305 0.0411768 0.167147 0.386541 0.62617 0.810894 0.919101 0.96987 0.989771 0.996494 0.998443 0.998848 0.998791 0.998609 0.998407 0.998214 0.99804 0.997887 0.997755 0.99764 0.997541 0.997457 0.997385 0.997323 0.997271 0.997227 0.997189 0.997156 0.997129 0.997106 0.997086 0.997069 0.997055 0.997043 0.997032 0.997024 0.997016 0.997006 #selex for gender,fleet: 2 / 4
0.0128709 0.0350788 0.172927 0.260383 0.368011 0.500574 0.639483 0.778104 0.915143 1.04981 1.18171 1.31085 1.43712 1.55968 1.67678 1.78613 1.88568 1.97425 2.05164 2.11838 2.17547 2.22406 2.2653 2.30026 2.32988 2.35497 2.37622 2.39424 2.4095 2.42245 2.43343 2.44275 2.45065 2.45736 2.46306 2.46789 2.47199 2.47548 2.47844 2.48095 2.48487 #bodywt for gender,fleet: 2 / 5
0 0.000107595 0.0457729 0.531291 0.89611 0.831709 0.615147 0.403163 0.248485 0.150309 0.0920623 0.0584041 0.038978 0.0276049 0.0207882 0.0165847 0.0139124 0.0121608 0.0109783 0.0101576 0.00957336 0.00914786 0.00883154 0.00859208 0.00840788 0.00826421 0.00815078 0.00806029 0.00798743 0.00792831 0.00788001 0.00784033 0.00780757 0.00778041 0.0077578 0.00773893 0.00772314 0.00770989 0.00769876 0.00768939 0.00767121 #selex for gender,fleet: 2 / 5
0.0128712 0.0397969 0.158945 0.288535 0.420578 0.558294 0.704666 0.850375 0.989654 1.1235 1.25388 1.38162 1.50632 1.62642 1.73971 1.84398 1.93773 2.02041 2.09231 2.15423 2.20723 2.25243 2.2909 2.3236 2.35138 2.37497 2.395 2.41201 2.42645 2.43872 2.44914 2.45798 2.4655 2.47188 2.4773 2.48191 2.48582 2.48915 2.49197 2.49437 2.49795 #bodywt for gender,fleet: 2 / 6
0 0.00013518 0.0135605 0.170981 0.546708 0.848888 0.922719 0.83609 0.67893 0.516456 0.38219 0.283706 0.215878 0.170499 0.140379 0.120285 0.106706 0.097371 0.0908287 0.0861523 0.0827447 0.080216 0.0783077 0.0768456 0.0757099 0.074817 0.0741075 0.0735383 0.0730781 0.0727033 0.0723961 0.0721432 0.0719339 0.07176 0.0716151 0.071494 0.0713926 0.0713074 0.0712358 0.0711754 0.0710599 #selex for gender,fleet: 2 / 6
0.0128709 0.0295543 0.102837 0.296477 0.518937 0.719553 0.909395 1.08801 1.25418 1.40727 1.54705 1.67366 1.78745 1.88901 1.97909 2.05851 2.1282 2.18907 2.24203 2.28795 2.32766 2.36191 2.39139 2.41671 2.43842 2.45702 2.47293 2.48653 2.49814 2.50804 2.51649 2.52369 2.52982 2.53504 2.53948 2.54326 2.54648 2.54922 2.55154 2.55352 2.55596 #bodywt for gender,fleet: 2 / 7
0 9.51542e-005 0.000133861 0.000391761 0.00255388 0.0115379 0.0346795 0.077505 0.140284 0.218165 0.303763 0.389886 0.471112 0.544195 0.607754 0.661713 0.706767 0.743972 0.77449 0.799434 0.819795 0.836423 0.850023 0.861171 0.870335 0.877891 0.884138 0.889319 0.893627 0.897218 0.90022 0.902734 0.904842 0.906615 0.908107 0.909364 0.910425 0.911321 0.912078 0.912719 0.913823 #selex for gender,fleet: 2 / 7
0.0128711 0.0388498 0.165327 0.281619 0.398913 0.527132 0.656844 0.779306 0.896159 1.0108 1.12638 1.24686 1.3763 1.51536 1.6582 1.7945 1.91565 2.01824 2.10304 2.17264 2.22988 2.27719 2.31652 2.34938 2.37694 2.40014 2.4197 2.43623 2.45022 2.46206 2.4721 2.48061 2.48783 2.49396 2.49916 2.50357 2.50732 2.51051 2.51321 2.5155 2.51878 #bodywt for gender,fleet: 2 / 8
0 0.000127103 0.0209465 0.281543 0.730526 0.897839 0.774043 0.537761 0.324143 0.180416 0.0978562 0.0541636 0.0318184 0.020429 0.014527 0.0113789 0.00963826 0.00863739 0.00803847 0.00766589 0.00742546 0.00726496 0.00715447 0.00707628 0.00701956 0.00697752 0.00694576 0.00692137 0.00690237 0.00688737 0.00687542 0.00686579 0.00685799 0.00685161 0.00684637 0.00684205 0.00683846 0.00683548 0.00683299 0.00683091 0.00682635 #selex for gender,fleet: 2 / 8
0.0128709 0.0345178 0.171961 0.286532 0.40125 0.533179 0.677475 0.823149 0.969063 1.11701 1.2671 1.41661 1.56062 1.69402 1.81351 1.91805 2.00825 2.08552 2.15149 2.20773 2.25566 2.29649 2.33127 2.36089 2.38611 2.40759 2.42588 2.44144 2.45468 2.46595 2.47553 2.48368 2.49061 2.4965 2.50151 2.50577 2.50939 2.51247 2.51509 2.51731 2.5204 #bodywt for gender,fleet: 2 / 9
0 0.000109011 0.015886 0.263647 0.724202 0.915675 0.846166 0.674395 0.498724 0.361037 0.266547 0.205917 0.168123 0.144688 0.130024 0.120684 0.114599 0.110535 0.107753 0.105801 0.1044 0.103373 0.102606 0.102023 0.101573 0.101221 0.100943 0.100721 0.100542 0.100396 0.100277 0.100179 0.100099 0.100032 0.0999758 0.0999292 0.0998902 0.0998575 0.09983 0.0998069 0.0997621 #selex for gender,fleet: 2 / 9
0.012871 0.0367348 0.162561 0.293187 0.424445 0.559161 0.697243 0.828919 0.952376 1.07395 1.20123 1.33929 1.48701 1.63566 1.77395 1.89474 1.99656 2.08127 2.15171 2.21053 2.25988 2.30146 2.33661 2.36638 2.39163 2.41307 2.43129 2.44677 2.45993 2.47112 2.48063 2.48871 2.49559 2.50143 2.50639 2.51061 2.5142 2.51725 2.51984 2.52204 2.52507 #bodywt for gender,fleet: 2 / 10
0 0.000119528 0.0104977 0.152707 0.52265 0.83336 0.895615 0.766832 0.563922 0.377952 0.245255 0.163008 0.115748 0.089485 0.0749715 0.0668512 0.0621997 0.0594543 0.0577796 0.0567231 0.0560344 0.0555712 0.0552506 0.0550229 0.0548573 0.0547343 0.0546412 0.0545697 0.0545139 0.0544699 0.0544348 0.0544065 0.0543836 0.0543649 0.0543495 0.0543368 0.0543262 0.0543175 0.0543101 0.054304 0.0542906 #selex for gender,fleet: 2 / 10
0.0128709 0.0295418 0.0974216 0.247819 0.593575 0.809982 0.983828 1.14045 1.28368 1.41517 1.53607 1.64729 1.74958 1.84345 1.92917 2.00688 2.07674 2.13897 2.19395 2.24217 2.2842 2.32066 2.35215 2.37928 2.40258 2.42257 2.43967 2.45429 2.46678 2.47744 2.48652 2.49427 2.50086 2.50648 2.51126 2.51532 2.51878 2.52173 2.52423 2.52636 2.5292 #bodywt for gender,fleet: 2 / 11
0 9.51191e-005 0.000123183 0.000148024 0.000964394 0.00852164 0.0393621 0.112322 0.23088 0.378354 0.529223 0.662616 0.768306 0.845477 0.8986 0.933737 0.956425 0.970911 0.98015 0.986082 0.989935 0.992477 0.994184 0.995352 0.996165 0.996743 0.99716 0.997466 0.997695 0.997868 0.998001 0.998104 0.998184 0.998249 0.9983 0.998341 0.998375 0.998402 0.998424 0.998443 0.998496 #selex for gender,fleet: 2 / 11
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0 0.251253 0.326867 0.336725 0.36186 0.408793 0.475491 0.553805 0.634095 0.708742 0.773368 0.826458 0.868419 0.900657 0.924929 0.942959 0.956246 0.966007 0.973183 0.97848 0.982415 0.985364 0.987594 0.989298 0.990612 0.991637 0.992443 0.993083 0.993596 0.994009 0.994345 0.994619 0.994845 0.995031 0.995185 0.995313 0.995419 0.995509 0.995584 0.995646 0.995778 #selex for gender,fleet: 2 / 12

0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.0642201 0.0684402 0.0726604 0.0768805 0.0811006 0.0853207 0.0895408 0.093761 #mean M for year Yinit: 2011 sex: 1

184.305 92.6808 200.884 57.4331 179.113 60.4673 24.1383 30.2753 85.8837 58.8341 105.49 49.6802 64.0719 52.8631 35.1391 48.0973 37.8943 44.6715 34.6229 28.3519 36.3618 26.3274 23.5333 15.918 11.0667 6.62819 4.18589 11.521 2.34267 2.56769 3.91666 1.21563 1.05942 1.83345 1.31775 0.497332 1.21775 0.485508 0.565923 0.530745 2.95005 #numbers for year Yinit: 2011 sex: 1

0.06 0.06 0.06 0.06 0.06 0.06 0.06

Agenda Item E.1.a
Attachment 8
November 2011

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Rebuilding Analysis for Pacific Ocean Perch in 2011

October 7, 2011

Owen S. Hamel
Groundfish Team, Fishery Resource Analysis and Monitoring Division,
National Marine Fisheries Service
Northwest Fisheries Science Center
2727 Montlake Boulevard East
Seattle, Washington 98112

1. Introduction

The Pacific Fishery Management Council (PFMC) adopted Amendment 11 to its Groundfish Management Plan in 1998. This amendment established a definition for an overfished stock of 25% of the unfished spawning biomass ($0.25B_0$). NMFS determined that a rebuilding plan was required for Pacific ocean perch (*Sebastes alutus*) in March 1999 based on the most recent stock assessment at that time (Ianelli and Zimmerman 1998). The PFMC began developing a rebuilding plan for Pacific ocean perch and submitted this plan to NMFS in February 2000. However, NMFS deferred adoption of the plan until the stock assessment was updated and reviewed, later that year (Ianelli *et al.* 2000).

A full stock assessment for then U.S. West Coast Pacific ocean perch stock was conducted in Stock Synthesis (Version 3, R. Methot) in 2011 (Hamel and Ono, 2011). This was the first full assessment of Pacific ocean perch since 2003 (Hamel *et al*., 2003), as that assessment had been updated every two years (Hamel 2005, 2007, 2009). The current assessment involves fitting an age-structured population dynamics model to catch, catch-rate, length-frequency, age-composition, and survey data, similar to previous assessments. Ianelli *et al*. (2000), Hamel *et al*. (2003), and Hamel (2005, 2007, 2009) presented results based on maximum likelihood and Bayesian estimation frameworks. The STAR panel that evaluated the 2003 assessment of Pacific ocean perch endorsed both the MPD estimates and the distributions for the model outputs that arose from the application of the MCMC algorithm to sample equally likely parameter vectors from the posterior distribution (PFMC 2003). Punt et al. (2003) conducted a rebuilding analysis with runs based upon both the MPD estimates and the MCMC outputs. The PFMC adopted a rebuilding plan based upon the results of the MCMC analysis. This rebuilding analysis was updated in 2005, 2007 and 2009. The 2011 STAR panel endorsed a MPD estimate with fixed natural mortality and steepness values, and an MCMC was therefore not appropriate for the final model. Therefore the current rebuilding analysis is based upon the decision table from the 2011 assessment.

Management under rebuilding has been effective. Total estimated catch (landings + model-estimated discard) for 2000-2009 (1,597 mt) was only 51% of the combined ACLs (Formerly OYs; 3,127 mt; Table 1). Assuming the GMT scorecard catch for 2010 (141 mt out of an ACL of 200 mt), the catch for 2000-2010 represents 52% of the combined ACLs.

Table 1. Management history since 2000. The modeled catch is the sum of the landings and the model-estimated discards based on discard rate and discard size composition information. These do not always match the Total Mortality report, the metric used to determine if overfishing has occurred.

Year	OFL	ACL (OY)	Total Mortality Report	Modeled Catch
2000	713	270	-	156
2001	1,541	303	-	*310*
2002	640	350	-	176
2003	689	377	-	157
2004	980	444	151.7	144
2005	966	447	76.2	76
2006	934	447	80.3	86
2007	900	150	**156.7**	*156*
2008	911	150	130.7	134
2009	1,160	189	180.5	*202*
2010	1,173	200	141.0	141

2. Specifications

2.1 Selection of B_0

The unfished spawning output, B_0, is determined from the fitted stock-recruitment relationship in order to be more consistent with the assumptions underlying the original stock assessment. For the base model, the estimate of B_0 is 65,560 units of spawning output (10^8 eggs) with current spawning output being 12,532 units. The values of B_0 for the high and low states of nature are similar to the base, with current output being 26,088 and 7,987 units. Summary (3+) biomass estimated for by the base model in 2011 is 25,482 mt, which is within 5% of the value estimated by an update of the old model (conducted for comparison; 26,839 mt). However, since the estimated unfished summary biomass is much larger (119,914 mt vs. 83,850 mt), and therefore, so is the unfished spawning output, the estimated depletion level of 19.1% in 2011 is much lower than the value of 28.6% (in 2009) from the 2009 assessment, or 31.5% (in 2011) which an update of the old model produced. The new assessment is considered an improvement upon the old assessment model which estimated an anomalously large recruitment in the early 1950s to allow for adequate biomass for the foreign fishery removals in the late 1960s. The current model estimates a larger B_0, coupled with somewhat larger average recruitments in the 1950s. The result is a similar current estimated biomass, but a higher B0 when compared to the old model. A comparison of recent and current model results is shown in Table 2.

Table 2. MPD and posterior median estimates of unfished spawning stock biomass or output (2011) (B_0) and depletion for the 2005, 2009 and 2011 stock assessments, as well as comparing the result of an update of the old model.

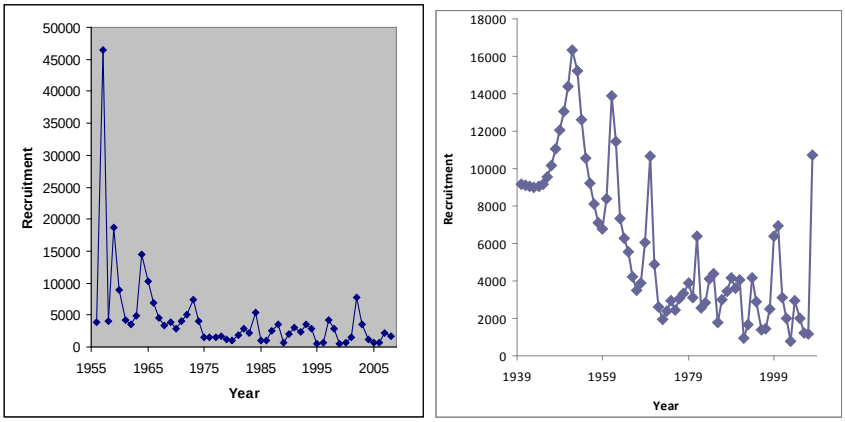
	2005	**2009**	**2011 Update**	**2011 New**
Unfished 3+ biomass	83,709	83,786	83,850	119,914
Ending year 3+ biomass	22,440	23,844	26,839	25,482
Unfished spawning biomass or *output*	37,838	37,780	37,838	*65,560*
Ending year spawning biomass or *output*	8,846	10,794	11,935	*12,532*
Depletion (Spawning biomass or output)	23.4%	28.6%	31.5%	19.1%

2.2 Generation of future recruitment

Recruitment in the assessment and projection models for Pacific ocean perch relate to the abundance of 3 year olds. This and recent assessments of Pacific ocean perch include the assumption that, *a priori*, recruitment is related to spawning output according to a Beverton-Holt stock-recruitment relationship. The rebuilding analysis conducted by Punt et al. (2003) included three different approaches: 1) basing the projections on resampling historical recruitments or from those for the years 1965-2001, 2) basing the projections on resampling historical recruits per spawner for those same years, and 3) assuming a Beverton-Holt spawner recruit relationship. The first approach was chosen by the Council for the final rebuilding plan in 2003 and was used in subsequent rebuilding analyses (for 2009: 3 year olds from the years 1965-2007; year classes 1962-2004).

The rationale for generating future recruitment by sampling historical recruitment for the rebuilding analysis conducted by Punt (2002) was that 1965-1998 was a period of relative stability in recruitment. For comparison, figure 1 plots the estimates of recruitment and recruits / spawning output from the assessments conducted by Hamel (2009) and Hamel and Ono (2011). The large but uncertain 2008 year class makes this approach less attractive, and the current norm is to use the stock-recruit relationship, so approach 3 above is used in the current rebuilding analysis. While

Hamel (2009) estimated steepness for Pacific ocean perch to be 0.51, the current assessment estimates then fixes steepness at 0.40. This does not reflect reduced current productivity so much as a higher historical stock level and therefore higher relative historical productivity.



2009: Age 3 recruits **2011: Age 0 recruits**

Figure 1: Recruitment: Pacific ocean perch assessments conducted in 2009 and 2011.

2.3 Mean generation time

The mean generation time is defined as the mean age weighted by net spawning output (see Figure 2 for net spawning output *versus* age.) The best estimate of the mean generation time is 31 years. This is 3 years longer than from the previous rebuilding analyses (Table 3).

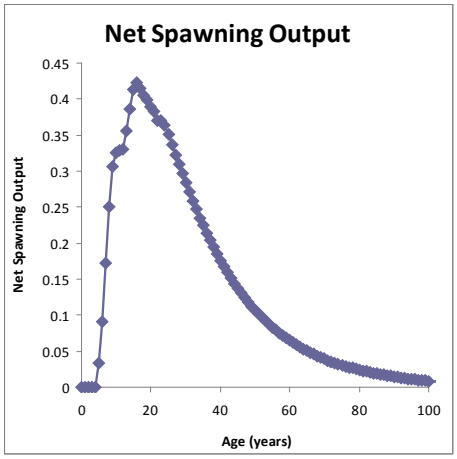


Figure 2*: Relationship between net spawning output and age for Pacific Ocean perch.*

Table 3: Summary Statistics

Value	2003	2005	2007*	2009	2011
T_{min}	2014	2015	2009	2017	2040
Mean generation time	28 years	28 years	28 years	28 years	31 years
T_{max}	2042	2043	2037	2045	2071
$T_{F=0}$ (No fishing mortality beginning in 2004, 2007, 2009, 2011 or 2013)	2014	2015	2010	2018	2043
P_{MAX}	70.0	92.9			
T_{TARGET}	2027	2017	2011	2020	TBD
SPR_{TARGET}		0.864	0.864	0.864	TBD

*** Note that a small data error in 2007 resulted in a slightly more optimistic rebuilding schedule compared to 2003 2005 or 2009.**

2.4 The harvest strategies

Table 4 summarizes the options considered in the rebuilding analyses. These include a no catch option (case 1), using the SPRs adopted for ACTs and ACLs from the last rebuilding analysis (cases 3 and 4), using the implied SPR in the current analysis from the 2011-12 ACTs (157/157 mt; case 5) or ACLs (180/183, case 6), or using the 40-10 (case 11) or OFL harvest rule (Case 12). The other 7 cases using values of $T_{rebuild}$ being the old T_{max} (2045), and a spread of cases up to the updated T_{max} (cases 7-10). I report the probability of recovering by 2045 and 2071, being the old and recalculated T_{max}.

Table 4. The 12 Scenarios explored in this rebuilding analysis including 2013 and 2014 Annual Catch (AC).

Case	Name	$T_{50\%}$	2013 AC	2014 AC	SPR	P_{2045}	P_{2071}
1	$T_{F=0}$	2043	0	0	1.000	57.3%	85.5%
2	$T_{rebuild}$ = 2045 (old T_{MAX})	2045	58	60	0.943	50.0%	81.1%
3	SPR for 2011-12 ACTs	2050	131	134	0.880	40.2%	75.0%
4	Rebuilding SPR 2005/7/9	2051	150	153	0.864	38.7%	73.2%
5	SPR from 2011-12 ACTs	2052	158	161	0.858	37.9%	72.6%
6	SPR from 2011-12 ACLs	2054	182	186	0.839	35.8%	70.1%
7	$T_{rebuild}$ = 2055	2055	199	203	0.826	34.4%	68.0%
8	$T_{rebuild}$ = 2060	2060	247	251	0.792	31.0%	62.0%
9	$T_{rebuild}$ = 2065	2065	291	295	0.762	29.3%	55.8%
10	$T_{rebuild}$ = 2071 (T_{MAX})	2071	328	333	0.738	27.9%	50.0%
11	40-10 (applied to OFL)	*	554	565	>=0.500	25.0%	25.3%
12	OFL	*	844	838	0.500	25.0%	25.2%

2.5 Other specifications

The calculations in this document were performed using 3.12b of the rebuilding software developed by Punt (2010) and the results are based on 2,000 Monte Carlo replicates (500 from each of the high and low states, and 1000 from the base case).

The definition of "recovery by year *y*" in this analysis is that the spawning output reaches $0.4B_0$ by year *y* (even if it subsequently drops below this level due to recruitment variability). Appendix 1 lists the estimates for the biological and technological parameters and the age-structure of the population at the start of 2000 and 2011. Appendix 2 lists the MPD time-series of recruitment and spawning output. The input to the rebuilding programs is given as Appendix 4. The catch for 2011 and 2012 were set to 180 and 183 mt (the Council-selected *ACLs* for 2011-2012).

3. Results

3.1 Time-to-recovery

The median year for rebuilding to the target level in the absence of fishing since the year of overfished declaration, T_{min}, is 2040. Figure 3 shows the distribution for the number of years beyond the year 2000 that it would have taken to recover to $0.4B_0$ had there been no harvest since 2000. $T_{\max}$ (T_{min} + one generation time) formerly the maximum permissible time period for rebuilding the stock to its target biomass, is 2071 when using the new information on the depletion level and the age-structure of the population in 2000. Table 3 gives summary statistics from the 2003, 2005, 2007 and 2009 rebuilding plans and the current analysis for full posterior results. The difference between the 2007 and 2009 results are largely due to the relatively low NWFSC trawl survey indices for POP in 2007 and 2008, coupled with a small data error in the 2007 assessment which was corrected in the 2009 assessment. The results for the 2011 rebuilding analysis relatively far from any of the previous analyses. While the rebuilding timeline has changed substantially from the 2009 version, the resulting catch from a SPR = 0.864 (ACL) or SPR = 0.88 (ACT) policy has a much smaller change (Table 5), since the change in timeline is due to an increase in B_0, and therefore an increase in the rebuilding target, rather than a decrease in current estimated biomass. $T_{F=0}$ (assuming zero catch from 2013 onward; 2043) is greater than T_{min} due to a dozen years with catch in the interim.

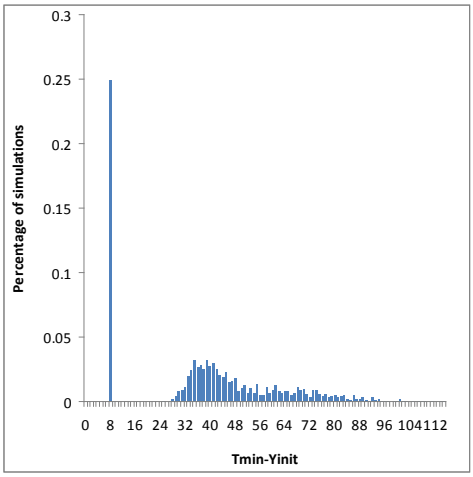


Figure 3: Distribution of time to recovery used to calculate T_{min}, the median year for rebuilding to the target level $0.4B_0$ in the absence of fishing since 2000 for the base-case analysis. The spike at 10 years indicates that for 25% of the simulations (those using the most optimistic state of nature) rebuilding occurs within 10 years.

3.2 OYs and fishing mortalities

Table 5 gives the probabilities of recovery at the old and new T_{max} (2045 and 2071) and 10 year projected Annual Catch (AC) and OFL values based on the SPR for each of the 12 cases explored in this rebuilding analysis.

Table 6 gives the ACs and OFLs for 2013 and 2014 along with the probability of rebuilding by a range of years from 2012 to 2071 given the three weighted models from the decision table and the 12 scenarios. Appendix 3 provides a similar table for strategies to provide for rebuilding by the years 2043 through 2055.

Table 5: Ten year AC/OFL projections.

Case	1		2		3		4		5		6		7		8		9		10		11		12
RUN	**F=0**		**2045**		**SPR for ACTs**		**SPR for ACLs**		**SPR from ACTs**		**SPR from ACLs**		**2055**		**2060**		**2065**		**2071**		**40-10**		**OFL**
SPR	1		0.943		0.880		0.864		0.858		0.839		0.826		0.792		0.762		0.738		>=0.500		0.500
T50%	2043		2045		2050		2051		2052		2054		2055		2060		2065		2071		*		*
P2045	57.3%		50.0%		40.2%		38.7%		37.9%		35.8%		34.4%		31.0%		29.3%		27.9%		25.0%		25.0%
P2071	85.5%		81.1%		75.0%		73.2%		72.6%		70.1%		68.0%		62.0%		55.8%		50.0%		25.3%		25.2%
10 Year projected **Catch levels** and OFLs at SPR rate above:																							
	AC	OFL	**AC**	OFL	**AC**	OFL	**AC**	OFL	**AC**	OFL	**AC**	OFL	**AC**	OFL	**AC**	OFL	**AC**	OFL	**AC**	OFL	**AC**	OFL	**AC=OFL**
2013	**0**	844	**58**	844	**131**	844	**150**	844	**158**	844	**182**	844	**199**	844	**247**	844	**291**	844	**328**	844	**554**	844	**844**
2014	**0**	867	**60**	865	**134**	862	**153**	861	**161**	861	**186**	860	**203**	860	**251**	858	**295**	857	**332**	855	**565**	848	**838**
2015	**0**	899	**62**	895	**138**	890	**158**	889	**166**	888	**191**	887	**209**	885	**258**	882	**303**	879	**341**	877	**586**	861	**842**
2016	**0**	935	**64**	929	**143**	922	**164**	919	**172**	919	**198**	916	**216**	915	**266**	910	**312**	905	**350**	901	**607**	878	**850**
2017	**0**	969	**66**	961	**147**	951	**169**	948	**177**	947	**204**	944	**222**	941	**273**	935	**320**	929	**359**	924	**623**	892	**856**
2018	**0**	999	**68**	988	**151**	976	**173**	972	**182**	971	**209**	967	**227**	964	**280**	956	**327**	948	**366**	942	**632**	901	**858**
2019	**0**	1025	**70**	1012	**154**	997	**177**	993	**185**	991	**213**	986	**232**	983	**285**	973	**332**	964	**372**	956	**635**	907	**857**
2020	**0**	1048	**71**	1033	**157**	1015	**180**	1010	**189**	1009	**217**	1003	**235**	999	**289**	987	**337**	977	**376**	968	**637**	911	**854**
2021	**0**	1071	**73**	1054	**160**	1034	**183**	1028	**192**	1026	**220**	1019	**239**	1015	**293**	1002	**341**	990	**381**	980	**643**	915	**852**
2022	**0**	1095	**74**	1076	**163**	1053	**187**	1047	**195**	1044	**224**	1037	**243**	1032	**298**	1017	**346**	1004	**386**	993	**651**	919	**850**

Table 6. Detailed management table for Pacific ocean perch.

Case	1	2	3	4	5	6	7	8	9	10	11	12
RUN	F=0	2045	SPR for ACTs	SPR for ACLs	SPR from ACTs	SPR from ACLs	2055	2060	2065	2071	40-10	OFL
AC (2013)	0.0	58.4	130.8	150.4	157.9	182.2	199.0	246.9	290.8	328.1	553.6	843.9
OFL (2013)	843.9	843.9	843.9	843.9	843.9	843.9	843.9	843.9	843.9	843.9	843.9	843.9
AC (2014)	0.0	59.8	133.6	153.5	161.1	185.8	202.7	251.0	295.2	332.5	565.2	837.7
OFL (2014)	866.6	864.6	862.1	861.5	861.2	860.4	859.8	858.2	856.6	855.4	847.6	837.7
50% Prob. Yr	2043.0	2045	2050.0	2051.0	2052.0	2054.0	2055.0	2060.0	2065.0	2071.0	NA	NA
SPR	1.000	0.943	0.880	0.864	0.858	0.839	0.826	0.792	0.762	0.738	>0.500	0.500
Probability of recovery by pre-specified years												
2012	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
2020	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
2030	25.4	25.4	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.1	25.0	25.0
2040	43.7	25.2	32.2	30.9	30.6	29.5	28.8	27.5	26.4	26.0	25.0	25.0
2045	57.3	28.8	40.2	38.7	37.9	35.8	34.4	31.0	29.3	27.9	25.1	25.0
2050	66.4	59.7	50.6	48.5	47.2	43.5	42.1	36.7	33.4	31.0	25.1	25.0
2060	76.8	72.1	65.7	64.0	62.9	58.9	56.8	50.0	44.6	39.7	25.1	25.0
2071	85.5	81.1	75.0	73.2	72.6	70.1	68.0	62.0	55.8	50.0	25.3	25.2

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Appendix 1: Biological and technological parameters used for the rebuilding analyses based on the MPD estimates. The female natural mortality rate (*M*) is 0.05 for all ages, while male *M* is 0.0514

Age	Fecundity	Female Weight	Male Weight	Female Selectivity	Male Selecitivity	*N (2000)*		*N (2011)*	
						F	M	F	M
0	0.000	0.006	0.007	0.000	0.000	3472	3472	1803	1803
1	0.000	0.030	0.032	0.061	0.061	3044	3040	1707	1704
2	0.000	0.087	0.090	0.061	0.061	1118	1115	1219	1216
3	0.000	0.168	0.173	0.063	0.063	615	613	4603	4584
4	0.000	0.258	0.265	0.084	0.086	559	556	488	485
5	0.042	0.362	0.363	0.164	0.168	1102	1094	486	482
6	0.123	0.450	0.442	0.325	0.321	1501	1488	745	738
7	0.244	0.523	0.506	0.521	0.505	571	565	1023	1013
8	0.374	0.585	0.559	0.692	0.668	295	291	267	264
9	0.481	0.641	0.604	0.805	0.785	1165	1152	622	615
10	0.537	0.690	0.644	0.859	0.854	927	917	917	905
11	0.569	0.736	0.677	0.875	0.888	972	960	1942	1914
12	0.602	0.779	0.707	0.869	0.900	717	707	1692	1665
13	0.682	0.819	0.732	0.855	0.898	551	543	618	607
14	0.778	0.856	0.754	0.839	0.891	285	279	337	331
15	0.874	0.889	0.774	0.824	0.882	622	608	304	298
16	0.940	0.920	0.790	0.811	0.872	510	496	594	580
17	0.972	0.946	0.804	0.800	0.863	310	300	801	782
18	0.998	0.970	0.816	0.792	0.856	245	236	303	295
19	1.030	0.991	0.826	0.785	0.849	548	523	155	151
20	1.058	1.008	0.834	0.779	0.844	237	224	613	596
21	1.093	1.024	0.841	0.775	0.839	261	246	488	473
22	1.115	1.037	0.847	0.771	0.835	201	187	512	496
23	1.169	1.049	0.852	0.769	0.832	164	152	378	365
24	1.209	1.059	0.856	0.766	0.830	117	108	291	280
25	1.223	1.067	0.859	0.764	0.827	127	116	150	145
26	1.236	1.075	0.862	0.763	0.826	92	84	329	315
27	1.246	1.081	0.864	0.762	0.824	67	60	270	257
28	1.255	1.086	0.866	0.760	0.823	80	71	164	156
29	1.263	1.091	0.868	0.760	0.822	135	120	130	122
30	1.270	1.095	0.869	0.759	0.821	263	232	291	271
31	1.276	1.098	0.870	0.758	0.821	134	118	126	116
32	1.280	1.101	0.871	0.758	0.820	78	67	139	127
33	1.285	1.103	0.872	0.757	0.820	62	54	106	97
34	1.288	1.105	0.872	0.757	0.819	66	56	87	79
35	1.291	1.107	0.873	0.757	0.819	76	65	62	56
36	1.294	1.109	0.873	0.756	0.819	77	65	67	60
37	1.296	1.110	0.874	0.756	0.819	79	67	49	43
38	1.298	1.111	0.874	0.756	0.818	105	88	35	31
39	1.300	1.112	0.874	0.756	0.818	103	86	42	37
40+	1.302	1.113	0.874	0.756	0.818	668	495	981	785

Appendix 2: MPD historical series of spawning output and recruitment.

Year	Recruitment (age 3)	Spawning output	Year	Recruitment (age 3)	Spawning output
1940	9,165	65,471	1976	2,450	18,508
1941	9,121	65,414	1977	3,071	18,275
1942	9,054	65,353	1978	3,340	17,968
1943	9,010	65,287	1979	3,871	17,094
1944	9,029	65,180	1980	3,115	16,269
1945	9,189	65,025	1981	6,407	15,227
1946	9,541	64,812	1982	2,540	14,624
1947	10,159	64,634	1983	2,837	14,282
1948	11,056	64,476	1984	4,098	13,691
1949	12,075	64,309	1985	4,387	13,091
1950	13,051	63,941	1986	1,763	12,596
1951	14,391	63,439	1987	3,006	12,124
1952	16,361	62,869	1988	3,460	11,855
1953	15,234	61,596	1989	4,180	11,425
1954	12,630	60,799	1990	3,586	10,973
1955	10,547	59,700	1991	4,078	10,706
1956	9,197	59,103	1992	942	10,253
1957	8,105	58,028	1993	1,688	9,827
1958	7,085	57,420	1994	4,147	9,500
1959	6,759	57,282	1995	2,870	9,303
1960	8,366	57,598	1996	1,378	9,237
1961	13,869	57,284	1997	1,438	9,202
1962	11,467	56,260	1998	2,478	9,209
1963	7,358	54,465	1999	6,400	9,168
1964	6,283	51,763	2000	6,945	9,178
1965	5,534	48,823	2001	3,096	9,405
1966	4,229	45,083	2002	1,985	9,569
1967	3,527	35,015	2003	805	9,795
1968	3,891	27,493	2004	2,921	10,072
1969	6,062	23,076	2005	2,017	10,438
1970	10,641	22,744	2006	1,250	10,941
1971	4,909	22,032	2007	1,193	11,509
1972	2,584	21,317	2008	10,709	11,985
1973	1,937	20,554	2009	2,696	12,318
1974	2,397	19,366	2010	3,589	12,450
1975	2,960	18,567	2011	3,606	12,532

Appendix 3. Table representing SPRs and catch levels for 2013 and 1014 for lowest SPRs (highest fishing rates) while achieving $T_{Rebuild}$ = 2043 through 2055.

$T_{Rebuild}$	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055
ACL(2013)	16	35	58	74	89	106	122	136	150	163	175	187	199
OFL(2013)	844	844	844	844	844	844	844	844	844	844	844	844	844
ACL(2014)	17	36	60	76	91	108	124	139	153	167	178	190	203
OFL(2014)	866	865	865	864	864	863	863	862	862	861	861	860	860
50% Year	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055
SPR	0.984	0.965	0.943	0.929	0.916	0.901	0.888	0.876	0.864	0.854	0.845	0.835	0.826
Probability of recovery by pre-specified years													
2012	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%
2020	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%
2030	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%
2040	41%	39%	37%	36%	35%	34%	33%	32%	31%	30%	30%	29%	29%
2045	56%	53%	50%	47%	46%	43%	41%	40%	39%	37%	36%	35%	34%
2050	65%	63%	60%	57%	56%	54%	52%	50%	49%	47%	44%	43%	42%
2060	75%	74%	72%	71%	70%	68%	67%	65%	64%	62%	60%	58%	57%
2071	84%	83%	81%	79%	78%	77%	76%	75%	73%	72%	71%	70%	68%

Appendix 4: Input File Ver. 2.8 (2005) (for SPR based on 2007-2010 specifications)

```
#Title
POP2011DecisionTableSPRs
# Number of sexes
2
# Age range to consider (minimum age; maximum age)
0 40
# Number of fleets
1
# First year of projection (Yinit)
2011
# First Year of rebuilding period (Ydecl)
2000
# Number of simulations
2000
# Maximum number of years
300
# Conduct projections with multiple starting values (0=No;else yes)
1
# Number of parameter vectors
4
# Is the maximum age a plus-group (1=Yes;2=No)
1
# Generate future recruitments using historical recruitments (1)  historical recruits/spawner (2)  or
a stock-recruitment (3)
3
# Constant fishing mortality (1) or constant Catch (2) projections
1
# Fishing mortality based on SPR (1) or actual rate (2)
1
# Pre-specify the year of recovery (or -1) to ignore
-1
# Fecundity-at-age
# 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35
36 37 38 39 40
 0 0 0 0 0 0.0420226 0.122927 0.24357 0.373559 0.480615 0.53664 0.568945 0.602341 0.681994 0.777746
0.873797 0.940049 0.972004 0.998125 1.02996 1.05773 1.09338 1.11452 1.16857 1.20902 1.22332 1.23565
1.24625 1.25535 1.26314 1.26982 1.27554 1.28043 1.28461 1.28819 1.29124 1.29385 1.29608 1.29799
1.29962 1.30191 #female fecundity; weighted by N in year Y_init across morphs and areas
# Age specific selectivity and weight adjusted for discard and discard mortality
#wt and selex for "gender fleet:" 1 1
0.00608269 0.0300204 0.086782 0.167835 0.258423 0.362366 0.450207 0.522858 0.585365 0.640505 0.690281
0.736195 0.77904 0.818978 0.855834 0.889393 0.919546 0.946332 0.969911 0.990522 1.00844 1.02396
1.03735 1.04888 1.05879 1.0673 1.0746 1.08085 1.0862 1.09077 1.09469 1.09803 1.10089 1.10333 1.10541
1.10719 1.10871 1.11001 1.11111 1.11206 1.11339
0 0.0606962 0.0608449 0.0629117 0.0836812 0.164472 0.324523 0.521415 0.692429 0.80453 0.859415
0.874945 0.869329 0.855023 0.838812 0.823743 0.810857 0.800264 0.791717 0.784869 0.77939 0.774995
0.771454 0.768588 0.766255 0.764361 0.762818 0.761545 0.760489 0.759611 0.758877 0.758263 0.757747
0.757313 0.756947 0.756638 0.756377 0.756156 0.755968 0.755809 0.755586
#wt and selex for "gender fleet:" 2 1
0.00678297 0.0320324 0.0900501 0.173222 0.265429 0.363317 0.442136 0.505662 0.558966 0.604481 0.64363
0.677477 0.706852 0.732374 0.754498 0.773586 0.789957 0.803912 0.815739 0.825713 0.834089 0.841098
0.846947 0.851817 0.855863 0.859223 0.86201 0.864316 0.866224 0.867801 0.869104 0.87018 0.871068
0.871801 0.872406 0.872905 0.873317 0.873656 0.873936 0.874167 0.874458
0 0.0606525 0.0608469 0.0632023 0.0859328 0.167995 0.321138 0.504983 0.668267 0.784919 0.854447
0.888322 0.899554 0.898279 0.891078 0.881736 0.872223 0.863445 0.855742 0.849167 0.843644 0.83905
0.835248 0.832112 0.82953 0.827411 0.825677 0.824253 0.823085 0.822126 0.821338 0.82069 0.820157
0.819718 0.819357 0.81906 0.818816 0.818614 0.818448 0.818312 0.81814
# M and current age-structure in year Yinit: 2011
 # gender = 1
0.05    0.05    0.05    0.05    0.05    0.05    0.05    0.05    0.05    0.05    0.05    0.05    0.05    0.05
       0.05    0.05    0.05    0.05    0.05    0.05    0.05    0.05    0.05    0.05    0.05    0.05    0.05    0.05
       0.05    0.05    0.05    0.05    0.05    0.05    0.05    0.05    0.05    0.05    0.05    0.05    0.05    0.05
       0.05
1803.23 1706.78 1219.21       4603.39 487.627 485.555 744.636 1023.03 266.863 622.383 917.146 1942.38
       1691.68 617.703 337.465 304.163 593.896 801.277 302.587 155.39  613.284 488.039 511.871 377.923
       290.912 150.457 328.811 269.79  164.317 129.849 290.655 125.591 138.624 106.387 87.0691 62.1805
       67.4315 49.0583 35.4553 42.218  980.563
# gender = 2
 0.051378187   0.051378187    0.051378187    0.051378187    0.051378187    0.051378187    0.051378187
       0.051378187    0.051378187    0.051378187    0.051378187    0.051378187    0.051378187
       0.051378187    0.051378187    0.051378187    0.051378187    0.051378187    0.051378187
```

```
       0.051378187    0.051378187    0.051378187    0.051378187    0.051378187    0.051378187
       0.051378187    0.051378187    0.051378187    0.051378187    0.051378187    0.051378187
       0.051378187    0.051378187    0.051378187    0.051378187    0.051378187    0.051378187
       0.051378187    0.051378187    0.051378187    0.051378187
1803.23 1704.43 1215.86 4584.4  484.945 482.211 738.465 1013.18 263.967 614.92  905.072 1914.22 1664.53
       606.74  330.887 297.715 580.319 781.603 294.666 151.109 595.665 473.404 495.69  365.169 280.33
       144.524 314.647 256.935 155.572 122.115 271.34  116.341 127.419 97.059  78.8642 55.9074 60.1615
       43.4342 31.168  36.8741 785.162
# Age-structure at Ydeclare= 2000
 3472.26 3044 1118.23 615.115 559.015 1101.96 1500.78 570.977 294.566 1164.86 927.126 971.644 716.572
550.955 284.653 621.538 509.606 310.197 245.014 548.234 236.818 261.329 200.517 164.079 117.161
127.041 92.4177 66.7867 79.5205 135.114 262.669 134.413 77.5107 62.239 65.7769 75.9145 76.8051
79.1912 105.07 103.392 668.477
 3472.26 3039.8 1115.15 612.578 555.936 1094.27 1487.99 565.393 291.494 1152.49 917.076 960.384
707.193 542.517 279.484 608.036 496.193 300.273 235.588 523.273 224.287 245.579 187.024 151.937
107.693 115.873 83.6474 60.0197 71.0031 119.896 231.579 117.672 67.3753 53.7464 56.4578 64.7591
65.0679 66.5809 87.7738 86.1482 494.515
# 20) Year for Tmin Age-structure (set to Ydecl by SS)
2000
#  recruitment and biomass
# 21) Number of historical assessment years
73
# 22) Historical data
# year recruitment spawner in B0 in R project in R/S project
1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950 1951 1952 1953 1954 1955 1956 1957 1958
1959 1960 1961 1962 1963 1964 1965 1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978
1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998
1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 #years (with first value
representing R0)
9328.97 9165.24 9121.09 9053.5  9009.7  9028.94 9189.39 9540.83 10158.5 11055.6 12075.1 13051.4 14391.3
       16360.7 15233.6 12629.9 10547.4 9196.69 8104.83 7084.76 6758.58 8366.46 13868.6 11466.7 7357.65
       6282.58 5533.99 4229.29 3527.37 3891.32 6061.71 10641.1 4908.72 2584.03 1936.56 2396.92 2960.05
       2449.93 3070.59 3340.45 3871.02 3114.83 6407.03 2539.6  2836.8  4097.79 4386.62 1762.89 3005.85
       3459.93 4180.4  3585.82 4077.68 942.258 1687.9  4147.09 2870.49 1378.22 1437.7  2478.1  6400.13
       6944.52 3096.09 1984.91 804.669 2920.91 2017.25 1249.79 1193.05 10708.6 2696.09 3588.57 3606.47
65559.7 65470.6 65414   65352.8 65287.2 65179.7 65025   64811.5 64634.3 64476.1 64309.2 63941   63438.5
       62868.7 61595.9 60799.3 59700.3 59103.1 58028   57419.6 57282.3 57598.2 57284.2 56259.6 54465.2
       51762.9 48822.6 45083.4 35014.9 27492.7 23075.5 22743.8 22032.4 21316.7 20554.3 19365.7 18566.9
       18508.4 18275   17967.6 17093.5 16268.5 15226.7 14624.4 14282   13691.3 13091.3 12596.2 12124.4
       11854.7 11424.9 10972.7 10706.3 10252.6 9826.99 9500.05 9303.17 9237.28 9202.24 9209.29 9167.72
       9178.16 9405.45 9569.44 9794.51 10072.3 10438.4 10940.5 11509.2 11985.3 12318.2 12450.3 12532.1 #
spbio; first value is S0 (virgin)
1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
# 23) Number of years with pre-specified catches
2
# 24) catches for years with pre-specified catches go next
2011 180
2012 183
# 25) Number of future recruitments to override
12
# Process for overiding (-1 for average otherwise index in data list)
2000  1 2000
2001  1 2001
2002  1 2002
2003  1 2003
2004  1 2004
2005  1 2005
2006  1 2006
2007  1 2007
2008  1 2008
2009  1 2009
2010  1 2010
2011  1 2011
# 27) Which probability to produce detailed results for (1=0.5; 2=0.6; etc.)
3
# Steepness sigma-R Auto-correlation
0.4 0.7 0
# Target SPR rate (FMSY Proxy); manually change to SPR_MSY if not using SPR_target
```

```
0.5
# Discount rate (for cumulative catch)
0.1
# Truncate the series when 0.4B0 is reached (1=Yes)
0
# Set F to FMSY once 0.4B0 is reached (1=Yes)
0
# Maximum possible F for projection (-1 to set to FMSY)
-1
# Defintion of recovery (1=now only;2=now or before)
2
# Projection type
4
# Definition of the 40-10 rule
10 40
# 37) Calculate coefficients of variation (1=Yes)
0
# Number of replicates to use
10
# Random number seed
-99004
# File with multiple parameter vectors
DecTabfourstates.SSO
# User-specific projection (1=Yes); Output replaced (1->9)
1  6
# 42) Catches and Fs (Year; 1/2/3 (F or C or SPR); value); Final row is -1
2013 3 0.839
-1 -1 -1
# Fixed catch project (1=Yes); Output replaced (1->9); Approach (-1=Read in else 1-9)
0 2 -1
# Split of Fs
2011  1
-1 1
# 45) Yrs to define T_target for projection type 4 (a.k.a. 5 pre-specified inputs)
2045 2055 2060 2065 2071
# Eight years for probability of recovery
2012 2020 2030 2040 2045 2050 2060 2071
# Time varying weight-at-age (1=Yes;0=No)
0
# File with time series of weight-at-age data
none
# Use bisection (0) or linear interpolation (1)
0
# Target Depletion
0.4
# CV of implementation error
0
```

Rebuilding analysis for yelloweye rockfish based on the 2011 update stock assessment

Ian G. Taylor
National Marine Fisheries Service
Northwest Fisheries Science Center
2725 Montlake Blvd. E.
Seattle WA, 98112
206-861-7603 (phone)
206-860-6792 (fax)
Ian.Taylor@noaa.gov

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Summary

Based on the 2011 update stock assessment, this rebuilding analysis compares the results of applying a suite of potential future management actions to the U.S. yelloweye rockfish stock. The base case model for the 2011 assessment estimated that the yelloweye rockfish resource is at 21.4% of the unexploited equilibrium spawning output at the beginning of 2011. This represents a small increase from the 2009 stock assessment, which estimated depletion in 2009 to be 20.3%. Uncertainty about the base case results is included through the integration over eight alternate (and less likely) states of nature along two axes of uncertainty: steepness (h) and the magnitude of historical catch prior to 2000. In the yelloweye assessment, steepness is the primary parameter governing productivity and the rebuilding trajectory, while the magnitude of catch determines the absolute scale of the population estimate. The 2011-2012 ACLs (previously called OYs) used in this analysis are assumed to be the NMFS preferred alternative of 17 mt. In the context of the 2011 update assessment, the 17 mt ACLs are slightly below those associated with a projection using the NMFS preferred alternative SPR of 76%, which in turn is estimated to be far below that which would result in overfishing.

Assuming the 2011 and 2012 ACLs of 17 mt are removed, various management options for 2013 and beyond are considered ranging from zero fishing mortality to the largest removal that could occur without overfishing (OFL catches, previously known as ABC catches). In the absence of any future fishing mortality (beginning in 2013 and assuming a 2011 and 2012 ACL of 17 mt) the yelloweye rockfish stock is projected to have a 50% probability of recovery to the rebuilding target ($SB_{40\%}$) by 2045, slightly sooner than the estimate of 2047 from the 2009 rebuilding analysis. In contrast, the stock is not projected to reach this level within the next 500 years if the full OFL catches are removed. The current NMFS preferred alternative rebuilding harvest rate (SPR = 76%) would produce an ACL of 17.8 mt in 2011 (18.1 mt in 2012) and has a 50% probability of rebuilding by 2067. This is a slightly faster rebuilding rate under the updated model parameters than that associated with the NMFS preferred alternative T_{TARGET} = 2074, which has an associated SPR = 72.7% and would produce an ACL of 21.0 mt in 2011 (21.4 mt in 2012). A range of additional management approaches to recovery based on historical and recalculated reference points are presented.

Introduction

The yelloweye rockfish (*Sebastes ruberrimus*) stock was determined to be "overfished" in 2002, based on the 2001 stock assessment (Wallace 2001) which included only the California and Oregon portions of the stock. The next assessment included the entire U.S. coastal population (Methot et al. 2002) and estimated that the stock was at 24% of unexploited spawning biomass in 2002. An updated rebuilding analysis was conducted (Methot and Piner 2002) and the estimated rebuilding parameters were adopted by the Pacific Fishery Management Council (PFMC 2004). Subsequent rebuilding analyses were conducted on the basis of the 2005 (Wallace et al. 2005), 2006 (Wallace et al. 2006), 2007 (Wallace 2008), and 2009 (Stewart et al. 2009) stock assessments.

The 2002 rebuilding analysis estimated that the mean generation time for yelloweye rockfish was 44 years, and that if no fishing occurred beginning in 2003 there would be a 50% chance of rebuilding by 2027. The estimated value for steepness (h) from the 2002 assessment was 0.437, and the degree of recruitment variability (σ_r) was assumed to be 0.4. Management alternatives with ACLs for 2003 between 22 and 27 mt were presented.

The 2005 rebuilding analysis (Tsou and Wallace 2005) was based on the updated stock assessment and estimates of steepness, and recruitment variability that were unchanged from 2002. Mean generation time was again estimated to be 44 years, but the year in which a 50% chance of rebuilding was projected to be achieved was increased to 2036. The maximum allowable rebuilding time (T_{MAX}) was estimated to be 2071, and the probability of achieving this target under the target F of 0.0153 was 80%.

A full stock assessment and subsequent rebuilding analysis (Tsou and Wallace 2006) was conducted in 2006. The 2006 assessment included area-specific models and revised the assumed values for natural mortality (from 0.045 to 0.036), steepness (from 0.437 to 0.45) and the degree of recruitment variability (from 0.4 to 0.5). The 2006 assessment estimated the 2006 depletion level to be 17.7%, somewhat lower than previous analyses. As a result of these changes, the rebuilding plan estimated that the mean generation time was 50 years and that in the absence of fishing beginning in 2007 the coastwide yelloweye stock would not rebuild to target levels with a 50% probability until 2046. The selected target SPR rate was 71.9%, with further reductions in the 2007 and 2008 ACL levels to 14.0 and 14.3 mt respectively if this rate were to be maintained. The results of this rebuilding analysis were included in Amendment 16-4 of the 2006 Pacific Coast Groundfish Fishery Management Plan (PFMC 2006) re-evaluating and revising the yelloweye rockfish rebuilding plan so that the rebuilding periods are as short as possible, taking into account the status and biology of the species, the socioeconomic needs of West Coast fishing communities, and the interaction of the depleted species within the marine ecosystem. The council ultimately adopted a 'ramp-down' from the *status quo* catch levels to those consistent with the SPR target of 71.9%, which led to ACLs in 2007 and 2008 of 23 and 20 mt.

The 2007 updated yelloweye assessment included several changes which led to an overall downward revision in the estimate of current spawning biomass and the level of relative depletion, compared to the 2006 assessment. The 2007 rebuilding plan was consistent with previous analyses in predicting an extremely long period need to achieve

target stock levels, and did not require a revision of the target reference points or strategy from the previous analysis. The median year to rebuild with no fishing mortality beginning in 2009 was estimated to be 2049, and it was estimated that recovery would not be achieved at an SPR rate consistent with OFL harvest levels (50.0%). The median year to rebuild under the SPR target (71.9%) was estimated to be 2082. An SPR of 71.2% (slightly more fishing mortality) was estimated to be possible and still achieve a 50% probability of recovery by the target year in Amendment 16-4, 2084. Management alternatives were presented that included the 'ramp-down' from *status quo* ACL levels to those consistent with the SPR target of 71.9% by 2011, as well as immediate (2009) implementation of this level. The 'ramp-down' alternative provided in the 2007 rebuilding analysis consisted of 2009 and 2010 harvest of 17 and 14 mt respectively. Subsequent analysis indicated no change in the estimated year for rebuilding with a 50% probability for the option ultimately accepted by the council of 17 mt harvest in both years.

In the 2009 assessment (Stewart et al. 2009), all major structural and parameter assumptions from previous stock assessments were revisited. Revised inputs included the weight-length relationship, the maturity schedule, and the addition of a fecundity relationship. Instead of fixed parameter values, natural mortality and steepness were estimated, as well as all growth parameters. Structural changes included use of a two-sex model, with explicit treatment of areas (California, Oregon and Washington) linked via a common stock-recruit relationship and the removal of stochastic recruitment variability over the limited period for which it had been estimated in previous assessments (1968-1992). Because a fecundity relationship was used for yelloweye specifying that spawning output per unit weight increases with fish weight, all reference to spawning output was in terms of eggs produced, instead of spawning biomass.

The 2009 rebuilding analysis (Stewart 2009) had relatively similar results to the 2007 rebuilding analysis in spite of being based on a substantially revised assessment model, and with the added complexity of integrating uncertainty over a matrix of 9 states of nature. The SPR_{TARGET} = 71.9% was retained, and the associated values of Mean generation time, T_{TARGET}, T_{MIN}, and T_{MAX} all remained within 3 years of the values estimated in 2007. In 2010, a new SPR_{TARGET} = 76% was chosen (the "NMFS preferred alternative"). This was the SPR consistent with the status-quo catch of 17 mt and had an associated T_{TARGET} = 1974.

Summary of 2011 update assessment

The 2011 update assessment for yelloweye (Taylor and Wetzel 2011) retained all the model assumptions of the 2009 assessment, but added additional age and length composition data and extended and recalculated the indices of abundance. Estimated quantities from the update assessment were very similar to the those estimated in the 2009 assessment, with very small increases in the estimated equilibrium spawning output (from 994 to 1028 million eggs), in the stock-recruit steepness parameter (from 0.417 to 0.441) and in the stock status (from 20.3% to 21.3% in 2009). The estimated current (2011) status from the 2011 update assessment was a depletion of 21.4%.

Although the base case assessment models for 2009 assessment and 2011 update captured some uncertainty via asymptotic intervals, uncertainty from two sources is reported through alternate states of nature bracketing the base case results and included

explicitly in the decision table. The magnitude of the estimated catch time-series has a large influence on the estimate of stock size and the estimate of steepness of the stock-recruit relationship was closely linked to the projected recovery rates. Alternate values of each were used to bracket the best estimates with marginal probabilities one-half as likely. For historical catch these values, 75% and 150% of the estimated catch series prior to 2000 was retained to match the choices made in the 2009 assessment. For steepness the 12.5^{th} and 87.5^{th} percentiles were calculated from the likelihood profile as a proxy for the probability distribution about this point estimate. This profile reflected the additional data added since 2009 and thus the resulting steepness values were slightly different than in the 2009 assessment and rebuilding plan.

These two axes of uncertainty were both assigned a marginal probability such that the base case model was twice as likely as either the low or higher alternative (Table 1). Following the 2009 rebuilding plan, all nine combinations from these two axes are used in this analysis to provide a more realistic degree of uncertainty in this rebuilding analysis.

Management performance under rebuilding

Following the 2002 declaration that the yelloweye rockfish stock was overfished the catch of yelloweye was reduced well below the 2001 level and maintained between 10.9 and 23.0 mt since then (Table 2). These catch levels represent a 95% reduction from average catches observed in the 1980s and 1990s. Managers have constrained catches by eliminating all retention of yelloweye rockfish in both commercial and recreational fisheries, instituting broad spatial closures (some specifically for moving fixed-gear fleets away from known areas of yelloweye abundance), and creating new gear restrictions intended to reduce trawling in rocky shelf habitats and the coincident catch of rockfish in shelf flatfish trawls. From 2002-2010, the total yelloweye catch (126.6 mt) has been only 68% of the sum of the ACLs for 2002-2010 and only 32% of the sum of the OFLs for that period. The total 2010 catch (11.4 mt) is estimated to be just 2.5% of the peak annual catch that occurred in the early 1980s.

Rebuilding calculations

This rebuilding analysis was conducted using software developed by A. Punt (version 3.12b, January 2010). No changes to the rebuilding calculations occurred between this version and the previous version used in the 2009 yelloweye rebuilding analysis. Because the rebuilding software does not have the capability for modeling area-based dynamics consistent with those in Stock Synthesis, there may be some differences in the rebuilding trajectory estimated here and that from the stock assessment. The steps followed were:

1. Define how virgin biomass (SB_0) will be calculated.
2. Define how future recruitment will be generated.
3. Define the fishery selectivity and allocation to be applied during rebuilding.
4. Decide how to include uncertainty in input parameters from the stock assessment in the rebuilding analysis.
5. Recalculate rebuilding reference points from the most current assessment results
   a) Calculate the projected year in which the stock would rebuild with a 50% probability if all future fishing mortality was eliminated ($T_{F=0}$).

b) Calculate the projected year for a 50% probability of rebuilding from the year in which the stock was first declared overfished (T_{MIN}).
c) Calculate the mean generation time.
d) Calculate the maximum allowable rebuilding time (T_{MAX}).

6. Identification and analysis of alternative harvest strategies for rebuilding.

The method of calculation used in each case was identical to that used in the 2009 rebuilding analysis although the range of years considered was shifted to reflect the update assessment.

1. Definition of SB_0

The equilibrium spawning output level (SB_0) used in this rebuilding analysis is calculated via the stock-recruitment, growth, maturity and fecundity relationships in order to be consistent with assessment model results. This level is estimated to be 1028 million eggs in the base case assessment model, which dictates that the rebuilding target ($SB_{40\%}$) is 411 million eggs. This result is highly uncertain, based on the range of values among the nine states of nature (Table 3), and this uncertainty is included in rebuilding projections.

2. Generation of future recruitment

The estimated parameters of the stock recruitment relationship (unexploited equilibrium recruitment [natural log of R_0], and steepness [h]) for each of the nine states of nature, are used to generate future recruitments in the rebuilding analysis. Because the degree of recruitment variability (σ_r) was not a component or result of the 2009 stock assessment or the 2011 update assessment, a value of 0.5 is used to be consistent with the last three rebuilding analyses. The values for equilibrium recruitment and steepness for each combination of the two states of nature are provided in Table 4.

3. Fishery selectivity and allocation

In order to project the effect of fishing on the yelloweye rockfish rebuilding trajectory, it is necessary to specify the fishery selectivity and relative allocation among fleets. This rebuilding analysis projects forward using selectivity and allocation averaged over recent years (2007-2009), not including the terminal year with catch, 2010, since these catches are projected based on the GMT scorecard and may not well reflect the final fleet-specific values in that year. This choice also provides some consistency between assessment model results and short term-forecasts from the rebuilding analysis, although the two still may differ. The resulting selectivity and weight at age are included in the basic input data files (Appendices A and B).

4. Inclusion of uncertainty

Uncertainty is included in this rebuilding analysis via 1,600 random simulations of stochastic future recruitment strengths and integration over the nine combinations of the two states of nature. The choice of 1,600 simulations was designed to be evenly divisible by 16, which allows the 9 states of nature to be sampled exactly in proportion to the relative probabilities in Table 1. However, analyses conducted in 2009 indicated that

there was no appreciable change in results between 1,000 simulations and 1,600 simulations.

5. Recalculate reference points

The median year of recovery in the absence of fishing ($T_{F=0}$) was calculated by setting fishing mortality to zero in 2013, and is equal to 2045. The value for T_{MIN}, the median year for rebuilding to the target level in the absence of fishing since the year of declaration (2000) is 2037 (revised downward from 2044 in the 2009 analysis).

The estimated generation time has increased by one year to 46 years compared to the 2009 analysis. In conjunction with T_{MIN}, the mean generation time dictates the revised estimate of T_{MAX}, 2083 (decreased from 2089 in the 2009 analysis). The NMFS preferred alternative harvest rate (SPR_{TARGET} = 76%) is revised from the 2009 rebuilding analysis (which used SPR = 71.9%), and the NMFS preferred alternative T_{TARGET} of 2074 is revised from the 2009 T_{TARGET} = 2087. The SPR = 76% harvest rate generates a P_{MAX} (probability of recovery by T_{MAX}) of 72.9%, which is higher than 2009 estimate of 52.3% because the higher SPR value and updated stock dynamics more than offsets the reduction in T_{MAX}.

All reference points from Amendment 16-4, the 2009 rebuilding analysis, and those recalculated here are summarized in Table 5.

6. Alternate rebuilding strategies

Assuming that a constant rate of harvest will be applied throughout a rebuilding period, the basis for rebuilding alternatives can be divided into two approaches: 1) strategies based on selection of a harvest rate, and 2) strategies based selection of a T_{TARGET} (year for 50% probability of recovery). The result of each of these strategies is contingent on the actual ACL removed in 2011 and 2012, which are assumed to be 17 mt. This rebuilding analysis therefore presents 13 alternate strategies:

1) Eliminate all harvest beginning in 2013 (F=0),
2) Apply the harvest rate that would currently generate 14 mt 2013-14 average ACL (SPR=80.5%),
3) Apply the harvest rate that would currently generate the 17 mt 2012 ACL (SPR=76.5%),
4) Apply the NMFS preferred alternative current rebuilding harvest rate (SPR_{TARGET}=76%),
5) Apply the harvest rate that is estimated to generate a 50% probability of recovery by the NMFS preferred alternative T_{TARGET} (2074, SPR=72.7%),
6) Apply the harvest rate that estimated to generate a 50% probability of recovery by the T_{MAX} from 2011 (2083, SPR=69.7%),
7) Apply the harvest rate that estimated to generate a 50% probability of recovery by the T_{MAX} from 2009 (2089, SPR=68.2%),
8) Apply a 40:10 harvest policy,
9) Apply the OFL harvest rate ($SPR_{50\%}$),

Apply the harvest rate that achieves a 50% probability of recovery for years distributed between $T_{F=0}$ (2045) and the current T_{MAX} (2083):

10) 2053,
11) 2061,
12) 2069,
13) 2077.

Results

Summary results from all alternatives are presented in Table 6. Detailed results are presented in Tables 7-9 and Figures 1-3. In the absence of any future fishing mortality, the yelloweye rockfish stock is projected to have a 50% probability of recovery to the rebuilding target (SB40%) by 2045 (alternative 1). In contrast, the stock is not projected to reach this level during the 500 years over which this projection was performed if the OFL catches are removed (alternative 9). The SPR proxy target used to generate OFL catches is 50%, which represents substantially more fishing mortality than that estimated to produce MSY for the base case assessment model (SPR = 57.7%) occurring at an estimated 38.1% relative depletion. Even the most optimistic state of nature predicts MSY harvest to be achieved with less fishing mortality (SPR = 51.5%) than the MSY proxy. These two scenarios (alternatives 1 and 9) bound the range of fishing mortality between none and the overfishing level. All other scenarios lie within this range.

Fishing at the NMFS preferred alternative SPR target (alternative 4, SPR = 76%) results in an increase from the 17 mt ACL in 2012 to 17.8 mt in 2013. This harvest rate has a 50% probability of recovery by the year 2067, a 62.1% probability of recovery by T_{TARGET} = 2074 (the NMFS preferred alternative), and a 72.9% probability of recovery by T_{MAX} = 2083. The SPR that best matches the 17 mt ACL for 2011 and 2012 is 76.5%, indicating that under the updated estimates of stock dynamics, the current harvest rates are very close to the NMFS preferred alternative SPR target. The harvest rate calculated from the 2011 assessment that is most consistent with the 2012 ACL (17 mt) is SPR = 76.5% (alternate 2), which is close to the NMFS preferred alternative of 76%.

Alternate management actions 10-13 are based on the SPR rates that result in a 50% probability of recovery by a set of 4 years spanning the range between $T_{F=0}$ in 2013 (2045) and slightly above the recalculated T_{MAX} (2083). As expected, the SPR rates for these alternatives (Table 6) are fairly evenly distributed between those associated the $T_{F=0}$ and T_{MAX} rates, from SPR = 86.4% for alternative 8 with 50% probability of recovery in 2053 to SPR = 71.6% for alternative 11 with 50% recovery in 2077.

In general, the connection between SPR rates of rebuilding and predicted year of 50% probability of rebuilding are consistent with those estimated for the 2009 yelloweye rebuilding plan, with slightly faster rebuilding associated with the slightly higher estimates of stock-recruit steepness and stock status in the 2011 update assessment compared to the 2009 assessment.

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Tables

Table 1. Relative probabilities for combinations of the two alternate states of nature used to represent uncertainty in this rebuilding analysis.

		Historical catch		
		Low	Best estimate	High
Steepness	Low	6.25%	12.5%	6.25%
	Estimated value	12.5%	25%	12.5%
	High	6.25%	12.5%	6.25%

Table 2. Yelloweye rockfish management performance under rebuilding.

Year	OFL (mt)[1]	ACL (mt)[1]	Commercial Catch (mt)[2]	Recreational Catch (mt)	Total Catch (mt)
2002	27[3]	13.5[3]	6.4	9.3	15.8
2003	52	22	3.0	9.4	12.4
2004	53	22	4.3	8.0	12.3
2005	54	26	4.7	10.4	15.1
2006	55	27	3.7	8.7	12.4
2007	47	23	6.0	13.6	19.6
2008	47	20	7.7	9.0	16.7
2009	31	17	3.4	7.5	10.9
2010	32	17	5.5	5.9	11.4

[1]OFL and ACL were called ABC and OY prior to 2010.
[2]Includes research catches.
[3]Includes the Columbia, Vancouver and Eureka INPFC areas only.

Table 3. Unexploited spawning output (SB_0, millions eggs) for the nine states of nature included in this rebuilding analysis.

		Historical catch		
		Low	Best estimate	High
Steepness	Low	770	1,023	1,532
	Estimated value	773	1,028	1,537
	High	777	1,033	1,545

Table 4. Stock recruitment parameters R_0 (1000s) and steepness (h) for the nine states of nature included in this rebuilding analysis.

		Historical catch		
		Low	Best estimate	High
Steepness	Low = 0.383	178	235	348
	MLE = 0.441	174	228	338
	High = 0.508	171	224	331

Table 5. Summary of rebuilding reference points for yelloweye rockfish from Amendment 16-4, the 2009 rebuilding analysis, and recalculated values based on the 2011 assessment results.

	Source		
Parameter	Amendment 16-4	2009 Rebuilding analysis	2011 Rebuilding analysis
SB_0 ([1]Spawning biomass or [2]Millions eggs)	3,322[1]	994[2]	1028[2]
Rebuilding target ($SB_{40\%}$)	1,329[1]	398[2]	411[2]
SB_{2011} (Millions eggs)	NA	NA	219
T_{MIN}	2046	2044	2037
Mean generation time	50	45	46
T_{MAX}	2096	2089	2083
$T_{F=0}$ (begin in 2007)	2048	NA	NA
$T_{F=0}$ (begin in 2011)	NA	2047	NA
$T_{F=0}$ (begin in 2013)	NA	NA	2045
P_{MAX}	80.0%	52.3%	72.9%
T_{TARGET}	2084	2087	2074[3]
SPR_{TARGET}	71.9%	71.9%	76%[3]

[3]T_{TARGET} and SPR_{TARGET} for 2011 rebuilding analysis are the NMFS preferred alternatives.

Table 6. Results of rebuilding alternatives based on selection of an SPR target or year for 50% probability of recovery. Alternatives 1-9 are ordered by decreasing SPR (bold). Alternatives 10-13 are sorted by increasing year of 50% probability of recovery (bold).

Run	1	2	3	4	5	6	7	8	9	10	11	12	13
Basis	F=0 2013+	SPR with 2013-14 avg. ACL of 14 mt	SPR from 2012 ACL of 17 mt	SPR = 76%	SPR that achieves 50% prob. recovery by T_{TARGET}	SPR that achieves 50% prob. recovery by 2011 T_{MAX}	SPR that achieves 50% prob. recovery by 2009 T_{MAX}	40:10 Harvest policy	OFL harvest rate SPR = 50%	SPR that achieves 50% prob. recovery by 2053	SPR that achieves 50% prob. recovery by 2061	SPR that achieves 50% prob. recovery by 2069	SPR that achieves 50% prob. recovery by 2077
2013 ACL (mt)	0.0	13.8	17.4	17.8	21.0	24.1	25.7	37.7	51.2	9.1	14.7	19.1	22.1
2013 OFL (mt)	51.2	51.2	51.2	51.2	51.2	51.2	51.2	51.2	51.2	51.2	51.2	51.2	51.2
2014 ACL (mt)	0.0	14.1	17.7	18.1	21.4	24.5	26.0	38.3	51.4	9.3	15.0	19.4	22.5
2014 OFL (mt)	52.5	52.2	52.1	52.1	52.1	52.0	52.0	51.7	51.4	52.3	52.2	52.1	52.0
50% prob. recovery by:	2045	2060	2066	2067	2074	2083	2089	NA	NA	**2053**	**2061**	**2069**	**2077**
SPR_{TARGET}	**100.0%**	**80.5%**	**76.5%**	**76.0%**	**72.7%**	**69.7%**	**68.2%**	**>=50%**	**50.0%**	86.4%	79.5%	74.7%	71.6%
Probability of recovery by reference points based on the 2009 rebuilding analysis:													
2044 (T_{MIN})	46.9%	15.9%	9.6%	8.7%	4.5%	2.6%	1.3%	0.0%	0.0%	24.9%	14.9%	6.9%	3.7%
2047 ($T_{F=0}$ from 2011)	62.0%	22.0%	15.4%	14.6%	8.8%	4.9%	3.5%	0.0%	0.0%	31.1%	19.9%	12.7%	6.8%
2087 (T_{TARGET})	100.0%	85.8%	77.5%	75.8%	65.6%	53.8%	47.9%	0.3%	0.1%	95.8%	83.4%	72.3%	61.2%
2089 (T_{MAX})	100.0%	87.7%	79.1%	77.5%	67.6%	55.4%	50.0%	0.4%	0.1%	96.8%	84.8%	73.7%	63.6%
Probability of recovery by recalculated 2011 reference points:													
2037 (T_{MIN})	22.9%	2.0%	0.6%	0.6%	0.1%	0.1%	0.1%	0.0%	0.0%	6.8%	1.8%	0.2%	0.1%
2045 ($T_{F=0}$ from 2013)	52.5%	17.8%	11.9%	11.2%	5.9%	3.1%	2.2%	0.0%	0.0%	26.7%	16.4%	8.6%	4.7%
2067 ($T_{SPR\ TARGET}$)	96.2%	66.5%	52.8%	50.9%	38.8%	29.2%	24.1%	0.0%	0.0%	77.9%	62.9%	45.6%	34.6%
2074 (T_{TARGET})	99.2%	75.1%	64.1%	62.1%	50.0%	37.2%	32.1%	0.2%	0.0%	85.3%	73.2%	57.7%	45.6%
2083 (T_{MAX})	99.9%	82.8%	73.9%	72.9%	61.3%	50.0%	42.8%	0.2%	0.1%	93.7%	81.0%	68.6%	57.2%

Table 7a. Probability of recovery for rebuilding alternatives for the years 2011-2030 (additional years in Table 7b)

Run	1	2	3	4	5	6	7	8	9	10	11	12	13
Basis	F=0 2013+	SPR with 2013-14 avg. ACL of 14 mt	SPR from 2012 ACL of 17 mt	SPR = 76%	SPR that achieves 50% prob. recovery by T_{TARGET}	SPR that achieves 50% prob. recovery by 2011 T_{MAX}	SPR that achieves 50% prob. recovery by 2009 T_{MAX}	40:10 Harvest policy	OFL harvest rate SPR = 50%	SPR that achieves 50% prob. recovery by 2053	SPR that achieves 50% prob. recovery by 2061	SPR that achieves 50% prob. recovery by 2069	SPR that achieves 50% prob. recovery by 2077
2011	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2012	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2013	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2014	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2015	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2016	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2017	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2018	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2019	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2020	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2021	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2022	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2023	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2024	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2025	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2026	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2027	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2028	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2029	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2030	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 7b. Probability of recovery for rebuilding alternatives every 5 years from 2035-2085 with reference point years from Table 6 interspersed. (continued from Table 7a)

Run	1	2	3	4	5	6	7	8	9	10	11	12	13
Basis	F=0 2013+	SPR with 2013-14 avg. ACL of 14 mt	SPR from 2012 ACL of 17 mt	SPR = 76%	SPR that achieves 50% prob. recovery by T_{TARGET}	SPR that achieves 50% prob. recovery by 2011 T_{MAX}	SPR that achieves 50% prob. recovery by 2009 T_{MAX}	40:10 Harvest policy	OFL harvest rate SPR = 50%	SPR that achieves 50% prob. recovery by 2053	SPR that achieves 50% prob. recovery by 2061	SPR that achieves 50% prob. recovery by 2069	SPR that achieves 50% prob. recovery by 2077
2035	16.3%	0.3%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	2.3%	0.3%	0.1%	0.0%
2037	22.9%	2.0%	0.6%	0.6%	0.1%	0.1%	0.1%	0.0%	0.0%	6.8%	1.8%	0.3%	0.1%
2040	30.1%	6.8%	3.2%	2.9%	1.2%	0.4%	0.2%	0.0%	0.0%	15.1%	5.9%	2.0%	0.9%
2044	46.9%	15.9%	9.6%	8.7%	4.5%	2.6%	1.3%	0.0%	0.0%	24.9%	14.9%	6.9%	3.7%
2045	52.5%	17.8%	11.9%	11.2%	5.9%	3.1%	2.3%	0.0%	0.0%	26.7%	16.4%	8.6%	4.7%
2047	62.0%	22.0%	15.4%	14.6%	8.8%	4.9%	3.5%	0.0%	0.0%	31.1%	19.9%	12.7%	6.8%
2050	71.3%	27.4%	20.6%	19.8%	13.9%	7.8%	6.2%	0.0%	0.0%	39.9%	26.1%	16.8%	11.9%
2055	79.6%	38.7%	28.6%	27.3%	20.8%	14.5%	11.3%	0.0%	0.0%	56.1%	36.1%	25.0%	18.4%
2060	88.3%	51.0%	38.4%	36.6%	27.3%	20.5%	16.6%	0.0%	0.0%	67.8%	47.5%	32.6%	24.8%
2065	94.7%	62.8%	48.7%	46.6%	35.3%	26.3%	21.6%	0.0%	0.0%	75.8%	59.3%	42.3%	31.6%
2067	96.3%	66.5%	52.8%	50.9%	38.8%	29.2%	24.1%	0.0%	0.0%	77.9%	62.9%	45.6%	34.6%
2070	98.4%	70.4%	58.0%	56.3%	43.7%	32.3%	27.8%	0.1%	0.0%	81.1%	68.0%	51.1%	39.1%
2074	99.2%	75.1%	64.1%	62.1%	50.0%	37.2%	32.1%	0.2%	0.0%	85.3%	73.3%	57.7%	45.6%
2075	99.4%	75.9%	65.4%	64.0%	51.4%	38.9%	33.8%	0.3%	0.0%	86.7%	74.1%	59.0%	47.3%
2080	99.8%	80.8%	71.4%	69.6%	58.6%	45.9%	39.2%	0.3%	0.1%	91.2%	78.4%	65.4%	53.8%
2083	99.9%	82.8%	73.9%	72.9%	61.3%	50.0%	42.8%	0.3%	0.1%	93.7%	81.0%	68.6%	57.3%
2085	100.0%	84.2%	75.6%	74.1%	63.5%	52.1%	45.3%	0.3%	0.1%	94.4%	82.3%	70.7%	59.4%
2087	100.0%	85.8%	77.5%	75.8%	65.6%	53.8%	47.9%	0.3%	0.1%	95.8%	83.4%	72.3%	61.2%
2089	100.0%	87.7%	79.1%	77.5%	67.6%	55.4%	50.0%	0.4%	0.1%	96.8%	84.8%	73.7%	63.6%

Table 8a. Median catches (mt) for rebuilding alternatives for the years 2011-2030 (additional years in Table 8b)

Run	1	2	3	4	5	6	7	8	9	10	11	12	13
Basis	F=0 2013+	SPR with 2013-14 avg. ACL of 14 mt	SPR from 2012 ACL of 17 mt	SPR = 76%	SPR that achieves 50% prob. recovery by T_{TARGET}	SPR that achieves 50% prob. recovery by 2011 T_{MAX}	SPR that achieves 50% prob. recovery by 2009 T_{MAX}	40:10 Harvest policy	OFL harvest rate SPR = 50%	SPR that achieves 50% prob. recovery by 2053	SPR that achieves 50% prob. recovery by 2061	SPR that achieves 50% prob. recovery by 2069	SPR that achieves 50% prob. recovery by 2077
2011	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0
2012	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0
2013	0.0	13.8	17.4	17.8	21.0	24.1	25.7	37.7	51.2	9.1	14.7	19.1	22.1
2014	0.0	14.1	17.7	18.1	21.4	24.5	26.0	38.3	51.4	9.3	15.0	19.4	22.5
2015	0.0	14.4	18.0	18.4	21.7	24.8	26.4	38.9	51.5	9.5	15.2	19.7	22.8
2016	0.0	14.6	18.3	18.7	22.0	25.1	26.7	39.4	51.5	9.7	15.5	20.0	23.1
2017	0.0	14.9	18.5	19.0	22.3	25.4	27.0	39.8	51.6	9.9	15.7	20.3	23.4
2018	0.0	15.1	18.8	19.3	22.6	25.7	27.3	40.2	51.6	10.0	16.0	20.6	23.7
2019	0.0	15.3	19.0	19.5	22.8	26.0	27.6	40.6	51.6	10.2	16.2	20.8	24.0
2020	0.0	15.5	19.3	19.8	23.1	26.3	27.8	41.0	51.6	10.4	16.4	21.1	24.2
2021	0.0	15.8	19.5	20.0	23.4	26.5	28.1	41.3	51.5	10.5	16.7	21.3	24.5
2022	0.0	16.0	19.8	20.3	23.6	26.8	28.3	41.6	51.5	10.7	16.9	21.6	24.8
2023	0.0	16.2	20.0	20.5	23.9	27.0	28.6	41.9	51.5	10.8	17.1	21.8	25.0
2024	0.0	16.4	20.2	20.7	24.1	27.3	28.9	42.2	51.5	11.0	17.3	22.1	25.3
2025	0.0	16.6	20.5	21.0	24.4	27.5	29.1	42.5	51.5	11.2	17.5	22.3	25.5
2026	0.0	16.8	20.7	21.2	24.6	27.8	29.4	42.8	51.5	11.3	17.7	22.6	25.8
2027	0.0	17.0	20.9	21.4	24.9	28.0	29.6	43.1	51.5	11.5	18.0	22.8	26.0
2028	0.0	17.2	21.2	21.7	25.1	28.3	29.9	43.4	51.6	11.6	18.2	23.1	26.3
2029	0.0	17.5	21.4	21.9	25.4	28.6	30.1	43.8	51.7	11.8	18.4	23.3	26.5
2030	0.0	17.7	21.7	22.2	25.6	28.8	30.4	44.1	51.7	12.0	18.6	23.6	26.8

Table 8b. Median catches (mt) for rebuilding alternatives every 5 years from 2035-2085 with reference point years from Table 6 interspersed. (continued from Table 8a)

Run	1	2	3	4	5	6	7	8	9	10	11	12	13
Basis	F=0 2013+	SPR with 2013-14 avg. ACL of 14 mt	SPR from 2012 ACL of 17 mt	SPR = 76%	SPR that achieves 50% prob. recovery by T_{TARGET}	SPR that achieves 50% prob. recovery by 2011 T_{MAX}	SPR that achieves 50% prob. recovery by 2009 T_{MAX}	40:10 Harvest policy	OFL harvest rate SPR = 50%	SPR that achieves 50% prob. recovery by 2053	SPR that achieves 50% prob. recovery by 2061	SPR that achieves 50% prob. recovery by 2069	SPR that achieves 50% prob. recovery by 2077
2035	0.0	18.8	22.9	23.4	27.0	30.2	31.8	46.0	52.2	12.8	19.8	24.8	28.1
2037	0.0	19.2	23.4	23.9	27.5	30.7	32.3	46.7	52.4	13.2	20.2	25.4	28.7
2040	0.0	19.9	24.2	24.7	28.3	31.6	33.1	47.7	52.7	13.7	20.9	26.2	29.5
2044	0.0	20.8	25.2	25.7	29.4	32.7	34.3	48.8	53.1	14.4	21.9	27.2	30.6
2045	0.0	21.0	25.4	26.0	29.7	33.0	34.5	49.0	53.2	14.5	22.1	27.5	30.9
2047	0.0	21.5	25.9	26.5	30.2	33.5	35.0	49.4	53.5	14.8	22.5	28.0	31.4
2050	0.0	22.1	26.7	27.2	31.0	34.3	35.8	49.9	53.5	15.4	23.2	28.7	32.2
2055	0.0	23.2	27.8	28.4	32.1	35.4	37.0	51.1	53.9	16.2	24.3	29.9	33.3
2060	0.0	24.3	29.0	29.6	33.4	36.7	38.3	52.2	54.3	17.0	25.4	31.1	34.6
2065	0.0	25.3	30.1	30.7	34.6	38.0	39.6	53.3	54.8	17.9	26.5	32.3	35.9
2067	0.0	25.8	30.7	31.3	35.2	38.6	40.1	53.7	55.0	18.2	27.0	32.9	36.4
2070	0.0	26.4	31.3	31.9	35.8	39.2	40.8	54.4	55.0	18.7	27.6	33.5	37.1
2074	0.0	27.2	32.3	33.0	36.9	40.3	41.8	55.2	55.6	19.3	28.5	34.6	38.2
2075	0.0	27.5	32.5	33.2	37.1	40.5	42.0	55.4	55.6	19.5	28.7	34.8	38.3
2080	0.0	28.4	33.5	34.2	38.2	41.5	43.1	56.2	56.1	20.2	29.7	35.8	39.4
2083	0.0	29.0	34.2	34.8	38.8	42.2	43.8	56.9	56.3	20.7	30.3	36.5	40.1
2085	0.0	29.4	34.6	35.3	39.3	42.7	44.3	57.2	56.5	21.0	30.7	36.9	40.6
2087	0.0	29.7	35.0	35.6	39.7	43.1	44.6	57.4	56.7	21.3	31.0	37.3	40.9
2089	0.0	30.1	35.5	36.1	40.1	43.5	45.1	57.8	56.8	21.6	31.4	37.8	41.4

Table 9a. Median spawning output (millions eggs) for rebuilding alternatives for the years 2011-2030 (additional years in Table 9b)

Run	1	2	3	4	5	6	7	8	9	10	11	12	13

Basis	F=0 2013+	SPR with 2013-14 avg. ACL of 14 mt	SPR from 2012 ACL of 17 mt	SPR = 76%	SPR that achieves 50% prob. recovery by T_{TARGET}	SPR that achieves 50% prob. recovery by 2011 T_{MAX}	SPR that achieves 50% prob. recovery by 2009 T_{MAX}	40:10 Harvest policy	OFL harvest rate SPR = 50%	SPR that achieves 50% prob. recovery by 2053	SPR that achieves 50% prob. recovery by 2061	SPR that achieves 50% prob. recovery by 2069	SPR that achieves 50% prob. recovery by 2077
2011	219.5	219.5	219.5	219.5	219.5	219.5	219.5	219.5	219.5	219.5	219.5	219.5	219.5
2012	224.4	224.4	224.4	224.4	224.4	224.4	224.4	224.4	224.4	224.4	224.4	224.4	224.4
2013	229.1	229.1	229.1	229.1	229.1	229.1	229.1	229.1	229.1	229.1	229.1	229.1	229.1
2014	235.4	233.9	233.6	233.5	233.2	232.9	232.7	231.4	230.0	234.4	233.8	233.4	233.1
2015	241.6	238.6	237.8	237.7	237.1	236.4	236.1	233.5	230.7	239.6	238.4	237.5	236.8
2016	247.6	243.1	242.0	241.8	240.8	239.8	239.3	235.4	231.2	244.6	242.8	241.4	240.4
2017	253.6	247.5	245.9	245.7	244.4	243.0	242.4	237.1	231.6	249.5	247.1	245.2	243.9
2018	259.4	251.7	249.8	249.5	247.8	246.1	245.3	238.6	231.8	254.3	251.3	248.8	247.2
2019	265.2	255.9	253.5	253.2	251.1	249.1	248.1	240.0	232.0	259.0	255.3	252.4	250.4
2020	271.0	259.9	257.2	256.8	254.4	252.0	250.8	241.3	232.1	263.7	259.3	255.8	253.5
2021	276.7	263.9	260.8	260.3	257.5	254.8	253.5	242.5	232.2	268.2	263.2	259.2	256.5
2022	282.3	267.8	264.3	263.8	260.6	257.6	256.0	243.7	232.2	272.7	267.0	262.5	259.5
2023	287.9	271.7	267.7	267.2	263.6	260.2	258.6	244.8	232.3	277.1	270.7	265.8	262.4
2024	293.5	275.5	271.1	270.6	266.7	262.9	261.1	245.9	232.4	281.5	274.5	269.0	265.3
2025	298.9	279.3	274.5	273.8	269.6	265.5	263.5	246.9	232.4	285.9	278.1	272.2	268.1
2026	304.4	282.9	277.7	277.1	272.4	268.0	265.8	247.8	232.4	290.1	281.7	275.2	270.8
2027	309.9	286.7	281.1	280.4	275.4	270.7	268.3	248.9	232.6	294.5	285.4	278.4	273.7
2028	315.5	290.5	284.4	283.7	278.3	273.2	270.7	249.9	232.7	298.8	289.0	281.5	276.5
2029	320.8	294.0	287.6	286.7	281.0	275.6	273.0	250.7	232.7	302.9	292.5	284.5	279.1
2030	326.4	297.8	290.9	290.0	284.0	278.3	275.4	251.9	232.9	307.2	296.1	287.6	281.9

Table 9b. Median spawning output (millions eggs) for rebuilding alternatives every 5 years from 2035-2085 with reference point years from Table 6 interspersed. (continued from Table 9a)

Run	1	2	3	4	5	6	7	8	9	10	11	12	13

Basis	F=0 2013+	SPR with 2013-14 avg. ACL of 14 mt	SPR from 2012 ACL of 17 mt	SPR = 76%	SPR that achieves 50% prob. recovery by T_{TARGET}	SPR that achieves 50% prob. recovery by 2011 T_{MAX}	SPR that achieves 50% prob. recovery by 2009 T_{MAX}	40:10 Harvest policy	OFL harvest rate SPR = 50%	SPR that achieves 50% prob. recovery by 2053	SPR that achieves 50% prob. recovery by 2061	SPR that achieves 50% prob. recovery by 2069	SPR that achieves 50% prob. recovery by 2077
2035	354.6	316.7	307.7	306.6	298.7	291.3	287.6	257.1	234.5	329.2	314.5	303.4	296.0
2037	366.3	324.6	314.8	313.5	304.9	296.8	292.9	259.5	235.7	338.3	322.2	310.1	302.0
2040	384.1	336.4	325.4	323.9	314.3	305.2	300.8	262.8	237.1	351.9	333.8	320.1	311.0
2044	407.5	351.8	339.2	337.5	326.4	315.9	310.8	266.6	238.9	369.8	348.7	333.1	322.6
2045	414.1	356.1	342.8	341.1	329.6	318.8	313.5	267.7	239.5	374.9	352.9	336.5	325.7
2047	425.7	363.6	349.4	347.6	335.4	324.1	318.5	269.0	239.8	383.7	360.2	342.8	331.2
2050	442.3	375.0	359.5	357.5	344.2	331.7	325.6	270.9	241.8	396.2	371.3	352.2	339.6
2055	472.5	393.2	375.5	373.2	357.8	343.5	336.6	274.0	242.0	418.7	389.0	367.0	352.6
2060	501.9	411.8	391.6	389.1	372.0	356.2	348.6	278.5	243.9	440.8	406.9	382.2	366.3
2065	531.6	430.1	407.6	404.8	386.2	368.5	359.9	283.1	246.3	462.7	424.7	397.4	379.7
2067	545.1	438.1	414.8	411.8	392.1	374.3	365.4	284.5	247.0	472.2	432.6	403.8	385.6
2070	563.6	449.9	425.1	422.0	401.3	381.8	372.4	286.8	248.1	485.7	443.8	413.9	394.1
2074	586.1	464.0	437.4	434.0	411.3	391.1	381.1	289.6	249.2	503.4	457.6	424.9	404.0
2075	592.2	467.4	440.4	437.2	414.5	393.3	383.2	289.6	249.6	507.2	460.9	428.4	406.7
2080	622.8	486.2	456.2	452.4	428.0	405.4	394.3	292.6	251.9	529.0	479.2	443.0	419.7
2083	638.5	496.3	465.1	461.2	435.2	411.1	400.2	294.0	252.9	541.0	488.8	450.6	426.3
2085	649.3	502.1	470.4	466.4	439.9	416.1	405.0	295.6	253.6	547.8	494.6	455.7	431.2
2087	661.2	509.5	476.8	472.8	445.5	421.2	409.0	296.6	254.3	557.2	501.5	461.8	437.0
2089	671.9	515.3	481.3	477.4	450.0	425.3	412.8	297.1	255.2	564.3	507.0	466.3	441.2

Figures

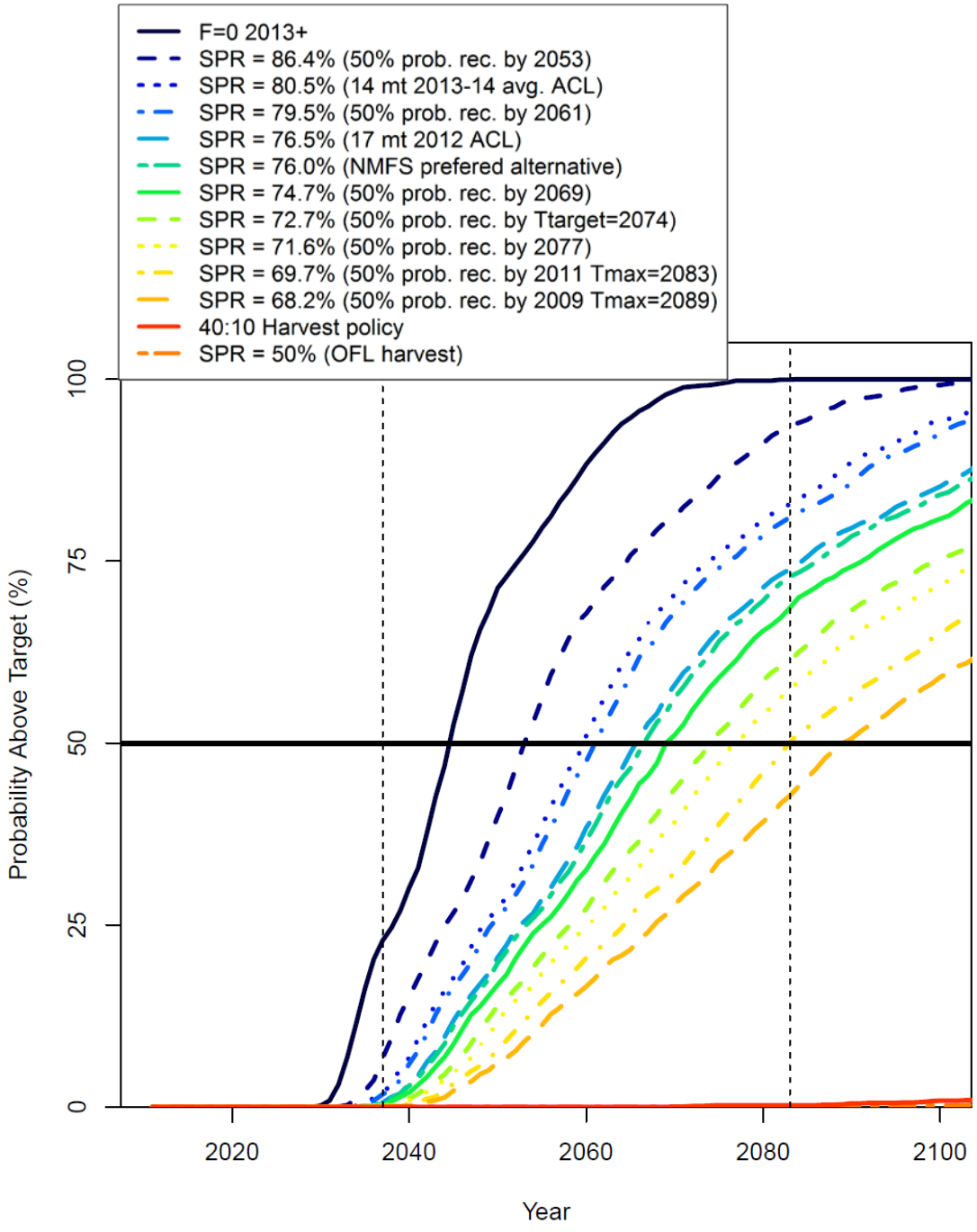

Figure 1. Probability of recovery for all rebuilding alternatives (SPR-based and year-based alternatives combined). Vertical dashed black lines indicate T_{MIN} = 2037 and T_{MAX} = 2083. Order of alternatives in legend matches the order of decreasing probability above target in any given year of the projections.

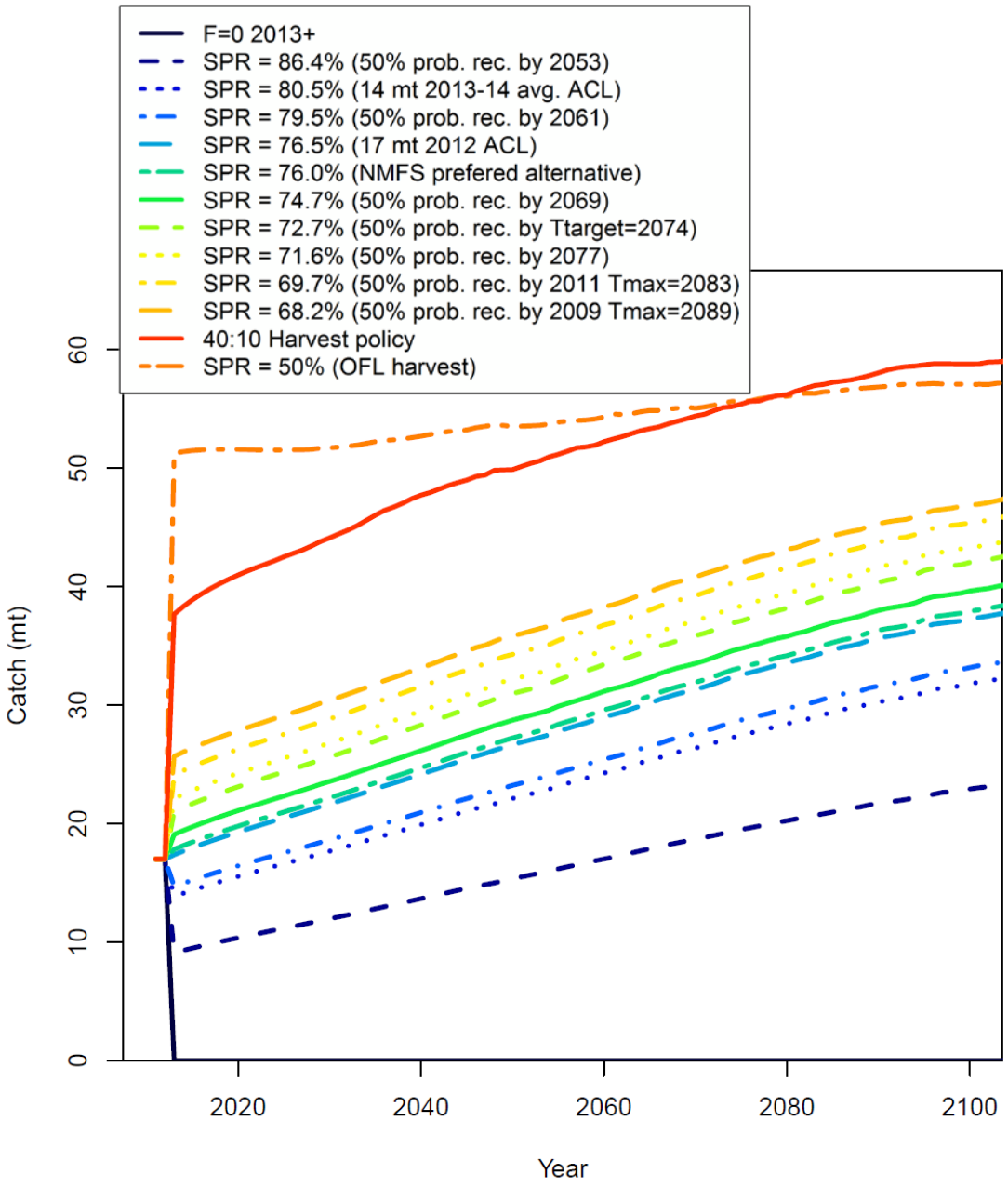

Figure 2. Projected median catch (mt) for rebuilding alternatives (SPR-based and year-based alternatives combined). Order of alternatives in legend matches the order of increasing catch in the year 2020 (reverse that of the order in the figure).

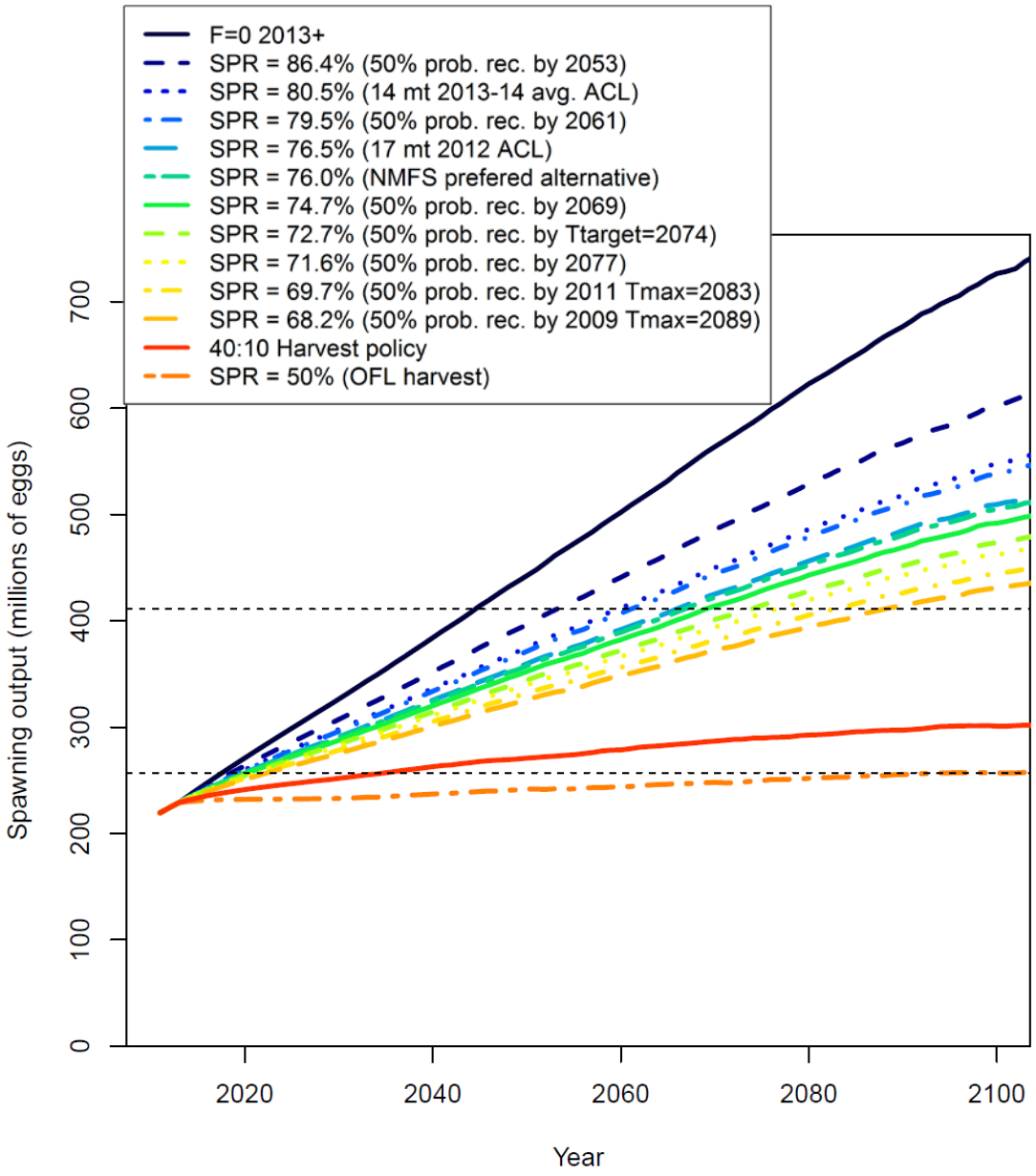

Figure 3. Projected median spawning output (millions of eggs) for rebuilding alternatives (SPR-based and year-based alternatives combined). Horizontal dashed black lines indicate 25% limit (256 million eggs) and 40% target (411 million eggs) relative to SB_0 (1028 million eggs). Order of alternatives in legend matches the order of decreasing spawning output in any given year of the projections.

Appendix A. Basic input file for rebuilding analyses

```
# Basic input file for 2011 yelloweye rebuilding analysis. This file used for projections
based on SPR rates.
Yelloweye_rebuilding_2011
# Number of sexes
2
# Age range to consider (minimum age; maximum age)
0 100
# Number of fleets
6
# First year of projection (Yinit)
2011
# First Year of rebuilding period (Ydecl)
2002
# Number of simulations
1600
# Maximum number of years
500
# Conduct projections with multiple starting values (0=No;else yes)
1
# Number of parameter vectors
16
# Is the maximum age a plus-group (1=Yes;2=No)
1
# Generate future recruitments using historical recruitments (1)  historical
recruits/spawner (2)  or a stock-recruitment (3)
3
# Constant fishing mortality (1) or constant Catch (2) projections
1
# Fishing mortality based on SPR (1) or actual rate (2)
1
# Pre-specify the year of recovery (or -1) to ignore
-1
# Fecundity-at-age
# 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61
62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91
92 93 94 95 96 97 98 99 100 #runnumber: 30 yelloweye_data.SS yelloweye_control.SS 6695.62
1.02769e+009 2.19494e+008
 0 0 28.3083 103.285 341.553 1014.2 2671.83 6204.22 12732.7 23330.1 38706.4 59025.3
83919.4 112652 144327 178069 213134 248951 285123 321394 357616 393710 429639 465389
500951 536316 571471 606397 641068 675453 709517 743223 776532 809406 841807 873699
905048 935824 965999 995548 1.02445e+006 1.05268e+006 1.08023e+006 1.10709e+006
1.13325e+006 1.15869e+006 1.18343e+006 1.20744e+006 1.23075e+006 1.25334e+006
1.27523e+006 1.29641e+006 1.31691e+006 1.33672e+006 1.35586e+006 1.37433e+006
1.39217e+006 1.40936e+006 1.42594e+006 1.4419e+006 1.45728e+006 1.47208e+006 1.48632e+006
1.50001e+006 1.51318e+006 1.52583e+006 1.53798e+006 1.54965e+006 1.56086e+006
1.57161e+006 1.58192e+006 1.59208e+006 1.60182e+006 1.61116e+006 1.62012e+006 1.6287e+006
1.63692e+006 1.6448e+006 1.65234e+006 1.65957e+006 1.66648e+006 1.6731e+006 1.67944e+006
1.6855e+006 1.6913e+006 1.69685e+006 1.70216e+006 1.70724e+006 1.71209e+006 1.71673e+006
1.72117e+006 1.72541e+006 1.72946e+006 1.73334e+006 1.73704e+006 1.74058e+006
1.74396e+006 1.74719e+006 1.75027e+006 1.75322e+006 1.75866e+006 #female fecundity;
weighted by N in year Y_init across morphs and areas
# Age specific selectivity and weight adjusted for discard and discard mortality
 #wt and selex for gender,fleet: 1 1
 0.045147 0.163178 0.222696 0.290492 0.365223 0.445539 0.530285 0.618588 0.709839
0.803631 0.899683 0.997778 1.09772 1.19929 1.30227 1.4064 1.51143 1.61705 1.72297 1.82891
1.93457 2.03968 2.14398 2.24722 2.34919 2.44969 2.54855 2.6456 2.74072 2.8338 2.92474
3.01346 3.09991 3.18404 3.26582 3.34522 3.42225 3.4969 3.56919 3.63912 3.70673 3.77204
3.83509 3.89593 3.95458 4.0111 4.06554 4.11794 4.16836 4.21686 4.26348 4.30828 4.35131
4.39264 4.43231 4.47038 4.5069 4.54192 4.57551 4.6077 4.63855 4.6681 4.69641 4.72352
4.74949 4.77434 4.79812 4.82089 4.84267 4.86351 4.88357 4.9029 4.92139 4.93906 4.95596
4.97211 4.98755 5.0023 5.01641 5.02988 5.04276 5.05506 5.06681 5.07803 5.08876 5.099
5.10878 5.11812 5.12704 5.13555 5.14369 5.15145 5.15886 5.16594 5.1727 5.17914 5.1853
5.19117 5.19678 5.20214 5.212
 0 0.0511233 0.0772332 0.112337 0.156989 0.21065 0.271667 0.337561 0.405497 0.472761
0.537103 0.596902 0.65118 0.699515 0.741909 0.778656 0.810226 0.837169 0.860061 0.879454
0.895857 0.909726 0.921458 0.931394 0.939825 0.946995 0.953108 0.958335 0.962819 0.966677
0.970009 0.972894 0.975403 0.977591 0.979505 0.981186 0.982667 0.983975 0.985135 0.986165
0.987085 0.987906 0.988643 0.989305 0.989902 0.990442 0.99093 0.991373 0.991776 0.992144
```

0.992479 0.992786 0.993068 0.993326 0.993564 0.993783 0.993985 0.994172 0.994345 0.994505
0.994654 0.994792 0.994921 0.995041 0.995152 0.995256 0.995354 0.995445 0.99553 0.995609
0.995681 0.995746 0.995807 0.995865 0.995919 0.995969 0.996017 0.996062 0.996105 0.996145
0.996183 0.996219 0.996253 0.996285 0.996315 0.996343 0.996371 0.996396 0.99642 0.996444
0.996465 0.996486 0.996506 0.996524 0.996542 0.996559 0.996575 0.99659 0.996604 0.996618
0.996643
 #wt and selex for gender,fleet: 1 2
 0.0462809 0.169552 0.232356 0.304214 0.383486 0.468356 0.557183 0.648721 0.74217
0.837091 0.933287 1.03069 1.12928 1.22902 1.32986 1.43167 1.53431 1.63757 1.74123 1.84504
1.94873 2.05204 2.15472 2.25653 2.35722 2.4566 2.55447 2.65067 2.74505 2.83748 2.92786
3.0161 3.10213 3.1859 3.26737 3.34651 3.4233 3.49775 3.56986 3.63965 3.70713 3.77233
3.83528 3.89603 3.95461 4.01106 4.06544 4.1178 4.16818 4.21663 4.26322 4.30799 4.351
4.39231 4.43196 4.47001 4.50651 4.54152 4.5751 4.60728 4.63811 4.66766 4.69597 4.72307
4.74903 4.77387 4.79766 4.82042 4.84219 4.86303 4.88309 4.90242 4.9209 4.93857 4.95546
4.97162 4.98705 5.00181 5.01591 5.02938 5.04226 5.05456 5.06631 5.07753 5.08825 5.09849
5.10827 5.11761 5.12653 5.13505 5.14318 5.15094 5.15835 5.16543 5.17218 5.17863 5.18479
5.19066 5.19627 5.20162 5.21149
 0 0.0213283 0.0352642 0.0561355 0.0857149 0.125189 0.174691 0.233098 0.298189 0.367085
0.436791 0.504638 0.56856 0.627179 0.679765 0.726107 0.766378 0.800993 0.830503 0.855511
0.876615 0.89438 0.909315 0.921869 0.932428 0.941321 0.948827 0.955176 0.960562 0.965145
0.969056 0.972406 0.975285 0.977769 0.979918 0.981784 0.983411 0.984833 0.986082 0.987181
0.988151 0.989011 0.989776 0.990457 0.991066 0.991611 0.992102 0.992544 0.992943 0.993304
0.993632 0.993931 0.994202 0.994451 0.994678 0.994886 0.995077 0.995253 0.995415 0.995564
0.995702 0.99583 0.995949 0.996059 0.996161 0.996256 0.996344 0.996426 0.996503 0.996575
0.99664 0.996697 0.996751 0.996801 0.996849 0.996894 0.996936 0.996975 0.997012 0.997047
0.99708 0.997112 0.997141 0.997169 0.997195 0.99722 0.997243 0.997266 0.997287 0.997306
0.997325 0.997343 0.99736 0.997376 0.997391 0.997406 0.997419 0.997432 0.997444 0.997456
0.997478
 #wt and selex for gender,fleet: 1 3
 0.0504337 0.189018 0.257432 0.331995 0.409383 0.487655 0.566341 0.645863 0.726964
0.810375 0.896654 0.986129 1.07889 1.17484 1.2737 1.37507 1.4785 1.58348 1.68953 1.79614
1.90288 2.00933 2.11512 2.21995 2.32351 2.42558 2.52596 2.62445 2.72094 2.81528 2.9074
2.99721 3.08467 3.16972 3.25235 3.33253 3.41028 3.48558 3.55846 3.62895 3.69706 3.76284
3.82631 3.88754 3.94655 4.0034 4.05814 4.11083 4.16151 4.21025 4.25709 4.3021 4.34533
4.38683 4.42667 4.46489 4.50156 4.53672 4.57043 4.60273 4.63369 4.66335 4.69176 4.71896
4.745 4.76994 4.7938 4.81663 4.83848 4.85938 4.87949 4.89886 4.91738 4.93509 4.95202
4.96821 4.98368 4.99846 5.01259 5.02609 5.03899 5.05131 5.06309 5.07433 5.08507 5.09533
5.10513 5.11449 5.12342 5.13196 5.1401 5.14788 5.15531 5.1624 5.16916 5.17562 5.18179
5.18767 5.19329 5.19865 5.20854
 0 0.0168565 0.0359177 0.0704144 0.125351 0.201915 0.296018 0.399604 0.503567 0.600364
0.685263 0.756326 0.813704 0.85879 0.893511 0.919871 0.93969 0.954505 0.965548 0.973775
0.979914 0.984509 0.987963 0.990573 0.992557 0.994075 0.995243 0.99615 0.996858 0.997415
0.997857 0.998209 0.998492 0.998722 0.998908 0.999062 0.999188 0.999293 0.99938 0.999454
0.999516 0.999569 0.999614 0.999653 0.999686 0.999715 0.99974 0.999762 0.999781 0.999798
0.999813 0.999826 0.999838 0.999848 0.999857 0.999866 0.999873 0.99988 0.999886 0.999892
0.999897 0.999902 0.999906 0.99991 0.999913 0.999916 0.999919 0.999922 0.999925 0.999927
0.999929 0.999931 0.999932 0.999934 0.999935 0.999937 0.999938 0.999939 0.99994 0.999941
0.999942 0.999943 0.999944 0.999945 0.999945 0.999946 0.999947 0.999947 0.999948 0.999948
0.999949 0.999949 0.99995 0.99995 0.999951 0.999951 0.999952 0.999952 0.999952 0.999952
0.999953
 #wt and selex for gender,fleet: 1 4
 0.0466444 0.171812 0.236089 0.310135 0.392403 0.480968 0.573886 0.669515 0.76669
0.864713 0.963252 1.0622 1.16158 1.26144 1.36181 1.4627 1.56407 1.66582 1.7678 1.86984
1.97175 2.0733 2.17428 2.27446 2.37364 2.4716 2.56818 2.66318 2.75648 2.84792 2.93742
3.02485 3.11016 3.19328 3.27417 3.35278 3.4291 3.50313 3.57486 3.6443 3.71147 3.77639
3.83909 3.8996 3.95797 4.01424 4.06845 4.12065 4.17089 4.21921 4.26568 4.31034 4.35325
4.39447 4.43403 4.472 4.50844 4.54338 4.57689 4.60901 4.6398 4.6693 4.69756 4.72462
4.75054 4.77535 4.79909 4.82182 4.84357 4.86437 4.88442 4.90372 4.92219 4.93984 4.95672
4.97286 4.98828 5.00302 5.01711 5.03057 5.04343 5.05572 5.06746 5.07868 5.08939 5.09962
5.10939 5.11873 5.12764 5.13615 5.14427 5.15203 5.15943 5.16651 5.17325 5.1797 5.18585
5.19172 5.19732 5.20267 5.21253
 0 0.011426 0.0195259 0.0322319 0.0512246 0.078121 0.11406 0.159308 0.213068 0.273565
0.338381 0.40488 0.470599 0.533513 0.592155 0.645622 0.693497 0.735745 0.772597 0.804456
0.831809 0.855178 0.875076 0.891982 0.906331 0.91851 0.928852 0.937647 0.945139 0.951534
0.957006 0.961703 0.965744 0.969233 0.972253 0.974877 0.977164 0.979163 0.980916 0.982458
0.983819 0.985024 0.986093 0.987045 0.987895 0.988656 0.989339 0.989954 0.990509 0.99101
0.991464 0.991877 0.992253 0.992596 0.992909 0.993196 0.993459 0.993701 0.993923 0.994128
0.994317 0.994492 0.994655 0.994805 0.994944 0.995074 0.995195 0.995307 0.995412 0.99551
0.995597 0.995675 0.995748 0.995816 0.99588 0.995941 0.995997 0.996051 0.996101 0.996148
0.996193 0.996235 0.996275 0.996312 0.996348 0.996381 0.996413 0.996443 0.996471 0.996498

0.996523 0.996547 0.99657 0.996591 0.996612 0.996631 0.996649 0.996667 0.996683 0.996699
0.996728
 #wt and selex for gender,fleet: 1 5
 0.0458503 0.168306 0.231642 0.305371 0.388624 0.480165 0.578473 0.681886 0.788778
0.897715 1.00756 1.11747 1.22692 1.33558 1.44328 1.54993 1.65553 1.76007 1.86354 1.96594
2.06723 2.16738 2.26632 2.36398 2.46027 2.5551 2.64839 2.74004 2.82997 2.9181 3.00434
3.08863 3.17093 3.25117 3.32932 3.40534 3.47923 3.55097 3.62055 3.68798 3.75327 3.81643
3.87749 3.93648 3.99343 4.04836 4.10133 4.15238 4.20154 4.24886 4.29439 4.33817 4.38026
4.42071 4.45956 4.49687 4.53267 4.56703 4.59999 4.6316 4.6619 4.69094 4.71878 4.74544
4.77098 4.79543 4.81885 4.84126 4.86271 4.88324 4.90305 4.92218 4.94047 4.95796 4.97469
4.99068 5.00597 5.02058 5.03454 5.04789 5.06064 5.07282 5.08446 5.09558 5.1062 5.11635
5.12604 5.13529 5.14413 5.15257 5.16063 5.16832 5.17567 5.18268 5.18938 5.19577 5.20187
5.2077 5.21325 5.21856 5.22834
 0 0.00497951 0.00812772 0.0129303 0.0200354 0.0302067 0.0442625 0.0629721 0.086926
0.116411 0.151331 0.191188 0.235142 0.282111 0.330901 0.380324 0.429299 0.476909 0.522437
0.565367 0.605371 0.642279 0.67605 0.706745 0.734491 0.759464 0.781866 0.801913 0.819821
0.835799 0.850049 0.862754 0.874085 0.884197 0.893229 0.901303 0.908532 0.915011 0.920828
0.926059 0.93077 0.935021 0.938862 0.94234 0.945494 0.948359 0.950967 0.953345 0.955515
0.957501 0.95932 0.960989 0.962523 0.963934 0.965235 0.966436 0.967546 0.968573 0.969524
0.970407 0.971227 0.971989 0.972699 0.97336 0.973977 0.974553 0.975091 0.975595 0.976066
0.976508 0.976906 0.977266 0.977603 0.977921 0.97822 0.978501 0.978766 0.979016 0.979252
0.979474 0.979684 0.979882 0.98007 0.980247 0.980414 0.980573 0.980723 0.980865 0.980999
0.981126 0.981247 0.981362 0.98147 0.981573 0.981671 0.981763 0.981851 0.981935 0.982014
0.982089 0.982227
 #wt and selex for gender,fleet: 1 6
 0.047457 0.17645 0.243537 0.321908 0.410686 0.508516 0.613589 0.723785 0.836934 0.951109
1.06483 1.17713 1.28749 1.39572 1.50187 1.60609 1.70859 1.80956 1.90918 2.00759 2.10486
2.20106 2.29619 2.39022 2.48312 2.5748 2.66519 2.7542 2.84174 2.92771 3.01203 3.09461
3.17538 3.25429 3.33126 3.40625 3.47924 3.55019 3.61909 3.68593 3.7507 3.81342 3.87411
3.93277 3.98943 4.04413 4.0969 4.14777 4.19679 4.24398 4.28941 4.33311 4.37514 4.41552
4.45433 4.4916 4.52738 4.56171 4.59466 4.62625 4.65655 4.68559 4.71343 4.74009 4.76564
4.7901 4.81352 4.83595 4.85741 4.87795 4.89777 4.91689 4.93519 4.95268 4.96941 4.98541
5.0007 5.01531 5.02928 5.04263 5.05538 5.06757 5.07922 5.09034 5.10097 5.11112 5.12081
5.13007 5.13891 5.14735 5.15542 5.16311 5.17046 5.17748 5.18418 5.19057 5.19668 5.20251
5.20807 5.21338 5.22317
 0 0.00140879 0.00257294 0.0045632 0.00785473 0.0131087 0.0211776 0.0330585 0.0497792
0.0722262 0.100961 0.136078 0.177153 0.223289 0.273245 0.325598 0.378907 0.431846
0.483294 0.532373 0.578462 0.62117 0.660309 0.695849 0.727877 0.756568 0.782144 0.80486
0.824981 0.842767 0.858471 0.872327 0.884551 0.895338 0.904864 0.913285 0.920737 0.927341
0.933203 0.938416 0.943059 0.947203 0.950909 0.95423 0.957211 0.959893 0.962311 0.964495
0.966471 0.968263 0.969891 0.971372 0.972723 0.973958 0.975087 0.976122 0.977072 0.977946
0.97875 0.979492 0.980177 0.980811 0.981398 0.981942 0.982447 0.982916 0.983353 0.983759
0.984139 0.984493 0.984808 0.985089 0.985353 0.9856 0.985832 0.986049 0.986254 0.986446
0.986628 0.986798 0.986959 0.98711 0.987253 0.987388 0.987515 0.987635 0.987749 0.987856
0.987958 0.988054 0.988145 0.988231 0.988312 0.98839 0.988463 0.988532 0.988598 0.98866
0.98872 0.988776 0.988879
 #wt and selex for gender,fleet: 2 1
 0.0539259 0.185573 0.25267 0.328419 0.411174 0.499395 0.591863 0.687727 0.786456
0.887728 0.991338 1.09712 1.20489 1.31446 1.42557 1.53794 1.65126 1.7652 1.87941 1.99355
2.1073 2.22035 2.33241 2.44322 2.55253 2.66014 2.76586 2.86955 2.97105 3.07027 3.1671
3.26149 3.35337 3.44271 3.52948 3.61367 3.69528 3.77432 3.8508 3.92475 3.99621 4.06521
4.13179 4.19599 4.25787 4.31749 4.37488 4.43012 4.48325 4.53434 4.58344 4.63062 4.67593
4.71944 4.76119 4.80125 4.83969 4.87654 4.91187 4.94574 4.97819 5.00929 5.03907 5.06759
5.0949 5.12104 5.14607 5.17001 5.19293 5.21485 5.23595 5.25627 5.2757 5.29428 5.31205
5.32903 5.34526 5.36078 5.37561 5.38979 5.40333 5.41627 5.42863 5.44045 5.45173 5.46251
5.4728 5.48264 5.49203 5.501 5.50956 5.51774 5.52555 5.533 5.54012 5.54692 5.55341 5.5596
5.56551 5.57116 5.58159
 0 0.0518398 0.079816 0.117909 0.166721 0.225504 0.292161 0.363647 0.436587 0.507864
0.575011 0.636368 0.691057 0.738838 0.779931 0.814846 0.844245 0.868839 0.889325 0.906346
0.920474 0.932201 0.941947 0.950061 0.956834 0.962504 0.967267 0.971282 0.974679 0.977566
0.980027 0.982135 0.983947 0.985511 0.986866 0.988045 0.989074 0.989975 0.990768 0.991468
0.992087 0.992636 0.993126 0.993564 0.993956 0.994308 0.994625 0.994912 0.995171 0.995406
0.99562 0.995816 0.995994 0.996157 0.996306 0.996443 0.996569 0.996686 0.996793 0.996892
0.996984 0.997069 0.997148 0.997221 0.997289 0.997353 0.997412 0.997468 0.997519 0.997568
0.997611 0.99765 0.997687 0.997721 0.997754 0.997784 0.997813 0.99784 0.997865 0.997889
0.997912 0.997933 0.997953 0.997972 0.99799 0.998008 0.998024 0.998039 0.998053 0.998067
0.99808 0.998092 0.998104 0.998115 0.998125 0.998135 0.998145 0.998154 0.998162 0.99817
0.998185
 #wt and selex for gender,fleet: 2 2
 0.0552534 0.192681 0.263397 0.343528 0.43103 0.5238 0.620085 0.718683 0.818926 0.920536
1.02346 1.12775 1.23345 1.34057 1.44904 1.55872 1.66943 1.78089 1.89283 2.00493 2.11687

2.22834 2.33904 2.44867 2.557 2.66377 2.7688 2.8719 2.97292 3.07173 3.16823 3.26234
3.35399 3.44314 3.52976 3.61382 3.69532 3.77427 3.85069 3.92458 3.99599 4.06495 4.1315
4.19568 4.25754 4.31714 4.37452 4.42975 4.48287 4.53396 4.58306 4.63023 4.67554 4.71904
4.7608 4.80086 4.83929 4.87615 4.91149 4.94535 4.97781 5.0089 5.03869 5.06721 5.09452
5.12067 5.14569 5.16964 5.19256 5.21448 5.23559 5.25591 5.27534 5.29392 5.31169 5.32867
5.34491 5.36042 5.37526 5.38943 5.40297 5.41592 5.42828 5.44009 5.45138 5.46216 5.47245
5.48229 5.49168 5.50065 5.50921 5.51739 5.5252 5.53266 5.53977 5.54657 5.55306 5.55925
5.56517 5.57081 5.58124
 0 0.0217085 0.0367487 0.0596831 0.0925919 0.136787 0.192233 0.257331 0.329197 0.404272
0.479017 0.550442 0.616385 0.675562 0.727455 0.772127 0.810028 0.841829 0.868293 0.890188
0.908235 0.923079 0.935281 0.945317 0.953582 0.960405 0.966052 0.970742 0.974651 0.977922
0.98067 0.982988 0.984953 0.986624 0.988052 0.989277 0.990333 0.991246 0.992039 0.992731
0.993336 0.993868 0.994337 0.994751 0.995119 0.995446 0.995738 0.996 0.996235 0.996446
0.996637 0.99681 0.996966 0.997109 0.997238 0.997357 0.997465 0.997564 0.997655 0.997739
0.997816 0.997887 0.997953 0.998014 0.99807 0.998123 0.998171 0.998216 0.998259 0.998298
0.998333 0.998364 0.998393 0.99842 0.998446 0.99847 0.998493 0.998514 0.998534 0.998553
0.998571 0.998587 0.998603 0.998618 0.998632 0.998645 0.998658 0.99867 0.998681 0.998691
0.998701 0.998711 0.99872 0.998728 0.998736 0.998744 0.998751 0.998758 0.998765 0.998771
0.998782
 #wt and selex for gender,fleet: 2 3
 0.0601075 0.214219 0.290644 0.372767 0.456919 0.541321 0.625889 0.711421 0.798942
0.889352 0.983281 1.08104 1.18265 1.28787 1.39629 1.50736 1.62049 1.73505 1.85046 1.96618
2.08171 2.19662 2.31053 2.42313 2.53414 2.64333 2.7505 2.85551 2.95821 3.05851 3.15632
3.25159 3.34425 3.4343 3.5217 3.60646 3.68857 3.76807 3.84497 3.91929 3.99109 4.06039
4.12724 4.1917 4.25381 4.31363 4.37121 4.42662 4.47991 4.53115 4.58038 4.62768 4.6731
4.71671 4.75856 4.79871 4.83723 4.87416 4.90956 4.94349 4.97601 5.00716 5.03699 5.06556
5.09292 5.1191 5.14417 5.16815 5.1911 5.21306 5.23419 5.25452 5.27397 5.29257 5.31035
5.32735 5.3436 5.35913 5.37398 5.38816 5.40172 5.41467 5.42705 5.43887 5.45016 5.46095
5.47125 5.48109 5.49049 5.49947 5.50804 5.51623 5.52404 5.5315 5.53863 5.54543 5.55192
5.55812 5.56404 5.56969 5.58013
 0 0.0173676 0.0382509 0.0767998 0.138612 0.224342 0.328234 0.44021 0.549681 0.648575
0.732478 0.80025 0.852958 0.892796 0.92228 0.94378 0.959307 0.970457 0.978446 0.984174
0.988291 0.991264 0.993423 0.995001 0.996164 0.997028 0.997674 0.998163 0.998535 0.99882
0.999042 0.999215 0.999351 0.99946 0.999546 0.999616 0.999673 0.999719 0.999757 0.999789
0.999815 0.999837 0.999856 0.999872 0.999885 0.999897 0.999907 0.999915 0.999923 0.999929
0.999935 0.99994 0.999945 0.999949 0.999952 0.999955 0.999958 0.99996 0.999963 0.999965
0.999966 0.999968 0.99997 0.999971 0.999972 0.999973 0.999974 0.999975 0.999976 0.999977
0.999978 0.999978 0.999979 0.999979 0.99998 0.99998 0.999981 0.999981 0.999982 0.999982
0.999982 0.999983 0.999983 0.999983 0.999983 0.999984 0.999984 0.999984 0.999984 0.999984
0.999985 0.999985 0.999985 0.999985 0.999985 0.999985 0.999985 0.999986 0.999986 0.999986
0.999986
 #wt and selex for gender,fleet: 2 4
 0.0556789 0.195209 0.267577 0.35015 0.44094 0.537655 0.638145 0.74075 0.844425 0.948657
1.0533 1.15843 1.26416 1.37063 1.47791 1.58603 1.69489 1.80437 1.91426 2.02434 2.13434
2.24397 2.35297 2.46106 2.56799 2.67352 2.77744 2.87956 2.97971 3.07777 3.17361 3.26714
3.35829 3.447 3.53323 3.61695 3.69816 3.77685 3.85304 3.92673 3.99796 4.06676 4.13317
4.19723 4.25898 4.31848 4.37577 4.43092 4.48397 4.53499 4.58403 4.63115 4.67641 4.71987
4.76159 4.80161 4.84001 4.87684 4.91214 4.94599 4.97842 5.00949 5.03926 5.06776 5.09506
5.12119 5.1462 5.17013 5.19304 5.21495 5.23604 5.25635 5.27578 5.29435 5.31211 5.32909
5.34532 5.36083 5.37566 5.38983 5.40337 5.41631 5.42867 5.44048 5.45176 5.46253 5.47283
5.48266 5.49205 5.50101 5.50957 5.51775 5.52556 5.53301 5.54013 5.54692 5.55341 5.5596
5.56551 5.57116 5.58159
 0 0.0116461 0.020415 0.0344617 0.0557967 0.0863221 0.127287 0.178795 0.239606 0.307321
0.37886 0.451034 0.521016 0.586629 0.646439 0.699711 0.746272 0.786357 0.820457 0.849204
0.873276 0.893338 0.910009 0.92384 0.935311 0.94483 0.952741 0.95933 0.964832 0.96944
0.973313 0.97658 0.979345 0.981696 0.983701 0.985419 0.986896 0.988172 0.989277 0.990239
0.991079 0.991814 0.992462 0.993033 0.993538 0.993987 0.994387 0.994744 0.995065 0.995352
0.995611 0.995845 0.996057 0.99625 0.996424 0.996584 0.996729 0.996862 0.996984 0.997096
0.997199 0.997294 0.997382 0.997463 0.997538 0.997607 0.997672 0.997732 0.997788 0.99784
0.997886 0.997927 0.997965 0.998001 0.998035 0.998066 0.998096 0.998124 0.99815 0.998175
0.998198 0.99822 0.99824 0.99826 0.998278 0.998295 0.998312 0.998327 0.998342 0.998356
0.998369 0.998381 0.998393 0.998404 0.998414 0.998424 0.998434 0.998443 0.998451 0.998459
0.998474
 #wt and selex for gender,fleet: 2 5
 0.0547497 0.191323 0.26274 0.345176 0.437425 0.537908 0.644796 0.756201 0.870385 0.98592
1.10176 1.21722 1.33192 1.44568 1.55846 1.6703 1.78122 1.89128 2.00049 2.10884 2.21629
2.32278 2.42819 2.53244 2.63538 2.7369 2.83686 2.93515 3.03163 3.12621 3.21877 3.30925
3.39755 3.48363 3.56744 3.64893 3.72809 3.80491 3.87937 3.9515 4.02129 4.08877 4.15397
4.21692 4.27766 4.33623 4.39267 4.44703 4.49937 4.54972 4.59815 4.64471 4.68945 4.73243
4.7737 4.81332 4.85133 4.8878 4.92278 4.95632 4.98847 5.01927 5.04879 5.07706 5.10414
5.13007 5.15489 5.17865 5.20139 5.22314 5.24411 5.26433 5.28366 5.30215 5.31983 5.33674

5.3529 5.36834 5.3831 5.39721 5.4107 5.42358 5.43589 5.44765 5.45888 5.46962 5.47987
5.48966 5.49901 5.50794 5.51647 5.52461 5.53239 5.53981 5.5469 5.55367 5.56013 5.5663
5.57219 5.57781 5.5882
 0 0.00506505 0.00846584 0.0137649 0.0217505 0.0333584 0.049588 0.0713603 0.0993433
0.133791 0.174451 0.220563 0.270956 0.324199 0.37878 0.433257 0.486373 0.537128 0.584791
0.628896 0.669207 0.705673 0.738382 0.767523 0.793343 0.816128 0.836171 0.853766 0.86919
0.882702 0.89454 0.904913 0.914012 0.922003 0.92903 0.93522 0.940683 0.945514 0.949795
0.953597 0.956981 0.960001 0.9627 0.965119 0.967293 0.969249 0.971013 0.972609 0.974054
0.975367 0.97656 0.977648 0.978642 0.979551 0.980383 0.981148 0.981851 0.982498 0.983095
0.983646 0.984156 0.984628 0.985066 0.985473 0.985851 0.986203 0.986531 0.986836 0.987122
0.987389 0.987628 0.987842 0.988044 0.988232 0.98841 0.988577 0.988733 0.988881 0.98902
0.989151 0.989275 0.989392 0.989502 0.989606 0.989704 0.989797 0.989884 0.989968 0.990046
0.990121 0.990191 0.990258 0.990321 0.990381 0.990438 0.990492 0.990543 0.990592 0.990638
0.990681 0.990762
 #wt and selex for gender,fleet: 2 6
 0.0566297 0.200386 0.275902 0.363338 0.461434 0.568422 0.682087 0.799992 0.91981 1.03964
1.15817 1.27469 1.38893 1.50094 1.61096 1.71927 1.82617 1.93192 2.03671 2.14067 2.24388
2.34635 2.44803 2.54886 2.64872 2.74749 2.84503 2.9412 3.03586 3.12886 3.2201 3.30945
3.39682 3.48212 3.56529 3.64626 3.725 3.80148 3.87569 3.94761 4.01724 4.08462 4.14974
4.21264 4.27335 4.33191 4.38836 4.44274 4.4951 4.5455 4.59397 4.64057 4.68536 4.72838
4.7697 4.80937 4.84744 4.88396 4.91898 4.95257 4.98476 5.01562 5.04518 5.07349 5.10061
5.12658 5.15144 5.17524 5.19801 5.2198 5.2408 5.26103 5.28038 5.29889 5.31659 5.3335
5.34968 5.36514 5.37991 5.39404 5.40753 5.42043 5.43275 5.44452 5.45576 5.46651 5.47677
5.48657 5.49593 5.50487 5.5134 5.52155 5.52934 5.53677 5.54387 5.55064 5.55711 5.56328
5.56918 5.57481 5.5852
 0 0.00144011 0.00270794 0.00493369 0.00870259 0.0148408 0.0244198 0.0386853 0.0588914
0.0860613 0.120743 0.162841 0.211584 0.265626 0.323248 0.382589 0.441867 0.499532
0.554361 0.605484 0.652368 0.69477 0.732677 0.766246 0.795745 0.821513 0.843915 0.863325
0.880102 0.894582 0.90707 0.917841 0.927136 0.935165 0.942111 0.948129 0.953355 0.957902
0.961869 0.965337 0.968378 0.971051 0.973407 0.97549 0.977335 0.978974 0.980435 0.981739
0.982907 0.983956 0.984899 0.98575 0.98652 0.987217 0.98785 0.988426 0.988951 0.98943
0.989869 0.990271 0.990641 0.990981 0.991294 0.991583 0.99185 0.992097 0.992326 0.992538
0.992736 0.992919 0.993082 0.993225 0.993359 0.993485 0.993603 0.993713 0.993816 0.993913
0.994004 0.99409 0.994171 0.994247 0.994318 0.994386 0.994449 0.994509 0.994566 0.994619
0.99467 0.994717 0.994762 0.994805 0.994846 0.994884 0.99492 0.994954 0.994987 0.995018
0.995047 0.995075 0.995125
M and current age-structure in year Yinit: 2011
 # gender = 1
 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379
0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379
0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379
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0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379
0.0462379 0.0462379 0.0462379
 52.6066 49.3344 46.1908 43.2277 40.518 37.7914 35.2322 32.7677 30.4021 28.1869 26.6381
24.9759 24.6723 23.7748 24.1344 24.0124 24.0501 23.627 23.6423 23.5725 23.0647 21.7377
20.6877 19.2273 17.6195 15.9364 14.5019 13.006 11.6721 10.5449 9.39019 8.27837 7.32203
6.47157 5.67741 4.98814 4.38525 3.86876 3.42086 3.03746 2.70401 2.41476 2.17115 1.95474
1.76833 1.60659 1.47067 1.3464 1.23825 1.14337 1.05871 0.98356 0.916282 0.855775 0.800677
0.750177 0.703656 0.660664 0.620864 0.584319 0.550594 0.519118 0.489825 0.462879 0.437628
0.415124 0.394307 0.373958 0.354816 0.336158 0.318489 0.301731 0.28579 0.270742 0.256492
0.243007 0.230222 0.218135 0.206726 0.196004 0.18592 0.176452 0.167543 0.159138 0.15122
0.143755 0.136709 0.130047 0.123748 0.117789 0.112148 0.106802 0.101733 0.0969308
0.0923695 0.0880326 0.0839001 0.079973 0.0762397 0.0726893 1.52113
 # gender = 2
 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087
0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087
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0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087

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0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087
0.045087 0.045087
 52.6066 49.3912 46.2971 43.3768 40.7037 38.0065 35.4707 33.0233 30.6692 28.4609 26.9206
25.2618 24.9744 24.0833 24.4625 24.3491 24.39 23.953 23.9473 23.8394 23.2722 21.8654
20.7287 19.1775 17.484 15.7275 14.2319 12.694 11.3336 10.1919 9.04001 7.94401 7.00898
6.18417 5.41966 4.75987 4.18558 3.6957 3.27249 2.91151 2.59848 2.32761 2.10015 1.89818
1.72437 1.57356 1.44698 1.3308 1.22951 1.14044 1.06067 0.989601 0.925714 0.868 0.815176
0.7665 0.721413 0.67952 0.640538 0.604586 0.571268 0.540039 0.510864 0.48395 0.458639
0.436059 0.415118 0.394545 0.375124 0.356101 0.338018 0.3208 0.30436 0.288791 0.274004
0.259979 0.246655 0.234042 0.222127 0.210922 0.20038 0.190476 0.181151 0.172346 0.164042
0.156202 0.148791 0.141772 0.135123 0.128821 0.122844 0.11717 0.111778 0.10666 0.101791
0.0971527 0.092725 0.0885102 0.0844965 0.0806734 1.736
# Age-structure at Ydeclare= 2013
 54.1634 50.9936 47.9496 44.9513 42.0732 39.3559 36.8657 34.3578 32.0015 29.7326 27.5565
25.5209 24.0929 22.5667 22.2712 21.4425 21.7497 21.6244 21.6447 21.2521 21.2555 21.1835
20.7193 19.5208 18.5724 17.2568 15.8101 14.2969 13.0076 11.6639 10.4662 9.45424 8.418
7.42057 6.56278 5.80009 5.08803 4.4701 3.92968 3.46675 3.06534 2.72177 2.42299 2.16383
1.94559 1.75171 1.58472 1.43984 1.3181 1.20678 1.1099 1.02491 0.949067 0.881742 0.821467
0.767253 0.717882 0.672628 0.630936 0.592403 0.55673 0.523971 0.493739 0.465522 0.43926
0.415102 0.392462 0.372285 0.353619 0.335373 0.318209 0.301478 0.285632 0.270604 0.256307
0.242812 0.230031 0.217936 0.206468 0.195627 0.185394 0.175776 0.166732 0.158239 0.150249
0.142711 0.135609 0.128914 0.122595 0.11662 0.110971 0.105627 0.100568 0.0957748
0.0912288 0.0869224 0.082832 0.0789428 0.075237 0.0717155 1.49763
 54.1634 51.0523 48.0599 45.106 42.2653 39.5788 37.1138 34.6243 32.2811 30.0201 27.8476
25.8124 24.388 22.8611 22.579 21.7543 22.0794 21.9618 21.9852 21.5798 21.5647 21.459
20.9411 19.6693 18.6419 17.243 15.7171 14.1356 12.7894 11.4058 10.1823 9.15567 8.12021
7.13523 6.29504 5.55401 4.86724 4.2746 3.75881 3.31887 2.93883 2.6147 2.33364 2.09045
1.88624 1.70493 1.54889 1.41351 1.29988 1.19559 1.10466 1.02469 0.953065 0.889252
0.831882 0.780051 0.732607 0.688884 0.648382 0.610746 0.575722 0.543419 0.513481 0.485418
0.459199 0.435012 0.412265 0.391972 0.373151 0.354659 0.337203 0.320105 0.30385 0.288373
0.273594 0.259598 0.246304 0.233694 0.221715 0.210376 0.199663 0.189589 0.180112 0.171208
0.162825 0.15491 0.147445 0.140397 0.133735 0.127426 0.12145 0.115786 0.110413 0.105312
0.100466 0.0958667 0.09149 0.0873211 0.0833414 0.0795531 1.70878
# Year for Tmin Age-structure (set to Ydecl by SS)
2002
#  recruitment and biomass
# Number of historical assessment years
97
# Historical data
# year recruitment spawner in B0 in R project in R/S project
1915  1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931
1932 1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949
1950 1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967
1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985
1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003
2004 2005 2006 2007 2008 2009 2010 2011 #years (with first value representing R0)
228.199  228.199 228.166 228.122 228.071 228.038 228.003 227.968 227.935 227.9 227.86
227.803 227.737 227.663 227.578 227.462 227.341 227.238 227.14 227.061 226.964 226.847
226.693 226.543 226.396 226.285 226.112 225.898 225.629 224.966 224.299 223.184 222.249
221.888 221.465 221.191 220.897 220.532 220.22 219.99 219.692 219.308 218.834 218.279
217.679 217.14 216.651 216.251 215.77 215.4 215.155 214.069 213.646 213.144 212.617
211.353 210.501 209.319 207.77 206.266 204.52 202.876 200.874 198.754 194.927 190.919
187.556 182.49 175.465 170.295 166.016 160.484 157.121 152.945 147.979 141.01 136.72
128.709 119.802 111.758 106.713 100.33 95.2454 88.9269 87.5695 84.2707 85.5017 86.1407
88.5068 90.9232 93.2207 95.3794 97.5645 99.3524 101.342 103.338 105.213 #recruits; first
value is R0 (virgin)
1.02769e+009  1.02769e+009 1.02723e+009 1.0266e+009 1.02589e+009 1.02542e+009
1.02492e+009 1.02443e+009 1.02396e+009 1.02347e+009 1.02291e+009 1.0221e+009 1.02118e+009
1.02014e+009 1.01895e+009 1.01732e+009 1.01562e+009 1.01419e+009 1.01282e+009
1.01172e+009 1.01038e+009 1.00876e+009 1.00664e+009 1.00457e+009 1.00254e+009
1.00103e+009 9.98666e+008 9.95743e+008 9.92105e+008 9.83185e+008 9.74338e+008
9.59766e+008 9.47766e+008 9.4319e+008 9.37871e+008 9.34446e+008 9.30784e+008 9.26264e+008
9.22426e+008 9.19604e+008 9.15972e+008 9.11322e+008 9.05614e+008 8.99004e+008
8.91914e+008 8.8562e+008 8.79954e+008 8.75358e+008 8.69862e+008 8.65667e+008 8.62907e+008
8.508e+008 8.46141e+008 8.40657e+008 8.34945e+008 8.21452e+008 8.12511e+008 8.00317e+008
7.84671e+008 7.69837e+008 7.53059e+008 7.37659e+008 7.19426e+008 7.00704e+008
6.68345e+008 6.36313e+008 6.10778e+008 5.74454e+008 5.27919e+008 4.96218e+008
4.71449e+008 4.4124e+008 4.23796e+008 4.03031e+008 3.79555e+008 3.48642e+008 3.307e+008
2.99193e+008 2.66925e+008 2.40004e+008 2.24091e+008 2.0494e+008 1.90416e+008 1.73207e+008
1.69624e+008 1.61081e+008 1.64243e+008 1.65896e+008 1.72094e+008 1.78547e+008
```

```
1.84803e+008 1.90791e+008 1.96963e+008 2.02098e+008 2.07907e+008 2.13833e+008
2.19494e+008 #spbio; first value is SPB_virgin (virgin)
1 0 0 0
```

```
0
# File with time series of weight-at-age data
none
# Use bisection (0) or linear interpolation (1)
0
# Target Depletion
0.4
# CV of implementation error
0
```

Appendix B. Parameter vector input file for rebuilding analyses

```
# values from cat75_hlow, catch at 75% and steepness at low value. # this is state of
nature 1 out of 9 (in no particular order) # and parameter set number 1 out of 1 for this
state
 0 0 29.7616 108.042 355.495 1050.11 2751.72 6357.19 12987 23703.3 39199.8 59624.7
84600.9 113389 145096 178851 213918 249730 285895 322160 358379 394474 430410 466169
501746 537131 572311 607266 641970 676393 710500 744252 777613 810542 843002 874957
906373 937219 967467 997092 1.02607e+006 1.05439e+006 1.08202e+006 1.10897e+006
1.13521e+006 1.16075e+006 1.18557e+006 1.20968e+006 1.23308e+006 1.25577e+006
1.27775e+006 1.29903e+006 1.31962e+006 1.33952e+006 1.35876e+006 1.37733e+006
1.39526e+006 1.41255e+006 1.42922e+006 1.44528e+006 1.46074e+006 1.47563e+006
1.48996e+006 1.50374e+006 1.517e+006 1.52973e+006 1.54197e+006 1.55372e+006 1.565e+006
1.57583e+006 1.58623e+006 1.59646e+006 1.60628e+006 1.6157e+006 1.62472e+006 1.63338e+006
1.64167e+006 1.64961e+006 1.65723e+006 1.66451e+006 1.67149e+006 1.67817e+006
1.68457e+006 1.69069e+006 1.69655e+006 1.70215e+006 1.70751e+006 1.71264e+006
1.71754e+006 1.72223e+006 1.72671e+006 1.731e+006 1.7351e+006 1.73901e+006 1.74276e+006
1.74633e+006 1.74975e+006 1.75302e+006 1.75614e+006 1.75912e+006 1.76463e+006 #female
fecundity; weighted by N in year Y_init across morphs and areas
 0.0455376 0.16493 0.224524 0.292289 0.366898 0.447035 0.531582 0.619697 0.710794
0.804474 0.900459 0.998527 1.09847 1.20008 1.30312 1.40732 1.51242 1.61813 1.72414
1.83017 1.93592 2.04112 2.14551 2.24885 2.35091 2.45151 2.55047 2.64763 2.74286 2.83605
2.9271 3.01595 3.10252 3.18679 3.2687 3.34825 3.42542 3.50023 3.57266 3.64276 3.71053
3.776 3.83922 3.90022 3.95904 4.01573 4.07034 4.12292 4.17352 4.22218 4.26898 4.31395
4.35716 4.39865 4.43849 4.47673 4.51341 4.5486 4.58234 4.61469 4.6457 4.67541 4.70387
4.73113 4.75724 4.78223 4.80616 4.82906 4.85098 4.87194 4.89214 4.9116 4.93021 4.948
4.96502 4.98128 4.99684 5.0117 5.02591 5.03949 5.05246 5.06486 5.07671 5.08803 5.09884
5.10917 5.11903 5.12845 5.13745 5.14605 5.15425 5.16209 5.16957 5.17671 5.18353 5.19005
5.19626 5.2022 5.20786 5.21327 5.22326 #bodywt for gender,fleet: 1 / 1
 0 0.0544711 0.0817579 0.118143 0.164042 0.218765 0.280533 0.346798 0.414724 0.481651
0.54541 0.60447 0.657934 0.705443 0.747045 0.783062 0.813977 0.840347 0.862744 0.881714
0.89776 0.911328 0.922809 0.932535 0.940791 0.947815 0.953807 0.958933 0.963332 0.967119
0.970391 0.973226 0.975692 0.977844 0.979728 0.981383 0.982841 0.98413 0.985273 0.98629
0.987197 0.988008 0.988736 0.98939 0.98998 0.990513 0.990995 0.991434 0.991832 0.992196
0.992528 0.992832 0.993111 0.993367 0.993603 0.99382 0.99402 0.994205 0.994377 0.994536
0.994683 0.994821 0.994948 0.995067 0.995178 0.995281 0.995378 0.995468 0.995553 0.995632
0.995704 0.995768 0.995829 0.995886 0.995939 0.99599 0.996037 0.996082 0.996125 0.996165
0.996202 0.996238 0.996272 0.996303 0.996334 0.996362 0.996389 0.996415 0.996439 0.996462
0.996483 0.996504 0.996524 0.996542 0.99656 0.996576 0.996592 0.996607 0.996622 0.996635
0.99666 #selex for gender,fleet: 1 / 1
 0.0466962 0.171499 0.234454 0.306351 0.385551 0.470264 0.558887 0.650217 0.74348
0.838256 0.934353 1.0317 1.13027 1.23003 1.3309 1.43277 1.53548 1.63882 1.74256 1.84644
1.95022 2.05362 2.15638 2.25827 2.35906 2.45853 2.5565 2.6528 2.74728 2.83982 2.93031
3.01867 3.10482 3.18872 3.27032 3.3496 3.42654 3.50114 3.5734 3.64334 3.71097 3.77633
3.83945 3.90036 3.95911 4.01574 4.07029 4.12281 4.17336 4.22199 4.26875 4.31369 4.35687
4.39835 4.43816 4.47638 4.51305 4.54823 4.58196 4.61429 4.64529 4.67499 4.70345 4.7307
4.7568 4.78179 4.80571 4.82861 4.85052 4.87148 4.89168 4.91113 4.92974 4.94753 4.96454
4.98081 4.99636 5.01122 5.02543 5.03901 5.05198 5.06438 5.07622 5.08754 5.09835 5.10868
5.11854 5.12796 5.13696 5.14555 5.15376 5.16159 5.16907 5.17622 5.18304 5.18955 5.19576
5.2017 5.20736 5.21277 5.22276 #bodywt for gender,fleet: 1 / 2
 0 0.0225958 0.0371544 0.0588146 0.0893036 0.129716 0.18007 0.239131 0.304606 0.373598
0.443136 0.510609 0.574019 0.632052 0.684031 0.729785 0.76951 0.803636 0.832718 0.857357
0.87815 0.895654 0.910371 0.922745 0.933156 0.941927 0.949332 0.955599 0.960917 0.965444
0.969309 0.972621 0.975469 0.977926 0.980053 0.981901 0.983512 0.984922 0.986159 0.987249
0.988212 0.989065 0.989824 0.9905 0.991105 0.991647 0.992134 0.992573 0.99297 0.99333
0.993656 0.993952 0.994223 0.99447 0.994696 0.994903 0.995093 0.995268 0.995429 0.995578
0.995716 0.995843 0.995961 0.996071 0.996172 0.996267 0.996355 0.996437 0.996514 0.996586
0.99665 0.996707 0.996761 0.996812 0.996859 0.996903 0.996945 0.996985 0.997022 0.997057
0.99709 0.997121 0.997151 0.997178 0.997205 0.997229 0.997253 0.997275 0.997296 0.997316
0.997335 0.997352 0.997369 0.997385 0.997401 0.997415 0.997429 0.997442 0.997454 0.997466
0.997487 #selex for gender,fleet: 1 / 2
 0.0509818 0.191557 0.260062 0.33442 0.41139 0.489176 0.567422 0.646605 0.727485 0.810787
0.897052 0.986584 1.07946 1.17554 1.27456 1.37609 1.47967 1.5848 1.69097 1.7977 1.90454
2.01109 2.11697 2.22188 2.32553 2.42769 2.52814 2.62673 2.7233 2.81775 2.90997 2.99989
3.08746 3.17263 3.25538 3.3357 3.41358 3.48903 3.56206 3.63269 3.70096 3.76689 3.83053
3.89191 3.95109 4.00811 4.06302 4.11588 4.16673 4.21564 4.26265 4.30783 4.35123 4.3929
4.4329 4.47129 4.50812 4.54344 4.57731 4.60977 4.64089 4.6707 4.69926 4.72661 4.7528
4.77787 4.80187 4.82484 4.84682 4.86785 4.8881 4.90759 4.92624 4.94407 4.96112 4.97742
4.993 5.00789 5.02213 5.03573 5.04873 5.06115 5.07302 5.08436 5.09519 5.10554 5.11542
5.12486 5.13387 5.14248 5.1507 5.15855 5.16604 5.1732 5.18003 5.18656 5.19278 5.19873
5.2044 5.20982 5.21982 #bodywt for gender,fleet: 1 / 3
```

```
 0 0.0179931 0.0382032 0.0744887 0.131698 0.210569 0.306484 0.411033 0.515049 0.611154
0.694887 0.764571 0.820557 0.864358 0.897963 0.923392 0.942457 0.956672 0.967243 0.975103
0.980958 0.985333 0.988617 0.991095 0.992976 0.994414 0.99552 0.996377 0.997046 0.997572
0.997988 0.99832 0.998587 0.998803 0.998978 0.999122 0.999241 0.999339 0.999422 0.999491
0.999549 0.999598 0.999641 0.999677 0.999708 0.999735 0.999758 0.999779 0.999797 0.999812
0.999826 0.999839 0.99985 0.999859 0.999868 0.999876 0.999883 0.999889 0.999895 0.9999
0.999905 0.999909 0.999913 0.999917 0.99992 0.999923 0.999926 0.999928 0.999931 0.999933
0.999935 0.999936 0.999938 0.999939 0.99994 0.999942 0.999943 0.999944 0.999945 0.999946
0.999947 0.999948 0.999948 0.999949 0.99995 0.99995 0.999951 0.999952 0.999952 0.999953
0.999953 0.999954 0.999954 0.999954 0.999955 0.999955 0.999955 0.999956 0.999956 0.999956
0.999957 #selex for gender,fleet: 1 / 3
 0.047076 0.173866 0.238336 0.312456 0.394654 0.483012 0.575617 0.67088 0.767683 0.865368
0.963624 1.06236 1.16158 1.26135 1.36169 1.4626 1.56402 1.66584 1.76793 1.87009 1.97212
2.07381 2.17493 2.27526 2.37459 2.4727 2.56942 2.66458 2.75803 2.84963 2.93928 3.02688
3.11235 3.19563 3.27668 3.35546 3.43195 3.50615 3.57805 3.64767 3.71501 3.78011 3.84299
3.90368 3.96224 4.01868 4.07307 4.12545 4.17587 4.22438 4.27102 4.31586 4.35895 4.40034
4.44008 4.47822 4.51482 4.54993 4.58361 4.61589 4.64684 4.67649 4.70491 4.73212 4.75818
4.78314 4.80703 4.8299 4.85178 4.87272 4.89289 4.91233 4.93091 4.94869 4.96569 4.98194
4.99748 5.01233 5.02652 5.04009 5.05306 5.06544 5.07728 5.08859 5.09939 5.10971 5.11956
5.12898 5.13797 5.14656 5.15475 5.16258 5.17006 5.1772 5.18401 5.19052 5.19673 5.20266
5.20832 5.21373 5.2237 #bodywt for gender,fleet: 1 / 4
 0 0.0122524 0.0208402 0.0342343 0.0541294 0.0821141 0.119247 0.165675 0.220472 0.281758
0.347053 0.413712 0.479302 0.541855 0.599971 0.652808 0.700006 0.741571 0.777766 0.809009
0.835802 0.85867 0.878123 0.89464 0.908651 0.920537 0.930628 0.939205 0.946511 0.952746
0.958081 0.962658 0.966598 0.969998 0.972942 0.9755 0.977729 0.979677 0.981386 0.98289
0.984217 0.985391 0.986434 0.987362 0.988191 0.988934 0.9896 0.9902 0.990741 0.99123
0.991673 0.992076 0.992443 0.992777 0.993083 0.993363 0.99362 0.993856 0.994073 0.994273
0.994458 0.994629 0.994787 0.994934 0.99507 0.995197 0.995315 0.995424 0.995527 0.995622
0.995708 0.995784 0.995855 0.995922 0.995985 0.996044 0.996099 0.996151 0.996201 0.996247
0.996291 0.996332 0.99637 0.996407 0.996442 0.996474 0.996505 0.996535 0.996562 0.996588
0.996613 0.996637 0.996659 0.99668 0.9967 0.996719 0.996737 0.996754 0.99677 0.996786
0.996814 #selex for gender,fleet: 1 / 4
 0.0463972 0.170948 0.234773 0.308938 0.392524 0.484231 0.582478 0.685567 0.79187
0.899989 1.00884 1.11768 1.22602 1.3336 1.44029 1.54604 1.65086 1.75474 1.85769 1.95969
2.0607 2.16067 2.25953 2.35719 2.45355 2.54853 2.64201 2.73389 2.82409 2.9125 2.99906
3.08369 3.16632 3.24691 3.32542 3.4018 3.47605 3.54814 3.61808 3.68586 3.75149 3.81499
3.87639 3.9357 3.99297 4.04822 4.1015 4.15284 4.2023 4.24991 4.29572 4.33978 4.38214
4.42284 4.46195 4.4995 4.53555 4.57014 4.60333 4.63516 4.66568 4.69494 4.72297 4.74984
4.77557 4.80021 4.82381 4.8464 4.86802 4.88872 4.90869 4.92797 4.94641 4.96404 4.98091
4.99703 5.01245 5.02718 5.04127 5.05473 5.0676 5.0799 5.09164 5.10287 5.11359 5.12384
5.13362 5.14297 5.15189 5.16042 5.16856 5.17633 5.18376 5.19085 5.19761 5.20408 5.21024
5.21613 5.22176 5.22712 5.23703 #bodywt for gender,fleet: 1 / 5
 0 0.00532106 0.00872229 0.0139284 0.0216487 0.0327128 0.0479958 0.0682969 0.0941933
0.125908 0.163234 0.205535 0.251825 0.300894 0.351448 0.402241 0.452167 0.500322 0.546022
0.5888 0.628383 0.664659 0.697643 0.727441 0.754223 0.778199 0.799597 0.818654 0.835599
0.850655 0.864027 0.875905 0.88646 0.895848 0.904206 0.911656 0.918307 0.924253 0.929577
0.934354 0.938646 0.942511 0.945997 0.949147 0.951999 0.954585 0.956935 0.959075 0.961025
0.962807 0.964438 0.965932 0.967304 0.968565 0.969726 0.970796 0.971785 0.972699 0.973545
0.97433 0.975058 0.975735 0.976364 0.97695 0.977497 0.978007 0.978483 0.978928 0.979345
0.979735 0.980087 0.980404 0.980701 0.980981 0.981244 0.981492 0.981725 0.981945 0.982152
0.982348 0.982532 0.982707 0.982871 0.983027 0.983174 0.983314 0.983445 0.98357 0.983688
0.9838 0.983906 0.984007 0.984102 0.984193 0.984279 0.98436 0.984437 0.984511 0.98458
0.984646 0.984768 #selex for gender,fleet: 1 / 5
 0.0478953 0.1786 0.24595 0.324504 0.41336 0.511132 0.615988 0.725805 0.838438 0.952006
1.06508 1.17676 1.28654 1.39428 1.50003 1.60394 1.70622 1.80705 1.90661 2.00501 2.10234
2.19864 2.29391 2.38812 2.48121 2.57311 2.66374 2.75299 2.84078 2.92701 3.01159 3.09443
3.17547 3.25463 3.33186 3.40712 3.48036 3.55157 3.62072 3.68781 3.75283 3.81579 3.87672
3.93562 3.99252 4.04745 4.10044 4.15154 4.20077 4.24819 4.29383 4.33774 4.37997 4.42056
4.45956 4.49703 4.533 4.56752 4.60065 4.63243 4.6629 4.69212 4.72012 4.74695 4.77266
4.79728 4.82085 4.84343 4.86503 4.88572 4.90568 4.92494 4.94336 4.96099 4.97784 4.99396
5.00936 5.02409 5.03817 5.05163 5.06449 5.07678 5.08853 5.09975 5.11046 5.12071 5.13049
5.13983 5.14875 5.15728 5.16542 5.17319 5.18061 5.1877 5.19446 5.20092 5.20709 5.21298
5.2186 5.22396 5.23387 #bodywt for gender,fleet: 1 / 6
 0 0.00154241 0.00280432 0.00495169 0.00848621 0.0140999 0.0226752 0.0352297 0.0527916
0.0762215 0.106028 0.142232 0.184334 0.231366 0.282034 0.334888 0.38848 0.441496 0.49284
0.541668 0.587391 0.629654 0.668295 0.703311 0.73481 0.762979 0.788052 0.810292 0.829966
0.847339 0.862663 0.876171 0.888079 0.89858 0.907847 0.916033 0.923274 0.929688 0.935379
0.940437 0.944942 0.94896 0.952553 0.955771 0.95866 0.961258 0.963599 0.965714 0.967627
0.969362 0.970938 0.972372 0.973679 0.974873 0.975966 0.976967 0.977886 0.978731 0.979509
0.980227 0.980889 0.981502 0.98207 0.982596 0.983084 0.983538 0.98396 0.984354 0.98472
0.985063 0.985368 0.98564 0.985894 0.986133 0.986357 0.986568 0.986766 0.986952 0.987127
```

0.987292 0.987447 0.987593 0.987732 0.987862 0.987985 0.988101 0.988211 0.988315 0.988413
0.988506 0.988594 0.988678 0.988757 0.988831 0.988902 0.988969 0.989033 0.989094 0.989151
0.989205 0.989305 #selex for gender,fleet: 1 / 6
 0.0544418 0.187734 0.254926 0.330634 0.413235 0.501233 0.593451 0.689077 0.7876 0.888708
0.992193 1.09788 1.2056 1.31513 1.42622 1.53857 1.65189 1.76582 1.88002 1.99417 2.10793
2.22099 2.33307 2.4439 2.55325 2.66091 2.76669 2.87044 2.97202 3.07133 3.16827 3.26277
3.35477 3.44424 3.53116 3.6155 3.69728 3.77649 3.85315 3.92729 3.99894 4.06813 4.13491
4.19933 4.26142 4.32125 4.37886 4.43431 4.48767 4.53897 4.5883 4.6357 4.68123 4.72495
4.76692 4.8072 4.84585 4.88291 4.91846 4.95253 4.98519 5.01648 5.04646 5.07518 5.10268
5.12901 5.15422 5.17835 5.20144 5.22353 5.24481 5.26529 5.28489 5.30363 5.32155 5.33869
5.35508 5.37074 5.38571 5.40003 5.4137 5.42677 5.43927 5.4512 5.4626 5.4735 5.48391
5.49385 5.50335 5.51242 5.52108 5.52936 5.53726 5.5448 5.55201 5.55889 5.56546 5.57174
5.57773 5.58344 5.59403 #bodywt for gender,fleet: 2 / 1
 0 0.0552626 0.0844875 0.123924 0.174006 0.233804 0.301086 0.372751 0.445452 0.516158
0.582514 0.64297 0.696736 0.743634 0.783924 0.818135 0.846931 0.87102 0.891089 0.90777
0.921621 0.933126 0.942693 0.950664 0.957322 0.9629 0.967589 0.971545 0.974895 0.977743
0.980173 0.982256 0.984047 0.985594 0.986936 0.988103 0.989123 0.990017 0.990803 0.991497
0.992112 0.992658 0.993145 0.993579 0.993969 0.99432 0.994635 0.994921 0.995179 0.995413
0.995626 0.995821 0.995998 0.996161 0.99631 0.996446 0.996572 0.996688 0.996795 0.996894
0.996986 0.997071 0.99715 0.997223 0.997291 0.997355 0.997414 0.997469 0.997521 0.997569
0.997613 0.997652 0.997689 0.997723 0.997755 0.997786 0.997815 0.997842 0.997867 0.997891
0.997914 0.997935 0.997955 0.997975 0.997993 0.99801 0.998026 0.998041 0.998056 0.998069
0.998082 0.998095 0.998106 0.998117 0.998128 0.998138 0.998147 0.998156 0.998165 0.998173
0.998188 #selex for gender,fleet: 2 / 1
 0.055808 0.195115 0.26603 0.346215 0.433629 0.526201 0.62223 0.720562 0.82056 0.921964
1.02473 1.12889 1.2345 1.34155 1.44997 1.55962 1.6703 1.78174 1.89366 2.00575 2.11768
2.22915 2.33985 2.4495 2.55785 2.66466 2.76973 2.87288 2.97397 3.07287 3.16946 3.26368
3.35545 3.44473 3.53148 3.6157 3.69736 3.77648 3.85307 3.92715 3.99875 4.0679 4.13465
4.19904 4.26111 4.32092 4.37852 4.43396 4.4873 4.53861 4.58793 4.63532 4.68085 4.72457
4.76654 4.80682 4.84547 4.88253 4.91808 4.95215 4.98481 5.01611 5.04609 5.07481 5.10231
5.12865 5.15386 5.17799 5.20108 5.22318 5.24445 5.26494 5.28454 5.30328 5.3212 5.33834
5.35472 5.37039 5.38536 5.39968 5.41335 5.42643 5.43892 5.45085 5.46226 5.47315 5.48356
5.4935 5.503 5.51207 5.52074 5.52901 5.53691 5.54446 5.55167 5.55855 5.56512 5.57139
5.57738 5.5831 5.59369 #bodywt for gender,fleet: 2 / 2
 0 0.0230208 0.0387365 0.0625263 0.0964052 0.141564 0.197821 0.263456 0.33552 0.410465
0.48481 0.555653 0.620921 0.679405 0.730639 0.774717 0.812104 0.843474 0.869585 0.891195
0.909015 0.923681 0.935743 0.945671 0.953852 0.960611 0.966208 0.97086 0.97474 0.977988
0.980719 0.983024 0.984978 0.986642 0.988064 0.989285 0.990337 0.991248 0.992039 0.992729
0.993333 0.993864 0.994332 0.994746 0.995114 0.995441 0.995733 0.995995 0.99623 0.996441
0.996632 0.996805 0.996962 0.997105 0.997234 0.997353 0.997461 0.997561 0.997652 0.997736
0.997813 0.997885 0.997951 0.998012 0.998068 0.998121 0.998169 0.998215 0.998257 0.998296
0.998332 0.998363 0.998392 0.998419 0.998445 0.998469 0.998492 0.998513 0.998533 0.998552
0.99857 0.998587 0.998603 0.998618 0.998632 0.998645 0.998658 0.99867 0.998681 0.998691
0.998702 0.998711 0.99872 0.998729 0.998737 0.998745 0.998752 0.998759 0.998765 0.998772
0.998783 #selex for gender,fleet: 2 / 2
 0.0608538 0.21745 0.293985 0.375836 0.459465 0.543279 0.627327 0.712459 0.799709
0.889961 0.983818 1.08157 1.18321 1.28848 1.39694 1.50806 1.62122 1.73581 1.85124 1.96696
2.0825 2.19741 2.31134 2.42395 2.53499 2.64421 2.75143 2.85649 2.95927 3.05965 3.15755
3.25292 3.34571 3.43588 3.52342 3.60833 3.69061 3.77027 3.84735 3.92186 3.99384 4.06334
4.13039 4.19506 4.25738 4.31741 4.37521 4.43083 4.48434 4.53579 4.58525 4.63277 4.67841
4.72224 4.76431 4.80468 4.8434 4.88054 4.91616 4.9503 4.98301 5.01436 5.0444 5.07316
5.10071 5.12708 5.15233 5.1765 5.19962 5.22175 5.24305 5.26356 5.28317 5.30193 5.31987
5.33702 5.35342 5.3691 5.38409 5.39841 5.4121 5.42518 5.43769 5.44963 5.46104 5.47195
5.48237 5.49232 5.50182 5.5109 5.51957 5.52785 5.53576 5.54331 5.55052 5.55741 5.56399
5.57026 5.57626 5.58198 5.59257 #bodywt for gender,fleet: 2 / 3
 0 0.0185868 0.0407569 0.0812905 0.145528 0.23354 0.338974 0.451455 0.560463 0.65822
0.740653 0.806901 0.858209 0.896852 0.925367 0.946109 0.961055 0.971768 0.979431 0.984916
0.988854 0.991694 0.993754 0.995258 0.996365 0.997186 0.997801 0.998264 0.998617 0.998888
0.999098 0.999261 0.99939 0.999492 0.999574 0.99964 0.999694 0.999737 0.999773 0.999803
0.999828 0.999848 0.999866 0.999881 0.999893 0.999904 0.999914 0.999922 0.999929 0.999935
0.99994 0.999945 0.999949 0.999952 0.999956 0.999959 0.999961 0.999963 0.999966 0.999967
0.999969 0.999971 0.999972 0.999973 0.999974 0.999976 0.999977 0.999977 0.999978 0.999979
0.99998 0.99998 0.999981 0.999981 0.999982 0.999982 0.999982 0.999983 0.999983 0.999983
0.999984 0.999984 0.999984 0.999985 0.999985 0.999985 0.999985 0.999985 0.999986 0.999986
0.999986 0.999986 0.999986 0.999986 0.999986 0.999987 0.999987 0.999987 0.999987 0.999987
0.999987 #selex for gender,fleet: 2 / 3
 0.0562558 0.197784 0.270409 0.353087 0.4438 0.540266 0.640382 0.742552 0.845789 0.949623
1.05393 1.15879 1.26432 1.37065 1.47785 1.58591 1.69476 1.80424 1.91417 2.02428 2.13433
2.24403 2.35309 2.46126 2.56826 2.67388 2.77789 2.88011 2.98038 3.07856 3.17452 3.26819
3.35948 3.44834 3.53473 3.61863 3.70001 3.77889 3.85526 3.92915 4.00058 4.06959 4.1362
4.20047 4.26244 4.32215 4.37967 4.43504 4.48831 4.53955 4.58882 4.63616 4.68165 4.72533

4.76726 4.80751 4.84612 4.88316 4.91868 4.95273 4.98537 5.01664 5.04661 5.07531 5.1028
5.12911 5.15431 5.17843 5.20151 5.22359 5.24486 5.26534 5.28493 5.30367 5.32159 5.33872
5.3551 5.37076 5.38573 5.40004 5.41371 5.42678 5.43927 5.4512 5.4626 5.47349 5.4839
5.49384 5.50333 5.5124 5.52106 5.52934 5.53724 5.54478 5.55199 5.55887 5.56543 5.57171
5.5777 5.58341 5.594 #bodywt for gender,fleet: 2 / 4
 0 0.012503 0.0218054 0.0366115 0.0589414 0.0906491 0.132871 0.185557 0.247316 0.315643
0.38742 0.459478 0.529056 0.594062 0.653148 0.705651 0.751451 0.790819 0.82427 0.852443
0.876016 0.895653 0.911963 0.925492 0.936709 0.946018 0.953754 0.960197 0.965578 0.970085
0.973873 0.977069 0.979775 0.982074 0.984037 0.985719 0.987165 0.988414 0.989496 0.990438
0.991261 0.991982 0.992616 0.993175 0.993671 0.994111 0.994503 0.994853 0.995167 0.995449
0.995703 0.995932 0.99614 0.996329 0.9965 0.996656 0.996799 0.996929 0.997049 0.997159
0.99726 0.997353 0.997439 0.997519 0.997592 0.997661 0.997724 0.997783 0.997837 0.997888
0.997934 0.997974 0.998012 0.998047 0.99808 0.998111 0.99814 0.998167 0.998193 0.998217
0.99824 0.998261 0.998282 0.998301 0.998319 0.998336 0.998352 0.998367 0.998381 0.998395
0.998408 0.99842 0.998432 0.998442 0.998453 0.998463 0.998472 0.998481 0.998489 0.998497
0.998512 #selex for gender,fleet: 2 / 4
 0.0554559 0.194532 0.266532 0.349475 0.442087 0.542714 0.64946 0.760411 0.873844
0.988393 1.10309 1.21735 1.33086 1.4435 1.55527 1.66623 1.77643 1.88591 1.99469 2.10275
2.21002 2.31644 2.42188 2.52622 2.62934 2.73108 2.83131 2.92989 3.0267 3.12162 3.21454
3.30538 3.39406 3.48051 3.56469 3.64655 3.72608 3.80326 3.87809 3.95057 4.02072 4.08855
4.15409 4.21738 4.27845 4.33734 4.39411 4.44878 4.50143 4.55209 4.60082 4.64767 4.6927
4.73596 4.77751 4.81739 4.85568 4.89241 4.92764 4.96143 4.99382 5.02486 5.05461 5.08311
5.11041 5.13656 5.16159 5.18555 5.20849 5.23044 5.25161 5.272 5.29152 5.31018 5.32803
5.3451 5.36142 5.37702 5.39193 5.40619 5.41981 5.43284 5.44528 5.45717 5.46853 5.47939
5.48975 5.49966 5.50912 5.51816 5.5268 5.53504 5.54291 5.55043 5.55762 5.56447 5.57102
5.57727 5.58324 5.58894 5.59949 #bodywt for gender,fleet: 2 / 5
 0 0.00541992 0.00909812 0.0148482 0.0235318 0.0361619 0.0538005 0.0773931 0.107574
0.144499 0.187764 0.236435 0.289165 0.344386 0.400491 0.455994 0.509647 0.560485 0.607842
0.651328 0.69078 0.726219 0.757797 0.785752 0.810375 0.831981 0.850888 0.867401 0.881809
0.894376 0.90534 0.91491 0.923273 0.930593 0.937008 0.942643 0.947601 0.951975 0.95584
0.959265 0.962307 0.965015 0.967431 0.969593 0.971531 0.973273 0.974841 0.976258 0.977539
0.978701 0.979756 0.980717 0.981594 0.982395 0.983128 0.9838 0.984418 0.984986 0.98551
0.985993 0.98644 0.986854 0.987237 0.987592 0.987923 0.98823 0.988516 0.988783 0.989032
0.989265 0.989473 0.989659 0.989834 0.989998 0.990152 0.990297 0.990433 0.990562 0.990682
0.990796 0.990903 0.991005 0.9911 0.99119 0.991275 0.991356 0.991432 0.991504 0.991572
0.991637 0.991698 0.991756 0.991811 0.991863 0.991912 0.991959 0.992003 0.992045 0.992085
0.992123 0.992193 #selex for gender,fleet: 2 / 5
 0.0572213 0.203113 0.278993 0.3667 0.46494 0.571899 0.685336 0.802813 0.92204 1.04118
1.15899 1.27482 1.38844 1.49992 1.60951 1.7175 1.82417 1.92976 2.03447 2.13843 2.24168
2.34422 2.44603 2.547 2.64702 2.74598 2.84372 2.94009 3.03496 3.12819 3.21965 3.30923
3.39684 3.48237 3.56578 3.64699 3.72597 3.8027 3.87714 3.94931 4.01919 4.08681 4.15218
4.21533 4.27629 4.3351 4.3918 4.44642 4.49903 4.54966 4.59838 4.64522 4.69025 4.73351
4.77506 4.81496 4.85325 4.89 4.92524 4.95905 4.99145 5.02252 5.05229 5.0808 5.10812
5.13428 5.15934 5.18332 5.20627 5.22824 5.24942 5.26982 5.28934 5.30801 5.32587 5.34294
5.35927 5.37488 5.3898 5.40406 5.41769 5.43072 5.44317 5.45506 5.46643 5.47729 5.48766
5.49758 5.50704 5.51609 5.52472 5.53297 5.54085 5.54837 5.55556 5.56242 5.56897 5.57522
5.5812 5.5869 5.59745 #bodywt for gender,fleet: 2 / 6
 0 0.00157913 0.00295503 0.00535838 0.00940687 0.0159639 0.0261349 0.0411838 0.0623537
0.0906206 0.126453 0.16966 0.219376 0.274181 0.332311 0.391898 0.451174 0.508625 0.563072
0.613693 0.66 0.701787 0.739072 0.772032 0.800954 0.826184 0.848093 0.867056 0.883432
0.897554 0.909727 0.920218 0.929267 0.93708 0.943835 0.949687 0.954766 0.959185 0.963038
0.966407 0.96936 0.971955 0.974242 0.976263 0.978053 0.979644 0.981061 0.982326 0.98346
0.984477 0.985392 0.986217 0.986963 0.987639 0.988253 0.988811 0.98932 0.989785 0.990211
0.990601 0.990959 0.991288 0.991592 0.991872 0.992131 0.992371 0.992592 0.992798 0.99299
0.993168 0.993325 0.993464 0.993594 0.993716 0.99383 0.993937 0.994037 0.994131 0.99422
0.994303 0.994381 0.994454 0.994524 0.994589 0.994651 0.994709 0.994764 0.994816 0.994865
0.994911 0.994955 0.994996 0.995035 0.995072 0.995108 0.995141 0.995172 0.995202 0.995231
0.995258 0.995307 #selex for gender,fleet: 2 / 6
 0.047214 0.047214 0.047214 0.047214 0.047214 0.047214 0.047214 0.047214 0.047214
0.047214 0.047214 0.047214 0.047214 0.047214 0.047214 0.047214 0.047214 0.047214 0.047214
0.047214 0.047214 0.047214 0.047214 0.047214 0.047214 0.047214 0.047214 0.047214 0.047214
0.047214 0.047214 0.047214 0.047214 0.047214 0.047214 0.047214 0.047214 0.047214 0.047214
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0.047214 0.047214 0.047214 0.047214 0.047214 0.047214 0.047214 0.047214 0.047214 0.047214
0.047214 0.047214 0.047214 0.047214 0.047214 0.047214 0.047214 0.047214 0.047214 0.047214
0.047214 0.047214 0.047214 0.047214 0.047214 0.047214 0.047214 0.047214 0.047214 0.047214
0.047214 0.047214 0.047214 0.047214 0.047214 0.047214 0.047214 0.047214 0.047214 0.047214
0.047214 0.047214 #mean M for year Yinit: 2011 sex: 1
 32.7144 30.6871 28.7293 26.8989 25.2719 23.5694 21.9835 20.4404 18.9457 17.5511 16.7631
15.8093 15.7066 15.1594 15.5132 15.5098 15.6191 15.3873 15.4838 15.5284 15.2568 14.3713

```
13.7078 12.738 11.6605 10.5271 9.58662 8.59443 7.72065 6.99934 6.24347 5.50558 4.8763
4.31666 3.78699 3.32802 2.92622 2.58304 2.28529 2.03091 1.80914 1.61635 1.4548 1.31018
1.18563 1.07747 0.987317 0.903929 0.831452 0.767931 0.711145 0.66077 0.615671 0.575119
0.538135 0.504169 0.472813 0.443782 0.416871 0.392194 0.369442 0.348181 0.328388 0.310235
0.293204 0.278204 0.264376 0.250718 0.237867 0.225237 0.213267 0.201909 0.191097 0.180905
0.171261 0.162142 0.153496 0.145326 0.137618 0.130381 0.123581 0.117202 0.111203 0.105543
0.100213 0.0951884 0.0904484 0.0859676 0.0817333 0.0777297 0.0739423 0.0703562 0.0669574
0.0637412 0.0606882 0.0577868 0.0550224 0.0523977 0.0499045 0.0475355 0.973992 #numbers
for year Yinit: 2011 sex: 1
 0.0459651 0.0459651 0.0459651 0.0459651 0.0459651 0.0459651 0.0459651 0.0459651
0.0459651 0.0459651 0.0459651 0.0459651 0.0459651 0.0459651 0.0459651 0.0459651 0.0459651
0.0459651 0.0459651 0.0459651 0.0459651 0.0459651 0.0459651 0.0459651 0.0459651 0.0459651
0.0459651 0.0459651 0.0459651 0.0459651 0.0459651 0.0459651 0.0459651 0.0459651 0.0459651
0.0459651 0.0459651 0.0459651 0.0459651 0.0459651 0.0459651 0.0459651 0.0459651 0.0459651
0.0459651 0.0459651 0.0459651 0.0459651 0.0459651 0.0459651 0.0459651 0.0459651 0.0459651
0.0459651 0.0459651 0.0459651 0.0459651 0.0459651 0.0459651 0.0459651 0.0459651 0.0459651
0.0459651 0.0459651 0.0459651 0.0459651 0.0459651 0.0459651 0.0459651 0.0459651 0.0459651
0.0459651 0.0459651 0.0459651 0.0459651 0.0459651 0.0459651 0.0459651 0.0459651 0.0459651
0.0459651 0.0459651 0.0459651 #mean M for year Yinit: 2011 sex: 2
 32.7144 30.7254 28.8011 26.9994 25.3972 23.7141 22.1433 20.6108 19.1224 17.731 16.9493
15.9973 15.9048 15.3604 15.7269 15.728 15.8382 15.5954 15.6767 15.6948 15.3823 14.4427
13.7211 12.6914 11.5583 10.3785 9.39966 8.38237 7.49346 6.76428 6.01222 5.28677 4.67298
4.13135 3.62227 3.18344 2.80098 2.47559 2.19421 1.95458 1.74618 1.56534 1.41424 1.27892
1.16243 1.06123 0.976992 0.898692 0.830507 0.770592 0.716813 0.668928 0.625876 0.58699
0.551339 0.518414 0.48785 0.459396 0.432881 0.408463 0.385856 0.364637 0.344809 0.326573
0.309403 0.294273 0.280293 0.266405 0.253292 0.240335 0.228007 0.216264 0.205043 0.194431
0.184359 0.174814 0.165745 0.157165 0.149061 0.141449 0.134291 0.127573 0.121249 0.115277
0.109645 0.10433 0.0993068 0.0945497 0.0900457 0.0857786 0.081734 0.0778966 0.0742526
0.0707978 0.067512 0.0643835 0.0613971 0.0585564 0.0558533 0.0532806 1.12437 #numbers for
year Yinit: 2011 sex: 2
 33.506 31.599 29.7562 27.8963 26.1029 24.4217 22.9219 21.3515 19.8863 18.4613 17.0831
15.7994 15.0656 14.1866 14.0742 13.566 13.8662 13.8484 13.9327 13.7145 13.7904 13.8211
13.5717 12.7778 12.1826 11.3164 10.3557 9.34646 8.50927 7.62688 6.85013 6.20907 5.53773
4.88263 4.32409 3.82748 3.35759 2.95048 2.59415 2.28984 2.02586 1.80036 1.60379 1.43291
1.28976 1.1616 1.05124 0.955407 0.875535 0.80165 0.737431 0.681146 0.630824 0.58618
0.546208 0.510263 0.477477 0.447361 0.419558 0.393813 0.369945 0.348057 0.327874 0.309013
0.291453 0.275348 0.260237 0.246927 0.234657 0.222537 0.211132 0.199923 0.189299 0.179218
0.169622 0.160575 0.152013 0.143918 0.136242 0.128989 0.122145 0.115721 0.109684 0.104021
0.0986958 0.0936715 0.0889396 0.0844799 0.0802726 0.0762955 0.0725373 0.0689839 0.0656225
0.0624397 0.0594233 0.0565689 0.0538593 0.0512844 0.0488311 0.0465017 0.950878 #numbers
for year Ydeclare: 2013 sex: 1
 33.506 31.6385 29.8304 28.0002 26.2316 24.5705 23.0872 21.5279 20.0702 18.649 17.2714
15.9864 15.2554 14.3756 14.2714 13.7646 14.0763 14.0626 14.1481 13.9202 13.9831 13.9908
13.7053 12.8625 12.2153 11.2949 10.2836 9.2316 8.35918 7.45315 6.66176 6.01273 5.34367
4.69849 4.15271 3.6712 3.2187 2.82869 2.48883 2.1997 1.94971 1.73684 1.55172 1.3911
1.2569 1.13671 1.03326 0.943389 0.868585 0.799044 0.738485 0.685267 0.637493 0.594951
0.556697 0.522141 0.490456 0.461189 0.434017 0.408718 0.38514 0.363424 0.343318 0.324445
0.306808 0.290587 0.275313 0.261853 0.249415 0.23706 0.225392 0.213864 0.202894 0.192444
0.182458 0.173014 0.16405 0.155554 0.147483 0.139845 0.132632 0.125857 0.119486 0.113507
0.10788 0.102565 0.0975531 0.092823 0.0883534 0.0841205 0.080113 0.0763164 0.0727177
0.0693035 0.0660613 0.0629876 0.0600642 0.0572809 0.0546238 0.0520965 1.09743 #numbers
for year Ydeclare: 2013 sex: 2
#R0  1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932
1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950
1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968
1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986
1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004
2005 2006 2007 2008 2009 2010 #years
178.478  178.478 178.446 178.402 178.353 178.32 178.285 178.251 178.218 178.184 178.145
178.089 178.024 177.951 177.868 177.753 177.634 177.533 177.436 177.358 177.263 177.148
176.997 176.85 176.704 176.596 176.426 176.215 175.951 175.301 174.649 173.56 172.649
172.297 171.886 171.62 171.334 170.979 170.676 170.451 170.161 169.788 169.327 168.788
168.205 167.682 167.206 166.816 166.346 165.983 165.74 164.691 164.276 163.786 163.271
162.056 161.234 160.1 158.622 157.19 155.536 153.981 152.099 150.115 146.572 142.893
139.825 135.257 129.014 124.471 120.74 115.972 113.083 109.525 105.336 99.5402 95.9819
89.4605 82.3251 75.9652 71.9741 66.9894 63.0161 58.1426 56.9647 54.3331 54.6485 54.3442
55.7585 57.2287 58.5901 59.8273 61.1155 62.0167 63.159 64.3413 65.4289 #Recruits
7.69897e+008  7.69897e+008 7.69555e+008 7.69084e+008 7.68554e+008 7.68205e+008
7.67834e+008 7.67467e+008 7.67118e+008 7.66755e+008 7.66337e+008 7.65737e+008
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7.65051e+008 7.64275e+008 7.63389e+008 7.62176e+008 7.60916e+008 7.59848e+008
7.58828e+008 7.58011e+008 7.57009e+008 7.55804e+008 7.54226e+008 7.52684e+008
7.51173e+008 7.50045e+008 7.48279e+008 7.46098e+008 7.43384e+008 7.36736e+008
7.30141e+008 7.19283e+008 7.10341e+008 7.06926e+008 7.02958e+008 7.004e+008 6.97664e+008
6.94286e+008 6.91415e+008 6.89297e+008 6.86572e+008 6.83084e+008 6.78802e+008
6.73842e+008 6.68519e+008 6.63781e+008 6.59504e+008 6.56017e+008 6.51853e+008
6.48652e+008 6.46514e+008 6.37404e+008 6.33838e+008 6.29653e+008 6.2529e+008 6.15121e+008
6.08341e+008 5.99129e+008 5.8734e+008 5.76151e+008 5.63508e+008 5.51889e+008 5.38152e+008
5.24046e+008 4.99767e+008 4.7573e+008 4.56533e+008 4.29285e+008 3.9442e+008 3.70613e+008
3.51971e+008 3.2926e+008 3.16061e+008 3.00363e+008 2.82622e+008 2.59305e+008 2.4565e+008
2.21828e+008 1.97407e+008 1.76958e+008 1.64712e+008 1.50008e+008 1.38733e+008
1.25412e+008 1.22273e+008 1.15369e+008 1.16188e+008 1.15398e+008 1.1909e+008 1.22974e+008
1.26613e+008 1.29955e+008 1.33473e+008 1.35957e+008 1.39132e+008 1.42451e+008
1.45534e+008 #SpawnBio
0.383 0.5 0 # spawn-recr steepness, sigmaR, autocorr
# values from cat100_hlow, catch at 100% and steepness at low value. # this is state of
nature 2 out of 9 (in no particular order) # and parameter set number 1 out of 2 for this
state
 0 0 31.1162 112.356 367.744 1080.46 2816.18 6473.87 13168.2 23948.2 39492.1 59937
84901.8 113650 145295 178975 213957 249683 285761 321940 358074 394085 429937 465613
501106 536408 571504 606376 640998 675340 709366 743040 776324 809179 841567 873453
904803 935587 965775 995344 1.02427e+006 1.05254e+006 1.08013e+006 1.10703e+006
1.13324e+006 1.15874e+006 1.18353e+006 1.20761e+006 1.23098e+006 1.25364e+006 1.2756e+006
1.29687e+006 1.31744e+006 1.33734e+006 1.35656e+006 1.37513e+006 1.39305e+006
1.41033e+006 1.427e+006 1.44306e+006 1.45853e+006 1.47342e+006 1.48776e+006 1.50154e+006
1.5148e+006 1.52754e+006 1.53979e+006 1.55155e+006 1.56285e+006 1.57369e+006 1.58409e+006
1.59434e+006 1.60417e+006 1.6136e+006 1.62265e+006 1.63131e+006 1.63962e+006 1.64758e+006
1.65521e+006 1.66251e+006 1.66951e+006 1.6762e+006 1.68262e+006 1.68875e+006 1.69462e+006
1.70024e+006 1.70562e+006 1.71076e+006 1.71568e+006 1.72038e+006 1.72488e+006
1.72918e+006 1.73329e+006 1.73722e+006 1.74098e+006 1.74457e+006 1.748e+006 1.75128e+006
1.75441e+006 1.75741e+006 1.76295e+006 #female fecundity; weighted by N in year Y_init
across morphs and areas
 0.0459232 0.166695 0.22642 0.294237 0.368826 0.448887 0.533321 0.6213 0.712246 0.805766
0.901583 0.999474 1.09923 1.20065 1.30348 1.40747 1.51235 1.61783 1.72361 1.8294 1.93491
2.03987 2.14403 2.24713 2.34897 2.44935 2.5481 2.64506 2.74009 2.8331 2.92398 3.01267
3.09909 3.18321 3.265 3.34442 3.42149 3.49619 3.56854 3.63855 3.70624 3.77166 3.83482
3.89577 3.95455 4.01121 4.06579 4.11834 4.16892 4.21758 4.26437 4.30934 4.35255 4.39405
4.4339 4.47215 4.50885 4.54406 4.57782 4.6102 4.64123 4.67097 4.69946 4.72675 4.75289
4.77792 4.80188 4.82482 4.84677 4.86777 4.88801 4.9075 4.92615 4.94398 4.96103 4.97734
4.99293 5.00784 5.02208 5.0357 5.04871 5.06115 5.07303 5.08438 5.09523 5.10559 5.11549
5.12494 5.13397 5.1426 5.15084 5.1587 5.16621 5.17339 5.18024 5.18678 5.19302 5.19898
5.20467 5.2101 5.22015 #bodywt for gender,fleet: 1 / 1
 0 0.055802 0.0834715 0.120224 0.166419 0.221317 0.283111 0.349258 0.416948 0.483562
0.546973 0.605686 0.658826 0.706052 0.747417 0.783242 0.814009 0.840267 0.862582 0.881495
0.897504 0.91105 0.92252 0.932243 0.940502 0.947532 0.953533 0.95867 0.963081 0.96688
0.970164 0.973011 0.975489 0.977651 0.979546 0.98121 0.982678 0.983975 0.985126 0.98615
0.987064 0.987882 0.988615 0.989274 0.989869 0.990407 0.990894 0.991336 0.991739 0.992106
0.992441 0.992748 0.99303 0.993289 0.993527 0.993746 0.993949 0.994136 0.994309 0.99447
0.994619 0.994758 0.994887 0.995007 0.995119 0.995224 0.995322 0.995413 0.995499 0.995579
0.995651 0.995717 0.995778 0.995836 0.99589 0.995941 0.995989 0.996035 0.996078 0.996118
0.996156 0.996192 0.996227 0.996259 0.996289 0.996318 0.996346 0.996371 0.996396 0.996419
0.996441 0.996462 0.996482 0.996501 0.996519 0.996536 0.996552 0.996567 0.996581 0.996595
0.996621 #selex for gender,fleet: 1 / 1
 0.0470987 0.173394 0.236518 0.308495 0.387689 0.472325 0.560823 0.652 0.745096 0.8397
0.93562 1.03279 1.13117 1.23074 1.33141 1.43306 1.53555 1.63866 1.74216 1.84581 1.94934
2.0525 2.15502 2.25667 2.35723 2.45647 2.55422 2.65031 2.74459 2.83694 2.92726 3.01545
3.10145 3.1852 3.26666 3.34581 3.42264 3.49713 3.5693 3.63916 3.70672 3.77201 3.83507
3.89593 3.95464 4.01123 4.06575 4.11825 4.16878 4.2174 4.26415 4.30909 4.35228 4.39375
4.43358 4.47181 4.5085 4.54369 4.57744 4.60981 4.64083 4.67056 4.69904 4.72633 4.75246
4.77748 4.80144 4.82437 4.84631 4.86732 4.88755 4.90704 4.92568 4.94351 4.96056 4.97687
4.99246 5.00736 5.0216 5.03522 5.04823 5.06066 5.07254 5.08389 5.09474 5.1051 5.115
5.12445 5.13348 5.14211 5.15034 5.15821 5.16572 5.17289 5.17974 5.18628 5.19252 5.19848
5.20417 5.20961 5.21965 #bodywt for gender,fleet: 1 / 2
 0 0.0231649 0.0379628 0.0598976 0.0906619 0.131303 0.181793 0.240869 0.306236 0.375017
0.444278 0.511445 0.574555 0.632317 0.684066 0.729637 0.769225 0.803254 0.832273 0.856877
0.877655 0.89516 0.909889 0.922281 0.932715 0.941512 0.948943 0.955236 0.960579 0.96513
0.969018 0.972351 0.975218 0.977693 0.979836 0.981699 0.983324 0.984747 0.985995 0.987095
0.988068 0.98893 0.989696 0.990379 0.990991 0.991539 0.992032 0.992476 0.992877 0.993241
0.993571 0.993871 0.994145 0.994395 0.994624 0.994834 0.995026 0.995204 0.995367 0.995518
0.995657 0.995786 0.995906 0.996017 0.99612 0.996216 0.996305 0.996389 0.996467 0.996539
0.996604 0.996662 0.996717 0.996768 0.996816 0.996861 0.996904 0.996944 0.996982 0.997017
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0.997051 0.997082 0.997112 0.99714 0.997167 0.997192 0.997216 0.997238 0.99726 0.99728
0.997299 0.997317 0.997334 0.997351 0.997366 0.997381 0.997394 0.997408 0.99742 0.997432
0.997454 #selex for gender,fleet: 1 / 2
 0.0514244 0.193633 0.262198 0.336463 0.413258 0.490855 0.568935 0.647983 0.728749
0.811945 0.898098 0.987506 1.08024 1.17616 1.27498 1.3763 1.47966 1.58455 1.69047 1.79695
1.90353 2.00983 2.11547 2.22013 2.32355 2.42547 2.52571 2.62409 2.72047 2.81473 2.90677
2.99653 3.08395 3.16898 3.2516 3.3318 3.40957 3.48492 3.55786 3.62841 3.69661 3.76248
3.82606 3.8874 3.94654 4.00353 4.05841 4.11125 4.16208 4.21098 4.25799 4.30317 4.34657
4.38825 4.42826 4.46667 4.50351 4.53886 4.57275 4.60524 4.63638 4.66622 4.69481 4.72219
4.74841 4.77352 4.79755 4.82056 4.84258 4.86364 4.88393 4.90346 4.92215 4.94001 4.9571
4.97344 4.98906 5.00399 5.01826 5.03191 5.04494 5.0574 5.0693 5.08068 5.09154 5.10193
5.11184 5.12131 5.13036 5.139 5.14725 5.15513 5.16266 5.16984 5.1767 5.18325 5.18951
5.19548 5.20118 5.20662 5.21668 #bodywt for gender,fleet: 1 / 3
 0 0.0187216 0.0395013 0.0765259 0.134477 0.213866 0.309928 0.41425 0.517777 0.613279
0.69642 0.765595 0.821184 0.864698 0.89811 0.923416 0.942409 0.956585 0.96714 0.974997
0.980856 0.985239 0.988533 0.991021 0.992911 0.994358 0.995471 0.996335 0.99701 0.99754
0.997961 0.998296 0.998566 0.998785 0.998962 0.999108 0.999228 0.999328 0.999412 0.999482
0.999541 0.999591 0.999634 0.999671 0.999703 0.99973 0.999754 0.999775 0.999793 0.999809
0.999823 0.999835 0.999847 0.999857 0.999865 0.999873 0.999881 0.999887 0.999893 0.999898
0.999903 0.999907 0.999911 0.999915 0.999918 0.999921 0.999924 0.999927 0.999929 0.999931
0.999933 0.999935 0.999937 0.999938 0.999939 0.999941 0.999942 0.999943 0.999944 0.999945
0.999946 0.999947 0.999947 0.999948 0.999949 0.999949 0.99995 0.999951 0.999951 0.999952
0.999952 0.999953 0.999953 0.999954 0.999954 0.999954 0.999955 0.999955 0.999955 0.999956
0.999956 #selex for gender,fleet: 1 / 3
 0.0474109 0.175448 0.239961 0.314032 0.396111 0.484318 0.576781 0.671937 0.768683
0.866353 0.964622 1.06338 1.16263 1.2624 1.36272 1.46358 1.56491 1.66661 1.76854 1.87052
1.97235 2.07382 2.1747 2.27479 2.37386 2.47172 2.5682 2.66311 2.75632 2.8477 2.93713
3.02452 3.10979 3.19289 3.27377 3.35239 3.42874 3.5028 3.57458 3.64408 3.71133 3.77633
3.83913 3.89976 3.95825 4.01464 4.06898 4.12132 4.17171 4.22019 4.26682 4.31164 4.35472
4.3961 4.43584 4.47399 4.5106 4.54572 4.57941 4.61171 4.64268 4.67235 4.70079 4.72803
4.75412 4.7791 4.80302 4.82592 4.84783 4.8688 4.88901 4.90848 4.92711 4.94492 4.96196
4.97824 4.99382 5.0087 5.02293 5.03654 5.04954 5.06196 5.07383 5.08517 5.09601 5.10636
5.11625 5.12569 5.13472 5.14333 5.15156 5.15942 5.16693 5.17409 5.18094 5.18747 5.19371
5.19966 5.20535 5.21078 5.22081 #bodywt for gender,fleet: 1 / 4
 0 0.0128088 0.0216119 0.035232 0.0553143 0.0833798 0.120421 0.166544 0.220825 0.281429
0.345951 0.411829 0.476703 0.538655 0.596312 0.64884 0.695867 0.73738 0.77362 0.804981
0.831944 0.855014 0.874689 0.891435 0.905674 0.917781 0.928082 0.936857 0.944345 0.950749
0.956239 0.960958 0.965025 0.968542 0.971592 0.974245 0.97656 0.978587 0.980367 0.981935
0.98332 0.984547 0.985638 0.98661 0.987479 0.988258 0.988958 0.989588 0.990156 0.990671
0.991138 0.991563 0.991949 0.992302 0.992625 0.99292 0.993192 0.993441 0.993671 0.993883
0.994078 0.994259 0.994427 0.994582 0.994727 0.994861 0.994986 0.995102 0.995211 0.995313
0.995403 0.995484 0.99556 0.995631 0.995698 0.995761 0.99582 0.995875 0.995928 0.995977
0.996023 0.996067 0.996108 0.996148 0.996184 0.996219 0.996252 0.996283 0.996313 0.996341
0.996367 0.996392 0.996416 0.996439 0.99646 0.99648 0.996499 0.996517 0.996535 0.996551
0.996581 #selex for gender,fleet: 1 / 4
 0.0466845 0.172305 0.236105 0.310153 0.393545 0.485022 0.583054 0.685994 0.792252
0.900449 1.0095 1.11862 1.22731 1.33526 1.44232 1.54843 1.65355 1.75769 1.86083 1.96296
2.06404 2.16402 2.26283 2.36039 2.45662 2.55143 2.64471 2.73637 2.82633 2.9145 3.0008
3.08518 3.16756 3.2479 3.32616 3.40231 3.47633 3.5482 3.61793 3.68552 3.75097 3.8143
3.87554 3.93471 3.99184 4.04697 4.10013 4.15137 4.20073 4.24825 4.29399 4.33798 4.38028
4.42093 4.45999 4.4975 4.53352 4.56808 4.60124 4.63306 4.66356 4.69281 4.72084 4.7477
4.77343 4.79807 4.82168 4.84427 4.86591 4.88661 4.9066 4.9259 4.94436 4.96202 4.97891
4.99506 5.01051 5.02527 5.03938 5.05287 5.06577 5.07809 5.08986 5.10111 5.11186 5.12213
5.13195 5.14132 5.15027 5.15882 5.16699 5.17479 5.18223 5.18935 5.19614 5.20262 5.20881
5.21472 5.22037 5.22575 5.23571 #bodywt for gender,fleet: 1 / 5
 0 0.00553229 0.00897589 0.0141953 0.0218656 0.0327698 0.0477293 0.067493 0.0926048
0.123284 0.159355 0.200244 0.245049 0.292648 0.341832 0.391419 0.440349 0.487738 0.532906
0.575373 0.614845 0.65118 0.684364 0.714472 0.741648 0.766077 0.787966 0.807535 0.825
0.840573 0.854451 0.866819 0.877844 0.887678 0.896458 0.904306 0.911329 0.917624 0.923273
0.928353 0.932927 0.937053 0.940782 0.944157 0.947219 0.949999 0.95253 0.954837 0.956944
0.95887 0.960636 0.962255 0.963743 0.965113 0.966376 0.967541 0.968618 0.969615 0.970538
0.971395 0.972191 0.972931 0.97362 0.974262 0.97486 0.97542 0.975942 0.976431 0.976889
0.977317 0.977705 0.978054 0.978381 0.97869 0.97898 0.979253 0.979511 0.979754 0.979983
0.980199 0.980403 0.980595 0.980777 0.98095 0.981112 0.981267 0.981412 0.98155 0.981681
0.981805 0.981923 0.982034 0.98214 0.98224 0.982335 0.982425 0.982511 0.982592 0.98267
0.982743 0.982878 #selex for gender,fleet: 1 / 5
 0.0483158 0.180652 0.248243 0.326973 0.415928 0.513717 0.61851 0.728197 0.840649
0.954007 1.06687 1.17832 1.28789 1.39542 1.50097 1.60469 1.70677 1.8074 1.90676 2.00496
2.10208 2.19816 2.29321 2.3872 2.48007 2.57175 2.66216 2.7512 2.83878 2.92481 3.0092
3.09186 3.17272 3.25172 3.32879 3.4039 3.47701 3.54809 3.61713 3.68411 3.74904 3.81192
3.87277 3.9316 3.98844 4.04332 4.09627 4.14732 4.19653 4.24392 4.28954 4.33344 4.37566

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4.41625 4.45525 4.49272 4.5287 4.56324 4.59638 4.62817 4.65867 4.6879 4.71593 4.74279
4.76852 4.79317 4.81677 4.83938 4.86102 4.88173 4.90172 4.92102 4.93948 4.95714 4.97403
4.99019 5.00563 5.0204 5.03451 5.048 5.0609 5.07322 5.085 5.09626 5.10701 5.11728 5.1271
5.13647 5.14543 5.15398 5.16215 5.16995 5.1774 5.18452 5.19131 5.1978 5.20399 5.20991
5.21555 5.22094 5.2309 #bodywt for gender,fleet: 1 / 6
 0 0.00158049 0.00286478 0.00504369 0.00861979 0.0142837 0.022913 0.0355154 0.0531053
0.0765276 0.106278 0.142371 0.184307 0.23113 0.281561 0.334166 0.387518 0.440315 0.491472
0.540151 0.585765 0.627956 0.666562 0.701571 0.733089 0.761296 0.786423 0.808726 0.828471
0.845919 0.861318 0.874903 0.886884 0.897457 0.906792 0.915042 0.922344 0.928815 0.934559
0.939666 0.944216 0.948277 0.951909 0.955163 0.958085 0.960713 0.963083 0.965224 0.967161
0.968918 0.970514 0.971967 0.973292 0.974502 0.975609 0.976625 0.977557 0.978414 0.979203
0.979931 0.980603 0.981225 0.981801 0.982335 0.98283 0.983291 0.98372 0.984119 0.984492
0.984839 0.985149 0.985425 0.985684 0.985927 0.986154 0.986368 0.986569 0.986758 0.986936
0.987104 0.987262 0.98741 0.987551 0.987683 0.987809 0.987927 0.988038 0.988144 0.988244
0.988339 0.988428 0.988513 0.988593 0.988669 0.988741 0.98881 0.988875 0.988936 0.988994
0.98905 0.989151 #selex for gender,fleet: 1 / 6
 0.0548914 0.189688 0.257027 0.332795 0.415381 0.503307 0.595419 0.69092 0.789307
0.890271 0.993607 1.09914 1.20669 1.31604 1.42694 1.5391 1.65221 1.76593 1.87992 1.99384
2.10738 2.22022 2.33208 2.4427 2.55184 2.65929 2.76488 2.86845 2.96985 3.06899 3.16578
3.26013 3.352 3.44134 3.52814 3.61238 3.69405 3.77318 3.84976 3.92383 3.99541 4.06455
4.13129 4.19566 4.25772 4.31752 4.37511 4.43055 4.48389 4.53519 4.58451 4.63191 4.67745
4.72118 4.76317 4.80346 4.84213 4.87921 4.91478 4.94888 4.98157 5.01289 5.0429 5.07165
5.09918 5.12554 5.15078 5.17495 5.19807 5.2202 5.24151 5.26204 5.28167 5.30045 5.31841
5.33559 5.35201 5.36771 5.38272 5.39707 5.41078 5.42389 5.43641 5.44838 5.45982 5.47074
5.48118 5.49116 5.50069 5.50979 5.51848 5.52679 5.53472 5.54229 5.54952 5.55643 5.56303
5.56933 5.57534 5.58108 5.59172 #bodywt for gender,fleet: 2 / 1
 0 0.056618 0.0862621 0.126104 0.17651 0.236494 0.303794 0.375315 0.447747 0.518106
0.584086 0.644176 0.697611 0.744227 0.784287 0.818318 0.846979 0.87097 0.89097 0.907605
0.921428 0.932918 0.942479 0.95045 0.957113 0.962698 0.967396 0.971362 0.974722 0.97758
0.98002 0.982112 0.983913 0.985468 0.986817 0.987992 0.989018 0.989918 0.99071 0.99141
0.992029 0.99258 0.99307 0.993509 0.993902 0.994256 0.994575 0.994862 0.995123 0.99536
0.995575 0.995771 0.995951 0.996115 0.996265 0.996404 0.996531 0.996648 0.996757 0.996857
0.996949 0.997035 0.997115 0.997189 0.997258 0.997322 0.997382 0.997438 0.997491 0.99754
0.997584 0.997623 0.99766 0.997695 0.997728 0.997759 0.997788 0.997815 0.997841 0.997865
0.997888 0.99791 0.99793 0.99795 0.997968 0.997985 0.998002 0.998017 0.998032 0.998046
0.998059 0.998071 0.998083 0.998094 0.998105 0.998115 0.998125 0.998134 0.998142 0.998151
0.998166 #selex for gender,fleet: 2 / 1
 0.0562783 0.197221 0.268324 0.348601 0.436011 0.528507 0.624412 0.722595 0.822436
0.92368 1.02628 1.13028 1.23572 1.34259 1.45082 1.56027 1.67073 1.78196 1.89366 2.00552
2.11722 2.22846 2.33893 2.44836 2.5565 2.6631 2.76797 2.87094 2.97184 3.07057 3.167
3.26107 3.3527 3.44185 3.52849 3.61259 3.69415 3.77318 3.84969 3.9237 3.99524 4.06433
4.13103 4.19538 4.25741 4.3172 4.37477 4.4302 4.48353 4.53482 4.58414 4.63154 4.67707
4.7208 4.76279 4.80308 4.84175 4.87884 4.9144 4.9485 4.98119 5.01251 5.04253 5.07128
5.09881 5.12518 5.15042 5.17458 5.19771 5.21984 5.24116 5.26168 5.28132 5.3001 5.31806
5.33523 5.35166 5.36736 5.38237 5.39671 5.41043 5.42354 5.43606 5.44803 5.45947 5.4704
5.48084 5.49081 5.50034 5.50944 5.51814 5.52644 5.53437 5.54195 5.54918 5.55609 5.56268
5.56898 5.575 5.58074 5.59138 #bodywt for gender,fleet: 2 / 2
 0 0.0236049 0.0395862 0.0636857 0.0978776 0.143296 0.199703 0.265347 0.337282 0.411987
0.486027 0.556544 0.621502 0.679714 0.730726 0.774635 0.811901 0.84319 0.869252 0.890839
0.908653 0.923325 0.935402 0.945349 0.953552 0.960332 0.965952 0.970625 0.974524 0.977791
0.980539 0.982859 0.984827 0.986503 0.987936 0.989167 0.990229 0.991148 0.991946 0.992643
0.993253 0.99379 0.994263 0.994681 0.995052 0.995383 0.995679 0.995943 0.996181 0.996395
0.996588 0.996763 0.996922 0.997066 0.997198 0.997318 0.997428 0.997528 0.997621 0.997706
0.997784 0.997856 0.997923 0.997985 0.998042 0.998095 0.998145 0.998191 0.998234 0.998274
0.998309 0.998341 0.998371 0.998398 0.998424 0.998449 0.998472 0.998494 0.998514 0.998533
0.998551 0.998568 0.998584 0.998599 0.998614 0.998627 0.99864 0.998652 0.998664 0.998674
0.998685 0.998694 0.998703 0.998712 0.99872 0.998728 0.998736 0.998743 0.998749 0.998756
0.998767 #selex for gender,fleet: 2 / 2
 0.0613745 0.219761 0.296353 0.378092 0.461531 0.545156 0.629048 0.714063 0.80122
0.891388 0.985155 1.0828 1.18431 1.28943 1.39772 1.50864 1.62159 1.73595 1.85115 1.96664
2.08194 2.19663 2.31032 2.42272 2.53354 2.64256 2.74958 2.85446 2.95705 3.05727 3.15502
3.25024 3.34289 3.43294 3.52036 3.60517 3.68735 3.76693 3.84392 3.91836 3.99029 4.05973
4.12674 4.19136 4.25365 4.31365 4.37143 4.42704 4.48054 4.53199 4.58144 4.62897 4.67462
4.71845 4.76053 4.80092 4.83966 4.87683 4.91247 4.94663 4.97938 5.01075 5.04082 5.06962
5.09719 5.1236 5.14888 5.17308 5.19624 5.21841 5.23975 5.26029 5.27994 5.29874 5.31672
5.33391 5.35034 5.36606 5.38108 5.39544 5.40917 5.42228 5.43482 5.4468 5.45825 5.46918
5.47963 5.48961 5.49915 5.50826 5.51696 5.52527 5.53321 5.54079 5.54803 5.55494 5.56154
5.56784 5.57386 5.57961 5.59026 #bodywt for gender,fleet: 2 / 3
 0 0.0193458 0.0421489 0.0835085 0.148558 0.237099 0.342626 0.454787 0.563211 0.660298
0.742107 0.807846 0.858775 0.897157 0.925504 0.946145 0.961034 0.971719 0.979372 0.984856
0.988798 0.991643 0.993709 0.99522 0.996333 0.997159 0.997778 0.998245 0.998601 0.998874
```

0.999086 0.999251 0.999382 0.999485 0.999568 0.999635 0.999689 0.999733 0.999769 0.9998
0.999825 0.999846 0.999864 0.999879 0.999891 0.999902 0.999912 0.99992 0.999927 0.999933
0.999939 0.999944 0.999948 0.999952 0.999955 0.999958 0.99996 0.999963 0.999965 0.999967
0.999969 0.99997 0.999972 0.999973 0.999974 0.999975 0.999976 0.999977 0.999978 0.999979
0.999979 0.99998 0.99998 0.999981 0.999981 0.999982 0.999982 0.999982 0.999983 0.999983
0.999983 0.999984 0.999984 0.999984 0.999984 0.999985 0.999985 0.999985 0.999985 0.999985
0.999986 0.999986 0.999986 0.999986 0.999986 0.999986 0.999986 0.999987 0.999987 0.999987
0.999987 #selex for gender,fleet: 2 / 3
 0.0566467 0.19954 0.272222 0.35486 0.445466 0.541801 0.641806 0.74391 0.847133 0.950992
1.05535 1.16025 1.26582 1.37215 1.47932 1.58731 1.69605 1.80539 1.91513 2.02504 2.13486
2.24432 2.35313 2.46104 2.56779 2.67315 2.77692 2.8789 2.97894 3.0769 3.17267 3.26614
3.35726 3.44596 3.53219 3.61595 3.6972 3.77596 3.85223 3.92603 3.99738 4.06631 4.13286
4.19707 4.25899 4.31867 4.37615 4.43149 4.48474 4.53597 4.58522 4.63256 4.67805 4.72173
4.76367 4.80393 4.84255 4.87961 4.91515 4.94922 4.98188 5.01318 5.04317 5.0719 5.09942
5.12576 5.15099 5.17514 5.19825 5.22037 5.24168 5.26219 5.28182 5.30059 5.31855 5.33571
5.35213 5.36783 5.38283 5.39717 5.41088 5.42399 5.43651 5.44847 5.45991 5.47083 5.48127
5.49124 5.50077 5.50986 5.51856 5.52686 5.53479 5.54236 5.54959 5.55649 5.56309 5.56939
5.5754 5.58114 5.59178 #bodywt for gender,fleet: 2 / 4
 0 0.0130705 0.0226077 0.0376627 0.0601967 0.0919837 0.134084 0.186407 0.247573 0.315144
0.386094 0.457353 0.526237 0.590702 0.649419 0.701718 0.74746 0.786886 0.820481 0.848857
0.872668 0.892558 0.909125 0.922904 0.934359 0.943888 0.951827 0.958455 0.964001 0.968657
0.972578 0.975892 0.978704 0.981097 0.983143 0.984899 0.986411 0.987718 0.988853 0.989842
0.990706 0.991465 0.992133 0.992722 0.993245 0.99371 0.994124 0.994495 0.994827 0.995126
0.995396 0.995639 0.99586 0.99606 0.996242 0.996408 0.99656 0.996699 0.996827 0.996944
0.997052 0.997151 0.997243 0.997328 0.997406 0.997479 0.997547 0.997609 0.997668 0.997722
0.997771 0.997814 0.997854 0.997892 0.997927 0.997961 0.997992 0.998021 0.998049 0.998075
0.998099 0.998122 0.998144 0.998164 0.998184 0.998202 0.998219 0.998236 0.998251 0.998266
0.998279 0.998292 0.998305 0.998317 0.998328 0.998338 0.998348 0.998358 0.998367 0.998375
0.998391 #selex for gender,fleet: 2 / 4
 0.0557902 0.196036 0.26802 0.350854 0.443289 0.543716 0.650298 0.761172 0.874649
0.989368 1.10435 1.21896 1.33286 1.44589 1.55803 1.6693 1.77975 1.88941 1.99829 2.10638
2.21361 2.31992 2.4252 2.52935 2.63222 2.7337 2.83364 2.93193 3.02843 3.12305 3.21567
3.30621 3.39461 3.48079 3.56471 3.64633 3.72563 3.8026 3.87722 3.94952 4.01949 4.08717
4.15257 4.21573 4.27668 4.33547 4.39214 4.44674 4.49931 4.5499 4.59857 4.64538 4.69036
4.73359 4.77511 4.81497 4.85324 4.88996 4.92518 4.95896 4.99135 5.0224 5.05215 5.08066
5.10797 5.13413 5.15917 5.18316 5.20611 5.22808 5.24927 5.26969 5.28924 5.30793 5.32581
5.3429 5.35925 5.37488 5.38983 5.40411 5.41777 5.43082 5.44329 5.45521 5.4666 5.47749
5.48788 5.49782 5.50731 5.51637 5.52503 5.5333 5.5412 5.54875 5.55595 5.56283 5.5694
5.57568 5.58167 5.58739 5.59799 #bodywt for gender,fleet: 2 / 5
 0 0.0056342 0.00935828 0.0151214 0.0237444 0.0361841 0.0534386 0.0763956 0.105656
0.141382 0.183221 0.230325 0.281457 0.335155 0.389908 0.444297 0.497111 0.547394 0.594468
0.637913 0.677529 0.713296 0.745326 0.77382 0.799038 0.821268 0.840807 0.857947 0.872963
0.886111 0.897625 0.907711 0.916555 0.92432 0.931148 0.937161 0.942467 0.947159 0.951317
0.955009 0.958295 0.961227 0.963848 0.966198 0.968308 0.970207 0.97192 0.97347 0.974873
0.976147 0.977307 0.978363 0.979328 0.98021 0.981019 0.981762 0.982444 0.983073 0.983653
0.984188 0.984684 0.985143 0.985568 0.985963 0.986331 0.986672 0.986991 0.987288 0.987565
0.987825 0.988057 0.988266 0.988461 0.988645 0.988817 0.988979 0.989131 0.989275 0.98941
0.989538 0.989658 0.989771 0.989878 0.98998 0.990075 0.990165 0.990251 0.990332 0.990408
0.990481 0.990549 0.990614 0.990676 0.990734 0.99079 0.990842 0.990892 0.99094 0.990985
0.991027 0.991106 #selex for gender,fleet: 2 / 5
 0.0577138 0.2054 0.281558 0.36947 0.46783 0.574818 0.688196 0.80554 0.924583 1.04351
1.1611 1.27671 1.39012 1.5014 1.61079 1.71858 1.82505 1.93044 2.03495 2.13869 2.24172
2.34405 2.44563 2.54638 2.64618 2.74492 2.84244 2.93861 3.03328 3.12631 3.21759 3.307
3.39444 3.47983 3.56309 3.64417 3.72304 3.79965 3.874 3.94608 4.01589 4.08344 4.14875
4.21184 4.27276 4.33153 4.38819 4.44279 4.49538 4.546 4.5947 4.64154 4.68657 4.72984
4.7714 4.81131 4.84962 4.88638 4.92164 4.95547 4.9879 5.01899 5.04878 5.07733 5.10468
5.13087 5.15596 5.17997 5.20296 5.22496 5.24617 5.26661 5.28617 5.30488 5.32277 5.33988
5.35625 5.37189 5.38685 5.40114 5.41481 5.42787 5.44035 5.45228 5.46368 5.47458 5.48498
5.49492 5.50442 5.5135 5.52216 5.53044 5.53835 5.5459 5.55311 5.55999 5.56657 5.57285
5.57885 5.58457 5.59518 #bodywt for gender,fleet: 2 / 6
 0 0.00161861 0.00301987 0.00546025 0.0095592 0.0161792 0.0264202 0.0415342 0.0627471
0.091016 0.126794 0.169884 0.219423 0.274007 0.331893 0.391233 0.45028 0.507533 0.561825
0.612335 0.658574 0.700333 0.737622 0.770615 0.799588 0.824882 0.846865 0.865906 0.882362
0.896563 0.908811 0.919374 0.92849 0.936365 0.943178 0.949083 0.95421 0.958672 0.962565
0.96597 0.968955 0.971579 0.973893 0.975938 0.97775 0.979361 0.980795 0.982077 0.983225
0.984255 0.985183 0.986019 0.986775 0.987461 0.988083 0.988649 0.989165 0.989637 0.990069
0.990464 0.990828 0.991162 0.99147 0.991754 0.992017 0.99226 0.992485 0.992695 0.992889
0.993069 0.993229 0.993371 0.993503 0.993626 0.993742 0.99385 0.993952 0.994048 0.994137
0.994222 0.994301 0.994376 0.994446 0.994513 0.994575 0.994635 0.99469 0.994743 0.994793
0.99484 0.994884 0.994926 0.994966 0.995004 0.99504 0.995074 0.995106 0.995136 0.995165
0.995192 0.995243 #selex for gender,fleet: 2 / 6

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 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383
0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383
0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383
0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383
0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383
0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383
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0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383
0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383
0.0469383 0.0469383 0.0469383 #mean M for year Yinit: 2011 sex: 1
 43.4033 40.6772 38.0509 35.5804 33.3409 31.0561 28.9166 26.8498 24.8615 23.0039 21.782
20.428 20.3778 19.7277 20.292 20.3744 20.6088 20.3791 20.5917 20.7299 20.4322 19.29
18.4429 17.1696 15.7414 14.2297 12.9755 11.6445 10.4706 9.50117 8.48033 7.48097 6.62789
5.8682 5.14811 4.52379 3.977 3.50989 3.10453 2.75819 2.45623 2.1937 1.97375 1.77683
1.60726 1.46005 1.33739 1.22396 1.12542 1.0391 0.961981 0.893609 0.832436 0.777465
0.727362 0.681372 0.63894 0.599675 0.563293 0.529948 0.499217 0.470508 0.443789 0.419292
0.396312 0.376083 0.357437 0.339014 0.321681 0.304641 0.288492 0.273171 0.258586 0.24484
0.231832 0.219534 0.207873 0.196854 0.186456 0.176693 0.167517 0.158907 0.150808 0.143165
0.135964 0.129176 0.122771 0.116715 0.110991 0.105578 0.100457 0.0956068 0.0910094
0.0866583 0.0825272 0.0786005 0.0748585 0.0713048 0.0679286 0.06472 1.33372 #numbers for
year Yinit: 2011 sex: 1
 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867
0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867
0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867
0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867
0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867
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0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867
0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867
0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867
0.0456867 0.0456867 0.0456867 #mean M for year Yinit: 2011 sex: 2
 43.4033 40.7281 38.1462 35.7137 33.507 31.2481 29.129 27.077 25.0983 23.2462 22.0324
20.6814 20.6482 20.005 20.5907 20.6834 20.9234 20.6824 20.8779 20.9831 20.6313 19.4149
18.4879 17.1309 15.6243 14.0461 12.7367 11.3684 10.171 9.18825 8.17019 7.1857 6.352
5.61551 4.92248 4.32493 3.80403 3.36089 2.97772 2.65147 2.36775 2.12161 1.91598 1.73186
1.57342 1.43581 1.32133 1.21497 1.1224 1.04112 0.968208 0.903337 0.845053 0.792447
0.744247 0.69976 0.658484 0.620076 0.5843 0.551369 0.520891 0.492292 0.465573 0.441006
0.417876 0.397505 0.378683 0.359978 0.342316 0.324858 0.308247 0.292425 0.277306 0.263008
0.24944 0.23658 0.224362 0.2128 0.201879 0.191617 0.181966 0.172905 0.164375 0.156316
0.148714 0.141538 0.134754 0.128329 0.122245 0.11648 0.111014 0.105827 0.100901 0.0962303
0.091787 0.0875555 0.0835152 0.0796713 0.0760129 0.0725302 1.53984 #numbers for year
Yinit: 2011 sex: 2
 44.6192 42.0139 39.5036 37.0063 34.6033 32.3386 30.2808 28.1797 26.2105 24.3087 22.4812
20.7759 19.649 18.4067 18.3422 17.7399 18.2314 18.2911 18.4887 18.2713 18.452 18.567
18.2927 17.2638 16.5004 15.3569 14.0759 12.7213 11.5978 10.4063 9.3558 8.48842 7.5755
6.6821 5.91959 5.2407 4.59733 4.03961 3.55121 3.13402 2.77204 2.46279 2.19318 1.95881
1.76246 1.58668 1.43533 1.30393 1.19445 1.0932 1.00525 0.928203 0.859359 0.798323
0.743709 0.694629 0.649891 0.608823 0.570929 0.535859 0.503363 0.473577 0.446124 0.420476
0.396605 0.374719 0.354186 0.336111 0.319451 0.302988 0.287499 0.272271 0.25784 0.244147
0.231112 0.218826 0.207199 0.196206 0.185783 0.175933 0.166639 0.157912 0.14971 0.142014
0.134775 0.127943 0.121507 0.115441 0.109716 0.104304 0.099188 0.0943505 0.0897736
0.0854391 0.0813306 0.0774421 0.0737503 0.0702412 0.0668972 0.0637214 1.31042 #numbers
for year Ydeclare: 2013 sex: 1
 44.6192 42.0665 39.6024 37.1447 34.7749 32.5374 30.5019 28.4167 26.4586 24.5633 22.7384
21.0328 19.9096 18.6668 18.6167 18.0192 18.5306 18.5997 18.8029 18.5754 18.7415 18.8276
18.505 17.4081 16.5723 15.3521 13.9988 12.5824 11.4076 10.1806 9.10721 8.22635 7.31424
6.43242 5.6858 5.02633 4.40587 3.87095 3.40469 3.00808 2.66516 2.37319 2.11932 1.89908
1.71511 1.55037 1.40862 1.28551 1.1831 1.08793 1.00511 0.93238 0.867135 0.809081 0.756917
0.70983 0.666683 0.626855 0.589898 0.555505 0.523468 0.493975 0.466679 0.441063 0.41713
0.395124 0.374405 0.356156 0.339295 0.322537 0.306714 0.291072 0.27619 0.262013 0.248465
0.235654 0.223495 0.211971 0.201022 0.19066 0.180873 0.171677 0.163029 0.154909 0.147265
0.140044 0.133233 0.126803 0.120725 0.114968 0.109517 0.104352 0.0994549 0.0948083
0.090395 0.0862104 0.0822297 0.0784388 0.0748191 0.0713755 1.51258 #numbers for year
Ydeclare: 2013 sex: 2
#R0  1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932
1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950
1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968
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1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986
1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004
2005 2006 2007 2008 2009 2010 #years
234.505  234.505 234.463 234.405 234.34 234.297 234.251 234.205 234.162 234.117 234.066
233.991 233.906 233.81 233.7 233.549 233.391 233.258 233.13 233.028 232.902 232.75
232.551 232.356 232.164 232.021 231.796 231.518 231.17 230.312 229.451 228.014 226.812
226.348 225.805 225.453 225.075 224.606 224.205 223.908 223.524 223.03 222.42 221.709
220.938 220.246 219.617 219.1 218.479 217.999 217.676 216.29 215.741 215.092 214.411
212.804 211.716 210.217 208.263 206.369 204.181 202.125 199.635 197.009 192.321 187.452
183.39 177.34 169.071 163.048 158.098 151.772 147.932 143.205 137.638 129.935 125.198
116.522 107.025 98.5535 93.226 86.5727 81.2614 74.7485 73.1516 69.6204 70.5327 70.8433
72.858 74.9234 76.871 78.6801 80.5198 81.9544 83.6025 85.2641 86.8067 #Recruits
1.02333e+009  1.02333e+009 1.02287e+009 1.02224e+009 1.02153e+009 1.02107e+009
1.02057e+009 1.02008e+009 1.01962e+009 1.01913e+009 1.01857e+009 1.01777e+009
1.01686e+009 1.01582e+009 1.01464e+009 1.01302e+009 1.01134e+009 1.00991e+009
1.00855e+009 1.00746e+009 1.00612e+009 1.00452e+009 1.00241e+009 1.00035e+009
9.98331e+008 9.96824e+008 9.94466e+008 9.91554e+008 9.87931e+008 9.79059e+008
9.70258e+008 9.55769e+008 9.43835e+008 9.39275e+008 9.33976e+008 9.30556e+008
9.26899e+008 9.22386e+008 9.18547e+008 9.15712e+008 9.12066e+008 9.07403e+008
9.01681e+008 8.95053e+008 8.8794e+008 8.81608e+008 8.75891e+008 8.71228e+008 8.65661e+008
8.61378e+008 8.58513e+008 8.46347e+008 8.41578e+008 8.3598e+008 8.30146e+008 8.16566e+008
8.07506e+008 7.95201e+008 7.79458e+008 7.64514e+008 7.47629e+008 7.32109e+008
7.13762e+008 6.94922e+008 6.62508e+008 6.30414e+008 6.04778e+008 5.68395e+008
5.21846e+008 4.90053e+008 4.65147e+008 4.34808e+008 4.17158e+008 3.96173e+008
3.72458e+008 3.41306e+008 3.23038e+008 2.91204e+008 2.58577e+008 2.31249e+008
2.14856e+008 1.95185e+008 1.80085e+008 1.62258e+008 1.57998e+008 1.48727e+008
1.51103e+008 1.51915e+008 1.57219e+008 1.62727e+008 1.67987e+008 1.72931e+008
1.78018e+008 1.82026e+008 1.86677e+008 1.91417e+008 1.95863e+008 #SpawnBio
0.383 0.5 0 # spawn-recr steepness, sigmaR, autocorr
# values from cat100_hlow, catch at 100% and steepness at low value. # this is state of
nature 2 out of 9 (in no particular order) # and parameter set number 2 out of 2 for this
state
 0 0 31.1162 112.356 367.744 1080.46 2816.18 6473.87 13168.2 23948.2 39492.1 59937
84901.8 113650 145295 178975 213957 249683 285761 321940 358074 394085 429937 465613
501106 536408 571504 606376 640998 675340 709366 743040 776324 809179 841567 873453
904803 935587 965775 995344 1.02427e+006 1.05254e+006 1.08013e+006 1.10703e+006
1.13324e+006 1.15874e+006 1.18353e+006 1.20761e+006 1.23098e+006 1.25364e+006 1.2756e+006
1.29687e+006 1.31744e+006 1.33734e+006 1.35656e+006 1.37513e+006 1.39305e+006
1.41033e+006 1.427e+006 1.44306e+006 1.45853e+006 1.47342e+006 1.48776e+006 1.50154e+006
1.5148e+006 1.52754e+006 1.53979e+006 1.55155e+006 1.56285e+006 1.57369e+006 1.58409e+006
1.59434e+006 1.60417e+006 1.6136e+006 1.62265e+006 1.63131e+006 1.63962e+006 1.64758e+006
1.65521e+006 1.66251e+006 1.66951e+006 1.6762e+006 1.68262e+006 1.68875e+006 1.69462e+006
1.70024e+006 1.70562e+006 1.71076e+006 1.71568e+006 1.72038e+006 1.72488e+006
1.72918e+006 1.73329e+006 1.73722e+006 1.74098e+006 1.74457e+006 1.748e+006 1.75128e+006
1.75441e+006 1.75741e+006 1.76295e+006 #female fecundity; weighted by N in year Y_init
across morphs and areas
 0.0459232 0.166695 0.22642 0.294237 0.368826 0.448887 0.533321 0.6213 0.712246 0.805766
0.901583 0.999474 1.09923 1.20065 1.30348 1.40747 1.51235 1.61783 1.72361 1.8294 1.93491
2.03987 2.14403 2.24713 2.34897 2.44935 2.5481 2.64506 2.74009 2.8331 2.92398 3.01267
3.09909 3.18321 3.265 3.34442 3.42149 3.49619 3.56854 3.63855 3.70624 3.77166 3.83482
3.89577 3.95455 4.01121 4.06579 4.11834 4.16892 4.21758 4.26437 4.30934 4.35255 4.39405
4.4339 4.47215 4.50885 4.54406 4.57782 4.6102 4.64123 4.67097 4.69946 4.72675 4.75289
4.77792 4.80188 4.82482 4.84677 4.86777 4.88801 4.9075 4.92615 4.94398 4.96103 4.97734
4.99293 5.00784 5.02208 5.0357 5.04871 5.06115 5.07303 5.08438 5.09523 5.10559 5.11549
5.12494 5.13397 5.1426 5.15084 5.1587 5.16621 5.17339 5.18024 5.18678 5.19302 5.19898
5.20467 5.2101 5.22015 #bodywt for gender,fleet: 1 / 1
 0 0.055802 0.0834715 0.120224 0.166419 0.221317 0.283111 0.349258 0.416948 0.483562
0.546973 0.605686 0.658826 0.706052 0.747417 0.783242 0.814009 0.840267 0.862582 0.881495
0.897504 0.91105 0.92252 0.932243 0.940502 0.947532 0.953533 0.95867 0.963081 0.96688
0.970164 0.973011 0.975489 0.977651 0.979546 0.98121 0.982678 0.983975 0.985126 0.98615
0.987064 0.987882 0.988615 0.989274 0.989869 0.990407 0.990894 0.991336 0.991739 0.992106
0.992441 0.992748 0.99303 0.993289 0.993527 0.993746 0.993949 0.994136 0.994309 0.99447
0.994619 0.994758 0.994887 0.995007 0.995119 0.995224 0.995322 0.995413 0.995499 0.995579
0.995651 0.995717 0.995778 0.995836 0.99589 0.995941 0.995989 0.996035 0.996078 0.996118
0.996156 0.996192 0.996227 0.996259 0.996289 0.996318 0.996346 0.996371 0.996396 0.996419
0.996441 0.996462 0.996482 0.996501 0.996519 0.996536 0.996552 0.996567 0.996581 0.996595
0.996621 #selex for gender,fleet: 1 / 1
 0.0470987 0.173394 0.236518 0.308495 0.387689 0.472325 0.560823 0.652 0.745096 0.8397
0.93562 1.03279 1.13117 1.23074 1.33141 1.43306 1.53555 1.63866 1.74216 1.84581 1.94934
2.0525 2.15502 2.25667 2.35723 2.45647 2.55422 2.65031 2.74459 2.83694 2.92726 3.01545
3.10145 3.1852 3.26666 3.34581 3.42264 3.49713 3.5693 3.63916 3.70672 3.77201 3.83507
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3.89593 3.95464 4.01123 4.06575 4.11825 4.16878 4.2174 4.26415 4.30909 4.35228 4.39375
4.43358 4.47181 4.5085 4.54369 4.57744 4.60981 4.64083 4.67056 4.69904 4.72633 4.75246
4.77748 4.80144 4.82437 4.84631 4.86732 4.88755 4.90704 4.92568 4.94351 4.96056 4.97687
4.99246 5.00736 5.0216 5.03522 5.04823 5.06066 5.07254 5.08389 5.09474 5.1051 5.115
5.12445 5.13348 5.14211 5.15034 5.15821 5.16572 5.17289 5.17974 5.18628 5.19252 5.19848
5.20417 5.20961 5.21965 #bodywt for gender,fleet: 1 / 2
 0 0.0231649 0.0379628 0.0598976 0.0906619 0.131303 0.181793 0.240869 0.306236 0.375017
0.444278 0.511445 0.574555 0.632317 0.684066 0.729637 0.769225 0.803254 0.832273 0.856877
0.877655 0.89516 0.909889 0.922281 0.932715 0.941512 0.948943 0.955236 0.960579 0.96513
0.969018 0.972351 0.975218 0.977693 0.979836 0.981699 0.983324 0.984747 0.985995 0.987095
0.988068 0.98893 0.989696 0.990379 0.990991 0.991539 0.992032 0.992476 0.992877 0.993241
0.993571 0.993871 0.994145 0.994395 0.994624 0.994834 0.995026 0.995204 0.995367 0.995518
0.995657 0.995786 0.995906 0.996017 0.99612 0.996216 0.996305 0.996389 0.996467 0.996539
0.996604 0.996662 0.996717 0.996768 0.996816 0.996861 0.996904 0.996944 0.996982 0.997017
0.997051 0.997082 0.997112 0.99714 0.997167 0.997192 0.997216 0.997238 0.99726 0.99728
0.997299 0.997317 0.997334 0.997351 0.997366 0.997381 0.997394 0.997408 0.99742 0.997432
0.997454 #selex for gender,fleet: 1 / 2
 0.0514244 0.193633 0.262198 0.336463 0.413258 0.490855 0.568935 0.647983 0.728749
0.811945 0.898098 0.987506 1.08024 1.17616 1.27498 1.3763 1.47966 1.58455 1.69047 1.79695
1.90353 2.00983 2.11547 2.22013 2.32355 2.42547 2.52571 2.62409 2.72047 2.81473 2.90677
2.99653 3.08395 3.16898 3.2516 3.3318 3.40957 3.48492 3.55786 3.62841 3.69661 3.76248
3.82606 3.8874 3.94654 4.00353 4.05841 4.11125 4.16208 4.21098 4.25799 4.30317 4.34657
4.38825 4.42826 4.46667 4.50351 4.53886 4.57275 4.60524 4.63638 4.66622 4.69481 4.72219
4.74841 4.77352 4.79755 4.82056 4.84258 4.86364 4.88393 4.90346 4.92215 4.94001 4.9571
4.97344 4.98906 5.00399 5.01826 5.03191 5.04494 5.0574 5.0693 5.08068 5.09154 5.10193
5.11184 5.12131 5.13036 5.139 5.14725 5.15513 5.16266 5.16984 5.1767 5.18325 5.18951
5.19548 5.20118 5.20662 5.21668 #bodywt for gender,fleet: 1 / 3
 0 0.0187216 0.0395013 0.0765259 0.134477 0.213866 0.309928 0.41425 0.517777 0.613279
0.69642 0.765595 0.821184 0.864698 0.89811 0.923416 0.942409 0.956585 0.96714 0.974997
0.980856 0.985239 0.988533 0.991021 0.992911 0.994358 0.995471 0.996335 0.99701 0.99754
0.997961 0.998296 0.998566 0.998785 0.998962 0.999108 0.999228 0.999328 0.999412 0.999482
0.999541 0.999591 0.999634 0.999671 0.999703 0.99973 0.999754 0.999775 0.999793 0.999809
0.999823 0.999835 0.999847 0.999857 0.999865 0.999873 0.999881 0.999887 0.999893 0.999898
0.999903 0.999907 0.999911 0.999915 0.999918 0.999921 0.999924 0.999927 0.999929 0.999931
0.999933 0.999935 0.999937 0.999938 0.999939 0.999941 0.999942 0.999943 0.999944 0.999945
0.999946 0.999947 0.999947 0.999948 0.999949 0.999949 0.99995 0.999951 0.999951 0.999952
0.999952 0.999953 0.999953 0.999954 0.999954 0.999954 0.999955 0.999955 0.999955 0.999956
0.999956 #selex for gender,fleet: 1 / 3
 0.0474109 0.175448 0.239961 0.314032 0.396111 0.484318 0.576781 0.671937 0.768683
0.866353 0.964622 1.06338 1.16263 1.2624 1.36272 1.46358 1.56491 1.66661 1.76854 1.87052
1.97235 2.07382 2.1747 2.27479 2.37386 2.47172 2.5682 2.66311 2.75632 2.8477 2.93713
3.02452 3.10979 3.19289 3.27377 3.35239 3.42874 3.5028 3.57458 3.64408 3.71133 3.77633
3.83913 3.89976 3.95825 4.01464 4.06898 4.12132 4.17171 4.22019 4.26682 4.31164 4.35472
4.3961 4.43584 4.47399 4.5106 4.54572 4.57941 4.61171 4.64268 4.67235 4.70079 4.72803
4.75412 4.7791 4.80302 4.82592 4.84783 4.8688 4.88901 4.90848 4.92711 4.94492 4.96196
4.97824 4.99382 5.0087 5.02293 5.03654 5.04954 5.06196 5.07383 5.08517 5.09601 5.10636
5.11625 5.12569 5.13472 5.14333 5.15156 5.15942 5.16693 5.17409 5.18094 5.18747 5.19371
5.19966 5.20535 5.21078 5.22081 #bodywt for gender,fleet: 1 / 4
 0 0.0128088 0.0216119 0.035232 0.0553143 0.0833798 0.120421 0.166544 0.220825 0.281429
0.345951 0.411829 0.476703 0.538655 0.596312 0.64884 0.695867 0.73738 0.77362 0.804981
0.831944 0.855014 0.874689 0.891435 0.905674 0.917781 0.928082 0.936857 0.944345 0.950749
0.956239 0.960958 0.965025 0.968542 0.971592 0.974245 0.97656 0.978587 0.980367 0.981935
0.98332 0.984547 0.985638 0.98661 0.987479 0.988258 0.988958 0.989588 0.990156 0.990671
0.991138 0.991563 0.991949 0.992302 0.992625 0.99292 0.993192 0.993441 0.993671 0.993883
0.994078 0.994259 0.994427 0.994582 0.994727 0.994861 0.994986 0.995102 0.995211 0.995313
0.995403 0.995484 0.99556 0.995631 0.995698 0.995761 0.99582 0.995875 0.995928 0.995977
0.996023 0.996067 0.996108 0.996148 0.996184 0.996219 0.996252 0.996283 0.996313 0.996341
0.996367 0.996392 0.996416 0.996439 0.99646 0.99648 0.996499 0.996517 0.996535 0.996551
0.996581 #selex for gender,fleet: 1 / 4
 0.0466845 0.172305 0.236105 0.310153 0.393545 0.485022 0.583054 0.685994 0.792252
0.900449 1.0095 1.11862 1.22731 1.33526 1.44232 1.54843 1.65355 1.75769 1.86083 1.96296
2.06404 2.16402 2.26283 2.36039 2.45662 2.55143 2.64471 2.73637 2.82633 2.9145 3.0008
3.08518 3.16756 3.2479 3.32616 3.40231 3.47633 3.5482 3.61793 3.68552 3.75097 3.8143
3.87554 3.93471 3.99184 4.04697 4.10013 4.15137 4.20073 4.24825 4.29399 4.33798 4.38028
4.42093 4.45999 4.4975 4.53352 4.56808 4.60124 4.63306 4.66356 4.69281 4.72084 4.7477
4.77343 4.79807 4.82168 4.84427 4.86591 4.88661 4.9066 4.9259 4.94436 4.96202 4.97891
4.99506 5.01051 5.02527 5.03938 5.05287 5.06577 5.07809 5.08986 5.10111 5.11186 5.12213
5.13195 5.14132 5.15027 5.15882 5.16699 5.17479 5.18223 5.18935 5.19614 5.20262 5.20881
5.21472 5.22037 5.22575 5.23571 #bodywt for gender,fleet: 1 / 5
 0 0.00553229 0.00897589 0.0141953 0.0218656 0.0327698 0.0477293 0.067493 0.0926048
0.123284 0.159355 0.200244 0.245049 0.292648 0.341832 0.391419 0.440349 0.487738 0.532906
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0.575373 0.614845 0.65118 0.684364 0.714472 0.741648 0.766077 0.787966 0.807535 0.825
0.840573 0.854451 0.866819 0.877844 0.887678 0.896458 0.904306 0.911329 0.917624 0.923273
0.928353 0.932927 0.937053 0.940782 0.944157 0.947219 0.949999 0.95253 0.954837 0.956944
0.95887 0.960636 0.962255 0.963743 0.965113 0.966376 0.967541 0.968618 0.969615 0.970538
0.971395 0.972191 0.972931 0.97362 0.974262 0.97486 0.97542 0.975942 0.976431 0.976889
0.977317 0.977705 0.978054 0.978381 0.97869 0.97898 0.979253 0.979511 0.979754 0.979983
0.980199 0.980403 0.980595 0.980777 0.98095 0.981112 0.981267 0.981412 0.98155 0.981681
0.981805 0.981923 0.982034 0.98214 0.98224 0.982335 0.982425 0.982511 0.982592 0.98267
0.982743 0.982878 #selex for gender,fleet: 1 / 5
 0.0483158 0.180652 0.248243 0.326973 0.415928 0.513717 0.61851 0.728197 0.840649
0.954007 1.06687 1.17832 1.28789 1.39542 1.50097 1.60469 1.70677 1.8074 1.90676 2.00496
2.10208 2.19816 2.29321 2.3872 2.48007 2.57175 2.66216 2.7512 2.83878 2.92481 3.0092
3.09186 3.17272 3.25172 3.32879 3.4039 3.47701 3.54809 3.61713 3.68411 3.74904 3.81192
3.87277 3.9316 3.98844 4.04332 4.09627 4.14732 4.19653 4.24392 4.28954 4.33344 4.37566
4.41625 4.45525 4.49272 4.5287 4.56324 4.59638 4.62817 4.65867 4.6879 4.71593 4.74279
4.76852 4.79317 4.81677 4.83938 4.86102 4.88173 4.90172 4.92102 4.93948 4.95714 4.97403
4.99019 5.00563 5.0204 5.03451 5.048 5.0609 5.07322 5.085 5.09626 5.10701 5.11728 5.1271
5.13647 5.14543 5.15398 5.16215 5.16995 5.1774 5.18452 5.19131 5.1978 5.20399 5.20991
5.21555 5.22094 5.2309 #bodywt for gender,fleet: 1 / 6
 0 0.00158049 0.00286478 0.00504369 0.00861979 0.0142837 0.022913 0.0355154 0.0531053
0.0765276 0.106278 0.142371 0.184307 0.23113 0.281561 0.334166 0.387518 0.440315 0.491472
0.540151 0.585765 0.627956 0.666562 0.701571 0.733089 0.761296 0.786423 0.808726 0.828471
0.845919 0.861318 0.874903 0.886884 0.897457 0.906792 0.915042 0.922344 0.928815 0.934559
0.939666 0.944216 0.948277 0.951909 0.955163 0.958085 0.960713 0.963083 0.965224 0.967161
0.968918 0.970514 0.971967 0.973292 0.974502 0.975609 0.976625 0.977557 0.978414 0.979203
0.979931 0.980603 0.981225 0.981801 0.982335 0.98283 0.983291 0.98372 0.984119 0.984492
0.984839 0.985149 0.985425 0.985684 0.985927 0.986154 0.986368 0.986569 0.986758 0.986936
0.987104 0.987262 0.98741 0.987551 0.987683 0.987809 0.987927 0.988038 0.988144 0.988244
0.988339 0.988428 0.988513 0.988593 0.988669 0.988741 0.98881 0.988875 0.988936 0.988994
0.98905 0.989151 #selex for gender,fleet: 1 / 6
 0.0548914 0.189688 0.257027 0.332795 0.415381 0.503307 0.595419 0.69092 0.789307
0.890271 0.993607 1.09914 1.20669 1.31604 1.42694 1.5391 1.65221 1.76593 1.87992 1.99384
2.10738 2.22022 2.33208 2.4427 2.55184 2.65929 2.76488 2.86845 2.96985 3.06899 3.16578
3.26013 3.352 3.44134 3.52814 3.61238 3.69405 3.77318 3.84976 3.92383 3.99541 4.06455
4.13129 4.19566 4.25772 4.31752 4.37511 4.43055 4.48389 4.53519 4.58451 4.63191 4.67745
4.72118 4.76317 4.80346 4.84213 4.87921 4.91478 4.94888 4.98157 5.01289 5.0429 5.07165
5.09918 5.12554 5.15078 5.17495 5.19807 5.2202 5.24151 5.26204 5.28167 5.30045 5.31841
5.33559 5.35201 5.36771 5.38272 5.39707 5.41078 5.42389 5.43641 5.44838 5.45982 5.47074
5.48118 5.49116 5.50069 5.50979 5.51848 5.52679 5.53472 5.54229 5.54952 5.55643 5.56303
5.56933 5.57534 5.58108 5.59172 #bodywt for gender,fleet: 2 / 1
 0 0.056618 0.0862621 0.126104 0.17651 0.236494 0.303794 0.375315 0.447747 0.518106
0.584086 0.644176 0.697611 0.744227 0.784287 0.818318 0.846979 0.87097 0.89097 0.907605
0.921428 0.932918 0.942479 0.95045 0.957113 0.962698 0.967396 0.971362 0.974722 0.97758
0.98002 0.982112 0.983913 0.985468 0.986817 0.987992 0.989018 0.989918 0.99071 0.99141
0.992029 0.99258 0.99307 0.993509 0.993902 0.994256 0.994575 0.994862 0.995123 0.99536
0.995575 0.995771 0.995951 0.996115 0.996265 0.996404 0.996531 0.996648 0.996757 0.996857
0.996949 0.997035 0.997115 0.997189 0.997258 0.997322 0.997382 0.997438 0.997491 0.99754
0.997584 0.997623 0.99766 0.997695 0.997728 0.997759 0.997788 0.997815 0.997841 0.997865
0.997888 0.99791 0.99793 0.99795 0.997968 0.997985 0.998002 0.998017 0.998032 0.998046
0.998059 0.998071 0.998083 0.998094 0.998105 0.998115 0.998125 0.998134 0.998142 0.998151
0.998166 #selex for gender,fleet: 2 / 1
 0.0562783 0.197221 0.268324 0.348601 0.436011 0.528507 0.624412 0.722595 0.822436
0.92368 1.02628 1.13028 1.23572 1.34259 1.45082 1.56027 1.67073 1.78196 1.89366 2.00552
2.11722 2.22846 2.33893 2.44836 2.5565 2.6631 2.76797 2.87094 2.97184 3.07057 3.167
3.26107 3.3527 3.44185 3.52849 3.61259 3.69415 3.77318 3.84969 3.9237 3.99524 4.06433
4.13103 4.19538 4.25741 4.3172 4.37477 4.4302 4.48353 4.53482 4.58414 4.63154 4.67707
4.7208 4.76279 4.80308 4.84175 4.87884 4.9144 4.9485 4.98119 5.01251 5.04253 5.07128
5.09881 5.12518 5.15042 5.17458 5.19771 5.21984 5.24116 5.26168 5.28132 5.3001 5.31806
5.33523 5.35166 5.36736 5.38237 5.39671 5.41043 5.42354 5.43606 5.44803 5.45947 5.4704
5.48084 5.49081 5.50034 5.50944 5.51814 5.52644 5.53437 5.54195 5.54918 5.55609 5.56268
5.56898 5.575 5.58074 5.59138 #bodywt for gender,fleet: 2 / 2
 0 0.0236049 0.0395862 0.0636857 0.0978776 0.143296 0.199703 0.265347 0.337282 0.411987
0.486027 0.556544 0.621502 0.679714 0.730726 0.774635 0.811901 0.84319 0.869252 0.890839
0.908653 0.923325 0.935402 0.945349 0.953552 0.960332 0.965952 0.970625 0.974524 0.977791
0.980539 0.982859 0.984827 0.986503 0.987936 0.989167 0.990229 0.991148 0.991946 0.992643
0.993253 0.99379 0.994263 0.994681 0.995052 0.995383 0.995679 0.995943 0.996181 0.996395
0.996588 0.996763 0.996922 0.997066 0.997198 0.997318 0.997428 0.997528 0.997621 0.997706
0.997784 0.997856 0.997923 0.997985 0.998042 0.998095 0.998145 0.998191 0.998234 0.998274
0.998309 0.998341 0.998371 0.998398 0.998424 0.998449 0.998472 0.998494 0.998514 0.998533
0.998551 0.998568 0.998584 0.998599 0.998614 0.998627 0.99864 0.998652 0.998664 0.998674

0.998685 0.998694 0.998703 0.998712 0.99872 0.998728 0.998736 0.998743 0.998749 0.998756
0.998767 #selex for gender,fleet: 2 / 2
 0.0613745 0.219761 0.296353 0.378092 0.461531 0.545156 0.629048 0.714063 0.80122
0.891388 0.985155 1.0828 1.18431 1.28943 1.39772 1.50864 1.62159 1.73595 1.85115 1.96664
2.08194 2.19663 2.31032 2.42272 2.53354 2.64256 2.74958 2.85446 2.95705 3.05727 3.15502
3.25024 3.34289 3.43294 3.52036 3.60517 3.68735 3.76693 3.84392 3.91836 3.99029 4.05973
4.12674 4.19136 4.25365 4.31365 4.37143 4.42704 4.48054 4.53199 4.58144 4.62897 4.67462
4.71845 4.76053 4.80092 4.83966 4.87683 4.91247 4.94663 4.97938 5.01075 5.04082 5.06962
5.09719 5.1236 5.14888 5.17308 5.19624 5.21841 5.23975 5.26029 5.27994 5.29874 5.31672
5.33391 5.35034 5.36606 5.38108 5.39544 5.40917 5.42228 5.43482 5.4468 5.45825 5.46918
5.47963 5.48961 5.49915 5.50826 5.51696 5.52527 5.53321 5.54079 5.54803 5.55494 5.56154
5.56784 5.57386 5.57961 5.59026 #bodywt for gender,fleet: 2 / 3
 0 0.0193458 0.0421489 0.0835085 0.148558 0.237099 0.342626 0.454787 0.563211 0.660298
0.742107 0.807846 0.858775 0.897157 0.925504 0.946145 0.961034 0.971719 0.979372 0.984856
0.988798 0.991643 0.993709 0.99522 0.996333 0.997159 0.997778 0.998245 0.998601 0.998874
0.999086 0.999251 0.999382 0.999485 0.999568 0.999635 0.999689 0.999733 0.999769 0.9998
0.999825 0.999846 0.999864 0.999879 0.999891 0.999902 0.999912 0.99992 0.999927 0.999933
0.999939 0.999944 0.999948 0.999952 0.999955 0.999958 0.99996 0.999963 0.999965 0.999967
0.999969 0.99997 0.999972 0.999973 0.999974 0.999975 0.999976 0.999977 0.999978 0.999979
0.999979 0.99998 0.99998 0.999981 0.999981 0.999982 0.999982 0.999982 0.999983 0.999983
0.999983 0.999984 0.999984 0.999984 0.999984 0.999985 0.999985 0.999985 0.999985 0.999985
0.999986 0.999986 0.999986 0.999986 0.999986 0.999986 0.999986 0.999987 0.999987 0.999987
0.999987 #selex for gender,fleet: 2 / 3
 0.0566467 0.19954 0.272222 0.35486 0.445466 0.541801 0.641806 0.74391 0.847133 0.950992
1.05535 1.16025 1.26582 1.37215 1.47932 1.58731 1.69605 1.80539 1.91513 2.02504 2.13486
2.24432 2.35313 2.46104 2.56779 2.67315 2.77692 2.8789 2.97894 3.0769 3.17267 3.26614
3.35726 3.44596 3.53219 3.61595 3.6972 3.77596 3.85223 3.92603 3.99738 4.06631 4.13286
4.19707 4.25899 4.31867 4.37615 4.43149 4.48474 4.53597 4.58522 4.63256 4.67805 4.72173
4.76367 4.80393 4.84255 4.87961 4.91515 4.94922 4.98188 5.01318 5.04317 5.0719 5.09942
5.12576 5.15099 5.17514 5.19825 5.22037 5.24168 5.26219 5.28182 5.30059 5.31855 5.33571
5.35213 5.36783 5.38283 5.39717 5.41088 5.42399 5.43651 5.44847 5.45991 5.47083 5.48127
5.49124 5.50077 5.50986 5.51856 5.52686 5.53479 5.54236 5.54959 5.55649 5.56309 5.56939
5.5754 5.58114 5.59178 #bodywt for gender,fleet: 2 / 4
 0 0.0130705 0.0226077 0.0376627 0.0601967 0.0919837 0.134084 0.186407 0.247573 0.315144
0.386094 0.457353 0.526237 0.590702 0.649419 0.701718 0.74746 0.786886 0.820481 0.848857
0.872668 0.892558 0.909125 0.922904 0.934359 0.943888 0.951827 0.958455 0.964001 0.968657
0.972578 0.975892 0.978704 0.981097 0.983143 0.984899 0.986411 0.987718 0.988853 0.989842
0.990706 0.991465 0.992133 0.992722 0.993245 0.99371 0.994124 0.994495 0.994827 0.995126
0.995396 0.995639 0.99586 0.99606 0.996242 0.996408 0.99656 0.996699 0.996827 0.996944
0.997052 0.997151 0.997243 0.997328 0.997406 0.997479 0.997547 0.997609 0.997668 0.997722
0.997771 0.997814 0.997854 0.997892 0.997927 0.997961 0.997992 0.998021 0.998049 0.998075
0.998099 0.998122 0.998144 0.998164 0.998184 0.998202 0.998219 0.998236 0.998251 0.998266
0.998279 0.998292 0.998305 0.998317 0.998328 0.998338 0.998348 0.998358 0.998367 0.998375
0.998391 #selex for gender,fleet: 2 / 4
 0.0557902 0.196036 0.26802 0.350854 0.443289 0.543716 0.650298 0.761172 0.874649
0.989368 1.10435 1.21896 1.33286 1.44589 1.55803 1.6693 1.77975 1.88941 1.99829 2.10638
2.21361 2.31992 2.4252 2.52935 2.63222 2.7337 2.83364 2.93193 3.02843 3.12305 3.21567
3.30621 3.39461 3.48079 3.56471 3.64633 3.72563 3.8026 3.87722 3.94952 4.01949 4.08717
4.15257 4.21573 4.27668 4.33547 4.39214 4.44674 4.49931 4.5499 4.59857 4.64538 4.69036
4.73359 4.77511 4.81497 4.85324 4.88996 4.92518 4.95896 4.99135 5.0224 5.05215 5.08066
5.10797 5.13413 5.15917 5.18316 5.20611 5.22808 5.24927 5.26969 5.28924 5.30793 5.32581
5.3429 5.35925 5.37488 5.38983 5.40411 5.41777 5.43082 5.44329 5.45521 5.4666 5.47749
5.48788 5.49782 5.50731 5.51637 5.52503 5.5333 5.5412 5.54875 5.55595 5.56283 5.5694
5.57568 5.58167 5.58739 5.59799 #bodywt for gender,fleet: 2 / 5
 0 0.0056342 0.00935828 0.0151214 0.0237444 0.0361841 0.0534386 0.0763956 0.105656
0.141382 0.183221 0.230325 0.281457 0.335155 0.389908 0.444297 0.497111 0.547394 0.594468
0.637913 0.677529 0.713296 0.745326 0.77382 0.799038 0.821268 0.840807 0.857947 0.872963
0.886111 0.897625 0.907711 0.916555 0.92432 0.931148 0.937161 0.942467 0.947159 0.951317
0.955009 0.958295 0.961227 0.963848 0.966198 0.968308 0.970207 0.97192 0.97347 0.974873
0.976147 0.977307 0.978363 0.979328 0.98021 0.981019 0.981762 0.982444 0.983073 0.983653
0.984188 0.984684 0.985143 0.985568 0.985963 0.986331 0.986672 0.986991 0.987288 0.987565
0.987825 0.988057 0.988266 0.988461 0.988645 0.988817 0.988979 0.989131 0.989275 0.98941
0.989538 0.989658 0.989771 0.989878 0.98998 0.990075 0.990165 0.990251 0.990332 0.990408
0.990481 0.990549 0.990614 0.990676 0.990734 0.99079 0.990842 0.990892 0.99094 0.990985
0.991027 0.991106 #selex for gender,fleet: 2 / 5
 0.0577138 0.2054 0.281558 0.36947 0.46783 0.574818 0.688196 0.80554 0.924583 1.04351
1.1611 1.27671 1.39012 1.5014 1.61079 1.71858 1.82505 1.93044 2.03495 2.13869 2.24172
2.34405 2.44563 2.54638 2.64618 2.74492 2.84244 2.93861 3.03328 3.12631 3.21759 3.307
3.39444 3.47983 3.56309 3.64417 3.72304 3.79965 3.874 3.94608 4.01589 4.08344 4.14875
4.21184 4.27276 4.33153 4.38819 4.44279 4.49538 4.546 4.5947 4.64154 4.68657 4.72984
4.7714 4.81131 4.84962 4.88638 4.92164 4.95547 4.9879 5.01899 5.04878 5.07733 5.10468

5.13087 5.15596 5.17997 5.20296 5.22496 5.24617 5.26661 5.28617 5.30488 5.32277 5.33988
5.35625 5.37189 5.38685 5.40114 5.41481 5.42787 5.44035 5.45228 5.46368 5.47458 5.48498
5.49492 5.50442 5.5135 5.52216 5.53044 5.53835 5.5459 5.55311 5.55999 5.56657 5.57285
5.57885 5.58457 5.59518 #bodywt for gender,fleet: 2 / 6
 0 0.00161861 0.00301987 0.00546025 0.0095592 0.0161792 0.0264202 0.0415342 0.0627471
0.091016 0.126794 0.169884 0.219423 0.274007 0.331893 0.391233 0.45028 0.507533 0.561825
0.612335 0.658574 0.700333 0.737622 0.770615 0.799588 0.824882 0.846865 0.865906 0.882362
0.896563 0.908811 0.919374 0.92849 0.936365 0.943178 0.949083 0.95421 0.958672 0.962565
0.96597 0.968955 0.971579 0.973893 0.975938 0.97775 0.979361 0.980795 0.982077 0.983225
0.984255 0.985183 0.986019 0.986775 0.987461 0.988083 0.988649 0.989165 0.989637 0.990069
0.990464 0.990828 0.991162 0.99147 0.991754 0.992017 0.99226 0.992485 0.992695 0.992889
0.993069 0.993229 0.993371 0.993503 0.993626 0.993742 0.99385 0.993952 0.994048 0.994137
0.994222 0.994301 0.994376 0.994446 0.994513 0.994575 0.994635 0.99469 0.994743 0.994793
0.99484 0.994884 0.994926 0.994966 0.995004 0.99504 0.995074 0.995106 0.995136 0.995165
0.995192 0.995243 #selex for gender,fleet: 2 / 6
 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383
0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383
0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383
0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383
0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383
0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383
0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383
0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383
0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383 0.0469383
0.0469383 0.0469383 0.0469383 #mean M for year Yinit: 2011 sex: 1
 43.4033 40.6772 38.0509 35.5804 33.3409 31.0561 28.9166 26.8498 24.8615 23.0039 21.782
20.428 20.3778 19.7277 20.292 20.3744 20.6088 20.3791 20.5917 20.7299 20.4322 19.29
18.4429 17.1696 15.7414 14.2297 12.9755 11.6445 10.4706 9.50117 8.48033 7.48097 6.62789
5.8682 5.14811 4.52379 3.977 3.50989 3.10453 2.75819 2.45623 2.1937 1.97375 1.77683
1.60726 1.46005 1.33739 1.22396 1.12542 1.0391 0.961981 0.893609 0.832436 0.777465
0.727362 0.681372 0.63894 0.599675 0.563293 0.529948 0.499217 0.470508 0.443789 0.419292
0.396312 0.376083 0.357437 0.339014 0.321681 0.304641 0.288492 0.273171 0.258586 0.24484
0.231832 0.219534 0.207873 0.196854 0.186456 0.176693 0.167517 0.158907 0.150808 0.143165
0.135964 0.129176 0.122771 0.116715 0.110991 0.105578 0.100457 0.0956068 0.0910094
0.0866583 0.0825272 0.0786005 0.0748585 0.0713048 0.0679286 0.06472 1.33372 #numbers for
year Yinit: 2011 sex: 1
 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867
0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867
0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867
0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867
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0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867 0.0456867
0.0456867 0.0456867 0.0456867 #mean M for year Yinit: 2011 sex: 2
 43.4033 40.7281 38.1462 35.7137 33.507 31.2481 29.129 27.077 25.0983 23.2462 22.0324
20.6814 20.6482 20.005 20.5907 20.6834 20.9234 20.6824 20.8779 20.9831 20.6313 19.4149
18.4879 17.1309 15.6243 14.0461 12.7367 11.3684 10.171 9.18825 8.17019 7.1857 6.352
5.61551 4.92248 4.32493 3.80403 3.36089 2.97772 2.65147 2.36775 2.12161 1.91598 1.73186
1.57342 1.43581 1.32133 1.21497 1.1224 1.04112 0.968208 0.903337 0.845053 0.792447
0.744247 0.69976 0.658484 0.620076 0.5843 0.551369 0.520891 0.492292 0.465573 0.441006
0.417876 0.397505 0.378683 0.359978 0.342316 0.324858 0.308247 0.292425 0.277306 0.263008
0.24944 0.23658 0.224362 0.2128 0.201879 0.191617 0.181966 0.172905 0.164375 0.156316
0.148714 0.141538 0.134754 0.128329 0.122245 0.11648 0.111014 0.105827 0.100901 0.0962303
0.091787 0.0875555 0.0835152 0.0796713 0.0760129 0.0725302 1.53984 #numbers for year
Yinit: 2011 sex: 2
 44.6192 42.0139 39.5036 37.0063 34.6033 32.3386 30.2808 28.1797 26.2105 24.3087 22.4812
20.7759 19.649 18.4067 18.3422 17.7399 18.2314 18.2911 18.4887 18.2713 18.452 18.567
18.2927 17.2638 16.5004 15.3569 14.0759 12.7213 11.5978 10.4063 9.3558 8.48842 7.5755
6.6821 5.91959 5.2407 4.59733 4.03961 3.55121 3.13402 2.77204 2.46279 2.19318 1.95881
1.76246 1.58668 1.43533 1.30393 1.19445 1.0932 1.00525 0.928203 0.859359 0.798323
0.743709 0.694629 0.649891 0.608823 0.570929 0.535859 0.503363 0.473577 0.446124 0.420476
0.396605 0.374719 0.354186 0.336111 0.319451 0.302988 0.287499 0.272271 0.25784 0.244147
0.231112 0.218826 0.207199 0.196206 0.185783 0.175933 0.166639 0.157912 0.14971 0.142014
0.134775 0.127943 0.121507 0.115441 0.109716 0.104304 0.099188 0.0943505 0.0897736

```
0.0854391 0.0813306 0.0774421 0.0737503 0.0702412 0.0668972 0.0637214 1.31042 #numbers
for year Ydeclare: 2013 sex: 1
 44.6192 42.0665 39.6024 37.1447 34.7749 32.5374 30.5019 28.4167 26.4586 24.5633 22.7384
21.0328 19.9096 18.6668 18.6167 18.0192 18.5306 18.5997 18.8029 18.5754 18.7415 18.8276
18.505 17.4081 16.5723 15.3521 13.9988 12.5824 11.4076 10.1806 9.10721 8.22635 7.31424
6.43242 5.6858 5.02633 4.40587 3.87095 3.40469 3.00808 2.66516 2.37319 2.11932 1.89908
1.71511 1.55037 1.40862 1.28551 1.1831 1.08793 1.00511 0.93238 0.867135 0.809081 0.756917
0.70983 0.666683 0.626855 0.589898 0.555505 0.523468 0.493975 0.466679 0.441063 0.41713
0.395124 0.374405 0.356156 0.339295 0.322537 0.306714 0.291072 0.27619 0.262013 0.248465
0.235654 0.223495 0.211971 0.201022 0.19066 0.180873 0.171677 0.163029 0.154909 0.147265
0.140044 0.133233 0.126803 0.120725 0.114968 0.109517 0.104352 0.0994549 0.0948083
0.090395 0.0862104 0.0822297 0.0784388 0.0748191 0.0713755 1.51258 #numbers for year
Ydeclare: 2013 sex: 2
#R0  1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932
1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950
1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968
1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986
1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004
2005 2006 2007 2008 2009 2010 #years
234.505  234.505 234.463 234.405 234.34 234.297 234.251 234.205 234.162 234.117 234.066
233.991 233.906 233.81 233.7 233.549 233.391 233.258 233.13 233.028 232.902 232.75
232.551 232.356 232.164 232.021 231.796 231.518 231.17 230.312 229.451 228.014 226.812
226.348 225.805 225.453 225.075 224.606 224.205 223.908 223.524 223.03 222.42 221.709
220.938 220.246 219.617 219.1 218.479 217.999 217.676 216.29 215.741 215.092 214.411
212.804 211.716 210.217 208.263 206.369 204.181 202.125 199.635 197.009 192.321 187.452
183.39 177.34 169.071 163.048 158.098 151.772 147.932 143.205 137.638 129.935 125.198
116.522 107.025 98.5535 93.226 86.5727 81.2614 74.7485 73.1516 69.6204 70.5327 70.8433
72.858 74.9234 76.871 78.6801 80.5198 81.9544 83.6025 85.2641 86.8067 #Recruits
1.02333e+009  1.02333e+009 1.02287e+009 1.02224e+009 1.02153e+009 1.02107e+009
1.02057e+009 1.02008e+009 1.01962e+009 1.01913e+009 1.01857e+009 1.01777e+009
1.01686e+009 1.01582e+009 1.01464e+009 1.01302e+009 1.01134e+009 1.00991e+009
1.00855e+009 1.00746e+009 1.00612e+009 1.00452e+009 1.00241e+009 1.00035e+009
9.98331e+008 9.96824e+008 9.94466e+008 9.91554e+008 9.87931e+008 9.79059e+008
9.70258e+008 9.55769e+008 9.43835e+008 9.39275e+008 9.33976e+008 9.30556e+008
9.26899e+008 9.22386e+008 9.18547e+008 9.15712e+008 9.12066e+008 9.07403e+008
9.01681e+008 8.95053e+008 8.8794e+008 8.81608e+008 8.75891e+008 8.71228e+008 8.65661e+008
8.61378e+008 8.58513e+008 8.46347e+008 8.41578e+008 8.3598e+008 8.30146e+008 8.16566e+008
8.07506e+008 7.95201e+008 7.79458e+008 7.64514e+008 7.47629e+008 7.32109e+008
7.13762e+008 6.94922e+008 6.62508e+008 6.30414e+008 6.04778e+008 5.68395e+008
5.21846e+008 4.90053e+008 4.65147e+008 4.34808e+008 4.17158e+008 3.96173e+008
3.72458e+008 3.41306e+008 3.23038e+008 2.91204e+008 2.58577e+008 2.31249e+008
2.14856e+008 1.95185e+008 1.80085e+008 1.62258e+008 1.57998e+008 1.48727e+008
1.51103e+008 1.51915e+008 1.57219e+008 1.62727e+008 1.67987e+008 1.72931e+008
1.78018e+008 1.82026e+008 1.86677e+008 1.91417e+008 1.95863e+008 #SpawnBio
0.383 0.5 0 # spawn-recr steepness, sigmaR, autocorr
# values from cat150_hlow, catch at 150% and steepness at low value. # this is state of
nature 3 out of 9 (in no particular order) # and parameter set number 1 out of 1 for this
state
 0 0 31.8431 114.773 374.898 1098.88 2856.7 6549.63 13289.7 24118.1 39703 60173.8 85145.8
113883 145504 179151 214094 249779 285815 321953 358046 394016 429826 465459 500909
536165 571215 606038 640610 674900 708874 742495 775725 808525 840858 872689 903985
934713 964847 994362 1.02324e+006 1.05145e+006 1.07899e+006 1.10584e+006 1.132e+006
1.15745e+006 1.18219e+006 1.20623e+006 1.22955e+006 1.25217e+006 1.27409e+006
1.29531e+006 1.31585e+006 1.33571e+006 1.35489e+006 1.37342e+006 1.39131e+006
1.40856e+006 1.42519e+006 1.44122e+006 1.45666e+006 1.47153e+006 1.48583e+006 1.4996e+006
1.51283e+006 1.52555e+006 1.53777e+006 1.54951e+006 1.56078e+006 1.5716e+006 1.58199e+006
1.59222e+006 1.60204e+006 1.61145e+006 1.62048e+006 1.62913e+006 1.63743e+006
1.64537e+006 1.65299e+006 1.66028e+006 1.66726e+006 1.67395e+006 1.68035e+006
1.68647e+006 1.69234e+006 1.69795e+006 1.70331e+006 1.70845e+006 1.71336e+006
1.71806e+006 1.72255e+006 1.72684e+006 1.73095e+006 1.73487e+006 1.73862e+006
1.74221e+006 1.74563e+006 1.74891e+006 1.75204e+006 1.75502e+006 1.76056e+006 #female
fecundity; weighted by N in year Y_init across morphs and areas
 0.0461246 0.167611 0.227448 0.295335 0.369949 0.449996 0.534385 0.622298 0.713164
0.806597 0.902323 1.00012 1.09978 1.2011 1.30383 1.40772 1.51249 1.61786 1.72353 1.8292
1.9346 2.03944 2.14347 2.24645 2.34817 2.44842 2.54704 2.64387 2.73878 2.83167 2.92243
3.01099 3.0973 3.18131 3.26298 3.3423 3.41926 3.49386 3.5661 3.63602 3.70362 3.76894
3.83202 3.89288 3.95158 4.00816 4.06267 4.11515 4.16566 4.21425 4.26098 4.30589 4.34904
4.39049 4.43028 4.46848 4.50514 4.5403 4.57402 4.60635 4.63735 4.66705 4.6955 4.72276
4.74887 4.77386 4.7978 4.8207 4.84263 4.86361 4.88382 4.90329 4.92192 4.93973 4.95677
4.97306 4.98863 5.00352 5.01775 5.03135 5.04435 5.05677 5.06864 5.07999 5.09082 5.10117
```

5.11106 5.12051 5.12953 5.13815 5.14638 5.15424 5.16174 5.16891 5.17575 5.18229 5.18853
5.19448 5.20017 5.2056 5.21563 #bodywt for gender,fleet: 1 / 1
 0 0.0565659 0.0845255 0.121601 0.168118 0.223297 0.285298 0.351559 0.419268 0.485817
0.549099 0.60764 0.660589 0.707617 0.748789 0.784437 0.815041 0.841156 0.863346 0.882152
0.898069 0.911537 0.92294 0.932607 0.940818 0.947808 0.953775 0.958882 0.963268 0.967046
0.970312 0.973144 0.975608 0.977759 0.979643 0.981299 0.982759 0.98405 0.985195 0.986214
0.987123 0.987936 0.988666 0.989322 0.989914 0.990449 0.990934 0.991374 0.991775 0.99214
0.992474 0.99278 0.99306 0.993317 0.993554 0.993773 0.993974 0.994161 0.994333 0.994493
0.994642 0.99478 0.994908 0.995028 0.99514 0.995244 0.995341 0.995432 0.995517 0.995597
0.995669 0.995734 0.995795 0.995853 0.995907 0.995958 0.996006 0.996051 0.996094 0.996134
0.996172 0.996208 0.996242 0.996274 0.996304 0.996333 0.99636 0.996386 0.996411 0.996434
0.996456 0.996477 0.996496 0.996515 0.996533 0.99655 0.996566 0.996581 0.996595 0.996609
0.996634 #selex for gender,fleet: 1 / 1
 0.0473105 0.174394 0.237662 0.309742 0.388988 0.473625 0.562083 0.653189 0.746199
0.840705 0.936525 1.03359 1.13187 1.23133 1.33189 1.43344 1.53581 1.63881 1.74219 1.84572
1.94913 2.05216 2.15456 2.25608 2.3565 2.45562 2.55324 2.6492 2.74335 2.83557 2.92576
3.01383 3.09971 3.18334 3.26469 3.34373 3.42045 3.49484 3.56691 3.63666 3.70413 3.76933
3.8323 3.89308 3.9517 4.00821 4.06266 4.11509 4.16555 4.2141 4.26079 4.30567 4.34879
4.39021 4.42999 4.46817 4.50481 4.53995 4.57366 4.60598 4.63696 4.66665 4.6951 4.72235
4.74845 4.77344 4.79737 4.82027 4.84219 4.86317 4.88338 4.90285 4.92147 4.93928 4.95631
4.9726 4.98817 5.00306 5.01729 5.03089 5.04388 5.0563 5.06817 5.07951 5.09035 5.1007
5.11059 5.12003 5.12905 5.13767 5.1459 5.15376 5.16126 5.16843 5.17527 5.1818 5.18804
5.194 5.19968 5.20511 5.21514 #bodywt for gender,fleet: 1 / 2
 0 0.023468 0.0384239 0.0605618 0.0915627 0.132449 0.183158 0.242399 0.307857 0.376651
0.445855 0.512914 0.575881 0.633486 0.685076 0.730496 0.769947 0.803856 0.832771 0.857287
0.877992 0.895436 0.910116 0.922468 0.932868 0.941638 0.949048 0.955323 0.960652 0.965191
0.969069 0.972395 0.975255 0.977724 0.979863 0.981723 0.983345 0.984764 0.986011 0.987109
0.98808 0.98894 0.989705 0.990388 0.990998 0.991546 0.992038 0.992481 0.992882 0.993245
0.993575 0.993875 0.994148 0.994398 0.994627 0.994836 0.995029 0.995206 0.995369 0.99552
0.995659 0.995788 0.995908 0.996019 0.996122 0.996218 0.996307 0.99639 0.996468 0.996541
0.996606 0.996664 0.996718 0.996769 0.996817 0.996863 0.996905 0.996945 0.996983 0.997018
0.997052 0.997083 0.997113 0.997141 0.997168 0.997193 0.997217 0.997239 0.997261 0.997281
0.9973 0.997318 0.997335 0.997351 0.997367 0.997381 0.997395 0.997408 0.997421 0.997433
0.997454 #selex for gender,fleet: 1 / 2
 0.0516744 0.194793 0.263442 0.337682 0.414372 0.491837 0.569791 0.648734 0.729418
0.812551 0.898652 0.988013 1.0807 1.17656 1.27532 1.37658 1.47985 1.58465 1.69047 1.79684
1.90332 2.00949 2.115 2.21954 2.32283 2.42463 2.52474 2.62299 2.71924 2.81337 2.90529
2.99492 3.08222 3.16714 3.24964 3.32973 3.40739 3.48263 3.55547 3.62593 3.69403 3.7598
3.8233 3.88455 3.94361 4.00052 4.05532 4.10809 4.15886 4.20769 4.25463 4.29975 4.34309
4.38471 4.42468 4.46303 4.49982 4.53512 4.56897 4.60142 4.63252 4.66232 4.69087 4.71822
4.74441 4.76948 4.79349 4.81647 4.83846 4.8595 4.87976 4.89927 4.91794 4.93578 4.95285
4.96917 4.98478 4.99969 5.01395 5.02758 5.0406 5.05305 5.06494 5.0763 5.08716 5.09753
5.10743 5.1169 5.12594 5.13457 5.14281 5.15068 5.1582 5.16538 5.17224 5.17878 5.18503
5.191 5.19669 5.20213 5.21218 #bodywt for gender,fleet: 1 / 3
 0 0.0191498 0.0403209 0.0779081 0.136503 0.21646 0.312867 0.417253 0.520598 0.61576
0.698489 0.767255 0.822476 0.865682 0.898848 0.923965 0.942814 0.956884 0.967361 0.975161
0.980978 0.985331 0.988602 0.991074 0.992952 0.994389 0.995496 0.996354 0.997025 0.997553
0.997971 0.998305 0.998573 0.99879 0.998967 0.999112 0.999232 0.999331 0.999414 0.999484
0.999543 0.999593 0.999636 0.999672 0.999704 0.999731 0.999755 0.999776 0.999794 0.99981
0.999824 0.999836 0.999847 0.999857 0.999866 0.999874 0.999881 0.999887 0.999893 0.999899
0.999903 0.999908 0.999912 0.999915 0.999919 0.999922 0.999925 0.999927 0.99993 0.999932
0.999934 0.999935 0.999937 0.999938 0.99994 0.999941 0.999942 0.999943 0.999944 0.999945
0.999946 0.999947 0.999948 0.999948 0.999949 0.99995 0.99995 0.999951 0.999951 0.999952
0.999952 0.999953 0.999953 0.999954 0.999954 0.999954 0.999955 0.999955 0.999955 0.999956
0.999956 #selex for gender,fleet: 1 / 3
 0.0475637 0.176167 0.240716 0.31478 0.396816 0.484963 0.57737 0.672494 0.769235 0.866929
0.965242 1.06406 1.16336 1.26318 1.36353 1.4644 1.56572 1.66739 1.76927 1.87118 1.97292
2.07428 2.17505 2.275 2.37394 2.47166 2.56798 2.66274 2.7558 2.84702 2.9363 3.02354
3.10867 3.19163 3.27236 3.35085 3.42707 3.501 3.57266 3.64204 3.70917 3.77407 3.83676
3.89729 3.95568 4.01198 4.06624 4.1185 4.1688 4.2172 4.26376 4.30851 4.35152 4.39284
4.43252 4.47061 4.50717 4.54224 4.57587 4.60813 4.63905 4.66868 4.69708 4.72428 4.75033
4.77528 4.79917 4.82203 4.84392 4.86486 4.88504 4.90449 4.92309 4.94088 4.9579 4.97417
4.98972 5.00459 5.01881 5.03239 5.04538 5.05779 5.06964 5.08097 5.0918 5.10214 5.11202
5.12145 5.13047 5.13908 5.1473 5.15515 5.16265 5.1698 5.17664 5.18317 5.1894 5.19535
5.20103 5.20645 5.21648 #bodywt for gender,fleet: 1 / 4
 0 0.0132072 0.0221757 0.0359825 0.0562443 0.0844399 0.121516 0.167547 0.221597 0.281852
0.345944 0.411359 0.475784 0.537335 0.594663 0.646943 0.693801 0.73522 0.771426 0.802804
0.82982 0.85297 0.872742 0.889594 0.903945 0.916164 0.926574 0.935454 0.943042 0.949538
0.955114 0.959913 0.964053 0.967637 0.970748 0.973457 0.975823 0.977896 0.979718 0.981324
0.982744 0.984004 0.985124 0.986123 0.987016 0.987817 0.988537 0.989185 0.989771 0.990302
0.990784 0.991221 0.99162 0.991985 0.992318 0.992624 0.992904 0.993162 0.993399 0.993619

0.993821 0.994009 0.994182 0.994343 0.994493 0.994632 0.994761 0.994882 0.994995 0.9951
0.995194 0.995278 0.995357 0.995431 0.9955 0.995565 0.995626 0.995684 0.995738 0.99579
0.995838 0.995883 0.995926 0.995967 0.996005 0.996042 0.996076 0.996108 0.996139 0.996168
0.996195 0.996221 0.996246 0.99627 0.996292 0.996313 0.996333 0.996352 0.99637 0.996387
0.996418 #selex for gender,fleet: 1 / 4
 0.0468033 0.172867 0.236657 0.310655 0.393972 0.485368 0.583344 0.686283 0.792617
0.900972 1.01026 1.11967 1.22869 1.33699 1.4444 1.55082 1.65623 1.76061 1.86394 1.96621
2.06738 2.16741 2.26622 2.36375 2.4599 2.5546 2.64775 2.73926 2.82906 2.91705 3.00316
3.08734 3.16952 3.24965 3.32771 3.40366 3.47748 3.54916 3.6187 3.6861 3.75137 3.81453
3.8756 3.93461 3.99158 4.04656 4.09958 4.15069 4.19992 4.24732 4.29293 4.33681 4.379
4.41955 4.45852 4.49593 4.53186 4.56634 4.59943 4.63116 4.6616 4.69077 4.71874 4.74554
4.77121 4.7958 4.81935 4.8419 4.86348 4.88414 4.9041 4.92336 4.94179 4.95942 4.97628
4.99241 5.00782 5.02256 5.03665 5.05012 5.06299 5.07529 5.08705 5.09828 5.10902 5.11927
5.12907 5.13842 5.14736 5.1559 5.16405 5.17184 5.17928 5.18638 5.19316 5.19964 5.20582
5.21172 5.21736 5.22274 5.23268 #bodywt for gender,fleet: 1 / 5
 0 0.00564427 0.00909876 0.0143023 0.0219061 0.0326614 0.0473542 0.0667009 0.091225
0.121145 0.156308 0.196184 0.239926 0.286476 0.334679 0.383399 0.431608 0.478437 0.523208
0.565436 0.60481 0.641171 0.674482 0.704799 0.732246 0.75699 0.779225 0.799156 0.816993
0.832936 0.84718 0.859902 0.871268 0.881428 0.890518 0.898657 0.905955 0.912507 0.918397
0.923701 0.928485 0.932807 0.936717 0.940262 0.94348 0.946407 0.949074 0.951507 0.953731
0.955767 0.957634 0.959349 0.960926 0.962378 0.963718 0.964955 0.9661 0.967159 0.968142
0.969054 0.969901 0.97069 0.971424 0.972109 0.972748 0.973345 0.973903 0.974425 0.974914
0.975372 0.975787 0.97616 0.976511 0.976842 0.977153 0.977446 0.977722 0.977982 0.978228
0.97846 0.978678 0.978885 0.979081 0.979265 0.97944 0.979606 0.979762 0.979911 0.980051
0.980184 0.980311 0.98043 0.980544 0.980652 0.980754 0.980851 0.980943 0.98103 0.981113
0.981192 0.981337 #selex for gender,fleet: 1 / 5
 0.0485381 0.181746 0.249538 0.328452 0.417562 0.515464 0.620317 0.730003 0.842398
0.955653 1.06837 1.17967 1.28907 1.39644 1.50182 1.60538 1.7073 1.80779 1.90699 2.00504
2.10202 2.19797 2.29288 2.38673 2.47946 2.571 2.66128 2.75018 2.83763 2.92353 3.00779
3.09032 3.17106 3.24994 3.3269 3.4019 3.47489 3.54587 3.6148 3.68168 3.74651 3.80929
3.87005 3.92879 3.98555 4.04035 4.09322 4.1442 4.19334 4.24066 4.28622 4.33005 4.37221
4.41274 4.45169 4.48911 4.52504 4.55953 4.59262 4.62438 4.65483 4.68403 4.71202 4.73884
4.76454 4.78915 4.81273 4.8353 4.85692 4.8776 4.89757 4.91685 4.93529 4.95293 4.9698
4.98594 5.00137 5.01612 5.03022 5.04369 5.05658 5.06889 5.08066 5.0919 5.10264 5.1129
5.12271 5.13207 5.14102 5.14957 5.15773 5.16552 5.17297 5.18007 5.18686 5.19334 5.19953
5.20544 5.21108 5.21647 5.22642 #bodywt for gender,fleet: 1 / 6
 0 0.00160229 0.00290218 0.00510579 0.00871927 0.014437 0.0231391 0.0358336 0.0535307
0.0770675 0.106928 0.143117 0.185123 0.231984 0.28242 0.335001 0.388303 0.441033 0.492112
0.540707 0.586237 0.628349 0.666881 0.701826 0.733286 0.761444 0.786529 0.808798 0.828515
0.84594 0.861321 0.874891 0.886862 0.897426 0.906754 0.915 0.922299 0.928767 0.93451
0.939617 0.944166 0.948228 0.95186 0.955115 0.958037 0.960667 0.963038 0.965179 0.967118
0.968876 0.970473 0.971927 0.973253 0.974464 0.975573 0.976589 0.977522 0.97838 0.97917
0.979899 0.980572 0.981194 0.981771 0.982305 0.982802 0.983263 0.983692 0.984092 0.984465
0.984813 0.985124 0.9854 0.985659 0.985902 0.98613 0.986344 0.986545 0.986734 0.986912
0.98708 0.987238 0.987387 0.987528 0.98766 0.987786 0.987904 0.988016 0.988122 0.988222
0.988317 0.988406 0.988491 0.988571 0.988648 0.98872 0.988788 0.988853 0.988915 0.988973
0.989029 0.989131 #selex for gender,fleet: 1 / 6
 0.0551043 0.190621 0.258075 0.333915 0.41653 0.504451 0.596533 0.69199 0.790328 0.891241
0.994528 1.10001 1.20752 1.31682 1.42767 1.53978 1.65282 1.76648 1.8804 1.99425 2.1077
2.22046 2.33222 2.44274 2.55178 2.65913 2.76461 2.86806 2.96936 3.06838 3.16505 3.25929
3.35104 3.44027 3.52695 3.61108 3.69264 3.77165 3.84812 3.92208 3.99356 4.0626 4.12923
4.1935 4.25547 4.31517 4.37267 4.42801 4.48127 4.53248 4.58172 4.62904 4.6745 4.71816
4.76007 4.8003 4.83889 4.87591 4.91142 4.94545 4.97808 5.00934 5.0393 5.06799 5.09547
5.12179 5.14698 5.1711 5.19418 5.21626 5.23753 5.25802 5.27761 5.29636 5.31428 5.33142
5.34781 5.36348 5.37846 5.39278 5.40646 5.41954 5.43204 5.44399 5.4554 5.4663 5.47672
5.48668 5.49618 5.50527 5.51394 5.52223 5.53014 5.5377 5.54492 5.55181 5.55839 5.56467
5.57068 5.57641 5.58702 #bodywt for gender,fleet: 2 / 1
 0 0.0573857 0.0873481 0.127552 0.178323 0.23863 0.306168 0.377822 0.450276 0.520562
0.586396 0.646292 0.69951 0.745904 0.78575 0.819583 0.848065 0.871898 0.891762 0.908281
0.922004 0.93341 0.9429 0.950812 0.957425 0.962968 0.96763 0.971566 0.974901 0.977737
0.980159 0.982235 0.984022 0.985567 0.986906 0.988072 0.989091 0.989984 0.99077 0.991465
0.99208 0.992626 0.993114 0.993549 0.99394 0.994291 0.994607 0.994893 0.995152 0.995387
0.995601 0.995796 0.995974 0.996137 0.996287 0.996424 0.99655 0.996667 0.996775 0.996874
0.996966 0.997051 0.997131 0.997204 0.997273 0.997337 0.997396 0.997452 0.997504 0.997552
0.997596 0.997635 0.997672 0.997707 0.99774 0.99777 0.997799 0.997826 0.997852 0.997876
0.997899 0.99792 0.997941 0.99796 0.997978 0.997995 0.998012 0.998027 0.998042 0.998055
0.998068 0.998081 0.998093 0.998104 0.998114 0.998124 0.998134 0.998143 0.998152 0.99816
0.998175 #selex for gender,fleet: 2 / 1
 0.0565007 0.19823 0.269478 0.349855 0.437314 0.529812 0.625684 0.723814 0.823591 0.92477
1.02731 1.13125 1.23663 1.34344 1.45161 1.561 1.6714 1.78256 1.89419 2.00597 2.11759
2.22874 2.33912 2.44845 2.55648 2.66297 2.76773 2.87059 2.97138 3.06999 3.1663 3.26025

3.35177 3.4408 3.52732 3.61131 3.69276 3.77168 3.84807 3.92197 3.9934 4.06239 4.12899
4.19324 4.25517 4.31486 4.37234 4.42768 4.48092 4.53213 4.58136 4.62868 4.67414 4.71779
4.7597 4.79993 4.83852 4.87554 4.91105 4.94509 4.97771 5.00898 5.03893 5.06763 5.09511
5.12143 5.14662 5.17074 5.19382 5.21591 5.23719 5.25767 5.27727 5.29601 5.31393 5.33108
5.34747 5.36314 5.37811 5.39243 5.40612 5.4192 5.4317 5.44365 5.45506 5.46596 5.47638
5.48634 5.49585 5.50493 5.5136 5.52189 5.5298 5.53736 5.54458 5.55147 5.55805 5.56434
5.57034 5.57607 5.58669 #bodywt for gender,fleet: 2 / 2
 0 0.0239091 0.0400637 0.0643925 0.0988572 0.144562 0.201232 0.267078 0.33913 0.413862
0.487849 0.55825 0.623052 0.68109 0.731924 0.775662 0.812772 0.843923 0.869865 0.89135
0.909078 0.923679 0.935697 0.945594 0.953757 0.960505 0.966097 0.970748 0.974629 0.97788
0.980615 0.982925 0.984884 0.986553 0.98798 0.989205 0.990262 0.991177 0.991973 0.992667
0.993274 0.993809 0.99428 0.994697 0.995067 0.995396 0.99569 0.995954 0.996191 0.996404
0.996597 0.996771 0.996929 0.997073 0.997204 0.997324 0.997433 0.997534 0.997626 0.997711
0.997789 0.997861 0.997927 0.997989 0.998046 0.998099 0.998148 0.998194 0.998237 0.998277
0.998312 0.998344 0.998373 0.998401 0.998427 0.998451 0.998474 0.998496 0.998516 0.998535
0.998553 0.99857 0.998586 0.998602 0.998616 0.998629 0.998642 0.998654 0.998665 0.998676
0.998686 0.998696 0.998705 0.998714 0.998722 0.99873 0.998737 0.998744 0.998751 0.998757
0.998769 #selex for gender,fleet: 2 / 2
 0.0616312 0.2209 0.297557 0.379253 0.462584 0.546089 0.629884 0.714835 0.801959 0.892119
0.985894 1.08355 1.18508 1.2902 1.39849 1.50939 1.62231 1.73663 1.85177 1.96719 2.08241
2.197 2.3106 2.42289 2.5336 2.64251 2.74942 2.85417 2.95665 3.05674 3.15437 3.24947 3.342
3.43193 3.51923 3.60392 3.68599 3.76545 3.84233 3.91666 3.98847 4.05781 4.12472 4.18924
4.25143 4.31133 4.36902 4.42454 4.47795 4.52931 4.57868 4.62612 4.67169 4.71545 4.75746
4.79777 4.83645 4.87355 4.90912 4.94322 4.97591 5.00723 5.03723 5.06598 5.0935 5.11986
5.14509 5.16925 5.19236 5.21448 5.23578 5.25628 5.2759 5.29466 5.3126 5.32976 5.34616
5.36184 5.37683 5.39117 5.40486 5.41795 5.43046 5.44242 5.45384 5.46476 5.47518 5.48514
5.49466 5.50375 5.51243 5.52072 5.52864 5.53621 5.54343 5.55033 5.55692 5.5632 5.56921
5.57494 5.58557 #bodywt for gender,fleet: 2 / 3
 0 0.0197778 0.0430061 0.0849893 0.150759 0.239931 0.345833 0.458053 0.566263 0.662961
0.744311 0.809597 0.860125 0.898176 0.926261 0.946702 0.961442 0.972017 0.979589 0.985016
0.988915 0.99173 0.993775 0.995269 0.99637 0.997188 0.9978 0.998262 0.998614 0.998885
0.999095 0.999258 0.999387 0.99949 0.999572 0.999638 0.999691 0.999735 0.999771 0.999801
0.999826 0.999847 0.999865 0.99988 0.999892 0.999903 0.999913 0.999921 0.999928 0.999934
0.999939 0.999944 0.999948 0.999952 0.999955 0.999958 0.999961 0.999963 0.999965 0.999967
0.999969 0.99997 0.999972 0.999973 0.999974 0.999975 0.999976 0.999977 0.999978 0.999979
0.999979 0.99998 0.99998 0.999981 0.999981 0.999982 0.999982 0.999983 0.999983 0.999983
0.999984 0.999984 0.999984 0.999984 0.999985 0.999985 0.999985 0.999985 0.999985 0.999986
0.999986 0.999986 0.999986 0.999986 0.999986 0.999986 0.999987 0.999987 0.999987 0.999987
0.999987 #selex for gender,fleet: 2 / 3
 0.0567989 0.20023 0.272937 0.355558 0.446119 0.542406 0.642382 0.744494 0.847762
0.951698 1.05615 1.16116 1.26682 1.37325 1.48048 1.58852 1.69727 1.8066 1.91631 2.02617
2.13591 2.24527 2.35397 2.46176 2.56838 2.67361 2.77724 2.87908 2.97897 3.07679 3.17241
3.26574 3.35671 3.44527 3.53137 3.61499 3.69611 3.77474 3.85088 3.92455 3.99578 4.06459
4.13103 4.19513 4.25694 4.31651 4.37389 4.42914 4.4823 4.53343 4.58259 4.62985 4.67525
4.71885 4.76071 4.80089 4.83945 4.87643 4.9119 4.94591 4.97851 5.00975 5.03968 5.06835
5.09581 5.12211 5.14729 5.17139 5.19446 5.21653 5.23779 5.25827 5.27785 5.29659 5.31451
5.33164 5.34802 5.36369 5.37866 5.39297 5.40665 5.41973 5.43222 5.44416 5.45557 5.46648
5.47689 5.48684 5.49634 5.50542 5.5141 5.52238 5.53029 5.53785 5.54506 5.55195 5.55853
5.56481 5.57081 5.57654 5.58715 #bodywt for gender,fleet: 2 / 4
 0 0.0134714 0.0231864 0.0384445 0.0611744 0.0931017 0.135236 0.187453 0.248367 0.315567
0.386075 0.456874 0.525328 0.58943 0.647867 0.699973 0.745604 0.784989 0.818598 0.847028
0.870923 0.890915 0.907593 0.921484 0.933051 0.942689 0.950729 0.95745 0.963083 0.967817
0.97181 0.975188 0.978057 0.980503 0.982596 0.984393 0.985943 0.987284 0.988449 0.989465
0.990354 0.991135 0.991823 0.992431 0.99297 0.99345 0.993878 0.99426 0.994604 0.994913
0.995192 0.995444 0.995673 0.99588 0.996069 0.996241 0.996399 0.996543 0.996676 0.996797
0.996909 0.997013 0.997108 0.997196 0.997278 0.997354 0.997424 0.997489 0.99755 0.997607
0.997658 0.997702 0.997745 0.997784 0.997821 0.997855 0.997888 0.997919 0.997947 0.997974
0.998 0.998024 0.998047 0.998068 0.998088 0.998107 0.998125 0.998142 0.998158 0.998174
0.998188 0.998202 0.998215 0.998227 0.998239 0.99825 0.99826 0.99827 0.998279 0.998288
0.998305 #selex for gender,fleet: 2 / 4
 0.0559041 0.196558 0.268518 0.351291 0.443647 0.544004 0.650562 0.761487 0.875108
0.990062 1.10535 1.22033 1.33461 1.44803 1.56053 1.67212 1.78284 1.89271 2.00174 2.10992
2.21719 2.32349 2.42871 2.53276 2.6355 2.73682 2.83658 2.93467 3.03096 3.12536 3.21775
3.30807 3.39624 3.48219 3.56589 3.64729 3.72638 3.80314 3.87757 3.94967 4.01946 4.08696
4.15218 4.21518 4.27597 4.33461 4.39113 4.44558 4.49801 4.54848 4.59703 4.64371 4.68858
4.7317 4.77311 4.81287 4.85104 4.88767 4.9228 4.9565 4.9888 5.01977 5.04945 5.07789
5.10513 5.13122 5.15621 5.18013 5.20302 5.22494 5.24607 5.26645 5.28595 5.3046 5.32244
5.33949 5.3558 5.3714 5.38631 5.40056 5.41418 5.4272 5.43964 5.45154 5.4629 5.47375
5.48413 5.49404 5.5035 5.51255 5.52118 5.52944 5.53732 5.54484 5.55203 5.55889 5.56545
5.57171 5.57768 5.58339 5.59396 #bodywt for gender,fleet: 2 / 5

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 0 0.00574563 0.00948066 0.0152243 0.0237688 0.0360336 0.0529748 0.0754443 0.104024
0.138884 0.179708 0.225705 0.275714 0.328345 0.382148 0.435752 0.487969 0.537852 0.584714
0.628115 0.667833 0.703818 0.736154 0.765019 0.79065 0.813316 0.833301 0.850883 0.866331
0.879895 0.891804 0.902262 0.911455 0.919544 0.926671 0.932961 0.938523 0.94345 0.947823
0.951714 0.955182 0.95828 0.961054 0.963544 0.965782 0.9678 0.969623 0.971272 0.972768
0.974127 0.975365 0.976494 0.977526 0.978471 0.979337 0.980133 0.980865 0.98154 0.982163
0.982739 0.983271 0.983765 0.984223 0.984648 0.985044 0.985412 0.985756 0.986076 0.986376
0.986655 0.986907 0.987132 0.987343 0.987542 0.987728 0.987904 0.988069 0.988224 0.988371
0.988509 0.988639 0.988762 0.988878 0.988988 0.989091 0.989189 0.989282 0.989369 0.989452
0.989531 0.989605 0.989676 0.989743 0.989806 0.989866 0.989923 0.989977 0.990029 0.990078
0.990124 0.990209 #selex for gender,fleet: 2 / 5
 0.0579455 0.206497 0.282853 0.370942 0.469444 0.576528 0.689946 0.807271 0.926245
1.04507 1.16253 1.278 1.39127 1.50242 1.61168 1.71935 1.8257 1.93099 2.03539 2.13903
2.24196 2.34419 2.44567 2.54632 2.64602 2.74465 2.84207 2.93813 3.03269 3.12562 3.21679
3.30609 3.39342 3.47869 3.56185 3.64282 3.72158 3.79809 3.87233 3.9443 4.01401 4.08145
4.14666 4.20966 4.27048 4.32916 4.38573 4.44025 4.49275 4.54328 4.5919 4.63866 4.68361
4.7268 4.76829 4.80813 4.84637 4.88307 4.91827 4.95204 4.98441 5.01544 5.04518 5.07367
5.10097 5.12711 5.15215 5.17612 5.19906 5.22102 5.24219 5.26259 5.28211 5.30078 5.31864
5.33572 5.35205 5.36766 5.38259 5.39685 5.41049 5.42353 5.43599 5.44789 5.45927 5.47014
5.48052 5.49044 5.49992 5.50897 5.51762 5.52588 5.53377 5.5413 5.5485 5.55537 5.56193
5.5682 5.57418 5.5799 5.59048 #bodywt for gender,fleet: 2 / 6
 0 0.00164047 0.00305885 0.00552731 0.00967014 0.0163551 0.026686 0.0419158 0.0632662
0.0916845 0.12761 0.170831 0.220473 0.275124 0.333038 0.392368 0.451375 0.508565 0.562777
0.613199 0.659347 0.701016 0.738221 0.771134 0.800037 0.825268 0.847196 0.866189 0.882603
0.896769 0.908987 0.919524 0.928619 0.936475 0.943272 0.949163 0.954279 0.958732 0.962616
0.966014 0.968993 0.971612 0.973921 0.975963 0.977772 0.979379 0.980811 0.982091 0.983237
0.984266 0.985192 0.986027 0.986782 0.987466 0.988088 0.988653 0.989169 0.98964 0.990071
0.990466 0.990829 0.991163 0.99147 0.991754 0.992017 0.99226 0.992485 0.992694 0.992888
0.993068 0.993228 0.993369 0.993501 0.993624 0.99374 0.993848 0.99395 0.994045 0.994135
0.994219 0.994299 0.994373 0.994444 0.99451 0.994573 0.994632 0.994687 0.99474 0.99479
0.994837 0.994881 0.994923 0.994963 0.995001 0.995036 0.99507 0.995102 0.995133 0.995162
0.995189 0.995239 #selex for gender,fleet: 2 / 6
 0.0467369 0.0467369 0.0467369 0.0467369 0.0467369 0.0467369 0.0467369 0.0467369
0.0467369 0.0467369 0.0467369 0.0467369 0.0467369 0.0467369 0.0467369 0.0467369 0.0467369
0.0467369 0.0467369 0.0467369 0.0467369 0.0467369 0.0467369 0.0467369 0.0467369 0.0467369
0.0467369 0.0467369 0.0467369 0.0467369 0.0467369 0.0467369 0.0467369 0.0467369 0.0467369
0.0467369 0.0467369 0.0467369 0.0467369 0.0467369 0.0467369 0.0467369 0.0467369 0.0467369
0.0467369 0.0467369 0.0467369 0.0467369 0.0467369 0.0467369 0.0467369 0.0467369 0.0467369
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0.0467369 0.0467369 0.0467369 0.0467369 0.0467369 0.0467369 0.0467369 0.0467369 0.0467369
0.0467369 0.0467369 0.0467369 0.0467369 0.0467369 0.0467369 0.0467369 0.0467369 0.0467369
0.0467369 0.0467369 0.0467369 #mean M for year Yinit: 2011 sex: 1
 65.4164 61.2546 57.255 53.4707 49.9755 46.4955 43.2201 40.078 37.0759 34.2663 32.1537
29.9744 30.007 29.1308 30.0974 30.3354 30.8063 30.5681 31.0026 31.3196 30.962 29.2976
28.0758 26.1869 24.0479 21.7697 19.8793 17.8615 16.0791 14.6062 13.0478 11.5177 10.2099
9.04363 7.93612 6.97509 6.13275 5.41279 4.78772 4.25349 3.78753 3.38232 3.0428 2.73875
2.47692 2.24961 2.06023 1.8851 1.73301 1.59982 1.48085 1.37541 1.28111 1.1964 1.11923
1.04841 0.983091 0.922666 0.866694 0.81541 0.768158 0.724023 0.682955 0.64531 0.609998
0.578923 0.550285 0.52198 0.49535 0.469165 0.44435 0.420805 0.398393 0.377271 0.357284
0.338387 0.32047 0.303536 0.287557 0.272551 0.258445 0.245208 0.232753 0.220997 0.20992
0.199476 0.189619 0.180297 0.171485 0.163151 0.155264 0.147794 0.140712 0.134009 0.127644
0.121592 0.115825 0.110346 0.105141 0.100193 2.0735 #numbers for year Yinit: 2011 sex: 1
 0.0454846 0.0454846 0.0454846 0.0454846 0.0454846 0.0454846 0.0454846 0.0454846
0.0454846 0.0454846 0.0454846 0.0454846 0.0454846 0.0454846 0.0454846 0.0454846 0.0454846
0.0454846 0.0454846 0.0454846 0.0454846 0.0454846 0.0454846 0.0454846 0.0454846 0.0454846
0.0454846 0.0454846 0.0454846 0.0454846 0.0454846 0.0454846 0.0454846 0.0454846 0.0454846
0.0454846 0.0454846 0.0454846 0.0454846 0.0454846 0.0454846 0.0454846 0.0454846 0.0454846
0.0454846 0.0454846 0.0454846 0.0454846 0.0454846 0.0454846 0.0454846 0.0454846 0.0454846
0.0454846 0.0454846 0.0454846 0.0454846 0.0454846 0.0454846 0.0454846 0.0454846 0.0454846
0.0454846 0.0454846 0.0454846 0.0454846 0.0454846 0.0454846 0.0454846 0.0454846 0.0454846
0.0454846 0.0454846 0.0454846 0.0454846 0.0454846 0.0454846 0.0454846 0.0454846 0.0454846
0.0454846 0.0454846 0.0454846 #mean M for year Yinit: 2011 sex: 2
 65.4164 61.3314 57.3985 53.6715 50.2252 46.7846 43.5406 40.4218 37.4359 34.6366 32.5353
30.3611 30.4242 29.5631 30.5688 30.8288 31.315 31.0652 31.4793 31.7506 31.313 29.534
28.1885 26.168 23.9045 21.5192 19.5394 17.4594 15.6363 14.1387 12.5807 11.0701 9.78936
8.65647 7.58888 6.66778 5.86443 5.18082 4.58959 4.08611 3.64824 3.26833 2.95097 2.66678
2.42224 2.20991 2.0333 1.86922 1.7265 1.60121 1.48887 1.38897 1.29925 1.2183 1.14416
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1.07576 1.01231 0.95329 0.898328 0.84775 0.800951 0.757042 0.716024 0.678317 0.642816
0.611562 0.582685 0.553977 0.526869 0.500066 0.474564 0.450271 0.427056 0.405105 0.384272
0.364528 0.345768 0.328014 0.311241 0.295479 0.280653 0.266731 0.25362 0.241231 0.229543
0.218507 0.208073 0.198188 0.188826 0.179953 0.171541 0.163557 0.155972 0.148779 0.141936
0.135418 0.129193 0.12327 0.117632 0.112264 2.39397 #numbers for year Yinit: 2011 sex: 2
 68.0317 63.7081 59.5787 55.7882 52.1455 48.6988 45.5154 42.3456 39.3622 36.5001 33.7654
31.2059 29.2811 27.2956 27.3243 26.5252 27.4041 27.6194 28.0468 27.8286 28.2227 28.5099
28.183 26.6665 25.5531 23.8327 21.8848 19.8104 18.0891 16.2521 14.6295 13.2887 11.8702
10.4777 9.28766 8.22638 7.2187 6.34435 5.57803 4.92307 4.35446 3.86851 3.44469 3.07613
2.76734 2.49081 2.25269 2.04596 1.87374 1.71449 1.57618 1.45506 1.34687 1.25099 1.16524
1.08821 1.01802 0.953618 0.894216 0.839262 0.788357 0.741714 0.698737 0.658595 0.621242
0.587001 0.554882 0.526617 0.500568 0.474822 0.450598 0.426779 0.404207 0.382789 0.362402
0.343187 0.325005 0.307815 0.291515 0.27611 0.261574 0.247923 0.235091 0.223049 0.21172
0.201025 0.190949 0.181448 0.172481 0.164002 0.155986 0.148405 0.141231 0.134436 0.127994
0.121897 0.116107 0.110602 0.105356 0.100373 2.07288 #numbers for year Ydeclare: 2013
sex: 1
 68.0317 63.7879 59.7281 55.9982 52.4072 49.0042 45.8574 42.7157 39.7533 36.9053 34.1784
31.6218 29.7023 27.7164 27.7727 26.9853 27.9018 28.1376 28.5798 28.3503 28.7267 28.9728
28.5719 26.9473 25.7182 23.8735 21.8073 19.6301 17.8232 15.925 14.2613 12.8949 11.4734
10.0953 8.92703 7.89368 6.91998 6.07992 5.34729 4.72389 4.18474 3.72564 3.32637 2.97998
2.69062 2.43151 2.20856 2.01498 1.85396 1.70438 1.57427 1.46005 1.35763 1.26655 1.18475
1.11095 1.04336 0.980993 0.923144 0.869328 0.819213 0.773094 0.73042 0.690381 0.652978
0.618594 0.58622 0.557719 0.531385 0.505205 0.480484 0.456041 0.432784 0.410629 0.389457
0.369438 0.350438 0.33243 0.315322 0.299129 0.283832 0.269457 0.255936 0.243238 0.231282
0.219983 0.209324 0.19926 0.189745 0.18073 0.172193 0.164101 0.15643 0.149149 0.142232
0.135673 0.129433 0.123489 0.117812 0.112411 2.39273 #numbers for year Ydeclare: 2013
sex: 2
#R0  1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932
1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950
1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968
1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986
1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004
2005 2006 2007 2008 2009 2010 #years
347.985  347.985 347.922 347.836 347.738 347.674 347.606 347.538 347.474 347.407 347.33
347.22 347.093 346.95 346.786 346.561 346.327 346.128 345.938 345.785 345.598 345.372
345.075 344.785 344.5 344.286 343.952 343.537 343.019 341.742 340.461 338.323 336.533
335.842 335.033 334.509 333.945 333.246 332.648 332.204 331.632 330.896 329.987 328.926
327.778 326.747 325.808 325.037 324.111 323.394 322.911 320.847 320.028 319.06 318.043
315.649 314.027 311.792 308.879 306.055 302.793 299.726 296.013 292.096 285.105 277.842
271.78 262.751 250.407 241.411 234.014 224.559 218.814 211.741 203.409 191.884 184.787
171.793 157.567 144.868 136.869 126.88 118.897 109.111 106.685 101.364 103.477 105.014
108.243 111.513 114.645 117.609 120.563 123.071 125.74 128.371 130.833 #Recruits
1.53162e+009  1.53162e+009 1.53094e+009 1.52999e+009 1.52893e+009 1.52823e+009
1.52749e+009 1.52675e+009 1.52606e+009 1.52533e+009 1.52449e+009 1.52329e+009
1.52191e+009 1.52036e+009 1.51858e+009 1.51615e+009 1.51363e+009 1.51149e+009
1.50944e+009 1.50781e+009 1.5058e+009 1.50338e+009 1.50022e+009 1.49712e+009 1.4941e+009
1.49183e+009 1.48829e+009 1.48392e+009 1.47848e+009 1.46516e+009 1.45195e+009
1.43021e+009 1.41229e+009 1.40544e+009 1.39748e+009 1.39235e+009 1.38685e+009
1.38007e+009 1.3743e+009 1.37003e+009 1.36455e+009 1.35754e+009 1.34894e+009 1.33898e+009
1.3283e+009 1.31878e+009 1.31019e+009 1.30318e+009 1.29481e+009 1.28837e+009 1.28406e+009
1.26579e+009 1.25862e+009 1.2502e+009 1.24143e+009 1.22104e+009 1.20742e+009 1.18894e+009
1.1653e+009 1.14285e+009 1.1175e+009 1.09418e+009 1.06663e+009 1.03833e+009 9.8966e+008
9.41469e+008 9.02968e+008 8.48331e+008 7.78436e+008 7.30686e+008 6.93266e+008
6.47693e+008 6.21156e+008 5.89613e+008 5.53971e+008 5.07169e+008 4.79696e+008
4.31862e+008 3.82843e+008 3.41777e+008 3.17112e+008 2.87525e+008 2.64797e+008
2.37979e+008 2.31503e+008 2.17525e+008 2.23039e+008 2.27079e+008 2.35654e+008
2.44458e+008 2.53006e+008 2.61202e+008 2.69476e+008 2.76583e+008 2.84232e+008
2.91858e+008 2.99076e+008 #SpawnBio
0.383 0.5 0 # spawn-recr steepness, sigmaR, autocorr
# values from cat75_hmle, catch at 75% and steepness at mle value. # this is state of
nature 4 out of 9 (in no particular order) # and parameter set number 1 out of 2 for this
state
 0 0 27.1664 99.6169 331.041 987.879 2615.28 6100.71 12570.2 23108.5 38439.4 58737.6
83639.5 112406 144137 177948 213089 248986 285239 321591 357892 394066 430075 465904
501545 536990 572225 607230 641980 676443 710584 744366 777749 810695 843166 875126
906540 937378 967612 997216 1.02617e+006 1.05445e+006 1.08205e+006 1.10895e+006
1.13515e+006 1.16063e+006 1.1854e+006 1.20945e+006 1.23278e+006 1.25539e+006 1.2773e+006
1.29851e+006 1.31902e+006 1.33885e+006 1.358e+006 1.37649e+006 1.39433e+006 1.41153e+006
1.42811e+006 1.44408e+006 1.45946e+006 1.47426e+006 1.4885e+006 1.50219e+006 1.51536e+006
1.528e+006 1.54015e+006 1.55182e+006 1.56301e+006 1.57376e+006 1.58406e+006 1.59421e+006
1.60394e+006 1.61328e+006 1.62222e+006 1.63079e+006 1.639e+006 1.64687e+006 1.6544e+006
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1.66161e+006 1.66851e+006 1.67512e+006 1.68145e+006 1.6875e+006 1.69329e+006 1.69882e+006
1.70412e+006 1.70918e+006 1.71403e+006 1.71865e+006 1.72308e+006 1.72731e+006
1.73135e+006 1.73521e+006 1.73891e+006 1.74243e+006 1.7458e+006 1.74902e+006 1.75209e+006
1.75503e+006 1.76045e+006 #female fecundity; weighted by N in year Y_init across morphs
and areas
 0.0447959 0.161569 0.220963 0.288709 0.363455 0.443836 0.528681 0.617102 0.708484
0.802415 0.898614 0.996863 1.09696 1.19871 1.30187 1.4062 1.51143 1.61726 1.7234 1.82956
1.93545 2.04078 2.1453 2.24876 2.35095 2.45166 2.55072 2.64797 2.74328 2.83653 2.92764
3.01652 3.10312 3.18739 3.2693 3.34882 3.42596 3.50072 3.57309 3.64311 3.7108 3.77618
3.83929 3.90018 3.95888 4.01544 4.06991 4.12234 4.17279 4.2213 4.26794 4.31275 4.35579
4.39711 4.43678 4.47484 4.51136 4.54637 4.57994 4.61211 4.64295 4.67248 4.70077 4.72786
4.7538 4.77863 4.80239 4.82512 4.84688 4.86769 4.88772 4.90702 4.92548 4.94312 4.95998
4.97611 4.99152 5.00624 5.02031 5.03376 5.0466 5.05887 5.0706 5.08179 5.09249 5.1027
5.11245 5.12177 5.13066 5.13915 5.14725 5.15499 5.16238 5.16943 5.17616 5.18259 5.18872
5.19458 5.20016 5.2055 5.21532 #bodywt for gender,fleet: 1 / 1
 0 0.0499826 0.0757589 0.110542 0.154938 0.208453 0.269462 0.33548 0.403648 0.471214
0.535888 0.596015 0.650594 0.699187 0.741794 0.778709 0.810404 0.837439 0.860392 0.879824
0.896248 0.910125 0.921855 0.931784 0.940202 0.947356 0.953452 0.958662 0.963128 0.966969
0.970284 0.973154 0.975647 0.977821 0.979722 0.981391 0.98286 0.984158 0.985308 0.98633
0.987241 0.988055 0.988785 0.989441 0.990032 0.990565 0.991049 0.991487 0.991886 0.992249
0.992581 0.992884 0.993163 0.993418 0.993653 0.993869 0.994069 0.994254 0.994425 0.994583
0.99473 0.994866 0.994993 0.995111 0.995221 0.995324 0.99542 0.99551 0.995594 0.995672
0.995743 0.995807 0.995867 0.995924 0.995977 0.996027 0.996074 0.996119 0.996161 0.9962
0.996238 0.996273 0.996306 0.996338 0.996368 0.996396 0.996423 0.996448 0.996472 0.996494
0.996516 0.996536 0.996556 0.996574 0.996591 0.996608 0.996623 0.996638 0.996652 0.996666
0.99669 #selex for gender,fleet: 1 / 1
 0.0459148 0.167829 0.230479 0.302262 0.381538 0.466476 0.555413 0.647086 0.740681
0.835752 0.932102 1.02966 1.12842 1.22833 1.32935 1.43135 1.53419 1.63767 1.74155 1.84557
1.94949 2.05303 2.15594 2.25797 2.35889 2.45848 2.55656 2.65296 2.74754 2.84015 2.9307
3.01911 3.1053 3.18921 3.27081 3.35007 3.42698 3.50154 3.57375 3.64362 3.71117 3.77644
3.83946 3.90026 3.95889 4.01539 4.06981 4.12219 4.17259 4.22107 4.26767 4.31245 4.35547
4.39678 4.43642 4.47447 4.51097 4.54597 4.57953 4.61169 4.64251 4.67204 4.70032 4.72741
4.75334 4.77816 4.80192 4.82465 4.8464 4.86721 4.88724 4.90654 4.92499 4.94263 4.95949
4.97561 4.99102 5.00575 5.01982 5.03326 5.0461 5.05837 5.07009 5.08129 5.09198 5.10219
5.11195 5.12126 5.13015 5.13864 5.14675 5.15448 5.16187 5.16892 5.17566 5.18208 5.18821
5.19407 5.19965 5.20498 5.21481 #bodywt for gender,fleet: 1 / 2
 0 0.020837 0.0345637 0.0551946 0.0845334 0.12381 0.1732 0.231608 0.296814 0.36592
0.435895 0.504035 0.568241 0.627114 0.67991 0.726417 0.766807 0.801503 0.83106 0.856089
0.877196 0.89495 0.909864 0.922391 0.932921 0.941783 0.949257 0.955576 0.960933 0.965488
0.969374 0.972701 0.975558 0.978022 0.980153 0.982003 0.983614 0.985023 0.986259 0.987347
0.988307 0.989158 0.989914 0.990587 0.991189 0.991729 0.992213 0.99265 0.993044 0.993401
0.993725 0.994019 0.994287 0.994532 0.994756 0.994961 0.99515 0.995323 0.995483 0.99563
0.995767 0.995893 0.996009 0.996118 0.996218 0.996312 0.996399 0.99648 0.996556 0.996627
0.99669 0.996747 0.9968 0.99685 0.996896 0.99694 0.996982 0.997021 0.997057 0.997092
0.997124 0.997155 0.997184 0.997211 0.997237 0.997261 0.997285 0.997306 0.997327 0.997347
0.997365 0.997383 0.997399 0.997415 0.99743 0.997444 0.997457 0.99747 0.997482 0.997494
0.997515 #selex for gender,fleet: 1 / 2
 0.0500339 0.187136 0.255487 0.330126 0.407671 0.486115 0.564953 0.644596 0.725799
0.809303 0.895678 0.985262 1.07816 1.17425 1.27328 1.37485 1.47848 1.58369 1.68996
1.79681 1.90379 2.01047 2.11651 2.22156 2.32535 2.42764 2.52822 2.62692 2.72359 2.81811
2.9104 3.00037 3.08798 3.17317 3.25592 3.33623 3.41408 3.48948 3.56246 3.63302 3.70121
3.76705 3.83059 3.89186 3.95092 4.00781 4.06259 4.1153 4.16601 4.21476 4.26162 4.30663
4.34986 4.39137 4.4312 4.46942 4.50607 4.54122 4.57491 4.6072 4.63814 4.66778 4.69617
4.72335 4.74937 4.77427 4.79811 4.82091 4.84273 4.8636 4.88369 4.90303 4.92152 4.93919
4.95609 4.97225 4.98769 5.00244 5.01654 5.03001 5.04288 5.05517 5.06691 5.07813 5.08885
5.09908 5.10885 5.11818 5.12708 5.13559 5.14371 5.15146 5.15886 5.16593 5.17267 5.17911
5.18525 5.19112 5.19671 5.20205 5.21189 #bodywt for gender,fleet: 1 / 3
 0 0.0162404 0.0348082 0.0686495 0.122909 0.198975 0.292908 0.396669 0.50106 0.598401
0.683845 0.755381 0.813131 0.858486 0.89339 0.919865 0.939753 0.954603 0.965659 0.973888
0.980022 0.984608 0.988051 0.990651 0.992625 0.994133 0.995294 0.996194 0.996896 0.997448
0.997885 0.998234 0.998514 0.998741 0.998925 0.999076 0.999201 0.999305 0.999391 0.999463
0.999525 0.999577 0.999621 0.999659 0.999692 0.99972 0.999745 0.999766 0.999785 0.999802
0.999816 0.999829 0.999841 0.999851 0.99986 0.999869 0.999876 0.999883 0.999889 0.999894
0.999899 0.999904 0.999908 0.999912 0.999915 0.999918 0.999921 0.999924 0.999926 0.999929
0.99993 0.999932 0.999934 0.999935 0.999937 0.999938 0.999939 0.99994 0.999941 0.999942
0.999943 0.999944 0.999945 0.999946 0.999946 0.999947 0.999948 0.999948 0.999949 0.999949
0.99995 0.99995 0.999951 0.999951 0.999952 0.999952 0.999952 0.999953 0.999953 0.999953
0.999954 #selex for gender,fleet: 1 / 3
 0.0463442 0.170395 0.234643 0.308748 0.391139 0.479853 0.572904 0.668622 0.765832
0.863844 0.96234 1.06124 1.16056 1.26039 1.36076 1.46168 1.56312 1.66496 1.76708 1.86929
1.97138 2.07315 2.17435 2.27477 2.37419 2.4724 2.56921 2.66446 2.75798 2.84965 2.93936

3.027 3.11251 3.19581 3.27686 3.35564 3.43211 3.50627 3.57812 3.64768 3.71495 3.77997
3.84275 3.90335 3.96178 4.01811 4.07237 4.12462 4.17489 4.22325 4.26975 4.31443 4.35736
4.39858 4.43816 4.47614 4.51257 4.54751 4.58102 4.61313 4.64391 4.67339 4.70163 4.72868
4.75458 4.77937 4.8031 4.8258 4.84752 4.86831 4.88832 4.9076 4.92604 4.94366 4.96051
4.97662 4.99201 5.00673 5.02079 5.03422 5.04705 5.05932 5.07103 5.08222 5.0929 5.10311
5.11285 5.12216 5.13104 5.13953 5.14763 5.15536 5.16274 5.16979 5.17652 5.18294 5.18906
5.19491 5.2005 5.20582 5.21564 #bodywt for gender,fleet: 1 / 4
 0 0.0109446 0.0188536 0.0313591 0.0501888 0.0770249 0.113072 0.158639 0.212927 0.274115
0.339711 0.406994 0.473428 0.536936 0.596026 0.649787 0.697815 0.740093 0.77688 0.8086
0.835765 0.858914 0.878574 0.895238 0.909348 0.921296 0.93142 0.940011 0.947313 0.953535
0.958849 0.963401 0.967312 0.970682 0.973596 0.976123 0.978322 0.980242 0.981924 0.983402
0.984704 0.985856 0.986877 0.987786 0.988596 0.989321 0.989971 0.990556 0.991082 0.991558
0.99199 0.992381 0.992737 0.993062 0.993358 0.99363 0.993878 0.994107 0.994317 0.99451
0.994689 0.994854 0.995007 0.995149 0.99528 0.995402 0.995516 0.995622 0.99572 0.995812
0.995895 0.995968 0.996036 0.9961 0.996161 0.996217 0.996271 0.996321 0.996368 0.996412
0.996454 0.996494 0.996531 0.996566 0.996599 0.996631 0.99666 0.996688 0.996715 0.99674
0.996763 0.996786 0.996807 0.996827 0.996846 0.996865 0.996882 0.996898 0.996914 0.996928
0.996955 #selex for gender,fleet: 1 / 4
 0.0455957 0.167106 0.230483 0.304345 0.387804 0.479588 0.578126 0.681701 0.788647
0.89751 1.00715 1.11677 1.22586 1.33411 1.4414 1.54768 1.65293 1.75718 1.86043 1.96266
2.06386 2.16397 2.26292 2.36065 2.45705 2.55203 2.6455 2.73735 2.8275 2.91586 3.00235
3.08689 3.16943 3.24991 3.3283 3.40456 3.47868 3.55063 3.62042 3.68804 3.75351 3.81685
3.87807 3.93721 3.9943 4.04937 4.10246 4.15361 4.20287 4.25029 4.2959 4.33976 4.38192
4.42243 4.46134 4.49869 4.53454 4.56894 4.60193 4.63356 4.66389 4.69295 4.7208 4.74748
4.77303 4.79749 4.82091 4.84332 4.86477 4.8853 4.9051 4.92421 4.94249 4.95997 4.97667
4.99265 5.00791 5.02251 5.03645 5.04978 5.06251 5.07467 5.08629 5.09739 5.10799 5.11812
5.12779 5.13702 5.14584 5.15426 5.1623 5.16997 5.1773 5.18429 5.19097 5.19735 5.20343
5.20923 5.21478 5.22007 5.22981 #bodywt for gender,fleet: 1 / 5
 0 0.00478955 0.00789791 0.0126864 0.0198349 0.0301512 0.044506 0.0637195 0.0884179
0.118897 0.155035 0.196276 0.2417 0.290137 0.340309 0.39096 0.440962 0.489374 0.535471
0.578749 0.618899 0.655779 0.689377 0.719784 0.747155 0.77169 0.793613 0.813156 0.83055
0.846016 0.859761 0.871977 0.882839 0.892503 0.90111 0.908785 0.915638 0.921766 0.927255
0.93218 0.936607 0.940593 0.944188 0.947438 0.95038 0.953048 0.955473 0.95768 0.959693
0.961532 0.963214 0.964756 0.966171 0.967472 0.96867 0.969775 0.970795 0.971738 0.972611
0.97342 0.974171 0.974869 0.975519 0.976123 0.976687 0.977213 0.977704 0.978163 0.978593
0.978995 0.979358 0.979684 0.979991 0.980279 0.980551 0.980806 0.981047 0.981273 0.981487
0.981688 0.981878 0.982058 0.982228 0.982388 0.98254 0.982683 0.982819 0.982947 0.983069
0.983184 0.983293 0.983397 0.983495 0.983588 0.983676 0.98376 0.983839 0.983914 0.983986
0.984054 0.984178 #selex for gender,fleet: 1 / 5
 0.0470765 0.1746 0.241472 0.319691 0.408389 0.506214 0.611355 0.721678 0.834996 0.949362
1.06328 1.17577 1.28631 1.39471 1.50103 1.60542 1.70808 1.80922 1.90901 2.00759 2.10505
2.20144 2.29677 2.391 2.4841 2.57598 2.66658 2.75579 2.84352 2.92968 3.01419 3.09695
3.17789 3.25696 3.33408 3.40922 3.48234 3.55342 3.62243 3.68938 3.75425 3.81706 3.87783
3.93656 3.99329 4.04805 4.10087 4.15178 4.20084 4.24807 4.29352 4.33724 4.37928 4.41968
4.4585 4.49577 4.53155 4.56588 4.59882 4.63041 4.6607 4.68973 4.71754 4.74419 4.76972
4.79416 4.81756 4.83997 4.8614 4.88192 4.90171 4.92081 4.93908 4.95655 4.97325 4.98921
5.00447 5.01906 5.033 5.04632 5.05905 5.07121 5.08282 5.09392 5.10452 5.11464 5.12431
5.13354 5.14236 5.15078 5.15881 5.16649 5.17381 5.18081 5.18748 5.19386 5.19994 5.20575
5.21129 5.21658 5.22632 #bodywt for gender,fleet: 1 / 6
 0 0.00137578 0.0025204 0.00448316 0.00773858 0.0129493 0.0209726 0.0328152 0.0495178
0.0719822 0.100782 0.136019 0.177266 0.223618 0.273818 0.326423 0.379977 0.433139
0.484776 0.534006 0.580204 0.622983 0.662157 0.697701 0.729709 0.758358 0.783878 0.806527
0.826573 0.844281 0.859905 0.873682 0.885828 0.89654 0.905995 0.914347 0.921735 0.92828
0.934086 0.939247 0.943843 0.947943 0.951607 0.95489 0.957836 0.960486 0.962874 0.96503
0.966981 0.968749 0.970355 0.971817 0.97315 0.974366 0.97548 0.9765 0.977436 0.978297
0.97909 0.979821 0.980496 0.98112 0.981697 0.982233 0.98273 0.983192 0.983622 0.984022
0.984396 0.984744 0.985055 0.985331 0.98559 0.985833 0.986061 0.986275 0.986477 0.986666
0.986844 0.987011 0.987169 0.987318 0.987458 0.987591 0.987716 0.987834 0.987946 0.988051
0.988151 0.988245 0.988335 0.988419 0.988499 0.988575 0.988647 0.988715 0.98878 0.988841
0.988899 0.988955 0.989055 #selex for gender,fleet: 1 / 6
 0.0535125 0.183774 0.250731 0.326419 0.409184 0.497467 0.590027 0.686003 0.784853
0.886253 0.989997 1.09592 1.20385 1.31358 1.42487 1.53743 1.65094 1.76508 1.8795 1.99386
2.10782 2.22109 2.33336 2.44437 2.55388 2.66169 2.7676 2.87147 2.97314 3.07252 3.16951
3.26404 3.35606 3.44552 3.53241 3.6167 3.69841 3.77754 3.8541 3.92813 3.99965 4.06871
4.13533 4.19958 4.2615 4.32115 4.37857 4.43383 4.48697 4.53807 4.58718 4.63436 4.67967
4.72317 4.76492 4.80497 4.84339 4.88023 4.91555 4.94939 4.98183 5.0129 5.04265 5.07115
5.09843 5.12455 5.14954 5.17346 5.19635 5.21824 5.23931 5.2596 5.27899 5.29754 5.31528
5.33223 5.34843 5.36392 5.37872 5.39286 5.40637 5.41928 5.43162 5.4434 5.45465 5.4654
5.47567 5.48548 5.49484 5.50378 5.51232 5.52047 5.52826 5.53569 5.54278 5.54956 5.55602
5.56219 5.56808 5.57371 5.58409 #bodywt for gender,fleet: 2 / 1

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 0 0.0506765 0.078287 0.116026 0.164557 0.223188 0.289848 0.361487 0.434695 0.506309
0.573814 0.635515 0.690509 0.738544 0.779837 0.814904 0.844411 0.869078 0.88961 0.906656
0.920794 0.932521 0.942259 0.950361 0.957119 0.962773 0.967519 0.971518 0.9749 0.977771
0.980218 0.982313 0.984112 0.985665 0.98701 0.988179 0.9892 0.990094 0.990879 0.991572
0.992185 0.99273 0.993215 0.993648 0.994035 0.994384 0.994698 0.994981 0.995237 0.99547
0.995681 0.995874 0.99605 0.996211 0.996358 0.996494 0.996618 0.996733 0.996839 0.996937
0.997027 0.997111 0.997189 0.997262 0.997329 0.997392 0.99745 0.997505 0.997556 0.997603
0.997646 0.997685 0.997721 0.997755 0.997787 0.997817 0.997845 0.997872 0.997897 0.99792
0.997943 0.997964 0.997983 0.998002 0.99802 0.998037 0.998053 0.998068 0.998082 0.998095
0.998108 0.99812 0.998132 0.998143 0.998153 0.998163 0.998172 0.998181 0.998189 0.998197
0.998212 #selex for gender,fleet: 2 / 1
 0.0548212 0.190749 0.261286 0.341329 0.428829 0.521666 0.618061 0.716791 0.817175
0.918929 1.022 1.12644 1.2323 1.33958 1.44823 1.5581 1.669 1.78068 1.89283 2.00515
2.11731 2.229 2.33991 2.44976 2.5583 2.66528 2.7705 2.87378 2.97497 3.07395 3.17061
3.26487 3.35666 3.44594 3.53267 3.61684 3.69845 3.77749 3.85398 3.92795 3.99943 4.06845
4.13504 4.19927 4.26117 4.3208 4.37821 4.43346 4.4866 4.53769 4.5868 4.63397 4.67928
4.72278 4.76453 4.80458 4.843 4.87984 4.91516 4.94901 4.98144 5.01252 5.04228 5.07077
5.09806 5.12418 5.14917 5.1731 5.19598 5.21788 5.23895 5.25924 5.27864 5.29718 5.31492
5.33187 5.34807 5.36356 5.37836 5.3925 5.40602 5.41893 5.43126 5.44305 5.4543 5.46505
5.47532 5.48513 5.49449 5.50343 5.51197 5.52013 5.52791 5.53534 5.54244 5.54921 5.55568
5.56185 5.56774 5.57336 5.58375 #bodywt for gender,fleet: 2 / 2
 0 0.0212035 0.0360113 0.0586739 0.0913087 0.135281 0.190605 0.255714 0.32772 0.403037
0.478081 0.549819 0.616055 0.675483 0.727575 0.772393 0.810394 0.842255 0.868749 0.89065
0.908688 0.923513 0.93569 0.945697 0.953933 0.960726 0.966346 0.97101 0.974896 0.978145
0.980873 0.983173 0.985121 0.986778 0.988193 0.989407 0.990453 0.991357 0.992142 0.992826
0.993425 0.99395 0.994413 0.994823 0.995186 0.99551 0.995798 0.996057 0.996288 0.996497
0.996686 0.996856 0.99701 0.997151 0.997279 0.997396 0.997502 0.9976 0.99769 0.997773
0.997849 0.997919 0.997984 0.998044 0.998099 0.998151 0.998199 0.998243 0.998285 0.998323
0.998358 0.998388 0.998417 0.998444 0.998469 0.998493 0.998515 0.998536 0.998556 0.998574
0.998592 0.998608 0.998624 0.998638 0.998652 0.998665 0.998678 0.998689 0.9987 0.998711
0.998721 0.99873 0.998739 0.998747 0.998755 0.998763 0.99877 0.998777 0.998783 0.998789
0.9988 #selex for gender,fleet: 2 / 2
 0.0596307 0.212095 0.288451 0.370664 0.454989 0.539567 0.624281 0.709923 0.797531
0.888021 0.982034 1.0799 1.18163 1.28699 1.39558 1.50684 1.62016 1.73494 1.85057 1.96652
2.08227 2.1974 2.31153 2.42434 2.53556 2.64494 2.75231 2.8575 2.96037 3.06083 3.1588
3.2542 3.347 3.43716 3.52468 3.60954 3.69176 3.77134 3.84832 3.92271 3.99457 4.06393
4.13083 4.19533 4.25747 4.31732 4.37493 4.43036 4.48366 4.53491 4.58415 4.63145 4.67687
4.72047 4.76232 4.80246 4.84096 4.87787 4.91326 4.94717 4.97966 5.01079 5.0406 5.06914
5.09647 5.12263 5.14766 5.17162 5.19454 5.21646 5.23756 5.25787 5.27728 5.29585 5.3136
5.33056 5.34678 5.36228 5.3771 5.39125 5.40477 5.4177 5.43004 5.44183 5.4531 5.46386
5.47413 5.48395 5.49332 5.50227 5.51081 5.51897 5.52676 5.5342 5.5413 5.54808 5.55455
5.56073 5.56662 5.57225 5.58264 #bodywt for gender,fleet: 2 / 3
 0 0.0167249 0.0370579 0.0748703 0.135936 0.221155 0.32493 0.437177 0.547174 0.646684
0.731167 0.799414 0.852474 0.892553 0.922189 0.943779 0.959353 0.970525 0.97852 0.984246
0.988357 0.991322 0.993473 0.995044 0.9962 0.997058 0.9977 0.998184 0.998552 0.998836
0.999055 0.999226 0.999361 0.999468 0.999553 0.999622 0.999678 0.999724 0.999761 0.999793
0.999818 0.99984 0.999859 0.999874 0.999887 0.999899 0.999909 0.999917 0.999924 0.999931
0.999936 0.999941 0.999946 0.99995 0.999953 0.999956 0.999959 0.999961 0.999963 0.999965
0.999967 0.999969 0.99997 0.999972 0.999973 0.999974 0.999975 0.999976 0.999977 0.999978
0.999978 0.999979 0.999979 0.99998 0.99998 0.999981 0.999981 0.999982 0.999982 0.999982
0.999983 0.999983 0.999983 0.999983 0.999984 0.999984 0.999984 0.999984 0.999984 0.999985
0.999985 0.999985 0.999985 0.999985 0.999985 0.999986 0.999986 0.999986 0.999986 0.999986
0.999986 #selex for gender,fleet: 2 / 3
 0.0553231 0.193613 0.265935 0.348553 0.439452 0.536294 0.636886 0.739542 0.843213
0.947398 1.05198 1.15703 1.26271 1.36915 1.47646 1.58462 1.69359 1.8032 1.91327 2.02355
2.13377 2.24364 2.35289 2.46123 2.56841 2.67419 2.77835 2.8807 2.98109 3.07936 3.1754
3.26912 3.36044 3.44931 3.53569 3.61956 3.70089 3.7797 3.85599 3.92978 4.00109 4.06997
4.13644 4.20056 4.26236 4.3219 4.37924 4.43441 4.48749 4.53853 4.58759 4.63472 4.67999
4.72345 4.76516 4.80518 4.84357 4.88039 4.91568 4.94951 4.98192 5.01298 5.04272 5.0712
5.09847 5.12458 5.14956 5.17347 5.19635 5.21823 5.2393 5.25958 5.27897 5.29752 5.31524
5.33219 5.34839 5.36387 5.37867 5.39281 5.40632 5.41923 5.43156 5.44334 5.45459 5.46534
5.4756 5.48541 5.49477 5.50371 5.51225 5.5204 5.52818 5.53561 5.5427 5.54948 5.55594
5.56211 5.568 5.57362 5.584 #bodywt for gender,fleet: 2 / 4
 0 0.0111546 0.0197152 0.0335408 0.0546981 0.0851674 0.126274 0.178165 0.239587 0.308076
0.380456 0.453438 0.524114 0.590258 0.650422 0.703874 0.750467 0.790465 0.824393 0.852912
0.876723 0.89651 0.912906 0.926472 0.937693 0.946981 0.954682 0.96108 0.966411 0.970867
0.974604 0.97775 0.980408 0.982664 0.984585 0.986228 0.987639 0.988856 0.989909 0.990824
0.991622 0.992321 0.992934 0.993475 0.993953 0.994378 0.994756 0.995093 0.995395 0.995666
0.99591 0.99613 0.99633 0.99651 0.996675 0.996824 0.996961 0.997086 0.9972 0.997305
0.997402 0.99749 0.997573 0.997648 0.997718 0.997783 0.997844 0.9979 0.997952 0.998
0.998043 0.998082 0.998117 0.998151 0.998182 0.998212 0.998239 0.998265 0.99829 0.998313
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0.998334 0.998354 0.998374 0.998392 0.998409 0.998425 0.99844 0.998455 0.998468 0.998481
0.998493 0.998505 0.998516 0.998526 0.998536 0.998545 0.998554 0.998562 0.99857 0.998577
0.998591 #selex for gender,fleet: 2 / 4
 0.0544482 0.189972 0.261417 0.343974 0.436411 0.537106 0.644173 0.75567 0.869823
0.985195 1.10075 1.21585 1.33014 1.44349 1.55589 1.66737 1.77802 1.88787 1.99696 2.10525
2.21272 2.31928 2.42484 2.52926 2.63243 2.7342 2.83444 2.93301 3.02979 3.12466 3.21752
3.30828 3.39687 3.48322 3.56728 3.64902 3.72841 3.80544 3.8801 3.95241 4.02237 4.09002
4.15536 4.21845 4.27931 4.33798 4.39452 4.44898 4.50139 4.55181 4.60031 4.64692 4.69171
4.73473 4.77603 4.81568 4.85372 4.89021 4.9252 4.95875 4.99091 5.02172 5.05123 5.07951
5.10658 5.1325 5.15731 5.18106 5.20379 5.22553 5.24648 5.26668 5.28599 5.30446 5.32211
5.33899 5.35512 5.37055 5.38528 5.39937 5.41283 5.42568 5.43797 5.4497 5.46091 5.47162
5.48185 5.49162 5.50095 5.50985 5.51836 5.52648 5.53424 5.54164 5.54871 5.55546 5.5619
5.56805 5.57392 5.57952 5.58987 #bodywt for gender,fleet: 2 / 5
 0 0.00487217 0.00822975 0.0135146 0.0215531 0.0333344 0.0499208 0.0722927 0.101156
0.136764 0.178821 0.226485 0.278479 0.333262 0.389225 0.444855 0.498855 0.550208 0.598195
0.642378 0.682555 0.718716 0.750992 0.779605 0.804839 0.827004 0.846415 0.863382 0.878195
0.891122 0.902404 0.912256 0.920868 0.928406 0.935016 0.940821 0.945931 0.950438 0.954422
0.957952 0.961087 0.963879 0.966369 0.968598 0.970595 0.972391 0.974008 0.975468 0.976789
0.977986 0.979074 0.980065 0.980968 0.981794 0.982549 0.983242 0.983879 0.984464 0.985004
0.985502 0.985963 0.986389 0.986783 0.98715 0.98749 0.987807 0.988101 0.988376 0.988633
0.988872 0.989087 0.989279 0.989459 0.989628 0.989787 0.989936 0.990076 0.990208 0.990332
0.99045 0.99056 0.990664 0.990762 0.990855 0.990943 0.991026 0.991104 0.991178 0.991248
0.991314 0.991377 0.991437 0.991493 0.991547 0.991597 0.991645 0.991691 0.991734 0.991775
0.991814 0.991885 #selex for gender,fleet: 2 / 5
 0.056179 0.198303 0.273566 0.360816 0.458807 0.565773 0.679497 0.797528 0.917516 1.03754
1.15627 1.27298 1.3874 1.49959 1.60978 1.71826 1.82534 1.93126 2.03624 2.1404 2.24381
2.34648 2.44837 2.54941 2.64949 2.74847 2.84622 2.94259 3.03744 3.13063 3.22205 3.31157
3.3991 3.48455 3.56786 3.64896 3.72782 3.80441 3.87872 3.95073 4.02045 4.08789 4.15308
4.21604 4.2768 4.3354 4.39189 4.4463 4.49868 4.54909 4.59758 4.64419 4.68898 4.73201
4.77333 4.81299 4.85105 4.88756 4.92257 4.95614 4.98831 5.01915 5.04869 5.07698 5.10408
5.13002 5.15485 5.17862 5.20137 5.22313 5.2441 5.2643 5.28362 5.3021 5.31976 5.33665
5.35279 5.36822 5.38296 5.39706 5.41052 5.42339 5.43568 5.44742 5.45864 5.46935 5.47958
5.48936 5.49869 5.5076 5.51611 5.52424 5.532 5.53941 5.54648 5.55323 5.55968 5.56583
5.5717 5.57731 5.58766 #bodywt for gender,fleet: 2 / 6
 0 0.00140585 0.00265155 0.00484502 0.00857009 0.014654 0.0241738 0.0383868 0.0585636
0.085746 0.120497 0.162727 0.211661 0.265937 0.323815 0.383413 0.442928 0.500796 0.555783
0.607016 0.653965 0.69639 0.734286 0.767815 0.797256 0.822949 0.845269 0.864592 0.881281
0.895674 0.90808 0.918772 0.927993 0.935954 0.942836 0.948797 0.95397 0.95847 0.962393
0.965822 0.968828 0.971469 0.973796 0.975852 0.977673 0.979291 0.980732 0.982019 0.983171
0.984204 0.985135 0.985973 0.986732 0.987418 0.988042 0.988609 0.989126 0.989598 0.990031
0.990427 0.99079 0.991125 0.991433 0.991718 0.99198 0.992223 0.992449 0.992658 0.992852
0.993032 0.993192 0.993333 0.993465 0.993589 0.993705 0.993813 0.993915 0.99401 0.9941
0.994184 0.994263 0.994338 0.994408 0.994474 0.994537 0.994596 0.994651 0.994704 0.994754
0.9948 0.994845 0.994887 0.994926 0.994964 0.995 0.995033 0.995065 0.995096 0.995124
0.995151 0.995201 #selex for gender,fleet: 2 / 6
 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303
0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303
0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303
0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303
0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303
0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303
0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303
0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303
0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303
0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303
0.0465303 0.0465303 0.0465303 #mean M for year Yinit: 2011 sex: 1
 39.8119 37.3577 34.9965 32.7823 30.7891 28.7442 26.8336 24.9836 23.1981 21.5285 20.4911
19.3023 19.0008 18.2612 18.453 18.2892 18.2443 17.862 17.8057 17.6903 17.2581 16.2309
15.4129 14.3004 13.086 11.822 10.745 9.62776 8.63302 7.79303 6.93605 6.11293 5.40555
4.77723 4.19126 3.6829 3.23842 2.85767 2.52753 2.24493 1.99916 1.78596 1.60637 1.44684
1.30939 1.1901 1.08983 0.99812 0.918261 0.848167 0.785588 0.730004 0.680211 0.635401
0.594572 0.557129 0.522617 0.490707 0.461153 0.434003 0.408938 0.385538 0.363754 0.34371
0.324924 0.308174 0.292678 0.277535 0.263289 0.249407 0.23626 0.22379 0.211928 0.20073
0.190125 0.180089 0.170574 0.16158 0.153092 0.145115 0.137616 0.130575 0.123952 0.117706
0.111823 0.106277 0.101044 0.0960975 0.0914213 0.086998 0.0828113 0.078845 0.075084
0.0715218 0.0681389 0.0649231 0.0618596 0.0589489 0.0561823 0.0535519 1.11375 #numbers
for year Yinit: 2011 sex: 1
 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798
0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798
0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798
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0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798
0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798
0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798
0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798
0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798
0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798
0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798
0.0453798 0.0453798 0.0453798 #mean M for year Yinit: 2011 sex: 2
 39.8119 37.4007 35.077 32.8952 30.9298 28.9071 27.0138 25.1761 23.3984 21.7329 20.7018
19.515 19.223 18.4856 18.6887 18.5281 18.4823 18.087 18.0124 17.8669 17.3899 16.3042
15.4231 14.2454 12.9699 11.6542 10.5344 9.38866 8.37659 7.52793 6.67487 5.86495 5.17455
4.56612 4.00271 3.51656 3.09345 2.73248 2.42059 2.1545 1.92371 1.72396 1.55618 1.40717
1.27889 1.16754 1.07404 0.988183 0.91328 0.847365 0.78829 0.735624 0.688244 0.645413
0.606187 0.570018 0.536499 0.50534 0.476334 0.44957 0.424759 0.401497 0.379761 0.359704
0.340842 0.324007 0.308393 0.293058 0.278584 0.26441 0.250936 0.238108 0.225859 0.214259
0.203241 0.19279 0.182863 0.173467 0.164593 0.156249 0.148401 0.14103 0.134092 0.127543
0.121368 0.115539 0.11003 0.104814 0.099874 0.0951923 0.0907526 0.0865384 0.0825348
0.078736 0.0751217 0.0716798 0.0683948 0.0652686 0.0622921 0.0594575 1.27126 #numbers for
year Yinit: 2011 sex: 2
 41.4045 38.7781 36.2741 34.0379 31.8864 29.8688 28.0526 26.1892 24.448 22.7618 21.1344
19.6125 18.6663 17.5822 17.3063 16.6311 16.8043 16.6536 16.6111 16.2614 16.2086 16.1021
15.7072 14.7709 14.0253 13.0118 11.9057 10.7547 9.77405 8.75701 7.85155 7.08699 6.30714
5.55822 4.91469 4.34314 3.81018 3.34787 2.94368 2.59747 2.29731 2.04038 1.81696 1.62316
1.45993 1.31493 1.19001 1.08161 0.990483 0.907149 0.834584 0.770893 0.714031 0.663524
0.618279 0.577561 0.54046 0.506434 0.475071 0.446071 0.419212 0.394536 0.371755 0.350486
0.330686 0.312466 0.29539 0.280165 0.266078 0.252313 0.239362 0.226742 0.214789 0.203453
0.192668 0.182487 0.172845 0.163721 0.155069 0.146892 0.139174 0.131922 0.125103 0.118702
0.112681 0.107003 0.101654 0.096612 0.0918546 0.0873574 0.0831063 0.0790851 0.0752791
0.0716735 0.0682546 0.0650163 0.0619411 0.0590178 0.0562329 0.053587 1.1122 #numbers for
year Ydeclare: 2013 sex: 1
 41.4045 38.8228 36.3577 34.1556 32.0334 30.0407 28.2457 26.3981 24.6687 22.9898 21.3656
19.8437 18.901 17.816 17.5478 16.873 17.0565 16.9082 16.8645 16.5022 16.4325 16.2982
15.8615 14.8699 14.0651 12.9899 11.8258 10.6253 9.60357 8.55831 7.63514 6.86107 6.08314
5.34467 4.71524 4.16059 3.64704 3.20396 2.81835 2.4894 2.2052 1.96275 1.75247 1.57049
1.41763 1.28189 1.16504 1.06362 0.978455 0.900255 0.832035 0.772 0.718196 0.670228
0.627074 0.588062 0.552331 0.519385 0.488851 0.460466 0.43404 0.409657 0.387052 0.365858
0.346054 0.327779 0.310592 0.295252 0.281025 0.267052 0.253861 0.240946 0.228667 0.216977
0.205814 0.195242 0.185201 0.175676 0.166629 0.158066 0.149978 0.142374 0.135222 0.128505
0.122182 0.116214 0.110586 0.105275 0.100255 0.0955023 0.091001 0.0867351 0.0826896
0.0788498 0.0752019 0.0717404 0.0684473 0.0653111 0.0623181 0.0594695 1.26925 #numbers
for year Ydeclare: 2013 sex: 2
#R0  1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932
1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950
1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968
1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986
1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004
2005 2006 2007 2008 2009 2010 #years
173.838  173.838 173.813 173.779 173.741 173.716 173.689 173.663 173.637 173.611 173.581
173.538 173.488 173.432 173.367 173.279 173.187 173.109 173.034 172.975 172.901 172.813
172.696 172.582 172.471 172.387 172.256 172.093 171.89 171.386 170.881 170.035 169.326
169.053 168.733 168.525 168.303 168.026 167.79 167.616 167.391 167.101 166.742 166.322
165.867 165.46 165.09 164.788 164.424 164.144 163.96 163.138 162.818 162.439 162.04
161.084 160.44 159.546 158.374 157.236 155.916 154.673 153.16 151.558 148.665 145.637
143.097 139.273 133.971 130.074 126.85 122.684 120.156 117.016 113.284 108.047 104.83
98.8191 92.1397 86.1151 82.3463 77.5783 73.7874 69.076 68.0837 65.6376 66.1885 66.1294
67.8099 69.5473 71.1769 72.6839 74.2398 75.4187 76.8292 78.2741 79.6238 #Recruits
7.73168e+008  7.73168e+008 7.72824e+008 7.7235e+008 7.71817e+008 7.71465e+008
7.71091e+008 7.70722e+008 7.70371e+008 7.70004e+008 7.69583e+008 7.6898e+008 7.68289e+008
7.67508e+008 7.66616e+008 7.65395e+008 7.64126e+008 7.63052e+008 7.62026e+008
7.61204e+008 7.60197e+008 7.58986e+008 7.574e+008 7.5585e+008 7.54333e+008 7.53202e+008
7.5143e+008 7.49242e+008 7.46517e+008 7.39835e+008 7.33207e+008 7.22289e+008 7.133e+008
7.09874e+008 7.05893e+008 7.03331e+008 7.00592e+008 6.97211e+008 6.94341e+008
6.92234e+008 6.89519e+008 6.86043e+008 6.81773e+008 6.76828e+008 6.71524e+008
6.66816e+008 6.62579e+008 6.59144e+008 6.55035e+008 6.51901e+008 6.49843e+008 6.4078e+008
6.37299e+008 6.33201e+008 6.28931e+008 6.18831e+008 6.12143e+008 6.03017e+008
5.91305e+008 5.80202e+008 5.67643e+008 5.56118e+008 5.4247e+008 5.28457e+008 5.04227e+008
4.80242e+008 4.61127e+008 4.33931e+008 3.99085e+008 3.75354e+008 3.56821e+008
3.34212e+008 3.21174e+008 3.05646e+008 2.8809e+008 2.6496e+008 2.51554e+008 2.27984e+008
2.03839e+008 1.83703e+008 1.71822e+008 1.57515e+008 1.46678e+008 1.33828e+008
1.31204e+008 1.24853e+008 1.26269e+008 1.26117e+008 1.30485e+008 1.35084e+008
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1.39476e+008 1.43609e+008 1.47948e+008 1.51285e+008 1.55337e+008 1.59554e+008
1.63557e+008 #SpawnBio
0.44056 0.5 0 # spawn-recr steepness, sigmaR, autocorr
# values from cat75_hmle, catch at 75% and steepness at mle value. # this is state of
nature 4 out of 9 (in no particular order) # and parameter set number 2 out of 2 for this
state
 0 0 27.1664 99.6169 331.041 987.879 2615.28 6100.71 12570.2 23108.5 38439.4 58737.6
83639.5 112406 144137 177948 213089 248986 285239 321591 357892 394066 430075 465904
501545 536990 572225 607230 641980 676443 710584 744366 777749 810695 843166 875126
906540 937378 967612 997216 1.02617e+006 1.05445e+006 1.08205e+006 1.10895e+006
1.13515e+006 1.16063e+006 1.1854e+006 1.20945e+006 1.23278e+006 1.25539e+006 1.2773e+006
1.29851e+006 1.31902e+006 1.33885e+006 1.358e+006 1.37649e+006 1.39433e+006 1.41153e+006
1.42811e+006 1.44408e+006 1.45946e+006 1.47426e+006 1.4885e+006 1.50219e+006 1.51536e+006
1.528e+006 1.54015e+006 1.55182e+006 1.56301e+006 1.57376e+006 1.58406e+006 1.59421e+006
1.60394e+006 1.61328e+006 1.62222e+006 1.63079e+006 1.639e+006 1.64687e+006 1.6544e+006
1.66161e+006 1.66851e+006 1.67512e+006 1.68145e+006 1.6875e+006 1.69329e+006 1.69882e+006
1.70412e+006 1.70918e+006 1.71403e+006 1.71865e+006 1.72308e+006 1.72731e+006
1.73135e+006 1.73521e+006 1.73891e+006 1.74243e+006 1.7458e+006 1.74902e+006 1.75209e+006
1.75503e+006 1.76045e+006 #female fecundity; weighted by N in year Y_init across morphs
and areas
 0.0447959 0.161569 0.220963 0.288709 0.363455 0.443836 0.528681 0.617102 0.708484
0.802415 0.898614 0.996863 1.09696 1.19871 1.30187 1.4062 1.51143 1.61726 1.7234 1.82956
1.93545 2.04078 2.1453 2.24876 2.35095 2.45166 2.55072 2.64797 2.74328 2.83653 2.92764
3.01652 3.10312 3.18739 3.2693 3.34882 3.42596 3.50072 3.57309 3.64311 3.7108 3.77618
3.83929 3.90018 3.95888 4.01544 4.06991 4.12234 4.17279 4.2213 4.26794 4.31275 4.35579
4.39711 4.43678 4.47484 4.51136 4.54637 4.57994 4.61211 4.64295 4.67248 4.70077 4.72786
4.7538 4.77863 4.80239 4.82512 4.84688 4.86769 4.88772 4.90702 4.92548 4.94312 4.95998
4.97611 4.99152 5.00624 5.02031 5.03376 5.0466 5.05887 5.0706 5.08179 5.09249 5.1027
5.11245 5.12177 5.13066 5.13915 5.14725 5.15499 5.16238 5.16943 5.17616 5.18259 5.18872
5.19458 5.20016 5.2055 5.21532 #bodywt for gender,fleet: 1 / 1
 0 0.0499826 0.0757589 0.110542 0.154938 0.208453 0.269462 0.33548 0.403648 0.471214
0.535888 0.596015 0.650594 0.699187 0.741794 0.778709 0.810404 0.837439 0.860392 0.879824
0.896248 0.910125 0.921855 0.931784 0.940202 0.947356 0.953452 0.958662 0.963128 0.966969
0.970284 0.973154 0.975647 0.977821 0.979722 0.981391 0.98286 0.984158 0.985308 0.98633
0.987241 0.988055 0.988785 0.989441 0.990032 0.990565 0.991049 0.991487 0.991886 0.992249
0.992581 0.992884 0.993163 0.993418 0.993653 0.993869 0.994069 0.994254 0.994425 0.994583
0.99473 0.994866 0.994993 0.995111 0.995221 0.995324 0.99542 0.99551 0.995594 0.995672
0.995743 0.995807 0.995867 0.995924 0.995977 0.996027 0.996074 0.996119 0.996161 0.9962
0.996238 0.996273 0.996306 0.996338 0.996368 0.996396 0.996423 0.996448 0.996472 0.996494
0.996516 0.996536 0.996556 0.996574 0.996591 0.996608 0.996623 0.996638 0.996652 0.996666
0.99669 #selex for gender,fleet: 1 / 1
 0.0459148 0.167829 0.230479 0.302262 0.381538 0.466476 0.555413 0.647086 0.740681
0.835752 0.932102 1.02966 1.12842 1.22833 1.32935 1.43135 1.53419 1.63767 1.74155 1.84557
1.94949 2.05303 2.15594 2.25797 2.35889 2.45848 2.55656 2.65296 2.74754 2.84015 2.9307
3.01911 3.1053 3.18921 3.27081 3.35007 3.42698 3.50154 3.57375 3.64362 3.71117 3.77644
3.83946 3.90026 3.95889 4.01539 4.06981 4.12219 4.17259 4.22107 4.26767 4.31245 4.35547
4.39678 4.43642 4.47447 4.51097 4.54597 4.57953 4.61169 4.64251 4.67204 4.70032 4.72741
4.75334 4.77816 4.80192 4.82465 4.8464 4.86721 4.88724 4.90654 4.92499 4.94263 4.95949
4.97561 4.99102 5.00575 5.01982 5.03326 5.0461 5.05837 5.07009 5.08129 5.09198 5.10219
5.11195 5.12126 5.13015 5.13864 5.14675 5.15448 5.16187 5.16892 5.17566 5.18208 5.18821
5.19407 5.19965 5.20498 5.21481 #bodywt for gender,fleet: 1 / 2
 0 0.020837 0.0345637 0.0551946 0.0845334 0.12381 0.1732 0.231608 0.296814 0.36592
0.435895 0.504035 0.568241 0.627114 0.67991 0.726417 0.766807 0.801503 0.83106 0.856089
0.877196 0.89495 0.909864 0.922391 0.932921 0.941783 0.949257 0.955576 0.960933 0.965488
0.969374 0.972701 0.975558 0.978022 0.980153 0.982003 0.983614 0.985023 0.986259 0.987347
0.988307 0.989158 0.989914 0.990587 0.991189 0.991729 0.992213 0.99265 0.993044 0.993401
0.993725 0.994019 0.994287 0.994532 0.994756 0.994961 0.99515 0.995323 0.995483 0.99563
0.995767 0.995893 0.996009 0.996118 0.996218 0.996312 0.996399 0.99648 0.996556 0.996627
0.99669 0.996747 0.9968 0.99685 0.996896 0.99694 0.996982 0.997021 0.997057 0.997092
0.997124 0.997155 0.997184 0.997211 0.997237 0.997261 0.997285 0.997306 0.997327 0.997347
0.997365 0.997383 0.997399 0.997415 0.99743 0.997444 0.997457 0.99747 0.997482 0.997494
0.997515 #selex for gender,fleet: 1 / 2
 0.0500339 0.187136 0.255487 0.330126 0.407671 0.486115 0.564953 0.644596 0.725799
0.809303 0.895678 0.985262 1.07816 1.17425 1.27328 1.37485 1.47848 1.58369 1.68996
1.79681 1.90379 2.01047 2.11651 2.22156 2.32535 2.42764 2.52822 2.62692 2.72359 2.81811
2.9104 3.00037 3.08798 3.17317 3.25592 3.33623 3.41408 3.48948 3.56246 3.63302 3.70121
3.76705 3.83059 3.89186 3.95092 4.00781 4.06259 4.1153 4.16601 4.21476 4.26162 4.30663
4.34986 4.39137 4.4312 4.46942 4.50607 4.54122 4.57491 4.6072 4.63814 4.66778 4.69617
4.72335 4.74937 4.77427 4.79811 4.82091 4.84273 4.8636 4.88369 4.90303 4.92152 4.93919
4.95609 4.97225 4.98769 5.00244 5.01654 5.03001 5.04288 5.05517 5.06691 5.07813 5.08885
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5.09908 5.10885 5.11818 5.12708 5.13559 5.14371 5.15146 5.15886 5.16593 5.17267 5.17911
5.18525 5.19112 5.19671 5.20205 5.21189 #bodywt for gender,fleet: 1 / 3
 0 0.0162404 0.0348082 0.0686495 0.122909 0.198975 0.292908 0.396669 0.50106 0.598401
0.683845 0.755381 0.813131 0.858486 0.89339 0.919865 0.939753 0.954603 0.965659 0.973888
0.980022 0.984608 0.988051 0.990651 0.992625 0.994133 0.995294 0.996194 0.996896 0.997448
0.997885 0.998234 0.998514 0.998741 0.998925 0.999076 0.999201 0.999305 0.999391 0.999463
0.999525 0.999577 0.999621 0.999659 0.999692 0.99972 0.999745 0.999766 0.999785 0.999802
0.999816 0.999829 0.999841 0.999851 0.99986 0.999869 0.999876 0.999883 0.999889 0.999894
0.999899 0.999904 0.999908 0.999912 0.999915 0.999918 0.999921 0.999924 0.999926 0.999929
0.99993 0.999932 0.999934 0.999935 0.999937 0.999938 0.999939 0.99994 0.999941 0.999942
0.999943 0.999944 0.999945 0.999946 0.999946 0.999947 0.999948 0.999948 0.999949 0.999949
0.99995 0.99995 0.999951 0.999951 0.999952 0.999952 0.999952 0.999953 0.999953 0.999953
0.999954 #selex for gender,fleet: 1 / 3
 0.0463442 0.170395 0.234643 0.308748 0.391139 0.479853 0.572904 0.668622 0.765832
0.863844 0.96234 1.06124 1.16056 1.26039 1.36076 1.46168 1.56312 1.66496 1.76708 1.86929
1.97138 2.07315 2.17435 2.27477 2.37419 2.4724 2.56921 2.66446 2.75798 2.84965 2.93936
3.027 3.11251 3.19581 3.27686 3.35564 3.43211 3.50627 3.57812 3.64768 3.71495 3.77997
3.84275 3.90335 3.96178 4.01811 4.07237 4.12462 4.17489 4.22325 4.26975 4.31443 4.35736
4.39858 4.43816 4.47614 4.51257 4.54751 4.58102 4.61313 4.64391 4.67339 4.70163 4.72868
4.75458 4.77937 4.8031 4.8258 4.84752 4.86831 4.88832 4.9076 4.92604 4.94366 4.96051
4.97662 4.99201 5.00673 5.02079 5.03422 5.04705 5.05932 5.07103 5.08222 5.0929 5.10311
5.11285 5.12216 5.13104 5.13953 5.14763 5.15536 5.16274 5.16979 5.17652 5.18294 5.18906
5.19491 5.2005 5.20582 5.21564 #bodywt for gender,fleet: 1 / 4
 0 0.0109446 0.0188536 0.0313591 0.0501888 0.0770249 0.113072 0.158639 0.212927 0.274115
0.339711 0.406994 0.473428 0.536936 0.596026 0.649787 0.697815 0.740093 0.77688 0.8086
0.835765 0.858914 0.878574 0.895238 0.909348 0.921296 0.93142 0.940011 0.947313 0.953535
0.958849 0.963401 0.967312 0.970682 0.973596 0.976123 0.978322 0.980242 0.981924 0.983402
0.984704 0.985856 0.986877 0.987786 0.988596 0.989321 0.989971 0.990556 0.991082 0.991558
0.99199 0.992381 0.992737 0.993062 0.993358 0.99363 0.993878 0.994107 0.994317 0.99451
0.994689 0.994854 0.995007 0.995149 0.99528 0.995402 0.995516 0.995622 0.99572 0.995812
0.995895 0.995968 0.996036 0.9961 0.996161 0.996217 0.996271 0.996321 0.996368 0.996412
0.996454 0.996494 0.996531 0.996566 0.996599 0.996631 0.99666 0.996688 0.996715 0.99674
0.996763 0.996786 0.996807 0.996827 0.996846 0.996865 0.996882 0.996898 0.996914 0.996928
0.996955 #selex for gender,fleet: 1 / 4
 0.0455957 0.167106 0.230483 0.304345 0.387804 0.479588 0.578126 0.681701 0.788647
0.89751 1.00715 1.11677 1.22586 1.33411 1.4414 1.54768 1.65293 1.75718 1.86043 1.96266
2.06386 2.16397 2.26292 2.36065 2.45705 2.55203 2.6455 2.73735 2.8275 2.91586 3.00235
3.08689 3.16943 3.24991 3.3283 3.40456 3.47868 3.55063 3.62042 3.68804 3.75351 3.81685
3.87807 3.93721 3.9943 4.04937 4.10246 4.15361 4.20287 4.25029 4.2959 4.33976 4.38192
4.42243 4.46134 4.49869 4.53454 4.56894 4.60193 4.63356 4.66389 4.69295 4.7208 4.74748
4.77303 4.79749 4.82091 4.84332 4.86477 4.8853 4.9051 4.92421 4.94249 4.95997 4.97667
4.99265 5.00791 5.02251 5.03645 5.04978 5.06251 5.07467 5.08629 5.09739 5.10799 5.11812
5.12779 5.13702 5.14584 5.15426 5.1623 5.16997 5.1773 5.18429 5.19097 5.19735 5.20343
5.20923 5.21478 5.22007 5.22981 #bodywt for gender,fleet: 1 / 5
 0 0.00478955 0.00789791 0.0126864 0.0198349 0.0301512 0.044506 0.0637195 0.0884179
0.118897 0.155035 0.196276 0.2417 0.290137 0.340309 0.39096 0.440962 0.489374 0.535471
0.578749 0.618899 0.655779 0.689377 0.719784 0.747155 0.77169 0.793613 0.813156 0.83055
0.846016 0.859761 0.871977 0.882839 0.892503 0.90111 0.908785 0.915638 0.921766 0.927255
0.93218 0.936607 0.940593 0.944188 0.947438 0.95038 0.953048 0.955473 0.95768 0.959693
0.961532 0.963214 0.964756 0.966171 0.967472 0.96867 0.969775 0.970795 0.971738 0.972611
0.97342 0.974171 0.974869 0.975519 0.976123 0.976687 0.977213 0.977704 0.978163 0.978593
0.978995 0.979358 0.979684 0.979991 0.980279 0.980551 0.980806 0.981047 0.981273 0.981487
0.981688 0.981878 0.982058 0.982228 0.982388 0.98254 0.982683 0.982819 0.982947 0.983069
0.983184 0.983293 0.983397 0.983495 0.983588 0.983676 0.98376 0.983839 0.983914 0.983986
0.984054 0.984178 #selex for gender,fleet: 1 / 5
 0.0470765 0.1746 0.241472 0.319691 0.408389 0.506214 0.611355 0.721678 0.834996 0.949362
1.06328 1.17577 1.28631 1.39471 1.50103 1.60542 1.70808 1.80922 1.90901 2.00759 2.10505
2.20144 2.29677 2.391 2.4841 2.57598 2.66658 2.75579 2.84352 2.92968 3.01419 3.09695
3.17789 3.25696 3.33408 3.40922 3.48234 3.55342 3.62243 3.68938 3.75425 3.81706 3.87783
3.93656 3.99329 4.04805 4.10087 4.15178 4.20084 4.24807 4.29352 4.33724 4.37928 4.41968
4.4585 4.49577 4.53155 4.56588 4.59882 4.63041 4.6607 4.68973 4.71754 4.74419 4.76972
4.79416 4.81756 4.83997 4.8614 4.88192 4.90171 4.92081 4.93908 4.95655 4.97325 4.98921
5.00447 5.01906 5.033 5.04632 5.05905 5.07121 5.08282 5.09392 5.10452 5.11464 5.12431
5.13354 5.14236 5.15078 5.15881 5.16649 5.17381 5.18081 5.18748 5.19386 5.19994 5.20575
5.21129 5.21658 5.22632 #bodywt for gender,fleet: 1 / 6
 0 0.00137578 0.0025204 0.00448316 0.00773858 0.0129493 0.0209726 0.0328152 0.0495178
0.0719822 0.100782 0.136019 0.177266 0.223618 0.273818 0.326423 0.379977 0.433139
0.484776 0.534006 0.580204 0.622983 0.662157 0.697701 0.729709 0.758358 0.783878 0.806527
0.826573 0.844281 0.859905 0.873682 0.885828 0.89654 0.905995 0.914347 0.921735 0.92828
0.934086 0.939247 0.943843 0.947943 0.951607 0.95489 0.957836 0.960486 0.962874 0.96503
0.966981 0.968749 0.970355 0.971817 0.97315 0.974366 0.97548 0.9765 0.977436 0.978297

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0.97909 0.979821 0.980496 0.98112 0.981697 0.982233 0.98273 0.983192 0.983622 0.984022
0.984396 0.984744 0.985055 0.985331 0.98559 0.985833 0.986061 0.986275 0.986477 0.986666
0.986844 0.987011 0.987169 0.987318 0.987458 0.987591 0.987716 0.987834 0.987946 0.988051
0.988151 0.988245 0.988335 0.988419 0.988499 0.988575 0.988647 0.988715 0.98878 0.988841
0.988899 0.988955 0.989055 #selex for gender,fleet: 1 / 6
 0.0535125 0.183774 0.250731 0.326419 0.409184 0.497467 0.590027 0.686003 0.784853
0.886253 0.989997 1.09592 1.20385 1.31358 1.42487 1.53743 1.65094 1.76508 1.8795 1.99386
2.10782 2.22109 2.33336 2.44437 2.55388 2.66169 2.7676 2.87147 2.97314 3.07252 3.16951
3.26404 3.35606 3.44552 3.53241 3.6167 3.69841 3.77754 3.8541 3.92813 3.99965 4.06871
4.13533 4.19958 4.2615 4.32115 4.37857 4.43383 4.48697 4.53807 4.58718 4.63436 4.67967
4.72317 4.76492 4.80497 4.84339 4.88023 4.91555 4.94939 4.98183 5.0129 5.04265 5.07115
5.09843 5.12455 5.14954 5.17346 5.19635 5.21824 5.23931 5.2596 5.27899 5.29754 5.31528
5.33223 5.34843 5.36392 5.37872 5.39286 5.40637 5.41928 5.43162 5.4434 5.45465 5.4654
5.47567 5.48548 5.49484 5.50378 5.51232 5.52047 5.52826 5.53569 5.54278 5.54956 5.55602
5.56219 5.56808 5.57371 5.58409 #bodywt for gender,fleet: 2 / 1
 0 0.0506765 0.078287 0.116026 0.164557 0.223188 0.289848 0.361487 0.434695 0.506309
0.573814 0.635515 0.690509 0.738544 0.779837 0.814904 0.844411 0.869078 0.88961 0.906656
0.920794 0.932521 0.942259 0.950361 0.957119 0.962773 0.967519 0.971518 0.9749 0.977771
0.980218 0.982313 0.984112 0.985665 0.98701 0.988179 0.9892 0.990094 0.990879 0.991572
0.992185 0.99273 0.993215 0.993648 0.994035 0.994384 0.994698 0.994981 0.995237 0.99547
0.995681 0.995874 0.99605 0.996211 0.996358 0.996494 0.996618 0.996733 0.996839 0.996937
0.997027 0.997111 0.997189 0.997262 0.997329 0.997392 0.99745 0.997505 0.997556 0.997603
0.997646 0.997685 0.997721 0.997755 0.997787 0.997817 0.997845 0.997872 0.997897 0.99792
0.997943 0.997964 0.997983 0.998002 0.99802 0.998037 0.998053 0.998068 0.998082 0.998095
0.998108 0.99812 0.998132 0.998143 0.998153 0.998163 0.998172 0.998181 0.998189 0.998197
0.998212 #selex for gender,fleet: 2 / 1
 0.0548212 0.190749 0.261286 0.341329 0.428829 0.521666 0.618061 0.716791 0.817175
0.918929 1.022 1.12644 1.2323 1.33958 1.44823 1.5581 1.669 1.78068 1.89283 2.00515
2.11731 2.229 2.33991 2.44976 2.5583 2.66528 2.7705 2.87378 2.97497 3.07395 3.17061
3.26487 3.35666 3.44594 3.53267 3.61684 3.69845 3.77749 3.85398 3.92795 3.99943 4.06845
4.13504 4.19927 4.26117 4.3208 4.37821 4.43346 4.4866 4.53769 4.5868 4.63397 4.67928
4.72278 4.76453 4.80458 4.843 4.87984 4.91516 4.94901 4.98144 5.01252 5.04228 5.07077
5.09806 5.12418 5.14917 5.1731 5.19598 5.21788 5.23895 5.25924 5.27864 5.29718 5.31492
5.33187 5.34807 5.36356 5.37836 5.3925 5.40602 5.41893 5.43126 5.44305 5.4543 5.46505
5.47532 5.48513 5.49449 5.50343 5.51197 5.52013 5.52791 5.53534 5.54244 5.54921 5.55568
5.56185 5.56774 5.57336 5.58375 #bodywt for gender,fleet: 2 / 2
 0 0.0212035 0.0360113 0.0586739 0.0913087 0.135281 0.190605 0.255714 0.32772 0.403037
0.478081 0.549819 0.616055 0.675483 0.727575 0.772393 0.810394 0.842255 0.868749 0.89065
0.908688 0.923513 0.93569 0.945697 0.953933 0.960726 0.966346 0.97101 0.974896 0.978145
0.980873 0.983173 0.985121 0.986778 0.988193 0.989407 0.990453 0.991357 0.992142 0.992826
0.993425 0.99395 0.994413 0.994823 0.995186 0.99551 0.995798 0.996057 0.996288 0.996497
0.996686 0.996856 0.99701 0.997151 0.997279 0.997396 0.997502 0.9976 0.99769 0.997773
0.997849 0.997919 0.997984 0.998044 0.998099 0.998151 0.998199 0.998243 0.998285 0.998323
0.998358 0.998388 0.998417 0.998444 0.998469 0.998493 0.998515 0.998536 0.998556 0.998574
0.998592 0.998608 0.998624 0.998638 0.998652 0.998665 0.998678 0.998689 0.9987 0.998711
0.998721 0.99873 0.998739 0.998747 0.998755 0.998763 0.99877 0.998777 0.998783 0.998789
0.9988 #selex for gender,fleet: 2 / 2
 0.0596307 0.212095 0.288451 0.370664 0.454989 0.539567 0.624281 0.709923 0.797531
0.888021 0.982034 1.0799 1.18163 1.28699 1.39558 1.50684 1.62016 1.73494 1.85057 1.96652
2.08227 2.1974 2.31153 2.42434 2.53556 2.64494 2.75231 2.8575 2.96037 3.06083 3.1588
3.2542 3.347 3.43716 3.52468 3.60954 3.69176 3.77134 3.84832 3.92271 3.99457 4.06393
4.13083 4.19533 4.25747 4.31732 4.37493 4.43036 4.48366 4.53491 4.58415 4.63145 4.67687
4.72047 4.76232 4.80246 4.84096 4.87787 4.91326 4.94717 4.97966 5.01079 5.0406 5.06914
5.09647 5.12263 5.14766 5.17162 5.19454 5.21646 5.23756 5.25787 5.27728 5.29585 5.3136
5.33056 5.34678 5.36228 5.3771 5.39125 5.40477 5.4177 5.43004 5.44183 5.4531 5.46386
5.47413 5.48395 5.49332 5.50227 5.51081 5.51897 5.52676 5.5342 5.5413 5.54808 5.55455
5.56073 5.56662 5.57225 5.58264 #bodywt for gender,fleet: 2 / 3
 0 0.0167249 0.0370579 0.0748703 0.135936 0.221155 0.32493 0.437177 0.547174 0.646684
0.731167 0.799414 0.852474 0.892553 0.922189 0.943779 0.959353 0.970525 0.97852 0.984246
0.988357 0.991322 0.993473 0.995044 0.9962 0.997058 0.9977 0.998184 0.998552 0.998836
0.999055 0.999226 0.999361 0.999468 0.999553 0.999622 0.999678 0.999724 0.999761 0.999793
0.999818 0.99984 0.999859 0.999874 0.999887 0.999899 0.999909 0.999917 0.999924 0.999931
0.999936 0.999941 0.999946 0.99995 0.999953 0.999956 0.999959 0.999961 0.999963 0.999965
0.999967 0.999969 0.99997 0.999972 0.999973 0.999974 0.999975 0.999976 0.999977 0.999978
0.999978 0.999979 0.999979 0.99998 0.99998 0.999981 0.999981 0.999982 0.999982 0.999982
0.999983 0.999983 0.999983 0.999983 0.999984 0.999984 0.999984 0.999984 0.999984 0.999985
0.999985 0.999985 0.999985 0.999985 0.999985 0.999986 0.999986 0.999986 0.999986 0.999986
0.999986 #selex for gender,fleet: 2 / 3
 0.0553231 0.193613 0.265935 0.348553 0.439452 0.536294 0.636886 0.739542 0.843213
0.947398 1.05198 1.15703 1.26271 1.36915 1.47646 1.58462 1.69359 1.8032 1.91327 2.02355
2.13377 2.24364 2.35289 2.46123 2.56841 2.67419 2.77835 2.8807 2.98109 3.07936 3.1754
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3.26912 3.36044 3.44931 3.53569 3.61956 3.70089 3.7797 3.85599 3.92978 4.00109 4.06997
4.13644 4.20056 4.26236 4.3219 4.37924 4.43441 4.48749 4.53853 4.58759 4.63472 4.67999
4.72345 4.76516 4.80518 4.84357 4.88039 4.91568 4.94951 4.98192 5.01298 5.04272 5.0712
5.09847 5.12458 5.14956 5.17347 5.19635 5.21823 5.2393 5.25958 5.27897 5.29752 5.31524
5.33219 5.34839 5.36387 5.37867 5.39281 5.40632 5.41923 5.43156 5.44334 5.45459 5.46534
5.4756 5.48541 5.49477 5.50371 5.51225 5.5204 5.52818 5.53561 5.5427 5.54948 5.55594
5.56211 5.568 5.57362 5.584 #bodywt for gender,fleet: 2 / 4
 0 0.0111546 0.0197152 0.0335408 0.0546981 0.0851674 0.126274 0.178165 0.239587 0.308076
0.380456 0.453438 0.524114 0.590258 0.650422 0.703874 0.750467 0.790465 0.824393 0.852912
0.876723 0.89651 0.912906 0.926472 0.937693 0.946981 0.954682 0.96108 0.966411 0.970867
0.974604 0.97775 0.980408 0.982664 0.984585 0.986228 0.987639 0.988856 0.989909 0.990824
0.991622 0.992321 0.992934 0.993475 0.993953 0.994378 0.994756 0.995093 0.995395 0.995666
0.99591 0.99613 0.99633 0.99651 0.996675 0.996824 0.996961 0.997086 0.9972 0.997305
0.997402 0.99749 0.997573 0.997648 0.997718 0.997783 0.997844 0.9979 0.997952 0.998
0.998043 0.998082 0.998117 0.998151 0.998182 0.998212 0.998239 0.998265 0.99829 0.998313
0.998334 0.998354 0.998374 0.998392 0.998409 0.998425 0.99844 0.998455 0.998468 0.998481
0.998493 0.998505 0.998516 0.998526 0.998536 0.998545 0.998554 0.998562 0.99857 0.998577
0.998591 #selex for gender,fleet: 2 / 4
 0.0544482 0.189972 0.261417 0.343974 0.436411 0.537106 0.644173 0.75567 0.869823
0.985195 1.10075 1.21585 1.33014 1.44349 1.55589 1.66737 1.77802 1.88787 1.99696 2.10525
2.21272 2.31928 2.42484 2.52926 2.63243 2.7342 2.83444 2.93301 3.02979 3.12466 3.21752
3.30828 3.39687 3.48322 3.56728 3.64902 3.72841 3.80544 3.8801 3.95241 4.02237 4.09002
4.15536 4.21845 4.27931 4.33798 4.39452 4.44898 4.50139 4.55181 4.60031 4.64692 4.69171
4.73473 4.77603 4.81568 4.85372 4.89021 4.9252 4.95875 4.99091 5.02172 5.05123 5.07951
5.10658 5.1325 5.15731 5.18106 5.20379 5.22553 5.24648 5.26668 5.28599 5.30446 5.32211
5.33899 5.35512 5.37055 5.38528 5.39937 5.41283 5.42568 5.43797 5.4497 5.46091 5.47162
5.48185 5.49162 5.50095 5.50985 5.51836 5.52648 5.53424 5.54164 5.54871 5.55546 5.5619
5.56805 5.57392 5.57952 5.58987 #bodywt for gender,fleet: 2 / 5
 0 0.00487217 0.00822975 0.0135146 0.0215531 0.0333344 0.0499208 0.0722927 0.101156
0.136764 0.178821 0.226485 0.278479 0.333262 0.389225 0.444855 0.498855 0.550208 0.598195
0.642378 0.682555 0.718716 0.750992 0.779605 0.804839 0.827004 0.846415 0.863382 0.878195
0.891122 0.902404 0.912256 0.920868 0.928406 0.935016 0.940821 0.945931 0.950438 0.954422
0.957952 0.961087 0.963879 0.966369 0.968598 0.970595 0.972391 0.974008 0.975468 0.976789
0.977986 0.979074 0.980065 0.980968 0.981794 0.982549 0.983242 0.983879 0.984464 0.985004
0.985502 0.985963 0.986389 0.986783 0.98715 0.98749 0.987807 0.988101 0.988376 0.988633
0.988872 0.989087 0.989279 0.989459 0.989628 0.989787 0.989936 0.990076 0.990208 0.990332
0.99045 0.99056 0.990664 0.990762 0.990855 0.990943 0.991026 0.991104 0.991178 0.991248
0.991314 0.991377 0.991437 0.991493 0.991547 0.991597 0.991645 0.991691 0.991734 0.991775
0.991814 0.991885 #selex for gender,fleet: 2 / 5
 0.056179 0.198303 0.273566 0.360816 0.458807 0.565773 0.679497 0.797528 0.917516 1.03754
1.15627 1.27298 1.3874 1.49959 1.60978 1.71826 1.82534 1.93126 2.03624 2.1404 2.24381
2.34648 2.44837 2.54941 2.64949 2.74847 2.84622 2.94259 3.03744 3.13063 3.22205 3.31157
3.3991 3.48455 3.56786 3.64896 3.72782 3.80441 3.87872 3.95073 4.02045 4.08789 4.15308
4.21604 4.2768 4.3354 4.39189 4.4463 4.49868 4.54909 4.59758 4.64419 4.68898 4.73201
4.77333 4.81299 4.85105 4.88756 4.92257 4.95614 4.98831 5.01915 5.04869 5.07698 5.10408
5.13002 5.15485 5.17862 5.20137 5.22313 5.2441 5.2643 5.28362 5.3021 5.31976 5.33665
5.35279 5.36822 5.38296 5.39706 5.41052 5.42339 5.43568 5.44742 5.45864 5.46935 5.47958
5.48936 5.49869 5.5076 5.51611 5.52424 5.532 5.53941 5.54648 5.55323 5.55968 5.56583
5.5717 5.57731 5.58766 #bodywt for gender,fleet: 2 / 6
 0 0.00140585 0.00265155 0.00484502 0.00857009 0.014654 0.0241738 0.0383868 0.0585636
0.085746 0.120497 0.162727 0.211661 0.265937 0.323815 0.383413 0.442928 0.500796 0.555783
0.607016 0.653965 0.69639 0.734286 0.767815 0.797256 0.822949 0.845269 0.864592 0.881281
0.895674 0.90808 0.918772 0.927993 0.935954 0.942836 0.948797 0.95397 0.95847 0.962393
0.965822 0.968828 0.971469 0.973796 0.975852 0.977673 0.979291 0.980732 0.982019 0.983171
0.984204 0.985135 0.985973 0.986732 0.987418 0.988042 0.988609 0.989126 0.989598 0.990031
0.990427 0.99079 0.991125 0.991433 0.991718 0.99198 0.992223 0.992449 0.992658 0.992852
0.993032 0.993192 0.993333 0.993465 0.993589 0.993705 0.993813 0.993915 0.99401 0.9941
0.994184 0.994263 0.994338 0.994408 0.994474 0.994537 0.994596 0.994651 0.994704 0.994754
0.9948 0.994845 0.994887 0.994926 0.994964 0.995 0.995033 0.995065 0.995096 0.995124
0.995151 0.995201 #selex for gender,fleet: 2 / 6
 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303
0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303
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0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303
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0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303
0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303
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0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303 0.0465303
0.0465303 0.0465303 0.0465303 #mean M for year Yinit: 2011 sex: 1
 39.8119 37.3577 34.9965 32.7823 30.7891 28.7442 26.8336 24.9836 23.1981 21.5285 20.4911
19.3023 19.0008 18.2612 18.453 18.2892 18.2443 17.862 17.8057 17.6903 17.2581 16.2309
15.4129 14.3004 13.086 11.822 10.745 9.62776 8.63302 7.79303 6.93605 6.11293 5.40555
4.77723 4.19126 3.6829 3.23842 2.85767 2.52753 2.24493 1.99916 1.78596 1.60637 1.44684
1.30939 1.1901 1.08983 0.99812 0.918261 0.848167 0.785588 0.730004 0.680211 0.635401
0.594572 0.557129 0.522617 0.490707 0.461153 0.434003 0.408938 0.385538 0.363754 0.34371
0.324924 0.308174 0.292678 0.277535 0.263289 0.249407 0.23626 0.22379 0.211928 0.20073
0.190125 0.180089 0.170574 0.16158 0.153092 0.145115 0.137616 0.130575 0.123952 0.117706
0.111823 0.106277 0.101044 0.0960975 0.0914213 0.086998 0.0828113 0.078845 0.075084
0.0715218 0.0681389 0.0649231 0.0618596 0.0589489 0.0561823 0.0535519 1.11375 #numbers
for year Yinit: 2011 sex: 1
 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798
0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798
0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798
0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798
0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798
0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798
0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798
0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798
0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798
0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798 0.0453798
0.0453798 0.0453798 0.0453798 #mean M for year Yinit: 2011 sex: 2
 39.8119 37.4007 35.077 32.8952 30.9298 28.9071 27.0138 25.1761 23.3984 21.7329 20.7018
19.515 19.223 18.4856 18.6887 18.5281 18.4823 18.087 18.0124 17.8669 17.3899 16.3042
15.4231 14.2454 12.9699 11.6542 10.5344 9.38866 8.37659 7.52793 6.67487 5.86495 5.17455
4.56612 4.00271 3.51656 3.09345 2.73248 2.42059 2.1545 1.92371 1.72396 1.55618 1.40717
1.27889 1.16754 1.07404 0.988183 0.91328 0.847365 0.78829 0.735624 0.688244 0.645413
0.606187 0.570018 0.536499 0.50534 0.476334 0.44957 0.424759 0.401497 0.379761 0.359704
0.340842 0.324007 0.308393 0.293058 0.278584 0.26441 0.250936 0.238108 0.225859 0.214259
0.203241 0.19279 0.182863 0.173467 0.164593 0.156249 0.148401 0.14103 0.134092 0.127543
0.121368 0.115539 0.11003 0.104814 0.099874 0.0951923 0.0907526 0.0865384 0.0825348
0.078736 0.0751217 0.0716798 0.0683948 0.0652686 0.0622921 0.0594575 1.27126 #numbers for
year Yinit: 2011 sex: 2
 41.4045 38.7781 36.2741 34.0379 31.8864 29.8688 28.0526 26.1892 24.448 22.7618 21.1344
19.6125 18.6663 17.5822 17.3063 16.6311 16.8043 16.6536 16.6111 16.2614 16.2086 16.1021
15.7072 14.7709 14.0253 13.0118 11.9057 10.7547 9.77405 8.75701 7.85155 7.08699 6.30714
5.55822 4.91469 4.34314 3.81018 3.34787 2.94368 2.59747 2.29731 2.04038 1.81696 1.62316
1.45993 1.31493 1.19001 1.08161 0.990483 0.907149 0.834584 0.770893 0.714031 0.663524
0.618279 0.577561 0.54046 0.506434 0.475071 0.446071 0.419212 0.394536 0.371755 0.350486
0.330686 0.312466 0.29539 0.280165 0.266078 0.252313 0.239362 0.226742 0.214789 0.203453
0.192668 0.182487 0.172845 0.163721 0.155069 0.146892 0.139174 0.131922 0.125103 0.118702
0.112681 0.107003 0.101654 0.096612 0.0918546 0.0873574 0.0831063 0.0790851 0.0752791
0.0716735 0.0682546 0.0650163 0.0619411 0.0590178 0.0562329 0.053587 1.1122 #numbers for
year Ydeclare: 2013 sex: 1
 41.4045 38.8228 36.3577 34.1556 32.0334 30.0407 28.2457 26.3981 24.6687 22.9898 21.3656
19.8437 18.901 17.816 17.5478 16.873 17.0565 16.9082 16.8645 16.5022 16.4325 16.2982
15.8615 14.8699 14.0651 12.9899 11.8258 10.6253 9.60357 8.55831 7.63514 6.86107 6.08314
5.34467 4.71524 4.16059 3.64704 3.20396 2.81835 2.4894 2.2052 1.96275 1.75247 1.57049
1.41763 1.28189 1.16504 1.06362 0.978455 0.900255 0.832035 0.772 0.718196 0.670228
0.627074 0.588062 0.552331 0.519385 0.488851 0.460466 0.43404 0.409657 0.387052 0.365858
0.346054 0.327779 0.310592 0.295252 0.281025 0.267052 0.253861 0.240946 0.228667 0.216977
0.205814 0.195242 0.185201 0.175676 0.166629 0.158066 0.149978 0.142374 0.135222 0.128505
0.122182 0.116214 0.110586 0.105275 0.100255 0.0955023 0.091001 0.0867351 0.0826896
0.0788498 0.0752019 0.0717404 0.0684473 0.0653111 0.0623181 0.0594695 1.26925 #numbers
for year Ydeclare: 2013 sex: 2
#R0  1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932
1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950
1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968
1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986
1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004
2005 2006 2007 2008 2009 2010 #years
173.838  173.838 173.813 173.779 173.741 173.716 173.689 173.663 173.637 173.611 173.581
173.538 173.488 173.432 173.367 173.279 173.187 173.109 173.034 172.975 172.901 172.813
172.696 172.582 172.471 172.387 172.256 172.093 171.89 171.386 170.881 170.035 169.326
169.053 168.733 168.525 168.303 168.026 167.79 167.616 167.391 167.101 166.742 166.322
165.867 165.46 165.09 164.788 164.424 164.144 163.96 163.138 162.818 162.439 162.04
161.084 160.44 159.546 158.374 157.236 155.916 154.673 153.16 151.558 148.665 145.637
143.097 139.273 133.971 130.074 126.85 122.684 120.156 117.016 113.284 108.047 104.83
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98.8191 92.1397 86.1151 82.3463 77.5783 73.7874 69.076 68.0837 65.6376 66.1885 66.1294
67.8099 69.5473 71.1769 72.6839 74.2398 75.4187 76.8292 78.2741 79.6238 #Recruits
7.73168e+008 7.73168e+008 7.72824e+008 7.7235e+008 7.71817e+008 7.71465e+008
7.71091e+008 7.70722e+008 7.70371e+008 7.70004e+008 7.69583e+008 7.6898e+008 7.68289e+008
7.67508e+008 7.66616e+008 7.65395e+008 7.64126e+008 7.63052e+008 7.62026e+008
7.61204e+008 7.60197e+008 7.58986e+008 7.574e+008 7.5585e+008 7.54333e+008 7.53202e+008
7.5143e+008 7.49242e+008 7.46517e+008 7.39835e+008 7.33207e+008 7.22289e+008 7.133e+008
7.09874e+008 7.05893e+008 7.03331e+008 7.00592e+008 6.97211e+008 6.94341e+008
6.92234e+008 6.89519e+008 6.86043e+008 6.81773e+008 6.76828e+008 6.71524e+008
6.66816e+008 6.62579e+008 6.59144e+008 6.55035e+008 6.51901e+008 6.49843e+008 6.4078e+008
6.37299e+008 6.33201e+008 6.28931e+008 6.18831e+008 6.12143e+008 6.03017e+008
5.91305e+008 5.80202e+008 5.67643e+008 5.56118e+008 5.4247e+008 5.28457e+008 5.04227e+008
4.80242e+008 4.61127e+008 4.33931e+008 3.99085e+008 3.75354e+008 3.56821e+008
3.34212e+008 3.21174e+008 3.05646e+008 2.8809e+008 2.6496e+008 2.51554e+008 2.27984e+008
2.03839e+008 1.83703e+008 1.71822e+008 1.57515e+008 1.46678e+008 1.33828e+008
1.31204e+008 1.24853e+008 1.26269e+008 1.26117e+008 1.30485e+008 1.35084e+008
1.39476e+008 1.43609e+008 1.47948e+008 1.51285e+008 1.55337e+008 1.59554e+008
1.63557e+008 #SpawnBio
0.44056 0.5 0 # spawn-recr steepness, sigmaR, autocorr
values from cat100_hmle, catch at 100% and steepness at mle value. # this is state of
nature 5 out of 9 (in no particular order) # and parameter set number 1 out of 4 for this
state
 0 0 28.3083 103.285 341.553 1014.2 2671.83 6204.22 12732.7 23330.1 38706.4 59025.3
83919.4 112652 144327 178069 213134 248951 285123 321394 357616 393710 429639 465389
500951 536316 571471 606397 641068 675453 709517 743223 776532 809406 841807 873699
905048 935824 965999 995548 1.02445e+006 1.05268e+006 1.08023e+006 1.10709e+006
1.13325e+006 1.15869e+006 1.18343e+006 1.20744e+006 1.23075e+006 1.25334e+006
1.27523e+006 1.29641e+006 1.31691e+006 1.33672e+006 1.35586e+006 1.37433e+006
1.39217e+006 1.40936e+006 1.42594e+006 1.4419e+006 1.45728e+006 1.47208e+006 1.48632e+006
1.50001e+006 1.51318e+006 1.52583e+006 1.53798e+006 1.54965e+006 1.56086e+006
1.57161e+006 1.58192e+006 1.59208e+006 1.60182e+006 1.61116e+006 1.62012e+006 1.6287e+006
1.63692e+006 1.6448e+006 1.65234e+006 1.65957e+006 1.66648e+006 1.6731e+006 1.67944e+006
1.6855e+006 1.6913e+006 1.69685e+006 1.70216e+006 1.70724e+006 1.71209e+006 1.71673e+006
1.72117e+006 1.72541e+006 1.72946e+006 1.73334e+006 1.73704e+006 1.74058e+006
1.74396e+006 1.74719e+006 1.75027e+006 1.75322e+006 1.75866e+006 #female fecundity;
weighted by N in year Y_init across morphs and areas
 0.045147 0.163178 0.222696 0.290492 0.365223 0.445539 0.530285 0.618588 0.709839
0.803631 0.899683 0.997778 1.09772 1.19929 1.30227 1.4064 1.51143 1.61705 1.72297 1.82891
1.93457 2.03968 2.14398 2.24722 2.34919 2.44969 2.54855 2.6456 2.74072 2.8338 2.92474
3.01346 3.09991 3.18404 3.26582 3.34522 3.42225 3.4969 3.56919 3.63912 3.70673 3.77204
3.83509 3.89593 3.95458 4.0111 4.06554 4.11794 4.16836 4.21686 4.26348 4.30828 4.35131
4.39264 4.43231 4.47038 4.5069 4.54192 4.57551 4.6077 4.63855 4.6681 4.69641 4.72352
4.74949 4.77434 4.79812 4.82089 4.84267 4.86351 4.88357 4.9029 4.92139 4.93906 4.95596
4.97211 4.98755 5.0023 5.01641 5.02988 5.04276 5.05506 5.06681 5.07803 5.08876 5.099
5.10878 5.11812 5.12704 5.13555 5.14369 5.15145 5.15886 5.16594 5.1727 5.17914 5.1853
5.19117 5.19678 5.20214 5.212 #bodywt for gender,fleet: 1 / 1
 0 0.0511233 0.0772332 0.112337 0.156989 0.21065 0.271667 0.337561 0.405497 0.472761
0.537103 0.596902 0.65118 0.699515 0.741909 0.778656 0.810226 0.837169 0.860061 0.879454
0.895857 0.909726 0.921458 0.931394 0.939825 0.946995 0.953108 0.958335 0.962819 0.966677
0.970009 0.972894 0.975403 0.977591 0.979505 0.981186 0.982667 0.983975 0.985135 0.986165
0.987085 0.987906 0.988643 0.989305 0.989902 0.990442 0.99093 0.991373 0.991776 0.992144
0.992479 0.992786 0.993068 0.993326 0.993564 0.993783 0.993985 0.994172 0.994345 0.994505
0.994654 0.994792 0.994921 0.995041 0.995152 0.995256 0.995354 0.995445 0.99553 0.995609
0.995681 0.995746 0.995807 0.995865 0.995919 0.995969 0.996017 0.996062 0.996105 0.996145
0.996183 0.996219 0.996253 0.996285 0.996315 0.996343 0.996371 0.996396 0.99642 0.996444
0.996465 0.996486 0.996506 0.996524 0.996542 0.996559 0.996575 0.99659 0.996604 0.996618
0.996643 #selex for gender,fleet: 1 / 1
 0.0462809 0.169552 0.232356 0.304214 0.383486 0.468356 0.557183 0.648721 0.74217
0.837091 0.933287 1.03069 1.12928 1.22902 1.32986 1.43167 1.53431 1.63757 1.74123 1.84504
1.94873 2.05204 2.15472 2.25653 2.35722 2.4566 2.55447 2.65067 2.74505 2.83748 2.92786
3.0161 3.10213 3.1859 3.26737 3.34651 3.4233 3.49775 3.56986 3.63965 3.70713 3.77233
3.83528 3.89603 3.95461 4.01106 4.06544 4.1178 4.16818 4.21663 4.26322 4.30799 4.351
4.39231 4.43196 4.47001 4.50651 4.54152 4.5751 4.60728 4.63811 4.66766 4.69597 4.72307
4.74903 4.77387 4.79766 4.82042 4.84219 4.86303 4.88309 4.90242 4.9209 4.93857 4.95546
4.97162 4.98705 5.00181 5.01591 5.02938 5.04226 5.05456 5.06631 5.07753 5.08825 5.09849
5.10827 5.11761 5.12653 5.13505 5.14318 5.15094 5.15835 5.16543 5.17218 5.17863 5.18479
5.19066 5.19627 5.20162 5.21149 #bodywt for gender,fleet: 1 / 2
 0 0.0213283 0.0352642 0.0561355 0.0857149 0.125189 0.174691 0.233098 0.298189 0.367085
0.436791 0.504638 0.56856 0.627179 0.679765 0.726107 0.766378 0.800993 0.830503 0.855511
0.876615 0.89438 0.909315 0.921869 0.932428 0.941321 0.948827 0.955176 0.960562 0.965145
0.969056 0.972406 0.975285 0.977769 0.979918 0.981784 0.983411 0.984833 0.986082 0.987181

0.988151 0.989011 0.989776 0.990457 0.991066 0.991611 0.992102 0.992544 0.992943 0.993304
0.993632 0.993931 0.994202 0.994451 0.994678 0.994886 0.995077 0.995253 0.995415 0.995564
0.995702 0.99583 0.995949 0.996059 0.996161 0.996256 0.996344 0.996426 0.996503 0.996575
0.99664 0.996697 0.996751 0.996801 0.996849 0.996894 0.996936 0.996975 0.997012 0.997047
0.99708 0.997112 0.997141 0.997169 0.997195 0.99722 0.997243 0.997266 0.997287 0.997306
0.997325 0.997343 0.99736 0.997376 0.997391 0.997406 0.997419 0.997432 0.997444 0.997456
0.997478 #selex for gender,fleet: 1 / 2
 0.0504337 0.189018 0.257432 0.331995 0.409383 0.487655 0.566341 0.645863 0.726964
0.810375 0.896654 0.986129 1.07889 1.17484 1.2737 1.37507 1.4785 1.58348 1.68953 1.79614
1.90288 2.00933 2.11512 2.21995 2.32351 2.42558 2.52596 2.62445 2.72094 2.81528 2.9074
2.99721 3.08467 3.16972 3.25235 3.33253 3.41028 3.48558 3.55846 3.62895 3.69706 3.76284
3.82631 3.88754 3.94655 4.0034 4.05814 4.11083 4.16151 4.21025 4.25709 4.3021 4.34533
4.38683 4.42667 4.46489 4.50156 4.53672 4.57043 4.60273 4.63369 4.66335 4.69176 4.71896
4.745 4.76994 4.7938 4.81663 4.83848 4.85938 4.87949 4.89886 4.91738 4.93509 4.95202
4.96821 4.98368 4.99846 5.01259 5.02609 5.03899 5.05131 5.06309 5.07433 5.08507 5.09533
5.10513 5.11449 5.12342 5.13196 5.1401 5.14788 5.15531 5.1624 5.16916 5.17562 5.18179
5.18767 5.19329 5.19865 5.20854 #bodywt for gender,fleet: 1 / 3
 0 0.0168565 0.0359177 0.0704144 0.125351 0.201915 0.296018 0.399604 0.503567 0.600364
0.685263 0.756326 0.813704 0.85879 0.893511 0.919871 0.93969 0.954505 0.965548 0.973775
0.979914 0.984509 0.987963 0.990573 0.992557 0.994075 0.995243 0.99615 0.996858 0.997415
0.997857 0.998209 0.998492 0.998722 0.998908 0.999062 0.999188 0.999293 0.99938 0.999454
0.999516 0.999569 0.999614 0.999653 0.999686 0.999715 0.99974 0.999762 0.999781 0.999798
0.999813 0.999826 0.999838 0.999848 0.999857 0.999866 0.999873 0.99988 0.999886 0.999892
0.999897 0.999902 0.999906 0.99991 0.999913 0.999916 0.999919 0.999922 0.999925 0.999927
0.999929 0.999931 0.999932 0.999934 0.999935 0.999937 0.999938 0.999939 0.99994 0.999941
0.999942 0.999943 0.999944 0.999945 0.999945 0.999946 0.999947 0.999947 0.999948 0.999948
0.999949 0.999949 0.99995 0.99995 0.999951 0.999951 0.999952 0.999952 0.999952 0.999952
0.999953 #selex for gender,fleet: 1 / 3
 0.0466444 0.171812 0.236089 0.310135 0.392403 0.480968 0.573886 0.669515 0.76669
0.864713 0.963252 1.0622 1.16158 1.26144 1.36181 1.4627 1.56407 1.66582 1.7678 1.86984
1.97175 2.0733 2.17428 2.27446 2.37364 2.4716 2.56818 2.66318 2.75648 2.84792 2.93742
3.02485 3.11016 3.19328 3.27417 3.35278 3.4291 3.50313 3.57486 3.6443 3.71147 3.77639
3.83909 3.8996 3.95797 4.01424 4.06845 4.12065 4.17089 4.21921 4.26568 4.31034 4.35325
4.39447 4.43403 4.472 4.50844 4.54338 4.57689 4.60901 4.6398 4.6693 4.69756 4.72462
4.75054 4.77535 4.79909 4.82182 4.84357 4.86437 4.88442 4.90372 4.92219 4.93984 4.95672
4.97286 4.98828 5.00302 5.01711 5.03057 5.04343 5.05572 5.06746 5.07868 5.08939 5.09962
5.10939 5.11873 5.12764 5.13615 5.14427 5.15203 5.15943 5.16651 5.17325 5.1797 5.18585
5.19172 5.19732 5.20267 5.21253 #bodywt for gender,fleet: 1 / 4
 0 0.011426 0.0195259 0.0322319 0.0512246 0.078121 0.11406 0.159308 0.213068 0.273565
0.338381 0.40488 0.470599 0.533513 0.592155 0.645622 0.693497 0.735745 0.772597 0.804456
0.831809 0.855178 0.875076 0.891982 0.906331 0.91851 0.928852 0.937647 0.945139 0.951534
0.957006 0.961703 0.965744 0.969233 0.972253 0.974877 0.977164 0.979163 0.980916 0.982458
0.983819 0.985024 0.986093 0.987045 0.987895 0.988656 0.989339 0.989954 0.990509 0.99101
0.991464 0.991877 0.992253 0.992596 0.992909 0.993196 0.993459 0.993701 0.993923 0.994128
0.994317 0.994492 0.994655 0.994805 0.994944 0.995074 0.995195 0.995307 0.995412 0.99551
0.995597 0.995675 0.995748 0.995816 0.99588 0.995941 0.995997 0.996051 0.996101 0.996148
0.996193 0.996235 0.996275 0.996312 0.996348 0.996381 0.996413 0.996443 0.996471 0.996498
0.996523 0.996547 0.99657 0.996591 0.996612 0.996631 0.996649 0.996667 0.996683 0.996699
0.996728 #selex for gender,fleet: 1 / 4
 0.0458503 0.168306 0.231642 0.305371 0.388624 0.480165 0.578473 0.681886 0.788778
0.897715 1.00756 1.11747 1.22692 1.33558 1.44328 1.54993 1.65553 1.76007 1.86354 1.96594
2.06723 2.16738 2.26632 2.36398 2.46027 2.5551 2.64839 2.74004 2.82997 2.9181 3.00434
3.08863 3.17093 3.25117 3.32932 3.40534 3.47923 3.55097 3.62055 3.68798 3.75327 3.81643
3.87749 3.93648 3.99343 4.04836 4.10133 4.15238 4.20154 4.24886 4.29439 4.33817 4.38026
4.42071 4.45956 4.49687 4.53267 4.56703 4.59999 4.6316 4.6619 4.69094 4.71878 4.74544
4.77098 4.79543 4.81885 4.84126 4.86271 4.88324 4.90305 4.92218 4.94047 4.95796 4.97469
4.99068 5.00597 5.02058 5.03454 5.04789 5.06064 5.07282 5.08446 5.09558 5.1062 5.11635
5.12604 5.13529 5.14413 5.15257 5.16063 5.16832 5.17567 5.18268 5.18938 5.19577 5.20187
5.2077 5.21325 5.21856 5.22834 #bodywt for gender,fleet: 1 / 5
 0 0.00497951 0.00812772 0.0129303 0.0200354 0.0302067 0.0442625 0.0629721 0.086926
0.116411 0.151331 0.191188 0.235142 0.282111 0.330901 0.380324 0.429299 0.476909 0.522437
0.565367 0.605371 0.642279 0.67605 0.706745 0.734491 0.759464 0.781866 0.801913 0.819821
0.835799 0.850049 0.862754 0.874085 0.884197 0.893229 0.901303 0.908532 0.915011 0.920828
0.926059 0.93077 0.935021 0.938862 0.94234 0.945494 0.948359 0.950967 0.953345 0.955515
0.957501 0.95932 0.960989 0.962523 0.963934 0.965235 0.966436 0.967546 0.968573 0.969524
0.970407 0.971227 0.971989 0.972699 0.97336 0.973977 0.974553 0.975091 0.975595 0.976066
0.976508 0.976906 0.977266 0.977603 0.977921 0.97822 0.978501 0.978766 0.979016 0.979252
0.979474 0.979684 0.979882 0.98007 0.980247 0.980414 0.980573 0.980723 0.980865 0.980999
0.981126 0.981247 0.981362 0.98147 0.981573 0.981671 0.981763 0.981851 0.981935 0.982014
0.982089 0.982227 #selex for gender,fleet: 1 / 5

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 0.047457 0.17645 0.243537 0.321908 0.410686 0.508516 0.613589 0.723785 0.836934 0.951109
1.06483 1.17713 1.28749 1.39572 1.50187 1.60609 1.70859 1.80956 1.90918 2.00759 2.10486
2.20106 2.29619 2.39022 2.48312 2.5748 2.66519 2.7542 2.84174 2.92771 3.01203 3.09461
3.17538 3.25429 3.33126 3.40625 3.47924 3.55019 3.61909 3.68593 3.7507 3.81342 3.87411
3.93277 3.98943 4.04413 4.0969 4.14777 4.19679 4.24398 4.28941 4.33311 4.37514 4.41552
4.45433 4.4916 4.52738 4.56171 4.59466 4.62625 4.65655 4.68559 4.71343 4.74009 4.76564
4.7901 4.81352 4.83595 4.85741 4.87795 4.89777 4.91689 4.93519 4.95268 4.96941 4.98541
5.0007 5.01531 5.02928 5.04263 5.05538 5.06757 5.07922 5.09034 5.10097 5.11112 5.12081
5.13007 5.13891 5.14735 5.15542 5.16311 5.17046 5.17748 5.18418 5.19057 5.19668 5.20251
5.20807 5.21338 5.22317 #bodywt for gender,fleet: 1 / 6
 0 0.00140879 0.00257294 0.0045632 0.00785473 0.0131087 0.0211776 0.0330585 0.0497792
0.0722262 0.100961 0.136078 0.177153 0.223289 0.273245 0.325598 0.378907 0.431846
0.483294 0.532373 0.578462 0.62117 0.660309 0.695849 0.727877 0.756568 0.782144 0.80486
0.824981 0.842767 0.858471 0.872327 0.884551 0.895338 0.904864 0.913285 0.920737 0.927341
0.933203 0.938416 0.943059 0.947203 0.950909 0.95423 0.957211 0.959893 0.962311 0.964495
0.966471 0.968263 0.969891 0.971372 0.972723 0.973958 0.975087 0.976122 0.977072 0.977946
0.97875 0.979492 0.980177 0.980811 0.981398 0.981942 0.982447 0.982916 0.983353 0.983759
0.984139 0.984493 0.984808 0.985089 0.985353 0.9856 0.985832 0.986049 0.986254 0.986446
0.986628 0.986798 0.986959 0.98711 0.987253 0.987388 0.987515 0.987635 0.987749 0.987856
0.987958 0.988054 0.988145 0.988231 0.988312 0.98839 0.988463 0.988532 0.988598 0.98866
0.98872 0.988776 0.988879 #selex for gender,fleet: 1 / 6
 0.0539259 0.185573 0.25267 0.328419 0.411174 0.499395 0.591863 0.687727 0.786456
0.887728 0.991338 1.09712 1.20489 1.31446 1.42557 1.53794 1.65126 1.7652 1.87941 1.99355
2.1073 2.22035 2.33241 2.44322 2.55253 2.66014 2.76586 2.86955 2.97105 3.07027 3.1671
3.26149 3.35337 3.44271 3.52948 3.61367 3.69528 3.77432 3.8508 3.92475 3.99621 4.06521
4.13179 4.19599 4.25787 4.31749 4.37488 4.43012 4.48325 4.53434 4.58344 4.63062 4.67593
4.71944 4.76119 4.80125 4.83969 4.87654 4.91187 4.94574 4.97819 5.00929 5.03907 5.06759
5.0949 5.12104 5.14607 5.17001 5.19293 5.21485 5.23595 5.25627 5.2757 5.29428 5.31205
5.32903 5.34526 5.36078 5.37561 5.38979 5.40333 5.41627 5.42863 5.44045 5.45173 5.46251
5.4728 5.48264 5.49203 5.501 5.50956 5.51774 5.52555 5.533 5.54012 5.54692 5.55341 5.5596
5.56551 5.57116 5.58159 #bodywt for gender,fleet: 2 / 1
 0 0.0518398 0.079816 0.117909 0.166721 0.225504 0.292161 0.363647 0.436587 0.507864
0.575011 0.636368 0.691057 0.738838 0.779931 0.814846 0.844245 0.868839 0.889325 0.906346
0.920474 0.932201 0.941947 0.950061 0.956834 0.962504 0.967267 0.971282 0.974679 0.977566
0.980027 0.982135 0.983947 0.985511 0.986866 0.988045 0.989074 0.989975 0.990768 0.991468
0.992087 0.992636 0.993126 0.993564 0.993956 0.994308 0.994625 0.994912 0.995171 0.995406
0.99562 0.995816 0.995994 0.996157 0.996306 0.996443 0.996569 0.996686 0.996793 0.996892
0.996984 0.997069 0.997148 0.997221 0.997289 0.997353 0.997412 0.997468 0.997519 0.997568
0.997611 0.99765 0.997687 0.997721 0.997754 0.997784 0.997813 0.99784 0.997865 0.997889
0.997912 0.997933 0.997953 0.997972 0.99799 0.998008 0.998024 0.998039 0.998053 0.998067
0.99808 0.998092 0.998104 0.998115 0.998125 0.998135 0.998145 0.998154 0.998162 0.99817
0.998185 #selex for gender,fleet: 2 / 1
 0.0552534 0.192681 0.263397 0.343528 0.43103 0.5238 0.620085 0.718683 0.818926 0.920536
1.02346 1.12775 1.23345 1.34057 1.44904 1.55872 1.66943 1.78089 1.89283 2.00493 2.11687
2.22834 2.33904 2.44867 2.557 2.66377 2.7688 2.8719 2.97292 3.07173 3.16823 3.26234
3.35399 3.44314 3.52976 3.61382 3.69532 3.77427 3.85069 3.92458 3.99599 4.06495 4.1315
4.19568 4.25754 4.31714 4.37452 4.42975 4.48287 4.53396 4.58306 4.63023 4.67554 4.71904
4.7608 4.80086 4.83929 4.87615 4.91149 4.94535 4.97781 5.0089 5.03869 5.06721 5.09452
5.12067 5.14569 5.16964 5.19256 5.21448 5.23559 5.25591 5.27534 5.29392 5.31169 5.32867
5.34491 5.36042 5.37526 5.38943 5.40297 5.41592 5.42828 5.44009 5.45138 5.46216 5.47245
5.48229 5.49168 5.50065 5.50921 5.51739 5.5252 5.53266 5.53977 5.54657 5.55306 5.55925
5.56517 5.57081 5.58124 #bodywt for gender,fleet: 2 / 2
 0 0.0217085 0.0367487 0.0596831 0.0925919 0.136787 0.192233 0.257331 0.329197 0.404272
0.479017 0.550442 0.616385 0.675562 0.727455 0.772127 0.810028 0.841829 0.868293 0.890188
0.908235 0.923079 0.935281 0.945317 0.953582 0.960405 0.966052 0.970742 0.974651 0.977922
0.98067 0.982988 0.984953 0.986624 0.988052 0.989277 0.990333 0.991246 0.992039 0.992731
0.993336 0.993868 0.994337 0.994751 0.995119 0.995446 0.995738 0.996 0.996235 0.996446
0.996637 0.99681 0.996966 0.997109 0.997238 0.997357 0.997465 0.997564 0.997655 0.997739
0.997816 0.997887 0.997953 0.998014 0.99807 0.998123 0.998171 0.998216 0.998259 0.998298
0.998333 0.998364 0.998393 0.99842 0.998446 0.99847 0.998493 0.998514 0.998534 0.998553
0.998571 0.998587 0.998603 0.998618 0.998632 0.998645 0.998658 0.99867 0.998681 0.998691
0.998701 0.998711 0.99872 0.998728 0.998736 0.998744 0.998751 0.998758 0.998765 0.998771
0.998782 #selex for gender,fleet: 2 / 2
 0.0601075 0.214219 0.290644 0.372767 0.456919 0.541321 0.625889 0.711421 0.798942
0.889352 0.983281 1.08104 1.18265 1.28787 1.39629 1.50736 1.62049 1.73505 1.85046 1.96618
2.08171 2.19662 2.31053 2.42313 2.53414 2.64333 2.7505 2.85551 2.95821 3.05851 3.15632
3.25159 3.34425 3.4343 3.5217 3.60646 3.68857 3.76807 3.84497 3.91929 3.99109 4.06039
4.12724 4.1917 4.25381 4.31363 4.37121 4.42662 4.47991 4.53115 4.58038 4.62768 4.6731
4.71671 4.75856 4.79871 4.83723 4.87416 4.90956 4.94349 4.97601 5.00716 5.03699 5.06556
5.09292 5.1191 5.14417 5.16815 5.1911 5.21306 5.23419 5.25452 5.27397 5.29257 5.31035
5.32735 5.3436 5.35913 5.37398 5.38816 5.40172 5.41467 5.42705 5.43887 5.45016 5.46095
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5.47125 5.48109 5.49049 5.49947 5.50804 5.51623 5.52404 5.5315 5.53863 5.54543 5.55192
5.55812 5.56404 5.56969 5.58013 #bodywt for gender,fleet: 2 / 3
 0 0.0173676 0.0382509 0.0767998 0.138612 0.224342 0.328234 0.44021 0.549681 0.648575
0.732478 0.80025 0.852958 0.892796 0.92228 0.94378 0.959307 0.970457 0.978446 0.984174
0.988291 0.991264 0.993423 0.995001 0.996164 0.997028 0.997674 0.998163 0.998535 0.99882
0.999042 0.999215 0.999351 0.99946 0.999546 0.999616 0.999673 0.999719 0.999757 0.999789
0.999815 0.999837 0.999856 0.999872 0.999885 0.999897 0.999907 0.999915 0.999923 0.999929
0.999935 0.99994 0.999945 0.999949 0.999952 0.999955 0.999958 0.99996 0.999963 0.999965
0.999966 0.999968 0.99997 0.999971 0.999972 0.999973 0.999974 0.999975 0.999976 0.999977
0.999978 0.999978 0.999979 0.999979 0.99998 0.99998 0.999981 0.999981 0.999982 0.999982
0.999982 0.999983 0.999983 0.999983 0.999983 0.999984 0.999984 0.999984 0.999984 0.999984
0.999985 0.999985 0.999985 0.999985 0.999985 0.999985 0.999985 0.999986 0.999986 0.999986
0.999986 #selex for gender,fleet: 2 / 3
 0.0556789 0.195209 0.267577 0.35015 0.44094 0.537655 0.638145 0.74075 0.844425 0.948657
1.0533 1.15843 1.26416 1.37063 1.47791 1.58603 1.69489 1.80437 1.91426 2.02434 2.13434
2.24397 2.35297 2.46106 2.56799 2.67352 2.77744 2.87956 2.97971 3.07777 3.17361 3.26714
3.35829 3.447 3.53323 3.61695 3.69816 3.77685 3.85304 3.92673 3.99796 4.06676 4.13317
4.19723 4.25898 4.31848 4.37577 4.43092 4.48397 4.53499 4.58403 4.63115 4.67641 4.71987
4.76159 4.80161 4.84001 4.87684 4.91214 4.94599 4.97842 5.00949 5.03926 5.06776 5.09506
5.12119 5.1462 5.17013 5.19304 5.21495 5.23604 5.25635 5.27578 5.29435 5.31211 5.32909
5.34532 5.36083 5.37566 5.38983 5.40337 5.41631 5.42867 5.44048 5.45176 5.46253 5.47283
5.48266 5.49205 5.50101 5.50957 5.51775 5.52556 5.53301 5.54013 5.54692 5.55341 5.5596
5.56551 5.57116 5.58159 #bodywt for gender,fleet: 2 / 4
 0 0.0116461 0.020415 0.0344617 0.0557967 0.0863221 0.127287 0.178795 0.239606 0.307321
0.37886 0.451034 0.521016 0.586629 0.646439 0.699711 0.746272 0.786357 0.820457 0.849204
0.873276 0.893338 0.910009 0.92384 0.935311 0.94483 0.952741 0.95933 0.964832 0.96944
0.973313 0.97658 0.979345 0.981696 0.983701 0.985419 0.986896 0.988172 0.989277 0.990239
0.991079 0.991814 0.992462 0.993033 0.993538 0.993987 0.994387 0.994744 0.995065 0.995352
0.995611 0.995845 0.996057 0.99625 0.996424 0.996584 0.996729 0.996862 0.996984 0.997096
0.997199 0.997294 0.997382 0.997463 0.997538 0.997607 0.997672 0.997732 0.997788 0.99784
0.997886 0.997927 0.997965 0.998001 0.998035 0.998066 0.998096 0.998124 0.99815 0.998175
0.998198 0.99822 0.99824 0.99826 0.998278 0.998295 0.998312 0.998327 0.998342 0.998356
0.998369 0.998381 0.998393 0.998404 0.998414 0.998424 0.998434 0.998443 0.998451 0.998459
0.998474 #selex for gender,fleet: 2 / 4
 0.0547497 0.191323 0.26274 0.345176 0.437425 0.537908 0.644796 0.756201 0.870385 0.98592
1.10176 1.21722 1.33192 1.44568 1.55846 1.6703 1.78122 1.89128 2.00049 2.10884 2.21629
2.32278 2.42819 2.53244 2.63538 2.7369 2.83686 2.93515 3.03163 3.12621 3.21877 3.30925
3.39755 3.48363 3.56744 3.64893 3.72809 3.80491 3.87937 3.9515 4.02129 4.08877 4.15397
4.21692 4.27766 4.33623 4.39267 4.44703 4.49937 4.54972 4.59815 4.64471 4.68945 4.73243
4.7737 4.81332 4.85133 4.8878 4.92278 4.95632 4.98847 5.01927 5.04879 5.07706 5.10414
5.13007 5.15489 5.17865 5.20139 5.22314 5.24411 5.26433 5.28366 5.30215 5.31983 5.33674
5.3529 5.36834 5.3831 5.39721 5.4107 5.42358 5.43589 5.44765 5.45888 5.46962 5.47987
5.48966 5.49901 5.50794 5.51647 5.52461 5.53239 5.53981 5.5469 5.55367 5.56013 5.5663
5.57219 5.57781 5.5882 #bodywt for gender,fleet: 2 / 5
 0 0.00506505 0.00846584 0.0137649 0.0217505 0.0333584 0.049588 0.0713603 0.0993433
0.133791 0.174451 0.220563 0.270956 0.324199 0.37878 0.433257 0.486373 0.537128 0.584791
0.628896 0.669207 0.705673 0.738382 0.767523 0.793343 0.816128 0.836171 0.853766 0.86919
0.882702 0.89454 0.904913 0.914012 0.922003 0.92903 0.93522 0.940683 0.945514 0.949795
0.953597 0.956981 0.960001 0.9627 0.965119 0.967293 0.969249 0.971013 0.972609 0.974054
0.975367 0.97656 0.977648 0.978642 0.979551 0.980383 0.981148 0.981851 0.982498 0.983095
0.983646 0.984156 0.984628 0.985066 0.985473 0.985851 0.986203 0.986531 0.986836 0.987122
0.987389 0.987628 0.987842 0.988044 0.988232 0.98841 0.988577 0.988733 0.988881 0.98902
0.989151 0.989275 0.989392 0.989502 0.989606 0.989704 0.989797 0.989884 0.989968 0.990046
0.990121 0.990191 0.990258 0.990321 0.990381 0.990438 0.990492 0.990543 0.990592 0.990638
0.990681 0.990762 #selex for gender,fleet: 2 / 5
 0.0566297 0.200386 0.275902 0.363338 0.461434 0.568422 0.682087 0.799992 0.91981 1.03964
1.15817 1.27469 1.38893 1.50094 1.61096 1.71927 1.82617 1.93192 2.03671 2.14067 2.24388
2.34635 2.44803 2.54886 2.64872 2.74749 2.84503 2.9412 3.03586 3.12886 3.2201 3.30945
3.39682 3.48212 3.56529 3.64626 3.725 3.80148 3.87569 3.94761 4.01724 4.08462 4.14974
4.21264 4.27335 4.33191 4.38836 4.44274 4.4951 4.5455 4.59397 4.64057 4.68536 4.72838
4.7697 4.80937 4.84744 4.88396 4.91898 4.95257 4.98476 5.01562 5.04518 5.07349 5.10061
5.12658 5.15144 5.17524 5.19801 5.2198 5.2408 5.26103 5.28038 5.29889 5.31659 5.3335
5.34968 5.36514 5.37991 5.39404 5.40753 5.42043 5.43275 5.44452 5.45576 5.46651 5.47677
5.48657 5.49593 5.50487 5.5134 5.52155 5.52934 5.53677 5.54387 5.55064 5.55711 5.56328
5.56918 5.57481 5.5852 #bodywt for gender,fleet: 2 / 6
 0 0.00144011 0.00270794 0.00493369 0.00870259 0.0148408 0.0244198 0.0386853 0.0588914
0.0860613 0.120743 0.162841 0.211584 0.265626 0.323248 0.382589 0.441867 0.499532
0.554361 0.605484 0.652368 0.69477 0.732677 0.766246 0.795745 0.821513 0.843915 0.863325
0.880102 0.894582 0.90707 0.917841 0.927136 0.935165 0.942111 0.948129 0.953355 0.957902
0.961869 0.965337 0.968378 0.971051 0.973407 0.97549 0.977335 0.978974 0.980435 0.981739
0.982907 0.983956 0.984899 0.98575 0.98652 0.987217 0.98785 0.988426 0.988951 0.98943

```
0.989869 0.990271 0.990641 0.990981 0.991294 0.991583 0.99185 0.992097 0.992326 0.992538
0.992736 0.992919 0.993082 0.993225 0.993359 0.993485 0.993603 0.993713 0.993816 0.993913
0.994004 0.99409 0.994171 0.994247 0.994318 0.994386 0.994449 0.994509 0.994566 0.994619
0.99467 0.994717 0.994762 0.994805 0.994846 0.994884 0.99492 0.994954 0.994987 0.995018
0.995047 0.995075 0.995125 #selex for gender,fleet: 2 / 6
 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379
0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379
0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379
0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379
0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379
0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379
0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379
0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379
0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379
0.0462379 0.0462379 0.0462379 #mean M for year Yinit: 2011 sex: 1
 52.6066 49.3344 46.1908 43.2277 40.518 37.7914 35.2322 32.7677 30.4021 28.1869 26.6381
24.9759 24.6723 23.7748 24.1344 24.0124 24.0501 23.627 23.6423 23.5725 23.0647 21.7377
20.6877 19.2273 17.6195 15.9364 14.5019 13.006 11.6721 10.5449 9.39019 8.27837 7.32203
6.47157 5.67741 4.98814 4.38525 3.86876 3.42086 3.03746 2.70401 2.41476 2.17115 1.95474
1.76833 1.60659 1.47067 1.3464 1.23825 1.14337 1.05871 0.98356 0.916282 0.855775 0.800677
0.750177 0.703656 0.660664 0.620864 0.584319 0.550594 0.519118 0.489825 0.462879 0.437628
0.415124 0.394307 0.373958 0.354816 0.336158 0.318489 0.301731 0.28579 0.270742 0.256492
0.243007 0.230222 0.218135 0.206726 0.196004 0.18592 0.176452 0.167543 0.159138 0.15122
0.143755 0.136709 0.130047 0.123748 0.117789 0.112148 0.106802 0.101733 0.0969308
0.0923695 0.0880326 0.0839001 0.079973 0.0762397 0.0726893 1.52113 #numbers for year
Yinit: 2011 sex: 1
 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087
0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087
0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087
0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087
0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087
0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087
0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087
0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087
0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087
0.045087 0.045087 #mean M for year Yinit: 2011 sex: 2
 52.6066 49.3912 46.2971 43.3768 40.7037 38.0065 35.4707 33.0233 30.6692 28.4609 26.9206
25.2618 24.9744 24.0833 24.4625 24.3491 24.39 23.953 23.9473 23.8394 23.2722 21.8654
20.7287 19.1775 17.484 15.7275 14.2319 12.694 11.3336 10.1919 9.04001 7.94401 7.00898
6.18417 5.41966 4.75987 4.18558 3.6957 3.27249 2.91151 2.59848 2.32761 2.10015 1.89818
1.72437 1.57356 1.44698 1.3308 1.22951 1.14044 1.06067 0.989601 0.925714 0.868 0.815176
0.7665 0.721413 0.67952 0.640538 0.604586 0.571268 0.540039 0.510864 0.48395 0.458639
0.436059 0.415118 0.394545 0.375124 0.356101 0.338018 0.3208 0.30436 0.288791 0.274004
0.259979 0.246655 0.234042 0.222127 0.210922 0.20038 0.190476 0.181151 0.172346 0.164042
0.156202 0.148791 0.141772 0.135123 0.128821 0.122844 0.11717 0.111778 0.10666 0.101791
0.0971527 0.092725 0.0885102 0.0844965 0.0806734 1.736 #numbers for year Yinit: 2011 sex:
2
 54.1634 50.9936 47.9496 44.9513 42.0732 39.3559 36.8657 34.3578 32.0015 29.7326 27.5565
25.5209 24.0929 22.5667 22.2712 21.4425 21.7497 21.6244 21.6447 21.2521 21.2555 21.1835
20.7193 19.5208 18.5724 17.2568 15.8101 14.2969 13.0076 11.6639 10.4662 9.45424 8.418
7.42057 6.56278 5.80009 5.08803 4.4701 3.92968 3.46675 3.06534 2.72177 2.42299 2.16383
1.94559 1.75171 1.58472 1.43984 1.3181 1.20678 1.1099 1.02491 0.949067 0.881742 0.821467
0.767253 0.717882 0.672628 0.630936 0.592403 0.55673 0.523971 0.493739 0.465522 0.43926
0.415102 0.392462 0.372285 0.353619 0.335373 0.318209 0.301478 0.285632 0.270604 0.256307
0.242812 0.230031 0.217936 0.206468 0.195627 0.185394 0.175776 0.166732 0.158239 0.150249
0.142711 0.135609 0.128914 0.122595 0.11662 0.110971 0.105627 0.100568 0.0957748
0.0912288 0.0869224 0.082832 0.0789428 0.075237 0.0717155 1.49763 #numbers for year
Ydeclare: 2013 sex: 1
 54.1634 51.0523 48.0599 45.106 42.2653 39.5788 37.1138 34.6243 32.2811 30.0201 27.8476
25.8124 24.388 22.8611 22.579 21.7543 22.0794 21.9618 21.9852 21.5798 21.5647 21.459
20.9411 19.6693 18.6419 17.243 15.7171 14.1356 12.7894 11.4058 10.1823 9.15567 8.12021
7.13523 6.29504 5.55401 4.86724 4.2746 3.75881 3.31887 2.93883 2.6147 2.33364 2.09045
1.88624 1.70493 1.54889 1.41351 1.29988 1.19559 1.10466 1.02469 0.953065 0.889252
0.831882 0.780051 0.732607 0.688884 0.648382 0.610746 0.575722 0.543419 0.513481 0.485418
0.459199 0.435012 0.412265 0.391972 0.373151 0.354659 0.337203 0.320105 0.30385 0.288373
0.273594 0.259598 0.246304 0.233694 0.221715 0.210376 0.199663 0.189589 0.180112 0.171208
0.162825 0.15491 0.147445 0.140397 0.133735 0.127426 0.12145 0.115786 0.110413 0.105312
```

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0.100466 0.0958667 0.09149 0.0873211 0.0833414 0.0795531 1.70878 #numbers for year
Ydeclare: 2013 sex: 2
#R0  1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932
1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950
1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968
1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986
1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004
2005 2006 2007 2008 2009 2010 #years
228.199  228.199 228.166 228.122 228.071 228.038 228.003 227.968 227.935 227.9 227.86
227.803 227.737 227.663 227.578 227.462 227.341 227.238 227.14 227.061 226.964 226.847
226.693 226.543 226.396 226.285 226.112 225.898 225.629 224.966 224.299 223.184 222.249
221.888 221.465 221.191 220.897 220.532 220.22 219.99 219.692 219.308 218.834 218.279
217.679 217.14 216.651 216.251 215.77 215.4 215.155 214.069 213.646 213.144 212.617
211.353 210.501 209.319 207.77 206.266 204.52 202.876 200.874 198.754 194.927 190.919
187.556 182.49 175.465 170.295 166.016 160.484 157.121 152.945 147.979 141.01 136.72
128.709 119.802 111.758 106.713 100.33 95.2454 88.9269 87.5695 84.2707 85.5017 86.1407
88.5068 90.9232 93.2207 95.3794 97.5645 99.3524 101.342 103.338 105.213 #Recruits
1.02769e+009  1.02769e+009 1.02723e+009 1.0266e+009 1.02589e+009 1.02542e+009
1.02492e+009 1.02443e+009 1.02396e+009 1.02347e+009 1.02291e+009 1.0221e+009 1.02118e+009
1.02014e+009 1.01895e+009 1.01732e+009 1.01562e+009 1.01419e+009 1.01282e+009
1.01172e+009 1.01038e+009 1.00876e+009 1.00664e+009 1.00457e+009 1.00254e+009
1.00103e+009 9.98666e+008 9.95743e+008 9.92105e+008 9.83185e+008 9.74338e+008
9.59766e+008 9.47766e+008 9.4319e+008 9.37871e+008 9.34446e+008 9.30784e+008 9.26264e+008
9.22426e+008 9.19604e+008 9.15972e+008 9.11322e+008 9.05614e+008 8.99004e+008
8.91914e+008 8.8562e+008 8.79954e+008 8.75358e+008 8.69862e+008 8.65667e+008 8.62907e+008
8.508e+008 8.46141e+008 8.40657e+008 8.34945e+008 8.21452e+008 8.12511e+008 8.00317e+008
7.84671e+008 7.69837e+008 7.53059e+008 7.37659e+008 7.19426e+008 7.00704e+008
6.68345e+008 6.36313e+008 6.10778e+008 5.74454e+008 5.27919e+008 4.96218e+008
4.71449e+008 4.4124e+008 4.23796e+008 4.03031e+008 3.79555e+008 3.48642e+008 3.307e+008
2.99193e+008 2.66925e+008 2.40004e+008 2.24091e+008 2.0494e+008 1.90416e+008 1.73207e+008
1.69624e+008 1.61081e+008 1.64243e+008 1.65896e+008 1.72094e+008 1.78547e+008
1.84803e+008 1.90791e+008 1.96963e+008 2.02098e+008 2.07907e+008 2.13833e+008
2.19494e+008 #SpawnBio
0.44056 0.5 0 # spawn-recr steepness, sigmaR, autocorr
# values from cat100_hmle, catch at 100% and steepness at mle value. # this is state of
nature 5 out of 9 (in no particular order) # and parameter set number 2 out of 4 for this
state
 0 0 28.3083 103.285 341.553 1014.2 2671.83 6204.22 12732.7 23330.1 38706.4 59025.3
83919.4 112652 144327 178069 213134 248951 285123 321394 357616 393710 429639 465389
500951 536316 571471 606397 641068 675453 709517 743223 776532 809406 841807 873699
905048 935824 965999 995548 1.02445e+006 1.05268e+006 1.08023e+006 1.10709e+006
1.13325e+006 1.15869e+006 1.18343e+006 1.20744e+006 1.23075e+006 1.25334e+006
1.27523e+006 1.29641e+006 1.31691e+006 1.33672e+006 1.35586e+006 1.37433e+006
1.39217e+006 1.40936e+006 1.42594e+006 1.4419e+006 1.45728e+006 1.47208e+006 1.48632e+006
1.50001e+006 1.51318e+006 1.52583e+006 1.53798e+006 1.54965e+006 1.56086e+006
1.57161e+006 1.58192e+006 1.59208e+006 1.60182e+006 1.61116e+006 1.62012e+006 1.6287e+006
1.63692e+006 1.6448e+006 1.65234e+006 1.65957e+006 1.66648e+006 1.6731e+006 1.67944e+006
1.6855e+006 1.6913e+006 1.69685e+006 1.70216e+006 1.70724e+006 1.71209e+006 1.71673e+006
1.72117e+006 1.72541e+006 1.72946e+006 1.73334e+006 1.73704e+006 1.74058e+006
1.74396e+006 1.74719e+006 1.75027e+006 1.75322e+006 1.75866e+006 #female fecundity;
weighted by N in year Y_init across morphs and areas
 0.045147 0.163178 0.222696 0.290492 0.365223 0.445539 0.530285 0.618588 0.709839
0.803631 0.899683 0.997778 1.09772 1.19929 1.30227 1.4064 1.51143 1.61705 1.72297 1.82891
1.93457 2.03968 2.14398 2.24722 2.34919 2.44969 2.54855 2.6456 2.74072 2.8338 2.92474
3.01346 3.09991 3.18404 3.26582 3.34522 3.42225 3.4969 3.56919 3.63912 3.70673 3.77204
3.83509 3.89593 3.95458 4.0111 4.06554 4.11794 4.16836 4.21686 4.26348 4.30828 4.35131
4.39264 4.43231 4.47038 4.5069 4.54192 4.57551 4.6077 4.63855 4.6681 4.69641 4.72352
4.74949 4.77434 4.79812 4.82089 4.84267 4.86351 4.88357 4.9029 4.92139 4.93906 4.95596
4.97211 4.98755 5.0023 5.01641 5.02988 5.04276 5.05506 5.06681 5.07803 5.08876 5.099
5.10878 5.11812 5.12704 5.13555 5.14369 5.15145 5.15886 5.16594 5.1727 5.17914 5.1853
5.19117 5.19678 5.20214 5.212 #bodywt for gender,fleet: 1 / 1
 0 0.0511233 0.0772332 0.112337 0.156989 0.21065 0.271667 0.337561 0.405497 0.472761
0.537103 0.596902 0.65118 0.699515 0.741909 0.778656 0.810226 0.837169 0.860061 0.879454
0.895857 0.909726 0.921458 0.931394 0.939825 0.946995 0.953108 0.958335 0.962819 0.966677
0.970009 0.972894 0.975403 0.977591 0.979505 0.981186 0.982667 0.983975 0.985135 0.986165
0.987085 0.987906 0.988643 0.989305 0.989902 0.990442 0.99093 0.991373 0.991776 0.992144
0.992479 0.992786 0.993068 0.993326 0.993564 0.993783 0.993985 0.994172 0.994345 0.994505
0.994654 0.994792 0.994921 0.995041 0.995152 0.995256 0.995354 0.995445 0.99553 0.995609
0.995681 0.995746 0.995807 0.995865 0.995919 0.995969 0.996017 0.996062 0.996105 0.996145
0.996183 0.996219 0.996253 0.996285 0.996315 0.996343 0.996371 0.996396 0.99642 0.996444
```

0.996465 0.996486 0.996506 0.996524 0.996542 0.996559 0.996575 0.99659 0.996604 0.996618
0.996643 #selex for gender,fleet: 1 / 1
 0.0462809 0.169552 0.232356 0.304214 0.383486 0.468356 0.557183 0.648721 0.74217
0.837091 0.933287 1.03069 1.12928 1.22902 1.32986 1.43167 1.53431 1.63757 1.74123 1.84504
1.94873 2.05204 2.15472 2.25653 2.35722 2.4566 2.55447 2.65067 2.74505 2.83748 2.92786
3.0161 3.10213 3.1859 3.26737 3.34651 3.4233 3.49775 3.56986 3.63965 3.70713 3.77233
3.83528 3.89603 3.95461 4.01106 4.06544 4.1178 4.16818 4.21663 4.26322 4.30799 4.351
4.39231 4.43196 4.47001 4.50651 4.54152 4.5751 4.60728 4.63811 4.66766 4.69597 4.72307
4.74903 4.77387 4.79766 4.82042 4.84219 4.86303 4.88309 4.90242 4.9209 4.93857 4.95546
4.97162 4.98705 5.00181 5.01591 5.02938 5.04226 5.05456 5.06631 5.07753 5.08825 5.09849
5.10827 5.11761 5.12653 5.13505 5.14318 5.15094 5.15835 5.16543 5.17218 5.17863 5.18479
5.19066 5.19627 5.20162 5.21149 #bodywt for gender,fleet: 1 / 2
 0 0.0213283 0.0352642 0.0561355 0.0857149 0.125189 0.174691 0.233098 0.298189 0.367085
0.436791 0.504638 0.56856 0.627179 0.679765 0.726107 0.766378 0.800993 0.830503 0.855511
0.876615 0.89438 0.909315 0.921869 0.932428 0.941321 0.948827 0.955176 0.960562 0.965145
0.969056 0.972406 0.975285 0.977769 0.979918 0.981784 0.983411 0.984833 0.986082 0.987181
0.988151 0.989011 0.989776 0.990457 0.991066 0.991611 0.992102 0.992544 0.992943 0.993304
0.993632 0.993931 0.994202 0.994451 0.994678 0.994886 0.995077 0.995253 0.995415 0.995564
0.995702 0.99583 0.995949 0.996059 0.996161 0.996256 0.996344 0.996426 0.996503 0.996575
0.99664 0.996697 0.996751 0.996801 0.996849 0.996894 0.996936 0.996975 0.997012 0.997047
0.99708 0.997112 0.997141 0.997169 0.997195 0.99722 0.997243 0.997266 0.997287 0.997306
0.997325 0.997343 0.99736 0.997376 0.997391 0.997406 0.997419 0.997432 0.997444 0.997456
0.997478 #selex for gender,fleet: 1 / 2
 0.0504337 0.189018 0.257432 0.331995 0.409383 0.487655 0.566341 0.645863 0.726964
0.810375 0.896654 0.986129 1.07889 1.17484 1.2737 1.37507 1.4785 1.58348 1.68953 1.79614
1.90288 2.00933 2.11512 2.21995 2.32351 2.42558 2.52596 2.62445 2.72094 2.81528 2.9074
2.99721 3.08467 3.16972 3.25235 3.33253 3.41028 3.48558 3.55846 3.62895 3.69706 3.76284
3.82631 3.88754 3.94655 4.0034 4.05814 4.11083 4.16151 4.21025 4.25709 4.3021 4.34533
4.38683 4.42667 4.46489 4.50156 4.53672 4.57043 4.60273 4.63369 4.66335 4.69176 4.71896
4.745 4.76994 4.7938 4.81663 4.83848 4.85938 4.87949 4.89886 4.91738 4.93509 4.95202
4.96821 4.98368 4.99846 5.01259 5.02609 5.03899 5.05131 5.06309 5.07433 5.08507 5.09533
5.10513 5.11449 5.12342 5.13196 5.1401 5.14788 5.15531 5.1624 5.16916 5.17562 5.18179
5.18767 5.19329 5.19865 5.20854 #bodywt for gender,fleet: 1 / 3
 0 0.0168565 0.0359177 0.0704144 0.125351 0.201915 0.296018 0.399604 0.503567 0.600364
0.685263 0.756326 0.813704 0.85879 0.893511 0.919871 0.93969 0.954505 0.965548 0.973775
0.979914 0.984509 0.987963 0.990573 0.992557 0.994075 0.995243 0.99615 0.996858 0.997415
0.997857 0.998209 0.998492 0.998722 0.998908 0.999062 0.999188 0.999293 0.99938 0.999454
0.999516 0.999569 0.999614 0.999653 0.999686 0.999715 0.99974 0.999762 0.999781 0.999798
0.999813 0.999826 0.999838 0.999848 0.999857 0.999866 0.999873 0.99988 0.999886 0.999892
0.999897 0.999902 0.999906 0.99991 0.999913 0.999916 0.999919 0.999922 0.999925 0.999927
0.999929 0.999931 0.999932 0.999934 0.999935 0.999937 0.999938 0.999939 0.99994 0.999941
0.999942 0.999943 0.999944 0.999945 0.999945 0.999946 0.999947 0.999947 0.999948 0.999948
0.999949 0.999949 0.99995 0.99995 0.999951 0.999951 0.999952 0.999952 0.999952 0.999952
0.999953 #selex for gender,fleet: 1 / 3
 0.0466444 0.171812 0.236089 0.310135 0.392403 0.480968 0.573886 0.669515 0.76669
0.864713 0.963252 1.0622 1.16158 1.26144 1.36181 1.4627 1.56407 1.66582 1.7678 1.86984
1.97175 2.0733 2.17428 2.27446 2.37364 2.4716 2.56818 2.66318 2.75648 2.84792 2.93742
3.02485 3.11016 3.19328 3.27417 3.35278 3.4291 3.50313 3.57486 3.6443 3.71147 3.77639
3.83909 3.8996 3.95797 4.01424 4.06845 4.12065 4.17089 4.21921 4.26568 4.31034 4.35325
4.39447 4.43403 4.472 4.50844 4.54338 4.57689 4.60901 4.6398 4.6693 4.69756 4.72462
4.75054 4.77535 4.79909 4.82182 4.84357 4.86437 4.88442 4.90372 4.92219 4.93984 4.95672
4.97286 4.98828 5.00302 5.01711 5.03057 5.04343 5.05572 5.06746 5.07868 5.08939 5.09962
5.10939 5.11873 5.12764 5.13615 5.14427 5.15203 5.15943 5.16651 5.17325 5.1797 5.18585
5.19172 5.19732 5.20267 5.21253 #bodywt for gender,fleet: 1 / 4
 0 0.011426 0.0195259 0.0322319 0.0512246 0.078121 0.11406 0.159308 0.213068 0.273565
0.338381 0.40488 0.470599 0.533513 0.592155 0.645622 0.693497 0.735745 0.772597 0.804456
0.831809 0.855178 0.875076 0.891982 0.906331 0.91851 0.928852 0.937647 0.945139 0.951534
0.957006 0.961703 0.965744 0.969233 0.972253 0.974877 0.977164 0.979163 0.980916 0.982458
0.983819 0.985024 0.986093 0.987045 0.987895 0.988656 0.989339 0.989954 0.990509 0.99101
0.991464 0.991877 0.992253 0.992596 0.992909 0.993196 0.993459 0.993701 0.993923 0.994128
0.994317 0.994492 0.994655 0.994805 0.994944 0.995074 0.995195 0.995307 0.995412 0.99551
0.995597 0.995675 0.995748 0.995816 0.99588 0.995941 0.995997 0.996051 0.996101 0.996148
0.996193 0.996235 0.996275 0.996312 0.996348 0.996381 0.996413 0.996443 0.996471 0.996498
0.996523 0.996547 0.99657 0.996591 0.996612 0.996631 0.996649 0.996667 0.996683 0.996699
0.996728 #selex for gender,fleet: 1 / 4
 0.0458503 0.168306 0.231642 0.305371 0.388624 0.480165 0.578473 0.681886 0.788778
0.897715 1.00756 1.11747 1.22692 1.33558 1.44328 1.54993 1.65553 1.76007 1.86354 1.96594
2.06723 2.16738 2.26632 2.36398 2.46027 2.5551 2.64839 2.74004 2.82997 2.9181 3.00434
3.08863 3.17093 3.25117 3.32932 3.40534 3.47923 3.55097 3.62055 3.68798 3.75327 3.81643
3.87749 3.93648 3.99343 4.04836 4.10133 4.15238 4.20154 4.24886 4.29439 4.33817 4.38026
4.42071 4.45956 4.49687 4.53267 4.56703 4.59999 4.6316 4.6619 4.69094 4.71878 4.74544

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4.77098 4.79543 4.81885 4.84126 4.86271 4.88324 4.90305 4.92218 4.94047 4.95796 4.97469
4.99068 5.00597 5.02058 5.03454 5.04789 5.06064 5.07282 5.08446 5.09558 5.1062 5.11635
5.12604 5.13529 5.14413 5.15257 5.16063 5.16832 5.17567 5.18268 5.18938 5.19577 5.20187
5.2077 5.21325 5.21856 5.22834 #bodywt for gender,fleet: 1 / 5
 0 0.00497951 0.00812772 0.0129303 0.0200354 0.0302067 0.0442625 0.0629721 0.086926
0.116411 0.151331 0.191188 0.235142 0.282111 0.330901 0.380324 0.429299 0.476909 0.522437
0.565367 0.605371 0.642279 0.67605 0.706745 0.734491 0.759464 0.781866 0.801913 0.819821
0.835799 0.850049 0.862754 0.874085 0.884197 0.893229 0.901303 0.908532 0.915011 0.920828
0.926059 0.93077 0.935021 0.938862 0.94234 0.945494 0.948359 0.950967 0.953345 0.955515
0.957501 0.95932 0.960989 0.962523 0.963934 0.965235 0.966436 0.967546 0.968573 0.969524
0.970407 0.971227 0.971989 0.972699 0.97336 0.973977 0.974553 0.975091 0.975595 0.976066
0.976508 0.976906 0.977266 0.977603 0.977921 0.97822 0.978501 0.978766 0.979016 0.979252
0.979474 0.979684 0.979882 0.98007 0.980247 0.980414 0.980573 0.980723 0.980865 0.980999
0.981126 0.981247 0.981362 0.98147 0.981573 0.981671 0.981763 0.981851 0.981935 0.982014
0.982089 0.982227 #selex for gender,fleet: 1 / 5
 0.047457 0.17645 0.243537 0.321908 0.410686 0.508516 0.613589 0.723785 0.836934 0.951109
1.06483 1.17713 1.28749 1.39572 1.50187 1.60609 1.70859 1.80956 1.90918 2.00759 2.10486
2.20106 2.29619 2.39022 2.48312 2.5748 2.66519 2.7542 2.84174 2.92771 3.01203 3.09461
3.17538 3.25429 3.33126 3.40625 3.47924 3.55019 3.61909 3.68593 3.7507 3.81342 3.87411
3.93277 3.98943 4.04413 4.0969 4.14777 4.19679 4.24398 4.28941 4.33311 4.37514 4.41552
4.45433 4.4916 4.52738 4.56171 4.59466 4.62625 4.65655 4.68559 4.71343 4.74009 4.76564
4.7901 4.81352 4.83595 4.85741 4.87795 4.89777 4.91689 4.93519 4.95268 4.96941 4.98541
5.0007 5.01531 5.02928 5.04263 5.05538 5.06757 5.07922 5.09034 5.10097 5.11112 5.12081
5.13007 5.13891 5.14735 5.15542 5.16311 5.17046 5.17748 5.18418 5.19057 5.19668 5.20251
5.20807 5.21338 5.22317 #bodywt for gender,fleet: 1 / 6
 0 0.00140879 0.00257294 0.0045632 0.00785473 0.0131087 0.0211776 0.0330585 0.0497792
0.0722262 0.100961 0.136078 0.177153 0.223289 0.273245 0.325598 0.378907 0.431846
0.483294 0.532373 0.578462 0.62117 0.660309 0.695849 0.727877 0.756568 0.782144 0.80486
0.824981 0.842767 0.858471 0.872327 0.884551 0.895338 0.904864 0.913285 0.920737 0.927341
0.933203 0.938416 0.943059 0.947203 0.950909 0.95423 0.957211 0.959893 0.962311 0.964495
0.966471 0.968263 0.969891 0.971372 0.972723 0.973958 0.975087 0.976122 0.977072 0.977946
0.97875 0.979492 0.980177 0.980811 0.981398 0.981942 0.982447 0.982916 0.983353 0.983759
0.984139 0.984493 0.984808 0.985089 0.985353 0.9856 0.985832 0.986049 0.986254 0.986446
0.986628 0.986798 0.986959 0.98711 0.987253 0.987388 0.987515 0.987635 0.987749 0.987856
0.987958 0.988054 0.988145 0.988231 0.988312 0.98839 0.988463 0.988532 0.988598 0.98866
0.98872 0.988776 0.988879 #selex for gender,fleet: 1 / 6
 0.0539259 0.185573 0.25267 0.328419 0.411174 0.499395 0.591863 0.687727 0.786456
0.887728 0.991338 1.09712 1.20489 1.31446 1.42557 1.53794 1.65126 1.7652 1.87941 1.99355
2.1073 2.22035 2.33241 2.44322 2.55253 2.66014 2.76586 2.86955 2.97105 3.07027 3.1671
3.26149 3.35337 3.44271 3.52948 3.61367 3.69528 3.77432 3.8508 3.92475 3.99621 4.06521
4.13179 4.19599 4.25787 4.31749 4.37488 4.43012 4.48325 4.53434 4.58344 4.63062 4.67593
4.71944 4.76119 4.80125 4.83969 4.87654 4.91187 4.94574 4.97819 5.00929 5.03907 5.06759
5.0949 5.12104 5.14607 5.17001 5.19293 5.21485 5.23595 5.25627 5.2757 5.29428 5.31205
5.32903 5.34526 5.36078 5.37561 5.38979 5.40333 5.41627 5.42863 5.44045 5.45173 5.46251
5.4728 5.48264 5.49203 5.501 5.50956 5.51774 5.52555 5.533 5.54012 5.54692 5.55341 5.5596
5.56551 5.57116 5.58159 #bodywt for gender,fleet: 2 / 1
 0 0.0518398 0.079816 0.117909 0.166721 0.225504 0.292161 0.363647 0.436587 0.507864
0.575011 0.636368 0.691057 0.738838 0.779931 0.814846 0.844245 0.868839 0.889325 0.906346
0.920474 0.932201 0.941947 0.950061 0.956834 0.962504 0.967267 0.971282 0.974679 0.977566
0.980027 0.982135 0.983947 0.985511 0.986866 0.988045 0.989074 0.989975 0.990768 0.991468
0.992087 0.992636 0.993126 0.993564 0.993956 0.994308 0.994625 0.994912 0.995171 0.995406
0.99562 0.995816 0.995994 0.996157 0.996306 0.996443 0.996569 0.996686 0.996793 0.996892
0.996984 0.997069 0.997148 0.997221 0.997289 0.997353 0.997412 0.997468 0.997519 0.997568
0.997611 0.99765 0.997687 0.997721 0.997754 0.997784 0.997813 0.99784 0.997865 0.997889
0.997912 0.997933 0.997953 0.997972 0.99799 0.998008 0.998024 0.998039 0.998053 0.998067
0.99808 0.998092 0.998104 0.998115 0.998125 0.998135 0.998145 0.998154 0.998162 0.99817
0.998185 #selex for gender,fleet: 2 / 1
 0.0552534 0.192681 0.263397 0.343528 0.43103 0.5238 0.620085 0.718683 0.818926 0.920536
1.02346 1.12775 1.23345 1.34057 1.44904 1.55872 1.66943 1.78089 1.89283 2.00493 2.11687
2.22834 2.33904 2.44867 2.557 2.66377 2.7688 2.8719 2.97292 3.07173 3.16823 3.26234
3.35399 3.44314 3.52976 3.61382 3.69532 3.77427 3.85069 3.92458 3.99599 4.06495 4.1315
4.19568 4.25754 4.31714 4.37452 4.42975 4.48287 4.53396 4.58306 4.63023 4.67554 4.71904
4.7608 4.80086 4.83929 4.87615 4.91149 4.94535 4.97781 5.0089 5.03869 5.06721 5.09452
5.12067 5.14569 5.16964 5.19256 5.21448 5.23559 5.25591 5.27534 5.29392 5.31169 5.32867
5.34491 5.36042 5.37526 5.38943 5.40297 5.41592 5.42828 5.44009 5.45138 5.46216 5.47245
5.48229 5.49168 5.50065 5.50921 5.51739 5.5252 5.53266 5.53977 5.54657 5.55306 5.55925
5.56517 5.57081 5.58124 #bodywt for gender,fleet: 2 / 2
 0 0.0217085 0.0367487 0.0596831 0.0925919 0.136787 0.192233 0.257331 0.329197 0.404272
0.479017 0.550442 0.616385 0.675562 0.727455 0.772127 0.810028 0.841829 0.868293 0.890188
0.908235 0.923079 0.935281 0.945317 0.953582 0.960405 0.966052 0.970742 0.974651 0.977922
0.98067 0.982988 0.984953 0.986624 0.988052 0.989277 0.990333 0.991246 0.992039 0.992731
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0.993336 0.993868 0.994337 0.994751 0.995119 0.995446 0.995738 0.996 0.996235 0.996446
0.996637 0.99681 0.996966 0.997109 0.997238 0.997357 0.997465 0.997564 0.997655 0.997739
0.997816 0.997887 0.997953 0.998014 0.99807 0.998123 0.998171 0.998216 0.998259 0.998298
0.998333 0.998364 0.998393 0.99842 0.998446 0.99847 0.998493 0.998514 0.998534 0.998553
0.998571 0.998587 0.998603 0.998618 0.998632 0.998645 0.998658 0.99867 0.998681 0.998691
0.998701 0.998711 0.99872 0.998728 0.998736 0.998744 0.998751 0.998758 0.998765 0.998771
0.998782 #selex for gender,fleet: 2 / 2
 0.0601075 0.214219 0.290644 0.372767 0.456919 0.541321 0.625889 0.711421 0.798942
0.889352 0.983281 1.08104 1.18265 1.28787 1.39629 1.50736 1.62049 1.73505 1.85046 1.96618
2.08171 2.19662 2.31053 2.42313 2.53414 2.64333 2.7505 2.85551 2.95821 3.05851 3.15632
3.25159 3.34425 3.4343 3.5217 3.60646 3.68857 3.76807 3.84497 3.91929 3.99109 4.06039
4.12724 4.1917 4.25381 4.31363 4.37121 4.42662 4.47991 4.53115 4.58038 4.62768 4.6731
4.71671 4.75856 4.79871 4.83723 4.87416 4.90956 4.94349 4.97601 5.00716 5.03699 5.06556
5.09292 5.1191 5.14417 5.16815 5.1911 5.21306 5.23419 5.25452 5.27397 5.29257 5.31035
5.32735 5.3436 5.35913 5.37398 5.38816 5.40172 5.41467 5.42705 5.43887 5.45016 5.46095
5.47125 5.48109 5.49049 5.49947 5.50804 5.51623 5.52404 5.5315 5.53863 5.54543 5.55192
5.55812 5.56404 5.56969 5.58013 #bodywt for gender,fleet: 2 / 3
 0 0.0173676 0.0382509 0.0767998 0.138612 0.224342 0.328234 0.44021 0.549681 0.648575
0.732478 0.80025 0.852958 0.892796 0.92228 0.94378 0.959307 0.970457 0.978446 0.984174
0.988291 0.991264 0.993423 0.995001 0.996164 0.997028 0.997674 0.998163 0.998535 0.99882
0.999042 0.999215 0.999351 0.99946 0.999546 0.999616 0.999673 0.999719 0.999757 0.999789
0.999815 0.999837 0.999856 0.999872 0.999885 0.999897 0.999907 0.999915 0.999923 0.999929
0.999935 0.99994 0.999945 0.999949 0.999952 0.999955 0.999958 0.99996 0.999963 0.999965
0.999966 0.999968 0.99997 0.999971 0.999972 0.999973 0.999974 0.999975 0.999976 0.999977
0.999978 0.999978 0.999979 0.999979 0.99998 0.99998 0.999981 0.999981 0.999982 0.999982
0.999982 0.999983 0.999983 0.999983 0.999983 0.999984 0.999984 0.999984 0.999984 0.999984
0.999985 0.999985 0.999985 0.999985 0.999985 0.999985 0.999985 0.999986 0.999986 0.999986
0.999986 #selex for gender,fleet: 2 / 3
 0.0556789 0.195209 0.267577 0.35015 0.44094 0.537655 0.638145 0.74075 0.844425 0.948657
1.0533 1.15843 1.26416 1.37063 1.47791 1.58603 1.69489 1.80437 1.91426 2.02434 2.13434
2.24397 2.35297 2.46106 2.56799 2.67352 2.77744 2.87956 2.97971 3.07777 3.17361 3.26714
3.35829 3.447 3.53323 3.61695 3.69816 3.77685 3.85304 3.92673 3.99796 4.06676 4.13317
4.19723 4.25898 4.31848 4.37577 4.43092 4.48397 4.53499 4.58403 4.63115 4.67641 4.71987
4.76159 4.80161 4.84001 4.87684 4.91214 4.94599 4.97842 5.00949 5.03926 5.06776 5.09506
5.12119 5.1462 5.17013 5.19304 5.21495 5.23604 5.25635 5.27578 5.29435 5.31211 5.32909
5.34532 5.36083 5.37566 5.38983 5.40337 5.41631 5.42867 5.44048 5.45176 5.46253 5.47283
5.48266 5.49205 5.50101 5.50957 5.51775 5.52556 5.53301 5.54013 5.54692 5.55341 5.5596
5.56551 5.57116 5.58159 #bodywt for gender,fleet: 2 / 4
 0 0.0116461 0.020415 0.0344617 0.0557967 0.0863221 0.127287 0.178795 0.239606 0.307321
0.37886 0.451034 0.521016 0.586629 0.646439 0.699711 0.746272 0.786357 0.820457 0.849204
0.873276 0.893338 0.910009 0.92384 0.935311 0.94483 0.952741 0.95933 0.964832 0.96944
0.973313 0.97658 0.979345 0.981696 0.983701 0.985419 0.986896 0.988172 0.989277 0.990239
0.991079 0.991814 0.992462 0.993033 0.993538 0.993987 0.994387 0.994744 0.995065 0.995352
0.995611 0.995845 0.996057 0.99625 0.996424 0.996584 0.996729 0.996862 0.996984 0.997096
0.997199 0.997294 0.997382 0.997463 0.997538 0.997607 0.997672 0.997732 0.997788 0.99784
0.997886 0.997927 0.997965 0.998001 0.998035 0.998066 0.998096 0.998124 0.99815 0.998175
0.998198 0.99822 0.99824 0.99826 0.998278 0.998295 0.998312 0.998327 0.998342 0.998356
0.998369 0.998381 0.998393 0.998404 0.998414 0.998424 0.998434 0.998443 0.998451 0.998459
0.998474 #selex for gender,fleet: 2 / 4
 0.0547497 0.191323 0.26274 0.345176 0.437425 0.537908 0.644796 0.756201 0.870385 0.98592
1.10176 1.21722 1.33192 1.44568 1.55846 1.6703 1.78122 1.89128 2.00049 2.10884 2.21629
2.32278 2.42819 2.53244 2.63538 2.7369 2.83686 2.93515 3.03163 3.12621 3.21877 3.30925
3.39755 3.48363 3.56744 3.64893 3.72809 3.80491 3.87937 3.9515 4.02129 4.08877 4.15397
4.21692 4.27766 4.33623 4.39267 4.44703 4.49937 4.54972 4.59815 4.64471 4.68945 4.73243
4.7737 4.81332 4.85133 4.8878 4.92278 4.95632 4.98847 5.01927 5.04879 5.07706 5.10414
5.13007 5.15489 5.17865 5.20139 5.22314 5.24411 5.26433 5.28366 5.30215 5.31983 5.33674
5.3529 5.36834 5.3831 5.39721 5.4107 5.42358 5.43589 5.44765 5.45888 5.46962 5.47987
5.48966 5.49901 5.50794 5.51647 5.52461 5.53239 5.53981 5.5469 5.55367 5.56013 5.5663
5.57219 5.57781 5.5882 #bodywt for gender,fleet: 2 / 5
 0 0.00506505 0.00846584 0.0137649 0.0217505 0.0333584 0.049588 0.0713603 0.0993433
0.133791 0.174451 0.220563 0.270956 0.324199 0.37878 0.433257 0.486373 0.537128 0.584791
0.628896 0.669207 0.705673 0.738382 0.767523 0.793343 0.816128 0.836171 0.853766 0.86919
0.882702 0.89454 0.904913 0.914012 0.922003 0.92903 0.93522 0.940683 0.945514 0.949795
0.953597 0.956981 0.960001 0.9627 0.965119 0.967293 0.969249 0.971013 0.972609 0.974054
0.975367 0.97656 0.977648 0.978642 0.979551 0.980383 0.981148 0.981851 0.982498 0.983095
0.983646 0.984156 0.984628 0.985066 0.985473 0.985851 0.986203 0.986531 0.986836 0.987122
0.987389 0.987628 0.987842 0.988044 0.988232 0.98841 0.988577 0.988733 0.988881 0.98902
0.989151 0.989275 0.989392 0.989502 0.989606 0.989704 0.989797 0.989884 0.989968 0.990046
0.990121 0.990191 0.990258 0.990321 0.990381 0.990438 0.990492 0.990543 0.990592 0.990638
0.990681 0.990762 #selex for gender,fleet: 2 / 5

```
 0.0566297 0.200386 0.275902 0.363338 0.461434 0.568422 0.682087 0.799992 0.91981 1.03964
1.15817 1.27469 1.38893 1.50094 1.61096 1.71927 1.82617 1.93192 2.03671 2.14067 2.24388
2.34635 2.44803 2.54886 2.64872 2.74749 2.84503 2.9412 3.03586 3.12886 3.2201 3.30945
3.39682 3.48212 3.56529 3.64626 3.725 3.80148 3.87569 3.94761 4.01724 4.08462 4.14974
4.21264 4.27335 4.33191 4.38836 4.44274 4.4951 4.5455 4.59397 4.64057 4.68536 4.72838
4.7697 4.80937 4.84744 4.88396 4.91898 4.95257 4.98476 5.01562 5.04518 5.07349 5.10061
5.12658 5.15144 5.17524 5.19801 5.2198 5.2408 5.26103 5.28038 5.29889 5.31659 5.3335
5.34968 5.36514 5.37991 5.39404 5.40753 5.42043 5.43275 5.44452 5.45576 5.46651 5.47677
5.48657 5.49593 5.50487 5.5134 5.52155 5.52934 5.53677 5.54387 5.55064 5.55711 5.56328
5.56918 5.57481 5.5852 #bodywt for gender,fleet: 2 / 6
 0 0.00144011 0.00270794 0.00493369 0.00870259 0.0148408 0.0244198 0.0386853 0.0588914
0.0860613 0.120743 0.162841 0.211584 0.265626 0.323248 0.382589 0.441867 0.499532
0.554361 0.605484 0.652368 0.69477 0.732677 0.766246 0.795745 0.821513 0.843915 0.863325
0.880102 0.894582 0.90707 0.917841 0.927136 0.935165 0.942111 0.948129 0.953355 0.957902
0.961869 0.965337 0.968378 0.971051 0.973407 0.97549 0.977335 0.978974 0.980435 0.981739
0.982907 0.983956 0.984899 0.98575 0.98652 0.987217 0.98785 0.988426 0.988951 0.98943
0.989869 0.990271 0.990641 0.990981 0.991294 0.991583 0.99185 0.992097 0.992326 0.992538
0.992736 0.992919 0.993082 0.993225 0.993359 0.993485 0.993603 0.993713 0.993816 0.993913
0.994004 0.99409 0.994171 0.994247 0.994318 0.994386 0.994449 0.994509 0.994566 0.994619
0.99467 0.994717 0.994762 0.994805 0.994846 0.994884 0.99492 0.994954 0.994987 0.995018
0.995047 0.995075 0.995125 #selex for gender,fleet: 2 / 6
 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379
0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379
0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379
0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379
0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379
0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379
0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379
0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379
0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379
0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379
0.0462379 0.0462379 0.0462379 #mean M for year Yinit: 2011 sex: 1
 52.6066 49.3344 46.1908 43.2277 40.518 37.7914 35.2322 32.7677 30.4021 28.1869 26.6381
24.9759 24.6723 23.7748 24.1344 24.0124 24.0501 23.627 23.6423 23.5725 23.0647 21.7377
20.6877 19.2273 17.6195 15.9364 14.5019 13.006 11.6721 10.5449 9.39019 8.27837 7.32203
6.47157 5.67741 4.98814 4.38525 3.86876 3.42086 3.03746 2.70401 2.41476 2.17115 1.95474
1.76833 1.60659 1.47067 1.3464 1.23825 1.14337 1.05871 0.98356 0.916282 0.855775 0.800677
0.750177 0.703656 0.660664 0.620864 0.584319 0.550594 0.519118 0.489825 0.462879 0.437628
0.415124 0.394307 0.373958 0.354816 0.336158 0.318489 0.301731 0.28579 0.270742 0.256492
0.243007 0.230222 0.218135 0.206726 0.196004 0.18592 0.176452 0.167543 0.159138 0.15122
0.143755 0.136709 0.130047 0.123748 0.117789 0.112148 0.106802 0.101733 0.0969308
0.0923695 0.0880326 0.0839001 0.079973 0.0762397 0.0726893 1.52113 #numbers for year
Yinit: 2011 sex: 1
 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087
0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087
0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087
0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087
0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087
0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087
0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087
0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087
0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087
0.045087 0.045087 #mean M for year Yinit: 2011 sex: 2
 52.6066 49.3912 46.2971 43.3768 40.7037 38.0065 35.4707 33.0233 30.6692 28.4609 26.9206
25.2618 24.9744 24.0833 24.4625 24.3491 24.39 23.953 23.9473 23.8394 23.2722 21.8654
20.7287 19.1775 17.484 15.7275 14.2319 12.694 11.3336 10.1919 9.04001 7.94401 7.00898
6.18417 5.41966 4.75987 4.18558 3.6957 3.27249 2.91151 2.59848 2.32761 2.10015 1.89818
1.72437 1.57356 1.44698 1.3308 1.22951 1.14044 1.06067 0.989601 0.925714 0.868 0.815176
0.7665 0.721413 0.67952 0.640538 0.604586 0.571268 0.540039 0.510864 0.48395 0.458639
0.436059 0.415118 0.394545 0.375124 0.356101 0.338018 0.3208 0.30436 0.288791 0.274004
0.259979 0.246655 0.234042 0.222127 0.210922 0.20038 0.190476 0.181151 0.172346 0.164042
0.156202 0.148791 0.141772 0.135123 0.128821 0.122844 0.11717 0.111778 0.10666 0.101791
0.0971527 0.092725 0.0885102 0.0844965 0.0806734 1.736 #numbers for year Yinit: 2011 sex:
2
 54.1634 50.9936 47.9496 44.9513 42.0732 39.3559 36.8657 34.3578 32.0015 29.7326 27.5565
25.5209 24.0929 22.5667 22.2712 21.4425 21.7497 21.6244 21.6447 21.2521 21.2555 21.1835
20.7193 19.5208 18.5724 17.2568 15.8101 14.2969 13.0076 11.6639 10.4662 9.45424 8.418
7.42057 6.56278 5.80009 5.08803 4.4701 3.92968 3.46675 3.06534 2.72177 2.42299 2.16383
1.94559 1.75171 1.58472 1.43984 1.3181 1.20678 1.1099 1.02491 0.949067 0.881742 0.821467
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0.767253 0.717882 0.672628 0.630936 0.592403 0.55673 0.523971 0.493739 0.465522 0.43926
0.415102 0.392462 0.372285 0.353619 0.335373 0.318209 0.301478 0.285632 0.270604 0.256307
0.242812 0.230031 0.217936 0.206468 0.195627 0.185394 0.175776 0.166732 0.158239 0.150249
0.142711 0.135609 0.128914 0.122595 0.11662 0.110971 0.105627 0.100568 0.0957748
0.0912288 0.0869224 0.082832 0.0789428 0.075237 0.0717155 1.49763 #numbers for year
Ydeclare: 2013 sex: 1
 54.1634 51.0523 48.0599 45.106 42.2653 39.5788 37.1138 34.6243 32.2811 30.0201 27.8476
25.8124 24.388 22.8611 22.579 21.7543 22.0794 21.9618 21.9852 21.5798 21.5647 21.459
20.9411 19.6693 18.6419 17.243 15.7171 14.1356 12.7894 11.4058 10.1823 9.15567 8.12021
7.13523 6.29504 5.55401 4.86724 4.2746 3.75881 3.31887 2.93883 2.6147 2.33364 2.09045
1.88624 1.70493 1.54889 1.41351 1.29988 1.19559 1.10466 1.02469 0.953065 0.889252
0.831882 0.780051 0.732607 0.688884 0.648382 0.610746 0.575722 0.543419 0.513481 0.485418
0.459199 0.435012 0.412265 0.391972 0.373151 0.354659 0.337203 0.320105 0.30385 0.288373
0.273594 0.259598 0.246304 0.233694 0.221715 0.210376 0.199663 0.189589 0.180112 0.171208
0.162825 0.15491 0.147445 0.140397 0.133735 0.127426 0.12145 0.115786 0.110413 0.105312
0.100466 0.0958667 0.09149 0.0873211 0.0833414 0.0795531 1.70878 #numbers for year
Ydeclare: 2013 sex: 2
#R0 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932
1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950
1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968
1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986
1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004
2005 2006 2007 2008 2009 2010 #years
228.199 228.199 228.166 228.122 228.071 228.038 228.003 227.968 227.935 227.9 227.86
227.803 227.737 227.663 227.578 227.462 227.341 227.238 227.14 227.061 226.964 226.847
226.693 226.543 226.396 226.285 226.112 225.898 225.629 224.966 224.299 223.184 222.249
221.888 221.465 221.191 220.897 220.532 220.22 219.99 219.692 219.308 218.834 218.279
217.679 217.14 216.651 216.251 215.77 215.4 215.155 214.069 213.646 213.144 212.617
211.353 210.501 209.319 207.77 206.266 204.52 202.876 200.874 198.754 194.927 190.919
187.556 182.49 175.465 170.295 166.016 160.484 157.121 152.945 147.979 141.01 136.72
128.709 119.802 111.758 106.713 100.33 95.2454 88.9269 87.5695 84.2707 85.5017 86.1407
88.5068 90.9232 93.2207 95.3794 97.5645 99.3524 101.342 103.338 105.213 #Recruits
1.02769e+009 1.02769e+009 1.02723e+009 1.0266e+009 1.02589e+009 1.02542e+009
1.02492e+009 1.02443e+009 1.02396e+009 1.02347e+009 1.02291e+009 1.0221e+009 1.02118e+009
1.02014e+009 1.01895e+009 1.01732e+009 1.01562e+009 1.01419e+009 1.01282e+009
1.01172e+009 1.01038e+009 1.00876e+009 1.00664e+009 1.00457e+009 1.00254e+009
1.00103e+009 9.98666e+008 9.95743e+008 9.92105e+008 9.83185e+008 9.74338e+008
9.59766e+008 9.47766e+008 9.4319e+008 9.37871e+008 9.34446e+008 9.30784e+008 9.26264e+008
9.22426e+008 9.19604e+008 9.15972e+008 9.11322e+008 9.05614e+008 8.99004e+008
8.91914e+008 8.8562e+008 8.79954e+008 8.75358e+008 8.69862e+008 8.65667e+008 8.62907e+008
8.508e+008 8.46141e+008 8.40657e+008 8.34945e+008 8.21452e+008 8.12511e+008 8.00317e+008
7.84671e+008 7.69837e+008 7.53059e+008 7.37659e+008 7.19426e+008 7.00704e+008
6.68345e+008 6.36313e+008 6.10778e+008 5.74454e+008 5.27919e+008 4.96218e+008
4.71449e+008 4.4124e+008 4.23796e+008 4.03031e+008 3.79555e+008 3.48642e+008 3.307e+008
2.99193e+008 2.66925e+008 2.40004e+008 2.24091e+008 2.0494e+008 1.90416e+008 1.73207e+008
1.69624e+008 1.61081e+008 1.64243e+008 1.65896e+008 1.72094e+008 1.78547e+008
1.84803e+008 1.90791e+008 1.96963e+008 2.02098e+008 2.07907e+008 2.13833e+008
2.19494e+008 #SpawnBio
0.44056 0.5 0 # spawn-recr steepness, sigmaR, autocorr
values from cat100_hmle, catch at 100% and steepness at mle value. # this is state of
nature 5 out of 9 (in no particular order) # and parameter set number 3 out of 4 for this
state
 0 0 28.3083 103.285 341.553 1014.2 2671.83 6204.22 12732.7 23330.1 38706.4 59025.3
83919.4 112652 144327 178069 213134 248951 285123 321394 357616 393710 429639 465389
500951 536316 571471 606397 641068 675453 709517 743223 776532 809406 841807 873699
905048 935824 965999 995548 1.02445e+006 1.05268e+006 1.08023e+006 1.10709e+006
1.13325e+006 1.15869e+006 1.18343e+006 1.20744e+006 1.23075e+006 1.25334e+006
1.27523e+006 1.29641e+006 1.31691e+006 1.33672e+006 1.35586e+006 1.37433e+006
1.39217e+006 1.40936e+006 1.42594e+006 1.4419e+006 1.45728e+006 1.47208e+006 1.48632e+006
1.50001e+006 1.51318e+006 1.52583e+006 1.53798e+006 1.54965e+006 1.56086e+006
1.57161e+006 1.58192e+006 1.59208e+006 1.60182e+006 1.61116e+006 1.62012e+006 1.6287e+006
1.63692e+006 1.6448e+006 1.65234e+006 1.65957e+006 1.66648e+006 1.6731e+006 1.67944e+006
1.6855e+006 1.6913e+006 1.69685e+006 1.70216e+006 1.70724e+006 1.71209e+006 1.71673e+006
1.72117e+006 1.72541e+006 1.72946e+006 1.73334e+006 1.73704e+006 1.74058e+006
1.74396e+006 1.74719e+006 1.75027e+006 1.75322e+006 1.75866e+006 #female fecundity;
weighted by N in year Y_init across morphs and areas
 0.045147 0.163178 0.222696 0.290492 0.365223 0.445539 0.530285 0.618588 0.709839
0.803631 0.899683 0.997778 1.09772 1.19929 1.30227 1.4064 1.51143 1.61705 1.72297 1.82891
1.93457 2.03968 2.14398 2.24722 2.34919 2.44969 2.54855 2.6456 2.74072 2.8338 2.92474
3.01346 3.09991 3.18404 3.26582 3.34522 3.42225 3.4969 3.56919 3.63912 3.70673 3.77204
3.83509 3.89593 3.95458 4.0111 4.06554 4.11794 4.16836 4.21686 4.26348 4.30828 4.35131

4.39264 4.43231 4.47038 4.5069 4.54192 4.57551 4.6077 4.63855 4.6681 4.69641 4.72352
4.74949 4.77434 4.79812 4.82089 4.84267 4.86351 4.88357 4.9029 4.92139 4.93906 4.95596
4.97211 4.98755 5.0023 5.01641 5.02988 5.04276 5.05506 5.06681 5.07803 5.08876 5.099
5.10878 5.11812 5.12704 5.13555 5.14369 5.15145 5.15886 5.16594 5.1727 5.17914 5.1853
5.19117 5.19678 5.20214 5.212 #bodywt for gender,fleet: 1 / 1
 0 0.0511233 0.0772332 0.112337 0.156989 0.21065 0.271667 0.337561 0.405497 0.472761
0.537103 0.596902 0.65118 0.699515 0.741909 0.778656 0.810226 0.837169 0.860061 0.879454
0.895857 0.909726 0.921458 0.931394 0.939825 0.946995 0.953108 0.958335 0.962819 0.966677
0.970009 0.972894 0.975403 0.977591 0.979505 0.981186 0.982667 0.983975 0.985135 0.986165
0.987085 0.987906 0.988643 0.989305 0.989902 0.990442 0.99093 0.991373 0.991776 0.992144
0.992479 0.992786 0.993068 0.993326 0.993564 0.993783 0.993985 0.994172 0.994345 0.994505
0.994654 0.994792 0.994921 0.995041 0.995152 0.995256 0.995354 0.995445 0.99553 0.995609
0.995681 0.995746 0.995807 0.995865 0.995919 0.995969 0.996017 0.996062 0.996105 0.996145
0.996183 0.996219 0.996253 0.996285 0.996315 0.996343 0.996371 0.996396 0.99642 0.996444
0.996465 0.996486 0.996506 0.996524 0.996542 0.996559 0.996575 0.99659 0.996604 0.996618
0.996643 #selex for gender,fleet: 1 / 1
 0.0462809 0.169552 0.232356 0.304214 0.383486 0.468356 0.557183 0.648721 0.74217
0.837091 0.933287 1.03069 1.12928 1.22902 1.32986 1.43167 1.53431 1.63757 1.74123 1.84504
1.94873 2.05204 2.15472 2.25653 2.35722 2.4566 2.55447 2.65067 2.74505 2.83748 2.92786
3.0161 3.10213 3.1859 3.26737 3.34651 3.4233 3.49775 3.56986 3.63965 3.70713 3.77233
3.83528 3.89603 3.95461 4.01106 4.06544 4.1178 4.16818 4.21663 4.26322 4.30799 4.351
4.39231 4.43196 4.47001 4.50651 4.54152 4.5751 4.60728 4.63811 4.66766 4.69597 4.72307
4.74903 4.77387 4.79766 4.82042 4.84219 4.86303 4.88309 4.90242 4.9209 4.93857 4.95546
4.97162 4.98705 5.00181 5.01591 5.02938 5.04226 5.05456 5.06631 5.07753 5.08825 5.09849
5.10827 5.11761 5.12653 5.13505 5.14318 5.15094 5.15835 5.16543 5.17218 5.17863 5.18479
5.19066 5.19627 5.20162 5.21149 #bodywt for gender,fleet: 1 / 2
 0 0.0213283 0.0352642 0.0561355 0.0857149 0.125189 0.174691 0.233098 0.298189 0.367085
0.436791 0.504638 0.56856 0.627179 0.679765 0.726107 0.766378 0.800993 0.830503 0.855511
0.876615 0.89438 0.909315 0.921869 0.932428 0.941321 0.948827 0.955176 0.960562 0.965145
0.969056 0.972406 0.975285 0.977769 0.979918 0.981784 0.983411 0.984833 0.986082 0.987181
0.988151 0.989011 0.989776 0.990457 0.991066 0.991611 0.992102 0.992544 0.992943 0.993304
0.993632 0.993931 0.994202 0.994451 0.994678 0.994886 0.995077 0.995253 0.995415 0.995564
0.995702 0.99583 0.995949 0.996059 0.996161 0.996256 0.996344 0.996426 0.996503 0.996575
0.99664 0.996697 0.996751 0.996801 0.996849 0.996894 0.996936 0.996975 0.997012 0.997047
0.99708 0.997112 0.997141 0.997169 0.997195 0.99722 0.997243 0.997266 0.997287 0.997306
0.997325 0.997343 0.99736 0.997376 0.997391 0.997406 0.997419 0.997432 0.997444 0.997456
0.997478 #selex for gender,fleet: 1 / 2
 0.0504337 0.189018 0.257432 0.331995 0.409383 0.487655 0.566341 0.645863 0.726964
0.810375 0.896654 0.986129 1.07889 1.17484 1.2737 1.37507 1.4785 1.58348 1.68953 1.79614
1.90288 2.00933 2.11512 2.21995 2.32351 2.42558 2.52596 2.62445 2.72094 2.81528 2.9074
2.99721 3.08467 3.16972 3.25235 3.33253 3.41028 3.48558 3.55846 3.62895 3.69706 3.76284
3.82631 3.88754 3.94655 4.0034 4.05814 4.11083 4.16151 4.21025 4.25709 4.3021 4.34533
4.38683 4.42667 4.46489 4.50156 4.53672 4.57043 4.60273 4.63369 4.66335 4.69176 4.71896
4.745 4.76994 4.7938 4.81663 4.83848 4.85938 4.87949 4.89886 4.91738 4.93509 4.95202
4.96821 4.98368 4.99846 5.01259 5.02609 5.03899 5.05131 5.06309 5.07433 5.08507 5.09533
5.10513 5.11449 5.12342 5.13196 5.1401 5.14788 5.15531 5.1624 5.16916 5.17562 5.18179
5.18767 5.19329 5.19865 5.20854 #bodywt for gender,fleet: 1 / 3
 0 0.0168565 0.0359177 0.0704144 0.125351 0.201915 0.296018 0.399604 0.503567 0.600364
0.685263 0.756326 0.813704 0.85879 0.893511 0.919871 0.93969 0.954505 0.965548 0.973775
0.979914 0.984509 0.987963 0.990573 0.992557 0.994075 0.995243 0.99615 0.996858 0.997415
0.997857 0.998209 0.998492 0.998722 0.998908 0.999062 0.999188 0.999293 0.99938 0.999454
0.999516 0.999569 0.999614 0.999653 0.999686 0.999715 0.99974 0.999762 0.999781 0.999798
0.999813 0.999826 0.999838 0.999848 0.999857 0.999866 0.999873 0.99988 0.999886 0.999892
0.999897 0.999902 0.999906 0.99991 0.999913 0.999916 0.999919 0.999922 0.999925 0.999927
0.999929 0.999931 0.999932 0.999934 0.999935 0.999937 0.999938 0.999939 0.99994 0.999941
0.999942 0.999943 0.999944 0.999945 0.999945 0.999946 0.999947 0.999947 0.999948 0.999948
0.999949 0.999949 0.99995 0.99995 0.999951 0.999951 0.999952 0.999952 0.999952 0.999952
0.999953 #selex for gender,fleet: 1 / 3
 0.0466444 0.171812 0.236089 0.310135 0.392403 0.480968 0.573886 0.669515 0.76669
0.864713 0.963252 1.0622 1.16158 1.26144 1.36181 1.4627 1.56407 1.66582 1.7678 1.86984
1.97175 2.0733 2.17428 2.27446 2.37364 2.4716 2.56818 2.66318 2.75648 2.84792 2.93742
3.02485 3.11016 3.19328 3.27417 3.35278 3.4291 3.50313 3.57486 3.6443 3.71147 3.77639
3.83909 3.8996 3.95797 4.01424 4.06845 4.12065 4.17089 4.21921 4.26568 4.31034 4.35325
4.39447 4.43403 4.472 4.50844 4.54338 4.57689 4.60901 4.6398 4.6693 4.69756 4.72462
4.75054 4.77535 4.79909 4.82182 4.84357 4.86437 4.88442 4.90372 4.92219 4.93984 4.95672
4.97286 4.98828 5.00302 5.01711 5.03057 5.04343 5.05572 5.06746 5.07868 5.08939 5.09962
5.10939 5.11873 5.12764 5.13615 5.14427 5.15203 5.15943 5.16651 5.17325 5.1797 5.18585
5.19172 5.19732 5.20267 5.21253 #bodywt for gender,fleet: 1 / 4
 0 0.011426 0.0195259 0.0322319 0.0512246 0.078121 0.11406 0.159308 0.213068 0.273565
0.338381 0.40488 0.470599 0.533513 0.592155 0.645622 0.693497 0.735745 0.772597 0.804456
0.831809 0.855178 0.875076 0.891982 0.906331 0.91851 0.928852 0.937647 0.945139 0.951534

0.957006 0.961703 0.965744 0.969233 0.972253 0.974877 0.977164 0.979163 0.980916 0.982458
0.983819 0.985024 0.986093 0.987045 0.987895 0.988656 0.989339 0.989954 0.990509 0.99101
0.991464 0.991877 0.992253 0.992596 0.992909 0.993196 0.993459 0.993701 0.993923 0.994128
0.994317 0.994492 0.994655 0.994805 0.994944 0.995074 0.995195 0.995307 0.995412 0.99551
0.995597 0.995675 0.995748 0.995816 0.99588 0.995941 0.995997 0.996051 0.996101 0.996148
0.996193 0.996235 0.996275 0.996312 0.996348 0.996381 0.996413 0.996443 0.996471 0.996498
0.996523 0.996547 0.99657 0.996591 0.996612 0.996631 0.996649 0.996667 0.996683 0.996699
0.996728 #selex for gender,fleet: 1 / 4
 0.0458503 0.168306 0.231642 0.305371 0.388624 0.480165 0.578473 0.681886 0.788778
0.897715 1.00756 1.11747 1.22692 1.33558 1.44328 1.54993 1.65553 1.76007 1.86354 1.96594
2.06723 2.16738 2.26632 2.36398 2.46027 2.5551 2.64839 2.74004 2.82997 2.9181 3.00434
3.08863 3.17093 3.25117 3.32932 3.40534 3.47923 3.55097 3.62055 3.68798 3.75327 3.81643
3.87749 3.93648 3.99343 4.04836 4.10133 4.15238 4.20154 4.24886 4.29439 4.33817 4.38026
4.42071 4.45956 4.49687 4.53267 4.56703 4.59999 4.6316 4.6619 4.69094 4.71878 4.74544
4.77098 4.79543 4.81885 4.84126 4.86271 4.88324 4.90305 4.92218 4.94047 4.95796 4.97469
4.99068 5.00597 5.02058 5.03454 5.04789 5.06064 5.07282 5.08446 5.09558 5.1062 5.11635
5.12604 5.13529 5.14413 5.15257 5.16063 5.16832 5.17567 5.18268 5.18938 5.19577 5.20187
5.2077 5.21325 5.21856 5.22834 #bodywt for gender,fleet: 1 / 5
 0 0.00497951 0.00812772 0.0129303 0.0200354 0.0302067 0.0442625 0.0629721 0.086926
0.116411 0.151331 0.191188 0.235142 0.282111 0.330901 0.380324 0.429299 0.476909 0.522437
0.565367 0.605371 0.642279 0.67605 0.706745 0.734491 0.759464 0.781866 0.801913 0.819821
0.835799 0.850049 0.862754 0.874085 0.884197 0.893229 0.901303 0.908532 0.915011 0.920828
0.926059 0.93077 0.935021 0.938862 0.94234 0.945494 0.948359 0.950967 0.953345 0.955515
0.957501 0.95932 0.960989 0.962523 0.963934 0.965235 0.966436 0.967546 0.968573 0.969524
0.970407 0.971227 0.971989 0.972699 0.97336 0.973977 0.974553 0.975091 0.975595 0.976066
0.976508 0.976906 0.977266 0.977603 0.977921 0.97822 0.978501 0.978766 0.979016 0.979252
0.979474 0.979684 0.979882 0.98007 0.980247 0.980414 0.980573 0.980723 0.980865 0.980999
0.981126 0.981247 0.981362 0.98147 0.981573 0.981671 0.981763 0.981851 0.981935 0.982014
0.982089 0.982227 #selex for gender,fleet: 1 / 5
 0.047457 0.17645 0.243537 0.321908 0.410686 0.508516 0.613589 0.723785 0.836934 0.951109
1.06483 1.17713 1.28749 1.39572 1.50187 1.60609 1.70859 1.80956 1.90918 2.00759 2.10486
2.20106 2.29619 2.39022 2.48312 2.5748 2.66519 2.7542 2.84174 2.92771 3.01203 3.09461
3.17538 3.25429 3.33126 3.40625 3.47924 3.55019 3.61909 3.68593 3.7507 3.81342 3.87411
3.93277 3.98943 4.04413 4.0969 4.14777 4.19679 4.24398 4.28941 4.33311 4.37514 4.41552
4.45433 4.4916 4.52738 4.56171 4.59466 4.62625 4.65655 4.68559 4.71343 4.74009 4.76564
4.7901 4.81352 4.83595 4.85741 4.87795 4.89777 4.91689 4.93519 4.95268 4.96941 4.98541
5.0007 5.01531 5.02928 5.04263 5.05538 5.06757 5.07922 5.09034 5.10097 5.11112 5.12081
5.13007 5.13891 5.14735 5.15542 5.16311 5.17046 5.17748 5.18418 5.19057 5.19668 5.20251
5.20807 5.21338 5.22317 #bodywt for gender,fleet: 1 / 6
 0 0.00140879 0.00257294 0.0045632 0.00785473 0.0131087 0.0211776 0.0330585 0.0497792
0.0722262 0.100961 0.136078 0.177153 0.223289 0.273245 0.325598 0.378907 0.431846
0.483294 0.532373 0.578462 0.62117 0.660309 0.695849 0.727877 0.756568 0.782144 0.80486
0.824981 0.842767 0.858471 0.872327 0.884551 0.895338 0.904864 0.913285 0.920737 0.927341
0.933203 0.938416 0.943059 0.947203 0.950909 0.95423 0.957211 0.959893 0.962311 0.964495
0.966471 0.968263 0.969891 0.971372 0.972723 0.973958 0.975087 0.976122 0.977072 0.977946
0.97875 0.979492 0.980177 0.980811 0.981398 0.981942 0.982447 0.982916 0.983353 0.983759
0.984139 0.984493 0.984808 0.985089 0.985353 0.9856 0.985832 0.986049 0.986254 0.986446
0.986628 0.986798 0.986959 0.98711 0.987253 0.987388 0.987515 0.987635 0.987749 0.987856
0.987958 0.988054 0.988145 0.988231 0.988312 0.98839 0.988463 0.988532 0.988598 0.98866
0.98872 0.988776 0.988879 #selex for gender,fleet: 1 / 6
 0.0539259 0.185573 0.25267 0.328419 0.411174 0.499395 0.591863 0.687727 0.786456
0.887728 0.991338 1.09712 1.20489 1.31446 1.42557 1.53794 1.65126 1.7652 1.87941 1.99355
2.1073 2.22035 2.33241 2.44322 2.55253 2.66014 2.76586 2.86955 2.97105 3.07027 3.1671
3.26149 3.35337 3.44271 3.52948 3.61367 3.69528 3.77432 3.8508 3.92475 3.99621 4.06521
4.13179 4.19599 4.25787 4.31749 4.37488 4.43012 4.48325 4.53434 4.58344 4.63062 4.67593
4.71944 4.76119 4.80125 4.83969 4.87654 4.91187 4.94574 4.97819 5.00929 5.03907 5.06759
5.0949 5.12104 5.14607 5.17001 5.19293 5.21485 5.23595 5.25627 5.2757 5.29428 5.31205
5.32903 5.34526 5.36078 5.37561 5.38979 5.40333 5.41627 5.42863 5.44045 5.45173 5.46251
5.4728 5.48264 5.49203 5.501 5.50956 5.51774 5.52555 5.533 5.54012 5.54692 5.55341 5.5596
5.56551 5.57116 5.58159 #bodywt for gender,fleet: 2 / 1
 0 0.0518398 0.079816 0.117909 0.166721 0.225504 0.292161 0.363647 0.436587 0.507864
0.575011 0.636368 0.691057 0.738838 0.779931 0.814846 0.844245 0.868839 0.889325 0.906346
0.920474 0.932201 0.941947 0.950061 0.956834 0.962504 0.967267 0.971282 0.974679 0.977566
0.980027 0.982135 0.983947 0.985511 0.986866 0.988045 0.989074 0.989975 0.990768 0.991468
0.992087 0.992636 0.993126 0.993564 0.993956 0.994308 0.994625 0.994912 0.995171 0.995406
0.99562 0.995816 0.995994 0.996157 0.996306 0.996443 0.996569 0.996686 0.996793 0.996892
0.996984 0.997069 0.997148 0.997221 0.997289 0.997353 0.997412 0.997468 0.997519 0.997568
0.997611 0.99765 0.997687 0.997721 0.997754 0.997784 0.997813 0.99784 0.997865 0.997889
0.997912 0.997933 0.997953 0.997972 0.99799 0.998008 0.998024 0.998039 0.998053 0.998067
0.99808 0.998092 0.998104 0.998115 0.998125 0.998135 0.998145 0.998154 0.998162 0.99817
0.998185 #selex for gender,fleet: 2 / 1

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 0.0552534 0.192681 0.263397 0.343528 0.43103 0.5238 0.620085 0.718683 0.818926 0.920536
1.02346 1.12775 1.23345 1.34057 1.44904 1.55872 1.66943 1.78089 1.89283 2.00493 2.11687
2.22834 2.33904 2.44867 2.557 2.66377 2.7688 2.8719 2.97292 3.07173 3.16823 3.26234
3.35399 3.44314 3.52976 3.61382 3.69532 3.77427 3.85069 3.92458 3.99599 4.06495 4.1315
4.19568 4.25754 4.31714 4.37452 4.42975 4.48287 4.53396 4.58306 4.63023 4.67554 4.71904
4.7608 4.80086 4.83929 4.87615 4.91149 4.94535 4.97781 5.0089 5.03869 5.06721 5.09452
5.12067 5.14569 5.16964 5.19256 5.21448 5.23559 5.25591 5.27534 5.29392 5.31169 5.32867
5.34491 5.36042 5.37526 5.38943 5.40297 5.41592 5.42828 5.44009 5.45138 5.46216 5.47245
5.48229 5.49168 5.50065 5.50921 5.51739 5.5252 5.53266 5.53977 5.54657 5.55306 5.55925
5.56517 5.57081 5.58124 #bodywt for gender,fleet: 2 / 2
 0 0.0217085 0.0367487 0.0596831 0.0925919 0.136787 0.192233 0.257331 0.329197 0.404272
0.479017 0.550442 0.616385 0.675562 0.727455 0.772127 0.810028 0.841829 0.868293 0.890188
0.908235 0.923079 0.935281 0.945317 0.953582 0.960405 0.966052 0.970742 0.974651 0.977922
0.98067 0.982988 0.984953 0.986624 0.988052 0.989277 0.990333 0.991246 0.992039 0.992731
0.993336 0.993868 0.994337 0.994751 0.995119 0.995446 0.995738 0.996 0.996235 0.996446
0.996637 0.99681 0.996966 0.997109 0.997238 0.997357 0.997465 0.997564 0.997655 0.997739
0.997816 0.997887 0.997953 0.998014 0.99807 0.998123 0.998171 0.998216 0.998259 0.998298
0.998333 0.998364 0.998393 0.99842 0.998446 0.99847 0.998493 0.998514 0.998534 0.998553
0.998571 0.998587 0.998603 0.998618 0.998632 0.998645 0.998658 0.99867 0.998681 0.998691
0.998701 0.998711 0.99872 0.998728 0.998736 0.998744 0.998751 0.998758 0.998765 0.998771
0.998782 #selex for gender,fleet: 2 / 2
 0.0601075 0.214219 0.290644 0.372767 0.456919 0.541321 0.625889 0.711421 0.798942
0.889352 0.983281 1.08104 1.18265 1.28787 1.39629 1.50736 1.62049 1.73505 1.85046 1.96618
2.08171 2.19662 2.31053 2.42313 2.53414 2.64333 2.7505 2.85551 2.95821 3.05851 3.15632
3.25159 3.34425 3.4343 3.5217 3.60646 3.68857 3.76807 3.84497 3.91929 3.99109 4.06039
4.12724 4.1917 4.25381 4.31363 4.37121 4.42662 4.47991 4.53115 4.58038 4.62768 4.6731
4.71671 4.75856 4.79871 4.83723 4.87416 4.90956 4.94349 4.97601 5.00716 5.03699 5.06556
5.09292 5.1191 5.14417 5.16815 5.1911 5.21306 5.23419 5.25452 5.27397 5.29257 5.31035
5.32735 5.3436 5.35913 5.37398 5.38816 5.40172 5.41467 5.42705 5.43887 5.45016 5.46095
5.47125 5.48109 5.49049 5.49947 5.50804 5.51623 5.52404 5.5315 5.53863 5.54543 5.55192
5.55812 5.56404 5.56969 5.58013 #bodywt for gender,fleet: 2 / 3
 0 0.0173676 0.0382509 0.0767998 0.138612 0.224342 0.328234 0.44021 0.549681 0.648575
0.732478 0.80025 0.852958 0.892796 0.92228 0.94378 0.959307 0.970457 0.978446 0.984174
0.988291 0.991264 0.993423 0.995001 0.996164 0.997028 0.997674 0.998163 0.998535 0.99882
0.999042 0.999215 0.999351 0.99946 0.999546 0.999616 0.999673 0.999719 0.999757 0.999789
0.999815 0.999837 0.999856 0.999872 0.999885 0.999897 0.999907 0.999915 0.999923 0.999929
0.999935 0.99994 0.999945 0.999949 0.999952 0.999955 0.999958 0.99996 0.999963 0.999965
0.999966 0.999968 0.99997 0.999971 0.999972 0.999973 0.999974 0.999975 0.999976 0.999977
0.999978 0.999978 0.999979 0.999979 0.99998 0.99998 0.999981 0.999981 0.999982 0.999982
0.999982 0.999983 0.999983 0.999983 0.999983 0.999984 0.999984 0.999984 0.999984 0.999984
0.999985 0.999985 0.999985 0.999985 0.999985 0.999985 0.999985 0.999986 0.999986 0.999986
0.999986 #selex for gender,fleet: 2 / 3
 0.0556789 0.195209 0.267577 0.35015 0.44094 0.537655 0.638145 0.74075 0.844425 0.948657
1.0533 1.15843 1.26416 1.37063 1.47791 1.58603 1.69489 1.80437 1.91426 2.02434 2.13434
2.24397 2.35297 2.46106 2.56799 2.67352 2.77744 2.87956 2.97971 3.07777 3.17361 3.26714
3.35829 3.447 3.53323 3.61695 3.69816 3.77685 3.85304 3.92673 3.99796 4.06676 4.13317
4.19723 4.25898 4.31848 4.37577 4.43092 4.48397 4.53499 4.58403 4.63115 4.67641 4.71987
4.76159 4.80161 4.84001 4.87684 4.91214 4.94599 4.97842 5.00949 5.03926 5.06776 5.09506
5.12119 5.1462 5.17013 5.19304 5.21495 5.23604 5.25635 5.27578 5.29435 5.31211 5.32909
5.34532 5.36083 5.37566 5.38983 5.40337 5.41631 5.42867 5.44048 5.45176 5.46253 5.47283
5.48266 5.49205 5.50101 5.50957 5.51775 5.52556 5.53301 5.54013 5.54692 5.55341 5.5596
5.56551 5.57116 5.58159 #bodywt for gender,fleet: 2 / 4
 0 0.0116461 0.020415 0.0344617 0.0557967 0.0863221 0.127287 0.178795 0.239606 0.307321
0.37886 0.451034 0.521016 0.586629 0.646439 0.699711 0.746272 0.786357 0.820457 0.849204
0.873276 0.893338 0.910009 0.92384 0.935311 0.94483 0.952741 0.95933 0.964832 0.96944
0.973313 0.97658 0.979345 0.981696 0.983701 0.985419 0.986896 0.988172 0.989277 0.990239
0.991079 0.991814 0.992462 0.993033 0.993538 0.993987 0.994387 0.994744 0.995065 0.995352
0.995611 0.995845 0.996057 0.99625 0.996424 0.996584 0.996729 0.996862 0.996984 0.997096
0.997199 0.997294 0.997382 0.997463 0.997538 0.997607 0.997672 0.997732 0.997788 0.99784
0.997886 0.997927 0.997965 0.998001 0.998035 0.998066 0.998096 0.998124 0.99815 0.998175
0.998198 0.99822 0.99824 0.99826 0.998278 0.998295 0.998312 0.998327 0.998342 0.998356
0.998369 0.998381 0.998393 0.998404 0.998414 0.998424 0.998434 0.998443 0.998451 0.998459
0.998474 #selex for gender,fleet: 2 / 4
 0.0547497 0.191323 0.26274 0.345176 0.437425 0.537908 0.644796 0.756201 0.870385 0.98592
1.10176 1.21722 1.33192 1.44568 1.55846 1.6703 1.78122 1.89128 2.00049 2.10884 2.21629
2.32278 2.42819 2.53244 2.63538 2.7369 2.83686 2.93515 3.03163 3.12621 3.21877 3.30925
3.39755 3.48363 3.56744 3.64893 3.72809 3.80491 3.87937 3.9515 4.02129 4.08877 4.15397
4.21692 4.27766 4.33623 4.39267 4.44703 4.49937 4.54972 4.59815 4.64471 4.68945 4.73243
4.7737 4.81332 4.85133 4.8878 4.92278 4.95632 4.98847 5.01927 5.04879 5.07706 5.10414
5.13007 5.15489 5.17865 5.20139 5.22314 5.24411 5.26433 5.28366 5.30215 5.31983 5.33674
5.3529 5.36834 5.3831 5.39721 5.4107 5.42358 5.43589 5.44765 5.45888 5.46962 5.47987
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5.48966 5.49901 5.50794 5.51647 5.52461 5.53239 5.53981 5.5469 5.55367 5.56013 5.5663
5.57219 5.57781 5.5882 #bodywt for gender,fleet: 2 / 5
 0 0.00506505 0.00846584 0.0137649 0.0217505 0.0333584 0.049588 0.0713603 0.0993433
0.133791 0.174451 0.220563 0.270956 0.324199 0.37878 0.433257 0.486373 0.537128 0.584791
0.628896 0.669207 0.705673 0.738382 0.767523 0.793343 0.816128 0.836171 0.853766 0.86919
0.882702 0.89454 0.904913 0.914012 0.922003 0.92903 0.93522 0.940683 0.945514 0.949795
0.953597 0.956981 0.960001 0.9627 0.965119 0.967293 0.969249 0.971013 0.972609 0.974054
0.975367 0.97656 0.977648 0.978642 0.979551 0.980383 0.981148 0.981851 0.982498 0.983095
0.983646 0.984156 0.984628 0.985066 0.985473 0.985851 0.986203 0.986531 0.986836 0.987122
0.987389 0.987628 0.987842 0.988044 0.988232 0.98841 0.988577 0.988733 0.988881 0.98902
0.989151 0.989275 0.989392 0.989502 0.989606 0.989704 0.989797 0.989884 0.989968 0.990046
0.990121 0.990191 0.990258 0.990321 0.990381 0.990438 0.990492 0.990543 0.990592 0.990638
0.990681 0.990762 #selex for gender,fleet: 2 / 5
 0.0566297 0.200386 0.275902 0.363338 0.461434 0.568422 0.682087 0.799992 0.91981 1.03964
1.15817 1.27469 1.38893 1.50094 1.61096 1.71927 1.82617 1.93192 2.03671 2.14067 2.24388
2.34635 2.44803 2.54886 2.64872 2.74749 2.84503 2.9412 3.03586 3.12886 3.2201 3.30945
3.39682 3.48212 3.56529 3.64626 3.725 3.80148 3.87569 3.94761 4.01724 4.08462 4.14974
4.21264 4.27335 4.33191 4.38836 4.44274 4.4951 4.5455 4.59397 4.64057 4.68536 4.72838
4.7697 4.80937 4.84744 4.88396 4.91898 4.95257 4.98476 5.01562 5.04518 5.07349 5.10061
5.12658 5.15144 5.17524 5.19801 5.2198 5.2408 5.26103 5.28038 5.29889 5.31659 5.3335
5.34968 5.36514 5.37991 5.39404 5.40753 5.42043 5.43275 5.44452 5.45576 5.46651 5.47677
5.48657 5.49593 5.50487 5.5134 5.52155 5.52934 5.53677 5.54387 5.55064 5.55711 5.56328
5.56918 5.57481 5.5852 #bodywt for gender,fleet: 2 / 6
 0 0.00144011 0.00270794 0.00493369 0.00870259 0.0148408 0.0244198 0.0386853 0.0588914
0.0860613 0.120743 0.162841 0.211584 0.265626 0.323248 0.382589 0.441867 0.499532
0.554361 0.605484 0.652368 0.69477 0.732677 0.766246 0.795745 0.821513 0.843915 0.863325
0.880102 0.894582 0.90707 0.917841 0.927136 0.935165 0.942111 0.948129 0.953355 0.957902
0.961869 0.965337 0.968378 0.971051 0.973407 0.97549 0.977335 0.978974 0.980435 0.981739
0.982907 0.983956 0.984899 0.98575 0.98652 0.987217 0.98785 0.988426 0.988951 0.98943
0.989869 0.990271 0.990641 0.990981 0.991294 0.991583 0.99185 0.992097 0.992326 0.992538
0.992736 0.992919 0.993082 0.993225 0.993359 0.993485 0.993603 0.993713 0.993816 0.993913
0.994004 0.99409 0.994171 0.994247 0.994318 0.994386 0.994449 0.994509 0.994566 0.994619
0.99467 0.994717 0.994762 0.994805 0.994846 0.994884 0.99492 0.994954 0.994987 0.995018
0.995047 0.995075 0.995125 #selex for gender,fleet: 2 / 6
 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379
0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379
0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379
0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379
0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379
0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379
0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379
0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379
0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379
0.0462379 0.0462379 0.0462379 #mean M for year Yinit: 2011 sex: 1
 52.6066 49.3344 46.1908 43.2277 40.518 37.7914 35.2322 32.7677 30.4021 28.1869 26.6381
24.9759 24.6723 23.7748 24.1344 24.0124 24.0501 23.627 23.6423 23.5725 23.0647 21.7377
20.6877 19.2273 17.6195 15.9364 14.5019 13.006 11.6721 10.5449 9.39019 8.27837 7.32203
6.47157 5.67741 4.98814 4.38525 3.86876 3.42086 3.03746 2.70401 2.41476 2.17115 1.95474
1.76833 1.60659 1.47067 1.3464 1.23825 1.14337 1.05871 0.98356 0.916282 0.855775 0.800677
0.750177 0.703656 0.660664 0.620864 0.584319 0.550594 0.519118 0.489825 0.462879 0.437628
0.415124 0.394307 0.373958 0.354816 0.336158 0.318489 0.301731 0.28579 0.270742 0.256492
0.243007 0.230222 0.218135 0.206726 0.196004 0.18592 0.176452 0.167543 0.159138 0.15122
0.143755 0.136709 0.130047 0.123748 0.117789 0.112148 0.106802 0.101733 0.0969308
0.0923695 0.0880326 0.0839001 0.079973 0.0762397 0.0726893 1.52113 #numbers for year
Yinit: 2011 sex: 1
 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087
0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087
0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087
0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087
0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087
0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087
0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087
0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087
0.045087 0.045087 #mean M for year Yinit: 2011 sex: 2
 52.6066 49.3912 46.2971 43.3768 40.7037 38.0065 35.4707 33.0233 30.6692 28.4609 26.9206
25.2618 24.9744 24.0833 24.4625 24.3491 24.39 23.953 23.9473 23.8394 23.2722 21.8654
20.7287 19.1775 17.484 15.7275 14.2319 12.694 11.3336 10.1919 9.04001 7.94401 7.00898
```

6.18417 5.41966 4.75987 4.18558 3.6957 3.27249 2.91151 2.59848 2.32761 2.10015 1.89818
1.72437 1.57356 1.44698 1.3308 1.22951 1.14044 1.06067 0.989601 0.925714 0.868 0.815176
0.7665 0.721413 0.67952 0.640538 0.604586 0.571268 0.540039 0.510864 0.48395 0.458639
0.436059 0.415118 0.394545 0.375124 0.356101 0.338018 0.3208 0.30436 0.288791 0.274004
0.259979 0.246655 0.234042 0.222127 0.210922 0.20038 0.190476 0.181151 0.172346 0.164042
0.156202 0.148791 0.141772 0.135123 0.128821 0.122844 0.11717 0.111778 0.10666 0.101791
0.0971527 0.092725 0.0885102 0.0844965 0.0806734 1.736 #numbers for year Yinit: 2011 sex:
2
 54.1634 50.9936 47.9496 44.9513 42.0732 39.3559 36.8657 34.3578 32.0015 29.7326 27.5565
25.5209 24.0929 22.5667 22.2712 21.4425 21.7497 21.6244 21.6447 21.2521 21.2555 21.1835
20.7193 19.5208 18.5724 17.2568 15.8101 14.2969 13.0076 11.6639 10.4662 9.45424 8.418
7.42057 6.56278 5.80009 5.08803 4.4701 3.92968 3.46675 3.06534 2.72177 2.42299 2.16383
1.94559 1.75171 1.58472 1.43984 1.3181 1.20678 1.1099 1.02491 0.949067 0.881742 0.821467
0.767253 0.717882 0.672628 0.630936 0.592403 0.55673 0.523971 0.493739 0.465522 0.43926
0.415102 0.392462 0.372285 0.353619 0.335373 0.318209 0.301478 0.285632 0.270604 0.256307
0.242812 0.230031 0.217936 0.206468 0.195627 0.185394 0.175776 0.166732 0.158239 0.150249
0.142711 0.135609 0.128914 0.122595 0.11662 0.110971 0.105627 0.100568 0.0957748
0.0912288 0.0869224 0.082832 0.0789428 0.075237 0.0717155 1.49763 #numbers for year
Ydeclare: 2013 sex: 1
 54.1634 51.0523 48.0599 45.106 42.2653 39.5788 37.1138 34.6243 32.2811 30.0201 27.8476
25.8124 24.388 22.8611 22.579 21.7543 22.0794 21.9618 21.9852 21.5798 21.5647 21.459
20.9411 19.6693 18.6419 17.243 15.7171 14.1356 12.7894 11.4058 10.1823 9.15567 8.12021
7.13523 6.29504 5.55401 4.86724 4.2746 3.75881 3.31887 2.93883 2.6147 2.33364 2.09045
1.88624 1.70493 1.54889 1.41351 1.29988 1.19559 1.10466 1.02469 0.953065 0.889252
0.831882 0.780051 0.732607 0.688884 0.648382 0.610746 0.575722 0.543419 0.513481 0.485418
0.459199 0.435012 0.412265 0.391972 0.373151 0.354659 0.337203 0.320105 0.30385 0.288373
0.273594 0.259598 0.246304 0.233694 0.221715 0.210376 0.199663 0.189589 0.180112 0.171208
0.162825 0.15491 0.147445 0.140397 0.133735 0.127426 0.12145 0.115786 0.110413 0.105312
0.100466 0.0958667 0.09149 0.0873211 0.0833414 0.0795531 1.70878 #numbers for year
Ydeclare: 2013 sex: 2
#R0 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932
1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950
1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968
1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986
1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004
2005 2006 2007 2008 2009 2010 #years
228.199 228.199 228.166 228.122 228.071 228.038 228.003 227.968 227.935 227.9 227.86
227.803 227.737 227.663 227.578 227.462 227.341 227.238 227.14 227.061 226.964 226.847
226.693 226.543 226.396 226.285 226.112 225.898 225.629 224.966 224.299 223.184 222.249
221.888 221.465 221.191 220.897 220.532 220.22 219.99 219.692 219.308 218.834 218.279
217.679 217.14 216.651 216.251 215.77 215.4 215.155 214.069 213.646 213.144 212.617
211.353 210.501 209.319 207.77 206.266 204.52 202.876 200.874 198.754 194.927 190.919
187.556 182.49 175.465 170.295 166.016 160.484 157.121 152.945 147.979 141.01 136.72
128.709 119.802 111.758 106.713 100.33 95.2454 88.9269 87.5695 84.2707 85.5017 86.1407
88.5068 90.9232 93.2207 95.3794 97.5645 99.3524 101.342 103.338 105.213 #Recruits
1.02769e+009 1.02769e+009 1.02723e+009 1.0266e+009 1.02589e+009 1.02542e+009
1.02492e+009 1.02443e+009 1.02396e+009 1.02347e+009 1.02291e+009 1.0221e+009 1.02118e+009
1.02014e+009 1.01895e+009 1.01732e+009 1.01562e+009 1.01419e+009 1.01282e+009
1.01172e+009 1.01038e+009 1.00876e+009 1.00664e+009 1.00457e+009 1.00254e+009
1.00103e+009 9.98666e+008 9.95743e+008 9.92105e+008 9.83185e+008 9.74338e+008
9.59766e+008 9.47766e+008 9.4319e+008 9.37871e+008 9.34446e+008 9.30784e+008 9.26264e+008
9.22426e+008 9.19604e+008 9.15972e+008 9.11322e+008 9.05614e+008 8.99004e+008
8.91914e+008 8.8562e+008 8.79954e+008 8.75358e+008 8.69862e+008 8.65667e+008 8.62907e+008
8.508e+008 8.46141e+008 8.40657e+008 8.34945e+008 8.21452e+008 8.12511e+008 8.00317e+008
7.84671e+008 7.69837e+008 7.53059e+008 7.37659e+008 7.19426e+008 7.00704e+008
6.68345e+008 6.36313e+008 6.10778e+008 5.74454e+008 5.27919e+008 4.96218e+008
4.71449e+008 4.4124e+008 4.23796e+008 4.03031e+008 3.79555e+008 3.48642e+008 3.307e+008
2.99193e+008 2.66925e+008 2.40004e+008 2.24091e+008 2.0494e+008 1.90416e+008 1.73207e+008
1.69624e+008 1.61081e+008 1.64243e+008 1.65896e+008 1.72094e+008 1.78547e+008
1.84803e+008 1.90791e+008 1.96963e+008 2.02098e+008 2.07907e+008 2.13833e+008
2.19494e+008 #SpawnBio
0.44056 0.5 0 # spawn-recr steepness, sigmaR, autocorr
values from cat100_hmle, catch at 100% and steepness at mle value. # this is state of
nature 5 out of 9 (in no particular order) # and parameter set number 4 out of 4 for this
state
 0 0 28.3083 103.285 341.553 1014.2 2671.83 6204.22 12732.7 23330.1 38706.4 59025.3
83919.4 112652 144327 178069 213134 248951 285123 321394 357616 393710 429639 465389
500951 536316 571471 606397 641068 675453 709517 743223 776532 809406 841807 873699
905048 935824 965999 995548 1.02445e+006 1.05268e+006 1.08023e+006 1.10709e+006
1.13325e+006 1.15869e+006 1.18343e+006 1.20744e+006 1.23075e+006 1.25334e+006
1.27523e+006 1.29641e+006 1.31691e+006 1.33672e+006 1.35586e+006 1.37433e+006

1.39217e+006 1.40936e+006 1.42594e+006 1.4419e+006 1.45728e+006 1.47208e+006 1.48632e+006
1.50001e+006 1.51318e+006 1.52583e+006 1.53798e+006 1.54965e+006 1.56086e+006
1.57161e+006 1.58192e+006 1.59208e+006 1.60182e+006 1.61116e+006 1.62012e+006 1.6287e+006
1.63692e+006 1.6448e+006 1.65234e+006 1.65957e+006 1.66648e+006 1.6731e+006 1.67944e+006
1.6855e+006 1.6913e+006 1.69685e+006 1.70216e+006 1.70724e+006 1.71209e+006 1.71673e+006
1.72117e+006 1.72541e+006 1.72946e+006 1.73334e+006 1.73704e+006 1.74058e+006
1.74396e+006 1.74719e+006 1.75027e+006 1.75322e+006 1.75866e+006 #female fecundity;
weighted by N in year Y_init across morphs and areas
 0.045147 0.163178 0.222696 0.290492 0.365223 0.445539 0.530285 0.618588 0.709839
0.803631 0.899683 0.997778 1.09772 1.19929 1.30227 1.4064 1.51143 1.61705 1.72297 1.82891
1.93457 2.03968 2.14398 2.24722 2.34919 2.44969 2.54855 2.6456 2.74072 2.8338 2.92474
3.01346 3.09991 3.18404 3.26582 3.34522 3.42225 3.4969 3.56919 3.63912 3.70673 3.77204
3.83509 3.89593 3.95458 4.0111 4.06554 4.11794 4.16836 4.21686 4.26348 4.30828 4.35131
4.39264 4.43231 4.47038 4.5069 4.54192 4.57551 4.6077 4.63855 4.6681 4.69641 4.72352
4.74949 4.77434 4.79812 4.82089 4.84267 4.86351 4.88357 4.9029 4.92139 4.93906 4.95596
4.97211 4.98755 5.0023 5.01641 5.02988 5.04276 5.05506 5.06681 5.07803 5.08876 5.099
5.10878 5.11812 5.12704 5.13555 5.14369 5.15145 5.15886 5.16594 5.1727 5.17914 5.1853
5.19117 5.19678 5.20214 5.212 #bodywt for gender,fleet: 1 / 1
 0 0.0511233 0.0772332 0.112337 0.156989 0.21065 0.271667 0.337561 0.405497 0.472761
0.537103 0.596902 0.65118 0.699515 0.741909 0.778656 0.810226 0.837169 0.860061 0.879454
0.895857 0.909726 0.921458 0.931394 0.939825 0.946995 0.953108 0.958335 0.962819 0.966677
0.970009 0.972894 0.975403 0.977591 0.979505 0.981186 0.982667 0.983975 0.985135 0.986165
0.987085 0.987906 0.988643 0.989305 0.989902 0.990442 0.99093 0.991373 0.991776 0.992144
0.992479 0.992786 0.993068 0.993326 0.993564 0.993783 0.993985 0.994172 0.994345 0.994505
0.994654 0.994792 0.994921 0.995041 0.995152 0.995256 0.995354 0.995445 0.99553 0.995609
0.995681 0.995746 0.995807 0.995865 0.995919 0.995969 0.996017 0.996062 0.996105 0.996145
0.996183 0.996219 0.996253 0.996285 0.996315 0.996343 0.996371 0.996396 0.99642 0.996444
0.996465 0.996486 0.996506 0.996524 0.996542 0.996559 0.996575 0.99659 0.996604 0.996618
0.996643 #selex for gender,fleet: 1 / 1
 0.0462809 0.169552 0.232356 0.304214 0.383486 0.468356 0.557183 0.648721 0.74217
0.837091 0.933287 1.03069 1.12928 1.22902 1.32986 1.43167 1.53431 1.63757 1.74123 1.84504
1.94873 2.05204 2.15472 2.25653 2.35722 2.4566 2.55447 2.65067 2.74505 2.83748 2.92786
3.0161 3.10213 3.1859 3.26737 3.34651 3.4233 3.49775 3.56986 3.63965 3.70713 3.77233
3.83528 3.89603 3.95461 4.01106 4.06544 4.1178 4.16818 4.21663 4.26322 4.30799 4.351
4.39231 4.43196 4.47001 4.50651 4.54152 4.5751 4.60728 4.63811 4.66766 4.69597 4.72307
4.74903 4.77387 4.79766 4.82042 4.84219 4.86303 4.88309 4.90242 4.9209 4.93857 4.95546
4.97162 4.98705 5.00181 5.01591 5.02938 5.04226 5.05456 5.06631 5.07753 5.08825 5.09849
5.10827 5.11761 5.12653 5.13505 5.14318 5.15094 5.15835 5.16543 5.17218 5.17863 5.18479
5.19066 5.19627 5.20162 5.21149 #bodywt for gender,fleet: 1 / 2
 0 0.0213283 0.0352642 0.0561355 0.0857149 0.125189 0.174691 0.233098 0.298189 0.367085
0.436791 0.504638 0.56856 0.627179 0.679765 0.726107 0.766378 0.800993 0.830503 0.855511
0.876615 0.89438 0.909315 0.921869 0.932428 0.941321 0.948827 0.955176 0.960562 0.965145
0.969056 0.972406 0.975285 0.977769 0.979918 0.981784 0.983411 0.984833 0.986082 0.987181
0.988151 0.989011 0.989776 0.990457 0.991066 0.991611 0.992102 0.992544 0.992943 0.993304
0.993632 0.993931 0.994202 0.994451 0.994678 0.994886 0.995077 0.995253 0.995415 0.995564
0.995702 0.99583 0.995949 0.996059 0.996161 0.996256 0.996344 0.996426 0.996503 0.996575
0.99664 0.996697 0.996751 0.996801 0.996849 0.996894 0.996936 0.996975 0.997012 0.997047
0.99708 0.997112 0.997141 0.997169 0.997195 0.99722 0.997243 0.997266 0.997287 0.997306
0.997325 0.997343 0.99736 0.997376 0.997391 0.997406 0.997419 0.997432 0.997444 0.997456
0.997478 #selex for gender,fleet: 1 / 2
 0.0504337 0.189018 0.257432 0.331995 0.409383 0.487655 0.566341 0.645863 0.726964
0.810375 0.896654 0.986129 1.07889 1.17484 1.2737 1.37507 1.4785 1.58348 1.68953 1.79614
1.90288 2.00933 2.11512 2.21995 2.32351 2.42558 2.52596 2.62445 2.72094 2.81528 2.9074
2.99721 3.08467 3.16972 3.25235 3.33253 3.41028 3.48558 3.55846 3.62895 3.69706 3.76284
3.82631 3.88754 3.94655 4.0034 4.05814 4.11083 4.16151 4.21025 4.25709 4.3021 4.34533
4.38683 4.42667 4.46489 4.50156 4.53672 4.57043 4.60273 4.63369 4.66335 4.69176 4.71896
4.745 4.76994 4.7938 4.81663 4.83848 4.85938 4.87949 4.89886 4.91738 4.93509 4.95202
4.96821 4.98368 4.99846 5.01259 5.02609 5.03899 5.05131 5.06309 5.07433 5.08507 5.09533
5.10513 5.11449 5.12342 5.13196 5.1401 5.14788 5.15531 5.1624 5.16916 5.17562 5.18179
5.18767 5.19329 5.19865 5.20854 #bodywt for gender,fleet: 1 / 3
 0 0.0168565 0.0359177 0.0704144 0.125351 0.201915 0.296018 0.399604 0.503567 0.600364
0.685263 0.756326 0.813704 0.85879 0.893511 0.919871 0.93969 0.954505 0.965548 0.973775
0.979914 0.984509 0.987963 0.990573 0.992557 0.994075 0.995243 0.99615 0.996858 0.997415
0.997857 0.998209 0.998492 0.998722 0.998908 0.999062 0.999188 0.999293 0.99938 0.999454
0.999516 0.999569 0.999614 0.999653 0.999686 0.999715 0.99974 0.999762 0.999781 0.999798
0.999813 0.999826 0.999838 0.999848 0.999857 0.999866 0.999873 0.99988 0.999886 0.999892
0.999897 0.999902 0.999906 0.99991 0.999913 0.999916 0.999919 0.999922 0.999925 0.999927
0.999929 0.999931 0.999932 0.999934 0.999935 0.999937 0.999938 0.999939 0.99994 0.999941
0.999942 0.999943 0.999944 0.999945 0.999945 0.999946 0.999947 0.999947 0.999948 0.999948
0.999949 0.999949 0.99995 0.99995 0.999951 0.999951 0.999952 0.999952 0.999952 0.999952
0.999953 #selex for gender,fleet: 1 / 3

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 0.0466444 0.171812 0.236089 0.310135 0.392403 0.480968 0.573886 0.669515 0.76669
0.864713 0.963252 1.0622 1.16158 1.26144 1.36181 1.4627 1.56407 1.66582 1.7678 1.86984
1.97175 2.0733 2.17428 2.27446 2.37364 2.4716 2.56818 2.66318 2.75648 2.84792 2.93742
3.02485 3.11016 3.19328 3.27417 3.35278 3.4291 3.50313 3.57486 3.6443 3.71147 3.77639
3.83909 3.8996 3.95797 4.01424 4.06845 4.12065 4.17089 4.21921 4.26568 4.31034 4.35325
4.39447 4.43403 4.472 4.50844 4.54338 4.57689 4.60901 4.6398 4.6693 4.69756 4.72462
4.75054 4.77535 4.79909 4.82182 4.84357 4.86437 4.88442 4.90372 4.92219 4.93984 4.95672
4.97286 4.98828 5.00302 5.01711 5.03057 5.04343 5.05572 5.06746 5.07868 5.08939 5.09962
5.10939 5.11873 5.12764 5.13615 5.14427 5.15203 5.15943 5.16651 5.17325 5.1797 5.18585
5.19172 5.19732 5.20267 5.21253 #bodywt for gender,fleet: 1 / 4
 0 0.011426 0.0195259 0.0322319 0.0512246 0.078121 0.11406 0.159308 0.213068 0.273565
0.338381 0.40488 0.470599 0.533513 0.592155 0.645622 0.693497 0.735745 0.772597 0.804456
0.831809 0.855178 0.875076 0.891982 0.906331 0.91851 0.928852 0.937647 0.945139 0.951534
0.957006 0.961703 0.965744 0.969233 0.972253 0.974877 0.977164 0.979163 0.980916 0.982458
0.983819 0.985024 0.986093 0.987045 0.987895 0.988656 0.989339 0.989954 0.990509 0.99101
0.991464 0.991877 0.992253 0.992596 0.992909 0.993196 0.993459 0.993701 0.993923 0.994128
0.994317 0.994492 0.994655 0.994805 0.994944 0.995074 0.995195 0.995307 0.995412 0.99551
0.995597 0.995675 0.995748 0.995816 0.99588 0.995941 0.995997 0.996051 0.996101 0.996148
0.996193 0.996235 0.996275 0.996312 0.996348 0.996381 0.996413 0.996443 0.996471 0.996498
0.996523 0.996547 0.99657 0.996591 0.996612 0.996631 0.996649 0.996667 0.996683 0.996699
0.996728 #selex for gender,fleet: 1 / 4
 0.0458503 0.168306 0.231642 0.305371 0.388624 0.480165 0.578473 0.681886 0.788778
0.897715 1.00756 1.11747 1.22692 1.33558 1.44328 1.54993 1.65553 1.76007 1.86354 1.96594
2.06723 2.16738 2.26632 2.36398 2.46027 2.5551 2.64839 2.74004 2.82997 2.9181 3.00434
3.08863 3.17093 3.25117 3.32932 3.40534 3.47923 3.55097 3.62055 3.68798 3.75327 3.81643
3.87749 3.93648 3.99343 4.04836 4.10133 4.15238 4.20154 4.24886 4.29439 4.33817 4.38026
4.42071 4.45956 4.49687 4.53267 4.56703 4.59999 4.6316 4.6619 4.69094 4.71878 4.74544
4.77098 4.79543 4.81885 4.84126 4.86271 4.88324 4.90305 4.92218 4.94047 4.95796 4.97469
4.99068 5.00597 5.02058 5.03454 5.04789 5.06064 5.07282 5.08446 5.09558 5.1062 5.11635
5.12604 5.13529 5.14413 5.15257 5.16063 5.16832 5.17567 5.18268 5.18938 5.19577 5.20187
5.2077 5.21325 5.21856 5.22834 #bodywt for gender,fleet: 1 / 5
 0 0.00497951 0.00812772 0.0129303 0.0200354 0.0302067 0.0442625 0.0629721 0.086926
0.116411 0.151331 0.191188 0.235142 0.282111 0.330901 0.380324 0.429299 0.476909 0.522437
0.565367 0.605371 0.642279 0.67605 0.706745 0.734491 0.759464 0.781866 0.801913 0.819821
0.835799 0.850049 0.862754 0.874085 0.884197 0.893229 0.901303 0.908532 0.915011 0.920828
0.926059 0.93077 0.935021 0.938862 0.94234 0.945494 0.948359 0.950967 0.953345 0.955515
0.957501 0.95932 0.960989 0.962523 0.963934 0.965235 0.966436 0.967546 0.968573 0.969524
0.970407 0.971227 0.971989 0.972699 0.97336 0.973977 0.974553 0.975091 0.975595 0.976066
0.976508 0.976906 0.977266 0.977603 0.977921 0.97822 0.978501 0.978766 0.979016 0.979252
0.979474 0.979684 0.979882 0.98007 0.980247 0.980414 0.980573 0.980723 0.980865 0.980999
0.981126 0.981247 0.981362 0.98147 0.981573 0.981671 0.981763 0.981851 0.981935 0.982014
0.982089 0.982227 #selex for gender,fleet: 1 / 5
 0.047457 0.17645 0.243537 0.321908 0.410686 0.508516 0.613589 0.723785 0.836934 0.951109
1.06483 1.17713 1.28749 1.39572 1.50187 1.60609 1.70859 1.80956 1.90918 2.00759 2.10486
2.20106 2.29619 2.39022 2.48312 2.5748 2.66519 2.7542 2.84174 2.92771 3.01203 3.09461
3.17538 3.25429 3.33126 3.40625 3.47924 3.55019 3.61909 3.68593 3.7507 3.81342 3.87411
3.93277 3.98943 4.04413 4.0969 4.14777 4.19679 4.24398 4.28941 4.33311 4.37514 4.41552
4.45433 4.4916 4.52738 4.56171 4.59466 4.62625 4.65655 4.68559 4.71343 4.74009 4.76564
4.7901 4.81352 4.83595 4.85741 4.87795 4.89777 4.91689 4.93519 4.95268 4.96941 4.98541
5.0007 5.01531 5.02928 5.04263 5.05538 5.06757 5.07922 5.09034 5.10097 5.11112 5.12081
5.13007 5.13891 5.14735 5.15542 5.16311 5.17046 5.17748 5.18418 5.19057 5.19668 5.20251
5.20807 5.21338 5.22317 #bodywt for gender,fleet: 1 / 6
 0 0.00140879 0.00257294 0.0045632 0.00785473 0.0131087 0.0211776 0.0330585 0.0497792
0.0722262 0.100961 0.136078 0.177153 0.223289 0.273245 0.325598 0.378907 0.431846
0.483294 0.532373 0.578462 0.62117 0.660309 0.695849 0.727877 0.756568 0.782144 0.80486
0.824981 0.842767 0.858471 0.872327 0.884551 0.895338 0.904864 0.913285 0.920737 0.927341
0.933203 0.938416 0.943059 0.947203 0.950909 0.95423 0.957211 0.959893 0.962311 0.964495
0.966471 0.968263 0.969891 0.971372 0.972723 0.973958 0.975087 0.976122 0.977072 0.977946
0.97875 0.979492 0.980177 0.980811 0.981398 0.981942 0.982447 0.982916 0.983353 0.983759
0.984139 0.984493 0.984808 0.985089 0.985353 0.9856 0.985832 0.986049 0.986254 0.986446
0.986628 0.986798 0.986959 0.98711 0.987253 0.987388 0.987515 0.987635 0.987749 0.987856
0.987958 0.988054 0.988145 0.988231 0.988312 0.98839 0.988463 0.988532 0.988598 0.98866
0.98872 0.988776 0.988879 #selex for gender,fleet: 1 / 6
 0.0539259 0.185573 0.25267 0.328419 0.411174 0.499395 0.591863 0.687727 0.786456
0.887728 0.991338 1.09712 1.20489 1.31446 1.42557 1.53794 1.65126 1.7652 1.87941 1.99355
2.1073 2.22035 2.33241 2.44322 2.55253 2.66014 2.76586 2.86955 2.97105 3.07027 3.1671
3.26149 3.35337 3.44271 3.52948 3.61367 3.69528 3.77432 3.8508 3.92475 3.99621 4.06521
4.13179 4.19599 4.25787 4.31749 4.37488 4.43012 4.48325 4.53434 4.58344 4.63062 4.67593
4.71944 4.76119 4.80125 4.83969 4.87654 4.91187 4.94574 4.97819 5.00929 5.03907 5.06759
5.0949 5.12104 5.14607 5.17001 5.19293 5.21485 5.23595 5.25627 5.2757 5.29428 5.31205
5.32903 5.34526 5.36078 5.37561 5.38979 5.40333 5.41627 5.42863 5.44045 5.45173 5.46251
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5.4728 5.48264 5.49203 5.501 5.50956 5.51774 5.52555 5.533 5.54012 5.54692 5.55341 5.5596
5.56551 5.57116 5.58159 #bodywt for gender,fleet: 2 / 1
 0 0.0518398 0.079816 0.117909 0.166721 0.225504 0.292161 0.363647 0.436587 0.507864
0.575011 0.636368 0.691057 0.738838 0.779931 0.814846 0.844245 0.868839 0.889325 0.906346
0.920474 0.932201 0.941947 0.950061 0.956834 0.962504 0.967267 0.971282 0.974679 0.977566
0.980027 0.982135 0.983947 0.985511 0.986866 0.988045 0.989074 0.989975 0.990768 0.991468
0.992087 0.992636 0.993126 0.993564 0.993956 0.994308 0.994625 0.994912 0.995171 0.995406
0.99562 0.995816 0.995994 0.996157 0.996306 0.996443 0.996569 0.996686 0.996793 0.996892
0.996984 0.997069 0.997148 0.997221 0.997289 0.997353 0.997412 0.997468 0.997519 0.997568
0.997611 0.99765 0.997687 0.997721 0.997754 0.997784 0.997813 0.99784 0.997865 0.997889
0.997912 0.997933 0.997953 0.997972 0.99799 0.998008 0.998024 0.998039 0.998053 0.998067
0.99808 0.998092 0.998104 0.998115 0.998125 0.998135 0.998145 0.998154 0.998162 0.99817
0.998185 #selex for gender,fleet: 2 / 1
 0.0552534 0.192681 0.263397 0.343528 0.43103 0.5238 0.620085 0.718683 0.818926 0.920536
1.02346 1.12775 1.23345 1.34057 1.44904 1.55872 1.66943 1.78089 1.89283 2.00493 2.11687
2.22834 2.33904 2.44867 2.557 2.66377 2.7688 2.8719 2.97292 3.07173 3.16823 3.26234
3.35399 3.44314 3.52976 3.61382 3.69532 3.77427 3.85069 3.92458 3.99599 4.06495 4.1315
4.19568 4.25754 4.31714 4.37452 4.42975 4.48287 4.53396 4.58306 4.63023 4.67554 4.71904
4.7608 4.80086 4.83929 4.87615 4.91149 4.94535 4.97781 5.0089 5.03869 5.06721 5.09452
5.12067 5.14569 5.16964 5.19256 5.21448 5.23559 5.25591 5.27534 5.29392 5.31169 5.32867
5.34491 5.36042 5.37526 5.38943 5.40297 5.41592 5.42828 5.44009 5.45138 5.46216 5.47245
5.48229 5.49168 5.50065 5.50921 5.51739 5.5252 5.53266 5.53977 5.54657 5.55306 5.55925
5.56517 5.57081 5.58124 #bodywt for gender,fleet: 2 / 2
 0 0.0217085 0.0367487 0.0596831 0.0925919 0.136787 0.192233 0.257331 0.329197 0.404272
0.479017 0.550442 0.616385 0.675562 0.727455 0.772127 0.810028 0.841829 0.868293 0.890188
0.908235 0.923079 0.935281 0.945317 0.953582 0.960405 0.966052 0.970742 0.974651 0.977922
0.98067 0.982988 0.984953 0.986624 0.988052 0.989277 0.990333 0.991246 0.992039 0.992731
0.993336 0.993868 0.994337 0.994751 0.995119 0.995446 0.995738 0.996 0.996235 0.996446
0.996637 0.99681 0.996966 0.997109 0.997238 0.997357 0.997465 0.997564 0.997655 0.997739
0.997816 0.997887 0.997953 0.998014 0.99807 0.998123 0.998171 0.998216 0.998259 0.998298
0.998333 0.998364 0.998393 0.99842 0.998446 0.99847 0.998493 0.998514 0.998534 0.998553
0.998571 0.998587 0.998603 0.998618 0.998632 0.998645 0.998658 0.99867 0.998681 0.998691
0.998701 0.998711 0.99872 0.998728 0.998736 0.998744 0.998751 0.998758 0.998765 0.998771
0.998782 #selex for gender,fleet: 2 / 2
 0.0601075 0.214219 0.290644 0.372767 0.456919 0.541321 0.625889 0.711421 0.798942
0.889352 0.983281 1.08104 1.18265 1.28787 1.39629 1.50736 1.62049 1.73505 1.85046 1.96618
2.08171 2.19662 2.31053 2.42313 2.53414 2.64333 2.7505 2.85551 2.95821 3.05851 3.15632
3.25159 3.34425 3.4343 3.5217 3.60646 3.68857 3.76807 3.84497 3.91929 3.99109 4.06039
4.12724 4.1917 4.25381 4.31363 4.37121 4.42662 4.47991 4.53115 4.58038 4.62768 4.6731
4.71671 4.75856 4.79871 4.83723 4.87416 4.90956 4.94349 4.97601 5.00716 5.03699 5.06556
5.09292 5.1191 5.14417 5.16815 5.1911 5.21306 5.23419 5.25452 5.27397 5.29257 5.31035
5.32735 5.3436 5.35913 5.37398 5.38816 5.40172 5.41467 5.42705 5.43887 5.45016 5.46095
5.47125 5.48109 5.49049 5.49947 5.50804 5.51623 5.52404 5.5315 5.53863 5.54543 5.55192
5.55812 5.56404 5.56969 5.58013 #bodywt for gender,fleet: 2 / 3
 0 0.0173676 0.0382509 0.0767998 0.138612 0.224342 0.328234 0.44021 0.549681 0.648575
0.732478 0.80025 0.852958 0.892796 0.92228 0.94378 0.959307 0.970457 0.978446 0.984174
0.988291 0.991264 0.993423 0.995001 0.996164 0.997028 0.997674 0.998163 0.998535 0.99882
0.999042 0.999215 0.999351 0.99946 0.999546 0.999616 0.999673 0.999719 0.999757 0.999789
0.999815 0.999837 0.999856 0.999872 0.999885 0.999897 0.999907 0.999915 0.999923 0.999929
0.999935 0.99994 0.999945 0.999949 0.999952 0.999955 0.999958 0.99996 0.999963 0.999965
0.999966 0.999968 0.99997 0.999971 0.999972 0.999973 0.999974 0.999975 0.999976 0.999977
0.999978 0.999978 0.999979 0.999979 0.99998 0.99998 0.999981 0.999981 0.999982 0.999982
0.999982 0.999983 0.999983 0.999983 0.999983 0.999984 0.999984 0.999984 0.999984 0.999984
0.999985 0.999985 0.999985 0.999985 0.999985 0.999985 0.999985 0.999986 0.999986 0.999986
0.999986 #selex for gender,fleet: 2 / 3
 0.0556789 0.195209 0.267577 0.35015 0.44094 0.537655 0.638145 0.74075 0.844425 0.948657
1.0533 1.15843 1.26416 1.37063 1.47791 1.58603 1.69489 1.80437 1.91426 2.02434 2.13434
2.24397 2.35297 2.46106 2.56799 2.67352 2.77744 2.87956 2.97971 3.07777 3.17361 3.26714
3.35829 3.447 3.53323 3.61695 3.69816 3.77685 3.85304 3.92673 3.99796 4.06676 4.13317
4.19723 4.25898 4.31848 4.37577 4.43092 4.48397 4.53499 4.58403 4.63115 4.67641 4.71987
4.76159 4.80161 4.84001 4.87684 4.91214 4.94599 4.97842 5.00949 5.03926 5.06776 5.09506
5.12119 5.1462 5.17013 5.19304 5.21495 5.23604 5.25635 5.27578 5.29435 5.31211 5.32909
5.34532 5.36083 5.37566 5.38983 5.40337 5.41631 5.42867 5.44048 5.45176 5.46253 5.47283
5.48266 5.49205 5.50101 5.50957 5.51775 5.52556 5.53301 5.54013 5.54692 5.55341 5.5596
5.56551 5.57116 5.58159 #bodywt for gender,fleet: 2 / 4
 0 0.0116461 0.020415 0.0344617 0.0557967 0.0863221 0.127287 0.178795 0.239606 0.307321
0.37886 0.451034 0.521016 0.586629 0.646439 0.699711 0.746272 0.786357 0.820457 0.849204
0.873276 0.893338 0.910009 0.92384 0.935311 0.94483 0.952741 0.95933 0.964832 0.96944
0.973313 0.97658 0.979345 0.981696 0.983701 0.985419 0.986896 0.988172 0.989277 0.990239
0.991079 0.991814 0.992462 0.993033 0.993538 0.993987 0.994387 0.994744 0.995065 0.995352
0.995611 0.995845 0.996057 0.99625 0.996424 0.996584 0.996729 0.996862 0.996984 0.997096

0.997199 0.997294 0.997382 0.997463 0.997538 0.997607 0.997672 0.997732 0.997788 0.99784
0.997886 0.997927 0.997965 0.998001 0.998035 0.998066 0.998096 0.998124 0.99815 0.998175
0.998198 0.99822 0.99824 0.99826 0.998278 0.998295 0.998312 0.998327 0.998342 0.998356
0.998369 0.998381 0.998393 0.998404 0.998414 0.998424 0.998434 0.998443 0.998451 0.998459
0.998474 #selex for gender,fleet: 2 / 4
 0.0547497 0.191323 0.26274 0.345176 0.437425 0.537908 0.644796 0.756201 0.870385 0.98592
1.10176 1.21722 1.33192 1.44568 1.55846 1.6703 1.78122 1.89128 2.00049 2.10884 2.21629
2.32278 2.42819 2.53244 2.63538 2.7369 2.83686 2.93515 3.03163 3.12621 3.21877 3.30925
3.39755 3.48363 3.56744 3.64893 3.72809 3.80491 3.87937 3.9515 4.02129 4.08877 4.15397
4.21692 4.27766 4.33623 4.39267 4.44703 4.49937 4.54972 4.59815 4.64471 4.68945 4.73243
4.7737 4.81332 4.85133 4.8878 4.92278 4.95632 4.98847 5.01927 5.04879 5.07706 5.10414
5.13007 5.15489 5.17865 5.20139 5.22314 5.24411 5.26433 5.28366 5.30215 5.31983 5.33674
5.3529 5.36834 5.3831 5.39721 5.4107 5.42358 5.43589 5.44765 5.45888 5.46962 5.47987
5.48966 5.49901 5.50794 5.51647 5.52461 5.53239 5.53981 5.5469 5.55367 5.56013 5.5663
5.57219 5.57781 5.5882 #bodywt for gender,fleet: 2 / 5
 0 0.00506505 0.00846584 0.0137649 0.0217505 0.0333584 0.049588 0.0713603 0.0993433
0.133791 0.174451 0.220563 0.270956 0.324199 0.37878 0.433257 0.486373 0.537128 0.584791
0.628896 0.669207 0.705673 0.738382 0.767523 0.793343 0.816128 0.836171 0.853766 0.86919
0.882702 0.89454 0.904913 0.914012 0.922003 0.92903 0.93522 0.940683 0.945514 0.949795
0.953597 0.956981 0.960001 0.9627 0.965119 0.967293 0.969249 0.971013 0.972609 0.974054
0.975367 0.97656 0.977648 0.978642 0.979551 0.980383 0.981148 0.981851 0.982498 0.983095
0.983646 0.984156 0.984628 0.985066 0.985473 0.985851 0.986203 0.986531 0.986836 0.987122
0.987389 0.987628 0.987842 0.988044 0.988232 0.98841 0.988577 0.988733 0.988881 0.98902
0.989151 0.989275 0.989392 0.989502 0.989606 0.989704 0.989797 0.989884 0.989968 0.990046
0.990121 0.990191 0.990258 0.990321 0.990381 0.990438 0.990492 0.990543 0.990592 0.990638
0.990681 0.990762 #selex for gender,fleet: 2 / 5
 0.0566297 0.200386 0.275902 0.363338 0.461434 0.568422 0.682087 0.799992 0.91981 1.03964
1.15817 1.27469 1.38893 1.50094 1.61096 1.71927 1.82617 1.93192 2.03671 2.14067 2.24388
2.34635 2.44803 2.54886 2.64872 2.74749 2.84503 2.9412 3.03586 3.12886 3.2201 3.30945
3.39682 3.48212 3.56529 3.64626 3.725 3.80148 3.87569 3.94761 4.01724 4.08462 4.14974
4.21264 4.27335 4.33191 4.38836 4.44274 4.4951 4.5455 4.59397 4.64057 4.68536 4.72838
4.7697 4.80937 4.84744 4.88396 4.91898 4.95257 4.98476 5.01562 5.04518 5.07349 5.10061
5.12658 5.15144 5.17524 5.19801 5.2198 5.2408 5.26103 5.28038 5.29889 5.31659 5.3335
5.34968 5.36514 5.37991 5.39404 5.40753 5.42043 5.43275 5.44452 5.45576 5.46651 5.47677
5.48657 5.49593 5.50487 5.5134 5.52155 5.52934 5.53677 5.54387 5.55064 5.55711 5.56328
5.56918 5.57481 5.5852 #bodywt for gender,fleet: 2 / 6
 0 0.00144011 0.00270794 0.00493369 0.00870259 0.0148408 0.0244198 0.0386853 0.0588914
0.0860613 0.120743 0.162841 0.211584 0.265626 0.323248 0.382589 0.441867 0.499532
0.554361 0.605484 0.652368 0.69477 0.732677 0.766246 0.795745 0.821513 0.843915 0.863325
0.880102 0.894582 0.90707 0.917841 0.927136 0.935165 0.942111 0.948129 0.953355 0.957902
0.961869 0.965337 0.968378 0.971051 0.973407 0.97549 0.977335 0.978974 0.980435 0.981739
0.982907 0.983956 0.984899 0.98575 0.98652 0.987217 0.98785 0.988426 0.988951 0.98943
0.989869 0.990271 0.990641 0.990981 0.991294 0.991583 0.99185 0.992097 0.992326 0.992538
0.992736 0.992919 0.993082 0.993225 0.993359 0.993485 0.993603 0.993713 0.993816 0.993913
0.994004 0.99409 0.994171 0.994247 0.994318 0.994386 0.994449 0.994509 0.994566 0.994619
0.99467 0.994717 0.994762 0.994805 0.994846 0.994884 0.99492 0.994954 0.994987 0.995018
0.995047 0.995075 0.995125 #selex for gender,fleet: 2 / 6
 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379
0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379
0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379
0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379
0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379
0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379
0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379
0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379
0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379 0.0462379
0.0462379 0.0462379 0.0462379 #mean M for year Yinit: 2011 sex: 1
 52.6066 49.3344 46.1908 43.2277 40.518 37.7914 35.2322 32.7677 30.4021 28.1869 26.6381
24.9759 24.6723 23.7748 24.1344 24.0124 24.0501 23.627 23.6423 23.5725 23.0647 21.7377
20.6877 19.2273 17.6195 15.9364 14.5019 13.006 11.6721 10.5449 9.39019 8.27837 7.32203
6.47157 5.67741 4.98814 4.38525 3.86876 3.42086 3.03746 2.70401 2.41476 2.17115 1.95474
1.76833 1.60659 1.47067 1.3464 1.23825 1.14337 1.05871 0.98356 0.916282 0.855775 0.800677
0.750177 0.703656 0.660664 0.620864 0.584319 0.550594 0.519118 0.489825 0.462879 0.437628
0.415124 0.394307 0.373958 0.354816 0.336158 0.318489 0.301731 0.28579 0.270742 0.256492
0.243007 0.230222 0.218135 0.206726 0.196004 0.18592 0.176452 0.167543 0.159138 0.15122
0.143755 0.136709 0.130047 0.123748 0.117789 0.112148 0.106802 0.101733 0.0969308
0.0923695 0.0880326 0.0839001 0.079973 0.0762397 0.0726893 1.52113 #numbers for year
Yinit: 2011 sex: 1

```
 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087
0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087
0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087
0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087
0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087
0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087
0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087
0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087 0.045087
0.045087 0.045087 #mean M for year Yinit: 2011 sex: 2
 52.6066 49.3912 46.2971 43.3768 40.7037 38.0065 35.4707 33.0233 30.6692 28.4609 26.9206
25.2618 24.9744 24.0833 24.4625 24.3491 24.39 23.953 23.9473 23.8394 23.2722 21.8654
20.7287 19.1775 17.484 15.7275 14.2319 12.694 11.3336 10.1919 9.04001 7.94401 7.00898
6.18417 5.41966 4.75987 4.18558 3.6957 3.27249 2.91151 2.59848 2.32761 2.10015 1.89818
1.72437 1.57356 1.44698 1.3308 1.22951 1.14044 1.06067 0.989601 0.925714 0.868 0.815176
0.7665 0.721413 0.67952 0.640538 0.604586 0.571268 0.540039 0.510864 0.48395 0.458639
0.436059 0.415118 0.394545 0.375124 0.356101 0.338018 0.3208 0.30436 0.288791 0.274004
0.259979 0.246655 0.234042 0.222127 0.210922 0.20038 0.190476 0.181151 0.172346 0.164042
0.156202 0.148791 0.141772 0.135123 0.128821 0.122844 0.11717 0.111778 0.10666 0.101791
0.0971527 0.092725 0.0885102 0.0844965 0.0806734 1.736 #numbers for year Yinit: 2011 sex:
2
 54.1634 50.9936 47.9496 44.9513 42.0732 39.3559 36.8657 34.3578 32.0015 29.7326 27.5565
25.5209 24.0929 22.5667 22.2712 21.4425 21.7497 21.6244 21.6447 21.2521 21.2555 21.1835
20.7193 19.5208 18.5724 17.2568 15.8101 14.2969 13.0076 11.6639 10.4662 9.45424 8.418
7.42057 6.56278 5.80009 5.08803 4.4701 3.92968 3.46675 3.06534 2.72177 2.42299 2.16383
1.94559 1.75171 1.58472 1.43984 1.3181 1.20678 1.1099 1.02491 0.949067 0.881742 0.821467
0.767253 0.717882 0.672628 0.630936 0.592403 0.55673 0.523971 0.493739 0.465522 0.43926
0.415102 0.392462 0.372285 0.353619 0.335373 0.318209 0.301478 0.285632 0.270604 0.256307
0.242812 0.230031 0.217936 0.206468 0.195627 0.185394 0.175776 0.166732 0.158239 0.150249
0.142711 0.135609 0.128914 0.122595 0.11662 0.110971 0.105627 0.100568 0.0957748
0.0912288 0.0869224 0.082832 0.0789428 0.075237 0.0717155 1.49763 #numbers for year
Ydeclare: 2013 sex: 1
 54.1634 51.0523 48.0599 45.106 42.2653 39.5788 37.1138 34.6243 32.2811 30.0201 27.8476
25.8124 24.388 22.8611 22.579 21.7543 22.0794 21.9618 21.9852 21.5798 21.5647 21.459
20.9411 19.6693 18.6419 17.243 15.7171 14.1356 12.7894 11.4058 10.1823 9.15567 8.12021
7.13523 6.29504 5.55401 4.86724 4.2746 3.75881 3.31887 2.93883 2.6147 2.33364 2.09045
1.88624 1.70493 1.54889 1.41351 1.29988 1.19559 1.10466 1.02469 0.953065 0.889252
0.831882 0.780051 0.732607 0.688884 0.648382 0.610746 0.575722 0.543419 0.513481 0.485418
0.459199 0.435012 0.412265 0.391972 0.373151 0.354659 0.337203 0.320105 0.30385 0.288373
0.273594 0.259598 0.246304 0.233694 0.221715 0.210376 0.199663 0.189589 0.180112 0.171208
0.162825 0.15491 0.147445 0.140397 0.133735 0.127426 0.12145 0.115786 0.110413 0.105312
0.100466 0.0958667 0.09149 0.0873211 0.0833414 0.0795531 1.70878 #numbers for year
Ydeclare: 2013 sex: 2
#R0  1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932
1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950
1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968
1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986
1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004
2005 2006 2007 2008 2009 2010 #years
228.199  228.199 228.166 228.122 228.071 228.038 228.003 227.968 227.935 227.9 227.86
227.803 227.737 227.663 227.578 227.462 227.341 227.238 227.14 227.061 226.964 226.847
226.693 226.543 226.396 226.285 226.112 225.898 225.629 224.966 224.299 223.184 222.249
221.888 221.465 221.191 220.897 220.532 220.22 219.99 219.692 219.308 218.834 218.279
217.679 217.14 216.651 216.251 215.77 215.4 215.155 214.069 213.646 213.144 212.617
211.353 210.501 209.319 207.77 206.266 204.52 202.876 200.874 198.754 194.927 190.919
187.556 182.49 175.465 170.295 166.016 160.484 157.121 152.945 147.979 141.01 136.72
128.709 119.802 111.758 106.713 100.33 95.2454 88.9269 87.5695 84.2707 85.5017 86.1407
88.5068 90.9232 93.2207 95.3794 97.5645 99.3524 101.342 103.338 105.213 #Recruits
1.02769e+009  1.02769e+009 1.02723e+009 1.0266e+009 1.02589e+009 1.02542e+009
1.02492e+009 1.02443e+009 1.02396e+009 1.02347e+009 1.02291e+009 1.0221e+009 1.02118e+009
1.02014e+009 1.01895e+009 1.01732e+009 1.01562e+009 1.01419e+009 1.01282e+009
1.01172e+009 1.01038e+009 1.00876e+009 1.00664e+009 1.00457e+009 1.00254e+009
1.00103e+009 9.98666e+008 9.95743e+008 9.92105e+008 9.83185e+008 9.74338e+008
9.59766e+008 9.47766e+008 9.4319e+008 9.37871e+008 9.34446e+008 9.30784e+008 9.26264e+008
9.22426e+008 9.19604e+008 9.15972e+008 9.11322e+008 9.05614e+008 8.99004e+008
8.91914e+008 8.8562e+008 8.79954e+008 8.75358e+008 8.69862e+008 8.65667e+008 8.62907e+008
8.508e+008 8.46141e+008 8.40657e+008 8.34945e+008 8.21452e+008 8.12511e+008 8.00317e+008
7.84671e+008 7.69837e+008 7.53059e+008 7.37659e+008 7.19426e+008 7.00704e+008
6.68345e+008 6.36313e+008 6.10778e+008 5.74454e+008 5.27919e+008 4.96218e+008
4.71449e+008 4.4124e+008 4.23796e+008 4.03031e+008 3.79555e+008 3.48642e+008 3.307e+008
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2.99193e+008 2.66925e+008 2.40004e+008 2.24091e+008 2.0494e+008 1.90416e+008 1.73207e+008
1.69624e+008 1.61081e+008 1.64243e+008 1.65896e+008 1.72094e+008 1.78547e+008
1.84803e+008 1.90791e+008 1.96963e+008 2.02098e+008 2.07907e+008 2.13833e+008
2.19494e+008 #SpawnBio
0.44056 0.5 0 # spawn-recr steepness, sigmaR, autocorr
# values from cat150_hmle, catch at 150% and steepness at mle value. # this is state of
nature 6 out of 9 (in no particular order) # and parameter set number 1 out of 2 for this
state
 0 0 29.3832 106.748 351.507 1039.21 2725.77 6303.48 12889.6 23546.3 38970.3 59315.1
84209.1 112917 144548 178233 213232 248981 285083 321285 357438 393464 429326 465007
500501 535798 570884 605742 640344 674660 708657 742296 775540 808350 840688 872520
903811 934531 964652 994149 1.023e+006 1.05119e+006 1.0787e+006 1.10551e+006 1.13163e+006
1.15704e+006 1.18174e+006 1.20573e+006 1.229e+006 1.25157e+006 1.27343e+006 1.29459e+006
1.31507e+006 1.33486e+006 1.35399e+006 1.37245e+006 1.39027e+006 1.40745e+006
1.42402e+006 1.43998e+006 1.45535e+006 1.47015e+006 1.48438e+006 1.49808e+006
1.51124e+006 1.52389e+006 1.53604e+006 1.54771e+006 1.55892e+006 1.56967e+006
1.57999e+006 1.59016e+006 1.5999e+006 1.60925e+006 1.61821e+006 1.6268e+006 1.63503e+006
1.64291e+006 1.65046e+006 1.65769e+006 1.66462e+006 1.67125e+006 1.67759e+006
1.68366e+006 1.68947e+006 1.69503e+006 1.70035e+006 1.70543e+006 1.71029e+006
1.71494e+006 1.71939e+006 1.72363e+006 1.7277e+006 1.73158e+006 1.73529e+006 1.73883e+006
1.74222e+006 1.74546e+006 1.74855e+006 1.7515e+006 1.75696e+006 #female fecundity;
weighted by N in year Y_init across morphs and areas
 0.0454676 0.16465 0.224291 0.292145 0.366874 0.447141 0.531806 0.620006 0.711142
0.804812 0.900735 0.998695 1.09849 1.19991 1.30273 1.4067 1.51155 1.61699 1.72273 1.82848
1.93395 2.03886 2.14297 2.24602 2.3478 2.44812 2.5468 2.64368 2.73864 2.83156 2.92234
3.01092 3.09724 3.18124 3.26289 3.34219 3.41911 3.49367 3.56586 3.63571 3.70325 3.76849
3.83148 3.89225 3.95086 4.00733 4.06173 4.1141 4.16449 4.21296 4.25956 4.30434 4.34737
4.38868 4.42834 4.46641 4.50293 4.53795 4.57154 4.60373 4.63459 4.66415 4.69248 4.7196
4.74557 4.77044 4.79424 4.81702 4.83882 4.85968 4.87976 4.89911 4.91762 4.93531 4.95223
4.9684 4.98386 4.99864 5.01276 5.02626 5.03916 5.05148 5.06325 5.0745 5.08524 5.0955
5.1053 5.11466 5.1236 5.13214 5.14029 5.14807 5.1555 5.1626 5.16937 5.17583 5.18201
5.1879 5.19352 5.19889 5.2088 #bodywt for gender,fleet: 1 / 1
 0 0.0521777 0.0786115 0.114039 0.158966 0.212811 0.273893 0.339728 0.4075 0.474526
0.53859 0.598103 0.652108 0.700197 0.742381 0.778954 0.810385 0.837222 0.860032 0.879365
0.895727 0.909567 0.921281 0.931208 0.939634 0.946803 0.952919 0.958151 0.962641 0.966506
0.969845 0.972738 0.975254 0.977449 0.97937 0.981058 0.982544 0.983859 0.985024 0.98606
0.986984 0.98781 0.988551 0.989217 0.989818 0.99036 0.990852 0.991298 0.991704 0.992074
0.992412 0.992721 0.993005 0.993265 0.993505 0.993726 0.993929 0.994118 0.994292 0.994454
0.994604 0.994743 0.994873 0.994993 0.995106 0.995211 0.995309 0.995401 0.995487 0.995567
0.99564 0.995706 0.995767 0.995825 0.995879 0.995931 0.995979 0.996025 0.996067 0.996108
0.996146 0.996182 0.996217 0.996249 0.996279 0.996308 0.996336 0.996362 0.996386 0.99641
0.996432 0.996452 0.996472 0.996491 0.996509 0.996526 0.996542 0.996557 0.996572 0.996585
0.996611 #selex for gender,fleet: 1 / 1
 0.046615 0.171129 0.234088 0.30603 0.385315 0.470137 0.558873 0.650296 0.743617 0.838405
0.934465 1.03173 1.13017 1.22977 1.33044 1.43209 1.53456 1.63764 1.74111 1.84472 1.94822
2.05133 2.15382 2.25542 2.35592 2.45511 2.5528 2.64882 2.74303 2.8353 2.92552 3.01361
3.09951 3.18314 3.26449 3.34351 3.4202 3.49455 3.56657 3.63627 3.70367 3.7688 3.83169
3.89237 3.9509 4.00731 4.06165 4.11397 4.16432 4.21275 4.25931 4.30407 4.34706 4.38836
4.428 4.46605 4.50255 4.53756 4.57113 4.60332 4.63417 4.66372 4.69204 4.71915 4.74512
4.76998 4.79378 4.81656 4.83835 4.8592 4.87929 4.89863 4.91713 4.93482 4.95174 4.96791
4.98337 4.99815 5.01227 5.02576 5.03866 5.05098 5.06275 5.074 5.08474 5.095 5.1048
5.11416 5.12309 5.13163 5.13978 5.14756 5.15499 5.16209 5.16886 5.17532 5.1815 5.18739
5.19301 5.19838 5.20828 #bodywt for gender,fleet: 1 / 2
 0 0.0217781 0.035912 0.0570166 0.0868386 0.126525 0.176172 0.234626 0.299659 0.368408
0.437902 0.505505 0.569179 0.627569 0.679954 0.726132 0.766274 0.800795 0.830239 0.855204
0.876285 0.89404 0.908975 0.921536 0.932107 0.941016 0.948538 0.954904 0.960307 0.964906
0.968834 0.972199 0.975093 0.977589 0.97975 0.981627 0.983264 0.984696 0.985953 0.98706
0.988038 0.988904 0.989675 0.990361 0.990975 0.991526 0.99202 0.992466 0.992869 0.993234
0.993565 0.993866 0.99414 0.994391 0.99462 0.99483 0.995023 0.995201 0.995364 0.995515
0.995655 0.995784 0.995904 0.996015 0.996118 0.996214 0.996303 0.996387 0.996464 0.996537
0.996602 0.99666 0.996715 0.996766 0.996814 0.996859 0.996901 0.996941 0.996979 0.997015
0.997048 0.99708 0.997109 0.997137 0.997164 0.997189 0.997213 0.997235 0.997257 0.997277
0.997296 0.997314 0.997331 0.997347 0.997362 0.997377 0.997391 0.997404 0.997416 0.997428
0.99745 #selex for gender,fleet: 1 / 2
 0.0507971 0.190731 0.259211 0.333715 0.41097 0.489095 0.567655 0.647075 0.728093
0.811431 0.897634 0.987023 1.07969 1.17551 1.27423 1.37544 1.47869 1.58349 1.68934
1.79575 1.90228 2.00852 2.11411 2.21873 2.3221 2.42398 2.52417 2.62249 2.7188 2.81299
2.90495 2.99462 3.08194 3.16686 3.24937 3.32944 3.40708 3.48229 3.55508 3.62549 3.69352
3.75923 3.82265 3.88381 3.94278 3.99959 4.05429 4.10694 4.1576 4.20631 4.25313 4.29813
4.34134 4.38284 4.42267 4.46089 4.49755 4.53271 4.56642 4.59874 4.6297 4.65937 4.68779
4.715 4.74106 4.76601 4.78988 4.81273 4.8346 4.85552 4.87565 4.89504 4.91358 4.93131
```

4.94826 4.96447 4.97996 4.99477 5.00892 5.02244 5.03536 5.04771 5.0595 5.07077 5.08153
5.09181 5.10163 5.11101 5.11996 5.12851 5.13668 5.14447 5.15192 5.15903 5.16581 5.17229
5.17847 5.18437 5.19001 5.19538 5.20531 #bodywt for gender,fleet: 1 / 3
 0 0.0174342 0.0369567 0.0720661 0.127638 0.204671 0.298944 0.40238 0.505959 0.602257
0.686652 0.757273 0.8143 0.859126 0.893669 0.919914 0.939663 0.954439 0.965464 0.973685
0.979826 0.984427 0.987889 0.990507 0.992499 0.994023 0.995199 0.996111 0.996824 0.997386
0.997831 0.998187 0.998473 0.998705 0.998893 0.999048 0.999176 0.999282 0.999371 0.999446
0.999509 0.999562 0.999608 0.999647 0.999681 0.99971 0.999735 0.999758 0.999777 0.999794
0.999809 0.999823 0.999835 0.999845 0.999855 0.999863 0.999871 0.999878 0.999884 0.99989
0.999895 0.9999 0.999904 0.999908 0.999912 0.999915 0.999918 0.999921 0.999923 0.999926
0.999928 0.99993 0.999931 0.999933 0.999934 0.999935 0.999937 0.999938 0.999939 0.99994
0.999941 0.999942 0.999943 0.999944 0.999944 0.999945 0.999946 0.999946 0.999947 0.999947
0.999948 0.999948 0.999949 0.999949 0.99995 0.99995 0.999951 0.999951 0.999951 0.999952
0.999952 #selex for gender,fleet: 1 / 3
 0.0469175 0.173105 0.237423 0.311436 0.393613 0.482063 0.574874 0.670433 0.767581
0.865617 0.964195 1.0632 1.16262 1.26251 1.36289 1.46376 1.56508 1.66674 1.76861 1.87052
1.97226 2.07364 2.17442 2.2744 2.37337 2.47112 2.56748 2.66228 2.75537 2.84662 2.93591
3.02317 3.1083 3.19125 3.27198 3.35045 3.42664 3.50053 3.57214 3.64147 3.70854 3.77337
3.83598 3.89642 3.95472 4.01093 4.06508 4.11723 4.16742 4.21571 4.26214 4.30677 4.34966
4.39085 4.4304 4.46836 4.50478 4.53972 4.57322 4.60534 4.63613 4.66563 4.6939 4.72097
4.74689 4.77171 4.79547 4.81821 4.83997 4.86079 4.88085 4.90017 4.91865 4.93632 4.95322
4.96938 4.98482 4.99958 5.01369 5.02717 5.04005 5.05236 5.06412 5.07536 5.08609 5.09634
5.10613 5.11548 5.12441 5.13294 5.14108 5.14886 5.15628 5.16337 5.17014 5.17659 5.18276
5.18865 5.19427 5.19963 5.20953 #bodywt for gender,fleet: 1 / 4
 0 0.0118732 0.0201495 0.0330429 0.0521932 0.0791608 0.115027 0.160022 0.213346 0.27326
0.337409 0.403228 0.468318 0.5307 0.588934 0.642121 0.689837 0.732032 0.768918 0.800876
0.828375 0.851921 0.872012 0.889119 0.903669 0.916043 0.926572 0.935541 0.943196 0.949741
0.955352 0.960174 0.96433 0.967922 0.971038 0.973747 0.976111 0.97818 0.979997 0.981596
0.983009 0.984261 0.985374 0.986365 0.987251 0.988045 0.988758 0.9894 0.989979 0.990504
0.990979 0.991411 0.991805 0.992164 0.992493 0.992794 0.99307 0.993324 0.993557 0.993773
0.993972 0.994156 0.994326 0.994485 0.994631 0.994768 0.994895 0.995013 0.995124 0.995227
0.995319 0.995401 0.995478 0.99555 0.995618 0.995682 0.995742 0.995798 0.995852 0.995902
0.995949 0.995993 0.996035 0.996075 0.996112 0.996148 0.996181 0.996213 0.996243 0.996271
0.996298 0.996323 0.996347 0.99637 0.996392 0.996412 0.996432 0.99645 0.996467 0.996484
0.996515 #selex for gender,fleet: 1 / 4
 0.046087 0.169426 0.232753 0.306396 0.389502 0.480864 0.579 0.682294 0.789151 0.898157
1.00817 1.11834 1.2281 1.3371 1.44514 1.55213 1.65802 1.76281 1.86649 1.96904 2.07042
2.17061 2.26955 2.36715 2.46335 2.55806 2.6512 2.74268 2.83242 2.92035 3.00638 3.09046
3.17254 3.25256 3.3305 3.40632 3.48 3.55154 3.62094 3.68819 3.7533 3.81631 3.87722
3.93606 3.99287 4.04769 4.10054 4.15148 4.20054 4.24777 4.29321 4.33692 4.37894 4.41932
4.45812 4.49537 4.53113 4.56544 4.59836 4.62993 4.66021 4.68923 4.71703 4.74368 4.7692
4.79364 4.81704 4.83945 4.86089 4.88141 4.90123 4.92036 4.93866 4.95616 4.97289 4.98889
5.00419 5.01881 5.03279 5.04614 5.05891 5.0711 5.08276 5.09389 5.10452 5.11468 5.12439
5.13365 5.1425 5.15096 5.15903 5.16674 5.1741 5.18112 5.18783 5.19423 5.20035 5.20618
5.21176 5.21707 5.22689 #bodywt for gender,fleet: 1 / 5
 0 0.00514089 0.0083198 0.0131297 0.020192 0.030234 0.0440312 0.0623113 0.0856349
0.114282 0.148174 0.18686 0.229564 0.275277 0.322873 0.371223 0.419286 0.466171 0.511167
0.553752 0.593583 0.630469 0.664347 0.69525 0.723286 0.748607 0.771399 0.791861 0.810198
0.826608 0.841285 0.854409 0.866144 0.876643 0.886043 0.894466 0.902023 0.908811 0.914918
0.920419 0.925383 0.929869 0.93393 0.937612 0.940956 0.943999 0.946771 0.949302 0.951616
0.953734 0.955677 0.957462 0.959103 0.960615 0.96201 0.963299 0.964491 0.965594 0.966618
0.967568 0.968451 0.969272 0.970038 0.970751 0.971417 0.972039 0.972621 0.973165 0.973674
0.974152 0.974584 0.974974 0.97534 0.975685 0.976009 0.976315 0.976603 0.976874 0.97713
0.977372 0.9776 0.977816 0.978019 0.978212 0.978394 0.978567 0.97873 0.978884 0.979031
0.97917 0.979301 0.979426 0.979544 0.979656 0.979763 0.979864 0.979959 0.980051 0.980137
0.980219 0.98037 #selex for gender,fleet: 1 / 5
 0.0478087 0.178167 0.245476 0.324019 0.412907 0.510779 0.615821 0.725919 0.838917
0.952904 1.06642 1.1785 1.28865 1.39668 1.50263 1.60666 1.70897 1.80976 1.9092 2.00743
2.10453 2.20054 2.29549 2.38935 2.48206 2.57357 2.66379 2.75263 2.84 2.92581 3.00997
3.0924 3.17303 3.2518 3.32864 3.40352 3.47639 3.54723 3.61603 3.68277 3.74746 3.81011
3.87072 3.92932 3.98592 4.04057 4.09329 4.14412 4.19309 4.24026 4.28566 4.32934 4.37134
4.41172 4.45051 4.48777 4.52354 4.55787 4.59082 4.62241 4.65272 4.68176 4.7096 4.73628
4.76183 4.78631 4.80974 4.83218 4.85366 4.87421 4.89405 4.9132 4.93151 4.94902 4.96577
4.98179 4.9971 5.01173 5.02572 5.03909 5.05187 5.06407 5.07574 5.08688 5.09753 5.1077
5.11741 5.12669 5.13555 5.14401 5.15209 5.15981 5.16718 5.17421 5.18093 5.18734 5.19346
5.1993 5.20488 5.2102 5.22003 #bodywt for gender,fleet: 1 / 6
 0 0.00144016 0.00262441 0.00464459 0.00797846 0.0132888 0.0214275 0.0333874 0.0501875
0.0727026 0.101481 0.136607 0.17765 0.223714 0.273564 0.325787 0.378953 0.431747 0.483056
0.532011 0.577994 0.620617 0.65969 0.695183 0.727183 0.755858 0.781432 0.804156 0.824291
0.842097 0.857825 0.871707 0.883959 0.894775 0.90433 0.912778 0.920257 0.926887 0.932774
0.93801 0.942675 0.94684 0.950565 0.953904 0.956901 0.959599 0.962031 0.964228 0.966217

0.96802 0.969659 0.971151 0.972511 0.973754 0.974891 0.975934 0.976891 0.977771 0.978581
0.979329 0.980019 0.980658 0.981249 0.981798 0.982307 0.98278 0.98322 0.98363 0.984013
0.98437 0.984688 0.984971 0.985237 0.985486 0.98572 0.98594 0.986146 0.98634 0.986523
0.986695 0.986857 0.98701 0.987154 0.98729 0.987418 0.987539 0.987654 0.987762 0.987865
0.987962 0.988054 0.988141 0.988223 0.988301 0.988375 0.988445 0.988511 0.988574 0.988634
0.988691 0.988795 #selex for gender,fleet: 1 / 6
 0.054296 0.187189 0.254426 0.330243 0.413003 0.501183 0.593579 0.689356 0.787989
0.889161 0.992665 1.09833 1.20599 1.31544 1.42641 1.53864 1.65181 1.76559 1.87964 1.99361
2.1072 2.22008 2.33196 2.4426 2.55174 2.65919 2.76476 2.86829 2.96964 3.06872 3.16542
3.25968 3.35144 3.44066 3.52732 3.61141 3.69293 3.77188 3.84828 3.92216 3.99355 4.06248
4.12901 4.19316 4.255 4.31457 4.37193 4.42713 4.48023 4.5313 4.58038 4.62754 4.67284
4.71633 4.75808 4.79813 4.83656 4.87342 4.90875 4.94262 4.97508 5.00618 5.03597 5.0645
5.09182 5.11797 5.14301 5.16697 5.18989 5.21183 5.23295 5.25328 5.27273 5.29133 5.30911
5.32611 5.34236 5.3579 5.37275 5.38694 5.4005 5.41346 5.42584 5.43767 5.44897 5.45976
5.47008 5.47993 5.48933 5.49832 5.5069 5.51509 5.52292 5.53039 5.53752 5.54433 5.55084
5.55704 5.56297 5.56863 5.57909 #bodywt for gender,fleet: 2 / 1
 0 0.052912 0.0812448 0.119698 0.168817 0.227804 0.294529 0.365945 0.4387 0.509715
0.576562 0.637616 0.692022 0.739554 0.780438 0.815184 0.844451 0.868944 0.889356 0.906323
0.920413 0.932115 0.941845 0.94995 0.956719 0.962388 0.967152 0.97117 0.974572 0.977462
0.979929 0.982041 0.983858 0.985427 0.986787 0.98797 0.989003 0.989908 0.990704 0.991407
0.992029 0.992582 0.993074 0.993514 0.993908 0.994263 0.994582 0.99487 0.995131 0.995368
0.995584 0.99578 0.995959 0.996123 0.996274 0.996412 0.996539 0.996656 0.996764 0.996864
0.996957 0.997043 0.997122 0.997196 0.997265 0.997329 0.997389 0.997445 0.997497 0.997545
0.997589 0.997629 0.997666 0.9977 0.997733 0.997764 0.997793 0.99782 0.997846 0.99787
0.997893 0.997914 0.997935 0.997954 0.997972 0.997989 0.998005 0.998021 0.998035 0.998049
0.998062 0.998075 0.998086 0.998098 0.998108 0.998118 0.998128 0.998137 0.998145 0.998153
0.998168 #selex for gender,fleet: 2 / 1
 0.0556397 0.194416 0.265306 0.345532 0.433051 0.525776 0.621976 0.720467 0.820596
0.92209 1.0249 1.12907 1.23465 1.34164 1.44997 1.55951 1.67006 1.78137 1.89314 2.00507
2.11684 2.22813 2.33865 2.44811 2.55626 2.66287 2.76773 2.87067 2.97154 3.07021 3.16657
3.26055 3.35208 3.44111 3.52762 3.61158 3.69299 3.77185 3.84818 3.922 3.99334 4.06224
4.12873 4.19285 4.25467 4.31422 4.37157 4.42676 4.47986 4.53092 4.58 4.62715 4.67245
4.71594 4.75769 4.79774 4.83617 4.87303 4.90836 4.94223 4.97469 5.00579 5.03559 5.06412
5.09144 5.1176 5.14263 5.1666 5.18953 5.21146 5.23259 5.25292 5.27237 5.29096 5.30875
5.32575 5.342 5.35754 5.37239 5.38658 5.40014 5.4131 5.42548 5.43731 5.44862 5.45941
5.46973 5.47958 5.48898 5.49797 5.50655 5.51474 5.52257 5.53004 5.53717 5.54398 5.55049
5.5567 5.56262 5.56828 5.57874 #bodywt for gender,fleet: 2 / 2
 0 0.0221689 0.0374292 0.0606283 0.0938159 0.138258 0.19387 0.259023 0.330824 0.405737
0.480253 0.551419 0.617105 0.676048 0.727744 0.772257 0.810038 0.841753 0.868158 0.890016
0.908042 0.922877 0.935079 0.945119 0.953393 0.960225 0.965884 0.970586 0.974507 0.977788
0.980547 0.982875 0.984848 0.986527 0.987962 0.989194 0.990256 0.991175 0.991973 0.992669
0.993279 0.993814 0.994286 0.994703 0.995074 0.995404 0.995698 0.995962 0.996199 0.996412
0.996604 0.996779 0.996936 0.99708 0.997211 0.99733 0.99744 0.99754 0.997632 0.997716
0.997794 0.997866 0.997932 0.997994 0.998051 0.998103 0.998153 0.998198 0.998241 0.99828
0.998316 0.998347 0.998377 0.998404 0.99843 0.998454 0.998477 0.998499 0.998519 0.998538
0.998556 0.998573 0.998589 0.998604 0.998618 0.998631 0.998644 0.998656 0.998667 0.998678
0.998688 0.998698 0.998707 0.998715 0.998724 0.998731 0.998739 0.998746 0.998752 0.998759
0.99877 #selex for gender,fleet: 2 / 2
 0.0605288 0.216102 0.292593 0.374645 0.458657 0.542916 0.627371 0.712824 0.800289
0.890655 0.984536 1.08224 1.18377 1.2889 1.3972 1.50813 1.6211 1.7355 1.85075 1.96628
2.08163 2.19636 2.31009 2.42252 2.53335 2.64237 2.74939 2.85424 2.95679 3.05695 3.15462
3.24975 3.3423 3.43223 3.51952 3.60418 3.6862 3.76561 3.84243 3.91668 3.98841 4.05765
4.12445 4.18885 4.25092 4.31069 4.36824 4.42362 4.47688 4.52809 4.57731 4.62459 4.67
4.71359 4.75544 4.79558 4.83409 4.87102 4.90643 4.94036 4.97288 5.00404 5.03388 5.06246
5.08982 5.11602 5.1411 5.1651 5.18806 5.21003 5.23117 5.25153 5.27099 5.28961 5.30741
5.32442 5.34069 5.35624 5.3711 5.38531 5.39888 5.41185 5.42424 5.43608 5.44739 5.4582
5.46852 5.47838 5.48779 5.49678 5.50537 5.51357 5.5214 5.52888 5.53602 5.54284 5.54934
5.55556 5.56149 5.56715 5.57762 #bodywt for gender,fleet: 2 / 3
 0 0.017966 0.0393616 0.0785984 0.141116 0.227345 0.331382 0.443145 0.55216 0.6505
0.733868 0.801189 0.853553 0.893146 0.922467 0.943863 0.959328 0.970444 0.978416 0.984137
0.988253 0.991228 0.99339 0.994972 0.996139 0.997006 0.997656 0.998147 0.998521 0.998809
0.999032 0.999206 0.999344 0.999453 0.999541 0.999611 0.999668 0.999715 0.999754 0.999786
0.999813 0.999835 0.999854 0.99987 0.999884 0.999895 0.999905 0.999914 0.999922 0.999928
0.999934 0.999939 0.999944 0.999948 0.999951 0.999954 0.999957 0.99996 0.999962 0.999964
0.999966 0.999968 0.999969 0.99997 0.999972 0.999973 0.999974 0.999975 0.999976 0.999977
0.999977 0.999978 0.999979 0.999979 0.99998 0.99998 0.99998 0.999981 0.999981 0.999982
0.999982 0.999982 0.999983 0.999983 0.999983 0.999983 0.999983 0.999984 0.999984 0.999984
0.999984 0.999984 0.999985 0.999985 0.999985 0.999985 0.999985 0.999985 0.999985 0.999985
0.999986 #selex for gender,fleet: 2 / 3
 0.0559939 0.196629 0.269049 0.351598 0.442309 0.538928 0.639343 0.741917 0.845608
0.949895 1.05462 1.15982 1.26561 1.37212 1.47942 1.58751 1.69631 1.80569 1.91546 2.02538

2.1352 2.24465 2.35345 2.46133 2.56805 2.67337 2.77709 2.87901 2.97897 3.07684 3.17251
3.26587 3.35686 3.44542 3.53151 3.61511 3.69619 3.77477 3.85085 3.92445 3.9956 4.06432
4.13065 4.19464 4.25634 4.31578 4.37303 4.42813 4.48114 4.53213 4.58114 4.62824 4.67348
4.71692 4.75862 4.79864 4.83703 4.87385 4.90915 4.943 4.97543 5.0065 5.03627 5.06478
5.09208 5.11822 5.14324 5.16719 5.1901 5.21203 5.23314 5.25346 5.2729 5.29149 5.30927
5.32626 5.34251 5.35804 5.37289 5.38707 5.40063 5.41358 5.42596 5.43779 5.44908 5.45988
5.47019 5.48003 5.48944 5.49842 5.507 5.51519 5.52301 5.53048 5.53761 5.54442 5.55092
5.55713 5.56305 5.56871 5.57917 #bodywt for gender,fleet: 2 / 4
 0 0.0121011 0.0210626 0.0353163 0.0568248 0.0874233 0.128295 0.179505 0.239821 0.306894
0.377725 0.449209 0.518585 0.583721 0.643203 0.696291 0.742793 0.782921 0.817142 0.846062
0.870338 0.89062 0.907514 0.921562 0.93324 0.942952 0.951041 0.957791 0.963439 0.968178
0.972168 0.975538 0.978396 0.980829 0.982908 0.984691 0.986226 0.987554 0.988705 0.989708
0.990585 0.991354 0.992031 0.992629 0.993159 0.99363 0.994049 0.994425 0.994761 0.995064
0.995337 0.995583 0.995806 0.996009 0.996193 0.996361 0.996515 0.996655 0.996784 0.996903
0.997012 0.997112 0.997205 0.997291 0.99737 0.997444 0.997512 0.997576 0.997635 0.99769
0.997739 0.997782 0.997823 0.997861 0.997897 0.997931 0.997962 0.997992 0.99802 0.998046
0.99807 0.998094 0.998116 0.998136 0.998156 0.998174 0.998192 0.998208 0.998224 0.998238
0.998252 0.998265 0.998278 0.99829 0.998301 0.998312 0.998322 0.998331 0.99834 0.998349
0.998365 #selex for gender,fleet: 2 / 4
 0.0550219 0.192551 0.263967 0.346327 0.438442 0.538771 0.64553 0.756877 0.871102
0.986786 1.10287 1.21865 1.3337 1.44783 1.56097 1.67311 1.78429 1.89455 2.00389 2.11231
2.21977 2.32621 2.43153 2.53563 2.6384 2.73971 2.83946 2.9375 3.03374 3.12806 3.22037
3.3106 3.39866 3.4845 3.56808 3.64935 3.72831 3.80492 3.8792 3.95115 4.02078 4.08811
4.15317 4.21599 4.27661 4.33507 4.39141 4.44568 4.49793 4.5482 4.59656 4.64306 4.68774
4.73067 4.77189 4.81146 4.84944 4.88588 4.92083 4.95434 4.98647 5.01726 5.04676 5.07502
5.10208 5.128 5.15282 5.17657 5.19931 5.22106 5.24204 5.26226 5.28161 5.30011 5.31779
5.33471 5.35088 5.36633 5.38111 5.39523 5.40873 5.42162 5.43394 5.44572 5.45696 5.46771
5.47797 5.48778 5.49714 5.50608 5.51463 5.52278 5.53057 5.53801 5.54511 5.55189 5.55837
5.56455 5.57045 5.57608 5.58649 #bodywt for gender,fleet: 2 / 5
 0 0.00522843 0.0086626 0.0139688 0.0219036 0.0333589 0.0492827 0.0705481 0.0977921
0.131268 0.170756 0.215563 0.264601 0.31653 0.369918 0.423384 0.475709 0.525907 0.573243
0.617231 0.657607 0.694287 0.727327 0.756883 0.783179 0.806472 0.827041 0.845163 0.861104
0.875116 0.88743 0.898255 0.907777 0.916162 0.923555 0.930083 0.935858 0.940977 0.945523
0.949568 0.953175 0.956399 0.959286 0.961878 0.964209 0.966311 0.96821 0.969928 0.971487
0.972904 0.974195 0.975372 0.976448 0.977434 0.978337 0.979167 0.979931 0.980635 0.981285
0.981886 0.982442 0.982957 0.983435 0.983879 0.984292 0.984676 0.985035 0.985369 0.985681
0.985973 0.986236 0.986471 0.986692 0.986899 0.987094 0.987277 0.98745 0.987612 0.987765
0.987909 0.988045 0.988174 0.988295 0.988409 0.988517 0.988619 0.988716 0.988808 0.988894
0.988976 0.989054 0.989127 0.989197 0.989263 0.989326 0.989385 0.989442 0.989495 0.989546
0.989595 0.989683 #selex for gender,fleet: 2 / 5
 0.0570367 0.20228 0.278047 0.365677 0.463899 0.570936 0.68457 0.802372 0.922031 1.04167
1.15999 1.2763 1.39033 1.50215 1.61198 1.72012 1.82684 1.93242 2.03704 2.14084 2.24389
2.34619 2.44771 2.54837 2.64807 2.74668 2.84406 2.94007 3.03458 3.12744 3.21853 3.30775
3.39499 3.48018 3.56323 3.64409 3.72274 3.79912 3.87324 3.94508 4.01465 4.08195 4.14701
4.20986 4.27052 4.32904 4.38545 4.43979 4.49212 4.54249 4.59093 4.63752 4.68229 4.7253
4.76661 4.80627 4.84434 4.88085 4.91588 4.94947 4.98166 5.01252 5.04209 5.07042 5.09754
5.12352 5.14839 5.1722 5.19499 5.21679 5.23781 5.25805 5.27742 5.29595 5.31366 5.33059
5.34678 5.36226 5.37706 5.3912 5.40471 5.41762 5.42996 5.44175 5.45301 5.46377 5.47405
5.48386 5.49324 5.50219 5.51075 5.51891 5.52671 5.53416 5.54127 5.54806 5.55454 5.56073
5.56664 5.57228 5.58271 #bodywt for gender,fleet: 2 / 6
 0 0.00147247 0.00276294 0.00502358 0.00884344 0.0150515 0.0247191 0.039087 0.0593985
0.0866616 0.121408 0.16353 0.21225 0.266224 0.323741 0.382952 0.44209 0.499616 0.554316
0.605328 0.65212 0.694452 0.732309 0.765845 0.795328 0.821089 0.843495 0.862916 0.879708
0.894207 0.906716 0.917508 0.926824 0.934874 0.941839 0.947876 0.95312 0.957683 0.961665
0.965148 0.968202 0.970887 0.973254 0.975346 0.9772 0.978848 0.980316 0.981627 0.982802
0.983856 0.984805 0.985661 0.986435 0.987136 0.987773 0.988352 0.98888 0.989363 0.989804
0.990209 0.990581 0.990923 0.991238 0.991529 0.991798 0.992047 0.992277 0.992491 0.99269
0.992874 0.993038 0.993183 0.993318 0.993444 0.993563 0.993674 0.993778 0.993875 0.993967
0.994054 0.994135 0.994211 0.994283 0.994351 0.994415 0.994476 0.994533 0.994586 0.994637
0.994685 0.994731 0.994774 0.994815 0.994853 0.99489 0.994924 0.994957 0.994988 0.995017
0.995045 0.995097 #selex for gender,fleet: 2 / 6
 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862
0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862
0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862
0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862
0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862
0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862
0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862
0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862

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0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862
0.0459862 0.0459862 0.0459862 #mean M for year Yinit: 2011 sex: 1
 78.5455 73.6174 68.89 64.4118 60.2536 56.1473 52.2757 48.5671 45.0265 41.7057 39.1206
36.4953 36.1734 34.9479 35.6311 35.5824 35.7761 35.2636 35.4159 35.4318 34.7685 32.8374
31.3196 29.1594 26.7607 24.2351 22.0819 19.8246 17.8086 16.1036 14.3496 12.6564 11.1984
9.90007 8.6859 7.63143 6.70858 5.91773 5.23172 4.64441 4.13352 3.69031 3.31703 2.98539
2.69975 2.45195 2.24376 2.05346 1.8879 1.74273 1.61325 1.49839 1.39561 1.30323 1.21915
1.14213 1.07121 1.00571 0.945092 0.889459 0.838138 0.790255 0.745703 0.704734 0.666346
0.632149 0.600518 0.569594 0.540504 0.512146 0.485292 0.459824 0.435598 0.412733 0.391081
0.370594 0.351167 0.332801 0.315464 0.299167 0.283839 0.269442 0.255893 0.243108 0.231061
0.219699 0.208974 0.198832 0.18924 0.180165 0.171573 0.16343 0.155706 0.148388 0.141436
0.134825 0.128525 0.122536 0.116842 0.111426 2.34425 #numbers for year Yinit: 2011 sex: 1
 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368
0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368
0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368
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0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368
0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368
0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368
0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368
0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368
0.0448368 0.0448368 0.0448368 #mean M for year Yinit: 2011 sex: 2
 78.5455 73.7021 69.0484 64.6338 60.53 56.468 52.6318 48.95 45.4284 42.12 39.5475 36.9282
36.6357 35.4246 36.1443 36.115 36.3203 35.7922 35.9181 35.8806 35.129 33.0753 31.4238
29.1218 26.588 23.9454 21.6941 19.3677 17.3065 15.5751 13.8215 12.1491 10.7209 9.45954
8.28909 7.27857 6.39874 5.64819 4.99977 4.44675 3.96721 3.5523 3.20394 2.89465 2.62854
2.39771 2.20405 2.02637 1.87155 1.73548 1.61369 1.50526 1.40785 1.31991 1.23947 1.16538
1.0968 1.03309 0.973844 0.919222 0.86862 0.8212 0.776909 0.73606 0.697648 0.663394
0.631627 0.600408 0.57094 0.542068 0.514621 0.488489 0.463538 0.439911 0.417471 0.396187
0.375966 0.356823 0.338736 0.321723 0.305713 0.290669 0.276501 0.263119 0.250495 0.238574
0.227304 0.216627 0.206512 0.196923 0.187827 0.17919 0.170981 0.16319 0.155775 0.14871
0.141965 0.135543 0.129426 0.123599 2.67443 #numbers for year Yinit: 2011 sex: 2
 81.5947 76.5041 71.6437 67.1486 62.8365 58.7517 54.9587 51.213 47.6812 44.298 41.068
38.0384 35.6797 33.2843 32.9895 31.8706 32.4923 32.4464 32.6216 32.1528 32.2902 32.3033
31.697 29.9352 28.5502 26.5797 24.392 22.0889 20.1254 18.0672 16.2291 14.6747 13.0757
11.5323 10.2034 9.02009 7.91359 6.95268 6.11176 5.39115 4.7661 4.23099 3.76554 3.36176
3.0217 2.71958 2.45938 2.23365 2.04402 1.87067 1.71987 1.58764 1.4697 1.36507 1.27146
1.18731 1.11072 1.04056 0.975961 0.916288 0.86107 0.810389 0.763635 0.720013 0.679424
0.6421 0.607126 0.57597 0.547152 0.518977 0.492474 0.466636 0.442169 0.418964 0.396891
0.376057 0.356329 0.33766 0.31996 0.303225 0.287428 0.272578 0.258611 0.245494 0.233148
0.221499 0.210522 0.20017 0.190398 0.181157 0.172418 0.16415 0.156321 0.148902 0.141865
0.135197 0.128863 0.12284 0.117099 0.111643 2.34384 #numbers for year Ydeclare: 2013 sex:
1
 81.5947 76.5921 71.8085 67.3805 63.1259 59.0898 55.3377 51.6239 48.1163 44.7498 41.5296
38.5042 36.1513 33.7557 33.487 32.3785 33.0347 33.0063 33.1923 32.7081 32.8215 32.7857
32.0973 30.2195 28.7092 26.6048 24.2888 21.8737 19.8161 17.6903 15.8069 14.2249 12.6228
11.095 9.79037 8.63829 7.56926 6.64635 5.84284 5.15742 4.56529 4.06029 3.6224 3.24354
2.92546 2.64306 2.4001 2.18935 2.01254 1.85032 1.70897 1.58474 1.47355 1.37456 1.28562
1.20533 1.13188 1.06424 1.00161 0.943444 0.889341 0.839464 0.793257 0.749955 0.709509
0.672206 0.637128 0.605846 0.576837 0.548327 0.521415 0.495047 0.469981 0.446116 0.423328
0.401749 0.381255 0.361816 0.343348 0.325865 0.309346 0.293808 0.279186 0.265446 0.252507
0.240286 0.228757 0.21787 0.207577 0.197827 0.18859 0.179833 0.171526 0.163638 0.156142
0.149027 0.142255 0.135804 0.129644 0.123779 2.67338 #numbers for year Ydeclare: 2013
sex: 2
#R0  1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932
1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950
1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968
1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986
1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004
2005 2006 2007 2008 2009 2010 #years
337.692  337.692 337.644 337.578 337.503 337.454 337.401 337.35 337.3 337.249 337.19
337.105 337.007 336.897 336.771 336.598 336.418 336.265 336.119 336.002 335.858 335.684
335.456 335.233 335.013 334.849 334.592 334.273 333.874 332.888 331.898 330.242 328.852
328.315 327.687 327.28 326.842 326.298 325.834 325.491 325.047 324.476 323.769 322.944
322.05 321.249 320.521 319.925 319.208 318.656 318.291 316.675 316.044 315.296 314.511
312.629 311.36 309.601 307.295 305.054 302.455 300.005 297.022 293.864 288.162 282.189
277.173 269.617 259.136 251.417 245.022 236.753 231.719 225.466 218.03 207.593 201.158
189.145 175.78 163.699 156.104 146.495 138.827 129.299 127.217 122.22 124.814 126.841
130.582 134.362 137.999 141.463 144.909 147.913 151.063 154.164 157.091 #Recruits
```

1.53737e+009 1.53737e+009 1.53668e+009 1.53573e+009 1.53466e+009 1.53396e+009
1.53321e+009 1.53247e+009 1.53176e+009 1.53103e+009 1.53018e+009 1.52897e+009
1.52759e+009 1.52602e+009 1.52424e+009 1.52179e+009 1.51925e+009 1.51709e+009
1.51503e+009 1.51338e+009 1.51136e+009 1.50893e+009 1.50575e+009 1.50264e+009 1.4996e+009
1.49733e+009 1.49377e+009 1.48938e+009 1.48392e+009 1.47052e+009 1.45724e+009
1.43536e+009 1.41735e+009 1.41047e+009 1.40248e+009 1.39733e+009 1.39182e+009
1.38503e+009 1.37925e+009 1.37501e+009 1.36954e+009 1.36255e+009 1.35397e+009
1.34403e+009 1.33337e+009 1.32391e+009 1.31539e+009 1.30847e+009 1.30021e+009
1.29389e+009 1.28973e+009 1.27154e+009 1.26453e+009 1.25628e+009 1.24768e+009
1.22741e+009 1.21397e+009 1.19564e+009 1.17214e+009 1.14985e+009 1.12464e+009
1.10149e+009 1.0741e+009 1.04596e+009 9.9736e+008 9.49244e+008 9.10878e+008 8.5631e+008
7.86413e+008 7.38783e+008 7.01553e+008 6.56154e+008 6.29913e+008 5.98683e+008
5.63379e+008 5.16917e+008 4.89914e+008 4.42549e+008 3.94047e+008 3.53571e+008
3.29607e+008 3.00782e+008 2.78897e+008 2.52985e+008 2.47501e+008 2.34589e+008
2.41248e+008 2.46516e+008 2.56396e+008 2.66584e+008 2.7659e+008 2.86314e+008 2.96179e+008
3.04937e+008 3.14285e+008 3.23656e+008 3.3266e+008 #SpawnBio
0.44056 0.5 0 # spawn-recr steepness, sigmaR, autocorr
values from cat150_hmle, catch at 150% and steepness at mle value. # this is state of
nature 6 out of 9 (in no particular order) # and parameter set number 2 out of 2 for this
state
 0 0 29.3832 106.748 351.507 1039.21 2725.77 6303.48 12889.6 23546.3 38970.3 59315.1
84209.1 112917 144548 178233 213232 248981 285083 321285 357438 393464 429326 465007
500501 535798 570884 605742 640344 674660 708657 742296 775540 808350 840688 872520
903811 934531 964652 994149 1.023e+006 1.05119e+006 1.0787e+006 1.10551e+006 1.13163e+006
1.15704e+006 1.18174e+006 1.20573e+006 1.229e+006 1.25157e+006 1.27343e+006 1.29459e+006
1.31507e+006 1.33486e+006 1.35399e+006 1.37245e+006 1.39027e+006 1.40745e+006
1.42402e+006 1.43998e+006 1.45535e+006 1.47015e+006 1.48438e+006 1.49808e+006
1.51124e+006 1.52389e+006 1.53604e+006 1.54771e+006 1.55892e+006 1.56967e+006
1.57999e+006 1.59016e+006 1.5999e+006 1.60925e+006 1.61821e+006 1.6268e+006 1.63503e+006
1.64291e+006 1.65046e+006 1.65769e+006 1.66462e+006 1.67125e+006 1.67759e+006
1.68366e+006 1.68947e+006 1.69503e+006 1.70035e+006 1.70543e+006 1.71029e+006
1.71494e+006 1.71939e+006 1.72363e+006 1.7277e+006 1.73158e+006 1.73529e+006 1.73883e+006
1.74222e+006 1.74546e+006 1.74855e+006 1.7515e+006 1.75696e+006 #female fecundity;
weighted by N in year Y_init across morphs and areas
 0.0454676 0.16465 0.224291 0.292145 0.366874 0.447141 0.531806 0.620006 0.711142
0.804812 0.900735 0.998695 1.09849 1.19991 1.30273 1.4067 1.51155 1.61699 1.72273 1.82848
1.93395 2.03886 2.14297 2.24602 2.3478 2.44812 2.5468 2.64368 2.73864 2.83156 2.92234
3.01092 3.09724 3.18124 3.26289 3.34219 3.41911 3.49367 3.56586 3.63571 3.70325 3.76849
3.83148 3.89225 3.95086 4.00733 4.06173 4.1141 4.16449 4.21296 4.25956 4.30434 4.34737
4.38868 4.42834 4.46641 4.50293 4.53795 4.57154 4.60373 4.63459 4.66415 4.69248 4.7196
4.74557 4.77044 4.79424 4.81702 4.83882 4.85968 4.87976 4.89911 4.91762 4.93531 4.95223
4.9684 4.98386 4.99864 5.01276 5.02626 5.03916 5.05148 5.06325 5.0745 5.08524 5.0955
5.1053 5.11466 5.1236 5.13214 5.14029 5.14807 5.1555 5.1626 5.16937 5.17583 5.18201
5.1879 5.19352 5.19889 5.2088 #bodywt for gender,fleet: 1 / 1
 0 0.0521777 0.0786115 0.114039 0.158966 0.212811 0.273893 0.339728 0.4075 0.474526
0.53859 0.598103 0.652108 0.700197 0.742381 0.778954 0.810385 0.837222 0.860032 0.879365
0.895727 0.909567 0.921281 0.931208 0.939634 0.946803 0.952919 0.958151 0.962641 0.966506
0.969845 0.972738 0.975254 0.977449 0.97937 0.981058 0.982544 0.983859 0.985024 0.98606
0.986984 0.98781 0.988551 0.989217 0.989818 0.99036 0.990852 0.991298 0.991704 0.992074
0.992412 0.992721 0.993005 0.993265 0.993505 0.993726 0.993929 0.994118 0.994292 0.994454
0.994604 0.994743 0.994873 0.994993 0.995106 0.995211 0.995309 0.995401 0.995487 0.995567
0.99564 0.995706 0.995767 0.995825 0.995879 0.995931 0.995979 0.996025 0.996067 0.996108
0.996146 0.996182 0.996217 0.996249 0.996279 0.996308 0.996336 0.996362 0.996386 0.99641
0.996432 0.996452 0.996472 0.996491 0.996509 0.996526 0.996542 0.996557 0.996572 0.996585
0.996611 #selex for gender,fleet: 1 / 1
 0.046615 0.171129 0.234088 0.30603 0.385315 0.470137 0.558873 0.650296 0.743617 0.838405
0.934465 1.03173 1.13017 1.22977 1.33044 1.43209 1.53456 1.63764 1.74111 1.84472 1.94822
2.05133 2.15382 2.25542 2.35592 2.45511 2.5528 2.64882 2.74303 2.8353 2.92552 3.01361
3.09951 3.18314 3.26449 3.34351 3.4202 3.49455 3.56657 3.63627 3.70367 3.7688 3.83169
3.89237 3.9509 4.00731 4.06165 4.11397 4.16432 4.21275 4.25931 4.30407 4.34706 4.38836
4.428 4.46605 4.50255 4.53756 4.57113 4.60332 4.63417 4.66372 4.69204 4.71915 4.74512
4.76998 4.79378 4.81656 4.83835 4.8592 4.87929 4.89863 4.91713 4.93482 4.95174 4.96791
4.98337 4.99815 5.01227 5.02576 5.03866 5.05098 5.06275 5.074 5.08474 5.095 5.1048
5.11416 5.12309 5.13163 5.13978 5.14756 5.15499 5.16209 5.16886 5.17532 5.1815 5.18739
5.19301 5.19838 5.20828 #bodywt for gender,fleet: 1 / 2
 0 0.0217781 0.035912 0.0570166 0.0868386 0.126525 0.176172 0.234626 0.299659 0.368408
0.437902 0.505505 0.569179 0.627569 0.679954 0.726132 0.766274 0.800795 0.830239 0.855204
0.876285 0.89404 0.908975 0.921536 0.932107 0.941016 0.948538 0.954904 0.960307 0.964906
0.968834 0.972199 0.975093 0.977589 0.97975 0.981627 0.983264 0.984696 0.985953 0.98706
0.988038 0.988904 0.989675 0.990361 0.990975 0.991526 0.99202 0.992466 0.992869 0.993234
0.993565 0.993866 0.99414 0.994391 0.99462 0.99483 0.995023 0.995201 0.995364 0.995515

0.995655 0.995784 0.995904 0.996015 0.996118 0.996214 0.996303 0.996387 0.996464 0.996537
0.996602 0.99666 0.996715 0.996766 0.996814 0.996859 0.996901 0.996941 0.996979 0.997015
0.997048 0.99708 0.997109 0.997137 0.997164 0.997189 0.997213 0.997235 0.997257 0.997277
0.997296 0.997314 0.997331 0.997347 0.997362 0.997377 0.997391 0.997404 0.997416 0.997428
0.99745 #selex for gender,fleet: 1 / 2
 0.0507971 0.190731 0.259211 0.333715 0.41097 0.489095 0.567655 0.647075 0.728093
0.811431 0.897634 0.987023 1.07969 1.17551 1.27423 1.37544 1.47869 1.58349 1.68934
1.79575 1.90228 2.00852 2.11411 2.21873 2.3221 2.42398 2.52417 2.62249 2.7188 2.81299
2.90495 2.99462 3.08194 3.16686 3.24937 3.32944 3.40708 3.48229 3.55508 3.62549 3.69352
3.75923 3.82265 3.88381 3.94278 3.99959 4.05429 4.10694 4.1576 4.20631 4.25313 4.29813
4.34134 4.38284 4.42267 4.46089 4.49755 4.53271 4.56642 4.59874 4.6297 4.65937 4.68779
4.715 4.74106 4.76601 4.78988 4.81273 4.8346 4.85552 4.87565 4.89504 4.91358 4.93131
4.94826 4.96447 4.97996 4.99477 5.00892 5.02244 5.03536 5.04771 5.0595 5.07077 5.08153
5.09181 5.10163 5.11101 5.11996 5.12851 5.13668 5.14447 5.15192 5.15903 5.16581 5.17229
5.17847 5.18437 5.19001 5.19538 5.20531 #bodywt for gender,fleet: 1 / 3
 0 0.0174342 0.0369567 0.0720661 0.127638 0.204671 0.298944 0.40238 0.505959 0.602257
0.686652 0.757273 0.8143 0.859126 0.893669 0.919914 0.939663 0.954439 0.965464 0.973685
0.979826 0.984427 0.987889 0.990507 0.992499 0.994023 0.995199 0.996111 0.996824 0.997386
0.997831 0.998187 0.998473 0.998705 0.998893 0.999048 0.999176 0.999282 0.999371 0.999446
0.999509 0.999562 0.999608 0.999647 0.999681 0.99971 0.999735 0.999758 0.999777 0.999794
0.999809 0.999823 0.999835 0.999845 0.999855 0.999863 0.999871 0.999878 0.999884 0.99989
0.999895 0.9999 0.999904 0.999908 0.999912 0.999915 0.999918 0.999921 0.999923 0.999926
0.999928 0.99993 0.999931 0.999933 0.999934 0.999935 0.999937 0.999938 0.999939 0.99994
0.999941 0.999942 0.999943 0.999944 0.999944 0.999945 0.999946 0.999946 0.999947 0.999947
0.999948 0.999948 0.999949 0.999949 0.99995 0.99995 0.999951 0.999951 0.999951 0.999952
0.999952 #selex for gender,fleet: 1 / 3
 0.0469175 0.173105 0.237423 0.311436 0.393613 0.482063 0.574874 0.670433 0.767581
0.865617 0.964195 1.0632 1.16262 1.26251 1.36289 1.46376 1.56508 1.66674 1.76861 1.87052
1.97226 2.07364 2.17442 2.2744 2.37337 2.47112 2.56748 2.66228 2.75537 2.84662 2.93591
3.02317 3.1083 3.19125 3.27198 3.35045 3.42664 3.50053 3.57214 3.64147 3.70854 3.77337
3.83598 3.89642 3.95472 4.01093 4.06508 4.11723 4.16742 4.21571 4.26214 4.30677 4.34966
4.39085 4.4304 4.46836 4.50478 4.53972 4.57322 4.60534 4.63613 4.66563 4.6939 4.72097
4.74689 4.77171 4.79547 4.81821 4.83997 4.86079 4.88085 4.90017 4.91865 4.93632 4.95322
4.96938 4.98482 4.99958 5.01369 5.02717 5.04005 5.05236 5.06412 5.07536 5.08609 5.09634
5.10613 5.11548 5.12441 5.13294 5.14108 5.14886 5.15628 5.16337 5.17014 5.17659 5.18276
5.18865 5.19427 5.19963 5.20953 #bodywt for gender,fleet: 1 / 4
 0 0.0118732 0.0201495 0.0330429 0.0521932 0.0791608 0.115027 0.160022 0.213346 0.27326
0.337409 0.403228 0.468318 0.5307 0.588934 0.642121 0.689837 0.732032 0.768918 0.800876
0.828375 0.851921 0.872012 0.889119 0.903669 0.916043 0.926572 0.935541 0.943196 0.949741
0.955352 0.960174 0.96433 0.967922 0.971038 0.973747 0.976111 0.97818 0.979997 0.981596
0.983009 0.984261 0.985374 0.986365 0.987251 0.988045 0.988758 0.9894 0.989979 0.990504
0.990979 0.991411 0.991805 0.992164 0.992493 0.992794 0.99307 0.993324 0.993557 0.993773
0.993972 0.994156 0.994326 0.994485 0.994631 0.994768 0.994895 0.995013 0.995124 0.995227
0.995319 0.995401 0.995478 0.99555 0.995618 0.995682 0.995742 0.995798 0.995852 0.995902
0.995949 0.995993 0.996035 0.996075 0.996112 0.996148 0.996181 0.996213 0.996243 0.996271
0.996298 0.996323 0.996347 0.99637 0.996392 0.996412 0.996432 0.99645 0.996467 0.996484
0.996515 #selex for gender,fleet: 1 / 4
 0.046087 0.169426 0.232753 0.306396 0.389502 0.480864 0.579 0.682294 0.789151 0.898157
1.00817 1.11834 1.2281 1.3371 1.44514 1.55213 1.65802 1.76281 1.86649 1.96904 2.07042
2.17061 2.26955 2.36715 2.46335 2.55806 2.6512 2.74268 2.83242 2.92035 3.00638 3.09046
3.17254 3.25256 3.3305 3.40632 3.48 3.55154 3.62094 3.68819 3.7533 3.81631 3.87722
3.93606 3.99287 4.04769 4.10054 4.15148 4.20054 4.24777 4.29321 4.33692 4.37894 4.41932
4.45812 4.49537 4.53113 4.56544 4.59836 4.62993 4.66021 4.68923 4.71703 4.74368 4.7692
4.79364 4.81704 4.83945 4.86089 4.88141 4.90123 4.92036 4.93866 4.95616 4.97289 4.98889
5.00419 5.01881 5.03279 5.04614 5.05891 5.0711 5.08276 5.09389 5.10452 5.11468 5.12439
5.13365 5.1425 5.15096 5.15903 5.16674 5.1741 5.18112 5.18783 5.19423 5.20035 5.20618
5.21176 5.21707 5.22689 #bodywt for gender,fleet: 1 / 5
 0 0.00514089 0.0083198 0.0131297 0.020192 0.030234 0.0440312 0.0623113 0.0856349
0.114282 0.148174 0.18686 0.229564 0.275277 0.322873 0.371223 0.419286 0.466171 0.511167
0.553752 0.593583 0.630469 0.664347 0.69525 0.723286 0.748607 0.771399 0.791861 0.810198
0.826608 0.841285 0.854409 0.866144 0.876643 0.886043 0.894466 0.902023 0.908811 0.914918
0.920419 0.925383 0.929869 0.93393 0.937612 0.940956 0.943999 0.946771 0.949302 0.951616
0.953734 0.955677 0.957462 0.959103 0.960615 0.96201 0.963299 0.964491 0.965594 0.966618
0.967568 0.968451 0.969272 0.970038 0.970751 0.971417 0.972039 0.972621 0.973165 0.973674
0.974152 0.974584 0.974974 0.97534 0.975685 0.976009 0.976315 0.976603 0.976874 0.97713
0.977372 0.9776 0.977816 0.978019 0.978212 0.978394 0.978567 0.97873 0.978884 0.979031
0.97917 0.979301 0.979426 0.979544 0.979656 0.979763 0.979864 0.979959 0.980051 0.980137
0.980219 0.98037 #selex for gender,fleet: 1 / 5
 0.0478087 0.178167 0.245476 0.324019 0.412907 0.510779 0.615821 0.725919 0.838917
0.952904 1.06642 1.1785 1.28865 1.39668 1.50263 1.60666 1.70897 1.80976 1.9092 2.00743
2.10453 2.20054 2.29549 2.38935 2.48206 2.57357 2.66379 2.75263 2.84 2.92581 3.00997

3.0924 3.17303 3.2518 3.32864 3.40352 3.47639 3.54723 3.61603 3.68277 3.74746 3.81011
3.87072 3.92932 3.98592 4.04057 4.09329 4.14412 4.19309 4.24026 4.28566 4.32934 4.37134
4.41172 4.45051 4.48777 4.52354 4.55787 4.59082 4.62241 4.65272 4.68176 4.7096 4.73628
4.76183 4.78631 4.80974 4.83218 4.85366 4.87421 4.89405 4.9132 4.93151 4.94902 4.96577
4.98179 4.9971 5.01173 5.02572 5.03909 5.05187 5.06407 5.07574 5.08688 5.09753 5.1077
5.11741 5.12669 5.13555 5.14401 5.15209 5.15981 5.16718 5.17421 5.18093 5.18734 5.19346
5.1993 5.20488 5.2102 5.22003 #bodywt for gender,fleet: 1 / 6
 0 0.00144016 0.00262441 0.00464459 0.00797846 0.0132888 0.0214275 0.0333874 0.0501875
0.0727026 0.101481 0.136607 0.17765 0.223714 0.273564 0.325787 0.378953 0.431747 0.483056
0.532011 0.577994 0.620617 0.65969 0.695183 0.727183 0.755858 0.781432 0.804156 0.824291
0.842097 0.857825 0.871707 0.883959 0.894775 0.90433 0.912778 0.920257 0.926887 0.932774
0.93801 0.942675 0.94684 0.950565 0.953904 0.956901 0.959599 0.962031 0.964228 0.966217
0.96802 0.969659 0.971151 0.972511 0.973754 0.974891 0.975934 0.976891 0.977771 0.978581
0.979329 0.980019 0.980658 0.981249 0.981798 0.982307 0.98278 0.98322 0.98363 0.984013
0.98437 0.984688 0.984971 0.985237 0.985486 0.98572 0.98594 0.986146 0.98634 0.986523
0.986695 0.986857 0.98701 0.987154 0.98729 0.987418 0.987539 0.987654 0.987762 0.987865
0.987962 0.988054 0.988141 0.988223 0.988301 0.988375 0.988445 0.988511 0.988574 0.988634
0.988691 0.988795 #selex for gender,fleet: 1 / 6
 0.054296 0.187189 0.254426 0.330243 0.413003 0.501183 0.593579 0.689356 0.787989
0.889161 0.992665 1.09833 1.20599 1.31544 1.42641 1.53864 1.65181 1.76559 1.87964 1.99361
2.1072 2.22008 2.33196 2.4426 2.55174 2.65919 2.76476 2.86829 2.96964 3.06872 3.16542
3.25968 3.35144 3.44066 3.52732 3.61141 3.69293 3.77188 3.84828 3.92216 3.99355 4.06248
4.12901 4.19316 4.255 4.31457 4.37193 4.42713 4.48023 4.5313 4.58038 4.62754 4.67284
4.71633 4.75808 4.79813 4.83656 4.87342 4.90875 4.94262 4.97508 5.00618 5.03597 5.0645
5.09182 5.11797 5.14301 5.16697 5.18989 5.21183 5.23295 5.25328 5.27273 5.29133 5.30911
5.32611 5.34236 5.3579 5.37275 5.38694 5.4005 5.41346 5.42584 5.43767 5.44897 5.45976
5.47008 5.47993 5.48933 5.49832 5.5069 5.51509 5.52292 5.53039 5.53752 5.54433 5.55084
5.55704 5.56297 5.56863 5.57909 #bodywt for gender,fleet: 2 / 1
 0 0.052912 0.0812448 0.119698 0.168817 0.227804 0.294529 0.365945 0.4387 0.509715
0.576562 0.637616 0.692022 0.739554 0.780438 0.815184 0.844451 0.868944 0.889356 0.906323
0.920413 0.932115 0.941845 0.94995 0.956719 0.962388 0.967152 0.97117 0.974572 0.977462
0.979929 0.982041 0.983858 0.985427 0.986787 0.98797 0.989003 0.989908 0.990704 0.991407
0.992029 0.992582 0.993074 0.993514 0.993908 0.994263 0.994582 0.99487 0.995131 0.995368
0.995584 0.99578 0.995959 0.996123 0.996274 0.996412 0.996539 0.996656 0.996764 0.996864
0.996957 0.997043 0.997122 0.997196 0.997265 0.997329 0.997389 0.997445 0.997497 0.997545
0.997589 0.997629 0.997666 0.9977 0.997733 0.997764 0.997793 0.99782 0.997846 0.99787
0.997893 0.997914 0.997935 0.997954 0.997972 0.997989 0.998005 0.998021 0.998035 0.998049
0.998062 0.998075 0.998086 0.998098 0.998108 0.998118 0.998128 0.998137 0.998145 0.998153
0.998168 #selex for gender,fleet: 2 / 1
 0.0556397 0.194416 0.265306 0.345532 0.433051 0.525776 0.621976 0.720467 0.820596
0.92209 1.0249 1.12907 1.23465 1.34164 1.44997 1.55951 1.67006 1.78137 1.89314 2.00507
2.11684 2.22813 2.33865 2.44811 2.55626 2.66287 2.76773 2.87067 2.97154 3.07021 3.16657
3.26055 3.35208 3.44111 3.52762 3.61158 3.69299 3.77185 3.84818 3.922 3.99334 4.06224
4.12873 4.19285 4.25467 4.31422 4.37157 4.42676 4.47986 4.53092 4.58 4.62715 4.67245
4.71594 4.75769 4.79774 4.83617 4.87303 4.90836 4.94223 4.97469 5.00579 5.03559 5.06412
5.09144 5.1176 5.14263 5.1666 5.18953 5.21146 5.23259 5.25292 5.27237 5.29096 5.30875
5.32575 5.342 5.35754 5.37239 5.38658 5.40014 5.4131 5.42548 5.43731 5.44862 5.45941
5.46973 5.47958 5.48898 5.49797 5.50655 5.51474 5.52257 5.53004 5.53717 5.54398 5.55049
5.5567 5.56262 5.56828 5.57874 #bodywt for gender,fleet: 2 / 2
 0 0.0221689 0.0374292 0.0606283 0.0938159 0.138258 0.19387 0.259023 0.330824 0.405737
0.480253 0.551419 0.617105 0.676048 0.727744 0.772257 0.810038 0.841753 0.868158 0.890016
0.908042 0.922877 0.935079 0.945119 0.953393 0.960225 0.965884 0.970586 0.974507 0.977788
0.980547 0.982875 0.984848 0.986527 0.987962 0.989194 0.990256 0.991175 0.991973 0.992669
0.993279 0.993814 0.994286 0.994703 0.995074 0.995404 0.995698 0.995962 0.996199 0.996412
0.996604 0.996779 0.996936 0.99708 0.997211 0.99733 0.99744 0.99754 0.997632 0.997716
0.997794 0.997866 0.997932 0.997994 0.998051 0.998103 0.998153 0.998198 0.998241 0.99828
0.998316 0.998347 0.998377 0.998404 0.99843 0.998454 0.998477 0.998499 0.998519 0.998538
0.998556 0.998573 0.998589 0.998604 0.998618 0.998631 0.998644 0.998656 0.998667 0.998678
0.998688 0.998698 0.998707 0.998715 0.998724 0.998731 0.998739 0.998746 0.998752 0.998759
0.99877 #selex for gender,fleet: 2 / 2
 0.0605288 0.216102 0.292593 0.374645 0.458657 0.542916 0.627371 0.712824 0.800289
0.890655 0.984536 1.08224 1.18377 1.2889 1.3972 1.50813 1.6211 1.7355 1.85075 1.96628
2.08163 2.19636 2.31009 2.42252 2.53335 2.64237 2.74939 2.85424 2.95679 3.05695 3.15462
3.24975 3.3423 3.43223 3.51952 3.60418 3.6862 3.76561 3.84243 3.91668 3.98841 4.05765
4.12445 4.18885 4.25092 4.31069 4.36824 4.42362 4.47688 4.52809 4.57731 4.62459 4.67
4.71359 4.75544 4.79558 4.83409 4.87102 4.90643 4.94036 4.97288 5.00404 5.03388 5.06246
5.08982 5.11602 5.1411 5.1651 5.18806 5.21003 5.23117 5.25153 5.27099 5.28961 5.30741
5.32442 5.34069 5.35624 5.3711 5.38531 5.39888 5.41185 5.42424 5.43608 5.44739 5.4582
5.46852 5.47838 5.48779 5.49678 5.50537 5.51357 5.5214 5.52888 5.53602 5.54284 5.54934
5.55556 5.56149 5.56715 5.57762 #bodywt for gender,fleet: 2 / 3

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 0 0.017966 0.0393616 0.0785984 0.141116 0.227345 0.331382 0.443145 0.55216 0.6505
0.733868 0.801189 0.853553 0.893146 0.922467 0.943863 0.959328 0.970444 0.978416 0.984137
0.988253 0.991228 0.99339 0.994972 0.996139 0.997006 0.997656 0.998147 0.998521 0.998809
0.999032 0.999206 0.999344 0.999453 0.999541 0.999611 0.999668 0.999715 0.999754 0.999786
0.999813 0.999835 0.999854 0.99987 0.999884 0.999895 0.999905 0.999914 0.999922 0.999928
0.999934 0.999939 0.999944 0.999948 0.999951 0.999954 0.999957 0.99996 0.999962 0.999964
0.999966 0.999968 0.999969 0.99997 0.999972 0.999973 0.999974 0.999975 0.999976 0.999977
0.999977 0.999978 0.999979 0.999979 0.99998 0.99998 0.99998 0.999981 0.999981 0.999982
0.999982 0.999982 0.999983 0.999983 0.999983 0.999983 0.999983 0.999984 0.999984 0.999984
0.999984 0.999984 0.999985 0.999985 0.999985 0.999985 0.999985 0.999985 0.999985 0.999985
0.999986 #selex for gender,fleet: 2 / 3
 0.0559939 0.196629 0.269049 0.351598 0.442309 0.538928 0.639343 0.741917 0.845608
0.949895 1.05462 1.15982 1.26561 1.37212 1.47942 1.58751 1.69631 1.80569 1.91546 2.02538
2.1352 2.24465 2.35345 2.46133 2.56805 2.67337 2.77709 2.87901 2.97897 3.07684 3.17251
3.26587 3.35686 3.44542 3.53151 3.61511 3.69619 3.77477 3.85085 3.92445 3.9956 4.06432
4.13065 4.19464 4.25634 4.31578 4.37303 4.42813 4.48114 4.53213 4.58114 4.62824 4.67348
4.71692 4.75862 4.79864 4.83703 4.87385 4.90915 4.943 4.97543 5.0065 5.03627 5.06478
5.09208 5.11822 5.14324 5.16719 5.1901 5.21203 5.23314 5.25346 5.2729 5.29149 5.30927
5.32626 5.34251 5.35804 5.37289 5.38707 5.40063 5.41358 5.42596 5.43779 5.44908 5.45988
5.47019 5.48003 5.48944 5.49842 5.507 5.51519 5.52301 5.53048 5.53761 5.54442 5.55092
5.55713 5.56305 5.56871 5.57917 #bodywt for gender,fleet: 2 / 4
 0 0.0121011 0.0210626 0.0353163 0.0568248 0.0874233 0.128295 0.179505 0.239821 0.306894
0.377725 0.449209 0.518585 0.583721 0.643203 0.696291 0.742793 0.782921 0.817142 0.846062
0.870338 0.89062 0.907514 0.921562 0.93324 0.942952 0.951041 0.957791 0.963439 0.968178
0.972168 0.975538 0.978396 0.980829 0.982908 0.984691 0.986226 0.987554 0.988705 0.989708
0.990585 0.991354 0.992031 0.992629 0.993159 0.99363 0.994049 0.994425 0.994761 0.995064
0.995337 0.995583 0.995806 0.996009 0.996193 0.996361 0.996515 0.996655 0.996784 0.996903
0.997012 0.997112 0.997205 0.997291 0.99737 0.997444 0.997512 0.997576 0.997635 0.99769
0.997739 0.997782 0.997823 0.997861 0.997897 0.997931 0.997962 0.997992 0.99802 0.998046
0.99807 0.998094 0.998116 0.998136 0.998156 0.998174 0.998192 0.998208 0.998224 0.998238
0.998252 0.998265 0.998278 0.99829 0.998301 0.998312 0.998322 0.998331 0.99834 0.998349
0.998365 #selex for gender,fleet: 2 / 4
 0.0550219 0.192551 0.263967 0.346327 0.438442 0.538771 0.64553 0.756877 0.871102
0.986786 1.10287 1.21865 1.3337 1.44783 1.56097 1.67311 1.78429 1.89455 2.00389 2.11231
2.21977 2.32621 2.43153 2.53563 2.6384 2.73971 2.83946 2.9375 3.03374 3.12806 3.22037
3.3106 3.39866 3.4845 3.56808 3.64935 3.72831 3.80492 3.8792 3.95115 4.02078 4.08811
4.15317 4.21599 4.27661 4.33507 4.39141 4.44568 4.49793 4.5482 4.59656 4.64306 4.68774
4.73067 4.77189 4.81146 4.84944 4.88588 4.92083 4.95434 4.98647 5.01726 5.04676 5.07502
5.10208 5.128 5.15282 5.17657 5.19931 5.22106 5.24204 5.26226 5.28161 5.30011 5.31779
5.33471 5.35088 5.36633 5.38111 5.39523 5.40873 5.42162 5.43394 5.44572 5.45696 5.46771
5.47797 5.48778 5.49714 5.50608 5.51463 5.52278 5.53057 5.53801 5.54511 5.55189 5.55837
5.56455 5.57045 5.57608 5.58649 #bodywt for gender,fleet: 2 / 5
 0 0.00522843 0.0086626 0.0139688 0.0219036 0.0333589 0.0492827 0.0705481 0.0977921
0.131268 0.170756 0.215563 0.264601 0.31653 0.369918 0.423384 0.475709 0.525907 0.573243
0.617231 0.657607 0.694287 0.727327 0.756883 0.783179 0.806472 0.827041 0.845163 0.861104
0.875116 0.88743 0.898255 0.907777 0.916162 0.923555 0.930083 0.935858 0.940977 0.945523
0.949568 0.953175 0.956399 0.959286 0.961878 0.964209 0.966311 0.96821 0.969928 0.971487
0.972904 0.974195 0.975372 0.976448 0.977434 0.978337 0.979167 0.979931 0.980635 0.981285
0.981886 0.982442 0.982957 0.983435 0.983879 0.984292 0.984676 0.985035 0.985369 0.985681
0.985973 0.986236 0.986471 0.986692 0.986899 0.987094 0.987277 0.98745 0.987612 0.987765
0.987909 0.988045 0.988174 0.988295 0.988409 0.988517 0.988619 0.988716 0.988808 0.988894
0.988976 0.989054 0.989127 0.989197 0.989263 0.989326 0.989385 0.989442 0.989495 0.989546
0.989595 0.989683 #selex for gender,fleet: 2 / 5
 0.0570367 0.20228 0.278047 0.365677 0.463899 0.570936 0.68457 0.802372 0.922031 1.04167
1.15999 1.2763 1.39033 1.50215 1.61198 1.72012 1.82684 1.93242 2.03704 2.14084 2.24389
2.34619 2.44771 2.54837 2.64807 2.74668 2.84406 2.94007 3.03458 3.12744 3.21853 3.30775
3.39499 3.48018 3.56323 3.64409 3.72274 3.79912 3.87324 3.94508 4.01465 4.08195 4.14701
4.20986 4.27052 4.32904 4.38545 4.43979 4.49212 4.54249 4.59093 4.63752 4.68229 4.7253
4.76661 4.80627 4.84434 4.88085 4.91588 4.94947 4.98166 5.01252 5.04209 5.07042 5.09754
5.12352 5.14839 5.1722 5.19499 5.21679 5.23781 5.25805 5.27742 5.29595 5.31366 5.33059
5.34678 5.36226 5.37706 5.3912 5.40471 5.41762 5.42996 5.44175 5.45301 5.46377 5.47405
5.48386 5.49324 5.50219 5.51075 5.51891 5.52671 5.53416 5.54127 5.54806 5.55454 5.56073
5.56664 5.57228 5.58271 #bodywt for gender,fleet: 2 / 6
 0 0.00147247 0.00276294 0.00502358 0.00884344 0.0150515 0.0247191 0.039087 0.0593985
0.0866616 0.121408 0.16353 0.21225 0.266224 0.323741 0.382952 0.44209 0.499616 0.554316
0.605328 0.65212 0.694452 0.732309 0.765845 0.795328 0.821089 0.843495 0.862916 0.879708
0.894207 0.906716 0.917508 0.926824 0.934874 0.941839 0.947876 0.95312 0.957683 0.961665
0.965148 0.968202 0.970887 0.973254 0.975346 0.9772 0.978848 0.980316 0.981627 0.982802
0.983856 0.984805 0.985661 0.986435 0.987136 0.987773 0.988352 0.98888 0.989363 0.989804
0.990209 0.990581 0.990923 0.991238 0.991529 0.991798 0.992047 0.992277 0.992491 0.99269
0.992874 0.993038 0.993183 0.993318 0.993444 0.993563 0.993674 0.993778 0.993875 0.993967
```

0.994054 0.994135 0.994211 0.994283 0.994351 0.994415 0.994476 0.994533 0.994586 0.994637
0.994685 0.994731 0.994774 0.994815 0.994853 0.99489 0.994924 0.994957 0.994988 0.995017
0.995045 0.995097 #selex for gender,fleet: 2 / 6
 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862
0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862
0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862
0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862
0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862
0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862
0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862
0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862
0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862 0.0459862
0.0459862 0.0459862 0.0459862 #mean M for year Yinit: 2011 sex: 1
 78.5455 73.6174 68.89 64.4118 60.2536 56.1473 52.2757 48.5671 45.0265 41.7057 39.1206
36.4953 36.1734 34.9479 35.6311 35.5824 35.7761 35.2636 35.4159 35.4318 34.7685 32.8374
31.3196 29.1594 26.7607 24.2351 22.0819 19.8246 17.8086 16.1036 14.3496 12.6564 11.1984
9.90007 8.6859 7.63143 6.70858 5.91773 5.23172 4.64441 4.13352 3.69031 3.31703 2.98539
2.69975 2.45195 2.24376 2.05346 1.8879 1.74273 1.61325 1.49839 1.39561 1.30323 1.21915
1.14213 1.07121 1.00571 0.945092 0.889459 0.838138 0.790255 0.745703 0.704734 0.666346
0.632149 0.600518 0.569594 0.540504 0.512146 0.485292 0.459824 0.435598 0.412733 0.391081
0.370594 0.351167 0.332801 0.315464 0.299167 0.283839 0.269442 0.255893 0.243108 0.231061
0.219699 0.208974 0.198832 0.18924 0.180165 0.171573 0.16343 0.155706 0.148388 0.141436
0.134825 0.128525 0.122536 0.116842 0.111426 2.34425 #numbers for year Yinit: 2011 sex: 1
 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368
0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368
0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368
0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368
0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368
0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368
0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368
0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368
0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368 0.0448368
0.0448368 0.0448368 0.0448368 #mean M for year Yinit: 2011 sex: 2
 78.5455 73.7021 69.0484 64.6338 60.53 56.468 52.6318 48.95 45.4284 42.12 39.5475 36.9282
36.6357 35.4246 36.1443 36.115 36.3203 35.7922 35.9181 35.8806 35.129 33.0753 31.4238
29.1218 26.588 23.9454 21.6941 19.3677 17.3065 15.5751 13.8215 12.1491 10.7209 9.45954
8.28909 7.27857 6.39874 5.64819 4.99977 4.44675 3.96721 3.5523 3.20394 2.89465 2.62854
2.39771 2.20405 2.02637 1.87155 1.73548 1.61369 1.50526 1.40785 1.31991 1.23947 1.16538
1.0968 1.03309 0.973844 0.919222 0.86862 0.8212 0.776909 0.73606 0.697648 0.663394
0.631627 0.600408 0.57094 0.542068 0.514621 0.488489 0.463538 0.439911 0.417471 0.396187
0.375966 0.356823 0.338736 0.321723 0.305713 0.290669 0.276501 0.263119 0.250495 0.238574
0.227304 0.216627 0.206512 0.196923 0.187827 0.17919 0.170981 0.16319 0.155775 0.14871
0.141965 0.135543 0.129426 0.123599 2.67443 #numbers for year Yinit: 2011 sex: 2
 81.5947 76.5041 71.6437 67.1486 62.8365 58.7517 54.9587 51.213 47.6812 44.298 41.068
38.0384 35.6797 33.2843 32.9895 31.8706 32.4923 32.4464 32.6216 32.1528 32.2902 32.3033
31.697 29.9352 28.5502 26.5797 24.392 22.0889 20.1254 18.0672 16.2291 14.6747 13.0757
11.5323 10.2034 9.02009 7.91359 6.95268 6.11176 5.39115 4.7661 4.23099 3.76554 3.36176
3.0217 2.71958 2.45938 2.23365 2.04402 1.87067 1.71987 1.58764 1.4697 1.36507 1.27146
1.18731 1.11072 1.04056 0.975961 0.916288 0.86107 0.810389 0.763635 0.720013 0.679424
0.6421 0.607126 0.57597 0.547152 0.518977 0.492474 0.466636 0.442169 0.418964 0.396891
0.376057 0.356329 0.33766 0.31996 0.303225 0.287428 0.272578 0.258611 0.245494 0.233148
0.221499 0.210522 0.20017 0.190398 0.181157 0.172418 0.16415 0.156321 0.148902 0.141865
0.135197 0.128863 0.12284 0.117099 0.111643 2.34384 #numbers for year Ydeclare: 2013 sex:
1
 81.5947 76.5921 71.8085 67.3805 63.1259 59.0898 55.3377 51.6239 48.1163 44.7498 41.5296
38.5042 36.1513 33.7557 33.487 32.3785 33.0347 33.0063 33.1923 32.7081 32.8215 32.7857
32.0973 30.2195 28.7092 26.6048 24.2888 21.8737 19.8161 17.6903 15.8069 14.2249 12.6228
11.095 9.79037 8.63829 7.56926 6.64635 5.84284 5.15742 4.56529 4.06029 3.6224 3.24354
2.92546 2.64306 2.4001 2.18935 2.01254 1.85032 1.70897 1.58474 1.47355 1.37456 1.28562
1.20533 1.13188 1.06424 1.00161 0.943444 0.889341 0.839464 0.793257 0.749955 0.709509
0.672206 0.637128 0.605846 0.576837 0.548327 0.521415 0.495047 0.469981 0.446116 0.423328
0.401749 0.381255 0.361816 0.343348 0.325865 0.309346 0.293808 0.279186 0.265446 0.252507
0.240286 0.228757 0.21787 0.207577 0.197827 0.18859 0.179833 0.171526 0.163638 0.156142
0.149027 0.142255 0.135804 0.129644 0.123779 2.67338 #numbers for year Ydeclare: 2013
sex: 2
#R0 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932
1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950

1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968
1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986
1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004
2005 2006 2007 2008 2009 2010 #years
337.692 337.692 337.644 337.578 337.503 337.454 337.401 337.35 337.3 337.249 337.19
337.105 337.007 336.897 336.771 336.598 336.418 336.265 336.119 336.002 335.858 335.684
335.456 335.233 335.013 334.849 334.592 334.273 333.874 332.888 331.898 330.242 328.852
328.315 327.687 327.28 326.842 326.298 325.834 325.491 325.047 324.476 323.769 322.944
322.05 321.249 320.521 319.925 319.208 318.656 318.291 316.675 316.044 315.296 314.511
312.629 311.36 309.601 307.295 305.054 302.455 300.005 297.022 293.864 288.162 282.189
277.173 269.617 259.136 251.417 245.022 236.753 231.719 225.466 218.03 207.593 201.158
189.145 175.78 163.699 156.104 146.495 138.827 129.299 127.217 122.22 124.814 126.841
130.582 134.362 137.999 141.463 144.909 147.913 151.063 154.164 157.091 #Recruits
1.53737e+009 1.53737e+009 1.53668e+009 1.53573e+009 1.53466e+009 1.53396e+009
1.53321e+009 1.53247e+009 1.53176e+009 1.53103e+009 1.53018e+009 1.52897e+009
1.52759e+009 1.52602e+009 1.52424e+009 1.52179e+009 1.51925e+009 1.51709e+009
1.51503e+009 1.51338e+009 1.51136e+009 1.50893e+009 1.50575e+009 1.50264e+009 1.4996e+009
1.49733e+009 1.49377e+009 1.48938e+009 1.48392e+009 1.47052e+009 1.45724e+009
1.43536e+009 1.41735e+009 1.41047e+009 1.40248e+009 1.39733e+009 1.39182e+009
1.38503e+009 1.37925e+009 1.37501e+009 1.36954e+009 1.36255e+009 1.35397e+009
1.34403e+009 1.33337e+009 1.32391e+009 1.31539e+009 1.30847e+009 1.30021e+009
1.29389e+009 1.28973e+009 1.27154e+009 1.26453e+009 1.25628e+009 1.24768e+009
1.22741e+009 1.21397e+009 1.19564e+009 1.17214e+009 1.14985e+009 1.12464e+009
1.10149e+009 1.0741e+009 1.04596e+009 9.9736e+008 9.49244e+008 9.10878e+008 8.5631e+008
7.86413e+008 7.38783e+008 7.01553e+008 6.56154e+008 6.29913e+008 5.98683e+008
5.63379e+008 5.16917e+008 4.89914e+008 4.42549e+008 3.94047e+008 3.53571e+008
3.29607e+008 3.00782e+008 2.78897e+008 2.52985e+008 2.47501e+008 2.34589e+008
2.41248e+008 2.46516e+008 2.56396e+008 2.66584e+008 2.7659e+008 2.86314e+008 2.96179e+008
3.04937e+008 3.14285e+008 3.23656e+008 3.3266e+008 #SpawnBio
0.44056 0.5 0 # spawn-recr steepness, sigmaR, autocorr
values from cat75_hhigh, catch at 75% and steepness at high value. # this is state of
nature 7 out of 9 (in no particular order) # and parameter set number 1 out of 1 for this
state
 0 0 24.7149 91.5954 307.555 927.511 2481.44 5846.18 12152 22505.1 37660.3 57819.7
82635.6 111371 143117 176979 212194 248177 284520 320963 357354 393612 429702 465607
501321 536833 572132 607196 642000 676512 710697 744517 777932 810904 843395 875368
906789 937628 967856 997449 1.02638e+006 1.05464e+006 1.08221e+006 1.10908e+006
1.13524e+006 1.16068e+006 1.18539e+006 1.20939e+006 1.23266e+006 1.25522e+006
1.27706e+006 1.2982e+006 1.31864e+006 1.3384e+006 1.35748e+006 1.37589e+006 1.39365e+006
1.41077e+006 1.42727e+006 1.44316e+006 1.45846e+006 1.47318e+006 1.48733e+006
1.50094e+006 1.51402e+006 1.52658e+006 1.53865e+006 1.55023e+006 1.56135e+006
1.57201e+006 1.58224e+006 1.5923e+006 1.60195e+006 1.6112e+006 1.62007e+006 1.62856e+006
1.6367e+006 1.64449e+006 1.65195e+006 1.65909e+006 1.66592e+006 1.67246e+006 1.67872e+006
1.6847e+006 1.69043e+006 1.6959e+006 1.70113e+006 1.70614e+006 1.71092e+006 1.71549e+006
1.71986e+006 1.72404e+006 1.72803e+006 1.73184e+006 1.73548e+006 1.73896e+006
1.74229e+006 1.74546e+006 1.74849e+006 1.75138e+006 1.75671e+006 #female fecundity;
weighted by N in year Y_init across morphs and areas
 0.0440349 0.158108 0.217283 0.284996 0.359873 0.440499 0.525644 0.614373 0.706039
0.800218 0.896625 0.995048 1.0953 1.19717 1.30046 1.40491 1.51026 1.61622 1.7225 1.82879
1.93482 2.0403 2.14496 2.24857 2.35089 2.45173 2.55091 2.64827 2.74368 2.83702 2.9282
3.01714 3.10378 3.18808 3.27 3.34953 3.42666 3.50138 3.57372 3.64369 3.71131 3.77661
3.83964 3.90043 3.95902 4.01547 4.06982 4.12213 4.17244 4.22082 4.26731 4.31197 4.35486
4.39603 4.43554 4.47345 4.5098 4.54465 4.57806 4.61007 4.64074 4.67012 4.69824 4.72517
4.75095 4.77562 4.79922 4.82181 4.84341 4.86406 4.88395 4.9031 4.92141 4.93891 4.95563
4.97162 4.98689 5.00148 5.01542 5.02874 5.04146 5.05361 5.06522 5.0763 5.08688 5.09698
5.10663 5.11584 5.12463 5.13302 5.14103 5.14868 5.15598 5.16294 5.16959 5.17593 5.18199
5.18776 5.19327 5.19853 5.2082 #bodywt for gender,fleet: 1 / 1
 0 0.0457211 0.0700116 0.103196 0.146064 0.198329 0.258526 0.324249 0.392625 0.460812
0.526398 0.587602 0.643311 0.693008 0.736638 0.774465 0.806953 0.834659 0.858174 0.878067
0.894869 0.909051 0.921026 0.931151 0.939726 0.947004 0.953199 0.958487 0.963014 0.966904
0.970256 0.973156 0.975672 0.977864 0.979779 0.981458 0.982935 0.984238 0.985392 0.986417
0.98733 0.988145 0.988875 0.989531 0.990121 0.990654 0.991136 0.991573 0.991971 0.992333
0.992663 0.992965 0.993242 0.993496 0.99373 0.993945 0.994143 0.994326 0.994496 0.994653
0.994798 0.994934 0.99506 0.995177 0.995286 0.995387 0.995482 0.995571 0.995654 0.995732
0.995802 0.995866 0.995925 0.995981 0.996033 0.996083 0.996129 0.996173 0.996215 0.996254
0.99629 0.996325 0.996358 0.996389 0.996419 0.996446 0.996473 0.996498 0.996521 0.996543
0.996565 0.996585 0.996604 0.996622 0.996639 0.996655 0.99667 0.996685 0.996699 0.996712
0.996736 #selex for gender,fleet: 1 / 1
 0.0451195 0.164091 0.226426 0.298092 0.377445 0.46261 0.551861 0.643873 0.737788 0.83314
0.929724 1.02748 1.12639 1.22645 1.32759 1.42973 1.53269 1.6363 1.74032 1.84449 1.94856
2.05226 2.15532 2.25751 2.35857 2.45831 2.55653 2.65305 2.74774 2.84045 2.93109 3.01957

3.10581 3.18976 3.27138 3.35066 3.42756 3.5021 3.57427 3.6441 3.71159 3.77679 3.83973
3.90044 3.95897 4.01536 4.06966 4.12192 4.17219 4.22053 4.26699 4.31163 4.3545 4.39565
4.43515 4.47303 4.50937 4.54422 4.57761 4.60962 4.64028 4.66964 4.69777 4.72469 4.75046
4.77513 4.79873 4.82131 4.84291 4.86356 4.88345 4.9026 4.9209 4.9384 4.95512 4.9711
4.98637 5.00097 5.01491 5.02822 5.04094 5.05309 5.0647 5.07578 5.08636 5.09646 5.1061
5.11531 5.1241 5.1325 5.14051 5.14815 5.15545 5.16241 5.16906 5.1754 5.18146 5.18723
5.19274 5.198 5.20767 #bodywt for gender,fleet: 1 / 2
 0 0.0191442 0.0320573 0.0516755 0.0798764 0.118024 0.166458 0.224222 0.289176 0.358421
0.428864 0.497703 0.562736 0.622474 0.676105 0.723374 0.764431 0.799691 0.829715 0.85512
0.876524 0.894511 0.909604 0.922267 0.932897 0.941834 0.949362 0.955719 0.961101 0.965673
0.969569 0.9729 0.975758 0.97822 0.980348 0.982193 0.983799 0.985202 0.986432 0.987513
0.988467 0.989312 0.990061 0.990729 0.991325 0.991859 0.992339 0.992771 0.993161 0.993513
0.993833 0.994124 0.994388 0.99463 0.994851 0.995053 0.995239 0.99541 0.995567 0.995712
0.995846 0.99597 0.996085 0.996191 0.99629 0.996382 0.996468 0.996548 0.996622 0.996692
0.996754 0.996809 0.996861 0.99691 0.996956 0.996999 0.99704 0.997078 0.997114 0.997147
0.997179 0.997209 0.997238 0.997265 0.99729 0.997314 0.997336 0.997358 0.997378 0.997397
0.997415 0.997432 0.997448 0.997464 0.997478 0.997492 0.997505 0.997518 0.99753 0.997541
0.997561 #selex for gender,fleet: 1 / 2
 0.0490832 0.182677 0.250848 0.325751 0.403865 0.48297 0.562404 0.642508 0.724028
0.807725 0.8942 0.983822 1.07672 1.17282 1.27185 1.37345 1.47714 1.58242 1.6888 1.79578
1.9029 2.00974 2.11594 2.22115 2.3251 2.42754 2.52827 2.6271 2.72388 2.81851 2.91089
3.00093 3.08859 3.17383 3.2566 3.33692 3.41476 3.49015 3.56309 3.6336 3.70173 3.7675
3.83095 3.89213 3.95109 4.00787 4.06252 4.11511 4.16569 4.2143 4.26101 4.30588 4.34896
4.39031 4.42999 4.46805 4.50454 4.53953 4.57306 4.60519 4.63596 4.66544 4.69366 4.72068
4.74654 4.77129 4.79497 4.81762 4.83928 4.86 4.87994 4.89913 4.91747 4.93501 4.95177
4.96778 4.98308 4.99771 5.01167 5.02502 5.03776 5.04993 5.06156 5.07266 5.08326 5.09338
5.10305 5.11227 5.12108 5.12949 5.13751 5.14517 5.15248 5.15946 5.16612 5.17247 5.17854
5.18432 5.18984 5.19511 5.20479 #bodywt for gender,fleet: 1 / 3
 0 0.014584 0.0315767 0.0630315 0.114345 0.187533 0.279357 0.382192 0.486852 0.585372
0.672517 0.745927 0.805482 0.852436 0.888682 0.916241 0.93698 0.952488 0.964047 0.972656
0.979076 0.983879 0.987486 0.990209 0.992277 0.993857 0.995073 0.996015 0.996751 0.997329
0.997787 0.998152 0.998445 0.998682 0.998875 0.999033 0.999164 0.999272 0.999362 0.999438
0.999502 0.999557 0.999603 0.999643 0.999677 0.999707 0.999732 0.999755 0.999775 0.999792
0.999807 0.999821 0.999833 0.999844 0.999853 0.999862 0.99987 0.999877 0.999883 0.999889
0.999894 0.999899 0.999903 0.999907 0.99991 0.999914 0.999917 0.99992 0.999922 0.999925
0.999927 0.999928 0.99993 0.999932 0.999933 0.999934 0.999936 0.999937 0.999938 0.999939
0.99994 0.999941 0.999942 0.999943 0.999943 0.999944 0.999945 0.999945 0.999946 0.999947
0.999947 0.999948 0.999948 0.999948 0.999949 0.999949 0.99995 0.99995 0.99995 0.999951
0.999951 #selex for gender,fleet: 1 / 3
 0.0456032 0.166877 0.230911 0.30502 0.387629 0.476727 0.570245 0.666427 0.764036
0.862354 0.961057 1.06007 1.15946 1.2593 1.35966 1.46057 1.56199 1.66384 1.76598 1.86823
1.97039 2.07223 2.17352 2.27405 2.37357 2.4719 2.56882 2.66418 2.75781 2.84957 2.93936
3.02708 3.11264 3.19599 3.27708 3.35587 3.43234 3.5065 3.57833 3.64784 3.71507 3.78002
3.84274 3.90325 3.9616 4.01782 4.07198 4.1241 4.17426 4.22249 4.26885 4.31339 4.35618
4.39725 4.43668 4.4745 4.51078 4.54557 4.57892 4.61087 4.64149 4.67082 4.69891 4.7258
4.75154 4.77617 4.79975 4.8223 4.84387 4.86451 4.88438 4.90351 4.9218 4.93928 4.95599
4.97196 4.98722 5.0018 5.01574 5.02904 5.04175 5.0539 5.06549 5.07656 5.08714 5.09723
5.10687 5.11608 5.12486 5.13325 5.14125 5.14889 5.15619 5.16315 5.16979 5.17613 5.18218
5.18795 5.19346 5.19871 5.20837 #bodywt for gender,fleet: 1 / 4
 0 0.00970341 0.0169507 0.0285819 0.0463545 0.0720447 0.107007 0.15172 0.205519 0.266651
0.332604 0.400579 0.467927 0.532456 0.592573 0.647296 0.696176 0.739175 0.776549 0.808729
0.836243 0.859646 0.879483 0.896262 0.910439 0.922418 0.932547 0.941123 0.948397 0.954582
0.959854 0.964361 0.968226 0.97155 0.974419 0.976904 0.979062 0.980943 0.982588 0.984031
0.985302 0.986424 0.987418 0.9883 0.989087 0.98979 0.990419 0.990985 0.991494 0.991954
0.99237 0.992747 0.99309 0.993403 0.993688 0.993949 0.994187 0.994407 0.994608 0.994794
0.994965 0.995123 0.99527 0.995405 0.995531 0.995648 0.995756 0.995857 0.995951 0.996039
0.996117 0.996187 0.996252 0.996313 0.996371 0.996425 0.996475 0.996523 0.996568 0.99661
0.99665 0.996687 0.996723 0.996756 0.996787 0.996817 0.996845 0.996872 0.996897 0.996921
0.996943 0.996964 0.996985 0.997004 0.997022 0.997039 0.997055 0.997071 0.997085 0.997099
0.997124 #selex for gender,fleet: 1 / 4
 0.0447984 0.163293 0.226258 0.299865 0.383255 0.475175 0.574053 0.678151 0.785755
0.895355 1.00576 1.11611 1.22587 1.33472 1.44253 1.54924 1.65485 1.75938 1.86285 1.96526
2.06659 2.16679 2.26581 2.36358 2.46 2.55498 2.64844 2.74027 2.83038 2.91869 3.00512
3.08959 3.17206 3.25246 3.33076 3.40693 3.48094 3.55278 3.62245 3.68995 3.75529 3.81849
3.87957 3.93856 3.9955 4.05041 4.10334 4.15433 4.20342 4.25066 4.2961 4.33979 4.38177
4.4221 4.46083 4.498 4.53367 4.56789 4.6007 4.63216 4.66231 4.6912 4.71887 4.74538
4.77075 4.79505 4.8183 4.84055 4.86184 4.88221 4.90186 4.92081 4.93894 4.95627 4.97283
4.98866 5.00379 5.01824 5.03205 5.04525 5.05785 5.06989 5.08139 5.09237 5.10286 5.11287
5.12244 5.13156 5.14028 5.1486 5.15654 5.16412 5.17136 5.17826 5.18485 5.19114 5.19714
5.20287 5.20834 5.21355 5.22314 #bodywt for gender,fleet: 1 / 5

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 0 0.00426517 0.00708885 0.0114749 0.0180771 0.0276862 0.0411724 0.0593801 0.0829864
0.112359 0.147456 0.187798 0.232523 0.280493 0.330438 0.381088 0.431283 0.480045 0.526609
0.570432 0.611171 0.648655 0.682855 0.713841 0.74176 0.766807 0.7892 0.809172 0.826953
0.842767 0.856825 0.86932 0.880429 0.890314 0.899117 0.906966 0.913974 0.920239 0.92585
0.930883 0.935407 0.939479 0.943151 0.946469 0.949473 0.952197 0.954672 0.956924 0.958977
0.960852 0.962567 0.964139 0.965582 0.966908 0.968128 0.969254 0.970292 0.971253 0.972141
0.972965 0.97373 0.97444 0.9751 0.975715 0.976288 0.976823 0.977322 0.977789 0.978226
0.978635 0.979003 0.979335 0.979647 0.979939 0.980215 0.980474 0.980718 0.980948 0.981165
0.981369 0.981562 0.981744 0.981916 0.982079 0.982232 0.982378 0.982515 0.982645 0.982768
0.982885 0.982996 0.9831 0.9832 0.983294 0.983383 0.983468 0.983548 0.983624 0.983697
0.983765 0.983891 #selex for gender,fleet: 1 / 5
 0.0462489 0.170565 0.23697 0.314875 0.403443 0.501353 0.606808 0.717662 0.831682 0.94685
1.0616 1.17489 1.28615 1.39519 1.50204 1.60686 1.70986 1.81127 1.91127 2.01 2.10757
2.20403 2.2994 2.39366 2.48676 2.57863 2.6692 2.75838 2.84607 2.93218 3.01662 3.09932
3.18019 3.25918 3.33622 3.41126 3.48429 3.55526 3.62416 3.69098 3.75573 3.81842 3.87904
3.93764 3.99422 4.04883 4.10149 4.15224 4.20113 4.2482 4.29349 4.33704 4.3789 4.41913
4.45777 4.49487 4.53047 4.56463 4.59739 4.62881 4.65892 4.68778 4.71543 4.74191 4.76726
4.79154 4.81478 4.83702 4.8583 4.87866 4.8983 4.91724 4.93536 4.95268 4.96924 4.98506
5.00018 5.01463 5.02844 5.04163 5.05423 5.06627 5.07776 5.08874 5.09923 5.10924 5.1188
5.12793 5.13664 5.14496 5.1529 5.16048 5.16772 5.17462 5.18121 5.1875 5.1935 5.19923
5.2047 5.20991 5.2195 #bodywt for gender,fleet: 1 / 6
 0 0.00121961 0.00225358 0.00404188 0.00703329 0.0118624 0.0193627 0.0305301 0.0464177
0.0679668 0.0958152 0.130141 0.170591 0.21632 0.266102 0.318508 0.372065 0.425406
0.477362 0.527012 0.573695 0.616993 0.656695 0.692756 0.725257 0.754367 0.780311 0.803346
0.823738 0.841756 0.857655 0.871675 0.884035 0.894936 0.904556 0.913053 0.920568 0.927224
0.933128 0.938375 0.943046 0.947212 0.950936 0.95427 0.957262 0.959953 0.962377 0.964565
0.966545 0.968339 0.969968 0.971451 0.972802 0.974036 0.975164 0.976198 0.977147 0.978019
0.978822 0.979562 0.980245 0.980877 0.981462 0.982004 0.982507 0.982975 0.983409 0.983814
0.984192 0.984544 0.984858 0.985138 0.9854 0.985645 0.985876 0.986092 0.986295 0.986486
0.986666 0.986835 0.986995 0.987145 0.987286 0.98742 0.987546 0.987665 0.987778 0.987884
0.987985 0.98808 0.98817 0.988256 0.988336 0.988413 0.988485 0.988554 0.988619 0.988681
0.988739 0.988795 0.988896 #selex for gender,fleet: 1 / 6
 0.052543 0.179632 0.246312 0.32195 0.404861 0.493424 0.586331 0.682664 0.781852 0.883556
0.987571 1.09374 1.2019 1.31185 1.42335 1.53614 1.64988 1.76426 1.87891 1.99351 2.10772
2.22122 2.33372 2.44494 2.55466 2.66265 2.76874 2.87275 2.97455 3.07403 3.17111 3.2657
3.35775 3.44724 3.53412 3.6184 3.70006 3.77913 3.85562 3.92956 4.00097 4.06991 4.13641
4.20051 4.26228 4.32176 4.379 4.43408 4.48704 4.53795 4.58686 4.63383 4.67894 4.72222
4.76376 4.8036 4.8418 4.87842 4.91352 4.94715 4.97937 5.01022 5.03977 5.06805 5.09512
5.12103 5.14582 5.16954 5.19222 5.21392 5.23479 5.25488 5.27409 5.29245 5.31 5.32677
5.34279 5.35811 5.37274 5.38672 5.40007 5.41282 5.425 5.43664 5.44775 5.45836 5.46849
5.47816 5.48739 5.49621 5.50462 5.51266 5.52032 5.52764 5.53463 5.5413 5.54766 5.55373
5.55953 5.56506 5.57524 #bodywt for gender,fleet: 2 / 1
 0 0.0463141 0.072331 0.108367 0.155316 0.212731 0.278723 0.350303 0.424008 0.496539
0.565218 0.628194 0.684445 0.73364 0.775953 0.811884 0.842103 0.867345 0.888331 0.905733
0.920144 0.93208 0.941976 0.950196 0.957042 0.962761 0.967554 0.971586 0.974991 0.977878
0.980335 0.982436 0.984239 0.985792 0.987136 0.988304 0.989322 0.990212 0.990994 0.991683
0.992293 0.992833 0.993314 0.993744 0.994128 0.994473 0.994784 0.995064 0.995317 0.995547
0.995756 0.995946 0.99612 0.996279 0.996424 0.996558 0.996681 0.996794 0.996898 0.996994
0.997083 0.997166 0.997242 0.997314 0.99738 0.997441 0.997499 0.997552 0.997602 0.997649
0.997691 0.997729 0.997764 0.997798 0.997829 0.997858 0.997886 0.997912 0.997937 0.99796
0.997982 0.998002 0.998022 0.99804 0.998058 0.998074 0.998089 0.998104 0.998118 0.998131
0.998144 0.998155 0.998167 0.998177 0.998187 0.998197 0.998206 0.998215 0.998223 0.99823
0.998245 #selex for gender,fleet: 2 / 1
 0.0537984 0.186226 0.256351 0.336223 0.423792 0.516884 0.613642 0.712771 0.81354
0.915643 1.01903 1.12374 1.22985 1.33738 1.44626 1.55638 1.66753 1.77947 1.89188 2.00447
2.11689 2.22884 2.34001 2.4501 2.55885 2.66604 2.77144 2.87489 2.97623 3.07533 3.17209
3.26642 3.35826 3.44757 3.53431 3.61846 3.70004 3.77903 3.85545 3.92934 4.00071 4.06961
4.13608 4.20016 4.26191 4.32138 4.37862 4.43369 4.48664 4.53754 4.58645 4.63343 4.67853
4.72182 4.76335 4.80319 4.8414 4.87802 4.91312 4.94675 4.97897 5.00983 5.03938 5.06766
5.09474 5.12065 5.14544 5.16916 5.19185 5.21355 5.23443 5.25452 5.27372 5.29208 5.30963
5.3264 5.34243 5.35775 5.37238 5.38636 5.39971 5.41246 5.42465 5.43628 5.44739 5.458
5.46813 5.4778 5.48704 5.49585 5.50427 5.5123 5.51997 5.52729 5.53428 5.54095 5.54731
5.55339 5.55918 5.56471 5.5749 #bodywt for gender,fleet: 2 / 2
 0 0.0194511 0.0333675 0.0549159 0.0863136 0.129103 0.183503 0.248107 0.320093 0.395835
0.471638 0.544328 0.611577 0.671981 0.724946 0.770505 0.809107 0.841438 0.868288 0.890451
0.908676 0.92363 0.935892 0.945952 0.954218 0.961025 0.966647 0.971306 0.975182 0.978418
0.981132 0.983417 0.985351 0.986993 0.988394 0.989595 0.990628 0.991521 0.992295 0.99297
0.993559 0.994077 0.994533 0.994935 0.995292 0.99561 0.995893 0.996146 0.996374 0.996578
0.996763 0.99693 0.997081 0.997218 0.997344 0.997458 0.997562 0.997658 0.997745 0.997826
0.9979 0.997969 0.998032 0.998091 0.998145 0.998195 0.998242 0.998285 0.998326 0.998363
0.998397 0.998427 0.998455 0.998481 0.998506 0.998529 0.99855 0.998571 0.99859 0.998608
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0.998625 0.998641 0.998656 0.99867 0.998684 0.998696 0.998708 0.99872 0.99873 0.998741
0.99875 0.998759 0.998768 0.998776 0.998784 0.998791 0.998798 0.998804 0.998811 0.998817
0.998827 #selex for gender,fleet: 2 / 2
 0.058378 0.206581 0.282691 0.36522 0.450229 0.535584 0.620983 0.707154 0.795135 0.885875
0.980055 1.07804 1.17988 1.28536 1.39409 1.50551 1.61903 1.73403 1.8499 1.96608 2.08209
2.19747 2.31185 2.42489 2.53632 2.6459 2.75345 2.85879 2.9618 3.06237 3.16042 3.25589
3.34873 3.43891 3.52643 3.61127 3.69345 3.77297 3.84987 3.92418 3.99593 4.06516 4.13193
4.19629 4.25828 4.31796 4.3754 4.43064 4.48376 4.53481 4.58385 4.63094 4.67616 4.71955
4.76118 4.8011 4.83938 4.87608 4.91125 4.94494 4.97722 5.00813 5.03772 5.06606 5.09317
5.11913 5.14395 5.16771 5.19043 5.21215 5.23306 5.25317 5.27239 5.29077 5.30833 5.32512
5.34116 5.35649 5.37113 5.38512 5.39848 5.41125 5.42344 5.43509 5.4462 5.45682 5.46696
5.47664 5.48588 5.49471 5.50313 5.51117 5.51884 5.52617 5.53316 5.53983 5.5462 5.55228
5.55808 5.56361 5.57381 #bodywt for gender,fleet: 2 / 3
 0 0.0149626 0.0335245 0.0686587 0.126526 0.20885 0.310837 0.422746 0.533687 0.63496
0.721533 0.791828 0.846687 0.888236 0.919018 0.94147 0.957679 0.969311 0.977638 0.983601
0.987882 0.990969 0.993208 0.994843 0.996047 0.996939 0.997607 0.99811 0.998494 0.998788
0.999016 0.999194 0.999334 0.999445 0.999534 0.999606 0.999664 0.999712 0.999751 0.999783
0.99981 0.999833 0.999852 0.999868 0.999882 0.999894 0.999904 0.999913 0.999921 0.999927
0.999933 0.999938 0.999943 0.999947 0.999951 0.999954 0.999957 0.999959 0.999961 0.999963
0.999965 0.999967 0.999969 0.99997 0.999971 0.999972 0.999974 0.999974 0.999975 0.999976
0.999977 0.999978 0.999978 0.999979 0.999979 0.99998 0.99998 0.99998 0.999981 0.999981
0.999982 0.999982 0.999982 0.999982 0.999983 0.999983 0.999983 0.999983 0.999984 0.999984
0.999984 0.999984 0.999984 0.999984 0.999985 0.999985 0.999985 0.999985 0.999985 0.999985
0.999985 #selex for gender,fleet: 2 / 3
 0.054358 0.189299 0.261295 0.343842 0.434925 0.532152 0.633232 0.736381 0.840484
0.945011 1.04984 1.15507 1.26088 1.36743 1.47483 1.5831 1.69219 1.80195 1.91218 2.02265
2.13307 2.24316 2.35263 2.46119 2.56859 2.67457 2.77892 2.88145 2.98199 3.08039 3.17655
3.27036 3.36175 3.45066 3.53707 3.62093 3.70225 3.78101 3.85725 3.93096 4.00219 4.07096
4.13731 4.20129 4.26295 4.32234 4.37951 4.43451 4.48741 4.53826 4.58712 4.63406 4.67912
4.72238 4.76388 4.80369 4.84187 4.87847 4.91355 4.94717 4.97937 5.01021 5.03974 5.06802
5.09508 5.12098 5.14576 5.16947 5.19215 5.21384 5.23471 5.25479 5.27399 5.29235 5.30989
5.32666 5.34269 5.358 5.37262 5.3866 5.39995 5.4127 5.42488 5.43651 5.44762 5.45823
5.46835 5.47803 5.48726 5.49607 5.50449 5.51252 5.52019 5.5275 5.53449 5.54116 5.54752
5.55359 5.55939 5.56492 5.5751 #bodywt for gender,fleet: 2 / 4
 0 0.00987319 0.0177084 0.030565 0.0505523 0.0797788 0.119768 0.170875 0.232 0.30072
0.373798 0.447808 0.519681 0.587046 0.648343 0.702776 0.750166 0.790779 0.825154 0.853978
0.877979 0.897869 0.914302 0.927859 0.93904 0.948269 0.955898 0.96222 0.967473 0.971853
0.975517 0.978594 0.981188 0.983385 0.985252 0.986846 0.988212 0.989387 0.990403 0.991285
0.992052 0.992723 0.993312 0.99383 0.994288 0.994693 0.995054 0.995376 0.995663 0.995921
0.996153 0.996363 0.996552 0.996723 0.996879 0.997021 0.99715 0.997268 0.997376 0.997475
0.997567 0.997651 0.997728 0.997799 0.997865 0.997927 0.997983 0.998036 0.998085 0.998131
0.998171 0.998207 0.998241 0.998272 0.998302 0.998329 0.998355 0.998379 0.998402 0.998424
0.998444 0.998463 0.998481 0.998498 0.998514 0.998529 0.998543 0.998557 0.99857 0.998582
0.998593 0.998604 0.998614 0.998623 0.998633 0.998641 0.998649 0.998657 0.998665 0.998672
0.998684 #selex for gender,fleet: 2 / 4
 0.0534269 0.185367 0.256271 0.338464 0.430754 0.531545 0.638954 0.751009 0.865877
0.982051 1.09843 1.21432 1.32934 1.44333 1.55629 1.66825 1.77929 1.88947 1.99882 2.10734
2.21499 2.32171 2.42738 2.5319 2.63515 2.73698 2.83726 2.93585 3.03264 3.12751 3.22036
3.31109 3.39963 3.48592 3.56991 3.65156 3.73086 3.80777 3.88232 3.95449 4.02431 4.0918
4.15698 4.21989 4.28057 4.33906 4.3954 4.44965 4.50186 4.55207 4.60035 4.64675 4.69132
4.73411 4.77519 4.81462 4.85243 4.8887 4.92346 4.95679 4.98872 5.01931 5.04861 5.07666
5.10352 5.12923 5.15383 5.17737 5.1999 5.22144 5.24219 5.26219 5.28131 5.29958 5.31705
5.33375 5.3497 5.36495 5.37952 5.39343 5.40673 5.41943 5.43156 5.44315 5.45421 5.46478
5.47487 5.4845 5.4937 5.50248 5.51086 5.51886 5.5265 5.53379 5.54075 5.54739 5.55373
5.55978 5.56556 5.57107 5.58121 #bodywt for gender,fleet: 2 / 5
 0 0.00433198 0.00737788 0.0122142 0.0196363 0.0306144 0.0462161 0.0674606 0.095127
0.129568 0.170588 0.217433 0.268882 0.323416 0.379411 0.435317 0.489783 0.541736 0.590406
0.635306 0.676201 0.713055 0.745979 0.775188 0.800959 0.823602 0.843436 0.860774 0.875909
0.889115 0.900639 0.9107 0.919492 0.927185 0.933929 0.93985 0.945059 0.949653 0.953712
0.957307 0.9605 0.963341 0.965875 0.968141 0.970173 0.971998 0.973641 0.975124 0.976466
0.977682 0.978786 0.979791 0.980708 0.981545 0.982312 0.983014 0.983659 0.984253 0.9848
0.985304 0.985771 0.986202 0.986602 0.986973 0.987317 0.987638 0.987936 0.988214 0.988473
0.988715 0.988932 0.989127 0.989309 0.98948 0.98964 0.989791 0.989933 0.990066 0.990192
0.99031 0.990422 0.990527 0.990626 0.99072 0.990808 0.990892 0.990971 0.991045 0.991116
0.991183 0.991246 0.991306 0.991363 0.991417 0.991468 0.991516 0.991562 0.991606 0.991647
0.991686 0.991758 #selex for gender,fleet: 2 / 5
 0.0551047 0.193364 0.267988 0.354766 0.452497 0.559461 0.673468 0.79205 0.912799 1.0337
1.15335 1.27094 1.38616 1.49904 1.60982 1.7188 1.82627 1.93253 2.03777 2.14215 2.24573
2.34855 2.45056 2.5517 2.65185 2.7509 2.84869 2.9451 3.03997 3.13317 3.22458 3.31408
3.40158 3.48698 3.57023 3.65126 3.73003 3.80652 3.88071 3.9526 4.02218 4.08948 4.15451
4.2173 4.27789 4.33631 4.39261 4.44682 4.49901 4.54921 4.59748 4.64388 4.68846 4.73127

4.77237 4.81181 4.84964 4.88593 4.92072 4.95407 4.98602 5.01664 5.04596 5.07404 5.10092
5.12665 5.15128 5.17484 5.19738 5.21895 5.23972 5.25972 5.27885 5.29714 5.31461 5.33132
5.34728 5.36254 5.37711 5.39104 5.40434 5.41705 5.42919 5.44078 5.45185 5.46242 5.47252
5.48216 5.49136 5.50015 5.50853 5.51654 5.52418 5.53148 5.53844 5.54509 5.55143 5.55749
5.56326 5.56878 5.57893 #bodywt for gender,fleet: 2 / 6
 0 0.00124336 0.00236604 0.00436078 0.007779 0.0134133 0.0223132 0.0357294 0.0549598
0.0811112 0.11484 0.156159 0.204381 0.258201 0.315898 0.375574 0.435385 0.493714 0.549272
0.601135 0.648728 0.691783 0.73027 0.764341 0.794265 0.820385 0.843076 0.862718 0.87968
0.894305 0.906907 0.917765 0.927125 0.935203 0.942184 0.948228 0.953472 0.958031 0.962005
0.965477 0.968519 0.971191 0.973545 0.975624 0.977465 0.9791 0.980556 0.981855 0.983019
0.984062 0.985001 0.985848 0.986613 0.987305 0.987934 0.988506 0.989028 0.989504 0.989939
0.990338 0.990705 0.991042 0.991352 0.991639 0.991903 0.992148 0.992375 0.992585 0.99278
0.992962 0.993123 0.993265 0.993398 0.993522 0.993639 0.993748 0.99385 0.993946 0.994036
0.994121 0.994201 0.994276 0.994346 0.994413 0.994476 0.994535 0.994591 0.994643 0.994693
0.99474 0.994785 0.994827 0.994867 0.994904 0.99494 0.994974 0.995006 0.995036 0.995065
0.995092 0.995142 #selex for gender,fleet: 2 / 6
 0.0459989 0.0459989 0.0459989 0.0459989 0.0459989 0.0459989 0.0459989 0.0459989
0.0459989 0.0459989 0.0459989 0.0459989 0.0459989 0.0459989 0.0459989 0.0459989 0.0459989
0.0459989 0.0459989 0.0459989 0.0459989 0.0459989 0.0459989 0.0459989 0.0459989 0.0459989
0.0459989 0.0459989 0.0459989 0.0459989 0.0459989 0.0459989 0.0459989 0.0459989 0.0459989
0.0459989 0.0459989 0.0459989 0.0459989 0.0459989 0.0459989 0.0459989 0.0459989 0.0459989
0.0459989 0.0459989 0.0459989 0.0459989 0.0459989 0.0459989 0.0459989 0.0459989 0.0459989
0.0459989 0.0459989 0.0459989 0.0459989 0.0459989 0.0459989 0.0459989 0.0459989 0.0459989
0.0459989 0.0459989 0.0459989 0.0459989 0.0459989 0.0459989 0.0459989 0.0459989 0.0459989
0.0459989 0.0459989 0.0459989 0.0459989 0.0459989 0.0459989 0.0459989 0.0459989 0.0459989
0.0459989 0.0459989 0.0459989 #mean M for year Yinit: 2011 sex: 1
 47.8023 44.9195 42.152 39.5472 37.1733 34.7772 32.5296 30.3602 28.2711 26.3103 24.983
23.5283 22.9648 21.99 21.9433 21.5582 21.2947 20.7117 20.4389 20.1021 19.4604 18.2662
17.2605 15.9846 14.6179 13.2122 11.9834 10.7309 9.60463 8.63439 7.66945 6.7569 5.96709
5.26643 4.62178 4.0618 3.57259 3.15228 2.78794 2.47542 2.20415 1.96923 1.77035 1.59487
1.44361 1.31237 1.20118 1.10051 1.01269 0.935482 0.86663 0.805395 0.750502 0.701058
0.656042 0.614809 0.576856 0.541804 0.509365 0.479511 0.451915 0.426176 0.402212 0.380096
0.359387 0.340718 0.323392 0.306622 0.290849 0.275598 0.261164 0.247479 0.23447 0.222174
0.21052 0.199484 0.18902 0.179127 0.169787 0.161004 0.152741 0.14498 0.137677 0.130793
0.124309 0.118196 0.112427 0.106974 0.101819 0.0969403 0.0923209 0.0879428 0.0837898
0.0798532 0.0761135 0.0725579 0.0691713 0.065952 0.0628905 0.0599783 1.26219 #numbers for
year Yinit: 2011 sex: 1
 0.0449369 0.0449369 0.0449369 0.0449369 0.0449369 0.0449369 0.0449369 0.0449369
0.0449369 0.0449369 0.0449369 0.0449369 0.0449369 0.0449369 0.0449369 0.0449369 0.0449369
0.0449369 0.0449369 0.0449369 0.0449369 0.0449369 0.0449369 0.0449369 0.0449369 0.0449369
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0.0449369 0.0449369 0.0449369 0.0449369 0.0449369 0.0449369 0.0449369 0.0449369 0.0449369
0.0449369 0.0449369 0.0449369 #mean M for year Yinit: 2011 sex: 2
 47.8023 44.9673 42.2415 39.6729 37.3303 34.9594 32.7318 30.577 28.4973 26.5419 25.2215
23.769 23.2141 22.241 22.2037 21.8201 21.5534 20.9553 20.6608 20.2899 19.599 18.3421
17.268 15.9214 14.4882 13.0253 11.7491 10.4643 9.31836 8.33863 7.37761 6.47892 5.70754
5.02865 4.40851 3.87279 3.40701 3.0085 2.66434 2.37015 2.11555 1.89564 1.70999 1.54634
1.40541 1.28316 1.17965 1.08565 1.00348 0.93107 0.866251 0.808389 0.756299 0.709167
0.666037 0.626324 0.589573 0.555453 0.523716 0.494381 0.467151 0.441646 0.417814 0.395756
0.375033 0.356325 0.338917 0.321995 0.306026 0.290518 0.275787 0.26177 0.248396 0.235713
0.223659 0.212217 0.201349 0.191062 0.181344 0.1722 0.163597 0.155513 0.147904 0.140725
0.133957 0.127569 0.121532 0.115817 0.110403 0.105271 0.100402 0.0957795 0.0913863
0.0872145 0.0832446 0.0794635 0.0758559 0.072421 0.0691494 0.0660324 1.42612 #numbers for
year Yinit: 2011 sex: 2
 49.5369 46.4991 43.6007 40.9713 38.4469 36.0709 33.9055 31.7197 29.6693 27.6901 25.7839
23.9947 22.7831 21.4552 20.9398 20.0495 20.0052 19.6525 19.4105 18.8775 18.6272 18.3187
17.7324 16.6429 15.7253 14.5617 13.3156 12.0342 10.9141 9.77257 8.74621 7.8621 6.98297
6.15168 5.43228 4.79414 4.20708 3.69716 3.25173 2.86906 2.53737 2.25288 2.00595 1.79212
1.61111 1.45141 1.31375 1.19433 1.09314 1.00155 0.921633 0.851386 0.788739 0.733022
0.683075 0.638085 0.597124 0.559604 0.525067 0.49317 0.463648 0.436479 0.411365 0.387938
0.366128 0.345999 0.327149 0.310157 0.294386 0.279122 0.264764 0.250881 0.237742 0.225284
0.213442 0.202247 0.191638 0.181591 0.172065 0.163058 0.154556 0.146559 0.139037 0.131971
0.125323 0.119056 0.113153 0.107588 0.102337 0.0973736 0.0926805 0.0882397 0.0840348

0.0800495 0.0762692 0.0726859 0.0692819 0.0660454 0.0629627 0.0600324 1.26075 #numbers
for year Ydeclare: 2013 sex: 1
 49.5369 46.5485 43.6934 41.102 38.6105 36.2626 34.121 31.9536 29.917 27.9467 26.045
24.2568 23.0486 21.7197 21.2109 20.3199 20.2839 19.9316 19.686 19.1379 18.8672 18.5269
17.8945 16.7456 15.7638 14.5334 13.2241 11.8879 10.7224 9.54916 8.5028 7.60831 6.73103
5.91076 5.20676 4.58722 4.02135 3.53255 3.10758 2.74403 2.43006 2.1617 1.92946 1.72887
1.55956 1.4103 1.28178 1.17029 1.07591 0.990186 0.915264 0.849234 0.790129 0.737367
0.689867 0.646887 0.607555 0.571338 0.537821 0.506703 0.477757 0.451 0.426163 0.402899
0.38116 0.361039 0.342135 0.325069 0.309189 0.293751 0.279184 0.265036 0.251597 0.238809
0.226607 0.215035 0.204037 0.193598 0.183683 0.174296 0.16543 0.157087 0.149238 0.141863
0.134921 0.128372 0.122197 0.116369 0.110862 0.105648 0.10071 0.096028 0.0915868
0.0873697 0.0833621 0.0795566 0.0759352 0.0724861 0.0691953 0.066062 1.42421 #numbers for
year Ydeclare: 2013 sex: 2
#R0 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932
1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950
1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968
1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986
1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004
2005 2006 2007 2008 2009 2010 #years
170.591 170.591 170.572 170.547 170.518 170.499 170.479 170.46 170.441 170.421 170.398
170.366 170.329 170.286 170.238 170.172 170.103 170.045 169.989 169.944 169.889 169.822
169.735 169.65 169.566 169.503 169.405 169.283 169.13 168.751 168.371 167.732 167.196
166.989 166.747 166.59 166.422 166.213 166.034 165.903 165.733 165.514 165.243 164.925
164.581 164.272 163.993 163.766 163.492 163.283 163.147 162.521 162.282 161.997 161.697
160.967 160.478 159.795 158.895 158.019 157 156.037 154.861 153.61 151.329 148.923
146.894 143.808 139.472 136.253 133.572 130.071 127.943 125.278 122.082 117.533 114.738
109.412 103.4 97.9113 94.4904 90.1055 86.6323 82.2575 81.4927 79.333 80.1082 80.3079
82.1948 84.1327 85.9641 87.6763 89.4289 90.8296 92.4373 94.0681 95.6045 #Recruits
7.77013e+008 7.77013e+008 7.76667e+008 7.7619e+008 7.75654e+008 7.753e+008 7.74924e+008
7.74553e+008 7.742e+008 7.73831e+008 7.73408e+008 7.728e+008 7.72106e+008 7.7132e+008
7.70424e+008 7.69196e+008 7.67921e+008 7.66842e+008 7.6581e+008 7.64985e+008 7.63974e+008
7.62758e+008 7.61165e+008 7.5961e+008 7.58088e+008 7.56955e+008 7.55178e+008 7.52983e+008
7.50251e+008 7.43541e+008 7.36886e+008 7.25919e+008 7.16891e+008 7.13457e+008
7.09466e+008 7.06903e+008 7.04164e+008 7.00781e+008 6.97916e+008 6.9582e+008 6.93117e+008
6.89653e+008 6.85397e+008 6.80467e+008 6.75183e+008 6.70504e+008 6.66305e+008
6.62919e+008 6.58861e+008 6.55789e+008 6.53805e+008 6.44789e+008 6.41386e+008
6.37369e+008 6.33186e+008 6.23151e+008 6.1655e+008 6.07505e+008 5.95869e+008 5.84849e+008
5.72372e+008 5.60939e+008 5.47379e+008 5.33457e+008 5.09282e+008 4.85357e+008
4.66326e+008 4.3919e+008 4.04379e+008 3.8073e+008 3.62309e+008 3.39809e+008 3.2693e+008
3.11573e+008 2.94202e+008 2.71263e+008 2.58105e+008 2.34791e+008 2.10929e+008
1.91112e+008 1.79604e+008 1.65705e+008 1.55322e+008 1.42961e+008 1.40878e+008
1.35112e+008 1.37162e+008 1.37693e+008 1.42789e+008 1.48165e+008 1.53383e+008
1.58388e+008 1.63641e+008 1.67938e+008 1.72982e+008 1.78225e+008 1.83285e+008 #SpawnBio
0.508 0.5 0 # spawn-recr steepness, sigmaR, autocorr
values from cat100_hhigh, catch at 100% and steepness at high value. # this is state of
nature 8 out of 9 (in no particular order) # and parameter set number 1 out of 2 for this
state
 0 0 25.6574 94.65 316.389 949.858 2529.97 5935.96 12294.3 22700.9 37897.9 58077.6 82888
111594 143291 177091 212236 248146 284415 320783 357099 393283 429298 465129 500768
536205 571428 606417 641146 675583 709694 743441 776785 809688 842111 874019 905377
936156 966326 995864 1.02475e+006 1.05296e+006 1.08048e+006 1.10731e+006 1.13342e+006
1.15882e+006 1.1835e+006 1.20747e+006 1.23071e+006 1.25324e+006 1.27506e+006 1.29618e+006
1.3166e+006 1.33633e+006 1.3554e+006 1.37379e+006 1.39154e+006 1.40866e+006 1.42515e+006
1.44103e+006 1.45632e+006 1.47104e+006 1.48519e+006 1.4988e+006 1.51187e+006 1.52444e+006
1.5365e+006 1.54809e+006 1.55921e+006 1.56987e+006 1.58011e+006 1.59018e+006 1.59983e+006
1.60909e+006 1.61796e+006 1.62646e+006 1.63461e+006 1.6424e+006 1.64987e+006 1.65702e+006
1.66386e+006 1.67041e+006 1.67668e+006 1.68267e+006 1.6884e+006 1.69389e+006 1.69913e+006
1.70414e+006 1.70894e+006 1.71352e+006 1.7179e+006 1.72208e+006 1.72608e+006 1.7299e+006
1.73355e+006 1.73704e+006 1.74037e+006 1.74355e+006 1.74659e+006 1.74949e+006
1.75483e+006 #female fecundity; weighted by N in year Y_init across morphs and areas
 0.0443489 0.159549 0.218836 0.286597 0.361462 0.442032 0.527092 0.615719 0.707275
0.801335 0.897618 0.995908 1.09602 1.19774 1.30086 1.40514 1.51031 1.61607 1.72215
1.82824 1.93406 2.03933 2.14378 2.24718 2.3493 2.44994 2.54893 2.6461 2.74133 2.8345
2.92552 3.0143 3.1008 3.18496 3.26675 3.34616 3.42317 3.4978 3.57004 3.63992 3.70746
3.77269 3.83566 3.89639 3.95493 4.01133 4.06565 4.11792 4.1682 4.21655 4.26302 4.30767
4.35054 4.39171 4.43121 4.46911 4.50547 4.54032 4.57374 4.60576 4.63643 4.66582 4.69396
4.7209 4.7467 4.77138 4.79501 4.81761 4.83923 4.85991 4.87982 4.89899 4.91732 4.93484
4.95159 4.96759 4.98289 4.99751 5.01147 5.02481 5.03756 5.04973 5.06136 5.07246 5.08307
5.09319 5.10286 5.11209 5.12091 5.12932 5.13735 5.14502 5.15233 5.15932 5.16598 5.17235
5.17842 5.18421 5.18974 5.19502 5.20472 #bodywt for gender,fleet: 1 / 1

```
 0 0.0466755 0.071249 0.104705 0.147786 0.200165 0.260352 0.325944 0.394091 0.461989
0.527262 0.588162 0.643597 0.693062 0.736506 0.774192 0.806577 0.834216 0.857688 0.877561
0.894358 0.908546 0.920535 0.930679 0.939276 0.946578 0.952796 0.958108 0.962658 0.966569
0.969943 0.972861 0.975396 0.977604 0.979535 0.981228 0.982718 0.984034 0.985199 0.986234
0.987156 0.98798 0.988718 0.989381 0.989978 0.990517 0.991005 0.991447 0.99185 0.992216
0.992551 0.992857 0.993137 0.993394 0.993631 0.993849 0.99405 0.994236 0.994408 0.994567
0.994715 0.994852 0.99498 0.995098 0.995209 0.995312 0.995409 0.995499 0.995583 0.995662
0.995734 0.995798 0.995858 0.995915 0.995968 0.996018 0.996066 0.99611 0.996152 0.996192
0.996229 0.996265 0.996298 0.99633 0.99636 0.996388 0.996415 0.99644 0.996464 0.996486
0.996508 0.996528 0.996548 0.996566 0.996583 0.9966 0.996616 0.99663 0.996645 0.996658
0.996682 #selex for gender,fleet: 1 / 1
 0.0454464 0.165628 0.228103 0.299837 0.379186 0.464291 0.553445 0.64534 0.739131
0.834355 0.930809 1.02843 1.1272 1.22711 1.32809 1.43005 1.53284 1.63625 1.74007 1.84404
1.9479 2.05138 2.15423 2.2562 2.35706 2.45659 2.55461 2.65094 2.74544 2.83798 2.92845
3.01676 3.10286 3.18667 3.26816 3.34731 3.4241 3.49853 3.57061 3.64034 3.70776 3.77289
3.83576 3.89641 3.95488 4.01123 4.06548 4.11771 4.16795 4.21627 4.26271 4.30733 4.35018
4.39133 4.43081 4.4687 4.50504 4.53988 4.57329 4.6053 4.63597 4.66534 4.69348 4.72042
4.74621 4.77089 4.79451 4.81711 4.83872 4.8594 4.87931 4.89848 4.9168 4.93432 4.95107
4.96708 4.98237 4.99699 5.01095 5.02429 5.03703 5.04921 5.06083 5.07194 5.08254 5.09266
5.10233 5.11156 5.12037 5.12879 5.13682 5.14448 5.1518 5.15879 5.16545 5.17181 5.17788
5.18368 5.18921 5.19448 5.20419 #bodywt for gender,fleet: 1 / 2
 0 0.0195579 0.0326491 0.0524719 0.0808761 0.119187 0.167704 0.22545 0.29028 0.359317
0.4295 0.498061 0.562829 0.622335 0.675778 0.722904 0.763862 0.799061 0.829053 0.854451
0.875866 0.893874 0.908998 0.921695 0.932362 0.941335 0.948899 0.95529 0.960705 0.965307
0.969231 0.972588 0.97547 0.977953 0.9801 0.981963 0.983585 0.985002 0.986245 0.987338
0.988303 0.989157 0.989916 0.990592 0.991196 0.991736 0.992222 0.99266 0.993055 0.993412
0.993736 0.994031 0.994299 0.994544 0.994768 0.994974 0.995162 0.995335 0.995495 0.995642
0.995778 0.995904 0.996021 0.996129 0.996229 0.996323 0.99641 0.996491 0.996566 0.996637
0.9967 0.996757 0.996809 0.996859 0.996906 0.996949 0.996991 0.997029 0.997066 0.9971
0.997133 0.997163 0.997192 0.997219 0.997245 0.997269 0.997292 0.997314 0.997335 0.997354
0.997372 0.99739 0.997406 0.997422 0.997437 0.997451 0.997464 0.997477 0.997489 0.9975
0.997521 #selex for gender,fleet: 1 / 2
 0.0494376 0.184351 0.252586 0.327425 0.4054 0.484352 0.563651 0.643649 0.725081 0.808699
0.895091 0.984618 1.07741 1.17337 1.27225 1.37367 1.47716 1.58225 1.68841 1.79517 1.90207
2.00869 2.11466 2.21966 2.3234 2.42564 2.52616 2.6248 2.72141 2.81587 2.90808 2.99797
3.08549 3.17059 3.25324 3.33343 3.41117 3.48645 3.5593 3.62974 3.69779 3.76349 3.82688
3.888 3.94691 4.00365 4.05826 4.11082 4.16136 4.20996 4.25665 4.3015 4.34458 4.38592
4.42559 4.46365 4.50014 4.53513 4.56867 4.60081 4.6316 4.66109 4.68932 4.71636 4.74223
4.767 4.7907 4.81337 4.83505 4.85579 4.87575 4.89497 4.91333 4.93089 4.94767 4.96371
4.97904 4.99368 5.00767 5.02104 5.03381 5.04601 5.05766 5.06878 5.0794 5.08955 5.09923
5.10848 5.11731 5.12574 5.13378 5.14146 5.14879 5.15579 5.16247 5.16884 5.17492 5.18073
5.18627 5.19155 5.20127 #bodywt for gender,fleet: 1 / 3
 0 0.0150931 0.0325022 0.0645218 0.116434 0.19008 0.282078 0.384778 0.489069 0.587107
0.673762 0.746744 0.805962 0.852672 0.888753 0.91621 0.936891 0.95237 0.96392 0.972531
0.978959 0.983773 0.987391 0.990126 0.992205 0.993795 0.995019 0.995969 0.996711 0.997294
0.997756 0.998125 0.998422 0.998662 0.998857 0.999017 0.99915 0.999259 0.999351 0.999428
0.999493 0.999548 0.999596 0.999636 0.999671 0.999701 0.999727 0.99975 0.99977 0.999788
0.999803 0.999817 0.999829 0.99984 0.99985 0.999859 0.999867 0.999874 0.99988 0.999886
0.999892 0.999896 0.999901 0.999905 0.999909 0.999912 0.999915 0.999918 0.999921 0.999923
0.999925 0.999927 0.999929 0.99993 0.999932 0.999933 0.999934 0.999936 0.999937 0.999938
0.999939 0.99994 0.999941 0.999941 0.999942 0.999943 0.999944 0.999944 0.999945 0.999945
0.999946 0.999946 0.999947 0.999947 0.999948 0.999948 0.999949 0.999949 0.999949 0.99995
0.99995 #selex for gender,fleet: 1 / 3
 0.045866 0.168117 0.232163 0.306202 0.388683 0.477635 0.57103 0.667142 0.764741 0.863099
0.961875 1.06098 1.16044 1.26034 1.36073 1.46163 1.56301 1.66477 1.76679 1.86889 1.97087
2.07251 2.17359 2.27389 2.37318 2.47127 2.56796 2.66309 2.75649 2.84804 2.93762 3.02513
3.1105 3.19367 3.27459 3.35322 3.42955 3.50357 3.57527 3.64467 3.71179 3.77664 3.83927
3.8997 3.95797 4.01414 4.06823 4.12031 4.17042 4.21861 4.26493 4.30945 4.35221 4.39327
4.43268 4.47049 4.50676 4.54154 4.57489 4.60684 4.63746 4.6668 4.69489 4.72179 4.74754
4.77219 4.79578 4.81834 4.83993 4.86058 4.88047 4.89962 4.91793 4.93544 4.95217 4.96816
4.98345 4.99805 5.012 5.02533 5.03806 5.05023 5.06184 5.07294 5.08353 5.09365 5.10331
5.11253 5.12134 5.12975 5.13777 5.14543 5.15274 5.15972 5.16638 5.17274 5.17881 5.1846
5.19012 5.19539 5.20509 #bodywt for gender,fleet: 1 / 4
 0 0.0101109 0.0175232 0.0293269 0.0472347 0.0729595 0.107791 0.152167 0.205422 0.26585
0.331015 0.398204 0.464842 0.528787 0.588474 0.642925 0.691676 0.734671 0.772135 0.804478
0.832203 0.855846 0.875937 0.892972 0.907401 0.919621 0.929976 0.938762 0.946231 0.952594
0.958027 0.962681 0.966678 0.970122 0.973099 0.97568 0.977926 0.979886 0.981602 0.98311
0.984438 0.985613 0.986654 0.98758 0.988406 0.989144 0.989806 0.990402 0.990938 0.991423
0.991862 0.99226 0.992622 0.992953 0.993254 0.99353 0.993783 0.994015 0.994229 0.994425
0.994607 0.994775 0.99493 0.995074 0.995207 0.995331 0.995447 0.995554 0.995654 0.995748
0.995831 0.995905 0.995975 0.99604 0.996101 0.996159 0.996213 0.996263 0.996311 0.996356
```

0.996399 0.996439 0.996476 0.996512 0.996546 0.996577 0.996607 0.996636 0.996662 0.996688
0.996712 0.996735 0.996756 0.996777 0.996796 0.996814 0.996832 0.996848 0.996864 0.996879
0.996906 #selex for gender,fleet: 1 / 4
 0.0450186 0.164329 0.227237 0.300698 0.38387 0.475535 0.574174 0.678101 0.785647
0.895321 1.00593 1.11659 1.22673 1.33601 1.44425 1.55137 1.65735 1.7622 1.86593 1.96853
2.06998 2.17025 2.26928 2.36699 2.46332 2.55818 2.65147 2.74311 2.83302 2.92111 3.0073
3.09154 3.17377 3.25393 3.332 3.40793 3.48172 3.55335 3.62281 3.69011 3.75527 3.81829
3.87921 3.93805 3.99483 4.04961 4.10241 4.15329 4.20227 4.24942 4.29477 4.33837 4.38028
4.42054 4.4592 4.49632 4.53194 4.56611 4.59888 4.63031 4.66042 4.68929 4.71694 4.74342
4.76878 4.79306 4.8163 4.83854 4.85982 4.88019 4.89984 4.9188 4.93693 4.95427 4.97084
4.98668 5.00182 5.01629 5.03011 5.04332 5.05594 5.06799 5.0795 5.0905 5.101 5.11103
5.12061 5.12975 5.13848 5.14681 5.15477 5.16236 5.16961 5.17653 5.18314 5.18944 5.19546
5.2012 5.20668 5.2119 5.22152 #bodywt for gender,fleet: 1 / 5
 0 0.00443084 0.0072905 0.0116897 0.0182529 0.0277292 0.0409381 0.0586733 0.0815736
0.109994 0.143913 0.182906 0.226184 0.272699 0.321263 0.370677 0.41983 0.467771 0.513744
0.557197 0.597767 0.63526 0.669614 0.700873 0.729154 0.754627 0.77749 0.797958 0.816248
0.83257 0.847128 0.860109 0.871686 0.882017 0.891242 0.89949 0.906871 0.913487 0.919426
0.924765 0.929572 0.933908 0.937826 0.941373 0.944588 0.947509 0.950166 0.952588 0.954799
0.956821 0.958673 0.960372 0.961933 0.963369 0.964692 0.965913 0.967042 0.968086 0.969053
0.96995 0.970783 0.971557 0.972278 0.972949 0.973576 0.97416 0.974707 0.975217 0.975696
0.976143 0.976548 0.976912 0.977255 0.977576 0.977879 0.978164 0.978433 0.978686 0.978925
0.97915 0.979362 0.979563 0.979753 0.979932 0.980101 0.980261 0.980413 0.980557 0.980693
0.980821 0.980943 0.981059 0.981169 0.981273 0.981371 0.981465 0.981554 0.981638 0.981718
0.981794 0.981933 #selex for gender,fleet: 1 / 5
 0.0465871 0.172205 0.238796 0.316828 0.405458 0.50336 0.608742 0.719473 0.833337
0.948335 1.06292 1.17604 1.28716 1.39606 1.50277 1.60746 1.71034 1.81161 1.91147 2.01005
2.10746 2.20375 2.29894 2.39302 2.48593 2.57762 2.668 2.75699 2.84449 2.93042 3.01469
3.09722 3.17792 3.25675 3.33364 3.40855 3.48143 3.55228 3.62106 3.68778 3.75243 3.81502
3.87556 3.93408 3.99059 4.04513 4.09774 4.14845 4.19729 4.24432 4.28957 4.33309 4.37494
4.41514 4.45377 4.49085 4.52645 4.5606 4.59336 4.62478 4.65489 4.68375 4.71141 4.73789
4.76326 4.78755 4.8108 4.83306 4.85435 4.87473 4.89439 4.91335 4.93149 4.94883 4.9654
4.98125 4.99639 5.01087 5.02469 5.03791 5.05053 5.06259 5.07411 5.08511 5.09561 5.10565
5.11523 5.12437 5.13311 5.14145 5.14941 5.15701 5.16426 5.17118 5.17779 5.1841 5.19012
5.19586 5.20134 5.20658 5.2162 #bodywt for gender,fleet: 1 / 6
 0 0.00124726 0.00229766 0.00410903 0.00713043 0.0119948 0.0195307 0.030725 0.046618
0.0681368 0.0959074 0.130101 0.170369 0.215873 0.265405 0.317553 0.370862 0.423979
0.475745 0.525246 0.571822 0.615053 0.654723 0.690784 0.723311 0.752468 0.778474 0.801581
0.822053 0.840154 0.856137 0.870241 0.882683 0.893663 0.903358 0.911926 0.919508 0.926227
0.932189 0.937491 0.942212 0.946425 0.950192 0.953566 0.956595 0.959319 0.961775 0.963992
0.965998 0.967817 0.969469 0.970972 0.972343 0.973595 0.97474 0.97579 0.976753 0.977638
0.978454 0.979205 0.9799 0.980542 0.981136 0.981687 0.982198 0.982673 0.983115 0.983527
0.983911 0.984269 0.984589 0.984873 0.985139 0.985389 0.985624 0.985844 0.986051 0.986245
0.986428 0.9866 0.986763 0.986916 0.98706 0.987196 0.987324 0.987446 0.98756 0.987669
0.987771 0.987868 0.98796 0.988047 0.988129 0.988207 0.988281 0.988351 0.988417 0.98848
0.98854 0.988596 0.9887 #selex for gender,fleet: 1 / 6
 0.0529166 0.181257 0.24807 0.323768 0.406674 0.495185 0.58801 0.684247 0.783328 0.88492
0.988815 1.09485 1.20287 1.31267 1.42401 1.53662 1.65018 1.76436 1.87882 1.99322 2.10722
2.22051 2.33281 2.44383 2.55335 2.66116 2.76706 2.87089 2.97253 3.07185 3.16878 3.26323
3.35515 3.44451 3.53128 3.61545 3.69702 3.776 3.85241 3.92627 3.99762 4.0665 4.13294
4.197 4.25872 4.31817 4.37539 4.43044 4.48338 4.53427 4.58317 4.63014 4.67523 4.71852
4.76006 4.7999 4.83811 4.87474 4.90985 4.9435 4.97573 5.0066 5.03616 5.06447 5.09156
5.11749 5.1423 5.16604 5.18875 5.21047 5.23137 5.25149 5.27072 5.28911 5.30668 5.32348
5.33953 5.35487 5.36953 5.38353 5.39691 5.40969 5.4219 5.43355 5.44469 5.45532 5.46548
5.47517 5.48443 5.49327 5.5017 5.50976 5.51745 5.52479 5.5318 5.53848 5.54487 5.55096
5.55677 5.56232 5.57254 #bodywt for gender,fleet: 2 / 1
 0 0.0472887 0.0736166 0.109953 0.157136 0.214668 0.280634 0.352052 0.425492 0.497699
0.566039 0.628698 0.684674 0.733646 0.77579 0.8116 0.841739 0.866933 0.887896 0.905292
0.919711 0.931662 0.941579 0.949823 0.956693 0.962436 0.967252 0.971307 0.974733 0.977639
0.980114 0.982231 0.984049 0.985616 0.986973 0.988151 0.989179 0.990079 0.990869 0.991566
0.992182 0.992729 0.993216 0.99365 0.994039 0.994389 0.994703 0.994987 0.995244 0.995477
0.995689 0.995882 0.996058 0.996219 0.996366 0.996502 0.996626 0.996741 0.996847 0.996944
0.997035 0.997119 0.997196 0.997269 0.997336 0.997398 0.997457 0.997511 0.997562 0.997609
0.997652 0.997691 0.997727 0.99776 0.997792 0.997822 0.99785 0.997877 0.997902 0.997925
0.997947 0.997968 0.997988 0.998007 0.998025 0.998041 0.998057 0.998072 0.998086 0.998099
0.998112 0.998124 0.998136 0.998146 0.998157 0.998166 0.998176 0.998184 0.998193 0.9982
0.998215 #selex for gender,fleet: 2 / 1
 0.0541888 0.187967 0.258259 0.338215 0.425788 0.518823 0.615485 0.714497 0.815143
0.91712 1.02037 1.12495 1.23092 1.3383 1.44702 1.55696 1.66792 1.77966 1.89187 2.00425
2.11646 2.2282 2.33915 2.44904 2.55759 2.66458 2.7698 2.87307 2.97424 3.07317 3.16978
3.26396 3.35567 3.44485 3.53147 3.61553 3.697 3.7759 3.85224 3.92605 3.99736 4.0662
4.13261 4.19665 4.25836 4.31779 4.375 4.43004 4.48298 4.53386 4.58276 4.62973 4.67482

4.71811 4.75965 4.79949 4.8377 4.87434 4.90945 4.9431 4.97533 5.00621 5.03577 5.06408
5.09117 5.11711 5.14192 5.16566 5.18837 5.2101 5.231 5.25112 5.27035 5.28874 5.30631
5.32311 5.33916 5.35451 5.36916 5.38317 5.39655 5.40933 5.42153 5.43319 5.44433 5.45496
5.46512 5.47481 5.48407 5.49291 5.50135 5.5094 5.51709 5.52443 5.53144 5.53813 5.54451
5.5506 5.55642 5.56197 5.57219 #bodywt for gender,fleet: 2 / 2
 0 0.019877 0.0339918 0.055772 0.087402 0.130376 0.184865 0.249437 0.32127 0.39677
0.472282 0.544673 0.611651 0.671828 0.72462 0.770058 0.808584 0.840878 0.867718 0.889893
0.908142 0.923128 0.935426 0.945523 0.953826 0.960668 0.966323 0.971013 0.974915 0.978176
0.980913 0.983218 0.985169 0.986827 0.988243 0.989456 0.9905 0.991403 0.992186 0.992869
0.993466 0.99399 0.994451 0.994859 0.99522 0.995542 0.995829 0.996086 0.996317 0.996524
0.996711 0.996881 0.997034 0.997174 0.997301 0.997416 0.997522 0.997619 0.997709 0.99779
0.997866 0.997935 0.998 0.998059 0.998114 0.998165 0.998213 0.998257 0.998298 0.998336
0.99837 0.998401 0.998429 0.998456 0.998481 0.998504 0.998526 0.998547 0.998567 0.998585
0.998602 0.998618 0.998634 0.998648 0.998662 0.998675 0.998687 0.998699 0.998709 0.99872
0.998729 0.998739 0.998747 0.998756 0.998764 0.998771 0.998778 0.998785 0.998791 0.998797
0.998808 #selex for gender,fleet: 2 / 2
 0.0588068 0.208496 0.284683 0.367142 0.452 0.537194 0.62246 0.708529 0.79643 0.887096
0.981197 1.07908 1.18081 1.28616 1.39472 1.50597 1.6193 1.73409 1.84975 1.96572 2.08151
2.19668 2.31085 2.42369 2.53492 2.64431 2.75168 2.85684 2.95969 3.0601 3.15801 3.25334
3.34605 3.43612 3.52352 3.60826 3.69034 3.76978 3.8466 3.92084 3.99252 4.0617 4.12842
4.19273 4.25468 4.31433 4.37174 4.42696 4.48006 4.53109 4.58012 4.62721 4.67242 4.71581
4.75745 4.79738 4.83567 4.87238 4.90756 4.94126 4.97356 5.00448 5.0341 5.06245 5.08959
5.11556 5.14041 5.16419 5.18693 5.20869 5.22962 5.24975 5.269 5.2874 5.305 5.32181
5.33788 5.35323 5.3679 5.38192 5.39531 5.4081 5.42032 5.43198 5.44313 5.45377 5.46393
5.47364 5.4829 5.49175 5.50019 5.50825 5.51595 5.5233 5.53031 5.537 5.54339 5.54949
5.5553 5.56086 5.57109 #bodywt for gender,fleet: 2 / 3
 0 0.015494 0.0345221 0.0702949 0.128827 0.211624 0.313736 0.425415 0.535887 0.636602
0.722648 0.792513 0.847057 0.888394 0.919045 0.941424 0.957597 0.969217 0.977544 0.983514
0.987805 0.990903 0.993152 0.994796 0.996007 0.996906 0.997579 0.998087 0.998474 0.998772
0.999002 0.999182 0.999324 0.999437 0.999527 0.999599 0.999658 0.999707 0.999747 0.999779
0.999807 0.99983 0.999849 0.999866 0.99988 0.999892 0.999902 0.999911 0.999919 0.999926
0.999932 0.999937 0.999942 0.999946 0.999949 0.999953 0.999956 0.999958 0.999961 0.999963
0.999965 0.999966 0.999968 0.999969 0.999971 0.999972 0.999973 0.999974 0.999975 0.999976
0.999976 0.999977 0.999978 0.999978 0.999979 0.999979 0.99998 0.99998 0.99998 0.999981
0.999981 0.999981 0.999982 0.999982 0.999982 0.999983 0.999983 0.999983 0.999983 0.999983
0.999984 0.999984 0.999984 0.999984 0.999984 0.999984 0.999984 0.999985 0.999985 0.999985
0.999985 #selex for gender,fleet: 2 / 3
 0.0546749 0.190718 0.262747 0.345242 0.436215 0.53332 0.634308 0.737423 0.841551
0.946148 1.05107 1.15639 1.26227 1.36886 1.47626 1.58449 1.69348 1.80312 1.91319 2.02346
2.13366 2.24352 2.35275 2.46106 2.56821 2.67395 2.77806 2.88036 2.98068 3.07887 3.17483
3.26845 3.35967 3.44842 3.53468 3.6184 3.69959 3.77824 3.85437 3.92799 3.99913 4.06782
4.13411 4.19803 4.25963 4.31897 4.3761 4.43107 4.48394 4.53476 4.58361 4.63052 4.67558
4.71883 4.76033 4.80014 4.83832 4.87493 4.91002 4.94364 4.97585 5.00671 5.03625 5.06454
5.09162 5.11754 5.14234 5.16607 5.18877 5.21049 5.23138 5.25149 5.27072 5.2891 5.30667
5.32346 5.33951 5.35485 5.3695 5.3835 5.39688 5.40965 5.42186 5.43351 5.44464 5.45528
5.46543 5.47512 5.48438 5.49321 5.50165 5.5097 5.51739 5.52473 5.53173 5.53842 5.5448
5.55089 5.55671 5.56225 5.57247 #bodywt for gender,fleet: 2 / 4
 0 0.0102894 0.0183051 0.0313522 0.0514868 0.080741 0.120562 0.171263 0.231753 0.299679
0.371902 0.445098 0.516282 0.583129 0.644097 0.698379 0.745771 0.786503 0.821083 0.850164
0.874453 0.89464 0.911366 0.925203 0.936646 0.946115 0.953962 0.96048 0.965908 0.970443
0.974245 0.977444 0.980146 0.982437 0.984389 0.986057 0.987489 0.988723 0.989791 0.990718
0.991527 0.992235 0.992856 0.993404 0.993888 0.994318 0.9947 0.995041 0.995347 0.995621
0.995867 0.99609 0.996291 0.996474 0.99664 0.996791 0.996929 0.997055 0.99717 0.997276
0.997374 0.997464 0.997546 0.997623 0.997694 0.997759 0.99782 0.997877 0.997929 0.997978
0.998021 0.99806 0.998096 0.99813 0.998161 0.998191 0.998219 0.998245 0.99827 0.998293
0.998315 0.998335 0.998354 0.998373 0.99839 0.998406 0.998421 0.998436 0.99845 0.998462
0.998475 0.998486 0.998497 0.998508 0.998517 0.998527 0.998536 0.998544 0.998552 0.998559
0.998573 #selex for gender,fleet: 2 / 4
 0.0536932 0.186556 0.257419 0.339482 0.431575 0.532145 0.639365 0.751317 0.866208
0.982541 1.0992 1.21546 1.3309 1.44533 1.55869 1.67101 1.78236 1.89277 2.00227 2.11087
2.21852 2.32517 2.43073 2.53508 2.63812 2.73971 2.83973 2.93805 3.03455 3.12913 3.22169
3.31213 3.4004 3.48643 3.57016 3.65157 3.73064 3.80734 3.88168 3.95367 4.02332 4.09064
4.15567 4.21845 4.279 4.33738 4.39362 4.44778 4.4999 4.55005 4.59826 4.64459 4.68911
4.73186 4.7729 4.81229 4.85007 4.88631 4.92106 4.95436 4.98628 5.01686 5.04615 5.0742
5.10106 5.12677 5.15138 5.17492 5.19745 5.219 5.23977 5.25978 5.27892 5.29721 5.3147
5.33141 5.34739 5.36265 5.37724 5.39118 5.40449 5.41721 5.42936 5.44097 5.45205 5.46264
5.47275 5.4824 5.49161 5.50041 5.50882 5.51684 5.52449 5.5318 5.53878 5.54544 5.55179
5.55786 5.56365 5.56917 5.57936 #bodywt for gender,fleet: 2 / 5
 0 0.00450033 0.00758533 0.0124351 0.0198097 0.0306288 0.0458985 0.0665778 0.0934045
0.126725 0.166382 0.211698 0.261556 0.314546 0.369144 0.423874 0.477431 0.528759 0.577079
0.62188 0.662891 0.700034 0.73338 0.763108 0.789461 0.812721 0.833185 0.851149 0.866896

0.880688 0.892768 0.903352 0.912632 0.920779 0.92794 0.934247 0.939811 0.944729 0.949086
0.952954 0.956396 0.959465 0.962208 0.964666 0.966873 0.968858 0.970649 0.972268 0.973734
0.975065 0.976275 0.977378 0.978384 0.979305 0.980148 0.980922 0.981633 0.982288 0.982892
0.98345 0.983966 0.984443 0.984886 0.985297 0.985679 0.986035 0.986366 0.986675 0.986963
0.987232 0.987474 0.98769 0.987893 0.988084 0.988263 0.988431 0.98859 0.988739 0.988879
0.989011 0.989136 0.989253 0.989364 0.989469 0.989568 0.989661 0.98975 0.989834 0.989913
0.989988 0.990058 0.990126 0.990189 0.99025 0.990307 0.990361 0.990412 0.990461 0.990508
0.990551 0.990632 #selex for gender,fleet: 2 / 5
 0.0555101 0.19523 0.27008 0.357021 0.454843 0.561821 0.67577 0.794236 0.91483 1.03556
1.15504 1.27246 1.38752 1.50026 1.6109 1.71973 1.82705 1.93315 2.03823 2.14243 2.24583
2.34846 2.45028 2.55121 2.65116 2.75 2.8476 2.94381 3.03849 3.13151 3.22274 3.31208
3.39941 3.48467 3.56777 3.64867 3.72733 3.80371 3.87779 3.94959 4.01909 4.08631 4.15127
4.21401 4.27454 4.33291 4.38917 4.44335 4.4955 4.54568 4.59394 4.64032 4.68489 4.72769
4.76878 4.80822 4.84606 4.88235 4.91715 4.95051 4.98248 5.01311 5.04244 5.07054 5.09744
5.12319 5.14784 5.17142 5.19399 5.21557 5.23637 5.2564 5.27555 5.29386 5.31136 5.32809
5.34408 5.35936 5.37397 5.38792 5.40124 5.41398 5.42614 5.43776 5.44885 5.45945 5.46956
5.47923 5.48845 5.49726 5.50567 5.5137 5.52136 5.52868 5.53566 5.54233 5.54869 5.55476
5.56056 5.56609 5.57628 #bodywt for gender,fleet: 2 / 6
 0 0.00127207 0.00241339 0.00443523 0.00788996 0.0135687 0.0225153 0.0359694 0.0552126
0.0813339 0.114975 0.156145 0.20416 0.25773 0.315157 0.374566 0.434134 0.492259 0.547659
0.599415 0.64695 0.689989 0.728497 0.762617 0.792612 0.818816 0.8416 0.861339 0.878398
0.893118 0.905811 0.916754 0.926195 0.934347 0.941397 0.947504 0.952804 0.957415 0.961435
0.96495 0.96803 0.970737 0.973122 0.975229 0.977096 0.978754 0.980231 0.98155 0.982731
0.98379 0.984744 0.985603 0.98638 0.987084 0.987723 0.988304 0.988834 0.989318 0.989761
0.990167 0.990539 0.990882 0.991198 0.991489 0.991758 0.992007 0.992238 0.992452 0.992651
0.992836 0.993 0.993145 0.99328 0.993406 0.993525 0.993636 0.99374 0.993838 0.993929
0.994016 0.994097 0.994173 0.994245 0.994313 0.994377 0.994437 0.994494 0.994548 0.994599
0.994647 0.994692 0.994735 0.994775 0.994814 0.99485 0.994885 0.994917 0.994948 0.994978
0.995005 0.995056 #selex for gender,fleet: 2 / 6
 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896
0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896
0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896
0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896
0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896
0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896
0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896
0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896
0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896
0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896
0.0456896 0.0456896 0.0456896 #mean M for year Yinit: 2011 sex: 1
 62.9517 59.1354 55.4743 52.0138 48.8207 45.6438 42.6523 39.7765 37.0186 34.4268 32.5073
30.5015 29.86 28.6584 28.7118 28.3045 28.0596 27.3764 27.1096 26.7493 25.9659 24.4205
23.1228 21.4473 19.6393 17.7699 16.1344 14.4599 12.9517 11.6513 10.3536 9.12367 8.05833
7.11226 6.2409 5.48371 4.82205 4.25356 3.76075 3.33806 2.97119 2.6535 2.3846 2.14735
1.9429 1.76556 1.61536 1.47943 1.3609 1.25677 1.16395 1.08145 1.00755 0.941019 0.880487
0.825075 0.774097 0.727039 0.683509 0.643467 0.606468 0.571968 0.539856 0.510229 0.48249
0.457493 0.434297 0.411841 0.39072 0.370294 0.350962 0.332635 0.315212 0.298744 0.283138
0.268359 0.254345 0.241094 0.228583 0.216814 0.205741 0.195336 0.185545 0.176312 0.167613
0.159411 0.151669 0.144349 0.137427 0.130876 0.124671 0.11879 0.11321 0.10792 0.102894
0.0981136 0.0935597 0.08923 0.0851116 0.0811931 1.72001 #numbers for year Yinit: 2011
sex: 1
 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299
0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299
0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299
0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299
0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299
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0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299
0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299
0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299
0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299
0.0446299 0.0446299 0.0446299 #mean M for year Yinit: 2011 sex: 2
 62.9517 59.1981 55.5919 52.179 49.0268 45.8834 42.9187 40.0629 37.3189 34.7359 32.8259
30.8242 30.1979 29.002 29.0727 28.6719 28.4272 27.7272 27.4348 27.0311 26.1825 24.5515
23.1602 21.3868 19.4856 17.5355 15.8327 14.1112 12.5732 11.2572 9.9622 8.74894 7.70681
6.78887 5.94973 5.22475 4.59442 4.05525 3.5897 3.19188 2.84768 2.55045 2.29963 2.07856
1.88827 1.72327 1.58365 1.4569 1.34619 1.24869 1.16148 1.08368 1.0137 0.950417 0.89255
0.839297 0.790044 0.744337 0.701842 0.662578 0.626145 0.592028 0.560155 0.530661 0.502954
0.47795 0.454684 0.432061 0.410712 0.389973 0.370273 0.351526 0.333639 0.316677 0.300556

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0.285254 0.270718 0.256956 0.243952 0.231715 0.220198 0.209372 0.19918 0.189562 0.180491
0.171928 0.163834 0.156169 0.148908 0.142023 0.13549 0.129286 0.12339 0.117789 0.112458
0.10738 0.102534 0.0979183 0.0935212 0.089331 1.9425 #numbers for year Yinit: 2011 sex: 2
 64.7552 61.0226 57.4444 53.9466 50.593 47.4184 44.4837 41.5609 38.8058 36.1569 33.618
31.2341 29.4645 27.6213 27.0174 25.9098 25.9396 25.5553 25.3197 24.6906 24.4391 24.1048
23.3907 21.9919 20.8177 19.3046 17.6735 15.9882 14.5143 13.0059 11.6478 10.4771 9.30915
8.20258 7.24422 6.3933 5.60971 4.92888 4.334 3.82295 3.37997 3.00006 2.67034 2.38484
2.14321 1.93003 1.74633 1.587 1.45205 1.32992 1.22343 1.12987 1.04647 0.97234 0.905929
0.846145 0.791744 0.741941 0.69612 0.65382 0.614688 0.57869 0.545426 0.514406 0.485533
0.458894 0.43395 0.411473 0.390614 0.37042 0.351425 0.333055 0.315669 0.299185 0.283515
0.268702 0.254665 0.241371 0.228765 0.216845 0.205591 0.195004 0.185043 0.175684 0.166877
0.158572 0.150747 0.14337 0.136406 0.129823 0.123597 0.117705 0.112124 0.106835 0.101817
0.0970588 0.0925383 0.0882393 0.0841437 0.0802497 1.69648 #numbers for year Ydeclare:
2013 sex: 1
 64.7552 61.0873 57.5661 54.1177 50.806 47.6662 44.7601 41.8586 39.1191 36.4801 33.9463
31.5639 29.7982 27.9545 27.3625 26.258 26.3032 25.9242 25.6887 25.044 24.7695 24.3961
23.6228 22.1452 20.8852 19.282 17.5647 15.8042 14.2675 12.7146 11.3276 10.141 8.97371
7.88032 6.94129 6.11427 5.35834 4.70532 4.1376 3.65202 3.23278 2.87454 2.56462 2.297
2.07118 1.87215 1.70084 1.5523 1.4266 1.31249 1.21282 1.12504 1.04652 0.976465 0.913444
0.856457 0.804339 0.756373 0.712005 0.670829 0.632544 0.597168 0.56434 0.533598 0.504877
0.478299 0.45333 0.430796 0.409829 0.38944 0.370199 0.351506 0.33375 0.316853 0.300729
0.28544 0.270907 0.257112 0.244008 0.231602 0.219879 0.208847 0.198465 0.188706 0.179519
0.170849 0.162673 0.154954 0.147659 0.14075 0.134205 0.128 0.122112 0.116521 0.111206
0.106159 0.101354 0.0967772 0.0924094 0.0882497 1.9155 #numbers for year Ydeclare: 2013
sex: 2
#R0  1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932
1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950
1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968
1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986
1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004
2005 2006 2007 2008 2009 2010 #years
223.727  223.727 223.703 223.669 223.632 223.607 223.581 223.554 223.53 223.504 223.474
223.431 223.382 223.326 223.263 223.175 223.085 223.008 222.934 222.875 222.802 222.714
222.599 222.487 222.376 222.294 222.164 222.003 221.802 221.303 220.801 219.96 219.252
218.98 218.66 218.454 218.231 217.955 217.72 217.546 217.321 217.032 216.673 216.254
215.799 215.392 215.023 214.722 214.36 214.083 213.902 213.076 212.759 212.382 211.986
211.022 210.375 209.472 208.282 207.125 205.776 204.504 202.947 201.292 198.274 195.09
192.403 188.313 182.565 178.293 174.732 170.078 167.244 163.695 159.436 153.373 149.639
142.526 134.49 127.14 122.545 116.654 111.976 106.083 105.023 102.093 103.611 104.57
107.205 109.881 112.436 114.853 117.285 119.342 121.574 123.8 125.903 #Recruits
1.0328e+009  1.0328e+009 1.03234e+009 1.0317e+009 1.03098e+009 1.03051e+009 1.03001e+009
1.02951e+009 1.02904e+009 1.02855e+009 1.02799e+009 1.02717e+009 1.02625e+009 1.0252e+009
1.024e+009 1.02236e+009 1.02066e+009 1.01922e+009 1.01784e+009 1.01674e+009 1.01539e+009
1.01376e+009 1.01163e+009 1.00956e+009 1.00752e+009 1.00601e+009 1.00363e+009 1.0007e+009
9.97052e+008 9.88094e+008 9.79207e+008 9.64566e+008 9.52512e+008 9.47924e+008
9.42591e+008 9.39163e+008 9.35499e+008 9.30975e+008 9.27142e+008 9.24333e+008
9.20715e+008 9.16081e+008 9.10388e+008 9.03797e+008 8.96731e+008 8.90474e+008
8.84856e+008 8.80323e+008 8.74893e+008 8.70779e+008 8.68116e+008 8.56067e+008
8.51509e+008 8.46132e+008 8.40532e+008 8.27122e+008 8.18294e+008 8.06204e+008
7.90654e+008 7.75926e+008 7.59252e+008 7.43969e+008 7.25846e+008 7.07241e+008
6.74947e+008 6.42986e+008 6.17555e+008 5.81301e+008 5.348e+008 5.032e+008 4.78572e+008
4.48498e+008 4.31261e+008 4.10715e+008 3.87479e+008 3.56812e+008 3.39194e+008 3.0802e+008
2.76118e+008 2.49614e+008 2.3419e+008 2.15575e+008 2.01647e+008 1.85083e+008 1.82213e+008
1.7444e+008 1.78439e+008 1.80995e+008 1.88156e+008 1.95638e+008 2.02986e+008 2.10128e+008
2.1751e+008 2.23914e+008 2.31036e+008 2.3832e+008 2.45381e+008 #SpawnBio
0.508 0.5 0 # spawn-recr steepness, sigmaR, autocorr
# values from cat100_hhigh, catch at 100% and steepness at high value. # this is state of
nature 8 out of 9 (in no particular order) # and parameter set number 2 out of 2 for this
state
 0 0 25.6574 94.65 316.389 949.858 2529.97 5935.96 12294.3 22700.9 37897.9 58077.6 82888
111594 143291 177091 212236 248146 284415 320783 357099 393283 429298 465129 500768
536205 571428 606417 641146 675583 709694 743441 776785 809688 842111 874019 905377
936156 966326 995864 1.02475e+006 1.05296e+006 1.08048e+006 1.10731e+006 1.13342e+006
1.15882e+006 1.1835e+006 1.20747e+006 1.23071e+006 1.25324e+006 1.27506e+006 1.29618e+006
1.3166e+006 1.33633e+006 1.3554e+006 1.37379e+006 1.39154e+006 1.40866e+006 1.42515e+006
1.44103e+006 1.45632e+006 1.47104e+006 1.48519e+006 1.4988e+006 1.51187e+006 1.52444e+006
1.5365e+006 1.54809e+006 1.55921e+006 1.56987e+006 1.58011e+006 1.59018e+006 1.59983e+006
1.60909e+006 1.61796e+006 1.62646e+006 1.63461e+006 1.6424e+006 1.64987e+006 1.65702e+006
1.66386e+006 1.67041e+006 1.67668e+006 1.68267e+006 1.6884e+006 1.69389e+006 1.69913e+006
1.70414e+006 1.70894e+006 1.71352e+006 1.7179e+006 1.72208e+006 1.72608e+006 1.7299e+006
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1.73355e+006 1.73704e+006 1.74037e+006 1.74355e+006 1.74659e+006 1.74949e+006
1.75483e+006 #female fecundity; weighted by N in year Y_init across morphs and areas
 0.0443489 0.159549 0.218836 0.286597 0.361462 0.442032 0.527092 0.615719 0.707275
0.801335 0.897618 0.995908 1.09602 1.19774 1.30086 1.40514 1.51031 1.61607 1.72215
1.82824 1.93406 2.03933 2.14378 2.24718 2.3493 2.44994 2.54893 2.6461 2.74133 2.8345
2.92552 3.0143 3.1008 3.18496 3.26675 3.34616 3.42317 3.4978 3.57004 3.63992 3.70746
3.77269 3.83566 3.89639 3.95493 4.01133 4.06565 4.11792 4.1682 4.21655 4.26302 4.30767
4.35054 4.39171 4.43121 4.46911 4.50547 4.54032 4.57374 4.60576 4.63643 4.66582 4.69396
4.7209 4.7467 4.77138 4.79501 4.81761 4.83923 4.85991 4.87982 4.89899 4.91732 4.93484
4.95159 4.96759 4.98289 4.99751 5.01147 5.02481 5.03756 5.04973 5.06136 5.07246 5.08307
5.09319 5.10286 5.11209 5.12091 5.12932 5.13735 5.14502 5.15233 5.15932 5.16598 5.17235
5.17842 5.18421 5.18974 5.19502 5.20472 #bodywt for gender,fleet: 1 / 1
 0 0.0466755 0.071249 0.104705 0.147786 0.200165 0.260352 0.325944 0.394091 0.461989
0.527262 0.588162 0.643597 0.693062 0.736506 0.774192 0.806577 0.834216 0.857688 0.877561
0.894358 0.908546 0.920535 0.930679 0.939276 0.946578 0.952796 0.958108 0.962658 0.966569
0.969943 0.972861 0.975396 0.977604 0.979535 0.981228 0.982718 0.984034 0.985199 0.986234
0.987156 0.98798 0.988718 0.989381 0.989978 0.990517 0.991005 0.991447 0.99185 0.992216
0.992551 0.992857 0.993137 0.993394 0.993631 0.993849 0.99405 0.994236 0.994408 0.994567
0.994715 0.994852 0.99498 0.995098 0.995209 0.995312 0.995409 0.995499 0.995583 0.995662
0.995734 0.995798 0.995858 0.995915 0.995968 0.996018 0.996066 0.99611 0.996152 0.996192
0.996229 0.996265 0.996298 0.99633 0.99636 0.996388 0.996415 0.99644 0.996464 0.996486
0.996508 0.996528 0.996548 0.996566 0.996583 0.9966 0.996616 0.99663 0.996645 0.996658
0.996682 #selex for gender,fleet: 1 / 1
 0.0454464 0.165628 0.228103 0.299837 0.379186 0.464291 0.553445 0.64534 0.739131
0.834355 0.930809 1.02843 1.1272 1.22711 1.32809 1.43005 1.53284 1.63625 1.74007 1.84404
1.9479 2.05138 2.15423 2.2562 2.35706 2.45659 2.55461 2.65094 2.74544 2.83798 2.92845
3.01676 3.10286 3.18667 3.26816 3.34731 3.4241 3.49853 3.57061 3.64034 3.70776 3.77289
3.83576 3.89641 3.95488 4.01123 4.06548 4.11771 4.16795 4.21627 4.26271 4.30733 4.35018
4.39133 4.43081 4.4687 4.50504 4.53988 4.57329 4.6053 4.63597 4.66534 4.69348 4.72042
4.74621 4.77089 4.79451 4.81711 4.83872 4.8594 4.87931 4.89848 4.9168 4.93432 4.95107
4.96708 4.98237 4.99699 5.01095 5.02429 5.03703 5.04921 5.06083 5.07194 5.08254 5.09266
5.10233 5.11156 5.12037 5.12879 5.13682 5.14448 5.1518 5.15879 5.16545 5.17181 5.17788
5.18368 5.18921 5.19448 5.20419 #bodywt for gender,fleet: 1 / 2
 0 0.0195579 0.0326491 0.0524719 0.0808761 0.119187 0.167704 0.22545 0.29028 0.359317
0.4295 0.498061 0.562829 0.622335 0.675778 0.722904 0.763862 0.799061 0.829053 0.854451
0.875866 0.893874 0.908998 0.921695 0.932362 0.941335 0.948899 0.95529 0.960705 0.965307
0.969231 0.972588 0.97547 0.977953 0.9801 0.981963 0.983585 0.985002 0.986245 0.987338
0.988303 0.989157 0.989916 0.990592 0.991196 0.991736 0.992222 0.99266 0.993055 0.993412
0.993736 0.994031 0.994299 0.994544 0.994768 0.994974 0.995162 0.995335 0.995495 0.995642
0.995778 0.995904 0.996021 0.996129 0.996229 0.996323 0.99641 0.996491 0.996566 0.996637
0.9967 0.996757 0.996809 0.996859 0.996906 0.996949 0.996991 0.997029 0.997066 0.9971
0.997133 0.997163 0.997192 0.997219 0.997245 0.997269 0.997292 0.997314 0.997335 0.997354
0.997372 0.99739 0.997406 0.997422 0.997437 0.997451 0.997464 0.997477 0.997489 0.9975
0.997521 #selex for gender,fleet: 1 / 2
 0.0494376 0.184351 0.252586 0.327425 0.4054 0.484352 0.563651 0.643649 0.725081 0.808699
0.895091 0.984618 1.07741 1.17337 1.27225 1.37367 1.47716 1.58225 1.68841 1.79517 1.90207
2.00869 2.11466 2.21966 2.3234 2.42564 2.52616 2.6248 2.72141 2.81587 2.90808 2.99797
3.08549 3.17059 3.25324 3.33343 3.41117 3.48645 3.5593 3.62974 3.69779 3.76349 3.82688
3.888 3.94691 4.00365 4.05826 4.11082 4.16136 4.20996 4.25665 4.3015 4.34458 4.38592
4.42559 4.46365 4.50014 4.53513 4.56867 4.60081 4.6316 4.66109 4.68932 4.71636 4.74223
4.767 4.7907 4.81337 4.83505 4.85579 4.87575 4.89497 4.91333 4.93089 4.94767 4.96371
4.97904 4.99368 5.00767 5.02104 5.03381 5.04601 5.05766 5.06878 5.0794 5.08955 5.09923
5.10848 5.11731 5.12574 5.13378 5.14146 5.14879 5.15579 5.16247 5.16884 5.17492 5.18073
5.18627 5.19155 5.20127 #bodywt for gender,fleet: 1 / 3
 0 0.0150931 0.0325022 0.0645218 0.116434 0.19008 0.282078 0.384778 0.489069 0.587107
0.673762 0.746744 0.805962 0.852672 0.888753 0.91621 0.936891 0.95237 0.96392 0.972531
0.978959 0.983773 0.987391 0.990126 0.992205 0.993795 0.995019 0.995969 0.996711 0.997294
0.997756 0.998125 0.998422 0.998662 0.998857 0.999017 0.99915 0.999259 0.999351 0.999428
0.999493 0.999548 0.999596 0.999636 0.999671 0.999701 0.999727 0.99975 0.99977 0.999788
0.999803 0.999817 0.999829 0.99984 0.99985 0.999859 0.999867 0.999874 0.99988 0.999886
0.999892 0.999896 0.999901 0.999905 0.999909 0.999912 0.999915 0.999918 0.999921 0.999923
0.999925 0.999927 0.999929 0.99993 0.999932 0.999933 0.999934 0.999936 0.999937 0.999938
0.999939 0.99994 0.999941 0.999941 0.999942 0.999943 0.999944 0.999944 0.999945 0.999945
0.999946 0.999946 0.999947 0.999947 0.999948 0.999948 0.999949 0.999949 0.999949 0.99995
0.99995 #selex for gender,fleet: 1 / 3
 0.045866 0.168117 0.232163 0.306202 0.388683 0.477635 0.57103 0.667142 0.764741 0.863099
0.961875 1.06098 1.16044 1.26034 1.36073 1.46163 1.56301 1.66477 1.76679 1.86889 1.97087
2.07251 2.17359 2.27389 2.37318 2.47127 2.56796 2.66309 2.75649 2.84804 2.93762 3.02513
3.1105 3.19367 3.27459 3.35322 3.42955 3.50357 3.57527 3.64467 3.71179 3.77664 3.83927
3.8997 3.95797 4.01414 4.06823 4.12031 4.17042 4.21861 4.26493 4.30945 4.35221 4.39327
4.43268 4.47049 4.50676 4.54154 4.57489 4.60684 4.63746 4.6668 4.69489 4.72179 4.74754

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4.77219 4.79578 4.81834 4.83993 4.86058 4.88047 4.89962 4.91793 4.93544 4.95217 4.96816
4.98345 4.99805 5.012 5.02533 5.03806 5.05023 5.06184 5.07294 5.08353 5.09365 5.10331
5.11253 5.12134 5.12975 5.13777 5.14543 5.15274 5.15972 5.16638 5.17274 5.17881 5.1846
5.19012 5.19539 5.20509 #bodywt for gender,fleet: 1 / 4
 0 0.0101109 0.0175232 0.0293269 0.0472347 0.0729595 0.107791 0.152167 0.205422 0.26585
0.331015 0.398204 0.464842 0.528787 0.588474 0.642925 0.691676 0.734671 0.772135 0.804478
0.832203 0.855846 0.875937 0.892972 0.907401 0.919621 0.929976 0.938762 0.946231 0.952594
0.958027 0.962681 0.966678 0.970122 0.973099 0.97568 0.977926 0.979886 0.981602 0.98311
0.984438 0.985613 0.986654 0.98758 0.988406 0.989144 0.989806 0.990402 0.990938 0.991423
0.991862 0.99226 0.992622 0.992953 0.993254 0.99353 0.993783 0.994015 0.994229 0.994425
0.994607 0.994775 0.99493 0.995074 0.995207 0.995331 0.995447 0.995554 0.995654 0.995748
0.995831 0.995905 0.995975 0.99604 0.996101 0.996159 0.996213 0.996263 0.996311 0.996356
0.996399 0.996439 0.996476 0.996512 0.996546 0.996577 0.996607 0.996636 0.996662 0.996688
0.996712 0.996735 0.996756 0.996777 0.996796 0.996814 0.996832 0.996848 0.996864 0.996879
0.996906 #selex for gender,fleet: 1 / 4
 0.0450186 0.164329 0.227237 0.300698 0.38387 0.475535 0.574174 0.678101 0.785647
0.895321 1.00593 1.11659 1.22673 1.33601 1.44425 1.55137 1.65735 1.7622 1.86593 1.96853
2.06998 2.17025 2.26928 2.36699 2.46332 2.55818 2.65147 2.74311 2.83302 2.92111 3.0073
3.09154 3.17377 3.25393 3.332 3.40793 3.48172 3.55335 3.62281 3.69011 3.75527 3.81829
3.87921 3.93805 3.99483 4.04961 4.10241 4.15329 4.20227 4.24942 4.29477 4.33837 4.38028
4.42054 4.4592 4.49632 4.53194 4.56611 4.59888 4.63031 4.66042 4.68929 4.71694 4.74342
4.76878 4.79306 4.8163 4.83854 4.85982 4.88019 4.89984 4.9188 4.93693 4.95427 4.97084
4.98668 5.00182 5.01629 5.03011 5.04332 5.05594 5.06799 5.0795 5.0905 5.101 5.11103
5.12061 5.12975 5.13848 5.14681 5.15477 5.16236 5.16961 5.17653 5.18314 5.18944 5.19546
5.2012 5.20668 5.2119 5.22152 #bodywt for gender,fleet: 1 / 5
 0 0.00443084 0.0072905 0.0116897 0.0182529 0.0277292 0.0409381 0.0586733 0.0815736
0.109994 0.143913 0.182906 0.226184 0.272699 0.321263 0.370677 0.41983 0.467771 0.513744
0.557197 0.597767 0.63526 0.669614 0.700873 0.729154 0.754627 0.77749 0.797958 0.816248
0.83257 0.847128 0.860109 0.871686 0.882017 0.891242 0.89949 0.906871 0.913487 0.919426
0.924765 0.929572 0.933908 0.937826 0.941373 0.944588 0.947509 0.950166 0.952588 0.954799
0.956821 0.958673 0.960372 0.961933 0.963369 0.964692 0.965913 0.967042 0.968086 0.969053
0.96995 0.970783 0.971557 0.972278 0.972949 0.973576 0.97416 0.974707 0.975217 0.975696
0.976143 0.976548 0.976912 0.977255 0.977576 0.977879 0.978164 0.978433 0.978686 0.978925
0.97915 0.979362 0.979563 0.979753 0.979932 0.980101 0.980261 0.980413 0.980557 0.980693
0.980821 0.980943 0.981059 0.981169 0.981273 0.981371 0.981465 0.981554 0.981638 0.981718
0.981794 0.981933 #selex for gender,fleet: 1 / 5
 0.0465871 0.172205 0.238796 0.316828 0.405458 0.50336 0.608742 0.719473 0.833337
0.948335 1.06292 1.17604 1.28716 1.39606 1.50277 1.60746 1.71034 1.81161 1.91147 2.01005
2.10746 2.20375 2.29894 2.39302 2.48593 2.57762 2.668 2.75699 2.84449 2.93042 3.01469
3.09722 3.17792 3.25675 3.33364 3.40855 3.48143 3.55228 3.62106 3.68778 3.75243 3.81502
3.87556 3.93408 3.99059 4.04513 4.09774 4.14845 4.19729 4.24432 4.28957 4.33309 4.37494
4.41514 4.45377 4.49085 4.52645 4.5606 4.59336 4.62478 4.65489 4.68375 4.71141 4.73789
4.76326 4.78755 4.8108 4.83306 4.85435 4.87473 4.89439 4.91335 4.93149 4.94883 4.9654
4.98125 4.99639 5.01087 5.02469 5.03791 5.05053 5.06259 5.07411 5.08511 5.09561 5.10565
5.11523 5.12437 5.13311 5.14145 5.14941 5.15701 5.16426 5.17118 5.17779 5.1841 5.19012
5.19586 5.20134 5.20658 5.2162 #bodywt for gender,fleet: 1 / 6
 0 0.00124726 0.00229766 0.00410903 0.00713043 0.0119948 0.0195307 0.030725 0.046618
0.0681368 0.0959074 0.130101 0.170369 0.215873 0.265405 0.317553 0.370862 0.423979
0.475745 0.525246 0.571822 0.615053 0.654723 0.690784 0.723311 0.752468 0.778474 0.801581
0.822053 0.840154 0.856137 0.870241 0.882683 0.893663 0.903358 0.911926 0.919508 0.926227
0.932189 0.937491 0.942212 0.946425 0.950192 0.953566 0.956595 0.959319 0.961775 0.963992
0.965998 0.967817 0.969469 0.970972 0.972343 0.973595 0.97474 0.97579 0.976753 0.977638
0.978454 0.979205 0.9799 0.980542 0.981136 0.981687 0.982198 0.982673 0.983115 0.983527
0.983911 0.984269 0.984589 0.984873 0.985139 0.985389 0.985624 0.985844 0.986051 0.986245
0.986428 0.9866 0.986763 0.986916 0.98706 0.987196 0.987324 0.987446 0.98756 0.987669
0.987771 0.987868 0.98796 0.988047 0.988129 0.988207 0.988281 0.988351 0.988417 0.98848
0.98854 0.988596 0.9887 #selex for gender,fleet: 1 / 6
 0.0529166 0.181257 0.24807 0.323768 0.406674 0.495185 0.58801 0.684247 0.783328 0.88492
0.988815 1.09485 1.20287 1.31267 1.42401 1.53662 1.65018 1.76436 1.87882 1.99322 2.10722
2.22051 2.33281 2.44383 2.55335 2.66116 2.76706 2.87089 2.97253 3.07185 3.16878 3.26323
3.35515 3.44451 3.53128 3.61545 3.69702 3.776 3.85241 3.92627 3.99762 4.0665 4.13294
4.197 4.25872 4.31817 4.37539 4.43044 4.48338 4.53427 4.58317 4.63014 4.67523 4.71852
4.76006 4.7999 4.83811 4.87474 4.90985 4.9435 4.97573 5.0066 5.03616 5.06447 5.09156
5.11749 5.1423 5.16604 5.18875 5.21047 5.23137 5.25149 5.27072 5.28911 5.30668 5.32348
5.33953 5.35487 5.36953 5.38353 5.39691 5.40969 5.4219 5.43355 5.44469 5.45532 5.46548
5.47517 5.48443 5.49327 5.5017 5.50976 5.51745 5.52479 5.5318 5.53848 5.54487 5.55096
5.55677 5.56232 5.57254 #bodywt for gender,fleet: 2 / 1
 0 0.0472887 0.0736166 0.109953 0.157136 0.214668 0.280634 0.352052 0.425492 0.497699
0.566039 0.628698 0.684674 0.733646 0.77579 0.8116 0.841739 0.866933 0.887896 0.905292
0.919711 0.931662 0.941579 0.949823 0.956693 0.962436 0.967252 0.971307 0.974733 0.977639
0.980114 0.982231 0.984049 0.985616 0.986973 0.988151 0.989179 0.990079 0.990869 0.991566
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0.992182 0.992729 0.993216 0.99365 0.994039 0.994389 0.994703 0.994987 0.995244 0.995477
0.995689 0.995882 0.996058 0.996219 0.996366 0.996502 0.996626 0.996741 0.996847 0.996944
0.997035 0.997119 0.997196 0.997269 0.997336 0.997398 0.997457 0.997511 0.997562 0.997609
0.997652 0.997691 0.997727 0.99776 0.997792 0.997822 0.99785 0.997877 0.997902 0.997925
0.997947 0.997968 0.997988 0.998007 0.998025 0.998041 0.998057 0.998072 0.998086 0.998099
0.998112 0.998124 0.998136 0.998146 0.998157 0.998166 0.998176 0.998184 0.998193 0.9982
0.998215 #selex for gender,fleet: 2 / 1
 0.0541888 0.187967 0.258259 0.338215 0.425788 0.518823 0.615485 0.714497 0.815143
0.91712 1.02037 1.12495 1.23092 1.3383 1.44702 1.55696 1.66792 1.77966 1.89187 2.00425
2.11646 2.2282 2.33915 2.44904 2.55759 2.66458 2.7698 2.87307 2.97424 3.07317 3.16978
3.26396 3.35567 3.44485 3.53147 3.61553 3.697 3.7759 3.85224 3.92605 3.99736 4.0662
4.13261 4.19665 4.25836 4.31779 4.375 4.43004 4.48298 4.53386 4.58276 4.62973 4.67482
4.71811 4.75965 4.79949 4.8377 4.87434 4.90945 4.9431 4.97533 5.00621 5.03577 5.06408
5.09117 5.11711 5.14192 5.16566 5.18837 5.2101 5.231 5.25112 5.27035 5.28874 5.30631
5.32311 5.33916 5.35451 5.36916 5.38317 5.39655 5.40933 5.42153 5.43319 5.44433 5.45496
5.46512 5.47481 5.48407 5.49291 5.50135 5.5094 5.51709 5.52443 5.53144 5.53813 5.54451
5.5506 5.55642 5.56197 5.57219 #bodywt for gender,fleet: 2 / 2
 0 0.019877 0.0339918 0.055772 0.087402 0.130376 0.184865 0.249437 0.32127 0.39677
0.472282 0.544673 0.611651 0.671828 0.72462 0.770058 0.808584 0.840878 0.867718 0.889893
0.908142 0.923128 0.935426 0.945523 0.953826 0.960668 0.966323 0.971013 0.974915 0.978176
0.980913 0.983218 0.985169 0.986827 0.988243 0.989456 0.9905 0.991403 0.992186 0.992869
0.993466 0.99399 0.994451 0.994859 0.99522 0.995542 0.995829 0.996086 0.996317 0.996524
0.996711 0.996881 0.997034 0.997174 0.997301 0.997416 0.997522 0.997619 0.997709 0.99779
0.997866 0.997935 0.998 0.998059 0.998114 0.998165 0.998213 0.998257 0.998298 0.998336
0.99837 0.998401 0.998429 0.998456 0.998481 0.998504 0.998526 0.998547 0.998567 0.998585
0.998602 0.998618 0.998634 0.998648 0.998662 0.998675 0.998687 0.998699 0.998709 0.99872
0.998729 0.998739 0.998747 0.998756 0.998764 0.998771 0.998778 0.998785 0.998791 0.998797
0.998808 #selex for gender,fleet: 2 / 2
 0.0588068 0.208496 0.284683 0.367142 0.452 0.537194 0.62246 0.708529 0.79643 0.887096
0.981197 1.07908 1.18081 1.28616 1.39472 1.50597 1.6193 1.73409 1.84975 1.96572 2.08151
2.19668 2.31085 2.42369 2.53492 2.64431 2.75168 2.85684 2.95969 3.0601 3.15801 3.25334
3.34605 3.43612 3.52352 3.60826 3.69034 3.76978 3.8466 3.92084 3.99252 4.0617 4.12842
4.19273 4.25468 4.31433 4.37174 4.42696 4.48006 4.53109 4.58012 4.62721 4.67242 4.71581
4.75745 4.79738 4.83567 4.87238 4.90756 4.94126 4.97356 5.00448 5.0341 5.06245 5.08959
5.11556 5.14041 5.16419 5.18693 5.20869 5.22962 5.24975 5.269 5.2874 5.305 5.32181
5.33788 5.35323 5.3679 5.38192 5.39531 5.4081 5.42032 5.43198 5.44313 5.45377 5.46393
5.47364 5.4829 5.49175 5.50019 5.50825 5.51595 5.5233 5.53031 5.537 5.54339 5.54949
5.5553 5.56086 5.57109 #bodywt for gender,fleet: 2 / 3
 0 0.015494 0.0345221 0.0702949 0.128827 0.211624 0.313736 0.425415 0.535887 0.636602
0.722648 0.792513 0.847057 0.888394 0.919045 0.941424 0.957597 0.969217 0.977544 0.983514
0.987805 0.990903 0.993152 0.994796 0.996007 0.996906 0.997579 0.998087 0.998474 0.998772
0.999002 0.999182 0.999324 0.999437 0.999527 0.999599 0.999658 0.999707 0.999747 0.999779
0.999807 0.99983 0.999849 0.999866 0.99988 0.999892 0.999902 0.999911 0.999919 0.999926
0.999932 0.999937 0.999942 0.999946 0.999949 0.999953 0.999956 0.999958 0.999961 0.999963
0.999965 0.999966 0.999968 0.999969 0.999971 0.999972 0.999973 0.999974 0.999975 0.999976
0.999976 0.999977 0.999978 0.999978 0.999979 0.999979 0.99998 0.99998 0.99998 0.999981
0.999981 0.999981 0.999982 0.999982 0.999982 0.999983 0.999983 0.999983 0.999983 0.999983
0.999984 0.999984 0.999984 0.999984 0.999984 0.999984 0.999984 0.999985 0.999985 0.999985
0.999985 #selex for gender,fleet: 2 / 3
 0.0546749 0.190718 0.262747 0.345242 0.436215 0.53332 0.634308 0.737423 0.841551
0.946148 1.05107 1.15639 1.26227 1.36886 1.47626 1.58449 1.69348 1.80312 1.91319 2.02346
2.13366 2.24352 2.35275 2.46106 2.56821 2.67395 2.77806 2.88036 2.98068 3.07887 3.17483
3.26845 3.35967 3.44842 3.53468 3.6184 3.69959 3.77824 3.85437 3.92799 3.99913 4.06782
4.13411 4.19803 4.25963 4.31897 4.3761 4.43107 4.48394 4.53476 4.58361 4.63052 4.67558
4.71883 4.76033 4.80014 4.83832 4.87493 4.91002 4.94364 4.97585 5.00671 5.03625 5.06454
5.09162 5.11754 5.14234 5.16607 5.18877 5.21049 5.23138 5.25149 5.27072 5.2891 5.30667
5.32346 5.33951 5.35485 5.3695 5.3835 5.39688 5.40965 5.42186 5.43351 5.44464 5.45528
5.46543 5.47512 5.48438 5.49321 5.50165 5.5097 5.51739 5.52473 5.53173 5.53842 5.5448
5.55089 5.55671 5.56225 5.57247 #bodywt for gender,fleet: 2 / 4
 0 0.0102894 0.0183051 0.0313522 0.0514868 0.080741 0.120562 0.171263 0.231753 0.299679
0.371902 0.445098 0.516282 0.583129 0.644097 0.698379 0.745771 0.786503 0.821083 0.850164
0.874453 0.89464 0.911366 0.925203 0.936646 0.946115 0.953962 0.96048 0.965908 0.970443
0.974245 0.977444 0.980146 0.982437 0.984389 0.986057 0.987489 0.988723 0.989791 0.990718
0.991527 0.992235 0.992856 0.993404 0.993888 0.994318 0.9947 0.995041 0.995347 0.995621
0.995867 0.99609 0.996291 0.996474 0.99664 0.996791 0.996929 0.997055 0.99717 0.997276
0.997374 0.997464 0.997546 0.997623 0.997694 0.997759 0.99782 0.997877 0.997929 0.997978
0.998021 0.99806 0.998096 0.99813 0.998161 0.998191 0.998219 0.998245 0.99827 0.998293
0.998315 0.998335 0.998354 0.998373 0.99839 0.998406 0.998421 0.998436 0.99845 0.998462
0.998475 0.998486 0.998497 0.998508 0.998517 0.998527 0.998536 0.998544 0.998552 0.998559
0.998573 #selex for gender,fleet: 2 / 4

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 0.0536932 0.186556 0.257419 0.339482 0.431575 0.532145 0.639365 0.751317 0.866208
0.982541 1.0992 1.21546 1.3309 1.44533 1.55869 1.67101 1.78236 1.89277 2.00227 2.11087
2.21852 2.32517 2.43073 2.53508 2.63812 2.73971 2.83973 2.93805 3.03455 3.12913 3.22169
3.31213 3.4004 3.48643 3.57016 3.65157 3.73064 3.80734 3.88168 3.95367 4.02332 4.09064
4.15567 4.21845 4.279 4.33738 4.39362 4.44778 4.4999 4.55005 4.59826 4.64459 4.68911
4.73186 4.7729 4.81229 4.85007 4.88631 4.92106 4.95436 4.98628 5.01686 5.04615 5.0742
5.10106 5.12677 5.15138 5.17492 5.19745 5.219 5.23977 5.25978 5.27892 5.29721 5.3147
5.33141 5.34739 5.36265 5.37724 5.39118 5.40449 5.41721 5.42936 5.44097 5.45205 5.46264
5.47275 5.4824 5.49161 5.50041 5.50882 5.51684 5.52449 5.5318 5.53878 5.54544 5.55179
5.55786 5.56365 5.56917 5.57936 #bodywt for gender,fleet: 2 / 5
 0 0.00450033 0.00758533 0.0124351 0.0198097 0.0306288 0.0458985 0.0665778 0.0934045
0.126725 0.166382 0.211698 0.261556 0.314546 0.369144 0.423874 0.477431 0.528759 0.577079
0.62188 0.662891 0.700034 0.73338 0.763108 0.789461 0.812721 0.833185 0.851149 0.866896
0.880688 0.892768 0.903352 0.912632 0.920779 0.92794 0.934247 0.939811 0.944729 0.949086
0.952954 0.956396 0.959465 0.962208 0.964666 0.966873 0.968858 0.970649 0.972268 0.973734
0.975065 0.976275 0.977378 0.978384 0.979305 0.980148 0.980922 0.981633 0.982288 0.982892
0.98345 0.983966 0.984443 0.984886 0.985297 0.985679 0.986035 0.986366 0.986675 0.986963
0.987232 0.987474 0.98769 0.987893 0.988084 0.988263 0.988431 0.98859 0.988739 0.988879
0.989011 0.989136 0.989253 0.989364 0.989469 0.989568 0.989661 0.98975 0.989834 0.989913
0.989988 0.990058 0.990126 0.990189 0.99025 0.990307 0.990361 0.990412 0.990461 0.990508
0.990551 0.990632 #selex for gender,fleet: 2 / 5
 0.0555101 0.19523 0.27008 0.357021 0.454843 0.561821 0.67577 0.794236 0.91483 1.03556
1.15504 1.27246 1.38752 1.50026 1.6109 1.71973 1.82705 1.93315 2.03823 2.14243 2.24583
2.34846 2.45028 2.55121 2.65116 2.75 2.8476 2.94381 3.03849 3.13151 3.22274 3.31208
3.39941 3.48467 3.56777 3.64867 3.72733 3.80371 3.87779 3.94959 4.01909 4.08631 4.15127
4.21401 4.27454 4.33291 4.38917 4.44335 4.4955 4.54568 4.59394 4.64032 4.68489 4.72769
4.76878 4.80822 4.84606 4.88235 4.91715 4.95051 4.98248 5.01311 5.04244 5.07054 5.09744
5.12319 5.14784 5.17142 5.19399 5.21557 5.23637 5.2564 5.27555 5.29386 5.31136 5.32809
5.34408 5.35936 5.37397 5.38792 5.40124 5.41398 5.42614 5.43776 5.44885 5.45945 5.46956
5.47923 5.48845 5.49726 5.50567 5.5137 5.52136 5.52868 5.53566 5.54233 5.54869 5.55476
5.56056 5.56609 5.57628 #bodywt for gender,fleet: 2 / 6
 0 0.00127207 0.00241339 0.00443523 0.00788996 0.0135687 0.0225153 0.0359694 0.0552126
0.0813339 0.114975 0.156145 0.20416 0.25773 0.315157 0.374566 0.434134 0.492259 0.547659
0.599415 0.64695 0.689989 0.728497 0.762617 0.792612 0.818816 0.8416 0.861339 0.878398
0.893118 0.905811 0.916754 0.926195 0.934347 0.941397 0.947504 0.952804 0.957415 0.961435
0.96495 0.96803 0.970737 0.973122 0.975229 0.977096 0.978754 0.980231 0.98155 0.982731
0.98379 0.984744 0.985603 0.98638 0.987084 0.987723 0.988304 0.988834 0.989318 0.989761
0.990167 0.990539 0.990882 0.991198 0.991489 0.991758 0.992007 0.992238 0.992452 0.992651
0.992836 0.993 0.993145 0.99328 0.993406 0.993525 0.993636 0.99374 0.993838 0.993929
0.994016 0.994097 0.994173 0.994245 0.994313 0.994377 0.994437 0.994494 0.994548 0.994599
0.994647 0.994692 0.994735 0.994775 0.994814 0.99485 0.994885 0.994917 0.994948 0.994978
0.995005 0.995056 #selex for gender,fleet: 2 / 6
 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896
0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896
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0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896
0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896
0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896
0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896
0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896
0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896 0.0456896
0.0456896 0.0456896 0.0456896 #mean M for year Yinit: 2011 sex: 1
 62.9517 59.1354 55.4743 52.0138 48.8207 45.6438 42.6523 39.7765 37.0186 34.4268 32.5073
30.5015 29.86 28.6584 28.7118 28.3045 28.0596 27.3764 27.1096 26.7493 25.9659 24.4205
23.1228 21.4473 19.6393 17.7699 16.1344 14.4599 12.9517 11.6513 10.3536 9.12367 8.05833
7.11226 6.2409 5.48371 4.82205 4.25356 3.76075 3.33806 2.97119 2.6535 2.3846 2.14735
1.9429 1.76556 1.61536 1.47943 1.3609 1.25677 1.16395 1.08145 1.00755 0.941019 0.880487
0.825075 0.774097 0.727039 0.683509 0.643467 0.606468 0.571968 0.539856 0.510229 0.48249
0.457493 0.434297 0.411841 0.39072 0.370294 0.350962 0.332635 0.315212 0.298744 0.283138
0.268359 0.254345 0.241094 0.228583 0.216814 0.205741 0.195336 0.185545 0.176312 0.167613
0.159411 0.151669 0.144349 0.137427 0.130876 0.124671 0.11879 0.11321 0.10792 0.102894
0.0981136 0.0935597 0.08923 0.0851116 0.0811931 1.72001 #numbers for year Yinit: 2011
sex: 1
 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299
0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299
0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299
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0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299
0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299
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0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299
0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299
0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299
0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299
0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299 0.0446299
0.0446299 0.0446299 0.0446299 #mean M for year Yinit: 2011 sex: 2
 62.9517 59.1981 55.5919 52.179 49.0268 45.8834 42.9187 40.0629 37.3189 34.7359 32.8259
30.8242 30.1979 29.002 29.0727 28.6719 28.4272 27.7272 27.4348 27.0311 26.1825 24.5515
23.1602 21.3868 19.4856 17.5355 15.8327 14.1112 12.5732 11.2572 9.9622 8.74894 7.70681
6.78887 5.94973 5.22475 4.59442 4.05525 3.5897 3.19188 2.84768 2.55045 2.29963 2.07856
1.88827 1.72327 1.58365 1.4569 1.34619 1.24869 1.16148 1.08368 1.0137 0.950417 0.89255
0.839297 0.790044 0.744337 0.701842 0.662578 0.626145 0.592028 0.560155 0.530661 0.502954
0.47795 0.454684 0.432061 0.410712 0.389973 0.370273 0.351526 0.333639 0.316677 0.300556
0.285254 0.270718 0.256956 0.243952 0.231715 0.220198 0.209372 0.19918 0.189562 0.180491
0.171928 0.163834 0.156169 0.148908 0.142023 0.13549 0.129286 0.12339 0.117789 0.112458
0.10738 0.102534 0.0979183 0.0935212 0.089331 1.9425 #numbers for year Yinit: 2011 sex: 2
 64.7552 61.0226 57.4444 53.9466 50.593 47.4184 44.4837 41.5609 38.8058 36.1569 33.618
31.2341 29.4645 27.6213 27.0174 25.9098 25.9396 25.5553 25.3197 24.6906 24.4391 24.1048
23.3907 21.9919 20.8177 19.3046 17.6735 15.9882 14.5143 13.0059 11.6478 10.4771 9.30915
8.20258 7.24422 6.3933 5.60971 4.92888 4.334 3.82295 3.37997 3.00006 2.67034 2.38484
2.14321 1.93003 1.74633 1.587 1.45205 1.32992 1.22343 1.12987 1.04647 0.97234 0.905929
0.846145 0.791744 0.741941 0.69612 0.65382 0.614688 0.57869 0.545426 0.514406 0.485533
0.458894 0.43395 0.411473 0.390614 0.37042 0.351425 0.333055 0.315669 0.299185 0.283515
0.268702 0.254665 0.241371 0.228765 0.216845 0.205591 0.195004 0.185043 0.175684 0.166877
0.158572 0.150747 0.14337 0.136406 0.129823 0.123597 0.117705 0.112124 0.106835 0.101817
0.0970588 0.0925383 0.0882393 0.0841437 0.0802497 1.69648 #numbers for year Ydeclare:
2013 sex: 1
 64.7552 61.0873 57.5661 54.1177 50.806 47.6662 44.7601 41.8586 39.1191 36.4801 33.9463
31.5639 29.7982 27.9545 27.3625 26.258 26.3032 25.9242 25.6887 25.044 24.7695 24.3961
23.6228 22.1452 20.8852 19.282 17.5647 15.8042 14.2675 12.7146 11.3276 10.141 8.97371
7.88032 6.94129 6.11427 5.35834 4.70532 4.1376 3.65202 3.23278 2.87454 2.56462 2.297
2.07118 1.87215 1.70084 1.5523 1.4266 1.31249 1.21282 1.12504 1.04652 0.976465 0.913444
0.856457 0.804339 0.756373 0.712005 0.670829 0.632544 0.597168 0.56434 0.533598 0.504877
0.478299 0.45333 0.430796 0.409829 0.38944 0.370199 0.351506 0.33375 0.316853 0.300729
0.28544 0.270907 0.257112 0.244008 0.231602 0.219879 0.208847 0.198465 0.188706 0.179519
0.170849 0.162673 0.154954 0.147659 0.14075 0.134205 0.128 0.122112 0.116521 0.111206
0.106159 0.101354 0.0967772 0.0924094 0.0882497 1.9155 #numbers for year Ydeclare: 2013
sex: 2
#R0  1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932
1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950
1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968
1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986
1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004
2005 2006 2007 2008 2009 2010 #years
223.727  223.727 223.703 223.669 223.632 223.607 223.581 223.554 223.53 223.504 223.474
223.431 223.382 223.326 223.263 223.175 223.085 223.008 222.934 222.875 222.802 222.714
222.599 222.487 222.376 222.294 222.164 222.003 221.802 221.303 220.801 219.96 219.252
218.98 218.66 218.454 218.231 217.955 217.72 217.546 217.321 217.032 216.673 216.254
215.799 215.392 215.023 214.722 214.36 214.083 213.902 213.076 212.759 212.382 211.986
211.022 210.375 209.472 208.282 207.125 205.776 204.504 202.947 201.292 198.274 195.09
192.403 188.313 182.565 178.293 174.732 170.078 167.244 163.695 159.436 153.373 149.639
142.526 134.49 127.14 122.545 116.654 111.976 106.083 105.023 102.093 103.611 104.57
107.205 109.881 112.436 114.853 117.285 119.342 121.574 123.8 125.903 #Recruits
1.0328e+009  1.0328e+009 1.03234e+009 1.0317e+009 1.03098e+009 1.03051e+009 1.03001e+009
1.02951e+009 1.02904e+009 1.02855e+009 1.02799e+009 1.02717e+009 1.02625e+009 1.0252e+009
1.024e+009 1.02236e+009 1.02066e+009 1.01922e+009 1.01784e+009 1.01674e+009 1.01539e+009
1.01376e+009 1.01163e+009 1.00956e+009 1.00752e+009 1.00601e+009 1.00363e+009 1.0007e+009
9.97052e+008 9.88094e+008 9.79207e+008 9.64566e+008 9.52512e+008 9.47924e+008
9.42591e+008 9.39163e+008 9.35499e+008 9.30975e+008 9.27142e+008 9.24333e+008
9.20715e+008 9.16081e+008 9.10388e+008 9.03797e+008 8.96731e+008 8.90474e+008
8.84856e+008 8.80323e+008 8.74893e+008 8.70779e+008 8.68116e+008 8.56067e+008
8.51509e+008 8.46132e+008 8.40532e+008 8.27122e+008 8.18294e+008 8.06204e+008
7.90654e+008 7.75926e+008 7.59252e+008 7.43969e+008 7.25846e+008 7.07241e+008
6.74947e+008 6.42986e+008 6.17555e+008 5.81301e+008 5.348e+008 5.032e+008 4.78572e+008
4.48498e+008 4.31261e+008 4.10715e+008 3.87479e+008 3.56812e+008 3.39194e+008 3.0802e+008
2.76118e+008 2.49614e+008 2.3419e+008 2.15575e+008 2.01647e+008 1.85083e+008 1.82213e+008
1.7444e+008 1.78439e+008 1.80995e+008 1.88156e+008 1.95638e+008 2.02986e+008 2.10128e+008
2.1751e+008 2.23914e+008 2.31036e+008 2.3832e+008 2.45381e+008 #SpawnBio
0.508 0.5 0 # spawn-recr steepness, sigmaR, autocorr
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# values from cat150_hhigh, catch at 150% and steepness at high value. # this is state of
nature 9 out of 9 (in no particular order) # and parameter set number 1 out of 1 for this
state
 0 0 26.5484 97.5464 324.797 971.22 2576.59 6022.76 12433 22893.9 38135.7 58340.9 83153.3
111839 143497 177246 212332 248179 284383 320687 356938 393058 429009 464775 500349
535721 570879 605802 640464 674836 708882 742565 775845 808686 841048 872897 904198
934921 965039 994525 1.02336e+006 1.05152e+006 1.079e+006 1.10579e+006 1.13186e+006
1.15723e+006 1.18187e+006 1.2058e+006 1.22902e+006 1.25152e+006 1.27331e+006 1.29441e+006
1.3148e+006 1.33452e+006 1.35356e+006 1.37195e+006 1.38968e+006 1.40678e+006 1.42326e+006
1.43913e+006 1.45441e+006 1.46912e+006 1.48327e+006 1.49687e+006 1.50994e+006 1.5225e+006
1.53457e+006 1.54615e+006 1.55727e+006 1.56793e+006 1.57816e+006 1.58824e+006 1.5979e+006
1.60716e+006 1.61603e+006 1.62453e+006 1.63268e+006 1.64048e+006 1.64795e+006
1.65511e+006 1.66196e+006 1.66851e+006 1.67478e+006 1.68078e+006 1.68652e+006
1.69201e+006 1.69725e+006 1.70227e+006 1.70707e+006 1.71166e+006 1.71604e+006
1.72023e+006 1.72424e+006 1.72807e+006 1.73172e+006 1.73521e+006 1.73855e+006
1.74174e+006 1.74478e+006 1.74769e+006 1.75305e+006 #female fecundity; weighted by N in
year Y_init across morphs and areas
 0.0446371 0.160874 0.220275 0.288091 0.362958 0.443486 0.528477 0.617018 0.708476
0.802434 0.898607 0.996782 1.09677 1.19836 1.30134 1.40547 1.51048 1.61608 1.72198 1.8279
1.93354 2.03862 2.14289 2.24611 2.34805 2.44852 2.54733 2.64434 2.73941 2.83243 2.92329
3.01194 3.0983 3.18233 3.26401 3.3433 3.42021 3.49474 3.56689 3.63668 3.70415 3.76931
3.8322 3.89288 3.95136 4.00772 4.06198 4.11422 4.16446 4.21278 4.25922 4.30385 4.3467
4.38785 4.42734 4.46523 4.50158 4.53643 4.56983 4.60185 4.63253 4.66192 4.69006 4.71701
4.74281 4.7675 4.79114 4.81375 4.83538 4.85607 4.87599 4.89517 4.91352 4.93105 4.94782
4.96384 4.97915 4.99378 5.00776 5.02112 5.03388 5.04607 5.05771 5.06883 5.07945 5.08959
5.09928 5.10852 5.11735 5.12578 5.13383 5.14151 5.14884 5.15584 5.16252 5.16889 5.17498
5.18078 5.18633 5.19161 5.20135 #bodywt for gender,fleet: 1 / 1
 0 0.0475654 0.0724155 0.106146 0.14946 0.201988 0.262214 0.327734 0.395713 0.463379
0.528388 0.589018 0.644202 0.693445 0.736703 0.774241 0.806511 0.834065 0.857477 0.87731
0.894081 0.908256 0.920241 0.930387 0.93899 0.946301 0.952531 0.957854 0.962417 0.966341
0.969726 0.972657 0.975202 0.977421 0.979362 0.981064 0.982563 0.983887 0.985059 0.986101
0.987029 0.987859 0.988603 0.989271 0.989873 0.990416 0.990908 0.991354 0.99176 0.99213
0.992467 0.992776 0.993059 0.993319 0.993558 0.993778 0.993981 0.994169 0.994342 0.994503
0.994652 0.994791 0.99492 0.99504 0.995152 0.995256 0.995354 0.995445 0.99553 0.99561
0.995682 0.995747 0.995808 0.995865 0.995919 0.99597 0.996018 0.996063 0.996105 0.996146
0.996183 0.996219 0.996253 0.996285 0.996315 0.996344 0.996371 0.996396 0.996421 0.996444
0.996465 0.996486 0.996506 0.996524 0.996542 0.996559 0.996574 0.996589 0.996604 0.996617
0.996642 #selex for gender,fleet: 1 / 1
 0.0457466 0.167044 0.229659 0.30147 0.380831 0.465895 0.554971 0.646767 0.740449 0.83556
0.931898 1.0294 1.12805 1.22782 1.32867 1.43048 1.53311 1.63636 1.74 1.84379 1.94747
2.05077 2.15343 2.25521 2.35589 2.45524 2.55308 2.64924 2.74358 2.83596 2.92627 3.01444
3.1004 3.18408 3.26545 3.34448 3.42117 3.4955 3.56748 3.63713 3.70446 3.76952 3.83232
3.89291 3.95133 4.00762 4.06183 4.11402 4.16422 4.21251 4.25892 4.30351 4.34635 4.38747
4.42695 4.46482 4.50115 4.53599 4.56939 4.60139 4.63206 4.66144 4.68958 4.71653 4.74232
4.76701 4.79064 4.81325 4.83487 4.85556 4.87548 4.89466 4.913 4.93054 4.9473 4.96332
4.97863 4.99326 5.00724 5.0206 5.03336 5.04554 5.05719 5.0683 5.07892 5.08906 5.09875
5.10799 5.11682 5.12525 5.13329 5.14097 5.1483 5.1553 5.16198 5.16836 5.17444 5.18025
5.18579 5.19108 5.20081 #bodywt for gender,fleet: 1 / 2
 0 0.0199402 0.0332012 0.053224 0.0818351 0.120324 0.168957 0.226728 0.291487 0.360372
0.430347 0.498675 0.563209 0.622502 0.675764 0.722745 0.763594 0.798716 0.82866 0.854031
0.875435 0.893446 0.90858 0.921294 0.931981 0.940976 0.948563 0.954976 0.960413 0.965035
0.968978 0.972353 0.975252 0.97775 0.979911 0.981787 0.983421 0.984849 0.986101 0.987203
0.988176 0.989038 0.989803 0.990485 0.991094 0.99164 0.992131 0.992573 0.992972 0.993333
0.99366 0.993958 0.994229 0.994477 0.994703 0.994911 0.995101 0.995277 0.995438 0.995587
0.995725 0.995852 0.99597 0.996079 0.996181 0.996276 0.996364 0.996446 0.996522 0.996594
0.996658 0.996715 0.996768 0.996818 0.996866 0.99691 0.996952 0.996991 0.997028 0.997063
0.997096 0.997127 0.997156 0.997183 0.997209 0.997234 0.997257 0.997279 0.9973 0.99732
0.997338 0.997356 0.997373 0.997389 0.997404 0.997418 0.997432 0.997444 0.997457 0.997468
0.997489 #selex for gender,fleet: 1 / 2
 0.0497616 0.185883 0.254185 0.328975 0.406834 0.485655 0.564841 0.64475 0.726112
0.809667 0.895996 0.985449 1.07815 1.174 1.27275 1.37403 1.47736 1.58227 1.68826 1.79483
1.90153 2.00796 2.11374 2.21854 2.32209 2.42415 2.5245 2.62297 2.71941 2.81372 2.90578
2.99553 3.08291 3.16788 3.25042 3.3305 3.40813 3.48332 3.55608 3.62643 3.6944 3.76003
3.82336 3.88443 3.94328 3.99997 4.05454 4.10706 4.15757 4.20613 4.2528 4.29763 4.34068
4.38201 4.42167 4.45972 4.4962 4.53119 4.56472 4.59686 4.62765 4.65714 4.68538 4.71242
4.73831 4.76308 4.78679 4.80947 4.83116 4.85192 4.87189 4.89111 4.90949 4.92707 4.94386
4.95992 4.97526 4.98992 5.00393 5.01731 5.0301 5.04231 5.05397 5.06511 5.07575 5.08591
5.09561 5.10488 5.11372 5.12216 5.13022 5.13792 5.14526 5.15227 5.15897 5.16535 5.17145
5.17726 5.18282 5.18811 5.19786 #bodywt for gender,fleet: 1 / 3
 0 0.015574 0.0333763 0.0659297 0.118411 0.192496 0.284672 0.387261 0.49122 0.588813
0.675011 0.747588 0.806483 0.852954 0.888872 0.916223 0.936841 0.952287 0.963822 0.97243
```

0.978863 0.983683 0.987311 0.990055 0.992142 0.99374 0.994972 0.995928 0.996675 0.997263
0.997729 0.998102 0.998401 0.998644 0.998841 0.999003 0.999137 0.999248 0.999341 0.999419
0.999485 0.999541 0.999589 0.99963 0.999665 0.999696 0.999722 0.999746 0.999766 0.999784
0.9998 0.999814 0.999826 0.999837 0.999847 0.999856 0.999864 0.999872 0.999878 0.999884
0.999889 0.999894 0.999899 0.999903 0.999907 0.99991 0.999913 0.999916 0.999919 0.999921
0.999924 0.999926 0.999927 0.999929 0.99993 0.999932 0.999933 0.999934 0.999935 0.999937
0.999938 0.999939 0.999939 0.99994 0.999941 0.999942 0.999942 0.999943 0.999944 0.999944
0.999945 0.999945 0.999946 0.999946 0.999947 0.999947 0.999948 0.999948 0.999948 0.999949
0.999949 #selex for gender,fleet: 1 / 3
 0.0461062 0.169254 0.233323 0.307315 0.389698 0.478533 0.57183 0.667887 0.765483
0.863881 0.962726 1.06191 1.16145 1.26141 1.36183 1.46273 1.56408 1.66578 1.7677 1.86967
1.9715 2.07298 2.17387 2.27397 2.37307 2.47095 2.56743 2.66235 2.75555 2.8469 2.93629
3.02362 3.10882 3.19182 3.27258 3.35106 3.42725 3.50114 3.57272 3.64201 3.70902 3.77378
3.83632 3.89667 3.95487 4.01096 4.06499 4.11701 4.16707 4.21522 4.2615 4.30598 4.34871
4.38974 4.42913 4.46692 4.50317 4.53794 4.57128 4.60322 4.63384 4.66317 4.69126 4.71816
4.74391 4.76856 4.79215 4.81473 4.83632 4.85698 4.87688 4.89604 4.91436 4.93188 4.94862
4.96463 4.97992 4.99454 5.00851 5.02185 5.0346 5.04678 5.05841 5.06952 5.08013 5.09026
5.09993 5.10917 5.11799 5.12641 5.13445 5.14212 5.14945 5.15644 5.16311 5.16948 5.17556
5.18136 5.1869 5.19219 5.20191 #bodywt for gender,fleet: 1 / 4
 0 0.010494 0.0180606 0.0300272 0.0480673 0.0738383 0.108573 0.152671 0.205466 0.265288
0.329767 0.396263 0.462265 0.525681 0.584968 0.639154 0.687768 0.730733 0.768256 0.800723
0.828617 0.852458 0.872763 0.890018 0.904663 0.917091 0.927644 0.936615 0.944255 0.950775
0.956352 0.961137 0.965252 0.968804 0.971878 0.974547 0.976871 0.978903 0.980684 0.98225
0.983632 0.984855 0.98594 0.986905 0.987767 0.988538 0.989231 0.989853 0.990415 0.990922
0.991382 0.9918 0.99218 0.992527 0.992844 0.993134 0.9934 0.993644 0.993869 0.994076
0.994267 0.994444 0.994607 0.994759 0.9949 0.995031 0.995152 0.995266 0.995371 0.99547
0.995558 0.995637 0.99571 0.995779 0.995844 0.995905 0.995962 0.996016 0.996066 0.996114
0.996159 0.996201 0.996241 0.996279 0.996314 0.996348 0.99638 0.99641 0.996438 0.996465
0.996491 0.996515 0.996538 0.996559 0.99658 0.996599 0.996618 0.996635 0.996652 0.996668
0.996696 #selex for gender,fleet: 1 / 4
 0.0452245 0.1653 0.228181 0.301539 0.384548 0.476018 0.574472 0.678267 0.785771 0.895513
1.00629 1.11723 1.2277 1.33735 1.44596 1.55344 1.65975 1.76489 1.86885 1.97163 2.07321
2.17354 2.27258 2.37027 2.46653 2.56128 2.65444 2.74592 2.83565 2.92355 3.00954 3.09357
3.17559 3.25554 3.33339 3.40912 3.48271 3.55414 3.62341 3.69054 3.75552 3.81838 3.87914
3.93783 3.99448 4.04913 4.10181 4.15257 4.20145 4.24849 4.29375 4.33727 4.3791 4.41929
4.45789 4.49495 4.53051 4.56464 4.59736 4.62874 4.65882 4.68765 4.71527 4.74173 4.76706
4.79132 4.81454 4.83677 4.85804 4.87839 4.89803 4.91699 4.93513 4.95246 4.96904 4.98488
5.00003 5.0145 5.02833 5.04154 5.05417 5.06623 5.07775 5.08875 5.09926 5.10929 5.11888
5.12803 5.13677 5.14511 5.15308 5.16068 5.16794 5.17487 5.18148 5.18779 5.19382 5.19957
5.20506 5.21029 5.21993 #bodywt for gender,fleet: 1 / 5
 0 0.00457469 0.00746308 0.0118701 0.0183953 0.0277528 0.0407199 0.058048 0.0803441
0.107952 0.140865 0.178701 0.220734 0.265988 0.313344 0.361664 0.409881 0.457069 0.502483
0.545566 0.585942 0.623394 0.657839 0.689295 0.717856 0.743672 0.766921 0.787802 0.80652
0.823275 0.838263 0.851664 0.863647 0.874368 0.883965 0.892565 0.900278 0.907207 0.913437
0.91905 0.924113 0.928687 0.932827 0.93658 0.939988 0.943088 0.945912 0.948489 0.950844
0.953001 0.954978 0.956794 0.958464 0.960002 0.96142 0.96273 0.963941 0.965063 0.966102
0.967068 0.967964 0.968799 0.969575 0.9703 0.970975 0.971607 0.972197 0.972749 0.973265
0.97375 0.974188 0.974583 0.974954 0.975303 0.975632 0.975941 0.976233 0.976508 0.976767
0.977012 0.977243 0.977461 0.977667 0.977862 0.978046 0.978221 0.978386 0.978542 0.97869
0.97883 0.978963 0.979089 0.979208 0.979321 0.979429 0.979531 0.979628 0.979719 0.979807
0.979889 0.980041 #selex for gender,fleet: 1 / 5
 0.0469015 0.173735 0.240521 0.318699 0.407418 0.505347 0.610693 0.721328 0.835052
0.949882 1.06428 1.17722 1.28816 1.39689 1.50344 1.60797 1.7107 1.81181 1.91152 2.00994
2.1072 2.20333 2.29836 2.39228 2.48503 2.57655 2.66677 2.7556 2.84295 2.92872 3.01284
3.09522 3.17579 3.25448 3.33124 3.40603 3.4788 3.54954 3.61822 3.68484 3.7494 3.81191
3.87237 3.93082 3.98727 4.04176 4.09431 4.14497 4.19377 4.24075 4.28597 4.32947 4.37128
4.41147 4.45007 4.48714 4.52272 4.55686 4.58962 4.62102 4.65114 4.68 4.70765 4.73414
4.75951 4.7838 4.80706 4.82932 4.85063 4.87101 4.89068 4.90966 4.9278 4.94516 4.96175
4.97761 4.99276 5.00725 5.02109 5.03432 5.04696 5.05903 5.07056 5.08158 5.0921 5.10215
5.11174 5.12091 5.12965 5.13801 5.14598 5.15359 5.16086 5.1678 5.17442 5.18074 5.18677
5.19253 5.19802 5.20327 5.21292 #bodywt for gender,fleet: 1 / 6
 0 0.00127393 0.00234148 0.00417832 0.00723559 0.0121474 0.0197412 0.0309996 0.0469546
0.068522 0.0963159 0.130499 0.170716 0.216131 0.265543 0.317549 0.370707 0.423674 0.4753
0.524677 0.57115 0.614299 0.65391 0.689932 0.722437 0.751587 0.777599 0.800721 0.821216
0.839346 0.85536 0.869498 0.881975 0.892989 0.902718 0.911321 0.918935 0.925684 0.931676
0.937005 0.941752 0.945989 0.949778 0.953173 0.956222 0.958964 0.961437 0.96367 0.96569
0.967523 0.969187 0.970702 0.972084 0.973346 0.9745 0.975558 0.97653 0.977423 0.978245
0.979004 0.979704 0.980352 0.980951 0.981507 0.982023 0.982503 0.982949 0.983365 0.983752
0.984114 0.984436 0.984723 0.984993 0.985245 0.985482 0.985704 0.985913 0.986109 0.986294
0.986468 0.986632 0.986787 0.986932 0.98707 0.9872 0.987322 0.987438 0.987548 0.987651

0.987749 0.987842 0.98793 0.988013 0.988092 0.988166 0.988237 0.988304 0.988368 0.988428
0.988485 0.98859 #selex for gender,fleet: 1 / 6
 0.0532535 0.182729 0.249673 0.325438 0.408353 0.496831 0.589596 0.685757 0.784755
0.886259 0.990061 1.096 1.20391 1.3136 1.42481 1.53729 1.6507 1.76473 1.87903 1.99327
2.1071 2.22023 2.33236 2.44322 2.55258 2.66022 2.76596 2.86965 2.97114 3.07032 3.16711
3.26144 3.35324 3.44249 3.52915 3.61322 3.69469 3.77359 3.84991 3.9237 3.99498 4.06379
4.13018 4.19418 4.25586 4.31526 4.37244 4.42745 4.48036 4.53122 4.5801 4.62704 4.67212
4.7154 4.75692 4.79675 4.83496 4.87158 4.90669 4.94033 4.97256 5.00344 5.033 5.06131
5.08841 5.11435 5.13917 5.16292 5.18563 5.20736 5.22828 5.24841 5.26765 5.28605 5.30364
5.32045 5.33652 5.35187 5.36654 5.38056 5.39395 5.40674 5.41897 5.43064 5.44179 5.45243
5.4626 5.47231 5.48158 5.49043 5.49888 5.50695 5.51465 5.52201 5.52903 5.53573 5.54212
5.54822 5.55405 5.55961 5.56986 #bodywt for gender,fleet: 2 / 1
 0 0.0481953 0.0748279 0.111471 0.158914 0.216609 0.282613 0.353944 0.427193 0.499143
0.567197 0.629573 0.685291 0.734043 0.776008 0.811679 0.841714 0.866834 0.887747 0.905111
0.919511 0.931455 0.94137 0.949618 0.956495 0.962246 0.967072 0.971137 0.974573 0.977489
0.979974 0.9821 0.983926 0.985501 0.986865 0.98805 0.989084 0.989989 0.990785 0.991486
0.992107 0.992658 0.993148 0.993586 0.993978 0.99433 0.994647 0.994934 0.995193 0.995428
0.995641 0.995836 0.996014 0.996176 0.996325 0.996462 0.996587 0.996703 0.99681 0.996909
0.997 0.997085 0.997164 0.997237 0.997304 0.997368 0.997427 0.997482 0.997533 0.997581
0.997624 0.997663 0.997699 0.997734 0.997766 0.997796 0.997824 0.997851 0.997877 0.9979
0.997923 0.997944 0.997964 0.997983 0.998001 0.998018 0.998034 0.998049 0.998063 0.998077
0.998089 0.998102 0.998113 0.998124 0.998134 0.998144 0.998154 0.998162 0.998171 0.998179
0.998193 #selex for gender,fleet: 2 / 1
 0.0545404 0.189544 0.259997 0.340044 0.427637 0.520635 0.617222 0.716142 0.816688
0.918563 1.02171 1.12619 1.23205 1.3393 1.44789 1.5577 1.66852 1.7801 1.89215 2.00436
2.11641 2.22797 2.33876 2.44847 2.55686 2.66368 2.76874 2.87186 2.97287 3.07167 3.16813
3.26219 3.35378 3.44284 3.52936 3.6133 3.69468 3.77349 3.84975 3.92348 3.99472 4.0635
4.12985 4.19384 4.25549 4.31488 4.37205 4.42705 4.47996 4.53082 4.57969 4.62663 4.67171
4.71499 4.75651 4.79635 4.83455 4.87118 4.90629 4.93993 4.97217 5.00304 5.03261 5.06092
5.08802 5.11396 5.13879 5.16254 5.18526 5.20699 5.2279 5.24803 5.26728 5.28568 5.30327
5.32008 5.33615 5.3515 5.36617 5.38019 5.39359 5.40638 5.4186 5.43028 5.44143 5.45207
5.46224 5.47195 5.48122 5.49007 5.49853 5.50659 5.5143 5.52165 5.52867 5.53537 5.54177
5.54787 5.5537 5.55926 5.56951 #bodywt for gender,fleet: 2 / 2
 0 0.020269 0.0345729 0.0565807 0.0884491 0.13163 0.186251 0.25085 0.322602 0.39793
0.473214 0.545356 0.612093 0.672057 0.724675 0.769979 0.80841 0.84064 0.867442 0.889598
0.907843 0.922834 0.935144 0.945258 0.953578 0.960439 0.966112 0.970818 0.974737 0.978013
0.980763 0.983081 0.985044 0.986712 0.988137 0.989358 0.99041 0.991319 0.992109 0.992797
0.993398 0.993927 0.994392 0.994804 0.995168 0.995493 0.995783 0.996042 0.996275 0.996484
0.996674 0.996845 0.997 0.99714 0.997269 0.997386 0.997493 0.997591 0.997681 0.997764
0.99784 0.997911 0.997976 0.998036 0.998091 0.998143 0.998191 0.998236 0.998277 0.998316
0.99835 0.998381 0.99841 0.998437 0.998462 0.998486 0.998508 0.998529 0.998549 0.998568
0.998585 0.998602 0.998617 0.998632 0.998646 0.998659 0.998671 0.998683 0.998694 0.998704
0.998714 0.998723 0.998732 0.99874 0.998748 0.998756 0.998763 0.99877 0.998776 0.998782
0.998794 #selex for gender,fleet: 2 / 2
 0.059189 0.210209 0.286471 0.368876 0.453608 0.538671 0.623833 0.709829 0.797678
0.888302 0.982357 1.08019 1.18184 1.28709 1.39554 1.50666 1.61984 1.73447 1.84997 1.96577
2.08139 2.19638 2.31037 2.42304 2.53411 2.64334 2.75054 2.85556 2.95826 3.05853 3.15631
3.25151 3.3441 3.43406 3.52136 3.60599 3.68798 3.76733 3.84408 3.91824 3.98985 4.05897
4.12563 4.18989 4.25179 4.3114 4.36876 4.42395 4.47702 4.52803 4.57703 4.6241 4.6693
4.71267 4.75429 4.79421 4.8325 4.8692 4.90438 4.93808 4.97038 5.00131 5.03093 5.05928
5.08643 5.11241 5.13727 5.16105 5.18381 5.20557 5.22651 5.24666 5.26592 5.28434 5.30194
5.31877 5.33485 5.35022 5.3649 5.37893 5.39234 5.40514 5.41737 5.42906 5.44022 5.45087
5.46105 5.47076 5.48004 5.4889 5.49736 5.50544 5.51314 5.5205 5.52753 5.53423 5.54063
5.54674 5.55257 5.55814 5.56839 #bodywt for gender,fleet: 2 / 3
 0 0.0159929 0.0354592 0.071835 0.131004 0.214268 0.316532 0.428036 0.538099 0.63831
0.723866 0.793318 0.847548 0.888665 0.919171 0.941461 0.957584 0.969177 0.977494 0.983462
0.987755 0.990858 0.993112 0.994761 0.995977 0.996881 0.997557 0.998069 0.998459 0.998758
0.998991 0.999172 0.999316 0.999429 0.999521 0.999594 0.999654 0.999703 0.999743 0.999776
0.999804 0.999827 0.999847 0.999864 0.999878 0.99989 0.999901 0.99991 0.999918 0.999925
0.999931 0.999936 0.999941 0.999945 0.999949 0.999952 0.999955 0.999957 0.99996 0.999962
0.999964 0.999966 0.999967 0.999969 0.99997 0.999971 0.999972 0.999973 0.999974 0.999975
0.999976 0.999977 0.999977 0.999978 0.999978 0.999979 0.999979 0.99998 0.99998 0.99998
0.999981 0.999981 0.999981 0.999982 0.999982 0.999982 0.999982 0.999983 0.999983 0.999983
0.999983 0.999983 0.999984 0.999984 0.999984 0.999984 0.999984 0.999984 0.999984 0.999985
0.999985 #selex for gender,fleet: 2 / 3
 0.0549573 0.191988 0.264057 0.346518 0.437408 0.534418 0.635339 0.738438 0.842601
0.947274 1.05229 1.15771 1.26368 1.37033 1.47775 1.58596 1.6949 1.80444 1.91439 2.02451
2.13455 2.24422 2.35324 2.46135 2.56829 2.67382 2.77773 2.87982 2.97995 3.07796 3.17374
3.2672 3.35826 3.44686 3.53297 3.61657 3.69764 3.77618 3.8522 3.92573 3.99678 4.06539
4.1316 4.19545 4.25699 4.31628 4.37335 4.42828 4.4811 4.53189 4.58071 4.6276 4.67263
4.71585 4.75734 4.79713 4.8353 4.8719 4.90698 4.9406 4.97281 5.00366 5.03321 5.0615

5.08858 5.11451 5.13931 5.16305 5.18576 5.20748 5.22838 5.2485 5.26774 5.28613 5.30372
5.32052 5.33659 5.35193 5.3666 5.38062 5.394 5.40679 5.41901 5.43068 5.44183 5.45247
5.46264 5.47234 5.48161 5.49046 5.49891 5.50698 5.51468 5.52203 5.52904 5.53574 5.54214
5.54824 5.55406 5.55962 5.56987 #bodywt for gender,fleet: 2 / 4
 0 0.0106796 0.018864 0.0320913 0.0523713 0.0816701 0.121368 0.17174 0.231701 0.298954
0.370441 0.442928 0.513499 0.579876 0.640531 0.694653 0.742017 0.782826 0.81756 0.846846
0.871368 0.891801 0.908773 0.922847 0.934513 0.944188 0.952224 0.958913 0.964494 0.969165
0.973089 0.976395 0.979193 0.98157 0.983596 0.985331 0.986822 0.988109 0.989224 0.990193
0.991039 0.99178 0.992432 0.993006 0.993515 0.993966 0.994368 0.994728 0.995049 0.995338
0.995598 0.995833 0.996046 0.996239 0.996414 0.996574 0.99672 0.996853 0.996976 0.997088
0.997191 0.997286 0.997374 0.997455 0.99753 0.9976 0.997665 0.997725 0.99778 0.997832
0.997879 0.99792 0.997958 0.997994 0.998028 0.998059 0.998089 0.998117 0.998143 0.998168
0.998191 0.998213 0.998233 0.998253 0.998271 0.998288 0.998305 0.99832 0.998335 0.998349
0.998362 0.998374 0.998386 0.998397 0.998407 0.998417 0.998427 0.998435 0.998444 0.998452
0.998467 #selex for gender,fleet: 2 / 4
 0.053935 0.187643 0.258491 0.340464 0.432411 0.532813 0.639889 0.751769 0.866692 0.98317
1.10008 1.21667 1.33248 1.44729 1.56102 1.67369 1.78531 1.89594 2.0056 2.11429 2.22197
2.32859 2.43406 2.53829 2.64116 2.74256 2.84236 2.94045 3.03671 3.13104 3.22335 3.31355
3.40157 3.48736 3.57086 3.65206 3.73091 3.80742 3.88157 3.95338 4.02287 4.09004 4.15493
4.21757 4.278 4.33626 4.3924 4.44646 4.49849 4.54855 4.59669 4.64295 4.68741 4.7301
4.77109 4.81043 4.84818 4.88438 4.91909 4.95237 4.98426 5.01482 5.04409 5.07212 5.09896
5.12466 5.14926 5.17279 5.19532 5.21686 5.23763 5.25764 5.27678 5.29508 5.31257 5.32929
5.34528 5.36055 5.37515 5.38909 5.40242 5.41514 5.4273 5.43892 5.45001 5.46061 5.47073
5.48039 5.48961 5.49842 5.50683 5.51487 5.52253 5.52985 5.53684 5.54351 5.54987 5.55595
5.56175 5.56728 5.57748 #bodywt for gender,fleet: 2 / 5
 0 0.00464617 0.00776248 0.0126202 0.0199495 0.0306278 0.0456102 0.0658062 0.0919188
0.124288 0.162787 0.206799 0.255292 0.306946 0.360322 0.414006 0.466737 0.517476 0.565441
0.610103 0.651161 0.688507 0.722179 0.75232 0.779148 0.802921 0.823917 0.842414 0.858685
0.872985 0.885549 0.896591 0.906301 0.914849 0.922383 0.929034 0.934915 0.940125 0.944751
0.948866 0.952534 0.955811 0.958745 0.961378 0.963746 0.965879 0.967806 0.96955 0.971131
0.972568 0.973876 0.975069 0.97616 0.977158 0.978073 0.978914 0.979687 0.980399 0.981057
0.981664 0.982226 0.982747 0.983231 0.983679 0.984097 0.984485 0.984847 0.985185 0.985501
0.985796 0.986061 0.986298 0.986521 0.986731 0.986927 0.987112 0.987286 0.98745 0.987604
0.987749 0.987886 0.988016 0.988138 0.988253 0.988362 0.988465 0.988562 0.988655 0.988742
0.988824 0.988902 0.988976 0.989047 0.989113 0.989176 0.989236 0.989293 0.989346 0.989398
0.989446 0.989535 #selex for gender,fleet: 2 / 5
 0.055879 0.196938 0.272014 0.359129 0.457062 0.56408 0.677997 0.796366 0.916817 1.03738
1.15667 1.2739 1.38879 1.50136 1.61184 1.72051 1.82769 1.93364 2.03856 2.14261 2.24586
2.34834 2.45 2.55077 2.65056 2.74925 2.84669 2.94275 3.03728 3.13015 3.22124 3.31045
3.39765 3.48279 3.56578 3.64657 3.72512 3.80141 3.87541 3.94712 4.01654 4.08369 4.14859
4.21127 4.27175 4.33007 4.38628 4.44042 4.49254 4.54269 4.59092 4.63728 4.68182 4.72461
4.76569 4.80512 4.84295 4.87923 4.91402 4.94738 4.97934 5.00997 5.03931 5.06741 5.09432
5.12007 5.14473 5.16832 5.19089 5.21249 5.23329 5.25333 5.2725 5.29082 5.30834 5.32508
5.34109 5.35638 5.371 5.38496 5.3983 5.41105 5.42323 5.43486 5.44597 5.45658 5.46671
5.47638 5.48562 5.49444 5.50287 5.51091 5.51858 5.52591 5.53291 5.53959 5.54596 5.55204
5.55785 5.56339 5.57361 #bodywt for gender,fleet: 2 / 6
 0 0.00129961 0.00246026 0.00451182 0.00800978 0.0137474 0.0227678 0.0363054 0.0556314
0.0818204 0.1155 0.156666 0.204631 0.258109 0.315411 0.374675 0.434092 0.492072 0.547344
0.598993 0.646444 0.689424 0.727894 0.761996 0.791987 0.818201 0.841002 0.860766 0.877853
0.892604 0.905328 0.916304 0.925775 0.933957 0.941034 0.947167 0.952491 0.957124 0.961165
0.964699 0.967796 0.970519 0.972918 0.975038 0.976917 0.978586 0.980073 0.981401 0.98259
0.983657 0.984617 0.985483 0.986266 0.986975 0.987619 0.988205 0.988739 0.989227 0.989673
0.990082 0.990458 0.990803 0.991122 0.991415 0.991687 0.991938 0.992171 0.992387 0.992587
0.992774 0.992939 0.993085 0.993221 0.993349 0.993469 0.993581 0.993686 0.993784 0.993877
0.993964 0.994046 0.994123 0.994196 0.994264 0.994329 0.994389 0.994447 0.994501 0.994552
0.994601 0.994646 0.99469 0.994731 0.99477 0.994806 0.994841 0.994874 0.994905 0.994935
0.994963 0.995014 #selex for gender,fleet: 2 / 6
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0.0454176 0.0454176 0.0454176 #mean M for year Yinit: 2011 sex: 1
 93.6023 87.8991 82.4323 77.2436 72.3968 67.6429 63.1486 58.8452 54.7352 50.8674 47.7484
44.623 43.8113 42.1431 42.3843 41.9217 41.7043 40.8123 40.5504 40.1374 39.0656 36.8128

34.9272 32.4487 29.7538 26.9529 24.5006 21.978 19.7023 17.7382 15.7711 13.9027 12.2827
10.8424 9.51414 8.35933 7.34975 6.48214 5.72989 5.08464 4.52453 4.03951 3.62899 3.26679
2.95469 2.68404 2.45487 2.24752 2.06679 1.90808 1.7667 1.6411 1.52865 1.42749 1.33549
1.25132 1.17393 1.10252 1.03649 0.975782 0.919706 0.867433 0.818792 0.773927 0.731926
0.694092 0.658986 0.624994 0.593026 0.562103 0.532839 0.505096 0.478724 0.453798 0.430178
0.40781 0.386601 0.366542 0.347602 0.329783 0.313013 0.297253 0.282418 0.268426 0.25524
0.242804 0.231063 0.219961 0.20946 0.19952 0.190105 0.181179 0.172709 0.164677 0.157044
0.149784 0.142866 0.136288 0.130029 0.124073 2.64383 #numbers for year Yinit: 2011 sex: 1
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0.0443617 0.0443617 0.0443617 #mean M for year Yinit: 2011 sex: 2
 93.6023 87.992 82.6065 77.4882 72.702 67.998 63.5442 59.272 55.1848 51.3324 48.2279
45.1101 44.3265 42.6722 42.9464 42.5002 42.29 41.3783 41.083 40.6082 39.4394 37.0556
35.0259 32.3948 29.5538 26.6249 24.0652 21.4658 19.14 17.1477 15.1808 13.3344 11.7469
10.3473 9.06654 7.95974 6.99727 6.17402 5.46323 4.85593 4.33057 3.87699 3.4943 3.15706
2.86686 2.6153 2.40253 2.20946 2.04092 1.89258 1.75997 1.64176 1.53549 1.43947 1.35171
1.271 1.19638 1.12717 1.06285 1.00344 0.948337 0.896747 0.848561 0.803981 0.762105
0.724326 0.689177 0.654988 0.622726 0.591378 0.561601 0.533264 0.506227 0.480589 0.456223
0.433094 0.411122 0.390317 0.370656 0.352148 0.334726 0.318347 0.302921 0.28836 0.274625
0.261655 0.249394 0.23778 0.226775 0.21634 0.206437 0.197031 0.188089 0.179595 0.171508
0.163803 0.156448 0.149442 0.142767 0.136404 2.9839 #numbers for year Yinit: 2011 sex: 2
 96.4661 90.8471 85.4647 80.242 75.2377 70.4833 66.0372 61.6731 57.5448 53.5915 49.8172
46.2674 43.4033 40.5381 39.7785 38.2442 38.4451 38.0095 37.7983 36.9776 36.7296 36.346
35.3674 33.3212 31.6088 29.361 26.9188 24.3816 22.1607 19.8769 17.8172 16.0397 14.2599
12.5697 11.1044 9.80179 8.60069 7.5565 6.6437 5.85933 5.17929 4.59601 4.08973 3.65134
3.28031 2.95297 2.67091 2.42631 2.21921 2.03182 1.8685 1.72507 1.59729 1.48379 1.38215
1.29072 1.20756 1.13148 1.06152 0.996966 0.937274 0.882388 0.831691 0.784428 0.740449
0.699883 0.661906 0.627695 0.595952 0.565215 0.536306 0.508343 0.481879 0.45679 0.43294
0.410399 0.389037 0.368807 0.349624 0.331483 0.314353 0.298237 0.28307 0.268816 0.255399
0.242745 0.230819 0.219573 0.208955 0.198914 0.189418 0.180429 0.171915 0.163842 0.156182
0.148919 0.142017 0.135452 0.129196 0.123247 2.62064 #numbers for year Ydeclare: 2013
sex: 1
 96.4661 90.943 85.6452 80.4958 75.5541 70.8522 66.4496 62.119 58.016 54.0802 50.3166
46.772 43.9142 41.0496 40.3134 38.7886 39.0196 38.5982 38.3934 37.5537 37.2755 36.8358
35.7681 33.6001 31.7545 29.3651 26.7864 24.129 21.8071 19.4499 17.3412 15.5351 13.7524
12.0791 10.6407 9.37255 8.21228 7.20964 6.3378 5.59211 4.94832 4.3983 3.9225 3.51172
3.16516 2.85977 2.59698 2.36919 2.17652 2.00168 1.84905 1.71472 1.59462 1.48757 1.39132
1.30435 1.22486 1.15174 1.08414 1.02144 0.963168 0.909345 0.859416 0.812671 0.769009
0.728614 0.690668 0.656434 0.624582 0.5936 0.564364 0.535955 0.508969 0.483288 0.458784
0.435548 0.413464 0.392501 0.372587 0.353729 0.335909 0.319135 0.303344 0.288499 0.274518
0.261321 0.248873 0.237118 0.226006 0.215481 0.205508 0.196052 0.187077 0.178553 0.170449
0.162751 0.155423 0.148441 0.141776 0.135427 2.95706 #numbers for year Ydeclare: 2013
sex: 2
#R0 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932
1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950
1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968
1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986
1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004
2005 2006 2007 2008 2009 2010 #years
330.719 330.719 330.683 330.634 330.578 330.541 330.502 330.463 330.426 330.387 330.343
330.28 330.207 330.124 330.03 329.9 329.766 329.651 329.542 329.454 329.346 329.216
329.045 328.878 328.714 328.591 328.398 328.159 327.86 327.12 326.375 325.126 324.076
323.671 323.196 322.888 322.558 322.147 321.797 321.538 321.204 320.773 320.239 319.615
318.939 318.333 317.784 317.336 316.796 316.384 316.114 314.886 314.414 313.852 313.262
311.827 310.863 309.52 307.749 306.026 304.018 302.123 299.804 297.338 292.843 288.098
284.091 277.99 269.412 263.03 257.706 250.744 246.499 241.179 234.794 225.702 220.09
209.406 197.322 186.256 179.318 170.42 163.339 154.418 152.774 148.31 151.322 153.794
157.927 162.083 166.087 169.912 173.704 177.07 180.551 183.967 187.205 #Recruits
1.54499e+009 1.54499e+009 1.5443e+009 1.54334e+009 1.54227e+009 1.54156e+009 1.5408e+009
1.54006e+009 1.53935e+009 1.53861e+009 1.53776e+009 1.53655e+009 1.53515e+009
1.53358e+009 1.53178e+009 1.52932e+009 1.52676e+009 1.52459e+009 1.52252e+009
1.52087e+009 1.51884e+009 1.51639e+009 1.5132e+009 1.51008e+009 1.50702e+009 1.50474e+009

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1.50118e+009 1.49677e+009 1.49129e+009 1.47783e+009 1.46449e+009 1.4425e+009 1.4244e+009
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1.37657e+009 1.3696e+009 1.36104e+009 1.35112e+009 1.3405e+009 1.33109e+009 1.32263e+009
1.31581e+009 1.30764e+009 1.30144e+009 1.29743e+009 1.27932e+009 1.27245e+009
1.26436e+009 1.25593e+009 1.23577e+009 1.2225e+009 1.20432e+009 1.18095e+009 1.15881e+009
1.13375e+009 1.11077e+009 1.08353e+009 1.05556e+009 1.00704e+009 9.5902e+008 9.20798e+008
8.66321e+008 7.96455e+008 7.48961e+008 7.11931e+008 6.66721e+008 6.40778e+008
6.09867e+008 5.74911e+008 5.28802e+008 5.02275e+008 4.55394e+008 4.07426e+008
3.67561e+008 3.44319e+008 3.16284e+008 2.95281e+008 2.70322e+008 2.65894e+008
2.54124e+008 2.62026e+008 2.68635e+008 2.7995e+008 2.91668e+008 3.03301e+008 3.14742e+008
3.26409e+008 3.37054e+008 3.48358e+008 3.5975e+008 3.70839e+008 #SpawnBio
0.508 0.5 0 # spawn-recr steepness, sigmaR, autocorr
```

An Alternative View of Widow Rockfish Productivity

Stephen Ralston, Xi He, E.J. Dick, John C. Field, and Alec D. MacCall.
Groundfish Analysis Team, FED, SWFSC, NMFS, Santa Cruz, CA

In west coast groundfish stock assessments, biological productivity is largely defined by a single parameter, i.e., steepness (***h***) of the Beverton-Holt spawner-recruit curve, which ranges from 0.20 (no compensation) to 1.00 (complete compensation). A steepness of 0.20 implies no latent surplus production and a total lack of resilience to the effects of exploitation, whereas a value of 1.0 implies a very strong density-dependent response and strong resilience to perturbations.

Previous experience on the west coast has shown that groundfish stock assessments conducted for the Pacific Fishery Management Council have difficulty in estimating ***h*** with acceptable precision. As a consequence, the SSC and the Council have adopted the use of a Bayesian prior estimate of the distribution of ***h*** that is based on the work of Dorn (2002), but which is recalculated biannually to ensure that it is up to date. We note that a Bayesian approach to stock assessment "determines the probabilities of alternative hypotheses using information for the stock in question and from inferences for other stocks/species" and this is useful because "it facilitates representing and taking account of the full range of uncertainties related to models and parameter values" (Punt and Hilborn 1997). In principle we support the application of the prior distribution of steepness developed by Dorn to rockfish stocks managed by the Council, which is depicted in Figure 1. Note that the prior distribution of rockfish steepness places more weight on higher values, with the mode at 0.94 and a mean equal to 0.76 (labeled "average" in the figure). Even so, the Dorn rockfish prior allows for steepness values at least as low as 0.30, albeit with low probability.

This year the widow rockfish (*Sebastes entomelas*) stock assessment was referred to the mop-up panel after a STAR panel concluded it did not meet the standard of best available science. In particular, three issues were identified for further exploration by the STAT team, which included: (1) development of a complete one-area model, (2) conversion of the model from age-based selection to length-based selection, and (3) incorporation of asymptotic selectivity curves for some fisheries and/or surveys. The STAT team successfully developed such a model in advance of the mop-up panel, and it was refined during the review that occurred the week of September 26-30.

One change recommended by the mop-up panel, which deviated from the analysis that was initially presented by the STAT, was to fix spawner-recruit steepness at the mean of the Dorn prior distribution, i.e., ***h*** = 0.76. The rationale for this decision was,

> "The assessment is unable to produce a reliable estimate of stock-recruit steepness. The model, therefore, uses a fixed value that represents an average value for all rockfish and therefore the extent of uncertainty in model results is underestimated."

Fundamentally, the rationale of this decision rests on the conclusion of the panel that "… no data currently exist to reliably estimate widow rockfish productivity." We take issue with this assertion and wish to draw the attention of the SSC and Council to our specific concerns.

First we note that the profile likelihood of steepness, when the likelihood contributed by the steepness prior is excluded, indicates that the data do contain information on widow rockfish steepness (Figure 2). Note that we develop a confidence region for the maximum likelihood estimate (MLE) of steepness using the profile likelihood method, evaluating the negative log-likelihood function over the domain of steepness (0.20 – 1.00, in 0.02 increments). For a single parameter, an approximate 95% confidence interval is bounded by 1.92 log-likelihood units above the minimum negative log-likelihood, based on the 95th quantile of the Chi-squared distribution with 1 degree of freedom (Venzon and Moolgavkar 1988; Hilborn and Mangel 1997). In this application we simply added 2 likelihood units for simplicity of presentation, which is equivalent to a 95.4% confidence interval. From this analysis we conclude that *in the absence of the Dorn prior*, for widow rockfish $0.22 \leq \boldsymbol{h} \leq 0.54$ with 95% confidence, which is an informative interval and is much less than the value adopted by the mop-up panel (0.76). We used the likelihood profile presented in Figure 2 to calculate the approximate probability distribution of steepness in the absence of the prior, which is also presented in Figure 1 (labeled no prior). The distribution is strongly skewed to the right, with a mode of $\boldsymbol{h} = 0.30$ and a mean of 0.38.

When the profile likelihood of steepness is recalculated to include the contribution of the steepness prior, a much different picture is presented (Figure 3). In this instance there is no significant difference between the maximum likelihood estimate and the value of steepness adopted by the mop-up panel (0.76). This is not surprising, given the strongly divergent probability distributions of the prior and the data, given the model (no prior) presented in Figure 1. Note that the blended Bayesian posterior distribution of steepness, based on the likelihood profile shown in Figure 3, has a mode at $\boldsymbol{h} = 0.36$ and a mean of 0.54 ("posterior" in Figure 1). We believe that the posterior distribution of steepness shown in Figure 1 more adequately characterizes the uncertainty in this key biological parameter and is consistent with the philosophy of the Bayesian approach (Punt and Hilborn 1997).

Why is the estimate of steepness important to the PFMC? These findings are crucial to determination of resource status relative to the rebuilding target (Figure 4). If the value of $\boldsymbol{h}$ adopted by the mop-up panel is used, the estimated depletion is 51% of B_0; if the MLE is used, estimated depletion is 26%; using the posterior mean for steepness, estimated depletion is 40%. The conclusion that rebuilding of the widow rockfish stock has occurred depends directly on the estimated value of steepness. We note that to conclude that the stock has rebuilt, i.e., 2011 depletion ≥ 40%, a steepness value of $\boldsymbol{h} \geq 0.54$ is required.

We advocate a consideration of the posterior distribution of steepness to inform the SSC and Council in decision-making. In particular, results presented in Figure 5 depict the

approximate cumulative probability distribution of steepness from the blended Bayesian result, i.e., the rockfish steepness prior is included in the profile likelihood. The figure illustrates that there is a 78% probability that steepness exceeds the MLE. The median of the distribution is $\boldsymbol{h}$ = 0.49 and the conditional expected value is $\boldsymbol{h}$ = 0.54. A summary of the mean, median, and mode of the three distributions presented in Figure 1 is provided in the table below:

	Central Tendency		
Distribution	mode	median	mean
prior	0.94	0.80	0.76
no prior (model+data)	0.30	0.33	0.38
posterior	0.36	0.49	0.54

Lastly, we draw attention to the estimated time series of recruitment deviations from the base model that was accepted by the mop-up panel, which is illustrated in Figure 6. Note that only one year-class in the last nine exceeds expectation (2004) and the last five year-classes have been particularly weak. We recommend that the Council consider the lack of evidence of successful recruitment in recent years and substantial uncertainty with respect to stock status in 2011 when establishing catch levels for widow rockfish.

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Venzon, DJ, and SH Moolgavkar. 1988. A method for computing profile-likelihood-based confidence intervals. Applied Statistics 37(1):87-94.

Hilborn, R, and M Mangel. 1997. The Ecological Detective: Confronting Models with Data. Monographs in Population Biology, 28. Princeton University Press, New Jersey, 315 p.

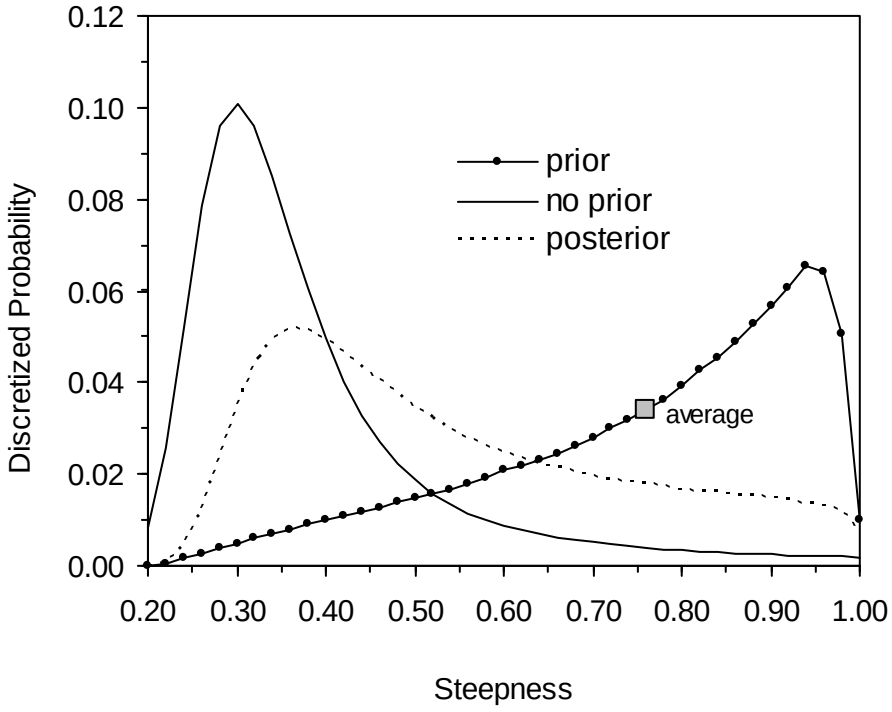

Figure 1. Distributions of widow rockfish steepness (***h***) based on: (1) the Dorn Prior, (2) the data and model (= no prior), and (3) the combination of the two (= posterior).

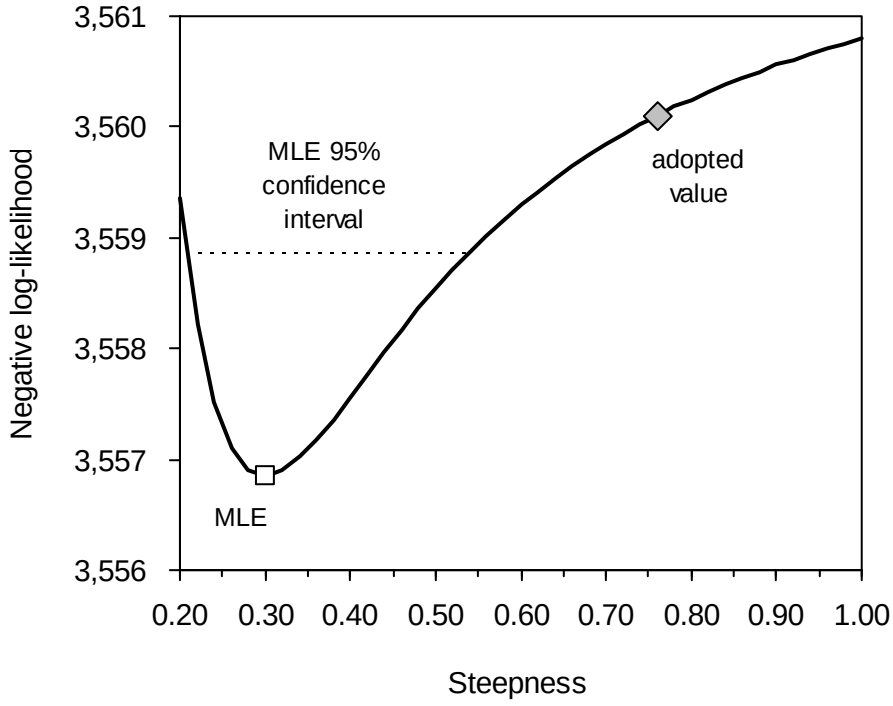

Figure 2. Profile likelihood of widow rockfish steepness when the steepness prior is excluded.

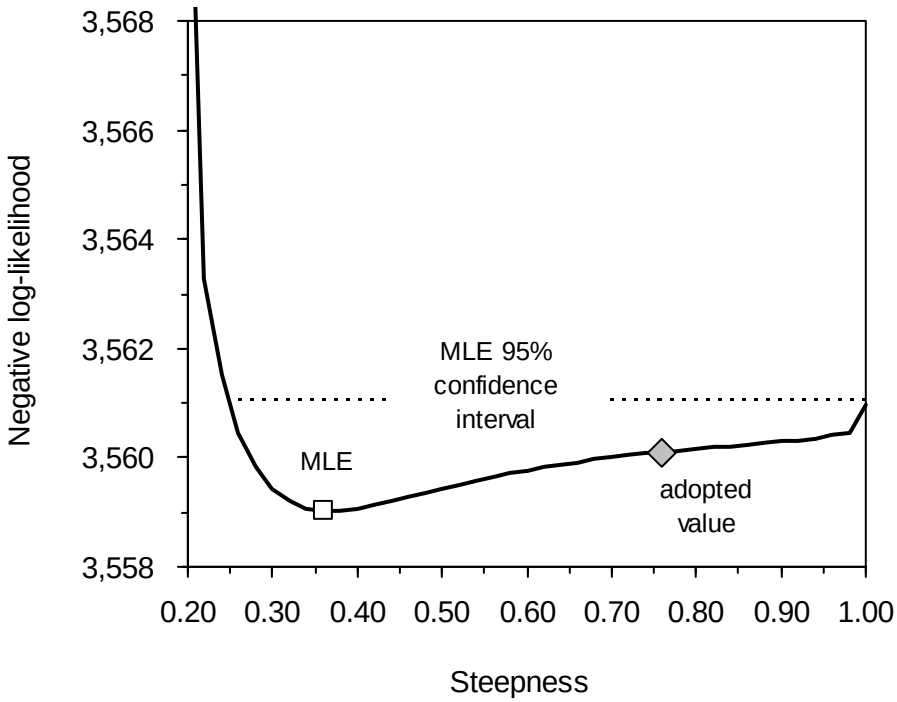

Figure 3. Profile likelihood of widow rockfish steepness when the steepness prior is included.

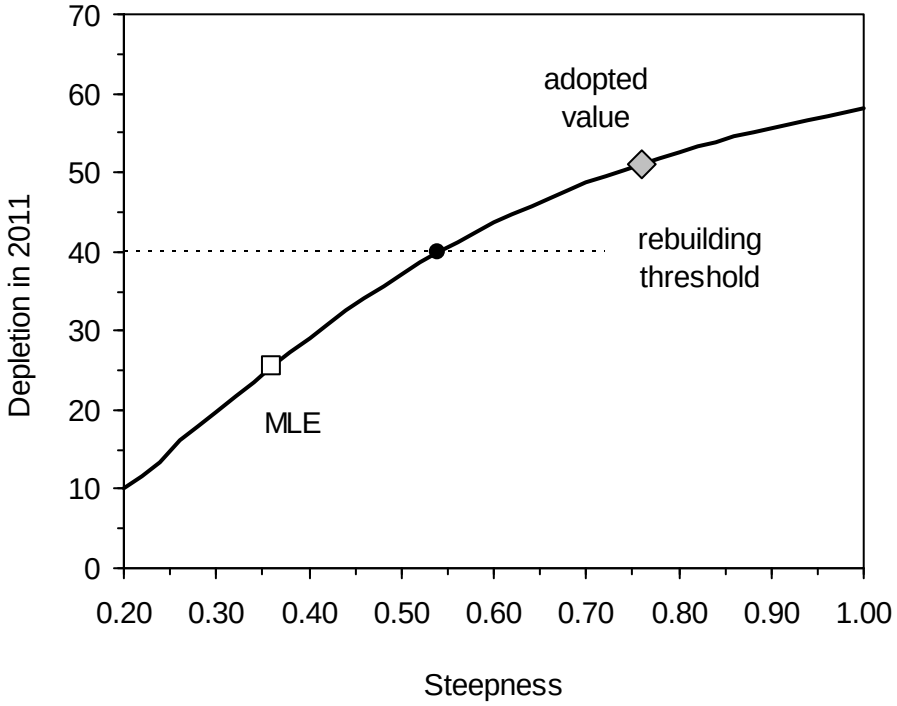

Figure 4. Relationship between estimated stock status and steepness when the steepness prior is included, i.e., the fully Bayesian result.

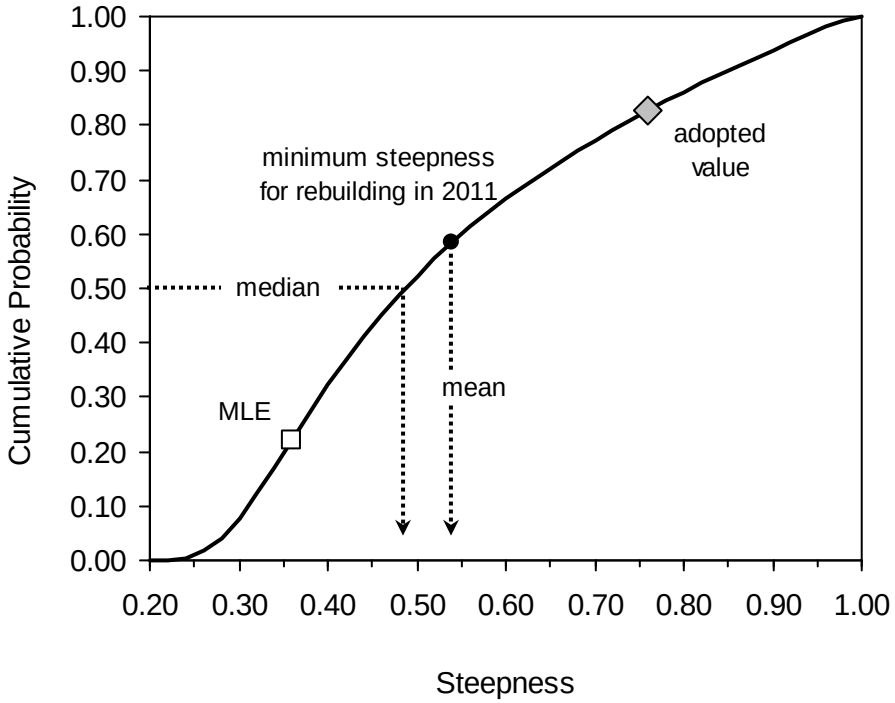

Figure 5. Cumulative probability distribution of steepness from the posterior.

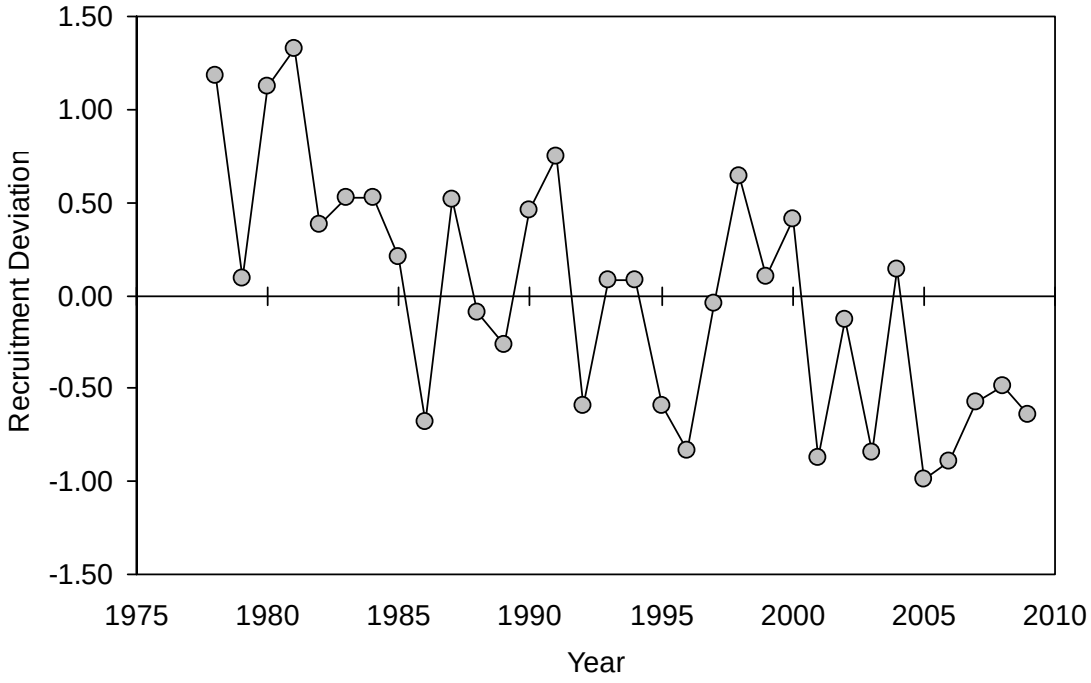

Figure 6. Time series of estimated recruitment deviations from the base model.

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Rebuilding Analysis for Darkblotched Rockfish in 2011

October 12, 2011

Andi Stephens
Groundfish Team, Fishery Resource Analysis and Monitoring Division,
National Marine Fisheries Service
Northwest Fisheries Science Center
2727 Montlake Boulevard East
Seattle, Washington 98112

1. Introduction

The Pacific Fishery Management Council (PFMC) adopted Amendment 11 to its Groundfish Management Plan in 1998. This amendment established a definition for an overfished stock of 25% of the unfished spawning biomass ($0.25B_0$). Darkblotched rockfish (*Sebastes crameri)* was declared overfished in January 2001 based on the most recent stock assessment at that time (Rogers et al. 2000). Rebuilding analyses were first conducted in mid-year 2001 (Methot and Rogers 2001) and included a partial update of the 2000 stock assessment.

The stock assessment for darkblotched rockfish was updated in 2003 (Rogers 2003). Full assessments were conducted in 2005 (Rogers 2005) and 2007 (Hamel 2007), using Stock-Synthesis II. An assessment update was done in 2009 (Wallace and Hamel 2009) using version 3 of Stock-Synthesis. The most recent assessment, also using version 3 of Stock-Synthesis, was performed in 2011 (Stephens, *et al.*, 2011). In 2005 the natural mortality rate used in the assessment was changed from the previously used value of 0.05 (based largely on Hoenig's method) to 0.07 (as a balance between Hoenig's method and Gunderson's method based on gonadosomatic index (GSI)). This latter value was used in the 2007 assessment and the 2009 and 2011 assessments as well.

The largest change in assumptions between the 2005 and 2007 assessments was the value of stock-recruitment steepness. In 2005, steepness was estimated at 1.0, and was set at 0.95. In 2007, a large amount of new age data was included in the assessment, largely as conditional age-at length compositions, and steepness was estimated (using the prior from meta-analysis of rockfish steepness conducted by Martin Dorn) at 0.6. That value of steepness was then fixed in the 2007 assessment and hence also used in the 2009 update. More recent meta-analysis results suggest a higher value for steepness (Martin Dorn, *pers. comm*), and the 2011 assessment fixed steepness at 0.76.

The SPR chosen following the 2005 rebuilding analysis (0.607) corresponded to a T_{target} (median rebuilding year) of 2011, which was much earlier than for previous rebuilding analyses, due largely to the high value of steepness (and thus high productivity at low stock sizes) assumed in the 2005 assessment. Based on the 2007 rebuilding analysis, the darkblotched rockfish stock was projected to recover 19 years later (2030) than anticipated from the 2005 rebuilding analysis. This then lead to the adoption by the PMFC of a new T_{TARGET} equal to 2028. For the 2011 rebuilding analysis, T_{TARGET} has been revised to 2025, and SPR_{Target} to 0.649.

Table 1 shows the management history by assessment year. The cumulative estimated catch over the cumulative OY/ACL over the period since rebuilding began (2002-2010) is 94.5%. So management under rebuilding has been generally effective, although individual year overages may have occurred, they have been balanced by years with less catch than allocated.

Table 1. Management history since 2002. The modeled catch is the sum of the landings and the model-estimated discards based on discard rate and discard size composition information. These do not always match the Total Mortality report, the metric used to determine if overfishing has occurred.

Year	OFL	ACL	Total Mortality Report	Modeled Catch
2002	187	168	-	263
2003	205	172	-	199
2004	240	240	230.9	242
2005	269	269	123.9	123
2006	294	200	193.3	211
2007	456	290	285.0	281
2008	487	330	252.6	227
2009	437	285	301.2	273
2010	440	291	-	302
2011	508	298	-	-

2. Specifications

2.1 Selection of B_0

As in 2007 the unfished spawning stock biomass, B_0, was determined from the fitted stock-recruitment relationship in order to be consistent with the assumptions underlying the current stock assessment. This is in contrast to previous rebuilding analyses for darkblotched rockfish which used a range of estimated historical recruitments to estimate B_0. The estimate of B_0 32,710 mt. Table 2 compares darkblotched summary statistics for 2011 with the 2009 model results.

Table 2. Estimates of unfished spawning stock biomass or output (2011) (B_0) and depletion for the 2009 and 2011 stock assessments.

	2009	**2011**
Unfished 1+ biomass	32,922	32,710
Ending year 1+ biomass	9,065	8,808
Unfished spawning biomass or output	28,835	29,168
Ending year spawning biomass or output	7,940	13,926
Depletion (Spawning biomass or output)	27.5%	30.2 %

2.2 Generation of future recruitment

Future recruitments were generated in 2009 using the Beverton-Holt spawner recruit relationship with steepness = 0.6 and $\sigma_r = 0.8$ as estimated within the 2007 assessment (Hamel, 2007). Prior to 2007, rebuilding analyses re-sampled from a range of estimated historical recruitments. For the current, 2011 rebuilding analysis, recruitments are generated as in 2007 and 2009, except that the new value of 0.76 is assumed for steepness. This choice is consistent with the assumptions underlying the current stock assessment.

2.3 Mean generation time

The mean generation time is defined as the mean age weighted by net spawning output (see Figure 2 for net spawning output *versus* age.) The best estimate of the mean generation time is 25 years. This is 3 years longer than from the previous rebuilding analyses (Table 3).

2.3 Methods used

The revised SSC default rebuilding analysis (Punt 2009) was used to find all rebuilding milestones, such as T_{MIN} and the mean generation time, in addition to the results for the various harvest strategies specified below. Darkblotched biological information can be found within the rebuilding analysis input file in Appendix A.

2.4 Harvest strategies

Table 3 summarizes the options considered in the rebuilding analyses. These include:

- No-catch beginning with the first year beyond the current 2011-12 ACLs
- Using the implied SPR in the current analysis from the 2011-12 ACLs (298/296 mt)
- Using the year (2017) associated with 50% probability of rebuilding associated with that SPR. This and the previous case give the upper and lower bounds on the ACLs for achieving rebuilding (P50%) by 2017.
- Using the SPR (0.621) from the 2009 analysis
- Using the SPR (0.607) from the old FMP.
- Using the first quartile-year between Tmin and Tmax.
- The 40-10 rule (applied to the OFL).
- The OFL rule

The reported results from each scenario include the year at which rebuilding is projected with a 50% probability, the 2013 and 2014 ACLs associated with that projection, the associated SPR, and the probabilities, respectively, of rebuilding by 2025 and by 2037 (T_{Target} and Tmax).

Table 3. The 12 Scenarios explored in this rebuilding analysis.

Name / Reasoning		$T_{50\%}$	2013 ACL	2014 ACL	SPR	P_{2025} (%)	P_{2037} (%)
F = 0	Beginning in 2013	2016	0	0	1	100	100
SPR = 0.649	Current ACLs based	2017	317	330	0.649	100	100
Yr = 2017		2017	347	360	0.626	100	100
SPR = 0.621	2009 SPR	2018	353	366	0.621	100	100
SPR = 0.607	Old FMP SPR	2018	372	385	0.607	100	100
Yr = 2018	1st quartile year	2018	423	437	0.571	100	100
40-10 rule (applied to OFL)		2024	508	528	>= 0.5	57.3	82.4
OFL Rule		2024	541	553	0.5	53.7	79.5

2.5 Other specifications

The calculations in this document were performed using 3.12b of the rebuilding software developed by Punt (2010) and the results are based on 1,500 Monte Carlo replicates in each case.

The definition of "recovery by year *y*" in this analysis is that the spawning output reaches $0.4B_0$ by year *y* (even if it subsequently drops below this level due to recruitment variability).

Appendix A lists the estimates for the biological and technological parameters and the age-structure of the population at the start of 2000 and 2011. Appendix B lists the MPD time-series of recruitment and spawning output. The input to the rebuilding programs is given as Appendix C. The catch for 2011 and 2012 were set to 298 and 296 mt (the Council-selected *ACLs* for 2011-2012).

3. Results

3.1 Time-to-recovery

Of the twelve harvest scenarios shown in table 3, all cases except for the last three provide a better-than-50% probability of rebuilding by T_{Target}, 2025.

The year for rebuilding to the target level in the absence of fishing since the year of overfished declaration, T_{min}, is 2016.

T_{max} (T_{min} + one generation time) formerly the maximum permissible time period for rebuilding the stock to its target biomass, is 2037 when using the new information on the depletion level and the age-structure of the population in 2001.

Table 4 shows summary statistics from the 2003, 2005, 2007 and 2009 rebuilding plans and the current analysis. The 2011 and 2009 analyses are in good agreement, and both are a little more optimistic than the 2007 rebuilding plans.

Table 4: Summary Statistics

Value	**2003**	**2005**	**2007**	**2009**	**2011**
T_{min}	2011	2009	2015	2012	2012
Mean generation time	33 years	24 years	25 years	25 years	25 years
T_{max}	2044	2033	2040	2037	2037
$T_{F=0}$ beginning in the year after the ACLs in place			2018 (from 2009)	2016 (from 2011)	2016 (from 2013)
T_{TARGET}	2019	2011	2028	2028	2025
SPR_{TARGET}		0.607	0.621	0.621	0.649

3.2 OYs and fishing mortalities

Table 5 gives 10 year projected Annual Catch (AC) and OFL values based on the SPR for each of the 12 cases explored in this rebuilding analysis. The top number in each cell in the table is the AC, and the bottom number is the OFL (formerly ABC).

Table 5. 10-year projected Annual Catch (top value) and OFL (bottom value).

Scenario	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
F = 0 from 2013	0 540	0 574	0 602	0 627	0 650	0 671	0 691	0 713	0 732	0 754
SPR = 0.649	317 540	329 562	338 577	346 589	351 599	357 608	362 616	367 625	372 634	378 643
Yr = 2017	347 540	359 560	369 575	376 586	381 595	387 603	391 610	396 618	401 625	407 635
SPR = 0.621	353 540	366 560	375 574	382 585	388 594	393 601	397 608	403 616	407 623	413 632
SPR = 0.607	372 540	385 560	394 573	401 583	407 591	412 598	416 604	421 611	425 618	431 626
Yr = 2018	423 540	437 558	445 569	452 577	457 583	461 588	464 593	469 598	473 604	478 611
40-10 rule	508 540	528 554	542 562	552 566	559 569	564 571	567 572	570 574	573 576	577 579
OFL Rule	540 540	553 553	560 560	563 563	565 565	567 567	568 568	570 570	573 573	576 576

Table 6 gives the probability of rebuilding by a range of years from 2012 to 2037, as well as the ACL and OFLs for 2013 and 2014, and the year by which the probability of rebuilding is 50%.

Table 6. Probability of rebuilding.

Scenario	2018	2025	2028	2033	2037	2013 ACL	2013 OFL	2014 ACL	2014 OFL	50% Year
F = 0 from 2013	100	100	100	100	100	0	541	0	574	2016
SPR = 0.649	100	100	100	100	100	317	540	330	562	2017
Yr = 2017	100	100	100	100	100	347	540	360	560	2017
SPR = 0.621	100	100	100	100	100	353	540	366	560	2018
SPR = 0.607	100	100	100	100	100	372	540	385	560	2018
Yr = 2018	50	100	100	100	100	423	540	437	558	2018
40-10 rule	30	57.3	66.1	77	82.4	508	540	528	554	2024
ABC Rule	20	53.7	63.1	0.74	79.5	541	540	553	553	2024

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Appendix A: Biological and technological parameters used for the rebuilding analyses based on the MPD estimates. The natural mortality rate (*M*) is 0.07 for all ages, and steepness (h) is 0.76 for the population.

Age	Fecundity	Female Weight	Male Weight	Female Selectivity	Male Selectivity	Numbers F		Numbers M	
						2001	2011	2001	2011
0	0.000	0.013	0.013	0.000	0.000	581	1272	581	1272
1	0.000	0.052	0.052	0.101	0.101	2868	1168	2868	1168
2	0.000	0.129	0.130	0.102	0.102	2424	365	2424	365
3	0.000	0.238	0.239	0.116	0.116	417	2149	417	2149
4	0.001	0.382	0.376	0.228	0.219	749	751	749	751
5	0.011	0.513	0.497	0.498	0.445	450	730	450	730
6	0.077	0.627	0.593	0.772	0.681	1097	894	1103	895
7	0.258	0.729	0.674	0.922	0.838	326	786	331	789
8	0.538	0.825	0.743	0.977	0.919	103	533	106	536
9	0.856	0.916	0.803	0.993	0.958	117	251	122	253
10	1.165	0.998	0.855	0.998	0.976	137	256	144	258
11	1.446	1.071	0.899	0.999	0.985	86	1232	91	1242
12	1.695	1.134	0.935	1.000	0.990	24	1017	26	1026
13	1.913	1.188	0.965	1.000	0.993	234	170	247	172
14	2.101	1.234	0.990	1.000	0.995	176	294	186	298
15	2.264	1.273	1.009	1.000	0.996	51	171	54	173
16	2.403	1.306	1.025	1.000	0.996	39	406	41	413
17	2.522	1.334	1.038	1.000	0.997	35	119	37	122
18	2.623	1.357	1.048	1.000	0.997	23	37	24	39
19	2.708	1.376	1.057	1.000	0.998	26	43	27	45
20	2.781	1.392	1.063	1.000	0.998	72	50	76	53
21	2.841	1.406	1.068	1.000	0.998	72	31	76	33
22	2.892	1.417	1.073	1.000	0.998	62	9	65	9
23	2.934	1.427	1.076	1.000	0.998	19	85	20	90
24	2.970	1.434	1.079	1.000	0.998	10	64	10	68
25	3.000	1.441	1.081	1.000	0.998	20	19	21	20
26	3.024	1.446	1.082	1.000	0.998	23	14	24	15
27	3.045	1.451	1.084	1.000	0.998	18	13	18	13
28	3.062	1.454	1.085	1.000	0.998	16	8	17	9
29	3.076	1.457	1.086	1.000	0.998	15	9	15	10
30	3.088	1.460	1.086	1.000	0.998	13	26	13	28
31	3.098	1.462	1.087	1.000	0.998	12	26	12	28
32	3.106	1.464	1.087	1.000	0.998	11	22	11	24
33	3.112	1.465	1.088	1.000	0.998	10	7	10	7
34	3.118	1.466	1.088	1.000	0.998	9	4	9	4
35	3.123	1.467	1.088	1.000	0.998	8	7	8	8

Age	Fecundity	Female Weight	Male Weight	Female Selectivity	Male Selectivity	Numbers F		Numbers M	
						2001	2011	2001	2011
36	3.126	1.468	1.088	1.000	0.998	7	8	7	9
37	3.130	1.469	1.088	1.000	0.998	6	6	7	7
38	3.132	1.469	1.088	1.000	0.998	6	6	6	6
39	3.134	1.470	1.089	1.000	0.998	5	5	5	5
40	3.136	1.470	1.089	1.000	0.998	4	5	4	5
41	3.138	1.471	1.089	1.000	0.998	3	4	3	4
42	3.139	1.471	1.089	1.000	0.998	3	4	3	4
43	3.140	1.471	1.089	1.000	0.998	3	4	3	4
44	3.141	1.471	1.089	1.000	0.998	2	3	3	3
45 +	3.142	1.471	1.089	1.000	0.998	30	28	31	29

Appendix B: Time-series of recruitment and spawning output since 1940.

Year	Recruitment	Spawning output	Year	Recruitment	Spawning output
1940	3,007	28,989	1976	2,504	14,892
1941	3,007	28,964	1977	1,104	14,823
1942	3,006	28,931	1978	1,845	15,073
1943	3,006	28,892	1979	5,045	15,223
1944	3,005	28,724	1980	5,012	15,106
1945	3,002	28,354	1981	4,144	15,117
1946	2,996	27,719	1982	1,229	14,888
1947	2,993	27,358	1983	875	14,374
1948	2,990	27,073	1984	1,091	13,801
1949	2,989	26,934	1985	991	13,049
1950	2,988	26,839	1986	1,061	12,019
1951	2,987	26,737	1987	2,959	11,602
1952	2,986	26,617	1988	3,221	10,296
1953	2,985	26,496	1989	274	9,493
1954	2,984	26,413	1990	787	8,836
1955	2,983	26,306	1991	1,018	7,695
1956	2,981	26,167	1992	704	6,848
1957	2,979	25,950	1993	496	6,461
1958	2,976	25,688	1994	1,296	5,735
1959	2,974	25,489	1995	3,733	5,345
1960	2,973	25,347	1996	1,361	5,002
1961	2,971	25,155	1997	2,057	4,630
1962	2,969	24,992	1998	1,047	4,138
1963	2,967	24,814	1999	5,624	3,506
1964	2,965	24,624	2000	6,152	3,354
1965	2,964	24,538	2001	1,162	3,262
1966	2,961	24,255	2002	1,034	3,383
1967	2,910	20,449	2003	1,997	3,610
1968	2,863	17,759	2004	2,682	3,947
1969	2,818	15,734	2005	2,792	4,363
1970	2,818	15,711	2006	2,100	5,058
1971	2,817	15,686	2007	2,002	5,911
1972	2,814	15,563	2008	5,330	6,766
1973	2,810	15,413	2009	841	7,568
1974	2,803	15,114	2010	2,505	8,231
1975	3,284	14,908	2011	2,544	8,808

Appendix C. Input file for darkblotched rockfish rebuilding based on selected SPRs.

```
#Title, #runnumber: 17 darkblotched_data.SS darkblotched_control.SS 3877.53
29168.1 8807.95 StartTime: Thu Sep 29 07:19:24 2011
SSv3_default_rebuild.dat
# Number of sexes
2
# Age range to consider (minimum age; maximum age)
0 45
# Number of fleets
1
# First year of projection (Yinit)
2011
# First Year of rebuilding period (Ydecl)
2001
# Number of simulations
1500
# Maximum number of years
500
# Conduct projections with multiple starting values (0=No;else yes)
0
# Number of parameter vectors
1000
# Is the maximum age a plus-group (1=Yes;2=No)
1
# Generate future recruitments using historical recruitments (1)  historical
recruits/spawner (2)  or a stock-recruitment (3)
3
# Constant fishing mortality (1) or constant Catch (2) projections
1
# Fishing mortality based on SPR (1) or actual rate (2)
1
# Pre-specify the year of recovery (or -1) to ignore
-1
# Fecundity-at-age
# 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27
28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 #runnumber: 17
darkblotched_data.SS darkblotched_control.SS 3877.53 29168.1 8807.95
 0 0 3.38911e-07 2.41141e-05 0.000740663 0.0109733 0.0770101 0.258095
0.537726 0.85554 1.16501 1.44637 1.69517 1.91251 2.10101 2.26355 2.40295
2.52191 2.62297 2.70847 2.78056 2.84116 2.89197 2.93448 2.96998 2.99958
3.02423 3.04474 3.06178 3.07594 3.08773 3.09751 3.10562 3.11235 3.11792
3.12254 3.12636 3.12953 3.13216 3.13433 3.13613 3.13762 3.13885 3.13987
3.14072 3.14175 #female fecundity; weighted by N in year Y_init across morphs
and areas
# Age specific selectivity and weight adjusted for discard and discard
mortality
 #wt and selex for gender,fleet: 1 1
 0.0126734 0.0517126 0.12861 0.238447 0.382141 0.513489 0.626987 0.72878
0.824981 0.915562 0.99785 1.07052 1.13359 1.18772 1.23385 1.27292 1.30588
1.33358 1.3568 1.37622 1.39243 1.40594 1.41719 1.42654 1.43431 1.44077
1.44612 1.45056 1.45425 1.4573 1.45983 1.46193 1.46367 1.46511 1.4663 1.46729
1.46811 1.46879 1.46935 1.46981 1.47019 1.47051 1.47078 1.47099 1.47117
1.47139
 0 0.101497 0.10176 0.115559 0.228296 0.497915 0.771901 0.921875 0.976634
0.993066 0.997791 0.999215 0.999685 0.999857 0.999927 0.999959 0.999975
```

```
0.999983 0.999988 0.999991 0.999993 0.999994 0.999995 0.999995 0.999996
0.999996 0.999996 0.999996 0.999996 0.999997 0.999997 0.999997 0.999997
0.999997 0.999997 0.999997 0.999997 0.999997 0.999997 0.999997 0.999997
0.999997 0.999997 0.999997 0.999997 0.999997
 #wt and selex for gender,fleet: 2 1
 0.0126734 0.0517126 0.130084 0.239075 0.376489 0.496587 0.593455 0.673903
0.743014 0.80319 0.854988 0.898771 0.935199 0.965153 0.989571 1.00935 1.02531
1.03813 1.04841 1.05664 1.06321 1.06845 1.07263 1.07596 1.07861 1.08071
1.08239 1.08373 1.08479 1.08563 1.0863 1.08683 1.08726 1.08759 1.08786
1.08807 1.08824 1.08837 1.08848 1.08857 1.08863 1.08869 1.08873 1.08876
1.08879 1.08882
 0 0.101497 0.101792 0.11609 0.218898 0.445125 0.681325 0.837681 0.918977
0.95768 0.97615 0.985376 0.990278 0.993053 0.994717 0.995768 0.99646 0.996933
0.997266 0.997506 0.997683 0.997815 0.997914 0.99799 0.998049 0.998094
0.998129 0.998157 0.998179 0.998196 0.998209 0.99822 0.998228 0.998235
0.99824 0.998244 0.998247 0.99825 0.998252 0.998254 0.998255 0.998256
0.998257 0.998258 0.998258 0.998259
# M and current age-structure in year Yinit: 2011
 # gender = 1
 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07
0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07
0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07
0.07
 1272.03 1167.94 364.764 2149.18 750.897 729.742 893.667 786.08 533.023
251.088 256.226 1231.93 1016.6 170 294.364 170.692 405.5 119.271 37.4855
42.6727 49.9226 31.3269 8.87939 85.1151 63.9416 18.6537 14.1718 12.6261
8.22207 9.39646 26.0009 26.2139 22.3413 7.01104 3.64992 7.28878 8.48755
6.48496 5.85518 5.30185 4.80265 4.3324 3.89432 3.5459 3.19866 28.1168
 # gender = 2
 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07
0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07
0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07
0.07
 1272.03 1167.94 364.764 2149.18 750.886 729.91 895.093 789.126 536.154
252.921 258.311 1242.21 1025.61 171.737 297.986 173.293 413.383 122.307
38.8189 44.6993 52.6414 33.0736 9.37073 89.8746 67.5097 19.6874 14.9898
13.3847 8.7217 9.9794 27.607 27.7464 23.5454 7.35122 3.80728 7.56599 8.76775
6.67072 6.00123 5.41645 4.89692 4.41577 3.97183 3.62061 3.26809 28.7304
# Age-structure at Ydeclare= 2001
 581.004 2867.97 2423.52 417.313 748.685 450.039 1096.67 326.467 103.034
117.438 137.44 86.2551 24.4494 234.368 176.067 51.3641 39.023 34.7669 22.6401
25.8739 71.5954 72.1821 61.5185 19.3054 10.0503 20.0702 23.3711 17.8568
16.1227 14.599 13.2245 11.9296 10.7233 9.76392 8.80775 7.97653 7.12186 6.4004
5.59025 4.70581 3.91046 3.33396 2.95524 2.68569 2.46373 30.2778
 581.004 2867.97 2423.52 417.312 748.649 450.382 1102.56 331.242 105.952
122.464 144.494 90.8731 25.7614 247.161 185.695 54.1607 41.2412 36.8279
23.9988 27.4605 75.9687 76.354 64.7945 20.23 10.4775 20.8214 24.1288 18.3579
16.5155 14.9062 13.4765 12.1523 10.9306 9.96407 8.99392 8.141 7.25773 6.51704
5.71818 4.86642 4.09004 3.49611 3.0754 2.76702 2.51982 30.6187
# Year for Tmin Age-structure (set to Ydecl by SS)
2001
#  recruitment and biomass
# Number of historical assessment years
121
# Historical data
# year recruitment spawner in B0 in R project in R/S project
```

```
1891  1892 1893 1894 1895 1896 1897 1898 1899 1900 1901 1902 1903 1904 1905
1906 1907 1908 1909 1910 1911 1912 1913 1914 1915 1916 1917 1918 1919 1920
1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932 1933 1934 1935
1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950
1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965
1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980
1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995
1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010
2011 #years (with first value representing R0)
3008.31  3008.31 3008.31 3008.31 3008.31 3008.31 3008.31 3008.31 3008.31
3008.31 3008.31 3008.31 3008.31 3008.31 3008.31 3008.31 3008.31 3008.31
3008.31 3008.31 3008.31 3008.31 3008.31 3008.31 3008.31 3008.31 3008.31
3008.31 3008.31 3008.31 3008.31 3008.31 3008.31 3008.31 3008.31 3008.31
3008.31 3008.31 3008.16 3008.01 3007.85 3007.65 3007.53 3007.42 3007.32
3007.21 3007.15 3007.08 3006.99 3006.85 3006.64 3006.37 3006.04 3004.65
3001.51 2995.95 2992.68 2990.05 2988.74 2987.84 2986.87 2985.73 2984.56
2983.74 2982.69 2981.32 2979.15 2976.48 2974.41 2972.94 2970.9 2969.15
2967.21 2965.12 2964.16 2960.96 2910.34 2863.09 2818.35 2817.76 2817.16
2814.09 2810.3 2802.57 3283.93 2504.06 1104.1 1845.14 5044.87 5012.28 4144.35
1228.91 874.632 1091.33 991.471 1061.42 2958.78 3221.37 274.474 787.043
1018.31 703.758 495.805 1295.56 3732.56 1360.93 2056.99 1047.48 5623.94
6151.83 1162.01 1034.41 1997.24 2682.37 2792.16 2099.71 2002.3 5329.93
841.357 2505.26 2544.05 #recruits; first value is R0 (virgin)
29168.1  29168.1 29168 29167.9 29167.8 29167.8 29167.8 29167.8 29167.8
29167.8 29167.8 29167.8 29167.8 29167.8 29167.8 29167.8 29167.8 29167.8
29167.8 29167.7 29167.7 29167.7 29167.7 29167.7 29167.6 29167.6 29167.6
29167.6 29167.5 29167.5 29167.5 29167.4 29167.4 29167.3 29167.3 29167.3
29167.2 29167.2 29149.7 29131.3 29111.3 29086.8 29072.4 29058.7 29046.6
29033.1 29025.9 29017.2 29006.5 28989.2 28963.9 28930.7 28891.8 28724.3
28353.8 27719.2 27358.2 27073.3 26933.8 26838.6 26736.6 26617.3 26496.4
26412.6 26305.5 26166.9 25950.1 25687.6 25488.5 25347.3 25155.4 24992.2
24813.6 24624 24538.2 24254.6 20448.6 17758.5 15734.3 15710.5 15686.1 15562.6
15412.6 15113.7 14907.8 14892.1 14822.9 15072.5 15222.8 15105.5 15116.8
14887.6 14374.1 13800.5 13048.6 12019 11602 10296.4 9492.7 8836.37 7694.64
6848.3 6460.68 5734.83 5345.23 5002.25 4630.15 4137.72 3506.31 3353.75
3261.53 3383.17 3609.7 3946.65 4362.89 5057.64 5910.63 6766.18 7568.02
8231.42 8807.95 #spbio; first value is SPB_virgin (virgin)
1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0  # in Bzero
0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1  0 0 0 # in R project
0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1  0 0 0 # in R/S project
# Number of years with pre-specified catches
2
# catches for years with pre-specified catches go next
2011 298
2012 296
# Number of future recruitments to override
11
```

```
# Process for overiding (-1 for average otherwise index in data list)
2001 1 2001
2002 1 2002
2003 1 2003
2004 1 2004
2005 1 2005
2006 1 2006
2007 1 2007
2008 1 2008
2009 1 2009
2010 1 2010
2011 1 2011
# Which probability to product detailed results for (1=0.5; 2=0.6; etc.)
3
# Steepness sigma-R Auto-correlation
0.76 0.8 0
# Target SPR rate (FMSY Proxy); manually change to SPR_MSY if not using
SPR_target
0.5
# Discount rate (for cumulative catch)
0.1
# Truncate the series when 0.4B0 is reached (1=Yes)
0
# Set F to FMSY once 0.4B0 is reached (1=Yes)
0
# Maximum possible F for projection (-1 to set to FMSY)
-1
# Defintion of recovery (1=now only;2=now or before)
2
# Projection type
11
# Definition of the 40-10 rule
10 40
# Calculate coefficients of variation (1=Yes)
0
# Number of replicates to use
10
# Random number seed
-99004
# File with multiple parameter vectors
rebuild.SSO
# User-specific projection (1=Yes); Output replaced (1->9)
0  5
# Catches and Fs (Year; 1/2/3 (F or C or SPR); value); Final row is -1
2013 1 1
-1 -1 -1
# Fixed catch project (1=Yes); Output replaced (1->9); Approach (-1=Read in
else 1-9)
0 2 -1
# Split of Fs
2011  1
-1  1
# Yrs to define T_target for projection type 4 (a.k.a. 5 pre-specified
inputs)
0.607 0.649 0.649 0.621 0.5
# Year for probability of recovery
```

```
2014 2018 2022 2025 2028 2031 2034 2037
# Time varying weight-at-age (1=Yes;0=No)
0
# File with time series of weight-at-age data
none
# Use bisection (0) or linear interpolation (1)
1
# Target Depletion
0.4
# CV of implementation error
0
```

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DRAFT 2011 petrale sole rebuilding analysis

Melissa A. Haltuch
National Marine Fisheries Service
Northwest Fisheries Science Center
2725 Montlake Blvd. E.
Seattle WA, 98112
206-302-2447 (phone)
206-860-6792 (fax)
Melissa.Haltuch@noaa.gov

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Summary

Based on the 2011 stock assessment, this rebuilding analysis compares the results of applying a suite of potential future management actions to the U.S. petrale sole stock. The 2011 base case assessment results estimate that the petrale sole resource is at 18% of the unexploited equilibrium spawning biomass at the beginning of 2011. This is an increase from the 2009 petrale sole stock assessment, which estimated depletion in 2009 to be 11.6%. Based on the 2009 stock assessment, the 2010 coast-wide ACL was reduced to 1,200 mt to reflect the overfished status of the stock and the 2011 coast-wide OFL and ACL were set at 1,021 mt and 976 mt, respectively. The 2012 ACL is set at the current proposed level of 1,279 mt. The distributions of catches between each fishing fleet are those from the 2011 stock assessment. Beginning in 2011, various management options are considered ranging from zero fishing mortality to the largest removal that could occur without overfishing (OFL catches). In the absence of fishing mortality from 2013 forward, the petrale sole stock is projected to have a 75% probability of recovery to the rebuilding target (*SB25%*) by 2013, similar to the 2009 petrale sole rebuilding analysis. If the OFL catches were removed (in 2011 and 2012) the stock is not projected to reach the rebuilding target until 2014, which is earlier than the year estimated in the 2009 rebuilding analysis. The 25:5, *F30%*, control rule (the OFL since the stock is estimated over 25% depletion in 2013) produces an ACL of 2711 mt in 2013 and has a 75% probability of rebuilding by 2013 and a 100% probability of recovery by 2014. A range of alternate management approaches to recovery are presented. All of the rebuilding alternatives, except for the SPR=0.2 alternatives, suggest that the petrale sole stock will rebuild before the T_{TARGET} year of 2016 with 100% probability. Note that the SPR=0.2 option is not a viable management option but is presented for comparison as estimates of Fmsy for flatfish have been just over SPR=0.2. Assuming 2012 catch equal to the current 2012 ACL is projected to allow the petrale stock to increase in 2013. The projected stock increase is due to a large 2007 recruitment entering the spawning biomass as well as a slightly more optimistic estimate of stock status resulting from the influence of the standardized winter CPUE indices in the 2011 stock assessment.

Introduction

The 2009 coast-wide petrale sole stock assessment documented that the stock had declined below the overfished level, as defined by the control rule applied to petrale sole at that time (40:10 rule), during the early 1950s and had remained below this through 2010 (Haltuch and Hicks 2009). Given the relatively high productivity of flatfish stocks the PFMC implemented a new control rule for all council managed flatfish stocks (25:5 control rule) during 2009. This generalized flatfish proxy control rule resulted in an overfished declaration for petrale sole during 2009 and the first rebuilding plan for petrale sole was completed (Haltuch and Hicks 2009a). This is the second rebuilding analysis for petrale sole and was completed during August 2011 using version 3.12b running 1000 simulations.

2011 Assessment summary

As with the 2009 petrale sole stock assessment, the current 2011 model is implemented as a single-area model. The current assessment has been upgraded to the newest version of SS (3.21d). Substantive changes from the 2009 petrale sole stock assessment are detailed below. The 2009 model was split into two seasons, winter (Nov.-Feb.) and summer (Mar.-Oct.) due to the timing of the fisheries and the shift over time toward fishing in the winter on spawning aggregations. Hence, the fishing year defined within the model is offset by two months from the calendar year. Early SS models did not allow the specification of catches from different

fleets to take place at different times of the year so a seasonal model was implemented. More recent SS versions allow the timing of the catches from each fleet to be specified at the correct time. Therefore, the 2011 model is a 12-month model with removals from fishery catch assigned to the appropriate season, as defined above. In transitioning from the seasonal to the 12-month model, the STAT verified that the two model configurations give essentially the same results using the data available in 2009. The ageing-error analysis has been updated to reflect the inter-lab comparison between the CAP and the WDFW. This analysis was conducted using data from additional ageing of otoliths included in the bomb radiocarbon age-validation study, as well as new break-and-burn double-reads provided by the CAP aging lab. The aging analysis has also been improved through the incorporation of new triple-read age data.

Major choices in the structuring of this stock assessment model include a seasonal fleet structure for each state, splitting the triennial survey into an early and late time period, and estimating selectivity and retention curves for each fleet. The seasonal fleet structure is used due to higher winter catches in recent decades. The fisheries are divided into WA-Winter, WA-Summer, OR-Winter, OR-Summer, CA-Winter, and CA-Summer fisheries. The model includes catch, length- and age-frequency data from the trawl fleets described above as well as standardized winter CPUE indices from 1987-2009 developed for the 2011 stock assessment. Biological data are derived from both port and on-board observer sampling programs. The National Marine Fisheries Service (NMFS) triennial bottom trawl survey (1980, 1983, 1986, 1989, 1992, 1995, 1998, 2001, and 2004) and Northwest Fisheries Science Center (NWFSC) trawl survey (2003–2010) relative biomass indices and biological sampling provide fishery independent information on relative trend and demographics of the petrale sole stock.

Petrale sole were lightly exploited during the early 1900s but by the 1950s the fishery was well developed and showing clear signs of depletion and declines in catches and biomass. The rate of decline in spawning biomass accelerated through the 1930s–1960s reaching minimums generally around or below 10% of the unexploited levels during the 1980s and 1990s. The petrale sole spawning stock biomass is estimated to have increased from its lowest estimated levels during the early 1990s, peaking in 2005, in response to above average recruitment. However, this increasing trend has reversed during 2005-2010 and the stock has been declining, due to strong year classes having passed through the fishery. Since 2010 the total biomass of the stock has increased slightly as a large 2007 recruitment appears to be moving into the population. Note that these fish are not yet fully mature so this increase is not strongly reflected in the spawning biomass. The estimated base model relative depletion level in 2011 is 18% (~95% asymptotic interval: ±3.6%, ~ 75% interval based on the range of states of nature: 15.1-21.4%), corresponding to 4,720 mt (~95% asymptotic interval: ±493 mt, states of nature interval: 4,440-5,052 mt) of female spawning biomass in the base model. The base model indicates that the spawning biomass has been below 25% of the unfished level since 1956. Unfished spawning stock biomass was estimated to be 26,278 mt in the base case model. The target stock size ($SB_{25\%}$) is therefore 6,570 mt which gives a catch of 2,578 mt. The 2011 stock assessment produced slightly more optimistic estimate of stock status, in comparison to the 2009 stock assessment, due to the use of the standardized winter CPUE indices.

Two alternative states of nature were presented as a decision table (Table 1), with the relative probabilities of each state of nature, 25%, based on the value for female natural mortality. Landings in 2011–2012 in the decision table are 976 mt and 1160 mt for all cases. Selectivity and fleet allocations are projected based the average 2009-2010 values. The low female M (0.13) state of nature projects the spawning stock depletion to increase beyond the target stock size of 25% of the unfished spawning biomass in 2014, one year later than the base

case model. The high female M (0.19) state-of-nature forecasts the petrale sole stock to be above the 25% of unfished spawning biomass target in 2013.

Important changes in the 2011 assessment included:

1. An annual model with removal of catches at during the winter and summer seasons

2. A new inter-lab ageing-error analysis and use of triple read otolith data

3. Inclusion of standardized commercial winter CPUE analyses from 1987-2009 for each fleet

4. Inclusion of a new, wider, prior on M (O. Hamel pers. comm.)

Management performance under rebuilding

This is the second rebuilding plan for petrale sole. Management actions implemented under the first rebuilding plan, completed during 2009, reduced the 2010 coast-wide ACL to 1,200 mt to reflect the overfished status of the stock and the 2011 coast-wide OFL and ACL were set at 1,021 mt and 976 mt, respectively. Since 2010 the total biomass of the stock has increased slightly as a large 2007 recruitment appears to be moving into the population. Note that these fish are not yet fully mature so this increase is not strongly reflected in the spawning biomass. However as the 2007 year class matures the size of the stock should continue to increase. The estimated base model relative depletion level in 2011 is 18% (~95% asymptotic interval: ±3.6%, ~ 75% interval based on the range of states of nature: 15.1-21.4%).

Rebuilding calculations

This rebuilding analysis was conducted using software developed by A. Punt (version 3.12b, January 2010). The steps followed were:

1. Define how virgin biomass (*SB0*) will be calculated.

2. Define how future recruitment will be generated.

3. Define the fishery selectivity and allocation to be applied during rebuilding.

4. Decide how to include uncertainty in input parameters from the stock assessment in the rebuilding analysis.

5. Calculate rebuilding reference points from the most current assessment results

    a) Calculate the projected year in which the stock would rebuild with a 50% probability if all future fishing mortality was eliminated (TF=0).

    b) Calculate the projected year for a 50% probability of rebuilding from the year in which the stock was first declared overfished (TMIN).
    c) Calculate the mean generation time.
    d) Calculate the maximum allowable rebuilding time (TMAX).

6. Identification and analysis of alternative harvest strategies for rebuilding.

1. Definition of SB0

The equilibrium spawning biomass level (*SB0*) used in this rebuilding analysis is calculated via the stock-recruitment relationship in order to be consistent with assessment model results. This level is estimated to be 26,278 mt in the base case assessment model, which dictates that the rebuilding target ($SB_{25\%}$) is 6,570 mt (Table 2).

2. Generation of future recruitment

The parameters of the stock recruitment relationship, unexploited equilibrium recruitment, the natural log of *R0*, steepness, *h*, and the degree of recruitment variability, σr,, from the 2011 stock assessment are used to generate future recruitments in the rebuilding analysis. The base model values are 16,512, 0.86, and 0.4 for *R0*, *h*, and, σr, respectively. The values for the high state of nature are 22,791, 0.8, and 0.4 for *R0*, *h*, and, σr,, respectively. The values for the low state of nature are 11,838, 0.93, and 0.4 for *R0*, *h*, and, σr,, respectively. Projections in Stock Synthesis do not include recruitment variability while the rebuilding analysis does include recruitment variability.

3. Fishery selectivity and allocation

In order to project the effect of fishing on the petrale sole rebuilding trajectory, it is necessary to specify the fishery selectivity and relative allocation among fleets. This analysis produces projections that use the selectivity from 2010 and the average allocation from 2009-2010. This allocation choice was made to capture any changes in the fraction of the catch coming from each state due to changes in fishing opportunities during the last 2 years. This choice is consist with the assessment model results.

4. Inclusion of uncertainty

The calculation of T_{MIN} and the evaluation of alternative harvest strategies within the rebuilding software involve projecting the population ahead taking account of uncertainty about future recruitment. Model and parameter uncertainty are included in this rebuilding analysis by including the two alternative states of nature from the 2011 stock assessment, based on identifying low (0.13) and high values (0.19) for the value of female natural mortality. The base model is given 50% of the weight and each alternative state of nature is given 25% of the weight.

5. Calculate reference points

The 2011 ACL is set at 976 mt. The 2012 ACL is set at 1,160 mt based on the 25:5 flatfish control rule. The distributions of catches between each fishing fleet are set to the average from 2009-2010. Recovery in the absence of fishing (TF=0) was calculated by setting fishing mortality to zero in 2011 for all projections. The value for TF=0 is 2014. The value for TMIN, the median year for rebuilding to the target level in the absence of fishing since the first year catches can be set to zero (2011) is 2013. All of the rebuilding alternatives, except for the SPR=0.2 and SPR that produces 50% probability of recovery by TMID alternatives, suggest that the petrale sole stock will rebuild before the TTARGET year of 2016. This calculation reflects a period of below average recruitments during the 2000s and a strong 2007 recruitment moving into the spawning biomass. The estimated generation time is 14 years. In conjunction with TMIN, the mean generation time generally dictates the estimate of TMAX, unless the stock can rebuild within 10 years of TMIN. Petrale sole are able to rebuild to the target biomass within ten years, so TMAX is 2021. All reference points from the rebuilding analysis are summarized in Table 2.

6. Alternate rebuilding strategies

Assuming that a constant rate of harvest will be applied throughout a rebuilding period, the basis for rebuilding alternatives can be divided into two approaches: 1) strategies based on selection of a harvest rate (SPR rate), or 2) strategies based selection of a TTARGET (year for 50% probability of recovery). This rebuilding analysis presents 5 alternate strategies spread among the approaches based on the selection of a harvest rate. Alternatives 1-5 correspond to requests made in the PFMC terms of reference for rebuilding analysis. A sixth alternative that corresponds to a range of years between TMIN and TMAX that produce 50% probability of recovery given the control rule was also explored. Due to the short time frame in which the petrale sole stock can rebuild, specifying years for which the probability of recovery is 50% were redundant with the range of harvest rates evaluated. Therefore these runs are not included this final document.

Specifically, the alternatives are:

1) Apply the SPR:
    a. 0.20
    b. 0.30
    c. 0.40
    d. 0.50
    e. 0.60
2) Eliminate all harvest beginning in 2011 (F=0).
3) Apply the ACL and 25:5 control rule.
4) Apply the OFL.

Results

Summary results from the rebuilding alternatives are presented in Table 3. Detailed results are presented in Tables 4-6 and Figures 1-3. In the absence of any future fishing mortality, the petrale sole stock is projected to have a 25% probability of recovery to the rebuilding target (*SB25%*) by 2012 and a 75% probability of rebuilding by 2013. The stock is also projected to reach these levels in 2012 and 2013 if the OFL catches are removed (Table 3). These two scenarios bound the range of fishing mortality between none and the overfishing level. All other scenarios lie within this range. The more aggressive, SPR=0.2 catches, in comparison to the current 25:5 control rule, are not a viable management option but are presented in this rebuilding plan because it is analogous to the harvest policy that would be set using the species specific estimates of reference points from the stock assessment. However, all catch options recover the stock on or before 2016 with a 75% probability of recovery due to the strong 2007 recruitment maturing into the spawning biomass. If catches are set at using the 25:5 control rule in 2013 the fishery the OFL and ACL are the same, 2711 mt, because the stock is projected to recover with greater than 50% probability in 2013. Conversely, a less aggressive harvest policy, e.g. the SPR = 0.5 alternative, sets annual catches at 1265 mt in 2013 and 1432 mt in 2014.

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Tables

Table 1. Forecasts from SS3 using the 25-5 control rule for the base model and alternative states of nature given.

			State of nature					
			Female M=0.13		Base case Female M estimated = 0.16		Female M=0.19	
Relative probability			0.25		0.5		0.25	
Management decision	Year	Catch (mt)	Depletion	Spawning biomass (mt)	Depletion	Spawning biomass (mt)	Depletion	Spawning biomass (mt)
25-5 catches (= OFL here) from base case	2013	2,766	24.1%	7,085	28.0%	7,361	32.6%	7,689
	2014	2,831	25.7%	7,547	29.6%	7,791	34.1%	8,039
	2015	2,799	25.9%	7,614	29.7%	7,803	33.7%	7,942
	2016	2,725	25.5%	7,481	29.0%	7,614	32.4%	7,653
	2017	2,603	24.9%	7,304	28.2%	7,403	31.3%	7,372
	2018	2,653	24.4%	7,184	27.6%	7,248	30.6%	7,212
	2019	2,575	24.0%	7,048	27.3%	7,165	30.1%	7,095
	2020	2,565	23.7%	6,975	27.2%	7,135	30.0%	7,073
	2021	2,563	23.6%	6,922	27.1%	7,133	30.0%	7,083
	2022	2,564	23.4%	6,878	27.2%	7,141	30.1%	7,099

Table 2. Summary of rebuilding reference points.

Parameter	2009 rebuilding analysis	2011 rebuilding analysis
SB0	25,334	26,278
Rebuilding target (*SB25%*)	6,334	6,570
SB2009 or 2011	2,938	4,720
SPR2009 or 2011	0.10	0.46
Year rebuilding begins	2011	2011
Present year	2009	2011
TMIN	2013-2014[a]	2013
Mean generation time	16	14
TMAX	2021	2021
TF=0 (beginning in 2011)	2013-2014 [a]	2013
PMAX	**NA**	**NA**
TTARGET	2016	2016
SPRTARGET	**NA**	**NA**

[a] A range of years are presented because the 2009 rebuilding analysis evaluated a range of alternative catch options for 2010, prior to the stock being declared overfished in 2011.

Table 3. Results of rebuilding alternatives based on Council requests. ACLs for 2013 and 2014 were obtained by a stepwise discounting the 2013 and 2014 OFL catches obtained using the 25-5 control rule catches and discounting them by the Pstar buffer (4.4%).

	Run #							
	SPR= 0.2	SPR= 0.3	SPR= 0.4	SPR= 0.5	SPR= 0.6	F=0	25-5 rule	OFL Rule
2013 AC (mt)	4286	2711	1831	1265	867	0	2711	2711
2013 OFL (mt)	2711	2711	2711	2711	2711	2711	2711	2711
2014 AC (mt)	3888	2774	1994	1432	1008	0	2774	2774
2014 OFL (mt)	2463	2774	2948	3061	3141	3315	2774	2774
50% prob.	2013	2013	2013	2013	2013	2013	2013	2013
Recovery by:								
SPR_{TARGET}	0.20	0.30	0.40	0.50	0.60	1.00	0.30	0.30
Probability of recovery (%) by reference points:								
$T_{F=0}$ from 2011 (2013)	75	75	75	75	75	75	75	75
T_{MIN} (2013)	75	75	75	75	75	75	75	75
T_{TARGET}(2016)	75	100	100	100	100	100	100	100
T_{MAX} (2021)	75	100	100	100	100	100	100	100

Table 4. Probability of recovery for rebuilding alternatives.

	SPR= 0.2	SPR= 0.3	SPR= 0.4	SPR= 0.5	SPR= 0.6	F=0	25-5 rule	OFL Rule
2011	0	0	0	0	0	0	0	0
2012	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
2013	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
2014	0.75	1	1	1	1	1	1	1
2015	0.75	1	1	1	1	1	1	1
2016	0.75	1	1	1	1	1	1	1
2017	0.75	1	1	1	1	1	1	1
2018	0.75	1	1	1	1	1	1	1
2019	0.751	1	1	1	1	1	1	1
2020	0.751	1	1	1	1	1	1	1
2021	0.754	1	1	1	1	1	1	1
2022	0.756	1	1	1	1	1	1	1
2023	0.759	1	1	1	1	1	1	1
2024	0.759	1	1	1	1	1	1	1
2025	0.759	1	1	1	1	1	1	1
2026	0.761	1	1	1	1	1	1	1
2027	0.762	1	1	1	1	1	1	1
2028	0.763	1	1	1	1	1	1	1
2029	0.766	1	1	1	1	1	1	1
2030	0.767	1	1	1	1	1	1	1
2031	0.769	1	1	1	1	1	1	1
2032	0.772	1	1	1	1	1	1	1
2033	0.772	1	1	1	1	1	1	1
2034	0.775	1	1	1	1	1	1	1
2035	0.775	1	1	1	1	1	1	1

Table 5. Median spawning biomass (mt) for rebuilding alternatives.

	SPR= 0.2	SPR= 0.3	SPR= 0.4	SPR= 0.5	SPR= 0.6	F=0	25-5 rule	OFL Rule
2011	4720	4720	4720	4720	4720	4720	4720	4720
2012	5938	5938	5938	5938	5938	5938	5938	5938
2013	7353	7353	7353	7353	7353	7353	7353	7353
2014	6948	7777	8241	8540	8750	9208	7777	7777
2015	6290	7783	8703	9329	9784	10820	7783	7783
2016	5654	7594	8905	9845	10553	12240	7594	7594
2017	5180	7370	8983	10201	11151	13522	7370	7370
2018	4911	7212	9048	10499	11670	14739	7212	7212
2019	4820	7174	9157	10798	12165	15847	7174	7174
2020	4781	7152	9259	11057	12583	16873	7152	7152
2021	4727	7159	9360	11291	12964	17829	7159	7159
2022	4658	7133	9420	11462	13288	18705	7133	7133
2023	4577	7083	9447	11595	13532	19471	7083	7083
2024	4532	7100	9514	11740	13766	20147	7100	7100
2025	4493	7089	9541	11835	13966	20808	7089	7089
2026	4456	7086	9618	11966	14191	21440	7086	7086
2027	4446	7108	9672	12090	14371	22045	7108	7108
2028	4423	7072	9670	12161	14504	22489	7072	7072
2029	4459	7125	9703	12225	14632	23001	7125	7125
2030	4423	7148	9797	12324	14797	23453	7148	7148
2031	4366	7083	9731	12324	14800	23697	7083	7083
2032	4353	7059	9692	12272	14830	23985	7059	7059
2033	4339	7051	9726	12303	14860	24208	7051	7051
2034	4341	7056	9714	12364	14909	24366	7056	7056
2035	4305	7047	9712	12367	14985	24562	7047	7047

Table 6. Median catches (mt) for rebuilding alternatives.

	SPR= 0.2	SPR= 0.3	SPR= 0.4	SPR= 0.5	SPR= 0.6	F=0	25-5 rule	OFL Rule
2011	976	976	976	976	976	0	976	976
2012	1160	1160	1160	1160	1160	0	1160	1160
2013	4286	2711	1831	1265	867	0	2711	2711
2014	3888	2774	1994	1432	1007	0	2774	2774
2015	3471	2738	2081	1548	1116	0	2738	2738
2016	3127	2660	2118	1624	1197	0	2660	2660
2017	2880	2585	2133	1678	1260	0	2585	2585
2018	2751	2525	2139	1720	1314	0	2525	2525
2019	2687	2486	2149	1752	1358	0	2486	2486
2020	2651	2476	2163	1787	1396	0	2476	2476
2021	2630	2473	2178	1813	1430	0	2473	2473
2022	2597	2473	2192	1836	1458	0	2473	2473
2023	2575	2467	2204	1863	1484	0	2467	2467
2024	2544	2478	2218	1889	1515	0	2478	2478
2025	2530	2490	2245	1913	1541	0	2490	2490
2026	2512	2476	2249	1932	1561	0	2476	2476
2027	2498	2464	2247	1936	1575	0	2464	2464
2028	2499	2471	2261	1949	1594	0	2471	2471
2029	2483	2474	2270	1961	1601	0	2474	2474
2030	2473	2466	2268	1972	1613	0	2466	2466
2031	2456	2453	2262	1975	1620	0	2453	2453
2032	2443	2459	2263	1969	1622	0	2459	2459
2033	2446	2449	2273	1978	1625	0	2449	2449
2034	2434	2439	2257	1976	1631	0	2439	2439
2035	2438	2457	2259	1971	1627	0	2457	2457

Figures

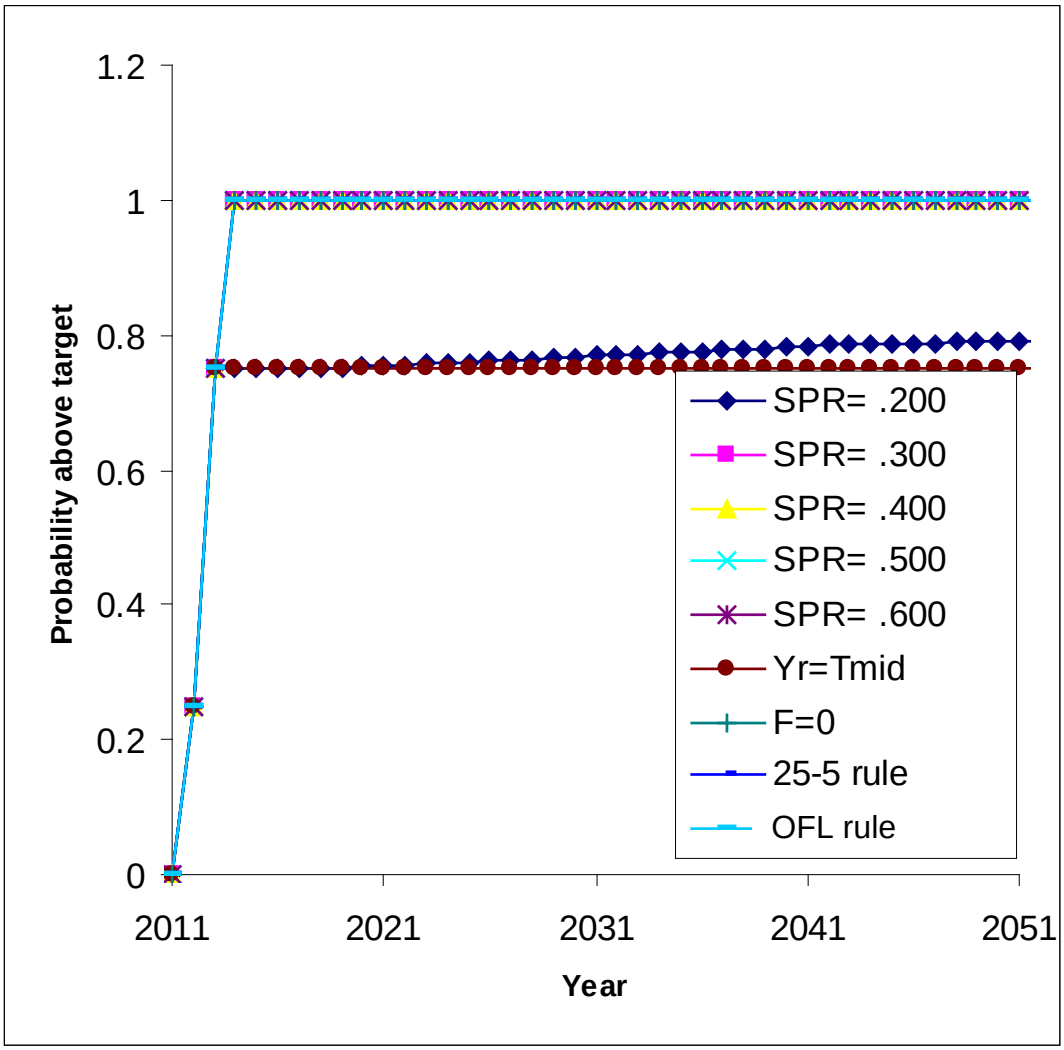

Figure 1. Probability of recovery for rebuilding alternatives.

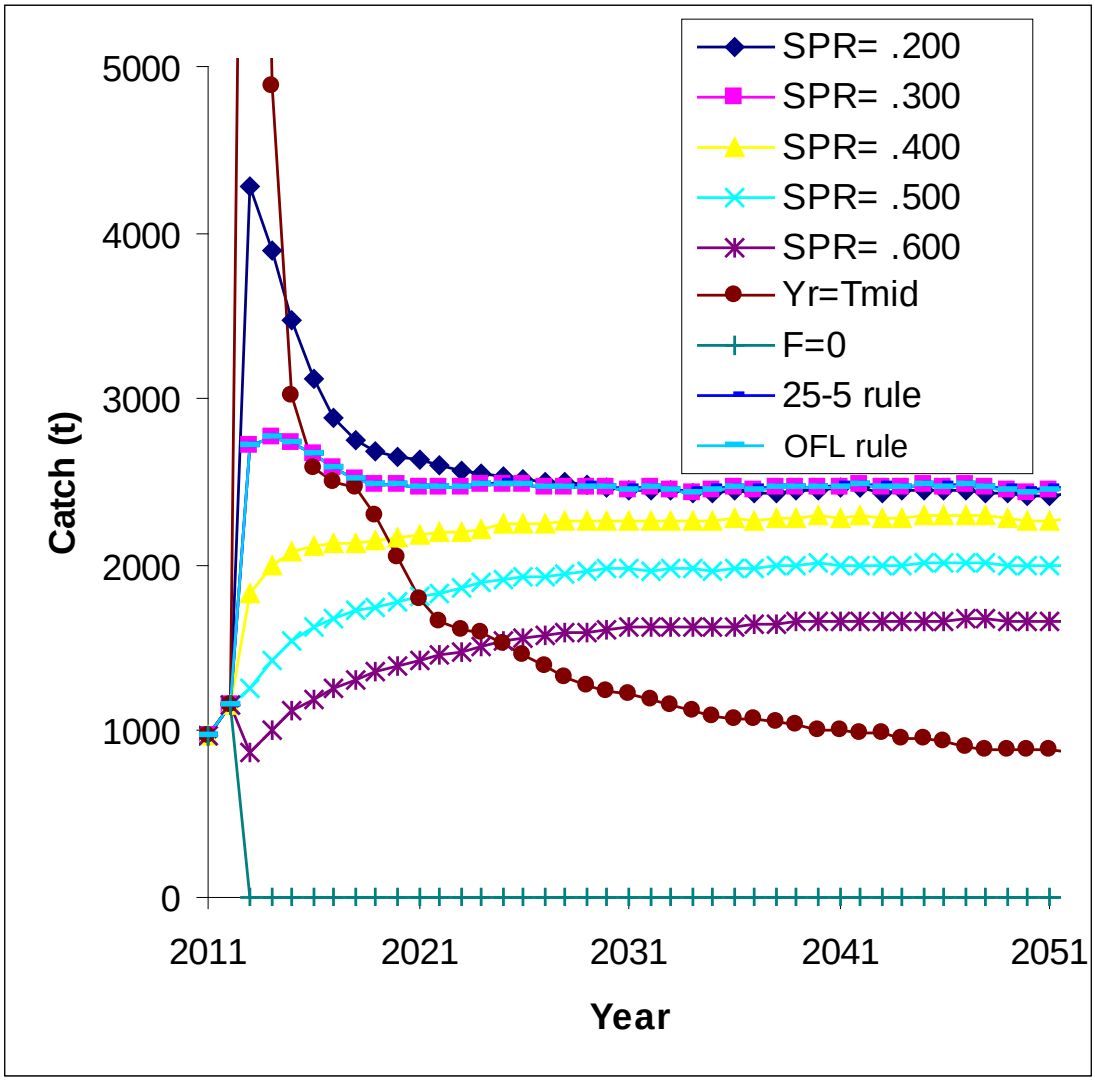

Figure 2. Projected median catch (mt) for rebuilding alternatives.

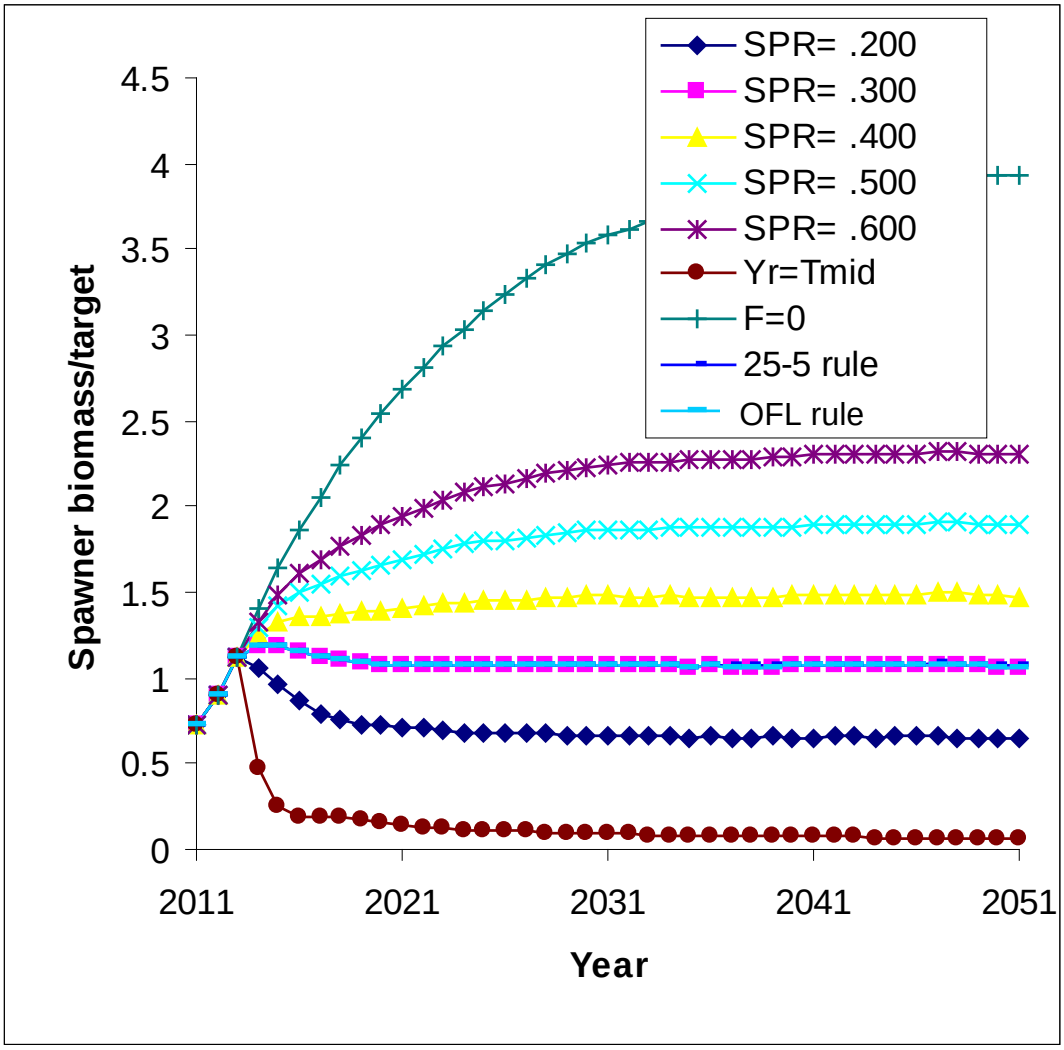

Figure 3. Projected median spawning biomass (mt) for rebuilding alternatives.

Appendix A. Basic input file for rebuilding analyses.

Rebuild.dat for 2011 petrale rebuiding

Petrale.SSv3.21d

Number of sexes

2

Age range to consider (minimum age; maximum age)

0 40

Number of fleets to consider

6

First year of projection (Yinit)

2011

First year the OY could have been zero under a rebuilding plan (Ydecl)

2011

Number of simulations

1000

Maximum number of years

200

Conduct projections for multiple starting values (0=No;else yes)

1

Number of parameter vectors

4

Is the maximum age a plus-group (1=Yes;2=No)

1

Generate future recruitments using historical recruitments (1), historical recruits/spawner (2), or a stock-recruitment (3)

3

Constant fishing mortality (1) or constant Catch (2) projections

1

Fishing mortality based on SPR (1) or actual rate (2)

1

Pre-specify the year of recovery (or -1) to ignore

-1

Fecundity-at-age

A blank comment line - needed for the program to run

0 0 0 0.000404698 0.0142813 0.110109 0.323594 0.568753 0.787322 0.978911 1.1519 1.30951 1.45221 1.58006 1.69342 1.79303 1.87988 1.95515 2.02003 2.07573 2.12337 2.16399 2.19856 2.22791 2.25278 2.27383 2.29163 2.30666 2.31935 2.33004 2.33906 2.34665 2.35305 2.35843 2.36296 2.36677 2.36998 2.37267 2.37494 2.37684 2.3794 #female fecundity; weighted by N in year Y init across morphs and areas

wgt and sel by gender/fleet

#wt and selex for gender,fleet: 1 1

0.0165014 0.0615514 0.124015 0.230992 0.375638 0.539983 0.713506 0.887565 1.05579 1.214 1.35991 1.49264 1.61219 1.71903 1.81382 1.89738 1.97054 2.03424 2.08941 2.13695 2.17777 2.21268 2.24247 2.26782 2.28934 2.30759 2.32303 2.33609 2.34712 2.35643 2.36428 2.37089 2.37647 2.38116 2.38511 2.38843 2.39123 2.39358 2.39556 2.39723 2.39945 #bodywt for gender,fleet: 1 / 1

0 2.46475e-005 0.000267763 0.00278136 0.0166333 0.0579419 0.138145 0.252507 0.383229 0.51083 0.622187 0.712081 0.780978 0.832126 0.869472 0.896593 0.916333 0.930807 0.941529 0.949565 0.955663 0.960345 0.963981 0.966833 0.969093 0.970897 0.972348 0.973524 0.97448 0.975263 0.975905 0.976435 0.976873 0.977236 0.977537 0.977788 0.977997 0.978172 0.978317 0.978439 0.978601 #selex for gender,fleet: 1 / 1

#wt and selex for gender,fleet: 1 2

0.0374549 0.0546126 0.0935754 0.180345 0.3106 0.46605 0.63511 0.808165 0.977947 1.13959 1.29031 1.42878 1.5545 1.66745 1.76795 1.85658 1.93413 2.00152 2.05976 2.10984 2.15274 2.18936 2.22054 2.24704 2.2695 2.28853 2.30461 2.3182 2.32967 2.33935 2.3475 2.35437 2.36016 2.36502 2.36912 2.37257 2.37547 2.37791 2.37996 2.38169 2.38399 #bodywt for gender,fleet: 1 / 2

0 0.00113364 0.00800745 0.0374882 0.111084 0.230855 0.378656 0.528148 0.659047 0.762174 0.837401 0.889422 0.924231 0.947159 0.962232 0.972218 0.978931 0.983526 0.986735 0.989023 0.990686 0.991917 0.992843 0.993552 0.994101 0.994531 0.994871 0.995143 0.995362 0.99554 0.995685 0.995803 0.9959 0.995981 0.996047 0.996102 0.996148 0.996186 0.996218 0.996244 0.996279 #selex for gender,fleet: 1 / 2

#wt and selex for gender,fleet: 1 3

0.00729218 0.0214877 0.117408 0.316548 0.450389 0.583696 0.717019 0.850322 0.986007 1.12501 1.2647 1.40041 1.52779 1.6441 1.74819 1.84003 1.92022 1.98973 2.04961 2.10098 2.14488 2.18229 2.21409 2.24108 2.26394 2.28328 2.29962 2.31342 2.32506 2.33487 2.34314 2.3501 2.35597 2.3609 2.36505 2.36855 2.37149 2.37396 2.37603 2.37778 2.38012 #bodywt for gender,fleet: 1 / 3

0 3.43954e-005 7.66638e-005 0.00150953 0.0217232 0.116884 0.320272 0.565608 0.762718 0.883058 0.945064 0.974278 0.987609 0.993735 0.996638 0.998078 0.998828 0.999241 0.99948 0.999625 0.999717 0.999778 0.999819 0.999848 0.999869 0.999885 0.999896 0.999905 0.999912 0.999918 0.999922 0.999926 0.999928

0.999931 0.999933 0.999934 0.999935 0.999936 0.999937 0.999938 0.999939 #selex for gender,fleet: 1 / 3

#wt and selex for gender,fleet: 1 4

0.00947379 0.0377057 0.0960571 0.193374 0.322882 0.470994 0.628695 0.789002 0.948079 1.10377 1.25367 1.39492 1.5251 1.64277 1.74751 1.83967 1.92003 1.98962 2.04955 2.10094 2.14485 2.18227 2.21408 2.24107 2.26393 2.28328 2.29962 2.31342 2.32506 2.33487 2.34314 2.35011 2.35597 2.3609 2.36506 2.36855 2.37149 2.37396 2.37603 2.37778 2.38012 #bodywt for gender,fleet: 1 / 4

0 0.00158801 0.00743421 0.0407599 0.1444 0.325372 0.53736 0.721552 0.848988 0.923481 0.962375 0.981445 0.990591 0.995011 0.997207 0.998343 0.998958 0.999307 0.999514 0.999643 0.999726 0.999782 0.99982 0.999848 0.999868 0.999883 0.999894 0.999903 0.99991 0.999915 0.999919 0.999923 0.999926 0.999928 0.99993 0.999931 0.999932 0.999933 0.999934 0.999935 0.999936 #selex for gender,fleet: 1 / 4

#wt and selex for gender,fleet: 1 5

0.0364557 0.0703322 0.123728 0.221597 0.352868 0.500398 0.655164 0.810941 0.964856 1.11568 1.26162 1.40003 1.52833 1.64483 1.74886 1.84058 1.92066 1.99007 2.04989 2.1012 2.14507 2.18245 2.21423 2.2412 2.26405 2.28338 2.29972 2.31351 2.32514 2.33495 2.34322 2.35018 2.35604 2.36097 2.36513 2.36862 2.37155 2.37402 2.3761 2.37785 2.38018 #bodywt for gender,fleet: 1 / 5

0 0.000127587 0.00162748 0.0159113 0.0809651 0.229492 0.438146 0.643129 0.797517 0.893474 0.945955 0.972639 0.985815 0.992336 0.995641 0.997379 0.998332 0.998879 0.999208 0.999414 0.999547 0.999638 0.9997 0.999745 0.999778 0.999803 0.999821 0.999836 0.999847 0.999856 0.999863 0.999869 0.999873 0.999877 0.99988 0.999883 0.999885 0.999886 0.999888 0.999889 0.999891 #selex for gender,fleet: 1 / 5

#wt and selex for gender,fleet: 1 6

0.0208179 0.0662438 0.122389 0.21613 0.339256 0.476562 0.621591 0.772387 0.928526 1.08671 1.24116 1.3866 1.5198 1.63942 1.74537 1.83825 1.91906 1.98892 2.04903 2.10054 2.14454 2.18201 2.21386 2.24088 2.26377 2.28312 2.29948 2.31329 2.32494 2.33476 2.34303 2.35 2.35587 2.3608 2.36496 2.36845 2.37139 2.37387 2.37594 2.37769 2.38003 #bodywt for gender,fleet: 1 / 6

0 0.000302998 0.00358601 0.0334551 0.154387 0.384696 0.639476 0.826322 0.927427 0.971959 0.989383 0.995882 0.998314 0.999259 0.999647 0.999817 0.999898 0.999939 0.99996 0.999973 0.99998 0.999985 0.999988 0.99999 0.999992 0.999993 0.999994 0.999994 0.999995 0.999995 0.999996 0.999996 0.999996 0.999996 0.999996 0.999996 0.999996 0.999996 0.999997 0.999997 0.999997 #selex for gender,fleet: 1 / 6

#wt and selex for gender,fleet: 2 1

0.00565496 0.0182929 0.112606 0.243147 0.352646 0.449335 0.529924 0.595395 0.647829 0.689101 0.720945 0.745063 0.763053 0.776319 0.786018 0.793066 0.798164 0.801841 0.804487 0.806387 0.807751 0.808729 0.809429 0.809931 0.81029 0.810548 0.810732 0.810863 0.810958 0.811025 0.811073 0.811108 0.811133 0.81115 0.811163 0.811172 0.811179 0.811183 0.811186 0.811189 0.811191 #bodywt for gender,fleet: 2 / 1

0 4.46774e-006 1.81516e-005 0.00174253 0.0367481 0.172414 0.376848 0.561294 0.690896 0.773209 0.824213 0.856119 0.876518 0.889868 0.89879 0.904855 0.909034 0.911943 0.913983 0.915421 0.91644 0.917163 0.917677 0.918044 0.918306 0.918493 0.918626 0.918722 0.91879 0.918839 0.918874 0.918898 0.918916 0.918929 0.918938 0.918945 0.918949 0.918953 0.918955 0.918957 0.918958 #selex for gender,fleet: 2 / 1

#wt and selex for gender,fleet: 2 2

0.0316389 0.0536701 0.0904868 0.17214 0.275011 0.372303 0.459105 0.534204 0.596476 0.645915 0.683881 0.712379 0.73345 0.748872 0.760082 0.768193 0.774042 0.77825 0.781273 0.783442 0.784997 0.786111 0.786909 0.78748 0.787889 0.788182 0.788391 0.788541 0.788648 0.788725 0.78878 0.788819 0.788847 0.788868 0.788882 0.788892 0.7889 0.788905 0.788909 0.788911 0.788914 #bodywt for gender,fleet: 2 / 2

0 0.00018455 0.00378204 0.0643947 0.313899 0.624683 0.825335 0.919604 0.959785 0.977322 0.985563
0.989778 0.992107 0.993479 0.99433 0.994878 0.995241 0.995487 0.995656 0.995773 0.995855 0.995913
0.995955 0.995984 0.996004 0.996019 0.99603 0.996037 0.996043 0.996047 0.996049 0.996051 0.996053
0.996054 0.996054 0.996055 0.996055 0.996056 0.996056 0.996056 0.996056 #selex for gender,fleet: 2 / 2

#wt and selex for gender,fleet: 2 3

0.00564638 0.0166484 0.0654793 0.264711 0.349351 0.422715 0.4904 0.55308 0.608148 0.653589 0.689322
0.716532 0.736829 0.751768 0.762666 0.770571 0.77628 0.780392 0.783348 0.785471 0.786993 0.788084
0.788865 0.789425 0.789825 0.790112 0.790317 0.790464 0.790569 0.790644 0.790698 0.790737 0.790764
0.790784 0.790798 0.790808 0.790815 0.79082 0.790824 0.790827 0.790829 #bodywt for gender,fleet: 2 / 3

0 3.29879e-005 5.42951e-005 0.00345134 0.0907147 0.37391 0.665005 0.834485 0.914297 0.950847 0.968445
0.977562 0.982636 0.985638 0.987504 0.988707 0.989505 0.990046 0.990418 0.990677 0.990858 0.990986
0.991076 0.99114 0.991186 0.991219 0.991242 0.991259 0.99127 0.991279 0.991285 0.991289 0.991292
0.991295 0.991296 0.991297 0.991298 0.991299 0.991299 0.991299 0.9913 #selex for gender,fleet: 2 / 3

#wt and selex for gender,fleet: 2 4

0.00564671 0.0166624 0.0499908 0.214538 0.312547 0.394664 0.470411 0.539511 0.598965 0.647141 0.684528
0.712747 0.733674 0.749017 0.760182 0.768264 0.774095 0.778292 0.781307 0.783471 0.785022 0.786133
0.786929 0.787499 0.787907 0.7882 0.788409 0.788558 0.788665 0.788742 0.788797 0.788836 0.788864
0.788884 0.788898 0.788909 0.788916 0.788921 0.788925 0.788928 0.78893 #bodywt for gender,fleet: 2 / 4

0 0.000870445 0.00131472 0.0151975 0.180048 0.517531 0.776638 0.901486 0.953214 0.974862 0.984632
0.989461 0.992058 0.993558 0.994473 0.995056 0.995439 0.995697 0.995874 0.995996 0.996082 0.996142
0.996184 0.996215 0.996236 0.996251 0.996262 0.99627 0.996276 0.99628 0.996283 0.996285 0.996286
0.996287 0.996288 0.996288 0.996289 0.996289 0.996289 0.996289 0.996289 #selex for gender,fleet: 2 / 4

#wt and selex for gender,fleet: 2 5

0.0056514 0.0226429 0.179793 0.245534 0.308238 0.376193 0.451982 0.526248 0.590275 0.641361 0.68045
0.709664 0.731189 0.746904 0.758308 0.766549 0.772487 0.776756 0.779822 0.782021 0.783597 0.784726
0.785535 0.786114 0.786528 0.786825 0.787037 0.787189 0.787298 0.787375 0.787431 0.787471 0.787499
0.78752 0.787534 0.787545 0.787552 0.787557 0.787561 0.787564 0.787566 #bodywt for gender,fleet: 2 / 5

0 2.69375e-006 6.30126e-005 0.0171875 0.269533 0.685677 0.899666 0.968133 0.988321 0.994837 0.997266
0.998312 0.998821 0.999094 0.999253 0.99935 0.999413 0.999454 0.999482 0.999501 0.999514 0.999523
0.99953 0.999534 0.999538 0.99954 0.999542 0.999543 0.999544 0.999544 0.999545 0.999545 0.999545
0.999546 0.999546 0.999546 0.999546 0.999546 0.999546 0.999546 0.999546 #selex for gender,fleet: 2 / 5

#wt and selex for gender,fleet: 2 6

0.00565706 0.0196928 0.127106 0.221972 0.303462 0.380976 0.457861 0.530384 0.592838 0.642979 0.681545
0.710466 0.731821 0.747432 0.758771 0.766969 0.772878 0.777129 0.780181 0.78237 0.78394 0.785065 0.78587
0.786446 0.786859 0.787155 0.787366 0.787517 0.787626 0.787703 0.787758 0.787798 0.787826 0.787847
0.787861 0.787872 0.787879 0.787884 0.787888 0.787891 0.787893 #bodywt for gender,fleet: 2 / 6

0 3.47532e-005 0.000232369 0.0213744 0.248884 0.630027 0.85988 0.948104 0.97848 0.989539 0.99405
0.996125 0.997186 0.997776 0.998128 0.998347 0.99849 0.998585 0.99865 0.998694 0.998725 0.998747
0.998763 0.998773 0.998781 0.998787 0.998791 0.998793 0.998795 0.998797 0.998798 0.998799 0.998799
0.9988 0.9988 0.9988 0.9988 0.9988 0.9988 0.9988 0.9988 #selex for gender,fleet: 2 / 6

Age specific information (Females then males), natural mortality and numbers at age

Females

0.158961 #mean M for year Yinit: 2011 sex: 1

7001.74 5736.2 4528.5 4348.55 7203.2 4132.39 1874.51 1472.83 847.909 651.903 335.175 284.616 164.236 171.649 41.9956 17.8925 11.107 5.37741 2.32556 0.625539 0.361331 0.220257 0.0751811 0.028713 0.00789175 0.00215176 0.0012059 0.00080711 0.00018254 5.42428e-005 2.04172e-005 9.44949e-006 3.72474e-006 1.30399e-006 8.80726e-007 3.90856e-007 1.16194e-007 5.26539e-008 1.89834e-008 9.8574e-009 1.49472e-008 #numbers for year Yinit: 2011 sex: 1

Males

0.177193 #mean M for year Yinit: 2011 sex: 2

7001.74 5632.57 4366.56 4119.1 6704.57 3723.11 1536.5 1024.26 498.531 337.813 158.624 125.01 67.3646 64.6723 14.3195 5.53776 3.1574 1.42678 0.580891 0.147231 0.0814257 0.0481957 0.0155985 0.00530539 0.00129193 0.000326721 0.000177564 0.0001171 2.65534e-005 8.26561e-006 3.38958e-006 1.70565e-006 7.01421e-007 2.67979e-007 2.03457e-007 9.77908e-008 3.0593e-008 1.43202e-008 5.30949e-009 2.83445e-009 4.63691e-009 #numbers for year Yinit: 2011 sex: 2

Age-structure at the start of year Yinit^0

7001.74 5736.2 4528.5 4348.55 7203.2 4132.39 1874.51 1472.83 847.909 651.903 335.175 284.616 164.236 171.649 41.9956 17.8925 11.107 5.37741 2.32556 0.625539 0.361331 0.220257 0.0751811 0.028713 0.00789175 0.00215176 0.0012059 0.00080711 0.00018254 5.42428e-005 2.04172e-005 9.44949e-006 3.72474e-006 1.30399e-006 8.80726e-007 3.90856e-007 1.16194e-007 5.26539e-008 1.89834e-008 9.8574e-009 1.49472e-008 #numbers for year Ydeclare: 2011 sex: 1

7001.74 5632.57 4366.56 4119.1 6704.57 3723.11 1536.5 1024.26 498.531 337.813 158.624 125.01 67.3646 64.6723 14.3195 5.53776 3.1574 1.42678 0.580891 0.147231 0.0814257 0.0481957 0.0155985 0.00530539 0.00129193 0.000326721 0.000177564 0.0001171 2.65534e-005 8.26561e-006 3.38958e-006 1.70565e-006 7.01421e-007 2.67979e-007 2.03457e-007 9.77908e-008 3.0593e-008 1.43202e-008 5.30949e-009 2.83445e-009 4.63691e-009 #numbers for year Ydeclare: 2011 sex: 2

Year Yinit^0 (used to compute the stock size at the start of year Ydecl)

2011

Recruitment and Spanwer biomasses

Number of historical assessment years

137

Historical data: Year, Recruitment, Spawner biomass, Used to compute B0, Used to project based

on R, Used to project based on R/S

1875 1876 1877 1878 1879 1880 1881 1882 1883 1884 1885 1886 1887
1888 1889 1890 1891 1892 1893 1894 1895 1896 1897 1898 1899

1900 1901 1902 1903 1904 1905 1906 1907 1908 1909 1910 1911
1912 1913 1914 1915 1916 1917 1918 1919 1920 1921 1922 1923
1924 1925 1926 1927 1928 1929 1930 1931 1932 1933 1934 1935
1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947
1948 1949 1950 1951 1952 1953 1954 1955 1956 1957 1958 1959
1960 1961 1962 1963 1964 1965 1966 1967 1968 1969 1970 1971
1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983
1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995
1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007
2008 2009 2010 2011 #years (with first value representing R0)

16511.5 16511.5 16511.5 16511.5 16511.5 16511.5 16511.3 16510.9 16510.4 16509.8 16509.1 16508.2
16507.2 16506.2 16505 16503.8 16502.5 16501.2 16499.8 16498.4 16496.9 16495.4 16493.8
16492.2 16490.6 16489 16487.3 16485.6 16483.9 16482.2 16480.4 16478.6 16476.8 16475
16473.2 16471.4 16469.5 16467.6 16465.7 16463.8 16461.9 16459.9 16458.1 16453.7 16451.7
16451.5 16453.5 16454.2 16452.5 16450.7 16447.1 16443.7 16440.7 16435.7 16431.4 16425.6
16421.2 16417 16410.5 16404 16381.2 16359.4 16345.7 16318.8 19579.1 18766.1 17043.9
15070.7 13676.8 13465.8 14491 15328.5 14700.7 13851.8 13067.4 12610.2 12574.1 12957.8
13216.5 13474.6 13513.9 12568.4 10767.8 10581.5 12569.9 17318.3 14827.2 8135.68 11100.7 12985
12836.1 33392.3 10064.2 14327.3 13834.3 13990.5 13916.6 8984.52 8169.25 10387.6 10190.5
14945.6 14541.6 9212.86 11086.8 11491.7 9682.95 9565.49 11555.7 17995.8 9420.96 5939.98
7919.03 10961.5 11484.2 13995 9757.15 7289.35 11955.1 12610.8 12369.3 9871.99 11986.8
26404.8 14070.2 13877.7 9474.25 11027.5 9103.74 10918 10492.1 18697.9 27329.6 14021.1
12447.7 13449 14003.5 #Recruits

26278.1 26278.1 26277.5 26276.8 26276.3 26275.7 26268.3 26254.5 26234.5 26209.1 26178.8 26143.9
26105.1 26062.8 26017.4 25969.2 25918.6 25865.8 25811.2 25755 25697.3 25638.4 25578.3
25517.3 25455.4 25392.8 25329.5 25265.7 25201.3 25136.5 25071.2 25005.6 24939.7 24873.5
24807.1 24740.4 24672.8 24605.1 24537.3 24469.4 24401.4 24333.3 24268.3 24118.6 24047
24042.5 24109.8 24135.1 24074.4 24014.9 23890.4 23776.8 23676.7 23514 23371.8 23185.1
23046.3 22913.1 22713 22514.2 21846.6 21242.5 20878.1 20197.4 19415.6 18560.1 17755.3
17175.5 15911.5 14714.6 14242.1 14023.1 12955.1 12254.4 10739.4 9411.54 7856.18 7343.97
7030.41 7048.1 6655.78 6227.03 6150.37 5759.6 5659.62 5509.08 5346.98 4833.97 4481.44
4113.26 4129.8 4253.03 4432.53 4408.85 4443.89 4634.52 4873.71 5471.82 5678.77 5839.39
5506.78 4989.91 4638.37 4403.87 3775.38 3038.85 2830.35 2933.68 2860.32 2590.69 2562.95
2622.68 2609.32 2290.78 2235.42 2264.97 2203.93 1828.47 1672.94 1729.83 2033.43 2317.41
2336.51 2188.7 2290.92 2562.43 2747.44 2925.14 3402.98 4287.99 4876.82 4753.99 4704.1
4367.87 4118.59 3860.6 4720.24 #SpawnBio

1 0 0 0

2012 1160

Number of future recruitments to override

2

Process for overiding (-1 for average otherwise index in data list)

2010 1 2010

2011 1 2011

Which probability to product detailed results for (1=0.5,2=0.6,etc.)

1

Steepness and sigma-R and auto-correlations

0.864405 0.4 0 # spawn-recr steepness, sigmaR, autocorr

Target SPR rate (FMSY Proxy)

0.300000

Discount rate (for cumulative catch)

0.100000

Truncate the series when 0.4B0 is reached (1=Yes)

0

Set F to FMSY once 0.4B0 is reached (1=Yes; 2=Apply 40:10 rule after recovery)

0

Maximum possible F for projection (-1 to set to FMSY)

-1

Defintion of recovery (1=now only;2=now or before)

2

Projection type (1,2,3 or 4)

11

Definition of the 40-10 rule

5 25

Calculate coefficients of variation (1=Yes)

0

Number of replicates to use

10

First Random number seed

-89102

File with multiple parameter vectors

rebuild.uncert.dat

User-specific projection (1=Yes); Output replaced (1->6)

0 5

Catches and Fs (Year; 1/2 (F or C); value); Final row is -1

2013 1 1 # Forecast in F #2013 4 999 #Forecast at F in previous year

-1 -1 -1

Fixed catch project (1=Yes); Output replaced (1-9); Approach (-1=Real)

0 2 -1

Split of Fs

2011 0.102438927 0.182368687 0.236566602 0.166563441 0.157243723 0.154818621

-1 1 1 1 1 1 1

Five pre-specified years (used to define Ttarget for option 4)

0.20 0.30 0.40 0.50 0.60

Year for which a probability of recovery is needed

2014 2015 2016 2017 2018 2019 2020 2021

Time varying weight-at-age (1=Yes;0=No)

0

File with time series of weight-at-age data

PetWgt.Csv

Use bisection (0) or linear interpolation (1)

1

Target Depletion

0.25

CV of implementation error

0

Appendix B. Parameter vector input file for rebuilding analyses.

base model in maximization mode, StartTime: Thu Jun 23 21:04:59 2011
0 0 0 0.000404698 0.0142813 0.110109 0.323594 0.568753 0.787322 0.978911 1.1519 1.30951 1.45221 1.58006 1.69342 1.79303 1.87988 1.95515 2.02003 2.07573 2.12337 2.16399 2.19856 2.22791 2.25278 2.27383 2.29163 2.30666 2.31935 2.33004 2.33906 2.34665 2.35305 2.35843 2.36296 2.36677 2.36998 2.37267 2.37494 2.37684 2.3794 #female fecundity; weighted by N in year Y_init across morphs and areas
0.0165014 0.0615514 0.124015 0.230992 0.375638 0.539983 0.713506 0.887565 1.05579 1.214 1.35991 1.49264 1.61219 1.71903 1.81382 1.89738 1.97054 2.03424 2.08941 2.13695 2.17777 2.21268 2.24247 2.26782 2.28934 2.30759 2.32303 2.33609 2.34712 2.35643 2.36428 2.37089 2.37647 2.38116 2.38511 2.38843 2.39123 2.39358 2.39556 2.39723 2.39945 #bodywt for gender,fleet: 1 / 1
0 2.46475e-005 0.000267763 0.00278136 0.0166333 0.0579419 0.138145 0.252507 0.383229 0.51083 0.622187 0.712081 0.780978 0.832126 0.869472 0.896593 0.916333 0.930807 0.941529 0.949565 0.955663 0.960345 0.963981 0.966833 0.969093 0.970897 0.972348 0.973524 0.97448 0.975263 0.975905 0.976435 0.976873 0.977236 0.977537 0.977788 0.977997 0.978172 0.978317 0.978439 0.978601 #selex for gender,fleet: 1 / 1
0.0374549 0.0546126 0.0935754 0.180345 0.3106 0.46605 0.63511 0.808165 0.977947 1.13959 1.29031 1.42878 1.5545 1.66745 1.76795 1.85658 1.93413 2.00152 2.05976 2.10984 2.15274 2.18936 2.22054 2.24704 2.2695 2.28853 2.30461 2.3182 2.32967 2.33935 2.3475 2.35437 2.36016 2.36502 2.36912 2.37257 2.37547 2.37791 2.37996 2.38169 2.38399 #bodywt for gender,fleet: 1 / 2
0 0.00113364 0.00800745 0.0374882 0.111084 0.230855 0.378656 0.528148 0.659047 0.762174 0.837401 0.889422 0.924231 0.947159 0.962232 0.972218 0.978931 0.983526 0.986735 0.989023 0.990686 0.991917 0.992843 0.993552 0.994101 0.994531 0.994871 0.995143 0.995362 0.99554 0.995685 0.995803 0.9959 0.995981 0.996047 0.996102 0.996148 0.996186 0.996218 0.996244 0.996279 #selex for gender,fleet: 1 / 2
0.00729218 0.0214877 0.117408 0.316548 0.450389 0.583696 0.717019 0.850322 0.986007 1.12501 1.2647 1.40041 1.52779 1.6441 1.74819 1.84003 1.92022 1.98973 2.04961 2.10098 2.14488 2.18229 2.21409 2.24108 2.26394 2.28328 2.29962 2.31342 2.32506 2.33487 2.34314 2.3501 2.35597 2.3609 2.36505 2.36855 2.37149 2.37396 2.37603 2.37778 2.38012 #bodywt for gender,fleet: 1 / 3
0 3.43954e-005 7.66638e-005 0.00150953 0.0217232 0.116884 0.320272 0.565608 0.762718 0.883058 0.945064 0.974278 0.987609 0.993735 0.996638 0.998078 0.998828 0.999241 0.99948 0.999625 0.999717 0.999778 0.999819 0.999848 0.999869 0.999885 0.999896 0.999905 0.999912 0.999918 0.999922 0.999926 0.999928 0.999931 0.999933 0.999934 0.999935 0.999936 0.999937 0.999938 0.999939 #selex for gender,fleet: 1 / 3
0.00947379 0.0377057 0.0960571 0.193374 0.322882 0.470994 0.628695 0.789002 0.948079 1.10377 1.25367 1.39492 1.5251 1.64277 1.74751 1.83967 1.92003 1.98962 2.04955 2.10094 2.14485 2.18227 2.21408 2.24107 2.26393 2.28328 2.29962 2.31342 2.32506 2.33487 2.34314 2.35011 2.35597 2.3609 2.36506 2.36855 2.37149 2.37396 2.37603 2.37778 2.38012 #bodywt for gender,fleet: 1 / 4
0 0.00158801 0.00743421 0.0407599 0.1444 0.325372 0.53736 0.721552 0.848988 0.923481 0.962375 0.981445 0.990591 0.995011 0.997207 0.998343 0.998958 0.999307 0.999514 0.999643 0.999726 0.999782 0.99982 0.999848 0.999868 0.999883 0.999894 0.999903 0.99991 0.999915 0.999919 0.999923 0.999926 0.999928 0.99993 0.999931 0.999932 0.999933 0.999934 0.999935 0.999936 #selex for gender,fleet: 1 / 4
0.0364557 0.0703322 0.123728 0.221597 0.352868 0.500398 0.655164 0.810941 0.964856 1.11568 1.26162 1.40003 1.52833 1.64483 1.74886 1.84058 1.92066 1.99007 2.04989 2.1012 2.14507 2.18245 2.21423 2.2412 2.26405 2.28338 2.29972 2.31351 2.32514 2.33495 2.34322 2.35018 2.35604 2.36097 2.36513 2.36862 2.37155 2.37402 2.3761 2.37785 2.38018 #bodywt for gender,fleet: 1 / 5
0 0.000127587 0.00162748 0.0159113 0.0809651 0.229492 0.438146 0.643129 0.797517 0.893474 0.945955 0.972639 0.985815 0.992336 0.995641 0.997379 0.998332 0.998879 0.999208 0.999414 0.999547 0.999638 0.9997 0.999745 0.999778 0.999803 0.999821 0.999836 0.999847 0.999856 0.999863 0.999869 0.999873 0.999877 0.99988 0.999883 0.999885 0.999886 0.999888 0.999889 0.999891 #selex for gender,fleet: 1 / 5
0.0208179 0.0662438 0.122389 0.21613 0.339256 0.476562 0.621591 0.772387 0.928526 1.08671 1.24116 1.3866 1.5198 1.63942 1.74537 1.83825 1.91906 1.98892 2.04903 2.10054 2.14454 2.18201 2.21386 2.24088 2.26377 2.28312 2.29948 2.31329 2.32494 2.33476 2.34303 2.35 2.35587 2.3608 2.36496 2.36845 2.37139 2.37387 2.37594 2.37769 2.38003 #bodywt for gender,fleet: 1 / 6
0 0.000302998 0.00358601 0.0334551 0.154387 0.384696 0.639476 0.826322 0.927427 0.971959 0.989383 0.995882 0.998314 0.999259 0.999647 0.999817 0.999898 0.999939 0.99996 0.999973 0.99998 0.999985 0.999988 0.99999 0.999992 0.999993 0.999994 0.999994 0.999995 0.999995 0.999996 0.999996 0.999996 0.999996 0.999996 0.999996 0.999996 0.999996 0.999997 0.999997 0.999997 #selex for gender,fleet: 1 / 6
0.00565496 0.0182929 0.112606 0.243147 0.352646 0.449335 0.529924 0.595395 0.647829 0.689101 0.720945 0.745063 0.763053 0.776319 0.786018 0.793066 0.798164 0.801841 0.804487 0.806387 0.807751 0.808729 0.809429 0.809931 0.81029 0.810548 0.810732 0.810863 0.810958 0.811025 0.811073 0.811108 0.811133 0.81115 0.811163 0.811172 0.811179 0.811183 0.811186 0.811189 0.811191 #bodywt for gender,fleet: 2 / 1
0 4.46774e-006 1.81516e-005 0.00174253 0.0367481 0.172414 0.376848 0.561294 0.690896 0.773209 0.824213 0.856119 0.876518 0.889868 0.89879 0.904855 0.909034 0.911943 0.913983 0.915421 0.91644 0.917163

0.917677 0.918044 0.918306 0.918493 0.918626 0.918722 0.91879 0.918839 0.918874 0.918898 0.918916
0.918929 0.918938 0.918945 0.918949 0.918953 0.918955 0.918957 0.918958 #selex for gender,fleet: 2 / 1
0.0316389 0.0536701 0.0904868 0.17214 0.275011 0.372303 0.459105 0.534204 0.596476 0.645915 0.683881
0.712379 0.73345 0.748872 0.760082 0.768193 0.774042 0.77825 0.781273 0.783442 0.784997 0.786111
0.786909 0.78748 0.787889 0.788182 0.788391 0.788541 0.788648 0.788725 0.78878 0.788819 0.788847
0.788868 0.788882 0.788892 0.7889 0.788905 0.788909 0.788911 0.788914 #bodywt for gender,fleet: 2 / 2
0 0.00018455 0.00378204 0.0643947 0.313899 0.624683 0.825335 0.919604 0.959785 0.977322 0.985563
0.989778 0.992107 0.993479 0.99433 0.994878 0.995241 0.995487 0.995656 0.995773 0.995855 0.995913
0.995955 0.995984 0.996004 0.996019 0.99603 0.996037 0.996043 0.996047 0.996049 0.996051 0.996053
0.996054 0.996054 0.996055 0.996055 0.996056 0.996056 0.996056 0.996056 #selex for gender,fleet: 2 / 2
0.00564638 0.0166484 0.0654793 0.264711 0.349351 0.422715 0.4904 0.55308 0.608148 0.653589 0.689322
0.716532 0.736829 0.751768 0.762666 0.770571 0.77628 0.780392 0.783348 0.785471 0.786993 0.788084
0.788865 0.789425 0.789825 0.790112 0.790317 0.790464 0.790569 0.790644 0.790698 0.790737 0.790764
0.790784 0.790798 0.790808 0.790815 0.79082 0.790824 0.790827 0.790829 #bodywt for gender,fleet: 2 / 3
0 3.29879e-005 5.42951e-005 0.00345134 0.0907147 0.37391 0.665005 0.834485 0.914297 0.950847 0.968445
0.977562 0.982636 0.985638 0.987504 0.988707 0.989505 0.990046 0.990418 0.990677 0.990858 0.990986
0.991076 0.99114 0.991186 0.991219 0.991242 0.991259 0.99127 0.991279 0.991285 0.991289 0.991292
0.991295 0.991296 0.991297 0.991298 0.991299 0.991299 0.991299 0.9913 #selex for gender,fleet: 2 / 3
0.00564671 0.0166624 0.0499908 0.214538 0.312547 0.394664 0.470411 0.539511 0.598965 0.647141 0.684528
0.712747 0.733674 0.749017 0.760182 0.768264 0.774095 0.778292 0.781307 0.783471 0.785022 0.786133
0.786929 0.787499 0.787907 0.7882 0.788409 0.788558 0.788665 0.788742 0.788797 0.788836 0.788864
0.788884 0.788898 0.788909 0.788916 0.788921 0.788925 0.788928 0.78893 #bodywt for gender,fleet: 2 / 4
0 0.000870445 0.00131472 0.0151975 0.180048 0.517531 0.776638 0.901486 0.953214 0.974862 0.984632
0.989461 0.992058 0.993558 0.994473 0.995056 0.995439 0.995697 0.995874 0.995996 0.996082 0.996142
0.996184 0.996215 0.996236 0.996251 0.996262 0.99627 0.996276 0.99628 0.996283 0.996285 0.996286
0.996287 0.996288 0.996288 0.996289 0.996289 0.996289 0.996289 0.996289 #selex for gender,fleet: 2 / 4
0.0056514 0.0226429 0.179793 0.245534 0.308238 0.376193 0.451982 0.526248 0.590275 0.641361 0.68045
0.709664 0.731189 0.746904 0.758308 0.766549 0.772487 0.776756 0.779822 0.782021 0.783597 0.784726
0.785535 0.786114 0.786528 0.786825 0.787037 0.787189 0.787298 0.787375 0.787431 0.787471 0.787499
0.78752 0.787534 0.787545 0.787552 0.787557 0.787561 0.787564 0.787566 #bodywt for gender,fleet: 2 / 5
0 2.69375e-006 6.30126e-005 0.0171875 0.269533 0.685677 0.899666 0.968133 0.988321 0.994837 0.997266
0.998312 0.998821 0.999094 0.999253 0.99935 0.999413 0.999454 0.999482 0.999501 0.999514 0.999523
0.99953 0.999534 0.999538 0.99954 0.999542 0.999543 0.999544 0.999544 0.999545 0.999545 0.999545
0.999546 0.999546 0.999546 0.999546 0.999546 0.999546 0.999546 0.999546 #selex for gender,fleet: 2 / 5
0.00565706 0.0196928 0.127106 0.221972 0.303462 0.380976 0.457861 0.530384 0.592838 0.642979 0.681545
0.710466 0.731821 0.747432 0.758771 0.766969 0.772878 0.777129 0.780181 0.78237 0.78394 0.785065 0.78587
0.786446 0.786859 0.787155 0.787366 0.787517 0.787626 0.787703 0.787758 0.787798 0.787826 0.787847
0.787861 0.787872 0.787879 0.787884 0.787888 0.787891 0.787893 #bodywt for gender,fleet: 2 / 6
0 3.47532e-005 0.000232369 0.0213744 0.248884 0.630027 0.85988 0.948104 0.97848 0.989539 0.99405
0.996125 0.997186 0.997776 0.998128 0.998347 0.99849 0.998585 0.99865 0.998694 0.998725 0.998747
0.998763 0.998773 0.998781 0.998787 0.998791 0.998793 0.998795 0.998797 0.998798 0.998799 0.998799
0.9988 0.9988 0.9988 0.9988 0.9988 0.9988 0.9988 0.9988 #selex for gender,fleet: 2 / 6
0.158961 0.158961 0.158961 0.158961 0.158961 0.158961 0.158961 0.158961 0.158961 0.158961 0.158961
0.158961 0.158961 0.158961 0.158961 0.158961 0.158961 0.158961 0.158961 0.158961 0.158961 0.158961
0.158961 0.158961 0.158961 0.158961 0.158961 0.158961 0.158961 0.158961 0.158961 0.158961 0.158961
0.158961 0.158961 0.158961 0.158961 0.158961 0.158961 0.158961 0.158961 #mean M for year Yinit: 2011 sex:
1
7001.74 5736.2 4528.5 4348.55 7203.2 4132.39 1874.51 1472.83 847.909 651.903 335.175 284.616 164.236
171.649 41.9956 17.8925 11.107 5.37741 2.32556 0.625539 0.361331 0.220257 0.0751811 0.028713 0.00789175
0.00215176 0.0012059 0.00080711 0.00018254 5.42428e-005 2.04172e-005 9.44949e-006 3.72474e-006
1.30399e-006 8.80726e-007 3.90856e-007 1.16194e-007 5.26539e-008 1.89834e-008 9.8574e-009 1.49472e-008
#numbers for year Yinit: 2011 sex: 1
0.177193 0.177193 0.177193 0.177193 0.177193 0.177193 0.177193 0.177193 0.177193 0.177193 0.177193
0.177193 0.177193 0.177193 0.177193 0.177193 0.177193 0.177193 0.177193 0.177193 0.177193 0.177193
0.177193 0.177193 0.177193 0.177193 0.177193 0.177193 0.177193 0.177193 0.177193 0.177193 0.177193
0.177193 0.177193 0.177193 0.177193 0.177193 0.177193 0.177193 0.177193 #mean M for year Yinit: 2011 sex:
2
7001.74 5632.57 4366.56 4119.1 6704.57 3723.11 1536.5 1024.26 498.531 337.813 158.624 125.01 67.3646
64.6723 14.3195 5.53776 3.1574 1.42678 0.580891 0.147231 0.0814257 0.0481957 0.0155985 0.00530539
0.00129193 0.000326721 0.000177564 0.0001171 2.65534e-005 8.26561e-006 3.38958e-006 1.70565e-006
7.01421e-007 2.67979e-007 2.03457e-007 9.77908e-008 3.0593e-008 1.43202e-008 5.30949e-009 2.83445e-009

4.63691e-009 #numbers for year Yinit: 2011 sex: 2
7001.74 5736.2 4528.5 4348.55 7203.2 4132.39 1874.51 1472.83 847.909 651.903 335.175 284.616 164.236
171.649 41.9956 17.8925 11.107 5.37741 2.32556 0.625539 0.361331 0.220257 0.0751811 0.028713 0.00789175
0.00215176 0.0012059 0.00080711 0.00018254 5.42428e-005 2.04172e-005 9.44949e-006 3.72474e-006
1.30399e-006 8.80726e-007 3.90856e-007 1.16194e-007 5.26539e-008 1.89834e-008 9.8574e-009 1.49472e-008
#numbers for year Ydeclare: 2011 sex: 1
7001.74 5632.57 4366.56 4119.1 6704.57 3723.11 1536.5 1024.26 498.531 337.813 158.624 125.01 67.3646
64.6723 14.3195 5.53776 3.1574 1.42678 0.580891 0.147231 0.0814257 0.0481957 0.0155985 0.00530539
0.00129193 0.000326721 0.000177564 0.0001171 2.65534e-005 8.26561e-006 3.38958e-006 1.70565e-006
7.01421e-007 2.67979e-007 2.03457e-007 9.77908e-008 3.0593e-008 1.43202e-008 5.30949e-009 2.83445e-009
4.63691e-009 #numbers for year Ydeclare: 2011 sex: 2
#R0 1876 1877 1878 1879 1880 1881 1882 1883 1884 1885 1886 1887 1888 1889 1890 1891 1892 1893 1894
1895 1896 1897 1898 1899 1900 1901 1902 1903 1904 1905 1906 1907 1908 1909 1910 1911 1912 1913 1914
1915 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932 1933 1934
1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950 1951 1952 1953 1954
1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968 1969 1970 1971 1972 1973 1974
1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994
1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 #years
16511.5 16511.5 16511.5 16511.5 16511.5 16511.5 16511.3 16510.9 16510.4 16509.8 16509.1 16508.2 16507.2
16506.2 16505 16503.8 16502.5 16501.2 16499.8 16498.4 16496.9 16495.4 16493.8 16492.2 16490.6 16489
16487.3 16485.6 16483.9 16482.2 16480.4 16478.6 16476.8 16475 16473.2 16471.4 16469.5 16467.6 16465.7
16463.8 16461.9 16459.9 16458.1 16453.7 16451.7 16451.5 16453.5 16454.2 16452.5 16450.7 16447.1 16443.7
16440.7 16435.7 16431.4 16425.6 16421.2 16417 16410.5 16404 16381.2 16359.4 16345.7 16318.8 19579.1
18766.1 17043.9 15070.7 13676.8 13465.8 14491 15328.5 14700.7 13851.8 13067.4 12610.2 12574.1 12957.8
13216.5 13474.6 13513.9 12568.4 10767.8 10581.5 12569.9 17318.3 14827.2 8135.68 11100.7 12985 12836.1
33392.3 10064.2 14327.3 13834.3 13990.5 13916.6 8984.52 8169.25 10387.6 10190.5 14945.6 14541.6 9212.86
11086.8 11491.7 9682.95 9565.49 11555.7 17995.8 9420.96 5939.98 7919.03 10961.5 11484.2 13995 9757.15
7289.35 11955.1 12610.8 12369.3 9871.99 11986.8 26404.8 14070.2 13877.7 9474.25 11027.5 9103.74 10918
10492.1 18697.9 27329.6 14021.1 12447.7 13449 14003.5 #Recruits
26278.1 26278.1 26277.5 26276.8 26276.3 26275.7 26268.3 26254.5 26234.5 26209.1 26178.8 26143.9 26105.1
26062.8 26017.4 25969.2 25918.6 25865.8 25811.2 25755 25697.3 25638.4 25578.3 25517.3 25455.4 25392.8
25329.5 25265.7 25201.3 25136.5 25071.2 25005.6 24939.7 24873.5 24807.1 24740.4 24672.8 24605.1 24537.3
24469.4 24401.4 24333.3 24268.3 24118.6 24047 24042.5 24109.8 24135.1 24074.4 24014.9 23890.4 23776.8
23676.7 23514 23371.8 23185.1 23046.3 22913.1 22713 22514.2 21846.6 21242.5 20878.1 20197.4 19415.6
18560.1 17755.3 17175.5 15911.5 14714.6 14242.1 14023.1 12955.1 12254.4 10739.4 9411.54 7856.18 7343.97
7030.41 7048.1 6655.78 6227.03 6150.37 5759.6 5659.62 5509.08 5346.98 4833.97 4481.44 4113.26 4129.8
4253.03 4432.53 4408.85 4443.89 4634.52 4873.71 5471.82 5678.77 5839.39 5506.78 4989.91 4638.37 4403.87
3775.38 3038.85 2830.35 2933.68 2860.32 2590.69 2562.95 2622.68 2609.32 2290.78 2235.42 2264.97 2203.93
1828.47 1672.94 1729.83 2033.43 2317.41 2336.51 2188.7 2290.92 2562.43 2747.44 2925.14 3402.98 4287.99
4876.82 4753.99 4704.1 4367.87 4118.59 3860.6 4720.24 #SpawnBio
0.864405 0.4 0 # spawn-recr steepness, sigmaR, autocorr
base model in maximization mode, StartTime: Thu Jun 23 21:04:59 2011
0 0 0 0.000404698 0.0142813 0.110109 0.323594 0.568753 0.787322 0.978911 1.1519 1.30951 1.45221 1.58006
1.69342 1.79303 1.87988 1.95515 2.02003 2.07573 2.12337 2.16399 2.19856 2.22791 2.25278 2.27383 2.29163
2.30666 2.31935 2.33004 2.33906 2.34665 2.35305 2.35843 2.36296 2.36677 2.36998 2.37267 2.37494 2.37684
2.3794 #female fecundity; weighted by N in year Y_init across morphs and areas
0.0165014 0.0615514 0.124015 0.230992 0.375638 0.539983 0.713506 0.887565 1.05579 1.214 1.35991 1.49264
1.61219 1.71903 1.81382 1.89738 1.97054 2.03424 2.08941 2.13695 2.17777 2.21268 2.24247 2.26782 2.28934
2.30759 2.32303 2.33609 2.34712 2.35643 2.36428 2.37089 2.37647 2.38116 2.38511 2.38843 2.39123 2.39358
2.39556 2.39723 2.39945 #bodywt for gender,fleet: 1 / 1
0 2.46475e-005 0.000267763 0.00278136 0.0166333 0.0579419 0.138145 0.252507 0.383229 0.51083 0.622187
0.712081 0.780978 0.832126 0.869472 0.896593 0.916333 0.930807 0.941529 0.949565 0.955663 0.960345
0.963981 0.966833 0.969093 0.970897 0.972348 0.973524 0.97448 0.975263 0.975905 0.976435 0.976873
0.977236 0.977537 0.977788 0.977997 0.978172 0.978317 0.978439 0.978601 #selex for gender,fleet: 1 / 1
0.0374549 0.0546126 0.0935754 0.180345 0.3106 0.46605 0.63511 0.808165 0.977947 1.13959 1.29031 1.42878
1.5545 1.66745 1.76795 1.85658 1.93413 2.00152 2.05976 2.10984 2.15274 2.18936 2.22054 2.24704 2.2695
2.28853 2.30461 2.3182 2.32967 2.33935 2.3475 2.35437 2.36016 2.36502 2.36912 2.37257 2.37547 2.37791
2.37996 2.38169 2.38399 #bodywt for gender,fleet: 1 / 2
0 0.00113364 0.00800745 0.0374882 0.111084 0.230855 0.378656 0.528148 0.659047 0.762174 0.837401
0.889422 0.924231 0.947159 0.962232 0.972218 0.978931 0.983526 0.986735 0.989023 0.990686 0.991917
0.992843 0.993552 0.994101 0.994531 0.994871 0.995143 0.995362 0.99554 0.995685 0.995803 0.9959 0.995981

0.996047 0.996102 0.996148 0.996186 0.996218 0.996244 0.996279 #selex for gender,fleet: 1 / 2
0.00729218 0.0214877 0.117408 0.316548 0.450389 0.583696 0.717019 0.850322 0.986007 1.12501 1.2647
1.40041 1.52779 1.6441 1.74819 1.84003 1.92022 1.98973 2.04961 2.10098 2.14488 2.18229 2.21409 2.24108
2.26394 2.28328 2.29962 2.31342 2.32506 2.33487 2.34314 2.3501 2.35597 2.3609 2.36505 2.36855 2.37149
2.37396 2.37603 2.37778 2.38012 #bodywt for gender,fleet: 1 / 3
0 3.43954e-005 7.66638e-005 0.00150953 0.0217232 0.116884 0.320272 0.565608 0.762718 0.883058 0.945064
0.974278 0.987609 0.993735 0.996638 0.998078 0.998828 0.999241 0.99948 0.999625 0.999717 0.999778
0.999819 0.999848 0.999869 0.999885 0.999896 0.999905 0.999912 0.999918 0.999922 0.999926 0.999928
0.999931 0.999933 0.999934 0.999935 0.999936 0.999937 0.999938 0.999939 #selex for gender,fleet: 1 / 3
0.00947379 0.0377057 0.0960571 0.193374 0.322882 0.470994 0.628695 0.789002 0.948079 1.10377 1.25367
1.39492 1.5251 1.64277 1.74751 1.83967 1.92003 1.98962 2.04955 2.10094 2.14485 2.18227 2.21408 2.24107
2.26393 2.28328 2.29962 2.31342 2.32506 2.33487 2.34314 2.35011 2.35597 2.3609 2.36506 2.36855 2.37149
2.37396 2.37603 2.37778 2.38012 #bodywt for gender,fleet: 1 / 4
0 0.00158801 0.00743421 0.0407599 0.1444 0.325372 0.53736 0.721552 0.848988 0.923481 0.962375 0.981445
0.990591 0.995011 0.997207 0.998343 0.998958 0.999307 0.999514 0.999643 0.999726 0.999782 0.99982
0.999848 0.999868 0.999883 0.999894 0.999903 0.99991 0.999915 0.999919 0.999923 0.999926 0.999928
0.99993 0.999931 0.999932 0.999933 0.999934 0.999935 0.999936 #selex for gender,fleet: 1 / 4
0.0364557 0.0703322 0.123728 0.221597 0.352868 0.500398 0.655164 0.810941 0.964856 1.11568 1.26162
1.40003 1.52833 1.64483 1.74886 1.84058 1.92066 1.99007 2.04989 2.1012 2.14507 2.18245 2.21423 2.2412
2.26405 2.28338 2.29972 2.31351 2.32514 2.33495 2.34322 2.35018 2.35604 2.36097 2.36513 2.36862 2.37155
2.37402 2.3761 2.37785 2.38018 #bodywt for gender,fleet: 1 / 5
0 0.000127587 0.00162748 0.0159113 0.0809651 0.229492 0.438146 0.643129 0.797517 0.893474 0.945955
0.972639 0.985815 0.992336 0.995641 0.997379 0.998332 0.998879 0.999208 0.999414 0.999547 0.999638
0.9997 0.999745 0.999778 0.999803 0.999821 0.999836 0.999847 0.999856 0.999863 0.999869 0.999873
0.999877 0.99988 0.999883 0.999885 0.999886 0.999888 0.999889 0.999891 #selex for gender,fleet: 1 / 5
0.0208179 0.0662438 0.122389 0.21613 0.339256 0.476562 0.621591 0.772387 0.928526 1.08671 1.24116
1.3866 1.5198 1.63942 1.74537 1.83825 1.91906 1.98892 2.04903 2.10054 2.14454 2.18201 2.21386 2.24088
2.26377 2.28312 2.29948 2.31329 2.32494 2.33476 2.34303 2.35 2.35587 2.3608 2.36496 2.36845 2.37139
2.37387 2.37594 2.37769 2.38003 #bodywt for gender,fleet: 1 / 6
0 0.000302998 0.00358601 0.0334551 0.154387 0.384696 0.639476 0.826322 0.927427 0.971959 0.989383
0.995882 0.998314 0.999259 0.999647 0.999817 0.999898 0.999939 0.99996 0.999973 0.99998 0.999985
0.999988 0.99999 0.999992 0.999993 0.999994 0.999994 0.999995 0.999995 0.999996 0.999996 0.999996
0.999996 0.999996 0.999996 0.999996 0.999996 0.999997 0.999997 0.999997 #selex for gender,fleet: 1 / 6
0.00565496 0.0182929 0.112606 0.243147 0.352646 0.449335 0.529924 0.595395 0.647829 0.689101 0.720945
0.745063 0.763053 0.776319 0.786018 0.793066 0.798164 0.801841 0.804487 0.806387 0.807751 0.808729
0.809429 0.809931 0.81029 0.810548 0.810732 0.810863 0.810958 0.811025 0.811073 0.811108 0.811133
0.81115 0.811163 0.811172 0.811179 0.811183 0.811186 0.811189 0.811191 #bodywt for gender,fleet: 2 / 1
0 4.46774e-006 1.81516e-005 0.00174253 0.0367481 0.172414 0.376848 0.561294 0.690896 0.773209 0.824213
0.856119 0.876518 0.889868 0.89879 0.904855 0.909034 0.911943 0.913983 0.915421 0.91644 0.917163
0.917677 0.918044 0.918306 0.918493 0.918626 0.918722 0.91879 0.918839 0.918874 0.918898 0.918916
0.918929 0.918938 0.918945 0.918949 0.918953 0.918955 0.918957 0.918958 #selex for gender,fleet: 2 / 1
0.0316389 0.0536701 0.0904868 0.17214 0.275011 0.372303 0.459105 0.534204 0.596476 0.645915 0.683881
0.712379 0.73345 0.748872 0.760082 0.768193 0.774042 0.77825 0.781273 0.783442 0.784997 0.786111
0.786909 0.78748 0.787889 0.788182 0.788391 0.788541 0.788648 0.788725 0.78878 0.788819 0.788847
0.788868 0.788882 0.788892 0.7889 0.788905 0.788909 0.788911 0.788914 #bodywt for gender,fleet: 2 / 2
0 0.00018455 0.00378204 0.0643947 0.313899 0.624683 0.825335 0.919604 0.959785 0.977322 0.985563
0.989778 0.992107 0.993479 0.99433 0.994878 0.995241 0.995487 0.995656 0.995773 0.995855 0.995913
0.995955 0.995984 0.996004 0.996019 0.99603 0.996037 0.996043 0.996047 0.996049 0.996051 0.996053
0.996054 0.996054 0.996055 0.996055 0.996056 0.996056 0.996056 0.996056 #selex for gender,fleet: 2 / 2
0.00564638 0.0166484 0.0654793 0.264711 0.349351 0.422715 0.4904 0.55308 0.608148 0.653589 0.689322
0.716532 0.736829 0.751768 0.762666 0.770571 0.77628 0.780392 0.783348 0.785471 0.786993 0.788084
0.788865 0.789425 0.789825 0.790112 0.790317 0.790464 0.790569 0.790644 0.790698 0.790737 0.790764
0.790784 0.790798 0.790808 0.790815 0.79082 0.790824 0.790827 0.790829 #bodywt for gender,fleet: 2 / 3
0 3.29879e-005 5.42951e-005 0.00345134 0.0907147 0.37391 0.665005 0.834485 0.914297 0.950847 0.968445
0.977562 0.982636 0.985638 0.987504 0.988707 0.989505 0.990046 0.990418 0.990677 0.990858 0.990986
0.991076 0.99114 0.991186 0.991219 0.991242 0.991259 0.99127 0.991279 0.991285 0.991289 0.991292
0.991295 0.991296 0.991297 0.991298 0.991299 0.991299 0.991299 0.9913 #selex for gender,fleet: 2 / 3
0.00564671 0.0166624 0.0499908 0.214538 0.312547 0.394664 0.470411 0.539511 0.598965 0.647141 0.684528
0.712747 0.733674 0.749017 0.760182 0.768264 0.774095 0.778292 0.781307 0.783471 0.785022 0.786133
0.786929 0.787499 0.787907 0.7882 0.788409 0.788558 0.788665 0.788742 0.788797 0.788836 0.788864
0.788884 0.788898 0.788909 0.788916 0.788921 0.788925 0.788928 0.78893 #bodywt for gender,fleet: 2 / 4

0 0.000870445 0.00131472 0.0151975 0.180048 0.517531 0.776638 0.901486 0.953214 0.974862 0.984632
0.989461 0.992058 0.993558 0.994473 0.995056 0.995439 0.995697 0.995874 0.995996 0.996082 0.996142
0.996184 0.996215 0.996236 0.996251 0.996262 0.99627 0.996276 0.99628 0.996283 0.996285 0.996286
0.996287 0.996288 0.996288 0.996289 0.996289 0.996289 0.996289 0.996289 #selex for gender,fleet: 2 / 4
0.0056514 0.0226429 0.179793 0.245534 0.308238 0.376193 0.451982 0.526248 0.590275 0.641361 0.68045
0.709664 0.731189 0.746904 0.758308 0.766549 0.772487 0.776756 0.779822 0.782021 0.783597 0.784726
0.785535 0.786114 0.786528 0.786825 0.787037 0.787189 0.787298 0.787375 0.787431 0.787471 0.787499
0.78752 0.787534 0.787545 0.787552 0.787557 0.787561 0.787564 0.787566 #bodywt for gender,fleet: 2 / 5
0 2.69375e-006 6.30126e-005 0.0171875 0.269533 0.685677 0.899666 0.968133 0.988321 0.994837 0.997266
0.998312 0.998821 0.999094 0.999253 0.99935 0.999413 0.999454 0.999482 0.999501 0.999514 0.999523
0.99953 0.999534 0.999538 0.99954 0.999542 0.999543 0.999544 0.999544 0.999545 0.999545 0.999545
0.999546 0.999546 0.999546 0.999546 0.999546 0.999546 0.999546 0.999546 #selex for gender,fleet: 2 / 5
0.00565706 0.0196928 0.127106 0.221972 0.303462 0.380976 0.457861 0.530384 0.592838 0.642979 0.681545
0.710466 0.731821 0.747432 0.758771 0.766969 0.772878 0.777129 0.780181 0.78237 0.78394 0.785065 0.78587
0.786446 0.786859 0.787155 0.787366 0.787517 0.787626 0.787703 0.787758 0.787798 0.787826 0.787847
0.787861 0.787872 0.787879 0.787884 0.787888 0.787891 0.787893 #bodywt for gender,fleet: 2 / 6
0 3.47532e-005 0.000232369 0.0213744 0.248884 0.630027 0.85988 0.948104 0.97848 0.989539 0.99405
0.996125 0.997186 0.997776 0.998128 0.998347 0.99849 0.998585 0.99865 0.998694 0.998725 0.998747
0.998763 0.998773 0.998781 0.998787 0.998791 0.998793 0.998795 0.998797 0.998798 0.998799 0.998799
0.9988 0.9988 0.9988 0.9988 0.9988 0.9988 0.9988 0.9988 #selex for gender,fleet: 2 / 6
0.158961 0.158961 0.158961 0.158961 0.158961 0.158961 0.158961 0.158961 0.158961 0.158961 0.158961
0.158961 0.158961 0.158961 0.158961 0.158961 0.158961 0.158961 0.158961 0.158961 0.158961 0.158961
0.158961 0.158961 0.158961 0.158961 0.158961 0.158961 0.158961 0.158961 0.158961 0.158961 0.158961
0.158961 0.158961 0.158961 0.158961 0.158961 0.158961 0.158961 0.158961 #mean M for year Yinit: 2011 sex:
1
7001.74 5736.2 4528.5 4348.55 7203.2 4132.39 1874.51 1472.83 847.909 651.903 335.175 284.616 164.236
171.649 41.9956 17.8925 11.107 5.37741 2.32556 0.625539 0.361331 0.220257 0.0751811 0.028713 0.00789175
0.00215176 0.0012059 0.00080711 0.00018254 5.42428e-005 2.04172e-005 9.44949e-006 3.72474e-006
1.30399e-006 8.80726e-007 3.90856e-007 1.16194e-007 5.26539e-008 1.89834e-008 9.8574e-009 1.49472e-008
#numbers for year Yinit: 2011 sex: 1
0.177193 0.177193 0.177193 0.177193 0.177193 0.177193 0.177193 0.177193 0.177193 0.177193 0.177193
0.177193 0.177193 0.177193 0.177193 0.177193 0.177193 0.177193 0.177193 0.177193 0.177193 0.177193
0.177193 0.177193 0.177193 0.177193 0.177193 0.177193 0.177193 0.177193 0.177193 0.177193 0.177193
0.177193 0.177193 0.177193 0.177193 0.177193 0.177193 0.177193 0.177193 #mean M for year Yinit: 2011 sex:
2
7001.74 5632.57 4366.56 4119.1 6704.57 3723.11 1536.5 1024.26 498.531 337.813 158.624 125.01 67.3646
64.6723 14.3195 5.53776 3.1574 1.42678 0.580891 0.147231 0.0814257 0.0481957 0.0155985 0.00530539
0.00129193 0.000326721 0.000177564 0.0001171 2.65534e-005 8.26561e-006 3.38958e-006 1.70565e-006
7.01421e-007 2.67979e-007 2.03457e-007 9.77908e-008 3.0593e-008 1.43202e-008 5.30949e-009 2.83445e-009
4.63691e-009 #numbers for year Yinit: 2011 sex: 2
7001.74 5736.2 4528.5 4348.55 7203.2 4132.39 1874.51 1472.83 847.909 651.903 335.175 284.616 164.236
171.649 41.9956 17.8925 11.107 5.37741 2.32556 0.625539 0.361331 0.220257 0.0751811 0.028713 0.00789175
0.00215176 0.0012059 0.00080711 0.00018254 5.42428e-005 2.04172e-005 9.44949e-006 3.72474e-006
1.30399e-006 8.80726e-007 3.90856e-007 1.16194e-007 5.26539e-008 1.89834e-008 9.8574e-009 1.49472e-008
#numbers for year Ydeclare: 2011 sex: 1
7001.74 5632.57 4366.56 4119.1 6704.57 3723.11 1536.5 1024.26 498.531 337.813 158.624 125.01 67.3646
64.6723 14.3195 5.53776 3.1574 1.42678 0.580891 0.147231 0.0814257 0.0481957 0.0155985 0.00530539
0.00129193 0.000326721 0.000177564 0.0001171 2.65534e-005 8.26561e-006 3.38958e-006 1.70565e-006
7.01421e-007 2.67979e-007 2.03457e-007 9.77908e-008 3.0593e-008 1.43202e-008 5.30949e-009 2.83445e-009
4.63691e-009 #numbers for year Ydeclare: 2011 sex: 2
#R0 1876 1877 1878 1879 1880 1881 1882 1883 1884 1885 1886 1887 1888 1889 1890 1891 1892 1893 1894
1895 1896 1897 1898 1899 1900 1901 1902 1903 1904 1905 1906 1907 1908 1909 1910 1911 1912 1913 1914
1915 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932 1933 1934
1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950 1951 1952 1953 1954
1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968 1969 1970 1971 1972 1973 1974
1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994
1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 #years
16511.5 16511.5 16511.5 16511.5 16511.5 16511.5 16511.3 16510.9 16510.4 16509.8 16509.1 16508.2 16507.2
16506.2 16505 16503.8 16502.5 16501.2 16499.8 16498.4 16496.9 16495.4 16493.8 16492.2 16490.6 16489
16487.3 16485.6 16483.9 16482.2 16480.4 16478.6 16476.8 16475 16473.2 16471.4 16469.5 16467.6 16465.7
16463.8 16461.9 16459.9 16458.1 16453.7 16451.7 16451.5 16453.5 16454.2 16452.5 16450.7 16447.1 16443.7

16440.7 16435.7 16431.4 16425.6 16421.2 16417 16410.5 16404 16381.2 16359.4 16345.7 16318.8 19579.1
18766.1 17043.9 15070.7 13676.8 13465.8 14491 15328.5 14700.7 13851.8 13067.4 12610.2 12574.1 12957.8
13216.5 13474.6 13513.9 12568.4 10767.8 10581.5 12569.9 17318.3 14827.2 8135.68 11100.7 12985 12836.1
33392.3 10064.2 14327.3 13834.3 13990.5 13916.6 8984.52 8169.25 10387.6 10190.5 14945.6 14541.6 9212.86
11086.8 11491.7 9682.95 9565.49 11555.7 17995.8 9420.96 5939.98 7919.03 10961.5 11484.2 13995 9757.15
7289.35 11955.1 12610.8 12369.3 9871.99 11986.8 26404.8 14070.2 13877.7 9474.25 11027.5 9103.74 10918
10492.1 18697.9 27329.6 14021.1 12447.7 13449 14003.5 #Recruits
26278.1 26278.1 26277.5 26276.8 26276.3 26275.7 26268.3 26254.5 26234.5 26209.1 26178.8 26143.9 26105.1
26062.8 26017.4 25969.2 25918.6 25865.8 25811.2 25755 25697.3 25638.4 25578.3 25517.3 25455.4 25392.8
25329.5 25265.7 25201.3 25136.5 25071.2 25005.6 24939.7 24873.5 24807.1 24740.4 24672.8 24605.1 24537.3
24469.4 24401.4 24333.3 24268.3 24118.6 24047 24042.5 24109.8 24135.1 24074.4 24014.9 23890.4 23776.8
23676.7 23514 23371.8 23185.1 23046.3 22913.1 22713 22514.2 21846.6 21242.5 20878.1 20197.4 19415.6
18560.1 17755.3 17175.5 15911.5 14714.6 14242.1 14023.1 12955.1 12254.4 10739.4 9411.54 7856.18 7343.97
7030.41 7048.1 6655.78 6227.03 6150.37 5759.6 5659.62 5509.08 5346.98 4833.97 4481.44 4113.26 4129.8
4253.03 4432.53 4408.85 4443.89 4634.52 4873.71 5471.82 5678.77 5839.39 5506.78 4989.91 4638.37 4403.87
3775.38 3038.85 2830.35 2933.68 2860.32 2590.69 2562.95 2622.68 2609.32 2290.78 2235.42 2264.97 2203.93
1828.47 1672.94 1729.83 2033.43 2317.41 2336.51 2188.7 2290.92 2562.43 2747.44 2925.14 3402.98 4287.99
4876.82 4753.99 4704.1 4367.87 4118.59 3860.6 4720.24 #SpawnBio
0.864405 0.4 0 # spawn-recr steepness, sigmaR, autocorr
state of nature - low - A blank comment line - needed for the program to run # in maximization mode, StartTime: Tue Jul 19 10:38:27 2011
0 0 0 0.000420114 0.0146945 0.112023 0.326555 0.571439 0.78933 0.98015 1.1522 1.30867 1.45009 1.57656
1.6885 1.78668 1.87215 1.9461 2.00975 2.0643 2.11089 2.15056 2.18427 2.21284 2.23703 2.25747 2.27473
2.28929 2.30155 2.31188 2.32058 2.32789 2.33405 2.33922 2.34356 2.34722 2.35028 2.35286 2.35502 2.35684
2.35927 #female fecundity; weighted by N in year Y_init across morphs and areas
0.0163326 0.0608918 0.123223 0.23035 0.375349 0.540067 0.713848 0.887972 1.05604 1.21386 1.35917
1.49111 1.6097 1.71545 1.80906 1.89139 1.96333 2.02584 2.07986 2.12634 2.16617 2.20019 2.22917 2.25379
2.27466 2.29233 2.30727 2.31988 2.33051 2.33948 2.34703 2.35338 2.35873 2.36323 2.36701 2.37018 2.37285
2.3751 2.37698 2.37856 2.38067 #bodywt for gender,fleet: 1 / 1
0 2.86306e-005 0.000301533 0.00303313 0.0176578 0.0602898 0.141662 0.256271 0.386184 0.51235 0.622186
0.710827 0.778857 0.829495 0.866595 0.893642 0.913409 0.92796 0.93878 0.94692 0.953115 0.957886 0.961599
0.964519 0.966835 0.968687 0.970179 0.971388 0.972372 0.973177 0.973839 0.974384 0.974835 0.975208
0.975518 0.975776 0.97599 0.976169 0.976318 0.976443 0.976608 #selex for gender,fleet: 1 / 1
0.037442 0.054545 0.0934767 0.180366 0.310878 0.466555 0.635676 0.808554 0.977909 1.1389 1.28878
1.42626 1.55086 1.6626 1.76185 1.84921 1.92551 1.99171 2.04881 2.09783 2.13976 2.1755 2.20588 2.23166
2.25349 2.27194 2.28753 2.30068 2.31176 2.3211 2.32895 2.33557 2.34113 2.3458 2.34973 2.35303 2.35581
2.35813 2.36009 2.36173 2.36392 #bodywt for gender,fleet: 1 / 2
0 0.00125426 0.00874666 0.0402032 0.117015 0.239719 0.3889 0.53801 0.667356 0.768514 0.841894 0.89244
0.926182 0.948385 0.962983 0.972665 0.979183 0.983654 0.986783 0.989018 0.990646 0.991853 0.992764
0.993461 0.994002 0.994426 0.994762 0.99503 0.995247 0.995422 0.995565 0.995682 0.995778 0.995857
0.995922 0.995977 0.996022 0.996059 0.996091 0.996117 0.996151 #selex for gender,fleet: 1 / 2
0.00732093 0.0215961 0.116417 0.314993 0.449501 0.583303 0.717042 0.850654 0.986439 1.12519 1.26423
1.39892 1.52503 1.63996 1.74262 1.83305 1.91188 1.9801 2.03878 2.08905 2.13194 2.16844 2.19943 2.22568
2.24789 2.26666 2.28249 2.29584 2.30709 2.31656 2.32453 2.33123 2.33687 2.34161 2.34559 2.34893 2.35174
2.3541 2.35609 2.35775 2.35997 #bodywt for gender,fleet: 1 / 3
0 3.99484e-005 8.84628e-005 0.00166566 0.0231508 0.121521 0.327351 0.571894 0.766473 0.884701 0.945581
0.974342 0.987534 0.993636 0.996551 0.998008 0.998774 0.999198 0.999446 0.999597 0.999694 0.999758
0.999802 0.999833 0.999855 0.999872 0.999884 0.999894 0.999902 0.999907 0.999912 0.999916 0.999919
0.999921 0.999923 0.999925 0.999927 0.999928 0.999929 0.999929 0.99993 #selex for gender,fleet: 1 / 3
0.00942627 0.0373238 0.0957337 0.19346 0.323242 0.471428 0.628981 0.788996 0.947746 1.10305 1.25238
1.39279 1.52189 1.63831 1.74173 1.83254 1.91158 1.97991 2.03866 2.08896 2.13188 2.16839 2.19939 2.22565
2.24787 2.26663 2.28247 2.29582 2.30707 2.31655 2.32452 2.33122 2.33686 2.3416 2.34558 2.34892 2.35173
2.35409 2.35608 2.35774 2.35996 #bodywt for gender,fleet: 1 / 4
0 0.00178177 0.00812647 0.0436239 0.151915 0.337435 0.550794 0.732893 0.856744 0.928043 0.964816
0.98269 0.991217 0.99533 0.997375 0.998434 0.999009 0.999337 0.999532 0.999654 0.999733 0.999787
0.999823 0.99985 0.999869 0.999883 0.999894 0.999903 0.999909 0.999915 0.999919 0.999922 0.999925
0.999927 0.999929 0.99993 0.999931 0.999932 0.999933 0.999934 0.999935 #selex for gender,fleet: 1 / 4
0.0362401 0.0702429 0.12373 0.221844 0.353379 0.501038 0.655739 0.811297 0.964902 1.11529 1.26058
1.39808 1.52525 1.64046 1.74313 1.83349 1.91224 1.98039 2.03902 2.08924 2.13211 2.16858 2.19955 2.22579
2.24799 2.26675 2.28258 2.29592 2.30717 2.31663 2.3246 2.3313 2.33694 2.34167 2.34565 2.349 2.35181
2.35417 2.35615 2.35781 2.36003 #bodywt for gender,fleet: 1 / 5

0 0.000139894 0.00176249 0.0169599 0.0849051 0.237313 0.447997 0.65202 0.803789 0.897192 0.947923
0.973615 0.986284 0.992559 0.995746 0.997427 0.998353 0.998887 0.999209 0.999411 0.999543 0.999633
0.999695 0.999739 0.999772 0.999797 0.999815 0.99983 0.999841 0.99985 0.999857 0.999863 0.999868
0.999871 0.999875 0.999877 0.999879 0.999881 0.999882 0.999884 0.999885 #selex for gender,fleet: 1 / 5
0.0159243 0.0640324 0.125071 0.219755 0.342029 0.477511 0.620658 0.770554 0.92681 1.08532 1.23967
1.38448 1.51665 1.63502 1.73962 1.83115 1.91062 1.97922 2.03815 2.08857 2.13156 2.16813 2.19917 2.22546
2.2477 2.26648 2.28233 2.29569 2.30695 2.31643 2.32441 2.33111 2.33675 2.34149 2.34548 2.34883 2.35164
2.354 2.35598 2.35765 2.35987 #bodywt for gender,fleet: 1 / 6
0 0.000305064 0.00352852 0.0344219 0.162288 0.403955 0.66325 0.844879 0.938137 0.977134 0.991683
0.996886 0.998764 0.99947 0.999753 0.999875 0.999931 0.999959 0.999974 0.999982 0.999987 0.99999
0.999992 0.999994 0.999995 0.999996 0.999996 0.999996 0.999997 0.999997 0.999997 0.999997 0.999997
0.999998 0.999998 0.999998 0.999998 0.999998 0.999998 0.999998 0.999998 #selex for gender,fleet: 1 / 6
0.00565065 0.0182809 0.110789 0.242422 0.352165 0.449009 0.529645 0.595049 0.647322 0.688381 0.719998
0.7439 0.761701 0.774809 0.784379 0.791324 0.796343 0.799958 0.802557 0.804421 0.805758 0.806715 0.8074
0.807891 0.808241 0.808492 0.808672 0.8088 0.808891 0.808957 0.809004 0.809037 0.809061 0.809078
0.809091 0.809099 0.809106 0.80911 0.809113 0.809115 0.809118 #bodywt for gender,fleet: 2 / 1
0 5.36712e-006 2.09599e-005 0.0018923 0.0384029 0.176457 0.381439 0.564876 0.693243 0.774626 0.825022
0.856546 0.8767 0.88989 0.898704 0.904694 0.90882 0.91169 0.913702 0.915119 0.916122 0.916833 0.917339
0.917699 0.917956 0.918139 0.91827 0.918363 0.91843 0.918478 0.918512 0.918536 0.918553 0.918566
0.918575 0.918581 0.918586 0.918589 0.918591 0.918593 0.918594 #selex for gender,fleet: 2 / 1
0.031437 0.0534572 0.0905473 0.172468 0.275355 0.372576 0.45929 0.534244 0.596285 0.645442 0.683119
0.711353 0.732197 0.747433 0.758494 0.766488 0.772245 0.776383 0.779353 0.781481 0.783005 0.784096
0.784877 0.785435 0.785835 0.78612 0.786324 0.78647 0.786574 0.786649 0.786702 0.78674 0.786768 0.786787
0.786801 0.786811 0.786818 0.786823 0.786827 0.786829 0.786832 #bodywt for gender,fleet: 2 / 2
0 0.000199435 0.00410499 0.0681349 0.323956 0.635093 0.832187 0.92344 0.961929 0.978606 0.986406
0.990383 0.992576 0.993866 0.994665 0.995179 0.995519 0.99575 0.995908 0.996018 0.996094 0.996149
0.996187 0.996214 0.996233 0.996247 0.996257 0.996264 0.996269 0.996273 0.996275 0.996277 0.996278
0.996279 0.99628 0.99628 0.996281 0.996281 0.996281 0.996281 0.996281 #selex for gender,fleet: 2 / 2
0.00564274 0.0167507 0.064755 0.264188 0.349016 0.42245 0.4902 0.552858 0.607784 0.653 0.68848 0.715448
0.735532 0.750293 0.761048 0.768839 0.77446 0.778504 0.781408 0.783491 0.784983 0.786051 0.786816
0.787363 0.787754 0.788034 0.788234 0.788377 0.788479 0.788552 0.788604 0.788641 0.788668 0.788687
0.788701 0.788711 0.788718 0.788723 0.788726 0.788729 0.788731 #bodywt for gender,fleet: 2 / 3
0 3.84673e-005 6.25361e-005 0.00372463 0.0946492 0.382315 0.672437 0.839152 0.917006 0.952477 0.969504
0.978309 0.983204 0.986099 0.987896 0.989055 0.989824 0.990344 0.990701 0.99095 0.991124 0.991246
0.991333 0.991395 0.991438 0.991469 0.991492 0.991507 0.991519 0.991527 0.991533 0.991537 0.99154
0.991542 0.991543 0.991544 0.991545 0.991546 0.991546 0.991546 0.991547 #selex for gender,fleet: 2 / 3
0.00564303 0.0167633 0.049926 0.214161 0.312637 0.39477 0.470536 0.539566 0.598823 0.646725 0.683822
0.711773 0.732469 0.747623 0.758636 0.766599 0.772338 0.776463 0.779424 0.781547 0.783067 0.784155
0.784934 0.785491 0.785889 0.786174 0.786377 0.786523 0.786627 0.786702 0.786755 0.786793 0.78682
0.786839 0.786853 0.786863 0.78687 0.786875 0.786879 0.786881 0.786884 #bodywt for gender,fleet: 2 / 4
0 0.00099917 0.00149497 0.0162184 0.18623 0.52636 0.782797 0.904791 0.954932 0.975818 0.985218 0.989858
0.992352 0.993792 0.99467 0.995229 0.995596 0.995843 0.996012 0.996129 0.996211 0.996268 0.996309
0.996338 0.996358 0.996373 0.996383 0.99639 0.996396 0.996399 0.996402 0.996404 0.996405 0.996406
0.996407 0.996408 0.996408 0.996408 0.996408 0.996409 0.996409 #selex for gender,fleet: 2 / 4
0.00564616 0.02162 0.181197 0.246746 0.308287 0.375939 0.451954 0.526344 0.590233 0.641042 0.679826
0.708756 0.73004 0.745558 0.756805 0.764923 0.770765 0.774962 0.777972 0.780129 0.781674 0.782779
0.78357 0.784135 0.78454 0.784829 0.785036 0.785183 0.785289 0.785365 0.785419 0.785457 0.785485
0.785504 0.785519 0.785529 0.785536 0.785541 0.785545 0.785547 0.78555 #bodywt for gender,fleet: 2 / 5
0 3.04822e-006 6.44687e-005 0.0181454 0.280143 0.698738 0.906427 0.970874 0.989463 0.995377 0.997562
0.998497 0.998951 0.999195 0.999335 0.999422 0.999477 0.999514 0.999538 0.999555 0.999567 0.999575
0.999581 0.999585 0.999588 0.99959 0.999591 0.999593 0.999593 0.999594 0.999594 0.999594 0.999595
0.999595 0.999595 0.999595 0.999595 0.999595 0.999595 0.999595 0.999595 #selex for gender,fleet: 2 / 5
0.00564697 0.0182204 0.117483 0.224691 0.304825 0.381399 0.45799 0.530401 0.59267 0.642546 0.680827
0.709483 0.730608 0.74603 0.757217 0.765296 0.771113 0.775292 0.77829 0.780439 0.781977 0.783078
0.783866 0.78443 0.784833 0.785121 0.785327 0.785474 0.785579 0.785655 0.785708 0.785747 0.785774
0.785794 0.785808 0.785818 0.785825 0.78583 0.785834 0.785837 0.785839 #bodywt for gender,fleet: 2 / 6
0 5.8407e-005 0.000251073 0.0215907 0.254792 0.640247 0.866949 0.951757 0.980328 0.990554 0.994674
0.996552 0.997506 0.998034 0.998348 0.998543 0.99867 0.998754 0.998811 0.99885 0.998878 0.998897
0.998911 0.99892 0.998927 0.998932 0.998935 0.998938 0.99894 0.998941 0.998942 0.998942 0.998943
0.998943 0.998943 0.998944 0.998944 0.998944 0.998944 0.998944 0.998944 #selex for gender,fleet: 2 / 6
0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13

0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 #mean M for year Yinit: 2011 sex: 1
5374.23 4599.39 3730.63 3695.18 6322.82 3716.61 1723.46 1376.65 799.867 617.67 318.504 271.088 156.663 163.783 40.2151 17.133 10.6236 5.14211 2.21424 0.59072 0.337673 0.203439 0.0686606 0.0258394 0.00704564 0.00189633 0.00104878 0.000691878 0.000153155 4.4799e-005 1.65176e-005 7.52421e-006 2.92409e-006 9.9452e-007 6.62745e-007 2.89265e-007 8.44077e-008 3.79865e-008 1.35291e-008 6.9985e-009 1.05531e-008 #numbers for year Yinit: 2011 sex: 1
0.144909 0.144909 0.144909

2.31931 2.33229 2.34326 2.3525 2.3603 2.36687 2.3724 2.37706 2.38099 2.38429 2.38707 2.38941 2.39138 2.39403 #female fecundity; weighted by N in year Y_init across morphs and areas
0.0164508 0.0620352 0.124834 0.231786 0.37626 0.54037 0.713698 0.887665 1.05593 1.21433 1.36057 1.49379 1.61398 1.72157 1.8172 1.90163 1.97569 2.04026 2.09625 2.14458 2.18611 2.22169 2.25207 2.27795 2.29994 2.31861 2.33443 2.34781 2.35913 2.36868 2.37675 2.38356 2.38929 2.39413 2.3982 2.40164 2.40453 2.40696 2.409 2.41073 2.41304 #bodywt for gender,fleet: 1 / 1
0 2.08862e-005 0.000232992 0.00251522 0.0155472 0.0554527 0.134417 0.248501 0.380024 0.509045 0.621885 0.712978 0.782682 0.834292 0.87185 0.899024 0.918728 0.933122 0.943747 0.951686 0.957692 0.962292 0.965856 0.968647 0.970854 0.972614 0.974029 0.975173 0.976105 0.976866 0.977491 0.978006 0.978432 0.978785 0.979078 0.979322 0.979526 0.979696 0.979838 0.979957 0.980115 #selex for gender,fleet: 1 / 1
0.0374963 0.0547026 0.0936234 0.180279 0.310414 0.465777 0.634868 0.808115 0.978257 1.14041 1.29175 1.43093 1.55744 1.67125 1.77264 1.86217 1.94061 2.00886 2.06791 2.11874 2.16233 2.19959 2.23134 2.25835 2.28127 2.3007 2.31715 2.33105 2.3428 2.35271 2.36108 2.36813 2.37408 2.37909 2.3833 2.38686 2.38985 2.39236 2.39448 2.39627 2.39866 #bodywt for gender,fleet: 1 / 2
0 0.00101121 0.00723364 0.0346322 0.10484 0.221478 0.367732 0.517502 0.649918 0.755036 0.832171 0.885752 0.921717 0.945453 0.961071 0.971422 0.978377 0.983134 0.986454 0.988818 0.990534 0.991803 0.992758 0.993487 0.994051 0.994493 0.994843 0.995123 0.995348 0.99553 0.995679 0.9958 0.9959 0.995983 0.996051 0.996108 0.996155 0.996194 0.996227 0.996254 0.99629 #selex for gender,fleet: 1 / 2
0.00726432 0.0213635 0.118296 0.318147 0.451443 0.584347 0.717293 0.850275 0.985781 1.12487 1.26499 1.40141 1.5297 1.64704 1.75219 1.84507 1.92628 1.99673 2.05749 2.10967 2.1543 2.19238 2.22478 2.25229 2.27562 2.29538 2.31209 2.32621 2.33813 2.34819 2.35668 2.36383 2.36986 2.37493 2.37921 2.38281 2.38584 2.38839 2.39053 2.39234 2.39476 #bodywt for gender,fleet: 1 / 3
0 2.92391e-005 6.56028e-005 0.00135617 0.0203026 0.112211 0.313004 0.558961 0.758535 0.881034 0.944261 0.974019 0.987556 0.993749 0.996669 0.998109 0.998855 0.999263 0.999498 0.99964 0.99973 0.999789 0.999829 0.999857 0.999877 0.999892 0.999903 0.999912 0.999918 0.999924 0.999928 0.999931 0.999934 0.999936 0.999938 0.999939 0.999941 0.999942 0.999942 0.999943 0.999944 #selex for gender,fleet: 1 / 3
0.00954769 0.038143 0.0962969 0.193191 0.322564 0.470751 0.628718 0.789371 0.948737 1.10467 1.25489 1.39665 1.52754 1.64607 1.75177 1.84489 1.92621 1.99671 2.0575 2.10968 2.15432 2.1924 2.2248 2.25231 2.27564 2.2954 2.31211 2.32623 2.33815 2.34821 2.3567 2.36385 2.36987 2.37495 2.37922 2.38282 2.38585 2.3884 2.39055 2.39235 2.39478 #bodywt for gender,fleet: 1 / 4
0 0.0013974 0.0067222 0.0377586 0.136472 0.312459 0.52266 0.70878 0.839943 0.917941 0.959272 0.979778 0.989699 0.994524 0.996932 0.99818 0.998856 0.99924 0.999468 0.99961 0.999701 0.999763 0.999805 0.999835 0.999857 0.999873 0.999886 0.999895 0.999903 0.999909 0.999913 0.999917 0.99992 0.999923 0.999925 0.999926 0.999928 0.999929 0.99993 0.99993 0.999932 #selex for gender,fleet: 1 / 4
0.0366388 0.0703668 0.123544 0.22116 0.352304 0.499854 0.654802 0.810855 0.965052 1.11617 1.26254 1.40156 1.53064 1.64805 1.75305 1.84575 1.92681 1.99714 2.05782 2.10993 2.15452 2.19257 2.22494 2.25244 2.27576 2.2955 2.3122 2.32631 2.33823 2.34829 2.35677 2.36392 2.36994 2.37502 2.37929 2.38289 2.38592 2.38846 2.39061 2.39241 2.39484 #bodywt for gender,fleet: 1 / 5
0 0.00011613 0.00149354 0.0148548 0.0769737 0.221442 0.427752 0.633439 0.790397 0.889039 0.94346 0.971305 0.985109 0.991958 0.995432 0.997258 0.998259 0.998834 0.999178 0.999393 0.999533 0.999627 0.999692 0.999739 0.999773 0.999798 0.999818 0.999832 0.999844 0.999853 0.999861 0.999867 0.999871 0.999875 0.999879 0.999881 0.999883 0.999885 0.999887 0.999888 0.99989 #selex for gender,fleet: 1 / 5
0.0284948 0.067246 0.119332 0.212231 0.336286 0.475551 0.62272 0.774745 0.930922 1.08863 1.24281 1.38844 1.52223 1.64267 1.74956 1.84343 1.9252 1.99599 2.05696 2.10927 2.15399 2.19213 2.22457 2.25212 2.27547 2.29524 2.31197 2.3261 2.33803 2.34809 2.35658 2.36374 2.36977 2.37485 2.37912 2.38272 2.38576 2.38831 2.39045 2.39226 2.39469 #bodywt for gender,fleet: 1 / 6
0 0.000308512 0.00363521 0.0323572 0.146143 0.364364 0.613153 0.80436 0.913791 0.964892 0.986043 0.994347 0.997598 0.99891 0.999467 0.999719 0.99984 0.999902 0.999936 0.999956 0.999968 0.999976 0.999981 0.999984 0.999987 0.999988 0.99999 0.999991 0.999991 0.999992 0.999993 0.999993 0.999993 0.999993 0.999994 0.999994 0.999994 0.999994 0.999994 0.999994 0.999994 #selex for gender,fleet: 1 / 6
0.00566207 0.0182835 0.114042 0.243936 0.353126 0.449623 0.530164 0.59573 0.648373 0.689921 0.722061 0.746461 0.764702 0.77818 0.788052 0.795239 0.800446 0.804208 0.806919 0.80887 0.810271 0.811278 0.812 0.812518 0.812889 0.813156 0.813347 0.813483 0.813581 0.813652 0.813702 0.813738 0.813764 0.813782 0.813796 0.813805 0.813812 0.813817 0.81382 0.813823 0.813825 #bodywt for gender,fleet: 2 / 1
0 3.7726e-006 1.57446e-005 0.00159283 0.0349358 0.167681 0.371189 0.556686 0.687755 0.771231 0.823019 0.855432 0.87616 0.889728 0.8988 0.90497 0.909224 0.912188 0.914268 0.915736 0.916777 0.917517 0.918045 0.918421 0.91869 0.918882 0.919019 0.919118 0.919188 0.919239 0.919275 0.919301 0.919319 0.919333 0.919342 0.919349 0.919354 0.919357 0.91936 0.919362 0.919363 #selex for gender,fleet: 2 / 1
0.0318624 0.0539619 0.0905358 0.171875 0.274644 0.371948 0.458813 0.534068 0.596617 0.646411 0.684747 0.713589 0.734958 0.750628 0.76204 0.77031 0.776283 0.780588 0.783685 0.78591 0.787508 0.788655 0.789477 0.790067 0.790489 0.790792 0.791009 0.791165 0.791276 0.791356 0.791414 0.791455 0.791484 0.791505

0.79152 0.791531 0.791539 0.791544 0.791548 0.791551 0.791554 #bodywt for gender,fleet: 2 / 2
0 0.000168868 0.00344935 0.0603734 0.302564 0.612601 0.817253 0.91505 0.957244 0.975809 0.984579
0.989078 0.99157 0.99304 0.993953 0.994541 0.994931 0.995196 0.995378 0.995504 0.995593 0.995656 0.9957
0.995732 0.995755 0.995771 0.995782 0.99579 0.995796 0.9958 0.995803 0.995806 0.995807 0.995808 0.995809
0.99581 0.99581 0.99581 0.995811 0.995811 0.995811 #selex for gender,fleet: 2 / 2
0.00565289 0.0165486 0.066531 0.265233 0.349662 0.422945 0.490555 0.553258 0.608502 0.654228 0.690286
0.717813 0.738391 0.753567 0.764659 0.772718 0.778548 0.782754 0.785782 0.78796 0.789524 0.790646
0.791452 0.792029 0.792443 0.79274 0.792953 0.793105 0.793214 0.793293 0.793349 0.793389 0.793418
0.793438 0.793453 0.793464 0.793471 0.793477 0.793481 0.793484 0.793486 #bodywt for gender,fleet: 2 / 3
0 2.79495e-005 4.67015e-005 0.00318051 0.0864393 0.364254 0.656196 0.828873 0.911031 0.948891 0.967186
0.976683 0.981975 0.985109 0.987058 0.988316 0.989151 0.989717 0.990107 0.990378 0.990568 0.990703
0.990798 0.990866 0.990914 0.990948 0.990973 0.990991 0.991003 0.991012 0.991019 0.991023 0.991027
0.991029 0.991031 0.991032 0.991033 0.991033 0.991034 0.991034 0.991034 #selex for gender,fleet: 2 / 3
0.00565328 0.0165635 0.0501722 0.215019 0.312471 0.394518 0.470209 0.539372 0.59906 0.647577 0.685334
0.713901 0.735131 0.750725 0.762093 0.770337 0.776294 0.780588 0.783678 0.785899 0.787493 0.788637
0.789458 0.790047 0.790469 0.790771 0.790988 0.791143 0.791254 0.791334 0.791391 0.791432 0.791461
0.791482 0.791498 0.791508 0.791516 0.791522 0.791526 0.791528 0.791531 #bodywt for gender,fleet: 2 / 4
0 0.000746815 0.00114009 0.014128 0.173065 0.507134 0.769212 0.897455 0.951114 0.973699 0.983923
0.988985 0.99171 0.993284 0.994246 0.994858 0.995261 0.995532 0.995718 0.995847 0.995937 0.996001
0.996046 0.996078 0.996101 0.996117 0.996128 0.996137 0.996143 0.996147 0.99615 0.996152 0.996154
0.996155 0.996156 0.996156 0.996157 0.996157 0.996157 0.996157 0.996157 #selex for gender,fleet: 2 / 4
0.00565962 0.0235222 0.179087 0.244934 0.308314 0.376298 0.451769 0.525934 0.590177 0.641638 0.681132
0.710719 0.732565 0.748544 0.76016 0.768568 0.774636 0.779006 0.782148 0.784406 0.786026 0.787189
0.788023 0.788621 0.789049 0.789356 0.789576 0.789734 0.789847 0.789928 0.789986 0.790028 0.790058
0.790079 0.790094 0.790105 0.790113 0.790119 0.790123 0.790126 0.790128 #bodywt for gender,fleet: 2 / 5
0 2.40102e-006 5.98942e-005 0.0160904 0.258402 0.672258 0.892797 0.965385 0.987196 0.994316 0.996986
0.998139 0.998702 0.999004 0.99918 0.999288 0.999357 0.999402 0.999433 0.999454 0.999469 0.999479
0.999487 0.999492 0.999496 0.999498 0.9995 0.999501 0.999502 0.999503 0.999503 0.999504 0.999504
0.999504 0.999504 0.999504 0.999505 0.999505 0.999505 0.999505 0.999505 #selex for gender,fleet: 2 / 5
0.00568624 0.0240174 0.134513 0.219133 0.301978 0.380445 0.45763 0.530274 0.592956 0.64343 0.682362
0.711629 0.733286 0.749149 0.760692 0.769051 0.775087 0.779435 0.782562 0.784809 0.786422 0.787579
0.788409 0.789004 0.789431 0.789736 0.789956 0.790113 0.790225 0.790306 0.790364 0.790405 0.790435
0.790456 0.790471 0.790482 0.79049 0.790495 0.790499 0.790502 0.790505 #bodywt for gender,fleet: 2 / 6
0 1.73635e-005 0.000223241 0.0210974 0.242104 0.61819 0.851557 0.943759 0.976276 0.988331 0.993312
0.995623 0.996812 0.997477 0.997874 0.998123 0.998284 0.998392 0.998466 0.998517 0.998552 0.998577
0.998595 0.998607 0.998616 0.998623 0.998627 0.99863 0.998633 0.998634 0.998636 0.998636 0.998637
0.998637 0.998638 0.998638 0.998638 0.998638 0.998638 0.998638 0.998638 #selex for gender,fleet: 2 / 6
0.19 0.19 0.19 0.19 0.19 0.19 0.19 0.19 0.19 0.19 0.19 0.19 0.19 0.19 0.19 0.19 0.19 0.19 0.19 0.19 0.19 0.19
0.19 0.19 0.19 0.19 0.19 0.19 0.19 0.19 0.19 0.19 0.19 0.19 0.19 0.19 0.19 0.19 0.19 0.19 0.19 #mean M for year Yinit:
2011 sex: 1
9228.5 7271.37 5567.2 5171.67 8311.35 4647.01 2057.65 1587.76 904.671 691.818 354.417 300.046 172.797
180.438 43.9462 18.7171 11.6299 5.63103 2.44339 0.66366 0.386748 0.238726 0.0824753 0.0319544 0.00884358
0.00244908 0.00138966 0.00094339 0.000218504 6.5932e-005 2.53902e-005 1.19494e-005 4.7837e-006
1.72181e-006 1.18126e-006 5.32567e-007 1.61166e-007 7.35587e-008 2.68476e-008 1.39831e-008 2.13377e-008
#numbers for year Yinit: 2011 sex: 1
0.21179 0.21179 0.21179 0.21179 0.21179 0.21179 0.21179 0.21179 0.21179 0.21179 0.21179 0.21179 0.21179
0.21179 0.21179 0.21179 0.21179 0.21179 0.21179 0.21179 0.21179 0.21179 0.21179 0.21179 0.21179 0.21179
0.21179 0.21179 0.21179 0.21179 0.21179 0.21179 0.21179 0.21179 0.21179 0.21179 0.21179 0.21179 0.21179
0.21179 0.21179 #mean M for year Yinit: 2011 sex: 2
9228.5 7114.64 5330.02 4846.45 7625.26 4117.09 1663.2 1096.29 530.758 358.186 167.529 131.541 70.6936
67.8532 14.9855 5.80351 3.31486 1.49686 0.610376 0.155791 0.0865731 0.0516855 0.0168864 0.00582333
0.00142788 0.000366029 0.000200821 0.000133991 3.10397e-005 9.77241e-006 4.07288e-006 2.07129e-006
8.63789e-007 3.36563e-007 2.56821e-007 1.23415e-007 3.86786e-008 1.80075e-008 6.69637e-009 3.55125e-009
5.75581e-009 #numbers for year Yinit: 2011 sex: 2
9228.5 7271.37 5567.2 5171.67 8311.35 4647.01 2057.65 1587.76 904.671 691.818 354.417 300.046 172.797
180.438 43.9462 18.7171 11.6299 5.63103 2.44339 0.66366 0.386748 0.238726 0.0824753 0.0319544 0.00884358
0.00244908 0.00138966 0.00094339 0.000218504 6.5932e-005 2.53902e-005 1.19494e-005 4.7837e-006
1.72181e-006 1.18126e-006 5.32567e-007 1.61166e-007 7.35587e-008 2.68476e-008 1.39831e-008 2.13377e-008
#numbers for year Ydeclare: 2011 sex: 1
9228.5 7114.64 5330.02 4846.45 7625.26 4117.09 1663.2 1096.29 530.758 358.186 167.529 131.541 70.6936
67.8532 14.9855 5.80351 3.31486 1.49686 0.610376 0.155791 0.0865731 0.0516855 0.0168864 0.00582333

0.00142788 0.000366029 0.000200821 0.000133991 3.10397e-005 9.77241e-006 4.07288e-006 2.07129e-006 8.63789e-007 3.36563e-007 2.56821e-007 1.23415e-007 3.86786e-008 1.80075e-008 6.69637e-009 3.55125e-009 5.75581e-009 #numbers for year Ydeclare: 2011 sex: 2
#R0 1876 1877 1878 1879 1880 1881 1882 1883 1884 1885 1886 1887 1888 1889 1890 1891 1892 1893 1894 1895 1896 1897 1898 1899 1900 1901 1902 1903 1904 1905 1906 1907 1908 1909 1910 1911 1912 1913 1914 1915 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932 1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950 1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 #years
22790.7 22790.7 22790.7 22790.7 22790.6 22790.6 22790.1 22789.3 22788.1 22786.7 22784.9 22782.9 22780.6 22778.2 22775.6 22772.9 22770 22767 22763.9 22760.7 22757.5 22754.1 22750.7 22747.2 22743.7 22740.1 22736.5 22732.8 22729.1 22725.3 22721.5 22717.7 22713.9 22710 22706.1 22702.1 22698.1 22694 22689.9 22685.8 22681.7 22677.6 22673.6 22663.7 22659.3 22659.7 22665 22667.2 22663.2 22659.3 22650.8 22643.1 22636.3 22625 22615.3 22602.2 22592.6 22583.6 22569.2 22555 22502 22452.3 22422.7 22362.2 29437.1 27976 24737.6 21240.2 18864.4 18475.9 20232.3 21851.5 20847.4 19409.1 18017.6 17166.1 16952.8 17461.2 17818.5 18133.1 18045.9 16656.8 14236.3 13920.4 16709.6 22899.3 19682.3 10820.6 14713.5 17136.2 16952.8 44013.3 13313.4 18790.5 18014.8 18131.4 17926 11534.5 10473.2 13224.4 13013.9 19024.6 18531.6 11761.7 14000.1 14518.2 12225.4 12006.1 14538.7 22506.1 11819.8 7485.36 9981.5 13917.4 14553.9 17723.3 12339.6 9246.21 15204.6 16167 15999.7 12840.9 15659.9 34700.6 18488.5 18231.4 12453 14498.3 11959 14323.7 13756.1 24491.8 35681.7 18300.6 16282.7 17585.8 18457 #Recruits
23586.1 23586.1 23585.4 23584.8 23584.3 23583.8 23576.7 23563.3 23544.4 23520.4 23492 23459.7 23424 23385.3 23344.1 23300.7 23255.3 23208.3 23159.8 23110.1 23059.3 23007.6 22955 22901.7 22847.8 22793.4 22738.4 22683.1 22627.4 22571.3 22515 22458.5 22401.7 22344.7 22287.5 22230.1 22172 22113.8 22055.5 21997.2 21938.8 21880.4 21825.1 21687.6 21626.8 21631.5 21704.7 21735.2 21680.6 21626.8 21510.1 21405.1 21314.5 21164.5 21036.2 20866.3 20744.4 20629.3 20450.5 20275.1 19647.7 19090 18771.7 18151.3 17440.7 16666.7 15948.6 15454.1 14309.3 13300.6 13089.3 13152.3 12350.5 11817.2 10422.8 9186.51 7750.91 7366.01 7179.16 7289.06 6961.46 6568.21 6504.38 6124.51 6034.96 5893.5 5732.97 5213.84 4848.5 4476.83 4512.7 4668.09 4863.77 4834.17 4858.64 5050.16 5330.15 5979.35 6195.52 6327.02 5951.23 5391.96 4993.64 4700.98 4017.02 3247.34 3031.45 3139.86 3069.91 2793.49 2756.25 2801.02 2766.21 2431.89 2374.38 2402.01 2327.81 1939.79 1785.44 1856.94 2180.71 2477.36 2496.92 2351.23 2467.49 2760.29 2967.01 3173.35 3709.47 4662.47 5286.81 5168.17 5098.99 4736.5 4463.35 4193.6 5052.13 #SpawnBio
0.796164 0.4 0 # spawn-recr steepness, sigmaR, autocorr

SCIENTIFIC AND STATISTICAL COMMITTEE REPORT ON STOCK ASSESSMENTS FOR 2013-2014 GROUNDFISH FISHERIES

The Groundfish Subcommittee of the Scientific and Statistical Committee (SSC-GS) met in Seattle during September 26-30, 2011 to review stock assessments for three groundfish species (widow rockfish, bocaccio, and darkblotched rockfish) and rebuilding analyses for six overfished groundfish stocks (Pacific ocean perch, petrale sole, canary rockfish, yelloweye rockfish, bocaccio, and darkblotched rockfish). The full Scientific and Statistical Committee (SSC) reviewed the assessment documents (Agenda Item E.1.a, Attachments 1-3), the rebuilding analyses (Agenda Item E.1.a, Attachments 5, 6, 8, and 10 and Supplemental Revised Attachments 7 and 9) and the Groundfish Subcommittee report (Agenda Item E.1.a, Attachment 4). The SSC also reviewed the document "An Alternative View of Widow Rockfish Productivity" (Agenda Item E.1.a, Supplemental Attachment 11) prepared by the Groundfish Analysis Team of the Southwest Fisheries Science Center at Santa Cruz.

Bocaccio

Dr Vladlena Gertseva (SSC and National Marine Fisheries Service [NMFS]/Northwest Fisheries Science Center [NWFSC]), chair of the September meeting, summarized the assessment and the SSC-GS report.

The last full assessment for bocaccio was completed in 2009. An update assessment, presented to the SSC in June 2011, did not meet the terms of reference for an update because of changes in model structure and data. The Stock Assessment Team (STAT) made these changes because a strict update estimated that the 2010 year-class was extraordinarily and unrealistically strong, based on length frequency data collected in the 2010 NWFSC shelf-slope trawl survey. The Council decided that the update should receive additional exploration and review based on a limited set of analyses developed by the SSC.

The revised update assessment covers the stock of bocaccio in the Conception, Monterey and Eureka International North Pacific Fisheries Commission (INPFC) areas and differs from a strict update in the following aspects: (1) it includes a new data source, an index of age-0 abundance based on power plant impingement data, and removes very small fish from the NWFSC data series, and (2) the major axis of uncertainty in the decision table is based on recruitment strength rather than the relative emphasis given to the different biomass indices.

The revised update assessment estimates that depletion in spawning output was 26 percent at the start of 2011, above the 25 percent minimum stock size threshold for rockfish but below the 40 percent management target. If harvests are consistent with the current rebuilding spawning biomass per recruit (SPR) of 0.777, the assessment projects that the stock would rebuild to the 40 percent management target by 2020 under both the base model and the pessimistic alternative, which is based on average strength for the 2010 year-class. The stock would rebuild by either 2016 or 2017 under the optimistic alternative, which allows a very strong 2010 year-class.

The SSC endorses the use of the 2011 bocaccio revised update assessment for status determination and management in the Council process.

The SSC-GS noted that additional fishery and survey data will be available by the March or April 2012 Council meetings. These data could be used to better evaluate the strength of the 2010 year-class. However, these new data cannot be evaluated in isolation. They should be evaluated only within the context of all the other data that inform the assessment model. In any event, a new update, if conducted and approved by the SSC, could be used for setting annual catch limits (ACLs) or annual catch targets (ACTs) for 2013 and 2014 but it should not be used for setting the overfishing limits (OFLs).

The SSC recommends that the next assessment of this stock should be a full assessment so that the strength of the 2010 year-class can be evaluated more rigorously, and to explore the conflicting indices that are currently part of the assessment structure.

Because the bocaccio assessment is based on a fully developed age-structured model, the SSC recommends that bocaccio be treated as a Category 1 stock.

Darkblotched rockfish

Dr. Vladlena Gertseva (SSC and NMFS/NWFSC), chair of the September meeting, summarized the assessment and the SSC-GS report.

The last full assessment for darkblotched rockfish was completed in 2007 and an update was conducted in 2009. A new update assessment was reviewed by the SSC in June 2011. This update's estimate of depletion at the start of 2009 was 15.1 percent, whereas the comparable estimate from the 2009 update was 27.5 percent. Such a large change in stock status was unexpected. Further, the cause of the change could not be determined during the limited time available for review of the update. The Council therefore decided that the update should receive additional exploration and review based on a limited set of analyses developed by the SSC.

The revised update assessment covers the stock of darkblotched rockfish in the waters off Washington, Oregon, and California. Although the revised update conducted a thorough step-wise evaluation of the new and modified data used in the assessment, the analyses were not able to pinpoint the new data elements that fully accounted for the large drop in estimated depletion. An analysis of the influence of the stock-recruit steepness parameter indicated that the revised update model would have estimated steepness at an implausibly high value (1). The 2007 full assessment and the 2009 update fixed the steepness parameter at 0.6. For the revised 2011 update the SSC-GS and the STAT agreed to fix the steepness at 0.76, the mean value of the most recent prior probability distribution from the meta-analysis of rockfish productivity conducted by Martin Dorn. Also, the SSC-GS recommended that the decision table be structured with stock-recruit steepness rather than natural mortality as the major axis of uncertainty.

Results from the revised update assessment are reasonably consistent with results from the 2009 update. The estimate of depletion at the start of 2009 is 25.9 percent from the revised update whereas it is 27.5 percent from the 2009 update. The revised update assessment estimates that depletion in spawning output was 30.2 percent at the start of 2011, above the 25 percent

minimum stock size threshold for rockfish but below the 40 percent management target. The estimated spawning output has increased steadily over the past ten years, more than doubling during this period. If harvests are consistent with the current rebuilding SPR of 0.649, the base model projects that the stock would rebuild to the management target by 2017.

The SSC endorses the use of the 2011 darkblotched rockfish revised update assessment for status determination and management in the Council process.

The SSC recommends that the next assessment of this stock should be a full assessment to allow further exploration of selectivity assumptions and how to treat the survey data.

Because the darkblotched rockfish assessment is based on a fully developed age-structured model, the SSC recommends that darkblotched rockfish be treated as a Category 1 stock.

Widow rockfish

Dr Vladlena Gertseva (SSC and NMFS/NWFSC), chair of the September meeting, summarized the assessment and the SSC-GS report.

Widow rockfish was declared to be overfished in 2001. The last full assessment for widow rockfish was completed in 2009. The widow rockfish Stock Assessment Review (STAR) Panel, which met during July, did not endorse the base model for management use and recommended that alternative model configurations be investigated. During the September Council meeting the SSC reviewed the assessment document and STAR Panel report and concurred with the STAR Panel recommendation that further exploration of alterative model configurations was needed. The Council agreed and decided that the assessment should receive additional exploration and review based on a set of analyses suggested by the SSC.

The revised assessment covers the stock of widow rockfish in the waters off Washington, Oregon, and California. Compared to the 2009 assessment, the new assessment made several important changes and simplifications to the model structure. The new assessment has one area. Selectivity curves are assumed to be length-based. Survey selectivity curves are forced to be asymptotic. Spawning output was measured in terms of spawning stock biomass. Natural mortality (M) is estimated separately for males versus females and is influenced by the prior probability distribution for M developed by Owen Hamel. Finally, the steepness parameter for the stock-recruitment relationship was fixed at 0.76, the mean value of the most recent prior probability distribution from the meta-analysis of rockfish productivity conducted by Martin Dorn. In the 2009 assessment the steepness parameter was estimated at 0.41.

There were also some changes in the data used in the new assessment relative to the 2009 assessment, including: treatment of the at-sea processing fleet as a separate fleet rather than as parts of the other fleets and use of length composition data. Recent previous assessments of widow rockfish relied on age composition data and did not use length composition data.

The new assessment estimates that depletion in spawning stock biomass was 51.1 percent at the start of 2011, above the 40 percent management target. Further, the estimated spawning stock biomass has increased steadily from a low of 30.6 percent at the start of 2001. The new

assessment estimates that the relative spawning stock biomass never dropped below the 25 percent minimum stock size threshold. The increase in biomass during the past decade was the result of reduced catches rather than strong year-classes. Estimates of recent recruitment have been below model expectations.

The new assessment's estimate of depletion at the start of 2009 was 50.0 percent, whereas the 2009 assessment's estimate of depletion at the start of 2009 was 38.5 percent. This large increase in estimated stock status resulted primarily from the decision by the SSC-GS and STAT to fix the steepness parameter at 0.76 due to the lack of information to reliably estimate steepness. If the new assessment had been allowed to estimate steepness, the value of steepness and the estimate of depletion would have been much lower.

The SWFSC Groundfish Analysis Team disagreed with the assertion by the SSC-GS that "no data currently exist to reliably estimate widow rockfish productivity." The SSC notes that the profile likelihood of steepness for widow rockfish is less informative compared to the steepness profiles estimated for other West Coast rockfish stocks. Furthermore, the magnitude of the likelihood values depends fundamentally on the adequacy of the underlying model structure. Changes in model structure, such as switching from domed to asymptotic selectivity, can produce much larger changes in log-likelihood than 2 units.

The SSC agree with the Groundfish Analysis Team's conclusion that there is considerable uncertainty regarding the new stock assessment's finding that the stock has rebuilt. Productivity and status of this stock are highly uncertain because the available biomass indices are not informative. Nonetheless, the SSC considers the base model of the new widow rockfish assessment to be the best available science.

The SSC endorses the use of the 2011 widow rockfish assessment for status determination and management in the Council process.

If the pessimistic state of nature is correct (steepness is equal to 0.41), then only the 1500 mt catch stream shown in Table ES8a of the assessment document results in the estimates of spawning stock biomass remaining above the minimum stock size threshold during the 10-year projection period.

The SSC recommends that the next assessment of this stock should be a full assessment to incorporate reconstructed historical landings data for Washington, to resolve potential inconsistencies in the age-reading data, to evaluate the strength of incoming year-classes, and to explore the utility of several legacy data sets, such as the Oregon bottom trawl catch per unit of effort (CPUE) index, for which complete documentation is lacking.

Because the widow rockfish assessment is based on a fully developed age-structured model, the SSC recommends that widow rockfish be treated as a Category 1 stock.

Rebuilding Analyses

The SSC reviewed rebuilding analyses for six overfished groundfish stocks managed by the

Council: Pacific ocean perch (POP), petrale sole, canary rockfish, yelloweye rockfish, bocaccio, and darkblotched rockfish.

Progress towards rebuilding for the rockfish was reviewed in relation to the median times to rebuild (T_{target}) that were adopted in Amendment 16-4 and/or the current T_{target} that was adopted in 2009 (Table 1, below). Rebuilding is occurring for all species. Figure 1 (below) shows relative population trajectories of overfished groundfish stocks since 1980. The SSC notes the following.

a) Catches of five of the six overfished species stocks have been lower than what was available as a cumulative optimum yield (OY)/ACL during the period of rebuilding. Catch of canary rockfish exceeded the cumulative OY/ACL by 18.5 percent over the period of 2001-2010. However, the percentage has steadily decreased (which is evident from changes in the running four year average), reflecting active management. POP catch exceeded the rebuilding OY in 2007 by 4 percent. However the cumulative catch for POP over 2000-2010 is only 52.2 percent of the cumulative rebuilding plan OYs for this period. In general, management has been quite effective at curtailing fishing mortality on the overfished stocks in order to rebuild them as quickly as possible.
b) All rebuilding analyses met the appropriate technical requirements by utilizing the latest version of the rebuilding program and by using the appropriate outputs from the rebuilding program.
c) In four cases (petrale sole and yelloweye, bocaccio and darkblotched rockfishes) rebuilding is one to eight years ahead of schedule. For these stocks, progress towards rebuilding is considered adequate, and the SSC recommends that no redefinition of T_{TARGET} or adjustment to the rebuilding harvest rate is necessary.
d) Two stocks are behind schedule and are very unlikely to rebuild by the current T_{TARGET}: canary rockfish and POP. Canary rockfish rebuilding is three years behind schedule. Although this deviation is relatively minor due to the sensitivity in the estimated median time to rebuild at different SPR rates, results indicate that even if all harvest is eliminated from 2013 onwards, there is slightly less than 50 percent probability that the stock will rebuild by the current T_{TARGET} (2027). For POP, if the current SPR rate in the rebuilding plan (0.864) is maintained, the stock would not rebuild with a 50 percent probability until 2051, which is 31 years later than the current T_{TARGET}. The change is primarily due to a revised estimate of B_0 and depletion, rather than the current biomass level. This represents a fundamental revision to our understanding of the status of this species, which in turn warrants revisions to $T_{TARGET.}$
e) Given the results of the 2011 assessments, new maximum times to rebuild ($T_{MAX(NEW)}$) were calculated for each stock based on the most recent assessment models and National Standard 1 Guidelines. These are needed for the two stocks which are behind schedule (canary rockfish and POP). Rebuilding will occur for these stocks well before ($T_{MAX(NEW)}$) if the current target SPR harvest rates are maintained. For this reason the SSC suggests that considering status quo harvest rates for all overfished stocks is a reasonable starting point for the Council's deliberative process when developing ACLs for the 2013-2014 biennial cycle.

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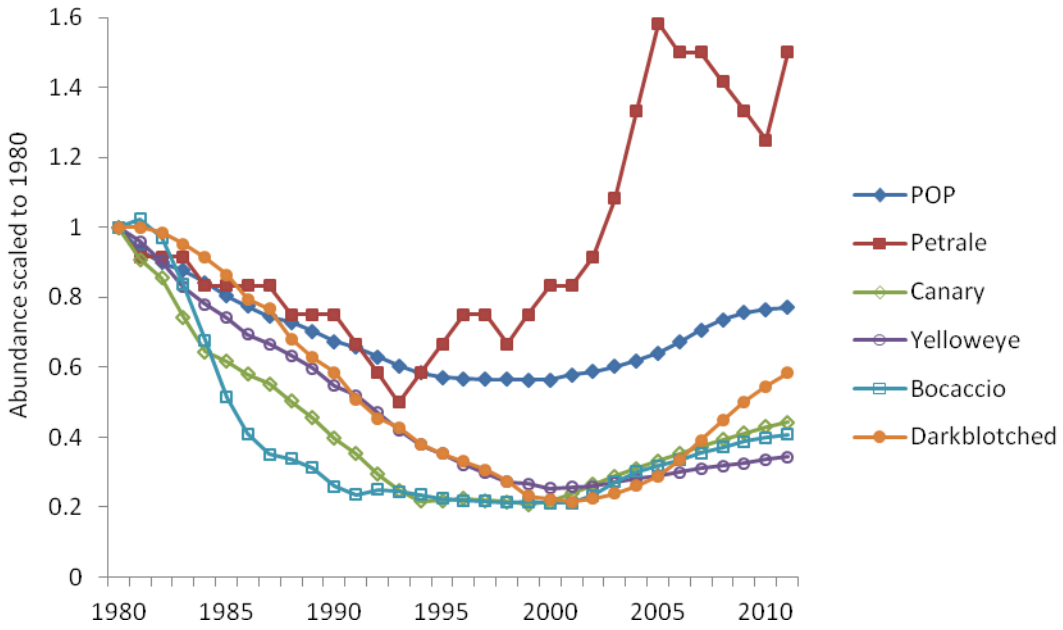
Abundance scaled to 1980
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1980
1985
1990
1995
2000
2005
2010
POP
Petrale
Canary
Yelloweye
Bocaccio
Darkblotched

Table 1. Projected rebuilding target dates for overfished groundfish at current harvest rates

Species	**2009 Assessment Depletion**	**2011 Assessment Depletion**	**Total Catch/ Total OY During Rebuilding[1]**	**Adopted SPR Harvest Rate**	**T_{TARGET} Specified in Amendment 16-4**	**Current T_{TARGET}[2]**	**New $T_{F=0}$**	**New $T_{REBUILD}$ At Current SPR[3]**	**Difference between Current T_{TARGET} and New $T_{REBUILD}$[4]**	**$T_{MAX(NEW)}$[5]**
Pacific ocean perch (POP)	28.6%	19%	52.2% (2000-2010)	86.4%	2017	2020	2043	2051	**-31**	2071
Petrale sole	11.6%	18%	NA	30% 25-5 rule	2016	2016	2013	2013	3	2023
Canary	23.7%	23%	118.5% (2001-2010)	88.7%	2063	2027	2028	2030	**-3**	2050
Yelloweye	20.3%	21.4%	63.7% (2003-2010)	76%	2084	2074	2045	2067	7	2083
Bocaccio	28.12%	26%	35% (2000-2010)	77.7%	2026	2022	2018	2021	1	2031
Darkblotched	27.5%	30%	94% (2002-2010)	62.1%	2011	2025	2016	2017	8	2037

1. The years considered are the years since the stock has been under rebuilding.
2. Current T_{TARGET} is the value adopted, or not modified, by the Council in 2009.
3. $T_{REBUILD}$ is the new time to rebuild at the adopted SPR harvest rate.
4. Positive values reflect rebuilding being ahead of schedule, while negative values reflect delays. Values which are bolded and underlined indicate a substantial difference indicating a low probability of rebuilding by T_{TARGET} (<40%).
5. $T_{MAX(NEW)}$ is the new maximum time to rebuild based on the NEW stock assessment and rebuilding analysis. In the case of petrale sole, the maximum rebuilding time is defined by the 10-year rule which is interpreted here as being 10 years beyond the year the stock was declared overfished (i.e., 2011).

Agenda Item E.2
Situation Summary
November 2011

NATIONAL MARINE FISHERIES SERVICE REPORT

National Marine Fisheries Service (NMFS) Northwest Region will briefly report on recent regulatory developments relevant to groundfish fisheries and issues of interest to the Pacific Fishery Management Council (Council). Recent Federal Register notices are provided in Attachment 1.

NMFS Northwest Fisheries Science Center (NWFSC) will also briefly report on groundfish-related science and research activities. The NWFSC provided a report on the estimated total mortality in the 2010 groundfish fisheries (Agenda Item E.2.c, NWFSC Report).

Council Task:

1. Discussion.

Reference Materials:

1. Agenda Item E.2.b, Attachment 1: *Federal Register* Notices Published Since the Last Council Meeting.
2. Agenda Item E.2.c, NWFSC Report: Estimated Discard and Catch of Groundfish Species in the 2010 US West Coast Fisheries (Provided electronically only).

Agenda Order:

a. Agenda Item Overview — Kelly Ames
b. Regulatory Activities — Frank Lockhart
c. Fisheries Science Center Activities — John Stein and Michelle McClure
d. Reports and Comments of Advisory Bodies and Management Entities
e. Public Comment
f. Council Discussion

PFMC
10/14/11

***FEDERAL REGISTER* NOTICES**

Groundfish and Halibut Notices
8/25/11 through 10/12/11

Documents available at NMFS Sustainable Fisheries Groundfish Web Site
http://www.nwr.noaa.gov/Groundfish-Halibut/Groundfish-Fishery-Management/index.cfm

76 FR 53833. DOC: NOAA. MAGACT Provisions; Fisheries off West Coast States; Pacific Coast Groundfish Fishery; Amendments 20 and 21; Trawl Rationalization Program; Correcting Amendments - 8/30/11.

76 FR 54713. NMFS: NOAA. MAGACT Provisions; Fisheries Off West Coast States; Pacific Coast Groundfish Fishery; Biennial Specifications and Management Measures; Correction - 9/2/11.

76 FR 54888. NMFS: NOAA. Fisheries Off West Coast States; Pacific Coast Groundfish Fishery Management Plan; Trawl Rationalization Program; Program Improvement and Enhancement; Amendment 21-1 - 9/2/11.

76 FR 55344. NMFS: NOAA. Pacific Coast Groundfish; Public Hearing Notice; Secretarial Fishery Management Plan Amendment 1 (previously Amendment 16-5) - 9/7/11.

76 FR 55865. NMFS: NOAA. Fisheries Off West Coast States; Notice of Availability for Secretarial Amendment 1 to the Pacific Coast Groundfish Fishery Management Plan - 9/9/11.

PFMC
10/14/11

Agenda Item E.2.c
NWFSC Report (Provided Electronically Only)
November 2011

NOAA
FISHERIES
SERVICE

Estimated Discard and Catch of Groundfish Species in the 2010 US West Coast Fisheries



Marlene A. Bellman[1]
Alia Al-Humaidhi[2]
Jason Jannot[1]
Janell Majewski[1]

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[1]West Coast Groundfish Observer Program
National Marine Fisheries Service
Northwest Fisheries Science Center
Fishery Resource Analysis and Monitoring Division
2725 Montlake Blvd E
Seattle, WA 98112

[2] Pacific States Marine Fisheries Commission
Northwest Fisheries Science Center
2725 Montlake Blvd E
Seattle, WA 98112

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Executive Summary

The primary objective of this report is to estimate fishing mortality for groundfish species in U.S. west coast fisheries during 2010 and evaluate mortality estimates relative to Acceptable Biological Catch (ABC) and Optimum Yield (OY) harvest management goals. Both of these management goals are published each year in the federal groundfish regulations for selected groundfish species (50 CFR 660 Subpart G). Our primary findings include:

- Estimated fishing mortality for darkblotched rockfish exceeded the 2010 OY specification by 1% (332 mt versus an OY of 330 mt). The darkblotched rockfish 2010 ABC (440 mt) was not exceeded.

- Estimated fishing mortality for longnose skate exceeded the 2010 OY specification by 3% (1387 mt versus an OY of 1349 mt). The longnose skate 2010 ABC (3269 mt) was not exceeded.

- Twenty-six groundfish species or species groups (65%) had fishing mortality estimates which were less than 50% of 2010 OY harvest specifications.

- A majority (52%) of the groundfish species or species groups showed a decrease in estimated mortality from 2009 to 2010.

- Sablefish (north of 36° N. latitude) fishing mortality was estimated to be 95% of its OY.

Summaries of 2010 catch from the following groundfish fishery sectors are included (*****Sectors where observer program data is used):

Commercial -

Limited entry (LE) bottom trawl*****

LE bottom trawl - targeting California halibut*****

Open access (OA) bottom trawl - targeting California halibut*****

OA fixed gear nearshore (Oregon/California)*****

Fixed gear LE sablefish primary season (tier endorsed)*****

Fixed gear LE non-primary sablefish (non-endorsed and daily trip limit sectors)*****

Fixed gear OA daily trip limit*****

At-sea Pacific hake/whiting catcher-processor*****

At-sea Pacific hake/whiting mothership*****

At-sea Pacific hake/whiting tribal*****

Exempted fishing permit (EFP)*****

LE mid-water trawl (shoreside hake)[1]

Non-commercial –

Tribal (shoreside fisheries)

Recreational (Washington/Oregon/California)

Research

[1]LE mid-water trawl (shoreside hake) sector is monitored by the NMFS NW Regional Office through electronic camera systems

Other non-groundfish fisheries included with incidental catch of groundfish species:
Commercial -

OA shrimp trawl – north of 40° 10' N latitude (Washington/Oregon/California)*****
OA shrimp trawl – south of 40° 10' N latitude
OA mid-water trawl
OA non-mid-water trawl – not targeting California halibut
Other gear groups - not trawl, shrimp trawl, or fixed-gear
Fixed gear targeting non-groundfish

Data Sources

Data sources used to estimate groundfish fishing mortality include landing receipts (fish tickets), trawl logbooks, onboard observers, recreational catch, research catch, and others.

Fleet-wide landing receipts (fish tickets) are the cornerstone of retained catch information for all sectors of the commercial groundfish fishery on the US west coast. Fish tickets are trip-aggregated sales receipts issued to vessels by fish-buyers in each port for each delivery of fish. They are provided to fish-buyers by a state agency and must be returned to the agency for processing. Fish tickets are designed by the individual states, and Washington, Oregon, and California each have a slightly different format of receipt. In addition, each state conducts species-composition sampling for numerous market categories that are reported on fish tickets. Market categories represent either a single species or a mixture of species. Fish ticket and species-composition data are submitted by state agencies to the Pacific Fisheries Information Network (PacFIN) regional database, which is maintained by the Pacific States Marine Fisheries Commission (PSMFC). Percentages for the species composition within market categories were applied to the fish ticket data used in our analyses. As such, landed weights from sampled market categories were distributed to individual species whenever possible.

Logbook record-keeping is a state-mandated requirement for the LE groundfish trawl sector in Washington, Oregon, and California. A common-format logbook is used by all three states and completed logbook information is entered into state agency databases. The electronic logbook data are then submitted by state agencies to the PacFIN regional database.

Fish ticket landings data and trawl logbook data for the calendar year 2010 were retrieved from the PacFIN database and divided into various sectors of the groundfish fishery as indicated in Figure 1. All additional data processing steps are described in the methods section below. Logbook data from the open-access (OA) groundfish trawl sector were not included in our analyses.

Discard estimation focused on commercial groundfish fishery sectors with scientific at-sea observations of discards, conducted by the Northwest Fishery Science Center (NWFSC) Fishery Resource Analysis and Monitoring Division (FRAM). The West Coast Groundfish Observer Program (WCGOP) and the At-Sea Hake Observer Program (A-SHOP) observe distinct sectors of the groundfish fishery. The WCGOP observes a number of different sectors of the groundfish fishery, including the limited entry (LE) groundfish bottom trawl, limited entry and open access (OA) fixed gear, and state-permitted nearshore fixed gear sectors. The WCGOP also observes several fisheries that incidentally catch groundfish, including the California

halibut trawl and pink shrimp trawl fisheries. WCGOP data from each of these groundfish sectors and fisheries were used for the purposes of discard estimation. Observations by the A-SHOP from the catcher-processor, mothership, and tribal components of the at-sea Pacific hake/whiting fishery were also summarized as mortality estimates in this report.

The WCGOP was established in 2001 by NOAA Fisheries (National Marine Fisheries Service, NMFS) (66 FR 20609). All commercial vessels that land groundfish caught in the United States Exclusive Economic Zone (EEZ) from 3-200 miles offshore are required to carry an observer when notified to do so by NMFS or its designated agent. Subsequent state rule-making also require vessels that fish for groundfish within 3 miles of shore or participate in other state-managed fisheries to carry WCGOP observers when notified. The WCGOP's goal is to improve total catch estimates by collecting information on the discarded catch (fish returned overboard at-sea) of west coast groundfish species. For more details about WCGOP goals, vessel selection, and data collection, see the WCGOP website at http://www.nwfsc.noaa.gov/research /divisions/fram/observer/. The website also provides estimates of observer coverage, observed catch, and a summary of observed fishing depths for each sector. A list of fisheries, in order of coverage priority and detailed information on data collection methods employed in each observed fishery can be found in the WCGOP manual (NWFSC 2010).

The sampling protocol employed by the WCGOP is primarily focused on the discarded portion of catch. To ensure that recorded weights for the retained portion of the observed catch are accurate, haul-level retained catch recorded by WCGOP observers are reconciled with trip-level fish ticket records. The WCGOP data are linked to fish tickets by fish ticket identification numbers obtained by the observer and are adjusted so that the total trip pounds of retained catch equals the total trip pounds on the fish ticket(s). This is done because the fish ticket weight is more accurate and fish tickets are legally binding documents. These steps are described in further detail on the WCGOP website under Data Processing, and in prior reports produced annually by the WCGOP at http://www.nwfsc.noaa.gov/research/divisions/fram/observer/. All additional data processing steps are described in the methods section below.

The At-Sea Hake Observer Program (A-SHOP) has conducted observations of the west coast at-sea Pacific hake/whiting fishery since 2001. Prior observations were conducted by the North Pacific Groundfish Observer Program. A-SHOP program information and documentation on data collection methods can be found in the observer manual (NWFSC 2010). The at-sea hake/whiting fishery has mandatory observer coverage, with each vessel over 38 m carrying two observers. However, catcher vessels which deliver catch to motherships are not observed.

Each year, a certain portion of the OY and ABC for groundfish species is harvested through various research activities. In 2010, research programs that caught groundfish included the NWFSC's groundfish bottom trawl survey, a hook and line survey, and the International Pacific Halibut Commission's (IPHC) longline survey, as well as other scientific research permits. All groundfish research catch information was provided to NOAA's Northwest Regional Office (NWR). These data were then summarized by the NWR and included in this report.

In addition to these data sources, further information provided by the Groundfish Management Team (GMT) was also used in the total mortality estimation process. The GMT is an advisory body to the PFMC that is comprised of representatives from federal, state, and Tribal agencies and is involved in evaluating

management performance and alternatives for groundfish fisheries between the U.S. borders with Canada and Mexico. For the purposes of this analysis, the GMT provided mortality rates, which are assumptions regarding the survival of discards, for sablefish and lingcod in the trawl and fixed gear sectors and for the major species groups reported in the state-permitted fixed gear nearshore sector.

Methods

Discard Estimation Methods

We used a deterministic approach to estimate discard mortality for all WCGOP observed sectors of the groundfish fishery. Through this approach, observed discard rates for each species were directly expanded to the fleet-wide level. First, discard ratios were computed from observer data as the discarded weight of a particular species/species group divided by the weight of retained catch of either all groundfish (excluding Pacific hake), sablefish, or other species based on the targeting behavior of that sector. Discard ratios were then multiplied by the fleet-wide landed weight of groundfish, sablefish or other species (depending on the denominator used to compute observed discard ratios). This provided an expanded estimate of fleet-wide discard weight for each species. Because of differences in data availability and management structure among sectors of the groundfish fishery, this approach was applied with slight modifications for each sector. Each of these modifications is detailed in the methodology for each sector below.

In all cases where a FMP groundfish species grouping or nearshore species grouping was used to compute discard ratios, any retained weights that were recorded by the observer but that did not appear on fish tickets were excluded from the denominator. This was necessary to prevent double-counting associated with differences in the species codes used by observers and processors. For instance, while observers may record rockfish catch at the species level, various species of rockfish are often grouped, weighed, and recorded together on the fish ticket under a grouped species code such as NUSP - northern unspecified slope rockfish. By using only the retained groundfish weight from fish tickets in discard ratio denominators, we prevent double-counting of retained weights. This is not an issue when using a single species in the denominator, such as sablefish in the fixed gear fisheries (see below), as any retained weights in observer and fish ticket data that share the same species code will match and adjust properly.

Species were defined and/or grouped for this report according to the WCGOP Data Processing Appendix, which can be found at: http://www.nwfsc.noaa.gov/research/divisions/fram/observer/. A complete listing of groundfish species is defined in the Groundfish Fishery Management Plan (http://www.pcouncil.org/wp-content/uploads/fmpthru19.pdf). Groundfish species that are currently being managed under rebuilding plans are presented separately from non-rebuilding species.

In all tables, (--) was used when there is no actual numeric value (i.e., the species was not caught). Values appear as 0.0 when a value exists but is smaller than the decimal places allotted. A value of NA represents that the calculation is not applicable for a particular species or stratum, or that the calculation did not produce a result (e.g., very small values might result in NA from a standard error calculation). Grey shading indicates that values include estimates of both discard and retained catch.

Limited Entry Bottom Trawl Sector

Fleet-wide discard estimates for the LE bottom (non-mid-water) trawl sector were derived from WCGOP observer data, fish ticket landings data, and trawl logbook data (Figure 1). For a description of the LE bottom trawl sector, vessel selection, observer coverage, vessel waivers, and prior LE bottom trawl sector reports, see: http://www.nwfsc.noaa.gov/research/divisions/fram/observer/.

LE bottom trawl vessels can hold a California halibut bottom trawl permit and participate in the state-permitted California halibut fishery. California halibut tows can occur on the same trip as tows targeting groundfish and were identified based on the following criteria: 1) the tow target was California halibut or 2) the tow target was nearshore mix, sand sole, or other flatfish, and the tow took place in less than 30 fathoms and south of 40°10' N. latitude. All tows in the observer and logbook data that met at least one of the above requirements were removed from the LE bottom trawl data sets and included as data for the California halibut fishery (see below). Tow targets are typically determined by the vessel captain.

Several additional filtering steps were then applied to the data to ensure that we had distinguished data for the LE bottom trawl sector appropriately. We investigated tows and landings with more than 2 mt of Pacific hake, to exclude effort that was targeted exclusively towards this species. On the basis of the Pacific hake catch criterion, one logbook tow in 2010 met the criterion and was removed. Next, 15 trawl logbook tows lacking a recorded depth were removed to ensure that all spatial and depth information was complete.

Observer data and trawl logbook data were then stratified by management area, depth, and season (Table 1). Records were separated into two groundfish management areas, north and south of 40° 10' N. latitude. Each management area was divided into three depth strata (0-125, 126-250, >250 fathoms). Two-month cumulative trip limit periods were combined to form two seasonal strata: winter (November-April) and summer (May-October). In some cases, if the numbers of observations were too limited, data were aggregated across seasons. In the north, data were combined across seasons in the shallowest depth stratum (0-125 fathoms). In the south, data were combined across seasons in the mid-depth stratum (126-250 fathoms). Table 1 presents the spatial and temporal distribution of tows and retained FMP groundfish (excluding Pacific hake) weight in the 2010 observer and trawl logbook data.

It should be noted that the stratification scheme used in this analysis is inconsistent with the sampling design employed by the WCGOP. The authors recognize this fact, but used this method to provide estimates that were relevant within the spatial and temporal structure of groundfish management. The validity of stratification in terms of isolating variance in discard has not yet been objectively tested. Until more work can be completed to evaluate which strata (area/depth/season) are most appropriate for discard analyses, broader stratification is often warranted to ensure adequate sample size or to meet confidentiality mandates. The depth strata used in the present analysis highlight the areas shoreward and seaward of RCA closures relevant in the fishery management framework and provide consistency when evaluating discard or bycatch over time, as depth-based spatial closures change.

Measures of uncertainty are not provided within the context of the WCGOP sampling design, as they would be biased by post-stratification. However, standard errors consistent with Pikitch et al. (1998) are provided for all observed discard ratios in the context of the post-stratified analysis. The standard errors are most likely an underestimate of the actual uncertainty, but are the sole measure we can provide at this time.

Once data had been stratified, discard ratios were computed from the observer data and multiplied by logbook catch weights in each stratum (Figure 2). This was done according to the following equation:

$$\hat{D}_{sxab} = \frac{\sum_t d_{sxt}}{\sum_t r_{xt}} \times \sum_t R_{xabt}$$

where:

s: species or species group
x: index strata (area, depth, season)
a: state of landing (Washington, Oregon or California)
b: bimonthly period (Jan-Feb, Mar-Apr, … , Nov-Dec)
t: tows
d: observed discard weight of species *s*
r: observed retained weight of all FMP groundfish excluding Pacific hake
R: weight of retained FMP groundfish (excluding Pacific hake) recorded in logbooks
$\hat{D}$: initial discard estimate for species *s* in stratum *x*, state *a* and bimonthly period *b*

Discard ratios and standard errors for the LE bottom trawl sector are presented in Tables 2a-2b. Pacific hake was excluded when using the retained FMP groundfish denominator because vessels that target or land large amounts are considered to be part of Pacific hake mid-water trawl sectors, which are distinct from the LE groundfish bottom trawl sector.

Although retained logbook weights of FMP groundfish (excluding Pacific hake) were initially used to expand observed discard ratios to the fleet-wide level in this sector, logbooks are not submitted for 100% of trawl trips and therefore do not capture all groundfish bottom trawl fishing effort. As a result, it was necessary to adjust initial fleet level discard estimates to reflect the level of effort indicated by fish ticket landings. To do this, both fish ticket and logbook data were aggregated by state and bimonthly periods (Figure 2) associated with cumulative trip limits. An adjustment ratio was then computed for each state and bimonthly period as the weight of FMP groundfish (excluding Pacific hake) recorded on fish tickets divided by that recorded in logbooks. Each adjustment ratio was multiplied by coinciding discard estimates and then summed across bimonthly periods, states, and spatial-temporal strata to produce coast-wide adjusted discard estimates for each species:

$$adj(\hat{D}_s) = \sum_x \sum_a \sum_b \hat{D}_{sxab} \times \frac{F_{ab}}{R_{ab}}$$

where:

F: weight of retained FMP groundfish (excluding Pacific hake) recorded on fish tickets
adj($\hat{D}_s$*)*: adjusted discard estimate for species *s*

Adjustment ratios were computed separately for each state and bimonthly period to account for differences between individual states' logbook submission rates and fish ticket recording methods. An adjustment ratio value less than 1 indicated that more FMP groundfish weight was recorded in logbooks than on fish tickets. Conversely, adjustment ratios greater than 1 occurred when fish ticket FMP groundfish weights were larger than logbook weights. In 2010, the value of the adjustment ratios computed for the LE bottom trawl sector ranged between 0.716 and 1.214 (mean of 1.033). Only three state-bimonthly period strata had ratios less than 1, which occurred from January through February, in Washington and California, and from July through

August in Washington. The largest adjustment ratio occurred in Washington from May through June. The majority of adjustment ratios for state and bimonthly periods were slightly larger than 1.

Coast-wide landings, final discard estimates, and estimated fishing mortality in the 2010 LE groundfish bottom trawl sector are reported in Table 3. A 50% mortality rate was applied to discarded sablefish and lingcod weight, which is a historical legacy and assumption from the GMT.

California Halibut Bottom Trawl Fishery

For a description of the California halibut bottom trawl sector, vessel selection, observer coverage, vessel waivers, and prior California halibut bottom trawl sector reports, see: http://www.nwfsc.noaa.gov/research/divisions/fram/observer/.

Fleet-wide discard estimates in the California halibut bottom trawl fishery were derived from WCGOP observer data and fish ticket landings data. Although all California halibut vessels are permitted by the state of California, we consider this fishery to consist of both a limited entry and an open access component (vessels that do not have federal limited entry groundfish permits). The WCGOP provides observer coverage under the LE groundfish bottom trawl sector and isolates data for the LE component of the California halibut fishery based on the following criteria: 1) the tow target was California halibut or 2) the tow target was nearshore mix, sand sole or other flatfish, and the tow took place in less than 30 fathoms, south of 40°10' N. latitude. All tows in the observer data that met at least one of the above requirements were included in the LE California halibut bottom trawl dataset. The WCGOP randomly samples the OA California halibut sector separately. These two components of the observed California halibut trawl fishery (LE and OA) were combined in this 2010 analysis to ensure sufficient sample size and to meet confidentiality mandates.

Discard ratios were computed for the combined (LE and OA) observed data using the retained weight of California halibut in the denominator. For individual LE and OA sectors, the fleet landed weight of California halibut was then used as a multiplier to expand observed discard ratios to the fleet (Table 4). Fleet-wide landings were compiled from "non-mid-water" trawl fish tickets (see Figure 1) for those vessels that had a state-issued California halibut bottom trawl permit.

Discard estimates were computed for each sector based on the following equation:

$$\hat{D}_s = \frac{\sum_t d_{st}}{\sum_t r_t} \times F$$

where:

s: species or species group
t: observed tows
d: observed discard weight of species *s*
r: observed retained weight of California halibut
F: weight of retained California halibut recorded on fish tickets
$\hat{D}_s$: discard estimate for species *s*

Although FMP groundfish and California halibut weights from the same fish tickets were used to adjust initial LE groundfish bottom trawl estimates and to expand discard ratios for the LE California halibut fleet, this is

not anticipated to be a major source of bias in our analysis, as the primary species retained on observed California halibut tows were non-groundfish. However, because some flatfish species were retained on these tows, it is possible that estimates for the shallowest strata in California for the LE groundfish bottom trawl sector could have been positively biased due to slightly larger adjustment ratios (caused by the inclusion of landed flatfish weight that was in fact caught on California halibut tows). Examination of the species composition on fish tickets in the areas where California halibut is typically landed suggests that the impact of this is minor. Given that groundfish are regularly discarded by the LE California halibut fishery, we felt that it was more appropriate to estimate discard for this fishery than to exclude LE California halibut discard estimates altogether from this report.

Table 5 presents estimated mortalities of species caught in the 2010 California halibut trawl fishery. A 50% mortality rate was applied for discarded lingcod, which is a historical legacy and assumption from the GMT. in the LE bottom trawl sector. Because limited entry vessels participating in the California halibut fishery often land catch at the same time as catch from bottom trawl tows targeting groundfish, it was not possible to split out landed weights for groundfish species from those reported in the LE bottom trawl sector. Joint groundfish landings for the LE bottom trawl sector and for LE vessels targeting California halibut are presented in Table 3.

Pink Shrimp Trawl Fishery

Fleet-wide discard estimates for the pink shrimp trawl fishery were derived from WCGOP observer data and fish ticket landings data (Figure 1). For a description of the pink shrimp trawl sector, vessel selection, observer coverage, vessel waivers, and prior pink shrimp trawl sector reports, see: http://www.nwfsc.noaa.gov/research/divisions/fram/observer/.

Discard ratios for this fishery were calculated by dividing the observed discard weight of each species or species group by the observed retained weight of pink shrimp (Table 6). The fleet landed weight of pink shrimp was then used as a multiplier to expand observed discard ratios to the fleet. The equation for the expansion of pink shrimp discard ratios is identical to that presented for the California halibut fishery, but where r represents the retained weight of pink shrimp and F represents the weight of retained pink shrimp recorded on fish tickets. Because observer data in 2010 were only available north of 40°10' N. latitude, only pink shrimp fish tickets in the north were compiled for the expansion. We assumed combined discard rates for all state pink shrimp fleets in the north. WCGOP coverage of the Washington pink shrimp fleet began in 2010 and is utilized for the first time in this report. Pink shrimp landings from south of 40°10' N. latitude are summarized as part of the remaining incidental fisheries landings in Table 18. Table 7 presents landings, final discard estimates, and total fishing mortality in the 2010 pink shrimp trawl fishery.

Non-Nearshore Fixed Gear Sector

Fleet-wide discard estimates for the LE and OA non-nearshore fixed gear sector of the groundfish fishery were derived from WCGOP observer data and fish ticket landings data. For a description of the fixed gear sectors, vessel selection, observer coverage, vessel waivers, and prior fixed gear sector reports, see: http://www.nwfsc.noaa.gov/research/divisions/fram/observer/.

Fish tickets for fixed gear that did not have recorded sablefish or nearshore species were included in the non-nearshore fixed gear sector only if groundfish landings were greater than non-groundfish landings based on a

unique vessel and landing date (Figure 1). If non-groundfish landings were greater than groundfish landings, those fixed gear fish tickets (which also did not have recorded sablefish or nearshore species) were summarized in Table 18 incidental landings. The commercial fixed gear fish tickets with recorded nearshore species weight were not used in this portion of the fixed gear analysis, regardless of whether they included recorded weights for sablefish. These fish tickets were instead included in the nearshore fixed gear groundfish sector (see next section).

Fish tickets were partitioned into three commercial fixed gear subsectors: LE sablefish primary, LE sablefish non-primary, and OA fixed-gear groundfish. Commercial fixed gear fish tickets were first divided out by whether the vessel had a federal groundfish permit (limited entry) or no federal groundfish permit (open access). OA fish tickets were placed in the OA fixed gear groundfish subsector. Next, LE fish tickets were separated based on whether the vessel's federal groundfish permit(s) had a sablefish endorsement (sablefish-endorsed) with tier quota for the primary season or whether it was not endorsed (also referred to as '0' tier permits). The LE sablefish primary season takes place from April through the end of October. Fish tickets for all LE sablefish vessels with tier endorsements that were operating within this period and within their allotted tier quota were placed in the LE sablefish primary subsector. If LE sablefish-endorsed vessels fished outside of the primary season (November through March) or made trips within the season after they had reached their cumulative tier quota, the fish tickets were placed in the sablefish non-primary subsector. In addition, fish tickets from non-endorsed LE vessels were also placed in the sablefish non-primary subsector.

Data used in our analyses were collected by WCGOP from the following fixed gear subsectors in order of priority: LE sablefish-endorsed primary season fixed gear, LE '0' tier (non-endorsed) and OA fixed gear (non-nearshore). LE sablefish-endorsed vessels that were fishing outside of the primary season or that had reached their cumulative tier quota in the primary season were not observed.

Observer data were stratified by subsector, area, and gear group (where applicable) (Table 8). Area strata were based on PFMC area management for sablefish trip limits and correspond to: north of 40° 10' N. latitude, from 40° 10' to 36° N. latitude, and south of 36° N. latitude. Data were summarized separately for longline and pot/trap gear groups. If landings were made by a fixed gear subsector for which there were no or very few WCGOP observations, the most appropriate observed discard ratios were selected and applied to these landings based on similarities in the fishery management structure, fishing and discard behavior, and the gear fished. For example, the OA fixed gear subsector landed 52.2 mt of sablefish between 40° 10' N. and 36° N. latitude with longline gear in 2010 but only a small portion of the fleet was observed by the WCGOP program in this stratum (Table 11). Given similarities in gear type and catch composition, LE non-endorsed sablefish data were selected as the most appropriate source of information to supplement observer data from OA fixed gear vessels. Observer data from both sources were combined to compute a discard ratio, which was then multiplied by the OA fixed gear longline landings in this area to generate estimated discard.

Explicit depth stratification of fixed gear fishing effort is not possible because there are no fleet-wide estimates of fishing depths. However, management restricted fixed gear fishing to depths greater than 100 fathoms in the area north of 40° 10' N. latitude, with the exception of fishing greater than 125 fathoms from 45° 3.83' to 43° N. latitude, and to depths greater than 150 fathoms in the area south of 40° 10' N. latitude.

The number of observed vessels, trips, and sets are summarized for each subsector in Tables 9-11, along with sablefish and FMP groundfish (excluding Pacific hake) fleet landings used as a measure for expanding discard

from observed trips to the entire fleet. Discard ratios in the two areas north of 36° N. latitude were calculated by dividing the stratum discard weight of each species by the observed retained catch weight of sablefish. Discard ratios for all species in the area south of 36° N. latitude were calculated by dividing the stratum discard weight of each species by the retained catch weight of all FMP groundfish species excluding Pacific hake. Retained groundfish was used as the denominator in this area rather than sablefish weight alone because fixed gear fisheries south of 36° N. latitude have a wider range of target species. A broader denominator was therefore necessary in order to effectively capture their level of fishing effort.

Stratum estimated discard for all subsectors were then summed for each area and summed coast-wide. Coast-wide landings, final discard estimates, and estimated fishing mortality are reported in Table 12 for the 2010 LE and OA non-nearshore fixed gear sectors combined. A 20% mortality rate is applied for discarded sablefish, as assumed by the GMT.

Nearshore Fixed Gear Sector

Fleet-wide discard estimates for the commercial nearshore fixed gear sector of the groundfish fishery were derived from WCGOP observer data, fish ticket landings data (Figure 1), and mortality rates provided by the GMT. For a description of the nearshore fixed gear sector, vessel selection, observer coverage, vessel waivers, and prior nearshore fixed gear sector reports, see: http://www.nwfsc.noaa.gov/research /divisions/fram/observer/.

The WCGOP provides coverage for the commercial nearshore fisheries in California and Oregon based on a selection process of state-issued nearshore permits/licenses. Although California and Oregon nearshore fisheries are sampled separately for observer coverage, fleet-wide discard estimates are provided for the areas north and south of the groundfish management line at 40° 10' N. latitude, in accordance with 2010 federal groundfish management specifications.

Mortality rates provided by the GMT differ for each species according to depth. In December 2007, the GMT provided a slightly revised suite of depth-specific discard survival assumptions for nearshore species. It was therefore necessary to generate discard estimates in each of the three depth intervals employed by the GMT (0-10, 11-20, > 20 fathoms). The percentage of catch for each species or species group by depth was calculated based on summarized observer data from 2003-2010 (Table 13). Fleet landings of each nearshore species or species group in 2010 were then distributed among depth intervals using the percentages computed in the previous step. Finally, the total distributed landed weights of all nearshore groundfish species within each depth stratum were used to expand observed discard to the fleet level.

Prior to the calculation of discard ratios in this sector, WCGOP observer data were stratified by area and depth (Table 14). In the area north of 40° 10' N. latitude, data were combined in the two deepest depth strata (11-20 and > 20 fathoms) to ensure an adequate sample size. Discard ratios were calculated by dividing the stratum discard weight of each species or species group by the retained weight of nearshore species.

Observed discard ratios (Table 14) were multiplied by the allocated landed weight of all nearshore groundfish species within each depth stratum (Table 13). These fleet-level estimates of gross discard within each stratum were then multiplied by depth-specific discard mortality rates (provided by the GMT) to generate estimates of discard mortality in each stratum (Table 15a-b). Final discard estimates for each area were obtained by summing estimates of discard mortality across depth strata. Gross discard estimates, discard mortality rates,

estimated discard mortality, and fishing mortality estimates in the 2010 nearshore fixed gear sectors north and south of 40° 10' N. latitude are reported in Tables 15a-15b.

Discard Estimation Summary

The estimated fishing mortalities of major U.S. west coast groundfish species are reported by sector/fishery in Table 16 for specific areas or groups consistent with ABC and OY guidelines. This table includes only the sectors/fisheries for which WCGOP observer data were available.

Bycatch estimation and summaries for several additional fish species observed by the WCGOP are available in separate reports; Pacific halibut is provided in Jannot et al. 2011, salmon species are provided in Bellman et al. 2011a, and green sturgeon and eulachon are provided in Bellman et al. 2011b.

Other Commercial Data Summaries

The mid-water trawl fishery for Pacific hake/whiting is comprised of several at-sea processing fleets. The three at-sea processing sectors include: catcher-processors, motherships (with non-tribal catcher boats), and a tribal fleet delivering to motherships. Observer data was used exclusively for all at-sea sectors from the At-Sea Hake Observer Program (A-SHOP). The objective of observation in this program is to produce estimates of total catch in the fishery. Observers do not estimate or report amounts of discard separately. However, they provide visual estimates of the proportions of catch that are discarded. These proportions form the basis of the retained and discarded catch amounts summarized in Table 17. All at-sea sectors for Pacific hake are summarized in Table 19 as 'All at-sea hake fisheries'. For more information on the at-sea hake sectors, see: http://www.nwfsc.noaa.gov/research/divisions/fram/observer/.

In addition, there is also a Pacific hake fleet which delivers to shoreside processors. The 2010 shoreside hake fishery was conducted under an Exempted Fishing Permit (EFP). Under this EFP, participants placed all of their catch directly into refrigerated tanks, rather than sorting the catch on deck, to preserve fish quality. They are allowed to avoid penalties for catch weights which go over their allotted trip-limits at the time of landing. This is described as a "maximum" retention fishery. Summaries of catch in the shoreside hake mid-water trawl fleet are included in Table 17. The summary is also included in Table 19 as 'Shoreside hake mid-water trawl'. The summary of retained catch is based exclusively on fish ticket data assigned to this fishery using the classification system outlined in Figure 1, and then combining any commercial trawl mid-water gear and any EFP mid-water trawl gear fish tickets. An additional estimate of Pacific hake discard (214 mt) was incorporated, based on electronic monitoring (EM) data and Office of Law Enforcement (OLE) reports (Lori Jesse, NMFS NW Regional Office, personal communication).

Landings of groundfish species from the WA tribal shoreside fisheries are summarized in Table 19. The summary of this fishery is based exclusively on fish ticket data assigned to this fishery using the classification system outlined in Figure 1. Discard estimates for WA tribal shoreside fisheries were not available. Tribal directed groundfish fisheries employ full retention requirements. In addition, full retention is monitored by a target tribal observation rate of 15% for Makah trawl fisheries. Discard mortality of fixed gear sablefish is accounted for in tribal management by reducing the tribal allocation to account for discard mortality. For more information on discard and retention in tribal sablefish fisheries and Makah trawl observations, see Appendix B of the 2011-2012 groundfish harvest specifications (PFMC and NMFS 2011).

Groundfish species catch from the recreational fisheries are summarized in Table 19. The summary of these fisheries is based exclusively on data provided by the state agencies: the Washington Department of Fish and Wildlife, the Oregon Department of Fish and Wildlife, and the California Department of Fish and Game. The state agencies provide catch weight (discarded + retained) estimates with PFMC-approved depth dependent mortality rates applied to account for discard mortality.

Research catch of groundfish species is summarized in Table 19, based on data provided by the NOAA Northwest Regional Office. Catch weight (discarded + retained) was summarized from reporting of scientific research permits that directly or indirectly caught groundfish off the U.S. west coast. Discarded and retained catch varies by research permit, and the summary reported here includes catch from permits with only retained catch, some tagging study catch where all fish were released alive, combined discarded and retained catch, etc. Research catch was summarized for all gear types employed.

Landings of groundfish species from other non-groundfish fisheries operating under federal open access landing limits, which are mostly state-managed and incidentally catch groundfish, are also summarized in Table 19 as 'Incidental fisheries'. The fisheries included in this summary are listed in the Introduction section. A more detailed breakdown of incidental landings is provided in Table 18. The summary of these fisheries was based exclusively on fish ticket data, with the exception of one WCGOP observed EFP (conducted by The Nature Conservancy) which supplied discard catch as well. It was not possible to provide discard estimates for the remaining incidental fisheries. In Table 18, data from PacFIN that is listed under the heading "EFP (Excluding Midwater Trawl)", includes cumulative groundfish landings for EFP's conducted in all fisheries, not simply those under the groundfish management plan. Fish tickets associated with the Pacific halibut directed commercial fishery were isolated based on landed catch of Pacific halibut recorded on the fish ticket on the day of the opening or within two subsequent days.

Results

In Table 20, fishing mortality estimates are evaluated in terms of 2010 OY and ABC harvest specifications from federal groundfish regulations (50 CFR 660 Subpart G). The ABCs for all rebuilding groundfish species were not exceeded in 2010. OY specifications for rebuilding species in 2010 relative to 2009 increased for darkblotched and Pacific ocean perch, remained the same for bocaccio, canary and cowcod rockfish, and decreased for widow and yelloweye rockfish (75 FR 39178).

The results indicate that for one of the rebuilding groundfish species, darkblotched rockfish, the fishing mortality estimate (332 mt) exceeded its OY (330 mt) by 1% (Table 20). The darkblotched rockfish OY increased by 45 mt relative to 2009. In response to a federal court ruling in April 2010, the NMFS darkblotched rockfish OY of 330 mt was adopted, which was higher than the original 291 mt OY specified in regulations. Estimated mortality of darkblotched rockfish increased for the second consecutive year (332 mt at 101% of OY in 2010; 301 mt at 106% of OY in 2009; 253 mt at 77% of OY in 2008) (Bellman et al. 2010 and Bellman et al. 2009). Mortality estimates of darkblotched rockfish and Pacific ocean perch were highest in the LE bottom trawl sector (Table 19).

Among other rebuilding species, the largest percentage of estimated mortality in relation to OY was 80% for Pacific ocean perch, with an estimated total fishing mortality of 159 mt and an OY of 200 mt. This proportion of OY (80%) is the lowest since 2006 when the Pacific ocean perch OY was more than double

(447 mt in 2006 compared to 200 mt in 2010). Pacific ocean perch mortality decreased between 2009 and 2010 from 181 mt to 159 mt despite an increase in OY of 11 mt. Pacific ocean perch is managed under the slope rockfish category when caught south of 40° 10' N. latitude, so species-specific estimates are reported only in the area north of this latitude. Thus, additional mortality of Pacific ocean perch at the population level can occur south of 40° 10' N. latitude, but it is not evaluated in groundfish management on an individual species-specific basis.

For other groundfish, only the mortality estimate for longnose skate (1387 mt) was above the 2010 OY (1349 mt) by 3%. This is the second year where the OY (1349 mt in both 2009 and 2010) was exceeded for longnose skate, despite a decrease in estimated mortality of 74 mt between 2009 and 2010. The estimated fishing mortality was still within the 2010 ABC of 3269 mt (Table 20). Estimated mortality of longnose skate was highest in the LE bottom trawl sector, followed by non-nearshore fixed gear sectors (Table 19).

Sablefish mortality in the area north of 36° N. latitude was estimated to be within 5% of its OY (Table 20) (6167 mt at 95% of a 6471 mt OY). Sablefish mortality north of 36° N. latitude decreased by 446 mt between 2009 and 2010, and the OY decreased by 581 mt.

As with all point estimates, mortality values presented in Tables 19 and 20 should be considered with caution. It should be noted that multiple sources of uncertainty were not accounted for in this analysis and may influence mortality estimates. These include uncertainty in sampling of landings for species composition, logbook spatial and depth information, observed retained weights, discard mortality rates, as well as others. Currently, it is not possible to quantify uncertainty for mortality estimates presented in this report, as measures of the variability associated with logbook and fish ticket data sources are not available. However, standard errors have been provided for all observed discard ratios.

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Figures

Figure 1. Fish ticket and logbook data processing for division into groundfish fishery sectors after retrieval of a full calendar year data set from the Pacific Coast Fisheries Information Network (PacFIN) database. Grey highlight indicates sectors for which federal observer data is available.

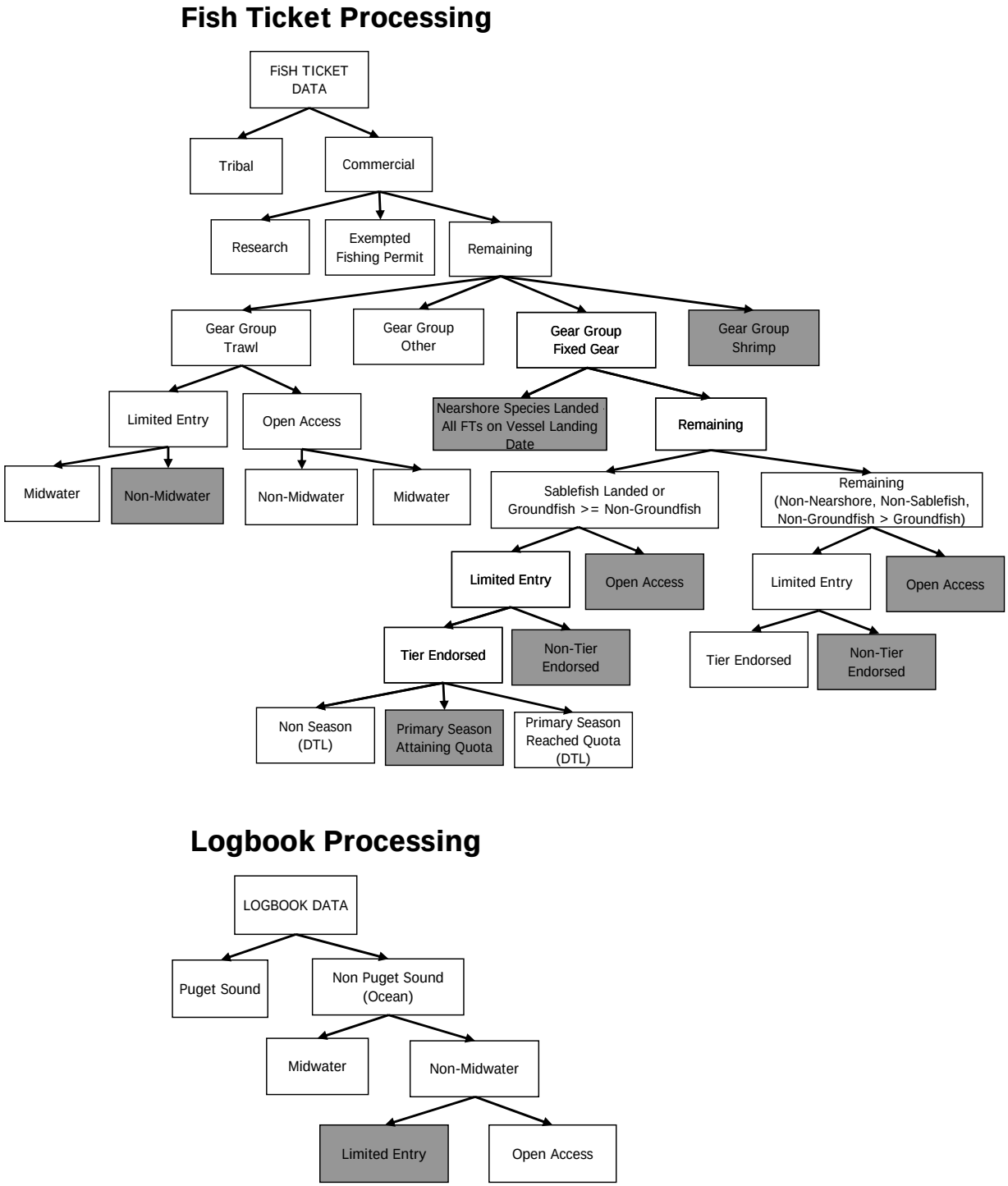
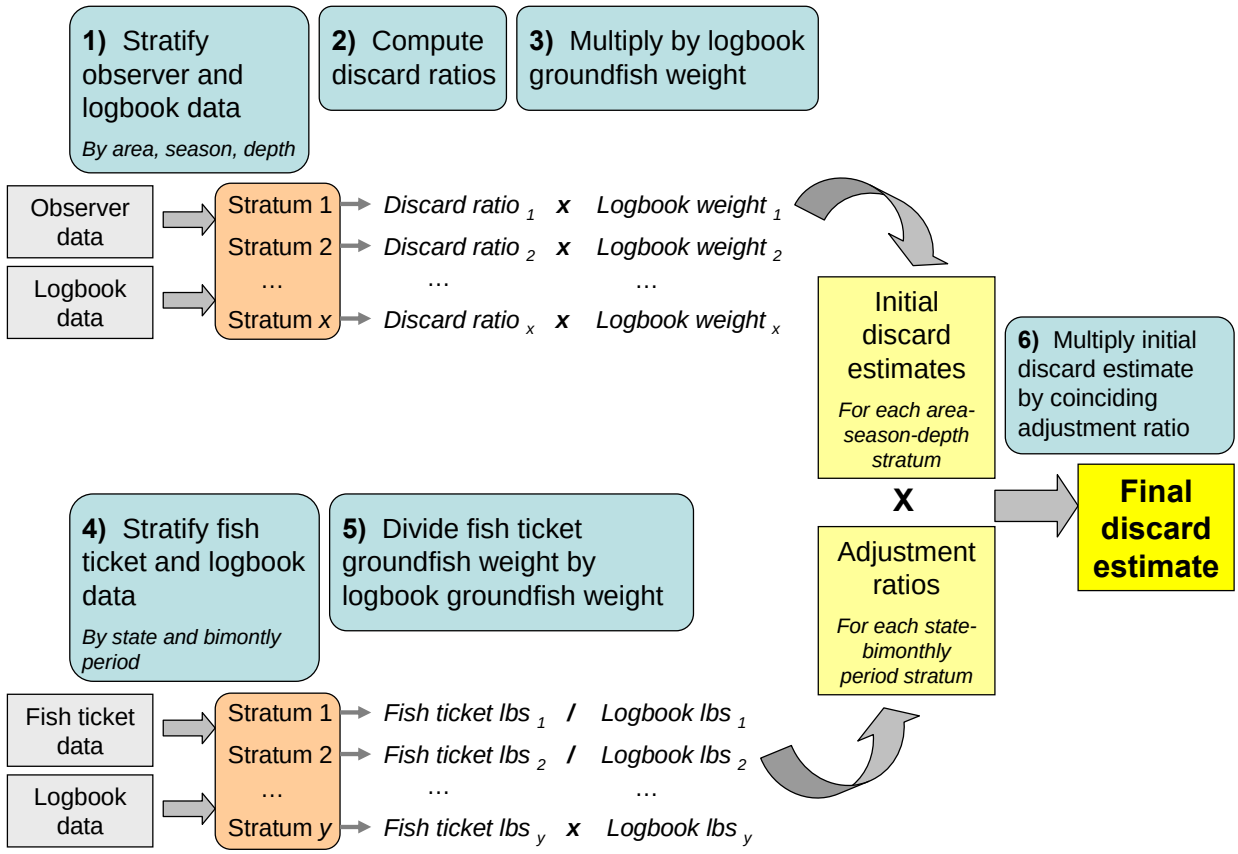


Figure 2. Flow-chart illustrating the process by which WCGOP observer data from the limited entry bottom trawl sector are expanded to the fleet-wide level. Observer data are then assigned to spatial/temporal strata based on latitude, depth, and season. Observed discard ratios are computed and applied to the coinciding logbook weight for each stratum. Finally, an adjustment ratio of the proportion of logbook fish ticket groundfish weight is multiplied by the initial expanded estimate to produce a final discard mortality estimate for each species. See the limited entry bottom trawl methods for further details.



Tables

Note: In all tables, (--) was used when there is no actual numeric value (i.e. the species was neither caught nor discarded). Values appear as 0.0 when a value exists but is smaller than the decimal places allotted. A value of NA represents that the calculation is not applicable for a particular species or strata, or that the calculation did not produce a result (e.g. very small values might result in NA from a standard error calculation). Grey shading indicates that values include estimates of both discard and retained catch.

Table 1. Number of tows and retained weight (mt) of FMP groundfish species (excluding Pacific hake) from observer and logbook data for the 2010 limited entry bottom trawl fishery by depth, season, and management area. Data are combined as needed to ensure adequate sample size. Tows targeting California halibut have been removed. Winter season is January-April and November-December and summer season is May-October.

	NORTH of 40°10' N Lat.				SOUTH of 40°10' N Lat.			
Depth interval (fathoms)	Number of tows		Retained groundfish (mt)		Number of tows		Retained groundfish (mt)	
	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer
Observed fleet								
0-125	422		328.5		65	62	28.4	32.3
126-250	177	370	438.0	879.4	75		61.3	
> 250	482	806	894.7	1199.1	37	120	47.4	191.2
Total	2257		3739.8		359		360.5	
All trawl logbooks								
0-125	2216		1675.3		170	483	102.0	241.1
126-250	1402	1925	3369.3	3912.3	538		535.7	
> 250	2990	2900	5990.1	4125.9	440	615	632.5	969.1
Total	11433		19073.0		2246		2480.4	
Percentage observed								
0-125	19%		20%		38%	13%	28%	13%
126-250	13%	19%	13%	22%	14%		11%	
> 250	16%	28%	15%	29%	8%	20%	7%	20%
Total	20%		20%		16%		15%	

Table 2a. Discard ratios and standard error from observed trips north of 40°10' N latitude in the 2010 limited entry bottom trawl fishery by season and depth. Ratios are computed as the observed discard weight divided by the observed weight (adjusted to fish tickets) of retained FMP groundfish species (excluding Pacific hake). Winter season is January-April and November-December and summer season is May-October. The 0-125 fm stratum was combined across seasons.

NORTH OF 40°10' N Lat.		Depth interval (fathoms)					
		0-125		126-250		≥ 250	
		Discard ratio	SE	Discard ratio	SE	Discard ratio	SE
Rebuilding species	**Season**	***Denominator = Retained groundfish (mt)***					
Bocaccio	winter	--	--	--	--	--	--
	summer			--	--	--	--
Canary rockfish	winter	0.0001	0.0045	0.0000	NA	--	--
	summer			0.0000	NA	0.0000	0.0029
Darkblotched rockfish	winter	0.0059	0.0893	0.0099	0.0825	0.0047	0.1156
	summer			0.0102	0.0690	0.0033	0.0696
Pacific ocean perch	winter	0.0047	1.2929	0.0008	0.0119	0.0001	0.0020
	summer			0.0103	0.0938	0.0017	0.0479
Widow rockfish	winter	0.0001	0.0055	0.0000	0.0026	0.0000	0.0003
	summer			0.0038	0.5330	0.0006	0.1348
Yelloweye rockfish	winter	--	--	--	--	--	--
	summer			0.0000	NA	0.0000	NA
Non-rebuilding species							
Arrowtooth flounder	winter	0.0938	0.2311	0.0944	0.2695	0.0151	0.0601
	summer			0.0229	0.0992	0.0103	0.0882
Big skate	winter	0.0168	0.0853	--	--	--	--
	summer			0.0002	0.2901	0.0001	NA
Black rockfish (North of 46°16' N. lat.)	winter	--	--	--	--	--	--
	summer			--	--	--	--
Black rockfish (South of 46°16' N. lat.)	winter	--	--	--	--	--	--
	summer			--	--	--	--
Cabezon (Oregon)	winter	--	--	--	--	--	--
	summer			--	--	--	--
California skate	winter	--	--	--	--	--	--
	summer			--	--	--	--
Chilipepper rockfish	winter	--	--	--	--	--	--
	summer			--	--	--	--
Dover sole	winter	0.0123	0.0416	0.0146	0.0833	0.0206	0.0805
	summer			0.0063	0.0677	0.0350	0.0848
English sole	winter	0.0400	0.0801	0.0008	0.0120	0.0000	0.0009
	summer			0.0000	0.0003	--	--
Greenspotted rockfish	winter	0.0000	NA	--	--	--	--
	summer			0.0000	NA	--	--
Greenstriped rockfish	winter	0.0022	0.0581	0.0000	NA	0.0000	NA
	summer			0.0001	0.0111	0.0000	0.0014
Grenadiers	winter	--	--	0.0000	0.0020	0.0063	0.0602
	summer			0.0000	0.0018	0.0167	0.1017
Kelp greenling	winter	0.0000	0.0241	--	--	--	--
	summer			--	--	--	--
Lingcod (North of 42° N. lat.)	winter	0.0057	0.0321	0.0014	0.0484	0.0000	0.0017
	summer			0.0000	0.0015	0.0000	0.0003
Lingcod (South of 42° N. lat.)	winter	0.0001	0.0138	--	--	--	--
	summer			--	--	--	--
Longnose skate	winter	0.0139	0.0307	0.0139	0.0502	0.0040	0.0148
	summer			0.0168	0.0331	0.0049	0.0142
Longspine thornyhead	winter	0.0000	NA	0.0004	0.0031	0.0264	0.0674
	summer			0.0015	0.0222	0.0375	0.0581
Mixed thornyheads	winter	--	--	--	--	0.0016	0.2129
	summer			0.0002	0.2109	0.0022	0.4293

Table 2a (continued).

NORTH OF 40°10' N Lat.		Depth interval (fathoms)					
		0-125		126-250		≥ 250	
		Discard ratio	SE	Discard ratio	SE	Discard ratio	SE
Non-rebuilding species (cont.)	**Season**	***Denominator = Retained groundfish (mt)***					
Other flatfish	winter	0.1228	0.0725	0.0032	0.0240	0.0035	0.0792
	summer			0.0019	0.0243	0.0003	0.0032
Other groundfish	winter	0.0143	0.0569	0.0066	0.0543	0.0014	0.0182
	summer			0.0052	0.0287	0.0019	0.0231
Other nearshore rockfish	winter	--	--	--	--	--	--
	summer			--	--	--	--
Other shelf rockfish	winter	0.0009	0.0457	0.0003	0.0066	0.0000	0.0037
	summer			0.0006	0.0124	0.0001	0.0100
Other slope rockfish	winter	0.0010	0.0364	0.0023	0.0078	0.0006	0.0029
	summer			0.0208	0.0305	0.0036	0.0187
Pacific cod (North of 43° N. lat.)	winter	0.0000	0.0015	--	--	--	--
	summer			--	--	--	--
Pacific hake	winter	0.0288	0.4056	0.0212	0.0835	0.0087	0.0827
	summer			0.0229	0.0730	0.0091	0.0660
Petrale sole	winter	0.0160	0.0272	0.0231	0.1192	0.0017	0.0425
	summer			0.0000	0.0009	0.0000	0.0003
Redstripe rockfish	winter	--	--	0.0000	0.0052	--	--
	summer			0.0000	0.0007	0.0000	0.0021
Sablefish (North of 36° N. lat.)	winter	0.0344	0.1981	0.0336	0.1078	0.0134	0.0251
	summer			0.0216	0.0596	0.0175	0.0423
Sharpchin rockfish	winter	0.0001	0.0405	0.0004	0.0736	0.0000	0.0062
	summer			0.0016	0.6077	0.0000	NA
Shortspine thornyhead	winter	0.0006	0.0089	0.0025	0.0094	0.0040	0.0147
	summer			0.0048	0.0131	0.0048	0.0110
Silvergray rockfish	winter	--	--	0.0001	0.2197	--	--
	summer			0.0007	2.9621	--	--
Spiny dogfish	winter	0.0354	0.3736	0.0588	0.2908	0.0136	0.2936
	summer			0.0175	0.1216	0.0012	0.0398
Splitnose rockfish	winter	0.0008	0.2136	0.0067	0.0617	0.0002	0.0199
	summer			0.0071	0.1354	0.0003	0.0572
Starry flounder	winter	0.0008	0.0110	--	--	--	--
	summer			--	--	--	--
Unspecified skate	winter	0.0001	0.0027	0.0004	0.0080	0.0005	0.0148
	summer			0.0001	0.0011	0.0002	0.0077
Yellowmouth rockfish	winter	--	--	--	--	0.0000	NA
	summer			0.0003	NA	0.0000	NA
Yellowtail rockfish	winter	0.0096	0.2100	0.0001	0.0119	--	--
	summer			0.0000	0.0005	--	--
Non-groundfish species							
Dungeness crab	winter	0.1105	0.2074	0.0001	0.0103	0.0000	0.0278
	summer			0.0004	0.0165	0.0000	0.0169
Eulachon	winter	0.0000	0.0013	--	--	--	--
	summer			--	--	--	--
Other non-FMP flatfish	winter	0.0098	0.0799	0.0006	0.0087	0.0020	0.0076
	summer			0.0002	0.0025	0.0034	0.0065
Other non-FMP skate	winter	0.0042	0.0734	0.0043	0.0222	0.0050	0.0158
	summer			0.0047	0.0132	0.0061	0.0110
Other nongroundfish	winter	0.0185	0.0236	0.0336	0.0481	0.0274	0.0168
	summer			0.0113	0.0083	0.0386	0.0183
Tanner crab	winter	0.0000	NA	0.0009	0.0199	0.0319	0.0879
	summer			0.0012	0.0120	0.0325	0.0428

Table 2b. Discard ratios and standard error from observed trips south of 40°10' N latitude in the 2010 limited entry bottom trawl fishery by season and depth. Ratios are computed as the observed discard weight divided by the observed weight (adjusted to fish tickets) of retained FMP groundfish species (excluding Pacific hake). Winter season is January-April and November-December and summer season is May-October. The 125-250 fm stratum was combined across seasons.

SOUTH OF 40°10' N Lat.		Depth interval (fathoms)					
		0-125		126-250		≥ 250	
		Discard ratio	SE	Discard ratio	SE	Discard ratio	SE
Rebuilding species	**Season**	***Denominator = Retained groundfish (mt)***					
Bocaccio	winter	0.0246	0.6463	0.0103	0.6904	--	--
	summer	0.0105	0.4070			--	--
Canary rockfish	winter	--	--	--	--	--	--
	summer	0.0003	0.0209			--	--
Cowcod	winter	--	--	0.0010	0.2690	--	--
	summer	0.0002	0.0208			--	--
Darkblotched rockfish	winter	0.0001	0.0229	0.0006	0.0166	--	--
	summer	0.0003	0.0260			--	--
Widow rockfish	winter	--	--	0.0052	0.2781	--	--
	summer	0.0003	0.0225			0.0000	0.0071
Yelloweye rockfish	winter	--	--	0.0001	NA	--	--
	summer	--	--			--	--
Non-rebuilding species							
Arrowtooth flounder	winter	0.0009	0.1378	0.0236	0.2016	0.0010	0.1427
	summer	0.0368	0.4661			0.0011	0.0369
Bank rockfish	winter	--	--	0.0001	0.0140	--	--
	summer	--	--			--	--
Big skate	winter	0.0032	1.4036	0.0001	0.0180	--	--
	summer	0.0067	0.1218			--	--
Blackgill rockfish	winter	--	--	--	--	--	--
	summer	--	--			--	--
California skate	winter	0.0124	0.1911	--	--	--	--
	summer	0.0075	0.1202			--	--
Chilipepper rockfish	winter	0.0630	0.5433	0.0226	0.4520	--	--
	summer	0.0841	0.7711			--	--
Dover sole	winter	0.0021	0.0772	0.0613	0.2913	0.0075	0.0623
	summer	0.0057	0.0434			0.1058	0.3819
English sole	winter	0.0368	0.1486	0.0062	0.0420	--	--
	summer	0.0137	0.0488			--	--
Greenspotted rockfish	winter	0.0000	0.0138	0.0001	NA	--	--
	summer	0.0006	0.0217			--	--
Greenstriped rockfish	winter	0.0079	0.2273	0.0001	0.0199	--	--
	summer	0.0076	0.1030			--	--
Grenadiers	winter	--	--	0.0000	NA	0.0560	0.6849
	summer	--	--			0.0447	0.6603
Kelp greenling	winter	--	--	--	--	--	--
	summer	--	--			--	--
Lingcod	winter	0.0066	0.0819	0.0000	0.0025	--	--
	summer	0.0093	0.0611			0.0000	0.0006
Longnose skate	winter	0.0488	0.2294	0.0822	0.3347	0.0264	0.1689
	summer	0.1330	0.5031			0.0316	0.1021
Longspine thornyhead	winter	--	--	0.0009	0.0129	0.0179	0.0789
	summer	0.0001	0.0125			0.0264	0.0533
Mixed thornyheads	winter	--	--	--	--	0.0093	0.1380
	summer	--	--			--	--

Table 2b (continued).

SOUTH OF 40°10' N Lat.		Depth interval (fathoms)					
		0-125		126-250		≥ 250	
		Discard ratio	SE	Discard ratio	SE	Discard ratio	SE
Non-rebuilding species (cont.)	**Season**	***Denominator = Retained groundfish (mt)***					
Other flatfish	winter	0.1885	0.2817	0.0256	0.1316	0.0000	0.0005
	summer	0.0193	0.0425			0.0001	0.0016
Other groundfish	winter	0.0367	0.3301	0.0567	0.3609	0.0051	0.0855
	summer	0.0307	0.2096			0.0024	0.0272
Other nearshore rockfish	winter	--	--	--	--	--	--
	summer	--	--			--	--
Other shelf rockfish	winter	0.0881	1.4622	0.0102	0.2276	--	--
	summer	0.0114	0.1639			--	--
Other slope rockfish	winter	--	--	0.0017	0.0108	0.0003	0.0406
	summer	--	--			0.0009	0.0179
Pacific cod	winter	--	--	--	--	--	--
	summer	--	--			--	--
Pacific hake	winter	0.0458	0.3357	0.1024	0.5966	0.0147	1.4489
	summer	0.0096	0.1079			0.0088	0.0832
Petrale sole	winter	0.0131	0.0754	0.0025	0.0196	--	--
	summer	0.0209	0.0679			0.0000	0.0065
Sablefish (North of 36° N. lat.)	winter	0.0018	0.1078	0.0407	0.1667	0.0152	0.1756
	summer	0.0204	0.3818			0.0131	0.0700
Sharpchin rockfish	winter	--	--	0.0010	0.2214	--	--
	summer	0.0000	NA			--	--
Shortbelly rockfish	winter	0.0121	0.2808	0.0055	0.9624	--	--
	summer	0.0005	0.0324			--	--
Shortspine thornyhead	winter	--	--	0.0030	0.0204	0.0003	0.0036
	summer	--	--			0.0013	0.0053
Spiny dogfish	winter	0.0153	0.2011	0.0472	1.2743	0.0004	NA
	summer	0.0047	0.0493			0.0001	0.0240
Splitnose rockfish	winter	0.0207	0.6352	0.1562	0.5918	0.0000	NA
	summer	0.0000	0.0019			0.0006	0.0115
Unspecified skate	winter	0.0002	0.0231	0.0002	0.0295	--	--
	summer	--	--			0.0000	0.0022
Yellowtail rockfish	winter	--	--	--	--	--	--
	summer	0.0001	0.0169			--	--
Non-rebuilding species	**Season**						
Dungeness crab	winter	0.1823	0.9758	0.0226	0.2521	--	--
	summer	0.1767	1.3009			0.0000	NA
Eulachon	winter	--	--	--	--	--	--
	summer	--	--			--	--
Other non-FMP flatfish	winter	0.0004	0.0201	0.0065	0.2045	0.0106	0.0637
	summer	0.0006	0.0078			0.0079	0.0451
Other non-FMP skate	winter	0.0112	0.1035	0.0141	0.0693	0.0167	0.0854
	summer	0.0026	0.0573			0.0063	0.0181
Other nongroundfish	winter	0.0231	0.0473	0.0160	0.0297	0.0724	0.0573
	summer	0.0389	0.1119			0.0357	0.0320
Tanner crab	winter	--	--	0.0025	0.1038	0.0828	0.2814
	summer	--	--			0.0523	0.1433

Table 3. Landings (mt), estimated discard (mt), and fishing mortality estimate (mt) of groundfish species from non-hake, commercial limited entry groundfish bottom trawls in 2010. Discard ratios (Table 2) were multiplied by FMP groundfish landings (excluding Pacific hake) to generate estimated discard.

	North of 40°10' N Lat.			South of 40°10' N Lat.			Coastwide		
	Landed	Discard	Estimate	Landed	Discard	Estimate	Landed	Discard	Estimate
Rebuilding species									
Bocaccio	0.2	--	0.2	2.0	10.9	12.9	2.2	10.9	13.1
Canary rockfish	1.6	0.3	1.9	0.4	0.1	0.5	2.0	0.4	2.4
Cowcod (South of 40°10' N. lat.)	--	--	--	--	0.6	0.6	--	0.6	0.6
Darkblotched rockfish	145.9	130.1	276.0	11.0	0.4	11.4	156.8	130.5	287.3
Pacific ocean perch (North of 40°10' N. lat.)	70.0	60.1	130.1	--	--	--	70.0	60.1	130.1
Widow rockfish	3.0	18.5	21.4	1.1	2.9	4.1	4.1	21.4	25.5
Yelloweye rockfish	0.0	0.0	0.0	--	0.1	0.1	0.0	0.1	0.1
Non-rebuilding species									
Arrowtooth flounder	3209.1	725.8	3934.9	--	24.1	24.1	3209.1	749.9	3959.0
Bank rockfish (South of 40°10' N. lat.)	--	--	--	13.9	0.1	13.9	13.9	0.1	13.9
Big skate	0.1	29.7	29.8	1.1	2.1	3.2	1.2	31.8	33.0
Black rockfish (North of 46°16' N. lat.)	--	--	--	--	--	--	--	--	--
Black rockfish (South of 46°16' N. lat.)	0.3	--	0.3	--	--	--	0.3	--	0.3
Blackgill rockfish (South of 40°10' N. lat.)	--	--	--	61.4	--	61.4	61.4	--	61.4
Cabezon (Oregon)	0.0	--	0.0	--	--	--	0.0	--	0.0
California skate	0.1	--	0.1	--	3.2	3.2	0.1	3.2	3.2
Chilipepper rockfish	0.3	0.2	0.5	330.5	40.2	370.7	330.9	40.4	371.3
Dover sole	9286.4	377.1	9663.4	1032.7	146.6	1179.3	10319.1	523.7	10842.7
English sole	137.0	70.9	207.9	21.0	10.7	31.7	158.0	81.6	239.6
Greenspotted rockfish	0.0	0.0	0.1	0.0	0.2	0.2	0.1	0.2	0.3
Greenstriped rockfish	2.6	4.0	6.6	--	2.8	2.8	2.6	6.8	9.4
Grenadiers	75.7	110.7	186.4	31.7	81.2	112.9	107.4	191.9	299.3
Kelp greenling	--	0.0	0.0	--	--	--	--	0.0	0.0
Lingcod (North of 42° N. lat.)		15.0			--			15.0	
50% mortality*	49.8	7.5	57.3	--	--	--	49.8	7.5	57.3
Lingcod (South of 42° N. lat.)		0.1			3.1			3.2	
50% mortality*	1.9	0.1	2.0	21.1	1.5	22.6	23.0	1.6	24.6
Longnose skate	898.7	187.2	1085.9	47.3	132.7	180.1	946.0	319.9	1266.0
Longspine thornyhead (North of 34° 27' N. lat.)	1094.2	333.1	1427.2	229.2	38.6	267.8	1323.4	371.6	1695.0
Mixed thornyheads	--	20.6	20.6	4.9	6.0	10.9	4.9	26.6	31.5

* Mortality rates provided by the Groundfish Management Team (GMT).

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.0 when a value is smaller than one decimal place.

Table 3 (continued).

	North of 40°10' N Lat.			South of 40°10' N Lat.			Coastwide		
	Landed	Discard	Estimate	Landed	Discard	Estimate	Landed	Discard	Estimate
Non-rebuilding species (cont.)									
Other flatfish	590.1	251.1	841.2	75.9	38.9	114.8	666.0	290.0	956.0
Other groundfish	0.6	85.7	86.3	1.1	48.6	49.7	1.7	134.2	135.9
Other nearshore rockfish	0.0	--	0.0	0.0	--	0.0	0.0	--	0.0
Other shelf rockfish	0.4	5.7	6.1	0.4	17.8	18.2	0.8	23.5	24.3
Other slope rockfish	118.7	113.3	232.0	4.8	2.0	6.8	123.5	115.3	238.8
Pacific cod (North of 43° N. lat.)	99.5	0.1	99.6	--	--	--	99.5	0.1	99.6
Pacific hake	365.8	310.4	676.2	--	82.2	82.2	365.8	392.5	758.3
Petrale sole	626.2	120.1	746.2	146.1	8.0	154.1	772.2	128.1	900.3
Redstripe rockfish (North of 40°10' N. lat.)	0.1	0.0	0.1	--	--	--	0.1	0.0	0.1
Sablefish (North of 36° N. lat.)		423.9			50.8			474.7	
50% mortality*	2188.1	211.9	2400.1	322.9	25.4	348.3	2511.1	237.3	2748.4
Sablefish (South of 36° N. lat.)		--			--			--	
50% mortality*	--	--	--	--	--	--	--	--	--
Sharpchin rockfish	0.3	8.2	8.5	--	0.6	0.6	0.3	8.8	9.1
Shortbelly rockfish	--	--	--	--	4.4	4.4	0.0	4.4	4.4
Shortspine thornyhead (North of 34°27' N. lat.)	956.6	75.0	1031.5	142.8	3.2	146.0	1099.4	78.1	1177.5
Silvergray rockfish (North of 40°10' N. lat.)	0.2	3.3	3.5	--	--	--	0.2	3.3	3.5
Spiny dogfish	54.9	430.6	485.5	5.3	29.2	34.6	60.2	459.8	520.1
Splitnose rockfish	3.6	56.4	59.9	47.6	89.1	136.7	51.2	145.5	196.6
Starry flounder	17.6	1.4	19.0	11.4	0.0	11.4	29.0	1.4	30.4
Unspecified skate	176.1	5.7	181.8	17.0	0.1	17.2	193.1	5.9	199.0
Yellowmouth rockfish (North of 40°10' N. lat.)	1.9	1.4	3.3	--	--	--	1.9	1.4	3.3
Yellowtail rockfish	13.7	16.5	30.2	0.1	0.0	0.1	13.8	16.5	30.3
Non-groundfish species									
California halibut	0.0	--	0.0	54.7	--	54.7	54.7	0.0	54.7
Dungeness crab	--	190.0	190.0	--	75.9	75.9	0.0	265.9	265.9
Eulachon	--	0.0	0.0	--	--	--	0.0	0.0	0.0
Other non-FMP flatfish	0.1	47.1	47.2	0.1	18.5	18.6	0.2	65.6	65.8
Other non-FMP skate	0.2	99.0	99.1	--	26.8	26.8	0.2	125.7	125.9
Other nongroundfish	4.7	533.2	537.9	12.2	103.7	115.9	16.9	636.9	653.8
Tanner crab	--	346.9	346.9	--	107.6	107.6	0.0	454.5	454.5

* Mortality rates provided by the Groundfish Management Team (GMT).

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.0 when a value is smaller than one decimal place.

Table 4. Observed discard ratios with standard error and California halibut landings (mt) from the federal limited entry and open access participants in the state-licensed California halibut fishery in 2010 (only occurs south of 40°10' N Lat.). Ratios are computed as the observed discard weight divided by the observed weight of retained California halibut (adjusted to fish tickets).

SOUTH of 40°10' N Lat.	Limited Entry	Open Access
Expansion factor		
Fleet landings of California halibut (mt) (Based on fish tickets)	54.7	66.4
	Combined LE and OA*	
Number of observed vessels	8	
Number of observed trips	43	
Number of observed tows	152	
Observed discard ratios and standard error	**Discard Ratio**	**SE**
Rebuilding species		
Bocaccio	--	--
Canary rockfish	--	--
Cowcod	--	--
Darkblotched rockfish	--	--
Widow rockfish	--	--
Yelloweye rockfish	--	--
Non-rebuilding species		
Big skate	0.2021	0.8765
California scorpionfish (South of 34°27' N. lat.)	0.0028	0.0464
California skate	0.0995	1.1560
English sole	0.0329	0.1782
Lingcod	0.0081	0.2007
Longnose skate	0.0009	0.2603
Other flatfish	0.2124	0.2815
Other groundfish	0.0085	0.6294
Other nearshore rockfish	0.0000	0.0071
Petrale sole	0.0009	0.0508
Spiny dogfish	0.0241	1.0420
Starry flounder	0.0118	0.0775
Unspecified skate	0.0662	0.6057
Non-groundfish species		
California halibut	0.0628	0.1197
Dungeness crab	2.0693	6.3084
Other non-FMP flatfish	0.0422	0.2724
Other non-FMP skate	0.0000	NA
Other nongroundfish	0.8222	0.5571

* LE and OA observer data were combined before computing discard ratios to maintain an adequate sample size.

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.0000 when a value is smaller than four decimal places.

Table 5. Landings (mt), estimated discard (mt), and fishing mortality estimate (mt) of groundfish species from the federal limited entry and open access participants in the state-licensed California halibut fishery in 2010. Discard ratios (Table 4) were multiplied by landings of California halibut to generate estimated discard. Because limited entry vessels participating in the California halibut fishery often land catch from this fishery at the same time as catch from bottom trawl tows targeting groundfish, it was not possible to split out groundfish landed weights for the limited entry bottom trawl and limited entry California halibut sectors. Joint landings for these two sectors are presented in Table 3.

SOUTH of 40°10' N Lat.	Limited Entry		Open Access		All CA Halibut Sectors		
	Landed	Discard	Landed	Discard	OA Landed	Discard	Fishing Mortality Estimate
Rebuilding species							
Bocaccio		--	--	--	--	--	--
Canary rockfish		--	--	--	--	--	--
Cowcod		--	--	--	--	--	--
Darkblotched rockfish		--	--	--	--	--	--
Widow rockfish		--	--	--	--	--	--
Yelloweye rockfish		--	--	--	--	--	--
Non-rebuilding species							
Big skate		11.06	--	13.41	--	24.46	24.46
California scorpionfish (South of 34°27' N. lat.)		0.15	0.04	0.18	0.04	0.34	0.38
California skate		5.45	--	6.60	--	12.05	12.05
Dover sole		--	0.03	--	0.03	--	0.03
English sole		1.80	0.05	2.19	0.05	3.99	4.04
Lingcod (South of 42° N. lat.)		0.45		0.54		0.99	
50% mortality *		0.22	0.02	0.27	0.02	0.49	0.51
Longnose skate		0.05	--	0.06	--	0.11	0.11
Other flatfish		11.62	3.95	14.09	3.95	25.71	29.66
Other groundfish		0.46	0.07	0.56	0.07	1.03	1.10
Other nearshore rockfish		0.00	0.00	0.00	0.00	0.00	0.01
Petrale sole		0.05	0.02	0.06	0.02	0.10	0.13
Spiny dogfish		1.32	--	1.60	--	2.92	2.92
Starry flounder		0.64	1.04	0.78	1.04	1.43	2.47
Unspecified skate		3.63	0.73	4.40	0.73	8.02	8.75
Non-groundfish species							
California halibut		3.44	66.35	4.17	66.35	7.61	73.96
Dungeness crab		113.25	--	137.30	--	250.54	250.54
Other non-FMP flatfish		2.31	1.77	2.80	1.77	5.11	6.88
Other non-FMP skate		0.00	--	0.00	--	0.01	0.01
Other nongroundfish		45.00	2.71	54.56	2.71	99.55	102.26

Included in Table 3 (LE Trawl)

*The mortality rate for lingcod in the limited entry bottom trawl fishery is provided by the Groundfish Management Team.

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.00 when a value is smaller than two decimal places.

Table 6. Observed discard ratios with standard error and pink shrimp landings (mt) from the pink shrimp fishery north of 40° 10' N. latitude in 2010. Ratios are computed as the observed discard weight divided by the observed weight of retained pink shrimp (adjusted to fish tickets).

NORTH of 40°10' N Lat.	Pink Shrimp Fishery	
Expansion factor (Based on fish tickets) **Fleet landings of pink shrimp (mt)**	20327.08	
Number of observed vessels	51	
Number of observed trips	126	
Number of observed tows	1654	
Observed discard ratios and standard error	Discard Ratio	SE
Rebuilding species		
Bocaccio	0.00000	NA
Canary rockfish	0.00000	NA
Darkblotched rockfish	0.00059	0.00063
Pacific ocean perch	0.00000	0.00018
Widow rockfish	0.00000	0.01569
Yelloweye rockfish	0.00000	NA
Non-rebuilding species		
Arrowtooth flounder	0.00112	0.00146
Big skate	0.00000	0.00138
Chilipepper rockfish	0.00000	0.00022
Dover sole	0.00015	0.00056
English sole	0.00012	0.00165
Greenstriped rockfish	0.00008	0.00047
Lingcod (North of 42° N. lat.)	0.00000	0.00214
Lingcod (South of 42° N. lat.)	0.00000	0.00244
Longnose skate	0.00002	0.00087
Other flatfish	0.00243	0.00222
Other groundfish	0.00002	0.00069
Other shelf rockfish	0.00007	0.00067
Other slope rockfish	0.00001	0.00038
Pacific cod	0.00000	0.02532
Pacific hake	0.01962	0.02898
Petrale sole	0.00006	0.00100
Redstripe rockfish	0.00000	0.00009
Sablefish	0.00006	0.00954
Sharpchin rockfish	0.00000	0.00165
Shortbelly rockfish	0.00001	0.00038
Shortspine thornyhead	0.00001	0.00263
Spiny dogfish	0.00081	0.19065
Splitnose rockfish	0.00001	0.00034
Unspecified skate	0.00000	NA
Yellowmouth rockfish	0.00000	0.00013
Yellowtail rockfish	0.00001	0.00111
Non-groundfish species		
Dungeness crab	0.00004	0.00338
Eulachon	0.00093	0.00117
Other non-FMP flatfish	0.00567	0.00472
Other non-FMP skate	0.00000	0.00253
Other nongroundfish	0.00334	0.00087
Pink shrimp + unidentified shrimp	0.02242	0.03951

Note: A value is (--) when the species was neither caught nor discarded (no value).
Values appear as 0.00000 when a value is smaller than five decimal places.

Table 7. Landings (mt), estimated discard (mt), and fishing mortality estimate (mt) of groundfish species from the pink shrimp fishery north of 40° 10' N. latitude in 2010. Discard ratios (Table 6) were multiplied by fleet landings of pink shrimp to generate estimated discard.

NORTH of 40°10' N Lat.	Pink Shrimp Fishery		
	Landed	Discard	Estimate
Rebuilding species			
Bocaccio	--	0.00	0.00
Canary rockfish	--	0.02	0.02
Darkblotched rockfish	--	12.07	12.07
Pacific ocean perch	--	0.06	0.06
Widow rockfish	--	0.07	0.07
Yelloweye rockfish	--	0.00	0.00
Non-rebuilding species			
Arrowtooth flounder	--	22.75	22.75
Big skate	--	0.01	0.01
Chilipepper rockfish	--	0.02	0.02
Dover sole	--	2.99	2.99
English sole	--	2.50	2.50
Greenstriped rockfish	--	1.69	1.69
Lingcod (North of 42° N. lat.)	--	0.10	0.10
Lingcod (South of 42° N. lat.)	--	0.01	0.01
Longnose skate	--	0.44	0.44
Other flatfish	--	49.37	49.37
Other groundfish	--	0.42	0.42
Other shelf rockfish	--	1.48	1.48
Other slope rockfish	--	0.14	0.14
Pacific cod	--	0.06	0.06
Pacific hake	--	398.86	398.86
Petrale sole	--	1.22	1.22
Redstripe rockfish	--	0.00	0.00
Sablefish	--	1.23	1.23
Sharpchin rockfish	--	0.02	0.02
Shortbelly rockfish	--	0.24	0.24
Shortspine thornyhead	--	0.17	0.17
Spiny dogfish	--	16.40	16.40
Splitnose rockfish	--	0.16	0.16
Unspecified skate	--	0.00	0.00
Yellowmouth rockfish	--	0.00	0.00
Yellowtail rockfish	--	0.22	0.22
Non-groundfish species			
Dungeness crab	--	0.80	0.80
Eulachon	--	18.92	18.92
Other non-FMP flatfish	--	115.22	115.22
Other non-FMP skate	--	0.06	0.06
Other nongroundfish	0.90	67.99	68.88
Pink shrimp + unidentified shrimp	20327.08	455.64	20782.71

Note: A value is (--) when the species was neither caught nor discarded (no value).
Values appear as 0.00 when a value is smaller than two decimal places.

Table 8. Expansion factor and observed discard rate description by area and gear type for limited entry (LE) and open access (OA) non-nearshore fixed gear sectors used to expand discard estimates to the fleet level for each area-sector-gear stratum. The stratum estimated discard weights for all sectors were then summed for each area and then summed coast-wide.

			Observed Discard Ratios	
Expansion Factor	**Area**	**Sector**	**Longline**	**Pot**
Sablefish Landings	North of 40° 10' N Lat.	LE sablefish primary	LE sablefish primary (North of 36°)	LE sablefish primary (North of 36°)
		LE sablefish non-primary	LE sablefish non-endorsed	OA fixed gear
		OA fixed gear	OA fixed gear	OA fixed gear
	36° to 40° 10' N Lat.	LE sablefish primary	LE sablefish primary (North of 36°)	LE sablefish primary (North of 36°)
		LE sablefish non-primary	LE sablefish non-endorsed	--
		OA fixed gear	LE sablefish non-endorsed + OA fixed gear	OA fixed gear
Groundfish Landings	South of 36° N Lat.	LE sablefish primary	LE sablefish primary	
		LE sablefish non-primary	LE sablefish non-endorsed	--
		OA fixed gear	OA fixed gear	OA fixed gear

Table 9. Observed discard ratios with standard error and sablefish landings (mt) from the LE sablefish primary (tier endorsed) fixed gear fleet in 2010. Ratios are computed as the observed discard weight divided by the observed weight of retained sablefish (north of 36° N lat.) or FMP groundfish (south of 36° N lat.) (adjusted to fish tickets). Discard ratios were multiplied by fleet landings of sablefish north of 36° N latitude and fleet landings of FMP groundfish south of 36° N latitude to generate discard estimates for each gear type; combined with other fixed gear sectors in Table 12.

LE Sablefish Primary	**North of 40°10' N Lat.** Longline		**North of 40°10' N Lat.** Pot		**40°10' to 36° N Lat.** Longline		**40°10' to 36° N Lat.** Pot		**South of 36° N Lat.** Longline	
Expansion factor (Based on fish tickets)										
Fleet landings of sablefish (mt)	1106.9		446.6		174.1		56.7			
Fleet landings of groundfish (mt)									10.2	
	Data combined across areas				*Data combined across areas*					
Number of observed vessels	18		7		18		7		3	
Number of observed trips	138		43		138		43		4	
Number of observed sets	745		314		745		314		9	
	Denominator = Retained sablefish (mt)								***Denominator = Retained groundfish (mt)***	
Observed discard ratios and standard error	Discard Ratio	SE	Discard Ratio	SE	Discard Ratio	SE	Discard Ratio	SE	Discard Ratio	SE
Rebuilding species										
Bocaccio	--	--	--	--	--	--	--	--	--	--
Canary rockfish	0.0000	0.0129	--	--	0.0000	0.0129	--	--	--	--
Cowcod (South of 40°10' N. lat.)	--	--	--	--	--	--	--	--	--	--
Darkblotched rockfish	0.0001	0.0018	0.0001	0.0028	0.0001	0.0018	0.0001	0.0028	--	--
Pacific ocean perch (North of 40°10' N. lat.)	0.0001	0.0116	0.0000	0.0026	0.0001	0.0116	0.0000	0.0026	--	--
Widow rockfish	0.0000	0.0196	--	--	0.0000	0.0196	--	--	--	--
Yelloweye rockfish	0.0002	0.1327	--	--	0.0002	0.1327	--	--	--	--
Non-rebuilding species										
Arrowtooth flounder	0.0321	0.0821	0.0043	0.0473	0.0321	0.0821	0.0043	0.0473	--	--
Big skate	0.0009	0.2400	--	--	0.0009	0.2400	--	--	--	--
Blackgill rockfish (South of 40°10' N. lat.)	0.0000	0.0009	0.0002	0.2350	0.0000	0.0009	0.0002	0.2350	--	--
California skate	0.0002	0.6421	--	--	0.0002	0.6421	--	--	--	--
Dover sole	0.0020	0.0126	0.0029	0.0125	0.0020	0.0126	0.0029	0.0125	--	--
Greenstriped rockfish	0.0002	0.0156	--	--	0.0002	0.0156	--	--	--	--
Grenadiers	0.0119	0.3694	0.0010	0.0045	0.0119	0.3694	0.0010	0.0045	0.1210	0.4769
Lingcod (North of 42° N. lat.)	0.0015	0.0244	0.0074	0.1169	0.0015	0.0244	0.0074	0.1169	--	--
Lingcod (South of 42° N. lat.)	0.0007	0.2374	--	--	0.0007	0.2374	--	--	--	--
Longnose skate	0.0346	0.0633	0.0002	0.0837	0.0346	0.0633	0.0002	0.0837	0.0063	
Longspine thornyhead (North of 34°27' N. lat.)	0.0000	0.0002	0.0000	0.0007	0.0000	0.0002	0.0000	0.0007	--	--
Longspine thornyhead (South of 34°27' N. lat.)	--	--	--	--	--	--	--	--	0.0137	0.0438
Mixed thornyheads	0.0000	0.0129	--	--	0.0000	0.0129	--	--	--	--
Other flatfish	--	--	0.0000	0.0064	--	--	0.0000	0.0064	--	--
Other groundfish	0.0016	0.0160	--	--	0.0016	0.0160	--	--	0.0046	
Other shelf rockfish	0.0003	0.0047	0.0001	0.0045	0.0003	0.0047	0.0001	0.0045	--	--
Other slope rockfish	0.0285	0.0342	0.0077	0.0256	0.0285	0.0342	0.0077	0.0256	--	--
Pacific hake	0.0001	0.0051	--	--	0.0001	0.0051	--	--	--	--
Petrale sole	0.0000	0.0092	0.0000	0.0021	0.0000	0.0092	0.0000	0.0021	--	--
Redstripe rockfish (North of 40°10' N. lat.)	--	--	0.0000	0.0021	--	--	0.0000	0.0021	--	--
Sablefish	0.1784	0.0511	0.1954	0.1029	0.1784	0.0511	0.1954	0.1029	0.0992	0.2422

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.0000 when a value is smaller than four decimal places.

Table 9 (continued).

LE Sablefish Primary	North of 40°10' N Lat.				40°10' to 36° N Lat.				South of 36° N Lat.	
	Longline		Pot		Longline		Pot		Longline	
Observed discard ratios and standard error	Discard Ratio	SE	Discard Ratio	SE	Discard Ratio	SE	Discard Ratio	SE	Discard Ratio	SE
Non-rebuilding species										
Shortspine thornyhead (North of 34°27' N. lat.)	0.0009	0.0022	0.0003	0.0080	0.0009	0.0022	0.0003	0.0080		
Shortspine thornyhead (South of 34°27' N. lat.)	--	--	--	--	--	--	--	--	0.1186	0.3174
Spiny dogfish	0.1618	0.4016	0.0308	0.5400	0.1618	0.4016	0.0308	0.5400	--	--
Splitnose rockfish (North of 40˚10' N. lat.)	0.0000	0.0058	--	--	0.0000	0.0058	--	--	--	--
Starry flounder	0.0000	NA	--	--	0.0000	NA	--	--	--	--
Unspecified skate	0.0003	0.0061	0.0001	0.0492	0.0003	0.0061	0.0001	0.0492	--	--
Yellowmouth rockfish (North of 40˚10' N. lat.)	0.0000	0.0243	--	--	0.0000	0.0243	--	--	--	--
Yellowtail rockfish	0.0000	0.0064	0.0000	NA	0.0000	0.0064	0.0000	NA	--	--
Non-groundfish species										
Dungeness crab	0.0000	0.0028	0.0021	0.0259	0.0000	0.0028	0.0021	0.0259	--	--
Other non-FMP flatfish	--	--	0.0000	0.0030	--	--	0.0000	0.0030	--	--
Other non-FMP skate	0.0010	0.0543	0.0000	NA	0.0010	0.0543	0.0000	NA	0.0201	0.1763
Other nongroundfish	0.1282	0.1498	0.0219	0.0220	0.1282	0.1498	0.0219	0.0220	0.0215	0.0976
Tanner crab	0.0002	0.0123	0.0031	0.0127	0.0002	0.0123	0.0031	0.0127	0.0024	0.0313

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.0000 when a value is smaller than four decimal places.

Table 10. Observed discard ratios with standard error, sablefish landings (mt), and groundfish landings (mt) from the LE non-primary sablefish fixed gear fleet in 2010. Ratios are computed as the observed discard weight divided by the observed weight of retained sablefish (north of 36° N lat.) or FMP groundfish (south of 36° N lat.) (adjusted to fish tickets). Discard ratios were multiplied by fleet landings of sablefish north of 36° N latitude and fleet landings of FMP groundfish south of 36° N latitude to generate discard estimates for each gear type; combined with other fixed gear sectors in Table 12.

LE Non-Primary	**North of 40°10' N Lat.**				**40°10' to 36° N Lat.**				**South of 36° N Lat.**			
	Longline		Pot		Longline		Pot		Longline		Pot	
Expansion factor (Based on fish tickets)												
Fleet landings of sablefish (mt)	319.2		13.5		133.9		--					
Fleet landings of groundfish (mt)									490.7		--	
	LE non-primary		*OA pot data*		*LE non-primary*				*LE non-primary*			
Number of observed vessels	3		4		4		--		31		--	
Number of observed trips	16		7		10		--		200		--	
Number of observed sets	19		24		13		--		438		--	
	Denominator = Retained sablefish (mt)								***Denominator = Retained groundfish (mt)***			
Observed discard ratios and standard error	Discard Ratio	SE	Discard Ratio	SE	Discard Ratio	SE	Discard Ratio	SE	Discard Ratio	SE	Discard Ratio	SE
Rebuilding species												
Bocaccio	--	--	--	--	--	--	--	--	--	--	--	--
Canary rockfish	--	--	--	--	--	--	--	--	--	--	--	--
Cowcod (South of 40°10' N. lat.)	NA	NA	NA	NA	--	--	--	--	--	--	--	--
Darkblotched rockfish	0.0010	0.0135	--	--	--	--	--	--	--	--	--	--
Pacific ocean perch (North of 40°10' N. lat.)	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA
Widow rockfish	--	--	--	--	--	--	--	--	--	--	--	--
Yelloweye rockfish	--	--	--	--	--	--	--	--	--	--	--	--
Non-rebuilding species												
Arrowtooth flounder	0.0007	0.0063	0.0012	0.0000	--	--	--	--	0.0000	0.0000	--	--
Blackgill rockfish (South of 40°10' N. lat.)	NA	NA	NA	NA	--	--	--	--	0.0001	0.0034	--	--
California skate	--	--	--	--	--	--	--	--	--	--	--	--
Chilipepper rockfish (South of 40°10' N. lat.)	NA	NA	NA	NA	--	--	--	--	--	--	--	--
Dover sole	0.0002	0.0057	--	--	0.0096	0.0431	--	--	0.0072	0.0411	--	--
English sole	0.0001	0.0092	--	--	--	--	--	--	--	--	--	--
Greenspotted rockfish	--	--	--	--	--	--	--	--	--	--	--	--
Grenadiers	--	--	--	--	0.0135	0.1425	--	--	0.0089	0.1208	--	--
Lingcod (North of 42° N. lat.)	0.0013	0.0886	--	--	NA	NA	NA	NA	NA	NA	NA	NA
Lingcod (South of 42° N. lat.)	NA	NA	NA	NA	--	--	--	--	--	--	--	--
Longnose skate	0.0105	0.0467	--	--	0.0317	0.1849	--	--	0.0293	0.2302	--	--
Longspine thornyhead (North of 34°27' N. lat.)	--	--	--	--	0.0038	0.0288	--	--	0.0029	0.1048	--	--
Longspine thornyhead (South of 34°27' N. lat.)	NA	NA	NA	NA	NA	NA	NA	NA	0.0045	0.0026	NA	NA
Mixed thornyheads	--	--	--	--	--	--	--	--	0.0033	0.0862	--	--
Other flatfish	--	--	--	--	--	--	--	--	--	--	--	--
Other groundfish	0.0027	0.0387	--	--	0.0001	0.0000	--	--	0.0072	0.3937	--	--
Other nearshore rockfish	--	--	--	--	--	--	--	--	--	--	--	--
Other shelf rockfish	--	--	--	--	--	--	--	--	0.0000	0.0411	--	--
Other slope rockfish	0.0001	0.0004	0.0008	0.0000	--	--	--	--	--	--	--	--
Pacific hake	0.0006	0.0238	--	--	--	--	--	--	0.0000	0.0549	--	--
Petrale sole	0.0001	0.0000	--	--	--	--	--	--	--	--	--	--
Sablefish	0.1832	0.2621	0.0156	0.0160	0.0596	0.0983	--	--	0.0271	0.0671	--	--
Shortspine thornyhead (North of 34°27' N. lat.)	0.0011	0.0118	--	--	0.0061	0.0182	--	--	0.0041	0.2597	--	--
Shortspine thornyhead (South of 34°27' N. lat.)	NA	NA	NA	NA	NA	NA	NA	NA	0.0202	0.0106	NA	NA
Spiny dogfish	0.0351	0.2557	--	--	--	--	--	--	0.0015	0.0681	--	--
Splitnose rockfish (North of 40°10' N. lat.)	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA
Splitnose rockfish (South of 40°10' N. lat.)	NA	NA	NA	NA	--	--	--	--	--	--	--	--
Unspecified skate	--	--	--	--	--	--	--	--	0.0003	0.0474	--	--
Yellowtail rockfish	--	--	--	--	--	--	--	--	--	--	--	--
Non-groundfish species												
Dungeness crab	0.0007	0.0000	--	--	--	--	--	--	--	--	--	--
Other non-FMP skate	0.0009	0.0875	--	--	0.0003	0.0071	--	--	0.0076	0.1533	--	--
Other nongroundfish	0.0451	0.2948	0.0002	0.0000	0.0745	0.2385	--	--	0.1904	0.1775	--	--
Tanner crab	--	--	--	--	0.0040	0.0326	--	--	0.0004	0.0441	--	--

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.0000 when a value is smaller than four decimal places.

Table 11. Observed discard ratios with standard error, sablefish landings (mt), and groundfish landings (mt) from the open access fixed gear fleet in 2010. Ratios are computed as the observed discard weight divided by the observed weight of retained sablefish (north of 36° N lat.) or FMP groundfish (south of 36° N lat.) (adjusted to fish tickets). Discard ratios were multiplied by fleet landings of sablefish north of 36° N latitude and fleet landings of FMP groundfish south of 36° N latitude to generate discard estimates for each gear type; combined with other fixed gear sectors in Table 12.

Open Access Fixed Gear	**North of 40°10' N Lat.**				**40°10' to 36° N Lat.**				**South of 36° N Lat.**			
	Hook-and-line		Pot		Hook-and-line		Pot		Hook-and-line		Pot	
Expansion factor (Based on fish tickets)												
Fleet landings of sablefish (mt)	218.9		26.1		52.2		123.3					
Fleet landings of groundfish (mt)									459.3		172.5	
					LE non-primary + OA							
Number of observed vessels	27		4		8		16		6		6	
Number of observed trips	50		7		19		24		10		9	
Number of observed sets	82		24		22		26		13		19	
	Denominator = Retained sablefish (mt)								***Denominator = Retained groundfish (mt)***			
Observed discard ratios and standard error	Discard Ratio	SE	Discard Ratio	SE	Discard Ratio	SE	Discard Ratio	SE	Discard Ratio	SE	Discard Ratio	SE
Rebuilding species												
Bocaccio	--	--	--	--	--	--	--	--	--	--	--	--
Canary rockfish	--	--	--	--	--	--	--	--	--	--	--	--
Cowcod (South of 40°10' N. lat.)	NA	NA	NA	NA	--	--	--	--	--	--	--	--
Darkblotched rockfish	0.0208	0.6166	--	--	--	--	--	--	--	--	--	--
Pacific ocean perch (North of 40°10' N. lat.)	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA
Widow rockfish	--	--	--	--	--	--	--	--	--	--	--	--
Yelloweye rockfish	--	--	--	--	--	--	--	--	--	--	--	--
Non-rebuilding species												
Arrowtooth flounder	0.1273	0.3364	0.0012	--	--	--	--	--	--	--	--	--
Big skate	0.0002	--	--	--	--	--	--	--	--	--	--	--
Blackgill rockfish (South of 40°10' N. lat.)	NA	NA	NA	NA	0.0003	0.0083	0.0022	0.0058	0.0006	0.0054	--	--
Chilipepper rockfish	--	--	--	--	--	--	--	--	--	--	--	--
Dover sole	0.0016	0.0157	--	--	0.0106	0.0384	0.0011	0.0046	0.0008	0.0249	0.0013	0.0140
Grenadiers	--	--	--	--	0.0098	0.0814	0.0004	0.0100	0.0247	0.1697	--	--
Lingcod (North of 42° N. lat.)	0.0003	0.0627	--	--	NA	NA	NA	NA	NA	NA	NA	NA
Lingcod (South of 42° N. lat.)	NA	NA	NA	NA	--	--	0.0079	0.1039	--	--	--	--
Longnose skate	0.0181	0.0708	--	--	0.0316	0.1376	--	--	0.0102	--	0.0020	--
Longspine thornyhead (North of 34°27' N. lat.)	--	--	--	--	0.0064	0.0388	--	--	NA	NA	NA	NA
Longspine thornyhead (South of 34°27' N. lat.)	NA	NA	NA	NA	NA	NA	NA	NA	0.0062	0.0300	--	--
Mixed thornyheads	0.0000	0.0075	--	--	--	--	--	--	0.0012	0.0290	--	--
Other groundfish	0.0010	0.0198	--	--	0.0003	0.0101	--	--	0.0007	0.0085	--	--
Other nearshore rockfish	--	--	--	--	--	--	--	--	--	--	--	--
Other shelf rockfish	--	--	--	--	--	--	--	--	--	--	--	--
Other slope rockfish	0.0056	0.0091	0.0008	--	--	--	0.0002	0.0024	--	--	0.0004	0.0127
Pacific hake	0.0010	0.0230	--	--	--	--	--	--	--	--	--	--
Petrale sole	--	--	--	--	--	--	--	--	--	--	--	--
Sablefish	0.1949	0.1383	0.0156	0.0160	0.0675	0.0810	0.3646	0.2428	0.0486	0.1978	0.1339	0.1277
Sharpchin rockfish	--	--	--	--	--	--	--	--	--	--	--	--
Shortspine thornyhead (North of 34°27' N. lat.)	0.0080	0.0540	--	--	0.0232	0.0749	--	--	0.0668	0.2873	--	--
Shortspine thornyhead (South of 34°27' N. lat.)	NA	NA	NA	NA	NA	NA	NA	NA	--	--	0.0007	0.0115
Spiny dogfish	0.0423	0.1962	--	--	0.0005	0.0139	--	--	0.0005	--	--	--
Splitnose rockfish (North of 40°10' N. lat.)	--	--	--	--	--	--	0.0001	0.0015	--	--	0.0006	0.0065
Splitnose rockfish (South of 40°10' N. lat.)	--	--	--	--	--	--	--	--	--	--	--	--
Unspecified skate	0.0003	0.0376	--	--	--	--	--	--	--	--	--	--
Yellowtail rockfish	0.0002	--	--	--	--	--	--	--	--	--	--	--
Non-groundfish species												
Dungeness crab	--	--	--	--	--	--	--	--	--	--	--	--
Other non-FMP skate	0.0001	--	--	--	0.0009	0.0099	--	--	0.0010	0.0072	--	--
Other nongroundfish	0.1074	0.9702	0.0002	--	0.0715	0.1960	0.0279	0.5204	0.0049	0.0252	0.1180	0.3741
Tanner crab	--	--	--	--	0.0093	0.0599	0.0074	0.1205	0.0047	0.0317	0.0013	0.0139

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.0000 when a value is smaller than four decimal places.

Table 12. Landings (mt), estimated discard (mt), and fishing mortality estimate (mt) of groundfish species in non-nearshore fixed gear sectors by area during 2010. Discard ratios were multiplied by fleet landings of sablefish north of 36° N latitude and fleet landings of FMP groundfish south of 36° N latitude to generate estimated discard (Tables 9-11: LE sablefish primary, LE non-primary, OA).

	North of 40°10' N Lat.			40°10' to 36° N Lat.			South of 36° N Lat.			Coastwide
	Landed	Discard	Estimate	Landed	Discard	Estimate	Landed	Discard	Estimate	Estimate
Rebuilding species										
Bocaccio	0.2	--	0.2	0.4	--	0.4	0.5	--	0.5	1.1
Canary rockfish	--	0.0	0.0	--	0.0	0.0	--	--	--	0.0
Cowcod (South of 40°10' N. lat.)	NA	NA	NA	--	--	--	--	--	--	0.0
Darkblotched rockfish	11.0	5.0	16.1	0.0	0.0	0.1	--	--	--	16.1
Pacific ocean perch (North of 40°10' N. lat.)	3.6	0.1	3.8	NA	NA	NA	NA	NA	NA	3.8
Widow rockfish	0.0	0.0	0.1	0.0	0.0	0.0	0.0	--	0.0	0.1
Yelloweye rockfish	0.1	0.2	0.3	--	0.0	0.0	--	--	--	0.3
Non-rebuilding species										
Arrowtooth flounder	3.8	65.6	69.3	--	5.8	5.8	0.0	0.0	0.0	75.2
Bank rockfish (South of 40°10' N. lat.)	NA	NA	NA	0.0	--	0.0	0.1	--	0.1	0.1
Big skate	0.0	1.1	1.1	--	0.2	0.2	--	0.1	0.1	1.3
Blackgill rockfish (South of 40°10' N. lat.)	NA	NA	NA	4.4	0.3	4.7	79.1	0.3	79.5	84.2
California skate	0.0	0.2	0.2	--	0.0	0.0	--	--	--	0.3
Chilipepper rockfish	0.0	--	0.0	0.1	--	0.1	0.1	--	0.1	0.2
Dover sole	3.2	3.9	7.2	0.2	2.5	2.7	0.3	4.1	4.4	14.2
English sole	0.0	0.0	0.0	--	--	--	--	--	--	0.0
Greenspotted rockfish	0.0	--	0.0	0.0	--	0.0	0.8	--	0.8	0.8
Greenstriped rockfish	0.0	0.2	0.2	--	0.0	0.0	0.0	--	0.0	0.3
Grenadiers	0.0	13.6	13.6	28.3	4.5	32.8	1.3	17.0	18.3	64.6
Lingcod (North of 42° N. lat.)	17.4	5.4	22.8	--	--	--	--	--	--	22.8
Lingcod (South of 42° N. lat.)	2.7	0.8	3.5	0.9	1.1	2.0	0.7	--	0.7	6.2
Longnose skate	23.8	45.7	69.5	1.0	11.9	12.9	1.3	19.5	20.8	103.2
Longspine thornyhead (North of 34°27' N. lat.)	1.9	0.0	1.9	2.1	0.8	3.0	1.4	4.3	5.7	10.6
Longspine thornyhead (South of 34°27' N. lat.)	--	--	--	--	--	--	22.1	2.3	24.4	24.4
Mixed thornyheads	--	0.0	0.0	--	0.0	0.0	3.9	2.2	6.1	6.1
Other flatfish	0.0	0.0	0.0	0.1	0.0	0.1	2.5	--	2.5	2.6
Other groundfish	0.0	2.8	2.8	0.6	0.3	0.9	0.3	3.9	4.2	7.9
Other shelf rockfish	0.6	0.3	1.0	0.9	0.1	0.9	4.7	0.0	4.7	6.6
Other slope rockfish	80.9	36.2	117.1	2.0	5.4	7.4	1.0	0.1	1.1	125.6

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.0 when a value is smaller than one decimal.

Table 12 (continued).

	North of 40°10' N Lat.			40°10' to 36° N Lat.			South of 36° N Lat.			Coastwide
	Landed	Discard	Estimate	Landed	Discard	Estimate	Landed	Discard	Estimate	Estimate
Non-rebuilding species (cont.)										
Pacific cod	2.9	--	2.9	--	--	--	--	--	--	2.9
Pacific hake	--	0.6	0.6	--	0.0	0.0	0.0	0.0	0.0	0.6
Petrale sole	0.1	0.1	0.2	0.0	0.0	0.0	0.1	--	0.1	0.4
Redstripe rockfish (North of 40°10' N. lat.)	0.2	0.0	0.2	NA	NA	NA	NA	NA	NA	0.2
Sablefish		386.5			98.6			59.7		
20% mortality *	2131.3	77.3	2208.6	540.5	19.7	560.2	834.9	11.9	846.9	3615.7
Sharpchin rockfish	0.1	--	0.1	--	--	--	--	--	--	0.1
Shortspine thornyhead (North of 34°27' N. lat.)	16.7	3.2	19.9	12.3	2.2	14.5	16.6	32.7	49.3	83.7
Shortspine thornyhead (South of 34°27' N. lat.)	NA	NA	NA	NA	NA	NA	160.6	11.2	171.8	171.8
Silvergray rockfish (North of 40°10' N. lat.)	0.1	0.0	0.1	NA	NA	NA	NA	NA	NA	0.1
Spiny dogfish	9.8	213.3	223.1	0.0	29.9	29.9	0.0	1.0	1.0	254.1
Splitnose rockfish	0.3	0.0	0.3	0.0	0.0	0.0	0.0	0.1	0.1	0.4
Starry flounder	--	0.0	0.0	--	0.0	0.0	0.0	--	0.0	0.0
Unspecified skate	17.3	0.4	17.7	0.1	0.1	0.1	0.0	0.2	0.2	18.0
Yellowmouth rockfish (North of 40°10' N. lat.)	1.0	0.0	1.0	NA	NA	NA	NA	NA	NA	1.0
Yellowtail rockfish	0.5	0.1	0.5	0.3	0.0	0.3	0.1	--	0.1	1.0
Non-groundfish species										
California halibut	--	--	--	0.1	--	0.1	0.1	--	0.1	0.2
Dungeness crab	0.5	1.2	1.7	1.2	0.1	1.3	--	--	--	3.0
Other non-FMP flatfish	--	0.0	0.0	--	0.0	0.0	--	--	--	0.0
Other non-FMP skate	--	1.4	1.4	--	0.3	0.3	--	4.4	4.4	6.0
Other nongroundfish	3.3	189.6	192.9	1.0	40.7	41.7	5.5	116.2	121.7	356.4
Tanner crab	--	1.6	1.6	0.2	2.2	2.4	0.0	2.6	2.6	6.6

* Mortality rate provided by the Groundfish Management Team (GMT).

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.0 when a value is smaller than one decimal place.

Table 13. Commercial landings of nearshore species (mt) in Oregon and California during 2010, partitioned by depth interval and groundfish management area based on observed catch from 2003 to 2010.

	Observed landings (mt) 2003-2010	2010 Fleet landings (mt)	Percentage of observed catch by depth (fathoms) 2003-2010			2010 Fleet landings reallocated by depth (fathoms)		
			0 - 10	11 - 20	> 20	0 - 10	11 - 20	> 20
NORTH of 40° 10' N Lat.								
Nearshore species - commercial								
Black rockfish (South of 46°16' N. lat.)	99.3	150.2	46.6%	51.4%	2.1%	70.0	77.1	3.1
Blue rockfish	11.3	7.7	24.0%	67.0%	9.0%	1.9	5.2	0.7
Cabezon (Oregon)	13.6	23.5	29.8%	67.0%	3.2%	7.0	15.7	0.8
Cabezon (California)	1.3	1.8	45.4%	41.2%	13.3%	0.8	0.7	0.2
Kelp greenling	9.2	18.5	50.9%	47.4%	1.7%	9.4	8.8	0.3
Lingcod (North of 42˚ N. lat.)	12.9	20.2	32.6%	62.6%	4.8%	6.6	12.7	1.0
Lingcod (South of 42˚ N. lat.)	4.2	4.3	30.0%	48.9%	21.1%	1.3	2.1	0.9
Other minor nearshore rockfish	9.4	8.2	25.9%	59.0%	15.1%	2.1	4.9	1.2
Total:						**99.1**	**127.2**	**8.2**
SOUTH of 40° 10' N Lat.								
Nearshore species - commercial								
Black rockfish	0.8	1.5	46.7%	48.1%	5.2%	0.7	0.7	0.1
Blue rockfish	0.8	1.1	52.1%	40.9%	7.1%	0.6	0.5	0.1
Cabezon (California)	5.1	21.1	94.5%	4.1%	1.4%	19.9	0.9	0.3
California scorpionfish (South of 34°27' N. lat.)	0.4	3.0	4.0%	1.3%	94.8%	0.1	0.0	2.8
California sheephead	8.4	30.1	73.6%	25.3%	1.1%	22.1	7.6	0.3
Deeper nearshore rockfish	6.5	31.3	28.4%	58.3%	13.2%	8.9	18.2	4.1
Gopher rockfish	3.3	27.2	56.0%	35.3%	8.7%	15.2	9.6	2.4
Kelp greenling	0.4	1.4	88.6%	8.5%	2.9%	1.3	0.1	0.0
Lingcod	3.8	14.0	49.3%	40.6%	10.0%	6.9	5.7	1.4
Shallow nearshore rockfish	2.2	26.6	84.8%	11.1%	4.1%	22.6	2.9	1.1
Total:						**98.3**	**46.3**	**12.7**

Table 14. Observed discard ratios with standard error and nearshore species fleet landings (mt) from the commercial nearshore fixed gear fishery in 2010 by groundfish management area and depth (fathoms).

	North of 40° 10' N lat.				South of 40° 10' N lat.					
	0 - 10 fm		11 - 20 fm	> 20 fm	0 - 10 fm		11 - 20 fm		> 20 fm	
Expansion factor (Based on fish tickets)										
Fleet landings of nearshore species (mt)	99.1		127.2	8.2	98.3		46.3		12.7	
			*Data combined across depths **							
Number of observed vessels	45		40		10		8		5	
Number of observed trips	92		116		19		19		21	
Number of observed sets	105		141		31		25		25	
	Denominator = Retained nearshore species (mt)									
Observed discard ratios and standard error	Discard Ratio	SE	Discard Ratio	SE	Discard Ratio	SE	Discard Ratio	SE	Discard Ratio	SE
Rebuilding species										
Bocaccio	--	--	--	--	--	--	--	--	--	--
Canary rockfish	0.0034	0.0245	0.0080	0.0330	--	--	0.0897	1.1773	0.2356	0.9243
Cowcod (South of 40°10' N. lat.)	NA	NA	NA	NA	--	--	--	--	--	--
Darkblotched rockfish	--	--	--	--	--	--	--	--	--	--
Pacific ocean perch (North of 40°10' N. lat.)	--	--	--	--	NA	NA	NA	NA	NA	NA
Widow rockfish	--	--	--	--	--	--	--	--	--	--
Yelloweye rockfish	0.0002	0.0652	0.0006	0.0860	--	--	0.0008	NA	0.0051	0.1639
Non-rebuilding species										
Black rockfish (South of 46°16' N. lat.) **	0.0324	0.0286	0.0142	0.0190	0.0079	0.1780	0.0152	0.4047	--	--
Blue rockfish **	0.0218	0.0359	0.0349	0.0470	0.0062	0.0743	0.0244	0.2103	0.1028	0.4822
Cabezon (Oregon) **	0.0081	0.0223	0.0088	0.0879	--	--	--	--	--	--
Cabezon (California) **	--	--	0.0003	0.0304	0.0558	0.2164	0.0019	0.1014	0.0002	NA
California scorpionfish (South of 34°27' N. lat.) **	NA	NA	NA	NA	0.0002	0.0133	--	--	0.0427	0.4525
California skate	--	--	--	--	--	--	--	--	0.0015	NA
Deeper nearshore rockfish **	--	--	--	--	0.0111	0.0426	0.0097	0.0187	0.0110	0.0146
Gopher rockfish (South of 40°10' N. lat.) **	NA	NA	NA	NA	0.0176	0.0532	0.0385	0.1029	0.0453	0.1437
Greenstriped rockfish	--	--	--	--	--	--	--	--	--	--
Kelp greenling **	0.0203	0.0206	0.0128	0.0170	0.0167	0.1711	0.0184	0.1103	0.0149	0.0867
Lingcod (North of 42° N. lat.) **	0.0753	0.2033	0.0804	0.0258	NA	NA	NA	NA	NA	NA
Lingcod (South of 42° N. lat.) **	0.0016	0.1274	0.0008	0.1056	0.0341	0.0983	0.0708	0.1782	0.1095	0.5163
Other flatfish	0.0000	NA	--	--	0.0004	0.0200	0.0067	0.1605	0.0017	0.0357
Other groundfish	--	--	0.0001	NA	--	--	0.0123	0.2332	0.0011	NA
Other minor nearshore rockfish **	0.0020	0.0049	0.0017	0.0047	--	--	--	--	--	--
Other shelf rockfish	--	--	0.0001	0.0036	--	--	0.0004	0.0038	0.0187	0.0542
Petrale sole	--	--	--	--	--	--	0.0031	0.0864	--	--
Shallow nearshore rockfish **	--	--	--	--	0.0278	0.0655	0.0321	0.1456	0.0583	0.1597
Spiny dogfish	--	--	--	--	0.0048	NA	--	--	0.0261	0.4992
Yellowtail rockfish	0.0016	0.0172	0.0043	0.0246	--	--	0.0013	0.0594	0.0063	0.0455
Non-groundfish species										
Buffalo sculpin **	0.0008	0.0388	0.0010	0.2495	0.0005	NA	0.0065	0.1727	--	--
California halibut	--	--	--	--	--	--	--	--	--	--
California sheephead **	--	--	--	--	0.0323	0.5254	--	--	--	--
Dungeness crab	0.0002	NA	0.0002	NA	--	--	0.0040	0.3488	--	--
Other greenling **	--	--	--	--	--	--	--	--	--	--
Other nongroundfish	0.0064	0.0487	0.0083	0.0417	0.0990	0.2359	0.0183	0.0673	0.0204	0.1175
Red Irish lord **	0.0007	0.1667	0.0002	0.0115	--	--	--	--	--	--

* Observer data were combined across the 11-20 and >20 fathom depth intervals North of 40° 10' N lat. before computing discard ratios to maintain an adequate sample size.

** Included in nearshore species denominator for discard ratios.

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.0000 when a value is smaller than four decimal places.

Table 15a. Gross estimated discard (mt), discard mortality rates (provided by the Groundfish Management Team), estimated discard mortality (mt), fleet landings (mt), and fishing mortality estimates (mt) for the 2010 commercial nearshore fixed gear fishery north of 40° 10' N latitude.

Nearshore North of 40° 10' N lat.	Gross estimated discard (mt) by depth (fm)			Discard mortality rate * by depth (fm)			Estimated discard mortality (mt) by depth (fm)			Estimated discard mortality (mt)	Fleet Landings (mt)	Estimated fishing mortality (mt)
	0-10	11-20	> 20	0-10	11-20	> 20	0-10	11-20	> 20			
Rebuilding species												
Bocaccio	--	--	--	10%	70%	100%	--	--	--	--	--	--
Canary rockfish	0.34	1.02	0.07	10%	55%	100%	0.03	0.56	0.07	0.66	--	0.66
Darkblotched rockfish	--	--	--	--	--	--	--	--	--	--	0.00	0.00
Pacific ocean perch	--	--	--	--	--	--	--	--	--	--	--	--
Widow rockfish	--	--	--	50%	90%	100%	--	--	--	--	0.02	0.02
Yelloweye rockfish	0.02	0.08	0.00	10%	50%	100%	0.00	0.04	0.00	0.04	--	0.04
Non-rebuilding species												
Arrowtooth flounder	--	--	--	--	--	--	--	--	--	--	0.00	0.00
Black rockfish (South of 46° 16' N. lat.)	3.21	1.80	0.12	10%	40%	90%	0.32	0.72	0.10	1.15	150.21	151.35
Blue rockfish	2.16	4.43	0.29	10%	60%	100%	0.22	2.66	0.29	3.16	7.74	10.90
Cabezon (Oregon)	0.80	1.11	0.07	7%	7%	7%	0.06	0.08	0.01	0.14	23.47	23.61
Cabezon (California)	--	0.04	0.00	7%	7%	7%	--	0.00	0.00	0.00	1.77	1.77
Dover sole	--	--	--	7%	7%	7%	--	--	--	--	0.00	0.00
Kelp greenling	2.01	1.63	0.11	7%	7%	7%	0.14	0.11	0.01	0.26	18.52	18.78
Lingcod (North of 42° N. lat.)	7.46	10.23	0.66	7%	7%	7%	0.52	0.72	0.05	1.28	20.24	21.53
Lingcod (South of 42° N. lat.)	0.16	0.10	0.01	7%	7%	7%	0.01	0.01	0.00	0.02	4.27	4.29
Longnose skate	--	--	--	7%	7%	7%	--	--	--	--	0.04	0.04
Other flatfish	0.00	--	--	7%	7%	7%	0.00	--	--	0.00	0.00	0.00
Other groundfish	--	0.01	0.00	--	--	--	--	0.01	0.00	0.01	0.01	0.02
Other minor nearshore rockfish	0.19	0.22	0.01	10%	40%	100%	0.02	0.09	0.01	0.12	8.23	8.35
Other shelf rockfish	--	0.01	0.00	--	--	--	--	0.01	0.00	0.01	2.46	2.47
Other slope rockfish	--	--	--	--	--	--	--	--	--	--	0.00	0.00

* Discard mortality rates provided by the Groundfish Management Team (GMT).

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.00 when a value is smaller than two decimal places.

Table 15a (continued).

Nearshore North of 40° 10' N lat.	Gross estimated discard (mt) by depth (fm)			Discard mortality rate * by depth (fm)			Estimated discard mortality (mt) by depth (fm)			Estimated discard mortality (mt)	Fleet Landings (mt)	Estimated fishing mortality (mt)
	0-10	11-20	> 20	0-10	11-20	> 20	0-10	11-20	> 20			
Non-rebuilding species (cont.)												
Sablefish	--	--	--	--	--	--	--	--	--	--	0.54	0.54
Silvergrey rockfish	--	--	--	--	--	--	--	--	--	--	0.01	0.01
Spiny dogfish	--	--	--	7%	7%	7%	--	--	--	--	0.00	0.00
Splitnose rockfish	--	--	--	--	--	--	--	--	--	--	0.00	0.00
Unspecified skate	--	--	--	7%	7%	7%	--	--	--	--	0.15	0.15
Yellowtail rockfish	0.16	0.54	0.03	10%	30%	75%	0.02	0.16	0.03	0.20	0.73	0.93
Non-groundfish species												
Buffalo sculpin	0.08	0.13	0.01	--	--	--	0.08	0.13	0.01	0.22	--	0.22
Dungeness crab	0.02	0.02	0.00	--	--	--	0.02	0.02	0.00	0.05	1.40	1.45
Other greenling	--	--	--	7%	7%	7%	--	--	--	--	--	0.00
Other nongroundfish	0.63	1.06	0.07	--	--	--	0.63	1.06	0.07	1.76	0.13	1.89
Red Irish lord	0.07	0.02	0.00	--	--	--	0.07	0.02	0.00	0.09	--	0.09

* Discard mortality rates provided by the Groundfish Management Team (GMT).

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.00 when a value is smaller than two decimal places.

Table 15b. Gross estimated discard (mt), discard mortality rates (provided by the Groundfish Management Team), estimated discard mortality (mt), fleet landings (mt), and fishing mortality estimates (mt) for the 2010 commercial nearshore fixed gear fishery south of 40° 10' N latitude.

Nearshore South of 40° 10' N lat	Gross estimated discard (mt) by depth (fm)			Discard mortality rate * by depth (fm)			Estimated discard mortality (mt) by depth (fm)			Estimated discard mortality (mt)	Fleet Landings (mt)	Estimated fishing mortality (mt)
	0-10	11-20	> 20	0-10	11-20	> 20	0-10	11-20	> 20			
Rebuilding species												
Bocaccio	--	--	--	10%	70%	100%	--	--	--	--	0.52	0.52
Canary rockfish	0.00	4.15	2.98	10%	55%	100%	0.00	2.28	2.98	5.26	0.00	5.26
Cowcod (South of 40°10' N. lat.)	--	--	--	--	--	--	--	--	--	--	--	--
Darkblotched rockfish	--	--	--	--	--	--	--	--	--	--	0.07	0.07
Widow rockfish	--	--	--	50%	90%	100%	--	--	--	--	0.03	0.03
Yelloweye rockfish	0.00	0.04	0.07	10%	50%	100%	0.00	0.02	0.07	0.08	0.00	0.08
Non-rebuilding species												
Arrowtooth flounder	--	--	--	--	--	--	--	--	--	--	0.00	0.00
Bank rockfish (South of 40°10' N. lat.)	--	--	--	--	--	--	--	--	--	--	0.02	0.02
Black rockfish (South of 46°16' N. lat.)	0.77	0.70	--	10%	40%	90%	0.08	0.28	--	0.36	1.51	1.87
Blackgill rockfish (South of 40°10' N. lat.)	--	--	--	--	--	--	--	--	--	--	0.48	0.48
Blue rockfish	0.61	1.13	1.30	10%	60%	100%	0.06	0.68	1.30	2.04	1.10	3.14
Cabezon (California)	5.48	0.09	0.00	7%	7%	7%	0.38	0.01	0.00	0.39	21.10	21.49
California scorpionfish (South of 34°27' N. lat.)	0.02	--	0.54	7%	7%	7%	0.00	--	0.04	0.04	2.99	3.03
California skate	--	--	0.02	7%	7%	7%	--	--	0.00	0.00	--	0.00
Chilipepper rockfish	--	--	--	--	--	--	--	--	--	--	0.05	0.05
Deeper nearshore rockfish	1.09	0.45	0.14	10%	40%	90%	0.11	0.18	0.12	0.41	31.27	31.68
Dover sole	--	--	--	--	--	--	--	--	--	--	0.00	0.00
Gopher rockfish (South of 40°10' N. lat.)	1.73	1.78	0.57	10%	45%	100%	0.17	0.80	0.57	1.55	27.20	28.75
Greenspotted rockfish	--	--	--	--	--	--	--	--	--	--	0.01	0.01
Grenadiers	--	--	--	--	--	--	--	--	--	--	0.10	0.10
Kelp greenling	1.64	0.85	0.19	7%	7%	7%	0.11	0.06	0.01	0.19	1.42	1.61
Lingcod	3.35	3.28	1.39	7%	7%	7%	0.23	0.23	0.10	0.56	13.97	14.53
Longspine thornyhead (South of 34°27' N. lat.)	--	--	--	--	--	--	--	--	--	--	0.01	0.01
Other flatfish	0.04	0.31	0.02	7%	7%	7%	0.00	0.02	0.00	0.03	1.01	1.04
Other groundfish	--	0.57	0.01	--	--	--	--	0.57	0.01	0.58	0.88	1.46
Other shelf rockfish	--	0.02	0.24	--	--	--	--	0.02	0.24	0.25	6.85	7.11
Other slope rockfish	--	--	--	--	--	--	--	--	--	--	0.01	0.01
Petrale sole	--	0.14	--	7%	7%	7%	--	0.01	--	0.01	--	0.01

* Discard mortality rates provided by the Groundfish Management Team (GMT).

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.00 when a value is smaller than two decimal places.

Table 15b (continued).

Nearshore South of 40° 10' N lat	Gross estimated discard (mt) by depth (fm)			Discard mortality rate * by depth (fm)			Estimated discard mortality (mt) by depth (fm)			Estimated discard mortality (mt)	Fleet Landings (mt)	Estimated fishing mortality (mt)
	0-10	11-20	> 20	0-10	11-20	> 20	0-10	11-20	> 20			
Non-rebuilding species (cont.)												
Sablefish (North of 36° N. lat.)	--	--	--	--	--	--	--	--	--	--	1.78	1.78
Sablefish (South of 36° N. lat.)	--	--	--	--	--	--	--	--	--	--	7.65	7.65
Shallow nearshore rockfish	2.74	1.48	0.74	10%	45%	100%	0.27	0.67	0.74	1.68	26.64	28.32
Shortspine thornyhead (North of 34°27' N. lat.)	--	--	--	--	--	--	--	--	--	--	0.16	0.16
Shortspine thornyhead (South of 34°27' N. lat.)	--	--	--	--	--	--	--	--	--	--	0.10	0.10
Spiny dogfish	0.48	0.00	0.33	7%	7%	7%	0.03	0.00	0.02	0.06	0.04	0.09
Starry flounder	--	--	--	--	--	--	--	--	--	--	0.12	0.12
Unspecified skate	--	--	--	7%	7%	7%	--	--	--	--	0.00	0.00
Yellowtail rockfish	--	0.06	0.08	10%	30%	75%	--	0.02	0.06	0.08	0.15	0.23
Non-groundfish species												
Buffalo sculpin	0.05	0.30	--	--	--	--	0.05	0.30	--	0.35	--	0.35
California halibut	--	--	--	--	--	--	--	--	--	--	1.77	1.77
California sheephead	3.18	--	--	--	--	--	3.18	--	--	3.18	30.07	33.25
Dungeness crab	--	0.19	--	--	--	--	--	0.19	--	0.19	1.32	1.50
Other greenling	--	--	--	--	--	--	--	--	--	--	0.04	0.04
Other non-FMP flatfish	--	--	--	--	--	--	--	--	--	--	0.02	0.02
Other nongroundfish	9.74	0.85	0.26	--	--	--	9.74	0.85	0.26	10.84	35.34	46.18
Tanner crab	--	--	--	--	--	--	--	--	--	--	0.00	0.00

* Discard mortality rates provided by the Groundfish Management Team (GMT).

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.00 when a value is smaller than two decimal places.

Table 16. Landings (mt), estimated discard (mt), and fishing mortality estimates (mt) of groundfish species in the 2010 groundfish fisheries by sector.

	LE bottom trawl			California halibut			Pink shrimp			Non-nearshore fixed gear			Nearshore fixed gear		
	Landed	Discard	Estimate	Landed	Discard	Estimate	Landed	Discard	Estimate	Landed	Discard	Estimate	Landed	Discard	Estimate
Rebuilding species															
Bocaccio (South of 40°10' N. lat.)	2.0	10.9	12.9	--	--	--	--	--	--	0.9	--	0.9	0.5	--	0.5
Canary rockfish	2.0	0.4	2.4	--	--	--	--	0.0	0.0	--	0.0	0.0	0.0	5.9	5.9
Cowcod (South of 40°10' N. lat.)	--	0.6	0.6	--	--	--	--	--	--	--	--	--	--	--	--
Darkblotched rockfish	156.8	130.5	287.3	--	--	--	--	12.1	12.1	11.1	5.1	16.1	0.1	--	0.1
Pacific ocean perch (North of 40°10' N. lat.)	70.0	60.1	130.1	--	--	--	--	0.1	0.1	3.6	0.1	3.8	--	--	--
Widow rockfish	4.1	21.4	25.5	--	--	--	--	0.1	0.1	0.1	0.0	0.1	0.1	--	0.1
Yelloweye rockfish	0.0	0.1	0.1	--	--	--	--	0.0	0.0	0.1	0.3	0.3	0.0	0.1	0.1
Non-rebuilding species															
Arrowtooth flounder	3209.1	749.9	3959.0	--	--	--	--	22.8	22.8	3.8	71.4	75.2	0.0	--	0.0
Black rockfish (North of 46°16' N. lat.)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Black rockfish (South of 46°16' N. lat.)	0.3	--	0.3	--	--	--	--	--	--	--	--	--	151.7	1.5	153.2
Cabezon (South of 42° N. lat.)	--	--	--	--	--	--	--	--	--	--	--	--	22.9	0.4	23.3
California scorpionfish (South of 34°27' N. lat.)	--	--	--	0.0	0.3	0.4	--	--	--	--	--	--	3.0	0.0	3.0
Chilipepper rockfish (South of 40°10' N. lat.)	330.5	40.2	370.7	--	--	--	--	--	--	0.2	--	0.2	0.0	--	0.0
Dover sole	10319.1	523.7	10842.7	0.0	--	0.0	--	3.0	3.0	3.7	10.5	14.2	0.0	--	0.0
English sole	158.0	81.6	239.6	0.0	4.0	4.0	--	2.5	2.5	0.0	0.0	0.0	--	--	--
Lingcod (North of 42° N. lat.)	49.8	7.5	57.3	--	--	--	--	0.1	0.1	17.4	5.4	22.8	20.2	1.3	21.5
Lingcod (South of 42° N. lat.)	23.0	1.6	24.6	0.0	0.5	0.5	--	0.0	0.0	4.3	1.9	6.2	18.2	0.6	18.8
Longnose Skate	946.0	319.9	1266.0	--	0.1	0.1	--	0.4	0.4	26.2	77.1	103.2	0.0	--	0.0
Other flatfish	666.0	290.0	956.0	4.0	25.7	29.7	--	49.4	49.4	2.6	0.0	2.6	1.0	0.0	1.0
Other groundfish															
Big skate	1.2	31.8	33.0	--	24.5	24.5	--	--	--	0.0	1.3	1.3	--	--	--
Cabezon (Oregon)	0.0	--	0.0	--	--	--	--	--	--	--	--	--	23.5	0.1	23.6
Kelp greenling	--	0.0	0.0	--	--	--	--	--	--	--	--	--	19.9	0.5	20.4
Other Skates	193.1	9.1	202.2	0.7	20.1	20.8	--	0.0	0.0	17.4	0.9	18.3	0.1	0.0	0.1
Spiny dogfish	60.2	459.8	520.1	--	2.9	2.9	--	16.4	16.4	9.9	244.2	254.1	0.0	0.1	0.1
Unspecified grenadiers	107.4	191.9	299.3	--	--	--	--	--	--	29.6	35.0	64.6	0.1	--	0.1
Other	1.7	134.2	135.9	0.1	1.0	1.1	--	0.4	0.4	0.9	7.0	7.9	0.9	0.6	1.5
Minor rockfish (North of 40°10' N. lat.)															
Nearshore															
Blue rockfish	--	--	--	--	--	--	--	--	--	--	--	--	7.7	3.2	10.9
Remaining nearshore rockfish	0.0	--	0.0	--	--	--	--	--	--	--	--	--	8.2	0.1	8.4

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.0 when a value is smaller than one decimal place.

Table 16 (continued).

	LE bottom trawl			California halibut			Pink shrimp			Non-nearshore fixed gear			Nearshore fixed gear		
	Landed	Discard	Estimate	Landed	Discard	Estimate	Landed	Discard	Estimate	Landed	Discard	Estimate	Landed	Discard	Estimate
Non-rebuilding species (cont.)															
Minor rockfish (North of 40°10' N. lat.) (cont.)															
Shelf															
Bocaccio	0.2	--	0.2	--	--	--	--	0.0	0.0	0.2	--	0.2	--	--	--
Chilipepper rockfish	0.3	0.2	0.5	--	--	--	--	0.0	0.0	0.0	--	0.0	--	--	--
Greenspotted rockfish	0.0	0.0	0.1	--	--	--	--			0.0	--	0.0	--	--	--
Greenstriped rockfish	2.6	4.0	6.6	--	--	--	--	1.7	1.7	0.0	0.2	0.2	--	--	--
Redstripe rockfish	0.1	0.0	0.1	--	--	--	--	0.0	0.0	0.2	0.0	0.2	--	--	--
Silvergray rockfish	0.2	3.3	3.5	--	--	--	--	--	--	0.1	--	0.1	0.0	--	0.0
Remaining shelf rockfish	0.4	5.7	6.1	--	--	--	--	1.5	1.5	0.6	0.3	1.0	2.5	0.0	2.5
Slope															
Sharpchin rockfish	0.3	8.2	8.5	--	--	--	--	0.0	0.0	0.1	--	0.1	--	--	--
Splitnose rockfish	3.6	56.4	59.9	--	--	--	--	0.2	0.2	0.3	0.0	0.3	0.0	--	0.0
Yellowmouth rockfish	1.9	1.4	3.3	--	--	--	--	0.0	0.0	1.0	0.0	1.0	--	--	--
Remaining slope rockfish	118.7	113.3	232.0	--	--	--	--	0.1	0.1	80.9	36.2	117.1	0.0	--	0.0
Unspecified rockfish				--	--	--	--	--	--	--	--	--	--	--	--
Minor rockfish (South of 40°10' N. lat.)															
Nearshore															
Blue rockfish	--	--	--	--	--	--	--	--	--	--	--	--	1.1	2.0	3.1
Gopher rockfish	--	--	--	--	--	--	--	--	--	--	--	--	27.2	1.5	28.8
Remaining nearshore rockfish	0.0	--	0.0	0.0	0.0	0.0	--	--	--	--	--	--	57.9	2.1	60.0
Shelf															
Greenspotted rockfish	0.0	0.2	0.2	--	--	--	--	--	--	0.8	--	0.8	0.0	--	0.0
Greenstriped rockfish	--	2.8	2.8	--	--	--	--	--	--	0.0	0.0	0.1	--	--	--
Yellowtail rockfish	0.1	0.0	0.1	--	--	--	--	--	--	0.4	0.0	0.4	0.2	0.1	0.2
Remaining shelf rockfish	0.4	17.8	18.2	0.0	--	0.0	--	--	--	5.5	0.1	5.6	6.9	0.3	7.1
Slope															
Bank rockfish	13.9	0.1	13.9	--	--	--	--	--	--	0.1	--	0.1	0.0	--	0.0
Blackgill rockfish	61.4	--	61.4	--	--	--	--	--	--	83.6	0.6	84.2	0.5	--	0.5
Sharpchin rockfish	--	0.6	0.6	--	--	--	--	--	--	--	--	--	--	--	--
Remaining slope rockfish	4.8	2.0	6.8	0.0	--	0.0	--	--	--	3.0	5.5	8.5	0.0	--	0.0
Unspecified rockfish	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pacific cod (North of 43° N. lat.)	99.5	0.1	99.6	--	--	--	--	0.1	0.1	2.9	--	2.9	--	--	--
Pacific hake	365.8	392.5	758.3	--	--	--	--	398.9	398.9	0.0	0.6	0.6	--	--	--
Petrale sole	772.2	128.1	900.3	0.0	0.1	0.1	--	1.2	1.2	0.3	0.1	0.4	--	0.0	0.0
Sablefish (North of 36° N. lat.)	2511.1	237.3	2748.4	--	--	--	--	1.2	1.2	2671.8	97.0	2768.8	2.3	--	2.3
Sablefish (South of 36° N. lat.)	--	--	--	--	--	--	--	--	--	834.9	11.9	846.9	7.6	--	7.6

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.0 when a value is smaller than one decimal place.

Table 16 (continued).

	LE bottom trawl			California halibut			Pink shrimp			Non-nearshore fixed gear			Nearshore fixed gear		
	Landed	Discard	Estimate	Landed	Discard	Estimate	Landed	Discard	Estimate	Landed	Discard	Estimate	Landed	Discard	Estimate
Non-rebuilding species (cont.)															
Shortbelly rockfish	0.0	4.4	4.4	--	--	--	--	0.2	0.2	--	--	--	--	--	--
Splitnose rockfish (South of 40°10' N. lat.)	47.6	89.1	136.7	--	--	--	--	--	--	0.0	0.1	0.1	--	--	--
Starry flounder	29.0	1.4	30.4	1.0	1.4	2.5	--	--	--	0.0	0.0	0.0	0.1	--	0.1
Thornyheads				--	--	--									
Longspine thornyhead (North of 34°27' N. lat.)	1323.4	371.6	1695.0	--	--	--	--	--	--	5.5	5.2	10.6	--	--	--
Longspine thornyhead (South of 34°27' N. lat.)	--	--	--	--	--	--	--	--	--	22.1	2.3	24.4	0.0	--	0.0
Shortspine thornyhead (North of 34°27' N. lat.)	1099.4	78.1	1177.5	--	--	--	--	0.2	0.2	45.6	38.1	83.7	0.2	--	0.2
Shortspine thornyhead (South of 34°27' N. lat.)	--	--	--	--	--	--	--	--	--	160.6	11.2	171.8	0.1	--	0.1
Mixed thornyheads	4.9	26.6	31.5	--	--	--	--	--	--	3.9	2.2	6.1	--	--	--
Yellowtail rockfish (North of 40°10' N. lat.)	13.7	16.5	30.2	--	--	--	--	0.2	0.2	0.5	0.1	0.5	0.7	0.2	0.9
Non-groundfish species															
California halibut	54.7	0.0	54.7	66.4	7.6	74.0	--	--	--	0.2	--	0.2	1.8	--	1.8
Dungeness crab	0.0	265.9	265.9	--	250.5	250.5	--	0.8	0.8	1.7	1.3	3.0	2.7	0.2	2.9
Eulachon	0.0	0.0	0.0	--	--	--	--	18.9	18.9	--	--	--	--	--	--
Other non-FMP flatfish	0.2	65.6	65.8	1.8	5.1	6.9	--	115.2	115.2	--	0.0	0.0	0.0	--	0.0
Other non-FMP skate	0.2	125.7	125.9	--	0.0	0.0	--	0.1	0.1	--	6.0	6.0	--	--	--
Tanner crab	0.0	454.5	454.5							0.2	6.4	6.6			

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.0 when a value is smaller than one decimal place.

Table 17. Retained catch (mt), estimated discard (mt), and fishing mortality estimates (mt) of groundfish species in the 2010 at-sea and shoreside Pacific hake/whiting fisheries by sector. These fisheries occur north of the 40° 10' N latitude groundfish management line.

	Catcher-Processor			Mothership			Tribal			All At-Sea Hake Fisheries	Non-Tribal Shoreside Hake[1]
	Retained	Discard	Estimate	Retained	Discard	Estimate	Retained	Discard	Estimate	Estimate	Estimate
Rebuilding species											
Bocaccio (South of 40°10' N. lat.)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Canary rockfish	0.02	0.12	0.14	0.19	0.14	0.33	0.37	0.34	0.71	1.18	3.96
Cowcod (South of 40°10' N. lat.)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Darkblotched rockfish	1.39	1.30	2.69	2.36	3.12	5.48	0.00	0.00	0.00	8.17	6.74
Pacific ocean perch (North of 40°10' N. lat.)	1.90	1.81	3.72	10.27	2.45	12.72	0.33	0.08	0.40	16.84	6.17
Widow rockfish	2.53	2.48	5.01	14.66	19.37	34.02	3.72	1.73	5.45	44.49	54.14
Yelloweye rockfish	--	--	--	0.00	0.01	0.01	--	--	--	0.01	--
Non-rebuilding species											
Arrowtooth flounder	3.00	2.26	5.26	1.32	1.31	2.63	2.43	2.66	5.10	12.98	8.30
Black rockfish (North of 46°16' N. lat.)	--	--	--	--	--	--	--	--	--	--	--
Black rockfish (South of 46°16' N. lat.)	--	--	--	--	--	--	--	--	--	--	--
Cabezon (South of 42° N. lat.)	--	--	--	--	--	--	--	--	--	--	--
Dover sole	0.58	0.52	1.10	0.14	0.62	0.76	--	--	--	1.86	1.25
English sole	0.01	0.00	0.01	0.00	0.00	0.00	--	--	--	0.01	0.25
Lingcod (North of 42° N. lat.)	0.01	0.02	0.03	0.15	0.18	0.33	0.30	0.33	0.63	0.98	1.84
Lingcod (South of 42° N. lat.)	--	--	--	--	--	--	--	--	--	--	0.02
Longnose Skate	0.00	0.16	0.16	0.00	0.39	0.39	--	--	--	0.55	0.15
Other flatfish	4.77	3.93	8.70	0.21	1.52	1.73	--	--	--	10.43	6.85
Other groundfish											
Big skate	0.00	0.08	0.08	0.00	0.15	0.15	0.00	0.05	0.05	0.28	--
Cabezon (Oregon)	--	--	--	--	--	--	--	--	--	--	--
Kelp greenling	--	--	--	--	--	--	--	--	--	--	--
Other Skates	--	--	--	--	--	--	--	--	--	--	0.76
Spiny dogfish	7.53	102.89	110.42	1.41	43.98	45.39	7.89	114.02	121.91	277.72	124.60
Unspecified grenadiers	0.00	0.01	0.01	--	--	--	--	--	--	0.01	--
Other	0.44	0.19	0.63	0.01	0.09	0.10	0.00	0.00	0.00	0.73	3.61
Minor rockfish (North of 40°10' N. lat.)											
Nearshore											
Blue rockfish	--	--	--	--	--	--	--	--	--	--	--
Remaining nearshore rockfish	--	--	--	--	--	--	--	--	--	--	0.01

[1] Shoreside hake tribal landings are summarized in Table 19 under WA Tribal Landings.

Note: A value is (--) when the species was neither caught nor discarded (no value) or not reported for inclusion. Values appear as 0.00 when a value is smaller than two decimal places.

Table 17 (continued).

	Catcher-Processor			Mothership			Tribal			All At-Sea Hake Fisheries	Non-Tribal Shoreside Hake[1]
	Retained	Discard	Estimate	Retained	Discard	Estimate	Retained	Discard	Estimate	Estimate	Estimate
Minor rockfish (North of 40°10' N. lat.) (cont.)											
Shelf											
Bocaccio	0.03	0.17	0.19	0.75	0.35	1.10	0.30	0.34	0.64	1.94	0.05
Chilipepper rockfish	--	--	--	0.00	1.07	1.07	--	--	--	1.07	20.75
Greenspotted rockfish	--	--	--	--	--	--	--	--	--	--	--
Greenstriped rockfish	--	--	--	0.00	0.00	0.00	--	--	--	0.00	--
Redstripe rockfish	0.01	0.00	0.01	0.00	0.00	0.00	0.13	0.04	0.16	0.18	0.42
Silvergray rockfish	0.04	0.03	0.07	0.33	0.03	0.35	0.04	0.01	0.05	0.47	0.02
Remaining shelf rockfish	0.00	0.00	0.00	--	--	--	0.01	0.00	0.01	0.01	1.12
Slope											
Sharpchin rockfish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Splitnose rockfish	18.30	13.12	31.43	0.85	11.28	12.13	--	--	--	43.55	22.29
Yellowmouth rockfish	--	--	--	0.06	0.00	0.06	0.00	0.00	0.00	0.07	--
Remaining slope rockfish	9.84	6.84	16.68	3.12	1.65	4.77	0.03	0.00	0.03	21.48	23.46
Pacific cod (North of 43° N. lat.)	0.00	0.00	0.00	--	--	--	0.00	0.00	0.00	0.00	0.10
Pacific hake	54285.00	--	54285.00	35714.00	--	35714.00	16145.91	163.09	16309.00	106308.00	*56150.05
Petrale sole	--	--	--	--	--	--	--	--	--	--	0.06
Sablefish (North of 36° N. lat.)	5.04	2.39	7.43	1.02	3.93	4.95	--	--	--	12.38	18.11
Shortbelly rockfish	--	--	--	0.00	0.00	0.00	--	--	--	0.00	0.23
Starry flounder	--	--	--	--	--	--	--	--	--	--	0.31
Thornyheads											
Longspine thornyhead (North of 34°27' N. lat.)	0.00	0.00	0.01	--	--	--	--	--	--	0.01	0.02
Shortspine thornyhead (North of 34°27' N. lat.)	2.09	1.66	3.75	0.00	0.22	0.22	--	--	--	3.97	10.34
Mixed thornyheads	--	--	--	--	--	--	--	--	--	--	--
Yellowtail rockfish (North of 40°10' N. lat.)	8.03	13.02	21.05	35.58	10.70	46.28	67.56	15.18	82.74	150.07	185.00
Non-groundfish species											
California halibut	--	--	--	--	--	--	--	--	--	--	--
Dungeness crab	--	--	--	--	--	--	--	--	--	--	0.47
Eulachon	--	--	--	--	--	--	--	--	--	--	0.00
Other non-FMP flatfish	--	--	--	--	--	--	--	--	--	--	--
Tanner crab	--	--	--	--	--	--	--	--	--	--	--

* Includes a discard estimate of 214 mt, based on Electronic Monitoring (EM) data and Office of Law Enforcement (OLE) reports.

[1] Shoreside hake tribal landings are summarized in Table 19 under WA Tribal Landings.

Note: A value is (--) when the species was neither caught nor discarded (no value) or not reported for inclusion. Values appear as 0.00 when a value is smaller than two decimal places.

Table 18. Incidental fishery landings (mt) and exempted fishing permit (EFP) catch of groundfish from shoreside commercial fisheries in 2010 by sector and gear group.

	Shoreside Commercial Fisheries										
	EFP (Excluding Midwater Trawl)[1]		PHLB	Other Fisheries By Gear Group							Incidental fisheries
	Discard	Retained	Derby[2]	HKL	MSC	NET	POT	TLS	TWL	TWS	estimate
Rebuilding species											
Bocaccio (South of 40°10' N. lat.)	--	--	--	0.06	--	0.05	--	0.01	--	0.01	0.13
Canary rockfish	--	--	--	--	--	--	--	0.06	--	--	0.06
Cowcod (South of 40°10' N. lat.)	--	--	--	--	--	0.03	--	--	--	--	0.03
Darkblotched rockfish	--	0.00	0.03	0.17	--	--	--	--	--	--	0.20
Pacific ocean perch (North of 40°10' N. lat.)	--	0.13	0.00	0.01	--	--	--	--	--	--	0.14
Widow rockfish	--	--	--	0.00	--	--	--	0.01	--	0.00	0.01
Yelloweye rockfish	--	--	--	--	--	--	--	--	--	--	--
Non-rebuilding species											
Arrowtooth flounder	--	--	0.04	0.01	--	--	--	--	--	--	0.05
Black rockfish (North of 46°16' N. lat.)	--	--	--	--	--	--	--	--	--	--	--
Black rockfish (South of 46°16' N. lat.)	--	--	--	--	--	--	--	0.16	--	--	0.16
Cabezon (South of 42° N. lat.)	--	--	--	--	0.00	0.03	--	0.01	--	0.00	0.05
California scorpionfish (South of 34°27' N. lat.)	--	--	--	--	--	0.14	--	0.04	0.00	0.09	0.28
Chilipepper rockfish (South of 40°10' N. lat.)	--	0.00	--	--	--	--	--	0.02	--	--	0.02
Dover sole	0.74	0.00	0.02	0.00	--	0.01	--	0.00	--	--	0.79
English sole	--	--	--	--	--	--	--	--	0.00	--	0.00
Lingcod (North of 42° N. lat.)	--	0.02	0.52	0.16	--	--	0.02	1.96	--	--	2.68
Lingcod (South of 42° N. lat.)	--	--	0.03	0.42	0.01	0.03	0.32	0.27	--	0.01	1.07
Longnose Skate	10.80	1.96	0.22	0.01	--	--	--	--	--	--	12.99
Other flatfish	--	--	--	0.13	0.02	0.16	--	--	0.23	7.73	8.27
Other groundfish											
Big skate	--	--	--	--	--	0.00	--	--	--	--	0.00
Cabezon (Oregon)	--	0.00	--	--	--	--	--	--	--	--	0.00
Kelp greenling	--	--	--	--	--	--	--	--	--	--	--
Other Skates	0.04	--	0.96	0.43	--	5.70	--	--	0.04	1.61	8.77
Spiny dogfish	0.22	--	0.03	--	--	0.17	--	--	--	--	0.42
Unspecified grenadiers	0.22	0.42	--	--	--	--	--	--	--	--	0.64
Other	0.15	0.01	--	0.25	--	3.37	--	0.00	--	0.04	3.82

[1] Discard estimates reported for a groundfish EFP observed by WCGOP during 2010. Retained groundfish landings from all EFPs summarized from PacFIN.

[2] Pacific halibut derby landings were isolated if Pacific halibut was recorded on the fish ticket on the day of the opening or within two subsequent days.

Note: A value is (--) when the species was not landed (no value). Values appear as 0.00 when a value is smaller than two decimal places.

Table 18 (continued).

	Shoreside Commercial Fisheries										
	EFP (Excluding Midwater Trawl)[1]		PHLB	Other Fisheries By Gear Group							Incidental fisheries
	Discard	Retained	Derby[2]	HKL	MSC	NET	POT	TLS	TWL	TWS	estimate
Non-rebuilding species (cont.)											
Minor rockfish (North of 40°10' N. lat.)											
Nearshore											
Blue rockfish	--	--	--	--	--	--	--	--	--	--	--
Remaining nearshore rockfish	--	--	--	--	--	--	--	0.02	--	--	0.02
Shelf											
Bocaccio	--	--	--	--	--	--	--	0.00	--	--	0.00
Chilipepper rockfish	--	--	0.00	--	--	--	--	--	--	--	0.00
Greenspotted rockfish	--	--	0.04	--	--	--	--	--	--	--	0.04
Greenstriped rockfish	--	--	0.01	--	--	--	--	--	--	--	0.01
Redstripe rockfish	--	--	--	--	--	--	--	--	--	--	--
Silvergray rockfish	--	--	--	--	--	--	--	--	--	--	--
Remaining shelf rockfish	--	0.01	--	--	--	--	--	0.48	--	--	0.49
Slope											
Sharpchin rockfish	--	0.00	--	--	--	--	--	--	--	--	0.00
Splitnose rockfish	--	--	--	0.00	--	--	--	--	--	--	0.00
Yellowmouth rockfish	--	--	--	0.30	--	--	--	--	--	--	0.30
Remaining slope rockfish	--	0.00	0.16	1.45	--	--	0.06	0.05	--	--	1.72
Minor rockfish (South of 40°10' N. lat.)											
Nearshore											
Blue rockfish	--	--	--	--	0.00	--	--	0.00	--	--	0.00
Gopher rockfish	--	--	--	--	0.01		--	--	--	--	0.01
Remaining nearshore rockfish	--	--	--	--	0.08	0.01	--	0.05	--	--	0.15
Shelf											
Greenspotted rockfish	--	--	--	0.02	--	--	--	--	--	0.01	0.03
Greenstriped rockfish	--	--	--	--	--	--	--	--	--	--	--
Yellowtail rockfish	--	--	--	--	--	0.26	--	0.03	--	--	0.28
Remaining shelf rockfish	--	0.00	--	0.96	0.02	0.12	--	0.09	--	0.11	1.30
Slope											
Bank rockfish	--	--	--	--	--	--	--	--	--	--	--
Blackgill rockfish	0.11	5.43	--	0.16	--	0.02	--	0.04	--	--	5.76
Sharpchin rockfish	--	--	--	--	--	--	--	--	--	--	--
Remaining slope rockfish	0.00	0.09	--	--	--	--	--	--	--	0.02	0.11

[1] Discard estimates reported for a groundfish EFP observed by WCGOP during 2010. Retained groundfish landings from all EFPs summarized from PacFIN.

[2] Pacific halibut derby landings were isolated if Pacific halibut was recorded on the fish ticket on the day of the opening or within two subsequent days.

Note: A value is (--) when the species was not landed (no value). Values appear as 0.00 when a value is smaller than two decimal places.

Table 18 (continued).

	Shoreside Commercial Fisheries										Incidental fisheries estimate
	EFP (Excluding Midwater Trawl)[1]		PHLB	Other Fisheries By Gear Group							
	Discard	Retained	Derby[2]	HKL	MSC	NET	POT	TLS	TWL	TWS	
Non-rebuilding species (cont.)											
Pacific cod (North of 43° N. lat.)	--	--	0.02	--	--	--	--	0.00	--	--	0.03
Pacific hake	0.01	--	--	--	--	--	--	--	--	--	0.01
Petrale sole	--	0.13	0.05	--	--	0.00	--	--	--	0.00	0.18
Sablefish (North of 36° N. lat.)	--	0.03	8.44	--	--	--	--	1.37	--	--	9.84
Sablefish (South of 36° N. lat.)	5.21	176.58	--	--	0.01	1.61	--	--	--	--	183.42
Shortbelly rockfish	--	--	--	--	--	--	--	--	--	--	--
Splitnose rockfish (South of 40°10' N. lat.)	0.00	0.01	--	0.00	--	--	--	--	--	--	0.01
Starry flounder	--	--	--	0.00	--	--	--	--	--	0.13	0.13
Thornyheads											
Longspine thornyhead (North of 34°27' N. lat.)	--	0.11	--	0.01	--	--	--	--	--	--	0.12
Longspine thornyhead (South of 34°27' N. lat.)	--	--	--	0.01	--	--	--	--	--	--	0.01
Shortspine thornyhead (North of 34°27' N. lat.)	0.82	11.56	0.00	0.40	--	--	--	0.02	--	--	12.80
Shortspine thornyhead (South of 34°27' N. lat.	--	--	--	0.04	--	0.02	--	--	--	--	0.06
Mixed thornyheads	0.01	--	--	--	--	0.02	--	--	--	--	0.03
Yellowtail rockfish (North of 40°10' N. lat.)	--	--	--	0.03	--	--	--	1.44	--	--	1.47
Non-groundfish species											
California halibut	--	--	--	55.43	0.01	46.65	0.04	0.38	0.50	13.34	116.35
Dungeness crab	--	0.06	--	0.00	16.99	--	22598.67	--	--	--	22615.72
Eulachon	--	--	--	--	--	--	--	--	--	--	--
Other non-FMP flatfish	0.00	--	--	--	--	0.01	--	--	0.08	3.40	3.50
Tanner crab	0.12	--	--	--	--	--		--	--	--	0.12

[1] Discard estimates reported for a groundfish EFP observed by WCGOP during 2010. Retained groundfish landings from all EFPs summarized from PacFIN.

[2] Pacific halibut derby landings were isolated if Pacific halibut was recorded on the fish ticket on the day of the opening or within two subsequent days.

Note: A value is (--) when the species was not landed (no value). Values appear as 0.00 when a value is smaller than two decimal places.

Table 19. Estimated fishing mortality (mt) of major west coast groundfish species in 2010 by sector.

	Shoreside commercial fisheries						WA tribal landings	All at-sea hake fisheries	Recreational fishing mortality			Research	Incidental fisheries	Estimated fishing mortality
	LE bottom trawl	CA halibut	Pink shrimp	Non-nearshore fixed gear	Nearshore fixed gear	Non-tribal shoreside hake			WA	OR	CA			
Rebuilding species														
Bocaccio (South of 40°10' N. lat.)	12.9	--	--	0.9	0.5	--	NA	NA	NA	NA	57.2	0.6	0.1	72.3
Canary rockfish	2.4	--	0.0	0.0	5.9	4.0	8.2	1.2	1.0	4.2	14.5	1.9	0.1	43.2
Cowcod (South of 40°10' N. lat.)	0.6	--	--	--	--	--	NA	NA	NA	NA	0.4	0.1	0.0	1.2
Darkblotched rockfish	287.3	--	12.1	16.1	0.1	6.7	0.2	8.2	--	--	--	1.0	0.2	332.0
Pacific ocean perch (North of 40°10' N. lat.)	130.1	--	0.1	3.8	--	6.2	0.3	16.8	--	0.0	--	1.7	0.1	159.0
Widow rockfish	25.5	--	0.1	0.1	0.1	54.1	46.6	44.5	--	0.2	0.7	1.4	0.0	173.3
Yelloweye rockfish	0.1	--	0.0	0.3	0.1	--	0.4	0.0	2.0	2.8	1.3	0.5	--	7.6
Non-rebuilding species														
Arrowtooth flounder	3959.0	--	22.8	75.2	0.0	8.3	3.3	13.0	--	0.0	--	8.0	0.1	4089.6
Black rockfish (North of 46°16' N. lat.)	--	--	--	--	--	--	0.0	--	199.4	NA	NA	0.0	--	199.5
Black rockfish (South of 46°16' N. lat.)	0.3	--	--	--	153.2	--	--	--	NA	316.5	179.8	0.0	0.2	650.0
Cabezon (South of 42° N. lat.)	--	--	--	--	23.3	--	--	--	NA	NA	23.8	0.0	0.0	47.1
California scorpionfish (South of 34°27' N. lat.)	--	0.4	--	--	3.0	--	--	NA	NA	NA	63.0	0.0	0.3	66.7
Chilipepper rockfish (South of 40°10' N. lat.)	370.7	--	--	0.2	0.0	--	--	NA	NA	NA	2.8	1.7	0.0	375.5
Dover sole	10842.7	0.0	3.0	14.2	0.0	1.2	56.7	1.9	--	0.0	--	31.1	0.8	10951.7
English sole	239.6	4.0	2.5	0.0	--	0.2	62.3	0.0	--	0.0	0.0	2.5	0.0	311.2
Lingcod (North of 42° N. lat.)	57.3	--	0.1	22.8	21.5	1.8	34.2	1.0	67.8	90.2	NA	2.2	2.7	301.7
Lingcod (South of 42° N. lat.)	24.6	0.5	0.0	6.2	18.8	0.0	--	--	NA	NA	96.4	0.3	1.1	147.9
Longnose Skate	1266.0	0.1	0.4	103.2	0.0	0.1	1.3	0.6	--	0.0	--	1.7	13.0	1386.5
Other flatfish	956.0	29.7	49.4	2.6	1.0	6.8	17.8	10.4	1.5	0.5	43.7	16.6	8.3	1144.3
Other groundfish														
Big skate	33.0	24.5	--	1.3	--	--	--	0.3	--	0.0	--	1.7	0.0	60.9
Cabezon (Oregon)	0.0	--	--	--	23.6	--	--	--	5.4	19.6	NA		0.0	48.7
Kelp greenling	0.0	--	--	--	20.4	--	--	--	2.8	25.4	10.5	0.0	--	59.2
Other Skates	202.2	20.8	0.0	18.3	0.1	0.8	23.6	--	1.1	--	--	0.1	8.8	275.8
Spiny dogfish	520.1	2.9	16.4	254.1	0.1	124.6	6.9	277.7	--	0.1	1.6	10.2	0.4	1215.1
Unspecified grenadiers	299.3	--	--	64.6	0.1	--	--	0.0	--	--	--	--	0.6	364.7
Other	135.9	1.1	0.4	7.9	1.5	3.6	0.5	0.7	--	0.0	35.5	15.5	3.8	206.5
Minor rockfish (North of 40°10' N. lat.)														
Nearshore														
Blue rockfish	--	--	--	--	10.9	--	--	--	2.6	23.0	3.7	0.0	--	40.2
Remaining nearshore rockfish	0.0	--	--	--	8.4	0.0	--	--	6.4	13.9	6.2	0.0	0.0	34.9

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.0 when a value is smaller than one decimal place.

Table 19 (continued).

	Shoreside commercial fisheries						WA tribal landings	All at-sea hake fisheries	Recreational fishing mortality			Research	Incidental fisheries	Estimated fishing mortality
	LE bottom trawl	CA halibut	Pink shrimp	Non-nearshore fixed gear	Nearshore fixed gear	Non-tribal shoreside hake			WA	OR	CA			
Non-rebuilding species (cont.)														
Minor rockfish (North of 40°10' N. lat.) (cont.)														
Shelf														
Bocaccio	0.2	--	0.0	0.2	--	0.0	0.0	1.9	0.8	0.1	--	0.0	0.0	3.2
Chilipepper rockfish	0.5	--	0.0	0.0	--	20.8	--	1.1	--	--	--	0.4	0.0	22.8
Greenspotted rockfish	0.1	--		0.0	--	--	--	--	--	0.0	0.0	0.0	0.0	0.2
Greenstriped rockfish	6.6	--	1.7	0.2	--	--	0.0	0.0	--	--	--	0.0	0.0	8.6
Redstripe rockfish	0.1	--	0.0	0.2	--	0.4	10.8	0.2	--	--	--	0.0	--	11.7
Silvergray rockfish	3.5	--	--	0.1	0.0	0.0	0.0	0.5	--	--	--	0.1	--	4.2
Remaining shelf rockfish	6.1	--	1.5	1.0	2.5	1.1	0.5	0.0	0.8	5.1	7.2	0.0	0.5	26.2
Slope														
Sharpchin rockfish	8.5	--	0.0	0.1	--	0.0	0.0	0.0	--	--	--	0.3	0.0	8.9
Splitnose rockfish	59.9	--	0.2	0.3	0.0	22.3	0.0	43.6	--	--	--	1.5	0.0	127.8
Yellowmouth rockfish	3.3	--	0.0	1.0	--	--	0.0	0.1	--	--	--	0.0	0.3	4.7
Remaining slope rockfish	232.0	--	0.1	117.1	0.0	23.5	24.2	21.5	--	0.0	--	0.2	1.7	420.4
Unspecified rockfish	--	--	--	--	--	--	--	--	--	--	--	3.7	--	3.7
Minor rockfish (South of 40°10' N. lat.)														
Nearshore														
Blue rockfish	--	--	--	--	3.1	--	--	NA	NA	NA	42.3	0.0	0.0	45.5
Gopher rockfish	--	--	--	--	28.8	--	--	NA	NA	NA	76.9	--	0.0	105.7
Remaining nearshore rockfish	0.0	0.0	--	--	60.0	--	--	NA	NA	NA	172.3	0.0	0.1	232.5
Shelf														
Greenspotted rockfish	0.2	--	--	0.8	0.0	--	--	NA	NA	NA	11.5	0.1	0.0	12.6
Greenstriped rockfish	2.8	--	--	0.1	--	--	--	NA	NA	NA	0.8	0.0	--	3.6
Yellowtail rockfish	0.1	--	--	0.4	0.2	--	--	NA	NA	NA	24.0	0.3	0.3	25.4
Remaining shelf rockfish	18.2	0.0	--	5.6	7.1	--	--	NA	NA	NA	175.2	2.1	1.3	209.5
Slope														
Bank rockfish	13.9	--	--	0.1	0.0	--	--	NA	NA	NA	0.1	0.2	--	14.3
Blackgill rockfish	61.4	--	--	84.2	0.5	--	--	NA	NA	NA	--	0.5	5.8	152.3
Sharpchin rockfish	0.6	--	--	--	--	--	--	NA	NA	NA	--	0.0	--	0.6
Remaining slope rockfish	6.8	0.0	--	8.5	0.0	--	--	NA	NA	NA	--	0.0	0.1	15.4
Unspecified rockfish	--	--	--	--	--	--	--	NA	NA	NA	--	4.0	--	4.0
Pacific cod (North of 43° N. lat.)	99.6	--	0.1	2.9	--	0.1	242.4	0.0	0.2	0.0	NA	1.2	0.0	346.5
Pacific hake	758.3	--	398.9	0.6	--	*56150.05	1967.9	106308.0	--	0.0	0.0	133.4	0.0	165717.2
Petrale sole	900.3	0.1	1.2	0.4	0.0	0.1	30.5	--	--	0.1	0.3	2.9	0.2	936.2

* Includes a discard estimate of 214 mt, based on Electronic Monitoring (EM) data and Office of Law Enforcement (OLE) reports.
Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.0 when a value is smaller than one decimal place.

Table 19 (continued).

	Shoreside commercial fisheries						WA tribal landings	All at-sea hake fisheries	Recreational fishing mortality			Research	Incidental fisheries	Estimated fishing mortality
	LE bottom trawl	CA halibut	Pink shrimp	Non-nearshore fixed gear	Nearshore fixed gear	Non-tribal shoreside hake			WA	OR	CA			
Non-rebuilding species (cont.)														
Sablefish (North of 36° N. lat.)	2748.4	--	1.2	2768.8	2.3	18.1	579.5	12.4	--	0.1	0.0	25.7	9.8	6166.5
Sablefish (South of 36° N. lat.)	--	--	--	846.9	7.6	--	--	NA	NA	NA	--	1.0	183.4	1038.9
Shortbelly rockfish	4.4	--	0.2	--	--	0.2	--	0.0	--	--	--	1.8	--	6.7
Splitnose rockfish (South of 40°10' N. lat.)	136.7	--	--	0.1	--	--	--	NA	NA	NA	--	2.9	0.0	139.8
Starry flounder	30.4	2.5	--	0.0	0.1	0.3	0.0	--	--	3.0	2.0	0.0	0.1	38.4
Thornyheads														
Longspine thornyhead (North of 34°27' N. lat.)	1695.0	--	--	10.6	--	0.0	0.0	0.0	--	--	--	12.8	0.1	1718.6
Longspine thornyhead (South of 34°27' N. lat.)	--	--	--	24.4	0.0	--	--	NA	NA	NA	--	1.3	0.0	25.7
Shortspine thornyhead (North of 34°27' N. lat.)	1177.5	--	0.2	83.7	0.2	10.3	16.0	4.0	--	--	--	3.5	12.8	1308.1
Shortspine thornyhead (South of 34°27' N. lat.)	--	--	--	171.8	0.1	--		NA	NA	NA	--	0.7	0.1	172.7
Mixed thornyheads	31.5	--	--	6.1	--		--	--	--	--		--	0.0	37.7
Yellowtail rockfish (North of 40°10' N. lat.)	30.2	--	0.2	0.5	0.9	185.0	535.7	150.1	38.5	7.6	0.4	4.2	1.5	954.8
Non-groundfish species														
California halibut	54.7	74.0	--	0.2	1.8	--	--	--	--	0.1	--	--	116.3	247.1
Dungeness crab	265.9	250.5	0.8	3.0	2.9	0.5	1420.5	--	--	--	--	0.0	22615.7	24559.8
Eulachon	0.0	--	18.9	--	--	0.0	--	--	--	0.0	--	0.1	--	19.1
Other non-FMP flatfish	65.8	6.9	115.2	0.0	0.0	--	--	--	--	--	--	0.0	3.5	191.5
Other non-FMP skate	125.9	0.0	0.1	6.0	--	--	--	--	--	--	--	--		132.0
Tanner crab	454.5			6.6		--	--	--	--	--	--	--	0.1	461.2

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.0 when a value is smaller than one decimal place.

Table 20. Estimated fishing mortality (mt) of major west coast groundfish species in 2010 and corresponding management reference points (harvest specifications).

	Estimated fishing mortality (mt)	Management reference points (harvest specifications)			
		Optimum Yield (mt)	Estimated mortality (as % of OY)	Allowable Biological Catch (mt)	Estimated mortality (as % of ABC)
Rebuilding species					
Bocaccio (South of 40°10' N. lat.)	72	288	25%	793	9%
Canary rockfish	43	105	41%	940	5%
Cowcod (South of 40°10' N. lat.)	1	4	29%	14	8%
Darkblotched rockfish	332	330	101%	440	75%
Pacific ocean perch (North of 40°10' N. lat.)	159	200	80%	1173	14%
Widow rockfish	173	509	34%	6937	2%
Yelloweye rockfish	8	14	54%	32	24%
Non-rebuilding species					
Arrowtooth flounder	4090	10112	40%	10112	40%
Black rockfish (North of 46°16' N. lat.)	199	464	43%	464	43%
Black rockfish (South of 46°16' N. lat.)	650	1000	65%	1317	49%
Cabezon (South of 42° N. lat.)	47	79	60%	111	42%
California scorpionfish (South of 34°27' N. lat.)	67	155	43%	155	43%
Chilipepper rockfish (South of 40°10' N. lat.)	376	2447	15%	2576	15%
Dover sole	10952	16500	66%	28582	38%
English sole	311	9745	3%	9745	3%
Lingcod (North of 42° N. lat.)	302	4829	9%	4058	9%
Lingcod (South of 42° N. lat.)	148			771	
Longnose Skate	1387	1349	103%	3269	42%
Other flatfish	1144	4884	23%	6731	17%
Other groundfish	2231	5600	40%	11200	20%
Big skate	61				
Cabezon (Oregon)	49				
Kelp greenling	59				
Other Skates	276				
Spiny dogfish	1215				
Unspecified grenadiers	365				
Other	207				
Minor rockfish (North of 40°10' N. lat.)	717	2283	31%	3678	20%
Nearshore	75	155	48%		
Blue rockfish	40			**	
Remaining nearshore rockfish	35			**	
Shelf	77	968	8%		
Bocaccio	3			**	
Chilipepper rockfish	23			**	
Greenspotted rockfish	0			**	
Greenstriped rockfish	9			**	
Redstripe rockfish	12			**	
Silvergray rockfish	4			**	
Remaining shelf rockfish	26			**	

** ABCs are not available for these species. ABC values that are listed for these species in other sources represent ABC contributions to the Minor Rockfish ABCs.

Table 20 (continued).

	Estimated fishing mortality (mt)	Management reference points (harvest specifications)			
		Optimum Yield (mt)	Estimated mortality (as % of OY)	Allowable Biological Catch (mt)	Estimated mortality (as % of ABC)
Non-rebuilding species (cont.)					
Minor rockfish (North of 40°10' N. lat.)					
Slope	562	1160	48%		
Sharpchin rockfish	9			**	
Splitnose rockfish	128			**	
Yellowmouth rockfish	5			**	
Remaining slope rockfish	420			**	
Unspecified remaining rockfish	4				
Minor rockfish (South of 40°10' N. lat.)	821	1990	41%	3382	24%
Nearshore	384	650	59%		
Blue rockfish	45			**	
Gopher rockfish	106			**	
Remaining nearshore rockfish	233			**	
Shelf	251	714	35%		
Greenspotted rockfish	13			**	
Greenstriped rockfish	4			**	
Yellowtail rockfish	25			**	
Remaining shelf rockfish	210			**	
Slope	183	626	29%		
Bank rockfish	14			**	
Blackgill rockfish	152			**	
Sharpchin rockfish	1			**	
Remaining slope rockfish	15			**	
Unspecified remaining rockfish	4				
Pacific cod (North of 43° N. lat.)	346	1600	22%	3200	11%
Pacific hake	165717	193935	85%	336560	49%
Petrale sole	936	1200	78%	2751	34%
Sablefish (North of 36° N. lat.)	6167	6471	95%	9217	78%
Sablefish (South of 36° N. lat.)	1039	1258	83%		
Shortbelly rockfish	7	6950	0%	6950	0%
Splitnose rockfish (South of 40°10' N. lat.)	140	461	30%	615	23%
Starry flounder	38	1077	4%	1578	2%
Thornyheads					
Longspine thornyhead (North of 34°27' N. lat.)	1719	2175	79%	3671	48%
Longspine thornyhead (South of 34°27' N. lat.)	26	385	7%		
Shortspine thornyhead (North of 34°27' N. lat.)	1308	1591	82%	2411	61%
Shortspine thornyhead (South of 34°27' N. lat.)	173	410	42%		
Mixed thornyheads	38				
Yellowtail rockfish (North of 40°10' N. lat.)	955	4562	21%	4562	21%

** ABCs are not available for these species. ABC values that are listed for these species in other sources represent ABC contributions to the Minor Rockfish ABCs.

Science, Service, Stewardship

Groundfish Science Report

Michelle McClure and John Stein

November 3, 2011

NOAA FISHERIES SERVICE

NOAA
FISHERIES
SERVICE

Overview

Economic Data Collection Status

Fishery-independent survey updates

Observer update and website

Efficiency studies to support catch shares

Off-year science

Future needs and plans

Economic Data Collection Program

- Status of EDC Forms (# of entities)

	Current Participants*			Total Required		
	Complete	Incomplete	%	Complete	Incomplete	%
First Recv'r/ Processor	30	5	86%	41	29	59%
Catcher Vessel	116	5	96%	140	19	88%
Catcher Processor	8	0	100%	8	0	100%
Mothership	8	0	100%	6	0	100%

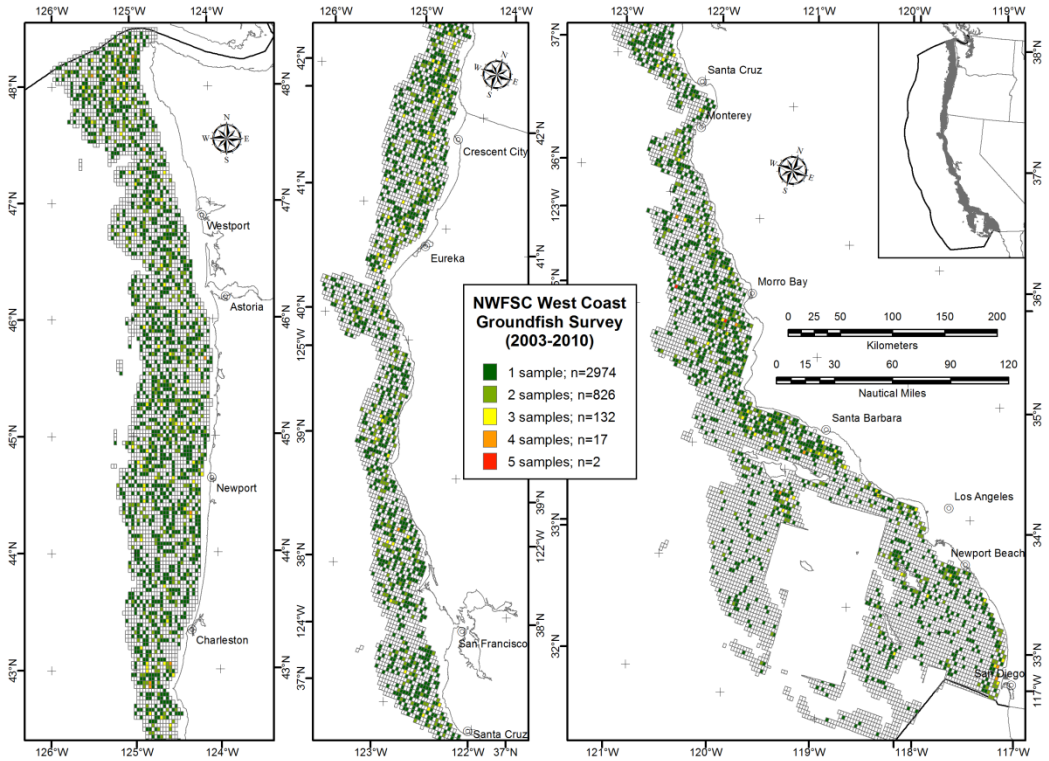
* Current participants are defined as any entity (person or business) who currently has an LEP-Trawl, QS permit, vessel account, or first receiver site license

West Coast Groundfish Bottom Trawl Survey

2011 Summary

Sampling days	190
Number of stations	727
Fish taxa identified	271
Number of otoliths	20,796
Individual weights	21,888
Individual sex/length	130,534





Southern California Shelf Rockfish Hook and Line Survey 2011

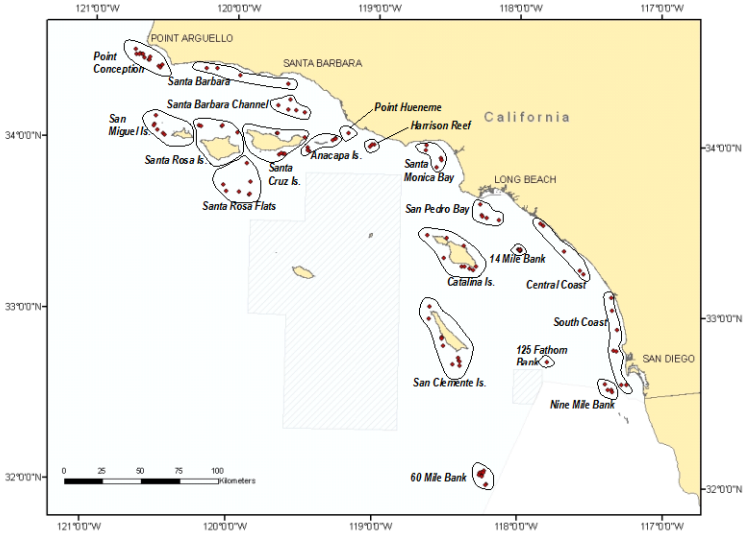
Dates	**Sept. 22 – Oct. 6**
Vessel-days	**22**
Chartered vessels	**F/V Aggressor** **F/V Mirage**



Information:

- Humboldt squid present at several locations including Anacapa Is., Harrison Reef, Santa Monica Bay, and 9 Mile Bank

- Plan on CIE/Peer Review of this survey in 2012



2011 Joint US-Canada Pacific Hake Integrated Acoustic Trawl Survey

- 70 Days at Sea
- 10072 nmi.
- 53 Trawls
- Bi-national effort



- Ecosystem components:
  - Physical Oceanography
  - Harmful Algal Bloom Sampling
  - Plankton Sampling



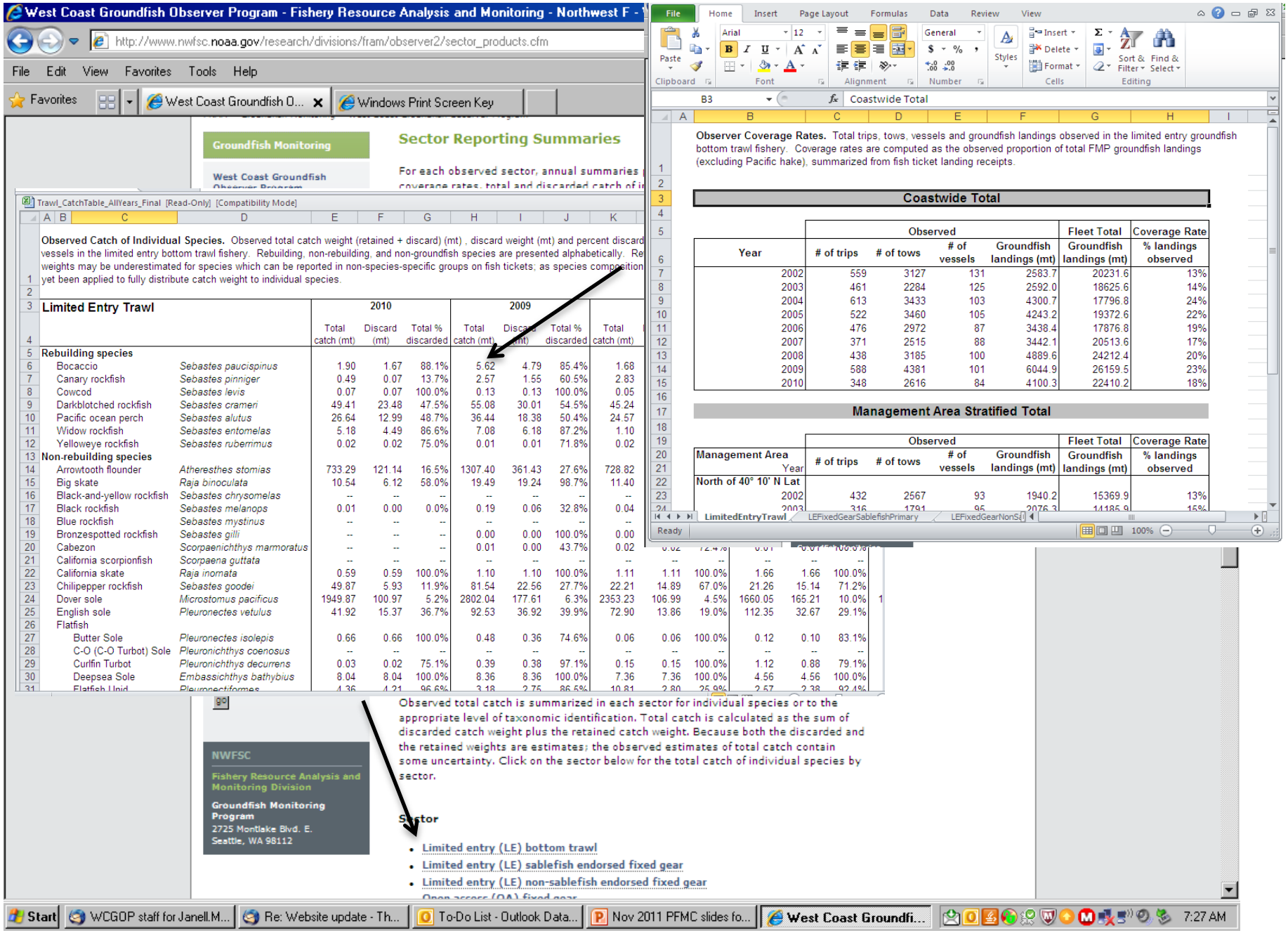
- No Humboldt Squid caught coast wide

Catch Shares Observer Data

- Current Implementation Challenges: Timeliness and accuracy of observer data into the Vessel Account system
- ***2010 Solutions***
  - On-board data entry
  - Database and process improvement
  - Printed IFQ trip summary receipts by obs.
  - Working with providers for data transfer

Observer Program Website Redevelopment




West Coast Groundfish Observer Program - Fishery Resource Analysis and Monitoring - Northwest F -
http://www.nwfsc.noaa.gov/research/divisions/fram/observer2/sector_products.cfm
File Edit View Favorites Tools Help
Favorites
West Coast Groundfish O...
Windows Print Screen Key
Groundfish Monitoring
West Coast Groundfish
Sector Reporting Summaries
For each observed sector, annual summaries
Trawl_CatchTable_AllYears_Final [Read-Only] [Compatibility Mode]
Observed Catch of Individual Species. Observed total catch weight (retained + discard) (mt) , discard weight (mt) and percent discard
vessels in the limited entry bottom trawl fishery. Rebuilding, non-rebuilding, and non-groundfish species are presented alphabetically. Re
weights may be underestimated for species which can be reported in non-species-specific groups on fish tickets; as species composition
yet been applied to fully distribute catch weight to individual species.
Limited Entry Trawl
2010
2009
Total catch (mt)
Discard (mt)
Total % discarded
Rebuilding species
Bocaccio Sebastes paucispinus 1.90 1.67 88.1% 5.62 4.79 85.4% 1.68
Canary rockfish Sebastes pinniger 0.49 0.07 13.7% 2.57 1.55 60.5% 2.83
Cowcod Sebastes levis 0.07 0.07 100.0% 0.13 0.13 100.0% 0.05
Darkblotched rockfish Sebastes crameri 49.41 23.48 47.5% 55.08 30.01 54.5% 45.24
Pacific ocean perch Sebastes alutus 26.64 12.99 48.7% 36.44 18.38 50.4% 24.57
Widow rockfish Sebastes entomelas 5.18 4.49 86.6% 7.08 6.18 87.2% 1.10
Yelloweye rockfish Sebastes ruberrimus 0.02 0.02 75.0% 0.01 0.01 71.8% 0.02
Non-rebuilding species
Arrowtooth flounder Atheresthes stomias 733.29 121.14 16.5% 1307.40 361.43 27.6% 728.82
Big skate Raja binoculata 10.54 6.12 58.0% 19.49 19.24 98.7% 11.40
Black-and-yellow rockfish Sebastes chrysomelas
Black rockfish Sebastes melanops 0.01 0.00 0.0% 0.19 0.06 32.8% 0.04
Blue rockfish Sebastes mystinus
Bronzespotted rockfish Sebastes gilli 0.00 0.00 100.0% 0.00
Cabezon Scorpaenichthys marmoratus 0.01 0.00 43.7% 0.02
California scorpionfish Scorpaena guttata
California skate Raja inornata 0.59 0.59 100.0% 1.10 1.10 100.0% 1.11 1.11 100.0% 1.66 1.66 100.0%
Chilipepper rockfish Sebastes goodei 49.87 5.93 11.9% 81.54 22.56 27.7% 22.21 14.89 67.0% 21.26 15.14 71.2%
Dover sole Microstomus pacificus 1949.87 100.97 5.2% 2802.04 177.61 6.3% 2353.23 106.99 4.5% 1660.05 165.21 10.0%
English sole Pleuronectes vetulus 41.92 15.37 36.7% 92.53 36.92 39.9% 72.90 13.86 19.0% 112.35 32.67 29.1%
Flatfish
Butter Sole Pleuronectes isolepis 0.66 0.66 100.0% 0.48 0.36 74.6% 0.06 0.06 100.0% 0.12 0.10 83.1%
C-O (C-O Turbot) Sole Pleuronichthys coenosus
Curlfin Turbot Pleuronichthys decurrens 0.03 0.02 75.1% 0.39 0.38 97.1% 0.15 0.15 100.0% 1.12 0.88 79.1%
Deepsea Sole Embassichthys bathybius 8.04 8.04 100.0% 8.36 8.36 100.0% 7.36 7.36 100.0% 4.56 4.56 100.0%
Observed total catch is summarized in each sector for individual species or to the appropriate level of taxonomic identification. Total catch is calculated as the sum of discarded catch weight plus the retained catch weight. Because both the discarded and the retained weights are estimates; the observed estimates of total catch contain some uncertainty. Click on the sector below for the total catch of individual species by sector.
NWFSC
Fishery Resource Analysis and Monitoring Division
Groundfish Monitoring Program
2725 Montlake Blvd. E.
Seattle, WA 98112
Sector
Limited entry (LE) bottom trawl
Limited entry (LE) sablefish endorsed fixed gear
Limited entry (LE) non-sablefish endorsed fixed gear
Start
WCGOP staff for Janell.M...
Re: Website update - Th...
To-Do List - Outlook Data...
Nov 2011 PFMC slides fo...
West Coast Groundfi...
7:27 AM
File Home Insert Page Layout Formulas Data Review View
Clipboard Font Alignment Number Cells Editing
B3 Coastwide Total
Observer Coverage Rates. Total trips, tows, vessels and groundfish landings observed in the limited entry groundfish bottom trawl fishery. Coverage rates are computed as the observed proportion of total FMP groundfish landings (excluding Pacific hake), summarized from fish ticket landing receipts.
Coastwide Total
Year
Observed
# of trips
# of tows
# of vessels
Groundfish landings (mt)
Fleet Total
Groundfish landings (mt)
Coverage Rate
% landings observed
2002 559 3127 131 2583.7 20231.6 13%
2003 461 2284 125 2592.0 18625.6 14%
2004 613 3433 103 4300.7 17796.8 24%
2005 522 3460 105 4243.2 19372.6 22%
2006 476 2972 87 3438.4 17876.8 19%
2007 371 2515 88 3442.1 20513.6 17%
2008 438 3185 100 4889.6 24212.4 20%
2009 588 4381 101 6044.9 26159.5 23%
2010 348 2616 84 4100.3 22410.2 18%
Management Area Stratified Total
Management Area
Year
North of 40° 10' N Lat
2002 432 2567 93 1940.2 15369.9 13%
LimitedEntryTrawl
LEFixedGearSablefishPrimary
Ready

http://www.nwfsc.noaa.gov/research/divisions/fram/observer/index.cfm

Stakeholder Involvement – Efficiency Studies

- Outreach meetings on cost efficiencies:
  - Coastal communities meetings in the winter of 2012
  - Workshop at April Council meeting
  - Build on information from existing pilot studies

Off-Year Science

- Council requests
- Assessment improvements
- Catch-share related (econ and bio)
- Linking environmental conditions and stock status

Looking Ahead

- Hake season timing
- Comprehensive ecosystem surveys
  - Filling gaps in coverage
  - Ecosystem factors (physical and biological conditions)
- Catch shares
- Spatial analyses

REVIEW OF EXEMPTED FISHING PERMITS FOR 2013-2014 GROUNDFISH FISHERIES

Exempted fishing permits (EFPs) provide a process for testing innovative fishing gears and strategies to substantiate methods for prosecuting sustainable and risk-averse fishing opportunities.

Three EFP applications were submitted for Council consideration at this meeting. The first EFP (Attachment 1), sponsored by Steve and Kathy Fosmark, seeks to test the effectiveness of trolled longline gear to selectively harvest chilipepper rockfish in waters off central California. The second EFP (Attachment 2), sponsored by the San Francisco Fishermen's Cooperative and Mr. Dan Platt, seeks to test the effectiveness of vertical hook-and-line gear to selectively harvest midwater species such as yellowtail rockfish. The third EFP, sponsored by the Central Coast Sustainable Groundfish Association, seeks to survey the distribution and size of overfished species in the Rockfish Conservation Area off the central coast of California using hook-and-line and trap gear.

The Council should review these EFP applications, consider public and advisory body comments, and consider moving the 2013-2014 EFP applications forward for public review. Any recommended modifications to EFP applications will be communicated to the EFP sponsors and the public. The Council is scheduled to decide their final recommendations for 2013-2014 EFPs at the June 2012 meeting in San Mateo, California.

Council Action:

1. **Consider EFP applications for 2013-2014 and provide preliminary recommendations for public review.**
2. **Adopt yield set-asides to accommodate those EFPs recommended for public review.**

Reference Materials:

1. Agenda Item E.3.a, Attachment 1: Evaluation of an epibenthic trolled longline to selectively catch chilipepper rockfish (*Sebastes goodei*) off California.
2. Agenda Item E.3.a, Attachment 2: Groundfish EFP Proposal: Yellowtail Rockfish Jig Fishing off California.
3. Agenda Item E.3.a, Attachment 3: Supporting a spatial analysis of the distribution and size of rebuilding stocks in the Rockfish Conservation Area through directed surveys.
4. Agenda Item E.3.b, NMS Letter.
5. Agenda Item E.3.c, Public Comments.

Agenda Order:

a. Agenda Item Overview — John DeVore
b. Reports and Comments of Advisory Bodies and Management Entities
c. Public Comment
d. **Council Action:** Adopt Preliminary Recommendations for Public Review

PFMC
10/14/11

Agenda Item E.3.a
Attachment 1
November 2011

Evaluation of an epibenthic trolled longline to selectively catch chilipepper rockfish (*Sebastes goodei*) off California

Date of Application: October 13, 2011

Applicants	Mailing address	Telephone #	Email
Steven and Kathy Fosmark F/V SeeAdler Moss Landing, CA	PO Box 1338 Pebble Beach, CA 93953	(831)-373-5238 (831)-601-4074	fvseeadler@aol.com kfosmark@aol.com
Scientific Advisors	**Mailing address**	**Telephone #**	**Email**
Dr. Steve Ralston Acting Director of the NMFS Santa Cruz Lab	NMFS-110 Schaffer Road Santa Cruz, CA 95060	(831)-420-3940	Steve.Ralston@noaa.gov
NMFS Contact	**Mailing address**	**Telephone #**	**Email**
Kevin Duffy Groundfish Branch Chief NMFS Northwest Regional Office	7600 Sand Point Way NE Seattle, WA 98115	(206)526-4743	Kevin.duffy@noaa.gov

Purpose and Goals

Chilipepper rockfish stocks on the west coast are considered healthy. However, because of weak stock management, harvest of these stocks is limited. In 2009, the total catch of chilipepper was estimated to be 311 mt of a 2,885 mt OY, or 11% of the total allowable catch. Area closures to protect overfished rockfish species have effectively closed access to this resource.

The goal of this project is to describe and evaluate the effectiveness of a species-selective longline technique, which if proven effective, will allow commercial fishermen access to chilipepper rockfish, a relatively abundant species of rockfish, while avoiding the weaker stocks. This fishery is constrained by the current rockfish area closures (Rockfish Conservation Areas, RCA), implemented to protect overfished rockfish species. Despite the depressed condition of some west coast groundfish stocks, there are other stocks that remain healthy. These healthier stocks could safely sustain increased harvest levels if they could be fished more cleanly and without bycatch of more depleted stocks. If stronger stocks could be targeted without increasing fishing mortality on depressed stocks, the California commercial fishing fleet would have additional fishing opportunities that would provide some economic relief to the industry while providing the public with a highly desirable product.

The research goal for the EFP is to establish the performance characteristics of the gear and to rigorously document the catch and bycatch when deployed in areas where chilipepper are abundant and bycatch species are not, under commercial fishing conditions. Specific objectives of the experiment are:

1) to test the trolled gear and fishing strategy with vertical lines and artificial flies, and
2) determine Groundfish Fishing Areas that are abundant with chilipepper rockfish, and that correspond to low densities of overfished species.

This latter objective may better help to answer the question of how EFP results can potentially be translated into future fleet-wide fishing opportunities.

Disposition of Catch

Target species (chilipepper) and legal incidental catch, such as widow rockfish, will be retained for sale. Fish not authorized for sale would be released alive if possible. If desired, incidental catch of certain species (e.g., canary and yelloweye) that cannot be released alive could be retained by the observer and provided to NMFS, CDFG, or other researchers.

Justification and Broader Significance

This EFP seeks to explore development of new, cleaner fishing opportunities in fulfillment of and compliance with the Magnuson-Stevens Act (MSA) mandates and goals (e.g., National Standards 1, 8, and 9). If more selective fishing methods can be developed, it is hoped that there will be additional opportunity in the groundfish fishery, which has been greatly constrained since rockfish conservation areas (RCAs) and lowered quotas were implemented to rebuild overfished species.

The long-term goal, if experiments prove successful, is to allow commercial fishing with this gear off the entire West Coast, including in the RCAs, by the Open Access and Limited Entry participants. This gear could also be used by fishermen to avoid species of concern and could create a fishery that would fill out the portfolios of those who make up the bulk of the fishermen in the West Coast's coastal communities. Thus, the benefits of this EFP would extend beyond the initial EFP participants.

Despite the generally depressed condition of many west coast groundfish stocks, there are some stocks that remain healthy. These healthier stocks could safely sustain increased harvest levels if they could be fished more cleanly and without bycatch of more depleted stocks. If stronger stocks could be targeted without increasing fishing mortality on depressed stocks, the West Coast commercial fishing fleet would have alternative fishing opportunities that would provide some economic relief to the industry while providing the public with highly desirable sustainably harvested local seafood.

Details

Total Duration of the EFP

This EFP proposal is for a total of 2 years (2013-2014).

Location of Fishing under the EFP

The EFP fishing would be conducted off **central California** between 38.0 degrees (Pt. Reyes) and 36.0 degrees (Point Lopez).

Within this area, fishing would occur at **depths of approximately 80-120 fm**. It is thought that there is a high-density of the target chilipepper rockfish in this range and that they tend to get smaller in size and schools are thinner in shallower depths. This range is currently within the non-trawl RCA established to protect overfished rockfish species. Vessels authorized under this EFP would be allowed to fish inside the current RCA using otherwise legal open access fixed gear.

Fishing effort will be concentrated in areas with canyon edges and walls, smooth hard bottom, with no rocks (example: canyon south of Año Nuevo). Areas to be selected for high-density target species will be between 38.0 degrees (Pt. Reyes) and 36 degrees (Point Lopez).

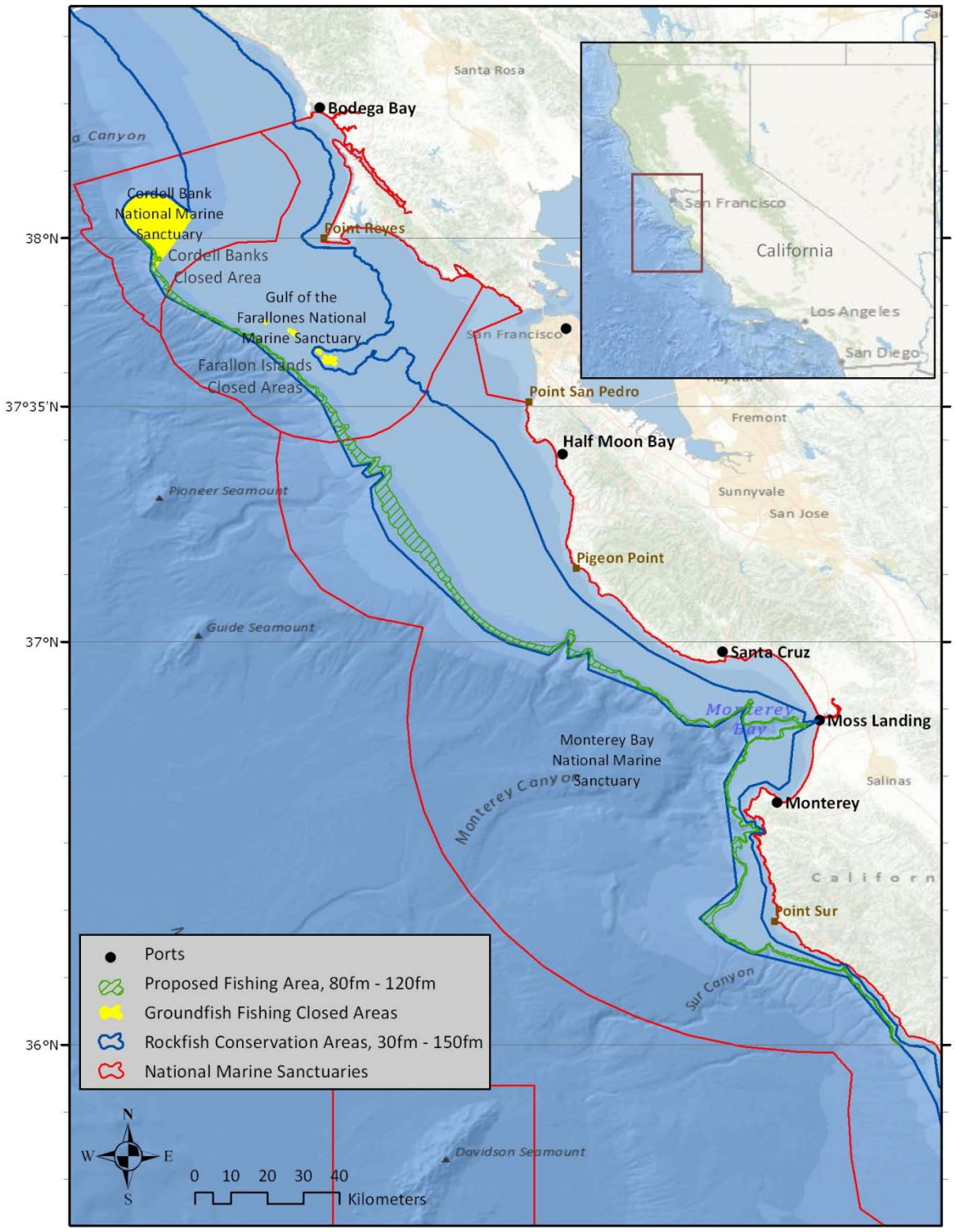


Figure 1: Map of the proposed EFP fishing area.

Description of the Gear to be Used

The gear is designed to selectively catch target chilipeppers in mid-water, when properly deployed, and will involve prospecting to avoid non-target species. A variety of gear is involved, including a hydraulic puller, conveyor belting or wide runner, fly-hooks, line, wire, snaps, small buoys (floats), one large buoy, and weights.

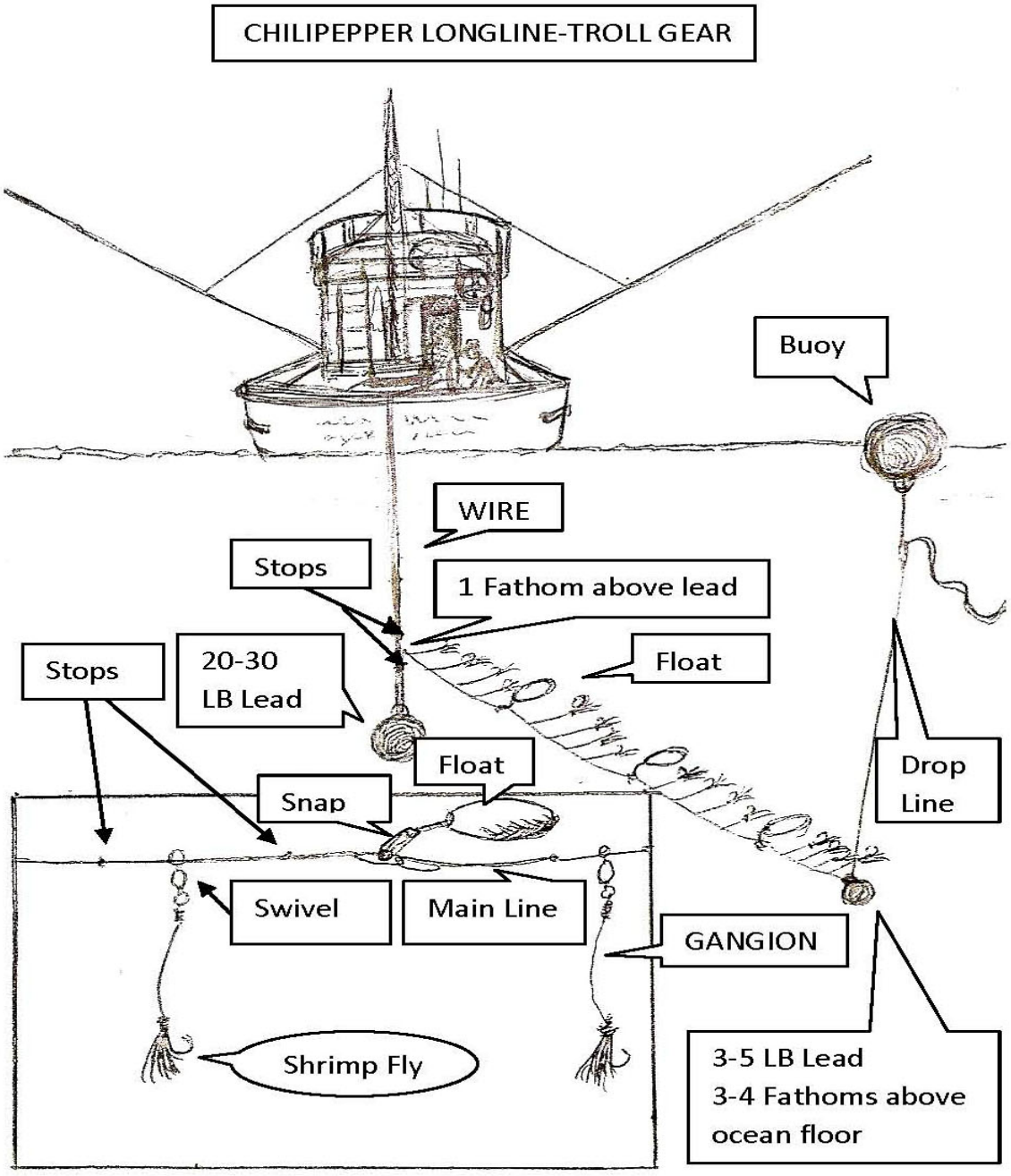


Figure 2. Gear description A

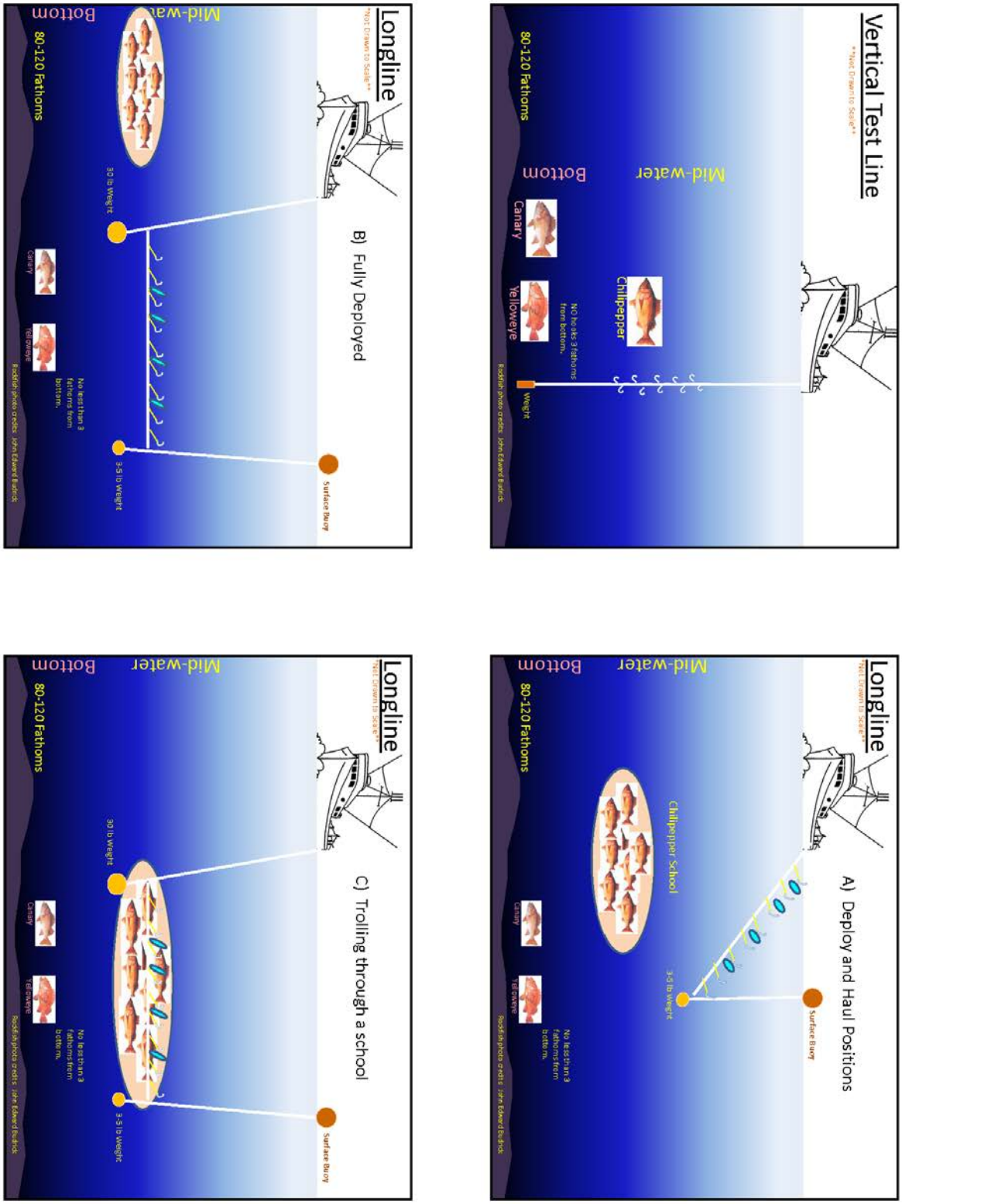


Figure 3. Gear description B

Specifications

Vertical Test Line

- No more than twenty (20) hooks (shrimp flies)
- No hooks closer than 3 fm of the bottom
- Weight – 3-5 lbs

Longline

- 3 segments:
    - a drop line from a surface bouy
    - linked (skates) main line,
    - a drop line attached to a reel

- All lines maintained at least 3 fathoms from the bottom

- DROP LINE - FROM BOUY
    - Weight - 3 to 5 lb (mainline will connect about 1 fathom above this weight)
    - Surface bouy

- MAINLINE – Between two drop lines
    - 200-1000 lb. test monofilament (lower test for smaller vessels, stronger test for larger vessels)
    - approximately 1000 - 1,083 feet
    - 1000 hooks per set maximum
    - shrimp flies (hooks) (no bait)
    - 12” monofilament ganions/leaders with swivel (approximately 60 lb test)
    - leaders spaced approximately 13” apart
    - 20 small floats, every 50 hooks (floats have short tethers and attach to the mainline w/ snaps)

- DROP LINE – FROM VESSEL
    - Weight - 30 lb

Deployment

Vertical Test Line

- Prior to setting the longline gear, a test set will be made with vertical line to ensure that the target species is present and minimize the chance of encountering any overfished rockfish.
- Using acoustic soundings, no hooks will get within 3 fm of the bottom.
- The weight may hit the bottom initially, then immediately be pulled up a bit.

Longline

Once the test set establishes the presence of chilipepper rockfish, the longline will be deployed:

- The vessel moves slowly ahead as the longline is deployed (gear is attached to the vessel at all times).
- The mainline may be spooled to a drum. One end, with buoy and weight attached in such a way that the gear does not touch the bottom, is sent overboard as the boat moves slowly ahead, and the remaining gear is deployed.
- The weighted buoy line length is adjusted in such a way that does not have bottom contact to reduce the likelihood of bycatch and to prevent the hooks from hanging up on bottom.

- When the line reacts to bites, take the boat out of gear and fish will climb the line to the floats as they do with vertical gear on up and as line is pulled, line rises to the surface. Boat must be going ahead while pulling to keep the fish on. The terminal drop line remains at 85 fathoms.
- As the boat moves forward the drop line moves close to the end of the boat tight and fish continue to climb the line.
- As the line is towed in, fish stay in area of line where school is, (pull through spot of fish). As line is pulled on board it becomes vertical and can be alternatively stacked in basket gear.

Effort

Time to fish will be short each fishing day, taking place at daybreak and late evening. During the day chilipepper come off the bottom and once they are mid-water they are difficult to catch by this method. Therefore the morning and evening are the best times.

Number of vessels covered under the EFP

Three (3) vessels are proposed for participation.

Species to be Harvested (target and incidental)

Table 1 provides an overview of the species that may be caught under the EFP, their status, and estimated catch amounts.

Table 1. Overview of Target and Incidental Species Caught under the EFP

Species	Target or Incidental?	Overfished? Y/N	Depth Range	Estimated Amount of EFP Harvest
Chilipepper *Sebastes goodei*	Target	No	0-1080 ft (0-180 fms)	To be determined by GMT
Widow Rockfish *Sebastes entomales*	Incidental	Yes*	0-1050 ft (0-175 fms)	To be determined by GMT
Bocaccio *Sebastes paucispinis*	Incidental	Yes	0-1050 ft (0-175 fms)	To be determined by GMT
Canary Rockfish *Sebastes pinniger*	Incidental	Yes	0-900 ft (0-150 fms)	To be determined by GMT
Yelloweye Rockfish *Sebastes ruberrimus*	Incidental	Yes	150-1200 ft (25-200 fms)	To be determined by GMT
Cowcod *Sebastes levis*	Incidental	Yes	132-1620ft (22-270fms)	To be determined by GMT
Dorkblotched Rockfish *Sebastes crameri*	Incidental	Yes	240-1200ft (40-200fms)	To be determined by GMT
Pacific Ocean Perch *Sebastes alutus*	Incidental	Yes	180-2100ft (30-350fms)	To be determined by GMT

**As of Oct. 3, 2011, it is "Overfished" according to PFMC (below B40) but "not overfished" in 2010 Status of U.S. Stocks Report to Congress (above B25). However, a new stock assessment is anticipated in November 2011.

Catch of species other than those listed in Table 1 are expected to be uncommon, although some yellowtail and perhaps other rockfish may be encountered in small numbers.

a. Species Descriptions

Descriptions of the **species life histories** can be found in Appendix B2 of the Pacific Coast Groundfish Fishery Management Plan.
http://www.nwr.noaa.gov/Groundfish-Halibut/Groundfish-Fishery-Management/NEPA-Documents/upload/FMP-Appendix-B2.pdf

Updated information on **species abundance** can be found in Chapter 3 of the Proposed Harvest Specifications and Management Measures for the 2011-2012 Pacific Coast Groundfish Fishery and Amendment 16-5 to the Pacific Coast Groundfish Fishery Management Plan to Update Existing Rebuilding Plans and Adopt a Rebuilding Plan for Petrale Sole; Final Environmental Impact Statement.
http://www.nwr.noaa.gov/Groundfish-Halibut/Groundfish-Fishery-Management/NEPA-Documents/upload/1112GF_SpexFEIS_100806-FINAL_feb21_.pdf

b. Estimated Harvest Amounts

Harvest amounts will be determined by the GMT.

Catch Accounting and Compliance

Attaining any of the above aggregate catch limits will terminate the EFP for all vessels. It is requested that there not be a trip limit for target species.

This EFP will incorporate a standardized data collection and reporting format as determined by NMFS Southwest Fisheries Science Center, Santa Cruz Lab, and Northwest Fisheries Science Center (Observer Program).

Observers: Under this EFP there will be 100% observer coverage with the cost of observer coverage borne by the EFP participants. Fisheries Observers will record all fish caught and ensure that aggregate bycatch limits are not exceeded, as well as collect data on fishing gear, location, catch, and disposition of catch.

Precautionary Measures

Given the potential to catch overfished species and by fishing in the RCA, the utmost caution will be taken with this experiment. The following measures are proposed and applicants are open to working with the PFMC, NMFS, and CDFG to implement others deemed necessary.

1. **Observers** – 100% observer coverage (a standard measure for EFPs, but worth noting here).
2. **Caps** – Based on input from the PFMC and NMFS, each boat will have either a ***daily*** or ***trip*** limit/cap of canary and yelloweye. If this cap is reached, based on catch accounting reports verified by the observer, fishing will cease for that day or trip.
3. **Trip reports and catch accounting** – On a timeline agreeable to NMFS and CDFG, trip and cumulative catch reports will be provided after each trip (e.g., within 48 hours).

Data Collection and Analysis Methodology

Data Collection

The following data will be collected by observer for all fishing under this EFP:

Gear Configuration

- Number of hooks
- Number of floats
- Weight sizes
- spacing of hooks
- number of hooks between floats
- length of drop line

Set and Haul Data:

- Position (GPS coordinates)
- Depth
- Time

Catch of each set of gear

- Species
- Total weight
- Species distribution
- Disposition (landings and discards)

If desired, incidental catch of certain species (e.g., canary and yelloweye) that cannot be released alive could be retained by the observer and provided to NMFS, CDFG, or other researchers for biological sampling.

Data Analysis

The applicant and the scientist (NMFS Santa Cruz Lab) will be responsible for data analysis. Data analysis will consist of statistical analysis of catch and bycatch of all species by set, trip, and month. Catch rates will be expressed as catch per hook, per set, per day, and per trip. Value of the catch will be recorded following sale. The final report will provide an estimate of fishing effort and total catch; absolute and relative species composition summarized by set, trip, and month; size composition of catch and bycatch; and sex ratio (if possible) and stage of maturity for chilipepper.

Participation

Choosing Participants

Vessels to participate in this EFP fishery will be chosen based on their ability to accommodate and pay for an observer, their willingness to maintain detailed catch data, and their willingness to participate during months when fish are available to this fishery.

Planned EFP Fishing by Participants

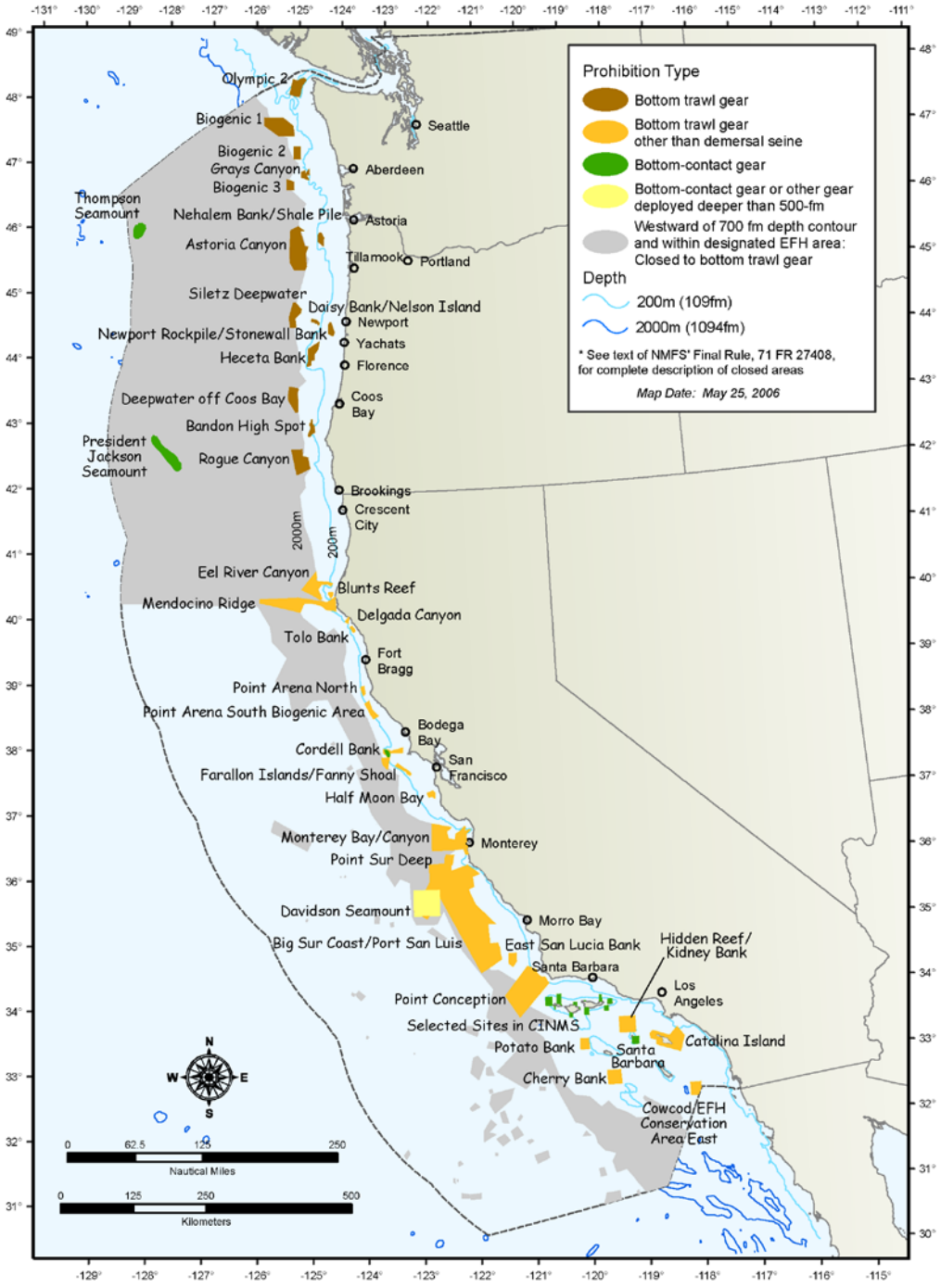
Timeframe / Months of fishing – Could be year round, but would be constrained by weather, marketing, and availability of observers.

Signatures

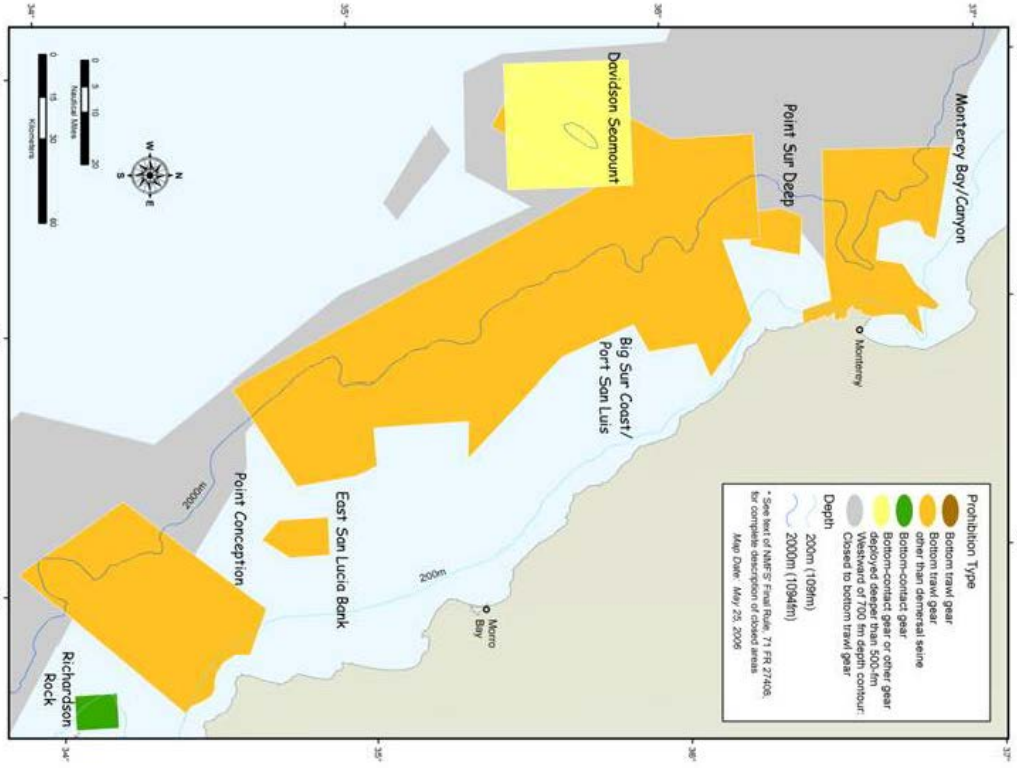
_____ _____

Steve Fosmark Kathy Fosmark

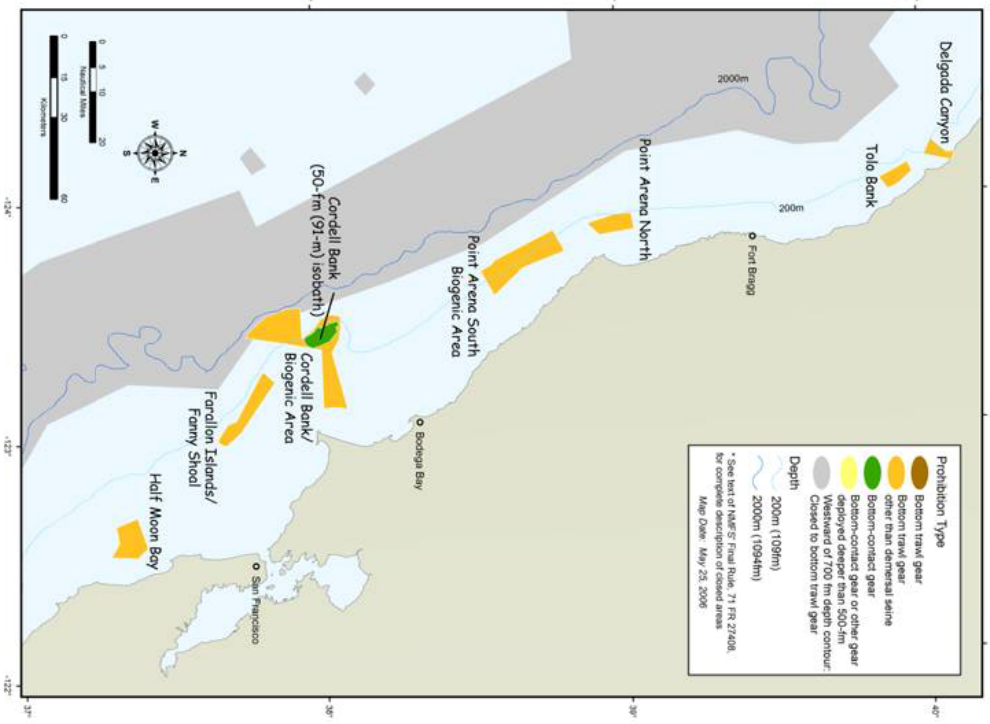
Appendix A- Maps



EFH area closures to protect Pacific Coast groundfish habitat - Coastwide.



EFH area closures to protect Pacific Coast groundfish habitat – Central California.



EFH area closures to protect Pacific Coast groundfish habitat – Northern California.

Agenda Item E.3.a
Attachment 2
November 2011

Groundfish EFP Proposal:
Yellowtail Rockfish Jig Fishing off California

Date of Application: October 13, 2011

Applicants	Mailing address	Telephone #	Email
San Francisco Community Fishing Association Contact: Barbara Emley	535 Ramsell St. San Francisco, CA 94132	(415) 585-5711	barbaraemley@sbcglobal.net
Dan Platt Open Access Representative Groundfish Advisory Panel **PFMC**	PO Box 1912 Ft. Bragg, CA 95437	(707) 813-7221	morefish@mcn.org
Scientific Advisors	Mailing address	Telephone #	Email
Yonat Swimmer Research Fisheries Biologist NMFS Pacific Islands Fisheries Science Center	501 W. Ocean Blvd Ste. 4200 Long Beach, CA 90802	(562) 980-4046	Yonat.Swimmer@noaa.gov
Dean Wendt Associate Dean, College of Science and Math California Polytechnic State University, San Luis Obispo	Cal Poly State University Biological Sciences Department San Luis Obispo, CA 93407	(805) 756-2988	Dwendt@calpoly.edu
NMFS Contact	Mailing address	Telephone #	Email
Kevin Duffy Groundfish Branch Chief NMFS Northwest Regional Office	7600 Sand Point Way NE Seattle, WA 98115	(206)526-4743	Kevin.duffy@noaa.gov
NMFS Technical Advisor	Mailing address	Telephone #	Email
Charles Villafana Fisheries Biologist NMFS Southwest Regional Office	501 W. Ocean Blvd Ste. 4200 Long Beach, CA 90802	(562)980-4033	Charles.villafana@noaa.gov

Purpose and Goals

West Coast fisheries have been increasingly restricted in state and federal waters over the last decade. Yet, demand remains for fresh, local seafood. To harvest abundant fish stocks with less impact, conservation engineering and gear experimentation is needed. **The purpose of this EFP is to test the potential for a new commercial jig gear configuration to harvest currently underutilized rockfish species (yellowtail) while avoiding overfished stocks to enhance optimum yield in the mixed stock West Coast groundfish fishery**.

This EFP aims to fulfill mandates and goals of the Magnuson-Stevens Act (MSA). It seeks to develop a new method to harvest abundant stocks while minimizing bycatch and providing for rebuilding of overfished stocks, consistent with National Standard 1 and National Standard 9. If successful, it will contribute to U.S. jobs, food, revenue, and sustainable fishing communities; and

would provide renewed opportunity for West Coast fisheries that have been constrained by rockfish conservation areas (RCAs) and lowered quotas implemented to rebuild overfished species.

Specifically, the EFP will test whether this experimental commercial jig gear configuration can:

1) avoid deep dwelling overfished rockfish stocks (canary and yelloweye) while selectively harvesting an abundant mid-water rockfish stock (yellowtail), and

2) provide enough harvest of abundant rockfish species to support, or at least contribute to, a commercial fishery off the West Coast in the long-term.

Disposition of Catch

Target species (yellowtail rockfish) and legal incidental catch, such as chilipepper rockfish, will be retained for sale. Fish not authorized for sale would be released alive if possible. If desired, incidental catch of certain species (e.g., canary and yelloweye) that cannot be released alive could be retained by the observer and provided to NMFS, CDFG, or other researchers.

Justification

The fishing grounds which have been historically accessible to portfolio fishermen in California's coastal communities are geographically identified as "shelf", and because of this, the gear used by these fishermen isn't useful for catching fish on the "slope" (depths greater than 100 fathoms-see Figure 5). The creation of the non-trawl rockfish conservation area (RCA) over the shelf (between 30 and 150 fathoms) has pushed fishermen outside their historical fishing grounds into deeper waters where fishing is no longer feasible with their current gear (see Appendix E).

In order to protect and rebuild overfished yelloweye and canary rockfish off California, depth and area closures were implemented off of California. Unfortunately, these closures have also prevented harvest of more abundant yellowtail rockfish that live higher in the water column. Combined with lower quotas, these measures caused many fishermen in California's coastal communities to switch fisheries and/or supplement their incomes in non-fishery jobs because they could no longer harvest the abundant groundfish stocks. If a gear could be developed capable of harvesting the more abundant mid-water species while avoiding catch of the overfished bottom dwellers, then the optimum yield of the fishery could be enhanced. There are currently no conservation concerns with yellowtail rockfish which is an under-utilized species.

In 2009, the Oregon Recreational Yellowtail Rockfish EFP, approved by the Council, was permitted to the Southern Oregon Sport Fishermen and Recreational Fishing Alliance (Oregon Chapter) for fishing in 2010 and 2011. Although not identical, this OR EFP is based on the same concept (i.e., placing hooks near the target species in mid-water and away from non-targets on the bottom). Therefore, it offers interesting insights of some relevance to this EFP application, particularly its catch composition and success at avoiding the non-target species. Under this EFP, 29 trips were made with an average of 11 anglers and 33 hooks per vessel (3 per line) were deployed on average. Reported catch of 4.3 mt (as of Aug. 1, 2011) was composed of roughly 62% Yellowtail, 23% Widow, 12% Canary and 3% other rockfish and 4kg of Yelloweye (2 fish) (see Appendix B). This catch is well below the 1 mt of Canary and 100 kg Yelloweye authorized for year two alone.

A similar design will be tested under this EFP with some modifications for use in a commercial fishery (e.g., number of hooks, size of weight). An EFP is necessary to test this gear because it is not currently authorized under the Groundfish FMP regulations and because fishing conducted under this

EFP is proposed for areas that are currently closed to fishing. If the proposed modified vertical hook and line fishing technique is successful, this exempted fishing permit (EFP) would allow commercial fishermen to access historical fishing grounds targeting healthy rockfish stocks and would promote ecologically and economically sustainable fisheries in Central and Northern California.

Broader Significance

The long-term goal, if experiments prove successful, is to allow commercial jig fishing with this gear off the entire West Coast, including in the RCAs, by the Open Access and Limited Entry participants. If successful, this gear could also be used by the Nearshore fleet to avoid species of concern and could create a fishery that would fill out the portfolios of those who make up the bulk of the fishermen in the West Coast's coastal communities. The recreational fleet might also benefit from using a similar gear with fewer hooks, similar to the Oregon Yellowtail EFP previously mentioned. Thus, the benefits of this EFP would extend beyond the initial EFP participants.

Despite the generally depressed condition of many west coast groundfish stocks, there are some stocks that remain healthy. These healthier stocks could safely sustain increased harvest levels if they could be fished more cleanly and without bycatch of more depleted stocks. If stronger stocks could be targeted without increasing fishing mortality on depressed stocks, the West Coast commercial fishing fleet would have alternative fishing opportunities that would provide some economic relief to the industry while providing the public with highly desirable sustainably harvested local seafood.

Details

In determining the proposed specifications for this experiment, several factors have been considered.

- **Creating a statistically valid sample size** – allowing for a sufficient number of hooks, lines, days, vessels, and locations that can provide valid conclusions as to the success of this gear at avoiding overfished non-target species and harvesting the target yellowtail in sufficient quantity to allow for potential expansion of this gear to support future commercial fishing.
- **Feasibility and efficiency** – whether participants can at least cover the costs involved to perform these experiments (including observer costs, fuel, gear, and bait), even if no profit is made under the EFP.
- **Safety-at-sea** – ensuring participants can fish on days with safe weather conditions.
- **Precaution and minimizing risk** – Knowing that overfished rockfish could be encountered and because at least some of the fishing would take place in the RCA, several precautionary measures are proposed.

With consideration of these factors, applicants are open to discussing modifications to this proposal with the GMT and GAP (e.g., # hooks, depth range, etc.).

Total Duration of the EFP

This EFP proposal is for a total of 2 years (2013-2014) with 30 fishing days for the first year, and possibly 45-60 days in the second year. In the second year, additional time and other modifications may be desired and/or necessary (e.g., number of participating vessels, hooks, area and days fished), but would be subject to review and approval through the PFMC process and NMFS.

Location of Fishing under the EFP

The fishing will occur between Point San Pedro and the Oregon/California border (37°35'N and 42°N), between 30 and 100 fathoms. Locations for the EFP fishing have been chosen based on known yellowtail habitat, rather than lines of latitude or fathom lines and it is known that there is appropriate yellow-tail habitat in this area, i.e., high relief rocky reef deeper than 30 fathoms (see Appendix D).

Yellowtail rockfish is the target in this experiment because they are underutilized and because they are a mid-water species, whereas the overfished rockfish species of greatest concern are bottom-dwelling (i.e., canary and yelloweye). The hooks would be located only in the mid-water column based on the hypothesis that this will be in the range of yellowtail but out of range for canary and yelloweye rockfish, making it less likely that they would encounter the hooks.

Fishing under this EFP is proposed to occur within the RCAs making this a sensitive and delicate experiment that would be undertaken with precautionary steps, such as having 100% observer coverage and daily limits (see section on **Precautionary Measures**). Unfortunately, it is thought that yellow-tail rock fish live primarily inside the RCAs and it would be useful to verify this assertion by reviewing fish ticket information from years prior to implementation of the RCAs. Recently, the Superintendent of the Cordell Bank National Marine Sanctuary reports seeing very large numbers ("clouds") of yellowtail rockfish on the "high spots" while in a submersible and saw no yelloweye and very few canary rockfish in this same area.

If the project proves successful in avoiding stocks of concern, then fishermen in other West Coast harbors may want to explore other appropriate habitat in their area. Much of the area proposed for this EFP is within the boundaries of the Gulf of the Farallones and Cordell Bank National Marine Sanctuaries. These sanctuaries are in support of this experiment. It has been 10 years since any fishing has taken place in this area, and the Sanctuaries' superintendents are very interested in learning the results of this experiment.

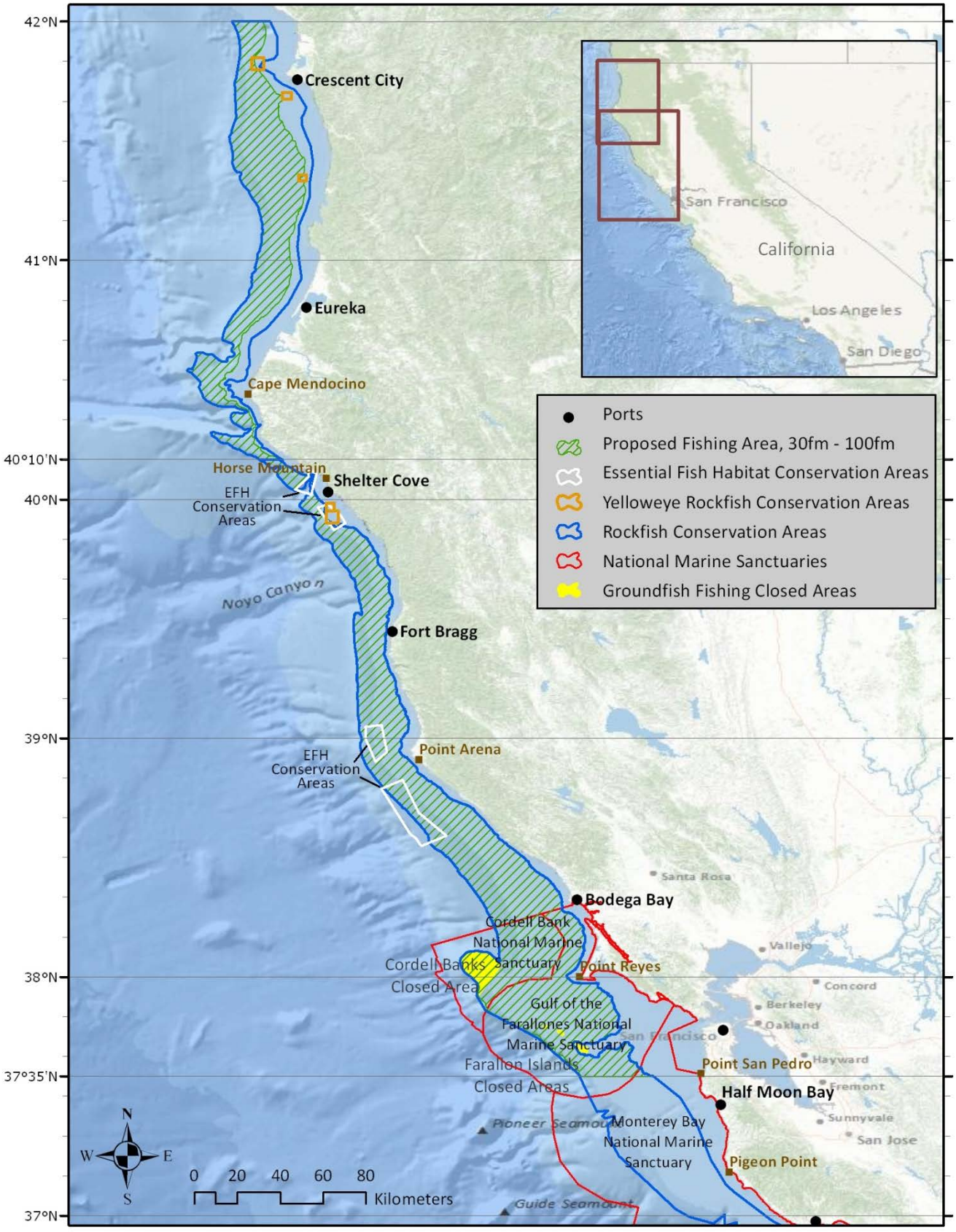


Figure 1. Chart of proposed EFP fishing area – Pigeon Point, CA, to CA/OR border.

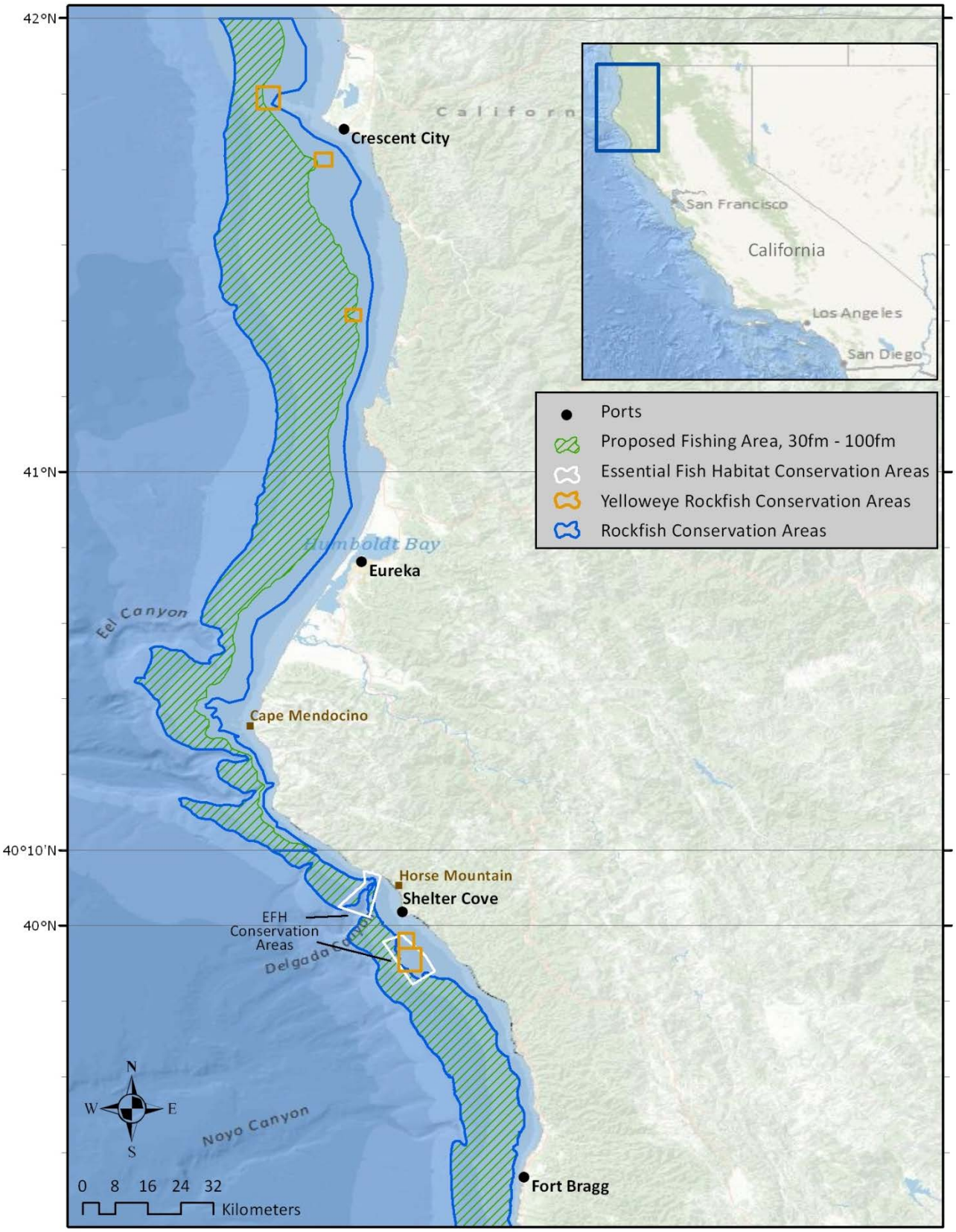


Figure 2. Chart of proposed EFP fishing area – Ft. Bragg, CA, to CA/OR border.

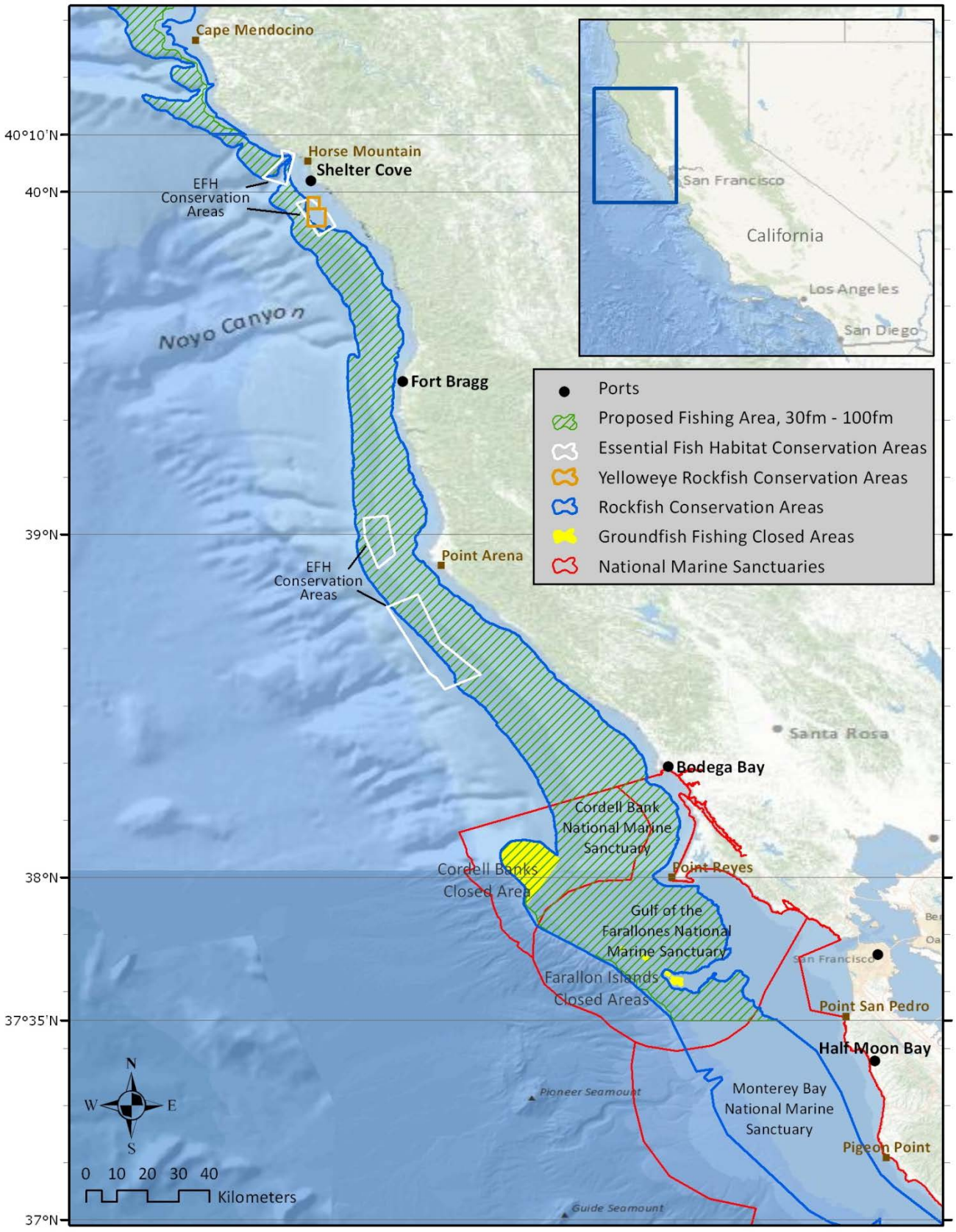


Figure 3: Chart of proposed EFP fishing area – Pigeon Point, CA, to Cape Mendocino, CA.

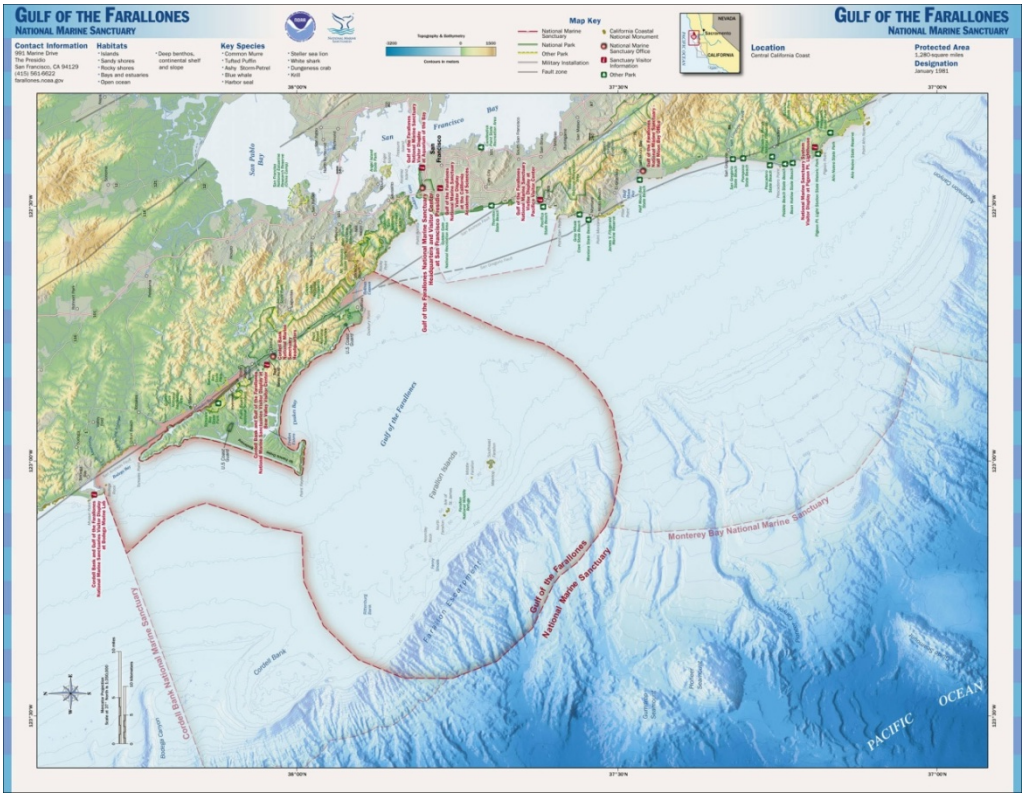


Figure 4: Detailed Chart of the Southern end of proposed fishing area

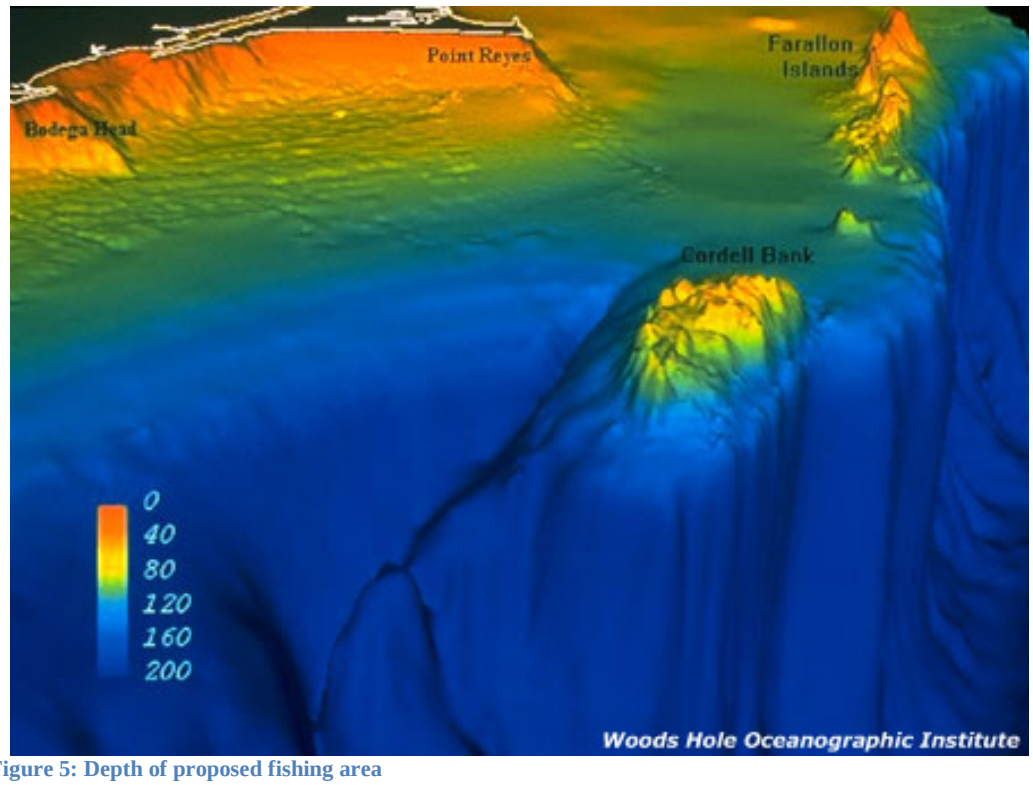


Figure 5: Depth of proposed fishing area

Description of the Gear to be Used

Specifications

- A vessel will fish up to two lines. If two are used, one will be on the bow and one on the stern.
- Each line will consist of all of the following:
    1. a tuna cord mainline
    2. a float above the top hook to keep the gear from contacting the bottom, as suggested by the GMT in 2009; float size large enough to float the gear without the weight
    3. a monofilament ganion with 25 to 50 hooks (shrimp flies) each, spaced 1-3 feet apart
    4. a weight of no more than 15 lbs
    5. a breakaway (lower test line) that is a minimum of 30 feet (5 fathoms) located between the lowest hook and the weight
- Still to be determined: weight, whether bait will be needed, and strength of the breakaway line.

Storage and Deployment

- The mainline can be coiled in a basket, wound on the reel of a fishing pole, or spooled on the boat's gurdies.
- The hooks can be placed on a "pinning rail" (usually a long piece of rubber with slots for the hooks) followed by the breakaway and the weight.
- After the weight is thrown overboard followed by the breakaway, the hooks will peel off the pinning rail.
- The float will be attached above the hooks as the gear is deployed.
- Once the fisherman feels the weight hit bottom, he immediately pulls the line up so that it does not drag on the bottom and to avoid tangling in the rocks.

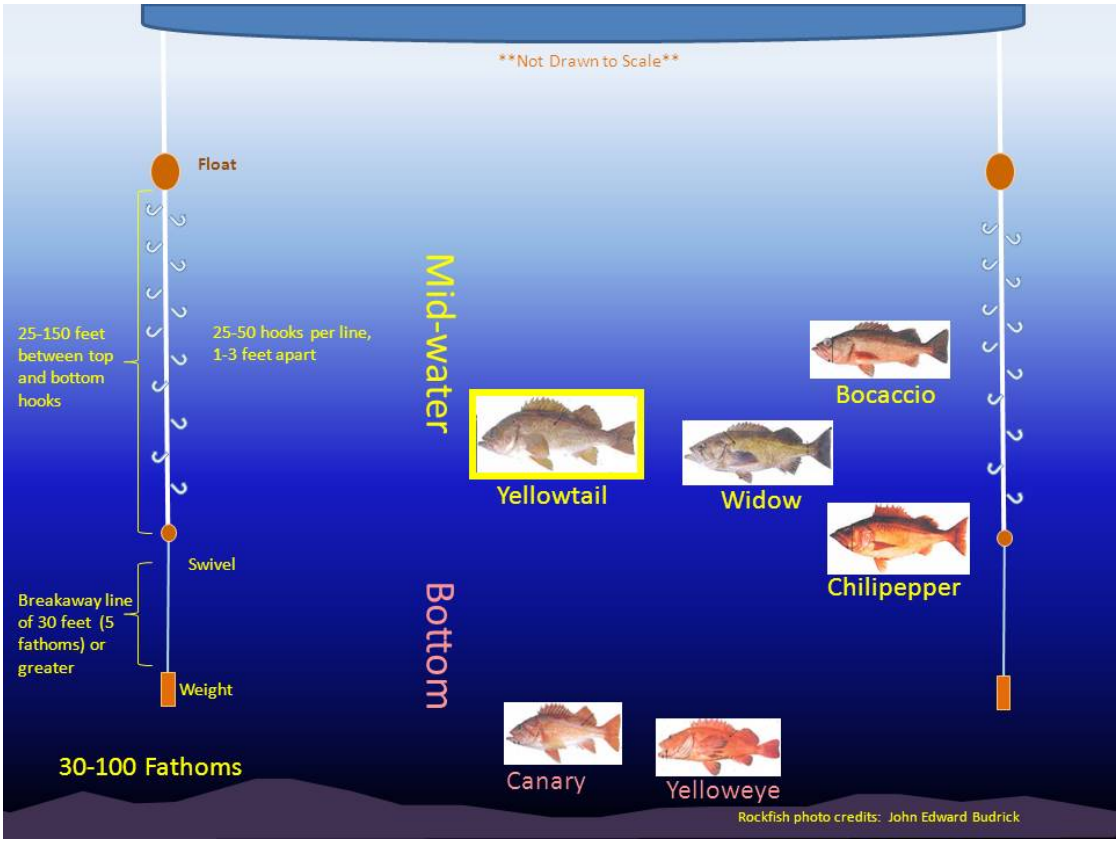


Figure 6. Conceptual drawing of the proposed gear

Effort

- *Trip length*:
  - Vessels out of Ft. Bragg and south – 4 to 5 days (2 day travel time, 2-3 fishing days);
  - Vessels out of Crescent City – 1 day
- *Drops per day*: TBD (depends on conditions), possibly 5 hours total drop time
- *Length of drop*: possibly 5 min to 30 minutes

Number of vessels covered under the EFP

A total of 4 vessels would participate in the study the first year (potential vessels: 2 out of San Francisco, 1 out of Ft. Bragg, 1 out of Crescent City). While the area is very large for 4 vessels to cover, we want the first year simply to explore whether the gear will be able to catch Yellowtail and successfully avoid overfished bottom-dwelling species. If successful and with PFMC approval, in the second year, the experiment could expand with more vessels to cover more area and locate additional suitable habitat (applicants are open to GMT/GAP feedback to determine an appropriate level of expansion if a specific proposal is necessary at this time or leaving it at 4 for both years). Applying for a second two-year EFP for the 2015-2016 cycle might be appropriate to discover more suitable habitat in a larger West Coast area and add more vessels.

Species to be Harvested (target and incidental)

Table 1 provides an overview of the species that will be caught under the EFP, their status, and estimated catch amounts. Other species incidentally caught will be landed as allowed under the Groundfish Open Access regulations.

Table 1. Overview of Target and Incidental Species Caught under the EFP

Species	Target or Incidental?	Overfished? Y/N	Depth Range	Estimated Amount of EFP Harvest
Yellowtail Rockfish *Sebastes flavidus*	Target	No	0-900 ft (0-150 fms)	To be determined by GMT
Widow Rockfish *Sebastes entomales*	Incidental	Yes*	0-1050 ft (0-175 fms)	To be determined by GMT
Bocaccio *Sebastes paucispinis*	Incidental	Yes	0-1050 ft (0-175 fms)	To be determined by GMT
Chilipepper *Sebastes goodei*	Incidental	No	0-1080 ft (0-180 fms)	To be determined by GMT
Canary Rockfish *Sebastes pinniger*	Incidental	Yes	0-900 ft (0-150 fms)	To be determined by GMT
Yelloweye Rockfish *Sebastes ruberrimus*	Incidental	Yes	150-1200 ft (25-200 fms)	To be determined by GMT

**As of Oct. 3, 2011, it is "Overfished" according to PFMC (below B40) but "not overfished" in 2010 Status of U.S. Stocks Report to Congress (above B25). However, a new stock assessment is anticipated in November 2011.

a. Species Descriptions

Descriptions of the **species life histories** can be found in Appendix B2 of the Pacific Coast Groundfish Fishery Management Plan.
http://www.nwr.noaa.gov/Groundfish-Halibut/Groundfish-Fishery-Management/NEPA-Documents/upload/FMP-Appendix-B2.pdf

Updated information on **species abundance** can be found in Chapter 3 of the Proposed Harvest Specifications and Management Measures for the 2011-2012 Pacific Coast Groundfish Fishery and Amendment 16-5 to the Pacific Coast Groundfish Fishery Management Plan to Update Existing Rebuilding Plans and Adopt a Rebuilding Plan for Petrale Sole; Final Environmental Impact Statement. http://www.nwr.noaa.gov/Groundfish-Halibut/Groundfish-Fishery-Management/NEPA-Documents/upload/1112GF_SpexFEIS_100806-FINAL_feb21_.pdf

b. Estimated Harvest Amounts

Harvest amounts will be determined by the GMT. To assist in determining potential harvest amounts, provided for consideration is an estimated range of CPUE and potential catch composition. Appendix A includes CPUE estimates, which was derived in order to consider the landings likely needed to cover costs of fishing under this EFP.

No prior data exists from which to pull an exact catch composition estimate from this gear. However, some data may be informative and could possibly be considered as the best available proxies. A possible proxy may potentially be derived from the mix of species caught during the first two years of the Oregon Recreational Yellowtail Rockfish EFP. If considered appropriate and desirable to use, an attempt to analyze this data can be found in Appendix C. Under that EFP, the reported catch of 4.3 mt (as of Aug. 1, 2011) was composed of roughly 62% Yellowtail, 23% Widow, 12% Canary and 3% other rockfish and 4kg of Yelloweye (2 fish) (see Appendix B). Also, analysis of PacFIN data to look at block data from groundfish landings from relevant ports could be another potential source. However, limitations with this data include: the landings would encompass trawl and hook & line gear together, past landings data could reflect abundance issues (i.e., lower abundance because of overfished stocks), and concerns with the accuracy of block reporting.

Catch Accounting and Compliance

This EFP will incorporate a standardized data collection and reporting format. Under the terms of this EFP there will be 100% observer coverage. Fisheries Observers will collect data on fishing gear, location, catch, and disposition of catch.

Precautionary Measures

Given the potential to catch overfished species and by fishing in the RCA, the utmost caution will be taken with this experiment. The following measures are proposed and applicants are open to working with the PFMC, NMFS, and CDFG to implement others deemed necessary.

1. **Observers** – 100% observer coverage (a standard measure for EFPs, but worth noting here).
2. **Caps** – Based on input from the PFMC and NMFS, each boat will have either a ***daily*** or ***trip*** limit/cap of canary and yelloweye. If this cap is reached, based on catch accounting reports verified by the observer, fishing will cease for that day or trip. Because the participants proposed for this EFP are Groundfish Open Access fishermen, trip limits for species other than yellowtail, widow, chilipepper, bocaccio, canary, and yelloweye would comply with the Groundfish Open Access regulations.

3. **Trip reports and catch accounting** – On a timeline agreeable to NMFS and CDFG, trip and cumulative catch reports will be provided after each trip (e.g., within 48 hours).
4. **Status and evaluation call before each trip** – Before each vessel departs on a trip, a cumulative catch accounting report (i.e., running total for the season) and evaluation of the trips taken thus far will be reviewed to determine if another trip can be made and to discuss lessons learned (e.g., float sizes, bait, etc.). If it is likely that the allocated harvest cap would be exceeded in the upcoming trip, then all fishing under the EFP will cease for the season. Participants on each call would include the EFP participants and could include NMFS (SF & OLE), CDFG (Marine Region & Enforcement).
5. **Annual or Biennial Summary Report** – An annual or biennial report will be provided to NMFS and the PFMC summarizing the catch to date, as preferred by NMFS and PFMC.

Data Collection and Analysis Methodology

Data Collection

The following data will be collected by observer for all fishing under this EFP:

Gear Configuration

- Number of hooks
- Weight size
- Breakaway line length
- Type of bait
- Float size and type
- Distance between hooks

Set and Haul Data:

- Position (GPS coordinates)
- Depth
- Time

Catch

- Species
- Total weight
- Species position on line (e.g., hook #)
- Disposition (landings and discards)
- Count

Attachment of depth recorders may be used, as available.

If desired, incidental catch of certain species (e.g., canary and yelloweye) that cannot be released alive could be retained by the observer and provided to NMFS, CDFG, or other researchers for biological sampling.

Data Analysis

Catch per unit effort will be calculated based on hooks per hour fished. This will allow comparison between short and long drops and different gear configurations. The data will be reported on a trip by trip level. The catch data will be analyzed for CPUE of all species and each species individually.

We have received a grant to engage an undergraduate student to provide data analysis and to ensure statistically valid data. We have begun to make arrangements with Cal Poly for that student and his/her supervisor,

Participation

Choosing Participants

Vessels participating in this EFP will be chosen on their ability to accommodate an observer, which means having bunk space for overnight trips; a life raft for enough people and a coast guard decal and their willingness to maintain detailed catch data. Vessels will also be required to have VMS as required by the open access and limited entry groundfish regulations.

Specific vessels proposed to participate under this EFP include, subject to approval and change if unforeseen circumstances arise:

1. F/V Autumn Gale… (Barbara Emley)
2. F/V High Hopes (John Mellor)
3. F/V Zhivago (Dan Platt)
4. F/V Cindrarosa (Kenyon Hensel)

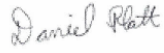
Planned EFP Fishing by Participants

Fishing will take place in appropriate habitats within the latitudes and fathom curves mentioned earlier. Finding these habitats is important to the success of the EFP. Weather conditions are critical for this type of fishing, which involves drifting (not too much wind or current), so times will be left to the discretion of the captains. It is likely that October will be the best time of year, but fishing would not be limited to October. The gear is as described earlier except that a vessel may choose to use less gear than authorized to check species composition prior to setting all gear.

Signatures



Barbara Emley



Daniel Platt

Appendix A- CPUE Estimates

Catch per unit effort is calculated below using 1 hook per hour as a unit of effort. The assumed effort per day is 5 hours of actual fishing time (gear in the water). Therefore, total catch is calculated for various numbers of hooks and CPUE of either 1 fish (2kg) or 2 fish (4kg) per hook per hour five hours a day. These numbers are expanded for 30 and 45 fishing days (3 vessels) and 40 and 60 fishing days(4 vessels). The green highlighted fields represent the estimated catch required to meet expenses of $800/day.

Estimated effort for 3-6 vessels

One day of effort is approximately 5 hours of wet gear time

# of vessels	Days per vessel		Total Days	
	4 trips / vessel	6 trips / vessel	10 days/ vessel	15 days/ vessel
3	10	15	30	45
4	10	15	40	60
5	10	15	50	75
6	10	15	60	90

Assessment of estimated harvest for Year 1 of the EFP

Preferred Gear Configuration	$800 a day needed to cover expenses (Including Observer Coverage, Fuel, Bait, and Gear)	fish = all fish caught, not species specific	Amount that would cover expenses

Comparision of gear configuration by day and CPUE

			Possible CPUE Values in # of fish / hour		Possible CPUE Values in kg of fish / hour	
# of hooks/line (2 lines / boat)	Total # of hooks per boat	spacing between top hook and bottom hook (1-3 ft btwn hooks)	CPUE = 1 fish per hook per hour x 5 hours	CPUE = 2 fish per hook per hour x 5 hours	CPUE =l kg per hook per hour x 5 hours	CPUE = 2 kg per hook per hour x 5 hours
10	20	9-27ft	100	200	100	200
20	40	19-57ft	200	400	200	400
25	50	24-72ft	250	500	250	500
30	60	29-87ft	300	600	300	600
40	80	39-117ft	400	800	400	800
45	90	44-132ft	450	900	450	900
50	100	49-147ft	500	1000	500	1000
100	200	99-297ft	1000	2000	1000	2000

Conclusion: At least 50 hooks would be needed to meet expenses if CPUE was between 1 and 2 fish per hook per hour with 5 hours of wet gear time.

Comparision of number of hooks for 30 days of fishing

			Possible CPUE Values in # of fish / hour		Possible CPUE Values in kg of fish / hour	
# of hooks/line (2 lines / boat)	Total # of hooks per boat	total days	CPUE = 1 fish per hook per hour x 5 hours	CPUE = 2 fish per hook per hour x 5 hours	CPUE =l kg per hook per hour x 5 hours	CPUE = 2 kg per hook per hour x 5 hours
10	20	30	3000	6000	3000	6000
20	40	30	6000	12000	6000	12000
25	50	30	7500	15000	7500	15000
30	60	30	9000	18000	9000	18000
40	80	30	12000	24000	12000	24000
45	90	30	13500	27000	13500	27000
50	100	30	15000	30000	15000	30000
100	200	30	30000	60000	30000	60000

Conclusion: With 30 days of fishing, between 12 and 24 MT of fish would be harvested

Comparision of number of hooks for 45 days of fishing

			Possible CPUE Values in # of fish / hour		Possible CPUE Values in kg of fish / hour	
# of hooks/line (2 lines / boat)	Total # of hooks per boat	total days	CPUE = 1 fish per hook per hour x 5 hours	CPUE = 2 fish per hook per hour x 5 hours	CPUE =l kg per hook per hour x 5 hours	CPUE = 2 kg per hook per hour x 5 hours
10	20	45	4500	9000	4500	9000
20	40	45	9000	18000	9000	18000
25	50	45	11250	22500	11250	22500
30	60	45	13500	27000	13500	27000
40	80	45	18000	36000	18000	36000
45	90	45	20250	40500	20250	40500
50	100	45	22500	45000	22500	45000
100	200	45	45000	90000	45000	90000

Conclusion: With 45 days of fishing, between 18 and 36 MT of fish would be harvested

Comparision of number of hooks for 40 days of fishing

			Possible CPUE Values in # of fish / hour		Possible CPUE Values in kg of fish / hour	
# of hooks/line (2 lines / boat)	Total # of hooks per boat	total days	CPUE = 1 fish per hook per hour x 5 hours	CPUE = 2 fish per hook per hour x 5 hours	CPUE =l kg per hook per hour x 5 hours	CPUE = 2 kg per hook per hour x 5 hours
10	20	40	4000	8000	4000	8000
20	40	40	8000	16000	8000	16000
25	50	40	10000	20000	10000	20000
30	60	40	12000	24000	12000	24000
40	80	40	16000	32000	16000	32000
45	90	40	18000	36000	18000	36000
50	100	40	20000	40000	20000	40000
100	200	40	40000	80000	40000	80000

Conclusion: With 40 days of fishing, between 16 and 32 MT of fish would be harvested

Comparision of number of hooks for 60 days of fishing

			Possible CPUE Values in # of fish / hour		Possible CPUE Values in kg of fish / hour	
# of hooks/line (2 lines / boat)	Total # of hooks per boat	total days	CPUE = 1 fish per hook per hour x 5 hours	CPUE = 2 fish per hook per hour x 5 hours	CPUE =l kg per hook per hour x 5 hours	CPUE = 2 kg per hook per hour x 5 hours
10	20	60	6000	12000	6000	12000
20	40	60	12000	24000	12000	24000
25	50	60	15000	30000	15000	30000
30	60	60	18000	36000	18000	36000
40	80	60	24000	48000	24000	48000
45	90	60	27000	54000	27000	54000
50	100	60	30000	60000	30000	60000
100	200	60	60000	120000	60000	120000

Conclusion: With 60 days of fishing, between 24 and 48 MT of fish would be harvested

Appendix B- Oregon EFP Catch

In 2009, the Oregon Recreational Yellowtail Rockfish EFP, approved by the Council, was permitted by NMFS to the Southern Oregon Sport Fishermen and Recreational Fishing Alliance (Oregon Chapter) for fishing in 2010 and 2011. Although not identical, this OR EFP is based on the same concept (i.e., placing hooks near the target species in mid-water and away from non-targets on the bottom), and, therefore, offers interesting insights of relevance to this EFP application, particularly the catch composition and success at avoiding non-target species. Under this EFP, 29 trips were made with an average of 11 anglers and 33 hooks per vessel (3 per line) were deployed on average.

Oregon Recreational Yellowtail Rockfish EFP Catch

Year 1	kg	% of total	anglers	catch per angler day
Total	**2083**	**100**	**137**	**15.20437956**
Yellowtail	1657	79.54873	137	12.09489051
Widow	266	12.77004	137	1.941605839
Canary	129	6.192991	137	0.941605839
Yelloweye	0	0	137	0
Other (approx kg)	31	1.488238	137	0.226277372
Year 2	**kg**	**% of total**	**anglers**	**catch per angler day**
Total	**2283**	**100**	**169**	**13.50887574**
Yellowtail	1062	46.51774	169	6.284023669
Widow	722	31.62505	169	4.272189349
Canary	380	16.64477	169	2.24852071
Yelloweye	4	0.175208	169	0.023668639
Other (approx kg)	115	5.037232	169	0.680473373
Both	**kg**	**% of total**	**anglers**	**catch per angler day**
Total	**4366**	**100**	**306**	**14.26797386**
Yellowtail	2719	62.27668	306	8.885620915
Widow	988	22.62941	306	3.22875817
Canary	509	11.65827	306	1.663398693
Yelloweye	4	0.091617	306	0.013071895
Other (approx kg)	146	3.344022	306	0.477124183

Appendix C- Potential Harvest Estimates

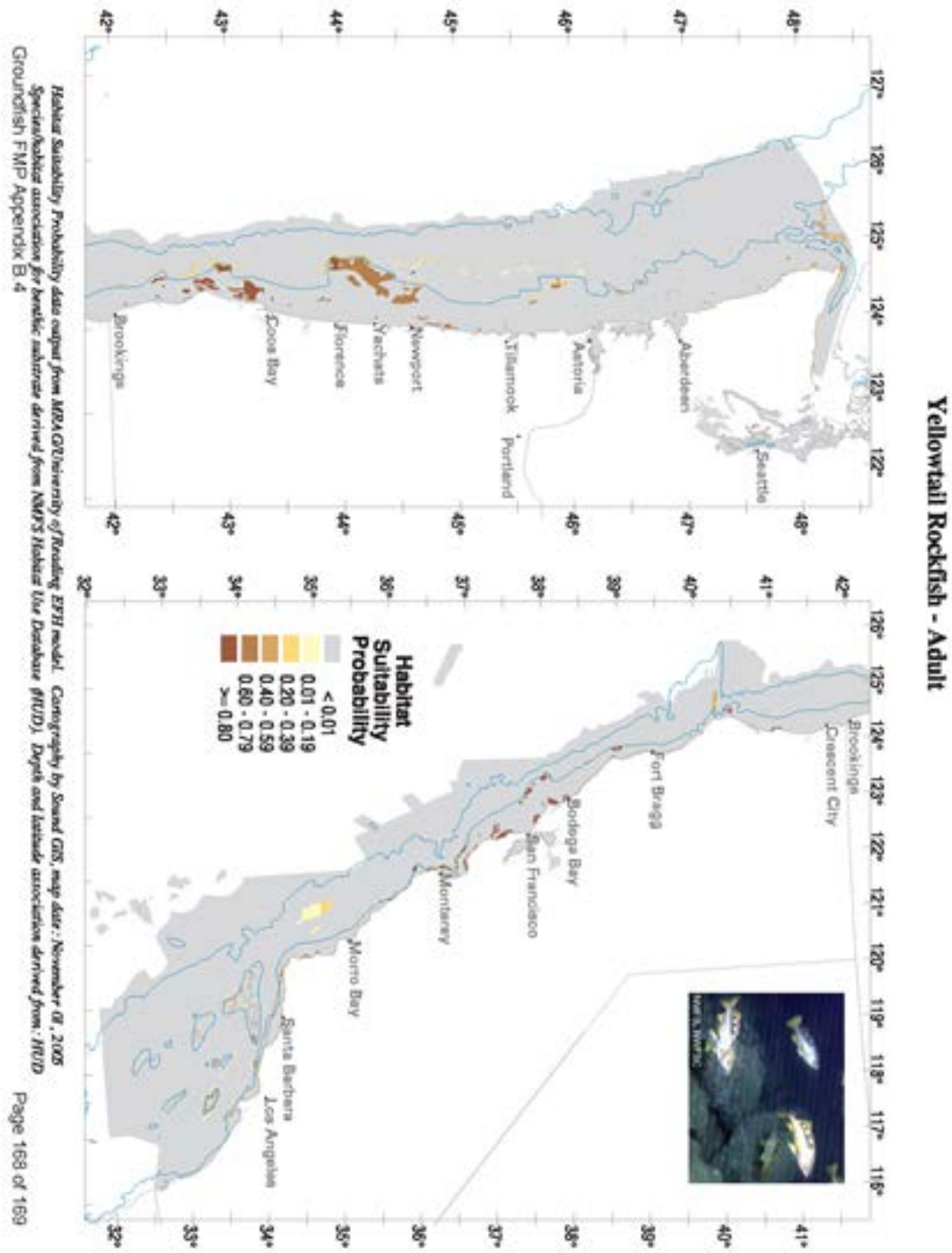
The estimates below are based on the catch composition from the Oregon Recreational Yellowtail Rockfish EFP (see Appendix B) and the estimated CPUE (see Appendix A).

Estimated Harvest		30 Days		45 Days		40 Days		60 Days	
Hooks	Species	CPUE = 1	CPUE = 2	CPUE = 1	CPUE = 2	CPUE = 1	CPUE = 2	CPUE = 1	CPUE = 2
50	Yellowtail	4670	9341	7006	14012	6227	12455	9340	18682
	Widow	1697	3394	2546	5092	2263	4525	3394	6788
	Canary	874	1748	1312	2623	1165	2331	1748	3496
	Yelloweye	7	13	10	21	9	17	14	26
	Other Rockfish	250	501	376	752	333	668	500	1002
80	Yellowtail	7473	14946	11209	22419	9964	19928	14946	29892
	Widow	2715	5431	4073	8146	3620	7241	5430	10862
	Canary	1398	2797	2098	4197	1864	3729	2796	5594
	Yelloweye	11	22	16	33	15	29	22	44
	Other Rockfish	401	802	601	1203	535	1069	802	1604
100	Yellowtail	9341	18683	14012	28024	12455	24911	18682	37366
	Widow	3394	6788	5092	10183	4525	9051	6788	13576
	Canary	1748	3497	2623	5246	2331	4663	3496	6994
	Yelloweye	13	27	21	41	17	36	26	54
	Other Rockfish	501	1003	752	1504	668	1337	1002	2006

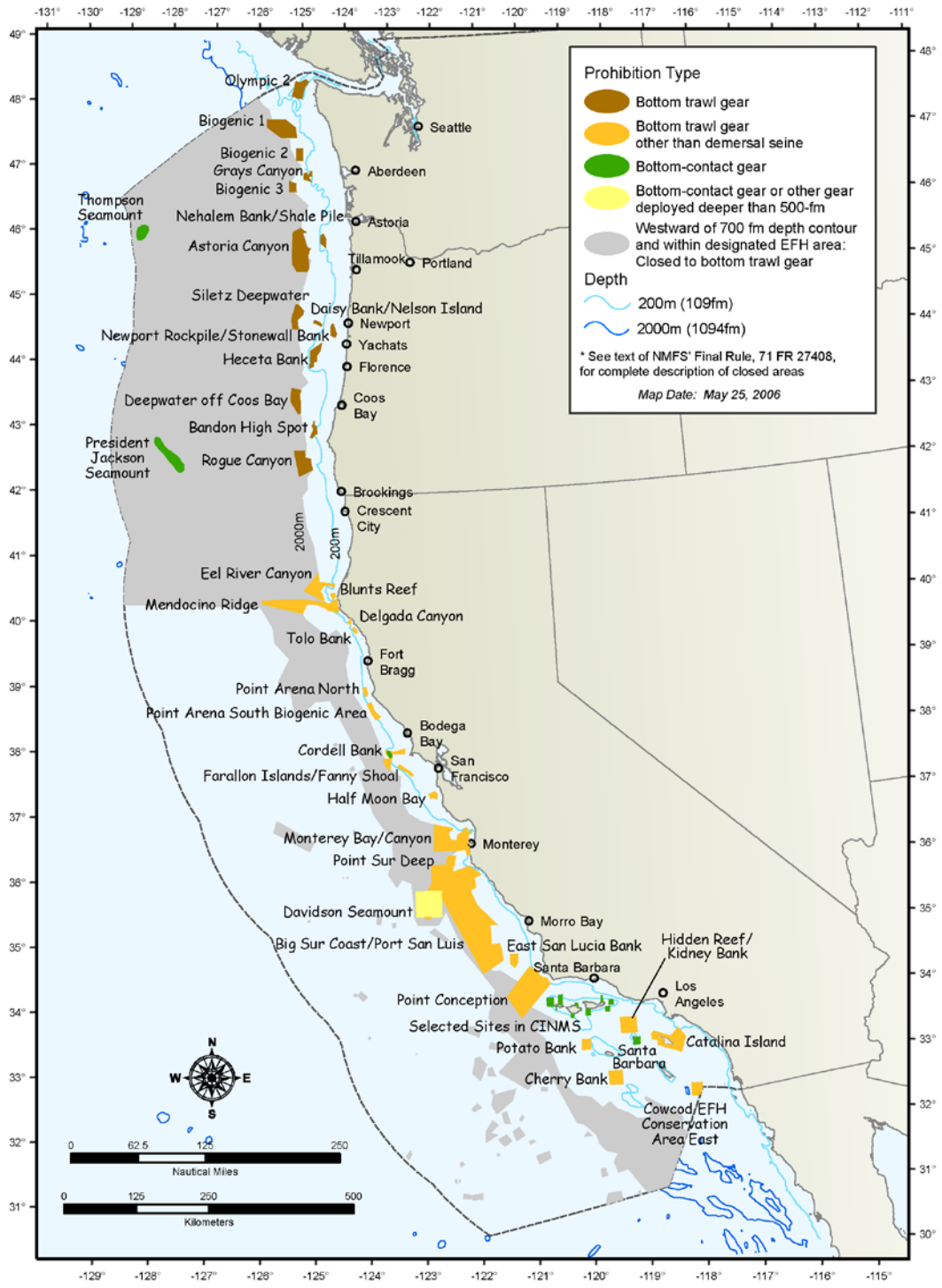
One day of effort is approximately 5 hours of wet gear time
All weights are in kg
CPUE = 1 (1 fish (2kg) per hook per hour five hours a day)
CPUE =2 (2 fish (4kg) per hook per hour five hours a day)

Appendix D- Adult Yellowtail Rockfish Habitat Suitability

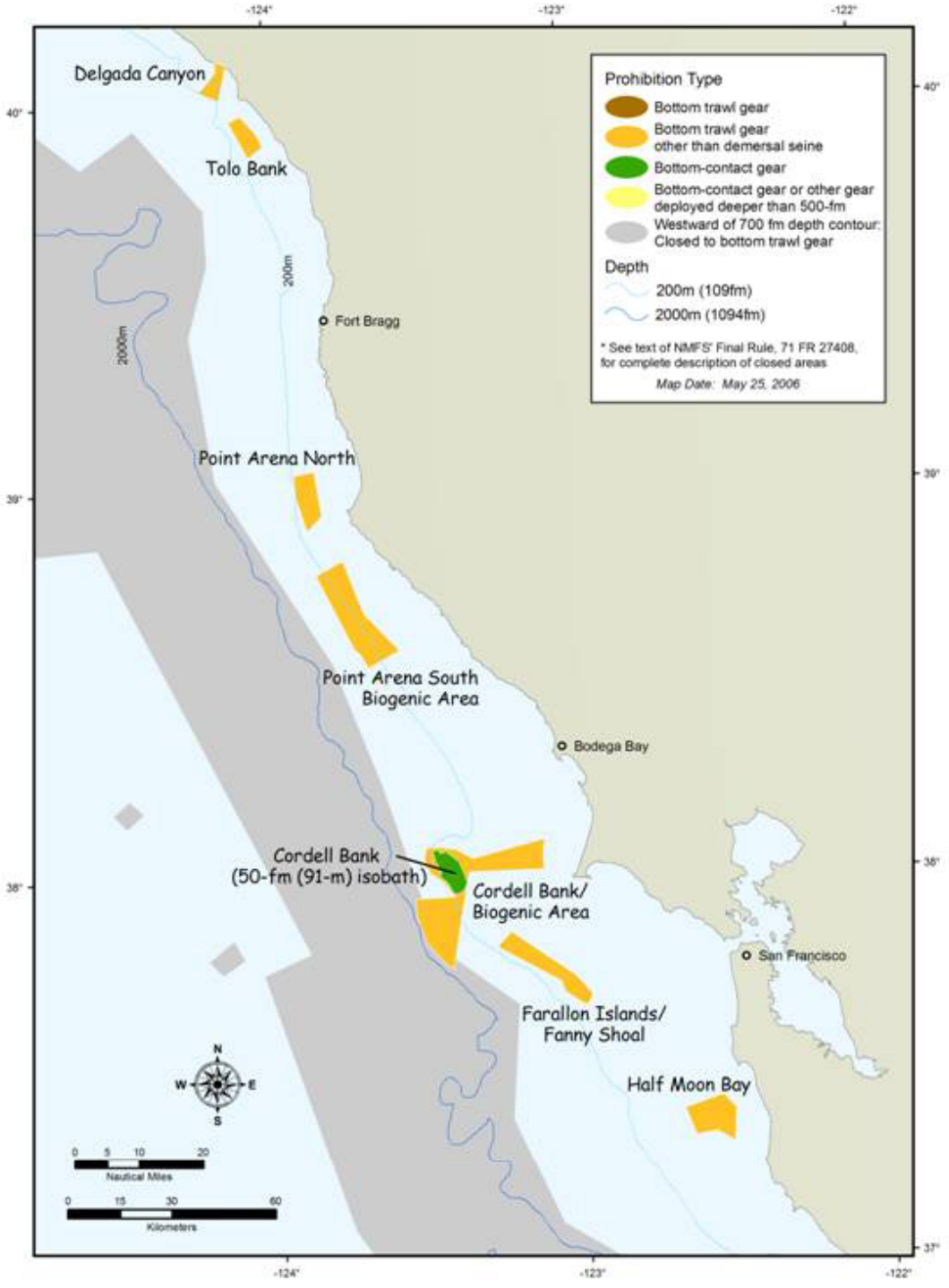
There is a high probability of suitable habitat for adult yellowtail rockfish within the proposed fishing area.



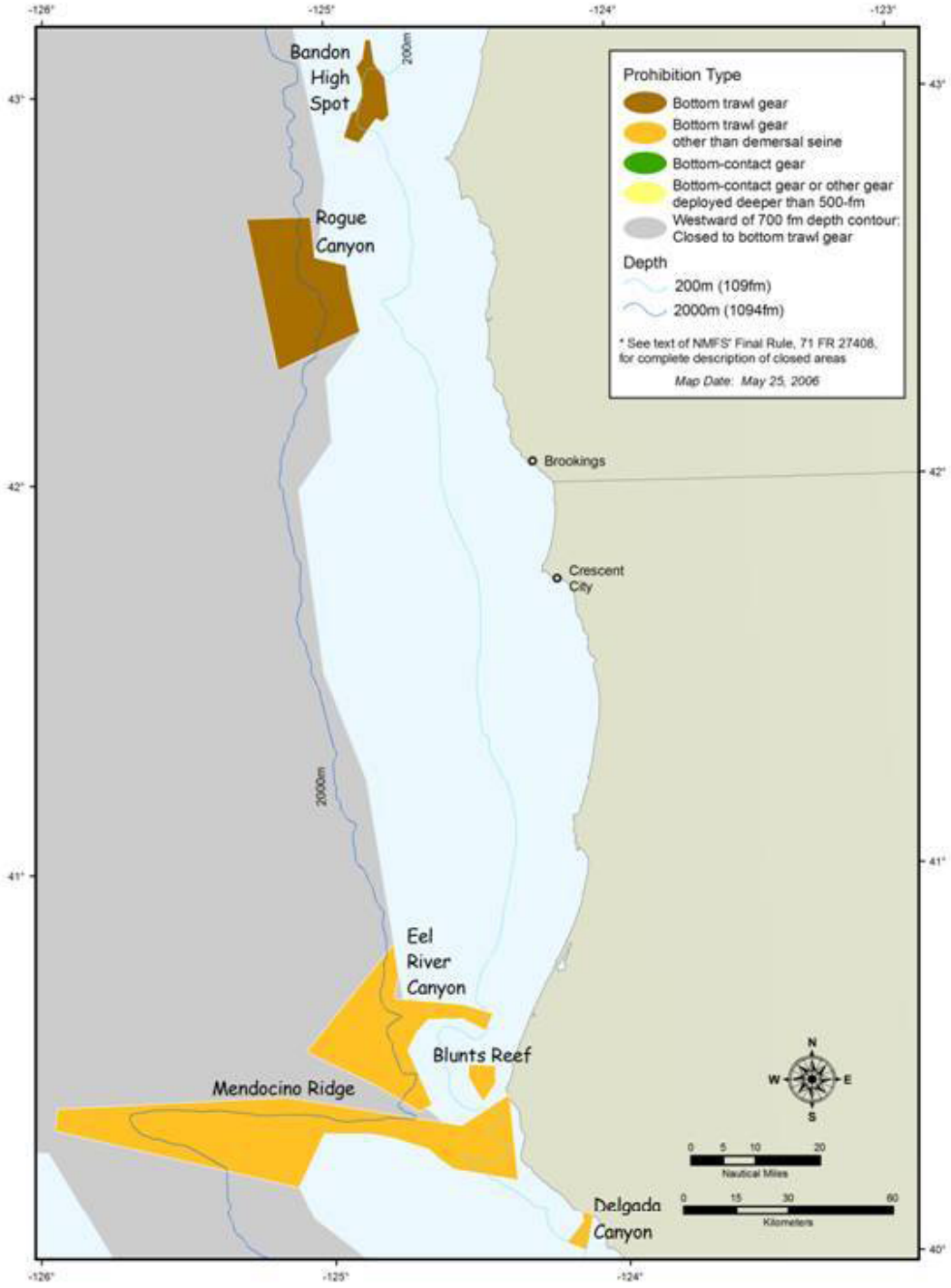
Appendix E- Essential Fish Habitat and Rockfish Conservation Areas



EFH area closures to protect Pacific Coast groundfish habitat - Coastwide.



EFH area closures to protect Pacific Coast groundfish habitat – Northern California.



EFH area closures to protect Pacific Coast groundfish habitat – Oregon and Northern California.

10/11/12

Dan Wolford
Chair
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384

Dear Chair Wolford and Council Members,

We appreciate the opportunity to submit the attached application for an Exempted Fishing Permit (EFP) for the 2013 and 2014 groundfish seasons.

Over the last ten years the Rockfish Conservation Area (RCA) has been an important tool in minimizing the catch of depleted species. However, we believe that not enough has been done to study its role in advancing rebuilding of depleted stocks through increased production. At the same time, it's also a coarse tool and may close some areas unnecessarily, especially given the assurances that come from the trawl rationalization program's Individual Fishing Quotas (IFQ) hard bycatch caps, observer coverage, and strong fishermen incentives. In addition, there are stocks of some species such as chilipepper, yellowtail rockfish, and lingcod that are difficult to access due to their proximity to the RCA. Currently, we do not know enough about the distribution of these rebuilding stocks to inform bycatch avoidance plans and promote fishing opportunities for underutilized stocks.

We are therefore working with the EFP partners and others on a collaborative research plan that includes conducting a spatial analysis of fisheries independent data to identify trends in size and abundance for rebuilding species as well as identify the areas that are predicted to be "hotspots" and "coldspots" for these species. We will conduct focused surveys with a Remotely Operated Vehicle (ROV) to groundtruth those predicted "hotspots" and "coldspots" within the Central Coast of California.

However, to both supplement and further groundtruth this analysis, we are requesting permission to conduct hook and line and trap fishing within the RCA off the Central Coast. In conjunction with ROV surveys, we will test the conclusions of the spatial analysis with respect to constraining species abundance, length, and habitat. We will also collect important biological information such as maturity, fecundity, and ageing. As funding permits, we will also explore the use of descending devices to test survivorship from barotraumas at depths within the RCA. Exact sampling locations will depend on the results of the spatial analysis which is not yet complete; however, we anticipate that we can provide coordinates by either the March or April Council meeting, depending on how far along the analysis is.

All quota needs, research, and observer costs will be covered by the EFP partners.

We believe that this information will have coast wide and fleet wide value and can, 1) be used in stock assessments and to potentially reduce uncertainty buffers, 2) inform any reconfiguration of the RCA that may occur, and 3) help guide fishing plans and bycatch avoidance efforts. This project achieves the priority considerations for EFP proposals.

We are excited that this project represents an opportunity to bring together a range of partners and data sources to meaningfully inform science, management, and fishing effort and we respectfully request the Council's consideration.

Sincerely,

Roger Cullen
President
Central Coast Sustainable Groundfish Association

Application for an Exempted Fishing Permit (EFP)

Title: Supporting a spatial analysis of the distribution and size of rebuilding stocks in the Rockfish Conservation Area through directed fishing surveys

a) Date of Application: October 13, 2011

b) Applicant: Central Coast Sustainable Groundfish Association (Roger Cullen [President], Chris Kubiak)

Project Partners:

The Nature Conservancy (Dr. Mary Gleason, Michael Bell, Steve Rienecke)

Environmental Defense Fund (Shems Jud, Dr. Rod Fujita, Huff McGonigal)

Academic Science advisors and partners:

Dr. Jono Wilson (University of California, Santa Barbara)

Dr. James Lindholm (California State University Monterey Bay)

Dr. Rick Starr (Moss Landing Marine Laboratory / California Sea Grant)

Dr. Dean Wendt (California Polytechnic University)

Dr. John Field (NMFS/SWFSC)

SUMMARY

Fishing opportunities, and the economic and social benefits associated with them, may be unnecessarily constrained in the groundfish fishery due to a lack of understanding of whether and how the RCAs are contributing to the rebuilding of depleted stocks. This EFP will result in a synthesis of existing data (best available information regarding the spatial distribution of depleted stocks) that will help fishermen avoid hot spots of depleted species, and new data on the status of stocks (abundance and productivity) within the RCAs that will inform stock assessments to more accurately reflect stock status. This information is critical for science-based management, including adjustments to rebuilding schedules, precautionary buffers, and ACLs that may be necessary. Moreover, fishermen are currently constrained by the potential economic burden of encountering rebuilding species during exploratory fishing or fishing near the RCAs and other depth-related closures. For this reason, landings of many targeted species (eg. lingcod, yellowtail rockfish, and chilipepper) are significantly lower than quota allocations due to efforts to avoid bycatch near the RCA. Using a combination of spatial modeling, fishermen knowledge, and scientific experimentation, the opportunity exists to increase the potential for fishermen to meet target quotas and reduce interactions with rebuilding species. Specifically, we request permission to conduct

fishing surveys within the RCAs to generate new data on the presence of rebuilding stocks and their stock status. This EFP has three broad goals:

- Inform our understanding of the contribution of RCA toward rebuilding populations of depleted stocks.
- Integrate data of various types and scales to build best available map of distribution of rebuilding stocks.
- Inform fishing opportunities and bycatch avoidance plans.

c) Statement of Purpose and Goals:

The Rockfish Conservation Areas (RCAs) were implemented in 2002 as depth-based closures aimed at minimizing the potential to catch overfished species (eg. yelloweye rockfish, canary rockfish, widow rockfish, dark-blotched rockfish, cowcod, and boccacio) that constrain the groundfish fishery, and they have largely been effective at achieving that purpose. However, the larger goal of the RCAs was to help these depleted stocks rebuild so that the fishery can become less constrained. Many factors need to be examined in order to determine whether the RCAs have in fact contributed to stock rebuilding, including the biological status (abundance, size structure, and productivity) of stocks within the RCAs; collecting biological data from within the RCA would help to inform stock assessments and setting uncertainty buffers by managers.

The recent transition of the trawl sector of the groundfish fishery to a catch share management system and the associated hard caps for these rebuilding species has created strong new incentives for fishermen to avoid these species on their own. Given these incentives and the fact that Annual Catch Limits (ACLs) for these rebuilding species are not to be exceeded, there has been a growing interest in developing better spatial maps of the distribution of these rebuilding species to inform fishing activities (ie. bycatch avoidance plans, risk pools, etc.) and management efforts (including potentially a reexamination of the role and configuration of the trawl RCA). In addition, there are other species, such as lingcod, yellowtail rockfish, and chilipepper rockfish that could be more fully utilized if fishermen could fish "cleaner" near the trawl RCA with reduced risk of bycatch of rebuilding species.

This Exempted Fishing Permit (EFP) application to conduct directed fishing activities (hook & line and trap surveys) within the RCA is a critical part of a larger effort to address these factors comprehensively; we plan to map the distribution of rebuilding species and collect biological information on stock status to inform spatial fishing plans, any potential future reconfiguration of the RCA, and stock assessments. The data collected under the proposed EFP are an important part of a broader collaborative research effort to bring together the best available scientific data, local knowledge, and new data collected through focused field research. Together these data will allow us to create and refine spatial maps of areas of predicted high and low density (as well as length frequency distributions) for rebuilding species.

Partners on this EFP include fishermen, The Nature Conservancy (TNC), Environmental Defense Fund (EDF), academic science advisors and partners from the University of California Santa Barbara, California State University Monterey Bay, Moss Landing Marine Laboratory, California Polytechnic State University, and also federal agency science advisors from the National Marine Fisheries Service Southwest Fisheries Science Center (NMFS/SWFSC) Santa Cruz lab. As part of our larger collaborative research effort in which this EFP is nested, we are conducting spatial analyses and modeling of existing fisheries-dependent and fisheries-independent data, in combination with local knowledge and best available habitat data, to identify areas of predicted high and low density ("hotspots" and "coldspots", respectively) of rebuilding species coast-wide. We will also be conducting visual surveys using a Remotely Operated Vehicle (ROV) at priority sites inside and near the trawl RCA in the Central Coast (Half Moon Bay to Point Buchon area) of California to assess rebuilding species density and habitat-associations as a first step toward ground-truthing the spatial analysis at a finer spatial scale. While the focus will be on rebuilding species, similar analyses can be conducted on an opportunistic basis for target species, as time and funding allow.

This EFP application is focused on gaining permission to use directed fishing surveys using vertical hook & line (targeting subadults and adults) and traps (targeting juveniles) inside the trawl RCA and non-trawl RCA to ground-truth the spatial analysis and ROV survey data. This study will be conducted in Central Coast fishing grounds between Half Moon Bay and Pt. Buchon; exact locations and study design for the directed fishing effort will be determined after the spatial analysis of existing data. All rebuilding species sampled from hook & line and trap surveys will be retained for biological analyses of growth, maturity, and fecundity. Efforts to ground-truth cold spots will target all species equally to confirm that they are in fact areas of low density for all rebuilding species, including yelloweye rockfish and cowcod. However, efforts to ground-truth hotspots, as well as to analyze growth, maturity, and fecundity patterns, will target canary rockfish, widow rockfish, and bocaccio and will aim to avoid cowcod and yelloweye rockfish (to the extent possible) due to the limited quota available. Therefore the results of the biological analysis portion of study will be most relevant to informing our understanding of the distribution of canary rockfish, widow rockfish, and bocaccio. **The quota needed to prosecute the EFP will be provided by the applicants and partners, and is described below.**

Broad goals of the EFP:

1) **Inform our understanding of the contribution of RCA toward rebuilding populations of depleted stocks**: To better understand the contribution of the RCA towards rebuilding depleted populations of formally declared overfished species, we will conduct a coast-wide spatial analysis of existing fisheries-dependent and fisheries-independent data to identify "cold spots" (ie. predicted low abundance of rebuilding stocks) and "hot spots" (ie. predicted moderate-high abundance of rebuilding stocks) in and near the RCA. We will then assess fish densities, length frequencies, and habitat associations of these rebuilding species inside and seaward/shoreward of the trawl RCA using visual ROV surveys at selected sites in the Central Coast. Finally, we will ground-truth these visual surveys with hook & line and trap surveys targeting selected

rebuilding species (with a focus on canary rockfish, widow rockfish, and bocaccio) inside and adjacent (seaward and shoreward) to the trawl RCA in these same sites; fishing shoreward of the trawl RCA at <100 fathoms will necessitate some fishing effort in the non-trawl RCA. All rebuilding species caught will be retained and length, weight, and biological samples will be provided to NMFS/SWFSC. These biological samples will potentially inform stock assessments and may provide a basis for reducing uncertainty buffers through the understanding of demographic patterns for rebuilding species within and adjacent to RCA.

2) **Integrate data of various types and scales to build best available map of distribution of rebuilding stocks:** We aim to test an approach for combining and integrating the best available scientific data (fisheries independent and fisheries-dependent data, available habitat data) with local knowledge and new data from focused field surveys (ROV and directed fishing effort) to develop the most accurate map possible of the distribution of rebuilding species with the goals of improving bycatch avoidance plans and to enhance fishing opportunities near the RCA. This ground-truthed spatial analysis will provide important information on the validity of this approach of integrating different types and scales of data that will be relevant coast-wide. Our enhanced understanding of the distribution of these species inside and near the RCAs will help to inform any future management discussions concerning reconfiguration of the RCAs.

3) **Inform fishing opportunities and bycatch avoidance plans:** The directed fishing research effort will inform spatial fishing plans and fishing opportunities in the Central Coast with the goal of reducing bycatch of rebuilding species and improving fishing opportunities for areas that can be targeted "cleanly" near the RCA.

Disposition of all species: Target species (listed below) not needed for biological analyses would be sold commercially. Biological samples from rebuilding species would be provided to NMFS/SWFSC for analysis of biological parameters. If funding allows, we may also explore the efficacy of descending devices for both rebuilding species and target species; however, all species caught would be counted against available quota.

d) Justification:

Fishing opportunities, and the economic and social benefits associated with them, may be unnecessarily constrained in the groundfish fishery due to a lack of understanding of whether and how the RCAs are contributing to the rebuilding of depleted stocks. This EFP will result in a synthesis of existing data (best available information regarding the spatial distribution of depleted stocks) that will help fishermen avoid hot spots of depleted species, and new data on the status of stocks within the RCAs that will make possible updated assessments that will more accurately reflect stock status. This information is critical for science-based management, including adjustments to rebuilding schedules, precautionary buffers, and ACLs that may be necessary.

This EFP is necessary because, while we can and will synthesize existing data to try to identify hot and cold spots of rebuilding species, a paucity of data exists. Our planned ROV surveys will help correct this deficiency, but the fishing surveys that this EFP would make possible would provide further ground-truthing and the biological samples necessary to accurately estimate fish sizes and productivity.

In order to create the most accurate map of spatial distribution of rebuilding species to inform fishing activities and fisheries management, we need to demonstrate that we can combine all of the best available scientific information, local knowledge, and strategic and focused surveys using visual techniques (ROV) and directed fishing research efforts. The spatial analysis that this EFP will be ground-truthing will complement fishermen's knowledge about where they can fish "cleanly" to avoid bycatch of rebuilding species and inform spatial fishing plans and spatial fisheries management (eg. any future reconfiguration of the RCA) coast-wide.

Gaining an improved understanding and quantitative data about the role of the RCA in helping to rebuild populations of these depleted species, and in particular their demographic patterns within and near the RCA, is critical to informing stock assessments and management for these species. Reviews of recent stock assessments have identified research and data needs for several constraining and target species. Our work in this EFP will contribute much needed life history, demographic information, and habitat associations of constraining species, as well as quantify survey selectivity for hook & line and trap methods. These needs are universal across species, and in many cases are lacking for depleted populations. Such data is integral to informing stock assessments and results will be communicated directly with stock assessment authors. Additionally, if larger individuals within the RCA are generating increased egg production leading in turn to increased recruitment, studies such as this can lead to a decrease of the uncertainty buffers used to establish ACLs.

Fishermen are currently constrained by the potential economic burden of encountering rebuilding species during exploratory fishing or fishing near the RCAs and other depth-related closures. For this reason, landings of many targeted species (eg. lingcod, yellowtail rockfish, and chilipepper) are significantly lower than quota allocations due to efforts to avoid bycatch near the RCA. Using a combination of spatial modeling, fishermen knowledge, and scientific experimentation, the opportunity exists to increase the potential for fishermen to meet target quotas and reduce interactions with rebuilding species.

e) Broader significance:

This project will promote understanding of the role of closed areas, like the RCAs, in contributing to the rebuilding of overfished species, as well as provide tangible evidence for areas that can be fished more cleanly to inform fishing opportunities. It will help inform stock assessments and may provide a basis for reducing uncertainty buffers. In addition, the results will inform future spatial management decisions, including any reconfiguration of the RCA that is considered. This project is also part of a larger collaborative research effort among many partners (fishermen, NGOs, academic, and agency) and will aim to demonstrate the benefits of combining different types of data and survey techniques to build the

most accurate picture of the distribution of depleted stocks needed to improve fishery performance. This project achieves the priority considerations for EFP proposals.

f) Duration of EFP: 2013 and 2014 fishing seasons. The directed fishing effort will be initiated late in the year (fall) of 2013 and will extend into 2014 as needed to complete the sampling, given the available quota.

g) Number of vessels covered: We anticipate engaging between 2 and 4 fixed gear fishing vessels from Central Coast ports.

h) Species to be harvested and harvest estimates:

We envision sequencing the research activities in a manner such that fishing activities with a low risk of encounter with rebuilding species are completed first, with riskier activities conducted subsequently. Specifically, we will do the ROV surveys first, then the directed fishing near and inside "coldspots", then the directed fishing near and inside "hotspots" so that we can collect as much data as possible before any EFP hard caps or quota limits are reached.

The project partners will provide the quota needed for the research effort. The species we anticipate encountering and the estimated harvest amounts are as follows:

	Species to be Harvested	**Harvest Estimates in quota pounds**
Rebuilding species	Cowcod	Up 200 lbs
	Yelloweye rockfish	Up to 34 lbs
	Canary rockfish	Up to 500 lbs (est. 200 lbs.)
	Widow rockfish	Up to 1,500 lbs (est. 300 lbs.)
	Dark-blotched rockfish	Up to 500 lbs (est. 200 lbs.)
	Bocaccio	Up to 1,000 lbs (est. 400 lbs.)
Other Species	Chilipepper rockfish Lingcod Minor shelf rockfish Minor slope rockfish Splitnose rockfish Yellowtail rockfish Other flatfish Pacific whiting Dover sole English sole Petrale sole	Harvest estimates difficult to make at this time; however, harvest amounts will be covered by quota from project partners.

i) Monitoring:

All vessels engaged in the EFP directed fishing will have 100% human observer coverage. Project partners will fund the observer costs during research fishing trips.

j) Data collection and analysis methodology - This EFP application is focused on gaining permission for the collaborative fishing surveys within the RCA that are part of the broader collaborative research effort described above. Under this proposed EFP, we will conduct directed fishing (hook & line and trap) to measure encounter rates and collect biological samples of rebuilding species inside the trawl and non-trawl RCAs. The exact number and locations to be surveyed will be based on the results of the spatial analysis and preliminary ROV surveys in 2012; a subset of "hotspots" and "coldspots" in the Central Coast will be identified for the directed fishing activity. With a focus on widow rockfish, boccacio, and canary rockfish we will identify a subset of research sites that span the 50-175 fathom depth range within the trawl RCA and non-trawl RCA. These sites will be visually surveyed using a ROV to assess fish densities and fish-habitat associations. Concurrently, we will conduct collaborative hook & line and trap sampling in "coldspots" and then "hotspots" within and adjacent to (shoreward and seaward) the trawl RCA to assess catch per unit effort, abundance and demographic patterns of constraining and target species. In the sections below, we detail the analyses to be conducted using these data that may help address pressing needs of stock assessment scientists, managers, and commercial fishermen.

<u>Ground-truthing "hot" and "cold" spots</u> – The groundtruthing of spatial data analysis will entail two types of surveys inside and adjacent to the trawl RCA at selected locations in the Central Coast: ROV visual surveys and directed fishing effort. We will collect GPS locations of every fish sighted with the ROV and landed with hook & line or trap. Precise length measurements will be made for all fish landed, and binned length measurements to the nearest 5 cm will be made for fish clearly sighted in the ROV surveys.

- **ROV Surveys** - The specific design of the ROV surveys will be based on the results of the spatial analysis of existing data combined with available habitat maps and local knowledge. We will conduct ROV visual surveys inside and outside the trawl RCA at (3-4) "hotspots" and (3-4) "coldspots" in the Central Coast as identified by the spatial analysis. The ROV surveys will be initiated in 2012 to do preliminary habitat assessments of selected studies sites and then will continue through 2013 to be coincident with the directed fishing activities. ROV surveys will be performed in the range of representative habitats (soft bottom, hard bottom, canyon head) found within the specified depth zones inside and adjacent to the trawl-RCA.

- **Directed Fishing Effort Surveys (under this EFP)**: To further ground-truth the hot and cold spots for rebuilding species identified through spatial analysis and ROV surveys, we will use vertical hook & line (for adults and subadults) and trap (for juveniles) gear in targeted locations inside

the trawl RCA and adjacent to it (shoreward and seaward).. The specific sites for the directed fishing effort will be determined after the spatial analysis is completed along with some initial ROV surveys in 2012. The directed fishing effort will be conducted coincident with more focused ROV surveys of selected areas in 2013. Specific predictions will arise from results of the spatial analyses and ROV surveys and we will generally seek to test the probability of encounter in relation to the probability of the area being categorized as a hot or cold spot.

For ground-truthing cold spots we will target all rebuilding species. For purposes of collecting biological data and for ground-truthing hotspots, we will target bocaccio, canary rockfish, and widow rockfish and aim to minimize encounter with yelloweye and cowcod due to low quota amounts. Our systematic sampling approach will begin with ROV work, transition to hook & line and trap sampling in cold spots, and end with hook & line and trap sampling in hot spots. We will focus the initial fishing effort deeper than 100 fathoms to minimize the chance of encounters with yelloweye rockfish until the majority of our proposed work is completed. In addition, we plan to phase the fishing effort over 2013-2014, starting at the end the 2013 fishing seasons to avail ourselves of remaining quota and extending into 2014, as needed.

Results from the hot and cold spot survey analyses will be used to further explore the habitat associations of rebuilding species. For instance, the recent stock assessment for canary rockfish suggested that abundance estimates could be improved through a better understanding of habitat affinities. These results will also be used to explore the relationship between the selectivity of the three survey methodologies (NMFS trawl survey data, ROV visual surveys, fishing effort surveys). Our surveys using ROV and hook & line and trap will take place in a stratified random design based on the spatial analysis. Survey selectivities of the different survey methods will be quantified and made available for use in stock assessments.

Biological Sample Analysis: We will collect biological samples from the fish caught using hook & line and trap sampling – especially targeting widow rockfish, canary rockfish and bocaccio. These biological data will be used to collect life history and demographic information for these rebuilding species. In order to ensure that our sampling can contribute to stock assessments, we will be in regular communication with the stock assessment authors and NMFS.

The biological samples will provide stock assessors with critical information on the Central Coast stocks. In particular, the following data have been identified as priority research areas for rebuilding species in the 2009 stock assessments.

a) Canary rockfish: Updated information on reproductive maturity and fecundity is needed.
b) Bocaccio: We will collect samples for length, weight, gonad staging, and aging. Aging analyses will be coordinated with emerging protocols developed for the northern range of the stock and all analyses will be coordinated with researchers along the entire West Coast.
c) Widow rockfish: The need exists to increase sample sizes for length and age measurements for the next stock assessment cycle. Furthermore, there is little reliable

data on the weight-fecundity relationship in the southern range of the stock. We will improve the understanding of life history characteristics through our research.

All biological analyses will conform to accepted protocols identified by NMFS and will be performed at the NMFS/SWFSC Santa Cruz, CA lab.

Our results will potentially help inform stock assessments and may also help identify the contribution of the RCAs to egg production of these rebuilding stocks. Our data will contribute to understanding demographic changes inside the RCAs as a result of a reduction in fishing mortality since closures were put in place. These data can be used to parameterize cohort models such as analyses of the spawning potential ratio. Through studies such as these, progress can be made towards understanding the role of closed areas in rebuilding overfished species.

As part of our larger collaborative research effort, the partners will also be working with managers to collect additional biological information from constraining and target species caught by members of the fishing association near the RCA as part of normal fishing operations outside of this EFP.

k) How vessels will be chosen

Vessels that have the appropriate gear, research experience, and local knowledge will be selected by the EFP applicant and project partners.

l) Time / Place / Gear Used in Fishing:

The ROV surveys will be conducted in the fall of 2013 and directed fishing activity will take place in the fall and winter seasons spanning from July 2013 - June 2014 fishing seasons (between October 2013 – March 2014). To provide for contingency and efficiency in planning and operations we request an EFP approval from July 1, 2013 to December 31, 2014.

The directed fishing effort will take place at 6-8 sites (3-4 hotspots and 3-4 cold spots as identified by the spatial analysis) in and adjacent to the trawl RCA between Half Moon Bay and Pt. Buchon, California. Fishing will occur inside the trawl RCA (100-150 fathoms), seaward of the trawl RCA (>150 fathoms) and potentially shoreward of the trawl RCA (50-100 fathoms) in the non-trawl RCA.

The gear to be used will include:

- Vertical hook and line gear: (eg. Hydraulic snapper reel gear or other to be specified at a later date)
- Traps: To survey juveniles that may not take a hook we will use conventional 2 chamber 1"X1" wire coated spot prawn traps with 3 and 1/4" round tunnel entrances (overall trap size 24" X 28" X 10"). Baited traps will be set in strings of approximately 12 traps, with 7 fathoms between

each trap, and a 24 hour soak time (consistent with a protocol used prior with California Department of Fish and Game).

m) Signature of applicant

Signature _____ **Date:** 10/12/11

Roger Cullen, President

Central Coast Sustainable Groundfish Association

CENTRAL COAST SUSTAINABLE GROUNDFISH ASSOCIATION INC.

A California Cooperative Fish Marketing Association

October 24, 2011

Mr. Dan Wolford
Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220 – 1384

Dear Chairman Wolford,

We appreciate the opportunity to submit the attached Electronic Monitoring Proposal for the IFQ Trawl Rationalization Program. Central Coast Sustainable Groundfish Association (CCSGA) is submitting this proposal on behalf of a group of partners that include CCSGA, The City of Morro Bay, The Nature Conservancy, and Environmental Defense Fund.

At this moment, several fishery stakeholders are coming together to develop proposal alternatives for monitoring under the new IFQ management structure. There is significant potential benefit to the entire industry in developing innovative and more cost effective monitoring alternatives that can be implemented in any segment of the fleet. We encourage fishery managers to approach this problem by identifying the "low-hanging fruit" or the segments of the IFQ fishery that can most easily be monitored via alternative and more affordable approaches. This will allow the fishery to gain some experience in new monitoring techniques and reduce the overall need for human observers, which should create overall cost efficiencies that will benefit all fishery participants.

In that spirit, please consider the attached proposal. We encourage you to incorporate this proposal and perspective with the others that will come from other segments of the fishery in the hope that the combination of these proposed ideas and concepts will lead to a more efficient and affordable monitoring program.

Effective and reliable catch monitoring alternatives exist and have been successfully used in other regions and countries to meet similar at sea monitoring challenges. Many of these alternatives take advantage of Electronic Monitoring (EM) tools that could be readily adapted and approved for the West Coast trawl IFQ program.

We encourage PFMC and NOAA to move quickly to approve cost effective monitoring solutions that include EM where appropriate. We would like to respectfully request that the Council consider the guidelines detailed in our proposal as a starting point for development of an Electronic Monitoring program. We look forward to working with the Council and all of the fishery stakeholders in finding constructive, durable solutions to the ongoing management challenges in the West Coast groundfish industry.

Sincerely,

Christopher J Kubiak

Christopher J Kubiak
Secretary, Central Coast Sustainable Groundfish Association Inc.
1555 8th Street Los Osos, California 93402

Electronic Monitoring Proposal for the IFQ Trawl Rationalization Program (For the Pacific Fisheries Management Council)

Need Statement/Justification:

A matter that is of critical importance for the success of the Pacific west coast IFQ Trawl Rationalization program (IFQ), will be to design and implement cost effective methods to meet the monitoring needs of this fishery so that it can properly and successfully achieve its catch accountability goals. Due to the great uncertainty surrounding the financial viability for this fleet being able to cover the costs of 100 percent (%) human-based observer coverage, many believe now is the time to invest in and consider alternative monitoring methods.

The high costs associated with 100% human observer coverage not only has the potential to drive many fishermen currently actively participating in this program out of business, but these costs will likely drive further quota consolidation. The effect that many fear as a result of consolidation is a loss of opportunity to certain port communities as participants sell or move their operations to regions with better infrastructure and lower associated business costs. Many small port communities in California have already witnessed this type of consolidation prior to implementation of the IFQ as well as a dramatic reduction in landings and an erosion of fishery infrastructure as a result of the emergence of increasing fishery regulations that were aimed at rebuilding overfished species populations. This migration and reduction of fishery infrastructure coupled with increasing restraining fishery regulation has led to the declining economic viability of the traditional bottom trawling groundfish business model in this region.

In the first three years of the IFQ program, the fishery relies on federal assistance to support human observer monitoring costs. As many are aware, once that assistance is no longer available, the additional cost placed on the industry will have significant consequences. It is very likely that these costs could be the tipping point for many smaller scale fishery operations and communities that have traditionally participated in this fishery. We feel that it will be very difficult for a diverse fleet that includes both trawl and fixed gear vessels to exist if fishermen have to cover the entire cost of 100% human observers.

While we are in agreement with the need for high catch accountability in this mixed species fishery in order to minimize the potential for any overharvest, especially of constraining species that are currently under rebuilding plans, the potential consequences of monitoring costs that are associated with a 100% human observer coverage requirement are a major concern to fishermen. The long-term success of this program for many communities will depend heavily on the ability to develop more affordable monitoring alternatives.

Concept:

We realize the nature and complexity of dealing with a mixed species fishery such as this one which includes both bottom trawl and fixed gear is challenging. We also believe there is an opportunity to introduce new technologies such as video-based Electronic Monitoring (EM) that relies on individual

accountability into this fishery to meet monitoring needs under certain conditions and restrictions. Our proposal, described below, represents an opportunity that considers the complex nature of this fishery while at the same time addresses a potential cost effective alternative monitoring solution that can meet catch accountability needs for a certain portion of the overall IFQ fleet.

This proposal is designed to be simplistic and provide assurance against potential catch accounting inaccuracies or "gaming" of the system. Some of the methods proposed such as depth restrictions, retention requirements, and some degree of zoning of fishing grounds would help ensure and safeguard against concerns such as bycatch for constraining species or high-grading of target species.

Additionally, this proposal is meant to serve as an opportunity to break through barriers that currently exist in this fishery, and allow alternative monitoring methods such as EM to be introduced into this fishery. We believe Electronic Monitoring can be useful in the monitoring of all types of groundfish vessels, so long as each vessel agrees to full retention requirements and fishing in appropriate areas further outside of the Rockfish Conservation Area (RCA) to minimize the chances to encounter constraining species.

Proposal Description:

This proposal is designed to describe how an Electronic Monitoring program would work for the fixed gear fleet, the bottom trawl fleet, and the mid-water trawl whiting fleet, currently operating under an IFQ management structure. The Central Coast Sustainable Groundfish Association would like to propose a pilot implementation of this approach be tested in Central California. There are a total of 10 fixed gear vessels that operate in central California between the ports of Port San Luis in the south to Half Moon Bay in the north including 3 major port groups: Port San Luis and Morro Bay; Monterey, Moss Landing, and Santa Cruz; Half Moon Bay.

The initial design would include some of the concepts and lessons learned from the planning phase through to the implementation stage for the Electronic Monitoring program developed for the British Columbia hook and line sablefish fishery (Stanley et al. 2011). While some of these concepts are necessary, the development of an Electronic Monitoring program for the west coast IFQ program may need to incorporate additional terms to better meet the monitoring and management requirements for this fishery. Some of these concepts have already been tested for this fishery and are described in Bryan et al. (2011).

We are proposing a few key concepts that would help foster wider acceptance for such a program and help ensure that all catch accountability and quota tracking needs are met in the IFQ and thus allow vessels an exemption from the human observer requirement. They include the following:

1. Full retention requirement for all IFQ species

    - This would ensure that all IFQ species are accounted for upon landing by the dockside monitor and that this information would be accounted for in the electronic fish ticket that will be uploaded into the NOAA quota tracking website for vessel accounts.

2. Including a depth restriction so that fishing will be conducted in waters deeper than 200 fathoms or at some reasonable distance seaward of the RCA boundary

    - This proposed depth limit would be necessary as a precautionary measure so as to avoid and minimize as much as possible the chance of encountering the most highly constrained overfished species such as yelloweye rockfish, cowcod, and canary rockfish. This should minimize the catch accounting risk of the monitoring program and simplify speciation work for the dockside monitor. This is based upon knowledge gained from the TNC fixed gear EFP that ran in the Morro Bay area from 2008-2010 (TNC 2011).

3. No-fishing zones may be imposed if there are concerns for constraining species

    - Any closures in addition to the 200 fathom depth limit or a reasonable distance seaward of the RCA may be implemented and should be agreed on by all involved parties based upon fishermen's local knowledge of the area for 'hotspots' for constraining species.

4. A random audit-based EM approach to match piece counts for fish recorded from EM equipment to that which was recorded by fishermen on logbooks for 10% of all fishing events, or some other agreed upon percentage

    - A random audit for 10% or some other agreed upon percentage of fishing events (based on management needs) would be used to verify EM piece counts with that recorded from fishermen logbooks for those fishing events. Remedies and penalties would be based on similar procedures that are in place for the BC system and have been described in previous EM pilot projects in 2008 and 2010 for fixed gear vessels in California (Pria et al. 2008, Brian et al. 2011). Any additional penalties other than what is described for the BC system should be agreed upon by the industry and management during the planning phase.

These concepts and others should be considered important for developing a cost-effective Electronic Monitoring program. Stanley et al. (2011) discussed the pros and cons of an audit vs. a full census approach for reviewing video imagery in fishery monitoring, and the example and lessons learned in the BC fishery indicates that an audit approach is more cost effective than a full on 100% census approach of reviewing all video imagery . For these reasons and those described above the **only** way to design an affordable Electronic Monitoring program for this or any other fishery is to utilize an audit-based approach of some type to verify either a subset of fishing events, or verify that no discarding occurs as

the fish are sorted from a groundfish trawler or when transfers are made to catcher mothership vessels in the whiting fleet.

Factors of Consideration for Developing a Program Design and Cost Structure:

Many factors can influence the design and cost in developing a pilot Electronic Monitoring program. Those factors were discussed at length and in detail for an informational report that was submitted to the Council for the June 2011 PFMC briefing book (Bryan et al. 2011). Some factors are determined by how the fishery operates (external factors) while others are directly related to decisions that are made around how the program itself will operate (internal factors) and are mentioned in Table 1.

The only comparable system for which to base a rough program design and cost structure for a fully functional EM program is the BC hook and line program for which the EM portion accounts for a yearly average cost per vessel of $136 CDN (~$140 USD) including video analysis. The cost for an operational EM program for the fixed gear fleet operating under the trawl IFQ could be higher or lower than this estimate depending on management requirements.

Nevertheless, we have demonstrated through previous EM pilot project work in 2008 and 2010 for fixed gear vessels in central California that this technology does indeed work, that it can meet monitoring requirements, and that fishermen can record accurate logbooks that not only match both observer data and EM piece counts really well but are also recorded independently and separate from these other two sources so as to reduce bias and not rely on either any particular source (observer or EM camera system) to generate catch accounting information (Pria et al. 2008, Bryan et al. 2011).

Management Input Needed to Develop a Program Design and Cost Structure:

The need exists to develop alternative monitoring methods that can meet catch accounting needs at an affordable rate and at the same time provide fishermen with the flexibility to depart on a trip in circumstances where short notice may be required. The only way that observers could possibly work in this fishery is if some type of observer sharing protocol were developed among a group of several fishermen in which the number of observers is less than the number of active fishermen in the group to scale down the cost. In practice, this was tested in the 2010 TNC EFP (TNC 2011) and was met with some success but also with a few challenges. One of the obstacles with this approach occurred when extended periods of bad weather prevented fishing activity for these smaller scale operations and sometimes left few available good weather days that would be suitable for fishing. If an observer sharing protocol were used only a few of those fishermen would be able to fish during this time, while if each vessel had an EM system on board then all fishermen could take advantage of the good weather period.

We encourage the Council and NMFS to act in developing guidelines and a set of conditions for how an EM program could work under the IFQ structure that would be agreed upon by management, science, and law enforcement, and fit the needs and requirements of these groups. Although Archipelago Marine Research Ltd. has worked with NMFS and TNC to run the pilot studies for the fixed-gear and whiting fleets, there are several companies that either provide Electronic Monitoring equipment and/or services

or are currently developing the technology and could be considered for developing a future Electronic Monitoring program for these or other fisheries. By not proceeding either in this way or some other similar fashion this could mean a missed opportunity for many as this technology has been demonstrated to be effective not only in Canada (Stanley et al. 2011), but in other areas of the globe as well such as the 9 Commonwealth fisheries in Australia (GSGislason & Associates 2007). Also, concerns for increasing the daily cost of observers is evident in both Alaska and the west coast as interviews with observer contractors indicate that current daily rates are not high enough for the providers to cover the costs and retain observers (Northern Economics 2011).

Table 1. Factors that influence the cost structure of an EM and observer program (Bryan et al. 2011).

Factors	Examples
External	
Fishery activity	Number of vessels, landing, fishing events and seadays
Port use patterns	Temporal and spatial distribution of the fishery
Internal	
Analysis and reporting requirements	Data product delivered
Overall maturity of data model	Integration of data from different sources and flow of monitoring data to quota system
Degree of program centralization	Management of the program operations centralized vs. replication necessary at various levels
Cost recovery method	Division of cost responsibilities between government and industry as well as within industry
Program responsiveness	Reporting timelines
Feedback and outreach processes	Reports, meetings, one-on-one feedback
Performance tolerances	Data quality requirements. If audit-based: additional analysis required based on initial results
Audit method and coverage level *	Amount of data that requires interpretation as well as level of detail within interpreted data

* Only a factor for audit-based programs

Given these and other potential obstacles, in this proposal we have in fact developed a feasible design for implementation of an Electronic Monitoring program for vessels that operate in the IFQ. The lessons

learned from two years worth of EM pilot projects in 2008 and 2010 for fixed gear vessels and several years of EM pilot projects from 2004-2010 with the whiting fleet should serve as justification enough that this technology can be applicable to this fishery. While the project partners recommend moving forward with this approach we also suggest that a program be implemented by 2013.

Thank you for your consideration!

References:

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Stanley, R.D., H. McElderry, T. Mawani, and J. Koolman. 2011. The advantages of an audit over a census approach to the review of viedo imagery in fishery monitoring. ICES Journal of Marine Science 68(8):1621-1627.

TNC. 2011. Morro Bay/Port San Luis Exempted Fishing Permit: Progress report for the Pacific Fishery Management Council. Submitted for March 2011 PFMC Briefing Book.

Signature

Signature Christopher J. Kubiak **Date:** 24 October 2011

Christopher Kubiak, Secretary

Central Coast Sustainable Groundfish Association

Oregon Recreational Yellowtail Rockfish EFP

2009 & 2011 Combined Final Report
October 19, 2011

The 2009 and 2011 Oregon yellowtail rockfish EFP activities have been completed. Total trips for both years were thirty four. The results are in excess of expectations. The purpose of this EFP is to avoid or minimize bycatch of prohibited species while targeting abundant offshore midwater stocks. The total impact on yelloweye rockfish was two fish (4 kg rounded) from a total of over 5.163 metric tons of rockfish landed. The other, canary rockfish are being impacted at rates well below that using common bottom gear. The overall EFP impact rate for canary rockfish is at 33% of yellowtail rockfish by weight. It is approximately 20% of all rockfish landed. The impact rate for canary to yellowtail was 113% by weight during the period 1993-1999 (ODFW) using traditional bottom gear when all depth access was open full season.

Following is the catch accounting for both years:

	weight in kg			by number
Yellowtail	Widow	Canary	Yelloweye	Other Rkfsh
All Trips Total 2009	1657	266	129	0	31
All Trips Total 2011	1421	800	886	4	115
Totals	3078	1066	1015	4	146

Total all fish except 'other' (kg) 5163

The level of participating angler expertise encompasses the full range. Novice and expert anglers participated in this EFP. Angler selection was on a first come first served basis. No expertise selection took place. While the charter operators are considered to be experts, no area selection took place to avoid known concentrations of canary or yelloweye rockfish. Higher canary impacts were encountered while intentionally fishing an area of high relief (pinnacles) near Depoe Bay, Oregon while yelloweye encounters remained virtually unchanged. The only area selection used was based on known concentrations of yellowtail rockfish without regard to any other species. Some trips took place within a federally recognized Yelloweye Rockfish Conservation Area.

A survey of angler intent was conducted and is summarized in Attachment 1. A majority indicated that they would participate in this fishery if it were put into regulation in both the charter and private sportboat level. Although 15 fish bag limit was preferred, a lower number would be acceptable down to a level of seven fish or greater.

John Holloway
RFA-OR

Oregon Recreational Yellowtail Rockfish EFP
2009 & 2011 Combined Final Report
Attachment 1

The number of responses to each answer is indicated in brackets.
A total of 299 anglers responded to the questionnaire.

Oregon Yellowtail EFP Angler Questionnaire

The National Marine Fisheries Service, the issuing agency of the permits for this experiment is asking for participant feedback. Your help is greatly appreciated and will be a factor in determining whether this fishery will become available to all recreational anglers. Please answer all questions that apply to your experience today. Please check all that apply.

1. For what of any of the following reasons did you choose to participate in this trip today?

[207] 15 rockfish bag limit

[155] A chance to participate in an experiment

[97] A desire to fish further offshore

2. Is there a bag limit size that would cause you not to participate?

[192] Six fish or less

[56] Seven to ten fish

[65] Eleven to fourteen fish

3. If this fishery were adopted as a recreational fishery open to all, with an acceptable bag limit, how likely would you be to participate in the future?

[217] Very likely

[51] Somewhat likely

[26] Occasionally, no more than other trips

[8] Not likely

4. If you fish aboard your own or another's private sport boat how likely would you be to participate if this were available to all?

[178] Very likely

[59] Somewhat likely

[35] Occasionally, no more than other trips

[29] Not likely

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE

Agenda Item E.3.b
NMS Letter
November 2011

August 24, 2011

Mr. Mark Cedergreen
Chairman
Pacific Fisheries Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384

Dear Mr. Chairman,

As the superintendents for Cordell Bank and Gulf of the Farallones National Marine Sanctuaries, we would like to express support for the Exempted Fishing Permit (EFP) for shelf rockfish proposed by the San Francisco Fishermen's Cooperative. In addition, the Cordell Bank Sanctuary Advisory Council supported the activity if monitored by observers and data analysis was conducted by fishery scientists. This EFP would allow local fishermen to test a selective vertical-gear fishing technique and implement a monitoring program to collect fisheries data from the catch. The proposed method will target populations of mid-water rockfishes, and it's expected that this fishing method will have minimal impact on the sensitive reef top habitat at Cordell Bank, seabirds, turtles and recovering rockfish populations protected by the Rockfish Conservation Area. Scientists from National Marine Fisheries Service have developed the research plan that will implement the by-catch caps established by the Groundfish Management Team for overfished species.

The sanctuary also supports elements of the EFP that promote the local, small boat fishery, the use of low impact gear, sustainable fishing practices and the potential for economic development in local ports and coastal communities. The submission of this EFP is one of several activities proposed to support the San Francisco Fishermen's Cooperative. The vision for this group is to develop a community owned and integrated seafood business that ensures the economic viability of the area's fleet of family owned fisheries operations. If harvest using this EFP method is viable, it would provide the fishermen's cooperative with one more high quality product, allowing them to supply sustainably caught seafood into local markets.

If the proposed fishing activity proves to be "clean", this is the type of sustainable fishing that should be promoted. Cordell Bank and Gulf of the Farallones National Marine Sanctuaries support this EFP to determine if midwater rockfishes can be sustainably harvested with vertical hook and line.

Sincerely,

David F. Howard

Dan Howard
Superintendent
Cordell Bank National Marine Sanctuary

Maria Brown

Maria Brown
Superintendent
Gulf of the Farallones National Marine Sanctuary

Barbara, this letter is responding to a question you posed – Is it necessary to fish in the Rockfish Conservation Area (RCA) to target yellowtail rockfish (Sebastes flavidus)? My understanding is that the current non-trawl RCA closure prohibits fishing between 30 and 150 fathoms in California. Love et al. (2002) say that yellowtail adults are most abundant between 45 and 90 fathoms which puts the center of the adult yellowtail distribution within the depth range closed by the non-trawl RCA. In addition, adults usually are found over high relief, such as boulders and sheer rock walls, most often swimming well off bottom, sometimes in schools of thousands (Love et al 2002). This accurately reflects what we have observed over Cordell Bank. We often observe yellowtail schooling with widow rockfish (S. entomelas), so if widows are still a species of concern this would be problematic. We rarely see canary rockfish (S. pinniger) schooling with yellowtail though their published depth range from NMFS trawl surveys (40-100 fathoms) overlaps with yellowtail (Love 2002). On Cordell Bank, we more often observe canary rockfish in deeper water and in closer proximity to the bottom. Because yellowtail are schooling in mid-water well off bottom, I think the chances of catching species of concern like yelloweye (S. ruberrimus) and canary are minimal. But it's this kind of information that we are hoping your data will help address. I hope this answers your question. Dan

Love, M.S., M. Yoklavich, and L. Thorsteinson. 2002. The Rockfishes of the Northeast Pacific. University of California Press.

ENFORCEMENT CONSULTANTS REPORT ON REVIEW OF EXEMPTED FISHING PERMITS FOR 2013-2014 GROUNDFISH FISHERIES

The Enforcement Consultants (EC) reviewed the three Exempted Fishing Permit (EFP) applications on the premise of moving forward with fleetwide applicability and regulatory criteria. EFPs that rely upon operator experience, skill, or abilities to be effective and cannot be managed through a regulation or readily replicated by other fishermen, fail to meet this requirement.

With this statement in mind, the EC looked at crafting regulations that would minimize the need for reliance on operator skill and focus on creating readily identifiable gear requirements that could be inspected by enforcement personnel at sea.

Yellowtail rockfish jig fishing off California – San Francisco Community Fishing Association / Barbara Emley and Dan Platt

The gear described in this proposal has most of the components that could be inspected in the field. There are specific hook counts, line lengths, and other criteria that could be objectively measured by enforcement personnel while at sea. One measurement that is ambiguous is the size of the float used for the gear. This could be determined along with material type to further craft possible regulations. The EC recommends those types of measurements be finalized and evaluated for any related regulatory language.

The EC also cautions that while this gear may minimize contact with bottom-dwelling species, it will not completely avoid them. The gear may come in to contact with the bottom in a variety of ways including strong currents, irregular bottom topography, and improper deployment.

In addition to the gear concerns, the Rockfish Conservation Area (RCA) incursion by a vessel that is actively fishing must be addressed. Some of those concerns may be mitigated by Vessel Monitoring System (VMS) adjustments and declarations, vessel marking requirements, and notifications.

Evaluation of an epibenthic trolled longline to selectively catch chillipepper rockfish (Sebastes goodei) off California – Kathy Fosmark

The gear described in this proposal is similar to the prior EFP when fished in the vertical configuration; however, it is not described with the same level of detail. In addition, the proposal lists an alternate configuration (trolled) that is missing easily measurable components. Operator skill, including a temporal requirement, is the main safeguard for avoiding overfished species. The EC would recommend defining components in such a way as to be reliant on gear configuration to avoid the bottom and to aid in replication. Those same definitions would serve as the basis for crafting regulations and enforcement. As in the prior EFP, RCA concerns also remain.

Supporting a spatial analysis of the distribution and size of rebuilding stock in the Rockfish Conservation Area through directed fishing surveys – Central Coast Sustainable Groundfish Association / Roger Cullen and Chris Kubiak

This proposal does not use any gear modifications, but conducts operations within the RCA. As with all three proposals, operations within the RCA will require an exemption to existing regulations. In order to accommodate this for the EFPs, there are several options that could be implemented as discussed earlier. However, fleetwide adoption will require the RCA lines to be adjusted. Enforcement does not have any issues with moving the lines given previous guidance on developing shapes and past criteria. The EC does have concerns with mixed use RCA lines. In other words, it is preferable to have a line where no fishing (or fishing) occurs on one side or the other. When certain fishers have access to areas that others do not, and they are utilizing the same or similar gear types, this creates confusion for both enforcement and constituents.

PFMC
11/3/11

GROUNFISH ADVISORY SUBPANEL REPORT ON REVIEW OF EXEMPTED FISHING PERMITS FOR 2013-2014 GROUNDFISH FISHERIES – PART 1

The Groundfish Advisory Subpanel (GAP) received a report from Mr. John DeVore on exempted fishing permit (EFP) applications for the 2013-2014 groundfish fisheries. The GAP recommends all three applications be forwarded for consideration subject to the following comments and conditions.

Evaluation of an epibenthic trolled longline to selectively catch chilipepper rockfish off California and **Yellowtail rockfish jig fishing off California**

The GAP's comments on these two EFPs pertain almost entirely to the associated bycatch caps requested by the two applicants. As initially presented, the applications did not include bycatch caps. The GAP struggled with discussing the relative merits of the EFPs without understanding what the impacts on other fisheries might be. To help solve that problem, the Groundfish Management Team (GMT) quickly prepared some draft bycatch caps based on previous submissions of the Fosmark EFP and bycatch rates from similar EFPs (e.g. Oregon Recreational Yellowtail). Working from that draft GMT document, the GAP prepared the table below, which strikes an appropriate balance between allowing the EFPs a reasonable chance to test the fishing methods at issue without fear of being shut down early, and ensuring that EFP set asides do not unduly impact established fisheries.

To accommodate intended targets for these two EFPs, the GAP recommends 200 tons of chilipepper for the Fosmark EFP, and 30 tons of yellowtail for the SFCFA EFP.

Table of recommended EFP set-asides for overfished species for 2013, and again 2014*

	Species	**Fosmark**	**SFCFA**	**CCSGA**	**EFP Total**
Overfished Species	Bocaccio	1.330	0.300	covered with IFQ quota lbs.	1.630
	Canary	0.027	0.400		0.427
	Cowcod	0.015	0.015		0.030
	Darkbl	0.100	0.100		0.200
	POP	-	-		0.000
	Widow**	9.000	3.000		12.000
	Yelloweye	0.010	0.010		0.020
	Petrale	-	-		0.000

***Cumulative limits will apply to all other species**
**** Based on the assumption that widow is rebuilt**

Supporting a spatial analysis of the distribution and size of rebuilding stocks in the Rockfish Conservation Area through directed fishing surveys

The GAP wholeheartedly supports this EFP because better spatial information on hot and cold spots within the Rockfish Conservation Area (RCA) and better biological data on the contribution of fish stocks within the RCA to overall stocks could increase the potential for fishermen to meet target quotas and reduce interactions with rebuilding species. The GAP offers the three following recommendations.

- The applicants should demonstrate, through a holding account, that they actually have the fish necessary to conduct the EFP prior to fishing.
- The GAP recommends either a notification system, or a marking system, or both, for vessels fishing in the EFP so that enforcement and other fishermen are aware that EFP fishing, rather than an illegal RCA incursion, is occurring.
- The GAP recommends that this EFP application be considered for approval for fishing in 2012. The GAP supports the new two-year process developed by the council for EFP applications that require bycatch set asides, however, that process could needlessly delay EFPs that provide their own fish. If the council does consider authorizing EFP fishing in 2012, the GAP requests that the EFP last through 2014.

In summary, the GAP recommends forwarding all three EFPs for further consideration subject to the comments and conditions described in this report.

PFMC
11/02/11

GROUNDFISH MANAGEMENT TEAM REPORT ON PRELIMINARY REVIEW OF EXEMPTED FISHING PERMITS FOR 2013-2014 GROUNDFISH FISHERIES

The Groundfish Management Team (GMT) reviewed the technical merit of three exempted fishing permit (EFP) applications for 2013-2014 relative to the evaluation criteria in the Council Operating Procedure (COP) 19 on EFPs.

The GMT reviewed the EFPs based on their technical merits and points out that the Council will likely need to make their final decision based partially on the availability of overfished species, relative to the 2013-2014 harvest specifications. The Council will take final action on any EFPs that are approved for public review and comment in June 2012. At this meeting, the Council will be considering and adopting preliminary preferred set aside amounts to be deducted from the annual catch limits (ACLs) or annual catch targets (ACTs) under Agenda items E.5 and E.9. The total set aside amount will include those reserved for EFPs under this agenda item. Tables of requested impacts for 2013 and 2014 by species and EFP are included for reference (Tables 1 and 2). However no species specific discussion on appropriate EFP bycatch limits is included in this report.

A primary requirement of EFPs is the evaluation of fishing gear or management measures that can be transferred into regulation and eventually applied fleet-wide. EFPs that rely upon operator experience, skill, or abilities that cannot be harnessed through a regulation or readily replicated by other fishermen, fail to meet this requirement because the resulting bycatch rates may differ from those estimated in the EFP.

Evaluation of an epibenthic trolled longline to selectively catch chilipepper rockfish (Sebastes goodei) off California – Kathy Fosmark.

The goal of this EFP (Agenda Item E.3.a, Attachment 1) is to evaluate the effectiveness of a longline fishing technique that targets chilipepper rockfish in the mid-water area (80-120 fm) of the rockfish conservation area (RCA) in central California, while avoiding overfished species.

The GMT offers the following recommendations for consideration. First, the goal and results of this EFP should be expressed in terms of the effectiveness of the longline gear to harvest chilipepper rockfish rather than the selectivity of the gear to avoid catching overfished species. Second, the maximum amount of hooks that could be fished should be reduced to something below 1,000 per set, for example, 500 hooks to avoid the possibility of large catches of prohibited species. The GMT understands the tradeoff between using a large number of hooks per set which provides for sufficient catch of target species that is needed to fund 100 percent observer coverage, and the risk of an unforeseen large catch of prohibited species. Third, some

documentation should be provided that fishing in the RCA is necessary to access chilipepper rockfish, for example, a historical fish ticket summary of catch in the proposed area prior to 1998 when the RCA was first implemented. The GMT also notes that the fishing strategy described in this EFP includes fishing at daybreak and late evening to maximize catch of target species while avoiding non-target species. This could be difficult to translate into fishing regulations that can be applied fleetwide and enforced. The GMT offers these recommendations to help improve the information collected during the EFP. **The GMT sees the technical merit in this EFP according to the requirements of COP 19 and recommends that it be forwarded for public review.**

Yellowtail rockfish jig fishing off California – San Francisco Community Fishing Association / Barbara Emley and Dan Platt.

This EFP (Agenda Item E.3.a Attachment 2) is intended to test commercial jig gear that is configured to selectively target yellowtail rockfish in mid-water (30-100 fm) areas of the RCA in northern California while avoiding harvest of overfished species.

The GMT offers the following recommendations to help improve the information collected in this EFP. First, clarify that the goal is to test the catchability and efficacy of the proposed fishing methods rather than evaluate species-selective properties of the tested gear. Second, some documentation should be provided that fishing in the RCA is necessary to access yellowtail, similar to what was suggested for the above EFP. Lastly, the GMT notes that the design of this EFP may allow the applicants to gather some information on the most effective depth for avoiding prohibited species by placing the hooks at varying depths when deploying fishing line off the bow and the stern at the same time. **The GMT sees the technical merit in this EFP according to the requirements of COP 19 and recommends that it be forwarded for public review.**

Supporting a spatial analysis of the distribution and size of rebuilding stock in the Rockfish Conservation Area through directed fishing surveys – Central Coast Sustainable Groundfish Association / Roger Cullen and Chris Kubiak.

The GMT discussed whether this proposal fits best under research or an EFP; it is our understanding that this proposal is appropriately considered under an EFP because it relies on fishing methods to harvest IFQ pounds rather than the research set aside. This EFP (Agenda Item E.3.a) is intended to use fishing and ROV surveys within the RCAs to generate new data on the presence of rebuilding stocks and their stock status. Hook and line and trap surveys within the RCA would allow for mapping the distribution of rebuilding species and collection of biological information on stock status to inform spatial fishing plans, potential future reconfiguration of the RCA, and stock assessments. The proposed ROV surveys are intended to assess rebuilding species densities and habitat association.

The GMT recognizes that data potentially gathered from this EFP would be very valuable and informative because data from within the RCAs is currently limited or nonexistent. For example, this type of data could help inform decisions on the potential for future refinements of the RCA boundaries. However, the GMT notes that while a two year study would be informative, several years (5+) of data may be needed before management changes can be implemented.

The GMT recommends that more detail be provided on the type of remotely operated vehicle (ROV) that will be used in this EFP. In addition, the GMT had concerns about the timing of the ROV surveys compared to the fishing surveys. Specifically, unless the fishing surveys occur temporally close to the ROV surveys, the data will not be directly comparable. This proposal would benefit from a review by the Scientific and Statistical Subcommittee (SSC) review that could provide guidance for enhancing the presentation of the scientific methods in the proposal. **The GMT recommends that this EFP be forwarded to the SSC for review and refinement.**

GMT Recommendations:

1. **The GMT acknowledges the technical merit of two EFP applications, the Fosmark and the San Francisco Community Fishing Association applications, and recommends adopting them for public review.**
2. **The GMT recommends that the Central Coast Sustainable Groundfish Association EFP be forwarded to the SSC for review and refinement.**

Finally, the GMT would like to acknowledge and thank the Recreational Fishing Alliance-Oregon Chapter for completing and submitting their final report on their 2009 and 2011 EFP activities.

Table 1. Applicant requested EFP set-aside for 2013, in mt. (SFSCA = San Francisco Community Fishing Association; CCSGA = Central Coast Sustainable Groundfish Association)

	Species	Fosmark[a] (Attachment 1)	SFCFA[b] (Attachment 2)	CCSGA[c] (Attachment 3)	EFP Total
Overfished Species	Bocaccio	3.3	3.3	covered with IFQ quota lbs.	6.6
	Canary	0.0	3.6		3.6
	Cowcod	0.0	0.0		0.0
	Darkbl	0.4	0.4		0.8
	POP	-	-		0.0
	Widow	9.0	9.0		18.0
	Yelloweye[d]	0.0	0.0		0.0
	Petrale	-	-		0.0
Non-Overfished Species	Lingcod N of 42° N lat. (OR & WA)	-	-	covered with IFQ quota lbs.	0.0
	Lingcod S of 42° N lat. (CA)	0.4	1.5		1.9
	Pacific Cod	-	-		0.0
	Sablefish N. of 36° N lat.[2]	4.5	7.6		12.2
	Sablefish S. of 36° N lat.	-	-		0.0
	Dover Sole	-	-		0.0
	English Sole	-	-		0.0
	Arrowtooth Flounder	-	-		0.0
	Starry Flounder	-	-		0.0
	Other Flatfish	-	-		0.0
	Chilipepper S. of 40° 10' N lat.	200.0	12.0		212.0
	Splitnose S of 40° 10' N. lat.	-	1.5		1.5
	Yellowtail N of 40° 10' N. lat.	-	30.0		30.0
	Shortspine Thornyhead N. of 34° 27' N. lat.	-	-		0.0
	Shortspine Thornyhead S. of 34° 27' N. lat.	-	-		0.0
	Longspine Thornyhead N. of 34° 27' N. lat.	-	-		0.0
	Longspine Thornyhead S. of 34° 27' N. lat.	-	-		0.0
	Minor Slope Rockfish N. of 40° 10' N. lat.	-	-		0.0
	Minor Slope Rockfish S. of 40° 10' N. lat.	0.2	36.3		36.5
	Minor Shelf Rockfish N. of 40° 10' N. lat.	-	-		0.0
	Minor Shelf Rockfish S. of 40° 10' N. lat.	0.2	1.1		1.3
	Black Rockfish N. of 46° 16' N. lat. (WA)	-	-		0.0
	Black Rockfish S. of 46° 16' N. lat. (OR & CA)	-	3.6		3.6
	Pacific Whiting	0.1	2.2		2.3
	Cabezon N. of 42° N. lat. (OR)	-	-		0.0
	Cabezon S. of 42° N. lat. (CA)	-	-	-	0.0

	Species	Fosmark[a] (Attachment 1)	SFCFA[b] (Attachment 2)	CCSGA[c] (Attachment 3)	EFP Total
	Shortbelly	-	-	-	0.0
	California Scorpionfish	-	-	-	0.0
	Longnose Skate	-	-	-	0.0
	Other Fish[e]	1.0	1.0	1.0	3.0

- = no impacts requested

[a] values taken from 2009 EFP statement, with an increase in widow to account for new stock assessment

[b] non-overfished non-target species are roughly 2 bi-monthly OA trip limits for each of 4 vessels

[c] all impacts will come from quota pounds of applicants, except for non-IFQ species

[d] there are yelloweye impacts in attachments 1 and 2 however they round to less than 0.1 mt (0.023 mt for each one, totaling 0.045 mt)

[e] 1.0 mt put in as a place holder

Table 2. Applicant requested EFP set-asides for 2014, in mt. (SFSCA = San Francisco Community Fishing Association; CCSGA = Central Coast Sustainable Groundfish Association)

	Species	Fosmark[a] (Attachment 1)	SFCFA[b] (Attachment 2)	CCSGA[c] (Attachment 3)	EFP Total
Overfished Species	Bocaccio	3.3	3.3	covered with IFQ quota lbs.	6.6
	Canary	0.0	3.6		3.6
	Cowcod	0.0	0.0		0.0
	Darkbl	0.4	0.4		0.8
	POP	-	-		0.0
	Widow	9.0	9.0		18.0
	Yelloweye[d]	0.0	0.0		0.0
	Petrale	-	-		0.0
Non-Overfished Species	Lingcod N of 42° N lat. (OR & WA)	-	-	covered with IFQ quota lbs.	0.0
	Lingcod S of 42° N lat. (CA)	0.4	2.2		2.6
	Pacific Cod	-	-		0.0
	Sablefish N. of 36° N lat.[2]	4.5	11.4		16.0
	Sablefish S. of 36° N lat.	-	-		0.0
	Dover Sole	-	-		0.0
	English Sole	-	-		0.0
	Arrowtooth Flounder	-	-		0.0
	Starry Flounder	-	-		0.0
	Other Flatfish	-	-		0.0
	Chilipepper S. of 40° 10' N lat.	200.0	12.0		212.0
	Splitnose S of 40° 10' N. lat.	-	2.2		2.2
	Yellowtail N of 40° 10' N. lat.	-	30.0		30.0
	Shortspine Thornyhead N. of 34° 27' N. lat.	-	-		0.0
	Shortspine Thornyhead S. of 34° 27' N. lat.	-	-		0.0
	Longspine Thornyhead N. of 34° 27' N. lat.	-	-		0.0
	Longspine Thornyhead S. of 34° 27' N. lat.	-	-		0.0
	Minor Slope Rockfish N. of 40° 10' N. lat.	-	-		0.0
	Minor Slope Rockfish S. of 40° 10' N. lat.	0.2	54.4		54.6
	Minor Shelf Rockfish N. of 40° 10' N. lat.	-	-		0.0
	Minor Shelf Rockfish S. of 40° 10' N. lat.	0.2	1.6		1.8
	Black Rockfish N. of 46° 16' N. lat. (WA)	-	-		0.0
	Black Rockfish S. of 46° 16' N. lat. (OR & CA)	-	5.4		5.4
	Pacific Whiting	0.1	3.3		3.4
	Cabezon N. of 42° N. lat. (OR)	-	-		0.0
	Cabezon S. of 42° N. lat. (CA)	-	-	-	0.0

	Species	Fosmark[a] (Attachment 1)	SFCFA[b] (Attachment 2)	CCSGA[c] (Attachment 3)	EFP Total
	Shortbelly	-	-	-	0.0
	California Scorpionfish	-	-	-	0.0
	Longnose Skate	-	-	-	0.0
	Other Fish[e]	1.0	1.0	1.0	3.0

- = no impacts requested

[a] values taken from 2009 EFP statement, with an increase in widow to account for new stock assessment

[b] non-overfished non-target species are roughly 2 bi-monthly OA trip limits for each of 4 vessels

[c] all impacts will come from quota pounds of applicants, except for non-IFQ species

[d] there are yelloweye impacts in attachments 1 and 2 however they round to less than 0.1 mt (0.023 mt for each one, totaling 0.045 mt)

[e] 1.0 mt put in as a place holder

PFMC
11/02/11

Agenda Item E.3.c
Public Comment
November 2011

To Whom it may Concern,

My name is Tim Calvert and I have made my living as a commercial fisherman in San Francisco for over 30 years. I own a "small" boat (under 40 ft) and throughout my career I have fished for salmon, crab, rockfish, blackcod, albacore, and herring. Prior to the RCA, I earned about one third of my annual income fishing a variety of rockfish with hook and line. I had cultivated a very good relationship with our local markets that paid well for a very good product. That is, I did not have to catch a lot of fish to earn a fair amount of money. At this time (late 1970's -80's-early 90's) I watched with horror as rockfish populations were being hammered by both drag nets and gill nets. These boats also weakened the markets by delivering large quantities of low quality fish. It was, quite frankly, a failure of fishery management to allow this to continue as long as it did. When rockfish was closed, I felt like I was being punished for someone else's crimes; not just the net fishermen who were cutting all of our throats, but also the fishery managers who watched and waited too long. The fact that the fishermen who were overfishing the resource were then "rewarded" with the best limited entry permits added insult to injury.

Many of the rockfish species are rebounding as a result of the strict closure. There is an opportunity to allow targeted fishing of abundant species (yellowtail and widow) using specifically designed gear (hook and line) which will avoid any by-catch. This is actually the way I fished before the RCA. Now my income comes primarily from salmon and crab. The closure of salmon the last several years meant that I had to depend solely on crab for my annual income. That is a precarious situation for small boat fishermen who are limited by rough weather and fewer traps. I have been able to support my family all these years by having a range of fishing opportunities throughout the year without having to depend on one season to make it financially for the year. The fact that there are management options that could alleviate some of the increasing desperation of fishing communities should be considered.

In conclusion, I urge you to adopt flexible management strategies, such as targeted fishing of under-utilized species, that will result in expanding the range of fishing opportunities for small, family-owned boats. This would benefit local fishermen, markets, and restaurants. Our fishing community has traditionally relied on fishing a variety of species spread out over the year's seasons which allowed more flexibility and opportunity to make our livings, supporting our families and preserving our communities and our culture.

Sincerely,

Tim Calvert
F/V Sandra Dee, San Francisco

Christian Iversen
ACE HIGH
170 White Oak Drive
Santa Rosa, CA 95409
August 24, 2011

Mr. Mark Cedergreen, Chairman
Pacific States Marine Fisheries Commission
7700 NE Ambassador Place, Suite 101
Portland, OR 97220-1384

SUBJECT: GROUNDFISH EXEMPTED FISHING PERMIT
AGENDA ITEM G3

I am a 51 year-old, 6th generation Californian, commercial fisherman. Commercial fishing has been my career since I was 15 years old. I've tried to do a few other jobs but I am only happy when I'm out on the ocean fishing. Given our economic problems in the fishing industry here in California, subsistence in this industry is just about impossible for the small boat commercial fisherman.

The pelagic shelf rockfish species, yellowtail rockfish and widow rockfish, caught on vertical hook and line has been my subsistence fishery when there was no fishing. When this was taken away, I could not believe that any agency that had any idea how we live here on the California coast, would do that. When the apparent answer is that we are being starved out of our vocation that sounds a little paranoid. However, my ninety-four year old grandfather told me that "just because you are paranoid, doesn't mean they aren't after you!".

I support the Groundfish Exempted Fishing Permit submitted by the San Francisco Community Fishing Association. Approval of this EFP would be a welcome step in returning access to the historic fishing with hook and line drift fishing for underutilized species.

I own a 1947 wooden 39 foot commercial fishing boat. This EFP is well designed and would not do any more than put food on my table when there is no other fishing available. Beans and rice are fine and I've lived on that for many months at a time, but a nice fresh piece of fish that I caught myself is the meaning of life for me.

Sincerely,

Christian Iversen

August 22, 2011

Pacific Fishery Management Council
7700 NE Ambassador Place Suite 101
Portland, OR 97220-1384

RE: Agenda Item G3 Exempted Fishing Permit

Dear Council Members:

My name is John Mellor, and I'm a commercial fisherman from San Francisco. Fishing up and down the California coast has been my sole source of income for 33 years, so I have struggled through all of the upheaval and changes in the industry that's occurred in those times. I have managed to survive in the business thanks to my taking an adaptive attitude to the fisheries I have participated in, currently - Salmon, crab, blackcod, slope rockfish, herring, and nearshore rockfish. I also fish in Alaska for salmon. A diversity of available fisheries is essential since first and foremost, we are betting on Mother Nature. If you add politics, market fluctuations and public opinion, that's a pretty complicated mix.

The pelagic shelf rockfish species, yellowtail rockfish and widow rockfish, caught primarily with vertical hook and line, were a very important part of this 'fishing portfolio' for me for most of that 33 years, until it was made unavailable by the RCA .

My situation mirrors that of most other members of the fishing community, and it would be an injustice for the culture of west coast commercial fishermen to be starved out of existence when all the time there is an abundance of under-utilized fish that could be cleanly harvested with no by-catch, that are within easy reach.

I do believe that the Magnusson act specifies that under-utilized species should be made available if they can be managed correctly. Since these species primarily occur in the middle and upper part of the water column, it would be easy to avoid by catch of the protected demersal species on the bottom, with a specific gear design that would present the hooks high enough off the bottom. This could easily be documented with a well designed EFP, and would in no way be creating a new fishery since this manner of catching these fish was around many years prior to the creation of the RCA. If this fishery was to be made available I would certainly use it as sustainability depends on the availability of diverse fishing opportunities.

Thanks for your consideration,

John Mellor

John Mellor F/V High Hopes
San Francisco, California

August 22, 2011

Pacific Fishery Management Council
7700 NE Ambassador Place Suite 101
Portland, OR 97220-1384

RE: Agenda Item G3 Exempted Fishing Permit

Dear Council Members:

I would like to voice my support for the experimental fishing permit (EFP) application for yellow tail rockfish. Shelf rockfish once played an important role in the lives of our coastal community fishermen.

Hook and line fishing for shelf rock fish has all but vanished in the last ten years. Current regulations make it impossible to justify targeting these underutilized and abundant fish. I am sure that with fishermen and scientists working together we can come up with a way to harvest the abundant stocks without impacting the canary or goldeneye populations.

Coastal community fishermen need to be able to target many different fish as a year unfolds and yellowtail was once a part of that portfolio.

Thank you for considering this EFP.

Josh Churchman

San Francisco Community Fishing Association

Direct from the boat. Fairtrade fish and crabs. Est. 2009

Larry J. Collins • President Joe Garafolo • General Manager



Mr. Mark Cedergreen, Chairman
Pacific Fisheries Management Council
7700 NE Ambassador Pl. Suite 101
Portland, OR 97220-1384

RE: Groundfish Exempted Fishing Permit, Agenda Item G3

August 24, 2011,

Dear Chairman Cedergreen and Council Members,

I am writing in support of the Groundfish Exempted Fishing Permit submitted by the San Francisco Community Fishing Association (SFCFA)

The SFCFA is the first CFA formed on the West Coast as allowed by the Magnuson-Stevens Act. The make-up of our CFA reflects the make-up of the family owned small boat portfolio fleet in all fishing communities on the West Coast. We have been formed for about a year. Hopefully, in time, every fishing community will form its own CFA. The difference between a CFA and a local association is that a CFA can hold fish quota in trust for the community. That is an important distinction.

Approval of the EFP under consideration would be the first step in returning our access to our historic fishing grounds with hook and line drift fishing for underutilized species. As "portfolio" fishermen when we lose access to one of our fisheries, such as salmon, or have a bad crab season, it becomes increasingly important that we maintain our historic access. Our style of fishing is to fish the most abundant species, not to specialize in one fishery which puts more pressure on what could be weaker stocks. This is a more environmentally wholesome way of fishing and makes more economic sense for our small boat fleet. Since 90% of the fleet on the West Coast could be thus described, this EFP demands a very serious look.

We have the support of the two main National Marine Sanctuaries in our area. I hope we will receive the Council's support as well.

Thank you,

Larry Collins,
President, SFCFA

535 Ramsell Street • San Francisco • CA • 94132
415-585-5711 • info@SFCrabboat.com

PRBO Conservation Science
3820 Cypress Drive, #11
Petaluma, CA 94954
707-781-2555
www.prbo.org

prbo

October 11, 2011

Mr. Mark Cedergreen, Chairman
Pacific Fisheries Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon, 97220-1384

Dear Mr. Chairman,

I am writing on behalf of PRBO Conservation Science (PRBO) to express our support for the Exempted Fishing Permit (EFP) for shelf rockfish proposed by the San Francisco Fishermen's Cooperative (SFFC). PRBO Conservation Science supports this EFP because it will help determine if midwater rockfish can be sustainably harvested with vertical hook and line.

The EFP, if granted, will allow local San Francisco fishermen to test a selective vertical-gear fishing technique and implement a monitoring program to collect fisheries data from the catch. The methods and research plan have been developed by scientists from the National Marine Fisheries Service and are in accordance with guidelines established by the Groundfish Management Team for overfished species. The proposed method will target populations of mid-water rockfish, and we expect that it will have minimal impact on sensitive habitats and species in the region.

PRBO supports sustainable fishing practices including the use of low impact gear in local ports and coastal communities. SFFC's vision is to develop a community-owned and integrated seafood business that ensures the economic viability of the area's fleet of family owned fisheries operations. If the proposed fishing activity proves to be "clean," this type of sustainable fishing should be promoted.

PRBO's 140 staff scientists are dedicated to conserving wildlife and ecosystems through innovative scientific research and outreach on land and at sea. PRBO has been conducting marine ecology research in the North Pacific for over 40 years. Our efforts include in-depth studies of the ecology of the greater Gulf of the Farallones and the effects of rockfish on the long-term breeding success of seabirds nesting on the Farallon Island where we work in partnership with NOAA National Marine Sanctuaries and the US Fish and Wildlife Service.

If you would like more information, please contact our Jaime Jahncke, PhD, California Current Director, at 707-781-2555, ext 335. Thank you for your consideration of our letter.

Sincerely,

Ellie M. Cohen
President and CEO

cc: Dr. Jaime Jahncke

David Bitts
President
Larry Collins
Vice-President
Duncan MacLean
Secretary
Mike Stiller
Treasurer

PACIFIC COAST FEDERATION of FISHERMEN'S ASSOCIATIONS

W.F. "Zeke" Grader, Jr.
Executive Director
Glen H. Spain
Northwest Regional Director
Vivian Helliwell
Watershed Conservation Director
In Memoriam:
Nathaniel S. Bingham
Harold C. Christensen

STEWARDS OF THE FISHERIES

www.pcffa.org

Please Respond to:

☐ **California Office**
P.O. Box 29370
San Francisco, CA 94129-0370
Tel: (415) 561-5080
Fax: (415) 561-5464

☐ **Northwest Office**
P.O. Box 11170
Eugene, OR 97440-3370
Tel: (541) 689-2000
Fax: (541) 689-2500

2 November 2011

Mr. Dan Wolford, Chair
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, OR 97220-1384

RE: Meeting Agenda Item E3, Exempted Fishery Permit Application for Yellowtail Rockfish Drift Fishing off California

Dear Chairman Wolford and Council Members:

The Pacific Coast Federation of Fishermen's Associations (PCFFA), representing working men and women in the West Coast commercial fishing fleet requests your approval for the above-entitled application for an exempted fishery permit to test the potential for a new commercial drift gear configuration to harvest currently underutilized rockfish species (yellowtail) while avoiding overfished stocks to enhance optimum yield in the mixed stock open access groundfish fishery off California.

PCFFA further supports the application submitted by Ms. Kathy Fosmark for another method of pursuing rockfish with hook-and-line gear within the Rockfish Conservation Area (RCA), also with the intent of targeting abundant and currently underutilized rockfish stocks while avoiding species of concern.

It is important that both of these applications be approved to test the viability of each. PCFFA cannot emphasize enough the importance of reestablishing access for hook-and-line fisheries, both commercial and recreational, within the RCA, for the take of underutilized rockfish species. These fish are important for maintaining the "portfolio" fisheries most fishing men and women are engaged in within our coastal fishing communities.

PCFFA strongly supports these EFP permits and urges their immediate approval by the PFMC.

Sincerely,

W.F. "Zeke" Grader, Jr.
Executive Director

Agenda Item E.4
Situation Summary
November 2011

BIENNIAL MANAGEMENT PROCESS FOR 2013-2014 GROUNDFISH FISHERIES – PART 1

At this meeting, the initial development of management recommendations for 2013-2014 groundfish fisheries has been divided into two parts. The tasks under this agenda item (Part I) are to adopt for public review and analysis (1) final 2013-2014 overfishing limits (OFLs) for groundfish stocks and stock complexes recommended by the Scientific and Statistical Committee (SSC); (2) final overfishing probabilities (P*s)/acceptable biological catches (ABCs) for groundfish stocks and stock complexes; and (3) preliminary preferred annual catch limits (ACLs) for groundfish stocks and stock complexes.

In June, the Council adopted a process and schedule for deciding 2013-2014 groundfish harvest specifications and management measures that requires timely, step-wise decision-making and expeditious preparation of a National Environmental Policy Act (NEPA) document. This schedule is more front-loaded than past biennial processes in order to better ensure implementation of new regulations on January 1, 2013. The Council also decided in June and reaffirmed in September that they intended to specify 2013-2014 harvest specifications and management measures with limited changes relative to those specified under 2012 regulations, to further ensure a January 1, 2013 start to the fishery. Council and NMFS staff will convene a teleconference on Wednesday, October 26 to scope the 2013-2014 specifications issues and the requisite NEPA analysis; NMFS will thereafter reach a decision on whether the appropriate NEPA document is an Environmental Assessment or an Environmental Impact Statement. This decision will impact the likelihood of implementing new regulations by January 1, 2013; therefore, the Council should receive an update on this issue under this agenda item.

The Council is tasked with adopting final SSC-recommended OFLs for 2013-2014 fisheries at this meeting. The Council expressed intent to minimize change in catch levels from the 2011-2012 cycle; however, some modification to 2012 OFLs needs to be considered to accommodate best available science (Attachment 1). Overfishing limits are provided for stocks that are newly assessed this year using proxy spawning potential ratio (SPR) harvest rates applied to estimates of exploitable biomass. Projected 2013-14 OFLs are also provided in Attachment 1 from past assessments for those category 1 and 2 stocks that were not assessed this year. The Council decided the OFLs for most of the stocks and stock complexes in September. However, OFLs for those stocks that were reviewed at this year's "mop-up" panel (i.e., bocaccio, darkblotched rockfish, and widow rockfish) need to be adopted under this agenda item. Revisions to the canary rockfish OFLs were also made at the "mop-up" panel, thus requiring reconsideration by the SSC and Council at this meeting. Finally, the Other Fish OFLs in Attachment 1 reflect the SSC recommendation in September that, "(t)he values for the Other Fish complex should equal the summed values of the component species." The OFL contribution of some of the species (e.g., skate species) is unknown; therefore, the summed "known" OFL contributions of component stocks in the Other Fish complex represent a likely underestimate of the true OFL. The SSC will review the OFLs provided in Attachment 1 and make their recommendations to the Council at this meeting.

The Council is also tasked with deciding final preferred ABCs at this meeting. As in the past process, the Council will select an overfishing probability (P*) value as a policy judgment on scientific uncertainty for each stock and stock complex. The P* decision determines the ABC based on the P*/sigma relationship depicted in Attachment 2. A sigma value, or estimated variance about the current biomass estimate, has been calculated by the SSC for each stock category. Note that a new sigma value was calculated for widow rockfish since the SSC Groundfish Subcommittee and the widow stock assessment team determined there was greater uncertainty in the assessment than determined for other category 1 stocks. The buffer amount determined in the P*/sigma relationship is subtracted from the OFL to determine the ABC. Attachment 3 provides 2013 and 2014 ABC values presuming the Council decides to maintain their P* choices decided in September for each stock and stock complex.

The Council is also tasked with deciding preliminary preferred 2013 and 2014 annual catch limits (ACLs) for groundfish stocks and stock complexes. Final ACLs cannot exceed the final ABCs in our management framework (see Attachment 3 for the preliminary ABCs decided in September and the proposed ABCs for other stocks and complexes (i.e., bocaccio, canary, darkblotched, widow, and the Other Fish complex) assuming status quo P* values are chosen). ACL alternatives for overfished species are provided (Attachment 4) based on the draft rebuilding analyses considered for adoption under Agenda Item E.1. Attachment 4 shows the estimated time to rebuild each stock under each alternative ACL – an important consideration in deciding overfished species' ACLs. The GMT provides their recommended range of alternative overfished species ACLs for detailed analysis under Agenda Item E.4.b, GMT Report.

Attachment 5 provides draft information on historical groundfish landings and revenue. This information is intended to support the description/analysis in the 2013-2014 groundfish harvest specifications and management measures EIS. Since these data are draft, Council staff is requesting comments before these data are used in analysis.

The GMT has provided questions to the SSC regarding analysis that will potentially aid our understanding of rebuilding alternative tradeoffs; these questions are provided under Agenda Item J.4. The SSC is being asked to provide their answers to these questions next March, when the Council and its advisors are scheduled to begin discussion on an FMP amendment that considers long term improvements to the groundfish harvest management framework and specifications decision-making process. The Council has decided this amendment will potentially affect the 2015-2016 specifications process at the earliest.

The Council should consider the advice of the SSC, GMT, other Council advisory bodies, and the general public before adopting final OFLs, final ABCs, and preliminary ACLs for public review and analysis. The Council is scheduled to decide a range of 2013-2014 groundfish management measures for analysis under Agenda Item E.9. In the event the Council cannot complete all the tasks under this agenda item or if additional analysis is requested before deciding these harvest specifications, the remainder of these decisions should be made under Agenda Item E.9.

Council Action

1. **Adopt final OFLs recommended by the SSC;**
2. **Adopt final P*s/ABCs for groundfish stocks and stock complexes;**
3. **Adopt a preliminary preferred ACL for each groundfish stock and stock complex.**

Reference Materials:

1. Agenda Item E.4.a, Attachment 1: 2012 OFLs (mt) and recommended 2013 and 2014 OFLs (mt) for west coast groundfish stocks.
2. Agenda Item E.4.a, Attachment 2: Relationship between P* and the percent reduction of the OFL for deciding the 2013 and 2014 ABCs for category 1, widow rockfish, category 2, and category 3 stocks based on sigma values of 0.36, 0.41, 0.72, and 1.44, respectively.
3. Agenda Item E.4.a, Attachment 3: 2012 ABCs and ACLs (mt) and presumptive 2013 and 2014 ABCs (mt) for west coast groundfish stocks assuming the status quo P* and stock category values do not change.
4. Agenda Item E.4.a, Attachment 4: Estimated time to rebuild and spawning potential ratio (SPR) harvest rate relative to alternative 2013-2014 ACLs for overfished west coast groundfish stocks.
5. Agenda Item E.4.a, Attachment 5: Historical Landings and Revenue in Groundfish Fisheries.
6. Agenda Item E.4.a, Attachment 6: Landings and Revenue Tables.
7. Agenda Item E.4.b, GMT Report: The Groundfish Management Team Report on the Suggested Range of Annual Catch Limit and Annual Catch Target Alternatives for Rebuilding Stocks.

Agenda Order:

a. Agenda Item Overview — John DeVore and Kelly Ames
b. Reports and Comments of Advisory Bodies and Management Entities
c. Public Comment
d. Council Action: Adopt Final Preferred Overfishing Limits and P*/Allowable Biological Catches, and a Preliminary Preferred Alternative Annual Catch Limit for each Stock and Stock Complex

PFMC
10/17/11

Table 1. 2012 OFLs (mt) and recommended 2013 and 2014 OFLs (mt) for west coast groundfish stocks (overfished stocks in CAPS; stocks with new assessments in **bold**; component stocks in status quo stock complexes in *italics*).

Stock	2012 OFL	2013 OFL	2014 OFL	Comments
OVERFISHED STOCKS				
BOCACCIO S. of 40^{0}10' N latitude	732	**884**	**881**	**Projected using a 50% SPR from the 2011 rebuilding analysis with a 6% reduction to subtract the portion of the assessed stock north of 40°10' N. lat.**
CANARY	622	**752**	**741**	**Projected using a 50% SPR from the 2011 rebuilding analysis.**
COWCOD S. of 40^{0}10' N latitude	13	11	12	Sum of Conception and Monterey OFLs.
COWCOD (Conception)	*6*	7	7	Projected using a 50% SPR from the 2009 rebuilding analysis.
COWCOD (Monterey)	*7*	5	5	Revised DB-SRA estimate.
DARKBLOTCHED	497	**541**	**553**	**Projected using a 50% SPR from the 2011 rebuilding analysis.**
PACIFIC OCEAN PERCH	1,007	**844**	**838**	**Projected using a 50% SPR from the 2011 rebuilding analysis.**
PETRALE SOLE	1,279	**2,711**	**2,774**	**Projected using a 30% SPR from the 2011 rebuilding analysis.**
YELLOWEYE	48	**51**	**51**	**Projected using a 50% SPR from the 2011 rebuilding analysis.**
NON-OVERFISHED STOCKS				
Arrowtooth Flounder	14,460	7,391	6,912	Projected using a 30% SPR from the 2007 full assessment.
Black Rockfish (OR-CA)	1,169	1,159	1,166	Projected using a 50% SPR from the 2007 full assessment with the addition of the northern OFL 3% reduction to account for the portion of the stock estimated between Cape Falcon and the Columbia River.
Black Rockfish (WA)	435	430	428	Projected using a 50% SPR from the 2007 full assessment with a 3% reduction to account for the portion of the stock estimated between Cape Falcon and the Columbia River.
Pacific Whiting (U.S. + Canada)	TBD in 2012	TBD in 2013	TBD in 2014	
Cabezon (OR)	50	49	49	Projected using a 45% SPR from the 2009 full assessment.
California scorpionfish	132	126	122	Projected using a 45% SPR from the 2005 full assessment.
Chilipepper S. of 40^{0}10' N latitude	1,872	1,768	1,722	Projected using a 50% SPR from the 2007 full assessment. The portion of the coastwide stock south of 40°10' N. lat. (93%) is based on average historical landings.
Dover Sole	44,826	**92,955**	**77,774**	**Projected using a 30% SPR from the 2011 full assessment.**
English Sole	10,620	7,129	5,906	Projected using a 30% SPR from the 2009 update assessment.
Lingcod N. of 42º N latitude (OR & WA)	2,251	2,102	1,984	Projected using a 45% SPR from the 2009 full assessment.
Lingcod S. of 42º N latitude (CA)	2,597	2,566	2,454	Projected using a 45% SPR from the 2009 full assessment.

Stock	2012 OFL	2013 OFL	2014 OFL	Comments
Longnose skate	3,006	2,902	2,816	Projected using a 45% SPR from the 2007 full assessment.
Longspine Thornyhead (coastwide)	3,483	3,391	3,304	Projected using a 50% SPR from the 2005 full assessment.
Pacific Cod	3,200	3,200	3,200	Status quo OFL.
Sablefish (coastwide)	8,623	**6,621**	**7,158**	**Projected using a 45% SPR from the 2011 full assessment.**
Shortbelly	6,950	6,950	6,950	MSY estimated from 2007 assessment.
Shortspine Thornyhead (coastwide)	2,358	2,333	2,310	Projected using a 50% SPR from the 2005 full assessment.
Splitnose S. of $40^0$10' N latitude	1,610	1,684	1,747	Projected using a 50% SPR from the 2009 full assessment. The portion of the coastwide stock south of 40°10' N. lat. (64.2%) is based on average historical (1916-2008) landings.
Starry Flounder	1,813	1,825	1,834	Projected using a 30% SPR from the 2005 full assessment.
WIDOW	4,923	**4,841**	**4,435**	**Projected using a 50% SPR from the 2011 full assessment.**
Yellowtail N. of $40^0$10' N latitude	4,573	4,579	4,584	Projected using a 50% SPR from the 2005 full assessment.
STOCK COMPLEXES				
Minor Nearshore Rockfish North	116	110	110	Sum of OFL contributions of component stocks in the complex.
Black and yellow	*0.0*	*0.0*	*0.0*	*Revised DB-SRA estimate.*
Blue (CA)	*27.5*	*27.4*	*27.4*	*Projected using a 50% SPR from the 2007 full assessment. The portion of the assessed stock in CA north of 40°10' N. lat. (12.7%) is based on average historical landings.*
Blue (OR & WA)	*33.1*	*32.3*	*32.3*	*Revised DCAC estimate.*
Brown	*5.3*	*5.5*	*5.5*	*Revised DB-SRA estimate.*
Calico	*0.0*	*0.0*	*0.0*	*Revised DB-SRA estimate.*
China	*11.7*	*9.8*	*9.8*	*Revised DB-SRA estimate.*
Copper	*28.6*	*26.0*	*26.0*	*Revised DB-SRA estimate.*
Gopher	*0.0*	*0.0*	*0.0*	*No harvest contribution (3a stock).*
Grass	*0.6*	*0.7*	*0.7*	*Revised DB-SRA estimate.*
Kelp	*0.0*	*0.0*	*0.0*	*Revised DB-SRA estimate.*
Olive	*0.3*	*0.3*	*0.3*	*Revised DB-SRA estimate.*
Quillback	*8.7*	*7.4*	*7.4*	*Revised DB-SRA estimate.*
Treefish	*0.2*	*0.2*	*0.2*	*Revised DB-SRA estimate.*
Minor Shelf Rockfish North	2,197	2,183	2,195	Sum of OFL contributions of component stocks in the complex.
Bronzespotted	*0.0*	*0.0*	*0.0*	*Revised DB-SRA estimate.*
Bocaccio	*268.2*	*284.0*	*284.0*	*Revised DB-SRA estimate.*
Chameleon	*0.0*	*0.0*	*0.0*	*No harvest contribution (3a stock).*
Chilipepper	*140.9*	*133.1*	*129.6*	*Projected using a 50% SPR from the 2007 full assessment. The portion of the coastwide stock north of 40°10' N. lat. (7%) is based on average historical landings.*
Cowcod	*0.0*	*0.0*	*0.0*	*No harvest contribution (3a stock).*
Flag	*0.1*	*0.1*	*0.1*	*Revised DB-SRA estimate.*
Freckled	*0.0*	*0.0*	*0.0*	*No harvest contribution (3a stock).*
Greenblotched	*1.4*	*1.3*	*1.3*	*Revised DB-SRA estimate.*

Stock	2012 OFL	2013 OFL	2014 OFL	Comments
Greenspotted 40°10' to 42° N latitude	*20.9*	***9.4***	***9.4***	***Catch-based allocation of 50% SPR from the full 2011 assessment (22.2% of OFL from northern California model)***
Greenspotted N. of 42 N latitude (OR & WA)		*6.1*	*6.1*	*DCAC estimate*
Greenstriped	*1,232.0*	*1,252.3*	*1,268.3*	*Projected using a 50% SPR from the full 2009 assessment. The portion of the coastwide stock north of 40°10' N. lat. (84.5%) is based on the mean of the 2003-2008 swept area biomass estimates from the NMFS trawl survey.*
Halfbanded	*0.0*	*0.0*	*0.0*	*No harvest contribution (3a stock).*
Harlequin	*0.0*	*0.0*	*0.0*	*Revised DB-SRA estimate.*
Honeycomb	*0.0*	*0.0*	*0.0*	*Revised DB-SRA estimate.*
Mexican	*0.0*	*0.0*	*0.0*	*Revised DB-SRA estimate.*
Pink	*0.0*	*0.0*	*0.0*	*Revised DB-SRA estimate.*
Pinkrose	*0.0*	*0.0*	*0.0*	*Revised DB-SRA estimate.*
Puget Sound	*0.0*	*0.0*	*0.0*	*No harvest contribution (3a stock).*
Pygmy	*0.0*	*0.0*	*0.0*	*No harvest contribution (3a stock).*
Redstripe	*288.3*	*269.9*	*269.9*	*Revised DB-SRA estimate.*
Rosethorn	*15.2*	*12.9*	*12.9*	*Revised DB-SRA estimate.*
Rosy	*2.5*	*3.0*	*3.0*	*Revised DB-SRA estimate.*
Silvergray	*180.0*	*159.4*	*159.4*	*Revised DB-SRA estimate.*
Speckled	*0.2*	*0.2*	*0.2*	*Revised DB-SRA estimate.*
Squarespot	*0.1*	*0.2*	*0.2*	*Revised DB-SRA estimate.*
Starry	*0.0*	*0.0*	*0.0*	*Revised DB-SRA estimate.*
Stripetail	*35.3*	*40.4*	*40.4*	*Revised DB-SRA estimate.*
Swordspine	*0.0*	*0.0*	*0.0*	*Revised DB-SRA estimate.*
Tiger	*1.1*	*1.0*	*1.0*	*Revised DB-SRA estimate.*
Vermilion	*11.1*	*9.7*	*9.7*	*Revised DB-SRA estimate.*
Minor Slope Rockfish North	1,507	1,518	1,553	Sum of OFL contributions of component stocks in the complex.
Aurora	*17*	*15.4*	*15.4*	*Revised DB-SRA estimate.*
Bank	*20*	*17.2*	*17.2*	*Revised DB-SRA estimate.*
Blackgill	*5*	*4.7*	*4.7*	*Revised DCAC estimate.*
Redbanded	*52*	*45.3*	*45.3*	*Revised DB-SRA estimate.*
Rougheye	*78*	*71.1*	*71.1*	*Revised DB-SRA estimate.*
Sharpchin	*232*	*214.5*	*214.5*	*Revised DB-SRA estimate.*
Shortraker	*22*	*18.7*	*18.7*	*Revised DB-SRA estimate.*
Splitnose	*897*	*939.0*	*974.1*	*Projected using a 50% SPR from the 2009 full assessment. The portion of the coastwide stock north of 40°10' N. lat. (35.8%) is based on average historical (1916-2008) landings.*
Yellowmouth	*185*	*192.4*	*192.4*	*Revised DB-SRA estimate.*
Minor Nearshore Rockfish South	1,145	1,164	1,160	Sum of OFL contributions of component stocks in the complex.
Shallow Nearshore Species	NA	NA	NA	
Black and yellow	*26.8*	*27.5*	*27.5*	*Revised DB-SRA estimate.*

Stock	2012 OFL	2013 OFL	2014 OFL	Comments
China	*19.8*	*16.6*	*16.6*	*Revised DB-SRA estimate.*
Gopher (N of Pt. Conception)	*165.0*	*157.0*	*153.0*	*Projected using a 50% SPR from the 2005 full assessment.*
Gopher (S of Pt. Conception)	*26.0*	*25.6*	*25.6*	*Revised DCAC estimate.*
Grass	*55.6*	*59.6*	*59.6*	*Revised DB-SRA estimate.*
Kelp	*25.9*	*27.7*	*27.7*	*Revised DB-SRA estimate.*
Deeper Nearshore Species	NA	NA	NA	
Blue (assessed area)	*190*	*187.8*	*187.8*	*Projected using a 50% SPR from the 2007 full assessment. The portion of the assessed stock in CA south of 40°10' N. lat. (87.3%) is based on average historical landings.*
Blue (S of 34 °27' N latitude)	*74.0*	*72.9*	*72.9*	*Revised DCAC estimate.*
Brown	*197.4*	*204.6*	*204.6*	*Revised DB-SRA estimate.*
Calico	*0.0*	*0.0*	*0.0*	*Revised DB-SRA estimate.*
Copper	*156.0*	*141.5*	*141.5*	*Revised DB-SRA estimate.*
Olive	*189.5*	*224.6*	*224.6*	*Revised DB-SRA estimate.*
Quillback	*6.3*	*5.4*	*5.4*	*Revised DB-SRA estimate.*
Treefish	*12.9*	*13.2*	*13.2*	*Revised DB-SRA estimate.*
Minor Shelf Rockfish South	2,243.3	1,910.0	1,912.9	Sum of OFL contributions of component stocks in the complex.
Bronzespotted	*6.7*	*3.6*	*3.6*	*Revised DB-SRA estimate.*
Chameleon	*0.0*	*0.0*	*0.0*	*No harvest contribution (3a stock).*
Flag	*26.6*	*23.4*	*23.4*	*Revised DB-SRA estimate.*
Freckled	*0.0*	*0.0*	*0.0*	*No harvest contribution (3a stock).*
Greenblotched	*24.6*	*23.1*	*23.1*	*Revised DB-SRA estimate.*
Greenspotted	*195.3*	***80.3***	***80.3***	***Catch-based allocation of 50% SPR from the full 2011 assessment (77.8% of OFL from northern California model + the OFL from the southern California model)***
Greenstriped	*226.0*	*229.7*	*232.7*	*Projected using a 50% SPR from the full 2009 assessment. The portion of the coastwide stock south of 40°10' N. lat. (15.5%) is based on the mean of the 2003-2008 swept area biomass estimates from the NMFS trawl survey.*
Halfbanded	*0.0*	*0.0*	*0.0*	*No harvest contribution (3a stock).*
Harlequin	*0.0*	*0.0*	*0.0*	*Revised DB-SRA estimate.*
Honeycomb	*7.8*	*9.9*	*9.9*	*Revised DB-SRA estimate.*
Mexican	*2.8*	*5.1*	*5.1*	*Revised DB-SRA estimate.*
Pink	*2.8*	*2.5*	*2.5*	*Revised DB-SRA estimate.*
Pinkrose	*0.0*	*0.0*	*0.0*	*Revised DB-SRA estimate.*
Pygmy	*0.0*	*0.0*	*0.0*	*No harvest contribution (3a stock).*
Redstripe	*0.5*	*0.5*	*0.5*	*Revised DB-SRA estimate.*
Rosethorn	*2.5*	*2.1*	*2.1*	*Revised DB-SRA estimate.*
Rosy	*36.9*	*44.5*	*44.5*	*Revised DB-SRA estimate.*
Silvergray	*0.6*	*0.5*	*0.5*	*Revised DB-SRA estimate.*
Speckled	*42.9*	*39.4*	*39.4*	*Revised DB-SRA estimate.*
Squarespot	*5.8*	*11.1*	*11.1*	*Revised DB-SRA estimate.*
Starry	*70.5*	*62.6*	*62.6*	*Revised DB-SRA estimate.*

Stock	2012 OFL	2013 OFL	2014 OFL	Comments
Stripetail	*20.6*	*23.6*	*23.6*	*Revised DB-SRA estimate.*
Swordspine	*12.9*	*14.2*	*14.2*	*Revised DB-SRA estimate.*
Tiger	*0.0*	*0.0*	*0.0*	*Revised DB-SRA estimate.*
Vermilion	*308.4*	*269.3*	*269.3*	*Revised DB-SRA estimate.*
Yellowtail	*1,248.9*	*1,064.4*	*1,064.4*	*Revised DB-SRA estimate.*
Minor Slope Rockfish South	903	681	685	Sum of OFL contributions of component stocks in the complex.
Aurora	*29.4*	*26.1*	*26.1*	*Revised DB-SRA estimate.*
Bank	*574.8*	*503.2*	*503.2*	*Revised DB-SRA estimate.*
Blackgill	*275.0*	***130.0***	***134.0***	***Projected using a 50% SPR from the 2011 full assessment.***
Pacific ocean perch	*0.0*	*0.0*	*0.0*	*No harvest contribution (3a stock).*
Redbanded	*11.9*	*10.4*	*10.4*	*Revised DB-SRA estimate.*
Rougheye	*0.5*	*0.4*	*0.4*	*Revised DB-SRA estimate.*
Sharpchin	*10.6*	*9.8*	*9.8*	*Revised DB-SRA estimate.*
Shortraker	*0.1*	*0.1*	*0.1*	*Revised DB-SRA estimate.*
Yellowmouth	*0.8*	*0.8*	*0.8*	*Revised DB-SRA estimate.*
Other Flatfish	10,146	10,060	10,060	Sum of OFL contributions of component stocks in the complex.
Butter sole	*4.6*	*4.6*	*4.6*	*Based on the average catch during 1994-1998 + a 60% discard rate estimated from the EDCP study.*
Curlfin sole	*8.2*	*8.2*	*8.2*	*Based on the average catch during 1994-1998 + a 60% discard rate estimated from the EDCP study.*
Flathead sole	*35.0*	*35.0*	*35.0*	*Max. catch = 35 mt in 2005*
Pacific sanddab	*4,942.5*	*4,801.0*	*4,801.0*	*Revised DB-SRA estimate.*
Rex sole	*4,308.6*	*4,371.5*	*4,371.5*	*Revised DB-SRA estimate.*
Rock sole	*66.0*	*66.7*	*66.7*	*Revised DB-SRA estimate.*
Sand sole	*780.8*	*773.2*	*773.2*	*Revised DB-SRA estimate.*
Other Fish a/	11,150	3,328	3,298	No analytical basis for the status quo OFL.
Big skate				
Cabezon (WA)				
California skate				
Finescale codling				
Kelp greenling (CA)	*110.6*	*118.9*	*118.9*	*Revised DB-SRA estimate.*
Kelp greenling (OR & WA)				
Leopard shark	*164.0*	*167.1*	*167.1*	*Revised DB-SRA estimate.*
Pacific rattail	*1,178.1*			
Ratfish				
Soupfin shark	*62.4*	*61.6*	*61.6*	*Revised DCAC estimate.*
Spiny dogfish	*2,200.2*	***2,980.0***	***2,950.0***	***Projected using a 45% SPR from the 2011 full assessment.***

a/ Values for these specifications are the sum of known contributions of component stocks. Fully specified OFLs and ABCs would require the addition of new species to the complex (e.g., non-FMP skates and grenadiers) since many of these species are landed in generic market categories (e.g., unspecified skates).

Table 2. Relationship between P* and the percent reduction of the OFL for deciding the 2013 and 2014 ABCs for category 1, widow rockfish, category 2, and category 3 stocks based on sigma values of 0.36, 0.41, 0.72, and 1.44, respectively.

P*	Assessment Uncertainty (σ)			
	Cat. 1 0.36	Widow 0.41	Cat. 2 0.72	Cat. 3 1.44
0.45	4.4%	5.0%	8.7%	16.6%
0.44	5.3%	6.0%	10.3%	19.5%
0.43	6.2%	7.0%	11.9%	22.4%
0.42	7.0%	7.9%	13.5%	25.2%
0.41	7.9%	8.9%	15.1%	27.9%
0.4	8.7%	9.9%	16.7%	30.6%
0.39	9.6%	10.8%	18.2%	33.1%
0.38	10.4%	11.8%	19.7%	35.6%
0.37	11.3%	12.7%	21.3%	38.0%
0.36	12.1%	13.7%	22.7%	40.3%
0.35	13.0%	14.6%	24.2%	42.6%
0.34	13.8%	15.6%	25.7%	44.8%
0.33	14.6%	16.5%	27.1%	46.9%
0.32	15.5%	17.4%	28.6%	49.0%
0.31	16.3%	18.4%	30.0%	51.0%
0.3	17.2%	19.3%	31.4%	53.0%
0.29	18.1%	20.3%	32.9%	54.9%
0.28	18.9%	21.3%	34.3%	56.8%
0.27	19.8%	22.2%	35.7%	58.6%
0.26	20.7%	23.2%	37.1%	60.4%
0.25	21.6%	24.2%	38.5%	62.1%
0.24	22.5%	25.1%	39.9%	63.8%
0.23	23.4%	26.1%	41.3%	65.5%
0.22	24.3%	27.1%	42.6%	67.1%
0.21	25.2%	28.2%	44.0%	68.7%
0.2	26.1%	29.2%	45.4%	70.2%
0.19	27.1%	30.2%	46.9%	71.8%
0.18	28.1%	31.3%	48.3%	73.2%
0.17	29.1%	32.4%	49.7%	74.7%
0.16	30.1%	33.5%	51.1%	76.1%
0.15	31.1%	34.6%	52.6%	77.5%
0.14	32.2%	35.8%	54.1%	78.9%
0.13	33.3%	37.0%	55.6%	80.2%
0.12	34.5%	38.2%	57.1%	81.6%
0.11	35.7%	39.5%	58.7%	82.9%
0.1	37.0%	40.9%	60.3%	84.2%
0.09	38.3%	42.3%	61.9%	85.5%
0.08	39.7%	43.8%	63.6%	86.8%
0.07	41.2%	45.4%	65.4%	88.1%
0.06	42.9%	47.1%	67.4%	89.3%
0.05	44.7%	49.1%	69.4%	90.6%

Table 3. 2012 ABCs and ACLs (mt) and presumptive 2013 and 2014 ABCs (mt) for west coast groundfish stocks assuming the P* values and stock category values decided in September 2011 do not change (overfished stocks in CAPS; stocks with new assessments in **bold**; component stocks in status quo stock complexes in *italics*).

Stock	2012 ABC	Category	Sub-category	2012 ACL	Presumptive 2013 ABC	Presumptive 2014 ABC
OVERFISHED STOCKS						
BOCACCIO S. of 40°10' N latitude	700	1		274	**845**	**842**
CANARY	594	1		107	**719**	**709**
COWCOD S. of 40°10' N latitude	10			3	9	9
COWCOD (Conception)	*5*	2	c	NA	5	6
COWCOD (Monterey)	*5*	3	d	NA	3	3
DARKBLOTCHED	475	1		296	**517**	**529**
PACIFIC OCEAN PERCH	962	1		183	**807**	**801**
PETRALE SOLE	1,222	1		1,160	**2,592**	**2,652**
YELLOWEYE	46	2		17	**43**	**43**
NON-OVERFISHED STOCKS						
Arrowtooth Flounder	12,049	2	d	12,049	6,157	5,758
Black Rockfish (OR-CA)	1,117	1		1,000	1,108	1,115
Black Rockfish (WA)	415	1		415	411	409
Cabezon (CA)	168	1		168	163	158
Cabezon (OR)	48	1		48	47	47
California scorpionfish	126	1		126	120	117
Chilipepper S. of 40°10' N latitude	1,789	1		1,789	1,690	1,647
Dover Sole	42,843	1		25,000	**88,865**	**74,352**
English Sole	10,151	1		10,151	6,815	5,646
Lingcod N. of 42° N latitude (OR & WA)	2,151	1		2,151	2,010	1,897
Lingcod S. of 42° N latitude (CA)	2,164	2	d	2,164	2,137	2,044
Longnose skate	2,873	1		1,349	2,774	2,692
Longspine Thornyhead (coastwide)	2,902	2	d	NA	2,825	2,752
Longspine Thornyhead N. of 34°27' N latitude	NA			2,064	NA	NA
Longspine Thornyhead S. of 34°27' N latitude	NA			366	NA	NA
Pacific Cod	2,222	3	b	1,600	2,221	2,221
Sablefish (coastwide)	8,242	1		NA	**5,654**	**6,113**
Sablefish N. of 36° N latitude	NA			5,347	**NA**	**NA**

Stock	2012 ABC	Category	Sub-category	2012 ACL	Presumptive 2013 ABC	Presumptive 2014 ABC
Sablefish S. of 36° N latitude	NA			1,298	**NA**	**NA**
Shortbelly	5,789	2	d	50	5,789	5,789
Shortspine Thornyhead (coastwide)	2,254	1		NA	2,230	2,208
Shortspine Thornyhead N. of 34°27' N latitude	NA			1,556	NA	NA
Shortspine Thornyhead S. of 34°27' N latitude	NA			401	NA	NA
Splitnose S. of $40^0$10' N latitude	1,538	1		1,538	1,610	1,670
Starry Flounder	1,511	2	d	1,360	1,520	1,528
WIDOW	4,705	1		600	**4,598**	**4,212**
Yellowtail N. of $40^0$10' N latitude	4,371	1		4,371	4,378	4,382
STOCK COMPLEXES						
Minor Nearshore Rockfish North	99			99	94	94
Black and yellow	*0.0*	3	d		*0.0*	*0.0*
Blue (CA)	*25.1*	2	d		*25.0*	*25.0*
Blue (OR & WA)	*27.6*	3	d		*26.9*	*26.9*
Brown	*4.5*	3	d		*4.6*	*4.6*
Calico	*0.0*	3	a		*0.0*	*0.0*
China	*9.8*	3	d		*8.2*	*8.2*
Copper	*23.9*	3	d		*21.6*	*21.6*
Gopher	*0.0*	3	a		*0.0*	*0.0*
Grass	*0.5*	3	d		*0.5*	*0.5*
Kelp	*0.0*	3	d		*0.0*	*0.0*
Olive	*0.2*	3	d		*0.3*	*0.3*
Quillback	*7.3*	3	d		*6.2*	*6.2*
Treefish	*0.2*	3	d		*0.2*	*0.2*
Minor Shelf Rockfish North	1,948			968	1,920	1,932
Bronzespotted	*0.0*	3	d		*0.0*	*0.0*
Bocaccio	*223.8*	3	d		*236.9*	*236.9*
Chameleon	*0.0*	3	a		*0.0*	*0.0*
Chilipepper	*134.7*	3	d		*111.0*	*108.1*
Cowcod	*0.0*	3	a		*0.0*	*0.0*
Flag	*0.1*	3	d		*0.1*	*0.1*
Freckled	*0.0*	3	a		*0.0*	*0.0*
Greenblotched	*1.1*	3	c		*1.1*	*1.1*
Greenspotted 40°10' to 42° N latitude	*17.4*	2	d		9	9
Greenspotted N. of 42 N latitude (OR & WA)		3			*5.1*	*5.1*
Greenstriped	*1,125.4*	2	d		*1,143*	*1,158*
Halfbanded	*0.0*	3	b		*0.0*	*0.0*
Harlequin	*0.0*	3	a		*0.0*	*0.0*

Stock	2012 ABC	Category	Sub-category	2012 ACL	Presumptive 2013 ABC	Presumptive 2014 ABC
Honeycomb	*0.0*	3	c		*0.0*	*0.0*
Mexican	*0.0*	3	c		*0.0*	*0.0*
Pink	*0.0*	3	d		*0.0*	*0.0*
Pinkrose	*0.0*	3	b		*0.0*	*0.0*
Puget Sound	*0.0*	3	a		*0.0*	*0.0*
Pygmy	*0.0*	3	a		*0.0*	*0.0*
Redstripe	*240.6*	3	d		*225.1*	*225.1*
Rosethorn	*12.7*	3	d		*10.8*	*10.8*
Rosy	*2.1*	3	d		*2.5*	*2.5*
Silvergray	*150.2*	3	d		*133.0*	*133.0*
Speckled	*0.2*	3	d		*0.1*	*0.1*
Squarespot	*0.1*	3	c		*0.1*	*0.1*
Starry	*0.0*	3	d		*0.0*	*0.0*
Stripetail	*29.4*	3	d		*33.7*	*33.7*
Swordspine	*0.0*	3	d		*0.0*	*0.0*
Tiger	*0.9*	3	d		*0.8*	*0.8*
Vermilion	*9.3*	3	c		*8.1*	*8.1*
Minor Slope Rockfish North	1,367			1,160	1,381	1,414
Aurora	*14.5*	3	d		*12.8*	*12.8*
Bank	*16.4*	3	d		*14.4*	*14.4*
Blackgill	*3.9*	3	c		*3.9*	*3.9*
Redbanded	*43.1*	3	d		*37.7*	*37.7*
Rougheye	*65.3*	3	d		*59.3*	*59.3*
Sharpchin	*193.5*	3	d		*178.9*	*178.9*
Shortraker	*18.2*	3	d		*15.6*	*15.6*
Splitnose	*857.6*	1			*897.7*	*931.3*
Yellowmouth	*154.1*	3	d		*160.5*	*160.5*
Minor Nearshore Rockfish South	990			990	1,005	1,001
Shallow Nearshore Species	NA	NA	NA		*NA*	*NA*
Black and yellow	*22.3*	3	c		*23.0*	*23.0*
China	*16.5*	3	c		*13.8*	*13.8*
Gopher (N of Pt. Conception)	*157.7*	1			*150.1*	*146.3*
Gopher (S of Pt. Conception)	*21.7*	3	c		*21.4*	*21.4*
Grass	*46.4*	3	d		*49.7*	*49.7*
Kelp	*21.6*	3	d		*23.1*	*23.1*
Deeper Nearshore Species	NA	NA	NA		*NA*	*NA*
Blue (assessed area)	*173.1*	2	d		*171.4*	*171.4*
Blue (S of 34°27' N latitude)	*61.8*	3	c		*60.8*	*60.8*

Stock	2012 ABC	Category	Sub-category	2012 ACL	Presumptive 2013 ABC	Presumptive 2014 ABC
Brown	*164.7*	3	d		*170.6*	*170.6*
Calico	*0.0*	3	b		*0.0*	*0.0*
Copper	*130.1*	3	d		*118.0*	*118.0*
Olive	*158.1*	3	d		*187.4*	*187.4*
Quillback	*5.3*	3	d		*4.5*	*4.5*
Treefish	*10.8*	3	d		*11.0*	*11.0*
Minor Shelf Rockfish South	1,890			714	1,617	1,620
Bronzespotted	*5.6*	3	c		*3.0*	*3.0*
Chameleon	*0.0*	3	a		*0.0*	*0.0*
Flag	*22.2*	3	c		*19.5*	*19.5*
Freckled	*0.0*	3	a		*0.0*	*0.0*
Greenblotched	*20.5*	3	d		*19.3*	*19.3*
Greenspotted	*163.0*	2	d		*73.3*	*73.3*
Greenstriped	*206.5*	2	d		*209.7*	*212.4*
Halfbanded	*0.0*	3	b		*0.0*	*0.0*
Harlequin	*0.0*	3	a		*0.0*	*0.0*
Honeycomb	*6.5*	3	c		*8.2*	*8.2*
Mexican	*2.4*	3	c		*4.2*	*4.2*
Pink	*2.3*	3	d		*2.1*	*2.1*
Pinkrose	*0.0*	3	a		*0.0*	*0.0*
Pygmy	*0.0*	3	a		*0.0*	*0.0*
Redstripe	*0.4*	3	d		*0.4*	*0.4*
Rosethorn	*2.1*	3	d		*1.8*	*1.8*
Rosy	*30.8*	3	d		*37.1*	*37.1*
Silvergray	*0.5*	3	d		*0.4*	*0.4*
Speckled	*35.8*	3	d		*32.8*	*32.8*
Squarespot	*4.8*	3	c		*9.2*	*9.2*
Starry	*58.9*	3	d		*52.2*	*52.2*
Stripetail	*17.2*	3	d		*19.7*	*19.7*
Swordspine	*10.8*	3	d		*11.9*	*11.9*
Tiger	*0.0*	3	d		*0.0*	*0.0*
Vermilion	*257.3*	3	d		*224.6*	*224.6*
Yellowtail	*1,042.2*	3	d		*887.7*	*887.7*
Minor Slope Rockfish South	832			626	618	622
Aurora	*24.5*	3	c		*21.7*	*21.7*
Bank	*525.1*	2	a		*459.4*	*459.4*
Blackgill	*262.8*	2	d		***118.7***	***122.3***
Pacific ocean perch	*0.0*	3	a		*0.0*	*0.0*

Stock	2012 ABC	Category	Sub-category	2012 ACL	Presumptive 2013 ABC	Presumptive 2014 ABC
Redbanded	*9.9*	3	d		*8.7*	*8.7*
Rougheye	*0.4*	3	d		*0.3*	*0.3*
Sharpchin	*8.9*	3	d		*8.2*	*8.2*
Shortraker	*0.1*	3	d		*0.1*	*0.1*
Yellowmouth	*0.7*	3	d		*0.7*	*0.7*
Other Flatfish	7,044			4,884	6,982	6,982
Butter sole	*3.2*	3	b		*3.2*	*3.2*
Curlfin sole	*5.7*	3	b		*5.7*	*5.7*
Flathead sole	*24.3*	3	b		*24.3*	*24.3*
Pacific sanddab	*3,431.7*	3	d		*3,331.9*	*3,331.9*
Rex sole	*2,991.6*	3	d		*3,033.8*	*3,033.8*
Rock sole	*45.8*	3	c		*46.3*	*46.3*
Sand sole	*542.1*	3	c		*536.6*	*536.6*
Other Fish a/	7,742	3		5,575	2,286	2,265
Big skate	~~*0.0*~~	3			*0.0*	*0.0*
Cabezon (WA)	~~*Unknown*~~	3			*0.0*	*0.0*
California skate	~~*0.0*~~	3			*0.0*	*0.0*
Finescale codling	~~*Unknown*~~	3			*0.0*	*0.0*
Kelp greenling (CA)	~~*110.6*~~	3	d		*82.5*	*82.5*
Kelp greenling (OR & WA)	~~*Unknown*~~	3			*0.0*	*0.0*
Leopard shark	~~*164.0*~~	3	d		*116.0*	*116.0*
Pacific rattail	~~*1,178.1*~~	3	c		*0.0*	*0.0*
Ratfish	~~*Unknown*~~	3			*0.0*	*0.0*
Soupfin shark	~~*62.4*~~	3	c		*42.8*	*42.8*
Spiny dogfish	~~***2,200.2***~~	2	d		***2,044***	***2,024***

a/ Values for these specifications are the sum of known contributions of component stocks. Fully specified OFLs and ABCs would require the addition of new species to the complex (e.g., non-FMP skates and grenadiers) since many of these species are landed in generic market categories (e.g., unspecified skates).

Table 4. Estimated time to rebuild and spawning potential ratio (SPR) harvest rate relative to alternative 2013-2014 ACLs for overfished west coast groundfish stocks.

Stock	Current Ttarget	Current SPR or Harvest Control Rule	Current Tmax	ACL Alt.	ACLs (mt)		SPR or Harvest Control Rule	Median Time to Rebuild	Rebuilding Duration Beyond T@F=0 (yrs.)	Prob. of Rebuilding by Ttarget	Prob. of Rebuilding by Tmax	Re-est. Tmax
					2013	2014						
Bocaccio S of 40°10' N lat. a/	2022	77.7%	2031	1	0	0	100%	2019	0	88.0%	99.0%	2031
				2	133	143	90.0%	2019	0	77.0%	97.0%	
				3	248	263	82.3%	2020	1	NA	NA	
				4	320	337	77.7%	2021	2	60.0%	90.0%	
				5	453	471	70.0%	2023	4	49.0%	70.0%	
				6	691	705	60.0%	2027	8	33.0%	63.0%	
				7	837	843	53.9%	2031	12	23.0%	51.0%	
Canary	2027	88.7%	2046	1	0	0	100%	2028	0	48.2%	75.0%	2050
				2	48	49	95.1%	2028	0	41.2%	75.0%	
				3	101	104	90.0%	2029	1	36.4%	75.0%	
				4	116	119	88.7%	2030	2	34.4%	75.0%	
				5	147	151	85.9%	2030	2	31.7%	75.0%	
				6	184	187	82.9%	2031	3	29.9%	75.0%	
				7	216	220	80.3%	2032	4	27.9%	74.9%	
				8	302	306	74.0%	2035	7	26.1%	73.6%	
				9	394	397	67.9%	2040	12	25.1%	66.3%	
				10	449	451	64.7%	2045	17	25.0%	59.4%	
				11	752	753	62.2%	2050	22	25.0%	50.0%	
Cowcod b/	2068	82.7%	2098	1	0	0	100%	2060	0	NA	78.4%	2097
				2	2	2	90.0%	2064	4	NA	72.4%	
				3	3	3	82.7%	2068	8	50.0%	66.2%	
				4	4	4	79.0%	2071	11	NA	66.2%	
				5	5	5	74.2%	2074	14	NA	66.2%	
				6	9	9	59.7%	2097	37	NA	53.3%	

Stock	Current Ttarget	Current SPR or Harvest Control Rule	Current Tmax	ACL Alt.	ACLs (mt)		SPR or Harvest Control Rule	Median Time to Rebuild	Rebuilding Duration Beyond T@F=0 (yrs.)	Prob. of Rebuilding by Ttarget	Prob. of Rebuilding by Tmax	Re-est. Tmax
					2013	2014						
Darkblotched	2025	64.9%	2037	1	0	0	100%	2016	0	100.0%	100.0%	2037
				2	317	330	64.9%	2017	1	100.0%	100.0%	
				3	347	360	62.6%	2017	1	100.0%	100.0%	
				4	353	366	62.1%	2018	2	100.0%	100.0%	
				5	372	385	60.7%	2018	2	100.0%	100.0%	
				6	423	437	57.1%	2018	2	100.0%	100.0%	
				7	488	501	53.0%	2020	4	72.8%	91.0%	
				8	553	565	49.0%	2025	9	NA	NA	
				9	676	685	43.0%	2037	21	NA	50.0%	
POP	2020	86.4%	2045	1	0	0	100%	2043	0	25.0%	85.5%	2071
				2	16	17	98.4%	2043	0	25.0%	84.0%	
				3	35	36	96.5%	2044	1	25.0%	83.0%	
				4	58	60	94.3%	2045	2	25.0%	81.0%	
				5	74	76	92.9%	2046	3	25.0%	79.0%	
				6	89	91	91.6%	2047	4	25.0%	78.0%	
				7	106	108	90.1%	2048	5	25.0%	77.0%	
				8	122	124	88.8%	2049	6	25.0%	76.0%	
				9	131	134	88.0%	2050	7	25.0%	75.0%	
				10	136	139	87.6%	2050	7	25.0%	75.0%	
				11	150	153	86.4%	2051	8	25.0%	73.0%	
				12	158	161	85.8%	2052	9	25.0%	72.6%	
				13	163	167	85.4%	2052	9	25.0%	72.0%	
				14	175	178	84.5%	2053	10	25.0%	71.0%	
				15	182	186	83.9%	2054	11	25.0%	70.1%	
				16	199	203	82.6%	2055	12	25.0%	68.0%	
				17	209	213	81.9%	2056	13	25.0%	NA	
				18	222	226	80.9%	2057	14	25.0%	NA	
				19	247	251	79.2%	2060	17	25.0%	62.0%	
				20	291	295	76.2%	2065	22	25.0%	55.8%	
				21	328	333	73.8%	2071	28	25.0%	50.0%	

Stock	Current Ttarget	Current SPR or Harvest Control Rule	Current Tmax	ACL Alt.	ACLs (mt)		SPR or Harvest Control Rule	Median Time to Rebuild	Rebuilding Duration Beyond T@F=0 (yrs.)	Prob. of Rebuilding by Ttarget	Prob. of Rebuilding by Tmax	Re-est. Tmax
					2013	2014						
Petrale	2016	25-5 Rule	2021	1	0	0	100%	2013	0	100.0%	100.0%	2021
				2	867	1,008	60%	2013	0	100.0%	100.0%	
				3	1,265	1,432	50%	2013	0	100.0%	100.0%	
				4	1,831	1,994	40%	2013	0	100.0%	100.0%	
				5	2,592	2,652	25-5 Rule (=ABC @ 28% depletion in 2013)	2013	0	100.0%	100.0%	
Yelloweye	2074	76.0%	2089	1	0	0	100%	2045	0	99.2%	99.9%	2083
				2	9	9	86.4%	2053	8	85.3%	93.7%	
				3	14	14	80.5%	2060	15	75.1%	82.8%	
				4	15	15	79.5%	2061	16	73.2%	81.0%	
				5	17	18	76.5%	2066	21	64.1%	73.9%	
				6	18	18	76.0%	2067	22	62.1%	72.9%	
				7	21	21	72.7%	2074	29	50.0%	61.3%	
				8	24	25	69.7%	2083	38	37.2%	50.0%	

a/ All bocaccio alternatives have been reduced from the rebuilding analysis results by 6% to represent the portion of the stock south of 40°10' N lat.
b/ All cowcod alternatives have been doubled from the rebuilding analysis to account for the Monterey contribution.

Agenda Item E.4.a
Attachment 5
November 2011

Historical Landings and Revenue in Groundfish Fisheries

PACIFIC FISHERY MANAGEMENT COUNCIL
STAFF REPORT
NOVEMBER 2011

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1. Introduction

Appendix F to the Final Environmental Impact Statement (FEIS) for the Proposed ABC/OY Specifications and Management Measures for the 2011-2012 Pacific Coast Groundfish Fishery contains tables and figures showing historical landings of groundfish and other species and associated ex-vessel revenue by fishery, season, month, and port. Other tables show fishery participation measured by numbers of vessels making landings and vessel length. This report presents an update. Data are provided in two ways. Tabular data are provided online in a spreadsheet workbook (http://www.pcouncil.org/groundfish/background/document-library/historical-landings-and-revenue-in-groundfish-fisheries/), which is intended to allow greater flexibility for end users. This document interprets and discusses data in those tables.

The data underlying these tables were extracted from the vessel daily summary (vdrfd) table in the Pacific Fishery Information Network (PacFIN) landings database or in a few cases the PacFIN web-based Multidimensional Explorer Tool. Species codes (spids) in the vdrfd table were grouped into one of three different sets of custom categories, depending on the table. Appendix B provides additional information about the grouping of species into these categories.

2. Trends in Coastwide Landings

2.1. Shoreside Landings of all Species by Management Group

Online tables:
Table 1. Landings (metric tons) by management group, 1981-2010.
Table 2. Ex-vessel revenue (inflation-adjusted dollars) by management group, 1981-2010.

The figures in this section illustrate trends in landings by species groups used in the PacFIN database to reflect management groups. These management groups correspond with managed species in Council's four FMPs and other major groupings for state managed and other species. Total shoreside west coast ex-vessel revenue in 2010 was $354 million (not including whiting processed at sea), or 102 percent of the annual average for the 1981-2010 time series when adjusted for inflation and 90 percent of the average for 1981-1990. Looking at inflation-adjusted ex-vessel revenue for the entire period, crab and groundfish account for the highest share of ex-vessel revenue, at 22 and 25 percent respectively. However, in 2010 their shares were 32 and 19 percent, reflecting increased landings and revenues from crab.

Figure 2-2 and Figure 2-1 illustrate trends by showing graphically years in which revenue and landings for each management group was greater than the annual average. The figures suggest an increasing trend in landings of CPS and crab. Groundfish ex-vessel revenue has not exceeded the long-term annual revenue since 1998 although landings volume has exceeded the average in several subsequent years. This likely reflects higher landings of Pacific whiting (a low value species) in those years.

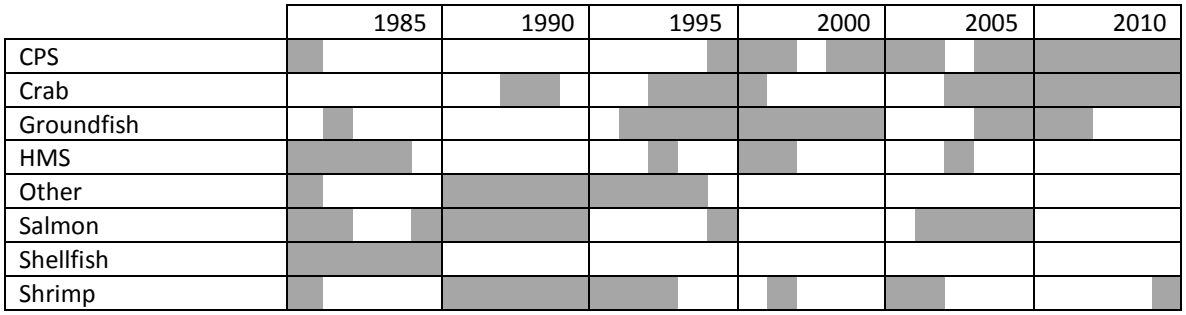

Figure 2-1. Annual landings compared to annual average for period, 1981-2010, by management group. Shaded cells show years above annual average.

	1985	1990	1995	2000	2005	2010
CPS						
Crab						
Groundfish						
HMS						
Other						
Salmon						
Shellfish						
Shrimp						

Figure 2-2. Annual inflation adjusted ex-vessel revenue compared to annual average for period, 1981-2010, by management group. Shaded cells show years above annual average.

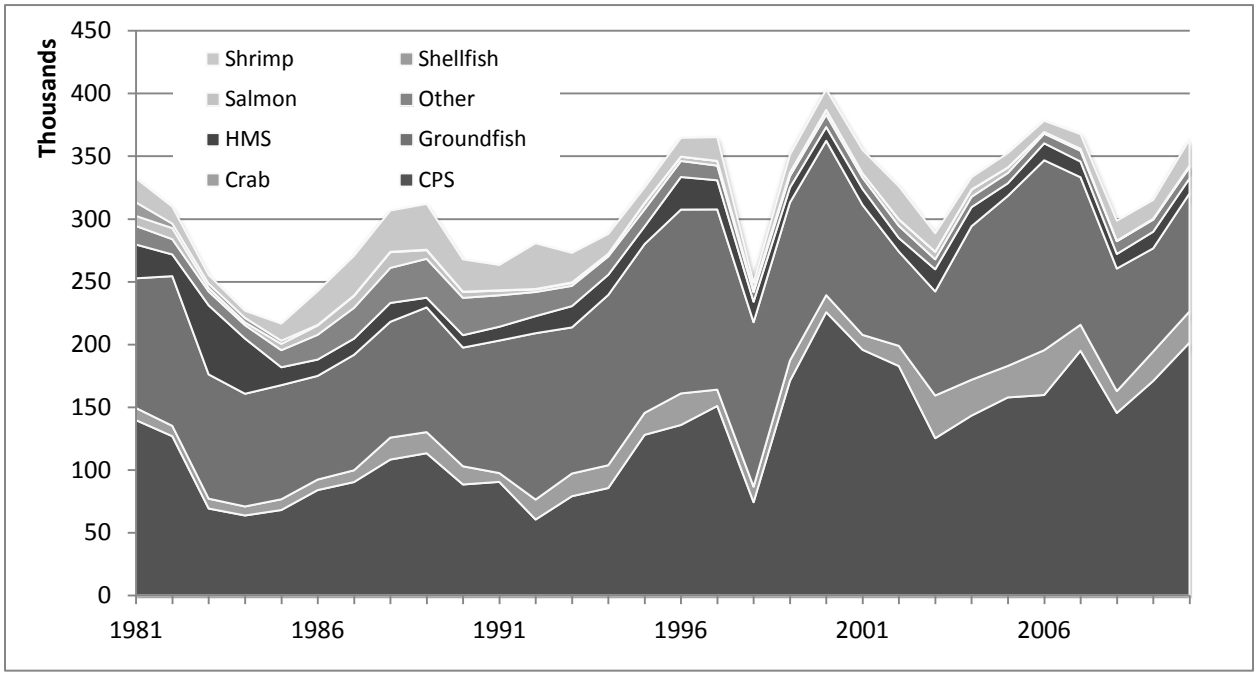

Figure 2-3. Landings (mt) by management group, 1981-2010.

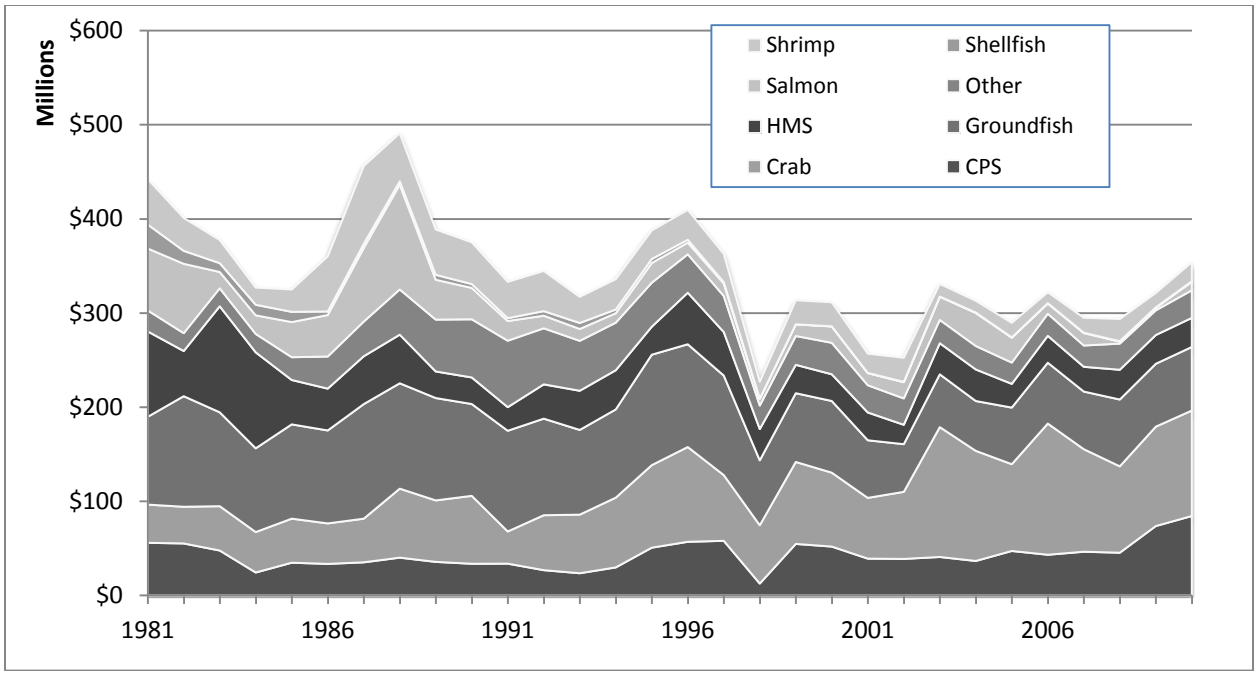

Figure 2-4. Inflation adjusted ex-vessel revenue ($millions) by management group, 1981-2010.

2.2. General Trends in Shoreside Groundfish Landings

Online tables:
Table 3. Landings (mt) for major groundfish species and species groups, 1981-2010.
Table 4. Ex-vessel revenue (inflation-adjusted dollars) for major groundfish species and species groups, 1986-2010.
Table 5. Groundfish landings (mt) by selected gear types (gr.group), 1981-2010.
Table 6. Ex-vessel revenue (inflation-adjusted dollars) by selected gear groups (gr.group), 1981-2010.

This section presents a similar set of figures as in the previous section but focusing on groundfish species.[1] Landings in PacFIN are usually reported at a species level; these have been grouped into 11 categories, with those species accounting for a large proportion of ex-vessel revenue displayed. For the entire period the individually reported species—sablefish, Dover sole, Pacific whiting, petrale sole, lingcod, and arrowtooth flounder—account for 56 percent of total revenue. (Note that these data do not include Pacific whiting processed at sea; including those catches would increase the share Pacific whiting accounts for.) Rockfish and thornyheads make up an additional 36 percent of the total. Annual groundfish inflation-adjusted ex-vessel revenue generally increased from 1981 to the mid 1990s and then fell dramatically; ex-vessel revenue in 2002, the low point, was just under 50 percent of the 1996 value. Revenue has subsequently rebounded somewhat, in 2010 slightly exceeding the annual average for the entire period and equaling $67.5 million. Sablefish and rockfish account for the largest share of ex-vessel revenue for the entire 1981-2010 period at 25 and 28 percent respectively. However, rockfish were a big component of the decline in landings in the late 1990s; in 2010 they accounted for just 7 percent of total groundfish ex-vessel revenue. Sablefish, on the other hand accounted for 53 percent of total revenue in 2010. In terms of landings volume Pacific whiting (landed shoreside) has shown the largest gain over the time period, accounting for 69 percent of total shoreside landings by weight in 2010.

Figure 2-5 and Figure 2-6 compare annual inflation-adjusted ex-vessel revenue and landings to the annual average to indicate trends. Since 2000 Pacific whiting, petrale sole, and sablefish show revenues above the long-term

[1] The PacFIN groundfish category includes a few species not in the Council's groundfish FMP; these are grouped under miscellaneous groundfish.

average. With respect to landings volume, Pacific whiting sablefish, and petrale sole show above average years since 2000.

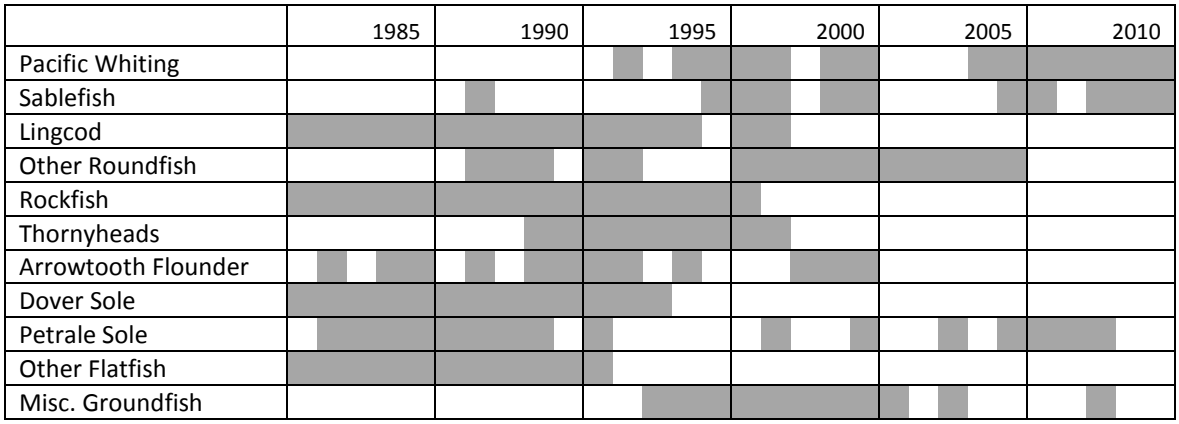

Figure 2-5. Landings compared to annual average for period, 1981-2010, for major groundfish species and species groups. Shaded cells show years above annual average.

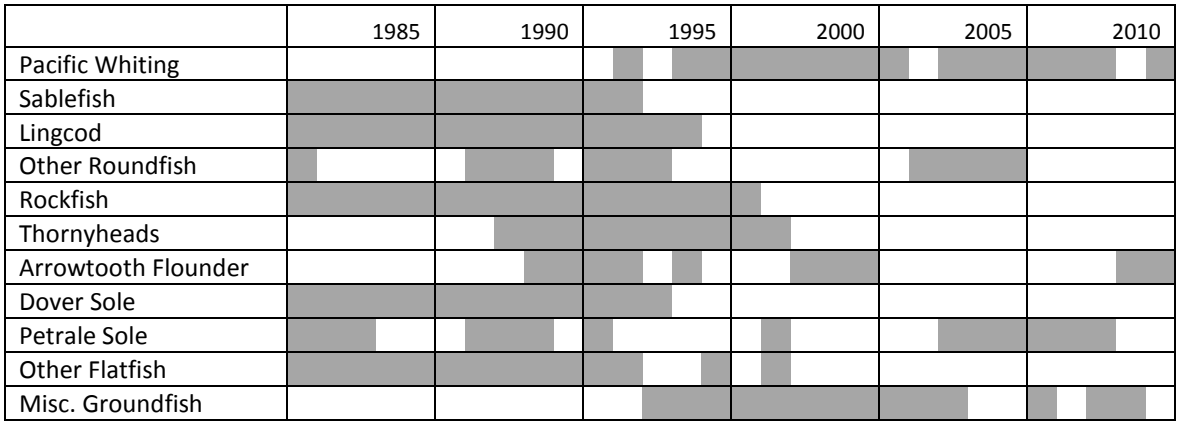

Figure 2-6. Annual inflation adjusted ex-vessel revenue compared to annual average for period, 1981-2010, for major groundfish species and species groups. Shaded cells show years above annual average.

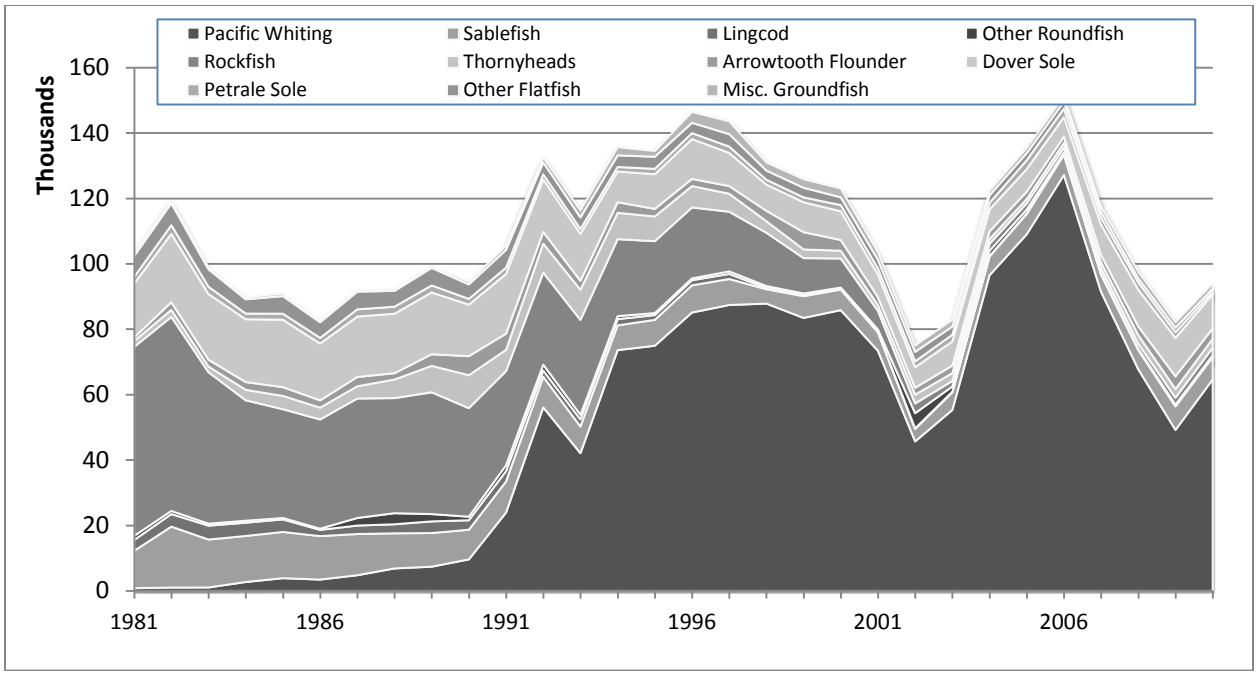

Figure 2-7. Landings (thousands of metric tons) for major groundfish species and species groups, 1981-2010.

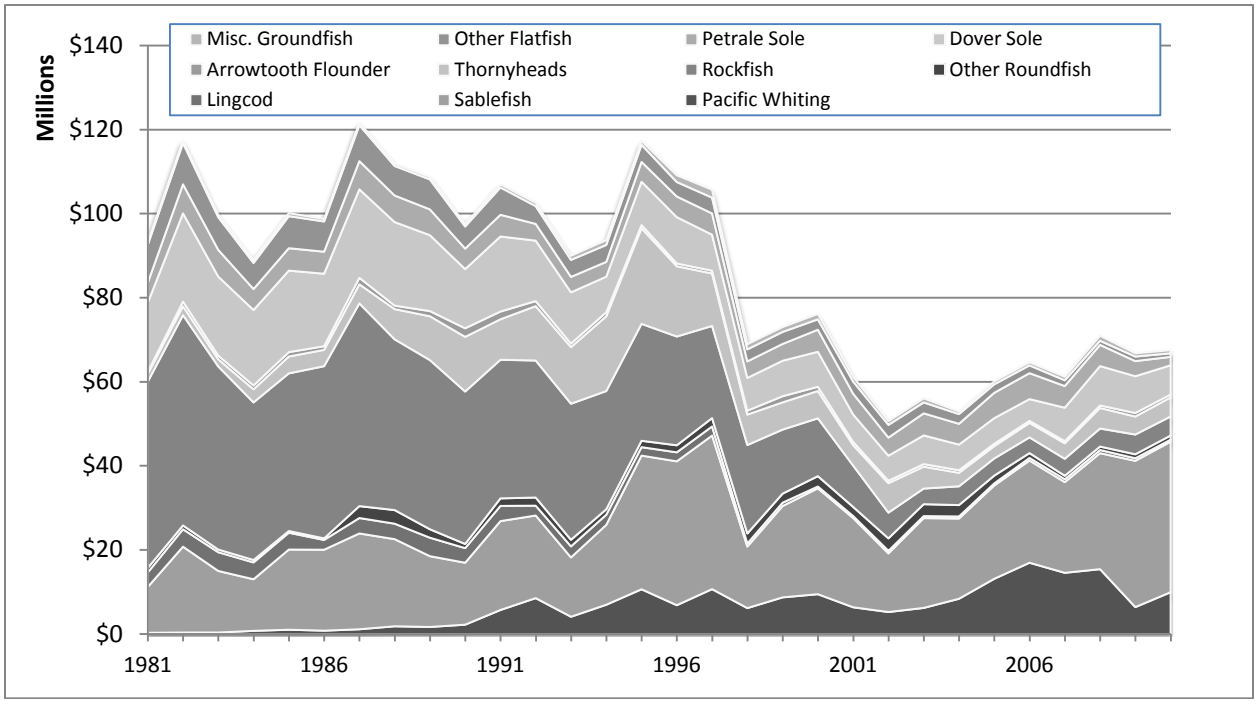

Figure 2-8. Inflation adjusted ex-vessel revenue ($millions) for major groundfish species and species groups, 1981-2010.

The vast majority of groundfish landings have been made by groundfish trawl gear. For the entire 1981-2010 period this gear accounted for 91 percent of shoreside landings but 73 percent of inflation adjusted ex-vessel revenue. Landings from trawl gear increased relative to other gear types (from 86 percent, 1981-1990, to 94 percent, 2000-2010) while revenue has declined (78 percent, 1981-1990 to 65 percent, 2000-2010). (See Figure 2-9 and Figure 2-10.)

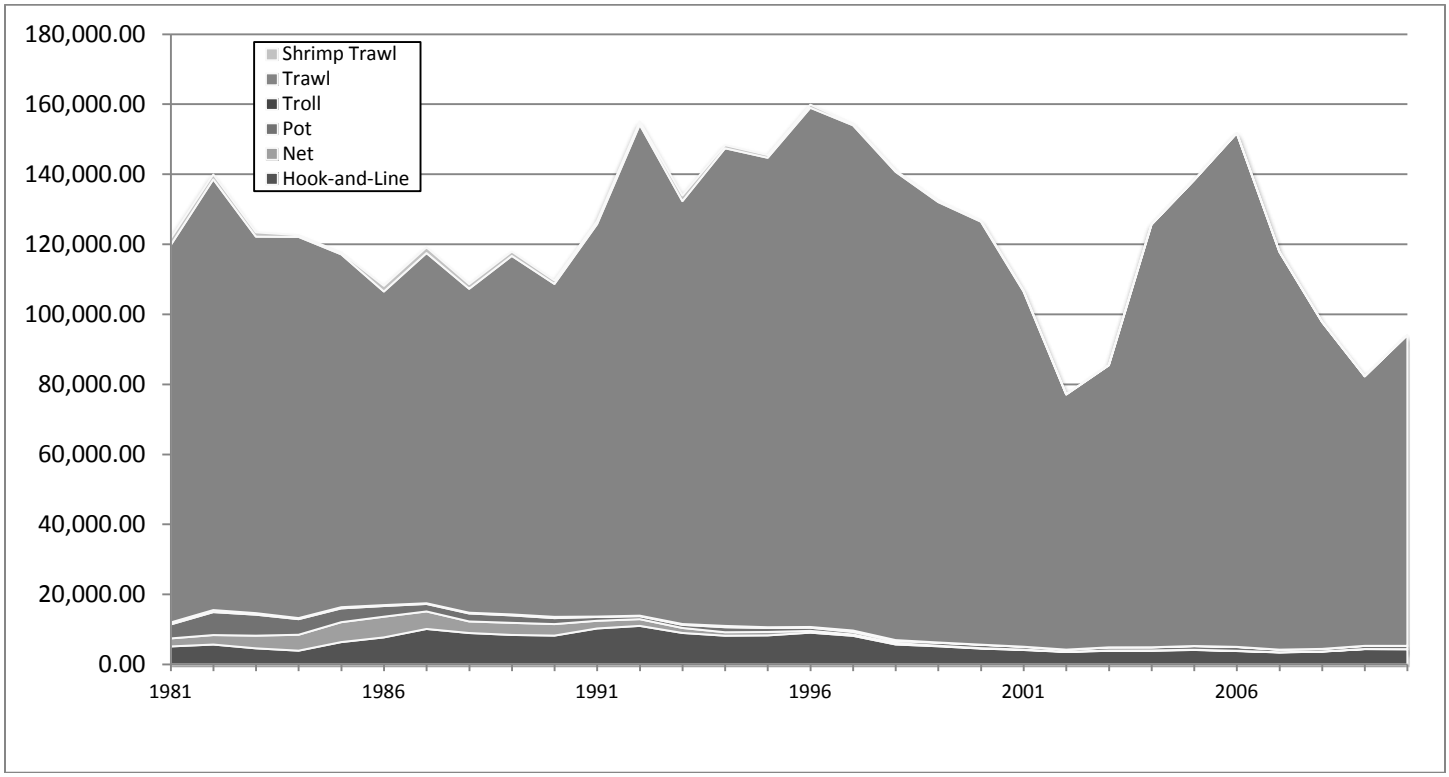

Figure 2-9. Groundfish landings (mt) by gear type, 1981-2010.

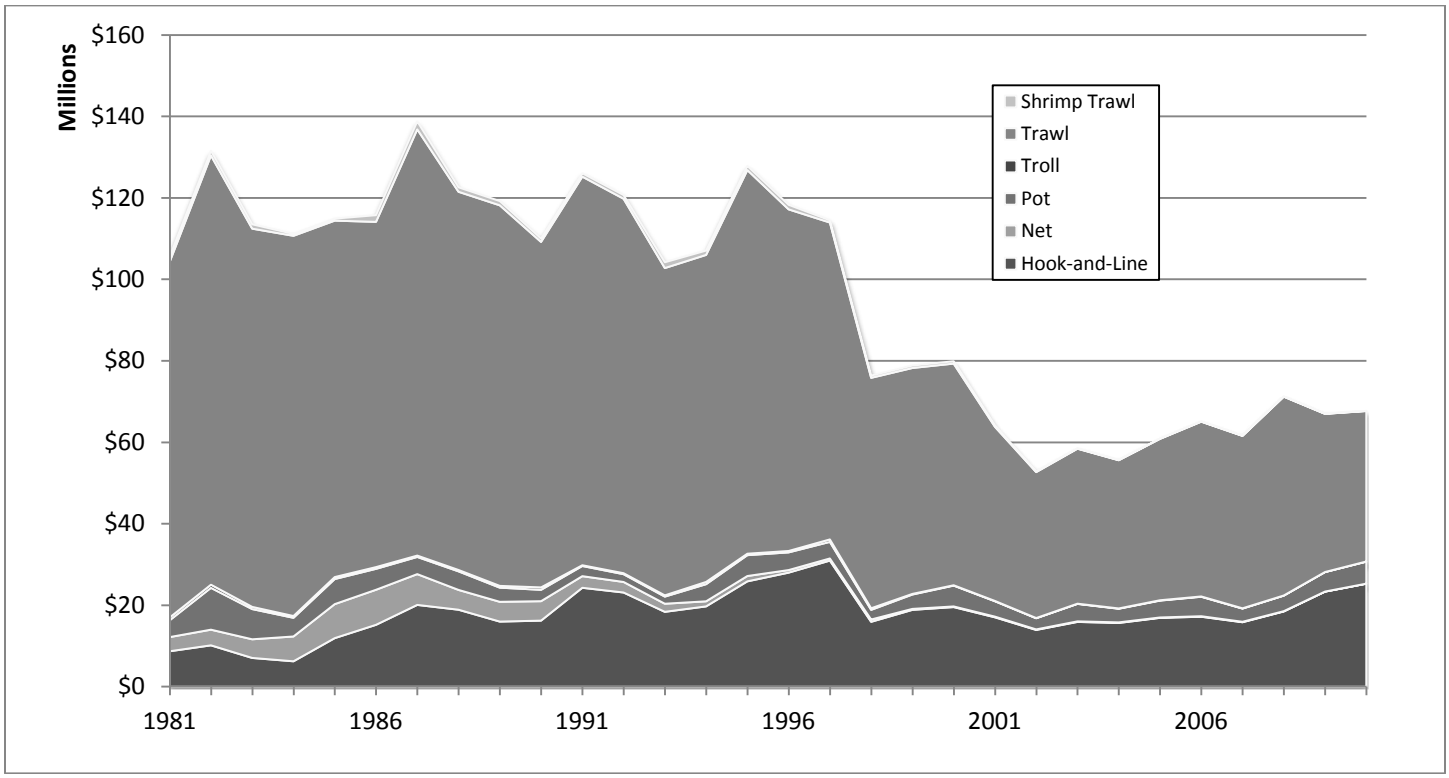

Figure 2-10. Groundfish ex-vessel revenue (inflation adjusted dollars) by gear type, 1981-2010.

3. Landing and Revenue by Fishery Sectors, 2006-2010

For management purposes groundfish fisheries are classified in a variety of "sectors" based on vessel permit status, allocation of fishing opportunity, fishing strategy, and other factors. Vessels are generally assigned to these sectors based on their regulatory status; in particular, whether the vessel is registered to a Federal groundfish limited access permit, and the specific endorsement on that permit. Since not all vessels landing groundfish possess a Federal groundfish limited access permit, some fishery sectors comprise vessels identified based on the composition of their landings. Beginning in 2010 Council staff worked with PacFIN staff to develop methods to code PacFIN data so that landings could be grouped according to these categories. In 2011 these codes were implemented directly into the PacFIN vdrfd table and used to generate the tables for this section.

Appendix A describes the procedures and criteria used to create 19 separately coded fishery sectors, 16 of which are applied to PacFIN data. The remaining 3 sectors cover Pacific whiting processed at sea; information on these catches is stored in a different database. PacFIN staff provided a custom dataset on these at-sea sectors used in generating the relevant tables in this report (see Section 3.3).

3.1. Commercial Nonwhiting Sectors

Online tables describing landings and revenue by nonwhiting commercial fishery sectors:

Table 7. Landings by selected species and species groups (mt) by the nonwhiting groundfish limited entry trawl sector, 2006-2010.
Table 8. Ex-vessel revenue from selected species and species groups (inflation adjusted dollars) by the nonwhiting groundfish limited entry trawl fishery, 2006-2010.
Table 9. Landings of selected species and species groups (mt) by the limited entry fixed gear sector, 2006-2010.
Table 10. Ex-vessel revenue from selected species and species groups (inflation adjusted dollars) by the limited entry fixed gear sector, 2006-2010.
Table 11. Landings of selected species and species groups (mt) by the directed open access sector (includes fixed gear, net gear, and troll gear), 2006-2010.
Table 12. Ex-vessel revenue from selected species and species groups (inflation adjusted dollars) by the directed open access sector (includes fixed gear, net gear, and troll gear), 2006-2010
Table 13. Landings of selected species and species groups (mt) by the non nearshore fixed gear fishery, 2006-2010.
Table 14. Ex-vessel revenue from selected species and species groups (inflation adjusted dollars) by the non nearshore fixed gear fishery, 2006-2010.
Table 15. Landings of selected species and species groups (mt) by the nearshore sector, 1996-2010.
Table 16. Ex-vessel revenue from selected species and species groups (inflation adjusted dollars) for the nearshore fixed gear sector, 2006-2010.
Table 17. Landings of selected species and species groups (mt) by the incidental open access sector, 2006-2010.
Table 18. Ex-vessel revenue from selected species and species groups (inflation adjusted dollars) by the incidental open access sector, 2006-2010
Table 19. Landings of selected species and species groups (mt) by the limited entry and open access nonearshore nonsablefish sector, 2006-2010.
Table 20. Ex-vessel revenue for selected species and species groups (inflation adjusted dollars) for the limited entry and open access nonnearshore nonsablefish sector, 2006-2010.
Table 21. Groundfish landings (mt) by commercial fishery sector, 2006-2010.
Table 22. Groundfish ex-vessel revenue (inflation adjusted dollars) by commercial fishery sector, 2006-2010.

For reporting purposes PacFIN sector codes have been grouped into the following fishery sectors:

- Nonwhiting groundfish limited entry trawl (sector 4)
- Limited entry fixed gear (sectors 5, 7)
- Directed open access (all gear types, sectors 6, 8, 11)
- Non nearshore (sectors 7, 8) catching sablefish
- Nearshore (sectors 5, 6) not catching sablefish and also defined by the catch of selected rockfish species

- Non nearshore non sablefish (sectors 9, 10)
- Incidental open access (sector 12)
- Other groundfish fishery landings, including vessels operating under exempted fishing permits, research catches, and groundfish caught in exempted trawl fisheries (targeting shrimp, prawns, and California halibut) (sectors 13, 14)

Finally, some vessel activity is unclassified because the catch is not from the Pacific Council's management area; catch in the PFMC area is a criterion for all the sector definitions. Note that the limited entry fixed gear and directed open access fisheries overlap with the spatially defined nearshore and non nearshore fisheries. "Non nearshore" is a term of art for classifying vessels fishing offshore on the continental slope and catching sablefish.

Figure 3-1 presents the data from online Table 22 graphically. The limited entry nonwhiting trawl sector earned 53 percent of overall inflation adjusted revenue during the period, followed by the limited entry fixed gear sector earning 28 percent and the directed open access sector (14 percent); the incidental open access sector (fisheries not targeting groundfish) and other/unclassified landings make up the remaining 2 percent of total revenue.

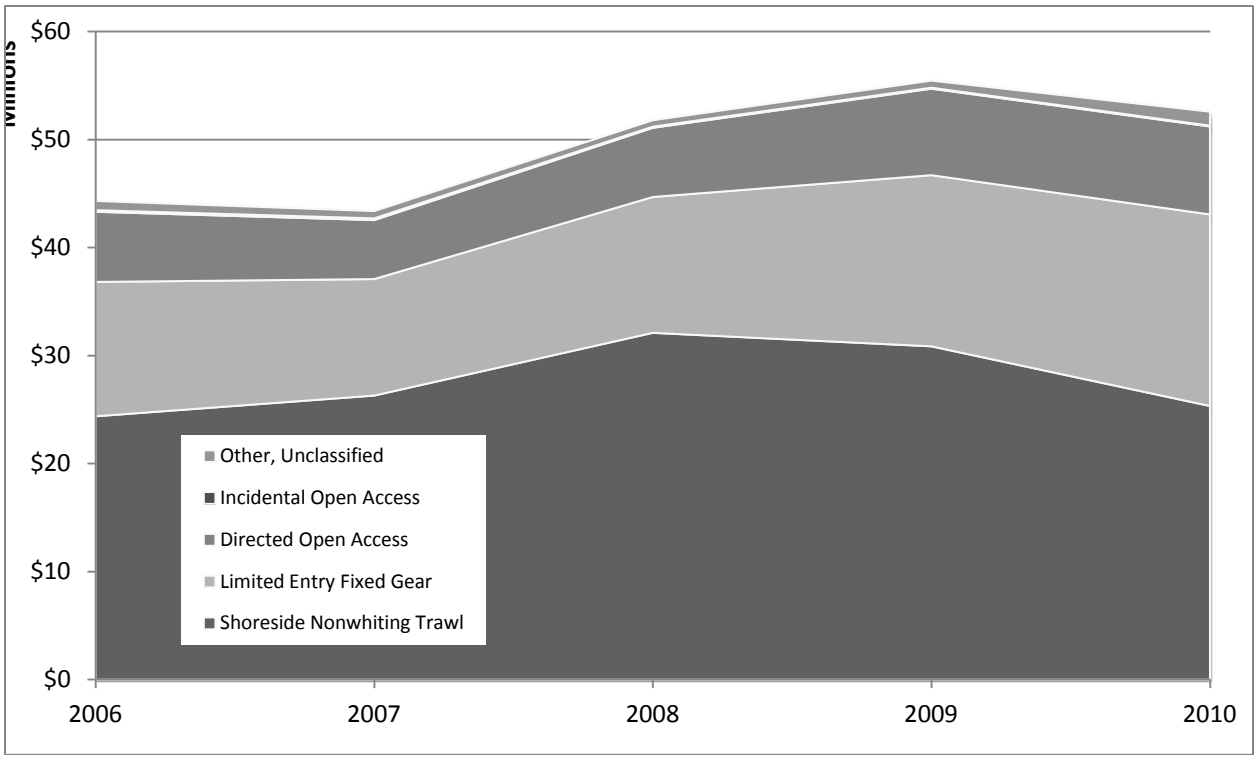

Figure 3-1. Groundfish ex-vessel revenue (inflation adjusted dollars) by commercial fishery sector, 2006-2010.

Table 3-1 shows the fraction of inflation adjusted ex-vessel revenue earned from the top three highest earning species in the commercial nonwhiting limited entry trawl, limited entry fixed gear, and directed open access sectors (information from online tables 8, 10, and 12), 2006-2010. In all three of these sectors sablefish is the top earner, comprising between 36 and 84 percent of total revenue. In the trawl fishery Dover sole is second (it is the top landed species by weight in this sector) followed by petrale sole. The limited entry fixed gear sector, which fishes offshore, depends secondly on thornyheads while the directed open access sector, primarily fishing nearshore earns a large portion of revenue from rockfish. In all three of these sectors the top three species account for a large fraction of total revenue, ranging from 78 to 97 percent. (Online tables 13-16 present landings and ex-vessel revenue for the cross-cutting nearshore and non nearshore sectors. By sector definition the nearshore

sector does not catch sablefish while this species dominates the non nearshore sector with 89 percent of total revenue.)

Table 3-1. Top three income earning species for three sectors, 2006-2010.

Species	Ann. Average	Pct Total
Limited Entry Trawl		
Sablefish	$10,138,423	36.3%
Dover Sole	$7,468,802	26.8%
Petrale Sole	$4,283,686	15.3%
Total	**$21,890,911**	**78.4%**
Limited Entry Fixed Gear		
Sablefish	$11,773,444	83.6%
Thornyheads	$1,541,733	11.0%
Rockfish	$362,759	2.6%
Total	**$13,677,935**	**97.2%**
Directed Open Access		
Sablefish	$3,437,438	48.8%
Rockfish	$2,435,537	34.6%
Other Roundfish	$635,849	9.0%
Total	**$6,508,825**	**92.4%**

3.2. Tribal Fisheries

Online tables:
Table 23. Landings of species and species groups (mt) by the treaty nonwhiting sector, 2006-2010.
Table 24. Ex-vessel revenue from species and species groups (inflation adjusted dollars) by the treaty nonwhiting sector, 2006-2010.

Several Pacific Northwest Indian tribes have treaty rights to fish for groundfish in their usual and accustomed fishing grounds. The Federal government has accommodated these fisheries through a regulatory process described at 50 CFR 660.324. Participants in the tribal commercial fisheries use similar gear to nontribal fishers. Groundfish caught in the tribal commercial fishery pass through the same markets as nontribal commercial groundfish catch. In addition to hook-and-line fisheries, the Makah tribe annually harvests a whiting allocation using midwater trawl gear. Since 1996, a portion of the U.S. whiting OY has been allocated to the Pacific Coast treaty tribes (PacFIN landings data for the tribal whiting fishery are discussed in the next section along with the other Pacific whiting sectors.)

Tribal nonwhiting groundfish fisheries are grouped into a single sector comprising all gear types. Sablefish and rockfish are the principal species landed, with sablefish accounting for the largest share of ex-vessel revenue according to online tables 23-24. Table 3-2 shows the composition of landings by gear type (PacFIN gear group). Trawl gear accounts for over half of landings by weight although fixed gear (hook-and-line and pot) is more important in terms of ex-vessel revenue, earning 76 percent based on data for the 2006-2010 period.

Table 3-2. Proportional nonwhiting tribal sector landings by gear group and species, 2006-2010 cumulated.

Species	Hook-and-Line	Pot	Troll	Trawl	Total
Sablefish	86.2%	97.0%	<1%	3.2%	39.6%
Rockfish	4.5%	1.7%	57.1%	35.5%	22.1%
Dover Sole	<1%	<1%		23.2%	12.8%
Other Flatfish	<1%			11.7%	6.5%
Arrowtooth Flounder	<1%			11.0%	6.1%
Other Groundfish	5.2%		<1%	4.8%	4.9%
Lingcod	2.5%	1.3%	42.7%	3.1%	3.2%
Petrale Sole	<1%			5.3%	2.9%
Thornyheads	1.4%	<1%	<1%	2.4%	1.9%
Gear as Pct Total	43.4%	0.5%	0.9%	55.2%	100.0%

3.3. Pacific Whiting Sectors

Online tables:
Table 27. Landings of Pacific whiting and other species (mt) by Pacific whiting sectors, 2006-2010.
Table 28. Ex-vessel revenue from Pacific whiting and other species (inflation adjusted dollars) by Pacific whiting sectors, 2006-2010.
Table 29. Nonwhiting landings by species category (mt) and whiting sectors, 2006-2010.
Table 30. Nonwhiting ex-vessel revenue by species category (inflation adjusted dollars) and whiting sectors, 2006-2010.

Figure 3-2 shows the trend in Pacific whiting landings by sector for the 5-year period, 2006-2010. Landings declined between 2006 and 2009, rebounding slightly in 2010 to 170,938 mt. Figure 3-3 shows the share of ex-vessel revenue from Pacific whiting by sector. Catcher-processors account for the largest share of revenue at 32 percent followed by the shoreside sector.

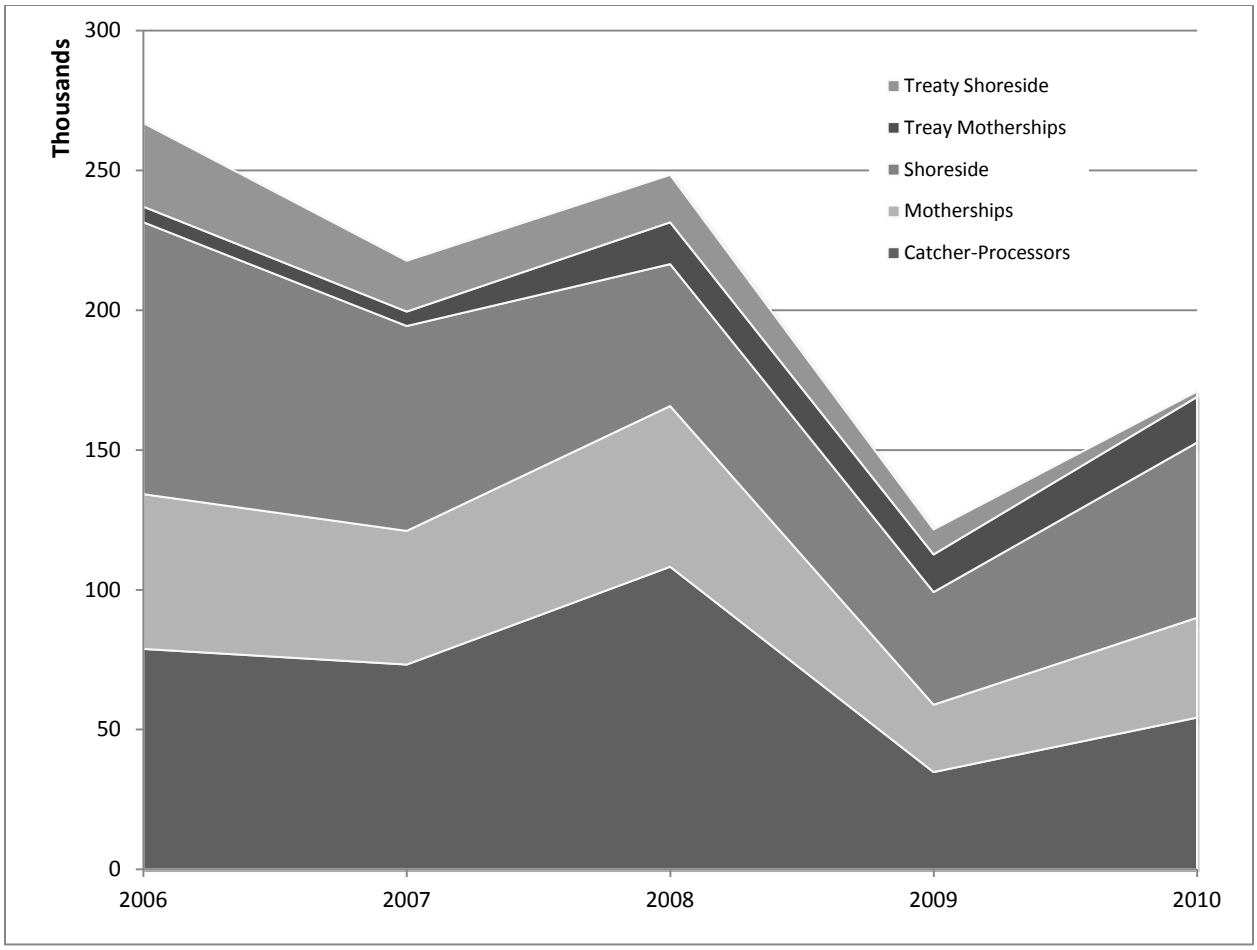

Figure 3-2. Landings of Pacific whiting (mt) by whiting sectors, 2006-2010.

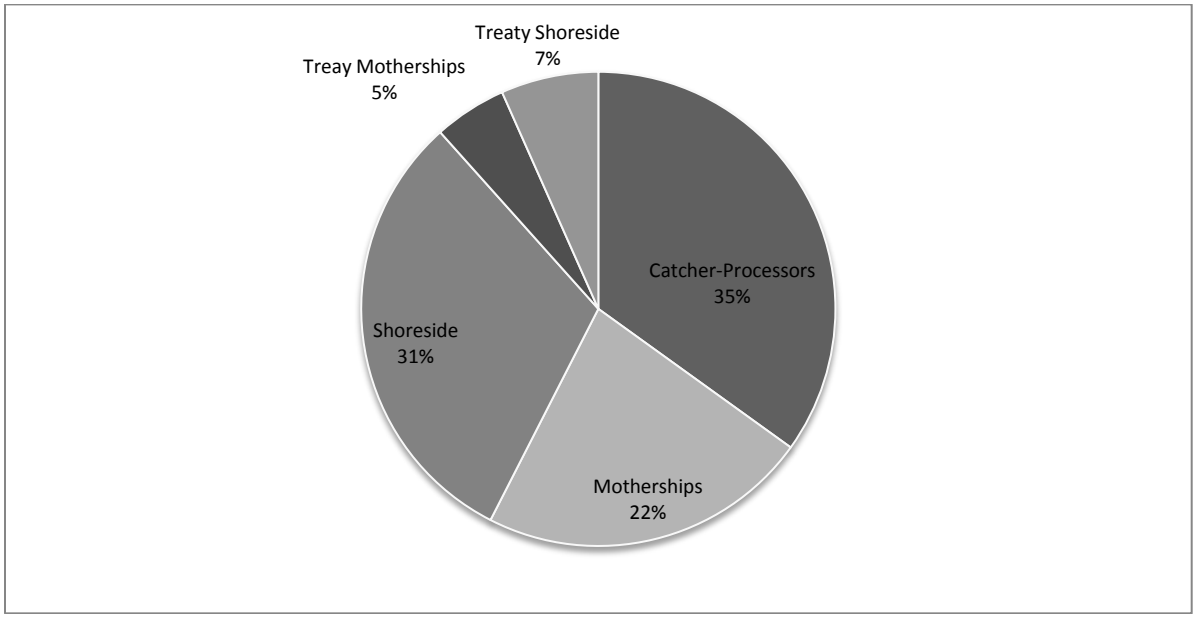

Figure 3-3. Ex-vessel revenue from whiting by whiting sectors, 2006-2010.

4. Landings and Revenue by Month

Online tables:

Table 25. Average groundfish landings (mt) by 2-month period and species by the tribal nonwhiting fishery sector, 2006-2010.
Table 31. Average annual groundfish landings (mt) by 2-month period and fishery sector, 2006-2010.
Table 32. Average annual groundfish ex-vessel revenue (dollars) by 2-month period and fishery sector, 2006-2010.
Table 33. Average monthly landings of Pacific whiting (mt) by whiting sectors, 2006-2010.
Table 34. Average monthly ex-vessel revenue from Pacific whiting (inflation adjusted dollars) by whiting sectors, 2006-2010.
Table 35. Average groundfish landings (mt) by 2-month period and species, 2006-2010.
Table 36. Average groundfish ex-vessel revenue (inflation adjusted dollars) by 2-month period and species, 2006-2010.

Figure 4-1 presents information from online Table 32 graphically, showing the three principal nonwhiting fishery sectors. Across all sectors revenues tend to peak during the summer months, although this trend is more pronounced in the limited entry fixed gear and directed open access fisheries. The trawl fishery shows a 7 percent difference between the highest and lowest earning bimonthly periods while the limited entry fixed gear sector shows a 26 percent difference. The seasonal allocation of sablefish fishing opportunity drives the more pronounced pattern in the fixed gear fisheries. In contrast, limited entry trawl prosecutes a significant winter fishery on the continental slope principally targeting Dover sole. Also, through 2010 this sector was managed by 2-month cumulative landing limits, intended to more evenly distribute landings throughout the year.

Figure 4-2 shows monthly landings of Pacific whiting by the whiting sectors. The season starts May 1, although some fishing has been allowed before then (for confidentiality all these landings are grouped in the "All months before June 1" category). Landings peak early in the season although there is second surge in landings late in the year. However, the seasonal distribution varies by sector; the mothership sector made 54 percent of their landings before June 1 while the shoreside sector made 66 percent of landings in June and July during the 2006-2010 period. Catcher-processors and the treaty sectors tend to comprise a higher proportion of the landings in the fall and winter months.

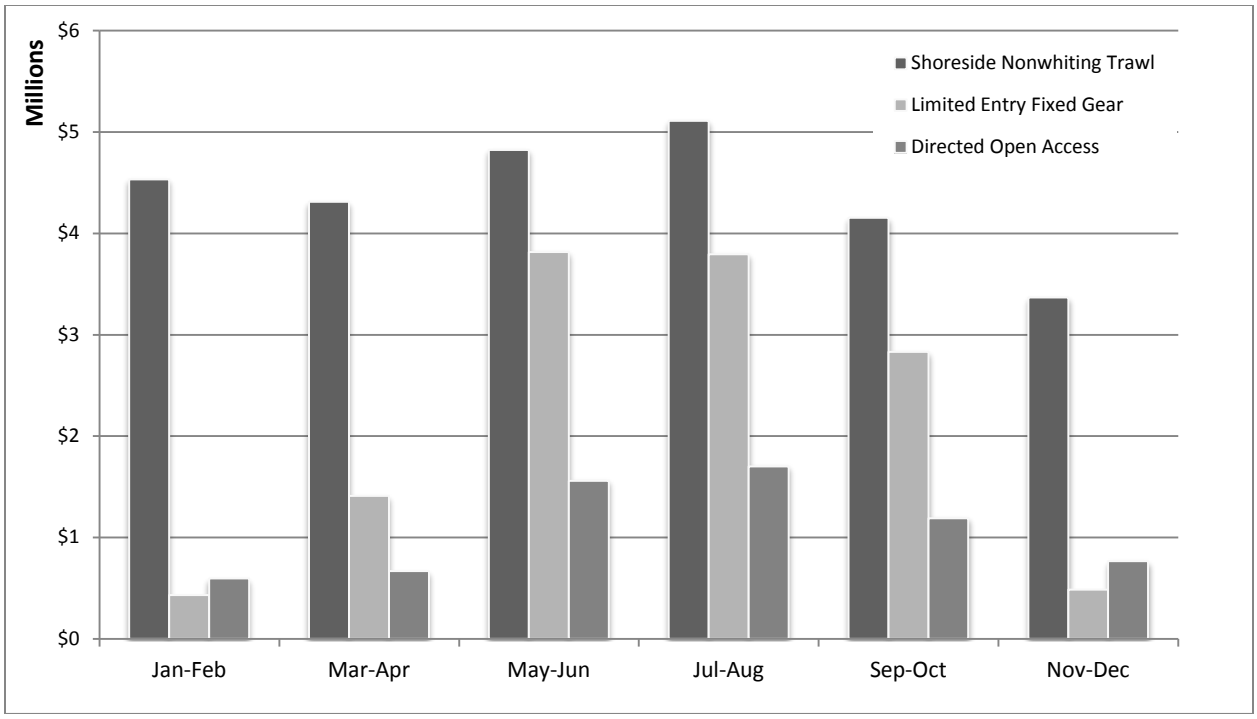

Figure 4-1. Average annual groundfish ex-vessel revenue (dollars) by 2-month period and fishery sector, 2006-2010.

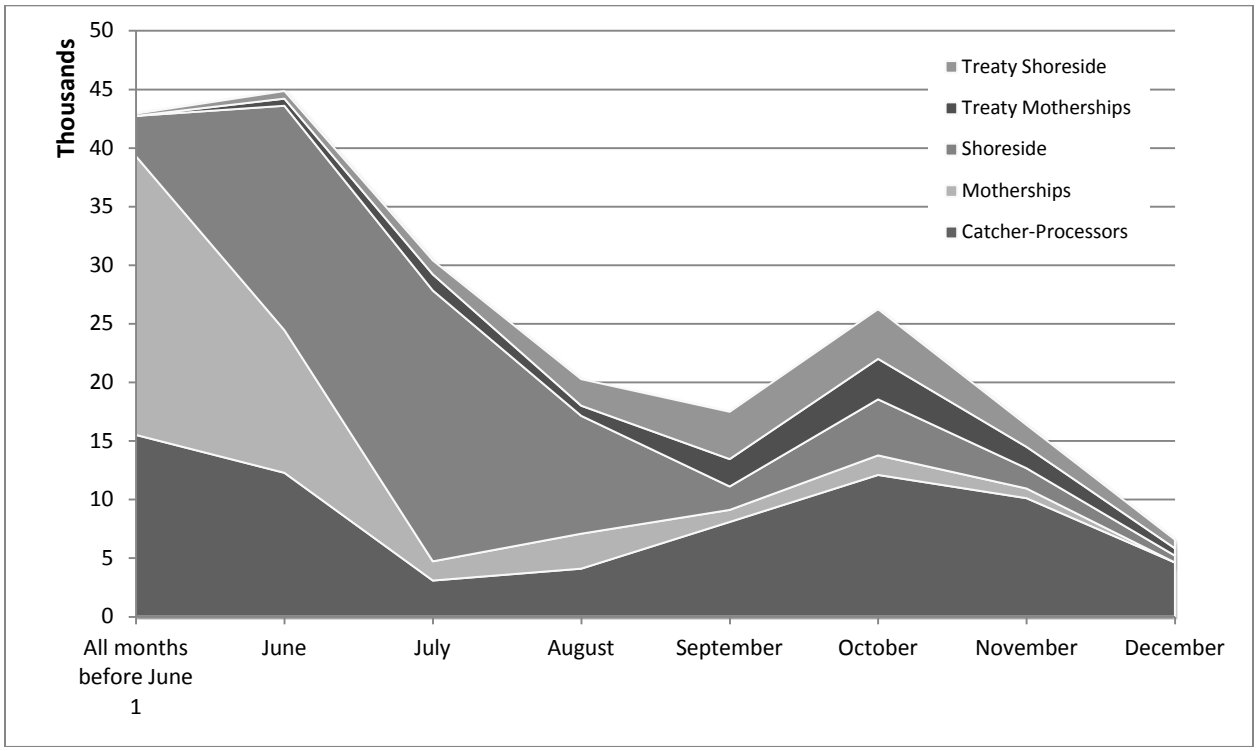

Figure 4-2. Average monthly landings of Pacific whiting (mt) by whiting sectors, 2006-2010.

5. Landings and Revenue by Port

Online tables:
Table 37. Groundfish landings (mt) by port group area, 2006-2010.
Table 38. Groundfish ex-vessel revenue (inflation adjusted dollars) by port group area, 2006-2010.
Table 39. Engagement (groundfish landings in port as percent of coastwide landings) and dependence (groundfish landings in port as percent of total landings in port), 2006-2010.
Table 40. Groundfish landings (mt) by species and species groups by port group area, 2009-2010.
Table 41. Groundfish ex-vessel revenue (dollars) by species and species groups by port group area, 2009-2010.
Table 42. Groundfish landings (mt) by fishery sectors and port group area, 2009-2010.
Table 43. Groundfish ex-vessel revenue (dollars) by fishery sectors and port group area, 2009-2010.

Figure 5-1 shows the distribution of groundfish ex-vessel revenue across west coast port regions, based on the data in online Table 38. Revenue from all port groups from Fort Bragg, California south have been grouped into one category in the figure, because the ports in this region individually account for a small proportion of coastwide revenue. The Oregon ports of Astoria (in the Columbia River port area) and Newport are the largest groundfish port areas measured by revenue, followed by the Washington coastal region. From a state-wide perspective Washington, Oregon, and California account for 24 percent, 36 percent, and 30 percent of coastwide revenue respectively.

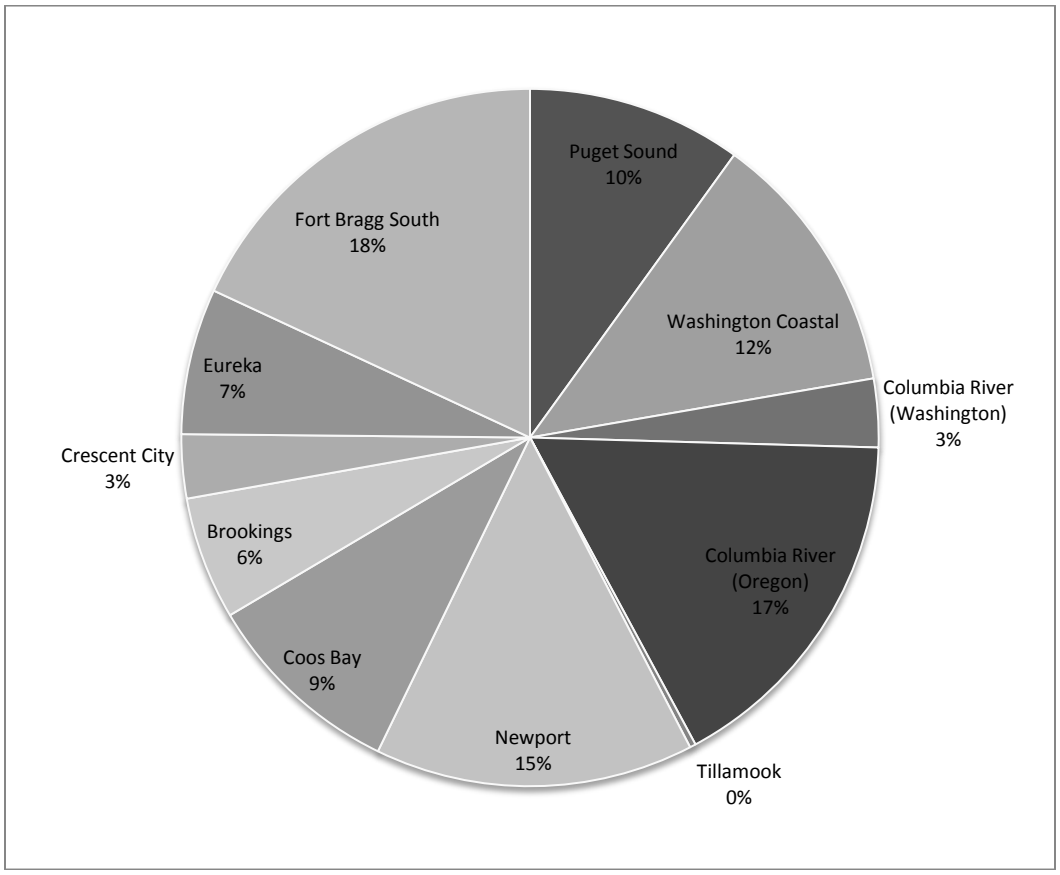

Figure 5-1. Proportion of groundfish ex-vessel revenue (inflation adjusted dollars) by port group area, 2006-2010.

Online Table 39 presents information on port engagement and dependence. Consistent with the previous figure, Astoria, Newport, and the Washington coast region are the most highly engaged ports in groundfish fisheries. However, Morro Bay, California, is by far the most dependent with 68 percent of total fishery revenue coming from groundfish, followed by Fort Bragg with 47 percent and Eureka, California, with 33 percent.

Figure 5-2 is based on online Table 43 showing groundfish landings by fishery sector and port group area in 2010. Tribal groundfish fisheries occur in Washington State only; the limited entry trawl fishery is prominent in Oregon ports while fixed gear fisheries dominate in California.

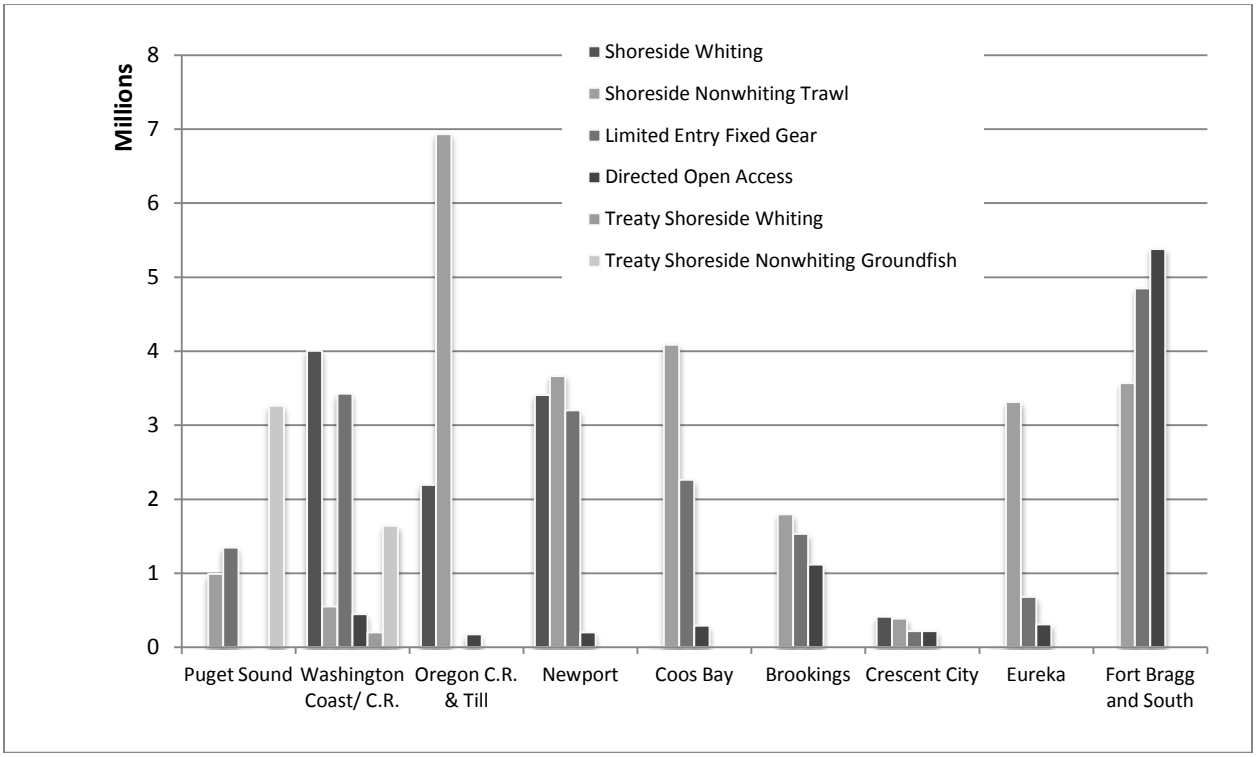

Figure 5-2. Groundfish ex-vessel revenue (dollars) by fishery sectors and port group area, 2010.

6. Participation

Online tables:
Table 44. Number of vessels making at least one groundfish landing by fishery sector and port group area, 2006-2010.
Table 45. Number of vessels making at least one groundfish landing, 2006-2010, by fishery sector and length interval (feet).

Figure 6-1, which is based on online Table 44, shows the number of vessels making at least one groundfish landing by fishery sector and port group during the 2006-2010 period. (Vessel counts are based on vessels ID numbers stored in the PacFIN database; many tribal vessels do not carry these numbers and thus it is not possible to derive accurate vessel counts. For that reason tribal sectors are not shown in the participation tables.) California from Fort Bragg south has a large number of vessels, dominated by those in the directed open access sector. Although Oregon ports account for a larger share of landings and ex-vessel revenue this is accomplished by fewer vessels.

Figure 6-2 helps to explain this contrast. Based on online Table 45, it shows the proportion of vessels in different length intervals by fishery sector, for vessels that landed groundfish at least once, 2006-2010. Vessels in the directed open access are generally smaller than those in the limited entry trawl sectors while the limited entry fixed fleet is intermediate. Table 6-1 shows the average length of vessels in these sectors, using the same source data on which online Table 45 is based.

Table 6-1. Average length of vessels in fishery sectors (based on data used for online Table 45).

Sector	Average length (ft)
Whiting Catcher-Processors	255
Whiting Mothership Catcher Vessels	88
Shoreside Whiting	84
Shoreside Nonwhiting Trawl	66
Limited Entry Fixed Gear	42
Directed Open Access	32
Incidental Open Access	35

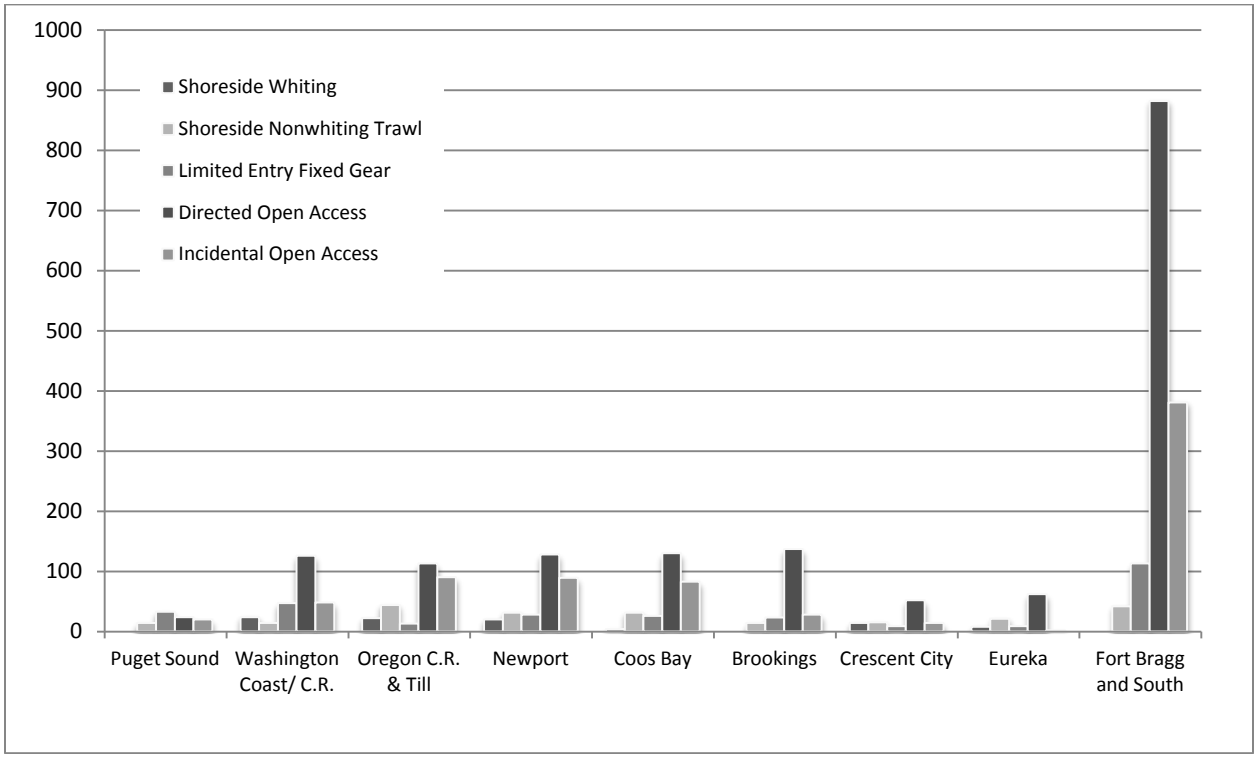

Figure 6-1. Number of vessels making at least one groundfish landing by sector and port group area, 2006-2010.

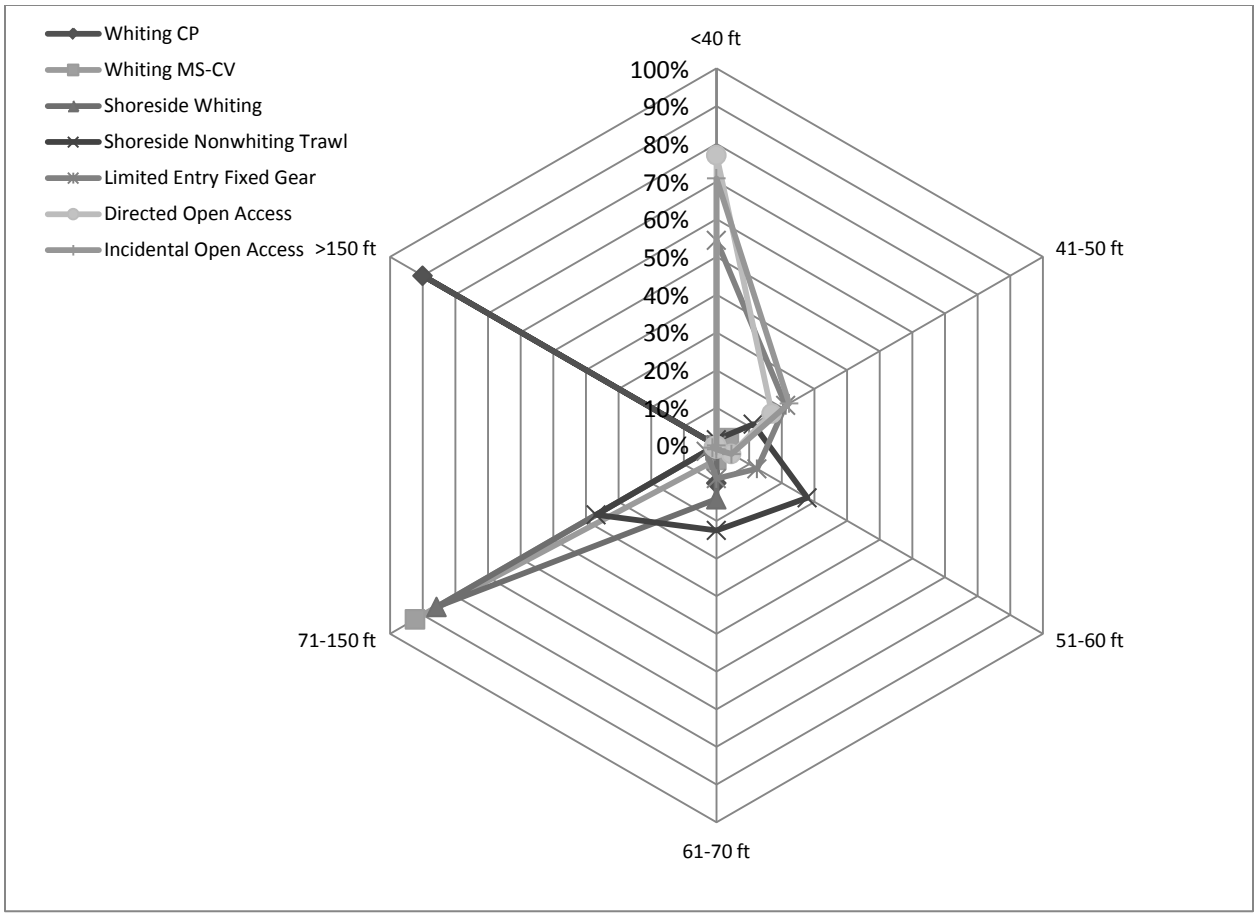

Figure 6-2. Proportion of vessels in each sector by length interval (feet) for vessels making at least one groundfish landing, 2006-2010 (CP = catcher-processor, MS-CV = mothership catcher vessel).

APPENDIX A
PacFIN Groundfish Sector Criteria

July 11, 2011

The field "dahl_sector" in the vdrfd table contains numeric codes identifying groundfish "sectors". These sectors are meant to identify landings according to fishery components, or sectors, used in management. Sectors are defined through a combination of species composition of landings, gear type, and permit status, among other factors. It should be noted that the results of this coding may differ from other categorizations of landings, such as that developed by the West Coast Groundfish Observer Program in their total mortality reports, because of differences in the underlying data structure (e.g., use of fish ticket data versus vessel summary data) and the procedures used to code the data. The record level for coding data is:

- Sector codes assigned at vessel-day-gear level
- Species composition criteria used in sector coding are calculated on a vessel-day-gear basis (agid+drvid+tdate+grgroup)

Sector codes 1, 2, and 16 are not available in the PacFIN Explorer tool, because the necessary landings data resides in a separate database (NORPAC).

The criteria used to code landings by sector are described below.

Global criteria

- Catch is from a PFMC area
- Sectors 1-15 PARGRP=C
- Sectors 16-19 PARGRP=I
- Sectors 01, 02, and 16 AGID = N (as noted)
- Sectors 03-15, 17-19 AGID = W, O, C

1: Whiting Catcher Processor Sector

- AGID =N
- Gear Group is TWL
- Valid trawl endorsement
- DRVID=PROC

2: Whiting Mothership Sector

- AGID =N
- Gear Group is TWL
- Valid trawl endorsement
- DRVID<>PROC

3: Shoreside Whiting Sector

- Removal type (ftl.removal_type) <> R (research)
- Whiting (PWHT) RWT >= 50% total vessel-day-gear RWT

- Gear Group is TWL
- Valid trawl endorsement

4: Shoreside Nonwhiting Trawl Sector

- Removal type (ftl.removal_type) <> E or R (EFP, research)
- Whiting (PWHT) RWT < 50% total vessel-day-gear RWT
- Nonwhiting groundfish (sp.mgrp=GRND and sp.spid <> PWHT) RWT >= 50% total vessel-day-gear RWT
- Groundfish (sp.mgrp=GRND) RWT > California halibut (CHLB,CHL1) RWT
- Pink shrimp, ridgeback prawn or spot prawn (PHSP, RPRW, SPRW) RWT < 100 lbs
- Gear Group is TWL
- Valid trawl endorsement

5: Nearshore Sector (Limited Entry)

- Gear Group is HKL or POT
- Removal type (ftl.removal_type) <> E or R (EFP, research)
- Sum of nearshore species[1] vessel-day-gear RWT >0
- Sablefish RWT = 0
- Groundfish (sp.mgrp=GRND) >= 50% of total vessel-day-gear RWT.[2]
- Valid longline endorsement or pot gear endorsement.

6: Nearshore Sector (Open Access)

- Gear Group = HKL or POT
- Removal type (ftl.removal_type) <> E or R (EFP, research)
- Sum of nearshore species vessel-day-gear RWT >0
- Sablefish RWT = 0
- Groundfish (sp.mgrp=GRND) >= 50% of total vessel-day-gear RWT
- No valid longline endorsement or pot gear endorsement

7: Non Nearshore Sector (Limited Entry)

- Gear Group is HKL or POT
- Removal type (ftl.removal_type) <> E or R (EFP, research)
- Sum of nearshore species RWT =0
- Sablefish RWT >0
- Groundfish (sp.mgrp=GRND) >= 50% of total vessel-day-gear RWT
- Valid longline endorsement or pot gear endorsement

8: Non Nearshore Sector (Open Access)

- Gear Group = HKL or POT
- Removal type (ftl.removal_type) <> E or R (EFP, research)
- Sum of nearshore species RWT =0
- Sum of sablefish vessel-day-gear RWT >0
- Groundfish (sp.mgrp=GRND) >= 50% of total vessel-day-gear RWT
- No valid longline endorsement or pot gear endorsement

9: Non Nearshore Non Sablefish Sector (Limited Entry)

- Gear Group is HKL or POT
- Removal type (ftl.removal_type) <> E or R (EFP, research)
- Sum of nearshore species RWT =0
- Sablefish RWT =0
- Groundfish (sp.mgrp=GRND) >= 50% of total vessel-day-gear RWT
- Valid longline endorsement or pot gear endorsement

10: Non Nearshore Non Sablefish Sector (Open Access)

- Gear Group = HKL or POT
- Removal type (ftl.removal_type) <> E or R (EFP, research)
- Sum of nearshore species RWT =0
- Sablefish =0
- Groundfish (sp.mgrp=GRND) >= 50% of total vessel-day-gear RWT
- No valid longline endorsement or pot gear endorsement

11: Non Fixed Gear Directed Open Access Sector

- Gear Group = NET or TLS
- Removal type (ftl.removal_type) <> E or R (EFP, research)
- Groundfish (sp.mgrp=GRND) RWT >= 50% of total vessel-day-gear RWT

12: Incidental Open Access Sector

- Removal type (ftl.removal_type) <> E or R (EFP, research)
- Groundfish (sp.mgrp=GRND) RWT > 0 and <50% of total vessel-day-gear RWT
- Gear Group = HKL or POT or NET or TLS
- No valid longline endorsement or pot gear endorsement

13: Exempted Trawl Sector (With Groundfish Landings)

- Removal type (ftl.removal_type) <> E or R (EFP, research)
- Gear group is TWL or TWS
- Groundfish (sp.mgrp=GRND) RWT > 0
- California halibut (CHLB, CHL1) RWT > 0 or pink shrimp, ridgeback prawn or spot prawn (PHSP, RPRW, SPRW) RWT >= 100 lbs
- No valid trawl endorsement

14: EFP and Miscellaneous Sector

- Groundfish (sp.mgrp=GRND) RWT > 0
- *Landings not accounted for in other sectors*

15: Commercial Nongroundfish Sector

- groundfish (sp.mgrp=GRND) RWT = 0

16: Treaty Mothership Whiting Sector

- AGID =N
- Whiting (PWHT) RWT >= 50% total vessel-day-gear RWT
- Gear Group is TWL
- PROC is a mothership

17: Treaty Shoreside Whiting Sector

- Whiting (PWHT) RWT >= 50% total vessel-day-gear RWT
- Gear Group is TWL

18: Treaty Shoreside Nonwhiting Groundfish Sector

- Whiting (PWHT) RWT < 50% total vessel-day-gear RWT
- Groundfish (sp.mgrp=GRND) RWT > 0

19: Treaty Nongroundfish Sector

- Groundfish (sp.mgrp=GRND) RWT = 0

Table A1. Sector code.

Code	Sector Name
1	Whiting Catcher Processor
2	Whiting Mothership
3	Shoreside Whiting
4	Shoreside Nonwhiting Trawl
5	Nearshore (Limited Entry)
6	Nearshore (Open Access)
7	Non Nearshore (Limited Entry)
8	Non Nearshore (Open Access)
9	Non Nearshore Non Sablefish (Limited Entry)
10	Non Nearshore Non Sablefish (Open Access)
11	Non Fixed Gear Directed Open Access
12	Incidental Open Access
13	Exempted Trawl (With Groundfish Landings)
14	EFP and Miscellaneous
15	Commercial Nongroundfish
16	Treaty Mothership Whiting
17	Treaty Shoreside Whiting
18	Treaty Shoreside Nonwhiting Groundfish
19	Treaty Nongroundfish

Table A2. Nearshore species list. (Source: M. Bellman, Heery, E., Jannot, J., and Majewski, J. 2010. *Explicit Retrieval and Processing of PacFIN Data Used in Total Mortality Estimation.* FRAM, NWFSC, NMFS.)

SPID	Common Name	SPID	Common Name
BISC	BROWN IRISH SCULPIN	KLPG	KELP GREENLING
BLCK	BLACK ROCKFISH	KLPR	KELP ROCKFISH
BLK1	NOM. BLACK ROCKFISH	NSHR	NORTHERN NEAR-SHORE ROCKFISH
BLU1	NOM. BLUE ROCKFISH	NUSR	NOR. UNSP. NEAR-SHORE ROCKFISH
BLUR	BLUE ROCKFISH	OLV1	NOM. OLIVE ROCKFISH
BRW1	NOM. BROWN ROCKFISH	OLVE	OLIVE ROCKFISH
BRWN	BROWN ROCKFISH	QLB1	NOM. QUILLBACK ROCKFISH
BSCL	BUFFALO SCULPIN	QLBK	QUILLBACK ROCKFISH
BYEL	BLACK-AND-YELLOW ROCKFISH	RCK2	UNSP. BOLINA RCKFSH
BYL1	NOM. BLACK-AND-YELLOW ROCKFISH	RCK7	UNSP. GOPHER RCKFSH
CBZ1	NOM. CABEZON	RCK9	BLACK+BLUE ROCKFISH
CBZN	CABEZON	RSCL	RED IRISH SCULPIN
CHN1	NOM. CHINA ROCKFISH	SCOR	CALIFORNIA SCORPIONFISH
CHNA	CHINA ROCKFISH	SCR1	NOM. CALIF. SCORPIONFISH
CLC1	NOM. CALICO ROCKFISH	SHP1	NOM. CALIFORNIA SHEEPHEAD
CLCO	CALICO ROCKFISH	SHPD	CALIFORNIA SHEEPHEAD
COP1	NOM. COPPER ROCKFISH	SSHR	SOUTHERN NEAR-SHORE ROCKFISH
COPP	COPPER ROCKFISH	SSRD	Deep So. Near-shore RF
GPH1	NOM. GOPHER ROCKFISH	SSRS	Shallow So. Near-shore RF
GPHR	GOPHER ROCKFISH	SUSR	SOU. UNSP. NEAR-SHORE ROCKFISH
GRAS	GRASS ROCKFISH	TRE1	NOM. TREEFISH
GRS1	NOM. GRASS ROCKFISH	TREE	TREEFISH
KGL1	NOM. KELP GREENLING	UDNR	UNSP. DEEP NEAR-SHORE RF
KLP1	NOM. KELP ROCKFISH	UGLG	UNSP. GREENLING
		USHR	UNSP. NEAR-SHORE ROCKFISH

[1] Nearshore rockfish species as defined by WCGOP spid list, see Table 2.

[2] This is equivalent to Groundfish (sp.mgrp=GRND) >= nongroundfish (all other sp.mgrp) by weight.

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APPENDIX B
Species Groups Used in Reporting

PacFIN species ids (spids), which generally code at the species level were grouped into one of three custom categorizations for reporting in the online tables. The table below shows the relationship between the PacFIN species ids and these categorizations. The species ids shown in the table are filtered to show only those for which landings were recorded in the vdrfd table. The groupings were used in the following tables:

Categorization 1: Tables 7-20.
Categorization 2: Tables 23-26, 35-36, and 40-41
Categorization 3: Tables 3-6

The shaded cells in the Categorization 2 and 3 columns highlight where they differ from Categorization 1.

SPID	Name	Complex	Complex2	Categorization 1	Categorization 2	Categorization 3
ARTH	Arrowtooth Flounder	FLAT	TRBT	Arrowtooth Flounder	Arrowtooth Flounder	Arrowtooth Flounder
ART1	Nom. Arrowtooth Flounder	FLAT	TRBT	Arrowtooth Flounder	Arrowtooth Flounder	Arrowtooth Flounder
DOVR	Dover Sole	FLAT	....	Dover Sole	Dover Sole	Dover Sole
DVR1	Nom. Dover Sole	FLAT	....	Dover Sole	Dover Sole	Dover Sole
EGLS	English Sole	FLAT	....	English Sole	Other Flatfish	Other Flatfish
EGL1	Nom. English Sole	FLAT	....	English Sole	Other Flatfish	Other Flatfish
DSOL	Deepsea Sole	FLAT	....	Non FMP Groundfish	Other Species	Other Flatfish
FNTS	Fantail Sole	FLAT	....	Non FMP Groundfish	Other Species	Other Flatfish
HTRB	Hornyhead Turbot	FLAT	....	Non FMP Groundfish	Other Species	Other Flatfish
LDB1	Nom. Longfin Sanddab	FLAT	SDAB	Non FMP Groundfish	Other Species	Other Flatfish
SDB1	Nom. Speckled Sanddab	FLAT	SDAB	Non FMP Groundfish	Other Species	Other Flatfish
SLNS	Slender Sole	FLAT	....	Non FMP Groundfish	Other Species	Other Flatfish
UDAB	Unsp. Sanddabs	FLAT	SDAB	Non FMP Groundfish	Other Species	Other Flatfish
UTRB	Unsp. Turbots	FLAT	TRBT	Non FMP Groundfish	Other Species	Other Flatfish
BSOL	Butter Sole	FLAT	....	Other Flatfish	Other Flatfish	Other Flatfish
CSOL	Curlfin Sole	FLAT	....	Other Flatfish	Other Flatfish	Other Flatfish
FSOL	Flathead Sole	FLAT	....	Other Flatfish	Other Flatfish	Other Flatfish
PDB1	Nom. Pacific Sanddab	FLAT	SDAB	Other Flatfish	Other Flatfish	Other Flatfish
REX1	Nom. Rex Sole	FLAT	....	Other Flatfish	Other Flatfish	Other Flatfish
RSL1	Nom. Rock Sole	FLAT	....	Other Flatfish	Other Flatfish	Other Flatfish
SSO1	Nom. Sand Sole	FLAT	....	Other Flatfish	Other Flatfish	Other Flatfish
SFL1	Nom. Starry Flounder	FLAT	....	Other Flatfish	Other Flatfish	Other Flatfish
OFLT	Other Flatfish	FLAT	....	Other Flatfish	Other Flatfish	Other Flatfish
PDAB	Pacific Sanddab	FLAT	SDAB	Other Flatfish	Other Flatfish	Other Flatfish
REX	Rex Sole	FLAT	....	Other Flatfish	Other Flatfish	Other Flatfish
RSOL	Rock Sole	FLAT	....	Other Flatfish	Other Flatfish	Other Flatfish
SSOL	Sand Sole	FLAT	....	Other Flatfish	Other Flatfish	Other Flatfish
STRY	Starry Flounder	FLAT	....	Other Flatfish	Other Flatfish	Other Flatfish

UFLT	Unsp. Flatfish	FLAT	....	Other Flatfish	Other Flatfish	Other Flatfish
PTR1	Nom. Petrale Sole	FLAT	....	Petrale Sole	Petrale Sole	Petrale Sole
PTRL	Petrale Sole	FLAT	....	Petrale Sole	Petrale Sole	Petrale Sole
BSKT	Big Skate	MGRN	SKAT	Other Groundfish	Other Groundfish	Misc. Groundfish
CSKT	California Skate	MGRN	SKAT	Other Groundfish	Other Groundfish	Misc. Groundfish
LSRK	Leopard Shark	MGRN	SHRK	Other Groundfish	Other Groundfish	Misc. Groundfish
LSKT	Longnose Skate	MGRN	SKAT	Other Groundfish	Other Groundfish	Misc. Groundfish
OGRN	Other Groundfish	MGRN	....	Other Groundfish	Other Groundfish	Misc. Groundfish
SSRK	Soupfin Shark	MGRN	SHRK	Other Groundfish	Other Groundfish	Misc. Groundfish
DSRK	Spiny Dogfish	MGRN	SHRK	Other Groundfish	Other Groundfish	Misc. Groundfish
RATF	Spotted Ratfish	MGRN	....	Other Groundfish	Other Groundfish	Misc. Groundfish
GRDR	Unsp. Grenadiers	MGRN	....	Other Groundfish	Other Groundfish	Misc. Groundfish
USKT	Unsp. Skate	MGRN	SKAT	Other Groundfish	Other Groundfish	Misc. Groundfish
ARRA	Aurora Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
BANK	Bank Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
BLCK	Black Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
RCK9	Black+Blue Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
BYEL	Black-And-Yellow Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
BLGL	Blackgill Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
BLUR	Blue Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
BCAC	Bocaccio	ROCK	....	Rockfish	Rockfish	Rockfish
RCK1	Bocaccio+Chilipepper Rckfsh	ROCK	....	Rockfish	Rockfish	Rockfish
BRNZ	Bronzespotted Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
BRWN	Brown Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
CLCO	Calico Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
SCOR	California Scorpionfish	ROCK	....	Rockfish	Rockfish	Rockfish
CNRY	Canary Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
RCK8	Canary+Vermilion Rckfsh	ROCK	....	Rockfish	Rockfish	Rockfish
CMEL	Chameleon Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
CLPR	Chilipepper	ROCK	....	Rockfish	Rockfish	Rockfish
CHNA	China Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
COPP	Copper Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
CWCD	Cowcod Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
DBRK	Darkblotched Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
FLAG	Flag Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
FRCK	Freckled Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
POP1	Gen. Shelf/Slope Rf	ROCK	....	Rockfish	Rockfish	Rockfish
GPHR	Gopher Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
GRAS	Grass Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
GBLC	Greenblotched Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
GSPT	Greenspotted Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish

GSRK	Greenstriped Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
HBRK	Halfbanded Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
HNYC	Honeycomb Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
KLPR	Kelp Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
MXRF	Mexican Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
ARR1	Nom. Aurora Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
BNK1	Nom. Bank Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
BLK1	Nom. Black Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
BYL1	Nom. Black-And-Yellow Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
BGL1	Nom. Blackgill Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
BLU1	Nom. Blue Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
BCC1	Nom. Bocaccio	ROCK	....	Rockfish	Rockfish	Rockfish
BRZ1	Nom. Bronzespotted Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
BRW1	Nom. Brown Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
CLC1	Nom. Calico Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
SCR1	Nom. California Scorpionfish	ROCK	....	Rockfish	Rockfish	Rockfish
CNR1	Nom. Canary Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
CML1	Nom. Chameleon Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
CLP1	Nom. Chilipepper	ROCK	....	Rockfish	Rockfish	Rockfish
CHN1	Nom. China Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
COP1	Nom. Copper Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
CWC1	Nom. Cowcod Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
DBR1	Nom. Darkblotched Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
FLG1	Nom. Flag Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
GPH1	Nom. Gopher Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
GRS1	Nom. Grass Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
GBL1	Nom. Greenblotched Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
GSP1	Nom. Greenspotted Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
GSR1	Nom. Greenstriped Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
HNY1	Nom. Honeycomb Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
KLP1	Nom. Kelp Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
MXR1	Nom. Mexican Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
OLV1	Nom. Olive Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
PNK1	Nom. Pink Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
PRR1	Nom. Pinkrose Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
POP2	Nom. Pop	ROCK	....	Rockfish	Rockfish	Rockfish
QLB1	Nom. Quillback Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
RDB1	Nom. Redbanded Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
RST1	Nom. Rosethorn Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish

ROS1	Nom. Rosy Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
SBL1	Nom. Shortbelly Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
SPK1	Nom. Speckled Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
SNS1	Nom. Splitnose Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
SQR1	Nom. Squarespot	ROCK	....	Rockfish	Rockfish	Rockfish
STR1	Nom. Starry Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
STL1	Nom. Stripetail Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
SWS1	Nom. Swordspine Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
TGR1	Nom. Tiger Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
TRE1	Nom. Treefish	ROCK	....	Rockfish	Rockfish	Rockfish
VRM1	Nom. Vermillion Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
WDW1	Nom. Widow Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
YEY1	Nom. Yelloweye Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
YTR1	Nom. Yellowtail Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
NUSR	Nor. Unsp. Near-Shore Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
NUSF	Nor. Unsp. Shelf Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
NUSP	Nor. Unsp. Slope Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
OLVE	Olive Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
ORCK	Other Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
POP	Pacific Ocean Perch	ROCK	....	Rockfish	Rockfish	Rockfish
PNKR	Pink Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
PRRK	Pinkrose Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
PUGT	Puget Sound Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
PGMY	Pygmy Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
QLBK	Quillback Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
RDBD	Redbanded Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
REDS	Redstripe Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
RSTN	Rosethorn Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
ROSY	Rosy Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
REYE	Rougheye Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
SHRP	Sharpchin Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
SBLY	Shortbelly Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
SRKR	Shortraker Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
SLGR	Silvergrey Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
SPKL	Speckled Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
SNOS	Splitnose Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
SQRS	Squarespot Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
STAR	Starry Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
STRK	Stripetail Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
SWSP	Swordspine Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
TIGR	Tiger Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish

TREE	Treefish	ROCK	....	Rockfish	Rockfish	Rockfish
RCK2	Unsp. Bolina Rckfsh	ROCK	....	Rockfish	Rockfish	Rockfish
UDNR	Unsp. Deep Near-Shore Rf	ROCK	....	Rockfish	Rockfish	Rockfish
RCK3	Unsp. Dpwtr Reds Rckfsh	ROCK	....	Rockfish	Rockfish	Rockfish
RCK7	Unsp. Gopher Rckfsh	ROCK	....	Rockfish	Rockfish	Rockfish
USHR	Unsp. Near-Shore Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
UPOP	Unsp. Pop Group	ROCK	....	Rockfish	Rockfish	Rockfish
RCK4	Unsp. Reds Rckfsh	ROCK	....	Rockfish	Rockfish	Rockfish
URCK	Unsp. Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
RCK6	Unsp. Rosefish Rckfsh	ROCK	....	Rockfish	Rockfish	Rockfish
USLF	Unsp. Shelf Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
USLP	Unsp. Slope Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
RCK5	Unsp. Small Reds Rckfsh	ROCK	....	Rockfish	Rockfish	Rockfish
VRML	Vermilion Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
WDOW	Widow Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
YEYE	Yelloweye Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
YMTH	Yellowmouth Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
YTRK	Yellowtail Rockfish	ROCK	....	Rockfish	Rockfish	Rockfish
LSPN	Longspine Thornyhead	ROCK	TRNY	Thornyheads	Thornyheads	Thornyheads
LSP1	Nom. Longspine Thornyhead	ROCK	TRNY	Thornyheads	Thornyheads	Thornyheads
SSP1	Nom. Shortspine Thornyhead	ROCK	TRNY	Thornyheads	Thornyheads	Thornyheads
SSPN	Shortspine Thornyhead	ROCK	TRNY	Thornyheads	Thornyheads	Thornyheads
THDS	Thornyheads (Mixed)	ROCK	TRNY	Thornyheads	Thornyheads	Thornyheads
LCOD	Lingcod	ROND	....	Lingcod	Lingcod	Lingcod
LCD1	Nom. Lingcod	ROND	....	Lingcod	Lingcod	Lingcod
PLCK	Walleye Pollock	ROND	....	Non FMP Groundfish	Other Species	Other Roundfish
CBZN	Cabezon	ROND	....	Other Roundfish	Other Groundfish	Other Roundfish
KLPG	Kelp Greenling	ROND	....	Other Roundfish	Other Groundfish	Other Roundfish
CBZ1	Nom. Cabezon	ROND	....	Other Roundfish	Other Groundfish	Other Roundfish
KGL1	Nom. Kelp Greenling	ROND	....	Other Roundfish	Other Groundfish	Other Roundfish
PCOD	Pacific Cod	ROND	....	P. Cod	Other Groundfish	Other Roundfish
PWHT	Pacific Whiting	ROND	....	P. Whiting	P. Whiting	P. Whiting
SABL	Sablefish	ROND	....	Sablefish	Sablefish	Sablefish

Table 1. Landings (metric tons) by management group, 1981-2010.
Table 2. Ex-vessel revenue (inflation-adjusted dollars) by management group, 1981-2010
Table 3. Landings (mt) for major groundfish species and species groups, 1981-2010.
Table 4. Ex-vessel revenue (inflation-adjusted dollars) for major groundfish species and species groups, 1986-2010
Table 5. Groundfish landings (mt) by selected gear types (gr.group), 1981-2010.
Table 6. Ex-vessel revenue (inflation-adjusted dollars) by selected gear groups (gr.group), 1981-2010
Table 7. Landings by selected species and species groups (mt) by the nonwhiting groundfish limited entry trawl sector, 2006-2010
Table 8. Ex-vessel revenue from selected species and species groups (inflation adjusted dollars) by the nonwhiting groundfish limited entry trawl fishery
Table 9. Landings of selected species and species groups (mt) by the limited entry fixed gear sector, 2006-2010
Table 10. Ex-vessel revenue from selected species and species groups (inflation adjusted dollars) by the limited entry fixed gear sector, 2006-201C
Table 11. Landings of selected species and species groups (mt) by the directed open access sector (includes fixed gear, net gear, and troll gear), 2006-201C
Table 12. Ex-vessel revenue from selected species and species groups (inflation adjusted dollars) by the directed open access sector (includes fixed gear, ne gear, and troll gear), 2006-2010.
Table 13. Landings of selected species and species groups (mt) by the non nearshore fixed gear fishery, 2006-2010
Table 14. Ex-vessel revenue from selected species and species groups (inflation adjusted dollars) by the non nearshore fixed gear fishery, 2006-201C
Table 15. Landings of selected species and species groups (mt) by the nearshore sector, 1996-2010
Table 16. Ex-vessel revenue from selected species and species groups (inflation adjusted dollars) for the nearshore fixed gear sector, 2006-201C
Table 17. Landings of selected species and species groups (mt) by the incidental open access sector, 2006-2010
Table 18. Ex-vessel revenue from selected species and species groups (inflation adjusted dollars) by the incidental open access sector, 2006-201C
Table 19. Landings of selected species and species groups (mt) by the limited entry and open access nonearshore nonsablefish sector, 2006-201C
Table 20. Ex-vessel revenue for selected species and species groups (inflation adjusted dollars) for the limited entry and open access nonnearshore
Table 21. Groundfish landings (mt) by shoreside commercial fishery sector, 2006-2010
Table 22. Groundfish ex-vessel revenue (inflation adjusted dollars) by shoreside commercial fishery sector, 2006-2010
Table 23. Landings of species and species groups (mt) by the treaty nonwhiting sector, 2006-2010
Table 24. Ex-vessel revenue from species and species groups (inflation adjusted dollars) by the treaty nonwhiting sector, 2006-2010
Table 25. Average groundfish landings (mt) by 2-month period and species by the tribal nonwhiting fishery sector, 2006-2010
Table 26. Average groundfish exvessel revenue (inflation adjusted dollars) by 2-month period and species by the tribal nonwhiting fishery sector, 2006-201C
Table 27. Landings of Pacific whiting and other species (mt) by Pacific whiting sectors, 2006-2010
Table 28. Ex-vessel revenue from Pacific whiting and other species (inflation adjusted dollars) by Pacific whiting sectors, 2006-2010
Table 29. Nonwhiting landings by species category (mt) and whiting sectors, 2006-2010
Table30. Nonwhiting ex-vessel revenue by species category (inflation adjusted dollars) and whiting sectors, 2006-2010
Table 31. Average annual groundfish landings (mt) by 2-month period and fishery sector, 2006-2010
Table 32. Average annual groundfish ex-vessel revenue (dollars) by 2-month period and fishery sector, 2006-2010
Table 33. Average monthly landings of Pacific whiting (mt) by whiting sectors, 2006-2010.
Table 34. Average monthly ex-vessel revenue from Pacific whiting (inflation adjusted dollars) by whiting sectors, 2006-2010.
Table 35. Average groundfish landings (mt) by 2-month period and species, 2006-2010.
Table 36. Average groundfish ex-vessel revenue (inflation adjusted dollars) by 2-month period and species, 2006-2010.
Table 37. Groundfish landings (mt) by port group area, 2006-2010.
Table 38. Groundfish ex-vessel revenue (inflation adjusted dollars) by port group area, 2006-2010
Table 39. Engagement (groundfish landings in port as percent of coastwide landings) and dependence (groundfish landings in port as percent of tota
Table 40. Groundfish landings (mt) by species and species groups by port group area, 2009-2010
Table 41. Groundfish ex-vessel revenue (dollars) by species and species groups by port group area, 2009-2010
Table 42. Groundfish landings (mt) by fishery sectors and port group area, 2009-2010
Table 43. Groundfish ex-vessel revenue (dollars) by fishery sectors and port group area, 2009-2010
Table 44. Number of vessels making at least one groundfish landing by fishery sector and port group area, 2006-2010
Table 45. Number of vessels making at least one groundfish landing, 2006-2010, by fishery sector and length interval (feet)
Table 46. Gross National Product Implicit Price Deflator used to compute inflation adjusted dollars (Index 2005=100, 4th quarter values used)

Notes:

Data extracted from PacFIN vdrfd table except where noted

All landings from PFMC area (ar.council = 'P')

Metric tons computed by dividing round weight pounds by 2204.6

Current (2010) dollars computed using GNP implicit price deflator (see Table 46)

Table 1. Landings (metric tons) by management group, 1981-2010.

Year	CPS	Crab	Groundfish	HMS	Other	Salmon	Shellfish	Shrimp	Total	Pct of Ann Average
1981	139,769.58	9,651.79	103,343.74	26,883.37	14,786.76	7,972.04	10,813.01	19,185.70	332,405.99	107%
1982	126,969.97	8,234.59	119,266.59	17,272.15	12,162.46	8,823.00	3,622.65	13,433.37	309,784.78	100%
1983	69,346.25	7,861.52	98,977.79	55,062.23	11,011.16	2,934.79	3,287.67	6,878.82	255,360.23	83%
1984	63,821.53	7,176.46	89,791.99	43,992.12	10,633.05	2,178.21	3,661.06	5,617.61	226,872.03	73%
1985	68,174.24	8,558.46	90,922.85	14,248.55	13,603.41	5,045.70	2,447.21	13,609.33	216,609.75	70%
1986	84,041.74	8,390.11	82,588.19	13,011.39	19,730.88	7,377.47	507.78	26,892.66	242,540.22	78%
1987	90,440.74	9,373.11	91,981.85	12,880.70	24,553.00	9,410.10	457.49	31,513.82	270,610.81	87%
1988	108,364.10	17,508.95	92,248.23	15,004.83	27,919.66	12,514.90	344.31	32,832.33	306,737.31	99%
1989	113,411.88	16,813.53	99,371.63	7,711.35	30,984.73	6,868.52	424.99	36,398.23	311,984.86	101%
1990	88,509.72	14,506.79	94,538.76	9,886.41	29,738.77	4,684.59	319.87	25,631.58	267,816.49	87%
1991	90,591.52	7,026.61	105,546.76	11,006.83	25,043.31	3,734.27	261.64	20,156.69	263,367.63	85%
1992	60,595.78	15,882.39	132,555.13	13,608.44	19,226.49	2,047.90	328.23	36,422.23	280,666.59	91%
1993	79,172.42	18,075.68	116,393.81	16,958.74	16,154.82	2,213.34	536.99	23,496.31	273,002.11	88%
1994	85,673.99	18,167.05	135,677.27	16,065.34	14,598.02	1,801.46	335.57	15,752.21	288,070.91	93%
1995	128,069.37	17,467.51	134,492.59	14,046.22	13,705.81	4,755.41	299.88	12,312.04	325,148.83	105%
1996	135,920.24	25,138.80	146,452.01	25,956.55	12,779.07	3,305.82	157.64	14,918.89	364,629.02	118%
1997	151,057.43	13,012.70	143,570.50	23,201.49	11,678.05	3,696.96	98.38	18,880.72	365,196.23	118%
1998	74,372.20	12,388.17	131,010.70	16,322.35	7,682.10	1,849.56	56.73	5,662.24	249,344.05	81%
1999	171,035.40	16,191.23	125,883.19	11,878.06	9,187.99	2,710.87	44.81	14,225.57	351,157.12	113%
2000	225,774.20	13,565.52	123,031.22	10,954.48	9,815.85	3,703.87	113.54	16,283.32	403,242.00	130%
2001	195,826.78	11,849.99	103,555.59	12,707.67	8,989.33	3,362.90	93.07	18,599.05	354,984.38	115%
2002	182,842.84	16,113.34	75,057.03	10,833.71	9,665.66	5,108.26	168.20	26,245.90	326,034.94	105%
2003	125,367.45	34,013.11	82,904.95	17,648.04	7,931.84	6,015.01	108.37	14,594.33	288,583.10	93%
2004	143,398.35	28,537.33	122,303.36	15,189.96	8,283.58	5,663.00	190.68	9,687.54	333,253.80	108%
2005	157,885.17	25,097.89	135,450.53	10,050.43	8,208.31	4,295.99	112.84	11,404.18	352,505.34	114%
2006	159,783.16	35,707.41	151,306.76	13,502.58	7,716.10	1,190.26	137.30	8,913.54	378,257.11	122%
2007	195,044.39	20,722.11	117,494.99	12,518.61	8,590.30	1,450.67	147.51	11,604.13	367,572.71	119%
2008	145,497.61	17,372.64	97,667.39	11,609.99	10,162.90	263.99	176.60	15,834.74	298,585.86	96%
2009	170,986.32	23,439.77	82,193.73	13,243.19	9,616.81	475.71	239.65	14,951.89	315,147.07	102%
2010	201,504.65	24,860.25	94,029.98	11,924.30	8,920.73	1,030.70	259.81	20,733.19	363,263.61	117%
Total	**3,833,249.02**	**502,704.81**	**3,319,609.11**	**505,180.08**	**423,080.95**	**126,485.27**	**29,753.48**	**542,672.16**	**9,282,734.88**	
Pct of total	41.3%	5.4%	35.8%	5.4%	4.6%	1.4%	0.3%	5.8%	100.0%	
Ann Average	127,774.97	16,756.83	110,653.64	16,839.34	14,102.70	4,216.18	991.78	18,089.07	309,424.50	

Extracted from vdrfd table on 9/16/2011

Commercial and Tribal landings

Table 2. Ex-vessel revenue (inflation-adjusted dollars) by management group, 1981-2010

Year	CPS	Crab	Groundfish	HMS	Other	Salmon	Shellfish	Shrimp	Total	Pct of Ann Average
1981	$55,998,640	$40,580,647	$93,229,050	$90,721,366	$22,288,376	$65,792,501	$25,432,486	$48,285,533	$442,328,599	129%
1982	$55,322,921	$38,969,996	$117,427,483	$47,978,701	$18,983,221	$73,642,032	$13,804,394	$34,948,659	$401,077,406	117%
1983	$47,805,588	$47,086,506	$99,730,154	$112,607,566	$19,132,417	$17,314,437	$9,395,067	$24,535,011	$377,606,747	110%
1984	$24,453,350	$42,958,055	$88,978,854	$101,893,972	$19,557,095	$19,751,549	$11,244,809	$18,246,717	$327,084,401	95%
1985	$34,866,834	$46,787,219	$100,147,761	$47,142,830	$24,192,622	$37,306,843	$10,898,137	$23,706,446	$325,048,692	95%
1986	$33,598,605	$43,010,208	$98,722,814	$44,431,760	$34,106,303	$44,041,568	$3,794,877	$58,549,065	$360,255,200	105%
1987	$35,273,990	$46,351,931	$121,684,223	$50,841,837	$36,832,098	$78,147,310	$4,487,382	$82,553,488	$456,172,260	133%
1988	$40,236,046	$73,293,177	$111,917,781	$51,621,970	$48,036,286	$111,311,679	$3,562,448	$51,070,077	$491,049,464	143%
1989	$35,736,781	$65,292,712	$108,733,051	$28,239,495	$55,078,825	$42,275,687	$5,293,153	$48,129,812	$388,779,515	113%
1990	$33,739,336	$72,144,093	$97,544,217	$28,217,128	$61,768,338	$33,321,535	$4,126,220	$44,300,089	$375,160,955	109%
1991	$33,871,271	$34,161,610	$106,974,995	$25,079,569	$70,573,131	$20,899,142	$3,001,733	$38,624,848	$333,186,298	97%
1992	$26,952,406	$58,349,834	$102,571,512	$36,425,737	$59,547,250	$13,347,872	$4,920,137	$42,603,433	$344,718,180	100%
1993	$23,673,975	$62,241,512	$89,981,088	$41,606,827	$53,030,173	$12,586,380	$6,375,742	$27,771,173	$317,266,871	92%
1994	$29,858,616	$74,109,481	$93,705,943	$41,620,757	$50,489,230	$10,018,552	$4,025,860	$32,219,257	$336,047,695	98%
1995	$50,829,359	$87,673,862	$117,307,656	$29,713,773	$46,741,173	$20,891,628	$4,336,602	$30,270,493	$387,764,547	113%
1996	$57,064,621	$100,686,034	$109,142,458	$54,740,119	$40,807,696	$12,403,894	$3,049,626	$31,760,728	$409,655,176	119%
1997	$58,123,006	$69,813,081	$105,714,304	$46,267,781	$38,314,643	$13,211,411	$1,469,863	$30,015,270	$362,929,359	106%
1998	$12,718,044	$61,922,378	$68,951,586	$33,230,961	$24,956,400	$7,386,586	$90,872	$17,814,278	$227,071,105	66%
1999	$54,820,857	$87,064,158	$73,018,912	$30,147,601	$30,637,713	$12,345,498	$62,221	$25,590,655	$313,687,615	91%
2000	$51,997,188	$78,497,843	$76,148,362	$28,374,330	$33,403,147	$17,353,203	$199,359	$25,505,978	$311,479,409	91%
2001	$39,204,004	$64,521,136	$61,189,658	$29,530,353	$28,912,583	$12,896,883	$216,641	$20,409,264	$256,880,521	75%
2002	$38,894,064	$71,228,478	$50,634,217	$20,609,000	$27,988,163	$17,165,404	$436,514	$25,591,691	$252,547,531	73%
2003	$40,955,506	$137,952,033	$56,068,035	$33,030,085	$24,777,051	$24,645,867	$158,243	$13,413,240	$331,000,059	96%
2004	$36,715,629	$116,956,847	$52,929,791	$33,512,906	$24,927,883	$35,040,401	$531,332	$12,472,183	$313,086,971	91%
2005	$47,328,047	$92,186,210	$60,105,741	$25,209,308	$22,616,691	$26,433,472	$307,014	$15,431,335	$289,617,819	84%
2006	$43,315,124	$139,325,637	$64,629,995	$28,595,754	$23,454,372	$10,826,810	$381,551	$11,633,164	$322,162,407	94%
2007	$46,527,791	$108,908,235	$61,203,800	$26,311,495	$22,613,735	$13,234,041	$373,908	$15,875,700	$295,048,707	86%
2008	$45,473,694	$91,751,243	$70,962,957	$31,621,411	$27,774,601	$2,058,144	$498,538	$23,609,752	$293,750,341	85%
2009	$73,809,779	$105,574,538	$66,775,005	$30,530,684	$26,249,034	$2,536,705	$683,999	$15,248,117	$321,407,861	93%
2010	$84,466,663	$112,013,059	$67,528,408	$30,891,643	$29,299,137	$8,962,013	$690,350	$20,152,102	$354,003,375	103%
Total	**$1,293,631,737**	**$2,271,411,755**	**$2,593,659,809**	**$1,260,746,719**	**$1,047,089,388**	**$817,149,043**	**$123,849,077**	**$910,337,558**	**$10,317,875,085**	
Pct of total	12.5%	22.0%	25.1%	12.2%	10.1%	7.9%	1.2%	8.8%	100.0%	
Ann Average	$43,121,058	$75,713,725	$86,455,327	$42,024,891	$34,902,980	$27,238,301	$4,128,303	$30,344,585	$343,929,170	

Extracted from vdrfd table on 9/16/2011

Commercial and Tribal landings

Table 3. Landings (mt) for major groundfish species and species groups, 1981-2010.

Year	Pacific Whiting	Sablefish	Lingcod	Other Roundfish	Rockfish	Thornyheads	Arrowtooth Flounder	Dover Sole	Petrale Sole	Other Flatfish	Misc. Groundfish	Total	Pct of Ann Avg
1981	838.49	11,419.00	3,303.51	1,277.60	57,778.41	1,801.34	1,074.11	16,467.51	2,040.71	6,383.47	959.60	103,343.75	93%
1982	1,026.58	18,627.22	3,839.97	954.68	59,315.90	2,157.94	2,351.00	20,918.69	2,630.35	6,716.65	727.60	119,266.58	108%
1983	1,050.81	14,651.87	4,251.83	612.82	46,289.15	1,749.44	2,076.55	20,084.40	2,214.22	5,357.45	639.24	98,977.78	89%
1984	2,720.70	14,077.47	4,058.55	609.43	36,819.40	3,189.01	2,379.34	19,207.95	1,739.18	4,375.94	615.01	89,791.98	81%
1985	3,894.06	14,132.40	3,838.56	428.83	33,263.35	4,068.97	2,679.40	20,616.41	1,839.47	5,389.02	772.38	90,922.85	82%
1986	3,465.34	13,289.92	1,906.66	367.86	33,386.66	3,610.12	2,229.95	17,351.33	1,750.44	4,797.07	432.83	82,588.18	75%
1987	4,795.35	12,601.56	2,586.84	2,318.62	36,526.19	3,747.22	2,829.71	18,488.70	2,204.86	5,397.45	485.35	91,981.85	83%
1988	6,867.50	10,743.82	2,767.35	3,385.67	35,193.38	5,663.33	1,945.80	18,184.50	2,149.20	4,834.16	513.52	92,248.23	83%
1989	7,413.67	10,284.53	3,562.60	2,231.59	37,238.32	8,085.43	3,552.48	18,880.49	2,152.72	5,381.18	588.63	99,371.64	90%
1990	9,632.47	9,065.38	2,906.69	1,085.80	33,178.74	10,084.29	5,824.04	15,752.83	1,764.62	4,416.40	827.49	94,538.75	85%
1991	23,970.24	9,500.79	3,167.02	1,819.62	28,737.10	6,514.66	4,945.28	18,273.48	1,927.38	5,423.84	1,267.34	105,546.75	95%
1992	56,127.83	9,361.16	1,887.54	1,814.26	28,121.10	8,872.98	3,573.19	16,074.38	1,553.52	3,644.34	1,524.82	132,555.12	120%
1993	42,108.29	8,146.51	2,210.28	1,392.36	29,004.72	9,224.00	2,712.89	14,371.18	1,503.23	3,540.54	2,179.82	116,393.82	105%
1994	73,617.02	7,578.61	1,906.78	915.95	23,538.68	8,047.89	3,249.40	9,388.52	1,375.15	3,562.66	2,496.59	135,677.25	123%
1995	74,962.72	7,914.84	1,468.95	606.89	21,979.65	7,554.82	2,321.19	10,592.69	1,659.06	3,692.14	1,739.64	134,492.59	122%
1996	85,128.63	8,317.03	1,559.36	568.93	21,668.98	6,531.82	2,191.57	12,187.02	1,828.63	3,152.44	3,317.62	146,452.03	132%
1997	87,417.00	7,943.19	1,568.76	769.61	18,245.16	5,504.35	2,343.51	10,125.52	1,947.74	3,814.27	3,891.37	143,570.48	130%
1998	87,857.01	4,384.05	350.13	634.07	16,297.77	3,525.74	3,168.48	8,022.91	1,462.78	2,839.90	2,467.85	131,010.69	118%
1999	83,471.15	6,647.72	357.76	470.92	10,814.73	2,648.18	5,284.97	9,141.29	1,498.13	2,927.71	2,620.63	125,883.19	114%
2000	85,854.70	6,281.21	145.59	471.78	8,887.44	2,377.56	3,276.41	8,779.79	1,893.29	2,391.30	2,672.15	123,031.22	111%
2001	73,412.40	5,636.59	156.18	747.86	5,673.37	1,760.84	2,464.84	6,890.23	1,845.25	2,709.78	2,258.25	103,555.59	94%
2002	45,708.13	3,798.30	205.46	4,628.02	2,962.16	2,715.68	2,084.59	6,300.92	1,797.11	2,900.01	1,956.64	75,057.02	68%
2003	55,335.57	5,419.96	165.38	1,587.24	1,668.35	2,401.72	2,327.04	7,355.82	2,069.61	2,506.11	2,068.14	82,904.94	75%
2004	96,504.40	5,755.34	178.06	1,566.19	2,112.13	1,477.32	2,327.01	6,745.95	1,962.34	2,346.34	1,328.27	122,303.35	111%
2005	109,053.36	6,208.32	202.97	1,148.26	1,896.54	1,311.96	2,239.64	6,902.46	2,734.35	2,165.30	1,587.37	135,450.53	122%
2006	127,166.35	6,197.73	260.43	437.02	1,462.47	1,459.37	1,918.49	5,967.91	2,610.20	2,141.22	1,685.56	151,306.75	137%
2007	91,442.11	5,240.46	267.88	157.02	1,493.40	1,822.17	2,261.74	9,278.99	2,252.91	1,661.31	1,617.01	117,495.00	106%
2008	67,760.53	5,871.02	284.87	109.77	1,523.64	2,679.35	2,667.64	11,217.40	2,219.78	1,174.03	2,159.36	97,667.39	88%
2009	49,223.34	7,198.37	233.24	325.56	2,073.26	2,702.38	3,844.33	11,743.92	1,768.00	1,328.24	1,753.10	82,193.74	74%
2010	64,654.39	6,822.87	173.05	413.19	2,280.26	2,711.99	3,225.88	10,384.55	803.09	965.73	1,594.98	94,029.98	85%
Grand Total	**1,522,480.14**	**263,117.24**	**49,772.25**	**33,857.42**	**639,430.41**	**126,001.87**	**85,370.47**	**385,697.74**	**57,197.32**	**107,936.00**	**48,748.16**	**3,319,609.02**	
Pact of Total	45.9%	7.9%	1.5%	1.0%	19.3%	3.8%	2.6%	11.6%	1.7%	3.3%	1.5%	100.0%	
Ann. Average	50,749.34	8,770.57	1,659.08	1,128.58	21,314.35	4,200.06	2,845.68	12,856.59	1,906.58	3,597.87	1,624.94	110,653.63	

Extracted from vdrfd table on 9/16/2011

Commercial and Tribal landings

Table 4. Ex-vessel revenue (inflation-adjusted dollars) for major groundfish species and species groups, 1986-2010.

Year	Pacific Whiting	Sablefish	Lingcod	Other Roundfish	Rockfish	Thornyheads	Arrowtooth Flounder	Dover Sole	Petrale Sole	Other Flatfish	Misc. Groundfish	Total	Pct of Ann Avg
1981	$291,911	$10,888,271	$3,441,773	$1,089,319	$44,309,076	$1,840,498	$467,261	$16,446,520	$4,770,982	$9,034,393	$649,046	$93,229,050	108%
1982	$357,410	$20,417,863	$4,143,794	$911,502	$50,043,305	$2,110,100	$1,116,100	$20,994,039	$6,913,599	$9,805,400	$614,367	$117,427,479	136%
1983	$357,758	$14,644,577	$4,460,285	$626,368	$43,569,836	$1,704,457	$871,142	$18,804,815	$6,350,802	$7,794,621	$545,495	$99,730,155	115%
1984	$745,607	$12,275,612	$4,010,581	$574,802	$37,497,378	$3,102,652	$926,043	$17,947,978	$4,990,216	$6,210,583	$697,404	$88,978,855	103%
1985	$1,020,413	$19,068,736	$4,004,375	$412,594	$37,504,187	$4,009,556	$1,044,839	$19,397,938	$5,331,840	$7,627,060	$726,223	$100,147,761	116%
1986	$793,245	$19,259,619	$2,325,798	$373,810	$40,959,743	$3,884,445	$875,172	$17,247,936	$5,234,775	$7,197,562	$570,708	$98,722,812	114%
1987	$1,128,443	$22,792,852	$3,671,792	$2,836,351	$48,231,921	$4,542,701	$1,551,662	$21,041,590	$6,715,264	$8,557,571	$614,081	$121,684,226	141%
1988	$1,838,094	$20,729,853	$3,677,877	$3,240,782	$40,626,274	$7,183,647	$830,312	$19,881,857	$6,319,026	$7,033,148	$556,912	$111,917,783	129%
1989	$1,672,397	$16,845,602	$4,391,748	$2,016,359	$40,246,118	$10,428,433	$1,234,070	$18,056,594	$6,140,843	$7,129,120	$571,767	$108,733,051	126%
1990	$2,219,810	$14,729,800	$3,478,121	$992,391	$36,271,584	$12,996,070	$2,051,049	$14,084,190	$4,874,959	$5,261,142	$585,102	$97,544,217	113%
1991	$5,713,003	$21,142,193	$3,621,200	$1,793,541	$32,973,402	$9,632,804	$1,846,535	$17,852,702	$5,162,932	$6,506,505	$730,179	$106,974,996	124%
1992	$8,538,851	$19,656,047	$2,333,623	$1,941,754	$32,601,178	$12,931,592	$1,207,214	$14,384,466	$3,978,051	$4,233,340	$765,395	$102,571,511	119%
1993	$4,107,220	$14,110,669	$2,628,289	$1,568,241	$32,376,847	$13,466,144	$828,400	$12,204,355	$3,676,264	$4,048,562	$966,095	$89,981,087	104%
1994	$6,959,585	$18,998,728	$2,408,048	$1,299,613	$28,134,525	$17,780,231	$979,036	$8,450,632	$3,522,530	$4,029,719	$1,143,297	$93,705,943	108%
1995	$10,640,626	$31,800,397	$2,017,314	$1,515,516	$27,823,000	$22,743,950	$773,928	$10,297,239	$4,716,630	$4,083,844	$895,214	$117,307,658	136%
1996	$6,851,216	$34,232,548	$2,139,001	$1,674,134	$25,882,936	$16,719,073	$657,451	$11,023,804	$4,909,670	$3,450,777	$1,601,849	$109,142,458	126%
1997	$10,675,128	$36,531,429	$2,168,689	$1,994,681	$21,924,831	$12,480,640	$662,443	$8,566,905	$5,059,031	$3,761,691	$1,888,839	$105,714,305	122%
1998	$6,162,088	$14,635,821	$738,160	$2,374,992	$21,053,040	$7,239,832	$925,167	$7,788,375	$3,940,110	$2,860,355	$1,233,646	$68,951,588	80%
1999	$8,713,274	$21,735,962	$799,334	$2,148,510	$15,234,712	$6,477,391	$1,462,928	$8,442,248	$3,998,605	$2,858,254	$1,147,694	$73,018,912	84%
2000	$9,471,392	$25,191,262	$429,061	$2,465,833	$13,761,430	$6,497,678	$1,007,914	$8,322,247	$5,247,834	$2,476,374	$1,277,337	$76,148,363	88%
2001	$6,356,823	$21,239,711	$470,042	$2,170,984	$9,837,721	$4,854,490	$771,550	$6,527,197	$4,941,087	$2,905,450	$1,114,599	$61,189,656	71%
2002	$5,227,086	$13,941,801	$621,718	$2,966,760	$6,116,428	$7,001,647	$568,708	$5,974,681	$4,311,176	$3,029,652	$874,560	$50,634,217	59%
2003	$6,203,290	$21,373,429	$477,305	$2,834,974	$3,716,297	$5,203,481	$617,987	$6,822,768	$5,246,684	$2,593,026	$978,792	$56,068,032	65%
2004	$8,380,893	$19,092,329	$491,580	$2,706,312	$4,466,190	$3,209,981	$610,660	$6,106,539	$4,948,026	$2,314,480	$602,802	$52,929,791	61%
2005	$13,131,582	$22,198,402	$503,945	$1,852,588	$4,085,368	$2,928,964	$567,285	$6,088,776	$6,030,479	$2,022,393	$695,959	$60,105,741	70%
2006	$16,955,466	$24,321,485	$612,795	$1,159,274	$3,729,871	$3,445,819	$486,025	$5,180,721	$6,166,905	$1,858,315	$713,316	$64,629,993	75%
2007	$14,554,808	$21,574,876	$686,320	$832,450	$4,039,296	$3,682,862	$519,174	$7,947,713	$5,156,315	$1,372,082	$837,905	$61,203,800	71%
2008	$15,427,597	$27,597,187	$747,669	$825,745	$4,288,737	$4,890,968	$595,795	$9,370,288	$5,045,172	$982,958	$1,190,840	$70,962,957	82%
2009	$6,398,040	$34,803,676	$609,708	$946,355	$4,703,716	$4,274,686	$841,478	$8,753,131	$3,599,038	$1,088,520	$756,657	$66,775,004	77%
2010	$9,935,220	$35,812,516	$474,805	$998,882	$4,533,920	$4,535,457	$686,894	$6,951,677	$2,004,335	$845,105	$749,596	$67,528,407	78%
Total	**$190,828,278**	**$651,643,252**	**$62,584,748**	**$49,145,416**	**$720,542,868**	**$221,800,248**	**$27,584,220**	**$360,959,920**	**$149,303,179**	**$132,972,002**	**$26,295,675**	**$2,593,659,807**	
Pct of Total	7.4%	25.1%	2.4%	1.9%	27.8%	8.6%	1.1%	13.9%	5.8%	5.1%	1.0%	100.0%	
Ann. Average	$6,360,943	$21,721,442	$2,086,158	$1,638,181	$24,018,096	$7,393,342	$919,474	$12,031,997	$4,976,773	$4,432,400	$876,523	$86,455,327	

Extracted from vdrfd table on 9/16/2011

Commercial and Tribal landings

Table 5. Groundfish landings (mt) by selected gear types (gr.group), 1981-2010.

Year	Hook-and-Line	Misc.	Net	Pot	Shrimp Trawl	Trawl	Troll	Grand Total	Pct of Ann Average
1981	4,308.38	2.13	1,769.48	3,960.66	1,846.06	90,949.01	508.01	103,343.73	93%
1982	5,015.93	3.14	2,249.06	6,549.96	1,393.61	103,487.58	567.31	119,266.59	108%
1983	3,989.46	5.68	3,202.77	5,988.58	1,220.51	84,140.92	429.87	98,977.79	89%
1984	3,270.63	9.16	4,328.12	4,452.32	496.44	76,919.79	315.53	89,791.99	81%
1985	5,361.06	1.07	5,499.36	3,938.38	521.84	75,261.38	339.76	90,922.85	82%
1986	6,715.68	2.27	5,776.83	3,052.13	1,599.06	65,170.01	272.19	82,588.17	75%
1987	7,575.75	11.20	4,649.68	2,138.61	1,621.52	75,789.37	195.73	91,981.86	83%
1988	6,439.68	2.55	3,054.42	2,276.69	1,309.95	78,951.50	213.43	92,248.22	83%
1989	6,679.55	11.06	3,247.50	2,125.04	1,232.29	85,800.45	275.74	99,371.63	90%
1990	6,626.61	27.83	3,162.61	1,704.60	965.94	81,692.84	358.34	94,538.77	85%
1991	8,293.21	1.04	1,897.79	1,085.62	872.67	93,281.75	114.69	105,546.77	95%
1992	9,150.74	6.24	1,793.65	826.73	925.59	119,692.78	159.39	132,555.12	120%
1993	7,559.41	1.48	1,286.86	871.13	1,596.69	104,843.57	234.66	116,393.80	105%
1994	6,460.81	0.47	757.39	1,403.77	889.73	125,792.63	372.47	135,677.27	123%
1995	6,396.33	1.69	791.77	1,117.67	754.14	125,213.64	217.36	134,492.60	122%
1996	7,474.42	1.66	327.81	860.86	889.96	136,675.30	222.00	146,452.01	132%
1997	7,100.04	0.11	322.35	661.93	393.14	134,677.49	415.43	143,570.49	130%
1998	4,661.39	1.96	386.99	545.49	385.61	124,750.66	278.60	131,010.70	118%
1999	4,646.83	0.28	139.65	821.37	426.93	119,754.94	93.19	125,883.19	114%
2000	4,110.30	1.03	93.79	938.82	310.91	117,541.01	35.37	123,031.23	111%
2001	3,696.97	0.49	87.14	733.51	240.81	98,759.98	36.69	103,555.59	94%
2002	3,191.32	2.98	73.35	520.33	89.14	71,155.55	23.72	75,056.39	68%
2003	3,489.05	0.66	79.75	841.58	31.46	78,438.33	24.13	82,904.96	75%
2004	3,704.33	*	65.30	850.33	27.18	117,615.50	39.08	122,303.36	111%
2005	3,932.26	2.38	56.01	1,023.03	15.81	130,378.91	42.13	135,450.53	122%
2006	3,663.22	0.07	62.75	1,078.72	19.26	146,443.65	39.09	151,306.76	137%
2007	3,156.73	0.73	46.48	713.50	24.51	113,530.07	22.97	117,494.99	106%
2008	3,588.33	0.20	33.60	703.48	14.44	93,312.51	14.84	97,667.40	88%
2009	4,389.21	*	12.53	891.17	16.35	76,871.07	13.20	82,193.72	74%
2010	4,370.99	0.14	8.45	924.28	13.56	88,694.80	17.78	94,030.00	85%
Grand Total	**159,018.62**	**101.53**	**45,263.24**	**53,600.29**	**20,145.11**	**3,035,586.99**	**5,892.70**	**3,319,608.48**	
Pct. Of Total	4.8%	0.0%	1.4%	1.6%	0.6%	91.4%	0.2%	100.0%	
Ann. Average	5,300.62	3.38	1,508.77	1,786.68	671.50	101,186.23	196.42	110,653.62	

Extrated from vdrfd table on 9/17/2011

*Excluded for confidentiality (in addition all landings by dredge gear excluded

Commercial and Tribal landings

Table 6. Ex-vessel revenue (inflation-adjusted dollars) by selected gear groups (gr.group), 1981-2010.

Year	Hook-and-Line	Misc.	Net	Pot	Shrimp Trawl	Trawl	Troll	Total	Pct of Ann Average
1981	$7,941,227	$5,787	$3,243,061	$4,084,176	$1,317,780	$76,027,731	$609,289	$93,229,050	108%
1982	$9,366,718	$7,377	$3,629,918	$10,263,656	$1,149,528	$92,265,073	$745,211	$117,427,483	136%
1983	$6,627,672	$8,858	$4,373,675	$7,416,715	$1,063,773	$79,719,333	$520,127	$99,730,154	115%
1984	$5,729,323	$12,417	$6,010,199	$4,568,514	$461,202	$71,772,934	$424,262	$88,978,852	103%
1985	$11,083,959	$27,574	$8,259,052	$6,154,538	$492,690	$73,651,540	$478,407	$100,147,761	116%
1986	$13,585,940	$25,477	$8,537,308	$5,139,905	$1,640,195	$69,369,953	$424,034	$98,722,812	114%
1987	$17,705,680	$32,455	$7,357,831	$4,217,063	$1,948,664	$90,091,493	$331,036	$121,684,223	141%
1988	$16,094,171	$35,757	$4,726,655	$4,556,062	$1,097,167	$85,077,237	$330,731	$111,917,780	129%
1989	$14,622,600	$15,389	$4,736,954	$3,475,434	$1,046,488	$84,409,563	$426,622	$108,733,051	126%
1990	$14,466,304	$35,073	$4,700,503	$2,788,510	$824,394	$74,136,324	$593,108	$97,544,216	113%
1991	$21,706,665	$2,889	$2,709,189	$2,496,374	$834,091	$79,042,283	$183,506	$106,974,996	124%
1992	$20,654,961	$13,608	$2,530,510	$1,870,886	$900,050	$76,361,212	$240,286	$102,571,512	119%
1993	$16,128,604	$2,181	$1,915,906	$1,714,069	$1,423,545	$68,493,561	$303,222	$89,981,088	104%
1994	$15,955,940	$2,370	$1,132,713	$4,047,203	$1,065,330	$70,946,827	$555,560	$93,705,943	108%
1995	$22,676,242	$3,824	$1,223,857	$4,990,659	$1,020,845	$87,031,747	$360,482	$117,307,655	136%
1996	$25,918,507	$3,931	$541,630	$4,168,425	$1,120,986	$77,042,326	$346,654	$109,142,458	126%
1997	$28,977,509	$404	$495,303	$3,807,445	$541,778	$71,287,162	$604,701	$105,714,302	122%
1998	$14,752,418	$2,457	$554,249	$2,301,672	$548,175	$50,399,245	$393,370	$68,951,586	80%
1999	$17,807,328	$1,759	$225,756	$3,463,460	$589,062	$50,776,418	$155,130	$73,018,912	84%
2000	$18,554,111	$8,670	$147,740	$4,947,613	$578,303	$51,830,596	$81,331	$76,148,364	88%
2001	$16,356,984	$5,688	$153,951	$3,479,252	$357,902	$40,761,919	$73,964	$61,189,660	71%
2002	$13,273,801	$30,619	$127,504	$2,562,238	$168,494	$34,415,625	$54,334	$50,632,615	59%
2003	$15,277,893	$9,649	$131,584	$4,127,223	$79,081	$36,391,086	$51,519	$56,068,035	65%
2004	$15,159,948	*	$140,954	$3,347,388	$68,124	$34,136,688	$73,352	$52,929,781	61%
2005	$16,690,539	$6,630	$91,500	$4,140,739	$65,487	$39,027,530	$83,315	$60,105,740	70%
2006	$16,911,012	$775	$123,643	$4,776,004	$57,096	$42,686,053	$75,413	$64,629,996	75%
2007	$15,477,614	$8,932	$103,129	$3,235,263	$48,971	$42,261,325	$68,567	$61,203,801	71%
2008	$18,280,125	$2,632	$57,438	$3,817,773	$23,913	$48,746,317	$34,758	$70,962,956	82%
2009	$23,203,337	*	$14,838	$4,781,025	$22,925	$38,733,132	$17,993	$66,775,006	77%
2010	$25,174,682	$1,684	$13,145	$5,395,652	$29,362	$36,874,001	$39,883	$67,528,409	78%
Grand Total	**$496,161,815**	**$319,949**	**$68,009,695**	**$126,134,936**	**$20,585,403**	**$1,873,766,231**	**$8,680,166**	**$2,593,658,195**	
Pct. Of Total	19.1%	0.0%	2.6%	4.9%	0.8%	72.2%	0.3%	100.0%	
Ann. Average	$16,538,727	$10,665	$2,266,990	$4,204,498	$686,180	$62,458,874	$289,339	$86,455,273	

Extracted from vdrfd table on 9/17/2011

*Excluded for confidentiality (in addition all landings by dredge gear excluded)

Commercial and Tribal landings

Table 7. Landings by selected species and species groups (mt) by the nonwhiting groundfish limited entry trawl sector, 2006-2010

	2006	2007	2008	2009	2010	Total	Ann. Average	Pct Total
Lingcod	114.62	118.93	107.02	108.47	72.50	521.54	104.31	0.5%
P. Cod	330.52	43.18	11.47	91.12	99.55	575.84	115.17	0.5%
P. Whiting	*	2.33	0.50	0.34	8.79	14.47	2.89	0.0%
Sablefish	2,466.49	2,427.56	2,870.91	3,009.34	2,510.95	13,285.25	2,657.05	11.9%
Rockfish	514.89	575.75	602.81	756.56	824.50	3,274.51	654.90	2.9%
Thornyheads	1,261.04	1,604.47	2,437.72	2,458.88	2,427.23	10,189.34	2,037.87	9.1%
Arrowtooth Flounder	1,714.34	2,025.10	2,634.55	3,822.78	3,208.71	13,405.48	2,681.10	12.0%
Dover Sole	5,739.59	8,950.81	10,969.56	11,600.93	10,318.86	47,579.75	9,515.95	42.7%
English Sole	867.89	621.45	326.56	265.10	157.72	2,238.72	447.74	2.0%
Petrale Sole	2,581.20	2,207.15	2,174.66	1,695.88	770.16	9,429.05	1,885.81	8.5%
Other Flatfish	1,085.24	871.55	734.77	868.09	682.54	4,242.19	848.44	3.8%
Other Groundfish	1,199.42	1,090.30	1,391.31	1,442.01	1,307.45	6,430.49	1,286.10	5.8%
Non FMP Groundfish	16.13	12.91	8.16	18.98	2.24	58.42	11.68	0.1%
California Halibut	11.93	14.52	9.99	9.35	9.31	55.10	11.02	0.0%
CPS	25.61	0.62	*	0.26	0.17	26.67	5.33	0.0%
All Other Species	12.23	24.91	33.15	39.75	14.51	124.55	24.91	0.1%

PacFIN vdrfd table 8/18/11

*Excluded for confidentiality

Table 8. Ex-vessel revenue from selected species and species groups (inflation adjusted dollars) by the nonwhiting groundfish limited entry trawl fishery, 2006-2010

	2006	2007	2008	2009	2010	Total	Ann. Average	Pct Total
Lingcod	$175,689	$206,137	$169,274	$177,277	$132,993	$861,370	$172,274	0.6%
P. Cod	$384,828	$54,944	$14,590	$94,642	$98,004	$647,008	$129,402	0.5%
P. Whiting	*	$406	$1,244	$5	$2,588	$4,586	$917	0.0%
Sablefish	$7,626,213	$8,184,081	$11,558,947	$12,596,233	$10,726,640	$50,692,114	$10,138,423	36.3%
Rockfish	$555,295	$714,662	$816,840	$938,171	$985,643	$4,010,610	$802,122	2.9%
Thornyheads	$2,070,651	$2,210,381	$3,177,728	$2,621,771	$2,536,808	$12,617,339	$2,523,468	9.0%
Arrowtooth Flounder	$441,582	$465,791	$588,988	$837,125	$684,967	$3,018,453	$603,691	2.2%
Dover Sole	$4,983,056	$7,667,414	$9,158,052	$8,636,999	$6,898,491	$37,344,012	$7,468,802	26.8%
English Sole	$652,386	$453,224	$240,248	$179,036	$106,387	$1,631,281	$326,256	1.2%
Petrale Sole	$6,094,980	$5,044,028	$4,934,054	$3,421,561	$1,923,806	$21,418,428	$4,283,686	15.3%
Other Flatfish	$967,580	$738,063	$619,884	$720,943	$582,144	$3,628,614	$725,723	2.6%
Other Groundfish	$425,907	$558,586	$828,475	$622,659	$663,405	$3,099,032	$619,806	2.2%
Non FMP Groundfish	$11,477	$10,661	$7,030	$20,222	$2,040	$51,430	$10,286	0.0%
California Halibut	$83,957	$111,225	$87,682	$78,547	$76,523	$437,934	$87,587	0.3%
CPS	$15,621	$271	*	$46	$49	$16,002	$3,200	0.0%
All Other Species	11,016.05	18,222.67	16,313.23	15,052.83	6,475.00	67,079.80	$13,416	0.0%

PacFIN vdrfd table 8/18/11

*Excluded for confidentiality

Table 9. Landings of selected species and species groups (mt) by the limited entry fixed gear sector, 2006-2010

	2006	2007	2008	2009	2010	Total	Ann. Average	Pct Total
Lingcod	17.34	14.81	20.74	15.88	12.34	81.11	16.22	0.6%
P. Cod	0.32	0.06	0.05	1.16	2.81	4.4	0.88	0.0%
P. Whiting	0.27	0.62	0.23	0.38	0.02	1.52	0.30	0.0%
Sablefish	2209.09	1782.22	1843.57	2428.4	2469.62	10732.9	2,146.58	79.5%
Other Roundfish	3.02	5.95	10.54	9.51	8.74	37.76	7.55	0.3%
Rockfish	136.37	113.92	131.22	172.88	150.44	704.83	140.97	5.2%
Thornyheads	171.93	174.08	199.41	199.94	230.42	975.78	195.16	7.2%
Arrowtooth Flounder	2.53	2.85	3.47	4.43	3.05	16.33	3.27	0.1%
Dover Sole	1.29	1.05	1.67	2.81	3.22	10.04	2.01	0.1%
Petrale Sole	0.21	0.2	0.34	0.12	0.11	0.98	0.20	0.0%
Other Flatfish		0.19	1.31	0.49	1.63	3.62	0.72	0.0%
Other Groundfish	167.21	241.29	246.84	73.41	64.66	793.41	158.68	5.9%
Non FMP Groundfish	*	*	*	*	0.8	0.83	0.17	0.0%
Pacific Halibut	47.05	37.48	27.68	10.22	2.16	124.59	24.92	0.9%
California Halibut	*	*	*	*	*	0.63	0.13	0.0%
CPS	0.15	0.06	0.08	*	*	0.43	0.09	0.0%
Crab	*	*	0.11	0.04	0.23	0.5	0.10	0.0%
HMS	1.6	1.56	1.44	0.69	0.55	5.84	1.17	0.0%
Other Nongroundfish	1.07	0.67	1.44	0.9	1.37	5.45	1.09	0.0%

PacFIN vdrfd table 8/18/11

*Excluded for confidentiality

Table 10. Ex-vessel revenue from selected species and species groups (inflation adjusted dollars) by the limited entry fixed gear sector, 2006-2010

	2006	2007	2008	2009	2010	Total	Ann. Average	Pct Total
Lingcod	$42,489	$43,034	$61,136	$46,432	$34,487	$227,579	$45,516	0.3%
P. Cod	$230	$63	$58	$854	$6,948	$8,154	$1,631	0.0%
P. Whiting	$682	$1,661	$2,076	$494	$91	$5,005	$1,001	0.0%
Sablefish	$10,628,949	$8,842,433	$10,259,869	$13,727,010	$15,408,960	$58,867,220	$11,773,444	83.6%
Other Roundfish	$27,130	$49,520	$80,822	$72,349	$65,443	$295,264	$59,053	0.4%
Rockfish	$330,135	$325,491	$405,445	$408,509	$344,214	$1,813,793	$362,759	2.6%
Thornyheads	$1,318,491	$1,389,236	$1,635,727	$1,547,646	$1,817,563	$7,708,663	$1,541,733	11.0%
Arrowtooth Flounder	$672	$671	$1,016	$1,156	$686	$4,201	$840	0.0%
Dover Sole	$1,373	$837	$1,775	$3,484	$2,998	$10,468	$2,094	0.0%
Petrale Sole	$296	$373	$628	$240	$179	$1,716	$343	0.0%
Other Flatfish	$0	$405	$5,318	$2,325	$12,019	$20,068	$4,014	0.0%
Other Groundfish	$88,646	$131,967	$124,525	$34,266	$39,530	$418,934	$83,787	0.6%
Non FMP Groundfish	*	*	*	*	$744	$1,066	$213	0.0%
Pacific Halibut	$347,283	$300,831	$213,920	$55,566	$16,518	$934,117	$186,823	1.3%
California Halibut	*	*	*	*	*	$5,397	$1,079	0.0%
CPS	$240	$248	$142	*	*	$940	$188	0.0%
Crab	*	*	$189	$119	$521	$1,941	$388	0.0%
HMS	$3,518	$3,451	$2,993	$1,654	$3,422	$15,038	$3,008	0.0%
Other Nongroundfish	$3,196	$3,242	$10,000	$6,707	$10,831	$33,976	$6,795	0.0%

PacFIN vdrfd table 8/18/11

*Excluded for confidentiality

Table 11. Landings of selected species and species groups (mt) by the directed open access sector (includes fixed gear, net gear, and troll gear), 2006-2010.

	2006	2007	2008	2009	2010	Total	Ann. Average	Pct Total
Lingcod	52.87	57.75	56.76	45.08	38.51	250.97	50.19	3.9%
P. Cod	0.11		0.02	0.05	0.1	0.28	0.06	0.0%
P. Whiting	*	*	*	*	*	0.02	0.00	0.0%
Sablefish	801.02	467.48	578.47	993.93	1047.55	3888.45	777.69	61.0%
Other Roundfish	61.76	59.67	59.46	59.64	56.11	296.64	59.33	4.7%
Rockfish	312.55	326.18	316.42	362.62	283.8	1601.57	320.31	25.1%
Arrowtooth Flounder	0.56	0.39	2.18	1.29	0.75	5.17	1.03	0.1%
Dover Sole	0.27	0.31	0.63	4.98	0.51	6.7	1.34	0.1%
Petrale Sole	0.19	0.04	0.04	0.03	0.16	0.46	0.09	0.0%
Other Flatfish	0.52	0.36	0.82	0.42	0.31	2.43	0.49	0.0%
Other Groundfish	89	25.76	63.24	21.37	21.8	221.17	44.23	3.5%
Non FMP Groundfish	0.01	0.05		0.01	0.04	0.11	0.02	0.0%
Pacific Halibut	6.71	8.36	12.62	2.4	1.22	31.31	6.26	0.5%
California Halibut	1.39	1.55	1.45	1.05	0.71	6.15	1.23	0.1%
CPS	0.14	0.16	0.17	0.06	0.01	0.54	0.11	0.0%
Crab	2.43	1.31	1.4	1.6	1	7.74	1.55	0.1%
HMS	1.5	1.53	1.32	0.25	0.44	5.04	1.01	0.1%
Salmon	0.25	0.38		0.02	0.15	0.8	0.16	0.0%
Shrimp	*	1.58	*	2.41	0.28	6.37	1.27	0.1%
Other Nongroundfish	4.86	3.72	6.85	3.09	3.47	21.99	4.40	0.3%

PacFIN vdrfd table 8/31/11

*Excluded for confidentiality

Table 12. Ex-vessel revenue from selected species and species groups (inflation adjusted dollars) by the directed open access sector (includes fixed gear, net gear, and troll gear), 2006-2010.

	2006	2007	2008	2009	2010	Total	Ann. Average	Pct Total
Lingcod	$227,686	$258,782	$262,982	$215,859	$183,516	$1,148,825	$229,765	3.4%
P. Cod	$102		$30	$32	$60	$227	$45	0.0%
P. Whiting	*	*	*	*	*	$101	$20	0.0%
Sablefish	$3,054,225	$1,830,811	$2,708,635	$4,500,457	$5,093,064	$17,187,192	$3,437,438	50.2%
Other Roundfish	$678,016	$651,806	$675,623	$603,330	$570,471	$3,179,246	$635,849	9.3%
Rockfish	$2,255,759	$2,483,408	$2,485,180	$2,439,088	$2,065,374	$11,728,809	$2,345,762	34.2%
Arrowtooth Flounder	$178	$206	$575	$387	$168	$1,514	$303	0.0%
Dover Sole	$840	$326	$1,195	$4,679	$655	$7,695	$1,539	0.0%
Petrale Sole	$436	$92	$112	$63	$507	$1,210	$242	0.0%
Other Flatfish	$2,246	$1,815	$4,189	$1,625	$1,526	$11,401	$2,280	0.0%
Other Groundfish	$83,372	$28,050	$43,276	$16,687	$15,417	$186,802	$37,360	0.5%
Non FMP Groundfish	$32	$260		$92	$95	$480	$95	0.0%
Pacific Halibut	$48,726	$65,383	$110,827	$14,640	$10,314	$249,890	$49,978	0.7%
California Halibut	$14,107	$16,486	$15,860	$10,544	$7,523	$64,520	$12,904	0.2%
CPS	$341	$327	$503	$265	$60	$1,496	$299	0.0%
Crab	$9,215	$7,440	$5,088	$4,995	$3,552	$30,290	$6,058	0.1%
HMS	$3,579	$3,951	$3,151	$567	$1,140	$12,388	$2,478	0.0%
Salmon	$2,485	$3,866		$258	$1,684	$8,293	$1,659	0.0%
Shrimp	*	$49,275	*	$60,040	$7,399	$180,716	$36,143	0.5%
Other Nongroundfish	$23,457	$17,830	$43,333	$25,027	$28,504	$138,151	$27,630	0.4%

PacFIN vdrfd table 8/31/11

*Excluded for confidentiality

Table 13. Landings of selected species and species groups (mt) by the non nearshore fixed gear fishery, 2006-2010.

	2006	2007	2008	2009	2010	Total	Ann. Average	Pct Total
Lingcod	14.97	11.54	19.93	15.19	11.81	73.44	14.69	0.4%
P. Cod	0.43	0.06	0.06	1.21	2.91	4.67	0.93	0.0%
P. Whiting	0.25	0.50	0.11	0.36	0.03	1.25	0.25	0.0%
Sablefish	3,006.78	2,242.54	2,418.93	3,421.15	3,514.18	14,603.58	2,920.72	85.7%
Rockfish	129.23	88.23	97.10	163.85	163.35	641.76	128.35	3.8%
Thornyheads	169.48	152.23	155.36	149.40	172.15	798.62	159.72	4.7%
Arrowtooth Flounder	3.09	3.23	5.65	5.72	3.80	21.49	4.30	0.1%
Dover Sole	1.56	1.30	2.26	3.57	3.69	12.38	2.48	0.1%
Petrale Sole	0.27	0.18	0.27	0.13	0.27	1.12	0.22	0.0%
Other Flatfish	*	0.17	0.02	0.04	0.09	0.46	0.09	0.0%
Other Groundfish	153.21	161.95	220.21	88.69	82.77	706.83	141.37	4.1%
Non FMP Groundfish	*	*	*	*	0.82	0.82	0.16	0.0%
Pacific Halibut	53.74	45.69	40.30	12.62	3.38	155.73	31.15	0.9%
California Halibut	*	0.06	*	*	0.04	0.19	0.04	0.0%
CPS	0.07	0.04	0.04	*	0.01	0.30	0.06	0.0%
Crab	1.62	1.32	1.00	0.98	0.69	5.61	1.12	0.0%
HMS	0.67	0.90	0.41	0.26	0.73	2.97	0.59	0.0%
Shrimp	*	1.58	*	2.81	1.16	8.07	1.61	0.0%
Other Nongroundfish	1.05	0.53	0.57	0.58	0.34	3.07	0.61	0.0%

PacFIN vdrfd table 8/19/11

*Excluded for confidentiality

Table 14. Ex-vessel revenue from selected species and species groups (inflation adjusted dollars) by the non nearshore fixed gear fishery, 2006-2010.

	2006	2007	2008	2009	2010	Total	Ann. Average	Pct Total
Lingcod	$26,800	$21,748	$45,755	$38,244	$28,368	$160,915	$32,183	0.2%
P. Cod	$332	$64	$76	$886	$7,006	$8,364	$1,673	0.0%
P. Whiting	$554	$925	$1,000	$378	$101	$2,958	$592	0.0%
Sablefish	$13,674,151	$10,649,938	$12,951,782	$18,222,488	$20,484,141	$75,982,500	$15,196,500	89.0%
Rockfish	$238,409	$128,620	$166,712	$284,323	$314,959	$1,133,023	$226,605	1.3%
Thornyheads	$1,299,105	$1,212,632	$1,261,733	$1,142,174	$1,308,659	$6,224,303	$1,244,861	7.3%
Arrowtooth Flounder	$850	$822	$1,591	$1,543	$852	$5,658	$1,132	0.0%
Dover Sole	$2,209	$1,105	$2,741	$4,433	$3,443	$13,931	$2,786	0.0%
Petrale Sole	$484	$325	$529	$281	$686	$2,305	$461	0.0%
Other Flatfish	*	$370	$81	$179	$288	$1,256	$251	0.0%
Other Groundfish	$80,563	$86,778	$110,388	$41,828	$50,796	$370,353	$74,071	0.4%
Non FMP Groundfish	*	*	*	*	$761	$769	$154	0.0%
Pacific Halibut	$395,854	$365,095	$324,747	$70,206	$26,832	$1,182,734	$236,547	1.4%
California Halibut	*	$536	*	*	$409	$1,378	$276	0.0%
CPS	$157	$176	$80	*	$52	$767	$153	0.0%
Crab	$6,737	$8,325	$3,939	$3,547	$2,758	$25,306	$5,061	0.0%
HMS	$1,125	$2,061	$551	$769	$3,983	$8,489	$1,698	0.0%
Shrimp	*	$49,275	*	$63,347	$14,298	$194,686	$38,937	0.2%
Other Nongroundfish	$2,164	$1,565	$1,609	$7,640	$6,154	$19,132	$3,826	0.0%

PacFIN vdrfd table 8/19/11

*Excluded for confidentiality

Table 15. Landings of selected species and species groups (mt) by the nearshore sector, 1996-2010

	2006	2007	2008	2009	2010	Total	Ann. Average	Pct Total
Lingcod	51.71	53.88	55.89	44.89	38.09	244.46	48.89	11.2%
Other Roundfish	64.78	65.57	69.9	69.13	64.84	334.22	66.84	15.3%
Rockfish	291.57	327.26	338.18	353.21	266.51	1576.73	315.35	72.2%
Other Flatfish	0.3	0.27	1.48	0.8	1.12	3.97	0.79	0.2%
Other Groundfish	2.35	1.15	0.83	0.6	0.62	5.55	1.11	0.3%
Non FMP Groundfish	0.01	0.05	*	0.01	*	0.09	0.02	0.0%
California Halibut	0.29	0.28	0.38	0.4	0.48	1.83	0.37	0.1%
CPS	0.12	0.16	0.08	0.06	0	0.42	0.08	0.0%
Crab	0.07	0.02	0.5	0.63	0.52	1.74	0.35	0.1%
Other Nongroundfish	2.95	1.83	2.25	2.59	3.4	13.02	2.60	0.6%

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*Excluded for confidentiality

Table 16. Ex-vessel revenue from selected species and species groups (inflation adjusted dollars) for the nearshore fixed gear sector, 2006-2010.

	2006	2007	2008	2009	2010	Total	Ann. Average	Pct Total
Lingcod	$212,199	$236,039	$263,855	$217,534	$184,629	$1,114,256	222,851	6.8%
Other Roundfish	$661,320	$674,587	$741,627	$666,723	$635,788	$3,380,045	$676,009	20.6%
Rockfish	$2,120,767	$2,470,845	$2,608,988	$2,473,926	$2,082,837	$11,757,363	$2,351,473	71.7%
Other Flatfish	$1,523	$1,444	$6,505	$3,655	$7,751	$20,878	$4,176	0.1%
Other Groundfish	$3,409	$2,388	$1,276	$1,064	$927	$9,064	$1,813	0.1%
Non FMP Groundfish	$31	$250	*	$91	*	$451	$90	0.0%
California Halibut	$2,443	$2,808	$4,325	$4,516	$5,596	$19,688	$3,938	0.1%
CPS	$317	$315	$361	$262	$15	$1,270	$254	0.0%
Crab	$286	$82	$1,300	$1,469	$1,287	$4,424	$885	0.0%
Other Nongroundfish	$14,098	$9,297	$15,327	$17,792	$24,896	$81,410	$16,282	0.5%

PacFIN vdrfd table 8/19/11

*Excluded for confidentiality

Table 17. Landings of selected species and species groups (mt) by the incidental open access sector, 2006-2010.

	2006	2007	2008	2009	2010	Total	Ann. Average	Pct Total
Lingcod	2.75	3.47	3	1.76	2.87	13.85	2.77	0.1%
Sablefish	17.53	20	11.76	10.57	2.65	62.51	12.50	0.3%
Other Roundfish	1.37	1.35	0.84	0.79	1.39	5.74	1.15	0.0%
Rockfish	5.99	4.46	2.07	2.16	4.37	19.05	3.81	0.1%
Thornyheads	*	*	*	*	*	0.02	0.00	0.0%
Arrowtooth Flounder	0.49	0.81	0.4	0.78	0.01	2.49	0.50	0.0%
Dover Sole	*	*	0.03	0.05	*	0.1	0.02	0.0%
English Sole	0	0	0	0	0	0	0.00	0.0%
Petrale Sole	0	*	0.01	0.01	*	0.04	0.01	0.0%
Other Flatfish	0.48	0.3	0.11	0.11	0.23	1.23	0.25	0.0%
Other Groundfish	15.56	18.75	7.34	8.26	5.17	55.08	11.02	0.3%
Non FMP Groundfish	*	0.08	0.03	0.01	0.02	0.14	0.03	0.0%
Pacific Halibut	70.45	74.43	44.59	41.36	28.47	259.3	51.86	1.3%
California Halibut	24.04	24.58	14.04	12.05	12.42	87.13	17.43	0.4%
CPS	287.87	2878.82	8680.29	3078.46	3465.44	18390.88	3,678.18	94.2%
Crab	15.45	16.58	11.54	11.75	13.64	68.96	13.79	0.4%
HMS	22.37	20.48	14.6	4.6	7.21	69.26	13.85	0.4%
Salmon	46.34	34.09	2.91	10.02	33.14	126.5	25.30	0.6%
Shrimp	6.64	5.17	2.64	1.6	3.46	19.51	3.90	0.1%
Other Nongroundfish	101.09	95.41	46.86	39.38	60.53	343.27	68.65	1.8%

PacFIN vdrfd table 8/19/11

*Excluded for confidentiality

Table 18. Ex-vessel revenue from selected species and species groups (inflation adjusted dollars) by the incidental open access sector, 2006-2010.

	2006	2007	2008	2009	2010	Total	Ann. Average	Pct Total
Lingcod	$8,050	$9,879	$11,161	$6,637	$10,347	$46,074	$9,215	0.4%
Sablefish	$80,900	$96,140	$60,679	$55,010	$16,591	$309,320	$61,864	2.7%
Other Roundfish	$17,531	$15,742	$11,315	$10,210	$16,845	$71,643	$14,329	0.6%
Rockfish	$21,988	$16,492	$13,840	$12,132	$25,417	$89,869	$17,974	0.8%
Thornyheads	*	*	*	*	*	$60	$12	0.0%
Arrowtooth Flounder	$199	$192	$96	$174	$2	$663	$133	0.0%
Dover Sole	*	*	$5	$59	*	$69	$14	0.0%
English Sole	$4	$0	$21	$5	$0	$30	$6	0.0%
Petrale Sole	$6	*	$32	$23	*	$197	$39	0.0%
Other Flatfish	$1,461	$956	$235	$498	$537	$3,687	$737	0.0%
Other Groundfish	$22,668	$23,639	$8,848	$4,970	$7,202	$67,327	$13,465	0.6%
Non FMP Groundfish	*	$301	$102	$106	$18	$538	$108	0.0%
Pacific Halibut	$498,447	$577,462	$360,573	$248,480	$242,788	$1,927,750	$385,550	17.1%
California Halibut	$244,529	$263,651	$150,714	$110,069	$109,243	$878,206	$175,641	7.8%
CPS	$37,720	$655,717	$1,552,167	$668,340	$599,913	$3,513,857	$702,771	31.1%
Crab	$55,876	$64,082	$50,210	$47,267	$38,026	$255,461	$51,092	2.3%
HMS	$52,229	$55,959	$46,228	$12,775	$21,636	$188,827	$37,765	1.7%
Salmon	$486,484	$372,304	$38,920	$93,818	$349,065	$1,340,591	$268,118	11.9%
Shrimp	$150,450	$126,565	$60,915	$41,943	$73,526	$453,399	$90,680	4.0%
Other Nongroundfish	$539,939	$547,968	$320,130	$267,466	$457,782	$2,133,285	$426,657	18.9%

PacFIN vdrfd table 8/19/11

*Excluded for confidentiality

Table 19. Landings of selected species and species groups (mt) by the limited entry and open access nonearshore nonsablefish sector, 2006-2010.

	2006	2007	2008	2009	2010	Total	Ann. Average	Pct Total (by sector)
Limited Entry								
Lingcod	0.47	1.85	0.93	0.54	0.17	3.96	0.79	0.8%
Rockfish	9	11.66	9.91	17.81	3.53	51.91	10.38	10.6%
Thornyheads	4.28	23.17	44.79	56.18	66.65	195.07	39.01	39.7%
Subtotal (all species)	89.13	129.48	124.72	76.53	71.31	491.17	98.23	100.0%
Open Access								
Lingcod	16.12	18.16	20.01	13.72	9.91	77.92	15.58	33.4%
Rockfish	20.07	19.22	22.38	21.84	27.83	111.34	22.27	47.7%
Thornyheads	*	*	*	0.28	0.14	0.44	0.09	0.2%
Subtotal (all species)	58.51	47.15	46.93	39.54	41.19	233.32	46.66	100.0%
Total (all species)	147.64	176.63	171.65	116.07	112.5	724.49	144.90	

PacFIN vdrfd table 8/23/11

*Excluded for confidentiality

Table 20. Ex-vessel revenue for selected species and species groups (inflation adjusted dollars) for the limited entry and open access nonnearshore nonsablefish sector, 2006-2010.

	2006	2007	2008	2009	2010	Total	Ann. Average	Pct Total (by sector)
Limited Entry								
Lingcod	$1,962	$7,659	$3,342	$2,359	$891	$16,213	$3,243	0.8%
Rockfish	$37,331	$64,081	$55,554	$54,373	$8,465	$219,804	$43,961	11.0%
Thornyheads	$34,782	$186,730	$382,199	$449,677	$557,019	$1,610,407	$322,081	80.6%
Subtotal (all species)	$117,843	$313,834	$482,385	$510,108	$573,264	$1,997,434	$399,487	100.0%
Open Access								
Lingcod	$66,000	$73,842	$103,465	$72,544	$50,653	$366,504	$73,301	38.4%
Rockfish	$78,250	$86,229	$94,749	$92,278	$97,371	$448,877	$89,775	47.0%
Thornyheads	*	*	*	$3,554	$1,184	$4,783	$957	0.5%
Subtotal (all species)	$182,241	$199,087	$218,337	$186,092	$168,684	$954,441	$190,888	100.0%
Total (all species)	$300,084	$512,921	$700,722	$696,200	$741,948	$2,951,875	$590,375	

PacFIN vdrfd table 8/23/11

*Excluded for confidentiality

Table 21. Groundfish landings (mt) by shoreside commercial fishery sector, 2006-2010

Sector	2006	2007	2008	2009	2010	Total	Ann. Average	Pct Total
Shoreside Nonwhiting Trawl	17893.93	20551.53	24270.02	26138.51	22391.86	111245.85	22249.17	84.2%
Limited Entry Fixed Gear	2709.59	2337.27	2459.39	2909.43	2949.21	13364.89	2672.978	10.1%
Directed Open Access	1378.18	985.64	1125.1	1537.55	1499.45	6525.92	1305.184	4.9%
Incidental Open Access	44.22	49.28	25.61	24.5	16.75	160.36	32.072	0.1%
Other, Unclassified	174.89	116.33	155.55	140.08	302.67	889.52	177.904	0.7%

vdrfd table, 9/21/11

Table 22. Groundfish ex-vessel revenue (inflation adjusted dollars) by shoreside commercial fishery sector, 2006-2010

Sector	2006	2007	2008	2009	2010	Total	Ann. Average	Pct Total
Shoreside Nonwhiting Trawl	$24,390,064	$26,308,400	$32,115,396	$30,866,692	$25,344,495	$139,025,047	$27,805,009	56.5%
Limited Entry Fixed Gear	$12,439,155	$10,785,737	$12,578,395	$15,844,988	$17,740,842	$69,389,116	$13,877,823	28.2%
Directed Open Access	$6,493,441	$5,457,899	$6,403,114	$8,008,768	$8,149,507	$34,512,728	$6,902,546	14.0%
Incidental Open Access	$152,863	$163,518	$106,355	$89,828	$77,028	$589,592	$117,918	0.2%
Other, Unclassified	$346,690	$232,489	$310,162	$408,393	$1,083,957	$2,381,692	$476,338	1.0%

vdrfd table, 9/22/11

Table 23. Landings of species and species groups (mt) by the treaty nonwhiting sector, 2006-2010.

	2006	2007	2008	2009	2010	Total	Ann. Average	Pct Total
Sablefish	668.57	516.32	526.20	639.46	579.54	2,930.09	586.02	31.8%
Dover Sole	221.37	303.35	238.24	130.67	56.69	950.32	190.06	10.3%
Petrale Sole	26.35	44.95	44.00	69.42	30.50	215.22	43.04	2.3%
Rockfish	190.59	65.02	228.54	529.70	619.74	1,633.59	326.72	17.7%
Thornyheads	21.30	38.46	36.15	30.75	15.97	142.63	28.53	1.5%
Arrowtooth Flounder	194.45	223.36	19.95	8.32	3.16	449.24	89.85	4.9%
Lingcod	44.26	46.41	67.72	44.85	34.16	237.40	47.48	2.6%
Other Flatfish	93.72	101.44	78.46	124.80	79.81	478.23	95.65	5.2%
Other Groundfish	38.69	81.42	141.80	70.65	30.45	363.01	72.60	3.9%
Other Species	413.93	370.35	293.18	337.55	413.64	1,828.65	365.73	19.8%

Pacfin vdrfd table, 08/26/11

Table 24. Ex-vessel revenue from species and species groups (inflation adjusted dollars) by the treaty nonwhiting sector, 2006-2010

Groundfish Species	2006	2007	2008	2009	2010	Grand Total	Ann. Average	Pct Total
Sablefish	$2,621,107	$2,432,432	$2,785,731	$3,575,719	$3,643,763	$15,058,752	$3,011,750	54.5%
Dover Sole	$178,525	$244,343	$199,329	$102,547	$47,035	$771,779	$154,356	2.8%
Petrale Sole	$61,303	$105,891	$106,637	$168,256	$73,904	$515,991	$103,198	1.9%
Rockfish	$202,119	$71,279	$275,274	$632,445	$741,074	$1,922,191	$384,438	7.0%
Thornyheads	$31,533	$64,613	$57,309	$43,257	$22,027	$218,739	$43,748	0.8%
Arrowtooth Flounder	$39,093	$48,229	$3,590	$1,467	$561	$92,940	$18,588	0.3%
Lingcod	$71,959	$82,281	$123,833	$84,707	$58,388	$421,168	$84,234	1.5%
Other Flatfish	$67,379	$74,641	$59,978	$92,653	$59,350	$354,001	$70,800	1.3%
Other Groundfish	$12,194	$31,714	$62,242	$28,852	$12,272	$147,274	$29,455	0.5%
Other Species	$1,887,167	$1,958,125	$1,921,567	$977,106	$1,377,875	$8,121,840	$1,624,368	29.4%

Pacfin vdrfd table, 08/26/11

Table 25. Average groundfish landings (mt) by 2-month period and species by the tribal nonwhiting fishery sector, 2006-2010.

	Jan-Feb	Mar-Apr	May-Jun	Jul-Aug	Sep-Oct	Nov-Dec
Sablefish		219.58	120.32	81.46	118.62	46.04
Dover Sole	2.54	19.30	67.56	44.49	32.02	24.16
Petrale Sole	1.97	3.52	10.76	10.12	13.25	3.42
Rockfish	19.58	50.80	61.58	63.83	108.36	22.57
Thornyheads	3.80	7.27	4.18	4.34	5.35	3.59
Arrowtooth Flounder	0.29	10.14	37.89	30.26	10.77	0.51
Lingcod	1.31	7.95	15.39	10.98	10.09	1.76
Other Flatfish	8.60	18.44	23.21	21.44	13.85	10.10
Other Groundfish	6.56	15.31	19.38	6.00	16.00	9.34
Other Species	9.90	20.96	35.61	16.71	17.02	6.45
Percent of Annual Landings	3.4%	23.5%	25.0%	18.3%	21.8%	8.1%

PacFIN vdrfd table, 08/26/11

Table 26. Average groundfish exvessel revenue (inflation adjusted dollars) by 2-month period and species by the tribal nonwhiting fishery sector, 2006-2010.

	Jan-Feb	Mar-Apr	May-Jun	Jul-Aug	Sep-Oct	Nov-Dec
Sablefish	$0	$1,081,481	$627,447	$432,176	$675,713	$267,811
Dover Sole	$2,084	$16,242	$57,529	$37,857	$27,002	$18,879
Petrale Sole	$4,803	$8,615	$26,262	$24,825	$32,676	$8,472
Rockfish	$23,180	$60,630	$73,272	$75,725	$130,408	$27,090
Thornyheads	$6,225	$11,599	$6,417	$6,753	$8,338	$5,653
Arrowtooth Flounder	$59	$2,213	$8,348	$6,799	$2,007	$73
Lingcod	$2,268	$15,170	$28,337	$19,956	$17,631	$3,123
Other Flatfish	$6,638	$13,999	$17,632	$16,168	$10,639	$7,653
Other Groundfish	$2,739	$6,163	$8,538	$2,329	$6,421	$3,966
Other Species	$11,017	$22,216	$37,824	$17,525	$17,790	$6,952
Percent of Annual Landings	1.4%	30.1%	21.7%	15.6%	22.6%	8.5%

PacFIN vdrfd table, 08/26/11

Table 27. Landings of Pacific whiting and other species (mt) by Pacific whiting sectors, 2006-2010

Sector / Species	2006	2007	2008	2009	2010	Grand Total	Ann. Average	Pct. Of All Sectors by Species
Catcher-Processors								
P. Whiting	78,864.70	73,265.67	108,240.46	34,800.70	54,292.05	349,463.57	69,892.71	34.1%
Other Species	231.05	322.52	893.24	102.40	356.88	1,906.09	381.22	24.3%
Motherships								
P. Whiting	55,355.20	47,810.51	57,497.93	24,091.47	35,713.85	220,468.96	44,093.79	21.5%
Other Species	245.56	175.05	188.58	205.25	212.88	1,027.32	205.46	13.1%
Shoreside								
P. Whiting	97,266.97	73,277.23	50,760.38	40,293.77	62,655.40	324,253.76	64,850.75	31.6%
Other Species	355.39	586.31	1,096.52	310.93	721.80	3,070.96	614.19	39.2%
Treay Motherships								
P. Whiting	5,568.00	5,166.99	14,944.47	13,460.53	16,308.98	55,448.98	11,089.80	5.4%
Other Species	93.00	92.27	207.94	145.00	220.58	758.80	151.76	9.7%
Treaty Shoreside								
P. Whiting	29,896.25	18,158.09	16,972.13	8,928.83	1,967.87	75,923.17	15,184.63	7.4%
Other Species	129.30	162.83	543.45	229.13	8.92	1,073.63	214.73	13.7%
Total P. Whiting	**266,951.12**	**217,678.49**	**248,415.37**	**121,575.30**	**170,938.15**	**1,025,558.44**	**205,111.69**	**100.0%**
Total Other Species	**1,054.30**	**1,338.98**	**2,929.73**	**992.71**	**1,521.06**	**7,836.80**	**1,567.36**	**100.0%**

PacFIN Explorer tool, NORPAC, 08/26/11

Table 28. Ex-vessel revenue from Pacific whiting and other species (inflation adjusted dollars) by Pacific whiting sectors, 2006-2010

	2006	2007	2008	2009	2010	Grand Total	Ann. Average	Pct. All Sectors by Species
Catcher-Processors								
P. Whiting	$10,094,000	$10,987,484	$24,308,829	$3,999,800	$9,505,188	$58,895,301	11,779,060.20	34.9%
Other Species	$84,189	$105,898	$248,216	$14,669	$59,909	$512,881	102,576.20	18.8%
Motherships								
P. Whiting	$6,867,112	$7,068,869	$15,332,832	$2,707,908	$6,094,928	$38,071,649	7,614,329.80	22.6%
Other Species	$68,824	$56,870	$69,309	$138,614	$75,728	$409,345	81,869.00	15.0%
Shoreside								
P. Whiting	$13,371,103	$11,770,322	$11,781,268	$5,376,746	$9,731,085	$52,030,524	10,406,104.80	30.9%
Other Species	$246,271	$307,752	$132,983	$160,178	$307,740	$1,154,924	230,984.80	42.4%
Treay Motherships								
P. Whiting	$742,740	$831,494	$3,418,874	$1,246,536	$2,131,325	$8,370,969	1,674,193.80	5.0%
Other Species	$52,881	$14,760	$48,300	$11,148	$90,889	$217,978	43,595.60	8.0%
Treaty Shoreside								
P. Whiting	$3,582,973	$2,781,817	$3,637,597	$1,020,792	$197,059	$11,220,238	2,244,047.60	6.7%
Other Species	$64,026	$88,133	$201,544	$68,475	$4,304	$426,482	85,296.40	15.7%
Total P. Whiting	**34,657,928**	**33,439,986**	**58,479,400**	**14,351,782**	**27,659,585**	**168,588,681**	**33,717,736**	**100.0%**
Total Other Species	**516,191**	**573,413**	**700,352**	**393,084**	**538,570**	**2,721,610**	**544,322**	**100.0%**

PacFIN Explorer tool, NORPAC, 08/26/11

Table 29. Nonwhiting landings by species category (mt) and whiting sectors, 2006-2010

	2006	2007	2008	2009	2010	Grand Total	Ann. Average	Percent of Total for Species and Sector
Catcher-Processors								
Rockfish	88.21	141.22	222.93	20.39	84.86	557.61	111.52	19.3%
Roundfish	2.02	4.00	1.90	0.20	7.46	15.57	3.11	9.0%
Flatfish	0.42	2.10	4.15	0.40	15.06	22.12	4.42	25.3%
Misc. Groundfish	6.30	63.91	489.39	28.30	110.71	698.61	139.72	32.6%
Nongroundfish	134.11	111.29	174.87	53.12	138.79	612.18	122.44	24.1%
Motherships								
Rockfish	152.85	127.39	133.42	189.57	118.54	721.78	144.36	25.0%
Roundfish	3.63	4.31	3.35	0.64	5.28	17.21	3.44	9.9%
Flatfish	1.07	0.80	1.35	1.41	5.12	9.74	1.95	11.1%
Misc. Groundfish	18.27	24.32	24.30	6.91	45.99	119.80	23.96	5.6%
Nongroundfish	69.74	18.23	26.15	6.72	37.95	158.79	31.76	6.3%
Shoreside								
Rockfish	226.37	319.31	151.55	211.36	344.85	1,253.45	250.69	43.4%
Roundfish	17.83	14.07	3.80	50.03	24.27	110.00	22.00	63.5%
Flatfish	2.58	4.08	1.73	4.11	20.06	32.56	6.51	37.2%
Misc. Groundfish	37.93	52.38	59.54	21.16	155.44	326.45	65.29	15.2%
Nongroundfish	70.69	196.48	879.90	24.27	177.18	1,348.50	269.70	53.1%
Treaty Motherships								
Rockfish	51.09	11.68	41.74	10.15	90.21	204.87	40.97	7.1%
Roundfish	0.47	1.02	2.79	2.40	0.76	7.43	1.49	4.3%
Flatfish	1.74	0.49	2.01	1.47	5.10	10.82	2.16	12.4%
Misc. Groundfish	37.72	68.78	158.58	128.27	121.96	515.31	103.06	24.0%
Nongroundfish	1.98	10.30	2.82	2.71	2.56	20.37	4.07	0.8%
Treaty Shoreside								
Rockfish	34.19	51.65	51.32	8.53	7.26	152.95	30.59	5.3%
Roundfish	1.12	1.32	4.28	16.22		22.93	4.59	13.2%
Flatfish	2.57	1.82	5.38	2.32	0.16	12.26	2.45	14.0%
Misc. Groundfish	76.97	93.90	213.86	99.76	1.39	485.88	97.18	22.6%
Nongroundfish	14.45	14.14	268.61	102.30	0.10	399.61	79.92	15.7%
Grand Total								
Rockfish	552.71	651.25	600.96	440.00	645.72	2,890.66	578.13	100.0%
Roundfish	25.07	24.72	16.12	69.49	37.77	173.14	34.63	100.0%
Flatfish	8.38	9.29	14.62	9.71	45.50	87.50	17.50	100.0%
Misc. Groundfish	177.19	303.29	945.67	284.40	435.49	2,146.05	429.21	100.0%
Nongroundfish	290.97	350.44	1,352.35	189.12	356.58	2,539.45	507.89	100.0%

PacFIN Explorer tool, NORPAC, 08/26/11

Species categories from PacFIN sp table, complex column

Table30. Nonwhiting ex-vessel revenue by species category (inflation adjusted dollars) and whiting sectors, 2006-2010

	2006	2007	2008	2009	2010	Grand Total	Ann. Average	Percent of Total for Species and Sector
Catcher-Processors								
Rockfish	$4,753	$10,511	$5,717	$738	$11,007	$32,726	$6,545	17.4%
Roundfish	$34,522	$68,388	$164,161	$11,278	$26,688	$305,037	$61,007	15.7%
Flatfish	$245	$337	$1,351	$41	$2,487	$4,461	$892	33.3%
Misc. Groundfish	$588	$13,452	$37,282	$79	$1,206	$52,607	$10,521	19.1%
Nongroundfish	$44,081	$13,210	$39,705	$2,533	$18,521	$118,050	$23,610	39.7%
Motherships								
Rockfish	$2,534	$1,713	$2,566	$517	$1,617	$8,947	$1,789	4.7%
Roundfish	$59,680	$51,206	$62,001	$135,439	$72,469	$380,795	$76,159	19.6%
Flatfish	$205	$75	$217	$176	$746	$1,419	$284	10.6%
Misc. Groundfish	$1,245	$1,365	$2,384	$768	$17	$5,779	$1,156	2.1%
Nongroundfish	$5,160	$2,511	$2,141	$1,714	$879	$12,405	$2,481	4.2%
Shoreside								
Rockfish	$25,775	$17,423	$2,365	$8,107	$77,188	$130,858	$26,172	69.4%
Roundfish	$197,388	$235,444	$104,065	$145,207	$219,874	$901,978	$180,396	46.3%
Flatfish	$601	$1,095	$160	$518	$1,938	$4,312	$862	32.2%
Misc. Groundfish	$11,688	$15,635	$3,313	$768	$2,947	$34,351	$6,870	12.5%
Nongroundfish	$10,819	$38,155	$23,080	$5,578	$5,793	$83,425	$16,685	28.0%
Treaty Motherships								
Rockfish	$12	$1,491	$94	$66	$386	$2,049	$410	1.1%
Roundfish	$52,843	$13,263	$48,206	$11,073	$89,584	$214,969	$42,994	11.0%
Flatfish	$26				$232	$258	$52	1.9%
Misc. Groundfish					$572	$572	$114	0.2%
Nongroundfish		$6		$9	$115	$130	$26	0.0%
Treaty Shoreside								
Rockfish	$828	$1,559	$6,827	$4,805		$14,019	$2,804	7.4%
Roundfish	$30,937	$54,765	$47,475	$7,122	$3,355	$143,654	$28,731	7.4%
Flatfish	$698	$428	$1,218	$553	$33	$2,930	$586	21.9%
Misc. Groundfish	$31,417	$29,963	$86,395	$33,642	$916	$182,333	$36,467	66.1%
Nongroundfish	$146	$1,418	$59,629	$22,353		$83,546	$16,709	28.1%
Grand Total								
Rockfish	$33,902	$32,697	$17,569	$14,233	$90,198	$188,599	$37,720	100.0%
Roundfish	$375,370	$423,066	$425,908	$310,119	$411,970	$1,946,433	$389,287	100.0%
Flatfish	$1,775	$1,935	$2,946	$1,288	$5,436	$13,380	$2,676	100.0%
Misc. Groundfish	$44,938	$60,415	$129,374	$35,257	$5,658	$275,642	$55,128	100.0%
Nongroundfish	$60,206	$55,300	$124,555	$32,187	$25,308	$297,556	$59,511	100.0%

PacFIN Explorer tool, NORPAC, 08/26/11

Species categories from PacFIN sp table, complex column

Table 31. Average annual groundfish landings (mt) by 2-month period and fishery sector, 2006-2010

Sector	Jan-Feb	Mar-Apr	May-Jun	Jul-Aug	Sep-Oct	Nov-Dec
Shoreside Nonwhiting Trawl	3,610.02	3,964.46	3,984.21	3,943.38	3,841.42	2,905.56
Limited Entry Fixed Gear	97.41	299.85	733.17	708.71	705.79	127.78
Directed Open Access	110.79	159.31	281.55	309.09	299.06	145.21
Incidental Open Access	2.93	2.16	11.28	11.87	2.20	1.64
Other Unclassified	14.76	17.51	39.25	52.74	42.47	10.78
Percent Annual Average	14.5%	16.8%	19.1%	19.0%	18.5%	12.1%

PacFIN vdrfd table, 08/23/11

Table 32. Average annual groundfish ex-vessel revenue (dollars) by 2-month period and fishery sector, 2006-2010

Sector	Jan-Feb	Mar-Apr	May-Jun	Jul-Aug	Sep-Oct	Nov-Dec
Shoreside Nonwhiting Trawl	$4,533,494	$4,310,211	$4,823,112	$5,109,462	$4,152,439	$3,366,926
Limited Entry Fixed Gear	$432,990	$1,411,617	$3,815,668	$3,793,298	$2,830,830	$485,260
Directed Open Access	$595,695	$669,810	$1,560,497	$1,700,950	$1,191,062	$767,061
Incidental Open Access	$10,608	$4,042	$40,625	$46,789	$6,236	$5,736
Other Unclassified	$30,901	$33,735	$100,787	$192,001	$46,587	$34,790
Percent Annual Average	12.2%	13.9%	22.4%	23.5%	17.8%	10.1%

PacFIN vdrfd table, 08/23/11

Table 33. Average monthly landings of Pacific whiting (mt) by whiting sectors, 2006-2010.

	All months before June 1	June	July	August	September	October	November	December	Total
Catcher-Processors	15,509.10	12,276.71	3,086.00	4,099.35	8,084.75	12,096.63	10,112.75	4,627.43	69,892.71
Motherships	23,778.06	12,172.49	1,637.02	2,983.87	1,027.45	1,668.70	826.20		44,093.79
Shoreside	3,447.70	19,149.76	23,107.62	10,053.99	1,999.25	4,780.48	1,729.62	582.34	64,850.75
Treaty Motherships		606.17	1,378.14	864.56	2,337.62	3,455.15	1,823.63	624.53	11,089.80
Treaty Shoreside	191.94	648.95	1,189.07	2,267.00	4,035.55	4,239.19	1,874.32	738.62	15,184.63
Total	42,926.80	44,854.07	30,397.85	20,268.77	17,484.62	26,240.15	16,366.52	6,572.92	205,111.69
Percent Total	20.9%	21.9%	14.8%	9.9%	8.5%	12.8%	8.0%	3.2%	100.0%

Pacfin vdrfd table, 08/26/11, NORPAC

Table 34. Average monthly ex-vessel revenue from Pacific whiting (inflation adjusted dollars) by whiting sectors, 2006-2010.

	All months before June 1	June	July	August	September	October	November	December	Total
Catche-Processors	$2,341,265	$2,362,229	$425,405	$803,313	$1,176,303	$2,260,214	$1,700,503	$709,827	$11,779,060
Motherships	$3,517,391	$2,288,277	$527,096	$598,924	$129,559	$402,637	$150,446		$7,614,330
Shoreside	$544,875	$2,831,572	$3,375,725	$1,921,804	$307,699	$1,034,451	$309,664	$80,315	$10,406,105
Treaty Motherships		$79,122	$192,088	$117,897	$448,701	$551,748	$263,526	$21,112	$1,674,194
Treaty Shoreside	$24,203	$72,386	$148,788	$320,059	$656,477	$659,017	$263,586	$99,531	$2,244,048
Total	$569,078	$2,903,958	$3,524,514	$2,241,864	$964,176	$1,693,468	$573,250	$179,846	$12,650,153
Precent Total	4.5%	23.0%	27.9%	17.7%	7.6%	13.4%	4.5%	1.4%	100.0%

Pacfin vdrfd table, 08/26/11, NORPAC

Table 35. Average groundfish landings (mt) by 2-month period and species, 2006-2010.

Groundfish Species	Jan-Feb	Mar-Apr	May-Jun	Jul-Aug	Sep-Oct	Nov-Dec
Sablefish	395.64	711.26	1,278.88	1,370.86	1,331.72	591.47
P. Whiting	0.53	662.15	21,937.13	33,162.12	6,789.97	2,312.80
Dover Sole	1,502.99	2,018.43	1,513.46	1,453.89	1,715.60	1,324.11
Petrale Sole	709.41	207.17	231.46	258.43	175.65	305.62
Rockfish	134.34	166.73	354.27	351.70	253.81	147.93
Arrowtooth Flounder	395.26	554.59	588.36	515.40	353.99	283.75
Lingcod	12.52	10.55	51.66	57.60	43.50	19.02
Other Flatfish	142.38	139.03	297.82	367.74	274.51	115.72
Other Groundfish	225.05	263.54	370.31	346.53	288.55	166.48
Other Species	5.91	12.75	45.68	50.97	14.66	1.96
Percent of annual average	4.2%	5.6%	29.6%	41.8%	12.8%	6.1%

PacFIN vdrfd table, 08/24/11

Table 36. Average groundfish ex-vessel revenue (inflation adjusted dollars) by 2-month period and species, 2006-2010.

Groundfish Species	Jan-Feb	Mar-Apr	May-Jun	Jul-Aug	Sep-Oct	Nov-Dec
Sablefish	$3,352,493	$6,052,948	$9,283,167	$18,019,270	$11,165,970	$3,595,988
P. Whiting	$1,491	$404,681	$9,176,788	$21,601,573	$722,548	$184,196
Dover Sole	$2,990,220	$4,172,580	$2,132,766	$3,413,381	$2,685,405	$1,806,423
Petrale Sole	$5,338,069	$680,398	$1,635,335	$2,389,572	$1,518,450	$2,164,353
Rockfish	$1,093,443	$888,200	$1,911,221	$2,921,567	$1,614,098	$720,506
Arrowtooth Flounder	$205,118	$126,132	$188,639	$284,132	$141,013	$111,550
Lingcod	$68,783	$49,322	$315,333	$520,127	$310,356	$82,508
Other Flatfish	$402,794	$236,150	$682,417	$1,074,324	$694,337	$242,986
Other Groundfish	$662,842	$285,531	$759,338	$946,465	$597,682	$251,815
Other Species	$31,349	$39,982	$200,614	$179,221	$47,361	$7,713
Percent of annual average	11.0%	9.8%	19.5%	37.7%	14.9%	7.2%

PacFIN vdrfd table, 08/24/11

Table 37. Groundfish landings (mt) by port group area, 2006-2010.

Port	2006	2007	2008	2009	2010
Puget Sound	4,217.47	3,327.07	2,674.05	3,384.24	3,007.83
Washington Coastal	53,121.41	42,644.81	34,907.38	18,992.70	27,435.61
Columbia River (Washington)	8,613.83	4,571.21	1,993.82	2,283.22	5,302.50
Washington Subtotal	**65,952.70**	**50,543.09**	**39,575.24**	**24,660.16**	**35,745.94**
Columbia River (Oregon)	31,489.31	25,733.73	18,441.25	22,666.35	21,564.83
Tillamook	73.30	48.86	41.10	62.30	37.17
Newport	33,646.86	24,065.50	19,073.72	17,347.02	20,701.52
Coos Bay	7,458.33	5,569.71	5,850.39	5,514.77	4,141.53
Brookings	1,075.34	1,388.68	1,670.50	1,743.31	1,783.35
Oregon Subtotal	**73,743.15**	**56,806.49**	**45,076.95**	**47,333.75**	**48,228.40**
Crescent City	2,140.28	1,641.82	4,283.96	2,665.92	2,745.73
Eureka	6,223.38	5,212.89	4,738.03	3,151.24	2,723.31
Fort Bragg	1,446.10	1,470.01	1,757.80	1,946.09	1,851.65
Bodega Bay	61.83	95.18	118.32	81.44	74.63
San Francisco	714.09	1,118.49	1,026.52	773.90	722.45
Monterey	916.28	456.83	540.53	476.22	566.26
Morro Bay	244.30	223.00	392.57	873.66	936.40
Santa Barbara	107.34	90.73	79.54	125.85	262.94
Los Angeles	111.42	164.72	145.23	143.78	149.91
San Diego	122.00	75.75	121.57	100.22	118.93
California Subtotal	**12,087.04**	**10,549.41**	**13,204.06**	**10,338.33**	**10,152.23**
Grand Total	**151,782.89**	**117,898.98**	**97,856.25**	**82,332.24**	**94,126.57**

PacFIN Explorer tool 08/24/11

Table 38. Groundfish ex-vessel revenue (inflation adjusted dollars) by port group area, 2006-2010.

Port	2006	2007	2008	2009	2010
Puget Sound	$8,167,952	$6,431,882	$5,826,757	$6,899,429	$5,825,459
Washington Coastal	$8,941,193	$9,067,190	$10,293,276	$6,005,731	$6,698,130
Columbia River (Washington)	$2,624,430	$1,444,394	$1,349,489	$1,547,721	$3,587,973
Washington Subtotal	**$19,733,575**	**$16,943,466**	**$17,469,522**	**$14,452,881**	**$16,111,562**
Columbia River (Oregon)	$11,894,665	$10,825,140	$12,293,342	$11,160,290	$9,307,241
Tillamook	$225,105	$192,062	$172,792	$190,527	$138,317
Newport	$9,151,008	$8,354,592	$10,988,794	$10,201,857	$10,486,939
Coos Bay	$5,712,642	$5,545,406	$6,886,246	$6,170,940	$6,656,090
Brookings	$2,766,668	$3,130,369	$4,012,645	$4,609,338	$4,452,249
Oregon Subtotal	**$29,750,088**	**$28,047,569**	**$34,353,819**	**$32,332,952**	**$31,040,836**
Crescent City	$1,776,661	$1,820,748	$2,593,056	$2,423,383	$1,246,151
Eureka	$4,080,945	$4,615,976	$5,172,879	$4,332,546	$4,314,348
Fort Bragg	$2,604,249	$2,857,018	$3,482,418	$4,181,810	$3,953,250
Bodega Bay	$147,566	$249,340	$311,635	$260,706	$365,714
San Francisco	$1,624,284	$2,067,299	$1,967,100	$1,479,162	$1,427,769
Monterey	$1,983,611	$1,371,350	$1,489,614	$1,312,302	$1,509,080
Morro Bay	$1,433,197	$1,527,241	$1,997,486	$3,782,206	$4,488,687
Santa Barbara	$534,455	$589,752	$539,350	$760,099	$1,458,267
Los Angeles	$656,596	$1,012,890	$940,338	$987,800	$1,018,748
San Diego	$809,186	$539,886	$930,245	$717,080	$787,669
California Subtotal	**$15,650,750**	**$16,651,500**	**$19,424,121**	**$20,237,094**	**$20,569,767**
Grand Total	**$65,134,413**	**$61,642,535**	**$71,247,462**	**$67,022,927**	**$67,722,165**

PacFIN Explorer tool, 08/24/11

Table 39. Engagement (groundfish landings in port as percent of coastwide landings) and dependence (groundfish landings in port as percent of total landings in port), 2006-2010.

	Engagement	Dependence
Puget Sound	10.0%	7.3%
Washington Coastal	12.3%	16.6%
Columbia River (Washington)	3.2%	10.9%
Washington	**25.5%**	**10.5%**
Columbia River (Oregon)	16.7%	31.9%
Tillamook	0.3%	5.4%
Newport	14.8%	30.4%
Coos Bay	9.3%	26.4%
Brookings	5.7%	38.4%
Oregon	**46.7%**	**29.9%**
Crescent City	3.0%	13.1%
Eureka	6.8%	32.9%
Fort Bragg	5.1%	47.4%
Bodega Bay	0.4%	5.1%
San Francisco	2.6%	13.2%
Monterey	2.3%	17.1%
Morro Bay	4.0%	68.4%
Santa Barbara	1.2%	2.2%
Los Angeles	1.4%	2.9%
San Diego	1.1%	11.4%
California	**27.8%**	**13.1%**
Grand Total	**100.0%**	**16.4%**

PacFIN Explorer tool, 08/24/11

Table 40. Groundfish landings (mt) by species and species groups by port group area, 2009-2010.

2009	Sablefish	P. Whiting	Dover Sole	Petrale Sole	Rockfish	Thornyheads	Arrowtooth Flounder	Lingcod	Other Flatfish	Other Groundfish	Other Species	Total
Puget Sound	769.95		626.75	157.29	570.91	68.17	504.88	54.74	204.82	189.52	237.22	3,384.25
Washington Coastal and Columbia River	833.49	18,874.49	502.10	68.45	202.47	90.07	452.54	17.76	26.53	190.26	17.77	21,275.93
Washington Subtotal	**1,603.44**	**18,874.49**	**1,128.85**	**225.74**	**773.38**	**158.24**	**957.42**	**72.50**	**231.35**	**379.78**	**254.99**	**24,660.18**
Columbia River (Oregon) and Tillamook	928.64	13,995.74	3,267.52	401.71	208.86	550.48	2,349.19	43.18	460.43	472.74	50.17	22,728.66
Newport	1,152.64	12,952.75	1,626.35	255.54	128.36	458.64	316.33	20.86	93.75	341.46	0.34	17,347.02
Coos Bay	691.88	1,608.13	1,846.40	277.95	40.64	385.04	164.27	16.44	207.74	276.25	0.03	5,514.77
Brookings	532.44		716.36	77.41	138.28	123.05	11.74	24.82	40.13	79.07		1,743.30
Oregon Subtotal	**3,305.60**	**28,556.62**	**7,456.63**	**1,012.61**	**516.14**	**1,517.21**	**2,841.53**	**105.30**	**802.05**	**1,169.52**	**50.54**	**47,333.75**
Crescent City	218.01	1,483.99	592.67	46.18	97.67	141.33	4.19	7.82	41.35	20.68	12.03	2,665.92
Eureka	478.09	307.86	1,572.76	154.04	37.42	352.88	40.74	9.08	87.88	110.49	*	3,151.24
Fort Bragg	523.44		713.17	161.58	244.64	203.20		22.22	30.62	52.13	0.05	1,946.09
Bodega Bay	26.13			*	15.91	1.15		1.59	6.01	1.52		81.43
San Francisco	140.31		248.61	92.24	98.72	68.65		4.68	111.96	8.44	0.24	773.90
Monterey	160.00	0.39	11.65	33.89	106.02	72.49	0.45	2.78	16.33	70.39	2.37	476.23
Morro Bay	654.03		20.07	18.93	133.76	19.31		7.64	8.24	11.62	*	873.66
Santa Barbara	47.58		0.19	0.02	35.35	26.55		0.60	8.53	6.70	0.28	125.86
Los Angeles	45.36		0.10	*	7.51	76.62		0.25	6.13	7.40	0.37	143.76
San Diego	18.43			*	13.47	64.98		0.09		3.25	*	100.22
California Subtotal	**2,311.38**	**1,792.24**	**3,159.22**	**530.64**	**790.47**	**1,027.16**	**45.38**	**56.75**	**317.05**	**292.62**	**15.40**	**10,338.31**
Grand Total	7,220.42	49,223.35	11,744.70	1,768.99	2,079.99	2,702.61	3,844.33	234.55	1,350.45	1,841.92	320.93	82,332.24

2010	Sablefish	P. Whiting	Dover Sole	Petrale Sole	Rockfish	Thornyheads	Arrowtooth Flounder	Lingcod	Other Flatfish	Other Groundfish	Other Species	Total
Puget Sound	589.95		577.91	64.73	659.59	59.04	475.83	44.26	104.67	96.00	335.85	3,007.83
Washington Coastal and Columbia River	898.43	30,688.35	309.73	19.26	216.24	55.09	393.91	8.54	13.83	128.17	6.54	32,738.09
Washington Subtotal	**1,488.38**	**30,688.35**	**887.64**	**83.99**	**875.83**	**114.13**	**869.74**	**52.80**	**118.50**	**224.17**	**342.39**	**35,745.92**
Columbia River (Oregon) and Tillamook	683.30	14,099.37	2,954.57	224.62	276.22	597.02	1,856.18	33.24	362.34	460.65	54.46	21,601.97
Newport	926.36	17,304.07	1,224.16	109.15	163.61	408.32	187.44	11.68	69.69	295.78	1.25	20,701.51
Coos Bay	755.31	135.23	1,883.67	138.17	65.15	398.00	243.56	15.12	208.37	298.81	0.13	4,141.52
Brookings	487.30		822.08	34.28	119.79	167.27	5.68	17.25	38.84	90.85		1,783.34
Oregon Subtotal	**2,852.27**	**31,538.67**	**6,884.48**	**506.22**	**624.77**	**1,570.61**	**2,292.86**	**77.29**	**679.24**	**1,146.09**	**55.84**	**48,228.34**
Crescent City	85.55	2,343.13	133.44	11.73	98.53	35.86	9.53	5.58	6.81	13.96	*	2,745.73
Eureka	522.58	84.22	1,447.50	55.37	20.52	381.30	58.16	3.72	34.62	115.18	0.14	2,723.31
Fort Bragg	504.27		679.88	56.38	269.36	275.92		18.85	13.27	36.01		1,851.65
Bodega Bay	40.92			*	16.69			1.04		0.46	*	74.64
San Francisco	108.64		273.47	56.38	134.88	34.77		4.92	69.69	39.49	0.22	722.46
Monterey	211.79	0.03	79.55	*	77.86	81.27		2.34	27.43	65.82	*	566.26
Morro Bay	772.17		0.07	*	103.94	30.36		8.90	6.29	14.61	0.04	936.40
Santa Barbara	173.61		0.12	0.14	29.05	48.65		1.15	3.26	6.72	0.22	262.94
Los Angeles	52.71		0.11	*	6.32	73.46		0.13	5.46	6.21	5.50	149.91
San Diego	24.80				27.69	64.95		0.08		1.40	*	118.93
California Subtotal	**2,497.04**	**2,427.38**	**2,614.14**	**213.38**	**784.85**	**1,026.54**	**67.69**	**46.71**	**166.83**	**299.86**	**7.82**	**10,152.24**
Grand Total	6,837.69	64,654.40	10,386.26	803.59	2,285.45	2,711.28	3,230.29	176.80	964.57	1,670.12	406.05	94,126.50

PacFIN vdrfd table 8/25/11

*Excluded for confidentiality

Table 41. Groundfish ex-vessel revenue (dollars) by species and species groups by port group area, 2009-2010.

2009	Sablefish	P. Whiting	Dover Sole	Petrale Sole	Rockfish	Thornyheads	Arrowtooth Flounder	Lingcod	Other Flatfish	Other Groundfish	Other Species	Total
Puget Sound	$4,555,238		$465,260	$339,564	$674,129	$87,100	$109,177	$97,874	$162,614	$73,447	$244,808	$6,809,211
Washington Coastal and Columbia River	$4,240,692	$2,333,951	$316,615	$128,354	$147,356	$79,241	$94,515	$27,340	$17,663	$63,944	$5,012	$7,454,683
Washington Subtotal	**$8,795,930**	**$2,333,951**	**$781,875**	**$467,918**	**$821,485**	**$166,341**	**$203,692**	**$125,214**	**$180,277**	**$137,391**	**$249,820**	**$14,263,894**
Columbia River (Oregon) and Tillamook	$4,019,487	$1,974,281	$2,413,265	$781,688	$279,230	$510,174	$511,745	$81,158	$375,818	$206,686	$48,863	$11,202,395
Newport	$5,846,862	$1,546,920	$1,147,031	$502,727	$155,311	$474,742	$67,543	$78,127	$64,728	$184,095	$369	$10,068,455
Coos Bay	$3,389,263	$261,654	$1,221,421	$515,552	$52,686	$324,849	$34,796	$33,132	$146,311	$110,547	$36	$6,090,247
Brookings	$2,663,541		$510,531	$143,998	$573,549	$129,681	$2,574	$98,670	$27,990	$398,532		$4,549,066
Oregon Subtotal	**$15,919,153**	**$3,782,855**	**$5,292,248**	**$1,943,965**	**$1,060,776**	**$1,439,446**	**$616,658**	**$291,087**	**$614,847**	**$899,860**	**$49,268**	**$31,910,163**
Crescent City	$984,425	$163,509	$470,791	$84,963	$393,287	$197,331	$924	$28,424	$31,612	$23,435	$12,993	$2,391,694
Eureka	$2,060,014	$33,574	$1,280,107	$292,832	$73,803	$401,496	$9,007	$21,890	$66,302	$36,867	*	$4,275,893
Fort Bragg	$2,356,334		$583,783	$368,441	$430,315	$232,447		$56,949	$23,856	$77,418	$62	$4,127,128
Bodega Bay	$128,386			*	$56,007	$1,002		$5,256	$6,133	$1,814		$257,297
San Francisco	$584,758		$203,653	$208,803	$228,351	$94,150		$20,986	$109,903	$8,873	$275	$1,459,822
Monterey	$621,533	$490	$7,585	$78,803	$264,265	$210,856	$196	$10,231	$19,673	$78,197	$3,830	$1,295,142
Morro Bay	$2,464,980		$18,014	$52,504	$957,973	$85,542		$36,771	$13,459	$103,293	*	$3,732,748
Santa Barbara	$195,952		$584	$41	$266,369	$222,385		$4,211	$11,679	$48,173	$635	$750,160
Los Angeles	$261,343		$702	*	$52,733	$632,623		$1,589	$17,013	$7,321	$1,360	$974,882
San Diego	$117,541			*	$43,504	$535,577		$656		$10,412	*	$707,704
California Subtotal	**$9,775,266**	**$197,573**	**$2,565,219**	**$1,142,494**	**$2,766,607**	**$2,613,409**	**$10,127**	**$186,963**	**$299,630**	**$395,803**	**$19,379**	**$19,972,470**
Grand Total	$34,490,349	$6,314,379	$8,639,342	$3,554,377	$4,648,868	$4,219,196	$830,477	$603,264	$1,094,754	$1,433,054	$318,467	$66,146,527

2010	Sablefish	P. Whiting	Dover Sole	Petrale Sole	Rockfish	Thornyheads	Arrowtooth Flounder	Lingcod	Other Flatfish	Other Groundfish	Other Species	Total
Puget Sound	$4,555,238	$0	$465,260	$339,564	$674,129	$87,100	$109,177	$97,874	$162,614	$73,447	$244,808	$6,809,211
Washington Coastal and Columbia River	$4,240,692	$2,333,951	$316,615	$128,354	$147,356	$79,241	$94,515	$27,340	$17,663	$63,944	$5,012	$7,454,683
Washington Subtotal	**$8,795,930**	**$2,333,951**	**$781,875**	**$467,918**	**$821,485**	**$166,341**	**$203,692**	**$125,214**	**$180,277**	**$137,391**	**$249,820**	**$14,263,894**
Columbia River (Oregon) and Tillamook	$4,019,487	$1,974,281	$2,413,265	$781,688	$279,230	$510,174	$511,745	$81,158	$375,818	$206,686	$48,863	$11,202,395
Newport	$5,846,862	$1,546,920	$1,147,031	$502,727	$155,311	$474,742	$67,543	$78,127	$64,728	$184,095	$369	$10,068,455
Coos Bay	$3,389,263	$261,654	$1,221,421	$515,552	$52,686	$324,849	$34,796	$33,132	$146,311	$110,547	$36	$6,090,247
Brookings	$2,663,541	$0	$510,531	$143,998	$573,549	$129,681	$2,574	$98,670	$27,990	$398,532		$4,549,066
Oregon Subtotal	**$15,919,153**	**$3,782,855**	**$5,292,248**	**$1,943,965**	**$1,060,776**	**$1,439,446**	**$616,658**	**$291,087**	**$614,847**	**$899,860**	**$49,268**	**$31,910,163**
Crescent City	$984,425	$163,509	$470,791	$84,963	$393,287	$197,331	$924	$28,424	$31,612	$23,435	*	$2,391,694
Eureka	$2,060,014	$33,574	$1,280,107	$292,832	$73,803	$401,496	$9,007	$21,890	$66,302	$36,867	$1	$4,275,893
Fort Bragg	$2,356,334		$583,783	$368,441	$430,315	$233,449	$196	$56,949	$29,989	$77,418	$62	$4,127,128
Bodega Bay	$128,386			*	$56,007			$5,256		$1,814	*	$257,297
San Francisco	$584,758		$203,653	$208,803	$228,351	$94,150	$70	$20,986	$109,903	$8,873	$275	$1,459,822
Monterey	$621,533	$490	$7,585	*	$264,265	$210,856	$0	$10,231	$19,673	$78,197	*	$1,295,142
Morro Bay	$2,464,980		$18,014	*	$957,973	$85,542	$0	$36,771	$13,459	$103,293	$212	$3,732,748
Santa Barbara	$195,952		$584	$41	$266,369	$222,385	$0	$4,211	$11,679	$48,173	$635	$750,160
Los Angeles	$261,343		$702	*	$52,733	$632,623	$0	$1,589	$17,013	$7,321	$1,360	$974,882
San Diego	$117,541		$0	$3	$43,504	$535,577	$0	$656	$0	$10,412	*	$707,704
California Subtotal	**$9,775,266**	**$197,573**	**$2,565,219**	**$1,142,494**	**$2,766,607**	**$2,613,409**	**$10,127**	**$186,963**	**$299,630**	**$395,803**	**$19,379**	**$19,972,470**
Grand Total	$34,490,349	$6,314,379	$8,639,342	$3,554,377	$4,648,868	$4,219,196	$830,477	$603,264	$1,094,754	$1,433,054	$318,467	$66,146,527

PacFIN vdrfd table 8/25/11

*Excluded for confidentiality

Table 42. Groundfish landings (mt) by fishery sectors and port group area, 2009-2010.

2009	Shoreside Whiting	Shoreside Nonwhiting Trawl	Limited Entry Fixed Gear	Directed Open Access	Incidental Open Access	Exempted Trawl, EFP and Other	Treaty Shoreside Whiting	Treaty Shoreside Nonwhiting Groundfish	Unclassified Landings	Total
Puget Sound		1,349.05	399.93	6.35	0.29	5.01		1,489.38	*	3,384.24
Washington Coastal and Columbia River	10,091.01	1,346.26	402.78	58.18	1.85	1.68	9,055.67	318.17		21,275.92
Washington Subtotal	**10,091.01**	**2,695.31**	**802.71**	**64.53**	**2.14**	**6.69**	**9,055.67**	**1,807.55**	**134.55**	**24,660.16**
Columbia River (Oregon) and Tillamook	14,085.97	8,425.78	148.31	51.79	3.32	9.52				22,728.65
Newport	12,993.14	3,772.90	526.92	43.78	2.96	7.32				17,347.02
Coos Bay	1,612.49	3,617.94	192.61	85.44	4.70	1.60			*	5,514.78
Brookings		1,198.51	263.55	276.15	0.84	4.25				1,743.30
Oregon Subtotal	**28,691.60**	**17,015.13**	**1,131.39**	**457.16**	**11.82**	**22.69**				**47,333.75**
Crescent City		986.74	107.94	81.63	0.04	*				2,665.92
Eureka		2,667.47	101.83	73.50		*				3,151.24
Fort Bragg		1,682.08	151.79	103.20	0.50	8.52				1,946.09
Bodega Bay		*	*	17.22	0.16	*				81.44
San Francisco	*	648.47	59.90	46.62	0.49	18.41				773.89
Monterey		292.48	108.21	71.44	0.63	*				476.23
Morro Bay		*	200.04	515.42	0.33	57.99				873.66
Santa Barbara			35.58	75.84	1.74	12.70				125.86
Los Angeles			118.48	14.51	5.15	5.64				143.78
San Diego			82.09	16.48	1.51	*				100.22
California Subtotal	**1,797.82**	**6,428.06**	**975.34**	**1,015.86**	**10.55**	**110.70**				**10,338.33**
Grand Total	40,580.43	26,138.50	2,909.44	1,537.55	24.51	140.08	9,055.67	1,807.55	138.51	82,332.24

2010	Shoreside Whiting	Shoreside Nonwhiting Trawl	Limited Entry Fixed Gear	Directed Open Access	Incidental Open Access	Exempted Trawl, EFP and Other	Treaty Shoreside Whiting	Treaty Shoreside Nonwhiting Groundfish	Unclassified Landings	Total
Puget Sound		1,260.49	223.50	2.54	0.54	*		1,415.80	*	3,007.83
Washington Coastal and Columbia River	28,973.92	865.76	563.88	73.25	2.67	*	1,976.68	277.54		32,738.09
Washington Subtotal	**28,973.92**	**2,126.25**	**787.38**	**75.79**	**3.21**	**8.52**	**1,976.68**	**1,693.34**	**100.83**	**35,745.92**
Columbia River (Oregon) and Tillamook	14,178.46	7,339.28	*	36.26	0.39	24.67				21,601.98
Newport	17,460.53	2,722.90	475.43	37.09	2.33	3.24				20,701.52
Coos Bay	134.98	3,616.94	337.03	50.81	0.57	1.19			*	4,141.52
Brookings		1,321.30	266.82	189.55	0.06	5.62				1,783.35
Oregon Subtotal	31,773.97	15,000.42	1,101.61	313.71	3.35	34.72				48,228.37
Crescent City	2,371.13	259.30	49.69	48.50	*	*				2,745.72
Eureka	81.00	2,444.28	134.37	63.57	*					2,723.31
Fort Bragg		1,567.15	195.36	87.59	*	1.50				1,851.66
Bodega Bay		*	*	32.29	0.11	*				74.64
San Francisco		624.87	49.45	32.50	1.01	14.63				722.46
Monterey		339.27	145.14	81.39	0.16	*				566.26
Morro Bay		*	193.20	535.73	0.51	206.96				936.40
Santa Barbara			68.97	182.94	3.63	7.40				262.94
Los Angeles			124.37	13.52	3.21	8.81				149.91
San Diego			86.45	31.01	1.38	*				118.92
California Subtotal	2,452.13	5,264.53	1,058.86	1,109.05	10.17	257.49				10,152.23
Grand Total	63,200.02	22,391.20	2,947.85	1,498.55	16.73	300.73	1,976.68	1,693.34	101.42	94,126.52

PacFIN vdrfd table 8/25/11

*Excluded for confidentiality

Table 43. Groundfish ex-vessel revenue (dollars) by fishery sectors and port group area, 2009-2010.

2009	Shoreside Whiting	Shoreside Nonwhiting Trawl	Limited Entry Fixed Gear	Directed Open Access	Incidental Open Access	Exempted Trawl, EFP and Other	Treaty Shoreside Whiting	Treaty Shoreside Nonwhiting Groundfish	Unclassified Landings	Total
Puget Sound		$1,199,908	$2,085,987	$13,544	$391	$7,679		$3,282,273	*	$6,809,210
Washington Coastal and Columbia River	$1,408,225	$1,146,724	$1,934,757	$287,700	$6,737	$6,485	$1,052,964	$1,610,967		$7,454,681
Washington Subtotal	**$1,408,225**	**$2,346,632**	**$4,020,744**	**$301,244**	**$7,128**	**$14,164**	**$1,052,964**	**$4,893,240**	**$219,550**	**$14,263,891**
Columbia River (Oregon) and Tillamook	$2,011,171	$8,078,019	$825,411	$239,467	$7,324	$15,869				$11,202,394
Newport	$1,574,266	$5,104,194	$3,114,459	$231,063	$14,275	$30,198				$10,068,455
Coos Bay	$263,824	$4,164,098	$1,212,946	$425,080	$20,869	$3,431			*	$6,090,248
Brookings		$1,615,920	$1,438,587	$1,479,649	$4,557	$10,352				$4,549,065
Oregon Subtotal	**$3,849,261**	**$18,962,231**	**$6,591,403**	**$2,375,259**	**$47,025**	**$59,850**				**$31,910,162**
Crescent City		$1,324,840	$532,172	$366,468	$220	*				$2,391,693
Eureka		$3,501,805	$427,928	$312,065		*				$4,275,893
Fort Bragg		$2,626,627	$864,016	$610,307	$2,724	$23,454				$4,127,128
Bodega Bay		*	*	$101,178	$713	*				$257,297
San Francisco	*	$899,444	$263,105	$268,162	$2,909	$26,200				$1,459,820
Monterey		$504,681	$406,668	$378,511	$2,605	*				$1,295,143
Morro Bay		*	$700,847	$2,585,485	$2,599	$234,936				$3,732,749
Santa Barbara			$259,100	$459,086	$9,922	$22,053				$750,161
Los Angeles			$864,933	$93,838	$3,879	$12,233				$974,883
San Diego			$645,310	$52,442	$8,929	*				$707,704
California Subtotal	**$201,532**	**$9,154,210**	**$5,025,648**	**$5,227,542**	**$34,500**	**$329,039**				**$19,972,471**
Grand Total	$5,459,018	$30,463,073	$15,637,795	$7,904,045	$88,653	$403,053	$1,052,964	$4,893,240	$244,683	$66,146,524

2010	Shoreside Whiting	Shoreside Nonwhiting Trawl	Limited Entry Fixed Gear	Directed Open Access	Incidental Open Access	Exempted Trawl, EFP and Other	Treaty Shoreside Whiting	Treaty Shoreside Nonwhiting Groundfish	Unclassified Landings	Total
Puget Sound		$989,238	$1,344,573	$13,587	$1,087	$19,874		$3,260,120	*	$5,825,458
Washington Coastal and Columbia River	$4,002,890	$548,168	$3,423,942	$445,285	$7,364	$3,864	$201,363	$1,638,063		$10,286,100
Washington Subtotal	**$4,002,890**	**$1,537,406**	**$4,768,515**	**$458,872**	**$8,451**	**$23,738**	**$201,363**	**$4,898,183**	**$212,140**	**$16,111,558**
Columbia River (Oregon) and Tillamook	$2,190,529	$6,929,722	*	$171,554	$1,765	$9,700				$9,445,557
Newport	$3,405,409	$3,662,952	$3,198,653	$200,580	$8,607	$10,738				$10,486,939
Coos Bay	$12,821	$4,085,658	$2,261,923	$288,437	$2,079	$5,172			*	$6,656,090
Brookings		$1,796,214	$1,530,062	$1,118,001	$101	$7,870				$4,452,248
Oregon Subtotal	**$5,608,759**	**$16,474,546**	**$7,131,604**	**$1,778,572**	**$12,552**	**$33,480**				**$31,040,834**
Crescent City	$410,055	$387,305	$218,749	$217,104	*	*				$1,246,150
Eureka	$11,328	$3,314,342	$678,666	$309,732	*					$4,314,348
Fort Bragg		$2,245,157	$1,151,139	$545,733	*	$10,988				$3,953,249
Bodega Bay		*	*	$211,321	$478	*				$365,713
San Francisco		$788,889	$342,209	$262,948	$8,048	$25,675				$1,427,769
Monterey		$533,597	$554,555	$420,053	$598	*				$1,509,080
Morro Bay		*	$736,020	$2,831,910	$4,371	$916,386				$4,488,687
Santa Barbara			$461,138	$946,422	$28,295	$22,412				$1,458,267
Los Angeles			$907,703	$76,389	$4,677	$29,979				$1,018,748
San Diego			$693,765	$84,320	$8,971	*				$787,670
California Subtotal	**$421,383**	**$7,331,973**	**$5,833,741**	**$5,906,016**	**$55,981**	**$1,020,671**				**$20,569,765**
Grand Total	$10,033,032	$25,343,925	$17,733,860	$8,143,460	$76,984	$1,077,889	$201,363	$4,898,183	$213,461	$67,722,157

PacFIN vdrfd table 8/25/11

*Excluded for confidentiality

Table 44. Number of vessels making at least one groundfish landing by fishery sector and port group area, 2006-2010

	Shoreside Whiting	Shoreside Nonwhiting Trawl	Limited Entry Fixed Gear	Directed Open Access	Incidental Open Access	Exempted Trawl EFP and Other	Unclassified Landings	Total
Puget Sound		14	33	24	20	8	89	191
Washington Coastal and Columbia River	24	14	47	126	48	13	4	278
Washington Subtotal	**24**	**28**	**80**	**150**	**68**	**21**	**93**	**469**
Columbia River (Oregon) and Tillamook	22	44	13	113	90	15	8	305
Newport	20	31	28	128	89	21		317
Coos Bay	4	31	26	130	83	12		286
Brookings		14	23	137	28	28		230
Oregon Subtotal	**46**	**120**	**90**	**508**	**290**	**76**	**8**	**1,138**
Crescent City	14	15	9	52	14	6		110
Eureka	8	21	9	62	2	5		107
Fort Bragg		9	9	100	15	13		146
Bodega Bay		2	3	45	22	1		73
San Francisco		17	10	134	51	30		242
Monterey		9	15	139	44	15		222
Morro Bay		4	13	211	57	35		320
Santa Barbara		1	13	119	83	33		249
Los Angeles			31	84	65	27		207
San Diego			19	50	44	5		118
California Subtotal	**22**	**78**	**131**	**997**	**397**	**170**		**1,795**
Grand Total	**92**	**226**	**301**	**1,655**	**755**	**267**	**101**	**3,402**

Table 45. Number of vessels making at least one groundfish landing, 2006-2010, by fishery sector and length interval (feet)

Length	Whiting Catcher-Processors	Whiting Mothership Catcher Vessels	Shoreside Whiting	Shoreside Nonwhiting Trawl	Limited Entry Fixed Gear	Directed Open Access	Incidental Open Access
<40	0	0	0	2	105	1,090	474
41-50	0	1	0	15	41	240	149
51-60	0	0	0	37	24	64	31
61-70	1	1	6	30	17	12	7
71-150	0	24	36	49	6	10	8
>150	9	0	0	0	0	0	0
Total	**10**	**26**	**42**	**133**	**193**	**1,416**	**669**

PacFIN vdrfd & sv tables, 09/02/11, NORPAC

Table 46. Gross National Product Implicit Price Deflator used to compute inflation adjusted dollars (Index 2005=100, 4th quarter values used).

Year	Deflator	2010 Inflator
1981	53.646	2.0713
1982	56.422	1.9694
1983	58.305	1.9058
1984	60.413	1.8393
1985	62.087	1.7897
1986	63.513	1.7495
1987	65.475	1.6971
1988	67.895	1.6366
1989	70.257	1.5816
1990	73.176	1.5185
1991	75.505	1.4717
1992	77.149	1.4403
1993	78.829	1.4096
1994	80.507	1.3802
1995	82.125	1.3530
1996	83.638	1.3286
1997	84.982	1.3075
1998	85.914	1.2934
1999	87.23	1.2739
2000	89.371	1.2433
2001	91.151	1.2191
2002	92.828	1.1970
2003	94.799	1.1721
2004	97.862	1.1355
2005	101.309	1.0968
2006	104.218	1.0662
2007	106.943	1.0390
2008	109.216	1.0174
2009	109.665	1.0132
2010	111.118	1.0000

Source: http://www.economagic.com/em-cgi/data.exe/fedstl/gnpdef+1

Table 5. 2013 OFLs (mt) and a range of alternative 2013 ABCs (mt) varied by the probability of overfishing (P*) for west coast groundfish stocks (overfished stocks in CAPS; stocks with new assessments in bold; component stocks in status quo stock complexes in italics).

Stock	2013 OFL	Category	Range of Alternative 2013 ABCs Overfishing Probability (P*)							
			0.45	0.40	0.35	0.30	0.25	0.20	0.15	0.10
OVERFISHED STOCKS										
BOCACCIO S. of 40°10' N latitude	**884**	1	**845**	**807**	**769**	**732**	**693**	**653**	**609**	**557**
CANARY	**752**	1	**719**	**686**	**654**	**622**	**589**	**556**	**518**	**474**
COWCOD S. of 40°10' N latitude	11		10	9	8	7	6	5	4	3
COWCOD (Conception)	7	2	6	5	5	5	4	4	3	3
COWCOD (Monterey)	5	3	4	3	3	2	2	1	1	1
DARKBLOTCHED	**541**	1	**517**	**494**	**471**	**448**	**424**	**400**	**373**	**341**
PACIFIC OCEAN PERCH	**844**	1	**807**	**771**	**734**	**699**	**662**	**624**	**582**	**532**
PETRALE SOLE	**2,711**	1	**2,592**	**2,475**	**2,359**	**2,245**	**2,125**	**2,003**	**1,868**	**1,708**
YELLOWEYE	**51**	2	**47**	**43**	**39**	**35**	**31**	**28**	**24**	**20**
NON-OVERFISHED STOCKS										
Arrowtooth Flounder	7,391	2	6,748	6,157	5,602	5,070	4,545	4,035	3,503	2,934
Black Rockfish (OR-CA)	1,159	1	1,108	1,058	1,009	960	909	857	799	730
Black Rockfish (WA)	430	1	411	392	374	356	337	318	296	271
Cabezon (CA)	170	1	163	155	148	141	133	126	117	107
Cabezon (OR)	49	1	47	45	43	41	38	36	34	31
California scorpionfish	126	1	120	115	110	104	99	93	87	79
Chilipepper S. of 40°10' N latitude	1,768	1	1,690	1,614	1,538	1,464	1,386	1,307	1,218	1,114
Dover Sole	**92,955**	1	**88,865**	**84,868**	**80,871**	**76,967**	**72,877**	**68,694**	**64,046**	**58,562**
English Sole	7,129	1	6,815	6,509	6,202	5,903	5,589	5,268	4,912	4,491
Lingcod N. of 42° N latitude (OR & WA)	2,102	1	2,010	1,919	1,829	1,740	1,648	1,553	1,448	1,324
Lingcod S. of 42° N latitude (CA)	2,566	2	2,343	2,137	1,945	1,760	1,578	1,401	1,216	1,019
Longnose skate	2,902	1	2,774	2,650	2,525	2,403	2,275	2,145	1,999	1,828
Longspine Thornyhead (coastwide)	3,391	2	3,096	2,825	2,570	2,326	2,085	1,851	1,607	1,346
Pacific Cod	3,200	3	2,669	2,221	1,837	1,504	1,213	954	720	506
Sablefish (coastwide)	**6,621**	1	**6,330**	**6,045**	**5,760**	**5,482**	**5,191**	**4,893**	**4,562**	**4,171**
Shortbelly	6,950	2	6,345	5,789	5,268	4,768	4,274	3,795	3,294	2,759
Shortspine Thornyhead (coastwide)	2,333	1	2,230	2,130	2,030	1,932	1,829	1,724	1,607	1,470
Splitnose S. of 40°10' N latitude	1,684	1	1,610	1,537	1,465	1,394	1,320	1,244	1,160	1,061
Starry Flounder	1,825	2	1,666	1,520	1,383	1,252	1,122	996	865	725

Stock	2013 OFL	Category	Range of Alternative 2013 ABCs Overfishing Probability (P*)							
			0.45	0.40	0.35	0.30	0.25	0.20	0.15	0.10
WIDOW	**4,841**	1	**4,598**	**4,363**	**4,134**	**3,904**	**3,671**	**3,428**	**3,165**	**2,862**
Yellowtail N. of 40^{0}10' N latitude	4,579	1	4,378	4,181	3,984	3,791	3,590	3,384	3,155	2,885
STOCK COMPLEXES										
Minor Nearshore Rockfish North	110		94	80	68	57	48	39	31	24
Black and yellow	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Blue (CA)	*27.4*	2	*25.0*	*22.9*	20.8	18.8	16.9	15.0	13.0	10.9
Blue (OR & WA)	*32.3*	3	*26.9*	*22.4*	18.5	15.2	12.2	9.6	7.3	5.1
Brown	*5.5*	3	*4.6*	*3.8*	3.2	2.6	2.1	1.6	1.2	0.9
Calico	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
China	*9.8*	3	*8.2*	*6.8*	5.6	4.6	3.7	2.9	2.2	1.6
Copper	*26.0*	3	*21.6*	*18.0*	14.9	12.2	9.8	7.7	5.8	4.1
Gopher	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Grass	*0.7*	3	*0.5*	*0.5*	0.4	0.3	0.2	0.2	0.1	0.1
Kelp	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Olive	*0.3*	3	*0.3*	*0.2*	0.2	0.1	0.1	0.1	0.1	0.0
Quillback	*7.4*	3	*6.2*	*5.1*	4.2	3.5	2.8	2.2	1.7	1.2
Treefish	*0.2*	3	*0.2*	*0.2*	0.1	0.1	0.1	0.1	0.0	0.0
Minor Shelf Rockfish North	2,183		1,920	1,690	1,485	1,298	1,125	963	805	646
Bronzespotted	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Bocaccio	*284.0*	3	*236.9*	*197.1*	163.0	133.5	107.6	84.6	63.9	44.9
Chameleon	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Chilipepper	*133.1*	3	*111.0*	*92.4*	76.4	62.5	50.4	39.7	29.9	21.0
Cowcod	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Flag	*0.1*	3	*0.1*	*0.1*	0.0	0.0	0.0	0.0	0.0	0.0
Freckled	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Greenblotched	*1.3*	3	*1.1*	*0.9*	0.7	0.6	0.5	0.4	0.3	0.2
Greenspotted 40°10' to 42° N latitude	***9.4***	2	**8.6**	**7.8**	**7.1**	**6.4**	**5.8**	**5.1**	**4.4**	**3.7**
Greenspotted N. of 42 N latitude (OR & WA)	*6.1*	3	*5.1*	*4.2*	3.5	2.9	2.3	1.8	1.4	1.0
Greenstriped	*1,252.3*	2	*1,143.3*	*1,043.2*	949.2	859.1	770.2	683.8	593.6	497.2
Halfbanded	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Harlequin	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Honeycomb	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Mexican	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Pink	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Pinkrose	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Puget Sound	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0

Stock	2013 OFL	Category	Range of Alternative 2013 ABCs Overfishing Probability (P*)							
			0.45	0.40	0.35	0.30	0.25	0.20	0.15	0.10
Pygmy	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Redstripe	*269.9*	3	*225.1*	*187.3*	154.9	126.9	102.3	80.4	60.7	42.6
Rosethorn	*12.9*	3	*10.8*	*9.0*	7.4	6.1	4.9	3.8	2.9	2.0
Rosy	*3.0*	3	*2.5*	*2.1*	1.7	1.4	1.1	0.9	0.7	0.5
Silvergray	*159.4*	3	*133.0*	*110.6*	91.5	74.9	60.4	47.5	35.9	25.2
Speckled	*0.2*	3	*0.1*	*0.1*	0.1	0.1	0.1	0.1	0.0	0.0
Squarespot	*0.2*	3	*0.1*	*0.1*	0.1	0.1	0.1	0.1	0.0	0.0
Starry	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Stripetail	*40.4*	3	*33.7*	*28.0*	23.2	19.0	15.3	12.0	9.1	6.4
Swordspine	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Tiger	*1.0*	3	*0.8*	*0.7*	0.6	0.5	0.4	0.3	0.2	0.2
Vermilion	*9.7*	3	*8.1*	*6.7*	5.6	4.6	3.7	2.9	2.2	1.5
Minor Slope Rockfish North	1,518		1,381	1,259	1,149	1,050	956	867	777	683
Aurora	*15.4*	3	*12.8*	*10.7*	8.8	7.2	5.8	4.6	3.5	2.4
Bank	*17.2*	3	*14.4*	*12.0*	9.9	8.1	6.5	5.1	3.9	2.7
Blackgill	*4.7*	3	*3.9*	*3.3*	2.7	2.2	1.8	1.4	1.1	0.7
Redbanded	*45.3*	3	*37.7*	*31.4*	26.0	21.3	17.2	13.5	10.2	7.2
Rougheye	*71.1*	3	*59.3*	*49.3*	40.8	33.4	26.9	21.2	16.0	11.2
Sharpchin	*214.5*	3	*178.9*	*148.9*	123.1	100.8	81.3	63.9	48.3	33.9
Shortraker	*18.7*	3	*15.6*	*13.0*	10.7	8.8	7.1	5.6	4.2	3.0
Splitnose	*939.0*	1	*897.7*	*857.3*	817.0	777.5	736.2	693.9	647.0	591.6
Yellowmouth	*192.4*	3	*160.5*	*133.6*	110.5	90.4	72.9	57.3	43.3	30.4
Minor Nearshore Rockfish South	1,164		1,005	868	749	644	549	463	382	303
Shallow Nearshore Species	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Black and yellow	*27.5*	3	*23.0*	*19.1*	*15.8*	*12.9*	*10.4*	*8.2*	*6.2*	*4.4*
China	*16.6*	3	*13.8*	*11.5*	*9.5*	*7.8*	*6.3*	*4.9*	*3.7*	*2.6*
Gopher (N of Pt. Conception)	*157.0*	1	*150.1*	*143.3*	*136.6*	*130.0*	*123.1*	*116.0*	*108.2*	*98.9*
Gopher (S of Pt. Conception)	*25.6*	3	*21.4*	*17.8*	*14.7*	*12.0*	*9.7*	*7.6*	*5.8*	*4.0*
Grass	*59.6*	3	*49.7*	*41.4*	*34.2*	*28.0*	*22.6*	*17.8*	*13.4*	*9.4*
Kelp	*27.7*	3	*23.1*	*19.2*	*15.9*	*13.0*	*10.5*	*8.2*	*6.2*	*4.4*
Deeper Nearshore Species	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Blue (assessed area)	*187.8*	2	*171.4*	*156.4*	142.3	128.8	115.5	102.5	89.0	74.5
Blue (S of 34 ^{o}27' N latitude)	*72.9*	3	*60.8*	*50.6*	41.8	34.3	27.6	21.7	16.4	11.5
Brown	*204.6*	3	*170.6*	*142.0*	117.4	96.2	77.5	61.0	46.0	32.3
Calico	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Copper	*141.5*	3	*118.0*	*98.2*	81.2	66.5	53.6	42.2	31.8	22.4

Stock	2013 OFL	Category	Range of Alternative 2013 ABCs Overfishing Probability (P*)							
			0.45	0.40	0.35	0.30	0.25	0.20	0.15	0.10
Olive	*224.6*	3	*187.4*	*155.9*	128.9	105.6	85.1	66.9	50.5	35.5
Quillback	*5.4*	3	*4.5*	*3.7*	3.1	2.5	2.0	1.6	1.2	0.9
Treefish	*13.2*	3	*11.0*	*9.2*	7.6	6.2	5.0	3.9	3.0	2.1
Minor Shelf Rockfish South	1,910		1,617	1,369	1,153	965	797	646	507	376
Bronzespotted	*3.6*	3	*3.0*	*2.5*	2.1	1.7	1.4	1.1	0.8	0.6
Chameleon	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Flag	*23.4*	3	*19.5*	*16.3*	13.4	11.0	8.9	7.0	5.3	3.7
Freckled	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Greenblotched	*23.1*	3	*19.3*	*16.1*	13.3	10.9	8.8	6.9	5.2	3.7
Greenspotted	***80.3***	2	***73.3***	***66.9***	***60.9***	***55.1***	***49.4***	***43.9***	***38.1***	***31.9***
Greenstriped	*229.7*	2	*209.7*	*191.3*	174.1	157.6	141.3	125.4	108.9	91.2
Halfbanded	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Harlequin	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Honeycomb	*9.9*	3	*8.2*	*6.8*	5.7	4.6	3.7	2.9	2.2	1.6
Mexican	*5.1*	3	*4.2*	*3.5*	2.9	2.4	1.9	1.5	1.1	0.8
Pink	*2.5*	3	*2.1*	*1.8*	1.5	1.2	1.0	0.8	0.6	0.4
Pinkrose	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Pygmy	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Redstripe	*0.5*	3	*0.4*	*0.3*	0.3	0.2	0.2	0.1	0.1	0.1
Rosethorn	*2.1*	3	*1.8*	*1.5*	1.2	1.0	0.8	0.6	0.5	0.3
Rosy	*44.5*	3	*37.1*	*30.9*	25.5	20.9	16.9	13.3	10.0	7.0
Silvergray	*0.5*	3	*0.4*	*0.4*	0.3	0.3	0.2	0.2	0.1	0.1
Speckled	*39.4*	3	*32.8*	*27.3*	22.6	18.5	14.9	11.7	8.9	6.2
Squarespot	*11.1*	3	*9.2*	*7.7*	6.4	5.2	4.2	3.3	2.5	1.8
Starry	*62.6*	3	*52.2*	*43.4*	35.9	29.4	23.7	18.6	14.1	9.9
Stripetail	*23.6*	3	*19.7*	*16.4*	13.6	11.1	9.0	7.0	5.3	3.7
Swordspine	*14.2*	3	*11.9*	*9.9*	8.2	6.7	5.4	4.2	3.2	2.2
Tiger	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Vermilion	*269.3*	3	*224.6*	*186.9*	154.6	126.6	102.1	80.2	60.6	42.5
Yellowtail	*1,064.4*	3	*887.7*	*738.7*	611.0	500.3	403.4	317.2	239.5	168.2
Minor Slope Rockfish South	681		618	561	507	457	408	360	311	259
Aurora	*26.1*	3	*21.7*	*18.1*	*15.0*	*12.3*	*9.9*	*7.8*	*5.9*	*4.1*
Bank	*503.2*	2	*459.4*	*419.2*	*381.4*	*345.2*	*309.5*	*274.8*	*238.5*	*199.8*
Blackgill	***130.0***	2	***118.7***	***108.3***	***98.5***	***89.2***	***80.0***	***71.0***	***61.6***	***51.6***
Pacific ocean perch	*0.0*	3	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Redbanded	*10.4*	3	*8.7*	*7.2*	*6.0*	*4.9*	*3.9*	*3.1*	*2.3*	*1.6*

Stock	2013 OFL	Category	Range of Alternative 2013 ABCs Overfishing Probability (P*)							
			0.45	0.40	0.35	0.30	0.25	0.20	0.15	0.10
Rougheye	*0.4*	3	*0.3*	*0.3*	*0.2*	*0.2*	*0.2*	*0.1*	*0.1*	*0.1*
Sharpchin	*9.8*	3	*8.2*	*6.8*	*5.7*	*4.6*	*3.7*	*2.9*	*2.2*	*1.6*
Shortraker	*0.1*	3	*0.1*	*0.1*	*0.1*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Yellowmouth	*0.8*	3	*0.7*	*0.6*	*0.5*	*0.4*	*0.3*	*0.3*	*0.2*	*0.1*
Other Flatfish	10,060		8,390	6,982	5,775	4,728	3,813	2,998	2,264	1,590
Butter sole	*4.6*	3	*3.9*	*3.2*	*2.7*	*2.2*	*1.8*	*1.4*	*1.0*	*0.7*
Curlfin sole	*8.2*	3	*6.9*	*5.7*	*4.7*	*3.9*	*3.1*	*2.5*	*1.9*	*1.3*
Flathead sole	*35.0*	3	*29.2*	*24.3*	*20.1*	*16.5*	*13.3*	*10.4*	*7.9*	*5.5*
Pacific sanddab	*4,801.0*	3	*4,004.0*	*3,331.9*	*2,755.8*	*2,256.5*	*1,819.6*	*1,430.7*	*1,080.2*	*758.6*
Rex sole	*4,371.5*	3	*3,645.8*	*3,033.8*	*2,509.2*	*2,054.6*	*1,656.8*	*1,302.7*	*983.6*	*690.7*
Rock sole	*66.7*	3	*55.6*	*46.3*	*38.3*	*31.3*	*25.3*	*19.9*	*15.0*	*10.5*
Sand sole	*773.2*	3	*644.8*	*536.6*	*443.8*	*363.4*	*293.0*	*230.4*	*174.0*	*122.2*
Other Fish a/	3,328	3	3,011	2,724	2,458	2,208	1,964	1,731	1,491	1,238
Big skate		3								
Cabezon (WA)		3								
California skate		3								
Finescale codling		3								
Kelp greenling (CA)	*118.9*	3	*99.2*	*82.5*	*68.2*	*55.9*	*45.1*	*35.4*	*26.8*	*18.8*
Kelp greenling (OR & WA)		3								
Leopard shark	*167.1*	3	*139.4*	*116.0*	*95.9*	*78.5*	*63.3*	*49.8*	*37.6*	*26.4*
Pacific rattail		3								
Ratfish		3								
Soupfin shark	*61.6*	3	*51.4*	*42.8*	*35.4*	*29.0*	*23.3*	*18.4*	*13.9*	*9.7*
Spiny dogfish	***2,980.0***	2	***2,720.7***	***2,482.3***	***2,258.8***	***2,044.3***	***1,832.7***	***1,627.1***	***1,412.5***	***1,183.1***

a/ Values for these specifications are the sum of known contributions of component stocks. Fully specified OFLs and ABCs would require the addition of new species to the complex (e.g., non-FMP skates and grenadiers) since many of these species are landed in generic market categories (e.g., unspecified skates).

Table 6. 2014 OFLs (mt) and a range of alternative 2014 ABCs (mt) varied by the probability of overfishing (P*) for west coast groundfish stocks (overfished stocks in CAPS; stocks with new assessments in bold; component stocks in status quo stock complexes in italics).

Stock	2014 OFL	Category	Range of Alternative 2014 ABCs Overfishing Probability (P*)							
			0.45	0.40	0.35	0.30	0.25	0.20	0.15	0.10
OVERFISHED STOCKS										
BOCACCIO S. of 40°10' N latitude	**881**	1	**842**	**804**	**766**	**729**	**691**	**651**	**607**	**555**
CANARY	**741**	1	**709**	**677**	**645**	**614**	**581**	**548**	**511**	**467**
COWCOD S. of 40°10' N latitude	12		10	9	8	7	6	5	4	3
COWCOD (Conception)	7	2	6	6	5	5	4	4	3	3
COWCOD (Monterey)	5	3	4	3	3	2	2	1	1	1
DARKBLOTCHED	**553**	1	**529**	**505**	**481**	**458**	**434**	**409**	**381**	**348**
PACIFIC OCEAN PERCH	**838**	1	**801**	**765**	**729**	**694**	**657**	**619**	**577**	**528**
PETRALE SOLE	**2,774**	1	**2,652**	**2,533**	**2,413**	**2,297**	**2,175**	**2,050**	**1,911**	**1,748**
YELLOWEYE	**51**	2	**47**	**43**	**39**	**35**	**31**	**28**	**24**	**20**
NON-OVERFISHED STOCKS										
Arrowtooth Flounder	6,912	2	6,311	5,758	5,239	4,742	4,251	3,774	3,276	2,744
Black Rockfish (OR-CA)	1,166	1	1,115	1,065	1,015	966	914	862	804	735
Black Rockfish (WA)	428	1	409	391	372	354	335	316	295	269
Cabezon (CA)	165	1	158	151	144	137	129	122	114	104
Cabezon (OR)	49	1	47	45	43	41	38	36	34	31
California scorpionfish	122	1	117	111	106	101	96	90	84	77
Chilipepper S. of 40°10' N latitude	1,722	1	1,647	1,573	1,498	1,426	1,350	1,273	1,187	1,085
Dover Sole	**77,774**	1	**74,352**	**71,008**	**67,663**	**64,397**	**60,975**	**57,475**	**53,586**	**48,998**
English Sole	5,906	1	5,646	5,392	5,138	4,890	4,630	4,365	4,069	3,721
Lingcod N. of 42° N latitude (OR & WA)	1,984	1	1,897	1,811	1,726	1,643	1,555	1,466	1,367	1,250
Lingcod S. of 42° N latitude (CA)	2,454	2	2,241	2,044	1,860	1,683	1,509	1,340	1,163	974
Longnose skate	2,816	1	2,692	2,571	2,450	2,332	2,208	2,081	1,940	1,774
Longspine Thornyhead (coastwide)	3,304	2	3,017	2,752	2,504	2,267	2,032	1,804	1,566	1,312
Pacific Cod	3,200	3	2,669	2,221	1,837	1,504	1,213	954	720	506
Sablefish (coastwide)	**7,158**	1	**6,843**	**6,535**	**6,227**	**5,927**	**5,612**	**5,290**	**4,932**	**4,510**
Shortbelly	6,950	2	6,345	5,789	5,268	4,768	4,274	3,795	3,294	2,759
Shortspine Thornyhead (coastwide)	2,310	1	2,208	2,109	2,010	1,913	1,811	1,707	1,592	1,455
Splitnose S. of 40°10' N latitude	1,747	1	1,670	1,595	1,520	1,446	1,370	1,291	1,204	1,101
Starry Flounder	1,834	2	1,674	1,528	1,390	1,258	1,128	1,001	869	728

WIDOW	**4,435**	1	**4,212**	**3,997**	**3,787**	**3,577**	**3,364**	**3,141**	**2,900**	**2,622**
Yellowtail N. of 40^{0}10' N latitude	4,584	1	4,382	4,185	3,988	3,796	3,594	3,388	3,158	2,888
STOCK COMPLEXES										
Minor Nearshore Rockfish North	110		94	80	68	57	48	39	31	24
Black and yellow	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Blue (CA)	*27.4*	2	*25.0*	*22.9*	20.8	18.8	16.9	15.0	13.0	10.9
Blue (OR & WA)	*32.3*	3	*26.9*	*22.4*	18.5	15.2	12.2	9.6	7.3	5.1
Brown	*5.5*	3	*4.6*	*3.8*	3.2	2.6	2.1	1.6	1.2	0.9
Calico	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
China	*9.8*	3	*8.2*	*6.8*	5.6	4.6	3.7	2.9	2.2	1.6
Copper	*26.0*	3	*21.6*	*18.0*	14.9	12.2	9.8	7.7	5.8	4.1
Gopher	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Grass	*0.7*	3	*0.5*	*0.5*	0.4	0.3	0.2	0.2	0.1	0.1
Kelp	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Olive	*0.3*	3	*0.3*	*0.2*	0.2	0.1	0.1	0.1	0.1	0.0
Quillback	*7.4*	3	*6.2*	*5.1*	4.2	3.5	2.8	2.2	1.7	1.2
Treefish	*0.2*	3	*0.2*	*0.2*	0.1	0.1	0.1	0.1	0.0	0.0
Minor Shelf Rockfish North	2,195		1,920	1,690	1,485	1,298	1,125	963	805	646
Bronzespotted	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Bocaccio	*284.0*	3	*236.9*	*197.1*	163.0	133.5	107.6	84.6	63.9	44.9
Chameleon	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Chilipepper	*129.6*	3	*111.0*	*92.4*	76.4	62.5	50.4	39.7	29.9	21.0
Cowcod	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Flag	*0.1*	3	*0.1*	*0.1*	0.0	0.0	0.0	0.0	0.0	0.0
Freckled	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Greenblotched	*1.3*	3	*1.1*	*0.9*	0.7	0.6	0.5	0.4	0.3	0.2
Greenspotted 40°10' to 42° N latitude	***9.4***	2	**8.6**	**7.8**	**7.1**	**6.4**	**5.8**	**5.1**	**4.4**	**3.7**
Greenspotted N. of 42 N latitude (OR & WA)	*6.1*	3	*5.1*	*4.2*	3.5	2.9	2.3	1.8	1.4	1.0
Greenstriped	*1,268.3*	2	*1,143.3*	*1,043.2*	949.2	859.1	770.2	683.8	593.6	497.2
Halfbanded	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Harlequin	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Honeycomb	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Mexican	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Pink	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Pinkrose	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Puget Sound	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Pygmy	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Redstripe	*269.9*	3	*225.1*	*187.3*	154.9	126.9	102.3	80.4	60.7	42.6
Rosethorn	*12.9*	3	*10.8*	*9.0*	7.4	6.1	4.9	3.8	2.9	2.0
Rosy	*3.0*	3	*2.5*	*2.1*	1.7	1.4	1.1	0.9	0.7	0.5

Silvergray	*159.4*	3	*133.0*	*110.6*	91.5	74.9	60.4	47.5	35.9	25.2
Speckled	*0.2*	3	*0.1*	*0.1*	0.1	0.1	0.1	0.1	0.0	0.0
Squarespot	*0.2*	3	*0.1*	*0.1*	0.1	0.1	0.1	0.1	0.0	0.0
Starry	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Stripetail	*40.4*	3	*33.7*	*28.0*	23.2	19.0	15.3	12.0	9.1	6.4
Swordspine	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Tiger	*1.0*	3	*0.8*	*0.7*	0.6	0.5	0.4	0.3	0.2	0.2
Vermilion	*9.7*	3	*8.1*	*6.7*	5.6	4.6	3.7	2.9	2.2	1.5
Minor Slope Rockfish North	1,553		1,381	1,259	1,149	1,050	956	867	777	683
Aurora	*15.4*	3	*12.8*	*10.7*	8.8	7.2	5.8	4.6	3.5	2.4
Bank	*17.2*	3	*14.4*	*12.0*	9.9	8.1	6.5	5.1	3.9	2.7
Blackgill	*4.7*	3	*3.9*	*3.3*	2.7	2.2	1.8	1.4	1.1	0.7
Redbanded	*45.3*	3	*37.7*	*31.4*	26.0	21.3	17.2	13.5	10.2	7.2
Rougheye	*71.1*	3	*59.3*	*49.3*	40.8	33.4	26.9	21.2	16.0	11.2
Sharpchin	*214.5*	3	*178.9*	*148.9*	123.1	100.8	81.3	63.9	48.3	33.9
Shortraker	*18.7*	3	*15.6*	*13.0*	10.7	8.8	7.1	5.6	4.2	3.0
Splitnose	*974.1*	1	*897.7*	*857.3*	817.0	777.5	736.2	693.9	647.0	591.6
Yellowmouth	*192.4*	3	*160.5*	*133.6*	110.5	90.4	72.9	57.3	43.3	30.4
Minor Nearshore Rockfish South	1,160		1,005	868	749	644	549	463	382	303
Shallow Nearshore Species	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Black and yellow	*27.5*	3	*23.0*	*19.1*	*15.8*	*12.9*	*10.4*	*8.2*	*6.2*	*4.4*
China	*16.6*	3	*13.8*	*11.5*	*9.5*	*7.8*	*6.3*	*4.9*	*3.7*	*2.6*
Gopher (N of Pt. Conception)	*153.0*	1	*150.1*	*143.3*	*136.6*	*130.0*	*123.1*	*116.0*	*108.2*	*98.9*
Gopher (S of Pt. Conception)	*25.6*	3	*21.4*	*17.8*	*14.7*	*12.0*	*9.7*	*7.6*	*5.8*	*4.0*
Grass	*59.6*	3	*49.7*	*41.4*	*34.2*	*28.0*	*22.6*	*17.8*	*13.4*	*9.4*
Kelp	*27.7*	3	*23.1*	*19.2*	*15.9*	*13.0*	*10.5*	*8.2*	*6.2*	*4.4*
Deeper Nearshore Species	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Blue (assessed area)	*187.8*	2	*171.4*	*156.4*	142.3	128.8	115.5	102.5	89.0	74.5
Blue (S of 34°27' N latitude)	*72.9*	3	*60.8*	*50.6*	41.8	34.3	27.6	21.7	16.4	11.5
Brown	*204.6*	3	*170.6*	*142.0*	117.4	96.2	77.5	61.0	46.0	32.3
Calico	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Copper	*141.5*	3	*118.0*	*98.2*	81.2	66.5	53.6	42.2	31.8	22.4
Olive	*224.6*	3	*187.4*	*155.9*	128.9	105.6	85.1	66.9	50.5	35.5
Quillback	*5.4*	3	*4.5*	*3.7*	3.1	2.5	2.0	1.6	1.2	0.9
Treefish	*13.2*	3	*11.0*	*9.2*	7.6	6.2	5.0	3.9	3.0	2.1
Minor Shelf Rockfish South	1,913		1,617	1,369	1,153	965	797	646	507	376
Bronzespotted	*3.6*	3	*3.0*	*2.5*	2.1	1.7	1.4	1.1	0.8	0.6
Chameleon	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Flag	*23.4*	3	*19.5*	*16.3*	13.4	11.0	8.9	7.0	5.3	3.7
Freckled	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0

Greenblotched	*23.1*	3	*19.3*	*16.1*	13.3	10.9	8.8	6.9	5.2	3.7
Greenspotted	***80.3***	2	***73.3***	***66.9***	***60.9***	***55.1***	***49.4***	***43.9***	***38.1***	***31.9***
Greenstriped	*232.7*	2	*209.7*	*191.3*	174.1	157.6	141.3	125.4	108.9	91.2
Halfbanded	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Harlequin	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Honeycomb	*9.9*	3	*8.2*	*6.8*	5.7	4.6	3.7	2.9	2.2	1.6
Mexican	*5.1*	3	*4.2*	*3.5*	2.9	2.4	1.9	1.5	1.1	0.8
Pink	*2.5*	3	*2.1*	*1.8*	1.5	1.2	1.0	0.8	0.6	0.4
Pinkrose	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Pygmy	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Redstripe	*0.5*	3	*0.4*	*0.3*	0.3	0.2	0.2	0.1	0.1	0.1
Rosethorn	*2.1*	3	*1.8*	*1.5*	1.2	1.0	0.8	0.6	0.5	0.3
Rosy	*44.5*	3	*37.1*	*30.9*	25.5	20.9	16.9	13.3	10.0	7.0
Silvergray	*0.5*	3	*0.4*	*0.4*	0.3	0.3	0.2	0.2	0.1	0.1
Speckled	*39.4*	3	*32.8*	*27.3*	22.6	18.5	14.9	11.7	8.9	6.2
Squarespot	*11.1*	3	*9.2*	*7.7*	6.4	5.2	4.2	3.3	2.5	1.8
Starry	*62.6*	3	*52.2*	*43.4*	35.9	29.4	23.7	18.6	14.1	9.9
Stripetail	*23.6*	3	*19.7*	*16.4*	13.6	11.1	9.0	7.0	5.3	3.7
Swordspine	*14.2*	3	*11.9*	*9.9*	8.2	6.7	5.4	4.2	3.2	2.2
Tiger	*0.0*	3	*0.0*	*0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Vermilion	*269.3*	3	*224.6*	*186.9*	154.6	126.6	102.1	80.2	60.6	42.5
Yellowtail	*1,064.4*	3	*887.7*	*738.7*	611.0	500.3	403.4	317.2	239.5	168.2
Minor Slope Rockfish South	685		618	561	507	457	408	360	311	259
Aurora	*26.1*	3	*21.7*	*18.1*	*15.0*	*12.3*	*9.9*	*7.8*	*5.9*	*4.1*
Bank	*503.2*	2	*459.4*	*419.2*	*381.4*	*345.2*	*309.5*	*274.8*	*238.5*	*199.8*
Blackgill	***134.0***	2	***118.7***	***108.3***	***98.5***	***89.2***	***80.0***	***71.0***	***61.6***	***51.6***
Pacific ocean perch	*0.0*	3	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Redbanded	*10.4*	3	*8.7*	*7.2*	*6.0*	*4.9*	*3.9*	*3.1*	*2.3*	*1.6*
Rougheye	*0.4*	3	*0.3*	*0.3*	*0.2*	*0.2*	*0.2*	*0.1*	*0.1*	*0.1*
Sharpchin	*9.8*	3	*8.2*	*6.8*	*5.7*	*4.6*	*3.7*	*2.9*	*2.2*	*1.6*
Shortraker	*0.1*	3	*0.1*	*0.1*	*0.1*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Yellowmouth	*0.8*	3	*0.7*	*0.6*	*0.5*	*0.4*	*0.3*	*0.3*	*0.2*	*0.1*
Other Flatfish	10,060		8,390	6,982	5,775	4,728	3,813	2,998	2,264	1,590
Butter sole	*4.6*	3	*3.9*	*3.2*	*2.7*	*2.2*	*1.8*	*1.4*	*1.0*	*0.7*
Curlfin sole	*8.2*	3	*6.9*	*5.7*	*4.7*	*3.9*	*3.1*	*2.5*	*1.9*	*1.3*
Flathead sole	*35.0*	3	*29.2*	*24.3*	*20.1*	*16.5*	*13.3*	*10.4*	*7.9*	*5.5*
Pacific sanddab	*4,801.0*	3	*4,004.0*	*3,331.9*	*2,755.8*	*2,256.5*	*1,819.6*	*1,430.7*	*1,080.2*	*758.6*
Rex sole	*4,371.5*	3	*3,645.8*	*3,033.8*	*2,509.2*	*2,054.6*	*1,656.8*	*1,302.7*	*983.6*	*690.7*
Rock sole	*66.7*	3	*55.6*	*46.3*	*38.3*	*31.3*	*25.3*	*19.9*	*15.0*	*10.5*
Sand sole	*773.2*	3	*644.8*	*536.6*	*443.8*	*363.4*	*293.0*	*230.4*	*174.0*	*122.2*

Other Fish a/	3,298	3	3,011	2,724	2,458	2,208	1,964	1,731	1,491	1,238
Big skate		3								
Cabezon (WA)		3								
California skate		3								
Finescale codling		3								
Kelp greenling (CA)	*118.9*	3	*99.2*	*82.5*	*68.2*	*55.9*	*45.1*	*35.4*	*26.8*	*18.8*
Kelp greenling (OR & WA)		3								
Leopard shark	*167.1*	3	*139.4*	*116.0*	*95.9*	*78.5*	*63.3*	*49.8*	*37.6*	*26.4*
Pacific rattail		3								
Ratfish		3								
Soupfin shark	*61.6*	3	*51.4*	*42.8*	*35.4*	*29.0*	*23.3*	*18.4*	*13.9*	*9.7*
Spiny dogfish	***2,950.0***	2	***2,720.7***	***2,482.3***	***2,258.8***	***2,044.3***	***1,832.7***	***1,627.1***	***1,412.5***	***1,183.1***

a/ Values for these specifications are the sum of known contributions of component stocks. Fully specified OFLs and ABCs would require the addition of new species to the complex (e.g., non-FMP skates and grenadiers) since many of these species are landed in generic market categories (e.g., unspecified skates).

Table 1. Final preferred 2013 and 2014 OFLs (mt) and ABCs (mt) and presumptive 2013 and 2014 ACLs (mt) for non-overfished west coast groundfish stocks assuming the status quo basis for deciding the ACLs (overfished stocks in CAPS; stocks with new assessments in bold; component stocks in status quo stock complexes in italics).

Stock	2013 OFL	2014 OFL	2013 ABC	2014 ABC	Presumptive ACLs 2013	Presumptive ACLs 2014	Basis for ACL
NON-OVERFISHED STOCKS							
Arrowtooth Flounder	7,391	6,912	6,157	5,758	6,157	5,758	Equals ABC
Black Rockfish (OR-CA)	1,159	1,166	1,108	1,115	1,000	1,000	Constant catch
Black Rockfish (WA)	430	428	411	409	411	409	Equals ABC
Cabezon (CA)	170	165	163	158	163	158	Equals ABC
Cabezon (OR)	49	49	47	47	47	47	Equals ABC
California scorpionfish	126	122	120	117	120	117	Equals ABC
Chilipepper S. of 40^{0}10’	1,768	1,722	1,690	1,647	1,690	1,647	Equals ABC
Dover Sole	**92,955**	**77,774**	**88,865**	**74,352**	**25,000**	**25,000**	Equals 2012 ACL
English Sole	7,129	5,906	6,815	5,646	6,815	5,646	Equals ABC
Lingcod N. of 42º (OR & WA)	2,102	1,984	2,010	1,897	2,010	1,897	Equals ABC
Lingcod S. of 42º (CA)	2,566	2,454	2,137	2,044	2,137	2,044	Equals ABC
Longnose skate	2,902	2,816	2,774	2,692	1,349	1,349	Equals 50% increase in 2004-06 ave. mortality, note GMT recommendation to analyze a 2,000 mt ACL alternative
Longspine Thornyhead (coastwide)	3,391	3,304	2,825	2,752	NA	NA	NA - no coastwide ACL
Longspine Thornyhead N. of 34°27'	NA	NA	NA	NA	2,009	1,958	79% of coastwide OFL with 25% scientific uncertainty reduction
Longspine Thornyhead S. of 34°27'	NA	NA	NA	NA	356	347	21% of coastwide OFL with 50% scientific uncertainty reduction
Pacific Cod	3,200	3,200	2,221	2,221	1,600	1,600	Equals 50% of the OFL
Sablefish (coastwide)	**6,621**	**7,158**	**TBD**		**NA**	**NA**	NA - no coastwide ACL
Sablefish N. of 36°	**NA**	**NA**	**NA**	**NA**	**TBD**		**TBD**
Sablefish S. of 36°	**NA**	**NA**	**NA**	**NA**			**TBD**
Shortbelly	6,950	6,950	5,789	5,789	50	50	Constant catch that allows incid. mort. but is low for ecological considerations
Shortspine Thornyhead (coastwide)	2,333	2,310	2,230	2,208	NA	NA	NA - no coastwide ACL
Shortspine Thornyhead N. of	NA	NA	NA	NA	1,540	1,525	66% of coastwide OFL

Stock	2013 OFL	2014 OFL	2013 ABC	2014 ABC	Presumptive ACLs 2013	Presumptive ACLs 2014	Basis for ACL
34°27'							
Shortspine Thornyhead S. of 34°27'	NA	NA	NA	NA	397	393	34% of the coastwide OFL with 50% scientific uncertainty reduction
Splitnose S. of 40^{0}10'	1,684	1,747	1,610	1,670	1,610	1,670	Equals ABC
Starry Flounder	1,825	1,834	1,520	1,528	1,520	1,528	Equals ABC
WIDOW	**4,841**	**4435**	**4,598**	**4,212**	**TBD**	**TBD**	600 mt constant catch under rebuilding plan. Now rebuilt.
Yellowtail N. of 40^{0}10'	4,579	4,584	4,378	4,382	4,378	4,382	Equals ABC
STOCK COMPLEXES							
Minor Nearshore Rockfish North	110	110	94	94	94	94	Equals ABC
Minor Shelf Rockfish North	2,183	2,195	1,920	1,932	968	968	Equals 2010 OY (and 2012 ACL)
Minor Slope Rockfish North	1,518	1,553	1,381	1,414	1,160	1,160	Equals 2010 OY (and 2012 ACL)
Minor Nearshore Rockfish South	1,164	1,160	1,005	1,001	990	990	Equals 2010 OY (and 2012 ACL)
Minor Shelf Rockfish South	1,910	1,913	1,617	1,620	714	714	Equals 2010 OY (and 2012 ACL)
Minor Slope Rockfish South	681	685	618	622	TBD	TBD	2012 ACL (based on 2010 OY) = 626, which is higher than 2013 and 2014 ABCs
Other Flatfish	10,060	10,060	6,982	6,982	4,884	4,884	Equals 2010 OY (and 2012 ACL)
Other Fish a/	3,328	3,298	2,286	2,265	TBD	TBD	2012 ACL = 2010 OY minus 50% of contribution of OR cabezon (25 mt), which is higher than 2013 and 2014 ABCs

a/ Values for these specifications are the sum of known contributions of component stocks. Fully specified OFLs and ABCs would require the addition of new species to the complex (e.g., non-FMP skates and grenadiers) since many of these species are landed in generic market categories (e.g., unspecified skates).

Table 2. Range of coastwide 2013 and 2014 sablefish ABCs (mt) and ACLs (mt) by alternative overfishing probabilities (P*s).[a/]

Year	Range of Alternative ABCs by Overfishing Probability (P*)							
	0.45	**0.40**	**0.35**	**0.30**	**0.25**	**0.20**	**0.15**	**0.10**
2013	6,330	6,045	5,760	5,482	5,191	4,893	4,562	4,171
2014	6,843	6,535	6,227	5,927	5,612	5,290	4,932	4,510

Year	Area	Range of Alternative ACLs Depending on the ABC as Defined by P*	
		0.45	**0.33**
2013	N of 36°	4,201	3,918
	S of 36°	1,507	1,405
2014	N of 36°	4,542	4,233
	S of 36°	1,629	1,519

a/ ACLs are apportioned north and south of 36° N lat. based on the average 2003-2010 swept area biomass estimates from the NWFSC trawl survey (S = 26.4% of coastwide biomass and N = 73.6% of coastwide biomass). ACLs are also adjusted by ABCs and the 40-10 harvest control rule.

Table 3. Widow rockfish decision table based on three states of nature (determined by *h* values) and three catch streams.

			State of nature					
			h = 0.41		Base case (h=0.76)		*h* = 0.90	
Management decision	Year	Catch (mt)	Depletion (%)	Spawning biomass (mt)	Depletion (%)	Spawning biomass (mt)	Depletion (%)	Spawning biomass (mt)
40/10 adjustment (*h*=0.41)	2011	600	30.0	22765	51.1	36342	55.6	39240
	2012	600	29.4	22288	50.7	36053	55.2	38978
	2013	2584	28.6	21686	49.9	35514	54.5	38429
	2014	2280	26.4	19996	47.6	33847	52.0	36732
	2015	2072	24.8	18807	46.0	32742	50.4	35593
	2016	1985	23.9	18154	45.4	32277	49.7	35091
	2017	2008	23.8	18045	45.7	32515	50.0	35296
	2018	2096	24.2	18346	46.9	33339	51.1	36096
	2019	2200	24.8	18787	48.4	34420	52.7	37165
	2020	2289	25.3	19202	50.0	35562	54.3	38308
	2021	2354	25.7	19530	51.6	36696	55.9	39460
	2022	2394	26.0	19751	53.1	37779	57.5	40576
Constant catch (3500 mt)	2011	600	30.0	22765	51.1	36342	55.6	39240
	2012	600	29.4	22288	50.7	36053	55.2	38978
	2013	3500	28.6	21686	49.9	35514	54.5	38429
	2014	3500	25.7	19472	46.8	33319	51.3	36204
	2015	3500	23.2	17618	44.3	31540	48.7	34389
	2016	3500	21.4	16233	42.6	30327	47.0	33137

			State of nature					
			h = 0.41		Base case (h=0.76)		*h* = 0.90	
Management decision	Year	Catch (mt)	Depletion (%)	Spawning biomass (mt)	Depletion (%)	Spawning biomass (mt)	Depletion (%)	Spawning biomass (mt)
	2017	3500	20.3	15407	41.9	29827	46.2	32601
	2018	3500	19.8	15050	42.1	29973	46.4	32721
	2019	3500	19.7	14910	42.8	30466	47.0	33201
	2020	3500	19.5	14815	43.7	31111	48.0	33853
	2021	3500	19.3	14675	44.7	31826	49.0	34596
	2022	3500	19.0	14439	45.8	32548	50.1	35370
	2011	600	30.0	22765	51.1	36342	55.6	39240
	2012	600	29.4	22288	50.7	36053	55.2	38978
	2013	4841	28.6	21686	49.9	35514	54.5	38429
	2014	4435	24.7	18704	45.8	32546	50.2	35429
	2015	4137	21.6	16363	42.6	30270	46.9	33117
OFL from	2016	3990	19.4	14702	40.4	28769	44.7	31575
base model	2017	3961	18.1	13716	39.5	28095	43.7	30863
	2018	4023	17.4	13227	39.5	28100	43.7	30842
	2019	4126	17.0	12916	40.0	28425	44.1	31156
	2020	4217	16.6	12576	40.6	28849	44.8	31591
	2021	4296	16.0	12108	41.2	29293	45.4	32075
	2022	4361	15.1	11468	41.8	29703	46.1	32553

Table 4. Widow rockish decision table based on two states of nature (determined by *h* values) and four future catch streams requested by the GMT.

			State of nature			
			h = 0.41		Base case (*h*=0.76)	
Management decision	Year	Catch (mt)	Depletion (%)	Spawning biomass (mt)	Depletion (%)	Spawning biomass (mt)
Constant catch (1500 mt)	2011	600	30.0	22765	51.1	36342
	2012	600	29.4	22288	50.7	36053
	2013	1500	28.6	21686	49.9	35514
	2014	1500	27.2	20619	48.5	34473
	2015	1500	26.1	19839	47.5	33785
	2016	1500	25.6	19443	47.2	33585
	2017	1500	25.7	19515	47.8	34014
	2018	1500	26.4	19993	49.2	35022
	2019	1500	27.2	20655	51.1	36325
	2020	1500	28.1	21354	53.1	37737
	2021	1500	29.0	22029	55.1	39182
	2022	1500	29.9	22648	57.1	40603
Constant catch (2000 mt)	2011	600	30.0	22765	51.1	36342
	2012	600	29.4	22288	50.7	36053
	2013	2000	28.6	21686	49.9	35514
	2014	2000	26.8	20332	48.1	34184
	2015	2000	25.4	19283	46.7	33223
	2016	2000	24.6	18639	46.1	32770

			State of nature			
			h = 0.41		Base case (h=0.76)	
Management decision	Year	Catch (mt)	Depletion (%)	Spawning biomass (mt)	Depletion (%)	Spawning biomass (mt)
Constant catch (2500 mt)	2017	2000	24.4	18486	46.3	32967
	2018	2000	24.7	18755	47.5	33759
	2019	2000	25.3	19217	49.0	34860
	2020	2000	26.0	19720	50.7	36082
	2021	2000	26.6	20197	52.5	37347
	2022	2000	27.2	20609	54.3	38596
	2011	600	30.0	22765	51.1	36342
	2012	600	29.4	22288	50.7	36053
	2013	2500	28.6	21686	49.9	35514
	2014	2500	26.4	20046	47.7	33896
	2015	2500	24.7	18729	45.9	32663
	2016	2500	23.5	17838	44.9	31957
	2017	2500	23.0	17460	44.9	31922
	2018	2500	23.1	17520	45.7	32499
	2019	2500	23.4	17783	47.0	33398
	2020	2500	23.8	18089	48.4	34429
	2021	2500	24.2	18364	49.9	35513
	2022	2500	24.5	18565	51.4	36589

Informational Briefing:

An Overview of Scientific Uncertainty Buffers and Acceptable Biological Catch Specifications

Pacific Fishery Management Council
November, 2011

New Terminology

<table>
<tr><th colspan="2">Harvest Specification Framework Prior to 2011</th><th colspan="2">Am. 23 Harvest Specification Framework</th></tr>
<tr><td>ABC</td><td>Overfishing Limit</td><td>OFL</td><td>Overfishing Limit</td></tr>
<tr><td rowspan="2">OY</td><td rowspan="2">Buffer accommodates scientific uncertainty, management uncertainty, socioeconomic concerns, rebuilding/precautionary zone concerns, ecological concerns, etc.</td><td>ABC</td><td>Buffer accommodates scientific uncertainty</td></tr>
<tr><td>ACL</td><td>Buffer accommodates management uncertainty, socioeconomic concerns, rebuilding/precautionary zone concerns, ecological considerations, etc.</td></tr>
<tr><td>HG</td><td>Buffer accommodates ad hoc sector allocations and other management objectives</td><td>ACT</td><td>Buffer accommodates inseason catch monitoring uncertainty</td></tr>
</table>

Which of the Metrics are Science Determinations vs. Policy Determinations?

SSC Scientific Determinations To Be Approved by the Council

- OFL
- Part of the ABC: Quantification of Assessment Variance (e.g., $\sigma = 0.36$ for cat. 1 stocks)
- Species or Stock Categorization Based On The Amount and Quality of Data Informing Harvest Specifications (Category 1, 2, or 3)

Council Policy Determinations

- Part of the ABC: Size of Scientific Uncertainty Buffer For All Three Categories of Stocks Based on a Risk Assessment
- P* : Probability the est. OFL is Wrong, thus P* is a Risk Assessment Metric

What Exactly Is Sigma (σ)?

- The Scientific Uncertainty Buffer has Two Parts:
  - Scientific Variability between Stock Assessments
  - Probability the OFL Point Estimate is Wrong
- σ is the Quantification of Stock Assessment Variability
- The SSC has Determined σ = 0.36 for Category 1 Stocks, σ = 0.41 for Widow, σ = 0.72 for Category 2 Stocks, and σ = 1.44 for Category 3 Stocks

What is P* and How Does It Work?

- The Scientific Uncertainty Buffer has Two Parts:
  - Scientific Variability between Stock Assessments (σ)
  - Probability the OFL Estimate is Wrong (P*)
- (P*) is an Overfishing Risk Assessment Metric
  - Choosing a P* Completes the Calculation of the Scientific Uncertainty Buffer, i.e., the Gap between OFL and ABC
  - Probability of Exceeding the OFL Given the Variability Between Stock Assessments (σ)

Why are we concerned about scientific uncertainty in estimating the OFL?

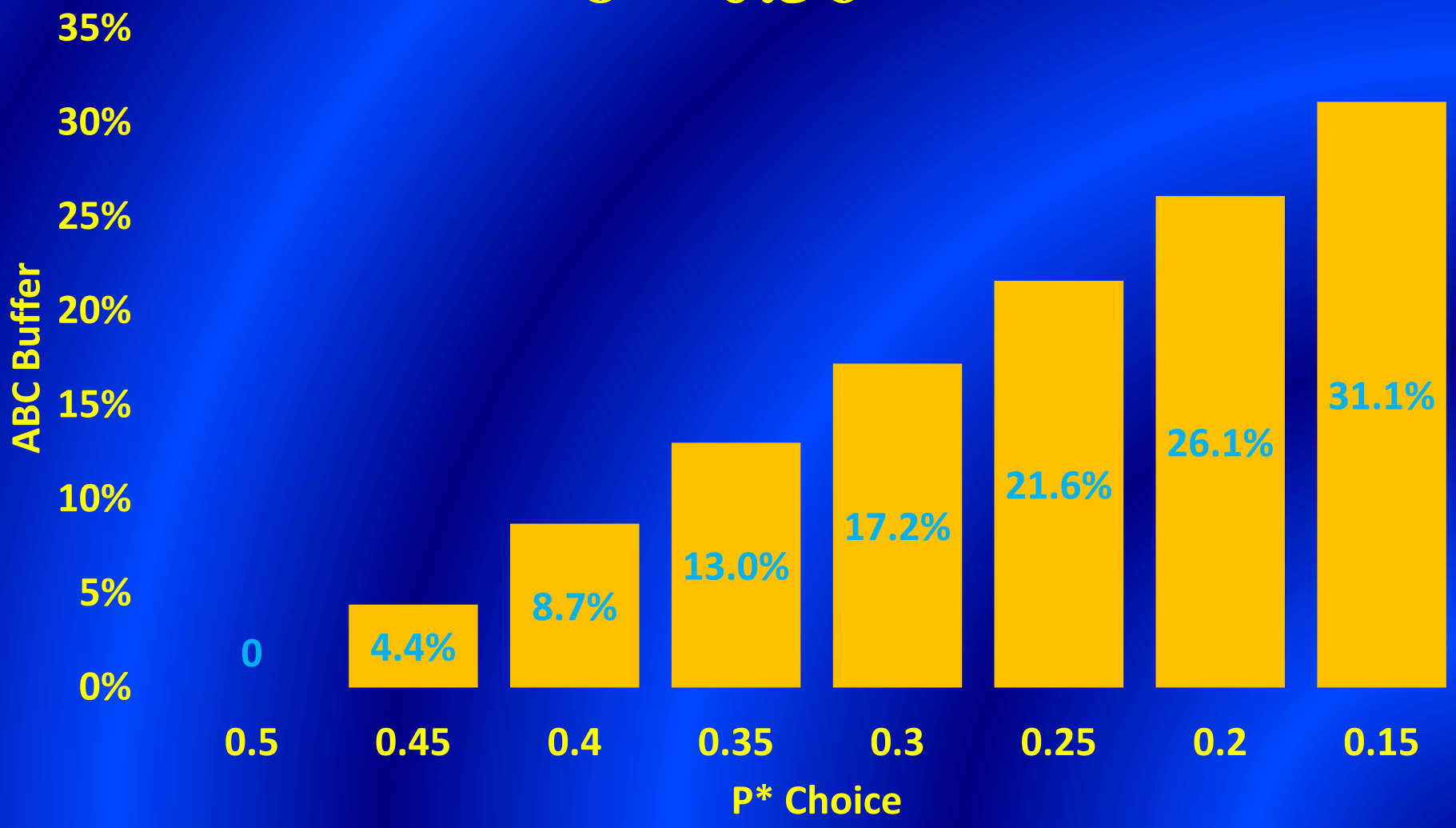
- The OFL is a median estimate, which means there is a 50% probability the estimate is too high (i.e., true OFL is lower) and a 50% probability the estimate is too low (i.e., actual OFL is higher)
- Any overfishing concern due to the true OFL being lower than the estimate can be mitigated by changing the probability from 50:50

How does P* mitigate this concern?

- A P* choice less than .5 adds a buffer to the OFL (i.e., ABC < OFL) and reduces the probability the OFL estimate is higher than the true value
  - There is no buffer when P* = 0.5
  - Council policy is the largest P* considered is P* = 0.45
- Specifying a P* of 0.45 means there is a 45% probability the OFL estimate is too high and a 55% probability the true OFL is as high or higher than estimated

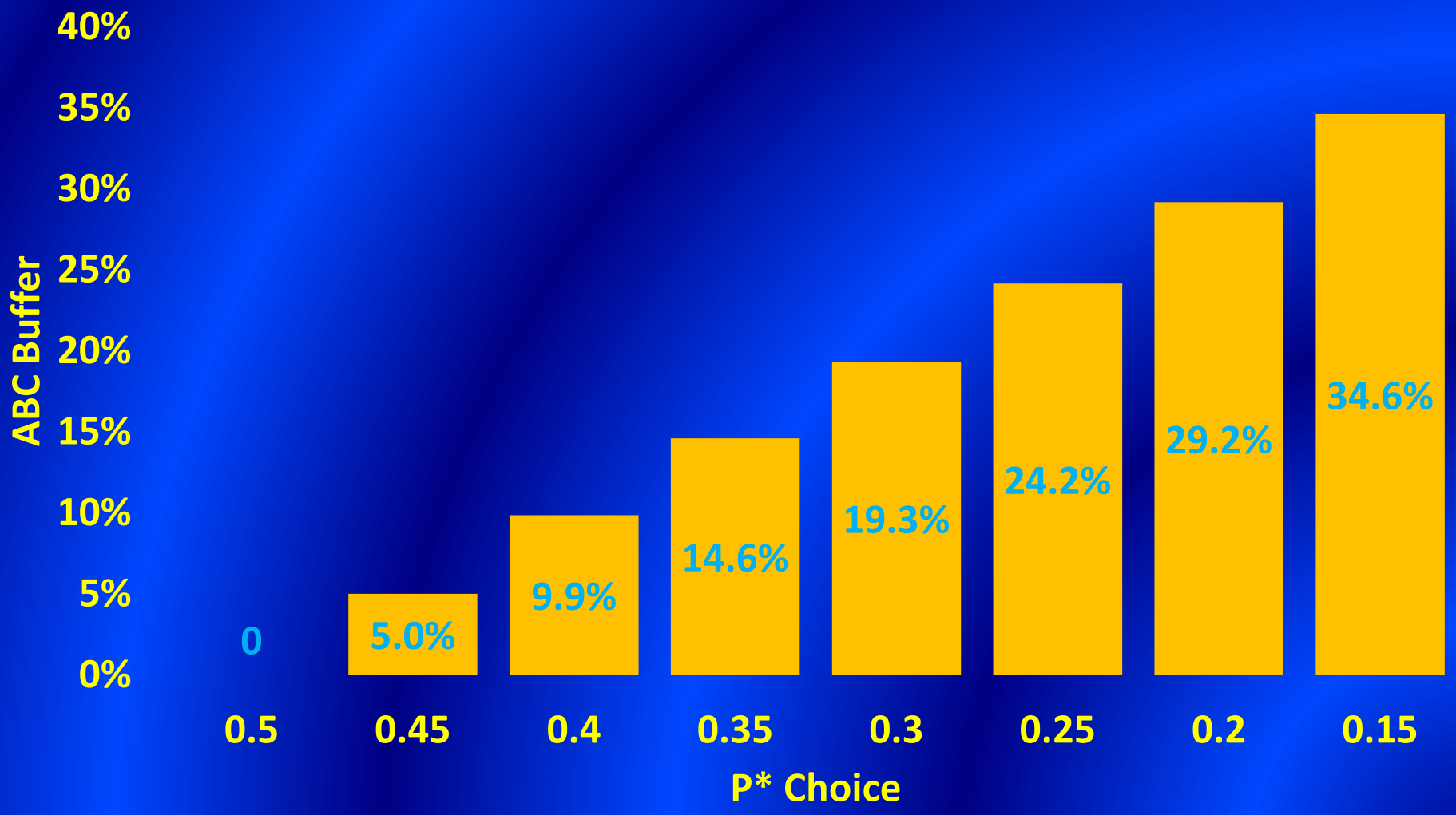
ABC Buffers for Category 1 Stocks Under Varying P* Levels

$\sigma = 0.36$



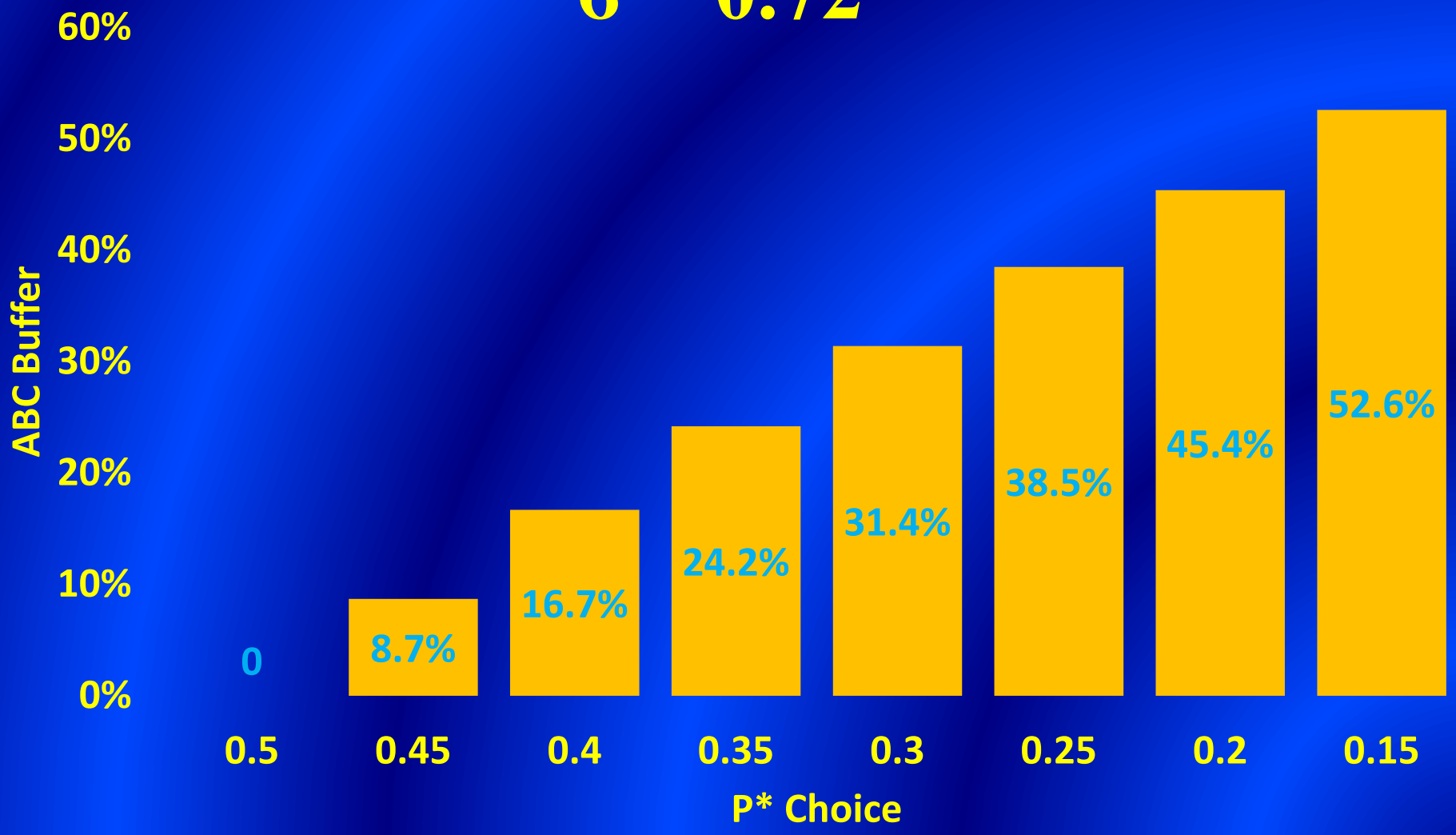
ABC Buffers for Widow Rockfish Under Varying P* Levels

σ = 0.41



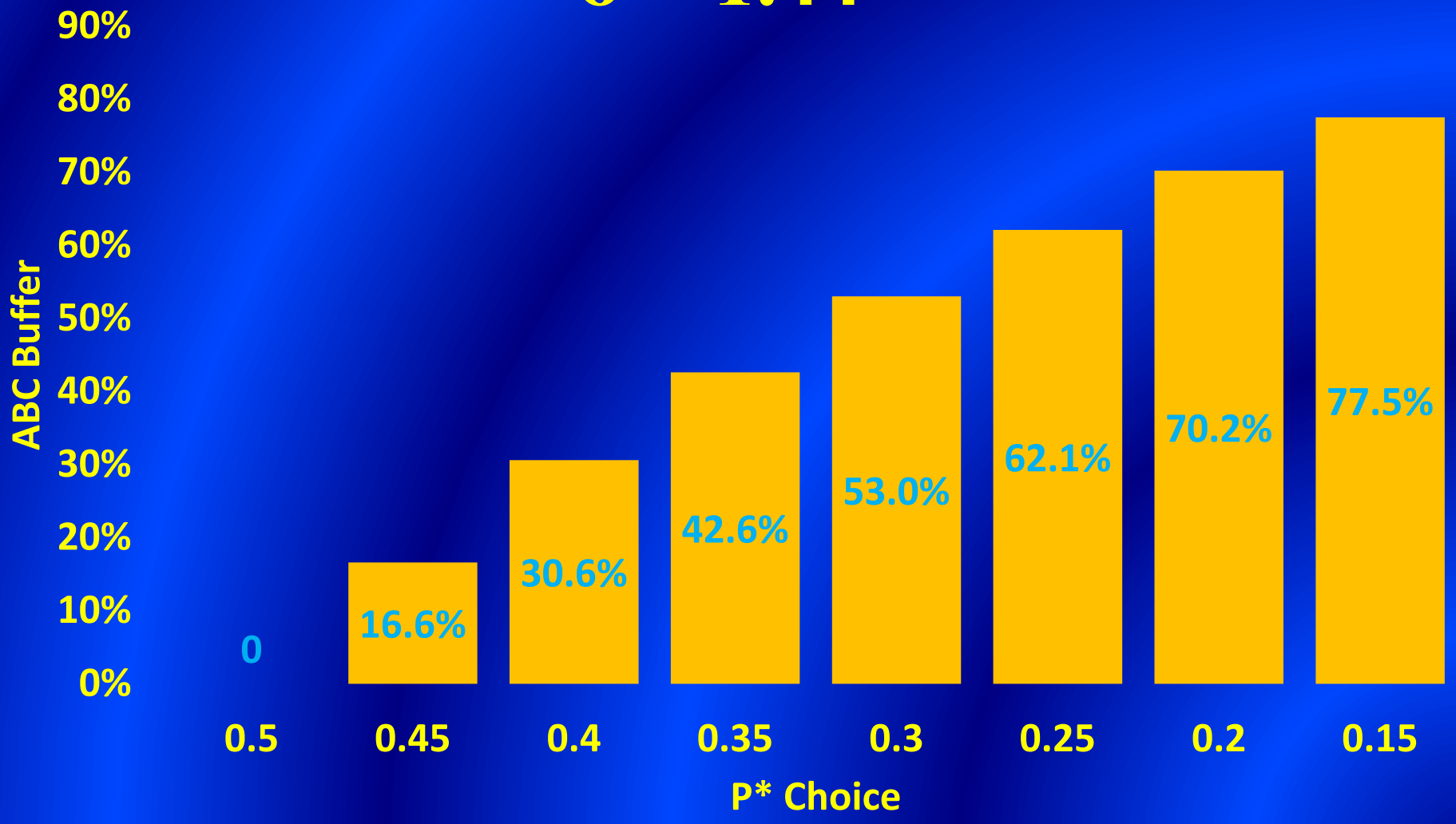
ABC Buffers for Category 2 Stocks Under Varying P* Levels

$\sigma = 0.72$

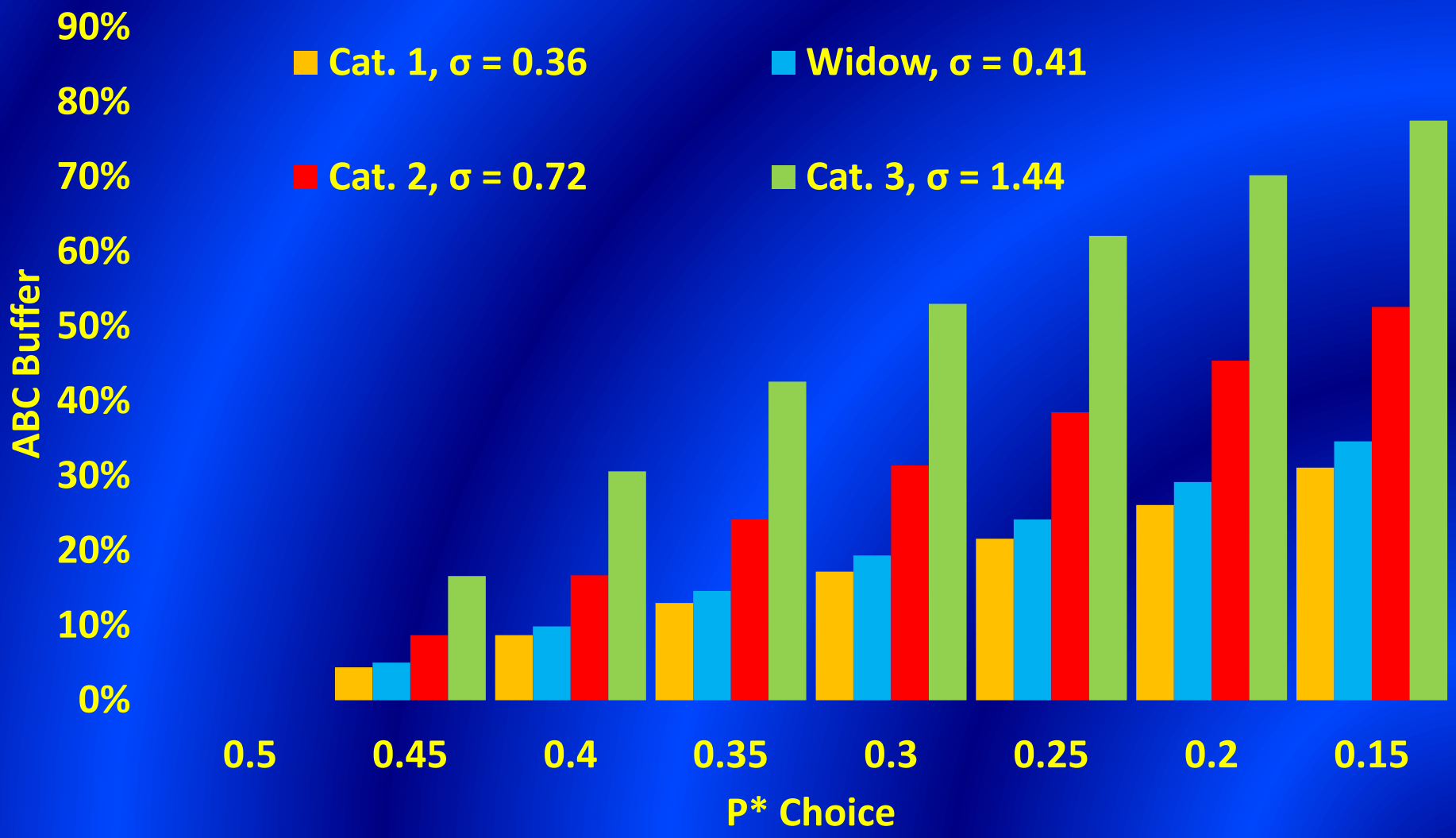


ABC Buffers for Category 3 Stocks Under Varying P* Levels

σ = 1.44



ABC Buffers for All Stock Categories Under Varying P* Levels



Dover Sole
2011 Harvest Specifications

Specifications	Comment
• Exploitable biomass = 657,004 mt	• Estimate from 2011 assessment
• OFL = 44,400 mt	• Projected from 2005 assessment
• ABC = 42,436 mt	• σ = 0.36 (cat. 1 stock), P* = 0.45
• ACL = 25,000 mt	• Higher ACL not selected due to management uncertainty and socio-economic considerations

Agenda Item E.4.b
GMT Report
November 2011

THE GROUNDFISH MANAGEMENT TEAM REPORT ON THE SUGGESTED RANGE OF ANNUAL CATCH LIMIT AND ANNUAL CATCH TARGET ALTERNATIVES FOR REBUILDING STOCKS

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1. INTRODUCTION

This report describes the rationale for the suggested range of 2013-14 annual catch limits (ACLs) for rebuilding stocks presented in Table 4 of Agenda Item E.4.a, Attachment 4. The alternatives presented are intended to aid the Council in identifying preliminary preferred ACLs and range for analysis. The alternatives are meant to help the Council compare and contrast strategies for rebuilding stocks in the shortest possible rebuilding time while taking into account the needs of fishing communities and the other factors named in section 304(e) of the Magnuson-Stevens Act.

The Groundfish Management Team (GMT) discussed these alternatives with Council staff based on the preliminary rebuilding analyses and information available at the team's meeting held October 3-7. The full SSC will review the preliminary rebuilding analyses and present recommendations for their adoption or modification to the Council under Agenda Item E.2.

In discussing these ACL alternatives, the GMT attempted to follow the Council's instructions to maintain as much similarity to the 2011-12 rebuilding plans as possible while still incorporating new information from the stock assessments, rebuilding analyses, and performance of the fisheries. The Council's intent, as we understand it, is to minimize changes and analytical workload as much as possible so as to allow for more time and staff resources to be directed toward consideration of longer term improvements to the biennial management cycle.

There are many variables with which to describe a rebuilding plan, including management measures, ACLs, the scheduled harvest rate, the T_{target} year, the probability that rebuilding will have occurred by that T_{target} year, and more. The advice we received at the team's October meeting was that the existing rebuilding plans were best described by the constant SPR harvest rate, or alternative harvest strategy where applicable (i.e., 25:5 harvest control rule for petrale sole and 600 mt constant catch for widow rockfish). As we understand it, the Council does not need to analyze a range of ACL/harvest rate alternatives for those stocks if the rebuilding plan is not revised. Those not being revised can therefore be "held constant" across the integrated rebuilding alternatives.

For a given harvest strategy, changes in estimates of a stock's status, scale , and productivity from the previous assessment cycle lead to changes in the other pieces of the rebuilding plan. Under the policy of the Groundfish Fishery Management Plan (FMP), the T_{target} must be based on at least a 50% probability of successful rebuilding by that year. If the T_{target} no longer meets that standard, the rebuilding plan must be revised and a range of ACLs and harvest rates considered.

Based on this standard, the Council's rebuilding plans will need to be revised for canary rockfish and Pacific Ocean Perch (POP). The other major change is the potential rebuilt declaration for widow rockfish, which could have potential ripple effects across the Council's integrated rebuilding strategy.

The expected increase in the allowable harvest of Pacific whiting is another substantial change that the Council may wish to consider in choosing a range of ACLs for analysis. The assessment conducted this past spring estimates that the stock to be at or above its virgin stock size. Forecasts of allowable harvests in 2013-14 are more than double the ACL that was set for 2011.

We discuss each stock and rebuilding plan individually below, taking those most likely to be revised first. The statement concludes with a general discussion on the use of annual catch targets (ACTs).

2. CONSIDERATION OF REBUILDING ACLS.

A. Widow Rockfish

The base model recommended by the Groundfish Subcommittee of the SSC at the Mop Up Panel estimates stock status to be greater than $B_{50\%}$, and as in the past couple of cycles, that the stock never dropped below the $B_{25\%}$ overfished threshold. Because the current estimate of biomass is greater than $B_{40\%}$, no rebuilding analysis was produced. As the Council will hear from the SSC, the estimate of status is very sensitive to the assumed "steepness" in the stock-recruit relationship. Because of this, the GMT has requested a set of runs to augment the decision table and to explore the risks posed by this uncertainty. Those will be considered under Agenda Item E.1.

For purposes of discussion, we assumed that the Council might consider a widow ACL that is considerably higher than the 600 mt constant catch harvest strategy in place for 2011-12. If so it would open the potential for the targeting of widow rockfish. Widow was a popular midwater target stock in the past. The Council may wish to explore how widow targeting could fit into the integrated approach to rebuilding.

The potential ripple effect with the Council's integrated approach to rebuilding would involve mainly canary rockfish and POP. Widow targeting ended before the West Coast Groundfish Observer Program went into place, yet we know from the Pikitch study, EFPs, and other sources that POP and canary would be encountered in midwater targeting of widow. The Council could consider allowing widow targeting within the current amounts of canary and POP allocated to the IFQ and co-op sectors, or, could consider increasing those allocations. We discuss how we might analyze those options in the discussions on canary and POP below.

B. Canary Rockfish

Again, the new rebuilding analysis forecasts that the Council's existing T_{target} is not thought achievable even if fishing mortality ceased entirely on the stock beginning in 2013. The reasons for this change will be discussed under Agenda Item E.2. The change will require the Council to revise the T_{target} and consider a range of ACLs and SPR harvest rates.

Patterns in this rebuilding analysis remain similar to the existing rebuilding plan despite the changed estimate of the fastest rebuilding time. The constant SPR harvest rate of 88.7% corresponds to a T_{target} that is only 2 years beyond the $T_{F=0}$ year. This is smaller than the 3 year gap between the $T_{F=0}$ and T_{target} set in 2011-12. The 3 year gap now maps to an SPR harvest rate of 82.9% and 2013-14 ACLs of 184 and 187 mt.

The status quo SPR harvest rate now corresponds to ACLs 8%-16% larger in 2013-14 than in 2011-2012 (116 mt/119 mt vs. 102 mt/107 mt). Keeping 2011-12 ACLs in place would equate

roughly to the SPR harvest of 90% alternative shown in Table 4 (Attachment 4). The 2011-12 projections of catch are ~20-30% lower than the ACL.

The potential for midwater widow targeting and the likely increased allowable harvest of whiting would be main the reasons for analyzing larger canary rockfish ACLs. It may be difficult to analyze how the encounter rates of canary rockfish would increase in both instances because of lack of data for midwater targeting and for ACLs of the magnitude we could see for whiting. In addition, the Council has used a "performance standard" type approach for the whiting sectors in recent years which depends less on projections of encounter rates from the GMT.

An increased allocation of canary rockfish to the shoreside IFQ program would also have a presumed positive impact on non-whiting bottom trawling on the continental shelf. Effort has been lower in 2011 relative to the pre-IFQ fishery. Placing more quota in circulation in the IFQ program could lead to increased effort, and hence, landings into fishing communities. The GMT and NMFS-Council staff project team are considering how to best model the IFQ fishery.

We expect that the effect of an increased canary rockfish ACL and allocations to the recreational, nearshore, and non-nearshore fixed gear fisheries would be small. The yelloweye rockfish catch allowable to those sectors has been and will continue to be the limiting factor in those fishery sectors.

If the Council wished to consider an SPR harvest rate or ACL that allows more harvest than the status quo, the guidance we received is that lower alternatives would need to be analyzed as well. If the Council wishes to do so, we would recommend analyzing the SPR harvest rate of 91.5%. The ACLs that correspond to that alternative are most similar to what was analyzed in the 2011-12 integrated alternatives. The SPR harvest rate of 90% is too similar to the status quo SPR harvest rate for there to be contrast in estimated impacts to fishing communities. We discuss the broad tradeoffs in canary rockfish impacts in the nearshore and recreational fisheries in more detail in the Appendix.

Recommendation: identify preliminary preferred ACL and the range of analysis necessary to revise to the T_{target} year.

C. Pacific Ocean Perch

The estimates of stock status for POP are fundamentally different from 2011-12 with the changed estimate of unfished stock size considerably higher than was estimated in past cycles. This change will be explored in more detail in Agenda Item E.1. For purposes here, the main point is that the stock has much further to rebuild than previously thought, which makes the circumstances much different from those the Council considered last cycle.

As we remarked during the discussions on the disapproval of the yelloweye and cowcod rebuilding plans last cycle, we are unclear on the law and how the "needs of fishing communities" and delays from the shortest rebuilding times are to be weighed by the Council. For this reason, we recommended a wide range of alternatives that consists of T_{target} years for each year beyond the $T_{F=0}$ year up to that corresponding to the status quo ACL. We then included one higher alternative, which we choose somewhat arbitrarily, that was far enough out to show contrast in the ACL and T_{target}. Earlier or later $T_{targets}$ could be added to the analysis if the Council chooses.

The changed estimate of B_{zero} does not affect the basic dynamics at play with bycatch of POP and its consequences to fishing communities. Recent catches for POP have been variable (Table 1). In 2011-12 the Council chose an ACT and an ACL for POP because of this variability. Coincidentally, the ACT level of 157 mt is corresponds to a SPR harvest rate that is close to the status quo SPR harvest rate of 86.4%. Because of the changed estimate of B_{zero} and resulting change in stock status, that SPR rate now corresponds to a T_{target} that is 8 years beyond the $T_{F=0}$ year. In the 2011-12 rebuilding plan, the Council's preferred T_{target} was only 2 years beyond the $T_{F=0}$ year (the same held for the different SPR harvest rates corresponding to the ACT and the ACL).

As highlighted above, the possible reasons for considering a higher than status quo ACL include new targeting opportunity for widow rockfish and the expected substantial increase in the allowable harvests of whiting. As with canary, the increased encounters with POP from these two potential changes will be difficult to analyze. If the Council wishes to consider a higher ACL, we would look to available data from the past midwater fishery and the best available information on POP bycatch in the whiting fisheries. In recent years, we have seen POP catch increase later in the season when the whiting fishery was operating deeper and more northerly than earlier in the season. As shown in Table 1, the bulk of the catch is taken in the bottom trawl sector and has increased in recent years as more effort has shifted to areas seaward of the trawl Rockfish Conservation Area.

Lastly, given the substantial difference in rebuilding estimates, we are unsure how to help the Council evaluate whether maintaining the similar SPR harvest rate or ACL amount for POP is reasonable or not. The questions and issues we raise for consideration by the Science and Statistical Committee in Agenda Item J.4 are intended to help the Council and the public understand the broad tradeoffs at play when such changes in rebuilding estimates occur, although those discussions are not intended to take place until after consideration of the 2013-14 ACLs. The question on what is reasonable for POP in 2013-14 is one of legal interpretation decided on principles of administrative law and one that the Council should seek further guidance on from NOAA General Counsel and NMFS.

Recommendation: identify preliminary preferred ACL and the range of analysis necessary to consider revisions to the T_{target} year based on guidance from NOAA General Counsel and NMFS.

Table 1. POP historical Catches 2007 -2009, compiled from the Total Mortality reports. Catches are for areas north of 40° 10' N. lat. Southern catch is accounted for as part of the minor slope rockfish complex

Year	Non-whiting trawl	Non-tribal whiting trawl	Tribal	Total Mortality	OY/ACL
2007	126.0	26.9	0.4	157.0	150
2008	106.3	15.9	0.1	131.0	150
2009	157.7	18.6	0.1	180.5	189

D. Yelloweye Rockfish

Estimate of stock status and biology and rebuilding times for yelloweye rockfish are similar to those seen in 2011-12. At the same time, small differences have mattered with yelloweye in the past. Yelloweye rockfish is one of the stocks where the Council and NMFS differed in the 2011-12 cycle. The Council recommended a 17 mt ACT and a 20 mt ACL. NMFS disapproved that recommendation and replaced it with a 17 mt ACL.

The status quo SPR rate of 76% from the NMFS preferred alternative now corresponds to an ACL of 18 mt instead of the 2011-12 ACL of 17 mt. The SPR now corresponds to a minimum T_{Target} of 2067 instead of the 2074 T_{Target}. That same T_{target} could now be achieved with an ACL of 21 mt and SPR harvest rate of 72.7%, although the Council, as in the past, can maintain the current SPR harvest rate and hold a greater than 50% probability of rebuilding by 2074.

These changes are enough to re-raise the issues that NMFS and the Council differed on last cycle, yet again. We are following the advice that the status quo is represented by the SPR and the ACL of 18 mt.

The dynamics for fishing communities has not changed substantially from what was analyzed in 2011-12; however, we do highlight a few reasons why the Council may wish to consider altering the SPR or ACL. Yelloweye rockfish is the most limiting stock for several sectors and has been challenging because of variability in catch, especially in the recreational fisheries. As an example, the Oregon recreational bottomfish fishery was restricted to inside of 20 fathoms from July to September in 2011 because of spike in yelloweye rockfish encounters early in the season.

Higher harvest guidelines or some approach for buffering against catch variability (e.g., ACTs) would make seasons more stable and additional inseason restrictions less likely to be needed.

Increased allowable harvest of yelloweye rockfish could also allow depth restrictions in the nearshore commercial fisheries to be eased. Preliminary analysis suggests that the ACL would have to be increased to at least 21 mt before such an adjustment could occur.

The IFQ sector is another that could benefit from increased yelloweye rockfish allocation. Currently, the Council has allocated 0.6 mt to the sector. This amount is larger than the estimated fleetwide average catch in recent years, yet individual accountability has created a different dynamic in the fishery and the low amount of available yelloweye rockfish quota is being pointed to as a possible cause of law trawl effort on the shelf during this first year of the IFQ program. Landings of shelf groundfish have been important for some fishing communities. This dynamic will be difficult to analyze, yet we can explore it as part of the 2013-14 analysis.

As in past cycles, raising the ACL is not the only option for addressing impacts to fishing communities. The Council can consider reallocating the ACL between sectors as well, based on new information on bycatch and other factors.

As noted above, if the Council wishes to analyze something higher than the status quo SPR harvest rate, the guidance we have received is that the range of alternatives should include lower options as well. If the Council wishes to consider such a range, we would recommend an SPR harvest rate that corresponds to an ACL of 14 mt, because we analyzed that amount for the 2011-12 cycle. The basic tradeoffs have not changed since that analysis. We outline those tradeoffs for the nearshore and recreational fisheries—the most dynamic sectors for yelloweye rockfish this cycle—in detail in the Appendix to this report.

Recommendation: maintain status quo SPR harvest rate or identify range of alternatives for analysis.

E. Darkblotched

The rebuilding analyses recommended by the SSC Groundfish Subcommittee at the Mop Up Panel shows that the Council's status quo SPR harvest rate can be maintained. Darkblotched rockfish is caught mainly in the whiting and non-whiting trawl fisheries operating in deeper waters, and catch has been near or even slightly over OYs in recent years. Potential reasons to consider increasing allowable harvest of darkblotched rockfish would be, again, because of the potential changes in the allowable harvest of whiting and, perhaps, widow rockfish as well, or to allow increased access to slope species in the bottom trawl fishery.

Recommendation: maintain status quo SPR harvest rate or identify range of alternatives for analysis.

F. Petrale sole

The Council's status quo harvest strategy is represented by the 25-5 harvest strategy. The stock is projected to be over $B_{25\%}$ in 2013, therefore this strategy would set the ACL equal to the ABC. The ACL will be doubled relative to the 2012 amount under this strategy based on the changes in the estimates of stock status discussed in Agenda Item E.1 and on par with where catch was prior to taking action to rebuild the stock in 2009. Lowering harvests below the status quo harvest rate would be per se more risk averse towards the objective of successful rebuilding, yet the rebuilding analyses shows no contrast in times or probabilities to rebuild between the ABC harvest rate and the zero harvest strategy. As discussed in the analysis of the rebuilding plan in 2011-12, petrale sole has been one of the top three sources of revenue to the tribal and non-tribal bottom trawl sector. Catch in other sectors is minimal.

Recommendation: maintain 25-5 harvest strategy or identify more risk-averse ACL for analysis.

G. Cowcod

No new assessment or rebuilding analysis was produced for cowcod this cycle because the 2008 and 2009 catch estimates were the only new pieces of information available to update estimates of stock status and biology. Two years of catch is too small a factor to alter the rebuilding estimates made in 2011-12. We understand that the cowcod assessment will be evaluated for the next harvest specifications cycle.

Cowcod was one stock where the Council's preferred ACL (4 mt) was disapproved and replaced by the Secretary of Commerce's preferred ACL or 3 mt. The GMT assumed the Council would not wish to revisit the range of ACLs for cowcod until after the 2013-14 cycle.

Recommendation: maintain SPR harvest strategy or identify range for analysis.

H. Bocaccio

The status quo SPR harvest rate for bocaccio can be maintained based on the new rebuilding analysis. As discussed under Agenda Item E.1, there is some concern over the size of the 2010 year class and the potential for increased encounters in the California fixed gear and recreational sector. The uncertainty in the size of this large year class creates uncertainty in all estimates of

stock status and rebuilding times, from the OFL to the T_{target}. After preliminary discussions at our October meeting, the GMT concluded that the projected impacts in the California recreational fishery are well below the harvest guideline for that sector. A pulse of young fish could therefore likely be accommodated under the status quo SPR harvest rate. We will be looking more closely at these projections and reporting back to the Council if necessary in a Supplemental Report. This issue is also discussed below in the section on the use of annual catch targets (ACTs).

Recommendation: maintain SPR harvest strategy or identify range for analysis

3. DISCUSSION OF ANNUAL CATCH TARGETS

The GMT had a preliminary discussion on the potential uses of annual catch targets (ACTs) as an accountability measure to keep total mortality of overfished species within the 2013-2014 ACLs. In particular, the GMT considered whether setting an ACT may provide a benefit for species where catches have been highly variable or are very uncertain in their inseason projections. The GMT also considered how an ACT may be an appropriate characterization of the buffer that may be present for some species between the projected catch at the start of the biennium and the rebuilding ACL. For future cycles, the GMT suggests exploring the idea that ACTs could be used to augment the constant SPR harvest rate for rebuilding species. For example a constant harvest rate is meant to allow increased catch to coincide with increased availability of fish, but this increase is rarely a smooth constant trend. ACTs could be used to provide stability in management measures and increase the probability of rebuilding within the specified target while waiting for the lag in total mortality information to estimate the increase in recruitment realized by the fisheries.

Bocaccio: The GMT discussed a few sources of uncertainty in bocaccio catch levels and potential benefits of setting an ACT below the ACL. As noted above, projections of catch have been kept well below the ACL in recent years meaning that management measures have, in effect, acted like an ACT. Currently, the GMT does not have an impact projection model to estimate bocaccio catches in commercial, non-nearshore non-IFQ fisheries off California. This limits the level of detailed foresight that can be obtained when trip limits and area restrictions are developed for the commercial non-nearshore fixed gear fisheries that impact bocaccio. Also, bocaccio show variable recruitment with some year classes having the potential to be very large. Bocaccio also grow very quickly for a rockfish and recruit to the fishery as young of the year. As discussed in Agenda Item E.1, there is evidence of such a strong 2010 year class in the most recent bocaccio assessment. Impacts could increase dramatically even if management measures stay similar to past years because of this year class. How large impacts could get is unknown. A formal ACT could provide a buffer between the level of catch that would be anticipated if the magnitude of the 2010 year class is closer to average-size and the rebuilding ACL. If evidence of a higher than average 2010 year class begins to manifest in the fishery, then the buffer between the ACT and the ACL may be narrowed as bocaccio impacts increase, but could also

allow fishery managers time to react to the new fishery information and tailor management measures accordingly in order to keep total impacts below the rebuilding ACL.

Canary rockfish: The GMT notes that there is uncertainty in catch projections of canary rockfish in the recreational fisheries, and catch of canary rockfish in these fisheries can be variable between years. The Council could consider setting an ACT below the rebuilding ACL to allow fishery managers time to react to the new fishery information and tailor management measures accordingly in order to keep total impacts below the rebuilding ACL.

Cowcod: The GMT discussed the levels of uncertainty in estimating cowcod catches in recent years, and how some of the uncertainty was coming from variable and unpredictable cowcod impacts from the groundfish trawl fisheries that occur off California. Implementation of the IFQ fishery has resulted in heightened accountability and near real time reporting of catch to date in the shorebased IFQ fishery. Relative to recreational fishery impacts, there is uncertainty in catch projections but cowcod impacts in the California recreational fishery have been below the HG in recent years. Also of note, total mortality of cowcod has been variable since 2004, between 0.5 mt and 3.3 mt but the OY/ACL has not been exceeded during that period. Protections implemented to rebuild cowcod, particularly the Cowcod Conservation Areas, appear to have worked well to keep catches within the rebuilding OYs/ACLs. Based on these considerations, an ACT may not be a necessary or appropriate accountability measure for cowcod at this time.

Yelloweye rockfish: Total mortality of yelloweye rockfish in groundfish fisheries has been consistently much lower than the rebuilding ACLs in recent years (between 17% and 55% below the OY/ACL in 2004-2009). One of the explanations for this may be that, on average, our projected impacts of yelloweye rockfish tend to be precautionary, leading to actual impacts coming in below the OY/ACL even when the scorecard is fully prescribed. The amount of precaution varies across sectors and has not been evaluated comprehensively. Some sectors may have more precaution built into their projections than others. We have enough years of data on catch now that we can begin to explore variability in yelloweye catch.

The recreational fisheries have been the sectors most affected by volatility in yelloweye catch and are most likely to be subject to inseason management, in part, because they are set up with such inseason capability. An ACT meant to buffer against such volatility could bring more stability to recreational seasons and management structures.

Darkblotched rockfish: Darkblotched rockfish are primarily encountered in the commercial, limited entry trawl fishery. Total mortality of darkblotched rockfish exceeded the 2009 OY by 6% (2009 Total Mortality Report). Catch of darkblotched rockfish in the limited entry non-tribal bottom trawl fishery was higher than anticipated in 2010 and changes to management measures were necessary at the end of 2010 to reduce impacts to darkblotched rockfish. Due to the dramatic change in management of the fishery with the start of a rationalized fishery in January

2011, where vessels began fish fishing individual fishing quotas (IFQ), the Council concluded that no changes to fishery management measures for 2011 were needed.

The GMT does not recommend an ACT for darkblotched rockfish for similar reasons, because three sectors of the rationalized trawl fishery (Shorebased IFQ Program, Mothership (MS) Coop Program, or Catcher/processor (C/P) Coop Program) will be fishing on allocations of darkblotched rockfish and with heightened accountability and near real time reporting of catch to date, particularly in the shorebased IFQ fishery. In addition, catches of darkblotched rockfish in the 2011 IFQ fishery sectors have been well below their respective allocations. Based on catches to date, the shorebased IFQ fishery has caught less than 20% of their available darkblotched rockfish quota pounds (Shorebased IFQ Sector Balances Website, October 11, 2011), the MS sector has caught less than 5% of their allocation and the C/P sector has caught less than 20% of their allocation (Preliminary At-Sea Whiting Report #4, Sept. 12, 2011). Though the relatively low catch levels so far this year does not guarantee that catch rates of darkblotched rockfish will not increase toward the end of 2011, based on the information available now it does not appear that there will be an overage in the individual trawl sectors (Shorebased IFQ, MS Coop, or C/P Coop), in aggregate trawl sector allocation or the 2011 ACL.

APPENDIX - Analysis of Canary and Yelloweye Rockfish Impacts in the Recreational and Nearshore Fisheries

The recreational fisheries and nearshore commercial fisheries were highlighted above in the discussion on the yelloweye rockfish and canary rockfish rebuilding plans. The information that included in this Appendix is intended to further help the Council identify a range of ACLs to include in the integrated analysis of rebuilding ACLs.

RECREATIONAL

Canary Rockfish

48 mt ACL

Under a 48 mt ACL, recreational fisheries in all three states would need to be restricted. Restrictions will vary by state depending on what management tools are available. Examples of management tools that would likely need to be used are: decreased bag limits, depth restrictions, shorter open seasons, etc.

Specific examples of implications of a 48 mt ACL:

Washington

- Recreational bottomfish fishing would be more restrictive under a 48 mt canary rockfish ACL than are currently in place.
- The time that the 20 fathom depth restriction is in place in the north coast would be increased.
- Rockfish retention restrictions would be increased in the south coast.
- The bottomfish season could be closed early if inseason catches were tracking higher than projections.

Oregon

- Impacts to canary rockfish are not as depth dependent as impact to yelloweye rockfish; therefore, seasonal depth restrictions are not as effective a management tool as with yelloweye rockfish. However, depth restrictions scenarios similar to those under the 14 mt yelloweye rockfish ACL above would likely be necessary.
- Additionally, a decrease in the daily bag limit may be required. Changes to bag limit affect canary bycatch more so than yelloweye rockfish bycatch.
- Another potential impact to the Oregon recreational fisheries under a 48 mt canary rockfish ACL could include reduced or eliminated all-depth halibut seasons in the Central Oregon coast subarea.

California

- The depths and season length would be more restrictive in the San Francisco and Central Management Areas under a 48 mt ACL.
- Season restrictions similar to those described under the 14 mt yelloweye rockfish ACL would likely be necessary for the management areas north of Point Arena.
- The groundfish season could be closed prematurely if catches were tracking higher than projections.

101 mt ACL

Under a 101 mt ACL, recreational fisheries in all three states would likely be able to operate similarly to status quo. Restrictions will vary by state depending on what management tools are available. Examples of management tools that would likely need to be used are: decreased bag limits, depth restrictions, shorter open seasons, etc.

Specific examples of implications of a 101 mt ACL:

Washington

- Status quo management measures would be in place under a 101 mt canary rockfish ACL.
- There is the potential that more restrictive measures such as, depth restrictions for bottomfish or lingcod or closed areas where higher canary encounters are a concern, would have to be implemented through inseason action if catches are tracking higher than projected.

- If canary catches are tracking significantly higher than projections early closure of the bottomfish fishery may be necessary.

Oregon

- Under the status quo canary ACL, yelloweye rockfish is the most limiting species to the Oregon bottomfish fishery. If there is an increase in yelloweye rockfish allocation to Oregon recreational fisheries, the allocation of canary impacts could be approached, requiring inseason action.
- Even under the status quo canary ACL, with no changes to the yelloweye ACL, variation in monthly and annual canary rockfish impacts is much greater with canary rockfish than yelloweye rockfish in the Oregon bottomfish fishery (**Error! Reference source not found.**). There is the potential for inseason actions to reduce canary rockfish impacts still exists.
- The Oregon recreational Pacific halibut fisheries should be able to proceed as planned.

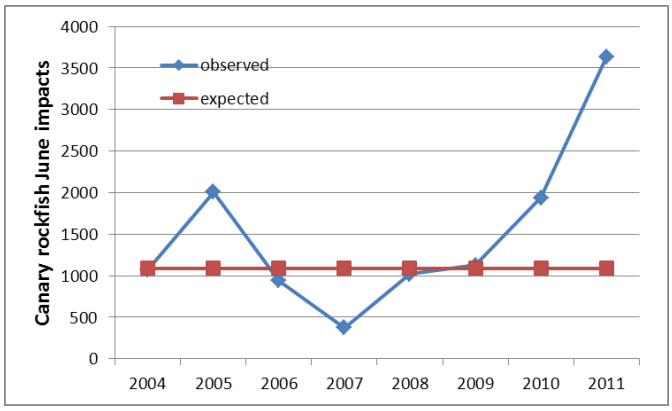

Figure 1. Oregon recreational canary rockfish bycatch estimates for June, 2004-2011.

California

- Because yelloweye rockfish is the most limiting species to California, an increase in the allocation to the recreational fishery could allow a longer season in the management areas north of Point Arena. Depth restrictions in the San Francisco and Central Management Areas could potentially be increased to 40 fathoms and 50 fathoms. Longer season lengths could also be considered. The Central and San Francisco Management Areas are also constrained by canary rockfish.
- Existing management measures would likely remain in place under a 101 mt canary rockfish ACL.
- If catches track higher than projected, more restrictive measures like depth restrictions for groundfish or closed management areas where canary encounters are high could be implemented.
- If canary encounters are tracking significantly higher than projections, an early closure of the groundfish fishery might be necessary.

116 mt ACL

Under a 116 mt ACL, recreational fisheries in all three states would likely be able to operate similarly to status quo. Yelloweye rockfish will be the limiting species, and will likely not allow access to the additional canary rockfish allocation

Specific examples of implications of a 116 mt ACL:

Washington

- Status quo management measures would likely be in place under a 116 mt canary rockfish ACL.
- There is the potential that more restrictive measures such as, depth restrictions for bottomfish or lingcod or closed areas where higher canary encounters are a concern, would have to be implemented through inseason action if catches are tracking higher than projected.
- If canary catches are tracking significantly higher than projections early closure of the bottomfish fishery may be necessary.

Oregon

- The Oregon bottomfish fishery will likely proceed as under status quo, due to yelloweye rockfish being the most restricting species.
- The Oregon recreational Pacific halibut fisheries should be able to proceed as planned.

California

- Because yelloweye rockfish is the most limiting species to California, an increase in the allocation to the recreational fishery could allow a longer season in the management areas north of Point Arena. Depth restrictions in the San Francisco and Central Management Areas could potentially be increased to 40 fathoms and 50 fathoms. Longer season lengths could also be considered. The Central and San Francisco Management Areas are more constrained by canary rockfish.

147 mt ACL

Under a 116 mt ACL, recreational fisheries in all three states would likely be able to operate similarly to status quo. Yelloweye rockfish will be the limiting species, and will likely not allow access to the additional canary rockfish allocation.

Specific examples of implications of a 147 mt ACL:

Washington

- Status quo management measures would likely be in place under a 116 mt canary rockfish ACL.
- There would be reduced potential that inseason action would be needed to restrict bottomfish fisheries if catches were tracking higher than projections as it is likely that canary catches would be below the harvest guideline due to more restrictive measures needed to reduce yelloweye rockfish catch.

Oregon

- The Oregon bottomfish fishery will likely proceed as under status quo, due to yelloweye rockfish being most restricting species.
- The Oregon recreational Pacific halibut fisheries should be able to proceed as planned.

California

- Because yelloweye rockfish is the most limiting species to California, an increase in the allocation to the recreational fishery could allow a longer season in the management areas north of Point Arena. Depth restrictions in the San Francisco and Central Management Areas could potentially be increased to 40 fathoms and 50 fathoms. Longer season lengths could also be considered. The Central and San Francisco Management Areas are more constrained by canary rockfish and the areas north of Point Arena are constrained by yelloweye rockfish, allowing only increases in season or depth restrictions to the south.

Yelloweye Rockfish

14 mt ACL

Under a 14 mt ACL, recreational fisheries in all three states would need to be restricted. Restrictions will vary by state depending on what management tools are available. Examples of management tools that would likely need to be used are: decreased bag limits, depth restrictions, shorter open seasons, closed areas, etc.

Specific examples of implications of a 14 mt ACL:

Washington

- The bottomfish fishery in Washington would require more restrictive regulations than what are currently in place. The restrictions in the north coast area would include extending the amount of time that the bottomfish fishery is closed seaward of 20 fathoms which is already closed from June through September. In the south coast, more restrictive regulations may include limiting bottomfish retention seaward of 30 fathoms.
- Early closure of the bottomfish fishery may be needed if catches track higher than what were projected.
- The management areas affected by more severe restrictions have already been heavily restricted through the use of area closures where bottomfish fishing is prohibited year round. The coastal ports of Westport, La Push and Neah Bay are sparsely populated and in very remote areas, they are heavily reliant on fishing activities for their local economies and would be significantly impacted by more restrictive fishing regulations.

Oregon

- The Oregon bottomfish fishery would have to have more severe depth restrictions than those currently in place. Possible seasonal depth restriction scenarios analyzed under similar yelloweye ACL during the 2011 and 2012 harvest specifications process are shown below:

Option	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Open all depths			Open < 20 fm						Open all depths		
2	Open < 40 fm			Open < 20 fm						Open < 40 fm		
3	Open < 30 fm			Open < 20 fm						Open < 30 fm		
4	Open < 25 fm			Open < 20 fm						Open < 25 fm		
5	Open < 20 fm											

  - Depth restrictions inside of 40 fathoms (what is currently in place from April 1 through September 30) virtually shuts down the port of Winchester Bay, as all of their reef locations are outside of 40 fathoms.
  - Depth restrictions inside of 30 fathoms will eliminate fishing grounds out of most ports, however there will still be opportunities out of most ports
  - Depth restrictions inside of 25 fathoms will eliminate additional fishing grounds off all ports. Additionally, it could lead to some localized depletion, as all anglers will be forced to fish within a narrow area of the ocean (there will be additional impacts on other rockfish species, such as the minor nearshore complex).
  - Depth restrictions inside of 20 fathoms will virtually shut down the ports of Garibaldi/Tillamook and Gold Beach, as all of their reef locations are outside of 20 fathoms. Additionally, fishing grounds out of all other ports will be further restricted. As with the 25 fathom restrictions, there is the possibility of localized depletion as anglers are required to fish within a narrow area. There will be additional impacts on other species, including rockfish in the minor nearshore complex, greenling species and cabezon.
- Another potential impact to the Oregon recreational fisheries under a 14 mt yelloweye rockfish ACL could include reduced or eliminated all-depth halibut seasons in the Central Oregon coast subarea.

California

- The California recreational groundfish fishery would need to adopt more severe season restrictions than those currently in place. Northern and Mendocino Management Area depth limits are already the most constrained coast-wide and cannot be brought in to shallower depths. This could mean a season as short as 1.5 months in the management

areas north of Point Arena with further substantial negative economic impacts to vulnerable communities.

- Premature closure of management areas north of Point Arena may be needed. The first spatial closure would most likely be using the Point Vizcaino management line to close off a portion of the Mendocino Management Area. This action would essentially close Shelter Cove which is historically the port with the highest yelloweye rockfish interactions. This action depends on the rate of encounters with yelloweye rockfish and the general location of the landings.
- Shallower depth restrictions for multiple management areas south of Point Arena may also be needed to stay under the 14 mt ACL.
- Yelloweye Rockfish Conservation Areas could be implemented at the beginning of the season or if projected catch were to exceed the harvest guideline.

18 mt ACL

Under an 18 mt ACL, recreational fisheries in all three states would likely be able to operate similarly to status quo. However yelloweye rockfish impacts are variable, monthly and annually, and inseason actions (restrictions) may still be necessary, as seen in 2011 in the Oregon bottomfish fishery. In June of 2011 Oregon saw unprecedented effort in the bottomfish fishery, combined with high yelloweye rockfish bycatch rates (**Error! Reference source not found.**), and had to take inseason action, moving the depth restrictions from inside of 40 fathoms to inside of 20 fathoms on July 21, 2011.

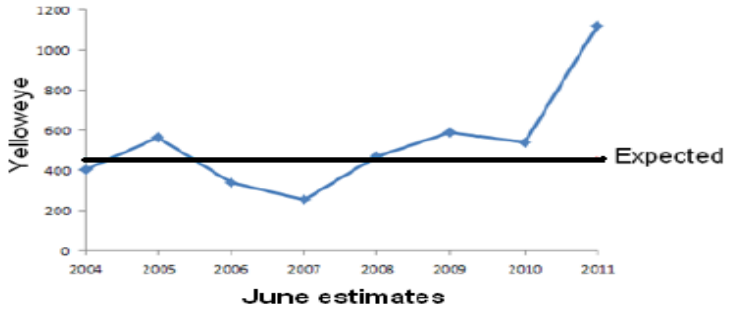

Figure 2. Oregon recreational yelloweye rockfish bycatch estimates for June, 2004-2011.

Under an 18 mt ACL, season structure and any additional inseason restrictions will vary by state depending on the magnitude of yelloweye rockfish impacts and what management tools are available. Examples of management tools that would likely need to be used are: decreased bag limits, depth restrictions, shorter open seasons, etc.

Specific examples of implications of an 18 mt ACL:

Washington

- Under an 18 mt ACL more restrictive management measures may be needed through inseason action if catch is tracking higher than expected. Potential inseason restrictions would include; more restrictive depths for bottomfish fishing or lingcod fishing or areas that are completely closed to bottomfish fishing or lingcod fishing.
- Early closure of the recreational bottomfish fishery may be necessary if catches are significantly higher than projections.

Oregon

- As seen in the last several years, the bottomfish fishery may have to be moved inseason to inside of 30, 25, or 20 fathoms, depending on how the projected impacts to yelloweye rockfish are tracking. Impacts of further depth restrictions are discussed above under the 14 mt ACL.
- Additionally, if it is anticipated that yelloweye rockfish bycatch rates are going to remain similar to seen in the last several years, the bottomfish fishery may have to be restricted to inside of 30 fathoms (instead of 40 fathoms) from April through September to help reduce impacts, as well as to reduce the potential for having to be restricted to inside of 20 fathoms.
- The Central Oregon coast subarea all-depth Pacific halibut seasons should be able to proceed as planned.

California

- Under this alternative status quo management would likely remain; currently, the allowable fishing depth is only 20 fathoms where the majority of the yelloweye are taken, as well as only a three to five month season depending on the management area.
- Recent lower than projected impacts used in the State's projection model could result in slightly longer seasons in the Northern and Mendocino Management Areas which are subject to three and five and a half month fishing seasons respectively.
- Closure of Shelter Cove through use of the Point Vizcaino Management Line or implementation of the Yelloweye Rockfish Conservation Areas could be implemented if catch were projected to exceed the harvest guideline.

21 mt ACL

Under a 21 mt ACL, recreational fisheries in all three states would likely be able to operate similarly to status quo, with the possibility of some liberalization of regulations. Restrictions will vary by state depending on what management tools are available. Examples of management tools that would likely need to be used are: decreased bag limits, depth restrictions, shorter open seasons, etc.

Specific examples of implications of a 21 mt ACL:

Washington

- Status quo management measures are likely under a 21 mt yelloweye rockfish ACL however there would be reduced potential for inseason action if catch is tracking higher than projections.

Oregon

- A 21 mt yelloweye rockfish ACL would likely allow the Oregon bottomfish fishery to operate as modeled under the 18 mt ACL with a much reduced potential for further depth restrictions inseason, as seen in the last several years.
- There is the possibility that the 40 fathom depth restrictions may be liberalized for one or more months (e.g. April or September), allowing more opportunity for deeper water species, such as lingcod.
- There is the possibility of allowing (limited) lingcod retention during the Central Oregon Coast subarea all-depth halibut season.
- The Central Oregon subarea Pacific halibut all-depth seasons should be able to proceed as planned.

California

- A 21 mt ACL may allow longer seasons (one month or more) in the Mendocino and Northern Management Areas which are subject to three and five and a half month seasons, respectively.
- This alternative could potentially provide one to two months of additional fishing opportunities in the San Francisco Management Area and the Central Management Area because they are less constrained by yelloweye rockfish.

NEARSHORE

Canary Rockfish

0 mt ACL

Under a 0 mt ACL, no fishing would be allowed in any fishery. All fisheries would be closed.

48 mt ACL

Under a 48 mt ACL, impacts to the nearshore fisheries in Oregon and California are expected to be similar (but not identical) to alternative 1 (49/51 mt) analyzed in the 2011-2012 FEIS. Under this alternative, landings in the nearshore fishery in California will be impacted more severely than Oregon due to areas of high canary bycatch, but both states will be denied access to healthy target stocks due to the low canary apportionment of the non-trawl allocation. It is unknown at this time whether the RCA depth restrictions could be changed due to the strong link between the amount of canary and yelloweye rockfish allocated to this fishery. Under lower yelloweye rockfish ACLs, it is likely that the 20 fm remains in place; under higher yelloweye alternatives, there may be the potential to liberate the 20 fm depth restriction in Oregon. California has two

large canary hot spots (north and south of 40º10' N latitude) so it is likely that the 20 fm line would need to stay in place to reduce bycatch.

101 mt ACL

Under a 101 mt ACL, impacts to the nearshore fisheries in Oregon and California are expected to be similar (but not identical) to the NMFS preferred alternative (102/107 mt) analyzed in the 2011-2012 FEIS. The nearshore fishery in both states will continue to be denied access to healthy target stocks unless the non-trawl apportionment of yelloweye rockfish is increased. Depending on the yelloweye ACL, Oregon may be able to liberate the depth restriction to 30 fm between 42° N and 43° N. latitude. California will most likely maintain the status quo depth restrictions (20 fm between 42° N and 40° 10' N. latitude; 30 fm between 40°10' N. latitude and 34° 27' N. latitude; 60 fm south 34° 27' N. latitude).

116 mt ACL

Under a 116 mt ACL, impacts to the nearshore fisheries in Oregon and California are expected to be similar to those under 101 mt ACL. Yelloweye rockfish poses the greatest constraint on this fishery, and unless nearshore yelloweye rockfish allocation increases, neither state will be able to utilize higher canary ACL alternatives. Under a 116 mt canary ACL and a higher yelloweye ACL, both states may gain greater access to target species and be able to modify the RCA to 30 fm between 42° N and 43°N. latitude.

147 mt ACL

Under a 147 mt ACL, impacts to the nearshore fisheries in Oregon and California are expected to be similar to those under 116 mt ACL.

Yelloweye Rockfish

14 mt ACL

Under a 14 mt ACL, impacts to the nearshore fisheries in Oregon and California are expected to be similar (but not identical) to the no action alternative (14 mt) analyzed in the 2011-2012 FEIS. Landings would be held at reduced levels, compared to historical harvest, by restrictive trip limits or state caps implemented to reduce impacts to overfished species (particularly yelloweye). The 20 fm shoreward non-trawl RCA depth restriction currently in regulation would remain in effect between 43º N. latitude and 40º10' N. latitude. Gear conflicts and concern about localized depletion described in the 2011-12 FEIS for the area north of 40º10' N. latitude would still persist. The depth restrictions south of 40º10' N. latitude would remain unchanged (30 fm between 40º10' N. latitude and 34º27' N. latitude; 60 fm south of 34º27' N. latitude).

18 mt ACL

Under an 18 mt ACL, impacts to the nearshore fisheries in Oregon and California are expected to be somewhat similar to alternative 2 (17 mt) in the 2011-12 FEIS. The nearshore fishery in both

states will continue to be denied access to healthy target stocks due to the low yelloweye apportionment of the non-trawl allocation. Landings restrictions may not be as severe as analyzed in 2011-12, but they will still be reduced compared to historical harvest and will not represent full attainment of harvest guidelines. There is the potential for the 20 fm depth restriction between 42° N. latitude to 43° N. latitude in Oregon to be liberated back out to 30 fm under an 18 mt ACL, but that cannot be confirmed without a full analysis. In California, it is highly likely that the status quo RCA structure will remain in effect unless the nearshore yelloweye allocation is revisited.

21 mt ACL

Under a 21 mt ACL, impacts to the nearshore fisheries in Oregon and California are expected to be less than under an 18 mt ACL, but the extent is unknown at this time. It is possible that the 20 fm depth restrictions may be removed in both states (between 40°10' N. latitude to 43° N. latitude), but that would depend on the nearshore yelloweye rockfish allocation and the overfished species catch sharing agreement between Oregon and California.

GROUNDFISH ADVISORY SUBPANEL REPORT ON BIENNIAL MANAGEMENT PROCESS FOR 2013-2014 GROUNDFISH FISHERIES – PART 1

The Groundfish Advisory Subpanel (GAP) received a presentation from Mr. John DeVore on proposed groundfish harvest specifications for the 2013-14 management cycle. The GAP offers the following comments and recommendations on proposed 2013-14 harvest specifications.

Overfished Species Annual Catch Limits

The GAP reviewed Attachment 4 and recommends the following annual catch limits (ACLs) and annual catch targets (ACTs) for 2013 and 2014.

Bocaccio

The potential of a large 2010 bocaccio year class recruiting into the fishery could disrupt recreational and nearshore commercial fisheries in California. Therefore, the GAP recommends a relatively larger ACL to mitigate the potential of a fishery disruption. Also, given the management uncertainty managing bocaccio impacts in the recreational fishery, the GAP recommends an ACT be specified to accommodate this uncertainty. Specifically, the GAP recommends maintaining the spawning potential ratio (SPR) harvest rate of 77.7 percent in the current bocaccio rebuilding plan, which provides 2013 and 2014 ACLs of 320 mt and 337 mt, respectively (i.e., ACL alternative 4 in Attachment 4). The GAP also believes it is prudent to specify bocaccio ACTs that are lower than these ACLs with the specific purpose of allowing the ACT to be exceeded to avoid disruption of California recreational and nearshore commercial fisheries in the event there is a strong recruitment event.

Canary Rockfish

The GAP understands that the canary rebuilding plan will have to be amended based on the new assessment and rebuilding analysis. The GAP stresses the importance of having adequate canary yield since the available harvest of canary dictates how constrained all groundfish fisheries will be. Specifically, the GAP requests a canary ACL high enough to increase the allocation to all groundfish sectors to access target species in their fisheries.

Canary is a particularly constraining species for all sectors. For trawl, the amount of canary caught in 2011 in the trawl individual quota fishery is a poor indication of the needs of the fleet, since fishermen have been avoiding canary for fear of exceeding their quota. This results in a significant amount of shelf species going unharvested due to the risk of any canary interaction. An increase in canary will allow more flexibility for the fleet, thereby also increasing the success of the Trawl Individual Quota program.

Fixed-gear and nearshore fishermen also will benefit from an increase in canary as well, simply to maintain their current level of fishing due to the rebuilding paradox.

In the recreational sector, particularly in northern California and Oregon, charter, party and private boat operators have been subjected to time and area closures, resulting in shorter seasons and fewer fishing trips. This has a direct effect on charter and party boat businesses in the form of fewer customers, higher costs due to increased changes in fishing operations and other related business decisions.

The current SPR harvest rate of 88.7 percent in the canary rebuilding plan (see ACL alternative 4 in Attachment 4) gives a false indications of meeting the needs of fishing communities, primarily due to avoidance measures by the trawl fleet (see recent total mortality reports and NMFS' IFQ tracking reports), as discussed above. The GAP notes the higher ACLs under ACL alternative 5 in Attachment 4 (SPR = 85.9 percent, 2013 and 2014 ACLs of 147 mt and 151 mt, respectively) is predicted to rebuild the stock in the same year (2030) as ACL alternative 4, which maintains the status quo SPR harvest rate. This will allow greater flexibility for all fishing sectors.

Cowcod

The GAP has no recommendation to change the cowcod ACL. The GAP would reiterate their arguments under Amendment 16-5 for a 4 mt cowcod ACL, but declines to do so given the reluctance of NMFS to adopt this specification and rebuilding plan.

Darkblotched Rockfish

The GAP recommends maintaining the current darkblotched rebuilding plan as the new assessment and rebuilding analysis indicates rebuilding progress is on track and is, in fact, ahead of schedule. To that end, the GAP recommends darkblotched ACL alternative 2 in Attachment 4 (2013 and 2014 ACLs of 317 mt and 330 mt, respectively) since it will likely meet the needs of the trawl fleet and fishing communities. The GAP understands the 2009 and 2010 darkblotched optimum yields were exceeded by a slight margin, which compels an evaluation of accountability measures. The GAP notes that implementation of trawl rationalization with 100 percent observer coverage on all trawl efforts and the accountability afforded by IFQ management provides the strongest accountability possible and removes the uncertainty associated with projecting and managing trawl impacts under the old system prior to rationalization.

Pacific Ocean Perch

The GAP has serious concerns about the Pacific ocean perch (POP) rebuilding plan given that it is unlikely that any management action on the west coast will affect stock rebuilding. The POP stock is distributed well north of the west coast Exclusive Economic Zone (EEZ) through the Gulf of Alaska, the Bering Sea and even off the coast of Japan. The higher harvests occurring in fisheries north of the west coast EEZ will likely drive stock rebuilding regardless of any west coast rebuilding strategy. Nevertheless, the GAP recommends maintaining the current level of harvest, which most closely corresponds to ACL alternative 15 in Attachment 4 (i.e., 2013 and 2014 ACLs of 182 mt and 186 mt, respectively). Further, the GAP recommends no ACT be specified for POP since the trawl rationalization program provides the best inseason accountability of catch possible.

Petrale sole

The GAP recommends maintaining the petrale sole rebuilding plan (i.e., ACL alternative 5 in Attachment 4). The GAP notes that the petrale stock is predicted to reach the rebuilding target in 2013, which is three years in advance of the target rebuilding year and the ACLs under alternative 5 meet the needs of fishing communities.

Yelloweye rockfish

The GAP recommends maintaining the target year in the current yelloweye rebuilding plan (2074), which is consistent with ACL alternative 7 in Attachment 4 (i.e., 21 mt in 2013 and 2014). Further, since there is greater management uncertainty in predicting and managing yelloweye impacts in recreational fisheries, an ACT should be established for this stock. Specifically, the GAP recommends an 18 mt ACT (see ACL alternative 6 in Attachment 4), which corresponds with the 76 percent SPR harvest rate in the current yelloweye rebuilding plan.

Summary of GAP-preferred alternatives for overfished species

Species	2012 ACL	GAP-preferred alternative (from Attachment 4)	SPR rate from preferred alternative	2013 ACL (mt)	2014 ACL (mt)	ACT?
Bocaccio	274	Alt. 4	77.7%	320	337	Yes, to be determined
Canary	107	Alt. 5	85.9%	147	151	No
Cowcod	3	(GAP-preferred alternative according to Amendment 16-5 under previous council discussion)		4	4	No
Darkblotched	296	Alt. 2	64.9%	317	330	No
POP	183	Alt. 15	83.9%	182	186	No
Petrale sole	1,160	Alt. 5	25-5 rule	2,592	2,652	No
Yelloweye	17	Alt. 7	72.7%	21	21	Yes: 18 mt; Alt. 6, which corresponds to current 76% SPR

Non-overfished Species Annual Catch Limits

The GAP recommends setting ACLs for non-overfished species equal to the preliminary preferred acceptable biological catch (ABC) specifications decided in September. The GAP notes that a very conservative ABC was decided for sablefish, which obviates the need for more precautionary ACLs. The GAP also understands the SSC is endorsing the new widow rockfish assessment, which indicates the stock has been successfully rebuilt. The SSC is also noting that there is greater scientific uncertainty in estimating the widow OFL relative to all other category 1 stocks. This has led to the SSC recommending a higher sigma of 0.41 for deciding the widow rockfish ABC, which addresses this higher uncertainty. Therefore, the GAP believes setting the ACL equal to the more precautionary ABC is adequately precautionary.

Regarding sablefish and spiny dogfish, the ABCs for which were proposed based on P* values of 0.33 and 0.3, respectively, the GAP would prefer to maintain the status quo ABC and

corresponding ACL calculations based on the P* values for those species on their respective categories (Category 1 and 2, respectively). These categories were based on the best available science.

The sablefish stock assessment-related scientific data is robust – therefore making it a Category 1 species. At the same time, sablefish is of huge importance to the West Coast fishing industry. To introduce a precautionary P* value contrary to existing policy for Category 1 species is premature and erodes the confidence of the industry in the Council's establishment of such a policy. Instead, the GAP suggests keeping the P* value of 0.45, as is used in other Category 1 stocks, in place and using another mechanism, such as an ACT or other management measures in the specifications process, to be precautionary in light of the recent stock assessment concerns.

Similarly, the spiny dogfish P* values should be treated the same. Spiny dogfish is a Category 2 species but the GAP suggests the Council use other management measure to determine appropriate precautionary levels for ACLs.

PFMC
11/03/11

GROUNDFISH MANAGEMENT TEAM REPORT ON THE BASIS FOR THE 2012 GROUNDFISH HARVEST SPECIFICATIONS

Stock or Complex	ABC	ACL
BOCACCIO S. of 40^{0}10' N lat	cat 1: 4% reduction from OFL (σ=0.36/P*=0.45)	SPR harvest rate of 77.7%
CANARY	cat 1: 4% reduction from OFL (σ=0.36/P*=0.45)	SPR harvest rate of 88.7%
COWCOD S. of 40^{0}10' N lat	cat 1 for assessed portion of stock, cat 3 for unassessed	SPR rate of 82.7 percent
DARKBLOTCHED	cat 1: 4% reduction from OFL (σ=0.36/P*=0.45)	SPR harvest rate of 64.9%
PACIFIC OCEAN PERCH	cat 1: 4% reduction from OFL (σ=0.36/P*=0.45)	SPR harvest rate of 86.4%
PETRALE SOLE	cat 1: 4% reduction from OFL (σ=0.36/P*=0.45)	SPR harvest rate of 32.4%
YELLOWEYE	cat 1: 4% reduction from OFL (σ=0.36/P*=0.45)	SPR harvest rate of 76%
Arrowtooth Flounder	cat 2: 17% reduction from OFL (σ=0.72/P*=0.40)	ABC=ACL, stock is above B25%
Black Rockfish (OR-CA)	cat 1: 4% reduction from OFL (σ=0.36/P*=0.45)	constant catch of 1,000 mt
Black Rockfish (WA)	cat 1: 4% reduction from OFL (σ=0.36/P*=0.45)	ABC=ACL, stock is above B40%
Pacific Whiting a/	n/a	150% of the 2010 U.S. OY
Cabezon (CA)	cat 1: 4% reduction from OFL (σ=0.36/P*=0.45)	ABC=ACL, stock is above B40%
Cabezon (OR)	cat 1: 4% reduction from OFL (σ=0.36/P*=0.45)	ABC=ACL, stock is above B40%
California scorpionfish		ABC=ACL, stock is above B40%
Chilipepper S. of 40^{0}10' N. lat	cat 1: 4% reduction from OFL (σ=0.36/P*=0.45)	ABC=ACL, stock is above B40%
Dover Sole	cat 1: 4% reduction from OFL (σ=0.36/P*=0.45)	ABC=ACL, stock is above B25%
English Sole	cat 1: 4% reduction from OFL (σ=0.36/P*=0.45)	ABC=ACL, stock is above B25%
Lingcod N. of 42º N lat.	cat 1: 4% reduction from OFL (σ=0.36/P*=0.45)	ABC=ACL, stock is above B40%
Lingcod S. of 42º N lat	cat 2: 17% reduction from OFL (σ=0.72/P*=0.40)	ABC=ACL, stock is above B40%
Longnose skate	cat 1: 4% reduction from OFL (σ=0.36/P*=0.45)	equivalent to the 2010 OY and represents a 50 percent increase in the average 2004–2006 mortality (landings and

Stock or Complex	ABC	ACL
		discard mortality)
Longspine Thornyhead (coastwide)	cat 2: 17% reduction from OFL (σ=0.72/P*=0.40)	
Longspine Thornyhead N. of 34º27' N lat.		79% of coastwide, with 25% reduction
Longspine Thornyhead S. of 34º27' N		21% of coastwide, with 50% reduction
Pacific Cod	cat 3: 31% reduction from OFL (σ=1.44/P*=0.40)	
Sablefish (coastwide)	cat 1: 4% reduction from OFL (σ=0.36/P*=0.45)	
Sablefish N. of 36º N latitude		40-10 reduction, 68% of coastwide
Sablefish S. of 36º N latitude		40-10 reduction, 32% of coastwide, 50% reduction
Shortbelly	(σ=0.72 with a P* of 0.40)	
Shortspine Thornyhead (coastwide)	cat 1: 4% reduction from OFL (σ=0.36/P*=0.45)	
Shortspine Thornyhead N. of 34º27' N latitude		66% of coastwide
Shortspine Thornyhead S. of 34º27' N latitude		34% of coastwide, with 50% reduction
Splitnose S. of 40^{0}10' N latitude	cat 1: 4% reduction from OFL (σ=0.36/P*=0.45)	ABC=ACL, stock is above B40%
Starry Flounder	cat 2: 17% reduction from OFL (σ=0.72/P*=0.40)	ABC=ACL, stock is above B25%
Widow	cat 1: 4% reduction from OFL (σ=0.36/P*=0.45)	Constant catch of 600 mt (= SPR harvest rate of 91.7 percent)
Yellowtail N. of 40^{0}10' N latitude	cat 1: 4% reduction from OFL (σ=0.36/P*=0.45)	ABC=ACL, stock is above B40%
STOCK COMPLEXES		
Minor Rockfish North	sigma value of 0.36 for category 1 stocks (splitnose and chilipepper rockfish), 0.72 for category 2 stocks (greenstriped rockfish and blue rockfish in California) and 1.44 for category 3 stocks (all others) with a P* of 0.45.	
Nearshore Rockfish North		equal to summed contribution of individual stocks
Shelf Rockfish North		less than summed contribution of individual stocks
Slope Rockfish North		less than summed contribution of individual stocks

Stock or Complex	ABC	ACL
Minor Rockfish South	sigma value of 0.36 for category 1 stocks (gopher rockfish north of 34°27' N. lat., blackgill), 0.72 for category 2 stocks (blue rockfish in the assessed area, greenstriped rockfish, and bank rockfish) and 1.44 for category 3 stocks (all others) with a P* of 0.45.	
Nearshore Rockfish South		less than summed contribution of individual stocks
Shelf Rockfish South		less than summed contribution of individual stocks
Slope Rockfish South		less than summed contribution of individual stocks
Other Flatfish	cat 3: 31% reduction OFL (σ=1.44/P*=0.40)	equivalent to 2010 OY
Other Fish a/	cat 3: 31% reduction OFL (σ=1.44/P*=0.40)	equal to the 2010 OY, minus half the OFL contribution for cabezon in Oregon (25 mt)

a/ Pacific whiting harvest specifications are established annually and so have not yet been implemented for 2012. The rationale in this table for Pacific whiting are
from 2011, the most recent year for which harvest specifications have been set.

Agenda Item E.4.b
Supplemental GMT Report 3
November 2011

GROUNDFISH MANAGEMENT TEAM REPORT ON THE BIENNIAL MANAGEMENT PROCESS FOR 2013-2014 GROUNDFISH FISHERIES—PART I

Introduction

In our first report under this agenda item, the Groundfish Management Team (GMT) focused on considerations for setting the range of annual catch limits (ACLs) for rebuilding stocks with additional discussion for setting annual catch targets (ACTs). In that report, we focused on the Council's guidance to maintain as much similarity to the 2011-12 harvest policies as possible. We attempt to summarize some key points from that statement here, while also addressing a few new considerations and some minor corrections and omissions to that report.

We also add discussion of setting ACLs for non-rebuilding stocks, again, focused on that same guidance of maintaining as much similarity to the 2011-12 harvest policies as possible. We also touch on some issues that are outstanding with setting overfishing limit (OFLs) for stocks within the Other Fish complex, and then address some miscellaneous issues.

Before beginning the discussion of individual issues, we suggest a path for the Council to follow over the three main groundfish agenda items focused on the 2013-2014 cycle: E.4, E.5, and E.9. Council staff recommended the three agenda items because there are multiple interrelated issues and analyses scheduled for consideration as part of the 2013-14 process, even with the limited scope that the Council is seeking.

Proposed Plan for Agenda Items E.4, E.5, and E.9

A rough outline of the schedule we suggest is given in the box below. Agenda Item E.5 was scheduled and intended as relatively short agenda item where the Council provides guidance but does not recommend action. Nonetheless, we recommend taking up certain issues at that time for consideration and guidance for follow-up in Agenda Item E.9.

The Council's main objective is to leave this meeting with a range of alternatives, including a preliminary preferred alternative (PPA) in some cases, that structure the draft Environmental Impact Statement (DEIS) and other analyses to provide the Council with the information necessary and desired for making final recommendations of the 2013-14 harvest specifications and management measures. At this meeting, focusing on the range of alternatives is key because adding new alternatives in April and June 2012, beyond the range analyzed in the DEIS, is likely to jeopardize the January 1 start date that is the reason for the narrowed in scope and frontloaded 2013-14 process.

Agenda Item E.4

- Provide guidance on the range of ACL alternatives to be considered for the rebuilding plans that must be revised (canary, POP, widow), and for any plan that the Council chooses to revise.
- For stocks allocated during the biennial cycle (i.e., not subject to Amendment 21), should the same proportions from 2012 be used or would the Council like to consider other alternatives? These alternatives could be brought forward under E.5 and E.9.
- ACL overages reported in the 2010 Total Mortality Report.
- Considering status of widow rockfish and appropriate ACLs.
- Non-rebuilding ACLs.
- Guidance requested on Other Fish OFLs.
- Minor corrections to the first GMT statement.

Agenda Item E.5

- If requested under E.4, the GMT will provide more information on alternative sector allocations for the Council to consider in refining the range of rebuilding ACLs.
- The GMT reports back to the Council on the effectiveness of managing blackgill rockfish, dogfish, greenspotted rockfish within their existing stock complexes, a summary of the team's Agenda Item E.9 report.
- The GMT will present new information on the effectiveness of stock complex ACLs at controlling catch of the component stocks.
- The GMT will present information on set-aside estimates, after updating those based on the Council's recommendations on the EFPs consider under Agenda Item E.3.

Agenda Item E.9

- Consider any new information requested under Agenda Item E.4 or E.5.
- Identify range of management measures alternatives for analysis, including:
    - Guidance on blackgill split between limited entry and open access fixed gear sectors.
    - Consider measures for controlling catch of longnose skate and dogfish.
    - Identify 2013-14 allocation alternatives for non-rebuilding species, including minor shelf rockfish and potentially longnose and dogfish
    - Guidance on the two-year split between the limited entry and open access fixed gear sectors for the sablefish south ACL.
    - Confirm or alter the 2012 harvest guidelines (HG) for
        - Blue rockfish in California
        - Formal catch sharing agreements between states (e.g., black rockfish in CA and OR)
        - State specific recreational HGs (e.g., yelloweye and canary rockfish)
    - Catch accounting between LE and OA

2010 Estimates of Totality Mortality

The West Coast Groundfish (WCGOP) Estimated Discard and Catch of Groundfish Species in the 2010 US West Coast Fisheries reports (aka Total Mortality Reports) were published in this Briefing Book (Agenda Item E.2.c, NWFSC Report). We do not offer detailed summary and discussion of those estimates here except in regards to the two estimated overages of the optimum yield (OY) harvest level that were recorded in 2010 for darkblotched rockfish and longnose skate.

With longnose skate, the result was expected, given performance in 2009. However, the GMT was waiting for detailed WCGOP data to inform appropriate management measures. Longnose skate is discussed more below with more detailed with even more detailed analysis scheduled for Agenda Item E.9.

We projected the darkblotched rockfish overage in November 2010, predicting that it would occur upon the receipt of the 2009 bycatch rates at this time last year (Agenda Item H.3.b, Supplemental GMT, November 2010). The Amendment 20 IFQ and harvest co-op programs were implemented, in large part, to better address such uncertainty in estimates of catch caused by the sampling error, variability, and time lag in the reporting of discards. With the implementation of the Amendment 20 programs this year, the management structure has changed significantly and the probability of an overage occurring has dropped substantially.

Overfishing Limits (OFLs)

A number of stocks managed within stock complexes do not have an OFL identified (Agenda Item E.4.a, Supplemental Attachment 7 and Supplemental Attachment 8). The issue, which we expect to be addressed by the SSC as part of their Supplemental Report, is that no analyses were produced for these species for review and approval by the SSC. These stocks do not have reliable historical catch streams and so the methodologies used last cycle to set OFLs for many stocks, DCAC and DB-SRA, were not used.[1] Other possible methods that rely less on having a reliable catch stream could be explored. Assuming zero for the OFL is a risk averse strategy for stock complex management and the true OFL for these stocks is almost certainly greater than zero. We have not thoroughly analyzed the impacts of the zero OFLs, yet most of the stocks with OFLs of zero are caught in relatively minor amounts.

The data needed (e.g., trawl survey) and expertise for some of these methods may beyond what the GMT has access to at this time and would require the time of science centers or state analysts to produce. ***The Council may wish to consider postponing the final recommendation of the Other Fish OFL until April to see if analysis could be produced and reviewed by the SSC on that timeline.*** We do not expect this delay would have a significant impact on analysis of management measures.

[1] See June 2011 Agenda Item E.2.a, Attachment 6: *Assessment Methods for Data-limited Stocks – Report of the Review Panel Meeting* for and explanation of the DCAC and DB-SRA methods to estimating OFLs.

ACLs for rebuilding stocks

The first GMT Report in this Agenda Item offers more detailed discussion on consideration of the analysis of rebuilding ACLs. We were working off two key pieces of guidance in that report, given to us at our October meeting by the 2013-14 Project Team. The first is that the current SPR harvest rate, or alternative harvest strategy, in the rebuilding plan provided the best measure of the status quo policy from 2011-12. The second was that the Council only needs to look at a range of ACLs for those rebuilding plans where that status quo rebuilding policy is being revised. The integrated analysis for 2013-14 could include only a single ACL for those rebuilding plans not being revised.

In this Agenda Item, the GMT suggests that the Council identify which rebuilding plans it intends to revise, and for those that it does, provide guidance on the range of ACLs for analysis. We recommend working off Agenda Item E.4.a Attachment 4, which provides a number of alternatives and basic rebuilding parameters for each rebuilding stock.

The GMT can provide additional information under Agenda Item E.5 and E.9 to assist with the Council in refining that range and in identifying a preliminary preferred ACL (PPA) for each rebuilding plan under Agenda Item E.9.

In setting a range for analysis, the Council is trying to compare and contrast estimated rebuilding times the "needs of fishing communities" and the other factors listed in the Magnuson-Stevens Act. The box following below identifies some GMT suggestions for a range of alternatives. This range is based on our familiarity with the fisheries and modeling bycatch impacts. We recommend catch levels because we have analyzed them before (and therefore have a good understanding of impacts) or because we think they are far enough from status quo levels to provide meaningful contrast in impacts to fishing communities. The uncertainty in projecting catch and effort makes it difficult to draw meaningful conclusions about small differences in catch.

We do not speak here to the reasons why a particular rebuilding plan may be "behind" or "ahead" of the schedule set last time, yet we do again recommend looking at these reasons using the dimensions of stock scale, status, and productivity either later at this meeting or further on in the analysis of 2013-14 harvest specifications and management measures.

Stock	Change Required	Explanation	GMT Recommended "High" Alternative	Explanation	GMT Recommended "Low" Alternative	Explanation
Widow	Yes	Base case model estimates stock to be over $B_{40\%}$.	Discussed below	—	Discussed below	—
POP	Yes	Major change in perception of the stock means T_{target} not achievable under status quo SPR	247/251 mt	Far enough out from recent catch to provide contrast to status quo.	—	—
Canary	Yes	Relatively minor change in estimates of stock status and biology mean that T_{target} is not achievable under status quo SPR	~200 mt	See text below	48mt	Similar to level analyzed in recent EIS analysis.
Darkblotched	No	T_{target} achievable with status quo SPR	—	—	—	No GMT recommendation.
Bocaccio	No	T_{target} achievable with status quo SPR	—	Uncertainty in recent year class may be cause to look at a higher ACL alternative.	—	—
Cowcod	No	Assessment and rebuilding analysis not updated	—	—	—	—
Yelloweye	No	T_{target} achievable with status quo SPR	At least 21 mt	No significant change expected in fisheries between this amount and the status quo.	14 mt	Analyzed in 2011-12 EIS.
Petrale	No	Estimated to rebuild by 2013, ahead of the existing T_{target}.	—	—	—	—

Widow

The GMT and Council staff requested that the assessment authors provide additional rebuilding runs (Agenda Item E.1.a, Attachment 3) under a number of constant catch scenarios to provide a view of biomass dynamics given alternative assumed steepness (*h*) values (i.e. *h* =0.41 vs. 0.76). The reason for providing this information was that, given the large uncertainty in the true value of steepness (and therefore stock status) and widow's management under a rebuilding plan, some team members thought the Council might want to consider adopting an ACL that is considerably lower than the ABC as a risk-averse strategy. Also, while greater availability of widow could allow for targeting of widow and yellowtail rockfish (e.g., with a midwater trawl fishing strategy), such opportunity would likely be tempered by availability of canary rockfish in the trawl fisheries.

Others on the GMT point out that most of the assessments for species in the groundfish FMP suffer from similar uncertainty surrounding steepness. For those species the Council generally adopts the base case to set the OFL and ABC and then takes into account management uncertainty and other factors in deciding whether to set the ACL less than the ABC. Under the IFQ program some fishermen may be able to successfully prosecute a widow and yellowtail rockfish target strategy despite the constraint that the canary ACL may present to the fleet as a whole.

Additional Considerations for Rebuilding Stocks and Two-Year Allocations

The GMT discussed the impact of the two-year allocations between the trawl and non-trawl sectors in combination to the ACL decisions. The ACL decision and the decision on how to allocate the ACL among the fishery sectors play into the "needs of the fishing community" calculus. In other words, the Council can address impacts by raising or lowering the ACL or by reallocating a given ACL among the sectors.

The Council sets the allocations for bocaccio, canary, cowcod, and yelloweye through the biennial process, as opposed to the fixed percentages set during Amendment 21. Petrale is another species that the Council considered in 2011-12, suspending the Amendment 21 allocations because of the overfished declaration and rebuilding plan. These allocations are displayed in Table 2 of Agenda Item E.9.a, Attachment 1. The Council can maintain the 2011-12 allocations or alter them for 2013-14.

Even for species where the Council chooses to not revise the rebuilding plan, the Council may need to consider how to allocate increases in catch arising from the constant SPR harvest rate (i.e., a given SPR rate produces a larger catch with estimates of stock status or scale increase); or to attempt a more complete allocation of ACL. For example many species have a buffer between the ACL and the amount allocated and may also be limiting attainment of target species (e.g., canary rockfish). These buffers are shown in the scorecard "Difference" row (*see* Table 1 of Agenda Item E.9.a, Attachment 1).

In considering these allocations, as the Council has been considering in the follow-up to Amendments 20 and 21, the current regulatory structure does not provide for inseason adjustments to the trawl allocation. Therefore, those fish are "stranded" and are not readily

available to be turned into QP and resolve a trawl sector overage. An overage in non-trawl sector would simply eat into the buffer, with no regulatory action required.

We request guidance from the Council on whether these two-year allocations are to be followed for 2013-14 or if alternative allocations should be analyzed.

Our first report in this Agenda Item included some discussion on new information and known dynamics in the various fisheries sectors between rebuilding ACLs and the expected fishing catch and effort and community impacts that result. The nearshore and recreational fishery sectors are two of the most dynamic and are affected most by canary and yelloweye. We did not highlight the increased encounter rate of canary rockfish seen in the recreational fisheries this cycle. The recreational fisheries are mainly structured around yelloweye bycatch, yet if the trends in canary catch continue then it could become even more limiting on season lengths and the depths open to fishing.[2]

The IFQ and co-op sectors were also a big focus of our first report. The change in widow's estimated stock status and other factors like the potential substantial increase in the whiting ACL over the next few years influence the dynamics of several stocks including darkblotched, POP, and canary rockfish.[3] We did not get into much detail about how we would analyze higher ACLs or allocations to the co-op or IFQ sectors. The changed management structure in those fisheries makes it difficult to analyze the difference in impact of two ACLs.

We have not included a discussion on the impact to the IFQ fishery yet because we are unsure how to be best analyze issues like potential targeting of widow rockfish and the impact that the current sector allocations for canary and yelloweye in the north and bocaccio and cowcod in the south are having on the program. Effort has been lower overall in the bottom trawl fishery and reports and some data show that the IFQ fleet may be avoiding shelf fishing opportunities for fear of lightning strikes that would exceed the low amounts of QP available for their operations. The fishery and the impact the fishery has on fishing communities could be much different if allocations are higher. It will be difficult to analyze these dynamics with much precision, yet we plan on providing some information from the 2011 data in Agenda Item E.5 or E.9.
If the Council wishes to evaluate some of these dynamics in the recreational and Amendment 20 fisheries, we would recommend considering an upper bound of at least 184/187 mt or 216/220 mt for canary. These amounts are similar to harvest levels after catch was reduced from historical levels yet before they ramped down to 44 mt. We believe these catch amounts would be high enough to provide some contrast to the status quo in terms of impacts to fishing communities and would be 3 and 4 to rebuilding years beyond $T_{F=0}$, respectively. That same gap between the T_{target} and $T_{F=0}$ in this current management cycle is three years. Again, it is the consideration of the shortest possible time to rebuild and the differential impacts to communities between alternative

[2] Related to the discussion on two-year allocations, the buffer that currently exists for canary rockfish came primarily from reductions in the harvest guidelines from the recreational fisheries - WA decreased from 4.9 mt in 2009-10 to 2.0 mt in 2011-12, OR decreased from 16.1 mt to 7.0 mt, and CA decreased from 22.9 mt to 14.5 mt. The Council made this change, at least in part, based on the assumption that yelloweye would limit fisheries before the recreational fisheries came close to their canary harvest guidelines.

[3] As a reminder, the latest whiting assessment estimated the stock to be above its unfished levels. The standard harvest rate would have produced a catch 2 to 3 times larger than what the Council recommended for the 2011 ACL. One reason for that change was that the bycatch impacts of a higher ACL had not been analyzed in the 2011-12 EIS.

rebuilding strategies on which the Council evaluates rebuilding plans. As we noted in our first report in our discussion on POP, we are unclear on how to weigh those impacts against times to rebuild and so cannot, from an analytical perspective, recommend whether a certain catch level or time to rebuild lies within the Council's discretion under the Magnuson-Stevens Act.

Brief Errata from Agenda Item E.4.b GMT Report

We wish to correct one minor point from our first GMT Report under this agenda item. On page 9, we said we did not have a model for projecting bycatch of bocaccio in fixed gear fisheries off California (i.e., non-nearshore and nearshore). There is a model to project bocaccio impacts in the non-nearshore fisheries north of 36° N. latitude, although this model may not cover all fishing activities in that area. Further, the nearshore model projects bocaccio impacts south of 40° N. latitude. Nonetheless, the general discussion on the potential usefulness of an ACT for bocaccio still stands.

Also in that report, we neglected to discuss the ACT for POP in place for 2011-12 in our discussion on the use of ACTs. We did not mean to imply that an ACT was not useful for POP. The Council is revising the POP rebuilding plan because of the changed rebuilding estimates, yet these changes do not necessarily alter the Council's rationale for setting the ACT.

Discard Mortality and Associated Management Implications for Longnose Skate and Spiny Dogfish Shark

The sablefish, lingcod, longnose skate, and spiny dogfish stock assessments, which were recommended as best available science for use in management by the Science and Statistical Committee (SSC), assume that a percentage of the discarded fish survive. The data used to inform the discard mortality rates are documented in the assessments and various EIS analyses and will be further documented in 2013-14. Total mortality estimates for sablefish and lingcod in the annual West Coast Groundfish (WCGOP) Estimated Discard and Catch of Groundfish Species in the US West Coast Fisheries reports (aka Total Mortality Reports) apply the same discard-mortality rate used in the assessments. The resulting total mortality estimates provided by WCGOP for sablefish and lingcod are therefore less than the total catch estimates, because some proportion of the discard is assumed to survive. On the other hand, the reports do not apply discard-mortality rates to the discarded portion of the catch for longnose skate and spiny dogfish shark, even though stock assessments apply a discard-mortality rate for these species.[4] The reason discard mortality rates are not applied for these species by the WCGOP is due to (a) an oversight by the GMT when preparing management measures for longnose skate, which was first assessed in 2007 for use in the 2009-2010 cycle and (b) the spiny dogfish assessment, with the discard mortality assumptions, was completed in 2011 for use in the 2013-2014 cycle.

[4] In stock assessments, the assumed discard mortality rate for spiny dogfish shark is 50% for hook and line and 100% for trawl (Gertseva and Taylor, 2011). The longnose skate assessment assumes 50% of the discarded skates survive in fixed gear and trawl fisheries (Gertseva and Schirripa, 2007).

Council staff and the GMT engaged in discussions with the SSC and assessment authors to determine the appropriateness of using the longnose skate and spiny dogfish discard mortality assumptions from the assessment for use in management for 2013-2014. This decision will have significant management implications. For example, the total fishing mortality estimate for longnose skate in 2009 was 1,455 mt, which is higher than the OY of 1,349 mt. If, for example, a 50% discard mortality estimate had been applied to longnose skate discarded by the trawl and non-nearshore fixed gear fisheries during 2009, then the estimated total fishing mortality would have been 330 mt less (Table 1 – see adjusted values). Under this scenario, the OY would not have been exceeded.

The GMT recommends continuing the discussion for longnose skate and spiny dogfish with the SSC in March 2012. For the purposes of the analysis conducted over winter for the draft EIS, the GMT recommends analyzing dogfish and longnose skate management measures under two scenarios 1) using the most conservative estimate of discard survivability (100 percent of the discards die) and 2) using discard mortality estimates that match those used in the respective stock assessments. The Council can consider both the SSC input and the draft EIS analysis of management measures in April 2012, when preliminary preferred decisions will occur for management measures.

ACLs for Non-rebuilding stocks

To follow the Council's guidance on minimizing changes from 2011-2012, the GMT assumed that the Council would choose to set the ACL equal to the ABC for those stocks where it did so in 2011-12, and then to then lower the ACL from the ABC where it did so in 2011-12 based on the same policy rationale updated on the best available scientific information on stock status and biology and performance in the fisheries. These rationales are summarized in the GMT Report, under this Agenda Item.

Stock Complexes

In September, the Council asked the GMT to evaluate whether blackgill rockfish, greenspotted rockfish, and dogfish could be managed within their current stock complexes. Agenda Item E.9.b, GMT Report 2 includes our discussion on these stocks. We also received new information, at this meeting, on the performance of the complex ACLs. We will present this information during Agenda Item E.5. ***We recommend not identifying a PPA or preferred range of ACLs for stock complexes until Agenda Item E.9 after the relevant information is presented.***

Longnose skate ACL Considerations

Longnose skate is the one stock managed with its own ACL where we see potential reason for the Council to consider altering the ACL by identifying a range of ACLs analysis. In brief, the rationale for setting the ACL was based partly on our understanding of recent catch levels that might have been too low based on what has been observed since 2009.

Longnose skate was assessed for the first time in 2007 for the 2009-2010 harvest specifications and management measures process (Agenda Item E.6.a, Attachment 3, June 2007). The biomass estimate for the start of 2009 was within the range of 41-80 percent of unfished stock size, with a best estimate of 66 percent. The major sources of uncertainty in the assessment are: 1) the magnitude of the historical catches, and 2) the NWFSC shelf-slope survey catchability coefficient *Q*. These sources of uncertainty were used to develop alternative states of nature for the decision table (Table 2).

During the setting of the 2009-2010 harvest specifications, the SSC noted the default harvest rate for groundfish F45 percent is unproven and potentially too aggressive for elasmobranchs (Agenda Item E.6.b, Supplemental SSC Report, June 2007). Under proxy harvest rate, catch streams ranged from ~3,000-3,500 mt and under the base case the stock biomass was projected above B40 percent. Instead of using the proxy harvest rate, the Council chose a constant catch stream based on the average total mortality from 2004-2006, and increased that mortality by 50 percent. This catch stream (1,349 mt) was intended to accommodate anticipated mortality in fisheries while keeping the stock biomass above 60 percent under all three states of nature (Table 3).

The same constant catch approach described above was used in setting the 2011-2012 harvest specifications. The GMT evaluated whether implementing the constant catch scenario of 1,349 mt was appropriate for the 2013-2014 specifications. Since the 2011-2012 cycle, the total mortality reports for 2009 and 2010 have been released, which were the first years where the mandatory sorting requirement for longnose skate was implemented.[5] The GMT notes that the longnose skate stock assessment decision table could be updated to reflect this new information – both in terms of actual removals in 2009-2010 and in the catch series used to inform the constant catch scenario. Specifically, the data used to inform the average landings constant catch scenario, both actual and those increased by 50 percent, could be updated with the 2009 and 2010 data.
Further, information in the 2009 and 2010 total mortality reports indicate that the constant catch ACL of 1,349 mt may have been set too close to the total mortality since total mortality has been above the ACL (Table 4). The GMT also noted in the previous section that the Total Mortality reports assume 100 percent of the discards die, while the assessment assumes 50 percent survive. Table 2 contains both the Total Mortality Reported values and the adjusted values, assuming that 50 percent of the discarded longnose skate in the limited entry trawl and non-nearshore fisheries survive. Under either scenario, it appears total mortality is very close or over the ACL.

[5] Due to the delay in implementing the 2009-2010 harvest specifications and management measures, the sorting requirement was not implemented until March 6, 2009. Therefore, the 2009 total mortality may be an underestimate.

Based on past policy preferences and the most recent data, the GMT recommends the Council consider whether a range of longnose skate ACLs should be analyzed for 2013-2014. The Council could consider requesting the following decision table runs from the stock assessment author, which would be used to inform the analysis:

1) No Action: 2012 constant catch approach of 1,349 mt
2) Alternative 1: Update decision table with most recent average catch information,
3) Alternative 2: Update decision table with most recent average catch information, increased by 50 percent
4) Alternative 3: A value that accommodates our recent understanding of longnose skate mortality, while keeping the stock above B40. We estimate this value to be ~2,000 mt.

Table 5. Total Mortality Estimates from the 2009 and 2010 Reports (Tables 19) and the Adjusted Values, which Assume 50 percent of the Discarded Longnose Skate Survive (in mt).

		Shoreside commercial fisheries															
		LE Btm			Non-	Nearshore	Non-tribal	WA	All at-sea	Recreational fishing mortality					Estimated		
Year	Value	trawl	CA halibut	Pink shrimp	Nearshore fixed gear	fixed gear	shoreside hake	tribal landings	hake fisheries	WA	OR	CA	Research	Incidental fisheries	fishing mortality	OY	% Attainment
2009	TM Report	1275.4		2.1	173.3	0.0	0.1		0.2				2.8	1.3	1455.1	1349	108%
2009	TM Adjusted	1025.1		2.1	91.1	0.0	0.1		0.2				2.8	1.3	1122.6	1349	83%
2010	TM Report	1266.0	0.1	0.4	103.2	0.0	0.1	1.3	0.6		0.0		1.7	13.0	1386.5	1349	103%
2010	TM Adjusted	1106	0.1	0.4	64.7	0.0	0.1	1.3	0.6		0.0		1.7	13.0	1188.0	1349	88%

Table 6. Decision Table ES-7 from the Longnose Skate Assessment.

Table ES-7. Decision table based on three states of nature, defined based on alternative catch histories and levels of NWFSC shelf-slope survey catchability Q.

		Low Q (Q=0.654) Low historical catch			Q=0.83 BASE			High Q (Q=1.046) High historical catch		
Forecast	Year	Total catch (mt) (landings and discard mortality)	SSB (mt)	Depletion	Total catch (mt) (landings and discard mortality)	SSB (mt)	Depletion	Total catch (mt) (landings and discard mortality)	SSB (mt)	Depletion
	2009	3,428	5,855	80%	3,428	4,673	66%	3,428	4,021	41%
	2010	3,269	5,577	76%	3,269	4,424	63%	3,269	3,854	39%
	2011	3,128	5,321	72%	3,128	4,195	60%	3,128	3,699	37%
	2012	3,006	5,087	69%	3,006	3,985	57%	3,006	3,555	36%
F45% for base scanario	2013	2,902	4,874	66%	2,902	3,794	54%	2,902	3,422	35%
40-10	2014	2,816	4,681	64%	2,816	3,621	51%	2,816	3,298	33%
	2015	2,745	4,508	61%	2,745	3,465	49%	2,745	3,185	32%
	2016	2,686	4,353	59%	2,686	3,327	47%	2,686	3,085	31%
	2017	2,638	4,217	57%	2,638	3,206	46%	2,638	2,997	30%
	2018	2,598	4,098	56%	2,598	3,100	44%	2,598	2,923	30%
	2009	899	5,855	80%	899	4,673	66%	899	4,021	41%
	2010	899	5,850	80%	899	4,697	67%	899	4,125	42%
	2011	899	5,845	80%	899	4,721	67%	899	4,228	43%
Average landings and	2012	899	5,840	80%	899	4,744	67%	899	4,327	44%
discard mortality	2013	899	5,832	79%	899	4,764	68%	899	4,418	45%
for base scanario	2014	899	5,823	79%	899	4,779	68%	899	4,500	46%
2004-2006	2015	899	5,810	79%	899	4,790	68%	899	4,571	46%
	2016	899	5,795	79%	899	4,796	68%	899	4,630	47%
	2017	899	5,777	79%	899	4,797	68%	899	4,679	47%
	2018	899	5,757	78%	899	4,794	68%	899	4,720	48%
	2009	1,349	5,855	80%	1,349	4,673	66%	1,349	4,021	41%
	2010	1,349	5,801	79%	1,349	4,649	66%	1,349	4,077	41%
50% increase	2011	1,349	5,749	78%	1,349	4,624	66%	1,349	4,130	42%
in average landings and	2012	1,349	5,696	78%	1,349	4,599	65%	1,349	4,179	42%
discard mortality	2013	1,349	5,643	77%	1,349	4,572	65%	1,349	4,220	43%
for base scanario	2014	1,349	5,590	76%	1,349	4,542	65%	1,349	4,253	43%
2004-2006	2015	1,349	5,536	75%	1,349	4,509	64%	1,349	4,277	43%
	2016	1,349	5,482	75%	1,349	4,475	64%	1,349	4,292	43%
	2017	1,349	5,429	74%	1,349	4,439	63%	1,349	4,300	44%
	2018	1,349	5,377	73%	1,349	4,402	63%	1,349	4,303	44%

GMT Recommendations

The GMT requests that the Council:

1. Identify which rebuilding plans will be revised, and for those identify a range of ACLs for analysis and a PPA, if desired, or alternatively, provide guidance on the information and discussion that would be helpful in identifying and a PPA and range of ACLs in Agenda Item E.9.
2. For canary rockfish, consider a high ACL alternative of at least 200 mt and a low of 48 mt.
3. For POP, consider a high ACL alternative of at least 247/251 mt.
4. Explore the potential for estimating OFLs for species in the Other Fish Complex. Postpone adoption of final harvest specifications in April 2012.
5. Provide guidance on whether to prepare alternative allocation schemes (i.e., something other than 2012 allocations) for bocaccio, canary, cowcod, petrale, and yelloweye.
6. Consider a range of longnose ACLs from No Action (1,349 mt) to 2,000 mt.
7. Postpone identifying a PPA or a preferred range of ACLs for stock complexes until Agenda Item E.9 after the relevant information is presented.

SCIENTIFIC AND STATISTICAL COMMITTEE REPORT ON BIENNIAL MANAGEMENT SPECIFICATIONS FOR 2013-2014 GROUNDFISH FISHERIES–PART 1

The Scientific and Statistical Committee (SSC) reviewed Table 1 of Agenda Item E.4 Attachment 1, which provides overfishing limits (OFLs) for bocaccio, darkblotched rockfish and widow rockfish. Assessments for these stocks were reviewed by Groundfish Subcommittee of the Scientific and Statistical Committee (SSC) and were endorsed by the full SSC at this meeting. Overfishing limits for boccaccio, darkblotched rockfish and widow rockfish are based the 50 percent spawning biomass per recruit (SPR) rate, which is considered a proxy for F_{MSY}. The SSC recommends adoption of the OFLs for bocaccio, darkblotched rockfish, and widow rockfish in Table 1. The SSC also recommends adoption of the adjusted OFL for canary rockfish in Table 1.

To set acceptable biological catch (ABCs) for these species, SSC again recommends use of the P* approach, in which the buffer between the OFL and the ABC is determined by the value of sigma, representing scientific uncertainty and established by the SSC, and the Council's choice of a P* to express its policy decision on acceptable risk. For all stocks except widow rockfish, the default value of sigma (0.36) for category 1 stocks was considered appropriate. For widow rockfish, the SSC recommends a larger value of sigma (0.41) derived from the base model and low state of nature in the widow rockfish decision table. This approach is intended to better represent uncertainty in stock-recruit steepness, which is considered the major source of uncertainty in the widow rockfish assessment. The resulting buffers for the Council's P* choice are given in Table 2 (Agenda Item E.4 Attachment 2).

Two other issues were discussed by the SSC related to OFLs for groundfish. First, it was brought to the SSC's attention that the yelloweye rockfish assessment does not estimate relative year class strength. Based on the criteria established for the stock categories, yelloweye rockfish should therefore be considered in category 2 rather than category 1, and the sigma for category 2 should be used to set the ABC. Second, based on SSC recommendations at the September 2011 meeting, the OFL for the Other Fish complex in Table 1 is the sum of OFLs only for those species with OFL estimates. Species in the complex without OFLs were assumed not to contribute to the OFL for the complex. OFLs could potentially be developed for additional species in the Other Fish complex, but this may require restructuring the complex to include species that are not currently in the complex, such as additional skate species.

PFMC
11/3/11

ZIONTZ, CHESTNUT, VARNELL, BERLEY & SLONIM
ATTORNEYS AT LAW

STEVEN H. CHESTNUT
JAMES L. VARNELL
RICHARD M. BERLEY
MARC D. SLONIM
BRIAN W. CHESTNUT
BRIAN C. GRUBER
JOSHUA OSBORNE-KLEIN

JOHN B. ARUM
1961–2010

2101 FOURTH AVENUE, SUITE 1230
SEATTLE, WASHINGTON 98121-2331
TELEPHONE 206 448 1230
FACSIMILE 206 448 0962
WWW.ZCVBS.COM

Via Email and First Class Mail

October 21, 2011

William W. Stelle, Jr.
Regional Administrator
National Marine Fisheries Service
7600 Sand Point Way NE
Seattle, WA 98115-0070

Re: Makah Treaty Groundfish Fisheries in 2012

Dear Mr. Stelle:

We have been asked to write to you on behalf of the Makah Indian Tribe. Pursuant to 50 C.F.R. § 660.324(d), please be advised that the Tribe intends to continue all of its existing groundfish fisheries in 2012 and requests that, except as noted below, all existing treaty groundfish regulations and allocations be continued.

The Tribe anticipates that it will again have five catcher boats participating in the Pacific whiting fishery. However, the Tribe has not yet determined its likely harvest in 2012, and will work with your staff to develop an appropriate set aside for the 2012 Makah whiting fishery.

The Tribe requests an increase of 15 metric tons (mt) in projected impacts on widow rockfish in 2012 (from 45 to 60 mt) associated with the Tribe's midwater trawl fishery. The Tribe understands that 38.1 mt of widows are available in the scorecard.

The Tribe also requests an increase of 24.6 mt in projected impacts on petrale sole in 2012 (from 45.4 to 70 mt) associated with the Tribe's bottom trawl fishery. The Tribe understands that 35.5 mt of petrale sole are available in the scorecard.

Makah representatives will be available to discuss any questions you or your staff may have regarding these matters at the upcoming Council meeting.

Sincerely,

ZIONTZ, CHESTNUT, VARNELL,
BERLEY & SLONIM

Marc D. Slonim

cc (via email):

Frank Lockhart
Kevin Duffy
Russ Svec
Steve Joner

COASTAL TREATY TRIBES STATEMENT ON SABLEFISH HARVEST SPECIFICATION FOR 2013-2014

The four Coastal Treaty Tribes—Hoh, Makah, and Quileute Tribes and the Quinault Indian Nation—do not support the preliminary preferred alternative ABC for sablefish that is based on a P* of 0.33. The best available science from the last assessment shows that the population decline has been caused primarily by below-average recruitment over the last ten years. The population is predicted to level out under the status quo harvest policy (P* of 0.45 with a 40-10 adjustment) or even increase if estimated high 2008 and 2010 recruitment events are realized. Lowering the P*, in addition to the decrease from the population decline, represents an undue burden on fishermen. It compounds the negative impact of lowered available harvest on our tribal communities and will have a disproportionate impact on tribes that are already economically depressed and highly dependent on sablefish fishing. There will be negligible benefit to the stock from this proposed reduction in harvest since abundance is largely dictated by recruitment success.

It is also a departure from the spirit of maintaining the 2011-2012 specifications and management measures for this next management cycle. There needs to be a more robust discussion among co-managers of the use of P* in precautionary fisheries management prior to setting a lower level (i.e., when should it be lowered and by how much?). It is premature to alter the harvest policy on such an important stock without full consideration of the impacts of possible alternatives. For 2013-2014 the ABC should be based on a P* of 0.45 just as it was last cycle (i.e. 6,330 and 6,843 respectively).

OCEANA | Protecting the World's Oceans
222 NW Davis Street, Suite 200
Portland, OR 97209 USA
+1.503.235.0278
oceana.org

October 21, 2011

Mr. Dan Wolford, Chair
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, OR 97220

RE: **Agenda Item E.4**. Biennial Management Specifications for 2013-2014 Groundfish Fisheries: **Spiny Dogfish**

Dear Chairman Wolford and Council Members:

This year, National Marine Fisheries Service scientists conducted the first ever stock assessment for spiny dogfish sharks off the U.S. Pacific Coast.[1] The assessment authors, the Scientific and Statistical Committee (SSC) and Groundfish Management Team (GMT) all noted that because of the extremely low productivity, longevity and other vital characteristics of spiny dogfish, fishing at the $F_{MSY\text{-}Proxy}$ level (spawning potential ratio [SPR] 45 percent) is expected to severely reduce this population over the long term. As the GMT made abundantly clear, "*This proxy SPR rate would lead this stock to **extinction** over a long time scale.*"[2] The SSC stated that it "*concurs that the Council $F_{MSY\text{-}Proxy}$ may be too aggressive for spiny dogfish and other elasmobranches [sharks and rays] managed under the Groundfish Fishery Management Plan.*"[3]

Surely the Council would not risk fishing on a stock at aggressive rates that would lead to extinction either in the short or long term. It is abundantly clear from the assessment that the $F_{MSY\text{-}Proxy}$ is incorrect and setting catch levels based on this could easily be defined as overfishing. That is why when taking final action to adopt the 2013-2014 biennial management specifications, we request that you base the overfishing limit (OFL) and allowable biological catch (ABC) on the model estimated SPR_{MSY}=0.77, which means an ABC no greater than 848 metric tons. [4]

If for whatever reason the Council chooses not to use the model estimated SPR, we request a further reduction in the P* value (probability of overfishing) to avoid the probability of actually overfishing - knowing that the proxy SPR is not correct - and set the Annual Catch Limit (ACL) in the range of the model estimated maximum sustainable yield (MSY) (848 mt). Importantly, we ask that you immediately direct the SSC and GMT to reevaluate the current proxy harvest

[1] Gertseva, V., and I. Taylor. 2011. Status of spiny dogfish shark resource off the continental U.S. Pacific Coast in 2011. PFMC. 2011. Agenda Item G.4.a Attachment 7
[2] PFMC. September 2011. Agenda Item G.4.b Supplemental GMT Report.
[3] PFMC. September 2011. Agenda Item G.4.b Supplemental SSC Report
[4] Supra note 1, at 10

rate and biological reference points for spiny dogfish and other elasmobranchs, and amend the Groundfish FMP appropriately.

This action is supported by the American Fisheries Society in a policy statement on the management of sharks and other elasmobranchs:

> *Population models used in fishery management appropriate for more highly productive species may be inappropriate for sharks and rays (Hoff 1990). Shark and ray management should be predicated on the long-term sustainability of healthy populations, and on the precautionary principle (FAO 1995) that management should be conservative in the face of sparse data, erring in favor of maintaining the health of the resource rather than fostering short-term economic gains.*[5]

At the September meeting the Council adopted a 2013-2014 OFL for spiny dogfish of 2,980 mt and 2,950 mt respectively, which is based on the proxy 45% SPR. The Council also selected a preliminary 2013 and 2014 ABC of 2,044 mt and 2,024 mt respectively, based on a P* value of 0.3. While less than the status quo, this is significantly higher than what would be calculated if using the SPR_{MSY} of 0.77 and not even within the 95% confidence interval (430 -1267 mt) of the model estimated MSY. Failure to adjust harvest levels now to adequately reflect the biology of the stock, will only constrain fisheries in the future.

It is important to note that the total average catch in 2009 and 2010 was 1,115 mt from all sectors. In 2010, however, 60% of the total spiny dogfish catch was discarded in the bottom trawl fishery. This means the west coast 'fishery' for spiny dogfish is more waste than anything else. Finally, recognizing this is a transboundary stock, the U.S. should develop a bilateral management plan with Canada for this shared population between the U.S. Pacific Coast and British Columbia.

Thank you for your attention to this important conservation matter.

Sincerely,



Ben Enticknap
Pacific Project Manager

[5] Musick, J.A., G. Burgess, G. Cailliet, M. Camhi, and S. Fordham. 2000. Management of sharks and their relatives (Elasmobranchii). American Fisheries Society Policy Statement. March 2000.

Natural Resources Defense Council
111 Sutter Street, 20th Floor
San Francisco, CA 94104
Tel: (415) 875-6100
Fax: (415) 875-6161

November 3, 2011

Mr. Dan Wolford, Chair
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, OR 97220

RE: Agenda Item E.4, Biennial Management Specifications for 2013-2014 Groundfish Fisheries

Dear Chairman Wolford and Council Members:

Please accept the following comments on behalf of the Natural Resources Defense Council (NRDC), in regards to the Council's adoption of OFLs, ABCs, and ACLs for the 2013-14 groundfish harvest specifications.

1. Widow Rockfish

The Council approved a new stock assessment for Widow Rockfish yesterday. That assessment dramatically revises the status of Widow Rockfish upward, making the stock appear fully rebuilt. NRDC has several concerns with respect to this stock, and strongly urges the Council to maintain an ACL for Widow for the 2013-14 specs cycle that is comparable to the status quo.

At the outset, we note that the improvement in Widow's status is driven entirely by a changed productivity value. The assessment authors acknowledge that the Widow model is extremely sensitive to changes in productivity: "The sensitivity analysis in this assessment shows that small changes in the steepness parameter (h) can lead to large changes in point estimates for stock status and management reference points."[1] This is well illustrated by the decision table, which shows current status to be a direct function of the steepness parameter.[2]

Moreover, the steepness parameter used is based only on an assumption. This year's assessment used a new value of h= 0.76, which is significantly higher than values used in the past. The basis for this value is a meta-analysis of all West Coast rockfish species; in other

[1] November 2011 Briefing Book, Agenda Item E.1.a Attachment 3, at 14.

[2] *Id.* at 16.

words, the value is not specific to Widow Rockfish. Using this value is an assumption, as there are no data suggesting 0.76 is the correct value for Widow steepness. The value is also likely an overestimate for at least two reasons.

First, Widow is believed to be one of the least productive rockfish species, so using a rockfish-wide average will significantly overshoot the actual productivity of Widow. Second, and more importantly, data do exist from which a Widow-specific steepness value can be estimated, and the results come in much lower than the assumed value of 0.76. The Southwest Fishery Science Center calculated a 95% confidence interval for h between 0.22 and 0.54—with a point estimate of 0.38—when only Widow-specific data are used.[3] Even incorporating the rockfish-wide average, the resulting posterior yields a point estimate of 0.54, significantly lower than the assessment assumes.[4]

While NRDC is concerned about the scientific decision on Widow productivity, it is the policy implications that are more troubling. Using the value of 0.76 for steepness radically alters the picture for Widow, making the stock appear rebuilt, and revising history such that the stock was never actually overfished. This, in turn, would imply increasing catch limits for Widow. Such an action would be a mistake, however, for several reasons.

First, there is serious uncertainty surrounding the steepness assumption, which is not captured in the sigma value for Widow. Unlike for most stocks, where sigma is based on the results of an inter-assessment comparison done by Dr. Ralston of the Southwest lab, Widow's sigma value was calculated directly off the decision table produced at the end of the assessment. This means it does not capture inter-assessment variability—i.e., the variability that goes with different model structures, different stock assessment authors, and different review panels. What this means in practice is that the sigma for Widow fails to capture the methodological debate about how to calculate steepness, which in this case is a huge source of uncertainty. Therefore any buffer created with this sigma will fail to adequately account for scientific uncertainty.

The second reason why it would be a mistake to believe Widow is fully recovered and raise catch limits is recent recruitment. The past decade of recruitment estimates are dramatically lower than expected, as shown on page 8 of the assessment.[5] The Southwest Center's white paper helpfully pulls out recent years' recruitment deviations in Figure 6, illustrating a strong downward trend.[6] Faced with recruitment failure, it would be foolhardy to raise catch limits and start depleting the biomass again. This would set up a situation where, the next time Widow is assessed and the h assumption is changed, the stock is shown to be overfished again and we have to start the whole rebuilding process over.

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[3] November 2011 Briefing Book, Agenda Item E.1.a Supplemental Attachment 11, at 2.

[4] *Id.*

[5] November 2011 Briefing Book, Agenda Item E.1.a Attachment 3, at 8.

[6] November 2011 Briefing Book, Agenda Item E.1.a Supplemental Attachment 11, at 6.

For these reasons, NRDC strongly urges the Council to maintain the 2013-14 Widow Rockfish ACL at a level comparable to the status quo.

2. Sablefish

NRDC has similar concerns about poor recruitment and potential over-harvesting of sablefish. The most recent stock assessment states that "average recruitment is estimated to have declined steadily between the 1970s and 2007. Recruitments during the 1980s were, on average, roughly an order of magnitude higher than the very poor recent cohorts estimated between 2002 and 2007."[7] While a few recent year classes appear strong, those estimates still have high uncertainty, and the background trend is one of consistently low recruitment.

Poor recruitment, when combined with status quo catch levels, has resulted in declining biomass for Sablefish. We are currently below the B_{MSY} level, and as noted by the SSC, "There is a strongly and robustly-estimated declining trend in spawning biomass, and there is little likelihood for recovery to the MSY proxy biomass under the catches considered in the decision tables."[8]

NRDC urges the Council to take proactive steps with Sablefish and implement a strong precautionary harvest reduction in 2013-14. This could take the form of a further reduction in P*—below the level of 0.33 set at the September meeting—or a direct lowering of the ACL.

Reducing Sablefish harvest is not only good from a conservation point of view; it is also economically prudent. The SSC has noted that "there is an appreciable (about 15 percent) probability that [Sablefish] is currently depleted below the overfished threshold."[9] This probability will increase in upcoming years, as stock size is projected to decline further.[10] Given the commercial importance of Sablefish, and the strict harvest limits that come with rebuilding, it would create real problems if the stock were declared overfished. Accordingly, the Council should view near-term quota reductions as an investment toward ensuring a stable resource in the future.

3. Spiny Dogfish

Spiny Dogfish is a long-lived species with low fecundity, with females reaching maturity around 35 years old and bearing only a small amount of pups each year. As a result, the species is highly vulnerable to fishing pressure. The stock assessment adopted in September notes, "Life

[7] September 2011 Briefing Book, Agenda Item G.4.a Attachment 9, at 7.

[8] September 2011 Briefing Book, Agenda Item G.4.b Supplemental SSC Report, at 3.

[9] *Id.*

[10] September 2011 Briefing Book, Agenda Item G.4.a Attachment 9, at 13.

history traits of spiny dogfish make the species highly susceptible to overfishing and slow to recover from stock depletion."[11]

Due to this slow growth and low fecundity, the assessment found the current FMSY proxy for Spiny Dogfish of 45%SPR to be far too aggressive. Indeed, fishing at this rate will eventually drive the stock to extinction.[12] A proper FMSY, the assessment estimated, would be 77%SPR—a far lower level of fishing pressure.[13]

Now that the Council has an estimated FMSY for Spiny Dogfish, and clear evidence that the current proxy is not only too aggressive but will result in extinction, it is untenable to define overfishing based on the current proxy. To avoid allowing overfishing, NRDC strongly urges the Council to set Spiny Dogfish ACLs for 2013-14 based on the 77%SPR estimated in the stock assessment.

Finally, NRDC supports the recommendation of the GMT that the Council engage in a review of elasmobranch F-proxies, and revise them as necessary to avoid overfishing.

We hope these comments are helpful, and thank you for your consideration.

Sincerely,

Seth Atkinson
Oceans Program Attorney
Natural Resources Defense Council
111 Sutter Street, 20th Floor
San Francisco, CA 94104
(415) 875-6100

[11] September 2011 Briefing Book, Agenda Item G.4.a Attachment 7, at 24.

[12] September 2011 Briefing Book, Agenda Item G.4.b Supplemental GMT Report, at 1.

[13] September 2011 Briefing Book, Agenda Item G.4.a Attachment 7, at 11.

Agenda Item E.5
Situation Summary
November 2011

FURTHER DIRECTION ON BIENNIAL MANAGEMENT SPECIFICATIONS FOR 2013-2014 GROUNDFISH FISHERIES – PART 1 (IF NEEDED)

At this meeting, the initial development of management recommendations for 2013-2014 groundfish fisheries has been divided into two parts. The tasks under this agenda item (Part I) are to adopt for public review and analysis (1) final 2013-2014 overfishing limits (OFLs) for groundfish stocks and stock complexes recommended by the Scientific and Statistical Committee (SSC); (2) final overfishing probabilities (P*s)/acceptable biological catches (ABCs) for groundfish stocks and stock complexes; and (3) preliminary preferred annual catch limits (ACLs) for groundfish stocks and stock complexes.

This agenda item is a continuation of Agenda Item E.4 and will only occur if the Council requests further information or analyses under Agenda Item E.4 before making decisions on 2013 and 2014 groundfish harvest specifications. Under this agenda item, the Council would provide guidance and direction on requested information and analysis before making final harvest specification decisions under Agenda Item E.9.

Council Action

1. Provide guidance and direction on harvest specifications analyses as needed.

Reference Materials:

1. None.

Agenda Order:

a. Agenda Item Overview
b. Reports and Comments of Advisory Bodies and Management Entities
c. Public Comment
d. Council Guidance and Direction

PFMC
10/14/11

GROUNDFISH MANAGEMENT TEAM RECOMMENDATIONS FOR OFF-THE-TOP DEDUCTIONS (SET-ASIDES)

Deductions to the annul catch limits (ACLs) or annual catch targets (ACTs) are made to account for fishing-related mortality resulting from scientific research, non-groundfish fisheries (also called incidental open access fisheries), Pacific Coast treaty Indian tribal harvest, and, as necessary, exempted fishing permits (EFPs). These deductions are important accountability measures that increase the likelihood that catches will remain below the ACLs or ACTs. The Groundfish Management Team (GMT) discussed the available data and provides the following recommended updates to information contained in the 2011-2012 Environmental Impact Statement, Appendix B. An explanation on how the overfished species set-aside recommendations were derived is provided under Agenda Item E.9.b GMT Report. A summary of all of the overfished and non-overfished species set-asides is provided in Attachment 1.

Additionally, set-asides taken from the trawl allocation are needed to accommodate bycatch in the at-sea whiting fishery. The Council adopted the values for 2012 during the Amendment 21 process. The GMT recommends modifying the set-asides for three species for the 2013-2014 cycle.

The GMT recommendations provided here are intended to inform final Council action on set-asides under Agenda Item E.9. Under this agenda item, the GMT requests confirmation that the approach taken is acceptable or provide guidance on another methodology.

Exempted Fishing Permits

The Council adopted preliminary EFPs for public review and their associated set-asides for both non-overfished and overfished species for 2013-2014 under Agenda Item E.3. The Council approved both the GAP and applicant recommended set-asides (as presented in the GMT report, Agenda Item E.3.b) for public review. These set-asides are summarized in Attachment 1. For non-overfished species, the GAP report only described specific set-aside amounts for chilipepper and yellowtail rockfish but explained that cumulative trip limits would apply for other non-overfished species. The applicant recommended set-asides are also used for the GAP EFP values for non-overfished species without specific set-asides which were estimated to be roughly 2, bi-monthly open access (OA) trip limits (periods 5 and 6) for each of 4 vessels in 2013 and 6 vessels in 2014. The total estimate of set-asides to be considered for off-the-top deductions is shown in two columns, one with the EFP set-asides provided by the applicants and the other with EFP set-asides as recommended by the GAP.

The GMT recommends that the highest EFP set-aside values be used in the DEIS analysis. Should the Council chose to adopt the lower set-aside values in June 2012, the analysis can be updated to reflect those changes.

Scientific Research

In past years, prior to establishing harvest guidelines for fishing activities, the Council has set aside a portion of the OYs for projected impacts from scientific research. Based on the relative

inability to manage scientific research catch, as well as the potential for some unreported research mortality, the Council adopted the historical maximum catch during scientific research activities, as estimated in 2005-2008, for the off-the-top deductions to the ACLs for 2011-2012.

For 2013-2014, research catch from the 2009 and 2010 West Coast Groundfish Observer Program Total Mortality reports for non-overfished species was summarized and added to previous year's estimates. **The GMT recommends following the same approach for research set-asides that was used in setting the 2011-2012 set-asides.**

Non-Groundfish Fisheries (Incidental Open Access)

Following the same approach that was used for 2011-2012, estimates of impacts in the incidental open access fisheries for were derived from the maximum values in the 2007-2010 WCGOP Total Mortality reports. The exception is that the recommended set-aside for longnose skate is based only on catch data from the 2009 and 2010 Total Mortality reports to reflect when catches of longnose skate were removed from the other skate category and reported individually.

The GMT recommends the Council adopt the set-asides for the incidental open access fisheries, as displayed in Attachment 1 for 2013-14.

Tribal

The Tribal fisheries consist of trawl (bottom, mid-water, and whiting), fixed gear, and treaty troll. The tribal set-asides are preliminary placeholders based on the amounts used in 2011-2012 except for the values for petrale sole and widow rockfish which were updated based on the letter from Makah (Agenda Item E.4.b, Supplemental Tribal Report, November 2011). The Tribes will discuss the needs for treaty fisheries and provide further updates to these amounts, if needed, prior to June.

The GMT recommends the Council adopt the tribal set-asides in Attachment 1 for 2013-2014, based on the Tribal requests for 2012.

At-Sea Whiting Set-asides

Unlike set-asides that are taken as off-the-top deductions after setting the ACL, set-asides for overfished (petrale and yelloweye) and non-overfished species are taken from the trawl allocation to accommodate bycatch in the at-sea whiting fishery. Like other set-asides, we do not manage these impacts inseason, so the set-aside amounts need to be set high enough to accommodate the historical maximum or any increased catch that is anticipated.

The 2012 bycatch amounts were based on the maximum historical catch during the Amendment 21 process, noting that they could be revised each biennium if necessary**. The GMT reviewed the recent catch from 2009-2010 and recommends the following set-asides for the 2013-2014 at-sea whiting fisheries (Table 1).** The changes for arrowtooth flounder, lingcod north of 42° N. latitude, and minor slope rockfish north of 40°10 N. latitude were calculated by roughly doubling the maximum value seen from 2007-2010. Under Agenda Item E.9 we will display the ACLs, off the top deductions and trawl and non-trawl allocations including the at-sea whiting set-asides.

Table 1. Recommended set-asides from the trawl allocation to accommodate bycatch in the at-sea whiting fishery for 2013-2014. Bolded values represent changes from the 2011-2012 set-asides.

Species/Species Group	Value in 2012 Regulations (mt.)	GMT Recommendations for 2013-2014
Petrale sole	5	5
Yelloweye rockfish	0	0
Arrowtooth flounder	10	**20**
Dover sole	5	5
English sole	5	5
Lingcod (N. of 42° N. lat.)	6	**15**
Other flatfish	20	20
Pacific cod (N. of 36° N. lat.)	5	5
Minor shelf rockfish (N. of 40°10' N. lat.)	35	35
Minor slope rockfish (N. of 40°10' N. lat.)	55	**100**
Starry flounder	5	5
Longspine thornyhead (N. of 32°27' N. lat.)	5	5
Shortspine thornyhead (N. of 32°27' N. lat.)	20	20
Yellowtail rockfish (N. of 40°10 N. lat.)	300	300

GMT Recommendations

For the 2013-14 cycle,

Under Agenda Item E.5

1. **The GMT requests confirmation that the approach taken to estimate set-asides is acceptable or provide guidance on another methodology for consideration under Agenda E.9.**

Under Agenda Item E.9:

1. **Adopt the research and incidental open access set-asides in Attachment 1.**
2. **Adopt the highest set-aside values for EFPs in Attachment 1 to facilitate the DEIS analysis.**
3. **Adopt the at-sea whiting set-asides in Table 1.**
4. **Adopt Tribal set-asides in Attachment 1, or update, as necessary, based on Tribal needs.**

Attachment 1. GMT proposed set-asides for overfished and non-overfished species for the 2013-2014 harvest specifications (mt). The EFP values are those the Council adopted under Agenda Item E.3. Tribal values represent values from Agenda Item E.4.b, Supplemental Tribal Report, November 2011. The 2012 values in regulation are included for reference.

Species/Species Group/ Area	Tribal	EFP		Research	Inc. OA	Total		Status Quo Set asides for 2012
	2013-14	2013 / 2014 Applicant	2013 / 2014 GAP	2013-14	2013-14	2013 / 2014 Applicant	2013 / 2014 GAP	
Overfished species								
Bocaccio		6.6	1.6	1.0	0.7	8.3	3.3	12.7
Canary	9.5	3.6	0.4	3.0	2.0	18.1	15.0	15.5
Cowcod		0.0	0.0	0.1		0.1	0.1	0.3
Darkblotched	0.1	0.8	0.2	1.4	18.0	20.3	19.7	21.0
Petrale	70.0			4.7	0.1	74.8	74.8	52.2
POP	10.9			1.6	0.4	12.9	12.9	13.0
Widow	60.0	18.0	12.0	1.6	3.3	82.9	76.9	58.6
Yelloweye	2.3	0.0	0.0	3.1	0.2	5.6	5.6	5.7
Non-overfished species								
Arrowtooth founder	2,041			8	30	2,079	2,079	2,078
Black Rockfish N. of 46°16' N. lat. (WA)	14					14	14	14
Black Rockfish S. of 46°16' N. lat. (WA)		3.6 / 5.4	3.6 / 5.4			4 / 5	4 / 5	0
Cabezon N. of 42° N. lat. (OR)						0	0	0
Cabezon S. of 42° N. lat. (CA)						0	0	0
California Scorpionfish					2	2	2	2
Chilipepper S. of 40°10' N. lat.		212 /212	200 / 200	9	5	226	214	15
Dover sole	1,497			38	55	1,590	1,590	1,590
English sole	91			5	7	103	103	100
Lingcod N. of 42° N. lat. (OR & WA)	250			5	16	271	271	271
Lingcod S. of 42° N. lat. (CA)		1.9 / 2.6	1.9 / 2.6		7	9	11	7
Longnose Skate	56			3	3	62	62	129
Other flatfish	60			17	125	202	202	198
Other Fish	none	3.0 / 3.0	3.0 / 3.0	none	none	3	3	0
Pacific Cod	400				2	402	402	400
Pacific Whiting	TBD	2.3 / 3.4	2.3 / 3.4	133	2,000	2,135 / 2,136	2,135 / 2,136	52,049
Minor Slope Rockfish N of 40°10' N. lat.	36			6	19	61	61	68
Minor Slope Rockfish S of 40°10' N. lat.		36.5 / 54.6	36.5 / 54.6	2	17	56 / 74	56 / 74	27
Minor Shelf Rockfish N. of 40°10' N. lat.	9			3	26	38	38	43
Minor Shelf Rockfish S. of 40°10' N. lat.		1.3 / 1.8	1.3 / 1.8	6	9	16 /17	16 / 17	13
Sablefish N. of 36° N. lat.	TBD	12.2 / 16.0	12.2 / 16.0	26	35	73 / 77	73 / 77	574
Sablefish S. of 36° N. lat.				3	2	5	5	34
Shortbelly				2		2	2	1
Splitnose S. of 40°10' N. lat.		1.5 / 2.2	1.5 / 2.2	9		11	11 / 11	7
Starry flounder	2				5	7	7	7
Shortspine Thornyhead N. of 34°27' N. lat.	38			5	2	45	45	45
Shortspine Thornyhead S. of 34°27' N. lat.				1	41	42	42	42
Lonspine Thornyhead N. of 34°27' N. lat.	30			13	3	46	46	44
Longspine Thornyhead S. of 34°27' N. lat.				1	2	3	3	3
Yellowtail N. of 40°10' N. lat.	490	30.0 /30.0	30.0 /30.0	4	3	527	527	499

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Option 1. Council Requested Tables with 2012 Allocations and Allocation Percentages, Applied to the Council's PPAs for 2013 and 2014 ACL Alternatives.

Yelloweye Rockfish 2013 and 2014				
Sector Specific Allocation[1]	**2012 Allocation Percentage[2]**	***2012 Allocation (mt)***	**2012 Projected Impacts[3] (mt)**	**Alt. 6 (18 mt)[4]**
LE Trawl- Non-Whiting	5.4%	*0.6*		0.7
LE Trawl- Whiting	0.0%	*0.0*		0.0
OA: Directed	9.9%	*1.1*	1.1	1.2
LE Fixed Gear	11.7%	*1.3*	0.9	1.4
Rec: WA	23.4%	*2.6*	2.5	2.8
Rec: OR	21.6%	*2.4*	2.3	2.6
Rec: CA	27.9%	*3.1*	3.1	3.4
Residual (beginning of 2012) [5]		*0.1*	0.7	

Canary Rockfish--2013								
Sector Specific Allocation	**2012 Allocation Percentage**	***2012 Allocation (mt)***	**2012 Projected Impacts (mt)**	**Alt. 2 (48 mt)**	**Alt. 3 (101 mt)**	**Alt. 4 (116 mt)**	**Alt. 5 (147 mt)**	**Alt. 7 (216 mt)**
LE Trawl- Non-Whiting	31.3%	*20.0*		9.0	25.6	30.3	40.0	61.6
LE Trawl- Whiting	22.1%	*14.1*		6.3	18.0	21.3	28.2	43.4
OA: Directed	6.3%	*4.0*	3.3	1.8	5.1	6.1	8.0	12.3
LE Fixed Gear	3.6%	*2.3*	1.6	1.0	2.9	3.5	4.6	7.1
Rec: WA	3.1%	*2.0*	1.0	0.9	2.6	3.0	4.0	6.2
Rec: OR	11.0%	*7.0*	4.0	3.1	8.9	10.6	14.0	21.5
Rec: CA	22.7%	*14.5*	9.3	6.5	18.5	21.9	29.0	44.6
Residual (beginning of 2012) [5]		*19.4*	30.0					

Canary Rockfish--2014								
Sector Specific Allocation	**2012 Allocation Percentage**	***2012 Allocation (mt)***	**2012 Projected Impacts (mt)**	**Alt. 2 (49 mt)**	**Alt. 3 (104 mt)**	**Alt. 4 (119 mt)**	**Alt. 5 (151 mt)**	**Alt. 7 (220 mt)**
LE Trawl- Non-Whiting	31.3%	*20.0*		9.3	26.5	31.2	41.2	62.8
LE Trawl- Whiting	22.1%	*14.1*		6.5	18.7	22.0	29.1	44.3
OA: Directed	6.3%	*4.0*	3.3	1.9	5.3	6.2	8.2	12.6
LE Fixed Gear	3.6%	*2.3*	1.6	1.1	3.0	3.6	4.7	7.2
Rec: WA	3.1%	*2.0*	1.0	0.9	2.7	3.1	4.1	6.3
Rec: OR	11.0%	*7.0*	4.0	3.3	9.3	10.9	14.4	22.0
Rec: CA	22.7%	*14.5*	9.3	6.7	19.2	22.6	29.9	45.5
Residual (beginning of 2012) [5]		*19.4*	30.0					

Bocaccio--2013					
Sector Specific Allocation	**2012 Allocation Percentage**	***2012 Allocation (mt)***	**2012 Projected Impacts (mt)**	**Alt. 4 (320 mt)**	
LE Trawl- Non-Whiting	24.0%	*60.0*		76.9	
LE Trawl- Whiting	0.0%	*0.0*		0.0	
OA: Directed	0.3%	*0.7*	0.5	0.9	
LE Fixed Gear	23.2%	*57.9*		74.2	
Rec: WA	0.0%	*0.0*	0.0	0.0	
Rec: OR	0.0%	*0.0*	0.0	0.0	
Rec: CA	52.5%	*131.0*	55.4	167.9	
Residual (beginning of 2012) [5]		*11.0*	144.7		

Bocaccio--2014				
Sector Specific Allocation	**2012 Allocation Percentage**	***2012 Allocation (mt)***	**2012 Projected Impacts (mt)**	**Alt. 4 (337 mt)**
LE Trawl- Non-Whiting	24.0%	*60.0*		78.8
LE Trawl- Whiting	0.0%	*0.0*		0.0
OA: Directed	0.3%	*0.7*	0.5	0.9
LE Fixed Gear	23.2%	*57.9*		76.1
Rec: WA	0.0%	*0.0*	0.0	0.0
Rec: OR	0.0%	*0.0*	0.0	0.0
Rec: CA	52.5%	*131.0*	55.4	172.1
Residual (beginning of 2012) [5]		*11.0*	144.7	

Cowcod--2013 and 2014				
Sector Specific Allocation	**2012 Allocation Percentage**	***2012 Allocation (mt)***	**2012 Projected Impacts (mt)**	**Alt. 3 (3 mt)**
LE Trawl- Non-Whiting	**66.7%**	*1.8*		1.9
LE Trawl- Whiting	**33.3%**	*0.9*	0.2	1.0
OA: Directed				
LE Fixed Gear				
Rec: WA				
Rec: OR				
Rec: CA				
Residual (beginning of 2012) [5]		0.2	0.9	

[1] Off the Top Deductions are based on the Applicant Requested EFP set-asides (maximum set-aside value).
[2] Allocation percentage were calculated based on the 2012 allocations, not on the projected impacts
[3] Projected Impacts from the beginning of 2012 scorecard. Empty cells are sectors with no projection models
[4] Alternative numbers refer to alternatives in Table 4 in Agenda Item E.4. a, Attachment 4 (November 2011), which was used to make the motion on the Council Floor

GROUNDFISH MANAGEMENT TEAM REPORT ON BIENNIAL MANAGEMENT SPECIFICATIONS FOR 2013-14, PART II — STOCK COMPLEX EVALUATION

Introduction

The Council has been considering analysis of the Groundfish Fishery Management Plan (FMP) complexes throughout the 2011-12 and 2013-14 processes. These analyses are recommended by the revised National Standard 1 guidelines and the general goals and objectives of the FMP. In September 2011, the Council recommended, after reviewing some analysis of stock complex vulnerability, to leave further consideration until after the 2013-14 process so as to accomplish the narrow scope and January 1, 2013 start date.

In September, the Council also asked the Groundfish Management Team (GMT) to evaluate whether blackgill rockfish south of 40°10 N. latitude, greenspotted rockfish, and dogfish could be adequately managed within their current complexes with some modifications to management measures (e.g., sorting requirements, fixed gear trip limits adjustments). Our evaluation of that question is reported in Agenda Item E.9.b, GMT Report 2. In sum, we responded that all three stocks could be managed within their complexes using various management measures. The one issue we noted was with blackgill and the individual fishing quota (IFQ) fishery where the Council's management options are more limited because it is more challenging to target management measures specifically at individual stocks within an IFQ management unit (e.g., quota shares and quota pounds are issued for the minor slope rockfish south of 40°10 N. latitude complex). Blackgill are also distributed deeper, meaning adjustments to the rockfish conservation area boundaries (RCA) has little effect unless the seaward boundaries were expanded substantially.

The Council's narrow scope for 2013-14 is focused on keeping step with the 2011-12 harvest specifications and management measures, except to address best available data (e.g., stock assessments, rebuilding analysis, and fisheries data) and "conservation concerns" that cannot be addressed through existing management measures. Such concern includes the ability to control catch to annual catch limits (ACL) and other targets with the existing management measures available in regulation and the FMP.

The annual estimates of total mortality that are used to track management performance have been produced only at the stock complex ACL level (with some exceptions). Earlier this year, the GMT made a request to the West Coast Groundfish Observer Program (WCGOP) to produce annual mortality estimates, by sector, for the individual stocks managed within complexes. We received that data just prior to this meeting. The analysis below shows that catch rises to that conservation concern level, at least in the minor slope rockfish complexes. We are currently analyzing the recreational catch data from all three states, and data for the shoreside whiting sector, to evaluate if there are concerns with any of the stock complexes where recreational catch is significant (recreational catch of slope rockfish is very small). We will present that analysis to the Council in Agenda Item E.9.

Under Agenda Item E.9, the Council will need either to re-affirm the September decision to maintain the current complexes or to provide new alternatives for analysis in the 2013-14 draft Environmental Impact Statement.

Evaluating Overfishing of the Component Stocks

As the Council works to make progress in better aligning the stock complexes with the National Standard 1 guidelines, one of the primary questions that should be addressed is the degree to which the complexes prevent overfishing. Under the FMP and National Standard guidelines, overfishing is gauged by comparing catch to the overfishing limit (OFL) and acceptable biological catch (ABC) harvest specifications for each stock.

The GMT examined the total mortality estimates provided by WCGOP and PacFIN data for sectors not included in those estimates (e.g., the at-sea trawl sectors) to compare catch against the 2013-14 OFLs and ABCs. Again, we are currently adding the recreational catch estimates to complete the analysis for Agenda Item E.9. Because the data that was provided was provided on a coastwide basis, we had to combine the north and south OFLs and ABCs together for those complexes with a geographic break.

An initial evaluation of the WCGOP and PacFIN data for all the stock complexes seems to indicate that the minor slope complexes have the highest number and magnitude of species where either the average or maximum catch was higher than the contributing OFLs. This is consistent with the groundfish vulnerability analysis that demonstrated the slope rockfishes complex had the most numbers of notably vulnerability species.

Slope Rockfish Complex

Based on the preliminary investigation of groundfish removals, three slope species in particular have consistently experienced catches higher than their OFL contributions: aurora, rougheye, and shortraker rockfishes (Table 1). These estimates do not include catch from shoreside whiting or recreational fisheries. Shoreside whiting will bump up catch of some species like rougheye, yet recreational catches will not.

These three species also exhibit high vulnerability scores (PSA scores of 2.10, 2.27 and 2.25, respectively) demonstrating they are of management concern. In particular, the PSA productivity scores of these species are low, indicating low resilience to overfishing and underscoring the need for management measures that effectively control catch to their respective OFLs and ABCs.

More detailed explorations of these data sets may be possible over the winter; however, as shown in Table 1, this first examination clearly identifies the conservation concern. We have been unable to explore the geographic breakdown of catch in detail yet expect that the minor slope rockfish north complex is of most concern. Over 99% of the OFLs and ABCs for rougheye and shortraker are apportioned to that complex. Aurora rockfish is more evenly split between the north and south complexes and so will have to be looked at closely.

If the Council wishes to follow the approach set for dogfish, blackgill, and greenspotted—i.e., to attempt management of the stocks within their current complexes—the management measures options for controlling catch would be similar to those discussed for blackgill in GMT Report 1 under Agenda Item E.9. These options include lowering the ACL for the complex, large trip limit reductions, scientific sorting requirements, harvest guidelines, and modifications to the seaward RCA boundary. As with blackgill, the options for managing catch of these three species within the IFQ fishery are limited. The GMT did not have time to fully discuss the implications of the various alternatives or to explore how catch breaks out between the sectors.

Options for restructuring complexes are twofold. First, the stocks of highest concern could be removed and managed with individual ACLs. Alternatively, the Council could consider removing species with the large or disproportionate complex contributions to reduce the overall complex OFL/ABC thereby reducing the likelihood that species with lower complex contributions would be harvested at the higher levels. We have not had time to discuss the relative pros and cons of these various approaches.

Again, our recommendation here is to highlight the issue in case the Council wishes to provide guidance to direct the team towards further analysis and preparations for Agenda Item E.9.

Table 1. Comparison of Contributing Harvest Specifications with Draft Mortality Estimates for Species in the Slope Rockfish Complex, Coastwide

Slope Rockfish Species N&S	PSA Vulnerability Score	PSA Productivity Scores	Coastwide OFL (contribution) a/		Coastwide ABC (presumptive) b/		Average Mortality (2004-2010) c/	Maximum Mortality (2004-2010) c/	Difference Between OFL and Mortality				Difference Between ABC and Mortality			
									+ / - Average		+ / - Maximum		+ / - Average		+ / - Maximum	
			2013	2014	2013	2014			2013	2014	2013	2014	2013	2014	2013	2014
Aurora	*2.10*	*1.33*	41.5	41.5	35	35	64.4	85.9	-22.9	-22.9	-44.4	-44.4	-29.9	-29.9	-51.3	-51.3
Bank	*2.02*	*1.25*	520.4	520.4	474	474	84.2	271.0	436.2	436.2	249.4	249.4	389.7	389.7	202.8	202.8
Blackgill	*2.08*	*1.22*	134.7	138.7	123	126	120.6	163.2	14.1	18.1	-28.5	-24.5	2.0	5.7	-40.6	-36.9
Redbanded	*2.02*	*1.28*	55.7	55.7	46	46	24.3	41.5	31.4	31.4	14.2	14.2	22.2	22.2	5.0	5.0
Rougheye	*2.27*	*1.17*	71.5	71.5	60	60	115.8	256.8	-44.3	-44.3	-185.3	-185.3	-56.2	-56.2	-197.2	-197.2
Sharpchin	*2.05*	*1.36*	224.3	224.3	187	187	16.5	48.3	207.8	207.8	176.0	176.0	170.6	170.6	138.8	138.8
Shortraker	*2.25*	*1.22*	18.8	18.8	16	16	35.0	68.4	-16.2	-16.2	-49.6	-49.6	-19.3	-19.3	-52.7	-52.7
Splitnose	*1.82*	*1.28*	2623	2721.1	898	932	281.3	344.4	2341.7	2439.8	2278.6	2376.7	617.1	650.6	554.0	587.6
Yellowmouth	*1.96*	*1.61*	193.2	193.2	161	161	7.2	13.7	186.0	186.0	179.5	179.5	153.3	153.3	146.8	146.8

	Draft Mortality Estimates for Several Commercial Fisheries d/						
	2004	2005	2006	2007	2008	2009	2010
Aurora	85.9	58.6	77.0	66.4	52.7	67.4	31.0
Bank	119.3	28.8	38.4	31.8	98.7	59.7	14.9
Blackgill	146.3	93.1	116.8	58.1	68.9	131.4	163.2
Redbanded	21.8	18.3	23.5	25.1	28.4	24.3	41.5
Rougheye	68.9	68.3	89.3	124.4	131.2	171.4	256.8
Sharpchin	27.0	13.2	1.9	9.4	5.1	14.0	9.5
Shortraker	68.4	20.6	10.5	49.0	57.2	30.5	30.2
Splitnose	344.4	234.5	274.9	294.1	272.1	323.9	203.3
Yellowmouth	10.8	8.0	2.3	11.1	2.7	3.2	4.4

a/ OFLs and OFL contributions for these species are the sum of Northern and Southern areas for each species from Agenda Item E.4.a, Attachment 1, Nov 2011
b/ ABCs and ABC contributions for these species are the sum of Northern and Southern areas for each species from Agenda Item E.4.a, Attachment 3, Nov 2011
c/ Mortality estimates from the years 2004-2010 are illustrated here because some data are not yet included for 2002 and 2003; different combinations or ranges of years may be considered as desired.
d/ Unless otherwise noted, the values in these columns are derived by summing together WCGOP mortality estimates (landings + discard estimates) from the following commercial fishery sectors: Limited Entry Non-Whiting Trawl Fishery; Limited Entry Fixed Gear Primary Sablefish Fishery; Limited Entry Fixed Gear sablefish DTL Fishery; Nearshore Fishery; Open Access Fishery; Pink Shrimp Fishery; California Halibut Fishery ; and landings estimates from Tribal at-sea data from NorPac and Tribal shorebased PacFin data. The Shoreside Whiting Landings are not yet included.

Agenda Item E.6
Situation Summary
November 2011

STATUS REPORTS ON THE RATIONALIZED TRAWL FISHERY

Under this agenda item, the Council will receive information on performance of the trawl fishery to dates and updates on any other issues related to implementation. The specific reports planned at this time are as follows

1. Report(s) from NMFS on program performance and any new or ongoing issues, other than those covered under the following agenda item on trailing actions—Agenda Item E.6.b, NMFS Report 1 and Agenda Item E.6.b, Supplemental NMFS Report 2).
2. At-sea sector co-op reports with information about the current year's fishery—Agenda Items E.6.c, Supplemental Mothership Sector Co-op Reports and E.6.c, Catcher-processor Sector Co-op Reports. Mothership sector representatives will provide a presentation of their report. A catcher processor sector representative will be on hand if there are questions about the report provided in the Council briefing materials. (The reports will only cover fishing completed up to the date of the report. By March 31 of next year, co-ops are required to submit to NMFS a final report with complete information).
3. Enforcement Consultants report on enforcement activities pertaining to the trawl rationalization program— Item E.6.d, Enforcement Consultant Report.

No specific Council action is required. However discussion under this agenda item may raise issues to be considered in the following agenda item on trawl rationalization trailing actions.

Council Task:

1. Discussion.

Reference Materials:

1. Agenda Item E.6.b, NMFS Report 1: Current IFQ Catch Data Snapshot
2. Agenda Item E.6.b, Supplemental NMFS Report 2: PRELIMINARY Report for 2011 At-Sea and Tribal Pacific Whiting Fisheries
3. Agenda Item E.6.c, Supplemental Mothership Co-op Report
4. Agenda Item E.6.c, Catcher-Processor Co-op Report
5. Agenda Item E.6.d, Enforcement Consultants Report

Agenda Order:

a.	Agenda Item Overview	Jim Seger
b.	NMFS Report	Frank Lockhart
c.	Whiting Mothership Cooperative Report	Dave Fraser and Joe Bersch
d.	Enforcement Consultants Report	Dayna Matthews
e.	Reports and Comments of Advisory Bodies and Management Entities	
f.	Public Comment	
g.	Council Discussion	

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Agenda Item E.6.b
NMFS Report 1
November 2011

CURRENT INDIVIDUAL FISHING QUOTA (IFQ) CATCH: DATA SNAPSHOT

Since the start of the fishery on January 11, 2011, 214,006,549 pounds have been debited to accounts overall, out of 375,004,872 pounds allocated, (57%) on 1,997 trips, by 102 vessels, using both trawl and fixed gear. Table 1 shows counts of fishtickets and average weights, by state and target, and counts of vessels by state, as of October 11, 2011.

Table 2 lists current shorebased IFQ catch by weight debited, attainment, and retention rates by species category, as of October 11, 2011. The current estimate of total retention rate (by weight) for the fishery is 99%.

Pacific whiting shows the greatest percentage attainment (89%), followed by sablefish north of 36° N. lat. (64%), petrale sole (58%), sablefish south of 36° N. lat. (52%), and longspine thornyheads, north of 34° 27' N. lat. (40%). Tables 3 and 4 show catch distributed by state and port for total IFQ catch, and non-whiting IFQ catch, respectively. Ports have been grouped to preserve confidentiality. Oregon currently shows 74% of total IFQ catch and (59% of non-whiting), Washington shows 22% of total IFQ catch (13% of non-whiting), and California, 4% (28% of non-whiting).

Monthly non-whiting catch rose to its peak in June, at 4,213,345 pounds, and has dropped 21% to 3,336,301 pounds in September since then (Figure 1). Monthly shorebased IFQ catch from Pacific whiting trips peaked in August at 65,284,548 pounds, and fell back to 32,151,128 pounds in September (Figure 2).

Table 1. Counts of tickets and average weights, by state and target, and counts of vessels by state (data as of October 11, 2011).

	ticket counts			vessels	ticket weights			
					non-whiting		whiting	
state	all	non-whiting	whiting	all	ave.	SE	ave.	SE
CA	542	542	-	33	14,602	663	-	-
OR	1216	526	690	63	32,292	971	203,122	2,855
WA	239	91	148	21	41,173	2,629	289,252	8,313
	1,997	1,159	838	102*				

*Number of vessels is not additive among states, due to multiple-state participation.

Table 2. Current catch (pounds debited), percent attainment and retention for the shorebased IFQ fishery, as of October 11, 2011.

IFQ Species	Allocation	Catch to Date	QP Remaining	Attainment	Retention
Arrowtooth flounder	27,406,105	4,503,632	22,902,473	16%	91%
Bocaccio rockfish South of 40°10' N.	132,277	5,457	126,820	4%	100%
Canary rockfish	57,100	7,099	50,001	12%	96%
Chilipepper rockfish South of 40°10' N.	3,252,370	544,587	2,707,783	17%	97%
Cowcod South of 40°10' N.	3,968	23	3,945	1%	74%
Darkblotched rockfish	552,997	91,250	461,747	17%	97%
Dover sole	49,018,682	13,488,387	35,530,295	28%	98%
English sole	41,166,808	238,351	40,928,457	1%	79%
Lingcod	4,107,873	461,148	3,646,725	11%	85%
Longspine thornyheads North of 34°27' N.	4,334,839	1,749,267	2,585,572	40%	95%
Minor shelf rockfish North of 40°10' N.	1,150,813	25,562	1,125,251	2%	82%
Minor shelf rockfish South of 40°10' N.	189,598	4,539	185,059	2%	17%
Minor slope rockfish North of 40°10' N.	1,828,779	204,056	1,624,723	11%	96%
Minor slope rockfish South of 40°10' N.	831,958	72,381	759,577	9%	99%
Other flatfish	9,253,683	1,259,644	7,994,039	14%	83%
Pacific cod	2,502,247	526,103	1,976,144	21%	100%
Pacific halibut (IBQ) North of 40°10' N.	257,524	66,475	191,049	26%	1%
Pacific ocean perch North of 40°10' N.	263,148	49,332	213,816	19%	99%
Pacific whiting	204,628,442	182,695,053	21,933,389	89%	99%
Petrale sole	1,920,226	1,116,217	804,009	58%	97%
Sablefish North of 36° N.	5,613,719	3,605,734	2,007,985	64%	99%
Sablefish South of 36° N.	1,170,390	608,167	562,223	52%	99%
Shortspine thornyheads North of 34°27' N.	3,156,138	1,144,877	2,011,261	36%	99%
Shortspine thornyheads South of 34°27' N.	110,231	7,965	102,266	7%	97%
Splitnose rockfish South of 40°10' N.	3,045,245	36,523	3,008,722	1%	35%
Starry flounder	1,471,586	24,010	1,447,576	2%	94%
Widow rockfish	755,348	264,681	490,667	35%	90%
Yelloweye rockfish	1,323	83	1,240	6%	87%
Yellowtail rockfish North of 40°10' N.	6,821,455	1,205,946	5,615,509	18%	100%
Total	375,004,872	214,006,549	160,998,323	57%	99%

Table 3. Total IFQ pounds debited by state and ports (whiting and non-whiting; data as of October 11, 2011).

State	Ports	Lbs. debited	Percent
WA			
	Ilwaco	9,134,191	4%
	Bellingham and Westport	37,755,006	18%
	Subtotal	46,889,197	22%
OR			
	Astoria	100,372,562	47%
	Newport	49,331,903	23%
	Charleston, Brookings, and unidentified ports	9,008,854	4%
	Subtotal	158,713,319	74%
CA			
	Crescent City, Eureka	3,777,674	2%
	Fort Bragg, Monterey, Morro Bay, Moss Landing, Princeton, San Francisco, Avila, and unidentified ports	4,626,359	2%
	Subtotal	8,404,033	4%
Total		214,006,549	100%

Table 4. Non-whiting IFQ pounds debited by state and ports (non-whiting only; data as of October 11, 2011).

State	Ports	Lbs. debited	Percent
WA			
	Ilwaco	2,600,162	9%
	Bellingham and Westport	1,373,784	5%
	Subtotal	3,973,946	13%
OR			
	Astoria	10,623,765	35%
	Newport	1,946,184	6%
	Charleston and Brookings	5,228,626	17%
	Subtotal	17,798,575	59%
CA			
	Crescent City, Eureka	3,777,674	13%
	Fort Bragg, Monterey, Morro Bay, Moss Landing, Princeton, San Francisco, Avila, and unidentified ports	4,626,359	15%
	Subtotal	8,404,033	28%
Total		30,176,554	100%

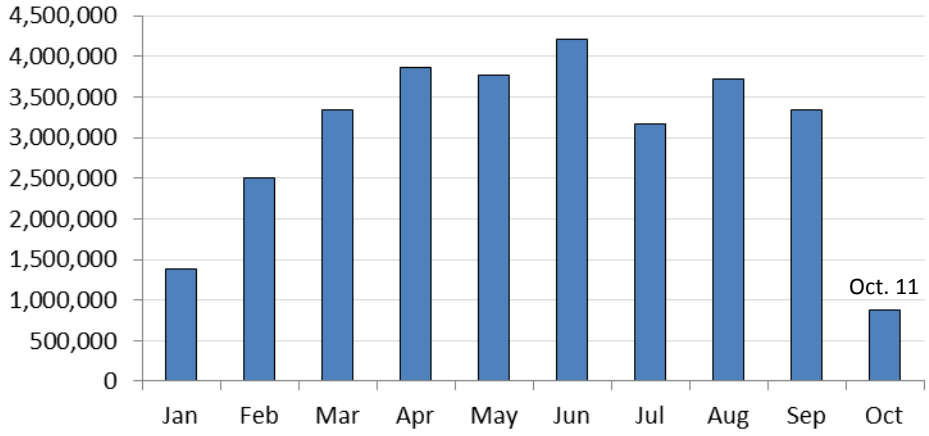

Figure 1. Monthly shorebased IFQ catch from non-whiting trips, as of October 11, 2011.

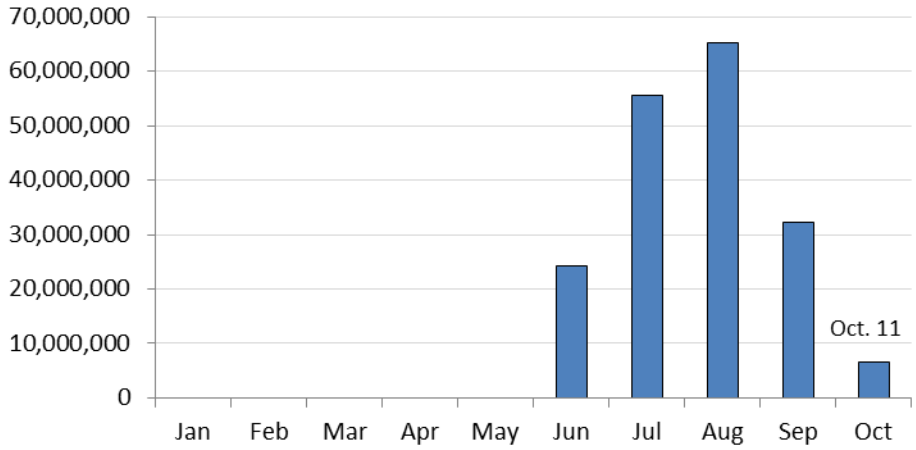

Figure 2. Monthly shorebased IFQ catch from Pacific whiting trips, as of October 11, 2011

Data were queried from the NMFS Vessel Accounts system on October 11, 2011 and were separated into non-whiting and whiting trips for reporting. IFQ fishing began January 11, 2011. A tsunami impacted Southern Oregon and Northern California on March 11, which likely affected effort and landings in those areas. In previous years, shoreside whiting began in California on April 1. The first whiting landings were made in 2011 after June 15th, when the fishery opened coastwide. Crab fishing during January through June was apparently a competing interest with the IFQ fishery, and participation in the two fisheries by vessels fishing IFQ in 2011 were negatively related (r^2 = 0.83, Mid-year IFQ Catch Report, Supplemental NMFS Report, G.7.b., September PFMC meeting).

Pacific Whiting Conservation Cooperative

Amendment 20 Catcher/Processor Cooperative

Preliminary Annual Report 2011

Submitted to the

Pacific Fishery Management Council

October 2011

Pacific Whiting Conservation Cooperative Preliminary Annual Report for 2011

Introduction

In 1997, the owners of the catcher/processor (C/P) vessels operating in the Pacific whiting fishery formed a fishing cooperative to coordinate harvesting efforts. This research and harvesting cooperative is the Pacific Whiting Conservation Cooperative (PWCC). A private contract dictates the activities of the PWCC and a harvest agreement facilitates efficient management and accurate accounting of harvest by the PWCC and PWCC member companies.

In 2011, rationalization for the groundfish trawl fishery was implemented via Amendments 20 and 21 to the Pacific Coast Groundfish Fishery Management Plan. National Marine Fisheries Service (NMFS) summarized the significant effects of Amendment 20 on the shoreside groundfish trawl and mothership whiting fisheries, as well as the effect on the C/P fishery in the September 2, 2011 proposed rule for the Program Improvement and Enhancement (PIE) Rule:

> "In January 2011, NMFS and the Pacific Fishery Management Council set up a new management program called the trawl rationalization program. This program significantly changes how two of these groups work. Shore trawlers now fish under their own set of individual species quotas by vessel…. [T]he mothership fishery works as a coop where catcher-vessels and motherships work together collectively. The catcher-processor fleet continues as a single coop."

Amendment 20 requires a preliminary report be submitted to the Pacific Fishery Management Council in November of the current year and a final report to NMFS the following March.

Purpose of Report

This report is intended to disclose all information required or identified in Federal Regulations at 50 CFR 660.113(d)(3). The table in this report is largely self-explanatory. The catch data in this report was provided by Sea State, Inc. and was obtained from the NMFS – At-Sea Hake Observer Program. Prior to trawl rationalization, NMFS provided a similar report, but with catch information at the sector level (rather than vessel-by-vessel). Catch information at the C/P-vessel level was and is known by NMFS. Therefore, production of this more detailed report by the PWCC should reduce NMFS work load and cost burden.

Reporting Requirements

Federal regulations (50CFR660.113(d)(3)) detail the report requirements:

"(3) Annual coop report - (i) The designated coop manager for the C/P coop must submit an annual report to the Council for its November meeting each year. The annual coop report will contain information about the current year's fishery, including:

> "(A) The C/P sector's annual allocation of Pacific whiting;

"(B) The C/P coop's actual retained and discarded catch of Pacific whiting, salmon, Pacific halibut, rockfish, groundfish, and other species on a vessel-by-vessel basis;

"(C) A description of the method used by the C/P coop to monitor performance of cooperative vessels that participated in the fishery;

"(D) A description of any actions taken by the C/P coop in response to any vessels that exceed their allowed catch and bycatch; and

"(E) Plans for the next year's C/P coop fishery, including the companies participating in the cooperative, the harvest agreement, and catch monitoring and reporting requirements."

A. C/P Sector's Annual Allocation of Pacific Whiting

On May 11, 2011, NMFS issued the C/P cooperative permit, which was effective on the date of issue. As specified at 50 CFR 660.160(c), the C/P cooperative permit authorized the PWCC to harvest 100 percent of the Pacific whiting and non-whiting groundfish allocated to the C/P sector. For 2011, the C/P sector amounts of Pacific whiting and non-whiting groundfish species with allocations are as follows:

2011 C/P sector allocations	mt	pounds
Pacific whiting	75,138.30	165,651,596
Pacific ocean perch	10.20	22,487
Widow rockfish	86.73	191,217
Darkblotched rockfish	8.50	18,739
Canary rockfish	4.79	10,569

B. C/P Cooperative's Actual Retained and Discarded Catch of Pacific Whiting, Salmon, Pacific Halibut, Rockfish, Groundfish, and Other Species on a Vessel-by-Vessel Basis

See Table 1. Catch data is current to the time this report was produced. A final C/P Cooperative Annual Report, with complete catch data, will be provided to NMFS in March 2012. Species are grouped per the advice of NMFS.

C. Description of the Method Used by the C/P Cooperative to Monitor Performance of Cooperative Vessels that Participated in the Fishery

Each vessel in the C/P Cooperative carries two NMFS-certified observers to monitor and account for the catch of Pacific whiting and non-whiting groundfish allocations (i.e., canary rockfish, widow rockfish, darkblotched rockfish, and Pacific ocean perch), and to monitor and account for the catch of prohibited species. Observers report each vessel's catch on a daily basis to both the NMFS Observer Program in Seattle and to Sea State, Inc. (a private, third-party catch monitoring firm).

For 2011, the C/P Cooperative contracted with Sea State, Inc. to process the catch data provided by the observer program and to provide in-season management support. Sea State regularly provides catch reports to each C/P vessel, the C/P fleet, and the C/P Cooperative. These reports may include cumulative fleet-wide and vessel-level catch data as well as tow-by-tow summaries. Fleet managers are able to reconcile the tow-by-tow catch information provided by Sea State against their own catch records to identify possible data errors and ensure accurate catch accounting throughout the fishing season. Sea State reports also provide a mechanism to identify and avoid fishing areas where incidental catch of overfished species and/or prohibited species is occurring. The C/P Cooperative has authorized Sea State, Inc. to identify specific fishing areas to be avoided as a mechanism to reduce catch of overfished species and/or prohibited species.

Catch aboard C/P vessels is weighed using flow scales and motion-compensated platform scales. The flow scale is tested daily by the vessel to ensure the accuracy of the data collected by the NMFS-certified observer. The motion compensated platform scale (or "observer scale") is also tested every 24 hours, which (as specified in the 2011 NMFS At-Sea Hake Observer Manual) is the responsibility of the NMFS-certified observer. The species composition of the catch is determined by the NMFS-certified observer. Because two observers are aboard each vessel the number of hauls sampled are high, at or near 100 percent. C/P vessels endeavor to provide conditions that facilitate large samples of individual hauls. The use of two observers, flow and platform scales, and high rates of sampling leads to very accurate catch accounting for Pacific whiting, non-whiting groundfish, and prohibited species.

The C/P Cooperative acknowledges and agrees that minimizing incidental catch of overfished species to the extent practicable is a primary objective of the C/P Cooperative. In general, incidental catch of overfished species in the C/P sector is very low. For 2011, each C/P Cooperative member agreed to employ bycatch avoidance techniques recommended by the PWCC Board of Directors and Sea State, Inc. Non-whiting groundfish species amounts (functionally, "bycatch limits") allocated by NMFS to the C/P sector were assigned to C/P Cooperative members proportional to their Pacific whiting allocations. These hard caps on incidental catch, if exceeded, would cause the C/P sector to cease fishing, thereby ensuring that C/P Cooperative catch of overfished species is minimized to the extent practicable.

D. Description of Any Actions Taken by the C/P Cooperative in Response to Any Vessels that Exceed Their Allowed Catch and Bycatch

As of the date this preliminary report was submitted, no vessels exceeded their allowed catch or bycatch amounts.

E. Plans for the 2012 C/P Cooperative Fishery, Including the Companies Participating in the Cooperative, the Harvest Agreement, and Catch Monitoring and Reporting Requirements

For 2012, companies participating in the C/P Cooperative include:

AMERICAN SEAFOODS COMPANY LLC; GLACIER FISH COMPANY LLC;
TRIDENT SEAFOODS CORPORATION

2012 C/P Cooperative Pacific Whiting Harvest Schedule:

Member	Percentage of Annual Catcher Processor Allocation
American Seafoods Company LLC	49.4%
Trident Seafoods Corporation	29.6%
Glacier Fish Company LLC	21.0%

2012 C/P Cooperative Catch Monitoring and Reporting Requirements:

Each member of the C/P Cooperative carries two NMFS-certified observers aboard each of its vessels to monitor and account for total catch, including catch of prohibited species. Observers report each vessel's catch on a daily basis to both the NMFS Observer Program in Seattle and to Sea State.

For 2012, the C/P Cooperative will contract with Sea State, Inc. to process the catch data provided by the observer program and to provide in-season management support. Sea State regularly provides catch reports to each C/P vessel, the C/P fleet, and the C/P Cooperative. These reports may include cumulative fleet-wide and vessel-level catch data as well as tow-by-tow summaries. Fleet managers are able to reconcile the tow-by-tow catch information provided by Sea State against their own catch records to identify possible data errors and ensure accurate catch accounting throughout the fishing season.

Catch aboard each C/P is weighed using flow scales and motion-compensated platform scales. The flow scale is tested daily to ensure the accuracy of the data collected by the NMFS-certified observer. Testing the flow scale is the vessel's responsibility. The motion-compensated platform scale (or "observer scale") must also be tested every 24 hours, which (as specified in the 2011 NMFS At-Sea Hake Observer Manual) is the responsibility of the NMFS-certified observer. The species composition of the catch is determined by the NMFS-certified observer. Because two observers are aboard each vessel the number of hauls sampled are high, at or near 100 percent. The observer sampling rate is subject to the observer program sampling protocols. C/P vessels endeavor to provide conditions that facilitate large samples of individual hauls. The use of two observers, flow and platform scales, and high rates of sampling leads to very accurate catch accounting for Pacific whiting, non-whiting groundfish, and prohibited species.

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Table 1. 2011 C/P Cooperative's Catch on a Vessel-by-Vessel Basis

Species name	Alaska Ocean	American Dynasty	American Triumph	Island Enterprise	Kodiak Enterprise	Northern Jaeger	Seattle Enterprise
Roundfish (mt)							
PACIFIC WHITING	4,680.89	3,095.30	3,167.70	6,789.84	2,595.68	3,495.38	7,421.63
PACIFIC COD		0.00					0.00
LINGCOD			0.01		0.01		
SABLEFISH (BLACK COD)	0.06	0.01	0.02	0.08	0.02	0.02	0.04
Flatfish (mt)							
ARROWTOOTH FLOUNDER (TURBOT)	0.38	0.41	0.46	1.11	0.15	0.29	1.48
DOVER SOLE				0.01			0.00
ENGLISH SOLE (LEMON SOLE)			0.01				0.00
PETRALE SOLE							
STARRY FLOUNDER							
OTHER FLATFISH				0.02			
Rockfish (mt)							
CANARY	0.04	0.02	0.01	0.18		0.03	0.16
CHILIPEPPER							
BLACK							
DARKBLOTCHED	0.02	0.02	0.01	0.37	0.02	0.06	0.25
LONGSPINE THORNYHEAD							
PACIFIC OCEAN PERCH	0.07	0.05	0.04	0.45	0.01	0.50	1.20
SHORTSPINE THORNYHEAD				0.29	0.00	0.01	0.00
SHORTBELLY							
SPLITNOSE			0.00	1.79			0.88
WIDOW	0.14	0.83	3.43	0.41	0.04	2.61	2.09
YELLOWEYE							
YELLOWTAIL	1.18	0.79	0.63	5.62	0.04	1.95	3.89
ALL OTHER ROCKFISH	4.76	6.39	4.65	13.51	4.62	4.42	4.57
Remaining groundfish (mt)							
SPINY DOGFISH SHARK	0.92	1.28	0.69	1.71	0.59	0.74	28.95
ALL OTHER GROUNDFISH	1.67	0.50	3.16	3.61	0.16	1.13	1.42
Prohibited species (mt)							
CHUM SALMON (DOG)	0.01	0.00		0.03	0.01	0.01	0.03
COHO SALMON							
KING SALMON (CHINOOK)	0.02	0.09	0.11	0.10	0.05	0.10	0.17
PINK SALMON (HUMPBACK)	0.00	0.00		0.00		0.00	0.00
SALMON - UNIDENT_				0.02			
SOCKEYE SALMON							
STEELHEAD							
PACIFIC HALIBUT	0.09	0.01		0.21	0.03	0.02	0.06
DUNGENESS CRAB							
Non-groundfsih species (mt)							
AMERICAN SHAD		12.18	0.06	0.07		0.02	3.34
FISH - UNIDENT_			0.01			0.00	
FISH WASTE (HEADS, DECOMP,ETC)		0.01		0.08		0.02	
JACK MACKEREL							0.01
JELLYFISH - UNIDENT_	0.00	0.00		0.01		0.01	0.01
MISC - UNIDENT_	0.01	0.03	0.00	0.04			
OCTOPUS - UNIDENT_		0.01		0.02	0.00		
PACIFIC SARDINE	0.00			0.00			0.00
PELAGIC OCTOPUS	0.03						
SQUID - UNIDENT_	4.16	5.41	3.84	8.21	1.91	5.45	4.08
ALL OTHER NON-GROUNDFISH	12.59	7.22	12.07	24.23	3.03	14.71	9.93
Total Weight (mt)	**4,707.04**	**3,130.58**	**3,196.89**	**6,852.05**	**2,606.38**	**3,527.48**	**7,484.18**

note: A cell with 0.00 mt indicates at least a trace amount of this species was caught; a blank cell indicates no amount of that species was caught.

Agenda Item E.6.c
Supplemental Mothership Sector Co-op Report
November 2011

Whiting Mothership Cooperative

An Amendment 20 Mothership Catcher Vessel Cooperative

Preliminary WMC Report
On the Current Year Pacific Whiting Fishery

Prepared by: dave fraser, WMC Coop Manager

Submitted to the PFMC: October 25th 2011

Preliminary WMC Report on the Current Year Pacific Whiting Fishery

Introduction

In March of 2011, the owners of the thirty seven trawl limited entry catcher vessel permits endorsed for operation in the Mothership sector of the Pacific whiting fishery formed a fishing cooperative to coordinate harvesting efforts. This cooperative is the Whiting Mothership Cooperative (WMC).

The WMC receives an allocation of whiting based on the cumulative catch histories of the members of the cooperative. The WMC operates under the WMC Membership Agreement contract which allocates whiting to members proportionate to the contribution to the cooperative's allocation made by NMFS on the basis of the whiting catch history assigned to the Cooperative by the members.

One of the primary purposes of the WMC cooperative is the management of bycatch of the four allocated overfished rockfish species and Chinook salmon. To that end the members of the WMC have all signed a WMC Bycatch Agreement that sets out the rules for modification of fishing behaviour with which members are obligated to comply.

Purpose of Report

This report is intended to disclose all information required or identified in Federal Regulations at 50 CFR 660.113(d)(3). The catch data in this report is current through October 9th, 2011. The catch data was provided by Sea State,, Inc. and was obtained from the NMFS – At-Sea Hake Observer Program.

Reporting Requirements

The required Annual Report elements (A-E) are found in the 50 CFR 660.113(d)(3)

> *(3) Annual coop report - (i) The designated coop manager for the C/P coop must submit an annual report to the Council for its November meeting each year. The annual coop report will contain information about the current year's fishery, including:*
> *(A) The C/P sector's annual allocation of Pacific whiting;*
> *(B) The C/P coop's actual retained and discarded catch of Pacific whiting, salmon, Pacific halibut, rockfish, groundfish, and other species on a vessel-by-vessel basis;*
> *(C) A description of the method used by the C/P coop to monitor performance of cooperative vessels that participated in the fishery;*

(D) A description of any actions taken by the C/P coop in response to any vessels that exceed their allowed catch and bycatch; and

(E) Plans for the next year's C/P coop fishery, including the companies participating in the cooperative, the harvest agreement, and catch monitoring and reporting requirements.

(A) Annual allocation of Pacific whiting to the WMC coop

The Mothership sector of the Pacific Whiting fishery was allocated 53,039 tons of whiting, of which 100% of the whiting was allocated to the Whiting Mothership Cooperative.

(B) The Mothership coop's actual retained and discarded catch of Pacific whiting, salmon, Pacific halibut, rockfish, groundfish, and other species on a vessel-by-vessel basis

All thirty seven of the MS/CV endorsed trawl limited entry permit holders joined the Whiting Mothership Cooperative (WMC).

As of October 9th, 2011, twelve MS/CVs have fished in the MS sector of the whiting fishery. An additional six MS/CV's have declared their intent to begin fishing after October 9th.

Data on the catch, as of Oct. 9th, of Whiting, Salmon, Halibut, Rockfish, Groundfish and Other Species, is shown in the tables attached tables #1 & 2(a-d) (attachment 1). The table #1 shows the aggregate fleet catch, with a breakdown of each species category. The following tables #2(a-d) show the vessel by vessel catch for each species category. In interpreting the tables a cell with "0.00 mt" indicates at least a trace amount of this species was caught; a blank cell indicates no amount of that species was caught.

(C) A description of the method used by the mothership coop to monitor performance of coop vessels that participated in the fishery

The WMC retained Sea State, Inc. Inc. as the Monitoring Agent for the coop. All WMC members provide NMFS and the VMS providers with the needed confidentiality waivers to allow Sea State, Inc. to access both Observer data and VMS data in real time.

The WMC provided Sea State, Inc. with a harvest schedule of each MS/CVs share of whiting and pro-rata portion of the allocated bycatch species. Sea State, Inc. queries the NORPAC observer database to obtain the Mothership observer

reports on a daily basis. Sea State, Inc. uses this data to produce daily reports which are distributed by email to all WMC members, the Coop manager, and to the Mothership processors.

The Sea State, Inc. report shows several tables of information, including:

- the daily catch and bycatch amounts for the fleet as a whole for most recent 8 days
- the overall YTD rates and percent of whiting quota and bycatch harvested for the fleet
- the daily bycatch rates for each Mothership's fleet for the last 3 days
- the seasonal percent of whiting quota and bycatch allocations harvested by vessel
- the seasonal bycatch rates by vessel

As MS/CV observers are debriefed, their data is incorporated into NORPAC and Sea State, Inc. updates its accounting accordingly. On the basis of the Sea State, Inc. data, the Coop manger audits vessel harvest amounts relative to the individual members' share of the quota and transfers between members to see that the coop's allocations are not exceeded.

(D) A description of any actions taken by the mothership coop in response to any vessels that exceed their allowed catch and bycatch

To date, no vessels have exceeded their allowed catch amounts under the Coop Agreement. The coop makes vessel specific whiting allocations, however, the bycatch allocations are managed as a common pool resource. This is not to say that vessels are not subject to individual accountability for bycatch performance.

The Coop agreement includes a variety of measures that serve to mitigate against the possibility of exceeding allowed catch and bycatch limits. These include:

- Precautionary closures of past bycatch hotspots.
- Night fishing restrictions
- Fleet relocation triggers and fleet to fleet reporting
- In season "hot spot" closure authority
- Seasonal apportionments ("pools") of whiting and bycatch allowances
- Sanctions against vessels that have exceeded a bycatch rate within a seasonal pool.

<u>Precautionary Closures of Past Bycatch Hotspots</u>

Prior to the beginning of the 2011 whiting fishery, the WMC created a "Bycatch Committee" which met several times to develop proposed closures that would apply seasonally. The committee reviewed GIS analysis of 10 years of at-sea

observer data overlaid on fine scale bathymetry. The analysis included bycatch rates and amounts as well as amounts of whiting. VMS tracklines of high bycatch tows were also incorporated in the review. Additionally, the committee reviewed logbook information from individual captains' historic directed rockfish experience, which provided insight into habitat associations for rockfish species.

The committee ended up recommending closure of 9 areas, totaling nearly 2000 km^2 which were adopted by the WMC board. The board also identified several other "cautionary" areas. The bycatch committee has met several times since the beginning of the season to review whether to modify or maintain the closures

Night Fishing

Based on the recommendations of the bycatch committee the board adopted a restriction on night fishing between 10:00 PM and 5:30 AM prior to September 1st. The board modified the night fishing restriction for the fall, restricting night fishing inside 100 fathoms between 7:00 PM and 7:00 AM.

Fleet Relocation and Real Time Fleet to Fleet Reporting

The Coop established Base Rates which were based on the pro-rata amounts of bycatch allocations relative to whiting allocations to the MS sector. Each Mothership processor maintains a spreadsheet reporting its fleet performance, measured against the Base Rates. The spreadsheet reports are shared each day between all the processing ships.

Each fleet's performance relative to the Base Rates constitutes a trigger requiring the fleet to relocate if they encounter a bycatch "hotspot". Relocation is required in the event of any of the following situations:

- If a fleet's three day rolling average rate of exceeds the Base Rate for any bycatch species, and that Fleet's cumulative year to date bycatch rate exceeds half of the Base Rate for that species,

- If a fleet's three day rolling average rate of exceeds 125% of the Base Rate for a bycatch species

- If a fleet's bycatch rate during any single day exceeds twice the Base Rate for a bycatch species,

This real time mechanism for response to bycatch encounters coupled with a requirement for test tows upon entering a new area, has served to avoid using up bycatch allocations.

In-season Hot Spot Closures

The WMC board delegated authority to Sea State, Inc. to impose In-season Hot Spot closures if they perceive a problem. However, the 'relocation' triggers described above have pre-empted the need to use this authority so far this season.

Seasonal Pools

The Coop divided the whiting allocation into 4 pools with various start dates. Each pool received a share of the bycatch allocations pro-rata to whiting. The Coop Agreement provides that if a pool reaches its share of the bycatch prior to harvesting its whiting allocation, the members of the pool must cease fishing.

Sanctions Against Member Vessels

In the event that a pool closes because of bycatch, members of that pool whose cumulative bycatch rate exceeded their pro-rata share by 25%, that vessel is restricted from harvesting additional whiting in a subsequent seasonal pool.

To date no pool has been closed due to bycatch, nor have there been any violations of the WMC Bycatch Agreement.

(E) Plans for the next year's mothership coop fishery, including the companies participating in the cooperative, the harvest agreement, and catch monitoring and reporting requirements

The WMC provides that membership in the Coop continues in the following year unless a member provides notice of intent to withdraw before November 1st. At this time, no members have filed notice of intent to withdraw. Therefore we anticipate that the membership will continue as it was this year, as shown in Exhibit A of the WMC Membership Agreement (Attachment 2) filed with NMFS for the 2011 season.

At this time we do not anticipate significant changes to the harvest agreement, catch monitoring, or reporting requirements. We do expect to make some technical edits to the membership agreement primarily for clarity and to better reflect the implementing regulation language.

Attachment #1

Table 1

Whiting Mothership Cooperative - Preliminary Annual Report - Fleeet Catch through 10-9-2011					
SpeciesName		**Catch**	**Retained (mt)**	**Discard (mt)**	**# Vessels**
ROUNDFISH	Code	mt	mt	mt	#
PACIFIC HAKE	206	26,359.77	26,268.83	90.94	12
PACIFIC COD	202	0.00	0.00	0.00	1
SABLEFISH (BLACK COD)	203	0.05	0.02	0.03	7
LINGCOD	603	0.11	0.01	0.10	8
FLATFISH	Code	mt	mt	mt	#
ARROWTOOTH FLOUNDER (TURBOT)	141	3.24	0.21	3.03	12
ROCKFISH	Code	mt	mt	mt	#
CANARY ROCKFISH	314	0.08	0.02	0.06	7
DARK BLOTCHED ROCKFISH	311	0.61	0.57	0.04	7
PACIFIC OCEAN PERCH	301	0.23	0.09	0.14	7
WIDOW ROCKFISH	305	9.54	0.81	8.73	12
BANK ROCKFISH	302	0.00	0.00	0.00	1
CHILIPEPPER ROCKFISH	307	0.01	0.00	0.01	2
REDSTRIPE ROCKFISH	310	0.01	0.00	0.01	1
YELLOWTAIL ROCKFISH	315	66.56	6.25	60.31	12
YELLOWMOUTH ROCKFISH	320	0.01	0.01	0.00	2
SPLITNOSE ROCKFISH	321	0.02	0.00	0.02	3
SILVERGRAY ROCKFISH	324	0.22	0.01	0.21	8
ROUGHEYE ROCKFISH	325	1.92	1.26	0.66	11
BOCACCIO	337	0.17	0.02	0.15	10
ROCKFISH - UNIDENT.	300	0.03	0.00	0.03	1
REMAINING GROUNDFISH SPECIES	Code	mt	mt	mt	#
PACIFIC SLEEPER SHARK	62	0.32	0.00	0.32	4
SPINY DOGFISH SHARK	66	16.72	0.00	16.72	12
SALMON SHARK	67	0.13	0.00	0.13	1
BROWN CAT SHARK	68	0.29	0.00	0.29	11
BLUE SHARK	69	0.14	0.00	0.14	2
BIG SKATE	94	0.04	0.00	0.04	1
PROHIBITED SPECIES	Code	#'s	mt	mt	#
KING SALMON (CHINOOK)	221	229	0.00	1.05	12
PINK SALMON (HUMPBACK)	222	2	0.00	0.00	1
SILVER SALMON (COHO)	223	5	0.00	0.01	3
CHUM SALMON (DOG)	225	12	0.00	0.05	4
PACIFIC HALIBUT	101	12	0.00	0.08	5
DUNGENESS CRAB	12	4	0.00	0.00	1
NON-GROUNDFISH SPECIES	Code	mt	mt	mt	#
AMERICAN SHAD	35	17.95	9.77	8.19	12
JELLYFISH - UNIDENT.	50	0.00	0.00	0.00	1
SQUID - UNIDENT.	60	5.96	1.24	4.73	12
OCTOPUS - UNIDENT.	199	0.00	0.00	0.00	1
CHUB MACKEREL (PACIFIC)	207	0.10	0.00	0.10	4
JACK MACKEREL	280	4.39	0.44	3.95	4
RAGFISH	606	1.74	0.00	1.74	9
KING-OF-THE-SALMON	608	0.80	0.00	0.80	5
PACIFIC SARDINE	614	0.00	0.00	0.00	1
LANTERNFISH - UNIDENT.	700	0.00	0.00	0.00	2
DUCKBILL BARRACUDINA	769	0.00	0.00	0.00	2
PACIFIC POMFRET	775	0.00	0.00	0.00	1
MEDUSAFISH	776	0.00	0.00	0.00	1
OCEAN SUNFISH	810	0.03	0.00	0.03	2
MISC - UNIDENT.	900	0.00	0.00	0.00	1
INVERTEBRATE - UNIDENT.	902	0.00	0.00	0.00	1

Table 2 (a)

Whiting Mothership Cooperative - Preliminary Annual Report - Vessel by Vessel Catch through 10-9-2011

SpeciesName		Vessel A		Vessel B		Vessel C	
ROUNDFISH	Code	Retain mt	Discard mt	Retain mt	Discard mt	Retain mt	Discard mt
PACIFIC HAKE	206	1495.29	0.00	3695.01	0.00	2142.70	0.00
PACIFIC COD	202						
SABLEFISH (BLACK COD)	203			0.00	0.01	0.00	0.01
LINGCOD	603	0.00	0.02	0.00	0.03	0.00	0.02
FLATFISH		Retain mt	Discard mt	Retain mt	Discard mt	Retain mt	Discard mt
ARROWTOOTH FLOUNDER (TURBOT)	141	0.00	0.04	0.00	0.10	0.00	0.09
FLATFISH		Retain mt	Discard mt	Retain mt	Discard mt	Retain mt	Discard mt
CANARY ROCKFISH	314	0.00	0.01	0.00	0.03		
DARK BLOTCHED ROCKFISH	311						
PACIFIC OCEAN PERCH	301			0.00	0.00		
WIDOW ROCKFISH	305	0.00	1.48	0.00	1.65	0.00	0.69
BOCACCIO	302	0.00	0.00	0.00	0.02		
ROUGHEYE ROCKFISH	307	0.00	0.00	0.00	0.01	0.00	0.06
SILVERGRAY ROCKFISH	310	0.00	0.00	0.00	0.00	0.00	0.01
SPLITNOSE ROCKFISH	315						
YELLOWMOUTH ROCKFISH	320					0.00	0.00
YELLOWTAIL ROCKFISH	321	0.00	5.25	0.00	16.01	0.00	2.91
REDSTRIPE ROCKFISH	324			0.00	0.01		
CHILIPEPPER ROCKFISH	325						
BANK ROCKFISH	337						
ROCKFISH - UNIDENT.	300	0.00	0.03				
REMAINING GROUNDFISH SPECIES		Retain mt	Discard mt	Retain mt	Discard mt	Retain mt	Discard mt
PACIFIC SLEEPER SHARK	62						
SPINY DOGFISH SHARK	66	0.00	0.18	0.00	0.64	0.00	0.20
SALMON SHARK	67						
BROWN CAT SHARK	68	0.00	0.01	0.00	0.00	0.00	0.01
BLUE SHARK	69						
BIG SKATE	94			0.00	0.04		
PROHIBITED SPECIES - Salmon		Retain mt	Discard #	Retain mt	Discard #	Retain mt	Discard #
CHUM SALMON (DOG)	221			0.00	2	0.00	2
KING SALMON (CHINOOK)	222	0.00	17	0.00	63	0.00	14
SILVER SALMON (COHO)	223			0.00	2		
PINK SALMON (HUMPBACK)	225						
PROHIBITED SPECIES - Other		Retain mt	Discard mt	Retain mt	Discard mt	Retain mt	Discard mt
PACIFIC HALIBUT	101	0.00	0.01	0.00	0.01		
DUNGENESS CRAB	12						
NON-GROUNDFISH SPECIES		Retain mt	Discard mt	Retain mt	Discard mt	Retain mt	Discard mt
JELLYFISH - UNIDENT.	35						
SQUID - UNIDENT.	50	0.01	0.22	0.00	0.33	0.00	0.50
OCTOPUS - UNIDENT.	60					0.00	0.00
CHUB MACKEREL (PACIFIC)	199						
JACK MACKEREL	207						
RAGFISH	280	0.00	0.19	0.00	0.21	0.00	0.23
AMERICAN SHAD	606	0.00	3.48	0.00	1.16	6.27	0.90
KING-OF-THE-SALMON	608	0.00	0.01				
PACIFIC SARDINE	614						
LANTERNFISH - UNIDENT.	700						
DUCKBILL BARRACUDINA	769						
PACIFIC POMFRET	775						
MEDUSAFISH	776						
OCEAN SUNFISH	810						
MISC - UNIDENT.	900						
INVERTEBRATE - UNIDENT.	902						
ALL NON- WHITNG	all	0.01	27.94	0.00	87.27	6.27	21.63

Table 2 (b)

Whiting Mothership Cooperative - Preliminary Annual Report - Vessel by Vessel Catch through 10-9-2011

SpeciesName		Vessel D		Vessel E		Vessel F	
ROUNDFISH	Code	Retain mt	Discard mt	Retain mt	Discard mt	Retain mt	Discard mt
PACIFIC HAKE	206	1525.21	0.00	1605.39	0.00	1906.62	0.00
PACIFIC COD	202					0.00	0.00
SABLEFISH (BLACK COD)	203					0.00	0.01
LINGCOD	603	0.00	0.01				
FLATFISH		Retain mt	Discard mt	Retain mt	Discard mt	Retain mt	Discard mt
ARROWTOOTH FLOUNDER (TURBOT)	141	0.00	0.18	0.00	0.07	0.00	0.93
FLATFISH		Retain mt	Discard mt	Retain mt	Discard mt	Retain mt	Discard mt
CANARY ROCKFISH	314					0.00	0.01
DARK BLOTCHED ROCKFISH	311			0.00	0.01	0.00	0.01
PACIFIC OCEAN PERCH	301					0.00	0.01
WIDOW ROCKFISH	305	0.00	0.77	0.00	0.35	0.00	0.76
BOCACCIO	302	0.00	0.00	0.00	0.01	0.00	0.02
ROUGHEYE ROCKFISH	307			0.00	0.11	0.00	0.07
SILVERGRAY ROCKFISH	310			0.00	0.01	0.00	0.01
SPLITNOSE ROCKFISH	315					0.00	0.01
YELLOWMOUTH ROCKFISH	320						
YELLOWTAIL ROCKFISH	321	0.00	5.73	0.00	1.17	0.00	11.76
REDSTRIPE ROCKFISH	324						
CHILIPEPPER ROCKFISH	325					0.00	0.01
BANK ROCKFISH	337					0.00	0.00
ROCKFISH - UNIDENT.	300						
REMAINING GROUNDFISH SPECIES		Retain mt	Discard mt	Retain mt	Discard mt	Retain mt	Discard mt
PACIFIC SLEEPER SHARK	62	0.00	0.00			0.00	0.19
SPINY DOGFISH SHARK	66	0.00	0.15	0.00	0.11	0.00	4.71
SALMON SHARK	67						
BROWN CAT SHARK	68	0.00	0.00	0.00	0.02	0.00	0.02
BLUE SHARK	69						
BIG SKATE	94						
PROHIBITED SPECIES - Salmon		Retain mt	Discard #	Retain mt	Discard #	Retain mt	Discard #
CHUM SALMON (DOG)	221						
KING SALMON (CHINOOK)	222	0.00	16	0.00	6	0.00	8
SILVER SALMON (COHO)	223						
PINK SALMON (HUMPBACK)	225						
PROHIBITED SPECIES - Other		Retain mt	Discard mt	Retain mt	Discard mt	Retain mt	Discard mt
PACIFIC HALIBUT	101	0.00	0.01				
DUNGENESS CRAB	12						
NON-GROUNDFISH SPECIES		Retain mt	Discard mt	Retain mt	Discard mt	Retain mt	Discard mt
JELLYFISH - UNIDENT.	35						
SQUID - UNIDENT.	50	0.00	0.13	0.00	0.30	0.00	0.53
OCTOPUS - UNIDENT.	60						
CHUB MACKEREL (PACIFIC)	199					0.00	0.04
JACK MACKEREL	207					0.04	0.84
RAGFISH	280	0.00	0.13	0.00	0.50	0.00	0.06
AMERICAN SHAD	606	0.00	0.56	3.41	0.35	0.00	0.02
KING-OF-THE-SALMON	608					0.00	0.14
PACIFIC SARDINE	614						
LANTERNFISH - UNIDENT.	700			0.00	0.00		
DUCKBILL BARRACUDINA	769						
PACIFIC POMFRET	775						
MEDUSAFISH	776	0.00	0.00				
OCEAN SUNFISH	810						
MISC - UNIDENT.	900						
INVERTEBRATE - UNIDENT.	902						
ALL NON- WHITNG	all	0.00	23.67	3.41	9.00	0.04	28.17

Table 2 (c)

Whiting Mothership Cooperative - Preliminary Annual Report - Vessel by Vessel Catch through 10-9-2011

SpeciesName		Vessel G		Vessel H		Vessel I	
ROUNDFISH	Code	Retain mt	Discard mt	Retain mt	Discard mt	Retain mt	Discard mt
PACIFIC HAKE	206	2734.98	0.00	2764.75	0.00	2205.14	0.00
PACIFIC COD	202						
SABLEFISH (BLACK COD)	203			0.00	0.01	0.00	0.00
LINGCOD	603	0.00	0.02				
FLATFISH		Retain mt	Discard mt	Retain mt	Discard mt	Retain mt	Discard mt
ARROWTOOTH FLOUNDER (TURBOT)	141	0.00	0.14	0.00	0.55	0.11	0.00
FLATFISH		Retain mt	Discard mt	Retain mt	Discard mt	Retain mt	Discard mt
CANARY ROCKFISH	314	0.00	0.00			0.01	0.00
DARK BLOTCHED ROCKFISH	311	0.00	0.00	0.00	0.01	0.57	0.00
PACIFIC OCEAN PERCH	301	0.00	0.04	0.00	0.01	0.09	0.00
WIDOW ROCKFISH	305	0.00	0.58	0.00	0.51	0.40	1.69
BOCACCIO	302	0.00	0.02			0.01	0.00
ROUGHEYE ROCKFISH	307	0.00	0.06	0.00	0.29	0.61	0.00
SILVERGRAY ROCKFISH	310			0.00	0.00		
SPLITNOSE ROCKFISH	315			0.00	0.01		
YELLOWMOUTH ROCKFISH	320					0.01	0.00
YELLOWTAIL ROCKFISH	321	1.15	3.56	0.00	0.64	0.77	1.34
REDSTRIPE ROCKFISH	324						
CHILIPEPPER ROCKFISH	325	0.00	0.00				
BANK ROCKFISH	337						
ROCKFISH - UNIDENT.	300						
REMAINING GROUNDFISH SPECIES		Retain mt	Discard mt	Retain mt	Discard mt	Retain mt	Discard mt
PACIFIC SLEEPER SHARK	62			0.00	0.11		
SPINY DOGFISH SHARK	66	0.00	0.30	0.00	3.63	0.00	0.12
SALMON SHARK	67					0.00	0.13
BROWN CAT SHARK	68	0.00	0.01	0.00	0.01		
BLUE SHARK	69						
BIG SKATE	94						
PROHIBITED SPECIES - Salmon		Retain mt	Discard #	Retain mt	Discard #	Retain mt	Discard #
CHUM SALMON (DOG)	221						
KING SALMON (CHINOOK)	222	0.00	22	0.00	16	0.00	14
SILVER SALMON (COHO)	223	0.00	2				
PINK SALMON (HUMPBACK)	225						
PROHIBITED SPECIES - Other		Retain mt	Discard mt	Retain mt	Discard mt	Retain mt	Discard mt
PACIFIC HALIBUT	101	0.00	0.03				
DUNGENESS CRAB	12	0.00	0.00				
NON-GROUNDFISH SPECIES		Retain mt	Discard mt	Retain mt	Discard mt	Retain mt	Discard mt
JELLYFISH - UNIDENT.	35						
SQUID - UNIDENT.	50	0.00	0.39	0.00	1.02	0.81	0.10
OCTOPUS - UNIDENT.	60						
CHUB MACKEREL (PACIFIC)	199			0.00	0.03		
JACK MACKEREL	207			0.04	1.98		
RAGFISH	280	0.00	0.15			0.00	0.16
AMERICAN SHAD	606	0.00	0.11	0.00	1.38	0.00	0.00
KING-OF-THE-SALMON	608			0.00	0.28		
PACIFIC SARDINE	614						
LANTERNFISH - UNIDENT.	700						
DUCKBILL BARRACUDINA	769			0.00	0.00		
PACIFIC POMFRET	775						
MEDUSAFISH	776						
OCEAN SUNFISH	810			0.00	0.02		
MISC - UNIDENT.	900						
INVERTEBRATE - UNIDENT.	902	0.00	0.00				
ALL NON- WHITNG	all	1.15	29.42	0.04	26.48	3.39	17.53

Table 2 (d)

Whiting Mothership Cooperative - Preliminary Annual Report - Vessel by Vessel Catch through 10-9-2011

SpeciesName		Vessel J		Vessel K		Vessel L	
ROUNDFISH	Code	Retain mt	Discard mt	Retain mt	Discard mt	Retain mt	Discard mt
PACIFIC HAKE	206	1212.37	90.94	1123.96	0.00	3857.39	0.00
PACIFIC COD	202						
SABLEFISH (BLACK COD)	203	0.01	0.00			0.00	0.00
LINGCOD	603			0.01	0.00	0.00	0.00
FLATFISH		Retain mt	Discard mt	Retain mt	Discard mt	Retain mt	Discard mt
ARROWTOOTH FLOUNDER (TURBOT)	141	0.00	0.13	0.10	0.00	0.00	0.80
FLATFISH		Retain mt	Discard mt	Retain mt	Discard mt	Retain mt	Discard mt
CANARY ROCKFISH	314			0.01	0.00	0.00	0.01
DARK BLOTCHED ROCKFISH	311	0.00	0.00			0.00	0.00
PACIFIC OCEAN PERCH	301			0.00	0.00	0.00	0.08
WIDOW ROCKFISH	305	0.03	0.09	0.37	0.00	0.00	0.17
BOCACCIO	302	0.00	0.02	0.00	0.00	0.00	0.05
ROUGHEYE ROCKFISH	307	0.00	0.01	0.65	0.00	0.00	0.04
SILVERGRAY ROCKFISH	310			0.01	0.00	0.00	0.18
SPLITNOSE ROCKFISH	315						
YELLOWMOUTH ROCKFISH	320					0.00	0.01
YELLOWTAIL ROCKFISH	321	0.02	0.03	4.31	0.00	0.00	11.91
REDSTRIPE ROCKFISH	324						
CHILIPEPPER ROCKFISH	325						
BANK ROCKFISH	337						
ROCKFISH - UNIDENT.	300						
REMAINING GROUNDFISH SPECIES		Retain mt	Discard mt	Retain mt	Discard mt	Retain mt	Discard mt
PACIFIC SLEEPER SHARK	62					0.00	0.02
SPINY DOGFISH SHARK	66	0.00	1.26	0.00	0.12	0.00	5.29
SALMON SHARK	67						
BROWN CAT SHARK	68	0.00	0.17	0.00	0.00	0.00	0.04
BLUE SHARK	69	0.00	0.10			0.00	0.03
BIG SKATE	94						
PROHIBITED SPECIES - Salmon		Retain mt	Discard #	Retain mt	Discard #	Retain mt	Discard #
CHUM SALMON (DOG)	221			0.00	1	0.00	7
KING SALMON (CHINOOK)	222	0.00	6	0.00	17	0.00	30
SILVER SALMON (COHO)	223			0.00	1		
PINK SALMON (HUMPBACK)	225			0.00	2		
PROHIBITED SPECIES - Other		Retain mt	Discard mt	Retain mt	Discard mt	Retain mt	Discard mt
PACIFIC HALIBUT	101					0.00	0.03
DUNGENESS CRAB	12						
NON-GROUNDFISH SPECIES		Retain mt	Discard mt	Retain mt	Discard mt	Retain mt	Discard mt
JELLYFISH - UNIDENT.	35					0.00	0.00
SQUID - UNIDENT.	50	0.09	0.63	0.33	0.00	0.00	0.58
OCTOPUS - UNIDENT.	60						
CHUB MACKEREL (PACIFIC)	199	0.00	0.02			0.00	0.01
JACK MACKEREL	207	0.35	0.49			0.01	0.64
RAGFISH	280	0.00	0.11				
AMERICAN SHAD	606	0.00	0.02	0.08	0.00	0.00	0.20
KING-OF-THE-SALMON	608	0.00	0.20			0.00	0.16
PACIFIC SARDINE	614	0.00	0.00				
LANTERNFISH - UNIDENT.	700	0.00	0.00				
DUCKBILL BARRACUDINA	769					0.00	0.00
PACIFIC POMFRET	775	0.00	0.00				
MEDUSAFISH	776						
OCEAN SUNFISH	810	0.00	0.01				
MISC - UNIDENT.	900	0.00	0.00				
INVERTEBRATE - UNIDENT.	902						
ALL NON- WHITNG	all	0.51	9.31	5.87	21.12	0.01	57.25

WHITING MOTHERSHIP COOPERATIVE MEMBERSHIP AGREEMENT

This WHITING MOTHERSHIP COOPERATIVE MEMBERSHIP AGREEMENT is entered into as of March 8th, 2011 by and among the entities listed on Exhibit A hereto that execute this Agreement prior to the date it is submitted to the National Marine Fisheries Service ("NMFS"), and any other members admitted pursuant to this Agreement (together, the "Members") and WHITING MOTHERSHIP COOPERATIVE, a Washington Fish Marketing Act nonprofit corporation (the "Cooperative").

RECITALS

A. Amendment 20 to the Pacific Coast Groundfish Fishery Management Plan adopts a cooperative-based rationalization system for the mothership sector of the Pacific whiting fishery.

B. The Members desire to form a fishery cooperative that qualifies to receive annual mothership whiting allocations under the regulations implementing Amendment 20.

Now, therefore, the parties agree as follows:

1. Cooperative Membership and Assignment of Whiting Catch History. To be qualified to join the Cooperative, a person must hold a Pacific Coast trawl limited entry groundfish permit with a "catcher vessel mothership" or "MS/CV" endorsement, and such person must not have incurred legal sanctions that prevent that person from fishing groundfish in the region under Pacific Fishery Management Council jurisdiction. Upon being admitted to the Cooperative, and for so long as each Member remains a Member, each Member shall assign all of the mothership sector Pacific whiting catch history for at least one of such Member's MS/CV permits to the Cooperative. Each Member acknowledges that upon such assignment, all mothership sector whiting catch history related to such MS/CV permit remains with the Cooperative for the calendar year of such assignment, unless otherwise provided herein. A schedule that identifies the Members and the permit(s) each of them has assigned to the Cooperative, that specifies each Member's percentage share of the Cooperative's annual allocation, and that identifies all of the vessels that will harvest under the Cooperative's annual allocation shall be prepared annually by the Cooperative's Manager (as defined in Section 8, below) on or before April 15, and when approved by the Cooperative's Board of Directors, shall be incorporated by reference as Exhibit B (such schedule being referred to hereafter as the "Harvest Schedule").

2. Cooperative Permit and Allocation. Unless and until it is dissolved in accordance with Section 7.a, below, the Cooperative shall apply each year for a Pacific whiting fishery mothership sector cooperative permit (the "Cooperative Permit") and a related allocation of whiting.

3. Harvest Shares. Subject to the terms and conditions of the regulations implementing Amendment 20, this Membership Agreement, the Articles of Incorporation and the Bylaws of the Cooperative (as the same may be amended from time to time) and applicable restrictions under U.S. antitrust law, each Member shall have the right to harvest the annual percentage of the Cooperative's annual allocation of Pacific whiting assigned to such Member on the Cooperative Harvest Schedule for that year, and to transfer some or all of such percentage to any person eligible to receive it.

a. Pacific Whiting. Each Member's annual Harvest Schedule percentage for Pacific whiting shall be proportionate to the contribution to the Cooperative's allocation for such species made by NMFS on the basis of the whiting catch history assigned to the Cooperative by such Member.

b. Non-Whiting Species, Set-Asides and Prohibited Species Management. The Members acknowledge that their mothership sector harvest of all species other than Pacific whiting, including but not limited to non-whiting allocated species such as Canary, Darkblotched and Widow rockfish, non-whiting "set –aside" species such as sablefish, and "prohibited species" such as salmon and halibut (together, the "Non-Whiting Species") will be managed by NMFS through set-asides and fishery management measures taken during the course of each fishing season, as NMFS determines appropriate. The Cooperative's Board of Directors shall have the authority to adopt such rules concerning the management and harvest of Non-Whiting Species by vessels harvesting the Cooperative's Pacific whiting allocation as the Cooperative's Board of Directors deems appropriate from time to time. The initial rules concerning management and harvest of Non-Whiting Species are set forth in Section 11 of this Agreement and on Exhibit C (the "Whiting Bycatch Agreement").

c. Management Measures. Each Member's mothership sector harvest activities shall be subject to all management measures generally applicable to the mothership sector of the Pacific whiting fishery. Unless a Member receives a transfer or permission from the Cooperative's Board of Directors that permits otherwise, each Member shall be restricted to harvesting such Member's allocation accordingly.

d. Vessel Use. To the extent permitted under the regulations implementing Amendment 20 and subject to the provisions of Section 11, below, the Members may arrange to have the allocations and apportionments they receive under this Agreement harvested by any eligible vessel or combination of eligible vessels, provided that if the operator(s) of such vessel(s) are not Members, the eligibility of such vessel(s) to do so shall be conditioned on their owner(s) agreeing in writing to assume all of the obligations of a Member under this Agreement. Such assumption shall not relieve the related Member of its obligations under this Agreement.

e. Pacific Whiting Allocation Transfers. To the extent permitted under the regulations implementing Amendment 20, each Member shall

have the right to transfer some or all of the Pacific whiting allocation such Member receives under this Agreement to one or more other Members on any terms such Members may agree upon. Each Member transferring an allocation shall notify the Cooperative's Monitoring Service (as defined in Section 4, below) and Manager (as defined in Section 8, below) of the transfer as of its effective date.

4. Catch Monitoring. To enable each Member and the Cooperative to monitor other Members' compliance with the regulations implementing Amendment 20 and this Agreement, each Member hereby agrees to cause each vessel harvesting any of its allocations under this Agreement to carry the number and type of NMFS-certified observers required by law aboard each of such vessels, and cause the operator(s) of such vessels to report each vessel's catch on a delivery-by-delivery basis to the Cooperative's quota harvest monitoring service (the "Monitoring Agent"). Each Member hereby authorizes NMFS to release directly to the Monitoring Agent all NMFS observer data and Vessel Monitoring System ("VMS") data related to Pacific whiting mothership sector operations of the vessels such Member owns or operates. Further, each Member agrees to obtain such releases from any vessels owned or operated by non-Members that harvest any of such Member's allocations under this Agreement. Each Member agrees that absent manifest error, the catch data produced for the Cooperative by the Monitoring Agent shall be presumed accurate, and that each Member's obligations under this Agreement and all related documents may be enforced to their fullest extent on the basis of such data.

5. Allocation and Management Measure Enforcement. Each Member acknowledges and agrees that the benefits associated with the Members' mutual harvest agreement will only accrue to the Members if each of them strictly complies with the Harvest Schedule percentages and Non-Whiting Species management and harvest rules set forth in this Agreement, set forth in the Whiting Bycatch Agreement, and that the Cooperative's Board of Directors may adopt from time to time. Further, each Member acknowledges that all other Members will be taking certain significant operational and financial actions in reliance on this Agreement, and that a breach of this Agreement by any Member would have significant adverse consequences. Therefore, to facilitate enforcement of this Agreement, each Member agrees to the procedure set forth in this Section 5.

a. Restrictions on Fishing Activity. The Members acknowledge and agree that one or more Members exceeding their Harvest Schedule allocations or violating the Cooperative's Non-Whiting Species management and harvest rules could subject the Cooperative and its other Members to joint and several liability to NMFS for fishing violations. The Members further acknowledge and agree that monetary penalties could be inadequate recourse under such circumstances. Therefore, the Members acknowledge and agree that each of them will comply with a "stop fishing" order from the Cooperative, and each of the Members further agrees that if any Member fails to comply with such order, the Cooperative shall have the authority to obtain an injunction, restraining order or other equivalent form of equitable relief to give effect to such "stop fishing" order.

b. Overharvest Forfeiture. In the event the Board of Directors determines that a vessel operator or vessel operators harvesting a Member's Pacific whiting allocation unintentionally exceeded that Member's Harvest Share percentage (as adjusted by transfers made in accordance with this Agreement), such Member shall be liable for an amount equal to the Unintentional Forfeiture Amount (as defined in Section 5.c, below) multiplied by the number of metric tons by which such harvest exceeded that Member's allocation or apportionment. In the event that the Board of Directors determines that a vessel operator or vessel operators harvesting a Member's Pacific whiting allocation intentionally exceeded that Member's Harvest Share percentage (as adjusted by transfers made in accordance with this Agreement), as the result of failing to comply with a "stop fishing" order or otherwise, such Member shall be liable for an amount equal to the Intentional Forfeiture Amount (as defined in Section 5.d, below) multiplied by the number of metric tons by which such harvest exceeded that Member's allocation or apportionment.

c. Failure to Comply with Bycatch Management Measures. In the event that a vessel harvesting a Member's Pacific whiting allocation under this Agreement fails to comply with a fishery management measure specified in Section 11 of this Agreement, as amended from time to time, or in the Whiting Bycatch Agreement, as amended from time to time, such Member shall be liable for an amount determined by the Cooperative's Board of Directors in its sole discretion, which shall not exceed the Management Measure Liquidated Damages amount (as defined below) multiplied by the number of instances of non-compliance.

d. Forfeiture Amounts and Liquidated Damages. The initial forfeiture amount for an unintentional overharvest of an unprocessed metric ton of Pacific whiting shall be equal to one hundred fifty percent (150%) of the ex-vessel value of a metric ton of Pacific whiting (the "Unintentional Forfeiture Amount"). The initial forfeiture amount for an intentional overharvest of an unprocessed metric ton of Pacific whiting shall be equal to three hundred percent (300%) of the ex-vessel value of a metric ton of Pacific whiting (the "Intentional Forfeiture Amount"). The initial liquidated damages amount for a violation of fishery management measures specified in Section 11 of this Agreement, as amended from time to time, and in the Whiting Bycatch Agreement, as amended from time to time (the "Management Measure Liquidated Damages") shall be Two Thousand Five Hundred Dollars ($2,500). The Cooperative's Board of Directors may adjust the Unintentional Forfeiture Amount, the Intentional Forfeiture Amount and the Management Measure Liquidated Damages as the Board of Directors deems appropriate, including during a fishing year.

e. Voluntary Compliance. The Members and the Cooperative agree that upon the Cooperative's Board of Directors determining that a Member's allocation has been overharvested or a vessel has failed to comply with management measures in effect under this Agreement or the Bycatch Management Agreement, the Cooperative shall not enforce its rights to collect against the party liable for the related forfeiture amount or liquidated damages without first providing the liable party with

fifteen (15) days advance notice of its intent to exercise its rights of collection, during which period the liable party may request reconsideration of the enforcement action or (if applicable) may obtain an amount of mothership sector Pacific whiting to cover the overharvest. The Board of Directors may grant or deny any request for reconsideration in their sole discretion. Notwithstanding the 15 day grace period provided under this Section, any amount assessed that is not paid or for which the payment obligation is not otherwise satisfied within thirty (30) days of assessment shall accrue interest at the rate of twelve percent (12%) per annum until paid.

f. Enforcement Procedure. Monitoring Agent shall monitor the fishing activities of all vessels harvesting Member allocations, and shall promptly report all apparent violations of this Agreement or the Whiting Bycatch Agreement to the Cooperative's Board of Directors. In addition, any Member or any master of any vessel harvesting a Member's Pacific whiting allocation may report any suspected violation of this Agreement. Upon receiving notice of an apparent violation, the Board of Directors shall notify the party who allegedly violated this Agreement or the Whiting Bycatch Agreement, and in all cases other than those in connection with which the Board of Directors elects to pursue specific performance or injunctive relief, the Board of Directors shall provide such party with not less than sixty (60) days to respond before taking action. Following the expiration of such 60 day period, the Board of Directors shall take action in connection with the apparent violation, and provide a report of the action taken and a copy of the record supporting that action to the party who is the subject of the Board of Director's action and to each Member. For purposes of this Section 5, state and federal landing reports, observer data, VMS tracking data, vessel log books and plotter data and Cooperative catch data produced by the Monitoring Agent in conformance with NMFS catch accounting and bycatch estimation procedures shall be presumed accurate and sufficient for determining whether a vessel breached this Agreement or the Whiting Bycatch Agreement, absent a clear and compelling demonstration of manifest error. Further, each Member agrees to take all actions and execute all documents necessary or convenient to give effect to the enforcement procedure contemplated under this Section 5.

g. Distribution of Proceeds and Damages. The amount of all overharvest forfeitures to the Cooperative in excess of the costs of enforcement shall be promptly distributed pro-rata among the Members who harvested less than their allocation or apportionment of the relevant species, with each such party receiving a fraction of such funds the numerator of which is the amount by which such party's catch or opportunity to harvest the relevant species was less than such party's allocation or apportionment, and the denominator of which is the sum of all parties' catch or opportunity losses. All Management Measure Liquidated Damages shall be paid to the Cooperative and shall be expended as the Board of Directors determines appropriate in its sole discretion.

6. MS/CV Permit Transfer Restrictions. Each Member acknowledges that the other Members will make investments in reliance on this Agreement, and that a breach of this Agreement during its term by any of them may cause the remaining

Members to suffer substantial adverse economic consequences. Therefore, each Member agrees that so long as it is bound by this Agreement, no Member shall have the authority to sell, charter or transfer operating authority over a MS/CV permit whose Pacific whiting catch history is assigned to the Cooperative to a party not bound by this Agreement, regardless of whether such transfer is temporary or permanent, and regardless of whether such transfer is effected as part of a vessel sale or otherwise, unless the proposed transferee first assumes all of the transferring Member's obligations under this Agreement with regard to the rights transferred, in which case the transferee shall be admitted as a Cooperative Member and the transferor shall be released from Cooperative membership obligations as of the date of the transferee Member's admission. Such obligations include but are not limited to compliance with processor commitment obligations pursuant to Section 10 and responsible fishing practices pursuant to Section 11. Any attempted or purported transfer of an MS/CV permit whose Pacific whiting catch history has been assigned to the Cooperative other than in compliance with this Section shall be void.

7. Term, Termination and Withdrawal.

a. Term and Termination. This Agreement shall take effect as of its execution by the Cooperative's initial Members. This Agreement shall remain in effect until terminated. This Agreement shall be terminated upon eighty percent (80%) of the Members voting to terminate this Agreement at a duly called, properly noticed membership meeting, provided that notwithstanding the date of such vote, termination shall not be effective until December 31 of the year during which such vote occurs, and this Agreement shall remain in effect until such date.

b. Withdrawal. No Member may withdraw from the Cooperative other than in accordance with this Section 7. A Member may withdraw from the Cooperative by providing written notice to that effect to all other Members on or before November 1 (the "Withdrawal Notice Date"). A Member that fails to provide such notice by the Withdrawal Notice Date shall be deemed to have automatically renewed its Cooperative membership for the following year, and all other Members shall be entitled to act in reliance on such renewal accordingly. If any Member provides a membership termination notice by the Withdrawal Notice Date, each of the other Members shall have thirty (30) days from the date they receive such notice to terminate their membership as well, notwithstanding the Withdrawal Notice Date deadline. If a Member provides timely written notice of withdrawal, such Member's Cooperative membership shall terminate as of December 31 of the year during which withdrawal notice was given. Termination of membership shall not relieve a person or entity of any obligations under this Agreement related to the period during which such person or entity was a Member, including but not limited to liquidated damages obligations for breach of this Agreement and indemnification obligations related to such person or entity's actions as a Member.

8. Cooperative Manager. The Members agree to cause the Cooperative to retain a manager who shall: (i) serve as the contact person for NMFS,

the Pacific Fishery Management Council (the "Council") and other Pacific whiting mothership sector cooperatives; (ii) be responsible for the annual distribution of catch and bycatch allocations among the Members; (iii) oversee reassignment of catch allocations within the Cooperative; (iv) oversee inter-cooperative catch allocation reassignments; (v) prepare and submit the annual reports that the Cooperative is required to file with the Council and NMFS, pursuant to Section 9, below; (vi) be authorized to receive and respond to any legal process in which the Cooperative is involved; and (vii) notify NMFS if the Cooperative is dissolved.

9. Annual Cooperative Report. The Cooperative's Manager shall annually prepare a report that describes the Cooperative's catch, bycatch, inseason catch history reassignments and all other significant activities undertaken by the Cooperative during the prior year. The Manager shall file the report with the Council and NMFS prior to the deadline for such filing adopted by the Council and NMFS from time to time.

10. Processor Obligation Declaration. Not less than thirty (30) days prior to submission of the Cooperative's annual permit application, each Member shall initially obligate in writing to a mothership operating under a mothership permit ("MS Permit") the Pacific whiting deliveries to be made under each of its MS/CV permits whose catch history will be assigned to the Cooperative during the upcoming year. Thereafter, if a Member elects to rescind such delivery obligation, the Member shall so notify the mothership to which its deliveries are obligated in writing on or before September 1 of the year prior to the year in which such rescission is to take effect, and shall obligate in writing such deliveries to a mothership operating under an MS permit on or before December 15 of such year. Each Member shall provide a copy of every delivery obligation to NMFS as required, and shall provide a copy of every delivery obligation and every notice rescinding a delivery obligation to the Cooperative's Manager.

11. Responsible Fishing Practices. The Members acknowledge that an objective of the Cooperative is to reduce the incidental catch of Non-Whiting Species. The Members further acknowledge that fishing practices can affect the rates and amounts of incidental catch of Non-Whiting Species. The Members therefore agree to exercise all reasonable efforts to conduct their fishing practices in a manner that reduces their incidental catch of Non-Whiting Species to the lowest commercially reasonable levels, through the methods and means adopted by the Cooperative's Board of Directors from time to time. Such methods and means may include time and area closures, using or not using specific types of gear in specific areas or during specific times, and requiring Members to participate in overfished species risk pools that provide appropriate incentives and disincentives.

a. Initial Management Measures. Notwithstanding the foregoing, the Members hereby adopt the following initial restrictions on their fishing activity, which may be modified by the Cooperative's Board of Directors from time to time, provided that no such modification to the provisions of subsections (i) through (vii),

below, shall take effect until January 1 of the year following the year during which the Cooperative's Board of Directors adopts such modification. Notwithstanding the foregoing, amendments to the Whiting Bycatch Agreement shall take effect as of the effective date of such amendments.

i. Each Member shall sign, be bound by the terms and conditions of, and exercise all commercially reasonable efforts to comply with the Whiting Bycatch Agreement, as amended and renewed from time to time. In addition, each Member shall cause the owner and operator of each vessel harvesting any of such Member's Pacific whiting allocation to do so.

ii Each Member agrees that the Cooperative's mothership sector Pacific whiting allocation shall be divided into four seasonal pools. The first pool shall be available for harvest on May 15; the second pool shall be available for harvest on July 1; the third pool shall be available for harvest on September 15; and the fourth seasonal pool shall be available for harvest on October 15.

iii Each seasonal pool shall be constituted by Member election. Each Member shall be entitled to apportion their Harvest Share among the seasonal pools in each Member's sole discretion. Not less than fifteen (15) days prior to the start date for each seasonal pool, each Member shall notify the Manager in writing regarding the amount of such Member's Pacific whiting allocation to be apportioned to such seasonal pool, shall identify the vessel or vessels that will harvest such Member's Harvest Share from such seasonal pool, and shall state the amount of tonnage to be harvested by each such vessel from such pool.

iv Upon the Manager having received the Members' pool apportionment notices, the Manager shall apportion the Non-Whiting Species set-asides and allocations established pursuant to Section 3.b, above, to the seasonal pool, pro rata according to the proportion of Pacific whiting tonnage that the Members have declared their intention to harvest from such seasonal pool. Such Non-Whiting Species set-asides and allocations shall be managed as a common pool resource available to the vessels harvesting the Members' Pacific whiting allocations from such seasonal pool, under the terms and conditions of this Section 11, as amended from time to time, the Whiting Bycatch Agreement as amended from time to time, and such additional management measures that the Cooperative's Board of Directors adopts from time to time.

v. As of the earlier of (i) the total amount of Pacific whiting Harvest Share allocated to a seasonal pool being harvested, or (ii) the aggregate amount of one or more Non-Whiting Species apportioned to that seasonal pool being caught, the Manager shall close such seasonal pool, and all harvesting from that pool shall cease. If a seasonal pool is closed because the total amount of Pacific whiting allocated to that seasonal pool has been harvested, all vessels that harvested Pacific whiting from such pool shall be eligible to harvest Pacific whiting from subsequent seasonal pools during the same fishing year. If a seasonal pool closes because the aggregate amount of

one or more Non-Whiting Species apportioned to the seasonal pool has been harvested, the Manager shall evaluate each participating vessel's catch amounts of each Non-Whiting Species apportionment that was fully harvested from such seasonal pool. If the amount of any such Non-Whiting Species harvested by a vessel participating in the pool exceeds one hundred and twenty five percent (125%) of the amount of such Non-Whiting Species allocated to such pool on the basis of the Pacific whiting tonnage assigned to such seasonal pool for harvesting by such vessel, such vessel shall not be eligible to harvest any Pacific whiting transferred from a closed pool to a subsequent pool, and shall not be eligible to harvest any Pacific whiting Harvest Share apportioned to a subsequent seasonal pool other than that assigned to such vessel at the time of initial Member election pursuant to Section 11(a)(iii), above, unless and until all other vessels operating in compliance with such 125% performance standard have ceased harvesting Pacific whiting for the year, and then only if there is Non-Whiting Species catch available in sufficient amount to support its fishing activity, as determined by the Cooperative's Board of Directors in its sole discretion.

vii. Any Non-Whiting Species set-asides or allocations that are not used before a seasonal pool subsequent to the seasonal pool to which they are apportioned opens shall be available for harvest by vessels participating in subsequent seasonal pools on a species by species basis, when the respective Non-Whiting Species set-aside or allocation originally made to such subsequent seasonal pool is exhausted. In the event that a Member's Pacific whiting Harvest Share tonnage is not fully harvested during a seasonal pool to which it was allocated, such Member may harvest its remaining Harvest Share or have its remaining Harvest Share harvested during such subsequent seasonal period <u>on the condition that</u> the Non-Whiting Species catch of the vessel(s) harvesting such Member's Harvest Share during the prior seasonal period was no greater than one hundred and twenty five percent (125%) of the amount of such Non-Whiting Species allocated to such pool on the basis of the Pacific whiting tonnage assigned to such seasonal pool for harvesting by such vessel.

b. For purposes of this Agreement, "fishing" shall mean all activity of a vessel between the time of initial gear deployment and final gear retrieval. For purposes of this Section 11, "gear deployment" and "gear retrieval" shall have the meanings given them in 50 C.F.R. 679.2 or its successor, as the same may be amended from time to time. Initial gear deployment shall mean setting trawl gear with an empty codend, and final gear retrieval shall mean retrieving trawl gear to either pull a codend aboard the vessel or to deliver the codend to another vessel.

12. <u>Inter-Cooperative Transfers</u>. No Member may cause the Cooperative to transfer any portion of its annual mothership Pacific whiting allocation other than in strict compliance with this Section 12. The Cooperative's Board of Directors shall establish the conditions to and procedure for inter-cooperative transfers as the Board of Directors deems appropriate. The Manager shall be responsible for monitoring Member compliance with such conditions and procedures, and no inter-cooperative transfer shall take effect unless and until it has been approved by the Manager.

13. Election of Remedies and Attorneys' Fees.

a. Damages in any way related to the performance or breach of obligations under this Agreement shall be limited to liquidated damages calculated in accordance with Section 5.b., above, and all costs, fees and expenses, including attorneys' fees, for which a party is entitled to reimbursement under this Agreement. Damages in any way related to the performance or breach of obligations under the Non-Whiting Species management and harvest rules set forth in Section 11 of this Agreement (as amended from time to time), set forth in the Whiting Bycatch Agreement (as amended from time to time) and that the Board of Directors may adopt from time to time shall be limited to the liquidated damages amounts established by the Board of Directors in compliance with this Agreement or as otherwise provided in the Whiting Bycatch Agreement, as levied in connection with the failure to comply. Each Member and the Cooperative hereby waive any claims to actual, direct, indirect or consequential damages in connection with any performance or breach of obligations under this Agreement and the Whiting Bycatch Agreement, and instead agree that payment of liquidated damages calculated and levied in accordance with this Agreement or the Whiting Bycatch Agreement shall be their sole damages.

b. Limitation of Remedies. As a substitute for the actual, direct, indirect and consequential monetary damages waived and released under this Agreement, the Members hereby limit their remedies for breach to the following:

i Specific Performance. The Cooperative, the Members, the Manager and the Monitoring Agent shall individually and collectively have the right to demand and receive immediate specific performance of each and every obligation that each Member has under this Agreement.

ii Injunctive Relief. If a Member is in breach of any obligation whatsoever he, she or it may have under this Agreement, and if such Member in breach fails to immediately comply with each and every obligation it has under this Agreement upon receiving a written demand to that effect from the Manager, the Monitoring Service Agent, the Cooperative or one or more Members, the Manager, the Monitoring Agent, the Cooperative and each Member shall individually and collectively have the right to seek and obtain injunctive relief requiring the Member in breach to immediately and fully comply with each and every obligation it has under this Agreement.

c. Indemnification Against All Governmental Fines, Penalties and Forfeitures. Notwithstanding any provision of this Agreement to the contrary, each Member that breaches this Agreement shall indemnify, defend and hold the Manager, the Monitoring Agent, the Cooperative and each of the other Members harmless from and against all claims, liabilities, fines, penalties, forfeitures and fees of any nature and amount whatsoever asserted or obtained by NMFS, the U.S. Department of Justice or any other U.S. governmental agency with jurisdiction over the Pacific whiting fishery

in connection with the Cooperative's or a Member's breach of this Agreement. This indemnification, defense and hold harmless shall extend to all attorneys' fees and all other costs and fees of any nature or amount whatsoever incurred in relation to such action, regardless of whether such cost is deemed reasonable in nature or amount.

d. Reimbursement of Fees and Costs. In connection with any legal proceeding related to this Agreement other than governmental proceedings addressed in Section 13(c), above, the non-prevailing party shall pay the prevailing party's reasonable costs and fees associated with the proceeding. For purposes of this Agreement, "legal proceedings" shall include arbitration, administrative, bankruptcy and judicial proceedings, including appeals therefrom. For purposes of this Agreement, "costs and fees" shall include all attorneys' fees, arbitration costs, court costs, costs of bonds or other financial security posted or pledged in connection with such action, expert witness costs, costs of receivers or special masters, and each and every other cost or fee of any nature or amount whatsoever incurred in connection with such action.

14. Release and Waiver of All Claims Against Manager and Monitoring Agent; Indemnification and Hold Harmless. The parties acknowledge that the effectiveness of this Agreement depends to a significant extent on the Manager and Monitoring Agent exercising their independent responsibility and judgment in fulfilling its terms. The parties further acknowledge that if the Manager or the Monitoring Agent were potentially liable for simple negligence in connection with such actions, the Manager and/or the Monitoring Agent would not accept the responsibilities they assume under this Agreement. It is therefore in the parties' interest to reduce the Manager's and the Monitoring Agent's potential liability under this Agreement. Therefore, the Cooperative and each of the Members hereby waive and release any and all claims against Manager and Monitoring Agent in connection with this Agreement, other than those arising out of gross negligence or willful misconduct by Manager and/or Monitoring Agent. Further, the Cooperative and each Member jointly and severally agree to indemnify, defend and hold the Manager and the Monitoring Agent harmless against any third party claims asserted against the Manager or the Monitoring Agent in connection with this Agreement, other than those arising out of gross negligence or willful misconduct by Manager or Monitoring Agent.

15. Miscellaneous.

a. This Agreement contains the entire understanding of the parties as to the matters addressed herein, and supersedes all prior agreements related to the same. No amendment to this Agreement shall be effective against a party hereto unless in writing and duly executed by such party. The Members agree to amend this Agreement as reasonably necessary to comply with changes in law, and policies and regulations implementing Amendment 20.

b. Each Member hereby represents and warrants that: (i) it is duly organized, validly existing and in good standing; and (ii) it has all authority,

corporate and otherwise, to enter into this Agreement on its own behalf and on behalf of all other owners of each of the MS/CV permits whose Pacific whiting catch history it has assigned to the Cooperative, and that this Agreement constitutes a valid, binding obligation of all such owners, enforceable against such permits and all such owners according to its terms.

c. This Agreement shall be governed by and construed in accordance with applicable federal law and the laws of the State of Washington.

d. This Agreement may be executed in counterparts which, when taken together, shall have the same effect as a fully executed original. Delivery of a signed copy of this Agreement by telefacsimile or electronic mail shall have the same effect as delivering a signed original.

e. The parties agree to execute any documents necessary or convenient to give effect to the intents and purposes of this Agreement.

f. All notices required to be given under this Agreement shall be deemed given when transmitted to the recipient by email or telefacsimile transmission, or when deposited in certified first class U.S. mail, postage prepaid, with the correct address. All notices required to be given to Cooperative Directors or Members under this Agreement shall be addressed to such Directors or Members at their record addresses as maintained by the Cooperative.

The address of the Cooperative is as follows:
Whiting Mothership Cooperative
4005 20th Avenue West, Suite 116
Seattle WA, 98199

The addresses of the Members are listed on Exhibit A attached hereto. The parties may from time to time change their address for notice purposes by written notice to the Cooperative, and Exhibit A shall be updated accordingly.

g. Except for the transfers pursuant to Section 3.e or Section 6 hereof, which transfers shall be governed by such Sections, no party may assign any of its rights hereunder without the prior written consent of the other parties hereto, which consent shall not be unreasonably withheld. Such consent may be conditioned upon execution of an adherence agreement by the party to whom such rights are proposed to be assigned. This Agreement shall be binding on the successors and assigns of all parties hereto.

h. This Agreement shall be construed as a whole according to its fair meaning, without a presumption that it shall be more strictly construed against the person who drafted it, as each party has participated in its preparation with the opportunity for assistance of counsel.

i. In the event that any provision of this Agreement is held to be invalid or unenforceable, such provision shall be deemed to be severed from this Agreement, and such holding shall not affect in any respect whatsoever the validity of the remainder of this Agreement.

j. Each Member agrees to use its best efforts to resolve any disputes arising under this Agreement through direct negotiations. Other than disputes in connection with which the Cooperative or its Members seek an injunction, a restraining order or some other form of equitable relief, all disputes not resolved through direct negotiation shall be submitted to binding arbitration in Seattle, Washington upon the request of any party. The party's written request will include the name of the arbitrator selected by the party requesting arbitration. The other party will have ten (10) days to provide written notice of the name of the arbitrator it has selected, if any. If the other party timely selects a second arbitrator, the two arbitrators will select a third arbitrator within ten (10) days. If the other party does not timely select the second arbitrator, there shall be only the one arbitrator. The single arbitrator or the three (3) arbitrators so selected will schedule the arbitration hearing as soon as possible thereafter. Every arbitrator, however chosen, must have no material ties to any Member or the Cooperative. The decision of the arbitrator (or in the case of a three (3) arbitrator panel, the decision of the majority) will be final and binding. The arbitration will be conducted under the rules of (but not by) the American Arbitration Association. The parties will be entitled to limited discovery as determined by the arbitrator(s) in his/her or their sole discretion. The arbitrator(s) will also determine the "prevailing party" and that party will be entitled to its reasonable costs, fees and expenses, including attorneys' and arbitrator fees, incurred in the action by said party. In no event will arbitration be available pursuant to this Section 15.j after the date when commencement of such legal or equitable proceedings based on such claim, dispute, or other matter in question would be barred by the applicable statute of limitations.

Dated as of the date first set forth above.

EACH MEMBER SIGNING BELOW MUST DELIVER A COPY OF THE 2011 PACIFIC COAST GROUNDFISH PERMIT ALONG WITH HIS/HER/ITS SIGNATURE.

[SIGNATURE PAGES FOLLOW]

Exhibit A

WHITING MOTHERSHIP COOPERATIVE
Members as of March 8, 2011

Permit Owner and Contact	*Permit Number*	*Mailing Address*
American Seafoods Company LLC Mike Hyde Jan Jacobs	GF0351	2025 First Avenue West Suite 900 Seattle, WA 98121
Bay Islander, Inc. Craig Cochran	GF0320	7563 Yaquina Bay Road Newport, OR 97365
Blue Sea Fisheries, Inc. Blue Moon Fisheries, Inc. Fred Yeck	GF0205	P.O. Box 1256 Newport, OR 97365
Calamari LLC Craig Urness	GF0272	P.O. Box 5583 Charleston, OR 97420
Cooper, Mark E. Mark Cooper	GF0254	P.O. Box 428 Newport, OR 97365
EX-1 Corporation Mike Rutherford	GF0810	880 N.E. Sturdevant Road Toledo, OR 97391
Fury Group, Inc. Michael Stone	GF0051 GF0675	4005 20th Avenue West Suite 207 Seattle, WA 98199
F/V Leslie Lee, Inc. Raymond Hall Danny Hall Skip Woodard	GF0144	P.O. Box 2276 Newport, OR 97365
F/V Neahkahnie LLC Dale Myer Donna Parker	GF0374	2727 Alaskan Way, Pier 69 Seattle, WA 98121

Permit Owner and Contact	*Permit Number*	*Mailing Address*
F/V Seeker, Inc. Jim Seavers	GF0109	1121 S.E. First Street Newport, OR 97365
FY Fisheries, Inc. Blue Dawn Fisheries, Inc. Harvest Moon Fisheries, Inc. Yaquina Sea Dawn, Inc. Jincks, Inc. Fred Yeck	GF0572	P.O. Box 352 Newport, OR 97365
Larkin, Marion Jean	GF0031 GF0136	19737 Trophy Lane Mount Vernon, WA 98274
Lisa Melinda Fisheries, Inc. David Smith Jerry Bates	GF0010	P.O. Box 1650 Newport, OR 97365
Marathon Fisheries, Inc. Kurt Cochran Craig Cochran	GF0105	P.O. Box 290 Siletz, OR 97380
MAR-GUN Fisheries, Inc. Gunnar Ildhuso, Jr.	GF0438	101 Nickerson Street Suite 340 Seattle, WA 98109
Mark I, Inc. J. Christopher Garbrick	GF0043	4225 23rd Avenue West Suite 103 Seattle, WA 98199
Miss Berdie, Inc. TS Fisheries, Inc. Stan Schones Tom Stam	GF0517	1483 Old River Road N.E. Siletz, OR 97380
Muir Milach, Inc. Dave Fraser Dave Willmore	GF0795	P.O. Box 954 Mercer Island, WA 98040
New Life Fisheries, Inc. Kurt Cochran	GF0321	P.O. Box 290 Siletz, OR 97380

Permit Owner and Contact	*Permit Number*	*Mailing Address*
Nicole Fisheries LLC Don Jester David Lethin	GF0052	112 Harrison Avenue Centralia, WA 98531
North Sea, Inc. Brian North Mike Storey	GF0132	P.O. Box 207 Chinook, WA 98614
Ocean Ballad, Inc. Don Jester David Lethin	GF708	112 Harrison Avenue Centralia, WA 98531
Pacific Dawn LLC Burt Parker Chris Peterson	GF0273	2324 N.W. 90th Street Seattle, WA 98117
Pacific Draggers, Inc. HB Lee, Inc. David Jincks Fred Yeck	GF0090	P.O. Box 352 Newport, OR 97365
Patience Fisheries, Inc. Mark E. Cooper	GF0256	P.O. Box 428 Newport, OR 97365
Phoenix Processor Limited Partnership Joe Bersch	GF0362	111 West Harrison Street Seattle, WA 98119
Rutherford, Mike and Kelly	GF0515	880 N.E. Sturdevant Road Toledo, OR 97391
Sea Clipper LLC (Ocean Gold) Rich Carrol	GF0433	P.O. Box 1104 Westport , WA 98595
Sea Storm Fisheries, Inc. Arctic Storm, Inc. Dale Myer Donna Parker	GF0210	2727 Alaskan Way, Pier 69 Seattle, WA 98121

Permit Owner and Contact	*Permit Number*	*Mailing Address*
Traveler Fisheries LLC J. Christopher Garbrick	GF0111	4225 23rd Avenue West Suite 103 Seattle, WA 98199
West Coast Fishery Investments LLC (Aleutian Spray) Craig Cross	GF0154 GF0904 GF0971	5470 Shilshole Avenue N.W. Suite 300 Seattle , WA 98107
Whaley, Lloyd D. and Todd	GF0220	PO Box 310 Brookings, OR 97415
Yaquina Trawlers, Inc. Raven Enterprises, Inc. DASL, Inc. Lyle Yeck Robert Smith	GF0124	1676 N.E. Yaquina Heights Drive Newport, OR 97365

Exhibit B

WHITING MOTHERSHIP COOPERATIVE
Harvest Schedule as of February 9, 2011

1. Members/Permit Owners and Allocation Percentages

Members/Permit Owners & Contact Persons	*Percentage Allocation*
American Seafoods Company LLC Mike Hyde Jan Jacobs	GF0351 9.945747%
Bay Islander, Inc. Craig Cochran	GF0320 0.505995%
Blue Sea Fisheries, Inc. and Blue Moon Fisheries, Inc. Fred Yeck	GF0205 1.207269%
Calamari LLC Craig Urness	GF0272 0.611940%
Cooper, Mark E. Mark Cooper	GF0254 1.919750%
EX-1 Corporation Mike Rutherford	GF0810 0.542467%
F/V Leslie Lee, Inc. Raymond Hall Danny Hall	GF0144 4.113516%
F/V/ Neahkahnie LLC Dale Myer Donna Parker	GF0374 3.944061%
F/V Seeker, Inc. Jim Seavers	GF0109 4.858447%
Fury Group, Inc. Michael Stone	GF0675 4.298209%
FY Fisheries, Inc. and Blue Dawn Fisheries, Inc. and Harvest Moon Fisheries, Inc. and Yaquina Sea Dawn, Inc. and Jincks, Inc. Fred Yeck	GF0572 4.982793%

Members/Permit Owners	*Percentage Allocation*
Larkin, Marion Marion Larkin	GF0031 & GF0136 0.374698% 0.152638%
Lisa Melinda Fisheries, Inc. David Smith Jerry Bates	GF0010 4.523843%
Marathon Fisheries, Inc. Kurt Cochran Craig Cochran	GF0105 4.903333%
MAR-GUN Fisheries, Inc. Gunnar Ildhuso, Jr.	GF0438 4.355232%
Mark I, Inc. J. Christopher Garbrick	GF0043 5.115294%
Miss Berdie, Inc. and TS Fisheries, Inc. Stan Schones Tom Stam	GF0517 4.558887%
Muir Milach, Inc. Dave Fraser Dave Willmore	GF0795 1.688707%
New Life Fisheries, Inc. Kurt Cochran	GF0321 0.151646%
Nicole Fisheries LLC Don Jester David Lethin	GF0052 0.125453%
North Sea, Inc. Brian North	GF0132 5.387414%
Ocean Ballad, Inc. David Lethin	GF0708 1.074783%

Members/Permit Owners	*Percentage Allocation*
Pacific Dawn LLC Burt Parker Chris Peterson	GF0273 3.002765%
Pacific Draggers, Inc. and HB Lee, Inc. David Jincks Fred Yeck	GF0090 3.141636%
Patience Fisheries, Inc. Mark E. Cooper	GF0256 0.931501%
Phoenix Processor Limited Partnership Joe Bersch	GF0362 1.527815%
Rutherford, Mike and Kelly	GF0515 0.955006%
Sea Clipper LLC Rich Carrol	GF0433 0.156388%
Sea Storm Fisheries, Inc. and Arctic Storm, Inc. Dale Myer Donna Parker	GF0210 3.443703%
Traveler Fisheries LLC J. Christopher Garbrick	GF0111 3.970116%
West Coast Fishery Investments LLC (Aleutian Spray) Craig Cross	GF0154 & GF0904 & GF0971 5.116051% 2.159780% 2.209872%
Whaley, Lloyd D. and Todd Todd Whaley	GF0220 1.040567%
Yaquina Trawlers, Inc. and Raven Enterprises, Inc. and DASL, Inc. Lyle Yeck Robert Smith	GF0124 3.002675%

2. List of Vessels Harvesting 2011 Allocations

Vessel Name and Official Number	***Vessel Name and Official Number***	***Vessel Name and Official Number***
BAY ISLANDER O.N. 521200	BLUE FOX O.N. 979437	CALAMARI O.N. 968968
EXCALIBUR O.N. 578930	LESLIE LEE O.N. 584873	LISA MELINDA O.N. 584360
MARATHON O.N. 596156	MAR-GUN O.N. 525608	MARK I O.N. 509552
MESSIAH O.N. 610150	MISS BERDIE O.N. 913277	MISS SARAH O.N. 921578
MISS SUE O.N. 580055	MUIR MILACH O.N. 611524	NEAHKAHNIE O.N. 599534
NEW LIFE O.N. 504299	NORDIC STAR O.N. 961	NORDIC FURY.. O.N. 542651
OCEAN HUNTER O.N. 926699	ARCTIC FURY O.N. 996920	PACIFIC CHALLENGER O.N. 518937
PACIFIC FURY O.N. 561934	PACIFIC PRINCE O.N. 697280	PACIFIC RAM O.N. 589115
PEGASUS O.N. 565120	PERSEVERANCE O.N. 536873	PREDATOR O.N. 547390
RAVEN O.N. 629499	SEA CLIPPER O.N. 553396	SEADAWN O.N. 548685
SEA STORM O.N. 628959	SEEKER O.N. 924585	STARWARD O.N. 617807
TRAVELER O.N. 929356	WESTERN DAWN O.N. 524423	WINONA J O.N. 645410

SEA STATE
P O. Box 74, Vashon, WA 98070

Ph: (206)463-7370
Fax: (206)463-7371
Email: karl@seastateinc.com

November 1, 2011

Mothership whiting coop – catch and bycatch year to date

Date	Whiting	Canary	Widow	Dark blotched	POP	Chinook
10/25/11	398	0.00	0.00	0.01	0.01	7
10/26/11	765	0.00	0.03	0.02	0.00	14
10/27/11	681	0.00	0.06	0.00	0.00	14
10/28/11	579	0.00	0.01	0.00	0.00	0
10/29/11	823	0.00	0.02	0.02	0.00	4
10/30/11	464	0.00	0.01	0.00	0.00	0
10/31/11	74	0.00	0.03	0.00	0.00	0
Totals year to date	37,604	0.08	12.44	0.769	0.26	532
Rate year to date		0.00	0.33	0.02	0.01	0.01
2011 Allocation for Motherships	53,039	3.40	61.70	6.00	7.20	
Percentage Taken	70.9%	2.3%	20.2%	12.8%	3.6%	

4.3 Relocation of Fishing Effort. If
(i) a Fleet's three (3) day rolling average bycatch rate of Overfished Species or Chinook salmon exceeds the Base Rate for any such species, and that Fleet's cumulative annual bycatch rate for such species exceeds fifty percent (50%) of the Base Rate for such species,
(ii) a Fleet's three (3) day rolling average bycatch rate for any of such species exceeds one-hundred twenty-five percent (125%) of the Base Rate for such species, or
(iii) a Fleet's bycatch rate during any single day exceeds two-hundred percent (200%) of the Base Rate for such species, then that Fleet and the Mothership to which it delivers shall relocate their fishing effort to an area where that Fleet could reasonably expect to achieve a lower Overfished Species and Chinook salmon bycatch rate.

Multiples of the base rate and their usage for movement tests.

Base rate multiple	Canary	Widow	Dark blotched	POP	Chinook	Movement test
100% (=base)	0.06	1.15	0.11	0.14	0.060	i
50%	0.03	0.58	0.06	0.07	0.030	i
125%	0.08	1.44	0.14	0.18	0.075	ii
200%	0.12	2.30	0.22	0.28	0.090	iii
150%	0.09	1.73	0.17	0.21	0.120	Note below

Report elevated tow if rate greater than base but less than 150%. Report high tow if rate > 150% of base.

Fleet rates (year to date) – use for test i.

Fleet	Canary rate	Widow rate	Dark blotched rate	POP rate	Chinook rate
ARCTIC STORM	0.000	0.415	0.010	0.001	0.029
EXCELLENCE	0.003	0.257	0.004	0.007	0.008
GOLDEN ALASKA	0.006	0.742	0.170	0.028	0.009
KATIE ANN	0.000	0.055	0.005	0.005	0.010

Fleet rates (3-day average) – use for test i and ii.

Fleet	Canary rate	Widow rate	Dark blotched rate	POP rate	Chinook rate
ARCTIC STORM	0.000	0.070	0.001	0.005	0.002
EXCELLENCE	0.000	0.000	0.058	0.000	0.000
KATIE ANN	0.000	0.000	0.000	0.000	0.015

Daily Fleet rates - use for test iii

Date	Vessel Name	Canary rate	Widow rate	Dark blotched rate	POP rate	Chinook rate
10/30/11	ARCTIC STORM	0.000	0.028	0.003	0.008	0.000
10/30/11	KATIE ANN	0.000	0.000	0.000	0.000	0.000

Vessel catch to date

Harvesting vessel	Whiting (ytd)	Canary (ytd)	Widow (ytd)	Dark blotched (ytd)	POP (ytd)	Chinook (ytd)
ARCTIC FURY	5,510	0.01	0.20	0.04	0.08	30
BAY ISLANDER	1,124	0.01	0.37	0.00	0.00	17
BLUE FOX	915	0.00	0.18	0.04	0.00	58
LISA MELINDA	2,481	0.00	0.14	0.01	0.01	26
MARATHON	2,205	0.01	2.10	0.57	0.09	14
MISS BERDIE	2,765	0.00	0.51	0.01	0.01	16
MUIR MILACH	1,541	0.00	0.02	0.01	0.01	8
PACIFIC FURY	2,735	0.00	0.58	0.00	0.04	22
PEGASUS	3,611	0.01	0.77	0.03	0.01	10
PERSEVERANCE	1,605	0.00	0.35	0.01	0.00	6
RAVEN	1,525	0.00	0.77	0.00	0.00	16
SEA STORM	2,460	0.00	2.39	0.01	0.00	95
SEADAWN	2,143	0.00	0.69	0.00	0.00	14
SEEKER	1,793	0.00	0.25	0.04	0.01	120
TRAVELER	3,695	0.03	1.65	0.00	0.00	63
WESTERN DAWN	1,495	0.01	1.48	0.00	0.00	17

Vessel rates to date

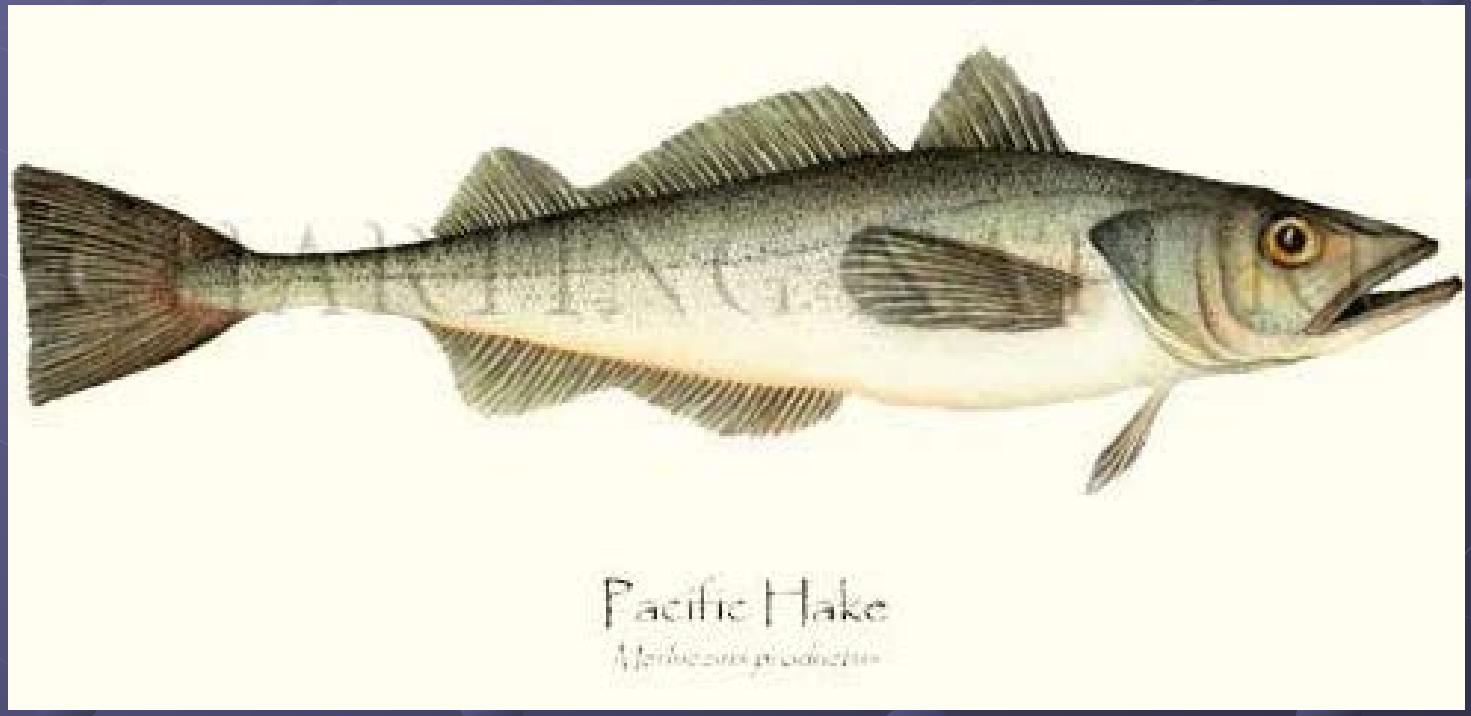
Harvesting vessel	Canary rate	Widow rate	Dark blotched rate	POP rate	Chinook rate
ARCTIC FURY	0.002	0.036	0.007	0.014	0.005
BAY ISLANDER	0.013	0.332	0.000	0.002	0.015
BLUE FOX	0.000	0.196	0.039	0.001	0.063
LISA MELINDA	0.000	0.055	0.005	0.005	0.010
MARATHON	0.002	0.951	0.257	0.042	0.006
MISS BERDIE	0.000	0.183	0.004	0.003	0.006
MUIR MILACH	0.000	0.014	0.006	0.004	0.005
PACIFIC FURY	0.002	0.210	0.000	0.015	0.008
PEGASUS	0.001	0.214	0.009	0.003	0.003
PERSEVERANCE	0.000	0.216	0.007	0.000	0.004
RAVEN	0.000	0.503	0.000	0.000	0.010
SEA STORM	0.000	0.970	0.004	0.000	0.039
SEADAWN	0.000	0.323	0.000	0.000	0.007
SEEKER	0.000	0.139	0.024	0.003	0.067
TRAVELER	0.009	0.448	0.000	0.001	0.017
WESTERN DAWN	0.004	0.988	0.000	0.000	0.011

	Whiting	Canary	Widow	Dark blotched	POP	Chinook
1st seasonal pool total catch	18,406	0.07	8.07	0.58	0.17	173
1st seasonal pool allocation	18,686	1.19	21.57	2.11	2.54	
Percentage Taken	98.5%	6.2%	37.4%	27.3%	6.7%	
2nd seasonal pool total catch	10,008	0.01	1.39	0.08	0.07	52
2nd seasonal pool allocation	10,314	0.66	11.90	1.17	1.40	
Percentage Taken	97.0%	0.8%	11.7%	6.8%	4.9%	
3rd seasonal pool total catch	9,190	0.00	2.97	0.11	0.02	307
3rd seasonal pool allocation	12,435	0.80	14.35	1.41	1.69	
Percentage Taken	73.9%	0.0%	20.7%	7.9%	1.5%	

Whiting Mothership Cooperative

Preliminary Report to the PFMC

November 5th, 2011



WMC Cooperative Structure

- WMC Membership Agreement
  - Allocation of Whiting to the Members
  - Catch Monitoring
  - Transfers between Members
  - Responsible Fishing Practices
  - Enforcement

  Signed by all 37 eligible permit holders
- Whiting Bycatch Agreement
  - Rules for modification of fishing behaviour

2011 Allocations

- 2011 Whiting Allocation to the WMC:
  - 53,039 mt
  - Assigned to members based on Catch History
- 2011 Bycatch Amounts
  - Canary Rockfish 3.4 mt
  - Dark Blotched 6.0 mt
  - POP 7.2 mt
  - Widow Rockfish 61.7 mt
  - Pooled to the Coop

WMC Bycatch Rules

- **Seasonal Pools**
- **Data Sharing**
- **Real Time Hot Spot Response**
- **Closure Areas**
- **Night Fishing Restrictions**
- **Enforcement/Sanctions**

WMC Bycatch Rules – Seasonal Pools

- Four seasonal pool allocations
- Rules for accessing rollover bycatch



WMC Bycatch Rules – Data

- Reporting to SeaState by the Fleet
  - Members Provide NMFS Confidentiality Waivers
  - SeaState Accesses NORPAC Observer Data
  - Motherships report daily to SeaState
- Reports from SeaState to the Fleet
  - Daily Report
  - Catch data
  - Bycatch rates for MS sector, fleet, and individual vessels, 3-day averages
  - Maps of bycatch hotspots
  - Other useful bycatch avoidance information

WMC Bycatch Rules - Data

- Mothership "**Fleet to Fleet**" Reporting Requirement
  - Total amount of whiting received in past day
  - Elevated Bycatch Tows - (between 100% to 150% of the Base Rate)
  - High Bycatch Tows – (>150% of Base Rate)

WMC Bycatch Rules – Hot Spot Response

Real Time Response to High Bycatch Rates

- Establish a Bycatch Base Rate of 4 species
  - Canary: 0.06 kg/mt *(4 lbs in a 30 ton haul)*
  - Dark Blotched 0.11 kg/mt *(7 lbs in a 30 ton haul)*
  - POP: 0.14 kg/mt *(9 lbs in a 30 ton haul)*
  - Widow: 1.15 kg/mt *(75 lbs in a 30 ton haul)*
  - Chinook 0.06 salmon/mt
- Fleet Relocation Required for Exceeding Trigger Rates

WMC Bycatch Rules – Hot Spot Response

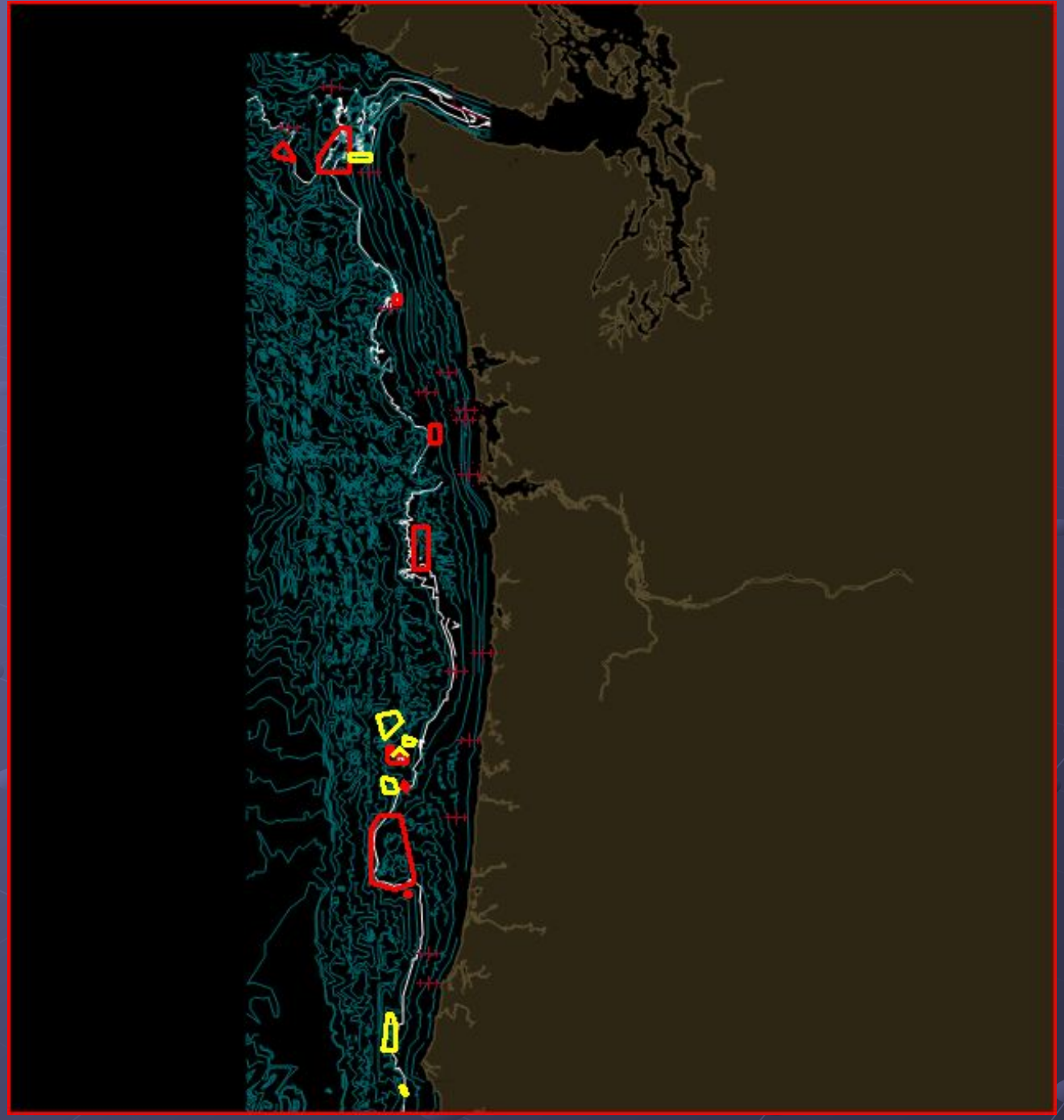
- Fleet Must Relocate IF:
  - 3 day average bycatch rate exceeds the Base Rate and the Fleet's YTD bycatch rate exceeds 50% of the Base Rate
  - 3 day average bycatch rate exceeds 125% of the Base Rate, or
  - Bycatch rate during any single day exceeds 200% of the Base Rate
- Fleet must move to an area where they can reasonably expect to achieve a lower rate.
  - Test tows required on entering new area

WMC Bycatch Rules – Closed Areas

- **Closure Areas:**
  - Pre-season Closures
  - Advisory Cautionary Areas
  - In-season Closures
  - Time Closures – Night Fishing Restrictions
  - NMFS Closures

WMC Pre-Season Closure Areas

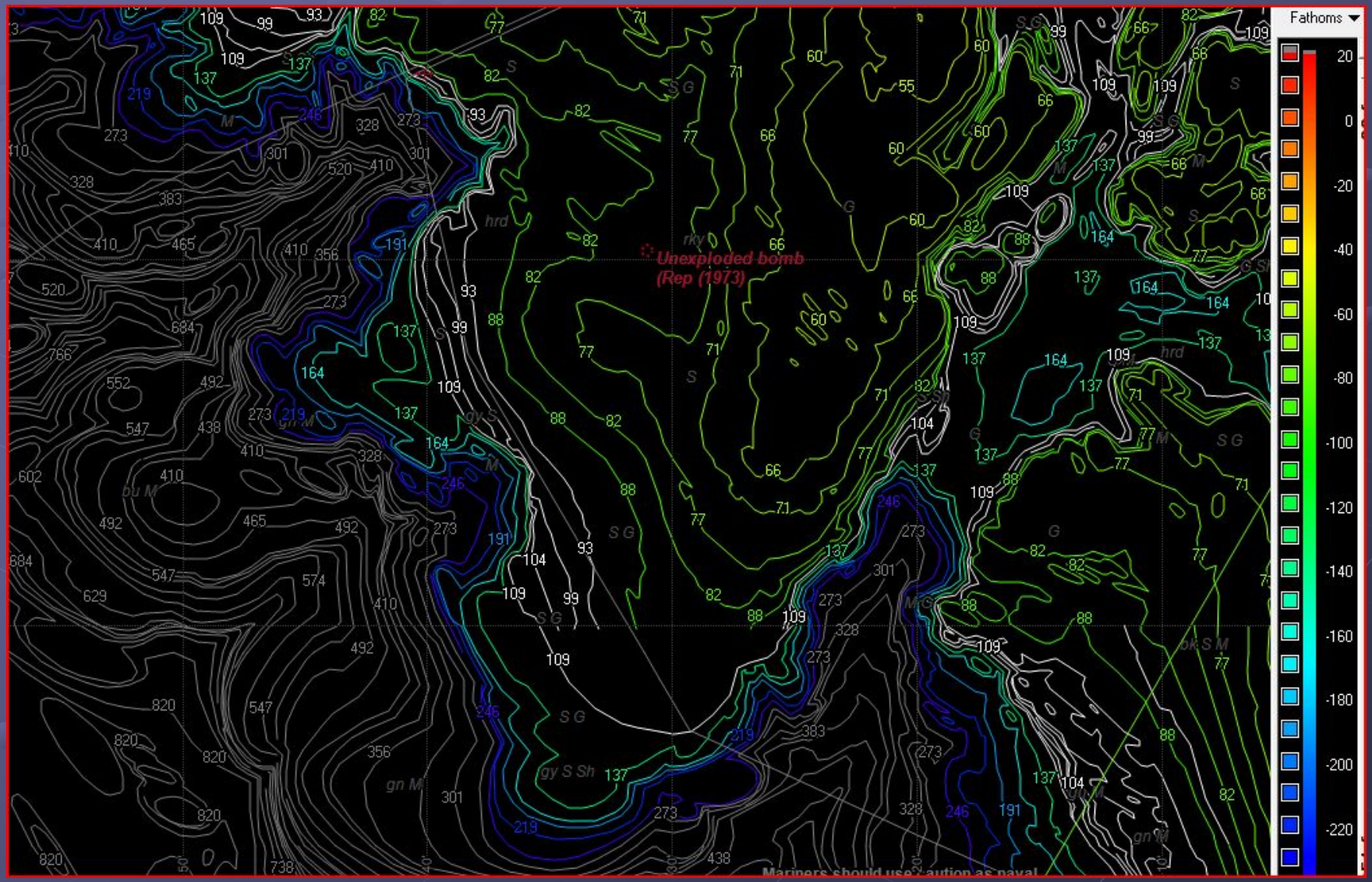
- Nine Closures
- 2000 sq. km.
- Advisory Areas



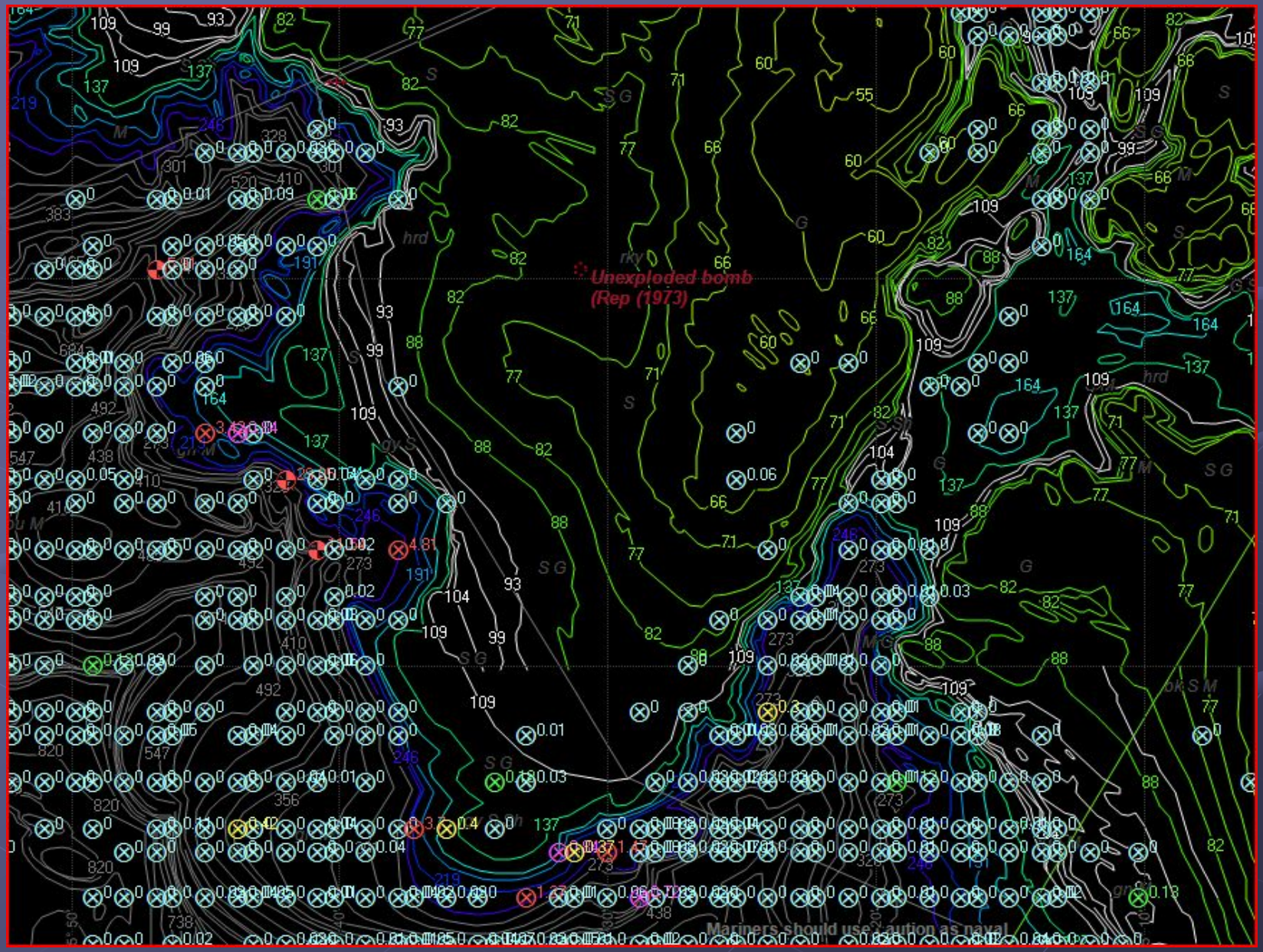
How We Got There

- Bycatch Committee
- Historic Observer Data 2000-2010
  - Whiting Catch
  - Bycatch of 4 Over-fished Species
  - GIS Layering with Detailed Bathymetry
- VMS Tracklines of “Disaster Tows”
- Captains’ Local Knowledge
- Flexibility – Commitment to Review & Adjust

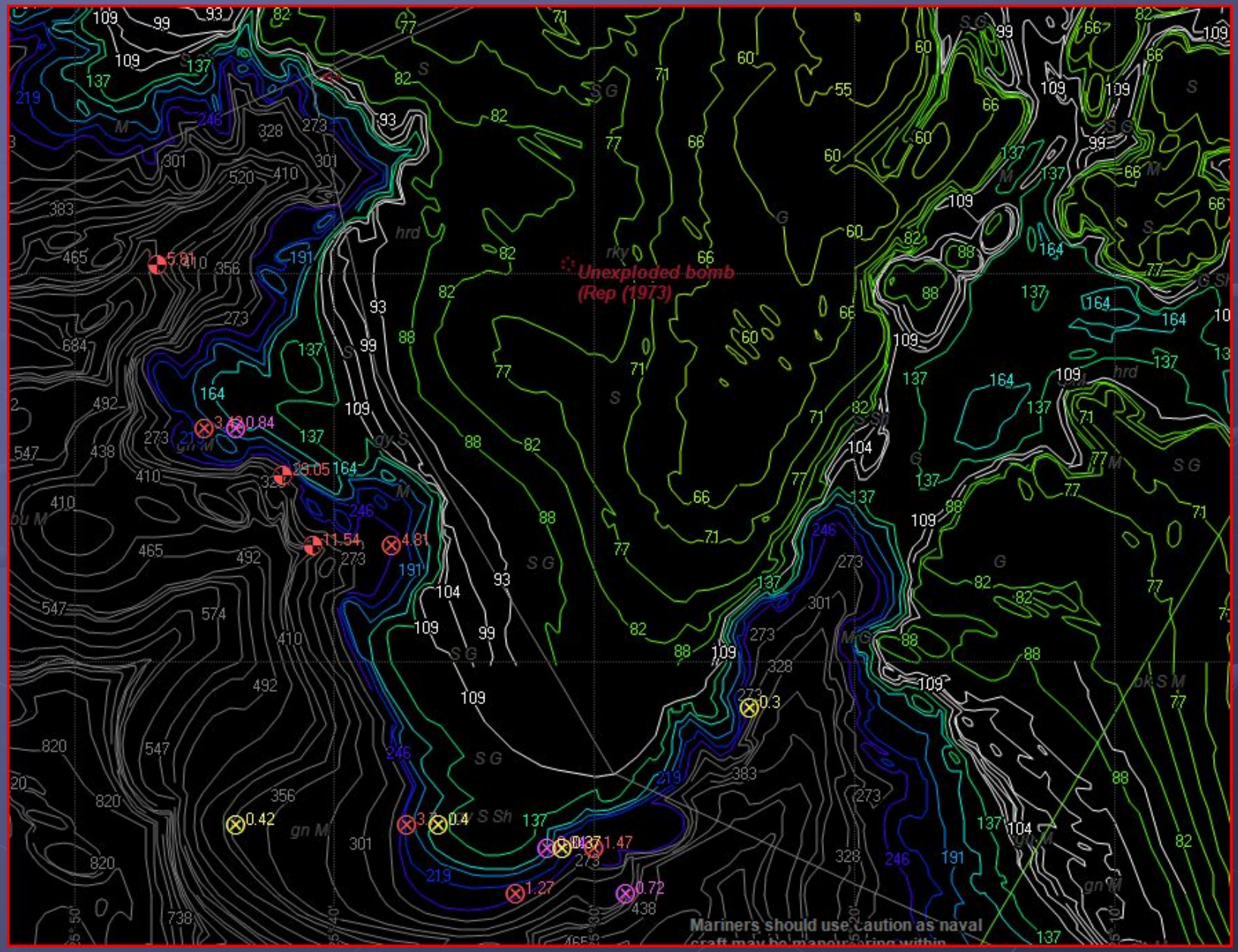
Development of a Closed Area - Nitinak Canyon



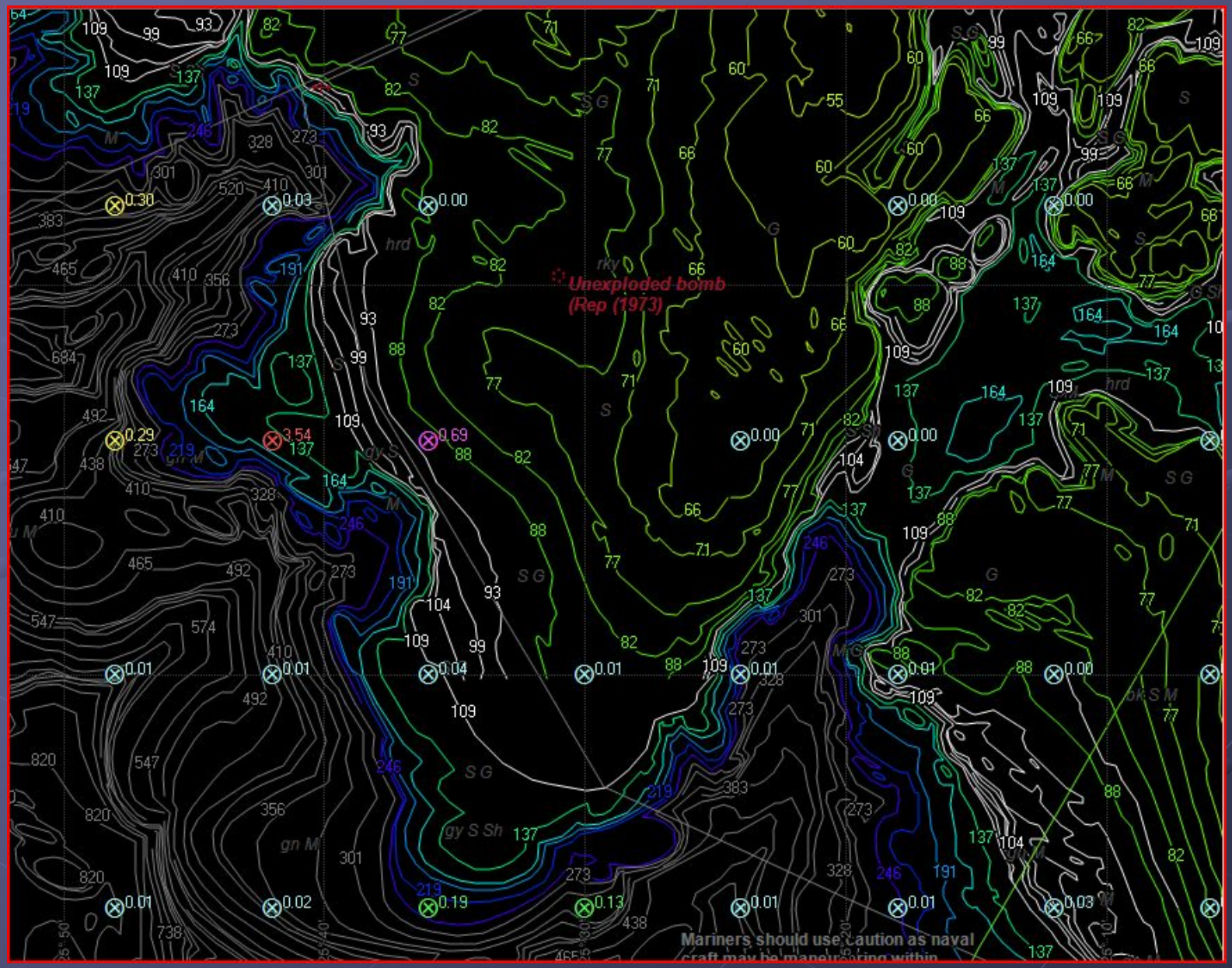
Nitinak Canyon – All Observed Dark Blotched Hauls



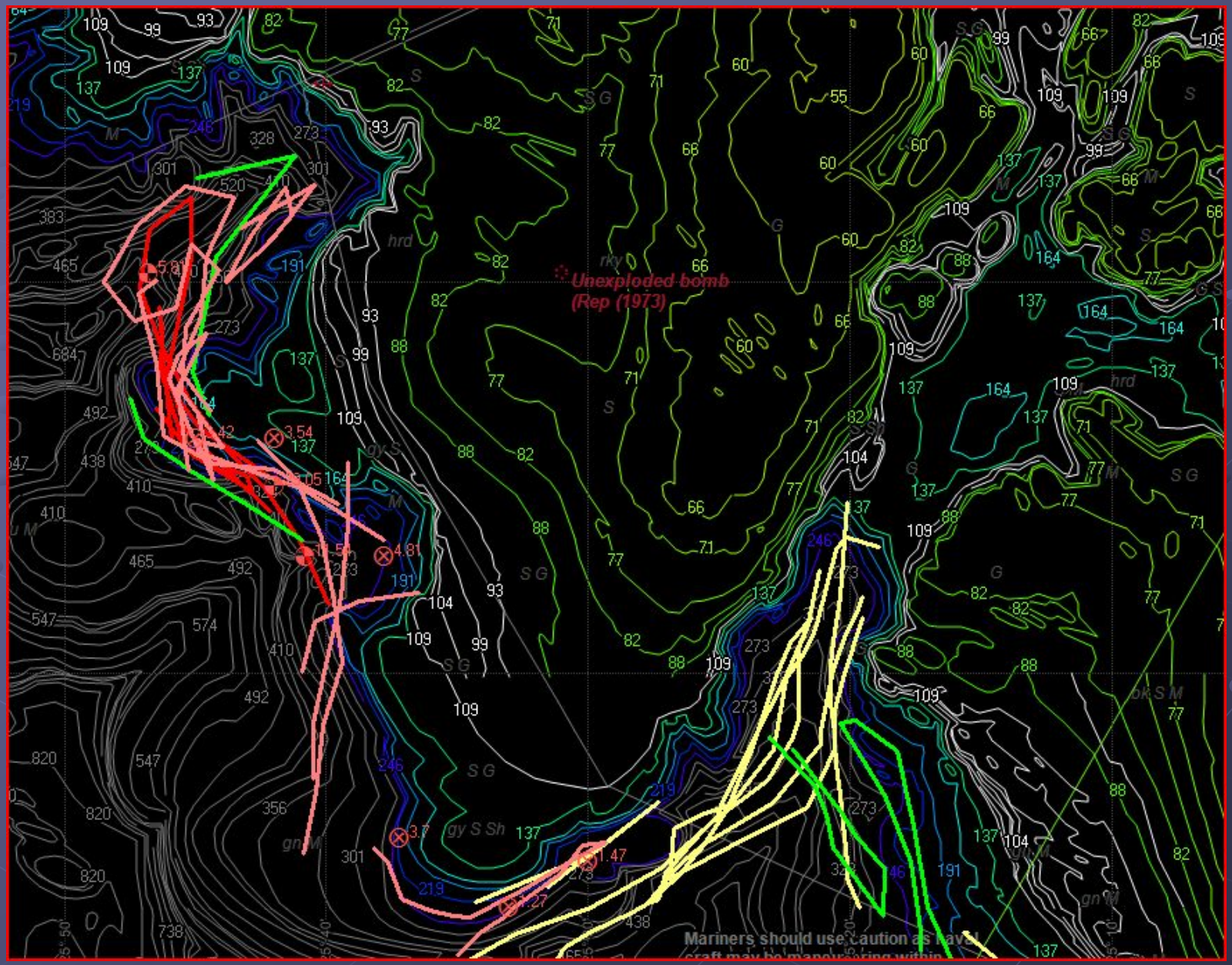
Nitinak Canyon – Observed Dark Blotched “Bad” Hauls



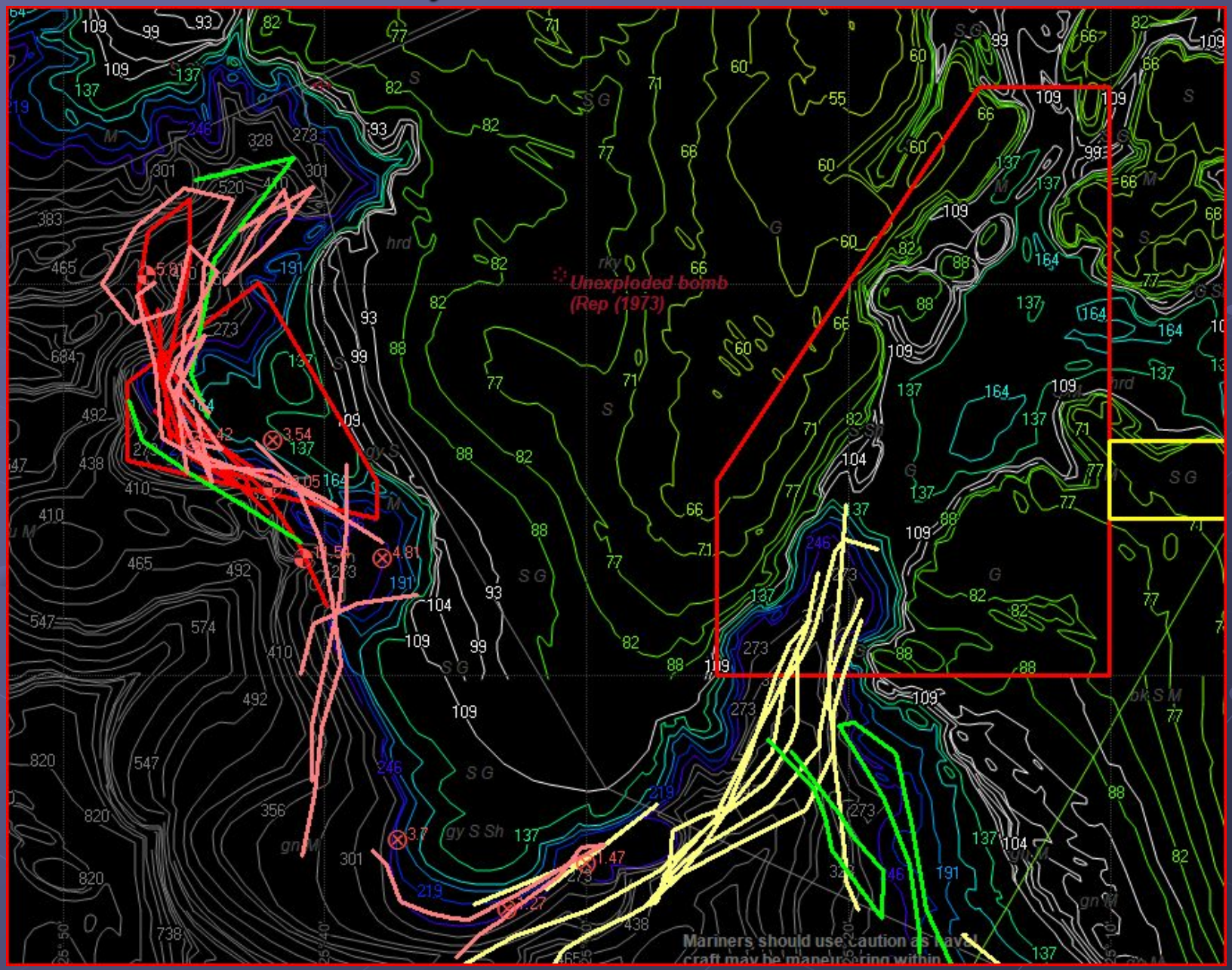
Nitinak Canyon – Observed Dark Blotched “Block Rates”



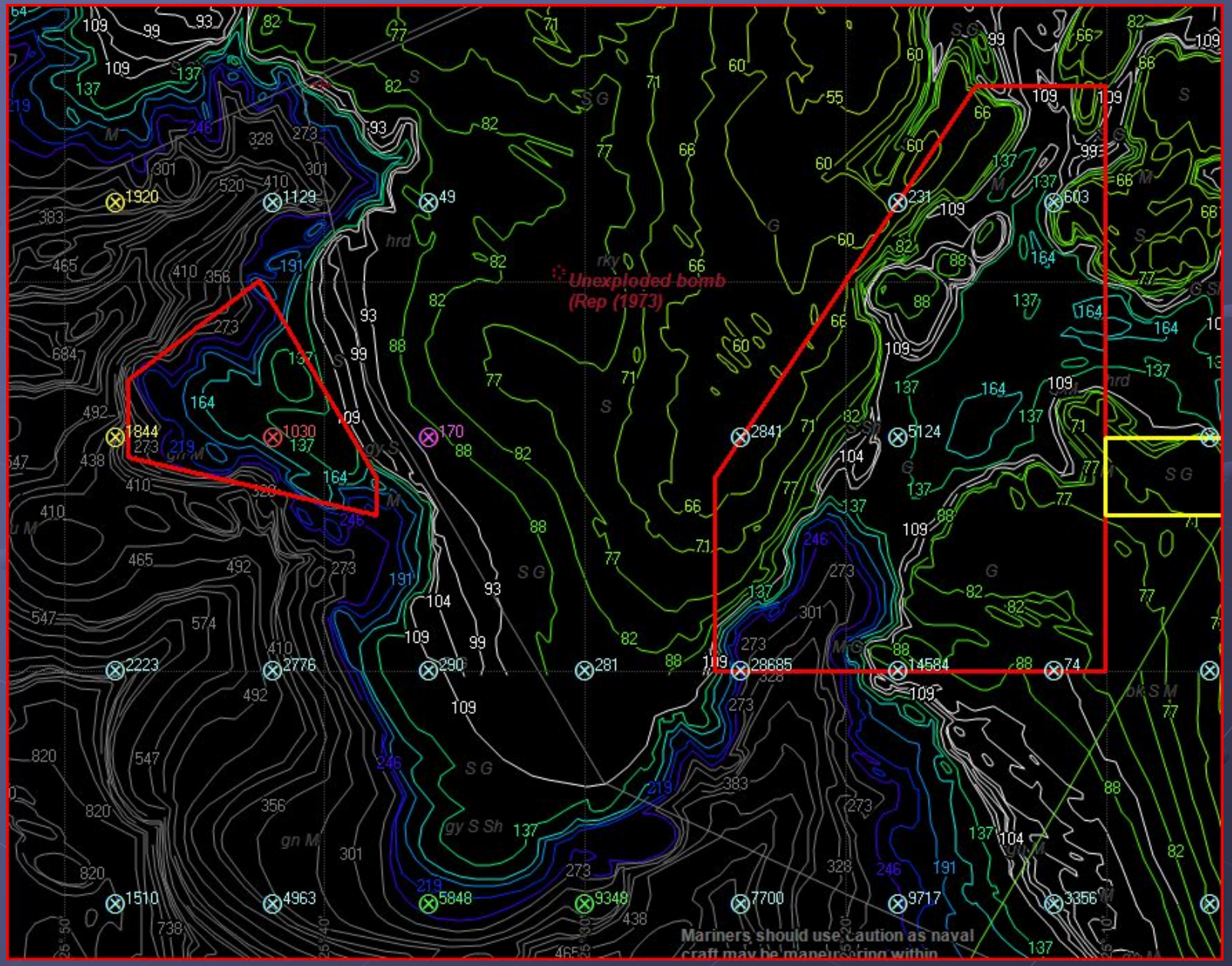
Nitinak Canyon – Dark Blotched “Disaster Tow” VMS Tracks



Nitinak Canyon – The WMC Area Closure



Nitinak Canyon – “Cost vs Benefit”



WMC Bycatch Rules – Misc.

- Other Fishing Restrictions
  - No Night Fishing
  - Vessels may short-wire and make deliveries at night
  - Test Tows required when entering a new fishing area
- Enforcement Actions
  - Stop Fishing Order
  - Vessel Captain Damages: $2,500 per violation
  - Owner Damages: $10,000 per violation

Results

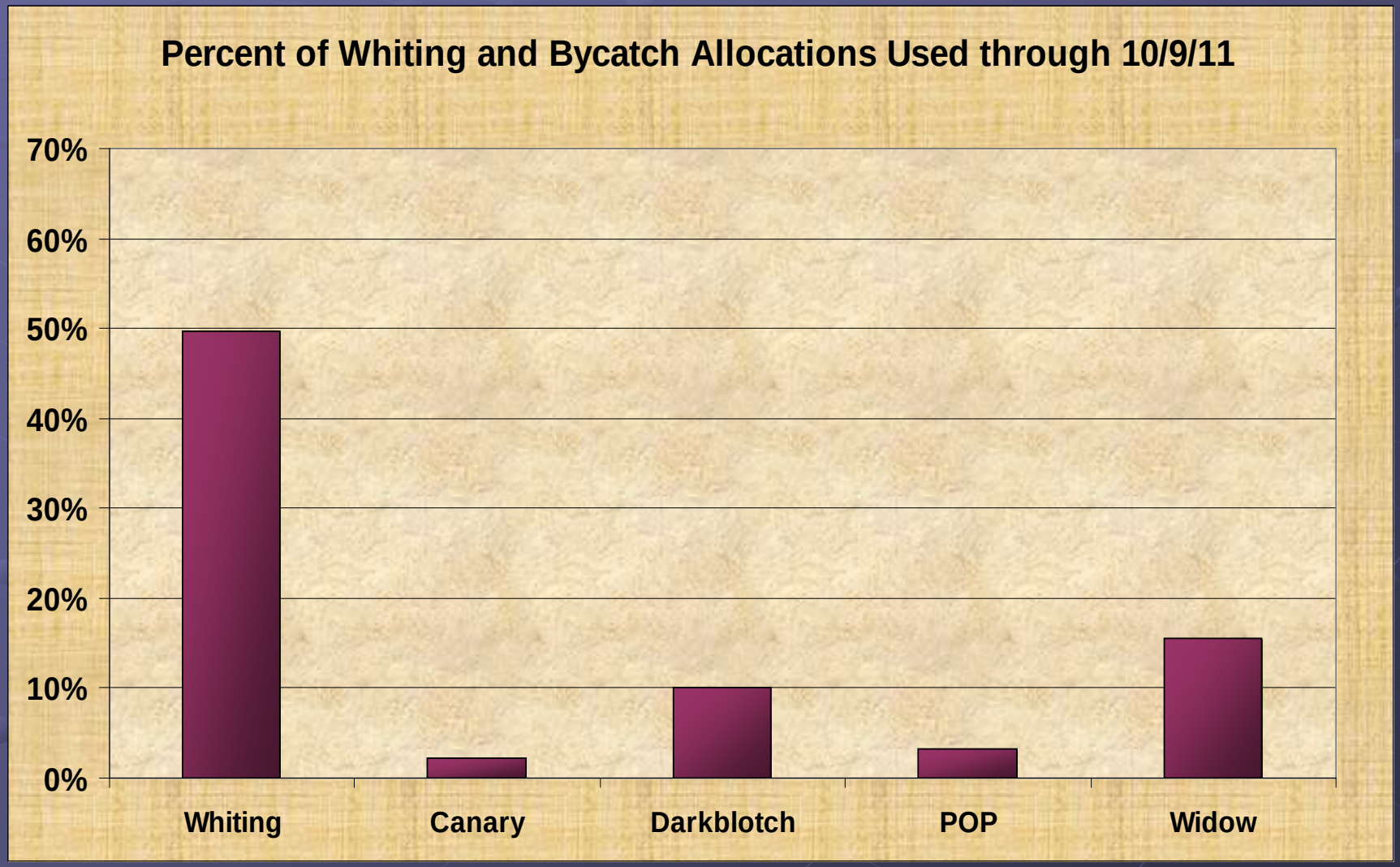


2011 Catch & Bycatch Use to Date

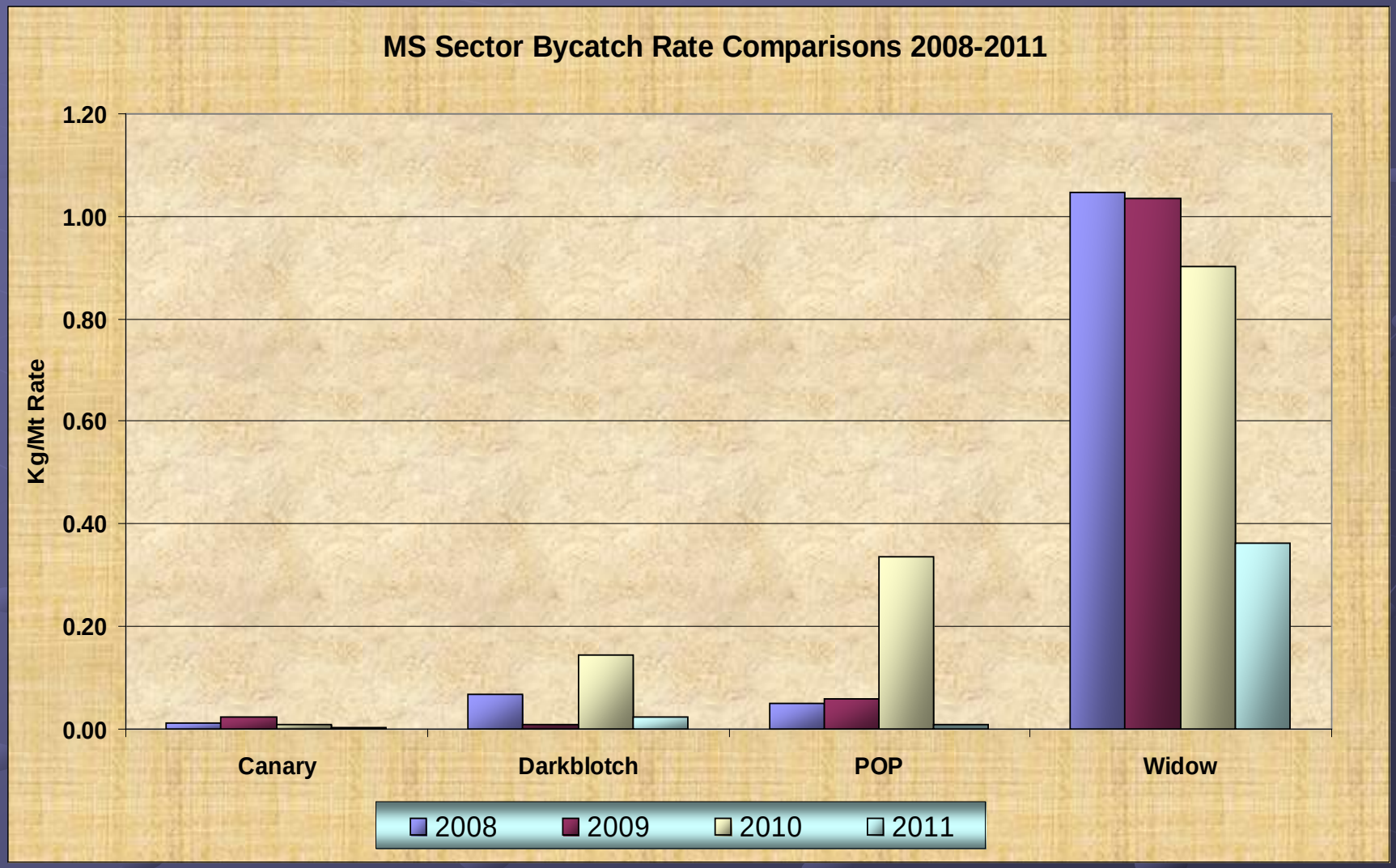
Comparison to Prior Years

Behavioural Changes

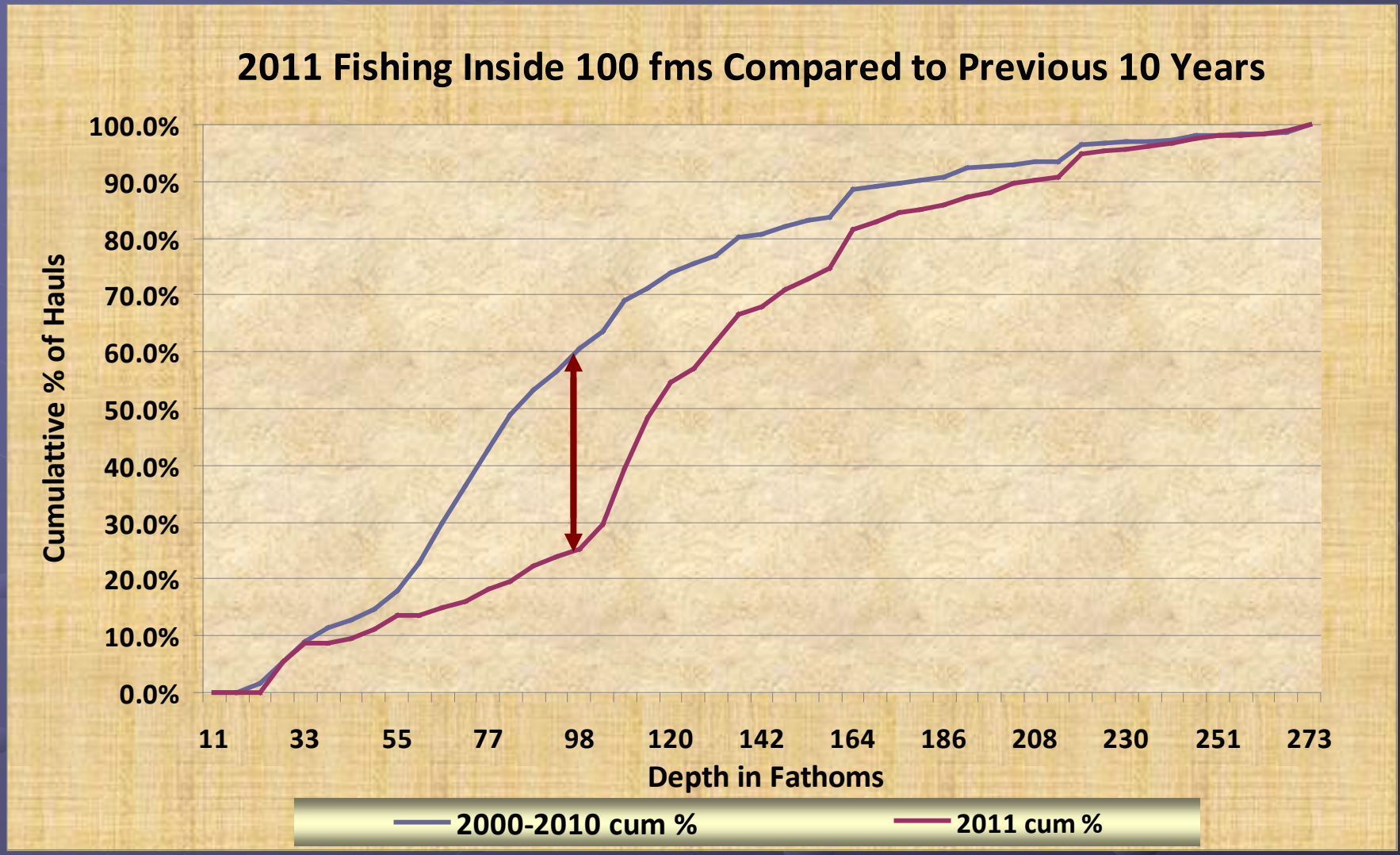
WMC Catch and Bycatch Use
through Oct. 9th 2011



2011 Rates Compared to 3 Prior Years



One Change in Behaviour



Biggest Change

Awareness that this is not a race



Questions?



TRAT COMPLIANCE SUMMARY, 2011

Information is current through October 28, 2011 unless otherwise noted.

Trat Account Overview

As of 10/26/11:

- 138 Quota Share Holder Accounts
- 146 Vessel Accounts
- 49 First Receiver Site Licenses
- 2,370 E-Fish Ticket Submittals



Permit/License Renewal Status

- Renewal Period, October 1 – November 30
  As of 10/26/11:
  - Quota Share Accounts ~ 50% (renewed or pending)
  - Vessel Accounts ~ 50% (renewed or pending)
  - Limited Entry Trawl Permits ~75% renewed

  Failure to renew QS Permits by deadline – No QPs in 2012

  Failure to renew vessel accounts by deadline – No carryover; no fishing in 2012 until renewed

  2012 QS Permits mailed early December 2011

Trat Fishery Overview*

- Shoreside IFQ Trawl
  - No. of vessels, 64
  - No. of trips, 989
- Shoreside IFQ Fixed Gear
  - No. of vessels, 14
  - No. of trips, 221
- Shoreside IFQ Hake
  - No. of vessels, 11
  - No. of trips, 818
- Mothership Catcher Vessel
  - No. of vessels, 7
  - No. of trips, 29

*Information current through October 26, 2011

Violation Investigation Summary

- VMS/RCA Investigations opened (all fisheries)
  - SW 2010: 75 NW 2010: 171
  - SW 2011: 72 NW 2011: 162

VMS/RCA (Trawl)

- 11 Non Reporting violations, no formal action /with notification, problems fixed
- 122 RCA/EFH incursions evaluated
- 59 total vessels
- 16 vessels with 3 to 10 incursions
  - 63 evaluations have been closed with no formal action / COPPS
  - 2 written warnings
  - 3 NOVAs
  - 54 open investigations

Violation Investigation Summary

- Gear Violations
  - 1 chafing gear (midwater)
- Declaration Violations, (including MSCV and Shoreside)
  - 11 improper declarations
    - 5 closed with no formal action / COPPS
    - 6 open investigations
- 30 Day Clock Violation
  - None. 3 close events / deficit was cleared late in the 30 days

Violation Investigation Summary

- Fishing in 2 Management Areas on the Same Trip
  - 2 events (open investigations)
- Fishing Prior to establishing Vessel Account
  - 2 events, no formal action / COPPS
- Fishing in Deficit
  - 60 events involving 30 vessels, (Trawl and Fixed Gear)
    - 10 closed with no formal action /COPPS
    - 6 written warnings
    - 44 open investigations
  - Multiple events by a single vessel
    - 7 vessels with 2 events
    - 2 vessel with 3 events
    - 4 vessels with 4 events
    - 1 vessel with 6 events

Violation Investigation Summary Observers

- 11 open cases involving Observer issues
  - Observer Harassment (8)
  - Lack of Observer Coverage (1)
  - Missing Species (3)
  - Complaints involving observer conduct (3)

Violation Investigation Summary E Fish Ticket Reporting

- 2370 E Ticket submittals
- 13 Open Investigations
  - Inaccurate Reporting by FR (7)
  - E Ticket 24 hour submittal requirement (6)

    982 submitted within 24 hrs (41%)

    2122 submitted within 48 hrs (90%)

    248 greater than 48 hours (10%)

    Of those 248: 118 were greater than 72 hours (4%)

    62 were greater than 5 days (2%)

    38 were greater that 10 days (1.6)
    - Of these 38, three FRs account for 25 of the 10+ day submittals (66%)

OSP / WDFW/ CDF&G Activity Report

- Patrol Hours: 952
- Contacts: 709
- Violations:
  - Warnings - 7
  - Citations – 2
  - Investigations – 4

  * Funding for states available Sept. 2011

State Citations

- 1 – for undersized mesh on large footrope trawl gear (51,000 pounds of Groundfish seized)
- 1- for unlawful retention of undersized Lingcod.

WARNINGS

- 2 - for unlawfully retaining Halibut
- 2- for unlawfully retaining undersized Lingcod
- 1- for State paperwork violation
- 1- for violating vessel marking requirements

INVESTIGATIONS

- 1- Observer conduct complaint (active)
- 1-Chafing gear violations (presently inactive)
- 2- dumping incidents (closed with no action)

USCG D 13

- 21 Groundfish vessels boarded since implementation of the TRAT program
- CG D13 documented 1 declaration discrepancy

TRAWL RATIONALIZATION TRAILING ACTIONS

At this meeting, the Council is scheduled to continue work on priorities it established at the September 2011 Council meeting. Detailed information on each of these prioritized actions is provided in Agenda Item E.7.a, Attachment 1, divided into the following groups:

- Ongoing Issues (for January 1, 2013 implementation)
- Trailing Actions for Program Improvement and Enhancement Rule 2 (PIE 2) (for January 1, 2013 implementation)
- Standalone Priorities (with variable implementation targets)
- Trailing Actions for PIE 3 (for January 1, 2014 implementation)
- Trailing Actions for PIE 3 – NMFS List (for January 1, 2014 implementation)
- Issues Tentatively Slated for 2013-2014 Biennial Specifications (for January 1, 2013 implementation)
- Candidate Trailing Actions from September 2011 Not Prioritized for Active Status

"Ongoing Issues" are those issues which the Council initially prioritized and began work on in 2010 but have not yet reached a point of finality. For each ongoing issue, trailing action for PIE 2, and standalone priority, Attachment 1 provides a summary which includes the next steps to be taken and actions the Council may wish to consider at this meeting. Included as a next step for a number of the items is a National Marine Fisheries Service (NMFS) determination of the type of National Environmental Policy Act analysis that will be required. NMFS is expected to provide this information in Agenda Item E.7.b, Supplemental NMFS Report.

A number of issues listed in Attachment 1 are slated to be addressed in the 2013-2014 specifications. Under Agenda Item E.9.b, NMFS will be providing advice on whether or not those issues should be covered within the biennial specifications process (Agenda Item E.9.b, NMFS Report).

The Trawl Rationalization Regulatory Evaluation Committee (TRREC) will meet on October 27 to address two priorities for potential implementation in 2013: the first priority was to review regulations and develop recommendations regarding (a) making it permissible for stacking both a limited entry trawl and fixed gear permit on a single vessel at the same time, (b) changing the season opening date for whiting, (c) allowing vessels to carry multiple gears at the same time, and (d) modifying several identified trawl gear regulations that impair increased efficiency and selectivity. As a secondary priority, the TRREC focused on other regulations made obsolete by implementation of the new trawl rationalization program in 2011. Their report will be provided in supplemental materials (Agenda Item E.7.b, Supplemental TRREC Report).

At the stock assessment "mop-up" meeting held after the last Council meeting, it was tentatively determined that widow rockfish has been rebuilt. In the event that this conclusion is approved by the Scientific and Statistical Committee and the Council, one of the more significant issues for Council decision making will be whether the issue of reallocation of widow rockfish quota shares (QS) should be reprioritized for active consideration at this time. The trawl

rationalization program calls for a review of QS allocation whenever a species is removed from the overfished species designation.

One follow-up to Council decision-making at the September Council meeting was an assessment of workload capabilities to achieve implementation targets. New issues identified by the TRREC (if moved forward by the Council), a possible move-up in the target date for action on the widow rockfish reallocation, and other information which may be forthcoming at the November Council meeting may also require reprioritization of issues slated for implementation in 2013 based on workload capabilities. Council staff and NMFS will provide an assessment of workload capabilities as part of this agenda item.

Council Action:

1. Provide guidance on trailing action issues as listed in Attachment 1.

Reference Materials:

1. Agenda Item E.7.a, Attachment 1: Trailing Action Priorities And Status.
2. Agenda Item E.7.b, Supplemental NMFS Report: NMFS' Preliminary Determinations on the Appropriate Level of NEPA for Trailing Actions.
3. Agenda Item E.7.b, Supplemental TRREC Report: Trawl Rationalization Regulatory Evaluation Committee Report on Trailing Actions.
4. Agenda Item E.7.c, Public Comment.

Agenda Order:

a. Agenda Item Overview — Jim Seger
b. Reports and Comments of Advisory Bodies and Management Entities
c. Public Comment
d. **Council Action**: Provide Guidance on Further Refinement of Trailing Issues, Including Stacking of Trawl Permits with Fixed Gear Permits

PFMC
10/13/11

TRAILING ACTION PRIORITIES AND STATUS

The table of contents provided on the following pages contains both a list of the items covered under this agenda and the target implementation dates. Council action to be implemented for the start of a particular year should be completed by April of the preceding year. In the body of the document, at the end of each item slated for 2013, and for the stand alone items, a status summary is provided with an "O" indicating the need for Council attention.

Note on 2014 priorities. With respect to the list of items from National Marine Fisheries Service (NMFS) prioritized for the 2014 program improvement and enhancement rule (PIE rule 3), the Council consented to providing NMFS the flexibility to include those issues (or any other issue) in earlier rule makings, if it could be done without hampering progress on the identified priorities.

Status on Set-Aside Flexibility Issue: The Council did not take action in September to prioritize the set-aside issue because there was some uncertainty about what actions were needed. At its June 2011 meeting the Council adopted the attachment on set-asides but the maker of the motion spoke to the motion as follows (from the final June 2011 minutes):

> ". . . the Council is desirous of providing flexibility for management purposes and attainment of the optimum yield. . . . there is no process for how the flexibility would be implemented inseason. NMFS has indicated there needs to be an EA. That provides us an opportunity to develop the process and they have some regulatory language on page 2 and 3 of that document that we might use as a starting point, but I am not suggesting we adopt that with this motion. The process on how we actually do the set-aside or reapportion the set-asides still needs to be developed."

The set-aside flexibility issue affects sectors other than the trawl sector. At the September Council meeting, NMFS indicated it would report by this meeting on options to address the intent of the June Council action.

Other Impacted Sectors: A number of issues prioritized as a trawl rationalization trailing action in this document may directly affect sectors other than the trawl sector:

- Stacking trawl permits on vessels that also have fixed gear permits (PIE 2)
- Adding a vessel monitoring system (VMS) declaration code for "transiting" with gear stowed (PIE 3)
- Revisions to weight conversion factors (PIE 3)
- Clarifying the sablefish at-sea exemption for processing in the individual fishing quota (IFQ) fishery (PIE 3)
- Clarifying fishery closure language (closure of fixed allocations vs. set-asides) (PIE 3)
- Permit renewal dates (PIE 3)
- Landing/offloading requirements for limited entry fixed gear and open access (PIE 3)
- General at-sea processing prohibition (PIE 3)

Set-aside flexibility has not yet been prioritized and so is not included in this list. Also excluded from this list are issues that were tentatively slated for consideration as part of the biennial specifications process.

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Ongoing Issues (For 2013 Implementation)

The following issues were originally included as priorities for the first program improvement and enhancement (PIE) rule but were not ready for that rulemaking or were scheduled for a separate rule making (e.g. cost recovery).

1. Cost Recovery

The Council completed work on the structure of the cost recovery program at its September meeting, specifying that the program start on January 1, 2013 and that the initial amounts to be recovered not exceed more than 3 percent of exvessel revenue for the shorebased sector, 2 percent for the mothership sector and 1 percent for the catcher-processor sector. The exact amounts to be used will be determined based on the best estimates available at the time the rule is ready to move forward. The process of identifying costs will continue, in coordination with the states, using the cost matrix developed by Pacific States Marine Fisheries Commission (PSMFC) for this purpose. National Oceanic and Atmospheric Administration General Counsel (NOAA GC) may report at this meeting on whether or not the states will be eligible to recover some costs through the cost recovery program. The details for some program elements such as the ongoing "role of the Council" and "the concept of accounting and adjustment between years" will be worked out in the regulatory deeming process. The Council operating procedures (COP) delegate deeming to the Executive Director, except for those circumstances for which the Council specifically desires that such deeming occur through the full Council process.

The Cost Recovery Committee (CRC) will begin its review of cost estimates and take up the task of looking for ways to reduce program costs after the NMFS Northwest Region and Northwest Fisheries Science Center have their cost tracking methodologies in place (expected to occur sometime in the earlier part of 2012). At that point, the information that the CRC needs for its work should be available.

	Summary: Status and Next Steps
	Council action on program structure complete and process for determining fee percentages complete.
	NOAA GC to report on state eligibility for cost recovery funds.
	Work to continue on matrix of costs for each agency. Recovery rates as a percent of exvessel value to be determined by NMFS and placed in regulations, (not to exceed specified percentages for each sector, see text)
	Regulations to be drafted by NMFS.
	Regulations to be deemed through process outlined in COP 1.[1]
	CRC to meet to discuss ways to reduce program costs (most likely in spring 2012).
	No action necessarily required at this time.

2. Quota Share/Quota Pound (QS/QP) Control Rules – Safe Harbors

a. Community Fishing Associations (CFAs)

Any further Council action indefinitely deferred. CFAs will continue to operate without an exception for the control limits. At such future time as a need for an exception is identified, the Council may again take up the issue of a safe harbor from control limits for CFAs.

	Summary: Status and Next Steps
	Action Tabled

b. Risk Pools (Moderate to Substantial Effort)

Council final action completed. The Council provided risk pools with a limited exception to the control rule, allowing them to operate under contracts which provide that a deficit from one year may be covered with QP issued for a subsequent year. Additionally, such agreements may be renewed for a series of consecutive years without necessarily violating control rules.

	Summary: Status and Next Steps
	Council action complete.
	Council staff to complete analysis.
	Regulations to be drafted by NMFS.
	Regulations to be deemed through process outlined in COP 1.
	No action necessarily required at this time.

[1] COP 1: "Unless otherwise explicitly directed by the Council, after NMFS has prepared the regulatory language, the Council authorizes the Executive Director to review the regulations to verify that they are consistent with the Council action before submitting them, along with his determination, to the Secretary on behalf of the Council."

c. Lenders (Moderate to Substantial Effort)

When it approved the initial issuance rule implementing the IFQ program, NMFS inserted into the QS control rule an exception for banks and financial institutions (underlined text in the following).

660.140(d)(4) *Accumulation limits*—(i) *QS and IBQ control limits.* QS and IBQ control limits are accumulation limits and are the amount of QS and IBQ that a person, individually or collectively, may own or control. QS and IBQ control limits are expressed as a percentage of the Shorebased IFQ Program's allocation. (A) *Control limits for individual species.* No person may own or control, or have a controlling influence over, by any means whatsoever an amount of QS or IBQ for any individual species that exceeds the Shorebased IFQ Program accumulation limits. (B) *Control limit for aggregate . . .* (C) The Shorebased IFQ Program accumulation limits are as follows: [see Table of QS Control Limits] (ii) Ownership—individual and collective *rule.* The QS or IBQ that counts toward a person's accumulation limit will include: (A) The QS or IBQ owned by that person, and (B) That portion of the QS or IBQ owned by an entity in which that person has an economic or financial interest, where the person's share of interest in that entity will determine the portion of that entity's QS or IBQ that counts toward the person's limit.	(iii) *Control.* Control means, but is not limited to, the following: (A) The person has the right to direct, or does direct, in whole or in part, the business of the entity to which the QS or IBQ are registered; (B) The person has the right to limit the actions of or replace, or does limit the actions of or replace, the chief executive officer, a majority of the board of directors, any general partner, or any person serving in a management capacity of the entity to which the QS or IBQ are registered; (C) The person has the right to direct, or does direct, and/or the right to prevent or delay, or does prevent or delay, the transfer of QS or IBQ, or the resulting QP or IBQ pounds; (D) The person, through loan covenants or any other means, has the right to restrict, or does restrict, and/or has a controlling influence over the day to day business activities or management policies of the entity to which the QS or IBQ are registered;	(E) The person, <u>excluding banks and other financial institutions that rely on QS or IBQ as collateral for loans</u>, through loan covenants or any other means, has the right to restrict, or does restrict, any activity related to QS or IBQ or QP or IBQ pounds, including, but not limited to, use of QS or IBQ, or the resulting QP or IBQ pounds, or disposition of fish harvested under the resulting QP or IBQ pounds; (F) The person, <u>excluding banks and other financial institutions that rely on QS or IBQ as collateral for loans</u>, has the right to control, or does control, the management of, or to be a controlling factor in, the entity to which the QS or IBQ, or the resulting QP or IBQ pounds, are registered; (G) The person, <u>excluding banks and other financial institutions that rely on QS or IBQ as collateral for loans</u>, has the right to cause or prevent, or does cause or prevent, the sale, lease or other disposition of QS or IBQ, or the resulting QP or IBQ pounds; and (H) The person has the ability through any means whatsoever to control or have a controlling influence over the entity to which QS or IBQ is registered.

In the preamble to the final rule, NMFS explained that this change was adopted in response to public comment:

> [Comment:] Proposed § 660.140(d)(4)(iii)(D) and (E) ''could eliminate the ability of a quota share/quota pound owner to obtain necessary financing for fishing operations. Under these sub-clauses, a bank or other financial institution would be unable to provide loans using quota shares/pounds as collateral, a common practice in limited access fisheries. A quota share brokerage would be unable to take title or otherwise encumber quota shares/pounds beyond the accumulation limits, even if a fisherman requested the broker do so.''
>
> [Response:] NMFS does not intend that these sections apply to banks or financial institutions, unless the financial documents specify control beyond normal business agreements. NMFS has modified the regulations accordingly. As for quota share brokerages, each transaction must comply with the accumulation or control limits; however, compliance does not prevent brokerage transactions. Compliance would be based on the facts of the transactions.
> [. . .]

NMFS acknowledges that participants in the fishery may be concerned about whether potential actions would comply with the accumulation limits. It is the responsibility of the participants to comply with the regulations; if participants have questions about potential actions, NMFS encourages those participants to provide the agency with specific facts and questions prior to entering into agreements or taking action in order to understand NMFS's interpretation of the potential facts in relation to the regulation.

There are two issues to address with respect to the safe harbor provided to lenders. The first is determination of the entities eligible for the safe harbor and the second is the scope of the exception provided to such entities (i.e. the activities allowed under the safe harbor).

Lending Entities Qualifying for an Exception

Subsequent to the modifications described above, public comment has expressed concern with a need to clarify for policy and regulatory purposes the types of institutions to which the exception is expected to apply. What types of entities might qualify as a "bank or other financial institution?" For example, it is traditional in the fishery for processors to lend harvesters money for capital acquisitions. Adopting language in the control limit regulations with more specificity could provide more clarity as to whether the exclusions applicable to "banks and other financial institutions" should be construed more broadly or more narrowly. Regardless of whether construed broadly or narrowly, in the following options the intent is that the exception for lenders only applies that QS or IBQ used as collateral. The following are a few alternatives presented for Council consideration may include:

Status Quo: Retain existing language (no action).
This alternative would not clarify the types of institutions to which the exceptions would apply, but would not include the limitation of Alternative 1, as it would not require the institution to be state or federally chartered. This alternative would also not be as broad as Alternative 2, as it would be limited to banks and financial institutions.

Strawdog Alternative 1: Replace "*banks and other financial institutions that rely on QS or IBQ as collateral for loans*" with "*a state or federally chartered bank or other state or federally chartered financial institution that relies on QS or IBQ as collateral for loans.*"
This alternative would result in a narrower application of exemptions for lending institutions from the control rule. While this alternative provides a clear test for whether the lending institution qualifies (i.e., whether it is state or federally chartered), it may result in some lending institutions not being able to avail themselves of the exemptions from the control rule. For instance, private equity funds may not be state or federally chartered.

Strawdog Alternative 2: Replace "*banks and other financial institutions that rely on QS or IBQ as collateral for loans*" with "*any person that relies on QS or IBQ as collateral for loans.*"
This alternative would result in a broader application of exemptions for lending institutions from the control rule, as "person" includes not only banks and other financial institutions, but other entities as well (such as processors, for instance) and individuals.

Strawdog Alternative 3: Leave unaltered the language "*banks and other financial institutions that rely on QS or IBQ as collateral for loans*" but add an amplification indicating that to qualify as a bank or financial institution for purposes of this paragraph the entity must be regularly or primarily engaged in the business of lending and not engaged in or

controlled by entities whose primary business is the harvest processing or distribution of fish or fish products.
This alternative would be intended to broaden the entities qualifying for this exception, similar to Alternative 2, but to also indicate that the provision is not intended to apply or benefit entities otherwise engaged in the fishery, which might use such an exemption to gain advantage through the control of amounts of quota shares in excess of the control limits.

Scope of the Exception Provided

Another concern with exempting certain activities of lending institutions from the control rule has to do with overlaps of the activities covered by the various paragraphs of the control rule and the need to provide clarifications to the public regarding the how the paragraphs might be applied. For example, banks and financial institutions are provided an exception with respect to the use of loan covenants to "restrict, any activity related to QS or IBQ or QP or IBQ pounds" (paragraph E) but are not provided an exception with respect to directing, delaying or preventing the transfer of QS or individual bycatch quota (IBQ) or having the right to do so (paragraph C). This concern could be addressed in a number of ways. One would be by adding the lender exemption to paragraph (C). However, there are also other conflicting overlaps between the paragraphs, for example between paragraphs (E) and (D). Again, paragraph (E) provides an exception for certain lenders pertaining to the direction of "any activity related to QS or IBQ or QP or IBQ pounds" while paragraph (D) does not provide those lenders an exception for "day to day business activities or management policies of the entities to which the QS of QP are registered." Paragraphs (G) and (C) also overlap. Some alternatives for addressing these issues are as follows:.

Status Quo: No change
Strawdog Alternative 1: Add the appropriate language providing an exception for lenders to paragraph (C).
Strawdog Alternative 2: Same as Alternative 1 but also remove the exceptions provided to lenders in all other paragraphs and add at the end of each of the other paragraphs language to the following effect: *"with the exception of those activities allowed under paragraph (C)"*

Suboption 2a: Further limit the exception under paragraph C so that the lenders exception pertains only to control over the transfer of QS and IBQ and not the affiliated QP or IBQ-pounds. All associated QP will be distributed to the borrower unless the bank or financial institution provides evidence that the borrower is in default on the loan, in which case the related QP will be distributed to the adaptive management program until such time as any the QS/IBQ held by the bank or financial institution is sold, or the QS/IBQ holdings of the bank or financial institution are below the QS control limits. (from the April 2011 strawdog option on which the Council requested further discussion).

Suboption 2b. Provide lenders with an exemption to all activities covered by paragraph (C) (i.e. do not select Suboption 2a)

Strawdog Alternative 3: Add exceptions for lenders to all paragraphs.

Alternative 1 would make it clear that lenders could control the transfer of QS, IBQ, QP, and IBQ but leave other possible inconsistencies in place. Alternatives 2 and 3 would eliminate any inconsistencies due to overlap among the paragraphs. Alternative 2 would achieve this end by restricting the exception for lenders to lender influence over the transfer of quota, as specified in paragraph C. Suboption 2a would restrict the exception just to QS and IBQ, not to the QP and IBQ-

pounds; and Suboption 2b would not add that limitation. Alternative 3 would achieve this end by providing lenders exceptions under all paragraphs.

	Summary: Status and Next Steps
	Prioritized for implementation in 2013.
O	Lending Entities Qualifying: Are the alternatives the ones the Council would like analyzed?
O	Scope of the Exception: Are the alternatives the ones the Council would like analyzed?

3. Other Lender Issues (Moderate to Substantial Effort)

a. Third party verification of quota share ownership (i.e. National Marine Fisheries Service informing a third party as to the ownership of particular QS)

NMFS is exploring whether or not the registered ownership of QS and QP accounts and the amounts in those accounts should be considered public information. A determination is expected soon. If this information is determined to be public information, then the needs that lenders have for verification may be addressed and there may be no need for further Council action on this issue.

	Summary: Status and Next Steps
	Prioritized for implementation in 2013.
O	Based on the NMFS report on this issue, is there any further action needed at this time (e.g. identification and analysis of an option under which NMFS would provide lenders independent confirmation regarding what QS is owned by an entity borrowing money from the lender?

b. A lien registry

At the September 2011 meeting, the Groundfish Advisory Subpanel (GAP) supported "a centralized lien registry and note[d] that this is a mandate under the Magnuson-Stevens Act (MSA), but recognize[d] that after many years and attempts at establishing this, it has never occurred" (Agenda Item G.6.b, Supplemental GAP Report). It is the Council staff's understanding that there continues to be limited resources within NMFS for implementing a centralized lien registry. This issue might be partially addressed by the option suggested for consideration as an alternative to unique identifiers for QS, in the following section.

Status Quo: No central lien registry. There may be other ways by which lenders can register their liens.
Strawdog Alternative: Establish a central lien registry for the West Coast trawl IFQ program. (Should the mothership catcher-vessel permits also be included?)

	Summary: Status and Next Steps
	Prioritized for implementation in 2013.
O	Does the Council wish to adopt the strawdog or other alternatives for analysis?

c. Unique identifiers for QS to facilitate financial transactions

At present, QS are highly divisible. Creating unique identifiers for QS would either be very costly or require a modification to the program to reduce the degree of divisibility. An alternative to unique identifiers might be to add a lender field to the QS ownership data table. Transfer of QS from the account would then require authorization from both the owner and the lender. The lender would

have no other authority with respect to the disposition of the QS or the QP from the account. The position of the lender with respect to the QS in the account would be similar to the position of a lender on the title for a car loan. If only some of the QS held by a particular individual were to be pledged as collateral, then the individual would be allowed to establish a separate account for the QS obligated to a lender. The approach might work as follows.

1. A QS holder wishing to pledge QS as collateral and the lender desiring to use the QS as collateral would sign a form provided by NMFS.
2. The form would state that a separate account would be opened with one field designating the owner and a separate field designating the binding party (lender). The form would also specify the amounts of QS held by the QS owner that would be placed into this account.
3. The only difference between this account and any other account would be that QS in the account could be transferred out of the account only through the filing of a QS transfer form signed by both the QS owner and the lender. The lender's only authority with respect to the account would be the ability to prevent QS transfers from the account.
4. With respect to any disputes that might arise between the QS owner and the lender regarding the terms and conditions on which the QS owner or lender is required to authorize QS transfers, these issues would be settled privately, through the courts if necessary, but not be a matter of concern for NMFS.

This provision might also begin to address the lien registry issue but would not be definitive in that regard. It would not provide the lender a way to determine whether there were any previous commitments of the QS for which the lender is securing transfer authorization authority (i.e. whether the same QS was already or subsequently obligated or bound through a separate transactions or lien).

Status Quo: No change.
Strawdog Alternative: Add a lender field to the QS ownership records. A lender name would only be added to the record with the agreement of QS owner but removal would require agreement of both the QS owner and the lender. While a lender is listed, transfer of QS from the account would require authorization from both the owner and the lender. To facilitate commitment of only part of an owners QS to a particular lender, a single QS owner would be able to establish additional QS accounts.

	Summary: Status and Next Steps
	Prioritized for implementation in 2013.
O	Does the Council wish to adopt the strawdog or other alternatives for analysis?

Trailing Actions for PIE 2 (For 2013 Implementation)

4. Develop a process to certify new observer providers

The current regulations authorize as west coast observer providers those entities certified to provide observers for the North Pacific fisheries. There is no independent means by which an entity can qualify as a West Coast observer provider without also having to qualify under the North Pacific programs. During previous Council deliberations on this issue there was discussion of the possibility that the states might act as observer providers, particularly with respect to shoreside monitoring.

No modifications to the Fishery Management Plan (FMP) or the trawl rationalization program appendix are required for this issue. The next steps are for NMFS to develop draft regulations and determine what types of analysis might be required under National Environmental Policy Act (NEPA). The Council may wish to provide guidance on whether the regulations should be drafted in a manner allowing states to qualify as observer providers or on other matters.

	Summary: Status and Next Steps
	Prioritized for implementation in 2013.
	NMFS to draft regulations and evaluate need for NEPA analysis.
O	Does the Council have any guidance regarding the development of regulations, particularly with respect to state ability to qualify as an observer provider?

5. Allow a fixed gear permit and a trawl permit to be registered to the same vessel at the same time

Originally, the license limitation program allowed a trawl and fixed gear (longline or fishpot) permit to be registered to the same vessel at the same time (additionally, there are a few permits endorsed for both trawl and one of the fixed gears). At a later time, because of enforcement and/or monitoring needs, regulations were modified to prohibit stacking of trawl permits with permits endorsed for other gears. Since then VMS and declaration systems may have reduced or eliminated the need for this restriction.

The trawl rationalization program was intended to allow vessels to move between the use of trawl and other gears while continuing to operate under the IFQ program (gear switching). Additionally, it allows vessels to participate in the IFQ fishery without ever using trawl gear. However, the flexibility of any vessel that wants to participate in both the IFQ program and the limited entry fixed gear fishery is limited by a limit on the number of times a permit may be transferred to a vessel in any year (one time per year).[2]

One option to address this issue would be to increase the number of transfers allowed per year. This would increase a vessel's flexibility to move between the limited entry trawl and fixed gear fishery and it would also allow more flexibility for vessels to move between the limited entry and open access fisheries, reducing the wall between these sectors. Such a provision would also increase administrative costs. The alternative presented here would keep the current limit on the number of transfers per year but allow a trawl and fixed gear permit to be on the same vessel at the same time. This would reduce administrative costs by reducing the need for vessels to transfer their permits on and off a vessel in order to move between limited entry fisheries. A determination is needed as to whether it would create any enforcement or monitoring complexities.

Status quo: A trawl endorsed permit cannot be on a vessel at the same time together with a limited entry longline of fishpot endorsed permit. A permit may only be transferred to a vessel one time per year.[2]
Alternative: Allow both a trawl permit and a longline or fishpot endorsed permit to be registered to the same vessel at the same time. No change to the number of transfers allowed per year.

[2] The transfer of a permit from a vessel to a vessel "unidentified" status does not count against the transfer limit but if the permit is then transferred to a vessel (whether back to the same vessel from which it was transferred or a different vessel) that transfer counts against the limit. Thus a permit can be moved from and back to the same vessel one time per year.

The Council might consider whether it wants to add an alternative that would increase the number of times a permit may be transferred per year. If this is done, notice should be provided to the fixed gear fleet that they may be affected by this change.

	Summary: Status and Next Steps
	Prioritized for implementation in 2013.
	NMFS to evaluate need for NEPA analysis.
O	Should allowing multiple permits per year be considered as a viable alternative or as an alternative considered but rejected early on?
O	Consider recommendations from the TRREC

6. Change the opt-out requirement for QP deficits (may become standalone item)

(Minor Effort)

Change the opt-out requirement for QP deficits lasting more than 30 days, in order to allow vessels to rejoin the fishery after deficits are cleared. *The following indented text repeats information provided at the September 2011 Council meeting.*

> Any vessel with a documented deficit is prohibited from fishing groundfish and is required to cure the deficit within 30 days. Under the current provision, if a vessel carries a deficit for more than 30 days and the amount of the deficit is within the carry-over allowance, then the vessel can stay within compliance of the program by opting out of the fishery for the remainder of the year. Vessels which do not opt out, but instead incur a violation, are allowed to rejoin the fishery as soon as the deficit is cured. One proposal is to allow a vessel which opts out to re-enter the fishery in the same year if it subsequently covers the deficit. Another proposal is to allow a vessel with a deficit that is within the carry-over limit to continue to fish.

In the following discussion, all references to a vessel's ability to opt-out of the fishery to avoid a violation due to a QP deficit apply only to those deficits which are less than the carryover allowance, unless otherwise noted. Deficits greater than the carryover allowance must be brought to within the carryover allowance before the 30-day clock expires, otherwise the vessel will incur a violation.

Status Quo: Vessels that have carried a known deficit for more than 30 days may avoid a violation by opting out of the fishery for the remainder of the year (so long as the deficit is less than the carryover allowance).
Alternative: Vessels that have carried a known deficit for more than 30 days may avoid a violation by opting out of the fishery (so long as the deficit is less than the carryover allowance). Such vessels may opt back in once they have cured their deficit.

The 30-day clock with the provision allowing vessels to opt-out for the remainder of the year was originally intended to encourage vessels to cover their overages sooner rather than later. However, as described at the September Council meeting, it created a situation in which a vessel which incurs a deficit and goes into violation (exceeds the 30-day clock) is able to re-enter the fishery sooner than a vessel that stays within the provisions of the program by opting out (for the year) before the 30-day clock expires (see following table). At the same time, changing the opt-out requirement (the alternative) might make the 30-day clock for covering a deficit less meaningful (relevant only for those vessels with deficits greater than the carryover provision). The alternative, while resolving the

inequity, eliminates a vessel's incentive for resolving deficits earlier rather than later, except with respect to deficits greater than the carryover allowance. Under the IFQ program, once it is established that a vessel has a deficit it must stop fishing until the deficit is covered. If the vessel is able and chooses to "opt-out," there is no cost in doing so; under the proposed alternative it could opt back in as soon as the deficit is covered, also at no cost. Since the vessel can't fish anyway, the steps of opting out and opting back in don't carry much meaning. This raises the question as to whether the alternative, if adopted, should also eliminate the 30-day provision, except with respect to overages greater than the carryover amount. Vessels with overages greater than the carryover allowance are not able to avoid violation by opting out of the fishery. They must get themselves to within the carryover allowance or face a violation.

Related to this issue, the Council has received public testimony expressing concern about the opt-out provision: it can be difficult to find QP for some species (constraining species) until late in the year and the opt-out provision potentially forces a vessel incurring a deficit for those species to forgo fishing for the entire year if it wishes to maintain a clean compliance history.

Table. Implications of the alternatives for vessels incurring a deficit that is ***within the carryover amount.***

Situation of Vessels Incurring a Deficit	Status Quo	Alternative
Vessel covers deficit within 30 days	Vessel not in violation. Vessel can re-enter as soon as deficit is covered.	Vessel not in violation. Vessel can re-enter as soon as deficit is covered.
Vessel opts out by 30 days and covers deficit later	Vessel not in violation. Vessel must stay out of the fishery the entire year.	Same as above.
Vessel does not opt out and covers deficit later	Vessel in violation. Otherwise same as covering deficit within 30 days.	Vessel in violation. Otherwise same as above.

The trade-off at issue between the two alternatives identified thus far is: resolving the inequity that occurs when vessels that have violated the program are able to re-enter the fishery sooner than vessels that have remained in compliance (resolved by the alternative) in contrast to the incentive to resolve a deficit that is less than the carryover amount before the 30-day clock expires (provided under status quo).

	Summary: Status and Next Steps
	Prioritized for implementation in 2013.
	NMFS to evaluate need for NEPA analysis.
O	Should the alternative also explicitly eliminate the 30 day clock for deficits that are less than the carryover amount?
O	Is there another alternative which is both perceived to be more equitable and maintains the full incentive to comply with the 30 day clock?

7. Revise the calculation of mothership processing ownership

(Minor Effort)

The processing ownership limit is phrased as a usage limit but references ownership.

B-2.2.2.d Usage Limit - No individual or entity owning an MS permit(s) may process more than 45 percent of the total MS sector whiting allocation.

Because ownership is referenced, during the deeming process the Council determined that the individual and collective rules should be applied.

The following indented text repeats information provided at the September 2011 Council meeting.

> The Council set a mothership processing ownership limit of 45 percent with the intent of ensuring there would be at least three buyers available to catcher vessels. However, the regulations were drafted in a manner which reduced the minimum number of buyers to two. Specifically the individual and collective rule used for the IFQ program QS control limits was applied to the processing ownership limits for the co-op program. Applying this rule when there is a limit on only ownership, and not one on control, yields a result different from the stated Council intent. As an example, a single entity could own 60 percent of two entities which each receive 30 percent of all deliveries. That single entity would effectively control 60 percent of the market (effectively control 2 entities which each receive 30 percent of deliveries) and still be within the 45 percent processing ownership cap when the individual and collective rule is applied (60 percent ownership x 2 entities x 30 percent of deliveries = 36 percent). A single buyer could then service the remaining 40 percent of the market, leaving only two buyers in the market, rather than the three intended by the Council. Under a worst case scenario, a single entity could control close to 90 percent of the market. If this situation is a concern, possibilities for resolving this issue include specifying the ownership limit as a control limit or applying an ownership calculation rule other than the individual and collective rule.

While the Council concern has been ensuring at least three independent buyers are available, experience from the 2011 fishery indicates that requiring a minimum number of buyers in this fashion can create a situation in which not enough processors are available for the fleet to harvest its allocation without a processor exceeding its limit. For example, if there are only two independent buyers available and their processing is limited to 45 percent each, then 10 percent would be left unharvested. As part of this action, the Council may wish to consider modifications to the processing limits which would allow the fleet to fully harvest the allocation. For example: under the mothership co-op program, before each season starts every vessel commits its allocations to a particular processor. There is a mutual agreement exception that allows those commitments to be released and transferred to a different processor (with agreement of both the vessels and processors). The control rule might be expanded such that so long as the start of year commitments are within the processing limits, the mutual agreement exception may be exercised in a manner that results in the 45 percent processing limit being exceeded.

Status Quo: Usage Limit - No individual or entity owning a MS permit(s) may process more than 45 percent of the total MS sector whiting allocation.
Strawdog Alternative 1: Change the ownership rule to a control rule so that ownership is not the only type of control which is limited. Maintain the current individual and collective rule for determining the amount of control over processing exerted directly through ownership.
Strawdog Alternative 2: Revise the rule for determining the amount of processing controlled through ownership (METHOD TO BE DETERMINED. An example might be a threshold rule under which any entity which owns a certain percentage (e.g. 50 percent) is considered to effectively own the entire entity for purposes of applying the ownership rule).

Note: if the Council changes its intent from ensuring there will be at least three markets to ensuring there is at least two markets, then it might be that no action is needed on this issue (status quo may suffice).

	Summary: Status and Next Steps
	Prioritized for implementation in 2013.
	NMFS to evaluate need for NEPA analysis.
O O	Identify alternatives for analysis. Consider whether to add an alternative allowing a co-op to deliver amounts in excess of the processing limits, through the mutual agreement exception.

8. Eliminate double filing of co-op reports (November and March)

(Minor Effort)

Currently both mothership and catcher-processor co-ops are required to submit to the Council a preliminary annual report in November and to NMFS a final annual report by March 31 of the following year. Those reports were provided at this meeting under Agenda Item E.6. While the mothership sector provided a presentation at this meeting, in future years the reports might be provided only as information items. Since the fishery is not completed on time for the November meeting and a subsequent final report must be provided by March 31 of the following year, question as been raised about the necessity of providing the preliminary report.

Status Quo: Require that co-ops provide a preliminary annual report to the Council in November and a final annual report to NMFS by March 31 of the following year.
Alternative: Require that co-ops provide only final annual reports for a particular year but require that it be provided to both NMFS and the Council. The annual report must be provided to NMFS by March 31 of the subsequent year. The annual report should be provided to the Council on time for distribution with the April briefing book, i.e. by the briefing book deadline for the April Council meeting (but no earlier than March 10).

	Summary: Status and Next Steps
	Prioritized for implementation in 2013.
	NMFS to evaluate need for NEPA analysis.

9. Move the whiting season opening date (may become standalone item)

(Minor to Moderate Effort)

The TRREC will provide recommendations on this issue based on their October 27 meeting.

	Summary: Status and Next Steps
	Prioritized for implementation in 2013.
	NMFS to evaluate need for NEPA analysis and other needed processes.
o	Respond to TRREC Report

Standalone Priorities

Stand alone priority items are high priority items on which the Council may need to start work well in advance of the identified target implementation date.

10. Reduce observer costs (2013-2014 Implementation)

(Substantial Effort)

Numerous means have been identified for reducing observer costs. One of these is the use of cameras and alternative technologies. Other cost reduction measures include looking at educational requirements and the need for 100 percent observer coverage. The most likely area for rapid progress might be reconsideration of the need for observers on whiting trips and whether cameras might be used instead, as was done in the past for the shorebased whiting fleet. Other changes would likely require more extensive effort and substantial progress is not likely to occur prior to the completion of the biennial specifications process and Council action on PIE 2 issues.

For changes to be in place by the start of 2013, action must be taken by April 2012. However, changes to observer coverage requirements could happen mid-year and still provide relief to the industry. At the same time, there are administrative efficiencies to be gained when regulatory changes are moved through as a package rather than separately.

	Summary: Status and Next Steps
	Prioritized for implementation in 2013 - 2014.
	Substantial progress not likely prior to spring 2012, except possibly for whiting trips,
O	Should consideration of the use of cameras for whiting trips be the first priority item?

11. Adaptive Management Program quota pound allocation (2015 Implementation)

(Moderate to Substantial Effort)

Previously, the GMT has discussed this issue extensively and developed analysis of a number of alternatives. As a first step, the Council may wish to ask the Groundfish Management Team (GMT) to review and update their previous analysis and provide it to the Council, as their workload allows.

	Summary: Status and Next Steps
	Prioritized for 2015. Work to begin.
O	Should the Council prioritize this as a task for the GMT?

12. Revise the widow rockfish QS allocation (2015 Implementation)

(Substantial Effort)

Originally slated for 2015, the mop-up panel has now determined that widow rockfish may be rebuilt. If this is confirmed through the Council process, the Council may wish to consider alternatives for reallocation at this time. QS trading starts in 2013, so it would be useful for QS traders to know what might be expected with respect to reallocation. The following are a few stawdog alternatives to consider (Note: For simplicity, examples in the following alternatives reference 100 percent of the QS. In fact, 10 percent of the QS is in the adaptive management program. Therefore the percentages referenced would need to be adjusted to take into account the 10 percent set-aside for adaptive management):

Status quo. No reallocation. Allow reallocations to occur through QS trading among QS holders.

Strawdog Alternative 1: Full Reallocation. Complete reallocation QS based on catch history using the same formulas used for the original allocation of target species QS (based on permit history from 1994 through 2003).

Strawdog Alternative 2: Pounds neutral reallocation. Based on rebuilt status, the trawl allocation for widow will likely increase substantially in 2012. Determine the percentage of the total QS that would result in an individual holding QS in 2013 receiving the same amount of QP they received in 2012. For example, if the 2012 trawl allocation was 600 mt and the new allocation will be 1,200 mt, if everyone keeps 50 percent of their QS then they will receive the same amount of nonAMP QP in 2013 that they did in 2012. This would leave 50 percent of the nonAMP QS for redistribution based on the allocation formula specified in Alternative 1.

Strawdog Alternative 3: Split the Difference. Same as Alternative 2 but reallocate only one half the difference between full reallocation and pounds neutral reallocation. For the example provided in Alternative 2 this would mean that 25 percent would be reallocated based on the Alternative 1 formula, and everyone would experience a 50 percent increase in the amount of nonAMP QP they receive as compared to 2013, i.e. 75 percent (50 percent plus 25 percent) of the QS would not be reallocated

Note: Because Alternative 1 would reduce the annual amount of QP received by some individuals, as compared to the 2011 and 2012 fisheries, Alternative 1 might entail the need for more rigorous analysis thanthe Alternatives 2 or 3.

	Summary: Status and Next Steps
	Prioritized for 2015 in anticipation of rebuilding in 2015.
	Mop-up panel found the stock to be rebuilt.
O	Should deliberations on this be accelerated if widow is declared rebuilt?

Trailing Actions for PIE 3 (2014 Implementation)

The following issues have been slated for PIE 3, to be implemented by 2014. No new information is provided on these issues at this time. The information below is from September 2011 Council documents.

13. Observer coverage exemption when testing trawl gear

(Minor Effort)

Trawl vessels have inquired into the requirements for testing trawl gear or adjusting the trawl net at-sea, with and without trawl doors deployed and without a cod end attached. Currently, it is recommended that the vessel declare into the IFQ fishery and obtain observer coverage.

14. Add a VMS declaration code for "transiting" with gear stowed

(Minor Effort)

If a vessel is strictly transiting between ports with gear stowed, the current regulatory interpretation is that the vessel must declare "other" through the VMS phone-in declaration system and observer coverage is not required. The development of a

VMS declaration code for "transiting" would provide more accurate reporting and monitoring.

15. Consider revisions to weight conversion factors based on new information

(Minor Effort)

Coastwide standards may be needed or need revising for some species. Also, consider a conversion factor for glazed fish.

Trailing Actions for PIE 3 – NMFS List (2014 Implementation)

16. Longterm resolution of QP surplus carryover provision (may become standalone item)

If it is determined that the surplus QP carryover provision creates a problem with respect to annual catch limit (ACL) requirements, develop a long-term solution.

17. Observer coverage on vessels processing groundfish at-sea

Correct regulations to require observer coverage for all vessels processing groundfish at sea (with some exceptions).

18. Clarify sablefish at-sea processing exemption for the IFQ fishery

The Council prohibited processing under the IFQ program except as already specifically allowed under the groundfish regulations. The groundfish regulations contained a prohibition against processing in the primary limited entry fixed gear sablefish fishery but grandfathered in existing processing vessels. There is one vessel that qualified for this exemption. This vessel is allowed to process sablefish taken during the primary sablefish season. The Council action on the IFQ program was interpreted as intending to allow this fixed gear processing vessel to also process in the trawl IFQ program, if it chose to enter that fishery. At present it cannot enter that fishery except by transferring its fixed gear permit off the vessel. This would invalidate the vessel's exemption from the processing prohibition. If the Council wishes to provide this vessel an opportunity to process in the trawl IFQ fishery, an adjustment to the regulations may be needed. Alternatively, if it becomes permissible for a trawl permit to be stacked with a fixed gear permit, then this fixed gear vessel will be able to process fish caught under the trawl IFQ program during the period of time the fixed gear primary season is open. If it is the Council's intent that this vessel should be allowed to process in the IFQ program, then the Council may wish to consider whether it is appropriate to extend the grandfather provision beyond the duration of the limited entry primary season for the purpose of participating in the trawl IFQ program.

19. Clarify fishery closure language

Consider adding trawl closure to automatic actions at 660.60(d). Specify how to address closure of a fixed allocation versus a set-aside.

20. Language describing whiting season start dates

Review the regulatory language describing the whiting season start dates. This issue is separate from changing the start date.

21. Reducing site inspection requirements

Revise the site inspection requirements for reissuance of first receiver site license such that an inspection is not required if there have been no changes to the catch monitoring plan.

22. Catch monitor briefings

Revise the catch monitor certification requirements to broaden the scope of monitor briefings.

23. QS transfer regulations

In preparation for the start of QS trading, NMFS needs to review regulations on transfers of quota share (QS) and may be providing recommendations on changes.

24. Permit renewal dates

Revise renewal process for limited entry permits, vessel accounts, and QS permits to start by September 15 each year.

25. Landing/offload language

Revise landing/offload language for limited entry fixed gear and open access to state all fish must be off vessel before next trip.

26. General at-sea processing prohibition—except whiting and existing exceptions (may become standalone item)

Add a prohibition on processing groundfish at-sea for other sectors (limited entry fixed gear and open access)

Issues Tentatively Slated for Biennial Specifications

27. Clarification of catch accounting among sectors

(Minor to moderate effort, depending on need for committee work)

There is currently some confusion regarding whether the groundfish catch of a limited entry permitted vessel (trawl, not fishing under the IFQ program, or fixed gear) and using open access gears counts against the limited entry allocation or the open access allocation.

28. Consider allowing multiple gears onboard a vessel participating in the IFQ fishery

(Minor Effort)

At its September 2011 meeting, the Council specified this as a PIE 2 priority and assigned it for review by the Trawl Rationalization Regulatory Evaluation Committee (TRREC) but also included it under the biennial specifications process. The TRREC will provide recommendations on this issue based on their October 27 meeting.

29. Allow trawl gear modifications that increase efficiency and selectivity

(Minor to Moderate Effort)

At its September 2011 meeting, the Council specified this as a PIE 2 priority and assigned it for review by the TRREC but also included it under the biennial specifications process. The four seam net issue is included here but the chaffing gear issue is included as a separate item. The TRREC will provide recommendations on this issue based on their October 27 meeting.

30. Chaffing Gear

At its September 2011 meeting, the Council specified this as a PIE 2 priority but also included it under the biennial specifications process and for possible inseason action.

31. Sablefish and Lingcod Survival Credits and Lingcod Size Limit

Because 100 percent of the IFQ species catch by trawl vessels is counted against QP (with the exception of Pacific halibut) small sablefish are being caught and retained (rather than discarded). Fishermen believe it would be of biological and economic benefit to discard small sablefish (for which some discard survival is expected) and receive credit for discard survival. With respect to lingcod, fishermen are forced to discard small lingcod because of the lingcod size limit but receive no credit for discard survival. This issue might be partially addressed by lowering or removing the lingcod size limit. Discard survival credit for lingcod could also be considered. These issues were raised during the trailing action discussion at the September Council meeting but prioritized for action as part of the biennial specifications.

Candidate Trailing Actions from September 2011 Not Prioritized for Active Status

Text for each of these items is the same as was provided at the September 2011 Council meeting.

32. Revising the Carryover Percent

"The percentage used for the carryover provision may be changed during the biennial specifications process" (*Amendment 20, Section A-2.2.2.b*). (Minor to Moderate Effort)

33. Revising the Unused QP Limits

"The vessel unused QP limits may be revisited in the first biennial specifications process after implementation of the program." (*Amendment 20, Section A-2.2.3.e*). (Minor to Moderate Effort)

34. Revisions to the initial QS/IBQ allocations

a. Revise the yelloweye QS allocation. (Substantial Effort)

b Revise the QS allocations for other overfished species--other than canary rockfish (which was revised prior to implementation), widow rockfish (see Item 12), and yelloweye rockfish (see Item 34.a.) *(September 2010 Council discussion and GAP Report)*. (Substantial Effort)

c. Revise the initial allocation of Pacific Halibut IBQ (not the intersector allocation). (Substantial Effort)

35. Observer coverage exemption when stowing gear at-sea

April 2011 Agenda Item E.6.b, EC report. (Minor to Moderate Effort)

Pot vessels often have more gear at-sea than can be carried on the vessel on a single trip. In some situation, it may be more cost-effective for vessels to move pot gear without retaining fish, if that would allow the vessel to have an exemption from the requirement to carry an observer.

36. Provisions for pot vessel activity across management lines on the same trip

Based on public comment. (Minor Effort)

When moving between management areas, it would be efficient for these vessels to pull gear and move it to the new area before delivering their fish. However, this would be considered fishing in two management areas on the same trip, which is a violation. There may also be a need for pot gear at-sea storage areas.

37. Changes to the RCA boundaries

March 2011 Agenda Item H.5.b, and April 2011 Agenda Item I.7.b, GAP Reports. (Moderate to Substantial Effort)

The GAP has proposed that boundaries of the RCA not be eliminated at this time, but be relaxed so fishermen can experiment using modified gear types in areas that are now closed to reduce bycatch and more selectively access target species.

38. Clarify difference between the "cease fishing report" for whiting and a similar report for observer program

April 2011, Agenda Item I.7.b, Supplemental NMFS Report 2. (Minor Effort)

PFMC
10/13/11

POLICY AND REGULATION ON ALLOCATIONS UPON REBUILDING THAT AFFECT WIDOW ROCKFISH ALLOCATIONS

Intersector Allocation (Amendment 21)

Amendment 21 Language on Widow Rockfish Allocation

Initially allocate 52% of the total LE trawl allocation of widow rockfish to the whiting sectors if the stock is under rebuilding or 10% of the total LE trawl allocation or 500 mt of the trawl allocation to the whiting sectors, whichever is greater, if the stock is rebuilt. If the stock is overfished when the initial allocation is implemented, the latter allocation scheme automatically kicks in when it is declared rebuilt. The distribution of the whiting trawl allocation of widow to individual whiting sectors will be done pro rata relative to the sectors' whiting allocation.

Related Regulatory Language on Widow Rockfish Allocation 660.55(c)(i)

(C) Widow rockfish. Allocate 52 percent of the total trawl allocation of widow rockfish to the whiting sectors if the stock is under rebuilding or 10 percent of the total trawl allocation or 500 mt of the trawl allocation to the whiting sectors, whichever is greater, if the stock is rebuilt. The latter allocation scheme automatically kicks in when widow rockfish is declared rebuilt. The distribution of the whiting trawl allocation of widow to each sector (MS, C/P, and IFQ) will be done pro rata relative to the sectors' whiting allocation. After deducting allocations for the whiting fisheries, allocate the remainder of the trawl allocation to the nonwhiting fishery.

Trawl Rationalization (Amendment 20)

QS Reallocation on Rebuilding

Reallocation With Change in Overfished Status: When an overfished species is rebuilt or a species becomes overfished there may be a change in the QS allocation within a sector (allocation between sectors is addressed in the intersector allocation process). When a stock becomes rebuilt, the reallocation will be to facilitate the re-establishment of historic target fishing opportunities. When a stock becomes overfished, QS may be reallocated to maintain target fisheries to the degree possible. That change may be based on a person's holding of QS for target species associated with the rebuilt species or other approaches deemed appropriate by the Council.

There is no related regulatory language.

Trawl Rationalization Trailing Actions

Agenda Item E.7

Council Action

- Provide guidance on trailing action issues as listed in E.7.a Attachment 1
  - Needed at the end of the day
    - Alternatives to analyze for each issue being moved forward
    - Workload guidance
      - If everything cannot be ready for final action in April which are the higher/lower priorities

Related Materials

- E.3.a, Attachment 4 – Central coast proposal to replace observers with cameras on fixed gear vessels and trawl vessels operating outside the RCA.

- E.9.b, NMFS Report – Recommendations that a number of items slated for the biennial specifications be handled under separate rule makings.

E.7.a, Attachment 1

- Introduction - page 1
  - Flexibility on PIE Rule 3 (2014 Priorities)
  - Set Aside Flexibility
  - Impacts on Nontrawl Sectors

- Table of Contents – pages 2 and 3
  - List of issues and time frames
  - Categories
    - Ongoing Issues
    - PIE 2 (2013)
    - Stand Alone (2013-14, 2015)
    - PIE 3 (2014)
    - Tentatively in Spex (2013)
    - Not prioritized
- Under each issue for 2013 and stand alone priorities a summary is provided of what needs/might be done
  - Under all items for 2013 alternative for analysis are needed.

Ongoing Activities (Started in 2010)

1. Cost recovery – final action on structure taken, ongoing work on regulations, analysis, and fees and meetings of CRC to be held
2. Control rule safe harbors
   a. CFAs – tabled
   b. Risk pools – final action taken and ongoing work (analysis and regulation drafting and deeming)
   c. Lenders – for this meeting
3. Other Lender Issues (3rd party verification, lien registry, and unique identifiers)

With Regard to Ongoing and PIE 2 Issues (Implementation for 2013)

Detail on

- Lender Issues
- Mothership Processing Limits

Lender Issue: Control Rule Safe Harbor (1)

- Who qualifies
  - Status Quo – exclusion from some provisions for "banks and other financial institutions that rely on QS or IBQ as collateral for loans"
  - Straw Dog Alt 1 – adds "state or federally chartered"
  - Straw Dog Alt 2 – expands to any person relying on QS as collateral
  - Straw Dog Alt 3 – maintains status quo but adds an amplification
    - Regularly and primarily involved in lending
    - Not engaged in fish harvesting, processing, or distribution

Lender Issues: Control Rule Safe Harbor(2)

What is the lender exclusion: Status Quo control provisions

No Lender Exclusion Provided	Lender Exclusion Provided
(A) & (B) directs the business of an entity or authority over director, board, partners etc.	(E) Any activity related to quota
(C) Prevents or delays quota transfer (shares or pounds)	(F) Controlling management of the entity or being a controlling factor
(D) Through loan covenants affects day to day business activities	(G) Cause or prevent sale, lease, or other disposition of quota
(H) Any other means of control over shares	

Some confusion about overlaps between

(C) and (E), (C) and (G), (D) and (E)/(F), (A/B) and (F).

Strawdog 1. Provide lenders an exclusion for (C).

Strawdog 2. Eliminate exclusion for everything but (C) and provide a clause in all other sections excluding lender activities covered under (C)

2a. Under (C) exclude lender control over shares but not pounds.

Strawdog 3. Add lender exclusion for all paragraphs.

Mothership Processing Limit

- Policy – Minimum of 3 markets.
  - Ended up with minimum of 2 markets.
- Provision is: no entity owning MS permits may process more than 45% of the sector's whiting.
- What happened? The individual and collective rule was applied to an ownership limit.

  Under IFQs, the rule is applied to a control limit and has a different effect.

Calculation of Processing Limit

	Portion of Deliveries Received	Portion of Each Company Owned by Entity #1	Individual and Collective Rule Applied
Company A	30%	60%	18%
Company B	30%	60%	18%
Company C	40%	0%	0%
Entity #1 Ownership of Processing			*36%*

- Applying individual and collective rule to ownership limit, Entity #1 is at 36%
- But Entity #1 effectively controls Company A and B (60%) (only 2 markets)
- There is not a control rule, just an ownership rule.

- Under a control rule,
  - The Individual and Collective Rule for evaluating ownership control is only the first step in evaluating control.
  - Entity #1 would be found to control 60% of the processing (30% + 30%)

Mothership Processing Limit Alternatives

- Status Quo (revise policy objective from a minimum of 3 markets to 2 markets)
- Strawdog Alt 1: Change the ownership rule to a control rule
- Strawdog Alt 2: Revise the rule for determining the amount of ownership (e.g. a threshold rule, if an entity owns more than 50% of a company then all processing by the company would count toward that entity. If less than 50%, none would count).

Another Issue Closely Related to Policy Objective on Number of Markets

- Each year before the season starts catcher vessels commit themselves to a particular mothership processor
  - these commitments must comply with the 45% processing ownership limit
- If some mothership processing capacity does not arrive, the mutual agreement exception allows processors to release catcher vessels from their commitments (to deliver to a different mothership processor)
- What happens if catcher vessels cannot use the mutual agreement exception to go to another processor because the only other processor available is already at 45%?
- This is another way in which the objective of providing markets could be frustrated by the ownership limit provision.

- Should this be addressed as part of this issue?

Workload Planning

Issue From E.7.a Attachment 1	
1. Cost Recovery	Regulation drafting, fee levels being worked on, CRC
2.b. Risk pool safe harbor	Regulations and EA to be drafted
2.c. Lender safe harbor	NEPA-Categorical Exclusion
3. Other lender issues (verification, lien registry and unique identifiers)	NEPA-Categorical Exclusion
4. New observer providers	NEPA-Categorical Exclusion
5. Trawl/FG Permit Stacking	NEPA-EA – relatively small EA
6. 30-day opt-out provision	No further NEPA
7. MS processor ownership	No further NEPA – work depends on options
8. Double filing co-op reports	No Further NEPA
9. Move whiting season start	NEPA-EA
10. Reduce observer costs (13-14)	NEPA-EA? (NMFS has not determined)
11. AMP (2015)	NEPA-?? (NMFS has not determined)
12. Widow QS Realloc (2015)	NEPA-?? (NMFS has not determined)
Items from spex? 28. Multiple gears on board. 29. Trawl gear regulations. 30. Chafing gear.	NEPA-EAs

Issue From E.7.a Attachment 1	
1. Cost Recovery	
2.b. Risk pool safe harbor	
2.c. Lender safe harbor	GAP
3. Other lender issues (verification, lien registry and unique identifiers)	GAP
4. New observer providers	GAP
5. Trawl/FG Permit Stacking	GAP, TRREC
6. 30-day opt-out provision	Include alt from Att#1 and EC report.
7. MS processor ownership	Remove
8. Double filing co-op reports	Yes - Move forward
9. Move whiting season start	GAP, TRREC
10. Reduce observer costs (13-14)	Yes - Move forward
11. AMP (2015)	Yes - Move forward
12. Widow QS Realloc (2015)	Yes - Move forward – *on the 2015 schedule*
From spex? 28. Multiple gears on board. 29. Trawl gear regulations. 30. Chafing gear.	GAP, TRREC – All 28, 29, 30 to go forward together GAP GAP, TRREC
Set-asides – action on process	

ENFORCEMENT CONSULTANTS REPORT ON TRAWL RATIONALIZATION TRAILING ACTIONS

The Enforcement Consultants (EC) have reviewed Agenda Item E.7.a, Attachment 1, November 2011 and have the following comments.

Trailing Action Issue 5: Allow a fixed gear permit and a trawl permit to be registered to the same vessel at the same time.

The EC recommends the alternative to allow both a trawl and a longline or fish pot permit to be registered to the same vessel at the same time. No change to the number of transfers allowed per year. The EC concurs with the analysis that Vessel Monitoring System and the declaration systems have reduced or eliminated the need for this restriction.

If this alternative is adopted, the EC strongly encourages industry leaders to impress upon their membership the importance of maintaining the proper declaration that accurately reflects their fishing activity. Accuracy with the declaration process is both legally required and vital to the analysis of effort by fishery managers.

Trailing Action Issue 6: Change the opt-out requirement for quota pound deficits.

The EC endorses the proposed alternative. Vessels that have carried a known deficit for more than 30 days may avoid a violation by opting out of the fishery (so long as the deficit is less than the carryover allowance). Such vessels may opt back in once they have cured their deficit.

To date there have been three events where a vessel was in deficit and approached the 30-day time period before covering their deficit. In two of these cases the deficit involved target species, and the vessel did not cover the deficit because it was participating in another fishery and chose to wait until the end of the 30-day period before covering their deficit. In the third situation, the deficit involved a large quantity of an overfished species. In all three situations the deficits were larger than the carryover amount (10 percent) and the vessels were not eligible to opt out.

The initial experience has demonstrated, at least in the short term, that opting out is not going to be a widely-used strategy, and thus may not create the tracking burden that some anticipated.

The EC does not support altering the 30-day clock requirement. With over 2400 landings occurring in the Trawl Rationalization fishery this year, there have been hundreds of deliveries incurring a “short-term” deficit. In the EC report under Agenda Item E.6, it was noted that the fleet has fished while in deficit 60 times, involving 30 vessels. After investigation and questioning of the affected vessels it appears the fleet was well aware of the 30-day clock requirement and less aware of the prohibition on fishing while in deficit. The prohibition on fishing while in deficit seems to be less of an incentive to cover deficits in a timely manner, and it is the 30-day clock requirement that has created the incentive to cover deficits in a timely

manner. Removal or extension of the 30-day period may significantly erode this incentive and should not be modified.

Trailing Action Issue 10: Reduce observer cost.

The analysis for this action considers the need for observers on whiting trips and whether cameras might be used instead. Others have suggested the interest in electronic monitoring extends beyond the whiting fleet and also includes fixed gear and traditional groundfish trawl. The EC position on cameras versus observers is well-documented (see June 2009 PFMC EC statement E.10.b).

"The EC recommends 100 percent observer coverage be deployed to achieve catch monitoring goals."

We recognize that our position, as stated, is influenced by our experience in the Shoreside Whiting exempted fishing permit over the past decade, (prior to trawl rationalization) where cameras were evaluated for their enforcement monitoring capability. The objective in that program was enforcing the maximum retention requirements using cameras as the monitoring tool. We were not successful in enforcing the maximum retention requirements for a number of reasons, including: problematic regulatory language, stated safety concerns as a reason for the discard, and the adequacy of the camera image as evidence. To date, no violations have been successfully prosecuted based solely on onboard camera evidence.

Under a rationalized fishery, with individual accountability for all catch (retained and discarded) enforcement of full retention, maximized retention, or some other defined level of retention is not the primary concern. There will be discards, small, large, intentional, unintentional, accidental, as a result of safety concerns, at night, during the day, and others. Considerations of how a camera can accurately determine the species and accurate weight of a discard are critical to the effectiveness of the program.

The use of cameras has been portrayed as a cost savings alternative. Those costs should be fully captured to accurately reflect any assumed savings. In most analysis, the cost of the system is accounted for, however, the cost of analysis may be underestimated. Someone has to collect and review the footage. The footage may be viewed by several entities to accurately determine what has been recorded. Beyond cost, it is a matter of accuracy and ultimately, a matter of risk.

The EC's role is to advise the Council on enforceability and effectiveness of regulations. The EC advises that the use of cameras does not have the same level of certainty that a fully-observed fishery would have. However, the level of certainty required for effective management should be not be decided by state and Federal enforcement, but by other entities such as the National Oceanic and Atmospheric Administration (NOAA) Science Center, NOAA Sustainable Fisheries Division, and/or industry.

PFMC
11/4/11

GROUNDFISH ADVISORY SUBPANEL REPORT ON TRAWL RATIONALIZATION TRAILING ACTIONS

The Groundfish Advisory Subpanel (GAP) received a report from Mr. Jim Seger on trawl rationalization trailing actions, and offers the following recommendations and comments on prioritization.

The GAP notes that all of the items listed in Agenda Item E.7.a Attachment 1 are important for the fleet and it was difficult to prioritize among them. We attempted to identify issues where urgent action is needed, as well as issues that have important implications for a large segment of the fleet.

Priority items for implementation in 2012

Whiting chafing gear - Before discussing priority items for implementation in 2013, the GAP wishes to highlight that chafing gear definitions for the whiting fishery need to be fixed in time for the 2012 whiting season. Currently, due to an inadvertent regulation change that is unsupported in the record, many whiting codends have illegal chafing gear. The GAP statement and the Council discussion at the September 2011 meeting clarified that the current chafing gear definition was never intended to apply to the mid-water whiting fishery. It is imperative that this regulation be corrected in a timely manner with the greatest of efficacy. As such, we recommend it not be tied to the biennial specifications process.

Priority items for implementation in 2013

Recognizing that Council staff time is limited, and that time constraints may potentially limit analysis of some of the actions listed here, the GAP presents the following list in priority order. The numbering comes from Agenda Item E.7.a Attachment 1.

10) Reducing observer costs – This is the highest priority for the GAP. Observer costs, coupled with all of the other costs impacting the fleet (e.g., buyback loan, high diesel prices, cost recovery), along with the transition to a new management regime have the potential to increase consolidation and limit profitability.

One promising way to reduce observer costs is with new technology, particularly electronic monitoring. Electronic monitoring is likely to not only reduce monitoring costs, but also increase flexibility in timing of fishing trips, reduce insurance requirements, free up deck and bunk space, and provide a safer fishing experience. The GAP discussed the electronic monitoring proposal put forward by the Central Coast Sustainable Groundfish Association which recommends authorizing electronic monitoring for any vessel fishing outside the Rockfish Conservation Area (RCA) that retains all individual fishing quota (IFQ) catch. Cameras would be utilized to ensure no discard occurred at the rail. The GAP believes that the proposal shows promise and recommends forwarding it for analysis. Likewise, it may also be feasible to monitor mothership (MS) catcher vessels (CVs) with cameras rather than observers.

6) Opt-out requirement for QP deficits – Modifying the opt-out requirement is a major priority for the GAP, and we discussed it at length. In general, the GAP continues to believe that a penalty for those who do not cure deficits within 30 days is draconian, as the requirement to quit fishing until the deficit is cleared is already a significant penalty. The GAP further notes that curing deficits on some species within 30 days may be impossible early in the year.

The GAP recommends forwarding three options for analysis.

1: Vessels that have a known deficit for more than 30 days may avoid a violation by opting out of the fishery, provided the deficit is within the carryover allowance. Such vessels may opt back in once the deficit is cured. This provides some flexibility to the fleet without any conservation implications.

2: Vessels that have a known deficit for more than 90 days should be able to opt out of the fishery without violation, provided the deficit is within the carryover allowance. Such vessels may opt back in once the deficit is cured. This provides greater flexibility than that described in option 1.

3: Vessels can opt out and opt back in without penalty at any time during the year after the deficit is cleared. This option provides the fleet with the greatest flexibility and doesn't appear to raise any conservation concerns.

For all three options, the deficit must be within the carryover allowance.

3) Lender issues –The GAP dealt with this issue by addressing the scope of the exemption first and recommends alternative 2 with sub-option 2a. The primary focus of the lender safe harbor should be to protect a lender's collateral, and alternative 2 with sub-option 2a provides for that without unduly broadening the exemption.

Regarding which entities qualify for the exemption, the GAP recommends alternative 3. Alternative 3 provides an exemption for entities regularly or primarily engaged in the business of lending and not engaged in or controlled by entities whose business includes the harvest, processing, or distribution of fish or fish products. Coupled with the narrow scope language chosen above, the GAP believes this exemption will appropriately restrict the safe harbor to legitimate lenders who only seek to use quota for collateral purposes.

The GAP also recommends that legitimate lenders who meet the exemption above, but that are not state or federally chartered banks or other financial institutions, be required to disclose ownership interest, subject to the 2 percent *de minimis* exception already included in the trawl program. That is, owners with an interest less than 2 percent would not be required to disclose ownership information.

Consistent with our September 2011 comment, the GAP supports a centralized lien registry for the IFQ program. Because a lien registry is not likely to be developed, the GAP suggests providing for a lender field in the quota share ownership records. This would require notification of and authorization from a lender who is listed before quota share could be transferred. It would

have no effect on quota pound transfers or disposition. This protects the lender from a borrower using the same quota to collateralize a number of different loans. This also does away with the need for unique identifiers.

4) Certification of new observer providers – The GAP believes this is an important issue, and that National Marine Fisheries Service (NMFS) should develop regulations to allow entities to qualify as West Coast observer providers without also having to qualify as North Pacific observer providers. Having an adequate number of observer providers should help ensure that there are enough observers in ports and also maintain competition for the provision of monitoring services.

29) Trawl gear modifications that increase efficiency and selectivity – The GAP strongly supports Trawl Rationalization Regulatory Evaluation Committee (TRREC) recommendation #6 found in Agenda Item E.7.b Supplemental TRREC Report. Current trawl gear regulations may impair innovations that would allow the fleet to better avoid overfished and constraining stocks. For example, emerging data suggests that a four-seam net provides much better water flow enhancing rigidity and thereby selectivity of excluder devices. The GAP notes that currently these regulations are dealt with in the biennial specifications process. The GAP recommends moving them to the trailing action process.

12) Revising the widow rockfish QS allocation – Widow rockfish reallocation is a major GAP priority. The GAP recommends forwarding all three options for analysis.

9) Whiting season start date – The GAP supports the TRREC recommendation for a single May 15 start date for the entire fishery. Under a rationalized fishery, it does not make sense to have varying start dates in different areas. The GAP notes that final action is probably not needed on this item until June 2012, as implementation is not needed until the spring of 2013. The GAP also supports reviewing the overall whiting fishery management regime, including consideration of moving towards a year round fishery. If this adds significant workload, it should remain a priority for the TRREC to address for implementation in the Program Improvements and Enhancements (PIE) 3 rule or beyond.

5) Allow fixed gear and trawl permits to be registered to the same vessel at the same time – The GAP understands that this would not require significant time investment and would clear up an inefficiency in the system.

<u>Other items including TRREC recommendations not listed above</u>

The following items, while they may be important, did not rise to the priority level of those listed above, which the GAP believes need to be addressed as soon as possible.

MS processing history – The GAP supports the following modification. No single MS permit may process more than 45 percent of the MS sector allocation, except if a MS permit and a MS CV permit to which it is obligated, reach mutual agreement. Then the MS CV permit may be obligtated to any other MS permit, including a MS permit that is otherwise capped at 45 percent.

Double filing of co-op reports – The GAP supports changing the co-op annual reporting requirement which is unnecessarily duplicative and redundant. The GAP recommends the alternative described in E.7.a Attachment 1 for a final annual report to be provided to the Council and NMFS in March of each year.

Multiple gears on board – The GAP supports this recommendation. It will provide more flexibility for fishermen and poses no threat to the resource, since all trips will be observed and quota is required to cover all catch.

Fishing in multiple management areas in a single trip - Providing a means to fish in two or more management areas will be important for the long-term success of the program, especially now that multiple area stock management seems to be proliferating. For example, fishermen whose grounds include those near the newly-enacted separate quota areas for lingcod may now have to change trips or even tows.

RCAs – It is a major GAP priority to begin to reconfigure RCAs. RCAs were established to limit the fleet's likelihood of exceeding overfished species OFLs under a very different management regime. Under the new system, the incentives are such that individual fishermen are extraordinarily risk averse. At the same time, the RCA may contain areas where some species could be sought with less bycatch of sensitive stocks than currently occurs in lawful fishing areas.

Length endorsement – The GAP believes this may be a contentious issue, and at present it is not a major constraint on the program. As such, it is a low priority for the GAP.

Adaptive management program – The GAP continues to believe this is not a priority at this time. We recommend rolling over the Adaptive Management Plan indefinitely subject to a need being shown.

Finally, the GAP requests that the council direct the TRREC to continue to meet to recommend additional modifications and priorities to help the trawl rationalization program function more smoothly.

PFMC
11/5/11

Agenda Item E.7.b
Supplemental NMFS Report
November 2011

NMFS' Preliminary Determinations on the Appropriate Level of NEPA for Trailing Actions

Trailing Action	New draft analysis prepared so far	Related analyses	Preliminary NEPA Determination
1. Lender Issues (revise control rules & other issues)	Nov 2011 – E.7.a: Trailing Action Priorities and Status	Am 20 EIS	CE
2. Allow a fixed gear permit and a trawl permit to be registered to the same vessel at the same time	Nov 2011 – E.7.a: Trailing Action Priorities and Status Sep 2011– G.8.a, Att. 1, #15	Am 20 EIS, app A	EA
3. Change the opt-out requirement for QP deficits	Nov 2011 – E.7.a: Trailing Action Priorities and Status Sep 2011– G.8.a, Att. 1, #16	Am 20 EIS	No further NEPA
4. Revise the calculation of mothership processing ownership	Nov 2011 – E.7.a: Trailing Action Priorities and Status Sep 2011– G.8.a, Att. 1, #17	Am 20 EIS	No further NEPA
5. Move the whiting season opening date	Nov 2011 – E.7.a: Trailing Action Priorities and Status Sep 2011– G.8.a, Att. 1, #19	Am 20 EIS, 1997 SAFE doc	EA
6. Consider allowing multiple gears onboard a vessel participating in the IFQ fishery	Nov 2011 – E.7.a: Trailing Action Priorities and Status Sep 2011– G.8.a, Att. 1, #26	Am 20 EIS	EA
7. Allow trawl gear modifications that increase efficiency and selectivity	Nov 2011 – E.7.a: Trailing Action Priorities and Status Sep 2011– G.8.a, Att. 1, #27		EA
8. Chaffing Gear	Nov 2011 – E.7.a: Trailing Action Priorities and Status	1994 EA	EA

	Sep 2011– G.8.b, Supplemental NMFS Report 3: Regulatory History on Chafing Gear		
9. Sablefish and Lingcod Survival Credits and Lingcod Size Limit	Nov 2011 – E.7.a: Trailing Action Priorities and Status		EA
10. Eliminate double filing of co-op reports (November and March)	Nov 2011 – E.7.a: Trailing Action Priorities and Status Sep 2011– G.8.a, Att. 1, #18	Am 20 EIS	No further NEPA
11. Observer coverage on vessels processing groundfish at-sea	Nov 2011 – E.7.a: Trailing Action Priorities and Status	Am 20 EIS	No further NEPA
12. Clarify sablefish at-sea processing exemption for the IFQ fishery	Nov 2011 – E.7.a: Trailing Action Priorities and Status	Am 20 EIS	CE
13. Clarify fishery closure language	Nov 2011 – E.7.a: Trailing Action Priorities and Status	Am 20 EIS	Undetermined
14. Develop a process to certify new observer providers	Nov 2011 – E.7.a: Trailing Action Priorities and Status Sep 2011– G.8.a, Att. 1, #7	Am 20 EIS	CE
15. Language describing whiting season start dates	Nov 2011 – E.7.a: Trailing Action Priorities and Status	Am 20 EIS	No further NEPA
16. Reducing site inspection requirements	Nov 2011 – E.7.a: Trailing Action Priorities and Status	Am 20 EIS	CE
17. Catch monitor briefings	Nov 2011 – E.7.a: Trailing Action Priorities and Status	Am 20 EIS	No further NEPA
18. QS transfer regulations	Nov 2011 – E.7.a: Trailing Action Priorities and Status	Am 20 EIS	Undetermined
19. Permit renewal dates	Nov 2011 – E.7.a: Trailing Action Priorities and Status	Am 20 EIS	No further NEPA

TRAWL RATIONALIZATION REGULATORY EVALUATION COMMITTEE REPORT ON TRAILING ACTIONS

The Trawl Rationalization Regulatory Evaluation Committee (TRREC) met October 27, 2011 to address the trawl fishery regulatory issues identified at the September 2011 Council meeting. The consensus recommendations of the group are presented in the following.

Allowing limited entry trawl and fixed gear permits to be stacked on a vessel

Recommendation 1: Allow a trawl gear permit to be stacked on a vessel which has a limited entry fixed gear permit(s) and *vice versa* (for example, allow a trawl permit to be stacked on a vessel with up to three fixed gear permits and allow from one to three fixed gear permits to be stacked on a vessel with a single trawl permit), and

a) use the established declaration process to specify for enforcement and monitoring purposes which permit is being used or if fishing is being conducted in the open access fishery, and
b) retain the current permit transfer limitation of once per year.

Rationale: Current regulations prohibit stacking of trawl and fixed gear permits on single vessels. This change would facilitate use of trawl and fixed gear by single vessels that wish to move between the individual fishing quota (IFQ) and limited entry fixed gear fisheries. The current declaration process would be used to notify National Marine Fisheries Service (NMFS) whether the vessel is fishing in the IFQ fishery or in the non-IFQ fixed gear fishery. Permit holders would be limited to the current once per year permit transfer provision in order to minimize administrative costs associated with permit transfer process (though some increase in activity will occur).

The committee noted that it should be permissible to stack trawl and fixed gear permits on the same vessel regardless of whether the first permit placed on the vessel is a trawl permit or a fixed gear permit.

Allowing multiple gears on board

Recommendation 2:

a) Remove trawl gear type (bottom and midwater) use and possession (on board) restrictions shoreward and seaward of the Rockfish Conservation Area (RCA), and
b) allow use--with declaration--of mid-water trawl gear for all IFQ species within the RCA and groundfish essential fish habitat (EFH) conservation areas coastwide year round, except whiting would also be subject to whiting regulations. Possession of midwater trawl gear on board within the RCA or groundfish EFH conservation areas would not require declaration, but when midwater gear is used within the RCA or groundfish EFH conservation areas that is the only gear which may be used on the trip.

Rationale: Current trawl regulations define the following trawl gear types: large footrope trawl, small footrope trawl, selective flatfish trawl, and midwater trawl. The permissible use and on board possession for each gear type varies whether fishing north or south of Cape Mendocino (40˚10˙ N. lat.) or shoreward, seaward or within the RCA. The specific gear restrictions can be found at Section 660.130 (c). These regulations were important when vessels were managed based on cumulative trip limits and fleet-wide impacts were modeled. Under trawl rationalization, individuals are accountable for their total fishery impacts and those impacts are observed on every trip and on every vessel. Thus, such specific gear type prohibitions no longer appear to be needed, with the exception that, until changes reflecting individual vessel accountability are made to trawl RCAs, fishing within the RCA should be restricted to mid-water (pelagic) trawl gear to avoid bottom dwelling species and bottom trawl gear should be restricted to waters shoreward of and seaward of the RCA. Under the proposed change, mid-water trawl could be used throughout the Exclusive Economic Zone (EEZ) year round, except for whiting which would be subject to whiting regulations. Fishing with midwater gear is already allowed in groundfish EFH conservation areas subject to other restrictions on the use of such gear. The committee's recommendations would treat possession and use of midwater gear the same both within the RCA and within groundfish EFH conservation areas.

Recommendation 3: Allow possession and use of fixed gear and trawl gear on the same trip subject to a declaration process and either:

Suboption 1 – The more restrictive RCA regulations, or
Suboption 2 – Gear and catch area reporting by the onboard observer.

Rationale: Current regulations do not allow for the use and possession of fixed gear and trawl gear on the same trip. The proposed change would allow a vessel participating in the IFQ fishery to use both gear types on the same trip, subject to one or the two suboptions described above. The committee believes that this recommendation is similar to others in that it provides flexibility in operations.

The committee emphasizes that progress on Recommendations 1 and 2 (fixed gear/trawl gear permit stacking and trawl gear onboard/usage on a single trip) should not be hindered by work on Recommendation 3 (possession and use of trawl and fixed gear on the same trip).

Changing whiting season start date

Recommendation 4: Use a single May 15 start date for all whiting sectors including California fisheries and eliminate the 5 percent California early season whiting fishery cap, to the extent that a fishery management plan (FMP) amendment is not required. This change would be implemented through the two-meeting process already authorized under the framework of the Pacific Coast Groundfish FMP.

Rationale: Current regulations start the at-sea fisheries on May 15 and the shore-based fisheries on June 15, except for the California shore-based fisheries which open either April 1 or April 15, depending on area (see Section 660.131 (b) (2) (iii). The proposed change would simplify the regulations and allow the northern area fisheries to start at the same time as the at-sea vessels. The California fisheries have been relatively dormant in recent years thus the change would be expected to have little impact on those fisheries. Having a uniform start date will provide all

sectors a consistent basis on which to plan their operations in the context of other fisheries and provide the shore-based sector with additional flexibility.

Trawl gear modifications

Recommendation 5: At the November 2011 Council meeting, adopt for analysis a general alternative to status quo that addresses industry concerns with regard to midwater gear requirements and restrictions including chafing gear regulations in particular. Council staff should work with industry in developing the specifics of the alternative(s) for presentation at the March 2012 meeting so that a final preferred alternative can be adopted at the April 2012 meeting. It may be important as part of this process to develop two sections in the regulations, one that deals with bottom trawl gear and the other that deals with midwater trawl gear. The industry has indicated commitment to working with NMFS and the Council to complete this much needed regulatory change.

Rationale: Current mid-water trawl gear requirements and restrictions were developed many years ago and are no longer appropriate for the current fleet. Many West Coast midwater vessels also fish in the North Pacific Council area which has a substantially different set of gear restrictions. The intent is to update the Pacific Fishery Management Council mid-water trawl regulations to conform to current fishery needs.

Recommendation 6: Eliminate codend, chafing gear, mesh size and selective flatfish trawl gear requirements and restrictions. Retain large and small footrope requirements and restrictions because of the prohibitions on gear use in groundfish EFH (50 CFR 660.130(b)(4)).

Rationale: These regulations can be found at Section 660.130(b). While these regulations were important when vessels were managed based on cumulative trip limits, under trawl rationalization individuals are accountable for their total fishery impacts and such specific gear regulations are no longer needed and may hinder experimentation to develop more biologically and ecologically sound gear configurations.

Secondary Priority Task

After completing its work on the above primary priority tasks, the TRREC moved to its secondary priority task: identifying other regulations made obsolete by implementation of the new trawl rationalization program in 2011. In this regard, the TRREC identified the following examples:

- The trawl vessel length (capacity) endorsement may no longer be needed.
- The general whiting fishery management regime (other than the sector allocations) may need reconsideration (e.g. whiting as a year-round fishery, processing of waste at-sea).
- Whether RCAs are still needed for the trawl fishery should be examined.
- Alternatives to the 100 percent observer requirement - such as electronic monitoring – should be considered.
- Allowing fishing in two or more management areas on the same trip should be examined. (In 2012, for example, lingcod allocations will be split at OR/CA border, which will be in addition to the 40˚ 10' based management areas).
- The large and small footrope definitions may need to be modified.

These and other items, yet to be identified, would be issues for future TRREC meetings.

Recommendation 7: The Council should:

a) Prioritize the TRREC recommendations (above) within the current list of workload items, and
b) Schedule additional meeting(s) of the TRREC following the November 2011 Council meeting, as appropriate.

The meeting, which started at 8:00 a.m., was adjourned by Chairperson, Dave Hanson, at approximately 3:00 p.m.

PFMC
11/02/11

CALIFORNIA FISHERIES FUND CFF

October 12, 2011

Mr. Dan Wolford
Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384

Re: Council Trailing Actions on Trawl Rationalization – Lender Safe Harbors

Dear Chairman Wolford:

I am writing on behalf of the California Fisheries Fund (www.californiafisheriesfund.org), a nonprofit revolving loan fund that invests in the Pacific fishing industry. Our mission is to help our borrowers (fishermen, fishing businesses, ports, communities and others) succeed in fisheries that achieve environmental conservation, improved profitability for the industry and stability for port communities.

First, we wish to thank the Pacific Fishery Management Council for recognizing the important role that lenders and financial institutions play in supporting a sustainable commercial fishing industry on the west coast. Your recommendations for lender safe harbors and tools such as third-party verification will prove essential to smoothing the transition to IFQ management of the groundfish fishery.

CFF was founded in large part because financing from traditional lenders, i.e. banks and credit unions, is not adequate to meet the needs of the commercial fishing industry. In fact, most CFF borrowers were not able to secure financing for fishing vessels and permits from traditional lenders who view small-scale commercial fishing as highly risky. Since our inception in 2008, we have made eleven loans to nine different borrowers. Of these, about half have been to borrowers who were not able to access financing from traditional lenders.

We have already begun to make loans to participants in the groundfish trawl IFQ fishery for vessel purchase and upgrades and gear upgrades/modifications. Two of our loans (one for vessel upgrades and one for gear purchase) are secured in part by QS. We expect to make further loans for quota leasing/acquisition and to aid young new participants in entering the fishery. Many of these loans will likely be secured (in whole or in part) with quota shares or quota pounds as collateral. Unfortunately, proposed language under consideration by the Council exempts only state- and federally-chartered institutions from the control caps. This language would not allow CFF, RSF Social Finance (www.rsfsocialfinance.org) and perhaps other likely lenders to avail themselves of the safe harbor. We are concerned that our lending would be seriously curtailed by such language.

While we are concerned about exceeding the control cap generally, CFF would be even more likely to exceed the control cap on a species-by-species basis. Since not all permits were allocated quota on an equal basis, as few as 2 permits pledged as collateral could push us over those species caps. A good example of this is Yelloweye rockfish – several permits appear to have been allocated more than 1% QS and the control cap is only 2.6%.

In order to allow legitimate lenders like CFF to finance Pacific IFQ fishing operations using quota share as collateral, CFF and other like organizations should be covered by safe harbors. We can recommend a couple of options for clarifying which organizations should be granted safe harbor status.

- Our preferred option is to adopt a requirement that lenders taking QS as collateral in excess of the control cap must refrain from placing delivery covenants on borrowers, i.e. restricting delivery to specific buyers and/or setting particular prices.

- A second option is to further clarify what kinds of entities are covered under the safe harbor by adding 501(c)3 nonprofit entities to the list of exempted institutions.

A third option might be a case-by-case safe harbor exemption granted to organizations such as CFF, that demonstrate legitimate lending practices to the Council.

We appreciate the opportunity to comment. If you have any questions about this important matter, please do not hesitate to contact me at (415) 293-6120 or phiggins@californiafisheriesfund.org.

Sincerely,
Phoebe R. Higgins
Project Manager/Loan Officer

RSF Social Finance
1002A O'Reilly Avenue, San Francisco, CA 94129
T: 415.561.3900 | F: 415.561.3919
www.rsfsocialfinance.org

RSF Social Finance
1002A O'Reilly Avenue
San Francisco, CA 94129
www.rsfsocialfinance.org

October 13, 2011

Mr. Dan Wolford
Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384

Re: Council Trailing Actions on Trawl Rationalization – Lender Safe Harbors

Dear Chairman Wolford:

I am writing on behalf of RSF Social Finance (www.rsfsocialfinance.org), a pioneering non-profit financial services organization dedicated to transforming the way the world works with money. We are writing in support of the California Fisheries Fund's letter regarding safe harbors for lenders.

RSF Social Finance has begun lending to sustainable commercial fishing businesses in the Pacific region that provide environmental and social benefits to working port communities and native fishermen. There is the likelihood that some of our loans will be secured (in whole or in part) with quota shares or quota pounds as collateral. Unfortunately, proposed language under consideration by the Council exempts only state- and federally-chartered institutions from the control caps, a category to which we do not belong.

In order to allow legitimate lenders like RSF Social Finance and CFF to finance Pacific IFQ fishing operations using quota share as collateral, we must be covered by safe harbors.

We appreciate the opportunity to comment. Thank you for your consideration.

Sincerely,

Scott Hackenberg
Lending Manager

-------- Original Message --------
Subject: Fw: testimony
Date: Sun, 23 Oct 2011 20:10:36 -0700
From: Lyle Hartzell <lylehartzell@charter.net>
To:pfmc.comments@noaa.gov
----- Original Message -----
From: SCOTT HARTZELL
To: Hartzell Lyle
Sent: Sunday, October 23, 2011 7:58 PM
Subject: testimony

October 24, 2011

Don Wolford, Chairman

Pacific Fishery Management Council

Re: Public Comments

Mr. Chairman and Members of the Council,

I am captain and half owner of the F/V Ossian. I am writing with regard to Agenda Item E-7 Attachment 1; particularly item #18, concerning processing sablefish at sea.

We started freezing dressed sablefish in 1993. In 1992, we fished Cobb and Brown Bear Seamounts for sablefish with pots and iced our dressed fish. Due to the long (300 plus miles) and two days and nights of running each way, we decided the only way to be profitable was to start freezing our dressed sablefish so we could make longer trips. In 1993, we installed freezing equipment and have frozen sablefish ever since, except for a few of the derby fisheries prior to tier limits. The F/V Keltie and subsequently the F/V Ossian continuously fished the seamounts up to 2005; thereafter it was prohibited. Many of the trips lasted up to a month. In addition to the benefit of longer trips, we received higher prices for frozen at sea sablefish. We would like to see the Council allow us to simultaneously stack a trawl permit with our fixed gear permits. Also, we request the ability to freeze trawl quota shares. As I understand the present rule, we cannot fish any trawl sablefish without losing our exemption to freeze sablefish at sea. Lastly, we would like to be able to freeze our allowable limit of ling cod, plus any other incidental bottom fish that we can keep.

I hope you will consider this testimony when rendering your decision in this matter.

Scott Hartzell

6016 Collard Lake Way

Florence, OR 97439

CENTRAL COAST SUSTAINABLE GROUNDFISH ASSOCIATION INC.

A California Cooperative Fish Marketing Association

October 31, 2011

Mr. Dan Wolford
Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220 – 1384

Re: Lender Safe Harbors

Dear Chairman Wolford,

The Central Coast Sustainable Groundfish Association is a Cooperative Fish Marketing Association based in Morro Bay, California which currently has nine members active in the Trawl IFQ fishery. As you know, our members have worked very hard this year to adapt to the new IFQ program. We are working cooperatively with the Council and other fishery stakeholders to develop a Risk Pool to manage constraining species, as well as innovative and more cost effective monitoring alternatives.

As the first year of the program comes to a close, we are thinking ahead about how to keep our ports viable and our fishermen profitable in the Trawl IFQ fishery. In order to sustain and grow their businesses and the local industry, some of our fishermen will likely purchase permits and/or quota shares (QS), upgrade their vessels and modify their gear. These kinds of investments require financing, some of which may be secured through the use of QS as collateral.

We are aware that the Council is considering safe harbors for lenders at its November meeting, so we are writing in support of the California Fisheries Fund's request for a safe harbor. We believe the California Fisheries Fund serves as a valuable alternative financing source to the fleet, proving most supportive to smaller operators and new entrants. Please consider language that would allow for a safe harbor exception for the California Fisheries Fund.

Thank you for your consideration.

Sincerely,



Roger Cullen
President
Central Coast Sustainable Groundfish Association Inc.
1555 8th Street
Los Osos, California 93402

City of Morro Bay

Morro Bay, CA 93442 • 805-772-6200
www.morro-bay.ca.us

October 31, 2011

Mr. Dan Wolford
Chair, Pacific Fishery Management Council
7700 NE Ambassador Place, suite 101
Portland, Oregon 97220

SU: Trawl rationalization trailing amendments, Safe Harbors for Lenders

Dear Chairman Wolford:

I am writing on behalf of the City of Morro Bay to urge your support for creating Safe Harbors for all potential lenders in the trawl Rationalization program, including non-profits such as the California Fisheries Fund. As the first year of the program comes to a close, we are thinking ahead about how to keep our port viable and our fishermen profitable in the West Coast Trawl program. In order to sustain and grow their businesses and the local industry, some of our fishermen will likely purchase permits and or Quota Shares (QS), upgrade their vessels or modify gear. These kinds of investment will require financing, some of which may be secured through the use of QS as collateral.

We believe the California Fisheries Fund serves as a valuable alternative financing source to the fleet, especially smaller operators and new entrants. Please consider language that would allow for a Safe Harbor exception for The California Fisheries Fund.

Thank you for your consideration.

Sincerely,

Rick Algert

CITY OF MONTEREY

HARBOR/MARINA DIVISION

October 28, 2011

Mr. Dan Wolford, Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220

Re: Lender Safe Harbors, Agenda E.7

Dear Chairman Wolford:

I am writing on behalf of the City of Monterey, a community that is committed to retaining and growing its commercial fishery economy, and heritage. As you know, we have worked to adapt to the new IFQ program this year, encouraging local fishermen to be innovative to stay viable through this change.

As the first year of the program comes to a close, we are thinking ahead about how to keep our port viable and our fishermen profitable in the IFQ fishery. In order to sustain and grow their businesses and the local industry, some of our fishermen will likely purchase permits and/or QS, upgrade their vessels, and modify their gear. These kinds of investments may require financing, some of which may be secured through the use of QS as collateral.

We are aware that the Council is considering safe harbors for lenders at its November meeting. The City of Monterey is writing in support of the concept of broadening the types of lenders to include some types of not-for-profit organizations. The California Fisheries Fund (CFF) is such a potential lender, as the CFFserves as a valuable alternative financing source to the fleet, proving most supportive to smaller operators and new entrants. Please consider language that would allow for a safe harbor exception for organizations such as the CFF.

Thank you for your consideration.

Sincerely,

Steve Scheiblauer
Harbormaster
City of Monterey, CA

OFFICE OF THE HARBORMASTER • CITY HALL • MONTEREY • CALIFORNIA • 93940 • 831.646.3950 • FAX 831.646.5674
Web Site • http://www.monterey.org/harbor

October 24, 2011

Mr. Dan Wolford
Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384

Re: Lender Safe Harbors

Dear Chairman Wolford:

As you know, members of our local Fort Bragg, California groundfish fleet have worked very hard this year to adapt to the new IFQ program, going so far as to collaborate and work cooperatively with other small port communities to develop a risk pool for managing overfished species. As a result of this innovative management tool, we have demonstrated the ability to look beyond old customs and have transitioned into forward thinking fishermen.

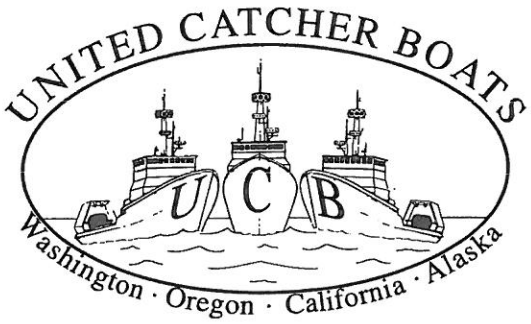
As the first year of the program comes to a close, we are thinking ahead about how to keep our port viable and our fishermen profitable in the IFQ fishery and once again we seek innovative and progressive solutions. In order to sustain and grow their businesses and the local industry, some of our fishermen will likely purchase permits and/or QS, upgrade their vessels and modify their gear. These kinds of investments require financing, some of which may be secured through the use of QS as collateral – a somewhat unconventional source to conventional lenders, which is all the more reason to look beyond typical financial institutions.

We are aware that the Council is considering safe harbors for lenders at its November meeting, so we are writing in support of the California Fisheries Fund's request for a safe harbor. While it makes sense to exempt banks and credit unions from the control rule, we believe the California Fisheries Fund will serve as a valuable alternative financing source to the fleet, proving most supportive to smaller operators and new entrants. Please consider language that would allow for a safe harbor exception for CFF.

Thank you for your consideration.

Sincerely,

Michelle Norvell
Fort Bragg, CA



November 4, 2011

Mr. Dan Wolford, Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101□
Portland, Oregon 97220

RE: Agenda Item E. 7, Trawl Rationalization Trailing Actions

Dear Mr. Wolford,

We are writing today to ask the Pacific Fishery Management Council (PFMC) initiate action to eliminate the requirement that Mothership Catcher Vessels (MSVCs) be required to have observer coverage while participating in the Whiting Mothership fishery. After one year of operating under the new Amendment 20/21 Catch Shares program, opportunities exist to reduce the cost of the program, both to the government and the industry. One of these opportunities is the elimination of 100% observer coverage on MSCVs. We request this action by the PFMC for the following reasons:

1. **Reduce the cost of the Trawl Catch Shares program**. Currently the federal government subsidizes the at-sea cost of observer coverage at 90% of the actual cost when vessels are at sea. For the 2011 Whiting Mothership fleet, this equates to approximately $152,000 (400 at-sea days at $380/day). As the NMFS contemplates reduction in federal funds to cover a portion of at-sea observer costs and what the observer cost subsidy will be for 2012, eliminating observer coverage for the mothership will free up funds that can be used for the Shoreside trawl catcher vessel trips. Without the Federal contribution for observer costs, many of these fishing companies' operational expenses will exceed their gross income.
2. **Collection of accurate catch data from the MSCV fleet does not require observer coverage onboard the catcher vessel**. Review of the catch and discard data collected by the MSCV observers to date from the 2011 season indicate that documented discard events from the MSCV fleet are extremely rare and account for less than 1/10th of 1% of the harvest. Of over 1000 tows documented by the observers onboard the MSCV fleet, only 4 were over 10,000 pounds, and were due to mechanical failure of deck equipment. All

tows were documented and recorded by the skipper in the logbook and in most cases the onboard observer asked the skipper to provide estimates of amount of these discard events.

3. **Tasks of an observer onboard a MSCV are minimal**. The source of harvest amount and species composition of the MSCV fleet comes from the two observers onboard the mothership processor vessel. This includes using a flow scale to determine and document the weight of the delivery and the accurate enumeration of any bycatch species such as rockfish or salmon. As documented by this year's fishery, the responsibilities of observers onboard MSCVs are very minimal. Their only task is to document any discard event if such an event occurs and provide an estimate of the amount of the discard event. And because these events are so few, the observer really has nothing to do while onboard a MSCV.
4. **The captain documents any discard event.** All MSCV tows can be documented in the vessel logbook. This includes the start and stop time and location of all tows. Any fish discarded when the net is retrieved can be estimated and recorded by the captain. Even without an observer present on the MSCV, data regarding discards will be available to manage the fishery. We suggest that logbooks be a mandatory requirement.
5. **We support a full-retention requirement**. As shown by the current year fishery data, discard events are extremely rare and account for very little tonnage. Requiring the fleet to deliver all fish caught is a reasonable requirement. Discards, when they do occur, happen when the codend has been filled beyond the point where it is disconnected from the intermediate portion of the trawl net, or the stuffing tube. Responsible fishing practices of a MSCV captain result in very little or no fish being spilled.
6. **Overfished Rockfish species encounters are minimized due to the MSCV Cooperative Agreement**. As presented in our report to the PFMC this meeting on the results of the first year of fishing under the new cooperative regulations, the MSCV fleet has greatly reduced its encounter of rockfish bycatch species. This is due to provisions of the Cooperative's Bycatch Agreement.

When the PFMC made its final recommendations for the new trawl catch shares program, the NMFS indicated that reducing the cost of the new program was an objective and that one example of this savings would be to not require observers onboard MSCVs. We believe that cost savings can be achieved by eliminating the observer requirement and ask the PFMC to make this recommendation. We ask that such a recommendation be added to one of the PIE amendment packages moving forward for implementation in an expeditious manner.

Thank you very much for consideration of our request.

Sincerely,

Brent Paine

Agenda Item E.8
Situation Summary
November 2011

CONSIDERATION OF INSEASON ADJUSTMENTS FOR 2011 AND 2012 FISHERIES

Groundfish management measures are set by the Council with the general understanding that these measures will likely be adjusted within the biennial management period to attain, but not exceed, the annual catch limits. This agenda item will consider inseason adjustments to ongoing 2011 and 2012 fisheries. Potential inseason adjustments include adjustments to Rockfish Conservation Area boundaries and adjustments to commercial and recreational catch limits. Adjustments are, in part, based on catch estimate revisions and the latest information from the West Coast Groundfish Observer Program.

Council Action:

1. **Consider information on the status of 2011 and 2012 fisheries, and adopt final inseason adjustments as necessary.**

Reference Materials:

1. Agenda Item E.8.b, Washington Department of Fish and Wildlife (WDFW) Report: WDFW Report on Inseason Adjustments for 2012.

Agenda Order:

a. Agenda Item Overview — Kelly Ames
b. Reports and Comments of Advisory Bodies and Management Entities
c. Public Comment
d. **Council Action:** Adopt Final Recommendations for Adjustments

PFMC
10/13/11

GROUNDFISH ADVISORY SUBPANEL REPORT ON CONSIDERATION OF INSEASON ADJUSTMENTS FOR 2011 AND 2012 FISHERIES

The Groundfish Advisory Subpanel (GAP) and the Groundfish Management Team (GMT) engaged in a joint discussion regarding potential inseason actions for the remainder of 2011and beginning of 2012. Following this initial inseason discussion the GAP wishes to recommend the following:

2011 INSEASON ACTIONS

Fixed-gear Sablefish fisheries

Limited Entry Daily-Trip-Limit and Open Access, North of 36 N Latitude

The GAP recommends no closure at this time, since the earliest a regulatory change could be made is December 1. A closure at this point would have very little effect because many fishermen will be gearing up for crab season and the weather is often bad. Furthermore, just mentioning a closure would likely have the opposite effect of trying to limit landings. Instead, it would exacerbate efforts, as fishermen would attain their bimonthly limits in the first month of the period (November), prior to the closure, especially since the market value of sablefish is so high right now. Fishermen will rush to catch sablefish as soon as possible so they can take advantage of the higher ex-vessel prices.

At the same time, the GAP wishes to reiterate the fact that a buffer may still exist and the fishery may not exceed its annual catch limit (ACL) north of 36 degrees N. Latitude. So far, the GMT has hard data only through July and possibly some in August. The data this year has been chaotic, leading to frequent inseason adjustments. This is no fault of the GMT; we have confidence that Dr. Sean Matson and the GMT have indentified and fixed all the data problems to date.

2012 INSEASON ACTIONS

Trawl rockfish conservation area (RCA) lines

The GAP requests the following changes:

$45^{o}46' – 48^{o}10'$: Move seaward line from 200 fm to 150 fm. For periods 1 through 6, include the modified petrale lines to the extent it is shallower than 150 fm.

Seaward of the RCA: Adjusting these lines will allow access to petrale in periods 2 and 6. The changes in periods 3 and 5 will allow fishermen to follow the fish as they move onto and off of the shelf. These revisions will provide opportunity for the trawl fleet to operate more efficiently under the rationalized system. The arguments for the old rules for retaining the seaward RCA lines at 200 no longer apply under rationalization.

These changes will help demonstrate how the trawl individual quota (TIQ) program is working and how trawlers are accountable for their own actions. Each vessel brings its own quota to the table and each fisherman knows where, whether and when he can fish.

The Council previously adopted changes to the RCA lines and fishermen have proven they can fish cleanly and efficiently, without exceeding any overall limits. This adaptation demonstrates the efficacy of the TIQ program.

Washington recreational:

The GAP discussed the emergency action taken by Washington Dept. of Fish and Wildlife (WDFW) to reduce recreational impacts on yelloweye off the southern Washington coast.

The GAP recommends the lingcod restricted area proposed by WDFW in Attachment 1 of Agenda Item E.8.b be adopted in the Federal regulations for 2012 and beyond.

Sablefish fixed-gear coastwide:

The GAP referred to the GMT's attachment under this item, Table 5, and suggests adopting Alternative 1. This option would result in:

Area	Fishery	HG	Alt. 1 mt	Atl. 1 %
N. of 36° N. lat. (US/Canada border to 36° N. lat.)	Limited Entry (LE) north	265	242	91%
	Open Access (OA) north	419	385	92%
South of 36° N. lat.	LE south	380	353	93%
	OA south	309	280	91%

This option would result in the following trip limits, as listed in GMT's Table 6:

Area	Fishery	Jan-Feb	Mar-Apr	May-June	July-Aug	Sept-Oct	Nov-Dec
N. of 36° N. lat. (US/Canada border to 36° N. lat.)	LE north	1,300 lbs. per week, not to exceed 5,000 lbs. per 2 mo.					
	OA north	300 lbs. per day, or 1 landing per week of up to 950 lbs., not to exceed 1,900 lbs. per 2 mo.					
South of 36° N. lat.	LE south	1,800 lbs. per week					
	OA south	300 lbs. per day, or 1 landing per week of up to 1,350 lbs., not to exceed 2,700 lbs. per 2 mo.					

Since these changes would be effective at the when the primary fishery starts, we have the opportunity to adjust the trip limits up or down during the year. We should have two periods of data by the June meeting and can respond to problems or potential opportunity as the need arises. There is less risk starting out at this level and it also should ensure more stability throughout the year.

While the GAP realizes that Alternative 1 projects more than 90 percent attainment in all fixed-gear sectors, members felt this is preferable because the sablefish ACL is dropping next year and fishermen should be afforded as much opportunity as possible.

Again, the data is an issue in the fixed-gear sablefish fishery. The GMT has fixed the problems with the data that occurred during 2011.

The GAP requests that further refinement of the data take place, as suggested by the GMT. Currently, the software can't sufficiently parse the landings data between the DTL and primary sablefish fishery. One solution to this would be to record landings data down to the specific groundfish permit number on the fish tickets. The infrastructure already is in place in the PacFIN database; there may be an issue with state systems.

This would eliminate potential data errors, provide real-time data for the scientists and economists and fishermen would benefit as well because it would increase stability in the fishery throughout the year.

PFMC
11/04/11

GROUNDFISH MANAGEMENT TEAM REPORT ON CONSIDERATION OF INSEASON ADJUSTMENTS FOR 2011 AND 2012 FISHERIES

PART I. 2011 FISHERIES

The Groundfish Management Team (GMT) considered the most recent information on the status of ongoing fisheries, research, and requests from industry and provides the following recommendations for 2011 inseason adjustments.

The GMT also received guidance from National Marine Fisheries Service (NMFS) Northwest Region (NWR) regarding timing of implementation of inseason recommendations from this meeting. NMFS anticipates implementing routine inseason adjustments to fishery management measures by December 1, 2011.

SCORECARD UPDATE

The November 2011 scorecard (Attachment 1) projected impacts have been updated to reflect: increased canary rockfish in the Washington recreational fishery; and increased canary and yelloweye rockfish in the Oregon recreational fishery; and decreased yelloweye rockfish in research, based on updates from the Washington Department of Fish and Wildlife (WDFW) and the International Pacific Halibut Commission (IPHC).

RESEARCH CATCH UPDATES

The GMT received updates from WDFW and IPHC that their research activities have been completed for the year. Both agencies provided updates to their yelloweye rockfish impacts, which are reflected in the November scorecard (Attachment 1).

RECREATIONAL FISHERIES

For Oregon recreational fisheries, projected impacts to both canary and yelloweye rockfish have increased, due to increased encounter rates from what was projected pre-season. However, projected impacts remain under the Oregon recreational harvest guidelines (HG).

COMMERCIAL FISHERIES

Fixed Gear Sablefish Daily Trip Limit Fisheries - 2011

The following section discusses 2011 inseason considerations for the four fixed gear, daily trip limit (DTL) fisheries, including both limited entry (LE) and open access (OA), north and south of 36° N. lat. for 2011. Hereafter, they will be referred to as follows: LE North, LE South, OA North, and OA South.

Landings projection models were updated with the most recent available data from PacFIN, acquired on October 28, 2011. The following sections describe these modeling results. It should

be noted that the Quota Species Monitoring (QSM) Best Estimate Report (BER), which is accessible by the public, is not currently correct for fixed gear sablefish DTL fisheries, due to data contamination with fixed gear IFQ sablefish landings. A corrected data feed of "hard" fish ticket data from PacFIN was used to inform inseason modeling for these fisheries.

Reflecting current sablefish landings data, model projections under a no action alternative (i.e., status quo) through the end of 2011 show potential overages in the LE North and OA South fisheries (Table 1), of 6% and 8% respectively. The projection for the LE North is the same as in September, yet actual catch has been higher than projections for the OA North, which was formerly projected to attain 98% of its harvest guideline (HG). Both southern sablefish DTL fisheries, including LE South and OA South, are tracking within their harvest guidelines (Table 2).

Table 1. Model-projected impacts of alternative trip limits in the fixed-gear, sablefish, DTL fisheries, north of 36° N. lat., for 2011. Harvest guidelines and projected impacts are in metric tons (mt). Currently a collective overage of 51 mt is projected is projected in the North.

Fishery	Alternative	HG	Projection	Difference	Attainment
LE N	No Action	273	290	-17	**106%**
	A1, Close 12/1/11		276	-3	101%
OA N	No Action	433	467	-34	**108%**
	A1, Close 12/1/11		434	9	100%

Table 2. Model-projected impacts of alternative trip limits in the fixed-gear, sablefish, DTL fisheries, south of 36° N. lat., for 2011. Harvest guidelines and projected impacts are in metric tons (mt).

Fishery	Alternative	HG	Projection	Difference	Attainment
LE S	No Action	393	374	19	95%
OA S	No Action	319	230	91	72%

The Council decided at the September, 2011 meeting not to take action regarding the projected overage of 6% (17 mt) in the LE North fishery, due to a probable remainder from the sablefish primary tier fishery (considering past attainment of this fishery from 2004-2010). A similar situation exists at this meeting.

The information that we have regarding primary tier fishery attainment is historical, from 2004 to 2010. Over that period, the average attainment was 95% of the sum of tier limits, with a maximum of 97% and a minimum of 93%. Table 3 translates a range of possible percentage attainments of the primary tier fishery into corresponding possible remainders, in metric tons, considering the current sum of tier limits for 2011. We do not have a projection model to make predictions of sablefish catch in the primary tier fishery, and landings data are incomplete at this time.

Table 3. Possible remainders from the primary tier sablefish fishery, for consideration, along with projected attainment of LE FG sablefish DTL fishery, and the OA sablefish fishery, north of 36° N. lat., for 2011 (past primary attainment averaged 95%, max 97%, min 93%).

Primary % attainment	Estimated remainder (mt)
100%	0
99%	15
98%	31
97%	46
96%	62
95%	77

If the projections for DTL attainment of 51 mt above the HGs in the area north of 36° N. lat. are correct, then attainment of 96% or less by the primary tier fishery would be required in order to provide a sufficient buffer to accommodate such an overage, and prevent exceeding the sablefish ACL for north of 36° N. lat.

Some additional, qualitative considerations are worth mentioning. The point has been made that closing the fishery mid-period (i.e., December 1) may stimulate increased fishing effort before the closure, so that bimonthly limits are attained early, as noted in the Grounfish Advisory Subpanel (GAP) statement. It is notable that the sablefish DTL projection models possess significant uncertainty, like any other projection model, which extrapolates average relationships among variables from previous years to the future, and actual landings for the remainder of the year have a relatively equal probability of being higher or lower than projections. It is also notable that sablefish prices have been steadily rising this year, especially in the north, and within the open access sablefish fisheries.

At this point in the season, few options are available to restrict landings for the rest of this year; according to model projections and regulations (i.e., trip limits cannot be reduced in the second month of a two month period), only fishery closure on December 1 was an option for potentially bringing landings to within the HG for the LE North and the OA North fisheries.

Although sablefish is subject to a coastwide acceptable biological catch (ABC) and overfishing limit (OFL). The southern DTL fisheries are projected to finish under their HGs and the sablefish ACL south of 36 N. lat. The sum total of all sablefish impacts is therefore unlikely to exceed the ABC and OFL, thus it is unlikely that there is a conservation concern.

Considerations for 2011:

1) **The GMT recommends the Council consider the potential risks associated with exceeding the sablefish ACL in the area north of 36° N. lat., for Alternative 1 versus the No Action alternative (Table 1), in the LE North and OA North sablefish DTL fisheries.**

PART II. 2012 FISHERIES

The GMT considered the most recent information on the status of 2011 fisheries, upcoming research, and requests from industry and provides the following recommendations for 2012 inseason adjustments.

SCORECARD

The scorecard for the beginning of 2012 (Attachment 2) has been updated to reflect: no exempted fishing permits (EFP) were applied for in 2012, therefore projected impacts have been set to zero; the tribal projected impacts has been increased for Petrale sole and widow rockfish; increased projected impact to canary rockfish in the Washington recreational fishery; and increased projected impacts to canary and yelloweye rockfish in the Oregon recreational fishery. Values remain in the allocation columns for EFPs since the federal regulations still contain those off the top deductions for 2012. The GMT updated the projected impacts in the scorecard (Attachment 1) for petrale sole and widow rockfish based on the letter provided by the Makah tribe (Agenda Item E.4.b, Supplemental Tribal Report).

RECREATIONAL

The Washington Department of Fish and Wildlife (WDFW) is asking the Council to adopt conforming regulations that close portions of Washington Marine Areas 1 and 2 to recreational lingcod fishing (Agenda Item E.8.b, WDFW report). The changes are needed to ensure that recreational yelloweye and canary impacts stay below the recreational harvest guideline in 2012 and beyond. Council action is needed at this meeting so that regulations are in place in time for recreational lingcod seasons that begin in early spring 2012.

The Oregon recreational projected impacts to canary and yelloweye rockfish are increased over what was projected in the biennial harvest specifications modeling. The increased projected impacts are based on increased encounter rates observed in 2011. The projected impacts are still within the 2012 HG for both species.

The GMT recommends the Council adopt conforming regulations to restrict recreational lingcod fisheries in Washington as proposed in Agenda Item E.8.b, WDFW Report.

COMMERCIAL

Fixed Gear Sablefish DTL fisheries - 2012

The following section discusses 2012 inseason considerations for the four fixed gear, daily trip limit (DTL) fisheries, including both limited entry (LE) and open access (OA), north and south of 36° N. lat. for 2012. Projections of landings were made in order to inform choice of trip limit structures for the year 2012 in these fisheries.

Table 4 shows the No Action Alternative trip limits for 2012, those that are currently in place as of November 1, 2011. If no action is taken at this meeting, these regulations would be in place for 2012.

Table 4. Sablefish DTL trip limits that were in place in 2011; the No-Action Alternative for 2012, not including any potential 2011 inseason action.

Area	Fishery	Jan-Feb	Mar-Apr	May-June	July-Aug	Sept-Oct	Nov-Dec
North of 36° N. lat. (U.S./Canada Border to 36° N. lat.)	LE N	1,750 lb. per week, not to exceed 7,000 lb. per 2 mo.	2,000 lb. per week, not to exceed 7,000 lb. per 2 mo.		2,000 lb. per week, not to exceed 3,500 lb. per 2 mo.		
	OA S	300 lb. per day, or 1 landing per week of up to 800 lb., not to exceed 2,400 lb. per 2 mo.	300 lb. per day, or 1 landing per week of up to 950 lb., not to exceed 1,900 lb. per 2 mo.		300 lb. per day, or 1 landing per week of up to 1,050 lb., not to exceed 2,100 lb. per 2 mo.		
South of 36° N. lat.	LE S	400 lb. per week, not to exceed 1,500 lb. per 2 mo.	2,100 lb. per week				
	OA S	400 lb. per day, or 1 landing per week of up to 1,500 lb., not to exceed 8,000 lb. per 2 mo.	300 lb. per day, or 1 landing per week of up to 1,200 lb., not to exceed 2,400 lb. per 2 mo.				300 lb. per day/one land per week of 1500 lb. /3000 lb. bimonthly

We present the projected results of status quo (No Action, NA) and two alternative trip limit structures for each of the four sablefish DTL fisheries in Table 5; the corresponding trip limits for these projections are located in Tables 6 and 7.

Table 5. Model-projected impacts of alternative trip limits (i.e. Alt. 1 and Alt. 2) in the fixed-gear, sablefish, DTL fisheries for 2012, compared to No Action. Harvest guidelines and projected impacts are in metric tons (mt).

Area	Fishery	HG	No Action (mt)	No Action (%)	Alt. 1 (mt)	Alt. 1 (%)	Alt. 2 (mt)	Alt. 2 (%)
North of 36° N. lat. (U.S./Canada Border to 36° N. lat.)	LE N	265	247	93%	242	91%	234	88%
	OA N	419	426	102%	381	91%	359	86%
South of 36° N. lat.	LE S	380	413	109%	353	93%	323	85%
	OA S	309	263	85%	284	92%	264	85%

Table 6. Proposed 2012 trip limits for sablefish DTL fisheries under Alternative 1.

Area	Fishery	Jan-Feb	Mar-Apr	May-June	July-Aug	Sept-Oct	Nov-Dec
North of 36° N. lat. (U.S./Canada Border to 36° N. lat.)	LE N	1,300 lb. per week, not to exceed 5,000 lb. per 2 mo.					
	OA N	300 lb. per day, or 1 landing per week of up to 900 lb., not to exceed 1,800 lb. per 2 mo.					
South of 36° N. lat.	LE S	1,800 lb. per week					
	OA S	300 lb. per day, or 1 landing per week of up to 1,350 lb., not to exceed 2,700 lb. per 2 mo.					

Table 7. Proposed 2012 trip limits for sablefish DTL fisheries under Alternative 2.

Area	Fishery	Jan-Feb	Mar-Apr	May-June	July-Aug	Sept-Oct	Nov-Dec
North of 36° N. lat. (U.S./Canada Border to 36° N. lat.)	LE N	1,300 lb. per week, not to exceed 4,900 lb. per 2 mo.					
	OA N	300 lb. per day, or 1 landing per week of up to 850 lb., not to exceed 1,700 lb. per 2 mo.					
South of 36° N. lat.	LE S	1,750 lb. per week					
	OA S	300 lb. per day, or 1 landing per week of up to 1,300 lb., not to exceed 2,600 lb. per 2 mo.					

The GMT considered the uncertainty in the landings data seen during 2011(in terms of correctly separating primary tier landings from DTL landings, and separating new IFQ fixed gear landings from DTL landings) along with the normal uncertainty associated with projection models, when constructing the three alternative trip limit structures for 2012 for each fishery presented here. Alternative 1 (Table 6) results in of projected attainments in the range of 91% to 93%, Alternative 2, consists of projected attainments in the range of 85% to 88%, and the No Action Alternative has projected attainments between 85% and 109%. We strove in A1 and A2 to present options with a predictable and temporally even structure, which was appreciated by the GAP, and avoid starting the year with highly variable trip limits, such as resulted from the "rolling over" of 2010 trip limits into 2011, due to unforeseeable delays in implementation.

Trip limits for the four DTL sablefish fisheries under Alternative 1 yield projected attainments of better than 90%, yet allow for some uncertainty in landings data and model projections. These trip limits can be adjusted inseason as needed to influence higher or lower landings as 2012 progresses.

The GMT recommends 2012 trip limits for the four DTL sablefish fisheries under Alternative 1, in Table 6.

IFQ fishery

The GMT worked with the GAP to further refine the request in the GAP inseason report and understands the request for 2012 to be:

1) 45°46' - 48°10': Move seaward line from 200 fm to 150 fm for Period 2.

Tables 8 and 9 highlight the changes proposed in this request.

Table 8. Current limited entry trawl rockfish conservation areas north of 40°10' N. lat.

	Jan-Feb	**Mar-Apr**	**May-Jun**	**Jul-Aug**	**Sept-Oct**	**Nov-Dec**
North of 48°10' N. lat.	shore - modified 200 fm line	shore - 200 fm line	shore - 150 fm line		shore - 200 fm line	shore - modified 200 fm line
48°10' N. lat. - 45°46' N. lat.	75 fm line - modified 200 fm line	75 fm line - 200 fm line	75 fm line - 150 fm line	100 fm line - 150 fm line	75 fm line - 150 fm line	75 fm line - 150 fm line
45°46' N. lat. - 40°10' N. lat.			75 fm line - 200 fm line	100 fm line - 200 fm line	75 fm line - 200 fm line	75 fm line - modified 200 fm line

Table 9. Proposed limited entry trawl rockfish conservation areas north of 40°10' N. lat. with the requested modification (strikeout vs bold).

	Jan-Feb	**Mar-Apr**	**May-Jun**	**Jul-Aug**	**Sept-Oct**	**Nov-Dec**
North of 48°10' N. lat.	shore - modified 200 fm line	shore - 200 fm line	shore - 150 fm line		shore - 200 fm line	shore - modified 200 fm line
48°10' N. lat. - 45°46' N. lat.	75 fm line - modified 200 fm line	75 fm line – ~~200 fm line~~ **150 fm line**	75 fm line - 150 fm line	100 fm line - 150 fm line	75 fm line - 150 fm line	75 fm line - 150 fm line
45°46' N. lat. - 40°10' N. lat.		75 fm line - 200 fm line	75 fm line - 200 fm line	100 fm line - 200 fm line	75 fm line - 200 fm line	75 fm line - modified 200 fm line

We examined time-weighted average bycatch rates from WCGOP, from 2005 to 2010, data which are available for this area, during this period (Table 10). It generally shows increased bycatch rates of rebuilding species in Periods 1 and 2, in the area shoreward of 150 fm, versus the area shoreward of 200 fm, indicating that if the seaward RCA were moved from 200 fm to 150 fm during periods 1 and 2 of 2012, that the probability of encountering darkblotched rockfish, Pacific ocean perch, widow rockfish and yelloweye rockfish will likely be higher than if status quo seaward boundaries remained in place. However, this fishery is now managed under IFQ, attainment of these rebuilding species is currently very low (NMFS report under Agenda Item E.6.b., Status Report on the 2011 Rationalized Trawl Fishery), at 17%, 19%, 35%

and 6% respectively, as of October 11, 2011. Fishing behavior, and bycatch rates, could potentially be different than those observed during pre-IFQ. We also note that the request was made for a relatively small area of the coast ($48^{o}10'$ - $45^{o}46'$ N. lat.). The Council should consider the potential impact of individual accountability when making this decision.

Table 10. Time-weighted average, pre-IFQ bycatch rates of rebuilding species, seaward of 150 fm and 200 fm, for Period 2, over the years 2005-2010, in the area north of 40°10'N. lat.

Species	**> 150 fm**	**> 200 fm**
bocaccio	0.0001%	0.0001%
canary	0.0030%	0.0044%
cowcod	0.0000%	0.0000%
darkblotched	0.7734%	0.5875%
pop	0.5384%	0.3041%
widow	0.0084%	0.0061%
yelloweye	0.0002%	0.0001%

Therefore, the GMT recommends the Council consider changes to the trawl Rockfish Conservation Area (RCA) from the 200 fm line to the 150 fm line (Table) for the area $45^{o}46'$ N. lat. (Cape Falcon) to $48^{o}10'$ N. lat. (Cape Alava) during March and April of 2012.

Minor Nearshore Rockfish and Black Rockfish Limits between 42° N. lat. and 40°10' N. lat.

In 2009-2010, the Council has recommended re-structuring and increases to the trip limits for minor nearshore rockfish and black rockfish trip limits in both the limited entry fixed gear fishery and the open access fishery. The Council has recommended that these changes be implemented consistently, over the entire calendar year. However, due to workload and delays in implementation, those changes were not able to be implemented until Period 2, leaving outdated trip limit structures and amounts in place during Period 1. The GMT finds it pertinent to strive for greater stability in structuring these limits using a stable trip limit for periods 1-6. Therefore, the GMT has determined that it would be appropriate to increase black rockfish limits for both LEFG and OA during Period 1 nearshore fisheries in California, between 42° N. lat. and 40°10' N. lat. Restructuring the trip limits in this manner would allow consistent access to the higher black rockfish ACL while restricting blue rockfish harvest to stay within its' harvest guidelines. The proposed modified trip limit for Period 1 is "8,500 lb /2months of which no more than 1,200 lb may be species other than black rockfish". Under this restructured trip limit, blue rockfish would continue to be managed under the 1,200 lb/2 month sub limit. With this change in Period 1, it will bring consistency to the trip limit structure and poundage for the entire year, as the Council as previously recommended.

The GMT recommends a minor nearshore rockfish and black rockfish trip limit between 42° N. lat. and 40°10' N. lat. in both the LEFG and OA fisheries be revised in Period 1 to "8,500 lb /2months of which no more than 1,200 lb may be species other than black rockfish."

Recommendations for 2012:

1) **The GMT recommends trip limits for the four DTL sablefish fisheries under Alternative 1, in Table 6.**

2) **The GMT recommends the Council consider changes to the trawl Rockfish Conservation Area (RCA) from the 200 fm line to the 150 fm line (see Table 9) for the area between 45°46' N. lat. (Cape Falcon) to 48°10' N. lat. (Cape Alava) during March and April (Period 2).**

3) **The GMT recommends a minor nearshore rockfish and black rockfish trip limit between 42° N. lat. and 40°10' N. lat. in both the LEFG and OA fisheries be revised in Period 1 to "8,500 lb /2months of which no more than 1,200 lb may be species other than black rockfish."**

4) **The GMT recommends the adoption of conforming regulations to restrict recreational lingcod fisheries in Washington as proposed in Agenda Item E.8.b, WDFW Report.**

Attachment 1. November 2011 Scorecard. Allocations[a] and projected mortality impacts (mt) of overfished groundfish species for 2011. Bolded numbers represent updates since the June Council meeting.

Fishery	Bocaccio b/		Canary		Cowcod b/		Dkbl		Petrale		POP		Widow		Yelloweye	
***Date*: 1 November, 2011**	Allocation a/	Projected Impacts	Allocation a/	Projected Impacts	Allocation a/	Projected Impacts	Allocation a/	Projected Impacts	Allocation a/	Projected Impacts	Allocation a/	Projected Impacts	Allocation a/	Projected Impacts	Allocation a/	Projected Impacts
Off the Top Deductions	13.4	13.4	20.0	19.7	0.3	0.3	18.7	18.7	65.4	64.5	12.8	12.9	61.0	58.6	5.9	4.5
EFPc/	11.0	11.0	1.3	1.0	0.2	0.2	1.5	1.5	2.0	2.0	0.1	0.1	11.0	8.7	0.1	0.0
Research d/	1.7	1.7	7.2	7.2	0.1	0.1	2.1	2.1	17.0	17.0	1.8	1.8	1.6	1.6	3.3	**2.0**
Incidental OA e/	0.7	0.7	2.0	2.0	--	--	15.0	15.0	1.0	0.1	0.0	0.1	3.3	3.3	0.2	0.2
Tribal f/			9.5	9.5			0.1	0.1	45.4	45.4	10.9	10.9	45.0	45.0	2.3	2.3
Trawl Allocations	60.0	60.0	34.1	34.1	1.8	1.8	265.0	265.0	876.0	876.0	137.0	137.0	491.0	491.0	0.6	0.6
---SB Trawl	60.0	60.0	25.9	25.9	1.8	1.8	250.5	250.5	871.0	871.0	119.6	119.6	342.1	342.1	0.6	0.6
---At-Sea Trawl			8.2	8.2			14.5	14.5	5.0	5.0	17.4	17.4	147.9	147.9		
a) At-sea whiting MS			3.4	3.4			6.0	6.0			7.2	7.2	61.2	61.2		
b) At-sea whiting CP			4.8	4.8			8.5	8.5			10.2	10.2	86.7	86.7		
Non-Trawl Allocation	189.6	55.9	29.8	18.9	0.9	0.2	14.0	5.8	35.0	0.0	7.0	0.4	49.0	10.0	10.5	9.8
Non-Nearshore	57.9		2.3												1.3	
LE FG				1.4				4.8				0.3		0.1		0.8
OA FG				0.2				0.8				0.1		0.0		0.1
Directed OA: Nearshore	0.7	0.5	4.0	3.2		0.0		0.2						0.2	1.1	1.0
Recreational Groundfish																
WA			2.0	**1.0**				--		--		--		--	2.6	2.5
OR			7.0	**3.8**				--		--		--		1.0	2.4	2.3
CA	131.0	55.4	14.5	9.3		0.2		--		--		--		8.7	3.1	3.1
TOTAL	263.0	129.3	83.9	**72.7**	3.0	2.3	297.7	289.5	976.4	940.5	156.8	150.3	601.0	559.6	17.0	**14.9**
2011 Harvest Specification	**263**	**263**	**102**	**102**	**3.0**	**3.0**	**298**	**298**	**976**	**976**	**157**	**157**	**600**	**600**	**17**	**17**
Difference g/	0.0	133.7	18.1	29.3	0.0	0.7	0.3	8.5	-0.4	35.5	0.2	6.7	-1.0	40.4	0.0	2.1
Percent of OY	100.0%	49.2%	82.3%	71.3%	100.0%	76.7%	99.9%	97.1%	100.0%	96.4%	99.9%	95.7%	100.2%	93.3%	100.0%	87.6%

Key	
	= not applicable
--	= trace, less than 0.1 mt
	= Fixed Values
	= off the top deductions

a/ Formal allocations are represented in the black shaded cells and are specified in regulation in Tables 1b and 1e. The other values in the allocation columns are 1) off the top deductions, 2) set asides from the trawl allocation (at-sea petrale only) 3) ad-hoc allocations recommended in the 2011-12 EIS process, 4) HG for the recreational fisheries for canary and YE.

b/ South of 40°10' N. lat.

c/ EFPs are amounts set aside to accommodate anticipated applications. Values in this table represent the estimates from the 11-12 biennial cycle, which are currently specified in regulation.

d/ Includes NMFS trawl shelf-slope surveys, the IPHC halibut survey, and expected impacts from SRPs and LOAs.

e/ The GMT's best estimate of impacts as analyzed in the 2011-2012 Environmental Impact Statement (Appendix B), which are currently specified in regulation.

f/ Tribal values in the allocation column represent the the values in regulation. Projected impacts are the tribes best estimate of catch.

g/ Petrale and widow allocations round higher than the ACL as a result of rounding issues. Projected impacts are under the ACL; there is no conservation concern.

Attachment 2. Scorecard for the beginning of 2012. Allocations[a] and projected mortality impacts (mt) of overfished groundfish species for 2012.

Fishery	Bocaccio b/		Canary		Cowcod b/		Dkbl		Petrale		POP		Widow		Yelloweye	
***Date*: 1 November 2011**	Allocation a/	Projected Impacts	Allocation a/	Projected Impacts	Allocation a/	Projected Impacts	Allocation a/	Projected Impacts	Allocation a/	Projected Impacts	Allocation a/	Projected Impacts	Allocation a/	Projected Impacts	Allocation a/	Projected Impacts
Off the Top Deductions	13.4	2.4	20.0	18.7	0.3	0.1	18.7	17.2	65.4	87.1	25.5	12.8	61.0	64.9	5.9	5.8
EFPc/	**11.0**	**0.0**	**1.3**	**0.0**	**0.2**	**0.0**	**1.5**	**0.0**	**2.0**	**0.0**	**12.8**	**0.0**	**11.0**	**0.0**	**0.1**	**0.0**
Research d/	1.7	1.7	7.2	7.2	0.1	0.1	2.1	2.1	17.0	17.0	1.8	1.8	1.6	1.6	3.3	3.3
Incidental OA e/	0.7	0.7	2.0	2.0	--	--	15.0	15.0	1.0	0.1	0.0	0.1	3.3	3.3	0.2	0.2
Tribal f/			9.5	9.5			0.1	0.1	45.4	**70.0**	10.9	10.9	45.0	**60.0**	2.3	2.3
Trawl Allocations	60.0	60.0	34.1	34.1	1.8	1.8	265.0	265.0	876.0	876.0	137.0	137.0	491.0	491.0	0.6	0.6
---SB Trawl	60.0	60.0	25.9	25.9	1.8	1.8	250.5	250.5	871.0	871.0	119.6	119.6	342.1	342.1	0.6	0.6
---At-Sea Trawl			8.2	8.2			14.5	14.5	5.0	5.0	17.4	17.4	147.9	147.9		
a) At-sea whiting MS			3.4	3.4			6.0	6.0			7.2	7.2	61.2	61.2		
b) At-sea whiting CP			4.8	4.8			8.5	8.5			10.2	10.2	86.7	86.7		
Non-Trawl Allocation	189.6	55.9	29.8	19.2	0.9	0.2	14.0	5.8	35.0	0.0	7.0	0.4	49.0	10.0	10.5	9.9
Non-Nearshore	57.9		2.3												1.3	
LE FG				1.4				4.8				0.3		0.1		0.8
OA FG				0.2				0.8				0.1		0.0		0.1
Directed OA: Nearshore	0.7	0.5	4.0	3.3		0.0		0.2						0.2	1.1	1.1
Recreational Groundfish																
WA			2.0	**1.0**				--		--		--		--	2.6	2.5
OR			7.0	**4.0**				--		--		--		1.0	2.4	**2.3**
CA	131.0	55.4	14.5	9.3		0.2		--		--		--		8.7	3.1	3.1
TOTAL	**263.0**	**118.3**	**83.9**	**72.0**	**3.0**	**2.1**	**297.7**	**288.0**	**976.4**	**963.1**	**169.5**	**150.2**	**601.0**	**565.9**	**17.0**	**16.3**
2011 Harvest Specification g/	**263**	**263**	**102**	**102**	**3.0**	**3.0**	**298**	**298**	**976**	**976**	**157**	**157**	**600**	**600**	**17**	**17**
Difference	0.0	144.7	18.1	30.0	0.0	0.9	0.3	10.0	-0.4	12.9	-12.5	6.8	-1.0	34.1	0.0	0.7
Percent of OY	100.0%	45.0%	82.3%	70.6%	100.0%	70.0%	99.9%	96.6%	100.0%	98.7%	108.0%	95.7%	100.2%	94.3%	100.0%	95.9%

Key	
	= not applicable
--	= trace, less than 0.1 mt
	= Fixed Values
	= off the top deductions

a/ Formal allocations are represented in the black shaded cells and are specified in regulation in Tables 1b and 1e. The other values in the allocation columns are 1) off the top deductions, 2) set asides from the trawl allocation (at-sea petrale only) 3) ad-hoc allocations recommended in the 2011-12 EIS process, 4) HG for the recreational fisheries for canary and YE.

b/ South of 40°10' N. lat.

c/ EFPs are amounts set aside to accommodate anticipated applications. Values in this table represent the estimates from the 11-12 biennial cycle, which are currently specified in regulation.

d/ Includes NMFS trawl shelf-slope surveys, the IPHC halibut survey, and expected impacts from SRPs and LOAs.

e/ The GMT's best estimate of impacts as analyzed in the 2011-2012 Environmental Impact Statement (Appendix B), which are currently specified in regulation.

f/ Tribal values in the allocation column represent the the values in regulation. Projected impacts are the tribes best estimate of catch.

Agenda Item E.8.b
WDFW Report
November 2011

WASHINGTON DEPARTMENT OF FISH AND WILDLIFE REPORT ON INSEASON ADJUSTMENTS FOR 2012

The Washington Department of Fish and Wildlife (WDFW) has recently become aware of areas off the Washington coast where recreational fishermen have been fishing to target bottomfish, primarily lingcod, and have had encounters with yelloweye rockfish. For the purposes of managing recreational halibut and bottomfish fisheries, WDFW divides our coast into four management areas. Two management areas along the northern coast are typically managed together and are commonly referred to as the north coast area. The other areas are the south coast area and the Columbia River area. The Columbia River area is separated from the south coast management area at Leadbetter Point and is shared with Oregon for halibut management purposes.

For over ten years, WDFW has had a large yelloweye rockfish conservation area (YRCA) off its north coast and there have been two smaller offshore YRCAs within the south coast area, one of which has been in place since 2006. In addition, we have utilized depth restrictions of 20 fm and 30 fm within these areas, respectively, to provide additional protection for overfished rockfish during the primary recreational bottomfish seasons. However, catches of yelloweye rockfish within the Columbia River area off Washington were essentially a few individual fish per year, and halibut and bottomfish effort was relatively low compared to the rest of the coast; therefore, we had not implemented any depth restrictions or created any YRCAs within this area.

Recently there has been increased interest by charter operations from Westport in fishing trips targeting lingcod in deep water in both the south coast and Columbia River management areas. Interest in the Columbia River area off Leadbetter point has also spread down to Ilwaco and northern Oregon. Earlier this year, a couple of those charter boats reported catching fairly large amounts of yelloweye rockfish while targeting bottomfish and lingcod. WDFW received additional reports of yelloweye encounters from charter boats targeting lingcod in the south coast late this summer. Needless to say, this has caused considerable alarm amongst the Washington and Oregon recreational fishing communities.

In response, WDFW took action through state emergency regulations to close areas in both the south coast (beginning September 3) and Columbia River areas (beginning Aug 27) to lingcod fishing to reduce impacts to yelloweye rockfish for the remainder of 2011. Following the emergency action WDFW worked with charter boats and fishing representatives in both Westport and Ilwaco to develop areas that are recommended for permanent closure to lingcod fishing for 2012 in federal regulations through inseason action (see Attachment 1). While the current catch data through August does not indicate that the Washington recreational harvest guideline for yelloweye rockfish will be exceeded in 2011, we believe these changes are necessary to keep yelloweye harvests within the Washington harvest guidelines in 2012 and beyond.

In addition to the final recommendation, WDFW considered other options such as alternative depths for closure, specific area closures (YRCAs) and the species that would be included in the restriction (i.e., halibut, bottomfish or lingcod only) and how the proposed regulation would align with current bottomfish restrictions. We support the measures described below because they will reduce encounters with yelloweye rockfish in deep water to the degree necessary to keep recreational yelloweye impacts within the harvest guideline and are easy for recreational fishermen to understand and enforcement to monitor.

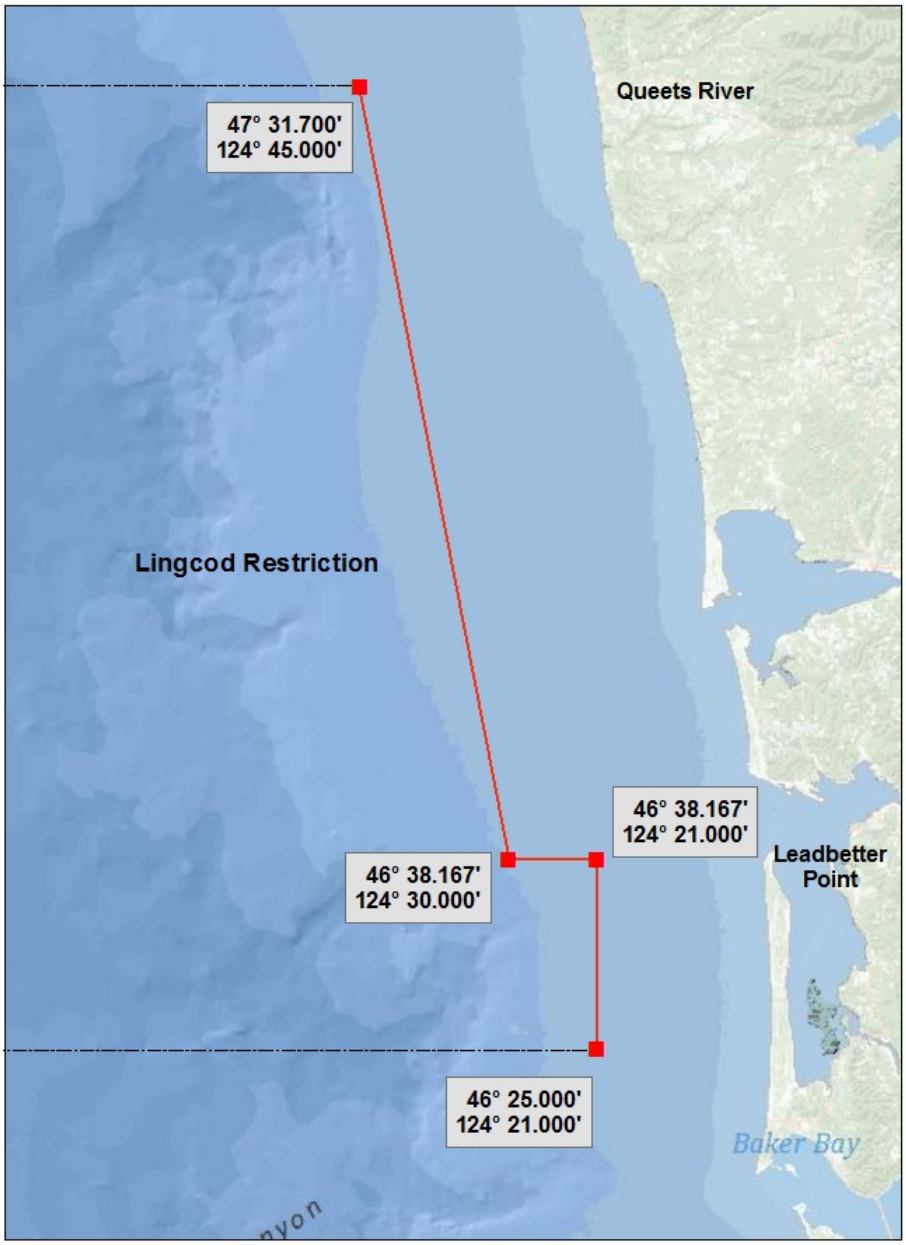
Proposed changes to groundfish regulations for the south coast and Columbia River management areas; Washington Marine Areas 1 (Leadbetter Point to the Washington/Oregon border) and Washington Marine Area 2 (Queets River to Leadbetter Point):

- Close recreational lingcod fishing seaward of a line connecting the following coordinates from the Queets River (47°31.70' N. lat.) to 46°25.00' N. lat, 124°21.00' W. lon., year round except as allowed in Washington Marine Area 2 on days open to the primary halibut fishery:

    1. 47°31.70' N. lat 124°45.00' W. lon.
    2. 46°38.17' N. lat 124°30.00' W. lon.
    3. 46°38.17' N. lat 124°21.00' W. lon.
    4. 46°25.00' N. lat 124°21.00' W. lon.

Agenda Item E.8.b
WDFW Attachment 1
November 2011

Proposed Lingcod Fishing Restricted Area off the Washington Coast



BIENNIAL MANAGEMENT SPECIFICATIONS PROCESS FOR 2013-2014 GROUNDFISH FISHERIES – PART 2

This is the second agenda item at this meeting addressing harvest specifications and management measures for 2013-2014 groundfish fisheries. Under Agenda Item E.4, the Council is scheduled to adopt final overfishing limits, overfishing probabilities (P*s)/acceptable biological catches, and stock complex structures. The Council should also adopt preliminary preferred annual catch limits (ACLs) for each stock and stock complex. In the event the Council does not complete all tasks under Agenda Item E.4 or if additional analyses are requested, the remainder of the harvest specifications decisions should be made under Agenda Item E.9. Further, under this agenda item, the Council is scheduled to take action on management measures including adopting set asides, two-year allocations, season structures for commercial and recreational fisheries, and new management measures.

Deductions from the ACLs or annual catch targets (ACTs) are necessary to account for fishing-related groundfish mortality resulting from Pacific Coast treaty Indian tribal harvest, scientific research, non-groundfish fisheries, and, as necessary, exempted fishing permits (EFPs). The Groundfish Management Team (GMT) prepared a report summarizing the recommended set-asides, excluding EFPs (Agenda Item E.9.b, GMT Report). The GMT will revise the amounts after the Council adopts the 2013-2014 EFPs for public review under Agenda Item E.3. The Council should adopt or modify the GMT recommendations under this agenda item.

The Council should also adopt preliminary two-year allocations for bocaccio, canary, cowcod, and yelloweye rockfish to facilitate the analysis. Attachment 1 contains recent catch estimates by sector relevant to deciding preliminary allocations. After the Council selects the range of overfished species ACLs under Agenda Item E.4, the GMT will calculate the sector allocations based on the 2011-2012 apportionments or other schemes, as requested. Last cycle, the Council temporarily suspended the trawl and non-trawl Amendment 21 allocation for petrale sole, since the stock was declared overfished. Guidance should be provided under this agenda item if the Council is interested in a similar structure for 2013-2014.

Helpful guidance from the Council under this agenda item would be a range of season and area restrictions for the primary fishing sectors; a range of trip limits, daily bag limits, and other harvest control measures for key target and constraining bycatch species; a range of geographic or sector-specific harvest guidelines; and a sense of how far fisheries should be restricted in 2013-2014 to rebuild depleted species as quickly as possible given the biological, ecological, social, and economic consequences of doing so.

At the September meeting, the Council adopted a prioritized range of new management measures as candidates for preliminary scoping and analysis. The National Marine Fisheries Service provided a report recommending alternate rulemakings for some of those management measures considered for implementation through the biennial process (Agenda Item E.9.b, NMFS Report). The GMT completed preliminary analysis and scoping of these management measures (Agenda Item E.9.b, GMT Report 2). The California Department of Fish and Game also provided

recommendations for a preliminary range of management measures for the commercial and recreational fisheries in California (Agenda Item E.9.b, CDFG Report). Public comment received by the Briefing Book deadline is also included.

Under this agenda item, the Council should carefully consider the list of potential management measures proposed by management entities, advisory bodies, and the public, as well as the intended narrow scope of action for 2013-2014 when deciding which issues are the highest priorities for more detailed analyses. Results of the detailed analyses will help the Council develop a preliminary preferred suite of 2013-2014 management measures at the April 2012 Council meeting. After a public review period, the Council will take final action at the June 2012 Council meeting.

Council Action:

1. **Adopt any remaining groundfish harvest specifications for 2013-2014.**
2. **Adopt deductions from the ACLs or ACTs (if applicable).**
3. **Adopt preliminary two-year allocations for bocaccio, canary, cowcod, and yelloweye.**
4. **Adopt preliminary petrale sole allocations.**
5. **Adopt a range of management measures for more detailed analysis.**

Reference Materials:

1. Agenda Item E.9.a, Attachment 1: Recent Year Catch Estimates Relevant to Deciding a Range of 2013-2014 Allocations.
2. Agenda Item E.9.b, NMFS Report: NMFS Advice on the Preliminary List of Management Measures for 2013-14 Groundfish Fisheries.
3. Agenda Item E.9.b, GMT Report: GMT Report on Off the Top Deductions (Set-Asides) for 2013-14.
4. Agenda Item E.9.b, GMT Report 2: GMT Report on Preliminary Management Measures for 2013-14.
5. Agenda Item E.9.b, CDFG Report: Preliminary Range of Management Measures for California's 2013-2014 Commercial and Recreational Groundfish Fisheries.
6. Agenda Item E.9.c, Public Comment.

Agenda Order:

a. Agenda Item Overview — Kelly Ames and John DeVore
b. Reports and Comments of Advisory Bodies and Management Entities
c. Public Comment
d. **Council Action:** Adopt Any Remaining Harvest Specifications, Preliminary Two-Year Allocations, and Management Measures for More Detailed Analysis.

PFMC
10/14/11

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RECENT YEAR CATCH ESTIMATES RELEVANT TO DECIDING A RANGE OF 2013-2014 ALLOCATIONS

1. September 2011 Groundfish Management Team Scorecard: This is the most recent scorecard, under the 2011 regulations (76FR27508, published May 2011), updated with the latest West Coast Groundfish Observer Data (2009 bycatch rates), tribal impacts, exempted fishing permits impacts, and research impacts. Bocaccio, canary, cowcod, petrale sole, and yelloweye allocations are based on the Council's recommendations for two-year allocations while darkblotched, Pacific Ocean Perch, and widow values represent the Amendment 21 allocations.

2. 2011-2012 Allocation Values and Percentages from Final Council Action in June 2010.

3. Historical Scorecard Percentages for Overfished Species, After Removing Set-Asides. These are the percentages adopted by the Council during the 2005-2006, 2007-2008, and 2009-2010 cycles. Percentages for the limited entry whiting trawl fishery are based on bycatch limits analyzed in the Environmental Impact Statement and may not represent the actual values specified in Federal regulation. The canary and yelloweye rockfish percentages for the California recreational fishery are based on the harvest guidelines for specified in regulation for each biennium. The canary and yelloweye rockfish percentages for the Washington and Oregon recreational fisheries represent the informal sharing agreements between the states in order to stay within the federally specified harvest guidelines north of 42° N. lat. In 2005-2006, values for the fixed gear nearshore values, sablefish daily trip limit are included in the open access groundfish directed row.

4. Table 19. Estimated total fishing mortality (mt) of major west coast groundfish species in 2010 by sector. Excerpt from the Estimated Discard and Total Catch of Selected Groundfish Species in the 2010 U.S. West Coast Fisheries (October 2011).

5. Table 19. Estimated total fishing mortality (mt) of major west coast groundfish species in 2009 by sector. Excerpt from the Estimated Discard and Total Catch of Selected Groundfish Species in the 2009 U.S. West Coast Fisheries (October 2010).

6. Estimated Total Mortality of Overfished Species in the Recreational Fisheries from 2005-2010. These data were provided by state staff and represent updates and corrections that occurred since the publication of the 2007 & 2008 Estimated Discard and Total Catch of Selected Groundfish Species in the U.S. West Coast Fisheries reports.

Attachment 1. September 2011 Scorecard. Allocations[a] and projected mortality impacts (mt) of overfished groundfish species for 2011. Bolded numbers represent updates since the June Council meeting.

Fishery	Bocaccio b/		Canary		Cowcod b/		Dkbl		Petrale		POP		Widow		Yelloweye	
***Date*: 15 Sept, 2011**	Allocation a/	Projected Impacts	Allocation a/	Projected Impacts	Allocation a/	Projected Impacts	Allocation a/	Projected Impacts	Allocation a/	Projected Impacts	Allocation a/	Projected Impacts	Allocation a/	Projected Impacts	Allocation a/	Projected Impacts
Off the Top Deductions	13.4	13.4	20.0	19.7	0.3	0.3	18.7	18.7	65.4	64.5	12.8	12.9	61.0	58.6	5.9	5.1
EFPc/	11.0	11.0	1.3	1.0	0.2	0.2	1.5	1.5	2.0	2.0	0.1	0.1	11.0	8.7	0.1	0.0
Research d/	1.7	1.7	7.2	7.2	0.1	0.1	2.1	2.1	17.0	17.0	1.8	1.8	1.6	1.6	3.3	**2.6**
Incidental OA e/	0.7	0.7	2.0	2.0	--	--	15.0	15.0	1.0	0.1	0.0	0.1	3.3	3.3	0.2	0.2
Tribal f/			9.5	9.5			0.1	0.1	45.4	45.4	10.9	10.9	45.0	45.0	2.3	2.3
Trawl Allocations	60.0	60.0	34.1	34.1	1.8	1.8	265.0	265.0	876.0	876.0	137.0	137.0	491.0	491.0	0.6	0.6
---SB Trawl	60.0	60.0	25.9	25.9	1.8	1.8	250.5	250.5	871.0	871.0	119.6	119.6	342.1	342.1	0.6	0.6
---At-Sea Trawl			8.2	8.2			14.5	14.5	5.0	5.0	17.4	17.4	147.9	147.9		
a) At-sea whiting MS			3.4	3.4			6.0	6.0			7.2	7.2	61.2	61.2		
b) At-sea whiting CP			4.8	4.8			8.5	8.5			10.2	10.2	86.7	86.7		
Non-Trawl Allocation	189.6	55.9	29.8	17.2	0.9	0.2	14.0	5.8	35.0	0.0	7.0	0.4	49.0	10.0	10.5	9.8
Non-Nearshore	57.9		2.3													
LE FG				1.4				4.8				0.3		0.1	0.8	0.8
OA FG				0.2				0.8				0.1		0.0	0.1	0.1
Directed OA: Nearshore	0.7	0.5	4.0	**3.2**		0.0		0.2						0.2	1.1	1.0
Recreational Groundfish																
WA			2.0	0.7				--		--		--		--	2.6	2.5
OR			7.0	2.4				--		--		--		1.0	2.4	**2.3**
CA	131.0	55.4	14.5	9.3		0.2		--		--		--		8.7	3.1	3.1
TOTAL	263.0	129.3	83.9	71.0	3.0	2.3	297.7	289.5	976.4	940.5	156.8	150.3	601.0	559.6	17.0	15.5
2011 Harvest Specification	**263**	**263**	**102**	**102**	**3.0**	**3.0**	**298**	**298**	**976**	**976**	**157**	**157**	**600**	**600**	**17**	**17**
Difference g/	0.0	133.7	18.1	31.0	0.0	0.7	0.3	8.5	-0.4	35.5	0.2	6.7	-1.0	40.4	0.0	1.5
Percent of OY	100.0%	49.2%	82.3%	69.6%	100.0%	76.7%	99.9%	97.1%	100.0%	96.4%	99.9%	95.7%	100.2%	93.3%	100.0%	91.2%
Key			= not applicable													
	--		= trace, less than 0.1 mt													
			= Fixed Values													
			= off the top deductions													

a/ Formal allocations are represented in the black shaded cells and are specified in regulation in Tables 1b and 1e. The other values in the allocation columns are 1) off the top deductions, 2) set asides from the trawl allocation (at-sea petrale only) 3) ad-hoc allocations recommended in the 2011-12 EIS process, 4) HG for the recreational fisheries for canary and YE.

b/ South of 40°10' N. lat.

c/ EFPs are amounts set aside to accommodate anticipated applications. Values in this table represent the estimates from the 11-12 biennial cycle, which are currently specified in regulation.

d/ Includes NMFS trawl shelf-slope surveys, the IPHC halibut survey, and expected impacts from SRPs and LOAs.

e/ The GMT's best estimate of impacts as analyzed in the 2011-2012 Environmental Impact Statement (Appendix B), which are currently specified in regulation.

f/ Tribal values in the allocation column represent the the values in regulation. Projected impacts are the tribes best estimate of catch.

g/ Petrale and widow allocations round higher than the ACL as a result of rounding issues. Projected impacts are under the ACL; there is no conservation concern.

Table 2. Allocation Values and Percentages from Final Council Action in June 2010.

2011 Percentages from Final Action in June 2010								
Sector	**Bocaccio**	Percentage	**Canary**	Percentage	**Cowcod**	Percentage	**Yelloweye**	Percentage
Shorebased Trawl, incl. whiting	60	24.0%	20.0	31.3%	1.8	66.7%	0.6	5.4%
At-Sea Whiting	0	0.0%	14.1	22.1%		0.0%	0.0	0.0%
Nearshore	0.7	0.3%	4.0	6.3%		0.0%	1.1	9.9%
Non-nearshore	57.9	23.2%	2.3	3.6%	0.9	33.3%	1.3	11.7%
Rec: WA	0	0.0%	2.0	3.1%			2.6	23.4%
Rec: OR	0	0.0%	7.0	11.0%			2.4	21.6%
Rec: CA	131	52.5%	14.5	22.7%			3.1	27.9%
Sub-Total	249.6	100.0%	63.9	100.0%	2.7	100.0%	11.1	100.0%

2012 Percentages from Final Action in June 2010								
Sector	**Bocaccio**	Percentage	**Canary**	Percentage	**Cowcod**	Percentage	**Yelloweye**	Percentage
Shorebased Trawl, incl. whiting	60	24.0%	20.0	31.0%	1.8	66.7%	0.6	5.4%
At-Sea Whiting	0	0.0%	14.8	22.9%		0.0%	0.0	0.0%
Nearshore	0.7	0.3%	4.0	6.2%		0.0%	1.1	9.9%
Non-nearshore	57.9	23.2%	2.3	3.6%	0.9	33.3%	1.3	11.7%
Rec: WA	0	0.0%	2.0	3.1%			2.6	23.4%
Rec: OR	0	0.0%	7.0	10.8%			2.4	21.6%
Rec: CA	131	52.5%	14.5	22.4%			3.1	27.9%
Sub-Total	249.6	100.0%	64.6	100.0%	2.7	100.0%	11.1	100.0%

Table 3. Historical Scorecard Percentages for Overfished Species, After Removing Set-Asides.

Fishery	Year	Bocaccio	Canary	Cowcod	Yelloweye
Limited Entry Trawl- Non-whiting	2005-2006	42.3%	24.0%	38.5%	2.4%
	2007-2008	34.7%	24.1%	87.5%	0.7%
	2009-2010	11.8%	19.1%	81.3%	5.6%
Limited Entry Trawl - Whiting	2005-2006	0.0%	21.9%	0.0%	2.4%
	2007-2008	0.0%	14.3%	0.0%	0.0%
	2009-2010	0.0%	22.2%	0.0%	0.0%
Limited Entry Fixed Gear	2005-2006	11.5%	2.7%	7.7%	14.8%
	2007-2008	9.7%	2.7%	3.1%	16.8%
	2009-2010	12.9%	1.2%	6.3%	12.1%
Open access Groundfish Directed c/	2005-2006	9.1%	3.0%	7.7%	3.6%
Sablefish DTL + Other	2007-2008	7.7%	0.3%	0.0%	2.2%
	2009-2010	10.2%	0.1%	6.3%	2.8%
Fixed Gear Nearshore	2007-2008	0.0%	6.1%	0.0%	15.3%
	2009-2010	0.2%	3.3%	0.0%	5.6%
WA - Rec	2005-2006	0.0%	5.7%	0.0%	30.8%
	2007-2008	0.0%	5.2%	0.0%	25.5%
	2009-2010	0.0%	6.0%	0.0%	25.2%
OR - Rec	2005-2006	0.0%	14.7%	0.0%	24.3%
	2007-2008	0.0%	19.8%	0.0%	24.1%
	2009-2010	0.0%	19.7%	0.0%	22.4%
CA - Rec	2005-2006	37.0%	27.9%	46.2%	21.9%
	2007-2008	47.9%	27.4%	9.4%	15.3%
	2009-2010	64.8%	28.2%	6.3%	26.2%

c/ Contains sablefish DTL, other, and fixed gear nearshore.

Table 19. Estimated fishing mortality (mt) of major west coast groundfish species in 2010 by sector.

	Shoreside commercial fisheries						WA tribal landings	All at-sea hake fisheries	Recreational fishing mortality			Research	Incidental fisheries	Estimated fishing mortality
	LE bottom trawl	CA halibut	Pink shrimp	Non-nearshore fixed gear	Nearshore fixed gear	Non-tribal shoreside hake			WA	OR	CA			
Rebuilding species														
Bocaccio (South of 40°10' N. lat.)	12.9	--	--	0.9	0.5	--	NA	NA	NA	NA	57.2	0.6	0.1	72.3
Canary rockfish	2.4	--	0.0	0.0	5.9	4.0	8.2	1.2	1.0	4.2	14.5	1.9	0.1	43.2
Cowcod (South of 40°10' N. lat.)	0.6	--	--	--	--	--	NA	NA	NA	NA	0.4	0.1	0.0	1.2
Darkblotched rockfish	287.3	--	12.1	16.1	0.1	6.7	0.2	8.2	--	--	--	1.0	0.2	332.0
Pacific ocean perch (North of 40°10' N. lat.)	130.1	--	0.1	3.8	--	6.2	0.3	16.8	--	0.0	--	1.7	0.1	159.0
Widow rockfish	25.5	--	0.1	0.1	0.1	54.1	46.6	44.5	--	0.2	0.7	1.4	0.0	173.3
Yelloweye rockfish	0.1	--	0.0	0.3	0.1	--	0.4	0.0	2.0	2.8	1.3	0.5	--	7.6
Non-rebuilding species														
Arrowtooth flounder	3959.0	--	22.8	75.2	0.0	8.3	3.3	13.0	--	0.0	--	8.0	0.1	4089.6
Black rockfish (North of 46°16' N. lat.)	--	--	--	--	--	--	0.0	--	199.4	NA	NA	0.0	--	199.5
Black rockfish (South of 46°16' N. lat.)	0.3	--	--	--	153.2	--	--	--	NA	316.5	179.8	0.0	0.2	650.0
Cabezon (South of 42° N. lat.)	--	--	--	--	23.3	--	--	--	NA	NA	23.8	0.0	0.0	47.1
California scorpionfish (South of 34°27' N. lat.)	--	0.4	--	--	3.0	--	--	NA	NA	NA	63.0	0.0	0.3	66.7
Chilipepper rockfish (South of 40°10' N. lat.)	370.7	--	--	0.2	0.0	--	--	NA	NA	NA	2.8	1.7	0.0	375.5
Dover sole	10842.7	0.0	3.0	14.2	0.0	1.2	56.7	1.9	--	0.0	--	31.1	0.8	10951.7
English sole	239.6	4.0	2.5	0.0	--	0.2	62.3	0.0	--	0.0	0.0	2.5	0.0	311.2
Lingcod (North of 42° N. lat.)	57.3	--	0.1	22.8	21.5	1.8	34.2	1.0	67.8	90.2	NA	2.2	2.7	301.7
Lingcod (South of 42° N. lat.)	24.6	0.5	0.0	6.2	18.8	0.0	--	--	NA	NA	96.4	0.3	1.1	147.9
Longnose Skate	1266.0	0.1	0.4	103.2	0.0	0.1	1.3	0.6	--	0.0	--	1.7	13.0	1386.5
Other flatfish	956.0	29.7	49.4	2.6	1.0	6.8	17.8	10.4	1.5	0.5	43.7	16.6	8.3	1144.3
Other groundfish														
Big skate	33.0	24.5	--	1.3	--	--	--	0.3	--	0.0	--	1.7	0.0	60.9
Cabezon (Oregon)	0.0	--	--	--	23.6	--	--	--	5.4	19.6	NA		0.0	48.7
Kelp greenling	0.0	--	--	--	20.4	--	--	--	2.8	25.4	10.5	0.0	--	59.2
Other Skates	202.2	20.8	0.0	18.3	0.1	0.8	23.6	--	1.1	--	--	0.1	8.8	275.8
Spiny dogfish	520.1	2.9	16.4	254.1	0.1	124.6	6.9	277.7	--	0.1	1.6	10.2	0.4	1215.1
Unspecified grenadiers	299.3	--	--	64.6	0.1	--	--	0.0	--	--	--	--	0.6	364.7
Other	135.9	1.1	0.4	7.9	1.5	3.6	0.5	0.7	--	0.0	35.5	15.5	3.8	206.5
Minor rockfish (North of 40°10' N. lat.)														
Nearshore														
Blue rockfish	--	--	--	--	10.9	--	--	--	2.6	23.0	3.7	0.0	--	40.2
Remaining nearshore rockfish	0.0	--	--	--	8.4	0.0	--	--	6.4	13.9	6.2	0.0	0.0	34.9

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.0 when a value is smaller than one decimal place.

Table 19 (continued).

	Shoreside commercial fisheries						WA tribal landings	All at-sea hake fisheries	Recreational fishing mortality			Research	Incidental fisheries	Estimated fishing mortality
	LE bottom trawl	CA halibut	Pink shrimp	Non-nearshore fixed gear	Nearshore fixed gear	Non-tribal shoreside hake			WA	OR	CA			
Non-rebuilding species (cont.)														
Minor rockfish (North of 40°10' N. lat.) (cont.)														
Shelf														
Bocaccio	0.2	--	0.0	0.2	--	0.0	0.0	1.9	0.8	0.1	--	0.0	0.0	3.2
Chilipepper rockfish	0.5	--	0.0	0.0	--	20.8	--	1.1	--	--	--	0.4	0.0	22.8
Greenspotted rockfish	0.1	--		0.0	--	--	--	--	--	0.0	0.0	0.0	0.0	0.2
Greenstriped rockfish	6.6	--	1.7	0.2	--	--	0.0	0.0	--	--	--	0.0	0.0	8.6
Redstripe rockfish	0.1	--	0.0	0.2	--	0.4	10.8	0.2	--	--	--	0.0	--	11.7
Silvergray rockfish	3.5	--	--	0.1	0.0	0.0	0.0	0.5	--	--	--	0.1	--	4.2
Remaining shelf rockfish	6.1	--	1.5	1.0	2.5	1.1	0.5	0.0	0.8	5.1	7.2	0.0	0.5	26.2
Slope														
Sharpchin rockfish	8.5	--	0.0	0.1	--	0.0	0.0	0.0	--	--	--	0.3	0.0	8.9
Splitnose rockfish	59.9	--	0.2	0.3	0.0	22.3	0.0	43.6	--	--	--	1.5	0.0	127.8
Yellowmouth rockfish	3.3	--	0.0	1.0	--	--	0.0	0.1	--	--	--	0.0	0.3	4.7
Remaining slope rockfish	232.0	--	0.1	117.1	0.0	23.5	24.2	21.5	--	0.0	--	0.2	1.7	420.4
Unspecified rockfish	--	--	--	--	--	--	--	--	--	--	--	3.7	--	3.7
Minor rockfish (South of 40°10' N. lat.)														
Nearshore														
Blue rockfish	--	--	--	--	3.1	--	--	NA	NA	NA	42.3	0.0	0.0	45.5
Gopher rockfish	--	--	--	--	28.8	--	--	NA	NA	NA	76.9	--	0.0	105.7
Remaining nearshore rockfish	0.0	0.0	--	--	60.0	--	--	NA	NA	NA	172.3	0.0	0.1	232.5
Shelf														
Greenspotted rockfish	0.2	--	--	0.8	0.0	--	--	NA	NA	NA	11.5	0.1	0.0	12.6
Greenstriped rockfish	2.8	--	--	0.1	--	--	--	NA	NA	NA	0.8	0.0	--	3.6
Yellowtail rockfish	0.1	--	--	0.4	0.2	--	--	NA	NA	NA	24.0	0.3	0.3	25.4
Remaining shelf rockfish	18.2	0.0	--	5.6	7.1	--	--	NA	NA	NA	175.2	2.1	1.3	209.5
Slope														
Bank rockfish	13.9	--	--	0.1	0.0	--	--	NA	NA	NA	0.1	0.2	--	14.3
Blackgill rockfish	61.4	--	--	84.2	0.5	--	--	NA	NA	NA	--	0.5	5.8	152.3
Sharpchin rockfish	0.6	--	--	--	--	--	--	NA	NA	NA	--	0.0	--	0.6
Remaining slope rockfish	6.8	0.0	--	8.5	0.0	--	--	NA	NA	NA	--	0.0	0.1	15.4
Unspecified rockfish	--	--	--	--	--	--	--	NA	NA	NA	--	4.0	--	4.0
Pacific cod (North of 43° N. lat.)	99.6	--	0.1	2.9	--	0.1	242.4	0.0	0.2	0.0	NA	1.2	0.0	346.5
Pacific hake	758.3	--	398.9	0.6	--	*56150.05	1967.9	106308.0	--	0.0	0.0	133.4	0.0	165717.2
Petrale sole	900.3	0.1	1.2	0.4	0.0	0.1	30.5	--	--	0.1	0.3	2.9	0.2	936.2

* Includes a discard estimate of 214 mt, based on Electronic Monitoring (EM) data and Office of Law Enforcement (OLE) reports.

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.0 when a value is smaller than one decimal place.

Table 19 (continued).

	Shoreside commercial fisheries						WA tribal landings	All at-sea hake fisheries	Recreational fishing mortality			Research	Incidental fisheries	Estimated fishing mortality
	LE bottom trawl	CA halibut	Pink shrimp	Non-nearshore fixed gear	Nearshore fixed gear	Non-tribal shoreside hake			WA	OR	CA			
Non-rebuilding species (cont.)														
Sablefish (North of 36° N. lat.)	2748.4	--	1.2	2768.8	2.3	18.1	579.5	12.4	--	0.1	0.0	25.7	9.8	6166.5
Sablefish (South of 36° N. lat.)	--	--	--	846.9	7.6	--	--	NA	NA	NA	--	1.0	183.4	1038.9
Shortbelly rockfish	4.4	--	0.2	--	--	0.2	--	0.0	--	--	--	1.8	--	6.7
Splitnose rockfish (South of 40°10' N. lat.)	136.7	--	--	0.1	--	--	--	NA	NA	NA	--	2.9	0.0	139.8
Starry flounder	30.4	2.5	--	0.0	0.1	0.3	0.0	--	--	3.0	2.0	0.0	0.1	38.4
Thornyheads														
Longspine thornyhead (North of 34°27' N. lat.)	1695.0	--	--	10.6	--	0.0	0.0	0.0	--	--	--	12.8	0.1	1718.6
Longspine thornyhead (South of 34°27' N. lat.)	--	--	--	24.4	0.0	--	--	NA	NA	NA	--	1.3	0.0	25.7
Shortspine thornyhead (North of 34°27' N. lat.)	1177.5	--	0.2	83.7	0.2	10.3	16.0	4.0	--	--	--	3.5	12.8	1308.1
Shortspine thornyhead (South of 34°27' N. lat.)	--	--	--	171.8	0.1	--		NA	NA	NA	--	0.7	0.1	172.7
Mixed thornyheads	31.5	--	--	6.1	--		--	--	--	--		--	0.0	37.7
Yellowtail rockfish (North of 40°10' N. lat.)	30.2	--	0.2	0.5	0.9	185.0	535.7	150.1	38.5	7.6	0.4	4.2	1.5	954.8
Non-groundfish species														
California halibut	54.7	74.0	--	0.2	1.8	--	--	--	--	0.1	--	--	116.3	247.1
Dungeness crab	265.9	250.5	0.8	3.0	2.9	0.5	1420.5	--	--	--	--	0.0	22615.7	24559.8
Eulachon	0.0	--	18.9	--	--	0.0	--	--	--	0.0	--	0.1	--	19.1
Other non-FMP flatfish	65.8	6.9	115.2	0.0	0.0	--	--	--	--	--	--	0.0	3.5	191.5
Other non-FMP skate	125.9	0.0	0.1	6.0	--	--	--	--	--	--	--	--		132.0
Tanner crab	454.5			6.6		--	--	--	--	--	--	--	0.1	461.2

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.0 when a value is smaller than one decimal place.

Table 19. Estimated total fishing mortality (mt) of major U.S. west coast groundfish species in 2009 by sector.

	Shoreside commercial fisheries							All						
	LE bottom trawl	CA halibut	Pink shrimp	Non-nearshore fixed gear	Nearshore fixed gear	Non-tribal shoreside hake[1]	WA tribal landings	at-sea hake fisheries	Total recreational fishing mortality			Research	Remaining incidental fisheries landings	Estimated total fishing mortality
									WA	OR	CA			
Rebuilding species														
Bocaccio (South of 40°10' N. lat.)	20.4	--	--	1.6	1.0	--	NA	NA	NA	NA	46.4	1.0	0.1	70.6
Canary rockfish	8.9	--	0.0	0.3	3.5	1.8	5.9	2.6	0.5	3.0	11.2	0.5	0.0	38.1
Cowcod (South of 40°10' N. lat.)	0.5	--	--	0.1	0.0	--	NA	NA	NA	NA	0.2	0.1	--	0.9
Darkblotched rockfish	272.4	--	18.3	8.0	0.1	0.6	0.0	0.3	--	--	--	1.5	0.1	301.2
Pacific ocean perch (North of 40°10' N. lat.)	157.7	--	0.4	0.5	--	17.1	0.5	1.6	--	--	--	2.7	0.0	180.5
Widow rockfish	28.5	--	0.0	0.3	0.0	102.7	29.5	26.0	0.0	0.4	1.5	5.3	0.4	194.6
Yelloweye rockfish	0.1	--	--	1.3	0.5	0.0	0.3	0.0	1.6	2.0	3.8	0.7	0.4	10.7
Non-rebuilding species														
Arrowtooth flounder	5314.6	--	20.8	83.4	0.0	2.3	10.5	2.5	--	0.0	--	7.7	1.6	5443.5
Black rockfish (North of 46°16' N. lat.)	0.1	--	--	--	--	--	0.0	--	206.7	NA	NA	0.0	--	206.8
Black rockfish (South of 46°16' N. lat.)	0.5	--	--	--	230.7	--	--	--	NA	309.0	243.7	0.0	0.0	783.9
Cabezon (South of 42° N. lat.)	--	--	--	--	18.7	--	--	--	NA	NA	32.4	0.0	0.0	51.1
California scorpionfish (South of 34°27' N. lat.)	--	0.0	--	--	3.1	--	--	NA	NA	NA	66.7	0.0	0.4	70.2
Chilipepper rockfish (South of 40°10' N. lat.)	304.3	--	--	0.5	0.1	--	--	NA	NA	NA	2.1	3.6	0.1	310.8
Dover sole	12361.4	--	6.6	11.4	0.0	0.0	130.7	0.1	--	0.0	--	29.4	6.5	12546.2
English sole	404.7	0.5	1.1	--	--	0.0	91.3	0.2	--	--	--	2.4	0.3	500.6
Lingcod (North of 42° N. lat.)	127.0	--	0.4	34.2	28.2	0.6	46.1	2.5	54.1	75.5	NA	1.3	2.8	372.7
Lingcod (South of 42° N. lat.)	39.1	0.0	0.1	17.6	20.1	0.0	--	--	--	NA	129.6	1.1	0.5	208.1
Longnose Skate	1275.4	--	2.1	173.3	0.0	0.1	--	0.2	--	--	--	2.8	1.3	1455.1
Other flatfish	1449.0	3.4	31.3	1.6	0.8	0.1	45.4	0.5	1.9	0.3	--	15.7	14.7	1564.7
Other groundfish	1609.8	64.8	0.6	299.3	54.4	16.4	184.5	163.6	7.8	41.4	20.1	27.2	24.4	2514.3
Big skate	78.6	21.8	--	5.8	--	0.0	--	0.1	--	0.0	--	0.3	0.0	106.5
Cabezon (Oregon)	0.1	--	0.0	--	30.3	--	--	--	5.4	18.6	NA	0.0	--	54.4
Kelp greenling	0.0	--	--	--	23.1	--	--	--	1.5	22.7	15.2	0.0	--	62.6
Other Skates	496.5	35.5	--	27.5	0.0	0.2	45.0	0.0	0.9	--	0.0	--	18.6	624.0
Spiny dogfish	665.5	3.2	0.4	216.2	0.0	16.0	125.4	163.4	--	0.1	4.9	10.9	1.0	1206.9
Unspecified grenadiers	203.6	--	--	44.4	--	--	--	--	--	--	0.0	--	--	248.0
Other	165.5	4.4	0.2	5.5	0.9	0.2	14.1	0.2	--	0.0	0.0	16.0	4.8	211.7
Minor rockfish (North of 40°10' N. lat.)	397.4	0.0	5.6	98.2	23.2	7.5	44.6	10.6	5.4	33.2	15.9	8.3	3.3	653.1
Nearshore	0.1	0.0	0.0	0.2	23.2	0.0	0.1	0.0	3.8	28.7	6.8	0.1	--	63.0
Blue rockfish	--	--	--	--	9.1	--	--	--	0.7	16.8	3.2	0.0	--	29.7
Remaining nearshore rockfish	0.1	--	--	0.2	14.1	--	0.1	--	3.1	11.9	3.6	0.1	--	33.3

[1] Non-Tribal Shoreside Hake does not include estimates of catch that was discarded at-sea.

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.00 when a value is smaller than two decimal places.

Table 19 (continued).

	Shoreside commercial fisheries						WA tribal landings	All at-sea hake fisheries	Total recreational fishing mortality			Research	Remaining incidental fisheries landings	Estimated total fishing mortality
	LE bottom trawl	CA halibut	Pink shrimp	Non-nearshore fixed gear	Nearshore fixed gear	Non-tribal shoreside hake[1]			WA	OR	CA			
Non-rebuilding species (cont.)														
Minor rockfish (North of 40°10' N. lat.) (cont.)														
Shelf	38.2	0.0	3.6	2.7	0.0	2.5	4.7	1.1	1.6	4.5	9.1	1.3	0.5	69.9
Bocaccio	0.2	--	--	--	--	0.0	--	1.0	1.2	0.1	--	0.0	--	2.5
Chilipepper rockfish	4.2	--	--	0.3	0.0	2.5	--	0.0	--	0.0	--	0.2	0.3	7.4
Greenspotted rockfish	0.1	--	0.0	0.1	0.0	--	--	--	--	--	--	0.0	0.0	0.2
Greenstriped rockfish	17.5	--	1.0	0.6	--	--	--	--	--	0.0	--	0.0	0.0	19.1
Redstripe rockfish	1.0	--	0.0	--	--	--	2.6	0.0	--	--	--	0.6	0.0	4.2
Silvergray rockfish	0.5	--	--	0.2	0.0	--		0.0	--	0.0	--	0.1	0.0	0.9
Remaining shelf rockfish	14.8	--	2.6	1.7	--	0.1	2.1	--	0.5	4.3	9.1	0.4	0.1	35.7
Slope	359.1	0.0	2.0	95.2	0.0	4.9	39.7	9.5	0.0	0.0	0.0	3.7	2.8	517.0
Sharpchin rockfish	7.3	--	0.0	--	--	0.1	0.0	--	--	--	--	0.9	0.0	8.3
Splitnose rockfish	84.7	--	1.7	1.3	0.0	0.8	0.0	0.1	--	--	--	2.6	0.0	91.2
Yellowmouth rockfish	2.5	--	--	0.4	--	--		0.0	--	--	--	0.0	0.0	2.8
Remaining slope rockfish	264.6	--	0.3	93.6	--	4.1	39.7	9.4	--	--	--	0.2	2.8	414.6
Unspecified rockfish	--	--	--	--	--	--	--	--	--	--	--	3.2	--	3.2
Minor rockfish (South of 40°10' N. lat.)	148.4	0.0	0.0	98.3	92.5	0.0	0.0	0.0	0.0	0.0	544.0	8.2	5.4	896.8
Nearshore	0.1	0.0	0.0	0.0	89.6	--	--	NA	NA	NA	297.9	0.2	0.2	388.0
Blue rockfish	--	--	--	--	3.3	--	--	NA	NA	NA	41.6	0.0	0.0	44.9
Gopher rockfish	--	--	--	--	26.4	--	--	NA	NA	NA	59.5	0.0	0.0	85.9
Remaining nearshore rockfish	0.1	0.0	--	--	59.9	--	--	NA	NA	NA	196.9	0.2	0.2	257.2
Shelf	14.6	0.0	0.0	7.9	0.4	0.0	0.0	0.0	0.0	0.0	246.1	2.3	1.7	273.0
Greenspotted rockfish	0.3	--	--	0.6	0.0	--	--	NA	NA	NA	--	0.1	0.0	1.1
Greenstriped rockfish	1.2	--	--	0.2	0.0	--	--	NA	NA	NA	1.7	0.0	--	3.1
Yellowtail rockfish	0.4	--	--	0.6	0.4	--	--	NA	NA	NA	48.9	0.3	--	50.6
Remaining shelf rockfish	12.7	0.0	--	6.5	--	--	--	NA	NA	NA	195.5	1.8	1.7	218.2
Slope	133.7	0.0	0.0	90.5	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.5	3.4	230.6
Bank rockfish	51.1	--	--	0.2	0.0	--	--	NA	NA	NA	0.0	0.1	0.1	51.6
Blackgill rockfish	48.0	--	--	82.1	2.4	--	--	NA	NA	NA	--	0.4	3.0	136.0
Sharpchin rockfish	4.8	--	--	0.0	--	--	--	NA	NA	NA	--	0.1	--	4.9
Remaining slope rockfish	29.8	0.0	--	8.1	--	--	--	NA	NA	NA	--	0.0	0.3	38.1
Unspecified rockfish	--	--	--	--	--	--	--	--	--	--	--	5.3	--	5.3
Pacific cod (North of 43° N. lat.)	96.6	--	--	1.4	--	0.0	147.1	0.5	0.1	0.0	NA	0.1	2.0	248.0
Pacific hake	937.0	--	1937.1	1.9	--	38276.4	8928.8	72048.6	--	0.0	0.1	34.7	0.0	122164.7
Petrale sole	1903.5	0.1	0.3	0.2	--	0.0	69.4	--	--	0.0	0.6	2.1	1.3	1977.6

[1] Non-Tribal Shoreside Hake does not include estimates of catch that was discarded at-sea.

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.00 when a value is smaller than two decimal places.

Table 19 (continued).

	Shoreside commercial fisheries													
	LE bottom trawl	CA halibut	Pink shrimp	Non-nearshore fixed gear	Nearshore fixed gear	Non-tribal shoreside hake[1]	WA tribal landings	All at-sea hake fisheries	Total recreational fishing mortality			Research	Remaining incidental fisheries landings	Estimated total fishing mortality
									WA	OR	CA			
Non-rebuilding species (cont.)														
Sablefish (North of 36° N. lat.)	3148.9	--	0.9	2771.5	--	21.6	636.6	0.2	--	0.5	0.0	10.6	34.1	6624.8
Sablefish (South of 36° N. lat.)	19.6	--	--	649.3	--	--	--	NA	--	NA	0.0	1.7	105.5	776.1
Shortbelly rockfish	8.0	--	--	--	0.0	0.0	--	--	--	--	--	1.1	--	9.2
Splitnose rockfish (South of 40°10' N. lat.)	193.7	--	--	0.3	--	--	--	NA	--	NA	--	9.3	0.1	203.4
Starry flounder	19.8	4.0	0.0	0.0	0.1	0.0	0.0	--	--	3.0	0.8	0.0	0.6	28.2
Thornyheads	3087.9	0.0	0.4	232.5	0.2	0.1	30.7	0.5	0.0	0.0	0.0	16.9	7.7	3376.9
Longspine thornyhead (North of 34°27' N. lat.)	1565.5	--	--	1.0	--	0.0	0.0	--	--	--	--	11.7	3.3	1581.6
Longspine thornyhead (South of 34°27' N. lat.)		--	--	19.7	0.0	--	--	NA	--	NA	--	0.8	0.0	20.5
Shortspine thornyhead (North of 34°27' N. lat.)	1475.0	--	0.4	42.1	0.2	0.1	30.7	0.5	--	--	--	3.8	4.2	1557.1
Shortspine thornyhead (South of 34°27' N. lat.)		--	--	166.8	--	--	--	NA	--	NA	--	0.6	0.1	167.5
Mixed thornyheads	47.3	--	--	2.9	0.0	0.0	--	0.0	--	--	--	--	--	50.2
Yellowtail rockfish (North of 40°10' N. lat.)	21.3	--	0.3	0.5	1.2	65.7	449.3	177.0	23.7	9.3	1.0	1.4	0.5	751.1
Non-groundfish species														
California halibut	48.4	88.1	--	0.4	4.0	--	--	--	--	--	235.0	--	153.1	529.0
Dungeness crab	180.3	159.9	0.2	1.3	9.0	0.0	879.1	--	--	--	--	--	21259.1	22489.0
Eulachon	0.0	--	10.8	--	--	--	--	0.0	--	0.0	--	--	--	10.8
Other non-FMP flatfish	69.8	1.2	67.3	0.1	0.0	--	--	--	--	--	--	--	0.0	138.5
Other non-FMP skate	138.9	--	0.0	7.7	--	--	--	--	--	--	--	--		146.6
Tanner crab	507.0	--	--	1.6	--	--	--	--	--	--	--	--	0.0	508.6

[1] Non-Tribal Shoreside Hake does not include estimates of catch that was discarded at-sea.

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.00 when a value is smaller than two decimal places.

Table 6. 2005 to 2010 Estimated Total Mortality of Overfished Species in the Receational Fisheries.

Species	Year	State	Mortality (mt)	Harvest Guideline*	% of Harvest Guideline
Bocaccio south 40°10 N. Lat	2005	CA	39.1	N/A	N/A
	2006	CA	42.5		
	2007	CA	53.6		
	2008	CA	34.8		
	2009	CA	50.0		
	2010	CA	56.6		
Canary	2005	CA	3.9	9.3	42%
		OR	4.9	6.7	73%
		WA	1.9	1.8	108%
	2006	CA	12.5	9.3	134%
		OR	2.9	6.7	43%
		WA	1.1	1.8	62%
	2007	CA	10.9	9	121%
		OR	2.5	6.5	38%
		WA	1.2	1.7	71%
	2008	CA	5.6	9	62%
		OR	3.0	6.5	46%
		WA	0.7	1.7	41%
	2009	CA	12.0	22.9	52%
		OR	3.0	16	19%
		WA	0.5	4.9	10%
	2010	CA	12.9	22.9	56%
		OR	4.2	16	26%
		WA	1	4.9	20%
Cowcod south 40°10 N. Lat	2005	CA	0.2	N/A	N/A
	2006	CA	0.2		
	2007	CA	0.3		
	2008	CA	0.3		
	2009	CA	0.3		
	2010	CA	0.2		
Yelloweye	2005	CA	1.9	N/A	N/A
		OR	4.1	N/A	
		WA	5.2		N/A
	2006	CA	3.5	3.7	95%
		OR	2.5	3.3	77%
		WA	1.7	3.4	49%
	2007	CA	8.0	2.1	381%
		OR	2.8	3.3	85%
		WA	2.5	3.5	71%
	2008	CA	1.7	2.1	81%
		OR	3.2	3.3	97%
		WA	2.4	3.5	69%
	2009	CA	3.9	2.8	139%
		OR	2.0	2.4	83%
		WA	1.6	2.7	59%
	2010	CA	1.4	2.8	50%
		OR	2.8	2.9	97%
		WA	2.0	2.6	77%

*There is one HG Federally specified for WA and OR. Values in the table represent the state's informal agreement for sharing of the Federal HG.

Table 1. Final preferred 2013 and 2014 OFLs (mt) and ABCs (mt) and preliminary preferred 2013 and 2014 ACLs (mt) for non-overfished west coast groundfish stocks and stock complexes (stocks with new assessments in bold; stocks without a preliminary preferred alternative identified have TBD in the 2013 and 2014 PPA ACL cells).

Stock	2013 OFL	2014 OFL	2013 ABC	2014 ABC	PPA ACLs		2013-14 ACL Range for Analysis				
					2013	2014	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
NON-OVERFISHED STOCKS											
Arrowtooth Flounder	7,391	6,912	6,157	5,758	6,157	5,758					
Black Rockfish (OR-CA)	1,159	1,166	1,108	1,115	1,000	1,000					
Black Rockfish (WA)	430	428	411	409	411	409					
Cabezon (CA)	170	165	163	158	163	158					
Cabezon (OR)	49	49	47	47	47	47					
California scorpionfish	126	122	120	117	120	117					
Chilipepper S. of 40^{0}10'	1,768	1,722	1,690	1,647	1,690	1,647					
Dover Sole	**92,955**	**77,774**	**88,865**	**74,352**	**25,000**	**25,000**					
English Sole	7,129	5,906	6,815	5,646	6,815	5,646					
Lingcod N. of 42º (OR & WA)	2,102	1,984	2,010	1,897	2,010	1,897					
Lingcod S. of 42º (CA)	2,566	2,454	2,137	2,044	2,137	2,044					
Longnose skate	2,902	2,816	2,774	2,692	TBD	TBD	1,349	2,000			
Longspine Thornyhead (coastwide)	3,391	3,304	2,825	2,752	NA	NA					
Longspine Thornyhead N. of 34°27'	NA	NA	NA	NA	2,009	1,958					
Longspine Thornyhead S. of 34°27'	NA	NA	NA	NA	356	347					
Pacific Cod	3,200	3,200	2,221	2,221	1,600	1,600					
Sablefish (coastwide)	**6,621**	**7,158**	**6,045**	**6,535**	**NA**	**NA**					
Sablefish N. of 36°	**NA**	**NA**	**NA**	**NA**	**40-10 adjusted ACLs calculated from an ABC using P* = 0.4**						
Sablefish S. of 36°	**NA**	**NA**	**NA**	**NA**							
Shortbelly	6,950	6,950	5,789	5,789	50	50					
Shortspine Thornyhead (coastwide)	2,333	2,310	2,230	2,208	NA	NA					
Shortspine Thornyhead N. of 34°27'	NA	NA	NA	NA	1,540	1,525					
Shortspine Thornyhead S. of 34°27'	NA	NA	NA	NA	397	393					
Splitnose S. of 40^{0}10'	1,684	1,747	1,610	1,670	1,610	1,670					
Starry Flounder	1,825	1,834	1,520	1,528	1,520	1,528					
WIDOW	**4,841**	**4435**	**4,598**	**4,212**	**TBD**	**TBD**	**600**	**1,500**	**2,000**	**2,500**	***3,500 a/***

Stock	2013 OFL	2014 OFL	2013 ABC	2014 ABC	PPA ACLs		2013-14 ACL Range for Analysis				
					2013	2014	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Yellowtail N. of $40^{0}10'$	4,579	4,584	4,378	4,382	4,378	4,382					
STOCK COMPLEXES											
Minor Nearshore Rockfish North	110	110	94	94	94	94					
Minor Shelf Rockfish North	2,183	2,195	1,920	1,932	968	968					
Minor Slope Rockfish North	1,518	1,553	1,381	1,414	1,160	1,160					
Minor Nearshore Rockfish South	1,164	1,160	1,005	1,001	990	990					
Minor Shelf Rockfish South	1,910	1,913	1,617	1,620	714	714					
Minor Slope Rockfish South	681	685	618	622	618	622					
Other Flatfish	10,060	10,060	6,982	6,982	4,884	4,884					
Other Fish b/	3,328	3,298	2,286	2,265	2,286	2,265					

a/ The 3,500 mt ACL alternative for widow rockfish was not formally decided for detailed analysis under Agenda Item E.4.

b/ Values for these specifications are the sum of known contributions of component stocks. Fully specified OFLs and ABCs would require the addition of new species to the complex (e.g., non-FMP skates and grenadiers) since many of these species are landed in generic market categories (e.g., unspecified skates).

Preliminary Range of Management Measures for California's 2013-2014 Commercial and Recreational Groundfish Fisheries

COMMERCIAL AND RECREATIONAL

The California Department of Fish and Game (CDFG) is proposing changes to the 2013-2014 groundfish regulations with the intent of remaining within harvest limits, particularly for overfished species. Regulations not specifically referenced in this report are anticipated to remain status quo from 2011-2012.

Changes to Rockfish Conservation Area (RCA) lines

Proposals from Industry to modify RCA lines to more closely approximate depth contours are being reviewed by CDFG Biological and Enforcement staff.

COMMERCIAL

CDFG is not proposing any changes to the commercial nearshore fishery. Proposed changes to federal commercial groundfish fisheries are included in the Groundfish Management Team Report on Preliminary Management Measures for 2013-14 (Agenda Item E.9.b, GMT Report 2).

RECREATIONAL

CDFG is proposing the following options for the 2013-2014 recreational groundfish management cycle:

Changes in Season Lengths and Depth Restrictions in Groundfish Management Areas

Season lengths and depth restrictions may be changed within each Management Area as needed to remain within the harvest guidelines, while providing as much fishing opportunity as possible.

2013-2014 Rockfish, Cabezon and Greenlings (RCG) Sub- Bag Limits Under Consideration

Bocaccio (statewide)

- Status quo: 2 fish
- Option: 3 fish

Greenling (statewide):

- Status quo: 2 fish
- Option: 3-10 fish

Revision to Size Limits and Fillet Length Restriction

Pending the results of the bocaccio STAR panel, we may consider elimination of the 10 inch size limit and removal of the fillet length restriction, for consistency with regulations for other rockfish species.

Revision of Species Retention Restrictions in the Cowcod Conservation Area (CCA)

- Status quo: Currently, only nearshore rockfish and a few associated groundfish species may be retained in the open depths (<20 fm) during the open season within the CCA
- Option: Allow retention of shelf rockfish while fishing at open depths (<20 fm) within the CCA when fishing for rockfish is open.

GROUNDFISH MANAGEMENT TEAM RECOMMENDATIONS FOR OFF-THE-TOP DEDUCTIONS (SET-ASIDES) FOR OVERFISHED SPECIES

Deductions to the annul catch limits (ACLs) or annual catch targets (ACTs) are made to account for fishing-related mortality resulting from scientific research, non-groundfish fisheries (also called incidental open access fisheries), Pacific Coast treaty Indian tribal harvest, and, as necessary, exempted fishing permits (EFPs). These deductions are important accountability measures that increase the likelihood that catches will remain below the ACLs or ACTs. The Groundfish Management Team (GMT) discussed the available data and provides the following recommended updates to information contained in the 2011-2012 Environmental Impact Statement, Appendix B.

Exempted Fishing Permits

The Council will adopt preliminary EFPs and their associated set-asides of overfished species under Agenda Item E.3. At that time, the GMT will update the set-aside table and provide a Supplemental Report for Council adoption. In the interim, the GMT has left the 2011-2012 set-aside values as place holders.

Scientific Research

The Council and the National Marine Fisheries Service (NMFS) do not have direct management control over scientific research activities, nevertheless, the catch must be considered in the ACL or ACT. For the 2011-2012 process, the Council adopted set-aside values equal to the maximum historical scientific research catch from 2005-2008, except for canary and yelloweye rockfish. The Council considered the high canary rockfish research impacts of 7.2 metric ton (mt) in 2006 a rare event. The largest impacts came from the NMFS trawl survey and surveys in later years encountered significantly less canary. The Council adopted a 4.5 mt canary rockfish set aside for 2011-2012, which is slightly higher than the average research catch from 2006-2008 (Table 1). For yelloweye rockfish, the Council adopted a 3.3 mt research set aside for 2011-2012 based on anticipated research needs of the International Pacific Halibut Commission (1.1 mt), Washington Department of Fish and Wildlife (1 mt), Oregon Department of Fish & Wildlife (1 mt), and other (0.2 mt).

For the 2013-2014 process, the Northwest Region provided an update on research catches of overfished species for 2009 and 2010 (Table 1). The GMT reviewed the new data and did not find a compelling reason to modify the approach used in setting the 2011-2012 set-asides, since the 2013-2014 research activities are anticipated to be similar. **The GMT recommends the Council adopt the overfished species research set-asides in Attachment 1 for the 2013-2014 cycle.** The values are equal to the maximum historical scientific research catch, with the exception of canary and yelloweye rockfish. The rationales for the canary and yelloweye rockfish values are provided above.

Table 1. Research catches of overfished rockfish species (mt) from 2005-2010 and the median, average, maximum and minimum by species (provided by NMFS NWR).

Year	Bocaccio	Canary	Cowcod	Dkbl	POP	Petrale	Widow	YE
2005	1.7	2.3	0.1	2.1	1.8	1.7	1.6	0.6
2006	0.2	7.2	0	0.9	1.2	2.3	0.2	0.1
2007	1	3	0	1	1	17	0	2
2008	1.2	1.8	0	1	1	2	1	1
2009	1	0.5	0.1	1.5	2.7	2.1	5.3	0.7
2010 a/	0.7	1.9	0.1	1	1.7	3	1.4	0.5
Summary Statistics								
Median	1.0	2.1	0.1	1.0	1.5	2.2	1.2	0.7
Average	1.0	2.8	0.1	1.3	1.6	4.7	1.6	0.8
Max	1.7	7.2	0.1	2.1	2.7	17	5.3	2
Min	0.2	0.5	0	0.9	1	1.7	0	0.1

a/Preliminary numbers from NMFS NWR

Non-Groundfish Fisheries (Incidental Open Access)

Pink Shrimp Trawl Fishery

The pink shrimp trawl fishery is not restricted by any rockfish conservation areas, but approved bycatch reduction devices or fish excluders in shrimp trawls are mandated to minimize incidental groundfish bycatch. Observer discard ratios from the pink shrimp fishery were used to estimate fleet-wide amounts of groundfish discards starting in 2007. **The GMT recommends adopting the maximum catch, as described by the 2007, 2008, and 2009 Total Mortality reports (Table 2), for the 2013-2014 set-asides (Attachment 1).**

Table 2. Overfished species impacts (in mt) from the pink shrimp trawl fishery, as determined from the Total Mortality Reports, 2007-2009. The GMT recommends adopting the maximum value for the 2013-2014 set-asides .

Year	Canary	Darkblotched	POP	Petrale	Widow	Yelloweye
2007	0.4	18.4	0.1	2.3	0.0	0.0
2008	0.3	11.3	0.1	1.4	0.0	0.0
2009	0.4	18.3	0.4	0.3	0.1	0.0
Maximum	**0.4**	**18.4**	**0.4**	**2.3**	**0.1**	**0.0**

All Other Open Access Incidental Fisheries

Recent information on all other open access incidental fisheries is consistent with the estimates provided in the 2011-2012 Environmental Impact Statement, Appendix B. **Therefore, the GMT recommends the Council adopt the set-asides for the incidental open access fisheries, as displayed in Attachment 1.**

Tribal

The Tribal fisheries consist of trawl (bottom, mid-water, and whiting), fixed gear, and treaty troll. The GMT's current best estimate (Table 3) of the set-asides needed for Tribal fisheries in 2013-2014 is based on the estimates used to calculate set-asides in 2011-2012 (2011-2012 Environmental Impact Statement, Appendix B). However, we anticipate new information may come forward that updates the estimate needed for some fisheries.

Table 3. Overfished species projected impacts from Tribal fisheries from the September 2011 scorecard.

Tribal		Canary	Dkbl	POP	Petrale	Widow	Yelloweye
Trawl	Bottom	0.8	0.1	3.7	45.4		0.0
	Mid-water	3.6					0.0
	Whiting	4.3					0.0
Fixed gear		0.3				40.0	2.3
Troll		0.5		7.2		5.0	0.0
Total		**9.5**	**0.1**	**10.9**	**45.4**	**45**	**2.3**

GMT Recommendations

For the 2013-14 cycle,

1. **Adopt revised EFP set-aside amounts, based on Council action under Agenda Item E.3 (to be provided in a Supplemental Report.**
2. **Adopt research set-asides in Attachment 1.**
3. **Adopt incidental open access fishery set asides as displayed in Attachment 1.**
4. **Adopt Tribal set asides in Attachment 1, or update, as necessary, based on Tribal needs.**

Attachment 1. GMT proposed set-asides for overfished species for the 2013-2014 harvest specifications (in mt). Note that EFP values are from 2011-2012 and will be updated after Agenda Item E.3 is completed.

Fishery	**Bocaccio**	**Canary**	**Cowcod**	**Dkbl**	**POP**	**Petrale**	**Widow**	**Yelloweye**
Sum of the Off the Top Deductions	**13.4**	**19.7**	**0.3**	**22.1**	**14.1**	**64.5**	**62.3**	**5.9**
EFP	11.0	1.0	0.2	1.5	0.1	2.0	8.7	0.1
Research	1.7	4.5	0.1	2.1	2.7	17.0	5.3	3.3
IPHC Survey								1.1
WDFW rockfish								1.0
ODFW rockfish								1.0
Other								0.2
Incidental Open Access	0.7	2.0	--	18.4	0.4	2.4	3.3	0.2
CA Halibut								
CA Gillnet	0.3						2.9	
CA Sheephead								
CPS- wetfish	0.1							
CPS- squid								
Dungeness crab								
HMS	0.1							
Pacific Halibut								
Pink shrimp		0.4		18.4	0.4	2.3	0.1	
Ridgeback prawn								
Salmon troll	0.2	1.6					0.3	0.2
Sea Cucumber						0.1		
Spot Prawn (trap)								
Tribal		9.5		0.1	10.9	45.4	45.0	2.3
Bottom Trawl		0.8		0.1	3.7	45.4		0.0
Troll		0.5						0.0
Fixed gear		0.3						2.3
Mid-water		3.6					40.0	0.0
Whiting		4.3			7.2		5.0	

Agenda Item E.9.b
GMT Report 2
November 2011

GROUNDFISH MANAGEMENT TEAM REPORT ON PRELIMINARY MANAGEMENT MEASURES FOR 2013-14

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Summary and Recommendations

1. Choose range of alternatives for monitoring and controlling catch of blackgill rockfish, including guidance for sharing between sectors for purposes of trip limit modeling (Table 3), if necessary.
2. Continue to manage greenspotted rockfish within the minor shelf complexes for 2013-2014.
3. Provide guidance on the scope of the RCA changes for the IFQ fishery in 2013-14.
4. Provide guidance on the use of multiple fishing gears during IFQ trips. Options range from complex to relatively simple.
5. Analyze modifying regulations to allow use of four-seam trawls shoreward of the RCA

Introduction

At their September meeting, the Council repeated their intent to reduce the scope and number of changes to status quo harvest specifications and management measures for 2013-2014. The Council adopted only a few new management measures for preliminary analysis and scoping. Based on Council guidance, the Groundfish Management Team (GMT) considered the following list of proposed management measures for analysis in the 2013-2014 cycle, and provides the following thoughts. For each proposal, the GMT attempted to give the Council enough information to assist them in the adoption of a preliminary range of 2013-2014 management measures for more detailed analysis.

Keeping Mortality within Harvest Specifications

At the September meeting, the Council provided guidance on analyzing alternatives for blackgill and greenspotted rockfish, spiny dogfish, and longnose skate including keeping the species within the complexes, adding a sorting requirement for blackgill rockfish, and adjusting trip limits as necessary to keep mortality of all groundfish species within harvest specifications.

Blackgill Rockfish (South of 40°10' N. latitude)

Although blackgill rockfish south of 40°10 N. latitude was assessed previously, species-specific harvest specifications were never defined in federal regulation. That is, it was never given its own overfishing limit (OFL), acceptable biological catch (ABC), or annual catch limit (ACL). Blackgill rockfish have been managed as part of the overall southern slope rockfish complex and its harvest specifications have contributed to the complex as a whole. Although the 2011 blackgill rockfish assessment (Agenda Item G.4.a, Attachment 13, September 2011) indicates that historical catches (Table 1) have been higher than the preliminary harvest specifications (OFL and ABC) for 2013-14, they never exceeded the historical contribution to the complex.

Table 1. Final OFLs and preliminary preferred ABCs for blackgill rockfish south of 40°10 N. latitude for 2013-2014 (Agenda Item E.4.a, Attachment 3) along with the historical OFL/ABC contribution of blackgill rockfish to the southern slope rockfish complex and catches of blackgill rockfish, as summarized from the 2011 stock assessment

Year	OFL	ABC*
2013	131	119
2014	134	122

**The Council's preliminary preferred ABCs from*

Year	OFL/ABC	ACL/OY	Catches
2001	343	306	128.0
2002	343	306	164.2
2003	343	306	189.8
2004	343	306	151.6
2005	343	306	113.6
2006	343	306	130.4
2007	292	292	55.1
2008	292	292	79.2
2009	282	282	136.8
2010	282	282	151.6
2011	282	263	
2012	282	263	

Status quo

Under status quo there will not be a sorting requirement. The total catch of blackgill rockfish taken in the IFQ fishery will count against the slope rockfish IFQ and the limited entry and open access landings will be managed by slope rockfish trip limits, which vary by location (Table 2). Total mortality of blackgill rockfish will continue to be reported by the West Coast Groundfish Observer Program (WGCOP) annually.

The only measure available to the IFQ fishery to reduce the catch of blackgill rockfish would be an adjustment to the seaward boundary of the RCA (trawl and non-trawl RCAs are currently at 150 fm). Because blackgill are most abundant from 160 to 270 fm[1], it is probable that to effectively reduce blackgill rockfish mortality, the RCA would have to be moved to depths that would effectively eliminate all slope rockfish opportunities, which would adversely affect the IFQ fishery.

[1] Excerpt from the assessment: "Blackgill are a slope rockfish species, and are generally rare in waters less than 100 meters and most abundant in waters between 300 and 500 meters depth. Love et al. (2002) report a depth distribution of 87 to 768 meters, however from ten years of data from the NWFSC combined trawl survey, only one haul greater than 600 meters encountered blackgill (that tow was at 647 meters) and the shallowest fish was encountered at 133 meters."

In the limited entry and open access fisheries, blackgill rockfish is included within the aggregate slope rockfish trip limits (Table 2). Under current regulations, the slope rockfish trip limit could be taken entirely of blackgill. The only measures available to this fishery to slow the catch of blackgill rockfish is to adjust the seaward boundary of the RCA (similar to the IFQ fishery) and/or trip limit reductions. Any trip limit reductions would be applied to the aggregate slope rockfish limit and would likely be drastic (because it would apply to the entire complex, not just blackgill rockfish) and would limit access to other healthy slope rockfish species.

Table 2. Summary of limited entry and open access fixed gear trip limits south of 40º10' N. lat.

Limited Entry (slope rockfish including darkblotched)	
South of 40º10'	40,000 lb/2 months
Open Access (slope rockfish including darkblotched)	
40º10' to 38º	Per trip, no more than 25% sablefish landed
South of 38º	10,000 lb/2 months

Manage in Complex, Apply Sorting Requirement, and/or Modify Trip Limits

Another alternative to keep blackgill rockfish mortality within harvest specifications is to keep the species in the slope rockfish complex and apply a sorting requirement. A sorting requirement could be implemented based on an ACL[2], a harvest guideline (HG), or a scientific sorting requirement. A HG and scientific sorting requirement would function similarly and could be applied to allow blackgill to be actively tracked within the fisheries[3].

Under a HG, landings and discards in the IFQ fishery would continue to count against slope rockfish QP[4]. Because a sorting requirement would be implemented, it is possible blackgill landings could be verified by catch monitors and port biologists. Discards at sea would be recorded by the observer at the species level, as currently done. If mortality appears to be tracking higher than the HG, the Council could reduce blackgill impacts by moving the seaward boundary of the RCA, which could adversely affect IFQ fishermen as described above under status quo. The GMT notes that attainment of a HG does not require action or closure of a fishery, per the definition in the regulations.

Implementing a HG for the limited entry and open access fixed gear fisheries could provide an effective means to keep catch within harvest specifications. Since these fisheries are currently managed under trip limits, the blackgill component of the aggregate slope rockfish trip limit could be reduced without greatly affecting other slope rockfish species.

Since there are no formal allocations between the limited entry and open access sectors (and no formal trip limit models), the GMT would need guidance on how to share between the sectors to begin modeling. The historical blackgill landings by sector are provided in Table 3 to help inform a decision to facilitate modeling.

[2] Issuing a blackgill specific ACL would automatically remove it from the complex.
[3] A sorting requirement only tracks landings and does not count them against a numerical value.
[4] Species specific IFQ can only be issued based on an ACL, not a harvest guideline.

Table 3. Landings of blackgill rockfish in the limited entry and open access sectors south of 40º10’ N, latitude from 2000-2010.

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Avg 00-10	Avg 05-10	Avg 08-10
LE	29.80	27.45	46.88	73.05	42.99	23.92	37.94	14.88	22.56	51.68	44.58	37.79	32.59	39.61
OA	3.21	11.64	38.40	53.35	25.82	12.91	18.49	7.72	15.01	28.64	45.95	23.74	21.45	29.87
Total Fleet	33.01	39.09	85.28	126.40	68.81	36.84	56.42	22.61	37.57	80.32	90.53	61.54	54.05	69.48

% LE	90.3%	70.2%	55.0%	57.8%	62.5%	64.9%	67.2%	65.8%	60.0%	64.3%	49.2%	61.4%	60.3%	57.0%
% OA	9.7%	29.8%	45.0%	42.2%	37.5%	35.1%	32.8%	34.2%	40.0%	35.7%	50.8%	38.6%	39.7%	43.0%

Greenspotted rockfish

The 2011 greenspotted rockfish assessment (Agenda Item G.4.a, Attachment 15, September 2011) indicates that landings (Table 4) have been far lower than preliminary harvest specifications for 2013-14. Since the majority of this stock currently resides at depths within the RCA and catches have been below their complex contribution, additional protective measures such as sorting requirements or more restrictive RCAs may not be necessary.

All trawl IFQ analyses and initial issuance regulations have been completed based on current management of minor shelf rockfish north and south of 40°10' N. lat. Removing greenspotted rockfish from the southern minor shelf rockfish complex and designating a species-specific specification would require modifications to initial issuance rules, and control and vessel limits (for individual species and aggregate QS) for greenspotted rockfish and southern minor shelf rockfish. Determining the permit catch histories of greenspotted rockfish separately from the other southern minor shelf rockfish catch histories may be a very difficult task and may not be doable in time for January 1, 2013 implementation.

As such, the Council may want to consider continuing to manage greenspotted rockfish within the minor shelf complexes for 2013-2014 for the reasons stated above.

Table 4. Greenspotted rockfish catches (mt) as summarized from the 2011 stock assessment.

Year	North (40º10'-34º27')	South (34º27'- US/Mexico border)
2000	31.8	17.4
2001	17.3	13.5
2002	4.6	10.7
2003	0.5	0.6
2004	0.6	14.6
2005	0.3	25.8
2006	0.2	7.2
2007	1.2	13.8
2008	0.9	10.9
2009	1.1	14.7
2010	0.4	11.3
2011	-	-
2012	-	-
2013	*73.3**	
2014	*73.3**	

**presumptive ABCs from Agenda Item E.4.a, Attachment 3. The Council did not identify separate ABCs for the two areas.*

Dogfish and Longnose Skate

In September, the Council asked the GMT to evaluate new trip limits for dogfish and longnose skate for 2013-14. The GMT has received detailed catch data from the West Coast Groundfish Observer Program (WCGOP) for both stocks, although we were unable to fully analyze the data for inclusion in this report. We will be analyzing catch and encounter rates for these two species by fishery sector, area, depth, and season and reporting on that analysis in a supplemental report at the November Council meeting.

In the GMT's preliminary discussions, we concluded that catch of dogfish can be managed without removing the stock from the Other Fish complex. Some trip limits exist now for the stock and dogfish are easily identifiable and reported individually on fish tickets. However, because of the high rate of discards, further reductions in trip limits may have limited effect in controlling total mortality. Trip limits can be used to limit additional targeting of dogfish yet do not create incentives to avoid incidental catch. The great majority of dogfish catch is thought to be incidental. Therefore, time-depth-area closures may be necessary to limit catch below certain levels. Other measures, such as handling rules (e.g., hook straightening; cutting the gangion near the hook; or carefully removing the hook by twisting it from the fish with a gaff) in fixed gear fisheries may also reduce overall mortality on dogfish.

In September, the Council chose a more risk-averse P* for dogfish (compared to other stocks) resulting in ABCs of 2,044 mt for 2013 and 2,024 mt for 2014. In Agenda Item E.4, the Council will decide the range of ACLs for Other Fish complex and/or dogfish, which will determine the level of catch to target with management measures.

The circumstances for longnose skate are similar to dogfish in that they are caught incidentally and therefore trip limits may have limited effect in controlling total mortality. Longnose skate was removed from the Other Fish complex and has been managed with its own ACL since 2009. Following the 2011-12 policy, the ACL for 2013-14 will be 1,349 mt.

Summary catches, 2007-09 for dogfish are reported in Table 5. The same information is presented for longnose skate in Table 6, although just for 2009 because landings of skate were not reliably reported prior to 2009. The GMT notes that WCGOP reports assume 100 percent of the discarded fish die and will be investigating whether that is an appropriate assumption.

More detail will be given with the complete analysis of WCGOP data.

Table 5. West Coast Groundfish Total Mortality Estimates, by Sector in Metric Tons, for Spiny Dogfish from 2007-2009.

	Shoreside commercial fisheries						WA	All	Total recreational fishing mortality				Remaining	Estimated
YEAR	LE bottom trawl	CA Halibut	Pink shrimp	Non-Nearshore fixed-gear	Nearshore fixed-Gear	Shoreside hake mid-water trawl	tribal landings	at-sea hake fisheries	WA	OR	CA	Research	incidental OA fisheries landings	total fishing mortality
2007	652	3	1	509	0	51	113	155	0	0	5	13	1	1,504
2008	1,023	3	4	332	1	59	303	673	--	0	3	14	82	2,497
2009	665.5	3.2	0.4	216.2	0.0	16.0	125.4	163.4	--	0.1	4.9	10.9	1.0	1,206.9

Table 6. West Coast Groundfish Total Mortality Estimates, by Sector in Metric Tons, for Longnose Skate in 2009. Estimates assume 100% mortality of discards.

	Shoreside commercial fisheries						WA	All	Total recreational fishing mortality				Remaining	Estimated
YEAR	LE bottom trawl	CA halibut	Pink shrimp	Non-Nearshore fixed-gear	Nearshore fixed-Gear	Shoreside hake mid-water trawl	tribal landings	at-sea hake fisheries	WA	OR	CA	Research	incidental OA fisheries landings	total fishing mortality
2009	1275.4	--	2.1	173.3	0	0.1	--	0.2	--	--	--	2.8	1.3	1,455.1

Increase Access to Target Species, While Minimizing Bycatch

Rockfish Conservation Area Boundary (RCA) Adjustments for the IFQ Fisheries
Every biennial cycle, the GMT provides analysis on the RCA boundaries for commercial fisheries. In the rationalized fishery, trawl and legal non-trawl gears can be used to harvest groundfish quota pounds (QP). Vessels adhere to the RCA according to the gear deployed.

For the 2013-2014 process, the GMT is requesting Council guidance on the scope of the IFQ RCA analysis for 2013-14. Changes to the current RCA structure would be explored to provide increased access to target species, while allowing individual accountability to minimize impacts to overfished species. Council guidance is necessary so that the GMT can coordinate with the Project Team to determine the type and scope of analysis required for the desired action. For example, some changes may be considered routine and accomplishable through inseason actions while others may require analysis in the EIS.

There is a wide range of RCA changes that could be contemplated. We list some examples below. To be clear, the GMT does not specifically endorse or recommend any of these options, they are listed only for the purpose of initiating discussion:

1. Changing the shoreward trawl RCA boundary from shore to 75 fm or 100 fm (boundaries in 2007, prior to shoreward closure), in the area north of Cape Alava (48°10' N. latitude)
2. Narrowing the trawl RCA either coastwide or in small areas of the coast. Examples of previous requests include:
    - Implementing a modified 200 fm trawl RCA boundary in Period 2 to provide increased access to petrale sole north of 40°10' N. latitude (Request from Agenda Item H.4.b, Supplemental GAP Report, March 2011)
    - Implementing a year round shoreward trawl RCA boundary of 100 fm north of 40°10' N. latitude (Request from Agenda Item H.4.b, Supplemental GAP Report, March 2011)
3. Creating a new non-trawl IFQ RCA that would apply only to QP harvested with legal non-trawl gears
4. Removing the trawl RCA entirely

The GMT notes that the complexity of item 4 may be greater than the narrow scope envisioned by the Council for the 2013-14 process.

IFQ Fishery Lingcod Length Restrictions
The Council requested analysis to inform either removing the lingcod length restriction in the IFQ fishery or lowering the length limit to 20 inches. This analysis looks like it is reasonable to analyze and there appears to be sufficient data to analyze biological impacts.

Allow Multiple Fishing Gears on a Single Trip under the IFQ Program

Issue: A primary benefit of such a management measure would be to improve the economic efficiency of IFQ trips.

Background: Current regulations place restrictions on the use of multiple fishing gears during single trips under the IFQ Program and are complex (Table 7). Under section 660.13(d)(5)(iv) of the regulations, a fisher can use multiple non-trawl gears on one trip, but can only catch groundfish against IFQ measures, while declared as IFQ (660.140(b)(i)-(v); also, one may not use groundfish fixed gear and groundfish trawl gear during a single trip. Multiple bottom trawl types may not be used during a single trip when fishing south of 40° 10' N. latitude; however, this restriction does not apply north of 40° 10' N. latitude where multiple types of bottom trawls can be fished seaward of the RCA on one trip. A summary of the regulations by area are as follows:

South of 40º10' N. latitude

- Bottom Trawl: A vessel *may not* have small footrope trawl gear and any other type of bottom trawl gear onboard simultaneously. § 660.130, (c)(2) and (c)(4)(ii)(A)
- Midwater Trawl and Bottom Trawl gear onboard: A vessel *may not* have both bottom trawl gear and midwater gear onboard simultaneously. § 660.130, (c)(3); and (c)(4)(ii)(A)

North of 40º10' N. latitude

- Midwater Trawl and Bottom Trawl gear onboard: a vessel *may not* have both bottom trawl gear and midwater gear on board simultaneously.
  § 660.130, (c)(3) and (c)(4)(i)(A) and (c)(4)(i)(F)
  - Shoreward of the RCA
    While fishing shoreward of the RCA north of 40º10' N. latitude, it is unlawful to fish for groundfish using small footrope trawl gear (except selective flatfish gear) or have small footrope trawl gear (except selective flatfish gear) on board. § 660.130, (c)(2);
    - ✓ In other words, it is illegal to use and possess small footrope gears (except SFF gear) shoreward of the trawl RCA north of 40º10' N. latitude. **Only selective flatfish trawl gear shoreward of the RCA N. of 40º10' N latitude may be on board and be deployed.**

  - Seaward of the RCA
    While fishing seaward of the RCA north of 40º10' N. latitude, a vessel may have more than one type of limited entry bottom trawl gear on board, either simultaneously or successively, during a cumulative trip period. § 660.130, (c)(4)(i)(A)
    - ✓ In other words**, it is legal to possess and use multiple groundfish bottom trawl gears onboard a vessel seaward of the RCA north of 40º10' N. latitude.**

Table 7. Multiple-trawl gear restrictions during single trips under the IFQ Program (by area). MWT = midwater trawl; BT = bottom trawl; SFF = selective flatfish trawl.

	MWT gear & BT gear allowed during the same trip	Multiple BT gears allowed during the same trip
South of 40º10' N. lat.	No	No
North of 40º10' (Shoreward of RCA)	No	**SFF only**
North of 40º10' (Seaward of RCA)	No	**Yes**

One final example that we would like to highlight for trawl fisheries north of 40º10' N. latitude, is that it is currently not permissible to carry a small-footrope trawl gear, except selective flatfish trawl gear, if fishing occurs shoreward of the RCA where only selective flatfish trawls are permitted. It is possible to use multiple bottom trawl gears seaward of the RCA, for example selective flatfish trawl gear and large footrope gear. While this combination is currently allowed, the 2009-2010 EIS indicated the number of sampled trips rarely encountered the use of multiple gears in California and Washington. Approximately 2.7 percent of the trips sampled in Oregon deployed used multiple gears, mostly in Astoria

One of the main reasons for restricting gear types, prior to the IFQ Program and 100 percent observer coverage was to ensure that appropriate bycatch rates for overfished species were applied for each trip and gear type. Another main reason for restricting gear types was to allow vessel monitoring systems, paired with vessel declarations, to provide enough information for the enforcement of gear-specific area restrictions.

Potential Solutions: Under the IFQ Program, where observer coverage is 100 percent, requests have been made by industry to allow multiple trawl gear types, or carry both fixed gear and trawl gear during single IFQ trips. In addition, the deployment of legal gear by area can now be tracked and verified for each haul under IFQ because observers record gear type used for each haul. Hence, the question is posed whether it should be permissible to fish with multiple gear types during a single trip under IFQ. Although versatility and flexibility is certainly advantageous to fishers, this issue should be thoroughly scoped regarding unintended consequences within federal and state regulations, fishery data recording and management, enforcement, management, and vessel safety before being developed and before implementation is anticipated. Preliminary concerns have been raised regarding these entities and are described below.

Agency Concerns: The GMT notes that the use of multiple bottom trawl gears seaward of the RCA, north of 40°10' N. latitude, is currently allowed, though few vessels participate. However, given recent interest in providing for multiple gears under the IFQ fisheries, it is anticipated that a greater number of vessels would participate causing increased problems for the reporting systems, as summarized in the sections below. These concerns arose during GMT discussions and are intended to flag issues for other groups and advisors to comment and advise the Council on based on their institutional perspectives and expertise (e.g., the Enforcement Consultants, WCGOP, the state management agencies, etc).

- ***PacFIN and landings receipts.*** PacFIN currently uses the Office of Law Enforcement (OLE) declarations database to distinguish between IFQ and non-IFQ catch in landings data in the Quota Species Monitoring (QSM) Best Estimate Reports. That declarations system currently only accommodates one IFQ gear type per IFQ trip, and would need to be updated and vetted, for purposes of enforcement, although PacFIN is currently examining more accurate, permanent means of separating IFQ from non-IFQ landings for the QSM.
- ***States.*** Such a change needs scoping at the state database manager level, and could potentially require significant effort for fish ticket data systems modification, if the similar issue of implementation of a 2011 Council recommendation to record fixed gear sablefish primary and subsequent daily trip limit landings to the individual groundfish permit level (which is still in transition) is an indication. It also has potential to complicate shoreside sampling programs for species composition and biological data, which ultimately informs stock assessments. Port sampling activities currently assume that sampled landings were caught with a single gear. Sampling would have to be adjusted if landed catch were to come from multiple gears. For one, catch would need to be assigned to the gear on the fish ticket, which might be possible if the onboard observers are able to track that information. Current state laws would also need to be examined for conflict.
- ***WCGOP***. From WCGOP's perspective, allowing multiple gears on an IFQ trip would create a substantial workload, and would require a considerable amount of time to prepare for and implement. Such a change would necessitate numerous database modifications, including redefining rules and recoding for gear type per haul, redefining and coding automated error checking, recreation of data entry interfaces and forms, redefining IFQ Vessel Account support catch calculation algorithms, and redefining observer trip-fish ticket matching procedures. It would delay other changes currently in motion to facilitate the IFQ program and IFQ Vessel Account catch data system, and create greater uncertainty in estimated catch per gear type.
- ***Enforcement.*** If a fisher were to carry both fixed and trawl gear on board for IFQ fishing, there is currently no way to confirm what gear is being fished at one point in time, and thus which RCA applies. The current solution to this (with an IFQ gear and a non-IFQ gear), is that enforcement must apply the most restrictive area regulation to the fisher on the trip (when fishing for IFQ groundfish and non-IFQ non-groundfish species). Many fishers are currently flagged for RCA violations when using a gear to which the RCA does not apply. This would also apply to multiple IFQ gears of different type, on one trip.

  Potential long-term solutions include either updating the VMS system with gear sensors, or implementing electronic logbooks; either could provide means for real-time declarations.

  The responsibility for communicating of gear type being fished for purposes of enforcement might not be an acceptable role for the observer. Section 6.4.1.1 of the FMP states that vessels that harvest groundfish in waters off Washington, Oregon, and California "may be required to accommodate an observer and/or video electronic-monitoring system for the purpose of collecting scientific data or verifying catch landings and discard used for scientific data collection. These vessels may also be required to

accommodate an observer and/or electronic monitoring system for the purpose of estimating total catch inseason, or to implement a sector-or vessel-specific total catch limit program." Enforcement of gear type is not listed among these purposes, and WCGOP has traditionally shied from placing observers in an enforcement role.

We understand that the observer program is already stretched thin, and this issue relates to another current issue of observer coverage; mixed IFQ/non-IFQ trips need an observer on-board for the entire trip, which adds substantial observer time.

Vessel safety: Safety concerns may arise from catch load distribution on the vessel, and load distribution during offloading of catch from one gear-type at a time, both of which are necessary for accurate fish ticket reporting. This issue may already be handled now, considering that trips with IFQ and non-IFQ catch do take place currently. Industry and the Coast Guard could comment on these issues.

Considerations for Further Analysis: The GMT suggests that it would improve economic efficiency to allow vessels fishing under the IFQ Program to deploy multiple gear types during a single trip. The GMT also suggests that this management measure could improve safety, because allowing multiple gears may facilitate individuals catching their QP with fewer trips across the bar and fewer days at sea. For example, under current regulations, if an individual wished to catch and deliver their QP of shallow water flatfish (e.g., sand dabs and English sole) and deeper water flatfish (e.g., Dover and rex sole), then that vessel would be required to:

- fish with the selective flatfish trawl shoreward of the RCA to catch the shallow water species;
- return to port, deliver the catch, and load the small footrope trawl on the net reel;
- return to sea and fish seaward of the RCA with the small footrope trawl
- return to port to deliver the catch.

The scenario described above demonstrates that the number of sea days and bar crossings could be reduced if multiple gear types were allowed during single trips.

At the same time, the GMT suggests that this analysis could be complex and difficult, depending on the alternatives selected. For example, allowing trawl and non-trawl gear to be fished during a single IFQ trip would represent the most complex analysis possible, and perhaps the most problematic combination for enforcement, the WCGOP, and the states. The simplest alternative may be to allow both the selective flatfish trawl and the small footrope trawl to be fished during a single trip. Other combination of trawl gears may be intermediate in complexity for an analysis, and would exhibit their own set of advantages and problems (e.g., allowing midwater and bottom trawls to be fished during a single trip).

The GMT is hesitant to list potential alternatives and Council considerations for each alternative at this stage. Instead, we seek guidance from the Council regarding whether to move forward, and if so, the types of alternatives that the Council would like to consider. The GMT recognizes that input will be required from the GAP, EC, WCGOP, NMFS, and the states to develop a list of reasonable alternatives if this management measure moves forward. The GMT stresses that the

analysis could become time consuming and overly complex if potential gear combinations become too numerous or too diverse.

Modify Regulations to Allow Use of Four-Seam Trawls Shoreward of the RCA

Issue: Allow the use of four-seam trawls shoreward of the RCA to facilitate the use of flexible grates for excluding Pacific halibut from trawl catches. A primary benefit of such a management is reduced catches of Pacific halibut and increase access to shelf flatfishes for the IFQ Program.

Background: Prior to 2005, small footrope trawls (and midwater trawls) were allowed shoreward of the RCA. There were no requirements regarding the number of panels (or seams), the breastline height (which approximates the maximum height of the headrope above the footrope), or the length of the headrope for bottom trawls fished shoreward of the RCA (Figure 1). The selective flatfish trawl became a requirement in 2005 north of 40° 10' N latitude when trawling shoreward of the RCA. Modifications to the "typical" small footrope trawl were required for the development of the selective flatfish trawl (see Figure 1) and are described in Federal Pacific Coast Groundfish Regulations (Page 375; September 2, 2011):

(i) Selective flatfish trawl gear. Selective flatfish trawl gear is a type of small footrope trawl gear. The selective flatfish trawl net must be a two-seamed net with no more than two riblines, excluding the codend. The breastline may not be longer than 3 ft (0.92 m) in length. There may be no floats along the center third of the headrope or attached to the top panel except on the riblines. The footrope must be less than 105 ft (32.26 m) in length. The headrope must be not less than 30 percent longer than the footrope. An explanatory diagram of a selective flatfish trawl net is provided as Figure 1 of part 660, subpart D."

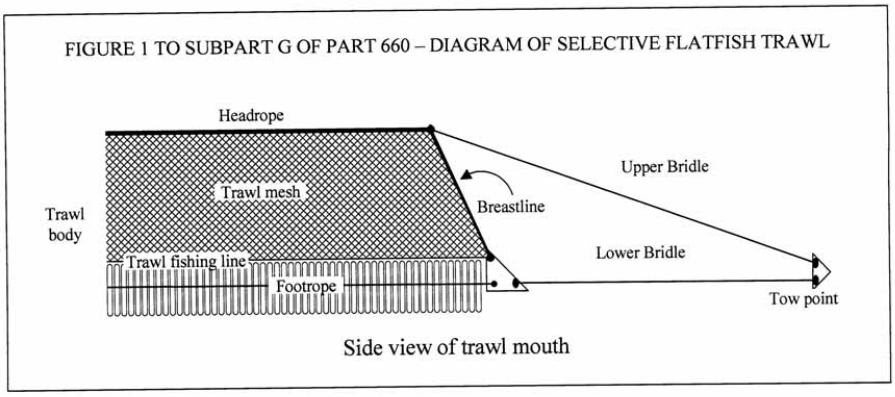

Figure 1. Diagram of the selective flatfish trawl (Federal Pacific Coast Groundfish Regulations, Page 375; September 2, 2011).

The purpose of this design was to reduce the catch of overfished rockfish species (e.g., canary rockfish), while providing access to a portion of the traditional shelf flatfish fishery (see 2005-2006 FEIS). The restricted breastline length ensured that the headrope height was approximately no more than 1 m above the footrope, and the required ratio of headrope length to footrope length provided a "cutback" headrope. Research in Oregon demonstrated that this low-rise trawl

with a "cutback" headrope would maintain or increase flatfish catches while reducing catches of certain larger rockfish and roundfish species (including canary rockfish) and Pacific halibut relative to the most common four-seam trawls that were used by the U.S. west coast groundfish fleet at the time (King et al. 2004; Hannah et al. 2005). The reduced catches of rockfishes, other roundfishes, and Pacific halibut was thought to be facilitated by the low and "cutback" headrope because: (a) some fishes may move up and away from the bottom as they encounter the trawl footrope (e.g., Bublitz 1996; Rose 1996), and, (b) some fraction of certain "schooling" species may exceed 1 meter above the bottom as the trawl passes by (e.g., Pacific whiting and canary rockfish).

Concern and Potential Solution: Under the current IFQ program, many fishermen are concerned of exceeding their Pacific halibut IBQ before accessing their QPs for target species (see the presentation by Dr. John Gauvin, PFMC, Agenda Item I.7.c, Public Comment, Power Point Presentation, April, 2011). Since the inception of the IFQ Program, fishermen have been experimenting with sorting grates (rigid and flexible) that have been successfully used in Alaska trawl fisheries to reduce the catch of Pacific halibut (e.g., Rose and Gauvin 2000). These grates guide certain species (such as Pacific halibut) out of the trawl at fishing depth (through top or bottom escape panels) while allowing for the retention of species that are smaller and/or that exhibit different behaviors within trawls. Flexible grates are preferable to rigid grates because of ease of handling (e.g., see PFMC, Agenda Item I.7.c, Supplemental Public Comment Power Point, April 2011), and potentially safety concerns.

Although rigid grates may be effectively applied to both four- and two-seam trawls, flexible grates may be ineffective or problematic in two-seam trawls, which are required shoreward of the RCA. The water flow in the back end of a two-seam trawl (e.g., in the areas of the intermediate and codend) may be low, and consequently, these areas of the two-seam net may collapse on occasion during a tow. The result may be reduced halibut escapement or high loss of target species. The water flow throughout four-seam trawls may be higher than two-seam trawls which may result in higher success of flexible sorting grates for excluding Pacific halibut from the catch. Hence, two-seam trawls that are required shoreward of the RCA may not be suitable for the installation of flexible grates.

Considerations for Further Analysis: The GMT acknowledges that the limited Pacific halibut IBQ may be a significant constraint for individuals achieving their target species QP, and consequently, the commercial fishery reaching the ACL for many of the trawl-dominant species. Under Amendment 21, the maximum halibut IBQ allowed for the IFQ Program will be 279,570 lbs (round wt, legal + sublegal) until 2014, and 215,054 lbs (round wt, legal + sublegal) thereafter. These values for Pacific halibut IBQ represent a significant reduction to the annual halibut mortality demonstrated by the limited entry trawl fishery prior to the IFQ Program (e.g., approximately 459,000 to 633,000 lbs round weight for the years 2005 to 2009; Heery et al., 2010). Hence, measures may be required to reduce Pacific halibut catch and increase access to target species.

Further analysis of this potential management measure may be possible with low or moderate effort, depending on alternatives. Some considerations for analysis of this potential management measure will include: (a) potential for increased (or decreased) catch of overfished species, (b)

improved access to target species, and (c) impact to the habitat (e.g., substrate). With these considerations in mind, potential alternatives that could be analyzed with low to moderate effort include:

- *No Action (Status Quo; Selective Flatfish Trawl).*

- *Alternative 1 (Four-Seam Selective Flatfish Trawl):* Allow four-seam trawls shoreward of the RCA, with all regulated specifications equal to the selective flatfish trawl except the number of seams (four instead of two).

- *Alternative 2 (Four-Seam Cutback Small Footrope Trawl):* Allow four-seam trawls shoreward of the RCA, with **cutback headrope** similar to the selective flatfish trawl. All other gear regulations currently in effect for small footrope trawls remain the same (e.g., small footrope, mesh size, chaffing gear, etc). Headrope height is unrestricted.

- *Alternative 3 (Four-Seam Small Footrope Trawl):* Allow four-seam, small footrope trawls shoreward of the RCA. All current gear regulations shown for small footrope trawls would remain in place (e.g., headrope height and the headrope length:footrope length ratio are unrestricted).

- *Alternative 4 (Two-Seam Selective Flatfish Trawl Modified with Four-Seam Intermediate & Codend):* Allow existing two-seam selective flatfish trawl nets to be modified to include a four-seam intermediate and cod-end section.

Alternatives 1 – 3 progressively deviate from the selective flatfish trawl while maintaining all features of the small footrope trawl. Alternative 4 is a combination selective flatfish trawl (2-seam) that is modified to allow four-panel (seam) intermediate and codend that may better facilitate the installation of a flexible grate. Some potential impacts of these alternatives include:

- The alternatives may not significantly impact the habitat (e.g., substrate) relative to status quo because only small footrope trawls are included. The analysis would become more complex if alternatives included large footrope trawls due to their potential impact to the substrate shoreward of the RCA.
- Alternatives 1 – 4 allow four-seam trawls shoreward of the RCA, which will facilitate the use of flexible grates. This action may increase escapement of Pacific halibut from trawls at fishing depth relative to status quo, and subsequently increase access to target species QP.
- Although Alternative 1 may show similar catch rates for overfished species as Status Quo, this alternative would require the most significant modifications to four-seam small footrope trawls that fishermen currently own, and would therefore be most expensive for the fleet to implement. Cost to the fleet decreases with each alternative.
- Catch rates for target species may be significantly higher for alternatives 2 and 3 relative to status quo under equal conditions (i.e., fishing in the same area at the same time).
- Even though catch rates of overfished species may be relatively higher for alternatives 2 and 3 relative to status quo (under equal conditions), the IFQ Program requires 100%

observer coverage, and fishermen are individually accountable for constraining catches within their Quota Pounds. This feature of the IFQ Program will likely result in fishermen adjusting their fishing methods to ensure that they remain within their Quota Pounds for overfished species (e.g., tow location and tow duration)

- Alternative 4 may show similar catch rates for overfished species as Status Quo, but would require fewer modifications to develop relative to Alternative 1. Alternative 4 might be a cost-effective solution that would enable fishermen to modify their two-seam selective flatfish trawl nets in a manner that is more compatible with flexible grate halibut excluder designs. This type of modification is common in Bering Sea flatfish trawl fisheries and has achieved successful results.

GMT Recommendation: The range of alternatives that provide for the use of Pacific halibut excluders (grates) could result in increased access to target species while minimizing catch of Pacific halibut, a significant benefit to the IFQ Program. The potential analysis described above could be completed with low to moderate effort since the overall impacts to groundfish would remain within the trawl allocation. That is, any changes to the harvest levels of the IFQ species will be accounted for by existing QPs. For non-IFQ species, changes to trip limits could be accommodated inseason if landings are projected to be greater than the trawl allocation. Further, as noted above, no changes to habitat are anticipated as a result of the proposed alternatives.

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NMFS Advice on Preliminary List of Management Measures for 2013-2014 Groundfish Fisheries

October, 2011

Council direction from the June, 2011 PFMC meeting was to reduce the scope and complexity of harvest specifications and management considerations for the 2013-14 biennium to be close to those in place in 2012, to not exceed the range of alternatives analyzed for the 2011-12 cycle, and to otherwise simplify and manage the process so as to ensure a January 1 fishery start date. With this in mind, NMFS reviewed the preliminary list of recommendations regarding potential management measures from the September, 2011 PFMC meeting. At the GMT meeting the week of October 3-7, NMFS members of the Project Team provided advice on which items to include in the harvest specifications process, and which items to address through future rulemakings. These notes summarize the NMFS direction that was provided.

Gear Regulation	Brief Description
1.) Chafing gear	Exempt midwater trawl gear when used in the primary whiting fishery from restrictions on the amount of chafing gear allowed on trawl nets
2.) 4 Seam Trawl nets	Allow the use of 4-seam bottom trawl nets
3.) Multiple Gears	Allow the use of multiple gears (trawl and non-trawl) on one trip in the IFQ fishery

1.) Chafing Gear: The 2007-2008 harvest specifications and management measures imposed restrictions on the amount of chafing gear that is allowed on trawl gears, including midwater trawl gear used to target Pacific whiting, consistent with the gear descriptions that were used during consultation on the impacts of the groundfish fishery on newly-designated groundfish essential fish habitat (EFH). Any changes to the amounts of chafing gear that are allowed to be used on trawl gears, including consideration of an exemption for midwater trawl gear from chafing restrictions, would require re-initiation of consultation on the effects of the Pacific whiting fishery on groundfish EFH. Consulting could jeopardize implementation of the 2013-2014 harvest specifications and management measures by January 1, 2013.

NMFS proposes to separate the above-listed change to gear regulations for IFQ fisheries from the 2013-2014 harvest specifications and management measures analyses and rulemaking. NMFS recommends that these issues be included in a future rulemaking; perhaps a separate gear-related rulemaking.

2.) 4-Seam Trawl Nets: Current regulations restrict trawl nets to 2-seams. While small-scale gear testing of a 4-seam trawl net occurred under an exempted fishing permit in the groundfish IFQ fishery in August 2011, data from those activities may not be available until December 2011. This information would be arriving late in the 13-14 biennial process, as the Council is scheduled to make a recommendation on "a

final set of new management measures for detailed analysis" at their November 2011 meeting. Therefore, it may be premature to consider removal of the 2-seam net restrictions across the entire groundfish trawl fishery at this time.

NMFS proposes to separate the above-listed change to gear regulations for IFQ fisheries from the 2013-2014 harvest specifications and management measures analyses and rulemaking. NMFS recommends that these issues be included in a future rulemaking; perhaps a separate gear-related rulemaking.

3.) Multiple Gears: The request to allow the use of more than one type of gear on a single IFQ fishing trip has been forwarded to the TRREC for consideration at their October 27th meeting. A complete and thorough exploration must be conducted by NMFS staff to find out how extensive the ripple effects on groundfish fishing regulations and enforcement of RCA and EFH areas would be if more than one type of gear was allowed to be used during a single trip. There may also be effects of changes to these regulations on how catch data from the IFQ fishery is interpreted (e.g. managers may lose the ability to estimate bycatch rates for each gear type used in the fishery) that would also need to be considered and described. Since these ripple effects may not necessarily translate to direct or indirect effects on the human environment, this investigation and documentation of regulatory and management implications may not necessarily be required for inclusion in a NEPA document. Nonetheless, it would likely be a work intensive and time consuming process for NMFS staff to fully gauge the potential adjustments that would be necessary to groundfish fishing regulations to implement this increased level of gear flexibility in the IFQ fishery. Additionally, it has been pointed out that there are data concerns for both PacFIN and the WCGOP that would need to be addressed, as well as OLE concerns.

NMFS proposes to separate the above-listed change to gear regulations for IFQ fisheries from the 2013-2014 harvest specifications and management measures analyses and rulemaking. NMFS recommends that these issues be included in a future rulemaking; perhaps as a separate gear-related rulemaking.

Gear Regulation	Brief Description
4.) Blackgill MMs	If blackgill rockfish is given its own species specific harvest specifications (e.g., ACL, harvest guideline, etc.) then new species-specific management measures will be considered, as necessary, to keep catch within the ACL. These measures may include sorting requirements, catch tracking and reporting and exploration of routine management measures, particularly for the LEFG and OA fisheries.
5.) Longnose MMs	The longnose skate OY was exceeded in 2009. Consideration of new, additional management measures is necessary to keep mortality within the ACL.
6.) CA Nearshore RF	Updating routine management measures for nearshore rockfish in California that may be needed to keep mortality within the sub-complex ACL because of changes to the nearshore permitting system. Unlikely any NEW measures will be necessary.
7.) Remove lingcod length limit	Request from industry to remove the minimum size limit for lingcod in the IFQ fishery (both trawl and non-trawl gears). In 1995 a minimum size limit was implemented for lingcod and was intended to minimize harvest of immature fish that are needed to sustain the reproductive potential of the stock. The potential

	impacts to the population dynamics from a removal of a long-standing size limit should be analyzed (probably by stock assessment authors at the Science Centers).
8.) Modify lingcod length limit	Request from industry to reduce the minimum size limit for lingcod in the IFQ fishery to 20 inches. In the past, changes to the lingcod minimum size limits were used to influence landings (pre-IFQ).

<u>Items 4-8</u> appear to meet the Council's guidance for a narrow scope of new management measures, including prioritization of measures that are conservation oriented or respond to new scientific information. NMFS recommends that these issues be included in the 2013-2014 harvest specifications and management measures analyses and rulemaking.

Regulation and FMP Amendment	Brief Description
9.) Fishing opportunities in the CCAs	CDFG is proposing new management measures in the CA recreational fishery that would allow for shelf rockfish species to be retained in the CCAs, in areas only shallower than 20 fathoms.

<u>9.) Fishing in CCAs</u>: The Council recommended a similar change to species retention regulations in the California recreational fishery for these species in the 2011-2012 harvest specifications and management measures cycle. These measures were not implemented by NMFS, primarily due to the lack of new information that could inform the implications of consideration of such a change, as required per the Groundfish FMP.

NMFS proposes to separate the above-listed change to CCA fishing regulations from the 2013-2014 harvest specifications and management measures analyses and rulemaking. In addition, NMFS would like to explore with the Council and California the collection of new information through an EFP, in collaboration with the NW and SW fishery science centers, to inform consideration of additional fishing opportunities that could be allowed within the CCAs, while still meeting the requirements for cowcod rebuilding plans.

Regulation and FMP Amendment	Brief Description
10.) Catch Accounting in LE and OA fisheries	FMP Am 21 changed some Am 6 language regarding catch accounting in the Limited Entry (LE) and Open Access (OA) fisheries. This has left the FMP and regulations with contradictory language pertaining to accounting for allocations between LE and OA fisheries.

<u>10.) Catch Accounting</u>: Current catch accounting in both the LE and OA fisheries, even with the contradictory language, does not directly affect management of the LE and/or OA fisheries and does not pose a conservation concern. NMFS acknowledges the need to fix any inconsistencies in both the FMP

and related groundfish regulations. However, we believe this issue is best dealt with through a different rulemaking, given Council direction to make the 2013-2014 specifications process as simple as possible.

This is currently the only issue for the 2013-2014 specifications process that would require an FMP amendment. An FMP amendment would create a more complex rulemaking and clearance and review process. While the exact amount of work required to address this issue is unknown at this time, NMFS believes it could add a significant workload to the process. Not including this FMP Amendment would promote implementation of the 2013-2014 harvest specifications and management measures by January 1, 2013. Therefore, NMFS recommends the above listed issue be addressed in a future rulemaking.

CALIFORNIA DEPARTMENT OF FISH AND GAME REPORT ON RETENTION OF SHELF ROCKFISH IN THE COWCOD CONSERVATION AREA IN 2013-14

Proposed Change

The California Department of Fish and Game (CDFG) requests a modification to existing regulations for recreational groundfish fishing within the Cowcod Conservation Areas (CCA) to reduce discarding; specifically, an allowance for retention of shelf rockfish taken during the open season for groundfish within the existing depth constraint of 20 fm. This action will not result in any additional cowcod impacts.

Background

Current recreational regulations prohibit retention of shelf rockfish within the CCA. Meanwhile, regulations authorize the take of nearshore rockfish, cabezon, California scorpionfish, lingcod, greenlings of the genus *Hexagrammos*, several state-managed species, and some species of sharks, skates, and flatfish within the depths and season open to recreational groundfish fishing in the CCA.

In 2001, the CCAs were implemented, and targeting of groundfish was prohibited within the CCA boundaries. However, an exception to the rule was made for CCA waters less than 20 fm in depth, so that take of nearshore rockfish and other nearshore species (listed above) was authorized[1]. Prohibiting retention of shelf rockfish was initiated to help rebuild bocaccio and cowcod which had recently been declared overfished. The California Fish and Game Commission (Commission) also believed that prohibiting shelf rockfish retention would discourage fishing for rockfish in deeper waters (outside legal depths) where bocaccio and cowcod may be found.

For several years, constituents have reported that prohibiting shelf rockfish retention results in wastage while fishing for target species. Part of the anglers' reasoning is that the CCA is the only place in the state where shelf rockfish are prohibited but nearshore rockfish can be retained. These shelf rockfish amount to "regulatory discards[2]" which represented foregone catch that is usually replaced by another fish to fill the 10 fish rockfish, cabezon and greenling (RCG) bag limit.

While developing 2011-2012 federal and state regulations, the Pacific Fishery Management Council (PFMC) recommended, and the Commission adopted, changes to recreational regulations to allow retention of shelf rockfish in the CCA while fishing in allowed depths (20 fm or less), during the open season, in part to reduce regulatory discarding. However, the National Marine Fisheries Service disapproved this change. As a result, the Commission reconsidered its initial decision and ultimately decided not to implement the change to maintain consistency with federal regulations.

[1] Take of non-groundfish species (highly migratory species, white seabass, etc) is currently allowed in all depths inside the CCA.
[2] Discards include fish released alive or dead.

Based on strong public support[3] and continued concerns with discards, CDFG again proposes allowing shelf rockfish retention within allowed depths (20 fm or less) in the CCA when the fishery for groundfish is open[4]. Removing the prohibition will also make regulations more consistent with those in other management areas and other fisheries (e.g., commercial fishery participants are allowed to retain shelf rockfish, including bocaccio, in depths of 20 fm or less in the CCA).

CDFG previously prepared an analysis of the estimated impacts of the proposed regulatory change for the 2011-2012 Federal Environmental Impact Statement (FEIS; PFMC and NMFS, 2011). This report provides additional information for consideration in 2013-14.

Methodology

California Recreational Fisheries Survey (CRFS) sample data were used to analyze rockfish catch within the CCA from 2005 through 2010. Using depth information from CRFS sample data, encounters of nearshore and shelf rockfish species were stratified by depth. Depth and location information used in the analysis are assumed to be reasonably accurate since the majority are global positioning system (GPS) coordinates taken by trained CRFS samplers on CPFVs. These data were then used to 1) evaluate current fishing activity in depths of 20 fm or less, 2) evaluate impacts to shelf rockfish, and 3) evaluate impacts to overfished species, as a result of allowing retention of shelf rockfish in depths of 20 fm or less in the CCA.

Results

A total of 884 rockfish were encountered (kept/retained or released) in all depths in the CCA from 2005 through 2010 based on interviews with 323 anglers, which included 35 CPFV fishing trips. Approximately 60 percent (526 fish) of those rockfish encounters occurred in depths less than 20 fm. Of these, 276 encounters (52 percent) were shelf rockfish, and 250 encounters (48 percent) were nearshore rockfish (Table 1). Vermilion and bocaccio rockfish were the most frequently encountered shelf species (Table 1). Zero cowcod were encountered.

[3] The Fish and Game Commission received over 300 letters from the public during development of the 2011-12 regulations in support of allowing retention of shelf rockfish within the CCA.
[4] Retention of bronzespotted, canary, cowcod, and yelloweye rockfish would still be prohibited statewide.

Table 1. Encounters of Nearshore and Shelf Rockfish (Numbers of Fish) in depths of 20 fm or less in the Cowcod Conservation Area from 2005 through 2010 (CRFS Sample Data).

Species	Total	
Vermilion rockfish	**173**	
Copper rockfish	149	
Bocaccio	**72**	
Blue rockfish	20	
Gopher rockfish	20	
Olive rockfish	17	
Treefish	17	
Kelp rockfish	15	
Starry rockfish	**13**	
Other nearshore rockfish	12	
Rosy rockfish	**11**	
Other shelf rockfish (non overfished)	**7**	
Total	526	
		% total
Nearshore rockfish total	250	48%
Shelf rockfish total	**276**	**52%**
Total	526	100%

Analysis/Implications of Proposed Action

Potential for increased fishing effort within the CCA

It is highly unlikely that increased fishing effort in the allowed depths of the CCA would result from the proposed action, due to the remoteness of fishing locations (40 to 100 miles from port). The 60 fm depth restriction in the Southern Management Area (SMA) beyond the CCA provides considerably more opportunity to target shelf rockfish in deeper water closer to shore. Any change in fishing effort in the CCA is expected to result from anglers that are already pursuing non-groundfish targets in the CCA, rather than as a result of the new opportunity to target and retain shelf rockfish in depths of 20 fm or less when the groundfish fishery is open.

Fishing activities in depths of 20 fm or less, specifically within the CCA, are comprised of non-groundfish and groundfish target strategies, although the number of anglers directly targeting groundfish is small. Based on CRFS data extracts, only a small number of anglers and CPFVs specifically travel to the CCA to directly target nearshore groundfish in depths of 20 fm or less. Only 26 percent of the anglers fishing in these depths reported "bottomfish" as their target fishery. Although the "bottomfish" effort category includes rockfish, it also includes other desired species such as lingcod and halibut.

Effects on target species

Shelf Rockfish

Since shelf rockfish encounters represent 52 percent of the rockfish encounters in depths of 20 fm or less in the CCA (Table 1), allowing retention will likely result in a small increase in impacts to shelf rockfish by converting discards[5] into landed catch (100 percent mortality rate). However, the risk of exceeding the minor shelf rockfish Annual Catch Limit (ACL) [6], as a result of this proposed action is extremely low.

Nearshore Species

Total mortality of nearshore rockfish, cabezon or greenling may decrease as a result of the proposed action because some anglers may prefer to fill their 10 fish RCG bag limit with larger shelf rockfish species.

Potential for increased conservation risk to overfished species

Bocaccio

Although bocaccio could be retained under the proposed action[7] and presently they cannot, CDFG does not anticipate any increase in bocaccio impacts above those previously reported in the 2011-12 FEIS (55.4 mt). The RecFISH model overestimates impacts occurring in the CCA because it assumes the depth restriction in the entire SMA is 60 fm, including inside the CCA. It also assumes the two fish sub-bag limit on bocaccio applies in the CCA. Therefore, the projected bocaccio impacts which have been "attributed" to the SMA are an overestimate because bocaccio retention is prohibited at all depths in the CCA under current law. As a result under the proposed action, retention of bocaccio could occur and modeled impacts would not change.

If the same harvest level remains in place for 2013-14[8], the risk of exceeding the recreational harvest guideline, let alone the entire bocaccio ACL, is extremely low.

Cowcod

As stated previously, zero cowcod were encountered in depths of 20 fm or less in the CCA. One encounter of cowcod by a PC angler targeting yellowtail (*Seriola dorsalis*) was observed deeper than 20 fm in the CCA between 2005 and 2010. The encounter was observed by a sampler onboard a CPFV, where the reported depth was approximately 58 fm (350 ft); the cowcod was released alive. The presence of only one cowcod in six years (outside the allowable depths) suggests that the encounter rate is very low. Projected impacts for cowcod for the entire California recreational fishery for 2011-12 are 0.2 mt and are not expected to increase as a result of this proposed action. The risk of exceeding a cowcod ACL of 3 mt or higher, as a result of this proposal, is also highly unlikely.

[5] The discard mortality rate varies depending on the individual species and depth encountered.

[6] In September 2011, the PFMC limited the scope of harvest specifications for 2013-14 in order to more closely reflect those in place for 2012. Therefore, it is likely that the 2013-14 shelf rockfish ACL will be the same as in 2011-12.

[7] Anglers would still have to abide by current regulations, including sub-bag limit, size limit, and season restrictions.

[8] Applying the status quo harvest rate (77.7%) in the 2011 rebuilding analysis results in higher ACLs for 2013-14 (320 mt and 337 mt, respectively) compared to the 2012 ACL (274 mt). If the PFMC maintains a similar non-trawl apportionment, the buffer between projected impacts and recreational apportionment is expected to increase for 2013-14.

In the 2011-12 FEIS, a 3 mt ACL was implemented for cowcod, of which 0.9 mt was allocated to the non-trawl fishery - including the recreational fishery. Since only de minimis take of cowcod has been observed by West Coast Groundfish Observer Program in the non-trawl commercial fisheries, a sufficient buffer exists to accommodate any unanticipated increase in impacts from the proposed action. In the unlikely event that cowcod catches might exceed the non-trawl allocation, inseason action could be taken to close the fishery or modify the allowable fishing depths in the SMA to prevent exceeding the ACL.

Reduced Discarding

Since shelf rockfish encounters represent 52 percent of the rockfish encounters in depths of 20 fm or less (Table 1), discarding would be reduced because these fish could now be included within the 10 fish RCG bag limit.

Improved Public Perception Regarding Discarding and Wastage

Strong public support for this measure at the state level suggests improved public perception that wastage of fish is being minimized.

Implications of status quo management

Fishing effort within the CCA

Fishing activity in the entire CCA is mainly comprised of recreational targeting of non-groundfish species (e.g., tuna, yellowtail, and white seabass) that occur at various depths depending on the target. These non-groundfish fisheries incidentally encounter rockfish while in pursuit of their target species, but retention of nearshore rockfish is only allowed in depths of 20 fm or less during the open season under existing law. As such, under current legal fishing practices, some discarding of rockfishes does occur in pursuit of other target species and will continue under status quo[9].

Effects on target species

Shelf Rockfish

Shelf rockfish are managed north and south of 40°10' N latitude (near Cape Mendocino) and total mortality of the complex south of 40°10' N latitude from recreational and commercial fisheries combined has been far below the ACL from 2006 through 2010 (Table 3).

[9] Fishing activities in depths greater than 20 fm are outside the scope of this analysis and CDFG is not proposing any changes to regulations governing these fisheries. Impacts to nearshore and some shelf rockfish species (including overfished species) as a result of these activities are already accounted for in model projections.

Table 3. Estimated total fishing mortality of shelf rockfish south of 40°10' N latitude from 2006 through 2010 as reported by the West Coast Groundfish Observer Program.

Year	Total Mortality (mt)	ACL (mt)	% ACL
2006	334	714	46.8%
2007	365	714	51.1%
2008	212	714	29.7%
2009	273	714	38.2%
2010	211	714	29.6%

Between 2006 and 2010, total recreational shelf rockfish impacts south of 40°10' N latitude ranged from 171 mt to 308 mt. In the SMA south of 34°27' N latitude (Point Conception)—including the CCA—they ranged from 72 mt to 122 mt (Table 4).

Table 4. Shelf rockfish impacts (mt) in the recreational fishery by area, south of 40°10' N latitude from 2006 through 2010.

Year	40°10' - 34°27'	south of 34°27'	Total
2006	203	72	275
2007	186	122	308
2008	80	91	171
2009	159	87	246
2010	110	101	211

As stated previously, shelf rockfish represented 52 percent of the encounters with rockfish in depths of 20 fm or less in the CCA (Table 1). Under status quo, total impacts of shelf rockfish in the SMA are expected to be similar to those in previous years[10]. It is also expected that the bycatch and discard of shelf rockfish species will continue while fishing in depths greater than 20 fm, along with the consequent mortality for some percentage of these discarded fish.

Impacts to overfished species

Bocaccio

Seventy-two bocaccio were encountered by CRFS samplers in depths of 20 fm of less in the CCA from 2005 to 2010. For the entire area south of 40°10' N latitude, the projected recreational impact to bocaccio[11] in 2012 under status quo is 55.4 mt (PFMC and NMFS, 2011).

Bocaccio encounters are anticipated to increase throughout southern California in 2013 due to a strong 2010 year class. If this year class is as strong as projected, under status quo some

[10] The CDFG uses its RecFISH model to project impacts to nearshore and overfished species based on a specified depth and season structure. It is not specifically designed to project impacts on non-overfished shelf rockfish species.

[11] The CDFG currently uses its RecFISH model to estimate impacts on overfished species. The model incorporates historic fishery data throughout the SMA, including data prior to implementation of the CCA when the fishery was less regulated, to inform future impacts. The model currently assumes all rockfish are taken in depths of 60 fm or less throughout the entire SMA when projecting impacts; impacts inside the CCA are not modeled separately from those in other areas. In other words, the model already assumes the recreational fishery operates to depths of 60 fm inside the CCA, rather than only 20 fm; so projected impacts are overestimated by the model.

increased encounter rate (and discarding) would be expected within the CCA in depths of 20 fm or less, although it cannot be quantified. In its report under Agenda Item E.4.b (November 2011), the Groundfish Management Team concluded that any increase in bocaccio impacts in 2013, as a result of the 2010 year class, is not expected to exceed the 2011 California recreational harvest guideline (131 mt).

If the 2010 year class is not as strong as projected, impacts under status quo would likely be similar to previous years.

Cowcod

Zero cowcod were encountered by CRFS samplers in depths of 20 fm or less in the CCA under current fishing practices from 2005 through 2010. Under status quo, impacts in depths of 20 fm or less are expected to be the same - zero. Projected impacts for cowcod for the entire California recreational fishery for 2011-12 under status quo regulations are 0.2 mt[12].

Reduced Discarding

Under status quo, it is expected that bycatch and discard of shelf rockfish species will continue along with the consequent mortality for some percentage of these discarded fish.

Improved Public Perception Regarding Discarding and Wastage

Under status quo, anglers will continue to perceive that there is a lack of concern on the part of policymakers for discarding fish.

Consistency in Regulations

Under status quo, recreational regulations between other management areas and regulations governing recreational and commercial fisheries in the CCA will continue to differ in reference to shelf rockfish retention. Public confusion regarding species retention regulations is expected to continue.

Summary

Removing the prohibition on shelf rockfish retention in depths of 20 fm or less in the CCA when fishing for rockfish is open will reduce discard mortality that currently occurs while in pursuit of other species within the 10 fish RCG bag limit. There will not be any additional cowcod impacts. Under the proposed action, recreational anglers will meet their RCG bag limit sooner and with less discarding. In addition, they should gain some satisfaction knowing that they are minimizing wastage of fish. Also, this change will make regulations more consistent with those in other management areas, and other fisheries. Increased impacts to shelf rockfish are expected to be minimal and can easily be accommodated within the recreational harvest guideline with a minimal risk of exceeding the ACLs. The take of bocaccio is not expected to increase; any minimal increase that may occur can be accommodated within the non-trawl allocation. No ACLs for target or overfished species are expected to be exceeded as a result of this action.

Reference

PFMC (Pacific Fishery Management Council) and NMFS (National Marine Fisheries Service). 2011. Proposed Harvest Specifications and Management Measures for the 2011-2012 Pacific

[12] See Footnote 7

Coast Groundfish Fishery and Amendment 16-5 to the Pacific Coast Groundfish Fishery Management Plan to Update Existing Rebuilding Plans and Adopt a Rebuilding Plan for Petrale Sole; Final Environmental Impact Statement. Pacific Fishery Management Council, Portland, OR. February 2011.

Agenda Item E.9.b
Supplemental EC Report
November 2011

ENFORCEMENT CONSULTANTS REPORT ON BIENNIAL MANAGEMENT SPECIFICATIONS FOR 2013-2014 GROUNDFISH FISHERIES – PART 2

The Enforcement Consultants (EC) reviewed the Groundfish Management Team (GMT) report on preliminary management measures for 2013-14. We focused on the issue of **"allowing multiple fishing gears on a single trip under the individual fishing quota program"** and the potential enforcement concerns flagged by the GMT. The EC believes that further analysis will be required. Until the EC understands how the on-board observer fits into compliance monitoring, tools available in electronic monitoring and reporting, and how the two may complement one another; we are unable to provide a proper evaluation of enforceability.

PFMC
11/06/11

GROUNDFISH ADVISORY SUBPANEL REPORT ON BIENNIAL MANAGEMENT PROCESS FOR 2013-2014 GROUNDFISH FISHERIES – PART 2

The Groundfish Advisory Subpanel (GAP) received a presentation from Mr. John DeVore and Ms. Kelly Ames on proposed groundfish harvest specifications and management measures for the 2013-14 management cycle. The GAP offers the following comments and recommendations on proposed 2013-14 harvest specifications and management measures.

Harvest Specifications

It was the GAP's understanding that preliminary actions under Agenda Item E.4 to decide a range of annual catch limits (ACLs), followed by additional guidance under Agenda Item E.5, would lead to final Council determinations on the range of ACLs for detailed analysis and identification of preliminary preferred ACL alternatives under this agenda item. The GAP reiterates the recommendations and considerations offered under Agenda Item E.4.b, Supplemental GAP Report. The GAP also offers the following recommendations for the range of 2013-14 harvest specifications to better analyze the biological and socioeconomic impacts that concern the GAP.

Canary. **With regard to canary rockfish, the GAP suggests that if ACL alternative 5 is chosen for analysis and ultimately adopted, all sectors will benefit from higher ACLs.** This is a particularly constraining species for all sectors and is important for the prosecution of all groundfish fisheries coastwide.

Several cumulative management measures, such as reduced trip and bag limits for the recreation sector and gear restrictions in the trawl sector, have been implemented to support canary rockfish rebuilding efforts. As canary is a species that affects all sectors, any increase in the ACL will increase the viability and economic efficiencies of those sectors.

For example, a higher canary ACL would help trawlers design a targeted midwater yellowtail rockfish fishery. According to the November 5, 2011, IFQ report, only 18% of this year's yellowtail trawl allocation has been harvested. This year, the trawl fleet has landed only 64% of what it landed for the same time last year. Forgoing harvest opportunity due to canary impacts at a time when the price per pound of yellowtail has increased is a loss to the fleet, the processors and the communities. Ample yellowtail quota is available north of 40°10' N latitude but remains inaccessible due to canary constraints.

Other sectors would also benefit from an increased canary yield by relaxing constraints to these fisheries. Nearshore commercial fisheries could fish in deeper waters with a higher allocation of canary, whiting fisheries could more efficiently access whiting with a larger bycatch cap, offshore fixed gear fisheries could access more productive areas on the shelf, etc. Relaxing such constraints leads to economic efficiencies and higher value catches and would contribute to safer conditions at sea since vessels would be able to fish closer to port to access target species.

Cowcod. **The GAP recommends analysis of a 4 mt ACL alternative for analysis and specification of that alternative as preferred.** While the GAP realizes that this alternative was rejected when NMFS disapproved Amendment 16-5, the GAP still believes there is a need for this slightly higher available harvest. Estimated total catch of cowcod in 2007 was slightly higher than the status quo 3 mt ACL with the California recreational and trawl fisheries having the highest impacts. Therefore, a higher yield would reduce the risk of constraining California recreational and trawl fisheries. Part of the reason there is such a low trawl catch and effort on the shelf this year is that trawlers have such a low cowcod quota, few are willing to risk catching any cowcod. Therefore, a 1 mt increase in available cowcod harvest would certainly provide significant economic benefits at the cost of 3 years of additional rebuilding. The GAP believes the "cost" of three years of additional rebuilding in a 60-year rebuilding plan is worth the socioeconomic benefits that California fishing communities would undoubtedly reap from increased recreational effort and higher trawl landings.

Darkblotched Rockfish. **The GAP requests analysis of darkblotched ACL alternatives 2, 3 and 6. All of the alternatives offer reasonable tradeoffs for rebuilding and harvest options. That is, they offer higher yields with only a small cost in terms of predicted duration of rebuilding.** The resulting ACLs also are higher than the current ACL of 296 mt and all options in the range between alternatives 2 and 6 are predicted to have a 100% probability of rebuilding by the current Ttarget of 2025. The highest ACLs vary in the median time to rebuild by one year (2018 vs. 2017) and the increased yield could leverage significant access to valuable target slope species and thus higher economic returns for fishing communities. Rebuilding by 2018 is still seven years sooner than the current Ttarget.

A higher darkblotched ACL would also increase total catch limits in the whiting fleet, reducing the risk of early closure.

Yelloweye. **The GAP reiterates their recommendation for using yelloweye ACL alternative 7 for the ACL (i.e., 21 mt in 2013 and 2104) and an 18 mt ACT, which corresponds to ACL alternative 6.** The GAP notes there is some management uncertainty in predicting and managing yelloweye impacts in recreational fisheries and using an ACT would help account for that while providing flexibility in fishing operations for all sectors.

Beyond the clear economic benefits of higher yelloweye yields for most groundfish sectors that have been well articulated by the GAP in past statements, higher available harvest of yelloweye could also restore much needed research surveys such as the extended International Pacific Halibut Commission survey, and allow potentially valuable EFPs that have recently been denied primarily due to yelloweye impacts.

Dover Sole. **The GAP recommends analysis of a 40,000 mt ACL alternative for Dover sole.** The GAP notes that Dover sole has become the primary target of the trawl fleet since the implementation of the TIQ program and a larger ACL could attract larger volume retail and food service outlets. This type of market development depends on the availability and dependability of high volumes of seafood supply. A higher ACL would result in an increased trawl allocation and a higher vessel use cap in terms of the amount, thereby benefitting those vessels that might be operating at the vessel use cap. The GAP notes that the projected biomass of Dover sole remains healthy even at harvest levels that approach the OFL or ABC.

Sablefish. **The GAP recommends reconsideration of the Council's ABC decision for sablefish and the adoption of a range of ACL alternatives for detailed analysis.** The GAP believes the ABC should be based on a P* value of 0.45. The sablefish stock assessment is robust with less inter-assessment variability in estimated biomass than most, if not all, west coast groundfish assessments with results informed by relatively rich fishery-independent and fishery-dependent data. These factors lead to the conclusion that scientific uncertainty in estimating OFL in the sablefish assessment is low compared to other assessments. **The GAP also recommends analysis of two ACL alternatives: 1) the preliminary preferred ACL based on a 40-10 adjusted ACL calculated using a P* of 0.4, and 2) a 40-10 adjusted ACL calculated from the ABC recommended by the GAP.** This would allow a better analysis of biological and socioeconomic impacts, which can only be done at the ACL level. Such an analysis is critically important in deciding final sablefish specifications given how important this stock is to the west coast fishing industry and economic analysis.

Longnose Skate. **The GAP recommends analysis of a 2,000 mt ACL alternative for longnose skate and specifying this alternative as the preliminary preferred ACL.** The decision table in the 2007 assessment projects the stock will maintain a healthy biomass at a level of annual removals higher than 2,000 mt. This level of harvest is less likely to constrain fisheries than the status quo ACL of 1,349 mt, which was slightly exceeded in 2010. Trip limit adjustments, should they be needed, should be sufficient to keep the harvest within the ACL.

Widow Rockfish. **The GAP also recommends analysis of a 3,500 mt ACL for widow rockfish and specifying this ACL as the preliminary preferred alternative.** The stock is now rebuilt and projected biomass and depletion under the base model in the assessment indicate the stock will remain healthy with this level of removals. This level of available harvest would allow resumption of the target widow/yellowtail fishery, which would greatly benefit fishing communities. The bycatch control afforded by IFQ management alleviates the concern regarding potentially higher bycatch of overfished species, particularly canary, when targeting widow and yellowtail rockfish by trawls.

Other Fish Complex. The GAP is concerned with the new harvest specifications adopted for the Other Fish complex. The GAP notes the SSC statement indicates these specifications are biased low because of the missing OFL contributions of many of the component species. The adopted ACL for this complex is now so low that catch of many of these species is likely to be a significant constraint to many west coast fisheries. Few options are available to react to catches of these species since they are a mixed assemblage of shallow and deep water species.

Vulnerable Species Currently Managed in Stock Complexes. The GAP is aware of the emerging issue of higher vulnerability of some rockfish species currently managed in stock complexes. **The GAP prefers a measured approach for analyzing and mitigating these impacts by developing measures in the 2015-16 biennial management process.** GAP members agree with the GMT recommendation to specify a sorting requirement for the five most vulnerable species in the slope and nearshore rockfish complexes. A sorting requirement would provide better information to track catch inseason. The industry will explore measures to voluntarily avoid these vulnerable species should the need arise based on inseason catch monitoring.

The GAP also recommends analysis of an alternative to remove these species from their respective complexes. This is especially important for the most vulnerable slope rockfish species that are primarily caught in trawl fisheries. The GAP believes the analysis could explore less Draconian management measures than extending the trawl RCA out to 250 fm should the need arise to avoid these species.

Management Measures

Species-Specific Management Measures for All Fleets

Blackgill Rockfish. **GAP members agreed that establishing lower trip limits and implementing a sorting requirement for blackgill rockfish would be a better alternative than adjusting the RCA boundaries.** The GAP agrees with the GMT that this species can be easily managed, given these management measures. **The GAP also recommends analysis of a blackgill allocation alternative of 60.3% for limited entry and 39.7% for open access, based on the 5- to 10-year average, as shown in Table 3 in Agenda Item E.9.b, GMT Report 2.**

Greenspotted Rockfish. **The GAP agrees with the GMT recommendation that the Council continue to manage greenspotted rockfish within the minor shelf complexes, for all the reasons stated by the GMT in Agenda Item E.9.b, GMT Report 2.**

Spiny Dogfish. If spiny dogfish catch starts to raise concerns regarding premature attainment of the Other Fish ACL, the GAP offers the following actions to reduce impacts. Reducing trip limits for spiny dogfish will help reduce impacts in any directed fishery that targets spiny dogfish. However, as the GMT stated in Agenda Item E.9.b, GMT Report 2, changing trip limits will have little effect and will only lead to increased discards in fisheries that do not target spiny dogfish but do have an incidental bycatch of the species. Furthermore, decreasing trip limits could put unnecessary constraints on target fisheries. Instead, the GAP suggests fishermen in both trawl and non-trawl fisheries simply avoid the species if they are encountered. In the fixed gear and recreational fisheries, improved avoidance and discard handling techniques such as those listed in Agenda Item E.9.b, GMT Report 2 should be pursued.

Longnose Skate. **The GAP agreed that, if there is a longnose skate ACL attainment issue, the trawl fleet can explore use of excluders and other appropriate avoidance and release techniques, such as those recommended for spiny dogfish.** Already there has been success with the use of skate excluders in trawl nets and continued refinement of this technology should be pursued.

Preliminary Two-year Allocations for Bocaccio, Canary, Cowcod, Yelloweye, and Petrale Sole

The GAP weighed potential changes in allocations for these five overfished species and decided at this time to use the current sector allocations for analysis in the Draft Environmental Impact Statement (DEIS).

It would be difficult at this meeting to suggest changes to allocations because ACLs and potential ACTs are not yet final and an impact analysis of integrated alternatives is not available. The GAP realizes that, as the ACLs and ACTs are finalized and when we have analyses informing the need for yields of these species to prosecute fisheries by different sectors, we will have the opportunity to provide more detailed perspectives on any changes to allocations.

Limited Entry Trawl Management Measures

General Gear Issues. The GAP reiterates the importance and priorities for addressing the trawl gear issues outlined in Agenda Item E.7.b Supplemental GAP Report. **The GAP recommends the highest priority gear issues be addressed as soon as possible. If analysis and rulemaking necessary to implement recommended gear changes can be accomplished faster in the specifications process, then the GAP recommends inclusion of these analyses in the specifications DEIS. Otherwise, a separate NEPA analysis and rulemaking is recommended.**

Lingcod Management Line Shift. **The GAP recommends shifting the management line used to manage lingcod from the California-Oregon border at 42° N latitude to 40°10' N latitude.** This management line shift should not pose any biological impacts since Cape Mendocino at 40°10' N latitude is a biogeographic break. Further, minimizing the number of management lines will limit fishery disruptions given the crossover provisions that prevent trawlers from fishing in more than one management area on a fishing trip. A management line at the California-Oregon border is especially problematic for trawlers fishing out of the ports of Brookings, Crescent City, and Eureka since they typically tow back and forth across that line.

Vessel Use Caps for Lingcod. **The vessel use caps for lingcod need to be increased when the lingcod ACL is divided into northern and southern components so fishermen won't lose access to fish they otherwise would have been able to use.** Currently, the coastwide vessel use cap for lingcod is 3.8%. When the quota allocation is reduced from a coastwide one to area-specific quotas, then a fisherman who is holding quota pounds at the cap will also be at the cap at the lower sub-area ACL. Trading lingcod quota pounds with someone in the other area will not improve the fisherman's portfolio if he is held to the same vessel use cap implemented when there was a coastwide allocation of quota. Therefore, the caps will need to be adjusted upward to allow fishermen to use an amount equal to what they had held prior to stratifying the coastwide quota to the two areas corresponding to the two areas for which lingcod ACLs are specified.

The GAP proposes the current vessel use cap of 3.8% be adjusted upward to account for the loss of quota pounds within each of the two management areas.

The formula for this is:

Old vessel cap / (sub-area ACL / (north ACL + south ACL))

For example:

Northern vessel cap -

3.8% / (840 mt / (840 mt + 970 mt)) = 8.2%

Southern vessel cap –

3.8% / (970 mt / (840 mt + 970 mt)) = 7.1%

Lingcod Survival Credit and Minimum Size Limit. **The GAP strongly recommends implementing a lingcod survival credit that would allow discarded lingcod that survive not to be counted against lingcod quota.** Currently all lingcod caught, whether they survive or not, are counted against quota, which is overly punitive and does not provide any incentive to carefully release smaller, unmarketable lingcod. **The GAP also recommends analysis of a 20 inch minimum size limit for lingcod coastwide to explore the threshold size where lingcod are no longer marketable.** The current lingcod minimum size limit is 24 inches south of 42° N latitude and 22 inches north of 42° N latitude and some of the smaller lingcod that are discarded may have market value. Given that all discarded lingcod count against quota, the higher minimum size limit further reduces the potential value of the catch.

Limited Entry Fixed Gear and Open Access Management Measures

Lingcod Landing Limits. **The GAP request the GMT analyze a 50 lb daily trip limit and a 250 lbs/month limit of lingcod during the months of December, January, and February for the limited entry and open access fixed gear fisheries both north and south of 40°10' N latitude.**

The current regulations (800 lbs/2 months during May-October and 400 lbs/month in November for limited entry; 400 lbs/month during May-November for open access) result in higher percentages of discards during the winter months. These discards could be turned into landed catch with little or no effect on other fisheries or other species.

Lingcod stocks are healthy and fishermen have noted that even a small landing limit increase would help them stay economically viable in light of the decreased limits for other species. These low landing limits, in place at a time when many fishermen will turn to Dungeness crab fishing, are low enough to discourage targeting of lingcod. Limited landings also will help processors and distributors keep the market channels open during the winter months.

Rockfish Conservation Area Management Line Changes

The GAP agrees with the general philosophy of the Trawl Rationalization Regulatory Evaluation Committee (TRREC) that questions whether Rockfish Conservation Areas (RCAs) are still needed for the trawl fishery given the protections afforded under rationalization. However, the GAP recommends the following trawl RCA adjustments and analyses for the 2013-14 specifications analysis. The GAP also recommends a line adjustment for the non-trawl RCA.

Trawl RCA Line Adjustments. **The GAP recommends adjusting the 150 fm trawl RCA management line to include all the petrale cutouts.** In a few instances, the petrale cutouts extend slightly shoreward of the current 150 fm line, which reduces flexibility to fish the petrale cutouts while maintaining a 150 fm seaward RCA boundary elsewhere. The GAP also recommends analyzing trawl impacts using the 125 fm line to enable inseason RCA adjustments to that line as a routine management measure for trawl management.

150 fm RCA Line Adjustments. **The GAP recommends a couple of minor adjustments to the 150 fm RCA management line to enable access to fish the tips of the Usal and Noyo canyons.** These were important areas to target healthy groundfish stocks in the fixed gear fisheries that were lost when the 150 fm line was first implemented. The GAP coordinated with Enforcement Consultants and these line changes do not seem to cause enforcement problems. The waypoints describing these minor RCA line adjustments are as follows:

Usal Canyon (Figure 1):

1. 39°49.099’ N lat., 124°06.028’ W long.;
2. 39°48.913’ N lat., 124°04.599’ W long.;
3. 39°48.599’ N lat., 124°04.512’ W long.;
4. 39°48.171’ N lat., 124°05.355’ W long.

Noyo Canyon (Figure 2):

1. 39°32.980’ N lat., 123°56.430’ W long.;
2. 39°31.918’ N lat., 123°56.489’ W long.;
3. 39°31.816’ N lat., 123°56.762’ W long.;
4. 39°32.275’ N lat., 123°57.354’ W long.;

California Recreational Management Measures

Yelloweye rockfish is a constraining species for all of California, but especially in the Northern California Mendocino area above Pt. Arena. Education and voluntary measures by the private boaters in this region has resulted in an estimated 2011 yelloweye bycatch of only 1.51 mt to date with a 3.1 mt allowance. If this improved performance in managing recreational impacts in this area continues, then the GAP recommends extending the season in this area. The preliminary preferred yelloweye ACL alternative proposed by the Council is 18 mt for 2013-14. With this 1 mt additional yield from increasing the ACL (or ACT) and assuming a 0.3 mt increased allocation to the California recreational fishery, and voluntary avoidance of yelloweye by anglers, the GAP proposes an increase in fishing opportunity for the Mendocino Management Area.

***Season Length*.** **The GAP recommends the following analysis of an alternative recreational season for this management area:**

A. The GAP proposes a change in the season specified in the Shelter Cove Area (i.e., the Vizcaino Management Control Line to the 40°10' N latitude line) be changed from closing on September 15 to closing on October 15. The additional month of fishing would add 25% more time on the water for this area.

B. Likewise, the GAP proposes that the season in the Fort Bragg area from the Pt. Arena line at 38°57.5' N latitude to the Vizcaino Management line be extended six weeks to close on October 31 rather than August 15. This six-week season extension will provide the same fishing opportunity as now exists in the Northern Area above 40°10' N latitude to the Oregon border.

C. All opening dates for California should be on the Saturday preceding an opener if it is scheduled for mid-week. For example, a May 15 opening date, that may be a Tuesday, would open on the preceding Saturday.

The GAP believes the reduced take of yelloweye in this region justifies consideration of these season extensions.

Control Depth. Currently, regulations for the northern management areas allow groundfish fishing out to a depth of 20 fm. This is a different depth restriction than those implemented in other areas of the state where an offshore line is established with fishing allowed shoreward of a line defined by waypoints and not a depth contour. **The GAP recommends analysis of an offshore line at 25 or 30 fm defined by waypoints that would allow fishing shoreward of the line.** This would remove the ambiguity of boaters knowing whether or not they are within legal fishing areas.

CDFG Management Recommendations. The GAP agrees with all of CDFG recommendations for management measures to be analyzed for 2013-14, including the 40-50 fm proposal for the San Francisco area, a 3 bocaccio and 3-10 greenling sub-bag limit (statewide), and the retention of shelf rockfish species while fishing at open depths (< 20 fm) adjacent to the Cowcod Conservation Areas when fishing for rockfish is open.

PFMC
11/06/11

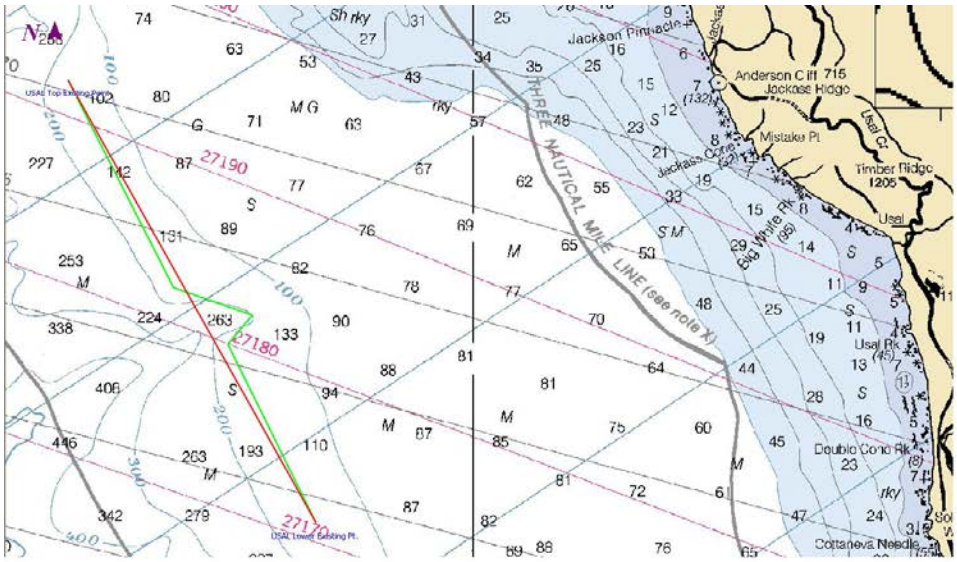


Figure 1. The proposed 150 fm RCA line adjustment at Usal Canyon.

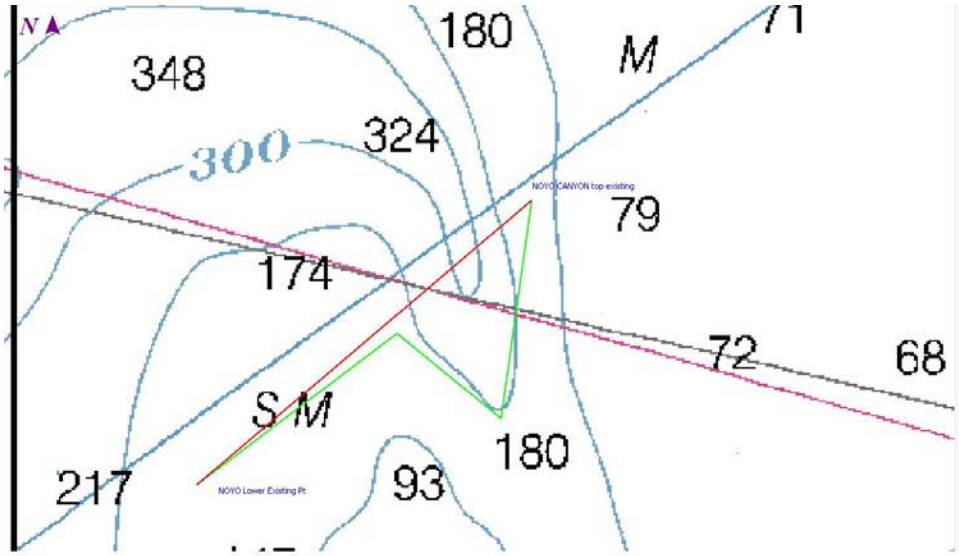


Figure 2. The proposed 150 fm RCA line adjustment at Noyo Canyon.

GROUNDFISH MANAGEMENT TEAM REPORT ON 2013-14 SPECIFICATIONS AND MANAGEMENT MEASURES, PART II

The Groundfish Management Team (GMT) provides the following responses to guidance under Agenda Item E.4 and E.5 and provides other information for Council consideration relative to 2013-14 biennial specifications.

Understanding Changes in Management Quantities Between Stock Assessments: Status, Scale, and Productivity

Changing estimates of past, present, and future stock status and biology from assessment cycle to assessment cycle is a major consideration in the Council's decision to revise rebuilding plans. We tend to describe such changes as leaving the stock as "ahead" or "behind" schedule or "worse off" or "better off" than before. As we noted in Agenda Item E.4, we recommend a different approach to considering such changes based on three elements of a stock assessment: (1) scale (absolute size of the stock in terms of spawning biomass, spawning output, or other measure), (2) status (current biomass relative to unfished stock biomass), and (3) productivity (which determines a stock's recruitment compensation or rate of increase). We offer two approaches of looking at these three elements, both for which we hope to discuss with the SSC in March.

Figure 1 and Figure 2 provide a way of visualizing the changes that have occurred between the 2009 and 2011 assessment cycles. Essentially, changes in status, scale, and productivity are proportional to changes in catch (i.e., the level of harvest corresponding to a harvest rate) and inversely proportional to changes in time to rebuild. Scale and productivity are most informative to how catch targets will change (i.e., a larger absolute population size allows for more catch at a given harvest rate, while a higher productivity grows the population faster), while status and productivity are most informative to why rebuilding times change. One can imagine rebuilding time as a destination with status as the starting point and productivity as the speed one is able to travel to the destination. These relationships are non-linear so Figure 1 and Figure 2 are most instructive in understanding qualitatively why rebuilding targets change with changes in assessments. The measures of status, scale, and productivity are not explicitly linked; therefore, they do not change similarly in every assessment, but once the change in those quantities is described, one can anticipate the change in future catch and rebuilding time.

The two figures use slightly different realizations of these relationships. We use canary rockfish to explain each. Figure 1 gives the ratio of values for the year 2009 for the last two assessments (2011:2009). Relative to the 2009 assessment, the 2009 values of status and scale in the 2011 assessment decreased, while productivity stayed the same. This translates to an estimate of MSY (a long term catch estimate) in the new assessment that is lower than the 2009 assessment (because scale decreased) and longer rebuilding time (because status decreased). Figure 2 gives this viewpoint from the terminal values in the 2011 assessment. Thus scale and status in year 2011 is compared to last assessments terminals values in 2009. Productivity remained unchanged, but status is again lower, thus rebuilding time is slightly longer. The 2011 spawning biomass, though, is larger now than estimated in the 2009 spawning biomass, translating to a higher ACL (a short term catch estimate) value in 2013 than that calculated for 2011 in the 2009

assessment. Such an exercise could be performed for each of the other species to understand why catches and time to rebuild have changed relative to the past assessment.

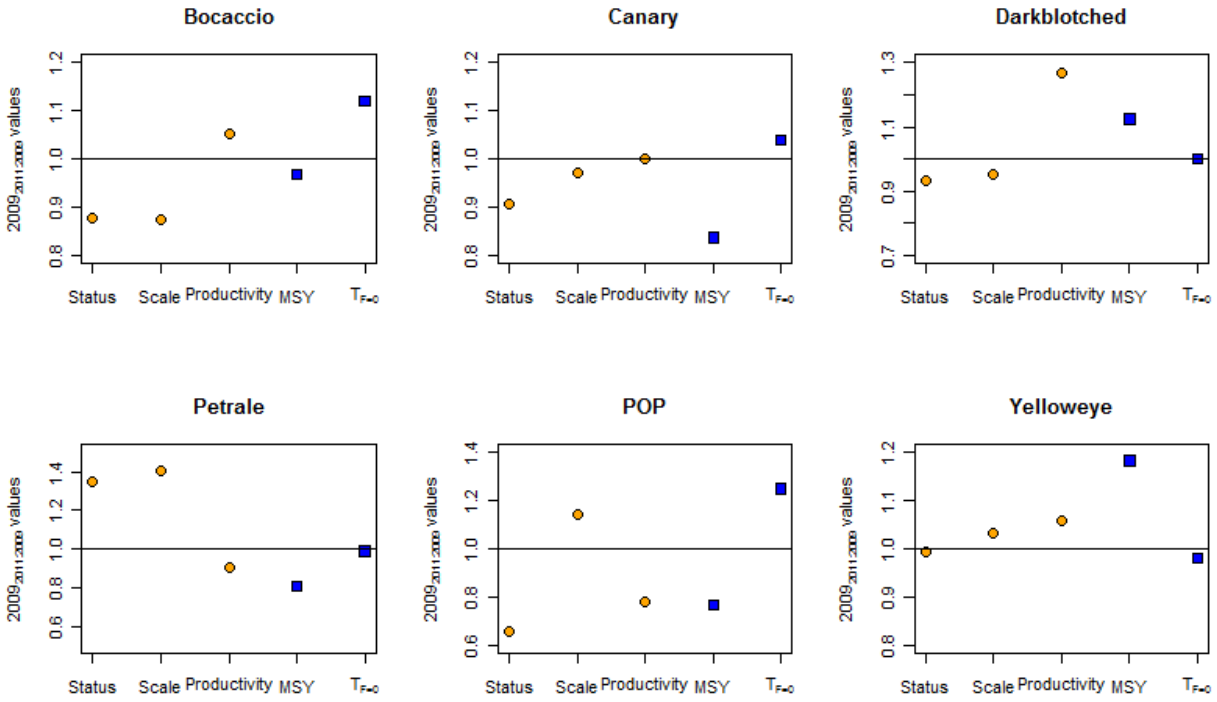


Figure 1. Ratio of 2011 to 2009 derived stock assessment quantities for common year 2009 for six rebuilding species. Status refers to depletion ratio in 2009, scale refers to spawning biomass ratio in 2009, productivity refers to the ratio of steepness, MSY is the ratio of maximum sustainable yield, and $T_{F=0}$ is the ratio of median time to rebuild under no fishing mortality for the 2011 and 2009 stock assessments.

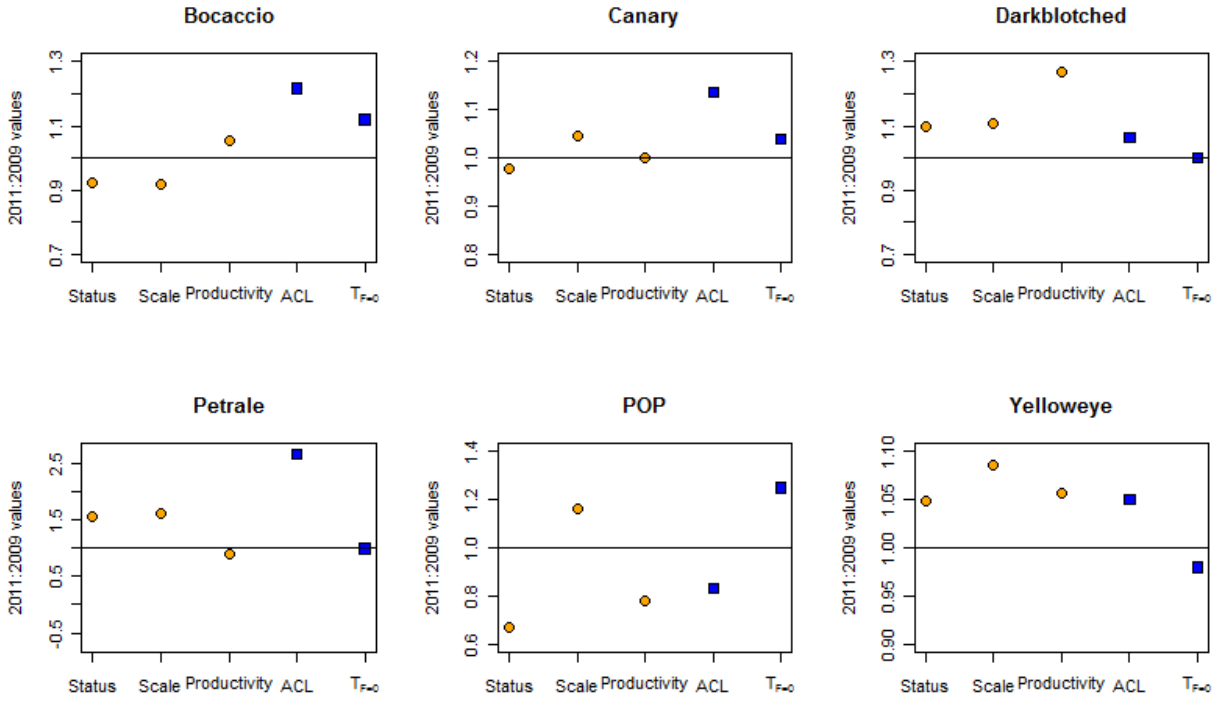


Figure 2. Ratio of 2011 to 2009 derived stock assessment quantities for six rebuilding species. Status and scale refer to the ratios of the terminal year depletions and spawning biomasses, respectively. Productivity refers to the steepness ratio, ACL is the ratio of annual catch limits 1 year after the terminal stock assessment year and $T_{F=0}$ is the ratio of median times to rebuild under no fishing mortality for the 2011 and 2009 stock assessments.

Additional measures for scale (e.g., exploitable biomass), productivity, and catch (e.g., OFL) are still in consideration as the GMT continues to refine this approach. In particular, stock productivity could be defined by the annual rate of increase expected under each rebuilding alternative (Agenda Item B.7.b, Supplemental GMT Report, June 2010). In short, this estimate describes how fast the stock increases back to B_{msy}.

Table **1** identifies the expected increase at the $T_{F=0}$ strategy from each rebuilding analysis and it also takes a backward look at the rate of increase estimated to have occurred from the stock's lowest status level to current status based on the status estimate from the 2011 stock assessments. This method allows an alternative, perhaps less abstract, way of looking at productivity than the steepness parameter.

Table 1. The top panel compares the expected annual rate of increase to T_{target} if fishing were ceased (i.e., the $T_{F=0}$ harvest strategy) calculated based on the 2009 and 2011 stock assessments and rebuilding analyses. The bottom panel shoes the estimate annual rate of increase achieved so far for each stock from the stock's lowest status to its current estimate of status in 2011, as calculated in the 2011 stock assessment. Two scenarios are provided for petrale sole. The Petrale 1 scenarios show the estimated increase from the low point of status to the 2011 estimate of status. Petrale 2 shows the expected rate of increase from that same low point to the stock's

projected status for 2013. Cowcod is not shown because the assessment and rebuilding analysis were not updated.[1]

Looking Ahead (TF=0)	Canary	Yelloweye	Dblotched	POP	Petrale	Bocaccio
Ttarget at F=0	*2028*	*2045*	*2016*	*2043*	*2013*	*2019*
# of years from 2011	17	34	5	32	2	8
Status in 2011 (% of B0)	23.7%	21.3%	24.5%	18.8%	18.0%	27.3%
Bmsy	40.0%	40.0%	40.0%	40.0%	25.0%	40.0%
Expected rate of increase per year	3.1%	1.9%	10.3%	2.4%	24.7%	4.9%
2009 estimates at TF=0	3.4%	1.7%	3.8%	3.8%	25.1%	4.0%
2009 rate +/- 2011 rate	-0.2%	0.1%	6.5%	-1.4%	-0.4%	0.9%

Looking Back	Canary	Yelloweye	Dblotched	POP	Petrale 1	Petrale 2	Bocaccio
Lowest status	10.9%	15.7%	9.1%	14.0%	15.0%	15.0%	14.2%
Year of lowest status	*1999*	*2000*	*2001*	*2000*	*2009*	*2011*	*2001*
2011 status (except Petrale 2)	23.7%	21.3%	24.5%	18.8%	18.0%	28.0%	27.3%
Estimated increase per year	6.7%	2.8%	10.4%	2.7%	9.5%	24.7%	6.8%

Range of ACL alternatives

Darkblotched Rockfish

Under higher ACL alternatives for darkblotched, it is likely that greater access to some target species as well as shallower RCA configurations may be afforded. The interaction between darkblotched rockfish, widow rockfish, and whiting are complex. However, the GMT notes the whiting OY is anticipated to go up in 2013-14 based on the last stock assessment. The GMT did not have time to analyze this in any great detail but could do so given further Council guidance. The GMT notes that guidance from the project team was that if the Council wished to consider an ACL higher than what corresponds to the status quo SPR harvest rate, then a lower alternative should be analyzed as well. In the case of darkblotched, that would be an ACL less than 317 mt. We refer to an ACL "lower than 317 mt." because the next lower ACL alternative presented in Agenda Item E.4.a, Attachment 4 is a zero. If the Council chooses to expand the ACLs recommended for analysis with alternatives higher than Alternative 2, the GMT recommends that a lower ACL alternative be included and requests guidance on what the lower end of the range should be.

Pacific Ocean Perch

In our review of the Council's range of alternatives for POP, we note that the 74 mt alternative is very near the lowest catches seen over the last few years (catch of POP has been variable and considerably higher than 74 mt). A lower alternative would give the GMT and Project Team more flexibility to explore and the GAP and public to comment on how fishing communities would be affected by a level of catch not seen before in the fishery. At the same time, our ability to quantify those impacts may be limited. Generally speaking, lower ACLs for this stock would

[1] The formula used to calculate the annual rate of increase (r) is: ([Status at Time 1]/[Status at Time 2])$^{(\text{Time2-Time1})}$-1.

reduce the flexibility of trawl vessels to fish deeper when targeting whiting and to target non-whiting target stocks on slope fishing grounds in the north

Widow Rockfish
Allocation: We understand that under Agenda Item E.7, Trawl Rationalization trailing actions, the Council moved to include revising the widow rockfish allocations as part of the 2013-2014 actions. During rebuilding, widow rockfish was allocated under Amendment 21 with 91 percent to trawl and 9 percent to non-trawl. Additionally, the trawl allocation is further subdivided between whiting (52 percent) and non-whiting (the remainder). The whiting values are then allocated between shoreside (42%), catcher-processor (34%), and mothership (24%). Under Amendment 20 trawl rationalization, the shoreside whiting allocation is then added to the shorebased non-whiting allocation to provide the shorebased IFQ allocation.

Now that widow rockfish is rebuilt, the FMP states that the whiting allocation will be 10 percent of the trawl allocation or 500 mt, whichever is greater. The whiting values are then allocated between shoreside (42%), catcher-processor (34%), and mothership (24%). The shorebased whiting share is then added to the shorebased non-whiting share to provide the shorebased IFQ allocation.

The GMT notes that changing the widow rockfish allocations would require an FMP amendment. Further, should the Council be interested in changing the allocations, we would need guidance at this meeting on the range of allocations to analyze. Further a Groundfish Allocation Committee meeting would be desired to solicit additional input. We have provided the historical data from the Amendment 21 EIS which could be used to inform such a range (Table 2).

The GMT did not have time to scope the workload and schedule associated with this option, which includes an FMP amendment. We note there is little time (~4-6 weeks) after the November Council meeting to conduct the analysis for the Draft Environmental Impact Statement (DEIS), which is due for internal review on February 5th. Further, we are unsure when a GAC meeting could be schedule and then input included for analysis.

ACL Alternative (3,500 mt): Under Agenda Item E.5, the Council moved to request information relative to an ACL of 3,500 mt for widow rockfish. The highest alternative selected by the Council under Agenda Item E.4 was 2,500 mt. The GMT commented on some impacts of increased widow rockfish ACLs under Agenda Item E.4 (e.g., increased impacts to POP and canary rockfish; E.4.b, GMT Report, November 2011). The GMT discussed the potential 3,500 mt alternative and concluded that this would provide an appropriate contrast from the next highest alternative (2,500 mt) and is reasonable to analyze. To put this amount into context, historical catches immediately prior to widow rockfish being declared overfished ranged from 4,770 mt - 2,258 mt during 1999-2001, respectively. The GMT notes that this level of ACL could provide for a directed midwater fishery. In addition, we pointed out under Agenda Item E.4.b, GMT Report that there is an expected substantial increase in the allowable harvest of whiting, so additional widow rockfish may be needed by the whiting fisheries to accommodate the likely increase of whiting catch.

Table 2. Historical data from Amendment 21 EIS

	Shoreside Non-whiting Trawl		Shoreside Whiting Trawl		At-Sea Catcher-Processors		At Sea Motherships	
Year	**Mt**	**% Non-treaty trawl sectors**	**Mt**	**% Non-treaty trawl sectors**	**Mt**	**% Non-treaty trawl sectors**	**Mt**	**% Non-treaty trawl sectors**
1995	6,165.30	93.6%	236.1	3.6%	87	1.3%	95.3	0.0%
1996	5,403.20	87.0%	571.5	9.2%	119.9	1.9%	117.3	0.0%
1997	6,213.30	94.6%	163.3	2.5%	72.6	1.1%	122	0.0%
1998	3,346.70	83.9%	349.6	8.8%	120.9	3.0%	173.7	0.0%
1999	3,691.10	91.2%	194.4	4.8%	104.1	2.6%	58.1	0.0%
2000	3,718.50	92.7%	83.3	2.1%	69.8	1.7%	141.2	0.0%
2001	1,729.60	89.1%	44.3	2.3%	139.7	7.2%	27.7	0.0%
2002	254.9	64.5%	5.1	1.3%	114.8	29.0%	20.4	0.1%
2003	4.1	14.3%	12.5	43.4%	11.6	40.0%	0.7	1.4%
2004	13.8	20.4%	34.3	50.6%	8.2	12.1%	11.4	0.2%
2005	3	1.9%	76.8	48.5%	43.1	27.2%	35.5	0.2%
2006	6.5	3.3%	47.9	24.6%	68	34.9%	72.7	0.2%
2007	15.7	6.4%	81.9	33.6%	73.1	30.0%	73	0.1%
2008	6	2.7%	101	45.4%	52.6	23.6%	62.9	28.3%
2009	28.5	18.1%	102.7	65.4%	0.96	0.6%	24.97	15.9%
2010	25.5	21.5%	54.1	45.6%	5.01	4.2%	34.02	28.7%
Average catch shares (95-07 avg)	2,351.20	88.7%	146.2	5.5%	79.4	3.0%	73	2.8%
Catch shares under healthy widow (95-00 avg)	4,756.40	90.8%	266.3	5.1%	95.7	1.8%	117.9	2.3%
Catch shares under widow rebuilding (0307 avg)	8.6	6.2%	50.7	36.5%	40.8	29.4%	38.7	27.9%
Average catch shares (08-10 avg)	20	12.0%	85.9	51.7%	19.5	11.8%	40.6	24.5%

Source: Data from 1995-2010 are from Table 4-28 of the Amendment 21 FEIS; data from 2008-2010 are from the 2008, 2009, and 2010 total mortality reports (Table 17, Table 19, and Table 16, respectively).

Rockfish Complexes

In Agenda Item E.4, we first presented the estimated catch for individual stocks managed within a rockfish complex. Here we add data from recreational and shoreside whiting fisheries and the other rockfish stock complexes and provide sector breakdowns of catch for the rockfish complexes below. In addition to the slope rockfish, there may be an issue with the nearshore complex, as discussed below.

The Council's task here is to provide input on the alternatives for analysis. At the broadest level, the analysis of alternatives is supposed to aid the Council in considering how to prevent

overfishing (National Standard 1) in a manner that best promotes the sustained participation of and minimizes adverse economic impacts to fishing communities (National Standard 8). The Council also considers other factors in comparing alternatives including implementation and management costs for the various entities engaged in management and enforcement of the groundfish fisheries.

There are two main conservation and management measure approaches for addressing the catch of stocks managed within complexes: (1) those that keep stock complexes intact and target stocks with specific management measures, and (2) those that would involve some restructuring of the complex. There are a host of suboptions within both categories, some of which we outline below.

Overall, our recommendation is to allow the GMT and Project Team flexibility to fully explore both approaches in the DEIS. The Council has held off on additional evaluation of stock complex restructuring because of the desired narrow scope for 2013-14. Yet the restructuring options could provide a cost effective option for both fishing communities and management to address the situation. Further analysis is needed to more fully explore the question.

Slope rockfish
The information we presented under Agenda Item E.5 showed that catches of aurora, shortraker, and rougheye rockfishes have been greater than the coastwide OFL for some (if not all) years. Table 3 shows that most of the catches have come in the bottom trawl sector.

More time is needed to look into these catch estimates and to explore, to the extent possible, information on the area of catch, and investigate the management measures available by sector to control catch to prevent overfishing. Current estimates have catch of the north minor slope rockfish complex in the IFQ fishery at only 20 percent of the overall catch of that complex in 2010.

(Attachment 1) identifies the basic options for addressing catch of aurora, shortraker, and rougheye in the various sectors.

Nearshore rockfish
After adding recreational and shoreside whiting catch to the data, it appears that catches have been greater than the coastwide OFL for some (if not all) years for China and quillback rockfishes (Tables 4-6). We still need to more fully explore what proportion of catch is coming from north and south areas.

Since catch of nearshore species occurs in recreational and nearshore fisheries, the tradeoffs between management options could be different than for the slope rockfish. Those tradeoffs are explored in (Attachment 2).

Shelf rockfish
The same review of catch in the minor shelf rockfish complexes shows that the catch of vermilion rockfish has exceeded its ABC-OFL in some years, but not in recent years (Tables 7

and 8). We have not broken catch out between sectors or explored the north and south division of catch. This complex appears to be of lower concern yet more analysis could be informative.

Other Fish

Catch for some species is exceeding the preferred OFLs for 2013-14, yet the reason is the one discussed under Agenda Item E.4 by the GMT and SSC: OFL estimates were not produced for species like big skate and Pacific grenadier. The zero contribution for these stocks is a conservative assumption and does not mean that any catch of these species rises to a level of overfishing. The OFLs and ABCs for this stock complex are coming mainly from dogfish and a few other species. Our understanding is that the Council does not intend to address this OFL issue until after the 2013-14 harvest specifications have been developed.

Table 3. Estimated annual catch by sector of selected component stock complex species, slope rockfish.

Species	Fishery	Year								
		2002	2003	2004	2005	2006	2007	2008	2009	2010
Aurora Rockfish	LE Trawl- North	8.11	27.09	28.78	11.83	14.30	28.76	37.91	50.62	25.11
	LE Trawl- South	48.14	46.47	51.73	41.16	47.88	32.61	11.29	5.66	4.06
	At-sea whiting	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Shoreside whiting	0.01	0.02	0.04	0.02	0.01	0.29	0.03	0.03	0.08
	Pink Shrimp	0.00	0.00	0.02	0.00	0.00	2.42	0.32	0.29	0.07
	California Halibut	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	LE Primary	0.07	0.15	0.07	0.05	0.03	0.02	0.03	0.05	0.06
	LE Non-Primary	0.85	1.31	0.91	0.29	0.28	0.24	0.28	1.29	0.56
	Fixed Gear Opan Access	0.11	0.40	0.33	0.08	0.04	0.06	0.13	0.67	0.23
	Nearshore	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total		**57.29**	**75.45**	**81.88**	**53.43**	**62.53**	**64.41**	**49.99**	**58.61**	**30.17**
Rougheye Rockfish	LE Trawl- North	49.38	57.35	57.17	45.75	61.68	88.77	85.30	122.34	146.48
	LE Trawl- South	0.37	0.05	0.08	0.00	0.00	0.00	0.00	0.00	0.00
	At-sea whiting	NA	NA	0.01	0.02	0.00	0.01	0.03	0.00	0.01
	Shoreside whiting	0.00	0.01	0.43	0.00	0.00	2.54	0.62	1.44	5.87
	Pink Shrimp	0.00	0.00	1.67	0.20	0.00	0.11	0.01	0.00	0.02
	California Halibut	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	LE Primary	4.59	5.73	7.35	10.72	6.58	19.02	9.58	16.69	57.95
	LE Non-Primary	0.10	0.09	0.00	0.68	0.58	0.17	2.69	5.17	14.76
	Fixed Gear Opan Access	0.10	0.13	0.00	1.82	0.61	0.51	1.69	2.81	2.98
	Nearshore	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.02	0.00
	Tribal-Shoresd & At-Sea	NA	NA	0.40	1.10	2.80	2.30	4.10	1.10	18.40
Total		**54.54**	**63.36**	**67.10**	**60.28**	**72.27**	**113.43**	**104.02**	**149.57**	**246.46**
Shortraker Rockfish	LE Trawl- North	17.97	24.03	13.76	9.68	8.14	26.29	27.41	23.20	22.30
	LE Trawl- South	0.00	0.00	0.01	0.00	0.00	3.10	0.74	1.75	0.63
	At-sea whiting	NA	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Shoreside whiting	0.00	0.00	0.08	0.00	0.00	1.37	0.21	0.07	1.67
	Pink Shrimp	0.00	0.00	0.00	0.18	0.00	0.02	0.07	0.00	0.00
	California Halibut	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	LE Primary	0.16	0.65	0.08	2.77	0.29	0.33	2.44	1.36	3.39
	LE Non-Primary	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.57
	Fixed Gear Opan Access	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.23
	Nearshore	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Tribal-Shoresd & At-Sea	NA	NA	0.00	0.00	0.00	0.30	0.40	0.00	1.10
Total		**18.14**	**24.70**	**13.94**	**12.62**	**8.42**	**31.41**	**31.26**	**26.40**	**29.89**

Table 4. Estimated annual catch by sector of selected component stock complex species, nearshore rockfish.

Species		Fishery	Year 2002	2003	2004	2005	2006	2007	2008	2009	2010
China Rockfish	Commercial	LE Trawl- North	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		LE Trawl- South	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Pink Shrimp	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		California Halibut	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
		LE Primary	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		LE Non-Primary	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Fixed Gear Opan Access	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Nearshore	NA	11.82	9.71	7.46	8.15	10.78	12.66	11.47	8.35
		Commercial Total	0.02	11.82	9.71	7.46	8.15	10.79	12.66	11.47	8.35
	Rec.	WA	NA	NA	1.79	2.05	2.16	2.18	2.30	1.26	3.49
		OR	NA	NA	1.78	1.89	2.44	2.89	2.89	2.25	2.49
		CA	NA	NA	9.07	14.96	12.24	13.92	15.04	22.21	18.98
		Recreational Total	0.00	0.00	12.64	18.90	16.85	18.99	20.23	25.71	24.95
		Combined Total	**0.02**	**11.82**	**22.35**	**26.36**	**25.00**	**29.78**	**32.89**	**37.18**	**33.30**
Quillback Rockfish	Commercial	LE Trawl- North	0.30	0.12	1.50	0.08	2.13	0.07	0.07	0.08	0.01
		LE Trawl- South	0.03	0.00	0.00	0.00	0.00	0.47	0.00	0.00	0.00
		Pink Shrimp	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		California Halibut									
		LE Primary									
		LE Non-Primary	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00
		Fixed Gear Opan Access	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00
		Nearshore	NA	2.41	2.65	5.20	5.32	7.67	7.84	2.92	1.62
		Commercial Total	0.33	2.53	4.15	5.28	7.45	8.22	7.91	3.12	1.63
	Rec	WA	NA	NA	2.31	2.33	2.26	2.81	2.28	1.25	1.57
		OR	NA	NA	2.00	2.85	4.51	4.37	3.92	3.38	4.08
		CA	NA	NA	3.39	5.60	10.50	12.44	4.84	5.93	2.91
		Recreational Total	0.00	0.00	7.69	10.78	17.27	19.61	11.05	10.56	8.56
		Combined Total	**0.33**	**2.53**	**11.84**	**16.06**	**24.72**	**27.83**	**18.96**	**13.67**	**10.19**

Table 5. Comparison of Contributing Harvest Specifications with Draft Mortality Estimates for Species in the Nearshore Rockfish Complex Coastwide.

Nearshore Rockfish Species N&S	PSA Vulnerability Score	PSA Productivity Score	Coastwide OFL (contribution) a/		Coastwide ABC (presumptive) b/		Average Mortality (2007-2010) c/	Maximum Mortality (2002-2010) /c	Difference Between OFL and Mortality d/				Difference Between ABC and Mortality d/			
									+ / - Average		+ / - Maximum		+ / - Average		+ / - Maximum	
			2013	2014	2013	2014			2013	2014	2013	2014	2013	2014	2013	2014
Black and Yellow	1.7	1.89	27.5	27.5	23.0	23.0	22.3	32.9	5.2	5.2	-5.4	-5.4	0.7	0.7	-9.9	-9.9
Black	1.94	1.33	1589.0	1594.0	1519.0	1524.0	860.6	992.3	728.4	733.4	596.7	601.7	658.4	663.4	526.7	531.7
Blue	2.01	1.39	320.4	320.4	284.1	284.1	133.8	379.0	186.6	186.6	-58.6	-58.6	150.3	150.3	-94.9	-94.9
Brown	1.99	1.61	210.1	210.1	175.2	175.2	88.1	107.4	122.0	122.0	102.7	102.7	87.1	87.1	67.8	67.8
Calico	1.46	1.75	0.0	0.0	0.0	0.0	0.3	0.6	-0.3	-0.3	-0.6	-0.6	-0.3	-0.3	-0.6	-0.6
China	2.23	1.33	26.4	26.4	22.0	22.0	33.3	37.2	-6.9	-6.9	-10.8	-10.8	-11.3	-11.3	-15.2	-15.2
Copper	2.27	1.36	167.5	167.5	139.6	139.6	68.2	79.0	99.3	99.3	88.5	88.5	71.4	71.4	60.6	60.6
Gopher	1.76	1.56	182.6	178.6	171.5	168.0	85.4	122.6	97.2	93.2	60.0	56.0	86.1	82.6	48.9	45.4
Grass	1.89	1.61	60.3	60.3	50.2	50.2	24.3	35.8	36.0	36.0	24.5	24.5	25.9	25.9	14.4	14.4
Kelp	1.62	1.83	27.7	27.7	23.1	23.1	6.8	7.7	20.9	20.9	20.0	20.0	16.3	16.3	15.4	15.4
Olive	1.87	1.69	224.9	224.9	187.7	187.7	35.6	91.4	189.3	189.3	133.5	133.5	152.1	152.1	96.3	96.3
Quillback	2.22	1.31	12.8	12.8	10.7	10.7	17.7	27.8	-4.9	-4.9	-15.0	-15.0	-7.0	-7.0	-17.1	-17.1
Rockfish Unid	NA	NA	0.0	0.0	0.0	0.0	0.8	7.2	-0.8	-0.8	-7.2	-7.2	-0.8	-0.8	-7.2	-7.2
Treefish	1.73	1.67	13.4	13.4	11.2	11.2	8.0	11.5	5.4	5.4	1.9	1.9	3.2	3.2	-0.3	-0.3

a/ OFLs and OFL contributions for these species are the sum of northern and southern areas for each species from Agenda Item E.4.a, Attachment 1, Nov 2011

b/ ABCs and ABC contributions for these species are the sum of northern and southern areas for each species from Agenda Item E.4.a, Attachment 3, Nov 2011

c/ Mortality estimates from the years 2002-2010 are summarized here except recreational catches are only included for 2004-2010; different combinations or ranges of years may be considered as desired.

d/ Unless otherwise noted, the values in these columns are derived by summing together WCGOP mortality estimates (landings + discard estimates) from the following commercial fishery sectors: Limited Entry Non-Whiting Trawl Fishery; Limited Entry Fixed Gear Primary Sablefish Fishery; Limited Entry Fixed Gear sablefish DTL Fishery; Nearshore Fishery; Open Access Fishery; Pink Shrimp Fishery; California Halibut Fishery ; landings estimates from Tribal at-sea data from NorPac and Tribal shorebased PacFIN data; and recreational fisheries.

Table 6. Draft Mortality Estimates for Nearshore Rockfish in Commercial and Recreational Fisheries Coastwide.

Nearshore Rockfish Species N&S	Draft Mortality Estimates for Several Commercial and Recreational Fisheries a/						
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Black and Yellow	15.4	15.8	12.1	14.1	18.7	23.7	32.9
Black	834.5	920.3	880.7	813.2	749.9	992.3	887.1
Blue	224.9	379.0	371.3	212.8	144.8	79.5	98.0
Brown	62.7	107.4	94.8	82.4	77.0	88.5	104.7
Calico	0.2	0.3	0.1	0.1	0.1	0.3	0.6
China	22.4	26.4	25.0	29.8	32.9	37.2	33.3
Copper	38.5	67.5	55.9	79.0	66.5	69.9	57.6
Gopher	58.5	70.3	64.6	57.1	71.2	90.5	122.6
Grass	22.5	24.7	35.8	29.3	24.4	23.8	19.4
Kelp	5.7	6.9	6.3	7.7	6.3	5.6	7.7
Olive	60.2	91.4	56.9	59.2	43.5	26.5	13.4
Quillback	11.8	16.1	24.7	27.8	19.0	13.7	10.2
Rockfish Unid	5.5	6.6	7.2	2.4	0.5	0.4	0.1
Treefish	6.3	11.5	4.8	7.7	6.3	10.2	7.6

a/ Unless otherwise noted, the values in these columns are derived by summing together WCGOP mortality estimates (landings + discard estimates) from the following commercial fishery sectors: Limited Entry Non-Whiting Trawl Fishery; Limited Entry Fixed Gear Primary Sablefish Fishery; Limited Entry Fixed Gear sablefish DTL Fishery; Nearshore Fishery; Open Access Fishery; Pink Shrimp Fishery; California Halibut Fishery ; landings estimates from Tribal at-sea data from NorPac and Tribal shorebased PacFIN data; and recreational fisheries.

Table 7. Comparison of Contributing Harvest Specifications with Draft Mortality Estimates for Species in the Shelf Rockfish Complexes, Coastwide.

Shelf Rockfish Species N&S	PSA Vulnerability Score	PSA Productivity Score	Coastwide OFL (contribution) a/		Coastwide ABC (presumptive) b/		Average Mortality (2007-2010) c/	Maximum Mortality (2002-2010) c/	Difference Between OFL and Mortality d/				Difference Between ABC and Mortality d/			
									+ / - Average		+ / - Maximum		+ / - Average		+ / - Maximum	
			2013	2014	2013	2014			2013	2014	2013	2014	2013	2014	2013	2014
Bocaccio Rockfish	1.93	1.28	1,168.0	1,165.0	1,081.9	1,078.9	65.5	123.1	1,102.5	1,099.5	1,044.9	1,041.9	1,016.4	1,013.4	958.8	955.8
Bronzespotted Rockfish	2.12	1.22	3.6	3.6	1,923.0	1,935.0	0.0	0.0	3.6	3.6	3.6	3.6	1,923.0	1,935.0	1,923.0	1,935.0
Chameleon Rockfish	2.03	1.39	0.0	0.0	0.0	0.0	0.1	2.9	-0.1	-0.1	-2.9	-2.9	-0.1	-0.1	-2.9	-2.9
Chilipepper Rockfish	1.35	1.83	1,899.1	1,851.6	1,801.0	1,755.1	237.6	374.4	1,661.5	1,614.0	1,524.7	1,477.2	1,563.4	1,517.5	1,426.6	1,380.7
Cowcod Rockfish	2.13	1.06	3.0	3.0	3.0	3.0	1.4	3.2	1.6	1.6	-0.2	-0.2	1.6	1.6	-0.2	-0.2
Flag Rockfish	1.97	1.33	23.5	23.5	19.6	19.6	6.7	14.1	16.8	16.8	9.4	9.4	12.9	12.9	5.5	5.5
Freckled Rockfish	1.44	1.78	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Greenblotched Rockfish	2.12	1.28	24.4	24.4	20.4	20.4	1.5	3.5	22.9	22.9	20.9	20.9	18.9	18.9	16.9	16.9
Greenspotted Rockfish	1.98	1.39	95.8	95.8	87.4	87.4	15.5	29.9	80.3	80.3	65.9	65.9	71.9	71.9	57.5	57.5
Greenstriped Rockfish	1.88	1.28	1,482.0	1,501.0	1,352.7	1,370.4	16.0	81.1	1,466.0	1,485.0	1,400.9	1,419.9	1,336.7	1,354.4	1,271.6	1,289.3
Halfbanded Rockfish	1.26	2	0.0	0.0	0.0	0.0	0.7	4.2	-0.7	-0.7	-4.2	-4.2	-0.7	-0.7	-4.2	-4.2
Harlequin Rockfish	1.94	1.31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Honeycomb Rockfish	1.97	1.36	9.9	9.9	8.2	8.2	3.9	8.2	6.0	6.0	1.7	1.7	4.3	4.3	0.0	0.0
Mexican Rockfish	1.8	1.5	5.1	5.1	4.2	4.2	0.0	0.3	5.1	5.1	4.8	4.8	4.2	4.2	3.9	3.9
Pink Rockfish	2.02	1.33	2.5	2.5	2.1	2.1	0.0	0.3	2.5	2.5	2.2	2.2	2.1	2.1	1.8	1.8
Pinkrose Rockfish	1.82	1.31	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.1	-0.1	0.0	0.0	-0.1	-0.1
Pygmy Rockfish	1.42	1.78	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	-0.4	-0.4	0.0	0.0	-0.4	-0.4
Redstripe Rockfish	2.16	1.31	270.4	270.4	225.5	225.5	6.6	19.7	263.8	263.8	250.7	250.7	218.9	218.9	205.8	205.8
Rockfish Unid	NA	NA	0.0	0.0	0.0	0.0	11.8	23.2	-11.8	-11.8	-23.2	-23.2	-11.8	-11.8	-23.2	-23.2
Rosethorn Rockfish	2.09	1.19	15.0	15.0	12.6	12.6	4.4	8.4	10.6	10.6	6.6	6.6	8.2	8.2	4.2	4.2
Rosy Rockfish	1.89	1.61	47.5	47.5	39.6	39.6	6.3	7.3	41.2	41.2	40.2	40.2	33.3	33.3	32.3	32.3
Silvergray Rockfish	2.02	1.22	159.9	159.9	133.4	133.4	11.9	40.4	148.0	148.0	119.5	119.5	121.5	121.5	93.0	93.0
Speckled Rockfish	2.1	1.33	39.6	39.6	32.9	32.9	6.1	9.8	33.5	33.5	29.8	29.8	26.8	26.8	23.1	23.1
Spotted Rockfish Unid	NA	NA	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	-0.5	-0.5	0.0	0.0	-0.5	-0.5
Squarespot Rockfish	1.86	1.61	11.3	11.3	9.3	9.3	4.9	9.4	6.4	6.4	1.9	1.9	4.4	4.4	-0.1	-0.1
Starry Rockfish	2.09	1.25	62.6	62.6	52.2	52.2	25.7	32.3	36.9	36.9	30.3	30.3	26.5	26.5	19.9	19.9
Stripetail Rockfish	1.8	1.39	64.0	64.0	53.4	53.4	13.4	49.7	50.6	50.6	14.3	14.3	40.0	40.0	3.7	3.7
Swordspine Rockfish	1.94	1.33	14.2	14.2	11.9	11.9	0.0	0.0	14.2	14.2	14.2	14.2	11.9	11.9	11.9	11.9
Tiger Rockfish	2.06	1.25	1.0	1.0	0.8	0.8	1.1	1.7	-0.1	-0.1	-0.7	-0.7	-0.3	-0.3	-0.9	-0.9
Vermilion Rockfish	2.05	1.22	279.0	279.0	232.7	232.7	166.4	339.1	112.6	112.6	-60.1	-60.1	66.3	66.3	-106.4	-106.4
Yellowtail Rockfish	1.88	1.33	5,643.4	5,648.4	5,265.7	5,269.7	92.4	339.7	5,551.0	5,556.0	5,303.7	5,308.7	5,173.3	5,177.3	4,926.0	4,930.0

a/ OFLs and OFL contributions for these species are the sum of northern and southern areas for each species from Agenda Item E.4.a, Attachment 1, Nov 2011.
b/ ABCs and ABC contributions for these species are the sum of northern and southern areas for each species from Agenda Item E.4.a, Attachment 3, Nov 2011.

c/ Mortality estimates from the years 2002-2010 are illustrated here however recreational catches are only included for 2004-2010; different combinations or ranges of years may be considered as desired.

d/ Unless otherwise noted, the values in these columns are derived by summing together WCGOP mortality estimates (landings + discard estimates) from the following commercial fishery sectors: Limited Entry Non-Whiting Trawl Fishery; Limited Entry Fixed Gear Primary Sablefish Fishery; Limited Entry Fixed Gear sablefish DTL Fishery; Nearshore Fishery; Open Access Fishery; Pink Shrimp Fishery; California Halibut Fishery ; landings estimates from Tribal at-sea data from NorPac and Tribal shorebased PacFIN data; and recreational fisheries.

Table 8. Draft Mortality Estimates for Shelf Rockfish in Commercial and Recreational Fisheries Coastwide.

	Draft Mortality Estimates for Several Commercial and Recreational Fisheries a/						
Shelf Rockfish Species N&S	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Bocaccio Rockfish	88.2	123.1	66.6	70.9	46.2	71.7	73.4
Bronzespotted Rockfish	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chameleon Rockfish	0.0	0.0	0.0	0.5	0.0	0.0	0.0
Chilipepper Rockfish	97.8	92.2	159.1	114.8	149.9	311.1	374.4
Cowcod Rockfish	1.6	0.8	1.2	3.2	0.5	0.7	1.0
Flag Rockfish	7.8	14.1	4.4	8.5	6.0	6.5	5.8
Freckled Rockfish	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Greenblotched Rockfish	1.5	2.5	1.6	3.5	0.4	1.8	0.3
Greenspotted Rockfish	21.5	29.9	8.3	20.0	13.0	16.1	12.9
Greenstriped Rockfish	20.2	68.6	46.3	22.8	7.0	21.9	12.2
Halfbanded Rockfish	0.6	1.3	0.5	0.4	0.8	0.7	0.9
Harlequin Rockfish	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Honeycomb Rockfish	2.9	8.2	1.8	3.2	3.3	3.9	5.3
Mexican Rockfish	0.0	0.0	0.3	0.0	0.0	0.0	0.0
Pink Rockfish	0.3	0.0	0.0	0.0	0.0	0.0	0.0
Pinkrose Rockfish	0.0	0.0	0.0	0.1	0.0	0.0	0.0
Pygmy Rockfish	0.0	0.4	0.0	0.0	0.0	0.0	0.0
Redstripe Rockfish	4.1	5.9	0.2	19.7	5.3	1.1	0.3
Rockfish Unid	6.7	13.9	6.6	11.5	20.1	12.6	3.1
Rosethorn Rockfish	6.4	2.3	1.1	5.2	3.2	4.8	4.3
Rosy Rockfish	5.3	5.9	3.9	6.4	5.3	6.0	7.3
Silvergray Rockfish	2.2	1.8	0.9	40.4	3.1	0.6	3.7
Speckled Rockfish	6.5	9.8	3.2	5.0	5.4	6.6	7.4
Spotted Rockfish Unid	0.0	0.0	0.5	0.0	0.0	0.0	0.0
Squarespot Rockfish	5.5	4.2	0.9	5.1	9.4	2.9	2.0
Starry Rockfish	14.1	32.3	15.2	31.4	24.8	25.5	21.1
Stripetail Rockfish	15.2	2.1	16.7	12.1	8.3	13.2	20.0
Swordspine Rockfish	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tiger Rockfish	0.3	0.4	0.8	1.7	1.4	0.9	0.6
Vermilion Rockfish	252.4	339.1	227.3	223.0	133.9	148.8	159.9
Yellowtail Rockfish	134.4	126.6	77.5	104.0	53.5	107.1	104.9

a/ Unless otherwise noted, the values in these columns are derived by summing together WCGOP mortality estimates (landings + discard estimates) from the following commercial fishery sectors: Limited Entry Non-Whiting Trawl Fishery; Limited Entry Fixed Gear Primary Sablefish Fishery; Limited Entry Fixed Gear sablefish DTL Fishery; Nearshore Fishery; Open Access Fishery; Pink Shrimp Fishery; California Halibut Fishery ; landings estimates from Tribal at-sea data from NorPac and Tribal shorebased PacFIN data; and recreational fisheries.

ALLOCATIONS

Annual Catch Target (ACT)

If the Council wishes to implement an ACT that is lower than the ACL for any stocks or allocation alternatives, it would be beneficial to do so under this agenda item, because it will affect the sector-specific allocations, and the subsequent analysis. Setting an ACT after this meeting, if it is based on an ACL that was analyzed in the DEIS, could still be possible.

Sector-Specific Allocations under the Preliminary Preferred ACL Alternatives

Based on Council guidance under Agenda Item E.4., the GMT developed tables applying the 2012 allocation percentages to the preliminary preferred (PPA) annual catch limits (ACL) alternatives. The "off the top deductions" or set-asides used in these tables are the higher EFP set-aside (the applicant requested levels). Also included in these tables were the actual allocations (mt) for 2012, for comparison, from which the allocation percentages were calculated. Two sets of tables were developed, differing in how the residual (leftover in the scorecard) from 2012 was treated. In Attachment 3, the residual was added back into the fishery harvest guideline[2] prior to the sector-specific allocation percentages being applied, in other words, the residual was redistributed to all sectors proportionally. In Attachment 4, the residual was treated as another sector, with its percentage of the fishery harvest guideline calculated for 2012, then applied to the ACL alternatives, the same as all other sectors. The GMT believes that these two sets of tables may better inform the Council on their decision to either leave a residual, or reallocate some or all of that residual to other sectors.

Additionally, there are two updates in the sector names from the table presented under Agenda Item E.5 at this meeting. To represent the allocations in the scorecard and the modeling platforms used in the fixed gear fisheries, the row for "OA: Directed" has been changed to "OA: Directed, Nearshore" and the row for "LE Fixed Gear" has been changed to "Non-Nearshore". To represent the allocations in the scorecard and the management allocations in the trawl fisheries, "LE Trawl-Non-Whiting" has been changed to "Shorebased Trawl" and "LE Trawl-Whiting" has been changed to "At-Sea Whiting". For both of these changes to titles, corresponding updates to the allocations and percentages have been made and are included in Attachments 3 and 4.

The GMT requests that the Council chose one set of EFP set-asides (applicant requested or GAP recommended) and one method of allocating the residual (Attachments 3 and 4) under this agenda item, so that we may proceed with our analysis, using only one set allocations applied to the PPA ACL alternatives. Having more than one set of allocations to analyze will increase the workload and the potential for errors.

[2] Fishery harvest guideline calculated by subtracting the "off the top" deductions (research, EFPs, tribal, etc) from the annual catch limit.

Limited Entry and Open Access Sablefish South of 36º N latitude

In June 2010, the Council recommended sablefish trip limits south of 36º N latitude be modeled assuming a 55%:45% (LE:OA) sharing based on the historical landings of non-trawl vessels from 2000-2009 (Table 9). If the Council would like to modify the catch sharing arrangement for 2013-14, the GMT requests that it be given under this agenda item.

Trawl/nontrawl allocations for non-overfished species

Petrale sole

Petrale sole is currently allocated under Amendment 21 (95% trawl:5% non-trawl) but in 2011-12, the Council chose to implement a two-year allocation, where the non-trawl sector received 5 mt, and the trawl sector the remaining. Under this agenda item, the Council may want to consider whether it would like to maintain "status quo" (i.e., 5 mt to non-trawl sector) or use Amendment 21 allocations. Table 10 summarizes petrale sole mortality from Amendment 21 EIS and WCGOP Total Mortality reports.

Table 9. Limited entry and open access sablefish landings in the Conception Area from 2000-2009.

Fleet	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Avg '00-'09	Avg '00-'05
Limited entry	71.54	99.18	111.68	109.11	76.98	72.74	62.87	69.62	107.35	307.59	1,088.67	541.24
Open access	14.11	13.79	28.92	31.95	26.17	16.94	116.79	115.78	93.89	437.60	895.94	131.88
Fleet total	85.66	112.97	140.60	141.06	103.15	89.68	179.66	185.39	201.24	745.20	1,984.61	673.12

LE%	83.5%	87.8%	79.4%	77.3%	74.6%	81.1%	35.0%	37.6%	53.3%	41.3%	54.9%	80.4%
OA%	16.5%	12.2%	20.6%	22.7%	25.4%	18.9%	65.0%	62.4%	46.7%	58.7%	45.1%	19.6%

Table 10. Summary of petrale sole mortality from Amendment 21 EIS and WCGOP Total Mortality reports.

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Av. '00-'10
Trawl	97.3%	98.0%	99.0%	97.3%	99.6%	99.6%	99.8%	99.8%	99.9%	100.0%	99.9%	*99.1%*
Non-Trawl	2.7%	2.0%	1.0%	2.7%	0.4%	0.4%	0.2%	0.2%	0.1%	0.0%	0.1%	*0.9%*

Shelf rockfish north and south of 40º10' N latitude
The Council will need to consider two year allocations for shelf rockfish north and south of 40º10' N latitude, which were not formally allocated under Amendment-21. For 2011-12, the Council chose to base allocations for shelf rockfish on the average mortality from 2005-2008 as reported in WGCOP total mortality reports. Based on general guidance to maintain similar approaches to that used in 2011-12, the GMT updated that analysis and included the most recent years of data (Table 11). Current allocations are not projected to restrict recent landings since both complexes have been under-harvested in recent years.

Table 11. Summary of total mortality of shelf rockfish from 2005 to 2010 as reported in WCGOP Total Mortality Reports.

	2005	2006	2007	2008	2009	2010	Average (05-08)	Average (05-10)
Other shelf rockfish N								
trawl	59.8%	66.1%	70.5%	44.4%	5.4%	8.6%	60.2%	42.5%
non-trawl	40.2%	33.9%	29.5%	55.6%	94.6%	91.4%	39.8%	57.5%
Other shelf rockfish S								
trawl	20.6%	6.6%	9.9%	11.8%	68.1%	48.4%	12.2%	27.6%
non-trawl	79.4%	93.4%	90.1%	88.2%	31.9%	56.1%	87.8%	73.2%

Spiny Dogfish and Longnose Skate
The Council may also want to consider two year allocations for spiny dogfish and longnose skate. The GMT provides Tables 12 and 13 which summarizes total mortality for each species as provided by WCGOP. For dogfish, the GMT will estimate set-asides prior to development of a fishery harvest guideline being allocated to trawl and non-trawl.

Table 12. Summary of total mortality of spiny dogfish from 2007 to 2009 as reported in WCGOP Total Mortality Reports.

	2007	2008	2009	2010	Average
trawl	62.5%	83.5%	79.3%	78.3%	75.2%
non-trawl	37.5%	16.5%	20.7%	21.7%	24.8%

Table 13. Summary of total mortality of longnose skate from 2009 to 2010 as reported in WCGOP Total Mortality Reports.

	2009	2010	Average
trawl	88.0%	92.5%	90.3%
non-trawl	12.0%	7.5%	9.7%

GMT Considerations:

1. **Consider whether to analyze additional ACL alternatives for darkblotched rockfish, POP, and widow rockfish;**
2. **Consider the GMT recommendation to allow flexibility to more fully explore various alternatives relative to rockfish complexes;**
3. **Consider whether to set an ACT for any stock;**
4. **Consider EFP set-asides (applicant requested or GAP recommended);**
5. **Consider how to allocate residuals (maintain a residual or redistribute to sectors);**
6. **Consider sector specific allocations under the PPA ACL alternatives for overfished species;**
7. **Consider whether to modify the catch sharing arrangement between limited entry and open access sablefish south of 36ºN latitude used in trip limit models;**
8. **Consider whether to modify the allocation used for Petrale sole in 2011-12;**
9. **Consider whether to modify the trawl/non-trawl allocations for shelf rockfish north and south of 40º10' N latitude from those used in 2011-12.**
10. **Consider two year allocations for spiny dogfish; and**
11. **Consider two year allocations for longnose skate.**

Attachment 1. Summary of slope rockfish management measures among the alternatives are in **bold underline.**

	No Action Keep in complex, no sorting requirement		**Alt 1 – Keep in complex, federal sorting requirements**		**Alt 2 – Remove from complex, federal sorting requirements**	
	Management Measures	**Inseason Response**	**Management Measures**	**Inseason Response**	**Management Measures**	**Inseason Response**
Shoreside Trawl	- IQ issued for minor slope rockfish - RCAs - WCGOP discard information at species level - Shoreside accounting at minor slope level	- RCAs modifications - Voluntary avoidance	Same as no action but - Shoreside accounting **at species level**	Same as no action	Same as no action but -IQ issued at the **species level** - Shoreside accounting at the **species level**	Same as from no action
At-Sea Trawl	- Set-asides for minor slope rockfish - Co-op management - WCGOP observers recording at spp level	- RCA modifications - Voluntary avoidance	Same as no action	Same as no action	Same as no action	Same as no action
Fixed Gear	-Trip limits for minor slope -RCAs - WCGOP discard information at species level - Shoreside accounting at minor slope level	- Lower trip limits for minor slope - RCA, - Voluntary avoidance	Same as no action but -Trip limits at the **species level** - Shoreside accounting at the **species level**	Same as no action but - Lower trip limits at the **species level**	Same as no action but -Trip limits at the **species level** - Shoreside accounting at the **species level**	Same as no action but -Lower trip limits at the **species level**

Attachment 2. Summary of nearshore rockfish management measures among the alternatives are in **bold underline.**

	No Action Keep in complex, no sorting requirement		**Alt 1 – Keep in complex, federal sorting requirements**		**Alt 2 – Remove from complex, federal sorting requirements**	
	Management Measures	**Inseason Response**	**Management Measures**	**Inseason Response**	**Management Measures**	**Inseason Response**
Shoreside Trawl	- Trip limits for nearshore (black, blue by species) - RCAs - WCGOP discard information at species level - Shoreside accounting at minor slope level	- RCAs modifications - Voluntary avoidance	Same as no action but - Shoreside accounting **at species level**	Same as no action	Same as no action but - Shoreside accounting at the **species level**	Same as from no action
Commercial Fixed Gear (OR and CA)	-Trip limits for nearshore species (black and blue by species) -RCAs - WCGOP discard information at species level - State regs require sorting at the nearshore species level	- Lower trip limits for nearshore species (black and blue by species) - RCA, - Voluntary avoidance	Same as no action but -Trip limits at the **species level** - **Federal sorting requirement** for shoreside accounting at the species level -**Allocations**: between and within commercial and recreational and/or between states	Same as no action but - Lower trip limits at the **species level**	Same as no action but -Trip limits at the **species level** - Shoreside accounting at the **species level** -**Allocations**: between and within commercial and recreational and/or between states	Same as no action but -Lower trip limits at the **species level**
Recreational	- Bag limits at aggregate level -Season dates - Depth closures - Shoreside	-Change bags -Prohibit retention at species level -Change season dates	Same as no action but -Bag limits at **species level** -**Allocations**: between	Same as no action but -Bag limit changes at **species level**	Same as no action but -Bag limits at **species level** -**Allocations**: between	Same as no action but -Bag limits at **species level**

	accounting at the species level -Angler reported discard, mostly contains species specific data	-Change depth closures -Voluntary avoidance	and within commercial and recreational and/or between states		and within commercial and recreational and/or between states	

Attachment 3. Council requested tables with 2012 allocations and allocation percentages, applied to the Council's PPA ACL alternatives, with 2012 residuals added back to the fishery HG, before sector allocation percentages applied.

Yelloweye Rockfish 2013 and 2014				
Sector Specific Allocation[1]	**2012 Allocation Percentage[2]**	***2012 Allocation (mt)***	**2012 Projected Impacts[3] (mt)**	**Alt. 6 (18 mt)[4]**
Shorebased Trawl	5.4%	*0.6*		0.7
At-sea Whiting	0.0%	*0.0*		0.0
OA: Directed, Nearshore	9.9%	*1.1*	1.1	1.2
Non-Nearshore	11.7%	*1.3*	0.9	1.4
Rec: WA	23.4%	*2.6*	2.5	2.8
Rec: OR	21.6%	*2.4*	2.3	2.6
Rec: CA	27.9%	*3.1*	3.1	3.4
Residual (beginning of 2012)		*0.1*	0.7	

Canary Rockfish--2013								
Sector Specific Allocation	**2012 Allocation Percentage**	***2012 Allocation (mt)***	**2012 Projected Impacts (mt)**	**Alt. 2 (48 mt)**	**Alt. 3 (101 mt)**	**Alt. 4 (116 mt)**	**Alt. 5 (147 mt)**	**Alt. 7 (216 mt)**
Shorebased Trawl	31.3%	*20.0*		11.6	33.1	39.2	51.7	79.7
At-sea Whiting	22.1%	*14.1*		3.7	10.5	12.4	16.4	25.2
OA: Directed, Nearshore	6.3%	*4.0*	3.3	1.8	5.1	6.1	8.0	12.3
Non-Nearshore	3.6%	*2.3*	1.6	1.0	2.9	3.5	4.6	7.1
Rec: WA	3.1%	*2.0*	1.0	0.9	2.6	3.0	4.0	6.2
Rec: OR	11.0%	*7.0*	4.0	3.1	8.9	10.6	14.0	21.5
Rec: CA	22.7%	*14.5*	9.3	6.5	18.5	21.9	29.0	44.6
Residual (beginning of 2012)		*19.4*	30.0					

Canary Rockfish--2014								
Sector Specific Allocation	**2012 Allocation Percentage**	***2012 Allocation (mt)***	**2012 Projected Impacts (mt)**	**Alt. 2 (49 mt)**	**Alt. 3 (104 mt)**	**Alt. 4 (119 mt)**	**Alt. 5 (151 mt)**	**Alt. 7 (220 mt)**
Shorebased Trawl	31.3%	*20.0*		12.0	34.3	40.4	53.4	81.3
At-sea Whiting	22.1%	*14.1*		3.8	10.9	12.8	16.9	25.8
OA: Directed, Nearshore	6.3%	*4.0*	3.3	1.9	5.3	6.2	8.2	12.6
Non-Nearshore	3.6%	*2.3*	1.6	1.1	3.0	3.6	4.7	7.2
Rec: WA	3.1%	*2.0*	1.0	0.9	2.7	3.1	4.1	6.3
Rec: OR	11.0%	*7.0*	4.0	3.3	9.3	10.9	14.4	22.0
Rec: CA	22.7%	*14.5*	9.3	6.7	19.2	22.6	29.9	45.5
Residual (beginning of 2012)		*19.4*	30.0					

Bocaccio--2013				
Sector Specific Allocation	**2012 Allocation Percentage**	***2012 Allocation (mt)***	**2012 Projected Impacts (mt)**	**Alt. 4 (320 mt)**
Shorebased Trawl	24.0%	*60.0*		76.9
At-sea Whiting	0.0%	*0.0*		0.0
OA: Directed, Nearshore	0.3%	*0.7*	0.5	0.9
Non-Nearshore	23.2%	*57.9*		74.2
Rec: WA	0.0%	*0.0*	0.0	0.0
Rec: OR	0.0%	*0.0*	0.0	0.0
Rec: CA	52.5%	*131.0*	55.4	167.9
Residual (beginning of 2012)		*11.0*	144.7	

Bocaccio--2014				
Sector Specific Allocation	**2012 Allocation Percentage**	***2012 Allocation (mt)***	**2012 Projected Impacts (mt)**	**Alt. 4 (337 mt)**
Shorebased Trawl	24.0%	*60.0*		78.8
At-sea Whiting	0.0%	*0.0*		0.0
OA: Directed, Nearshore	0.3%	*0.7*	0.5	0.9
Non-Nearshore	23.2%	*57.9*		76.1
Rec: WA	0.0%	*0.0*	0.0	0.0
Rec: OR	0.0%	*0.0*	0.0	0.0
Rec: CA	52.5%	*131.0*	55.4	172.1
Residual (beginning of 2012)		*11.0*	144.7	

Cowcod--2013 and 2014				
Sector Specific Allocation	**2012 Allocation Percentage**	***2012 Allocation (mt)***	**2012 Projected Impacts (mt)**	**Alt. 3 (3 mt)**
LE Trawl- Non-Whiting	66.7%	*1.8*		2.6
LE Trawl- Whiting OA: Directed, Nearshore Non-Nearshore Rec: WA Rec: OR Rec: CA	33.3%	*0.9*	0.2	1.0
Residual (beginning of 2012)		0.2	0.9	

[1] Off the Top Deductions are based on the Applicant Requested EFP set-asides (maximum set-aside value).

[2] Allocation percentage were calculated based on the 2012 HG allocations, not on the projected impacts

[3] Projected Impacts from the beginning of 2012 scorecard. Empty cells are sectors with no harvest projection models

[4] Alternative numbers refer to alternatives in Table 4 in Agenda Item E.4. a, Attachment 4 (November 2011), which was used to make the motion on the Council Floor

Attachment 4. Council requested tables with 2012 allocations and allocation percentages, applied to the Council's PPA ACL alternatives, with 2012 residual percentage applied to the alternatives.

Yelloweye Rockfish 2013 and 2014				
Sector Specific Allocation[1]	**2012 Allocation Percentage[2]**	***2012 Allocation (mt)***	**2012 Projected Impacts[3] (mt)**	**Alt. 6 (18 mt)[4]**
Shorebased Trawl	5.4%	*0.6*		0.7
At-sea Whiting	0.0%	*0.0*		0.0
OA: Directed, Nearshore	9.8%	*1.1*	1.1	1.2
Non-Nearshore	11.6%	*1.3*	0.9	1.4
Rec: WA	23.2%	*2.6*	2.5	2.8
Rec: OR	21.4%	*2.4*	2.3	2.6
Rec: CA	27.7%	*3.1*	3.1	3.4
Residual	0.9%	*0.1*	0.7	0.1

Canary Rockfish--<u>2013</u>								
Sector Specific Allocation	**2012 Allocation Percentage**	***2012 Allocation (mt)***	**2012 Projected Impacts (mt)**	**Alt. 2 (48 mt)**	**Alt. 3 (101 mt)**	**Alt. 4 (116 mt)**	**Alt. 5 (147 mt)**	**Alt. 7 (216 mt)**
Shorebased Trawl	24.0%	*20.0*		8.9	25.4	30.1	39.7	61.2
At-sea Whiting	16.9%	*14.1*		2.8	8.0	9.5	12.6	19.4
OA: Directed, Nearshore	4.8%	*4.0*	3.3	1.4	3.9	4.6	6.1	9.4
Non-Nearshore	2.8%	*2.3*	1.6	0.8	2.3	2.7	3.5	5.4
Rec: WA	2.4%	*2.0*	1.0	0.7	2.0	2.3	3.1	4.7
Rec: OR	8.4%	*7.0*	4.0	2.4	6.9	8.1	10.7	16.5
Rec: CA	17.4%	*14.5*	9.3	5.0	14.2	16.8	22.2	34.2
Residual	23.3%	*19.4*	30.0	6.7	19.0	22.5	29.7	45.8

Canary Rockfish--<u>2014</u>								
Sector Specific Allocation	**2012 Allocation Percentage**	***2012 Allocation (mt)***	**2012 Projected Impacts (mt)**	**Alt. 2 (49 mt)**	**Alt. 3 (104 mt)**	**Alt. 4 (119 mt)**	**Alt. 5 (151 mt)**	**Alt. 7 (220 mt)**
Shorebased Trawl	24.0%	*20.0*		9.2	26.3	31.0	40.9	62.4
At-sea Whiting	16.9%	*14.1*		2.9	8.3	9.8	13.0	19.8
OA: Directed, Nearshore	4.8%	*4.0*	3.3	1.4	4.1	4.8	6.3	9.6
Non-Nearshore	2.8%	*2.3*	1.6	0.8	2.3	2.8	3.6	5.5
Rec: WA	2.4%	*2.0*	1.0	0.7	2.0	2.4	3.2	4.8
Rec: OR	8.4%	*7.0*	4.0	2.5	7.1	8.4	11.1	16.9
Rec: CA	17.4%	*14.5*	9.3	5.2	14.7	17.4	22.9	34.9
Residual	23.3%	*19.4*	30.0	6.9	19.7	23.2	30.7	46.7

Bocaccio--2013				
Sector Specific Allocation	**2012 Allocation Percentage**	***2012 Allocation (mt)***	**2012 Projected Impacts (mt)**	**Alt. 4 (320 mt)**
Shorebased Trawl	23.0%	*60.0*		73.7
At-sea Whiting	0.0%	*0.0*		0.0
OA: Directed, Nearshore	0.3%	*0.7*	0.5	0.9
Non-Nearshore	22.2%	*57.9*		71.1
Rec: WA	0.0%	*0.0*	0.0	0.0
Rec: OR	0.0%	*0.0*	0.0	0.0
Rec: CA	50.3%	*131.0*	55.4	160.9
Residual	4.2%	*11.0*	144.7	13.5

Bocaccio--2014				
Sector Specific Allocation	**2012 Allocation Percentage**	***2012 Allocation (mt)***	**2012 Projected Impacts (mt)**	**Alt. 4 (337 mt)**
Shorebased Trawl	23.0%	*60.0*		75.5
At-sea Whiting	0.0%	*0.0*		0.0
OA: Directed, Nearshore	0.3%	*0.7*	0.5	0.9
Non-Nearshore	22.2%	*57.9*		72.9
Rec: WA	0.0%	*0.0*	0.0	0.0
Rec: OR	0.0%	*0.0*	0.0	0.0
Rec: CA	50.3%	*131.0*	55.4	164.9
Residual	4.2%	*11.0*	144.7	13.8

Cowcod--2013 and 2014				
Sector Specific Allocation	**2012 Allocation Percentage**	***2012 Allocation (mt)***	**2012 Projected Impacts (mt)**	**Alt. 3 (3 mt)**
Shorebased Trawl	62.1%	*1.8*		1.8
At-sea Whiting	31.0%	*0.9*	0.2	0.9
OA: Directed, Nearshore				
Non-Nearshore				
Rec: WA				
Rec: OR				
Rec: CA				
Residual	6.9%	0.2	0.9	0.2

[1] Off the Top Deductions are based on the Applicant Requested EFP set-asides (maximum set-aside value).
[2] Allocation percentage were calculated based on the 2012 OY allocations, not on the projected impacts.
[3] Projected Impacts from the beginning of 2012 scorecard. Empty cells are sectors with no harvest projection models.

[4] Alternative numbers refer to alternatives in Table 4 in Agenda Item E.4. a, Attachment 4 (November 2011), which was used to make the motion on the Council floor.

GROUNDFISH MANAGEMENT TEAM REPORT ON 2013-14 HARVEST SPECIFICATIONS AND MANAGEMENT MEASURES, PART II

MANAGEMENT MEASURES

The Council adopted only a few new management measures for preliminary analysis in September. Based on Council guidance, the Groundfish Management Team (GMT) provided some additional information to assist the Council in the adoption of a preliminary range of management measures for more detailed analysis under Agenda Item A.9.b, GMT Report 2. A summary of the preliminary preferred management measures follows:

- Rockfish Conservation Area Boundary (RCA) points; these revisions may include but are not limited to:

  • Consider modest revision to a few points on the boundary line approximating the 150 fm depth contour off of Washington where it crosses the 200 fm line.

- Management measures to keep spiny dogfish and longnose skate mortalities within harvest specifications

- RCA adjustments for the Individual Fishing Quota (IFQ) Fisheries

- IFQ Fishery lingcod length restrictions

- Allow multiple fishing gears on a single trip in the IFQ fisheries

- Modify regulations to allow use of four-seam trawls shoreward of the RCA

- Clarify catch accounting under the limited entry and open access fisheries.

The National Marine Fisheries Service (NMFS) provided their advice relative to the preliminary list of management measure for 2013-2014 during the GMT meeting the week of October 3-7, their advice on whether the management measures should be analyzed as part of the 2013-2014 harvest specification and management measure process or through future rule makings is summarized in Agenda Item E.9.b, NMFS Report.

The following GMT report provides further analysis of the preliminary preferred management measures from September and comments on new measures brought forward this week. **The GMT requests guidance from the Council on the management measures to be analyzed over winter for 2013-2014.**

Longnose Skate and Spiny Dogfish

Total Mortality by Sector

Summaries of total mortality for spiny dogfish (2007-09) and longnose skate (2009) were provided previously under this agenda (Agenda Item E.9.b, GMT Report 2, November 2011; see Tables 5 and 6) and under Agenda E.4 for longnose skate (2009 and 2010; Agenda Item E.4.b, Supplemental GMT Report 3, November 2011).

We provide Table 1 to illustrate total mortality of spiny dogfish by sector for the years 2007-2010. These annual comparisons were included to evaluate annual variability and differences among sectors. Spiny dogfish were primarily caught by shoreside whiting trawl, non-nearshore fixed gear, and at-sea whiting fisheries. A large difference is apparent for non-nearshore fixed gear, where total mortality was 509 mt in 2007 but dropped to 332 mt in 2008. This reduction in total mortality was due to the loss of a spiny dogfish processor in northern Washington after the 2007 season. The reduction in processing capability also is responsible for a reduction in dogfish targeting after the 2007 season. We also point out that spiny dogfish total mortality for non-tribal catcher-processors was 489 mt in 2008, which is 5x – 10x higher than during the other years (Table 1).

Longnose skate (see Agenda Item E4b, Supplemental GMT Report 3, November 2011), were caught almost exclusively by the non-nearshore fixed gear fishery and the shoreside non-whiting trawl fishery. Only two years of data are available for this species because it was not sorted prior to 2009.

Table 1. Total mortality (mt) of spiny dogfish among sectors for 2007-2010. Data were taken from West Coast Groundfish Observer Program total morality reports.

	Year			
Sectors	**2007**	**2008**	**2009**	**2010**
Shoreside non-whiting trawl	652.0	1023.0	665.5	520.1
Non-nearshore fixed gear	509.0	332.0	216.2	254.1
Nearshore fixed gear	0	1.0	0	0.1
Non-Tribal Shoreside Whiting	51.4	59.5	16.0	124.6
Non-Tribal Mothership	22.6	24.0	6.8	45.4
Non-Tribal Catcher-Processor	63.5	489.1	27.9	110.4
WA (Recreational)	0	0	0	0
OR (Recreational)	0	0	0.1	0.1
CA (Recreational)	5.0	3.0	4.9	1.6
TOTAL	1303.5	1931.6	937.5	1056.4

Management Measures

The GMT showed that both longnose skate and spiny dogfish may require more restrictive management measures to keep fishing mortality below their respective annual catch limits (ACLs) (Agenda Item E.9.b, GMT Report 2, November 2011). Many similarities between the

two species were described in that report, including that both species exhibit a wide depth and latitudinal distribution and both are largely bycatch species. Although both species are primarily incidentally caught while targeting other groundfish, both have been intermittently retained and sold. Spiny dogfish are, however, targeted by some vessels, and there has been an increase in landings of longnose skate since 2004 (Gertseva and Schirripa 2007; Bellman et al. 2010; Bellman et al. 2011). The 2009 and 2010 total catch of longnose skate (Bellman et al. 2010; Bellman et al. 2011) represent the 3rd and 2nd highest catches over the past 50 years (see Gertseva and Schirripa 2007).

We previously pointed out that longnose skate was removed from the Other Fish complex and has been managed with its own ACL since 2009, whereas spiny dogfish currently remains within the Other Fish complex (Agenda Item E.9.b, GMT Report 2, November 2011). The GMT noted that it may still be possible to manage catches of dogfish without its removal from the complex; however, fewer management options are available for that case.

In GMT Report 2 (under this agenda item), we suggested that longnose skate and spiny dogfish may be managed using time-area tools, such as trip limits. West Coast Groundfish Observer Program (WCGOP) and PacFIN data were used to evaluate potential effectiveness of these typical management measures (e.g., trip limits and RCA changes) and others to keep fishing mortality below ACLs.

The GMT report provides the following examples of potential management measures and data that may be used to control catches of spiny dogfish and longnose skate. This is not a complete analysis, but rather a display of data and management measures that may be available to keep the catch of these species below their ACLs.

Trip Limits

Trip limits may be used to effectively reduce or eliminate targeting of spiny dogfish, but may be less effective for reducing catches of longnose skate (which is generally not targeted). Spiny dogfish may be found in dense concentrations or schools, and certain vessels will pursue and catch these large concentrations. Individual catches of spiny dogfish reached nearly 5 mt per set for trawl and longline during 2009 and 2010; most sets yielded less than 0.5 mt (Figures 1 and 2). For observed sets where spiny dogfish were caught, fishermen recorded that they were targeting the species 32 percent of the time for fixed gear and ~0.05 percent for trawl (averages during 2002 – 2010 (WCGOP data). Even though, WCGOP data shows that only a few trawl vessels target this species, catches can be very high (a few trawl sets produced > 15 mt during the period 2002 – 2008). Hence, some level of trip limit could reduce these targeting events, and making catch mortality more representative of incidental, unavoidable catches while pursuing other targeted species (e.g., at the lower range of catch levels shown in Figures 1 and 2).

Longnose skate are not typically the primary target species for trawl or longline. Instead, this species is normally caught incidentally while targeting other species. Maximum catches of longnose skate per set were less than 2.5 mt (trawl) and less than 0.5 mt for fixed gear during 2009 and 2010 (Figures 1 and 2). Most sets produced less than 0.25 mt (trawl) and less than 0.1 mt (fixed gear). Nonetheless, even though fishermen do not solely target longnose skate, landings have increased in recent years to nearly all time high levels (see above) and increased

fishing in areas with relatively high concentrations could become more frequent. Hence, the effectiveness of trip limit management for reducing the catch of this species is uncertain; however, they could be set to prevent any new target fisheries from developing. The GMT notes that trip limits for this species may result in frequent discarding, because limits would have to be relatively low to produce a large impact (see Figures 1 and 2).

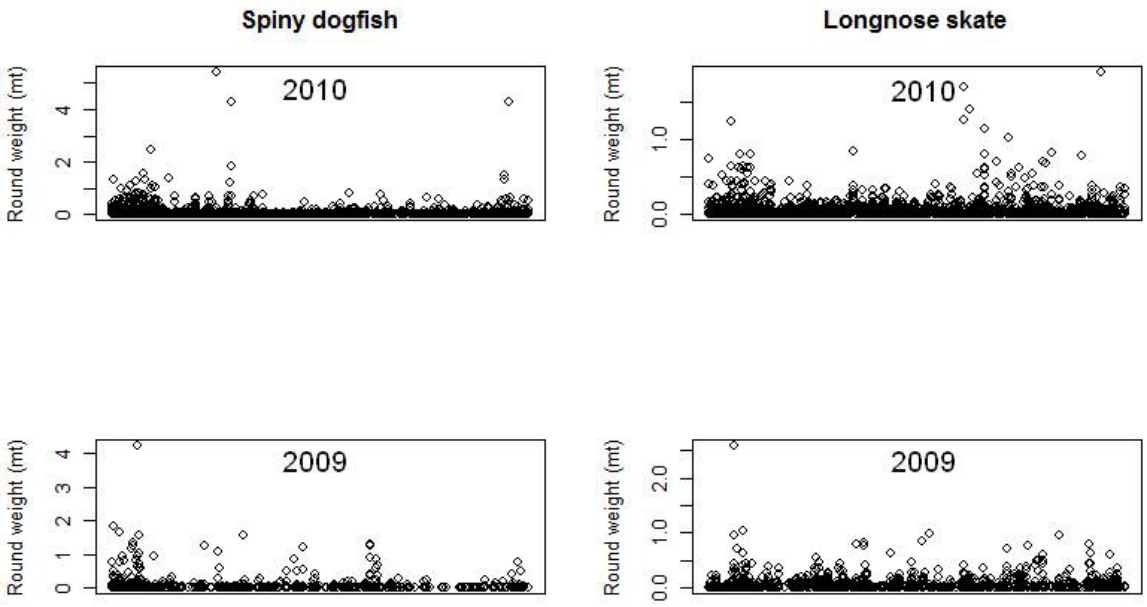


Figure 1. Spiny dogfish shark and longnose skate catch (mt) by tow for bottom trawl during 2009 and 2010. Only positive tows were included. Data were acquired from the WCGOP.

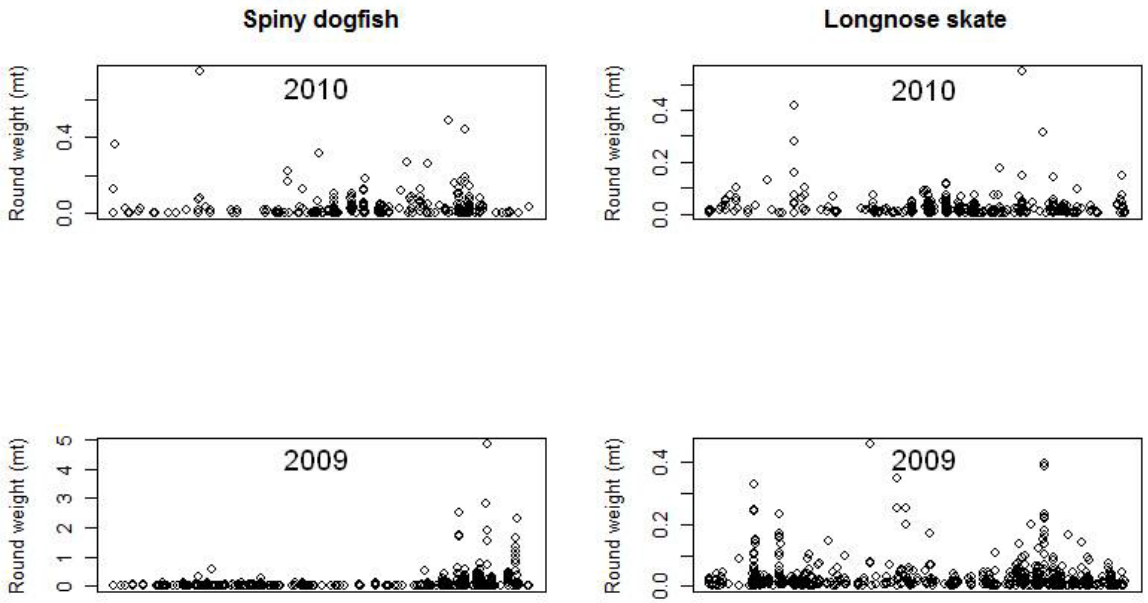


Figure 2. Spiny dogfish shark and longnose skate catch (mt) by set by fixed gear during 2009 and 2010. Only sets with spiny dogfish or longnose skate catch were included. Data were acquired from the WCGOP.

Depth Restrictions (e.g., RCAs)

WCGOP data demonstrate that both spiny dogfish and longnose skate are caught over a wide range of depths (0-50 fm to > 600 fm) and management areas by both trawl and fixed gear (Tables 1 and 2). Note that we only provided data for two management areas for these examples. Both species are caught coastwide.

Tables 1 and 2 show that longnose skate and spiny dogfish may be caught at very shallow depths. Highest trawl catches for spiny dogfish, for example, are shown at the shallowest depth strata (100 fm north of 40° 10' N. lat. and up to 150 fm south of 40° 10' N. lat). Hence, shoreward RCA lines would likely have to be moved to ~50 fm or shallower to effectively reduce catches of spiny dogfish. A similar situation may exist for longnose skate, where the highest catches by trawl between 45° 46' and 48°10' N lat. were in the 50-100 fm depth strata.

At the deeper end of the spectrum, WCGOP data demonstrate that catches are highest to approximately 350 fm for both spiny dogfish and longnose skate (Tables 2 and 3). Catches may subsequently begin to drop at depths beyond 350 fm (Table 2). This wide depth distribution of trawl catches is demonstrated in Figure 3 for longnose skate, which shows that a seaward depth restriction of 250 fm would still leave large areas where longnose skate encounters would occur. In this case, the seaward depth restriction may have to be much deeper than 250 fm to effectively reduce catches of longnose skate.

These results suggest that significant reductions in catches of longnose skate and spiny dogfish using depth-based management may be possible but would likely result in large impacts to the fisheries and associated communities.

Table 2. WCGOP Observed of longnose skate (mt) by depth (fm) for fixed gear and trawl sets for 2002-2010 Catches are shown for two areas. Remaining areas along the U.S. west coast can be provided at request.

	FIXED GEAR		TRAWL	
Area 2	Depth (fm)	Catch (mt)	Depth (fm)	Catch (mt)
48°10' to 45°46'			0-50	5.3
	50-100		50-100	124.6
	100-150	16.8	100-150	23.5
	150-200	21.4	150-200	7.9
	200-250	14.1	200-250	42.9
	250-300	5.7	250-300	45.1
	300-350	1.8	300-350	22.6
	350-400	0.3	350-400	5.7
	400+	0.2	400-450	1.3
			450-500	0.1
			500+	0.1

Area 3	Depth (fm)	Catch (mt)	Depth (fm)	Catch (mt)
45°46' to 40°10'			0-100	50.9
	0-150	7.2	100-150	21.5
	150-200	16.2	150-200	2.5
	200-250	12.9	200-250	83.0
	250-300	4.7	250-300	92.0
	300+	0.8	300-350	37.7
			350-400	5.1
			400-450	1.9
			450-500	0.1
			500-550	0.1
			550-600	0.1
			600	0.0

Table 3. WCGOP Observed of spiny dogfish shark (mt) by depth (fm) for fixed gear and trawl sets for 2002-2010. Catches are shown for two areas. Remaining areas along the U.S. west coast can be provided at request.

	FIXED GEAR		TRAWL	
Area 2	Depth (fm)	Catch (mt)	Depth (fm)	Catch (mt)
48°10' to 45°46'			0-50	6.7
	50-100		50-100	307.8
	100-150	120.1	100-150	108.5
	150-200	91.0	150-200	28.2
	200-250	50.0	200-250	141.3
	250-300	30.5	250-300	55.5
	300-350	3.1	300-350	25.2
	350-400	2.2	350-400	4.7
	400+	12.1	400-450	0.3
			450-500	0.1
			500+	0.1

Area 3	Depth (fm)	Catch (mt)	Depth (fm)	Catch (mt)
45°46' to 40°10'			0-100	0.1
	0-150	0.1	100-150	20.9
	150-200	8.5	150-200	18.9
	200-250	20.0	200-250	11.5
	250-300	10.4	250-300	134.0
	300+	2.1	300-350	34.6
			350-400	8.2
			400-450	0.4
			450-500	0.2
			500-550	0.1
			550-500	0.0
			600	0.0

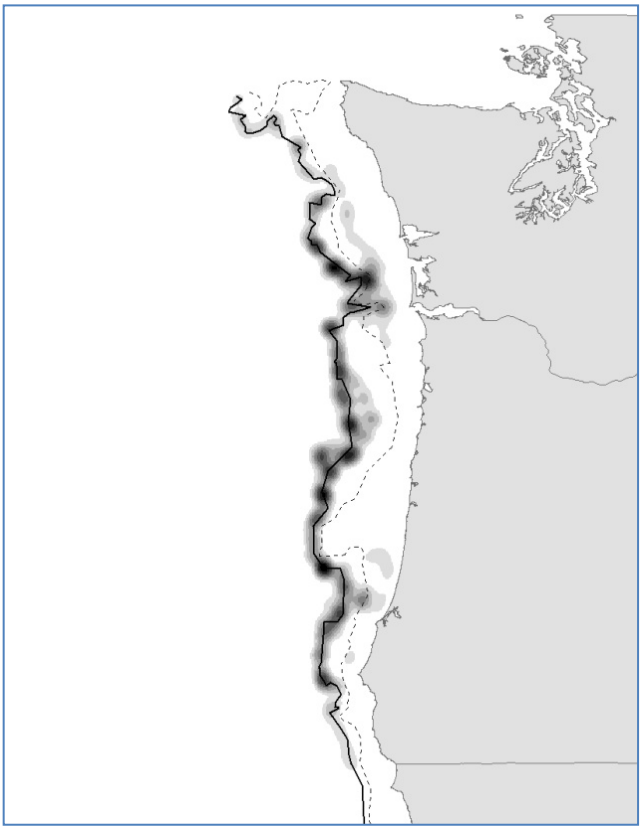


Figure 3. Distribution of bottom trawl tows (shaded areas) where longnose skate were retained and recorded in logbooks during 2010. Darker shading represents higher number of tows with longnose skate. Dashed line = 75 fm line; Solid line = 250 fm line. RCA lines were included for reference only. Data was acquired from the PacFIN data base. Only hauls where a hail weight was recorded are included.

Establishing IFQ

Establishing longnose skate and spiny dog as IFQ species (i.e., quota share and quota pounds (QP) would be distributed) is another option to increase the probability of keeping catches below the ACL. Individual accountability acts as a significant deterrent because of the provision requiring vessels to remain off water until deficits are cleared. The restrictions associated with QP species (individual accountability) may therefore help to ensure that ACLs are not exceeded, and may circumvent the need for other management measures, such as RCAs.

There are additional reasons that making longnose skate and spiny dogfish IFQ species would be effective. These species have very high discard rates, and IFQ provides direct, real-time catch accounting of discard. Over 2008-2010, 92 percent of spiny dogfish catch using trawl gear was discarded, and 70 percent of longnose skate catch was discarded. Over the same time period, 88 percent of longnose skate and 79 percent of spiny dogfish was caught with trawl gear. Together with permit-level individual accountability, IFQ is a potential control measure for these species. Additionally, managing these species with IFQ would avoid the ineffective nature of trip limits on discard species, and would avoid the undue restrictions to the fleet on depth which would be needed to manage either species using depth based management (RCA).

The GMT points out that spiny dogfish would need to be removed from the Other Fish complex before applying this measure.

Other Potential Management Measures
Other management measures may be available to reduce fishing mortality for dogfish and longnose skate if necessary. Both species may exhibit some level of survival after discard (Agenda Item E.4.b, Supplemental GMT Report 3, November 2011). Hence, if handled properly (e.g., careful release in longline fisheries; short deck times on trawl vessels), then fishing mortality may be reduced. Gear modifications and requirements is another option to reduce fishing mortality, especially for longnose skate. For example, flexible grates and escape panels have been shown to effectively allow escapement of skate at fishing depth while retaining most target species that enter the net. These types of potential management measures could be further explored. We are uncertain whether we have the information to quantify the potential savings of these types of measures.

Catch Accounting between the Limited Entry and Open Access Sectors
The GMT has previously expressed the importance of clarifying the regulations for catch accounting between the limited entry and open access sectors due to the potential impacts on current models, especially sablefish. It is the GMT's understanding that this issue is simply a matter of clarifying the regulations and Fishery Management Plan to be consistent with Council action. If upon further investigation this issue is more complex than originally thought and cannot be corrected in the biennial spex, the GMT will continue to work with Council and NWR staff to implement Council intent.

New requests for management measures
Under written public comments, two new requests were submitted for consideration in 2013-14 – one to modify RCA way points in southern California and another to modify the lingcod closure for nearshore fishery in Oregon. RCA modifications for other areas of the coast are currently being considered for 2013-14 and this new request can likely be accommodated and included with the others.

Current commercial lingcod regulations for the limited entry and open access fixed gear nearshore fisheries north and south of 40º10' N. latitude include a closure for the months of December through April. The closure was originally implemented to protect the stock when it was declared overfished. The 2009 stock assessment indicated that the stock was rebuilt coastwide and as a result, the Council did give some consideration to removing the closure for both Oregon and California in 2011-12 (2011-12 FEIS). This management measure was ultimately "considered but rejected" due to overfished species concerns, primarily yelloweye. At that time, the GMT concluded that if lingcod harvest was not increased, but the closure was modified or removed, the trip limits would likely have to be reduced year round to the extent that they would effectively just be incidental trip limits. In other words, the same amount of harvest could be taken but spread it out over 11 months, instead of 6. The GMT suggested that this measure may have required reducing trip limits drastically.

Circumstances are different during this biennial cycle relative to that of the 2011-12 cycle. During the 2011-12 analysis, the Council was facing the possibility of a 13 mt ACL for yelloweye rockfish, whereas the Council selected a PPA of 18 mt for the 2013-14 cycle during Agenda Item E. 4 at this November meeting. On the other hand, the Council reaffirmed their commitment to keeping management measures restricted for this 2013-14 cycle to ensure a January 1, 2013 start date. The current (2012) ACL for yelloweye rockfish is 17 mt.

The GMT seeks guidance from the Council whether this management measure should be analyzed by the GMT for 2013-14.

Lingcod North and South of 42º N latitude
Under Agenda Item E.7.d the Council recommended that NMFS address concerns heard under public testimony on the subarea allocations of lingcod north and south of 42º N latitude. The general hope of the Council is that NMFS will be able to resolve this issue in time for the beginning of the 2012 fishery. Additionally the Council will need to decide how to handle this issue for 2013-2014. Some ideas that have been expressed to address this issue are:

1. Adopt a coastwide ACL for lingcod, rather than the current north and south of 42° N latitude split, and adjust the ACL accordingly.
2. Adjust the north/south split from 42° N latitude to 40° 10' N latitude. This would require coordination with the stock assessor to determine the OFL and ABC for each area. These would then be used to determine the new area specific ACLs.
3. Implement a line at 42° N latitude from shore to the shoreward RCA boundary line and then seaward of the RCA there would be no subarea restrictions for lingcod.

Additionally, accumulation limits for lingcod may need to be addressed. The GMT has not had time to analyze or discuss these items and therefore have no recommendations at this time. We seek guidance from the Council on which, if any, of these management measures should be analyzed for 2013-14.

Recreational Management Measures
In keeping with the Council's intent of limiting the scope and number of changes to status quo harvest specifications and management measures during the 2013-2014 cycle, neither Washington or Oregon are proposing any new management measures to be analyzed for the recreational fisheries. Status quo management measures (bag limits, depth restrictions, etc.) will provide the basis for keeping recreational impacts of overfished species within sector specific harvest guidelines for 2013-2014.

GMT Recommendations:
Consider whether to analyze the following management measures during the 2013-2014 harvest specification and management measure cycle:

1. Revise latitude and longitude coordinates that are used to define the rockfish conservation area (RCA) boundaries as necessary for trawl and fixed gear.
2. Rockfish Conservation Area Boundary (RCA) adjustments for the IFQ fisheries.
3. IFQ fishery lingcod length restrictions.
4. Allow multiple fishing gears on a single trip under the IFQ program.

5. Modify regulations to allow uses for four-seam trawls shoreward of the RCA.
6. Management measures to keep spiny dogfish and longnose skate mortalities within harvest specifications including; trip limits, depth restrictions, establishing longnose skate and spiny dogfish as IFQ species, and gear modifications to reduce bycatch.
7. Clarify catch accounting under the limited entry and open access fisheries.
8. RCA modifications in California and the lingcod closure in Oregon as requested in Agenda Item E.9.c Public Comment.
9. Lingcod quota pound allocations north and south of 42° north latitude.

PFMC
11/6/11

Agenda Item E.9.b
Supplemental Joint ODFW/CDFG Report
November 2011

OREGON DEPARTMENT OF FISH AND WILDLIFE AND CALIFORNIA DEPARTMENT OF FISH AND GAME JOINT PROPOSAL ON MANAGEMENT MEASURES FOR 2013-2014 FISHERIES

The southern component of black rockfish was first assessed in 2003. Beginning in 2004, the Council allocated 58 percent of the optimum yield (OY; now referred to as an Annual Catch Limit or ACL) to Oregon and 42 percent to California based on recent year landings. This allocation was also used in adopting biennial harvest guidelines for the two states starting with the 2004-05 cycle and continuing through 2011. The Oregon Department of Fish and Wildlife and California Department of Fish and Game propose the sharing arrangement of the black rockfish ACL be used again in 2013-2014.

Proposed 2013-2014 Tribal Management Measures

Black Rockfish - The 2013 and 2014 tribal harvest guidelines will be set at 30,000 pounds for the management area between the US/Canada border and Cape Alava, and 10,000 pounds for the management area located between Destruction Island and Leadbetter Point. No tribal harvest restrictions are proposed for the management area between Cape Alava and Destruction Island.

Sablefish - The 2013 and 2014 tribal set asides for sablefish will be set at 10 percent of the Monterey through Vancouver area ACL minus approximately 1.5 percent to account for estimated discard mortality. Allocations among tribes and among gear types, if any, will be determined by the tribes.

Pacific cod - The tribes will be subject to a 400 mt harvest guideline for 2013 and 2014.

For all other tribal groundfish fisheries the following trip limits will apply:

Thornyheads - Tribal fisheries will be restricted to 17,000 lbs/2 months for shortspine thornyheads and 22,000 lbs/2 months for longspine thornyheads. Those limits would be accumulated across vessels into a cumulative fleetwide harvest target for the year. The limits available to individual fishermen will then be adjusted inseason to stay within the overall harvest target as well as estimated impacts to overfished species

Canary Rockfish - Tribal fisheries will be restricted to a 300 pound per trip limit.

Other Minor Nearshore, Shelf and Slope Rockfish - Tribal fisheries will be restricted to a 300 pound per trip limit for each species group, or the Limited Entry trip limits if they are less restrictive than the 300 pound per trip limit.

Yelloweye Rockfish - The tribes will continue developing depth, area, and time restrictions in their directed Pacific halibut fishery to minimize impacts on yelloweye rockfish. Tribal fisheries will be restricted to 100 pounds per trip.

Lingcod - Tribal fisheries will be subject to a 250 mt harvest guideline for 2013 and 2014.

Spiny Dogfish – Tribal fisheries for dogfish in 2013 and 2014 would be restricted to 200,000 lbs/2 months. Targeting of dogfish by treaty fishermen in 2013 and 2014 would be conducted while staying within current estimates of impacts on overfished species.

Full Retention - The tribes will require full retention of all overfished rockfish species as well as all other marketable rockfishes during treaty fisheries.

Makah Trawl Fisheries for 2013 and 2014

Midwater Trawl Fishery - Treaty midwater trawl fishermen will be restricted to a cumulative limit of yellowtail rockfish, based on the number of vessels participating, not to exceed 180,000 lbs/2 month period for the entire fleet. Their landings of widow rockfish must not exceed 10 percent of the cumulative poundage of yellowtail rockfish landed by a given vessel for the year. The tribe may adjust the cumulative limit for any two-month period to minimize the incidental catch of canary and widow rockfish, provided the average cumulative limit does not exceed 180,000 pounds for the fleet.

Bottom Trawl Fishery - Treaty fishermen using bottom trawl gear will be subject to trip limits similar to those applied in recent years for shortspine and longspine thornyhead, Dover sole, English sole, rex sole, arrowtooth flounder, and other flatfish. These are 110,000 lbs/2 months for Dover sole, English sole, and Other Flatfish; 150,000 lbs/2 months for arrowtooth flounder; 17,000 lbs/2 months for shortspine thornyhead; and 22,000 lbs/2 months for longspine thornyhead. For Dover sole, longspine thornyheads, and arrowtooth flounder, these bi-monthly limits in place at the beginning of the season will be combined across periods and the fleet to create a cumulative harvest target. The limits available to individual fishermen will then be adjusted inseason to stay within the overall harvest target as well as estimated impacts to overfished species. For petrale sole, fishermen would be restricted to 50,000 pounds per two month period for the entire year. Because of the relatively modest expected harvest, all other trip limits for the tribal fishery will be those in place in recent years and will not be adjusted downward, nor will time restrictions or closures be imposed, unless in-season catch statistics demonstrate that the tribe has taken ½ of the harvest in the tribal area. Fishermen will be restricted to small footrope ($\leq$ 8 inches) trawl gear. Exploration of the use of selective flatfish trawl gear may be conducted.

Observer Program - The Makah Tribe has an observer program in place to monitor and enforce the limits proposed above.

F/V Top Gun
Jeff Miles
PO Box 424
Port Orford, OR 97465

October 10, 2011

Mr. Dan Wolford, Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384

RE: Agenda Item E.9. 2013-14 Biennial Management Process – Part 2 (Adopt PPAs for a Range of Management Measures.

Dear Chairman Wolford,

I commercial fish out of Port Orford, OR. About 40% of my fishing is in the open access nearshore fishery. In the past lingcod has been an important fishery for our community. While the lingcod fishery has recovered, commercial fishermen have not seen any increase in fishing opportunity. I respectfully request the Council consider increasing access to the lingcod fishery in 2012 to provide more opportunity for nearshore fishermen.

In a regular fishing day, nearshore fishermen may catch and discard up to 400-500 lbs of lingcod per fishing trip. This is what happens in a fishery that has recovered but management measures have not been adjusted. I propose to retain lingcod instead of discarding the fish. I understand the amount retained (or the increase in trip limit) must consider impact to overfished species. I propose we increase the lingcod fishery to include fishing January 1 – April 30. As a starting point, I propose a limit in Jan-April of 250 lbs per month with a 50 lb daily trip limit. This proposal would allow some lingcod to be retained instead of discarded, the daily and monthly trip limits are low enough so as to discourage targeting, and the lingcod would be retained only as a function of daily, routine fishing operations. I recognize that the Council will need to analyze the impact to overfished species from various trip limit scenarios and will then decide the appropriate Jan-April trip limit/increase in response to the rebuilt lingcod stock.

Even a modest increase in lingcod would provide additional revenue to nearshore fishermen and their communities.

Sincerely,
Jeff Miles, F/V Top Gun

----- Original Message -----

From: Mark Ludes
To: PFMCcomments@noah.gov
Sent: Thursday, October 13, 2011 6:17 AM
Subject: Extending commercial lingcod season

PFMC Board;

It is my understanding that there is an option to increase the commercial lingcod season being addressed. I am in favor of this option for many reasons. Primarily, it is known, and data shows, that lingcod have rebounded much faster than expected. This alone should be enough to grant a small increase to help a struggling industry and economy.

Thank you for your time,
Mark Ludes

-------- Original Message --------

Subject: Public Comment
Date: Tue, 11 Oct 2011 07:59:11 -0700
From:LYLE KEELER <crab101@wildblue.net>
To:pfmc.comments@noaa.gov
RE: Changes to management of lingcod fishery

Dear Council,

I am a commercial fisherman that fishes nearshore in Oregon. I have been fishing since 1969 out of Port Orford. We used to have a healthy lingcod fishery that we all fished in. I understand there were problems with lingcod stocks in the past but the lingcod fishery has recovered. I support a change to the lingcod fishery to increase fishing opportunity. Would the Council consider analysis of increased trip limits and increased season (open the winter months to fishing) and a slot limit? While I am nearshore fishing, I continually discard lingcod when I reach our limit and during the closed months. This is a sign to me of a healthy fishery that could allow more fishing opportunity. I understand there is an issue with overfished species bycatch and I encourage the Council to provide analysis to find out how to address that concern while allowing more fishing opportunity for the rebuilt stock.

Thank you for your consideration.

Lyle Keeler, F/V Dominion

-------- Original Message --------

Subject: Public Comment
Date: Thu, 13 Oct 2011 15:56:17 -0700
From: Aaron Longton <aaron@oceanresourceteam.org>
To:pfmc.comments@noaa.gov

Dear Council Members:

I commercial fish for lingcod. The lingcod stock is rebuilt and ready for management review that could provide for increased fishing opportunity. Would you please include lingcod management in the 2013-14 groundfish review so nearshore fishermen can provide input and information along with staff analysis for new lingcod management? Fixed-gear fishermen have taken many fishing reductions over the past 10 years. Lingcod was severely reduced, our canary and yelloweye fisheries are gone, blackcod is in a decline, and the price we get for fish doesn't keep up with the increase in fuel and boat repairs to keep us on the water. The Council has a unique opportunity right now to manage the rebuilt lingcod stock to increase fishing opportunity.

Thank you for considering adding lingcod to the list for review in 2013-14.

Sincerely,
Aaron Longton, F/V Golden Eye

----- Original Message -----

From: Eric & Ellen
To: P.Council
Cc: Kelly.Ames@noaa.gov and John DeVore
Sent: Thursday, October 13, 2011 1:47 PM
Subject: RCA boundaries

Dear PFMC members,
My name is Eric Kramer. I am a commercial groundfisherman out of Oxnard, California.
I would like to propose an adjustment to the RCA boundaries on Santa Rosa Flats. There is a fairly large area of water that is less than 60F in the vicinity of 33 43.012 north and 120 02.400 west.[see chart 18720] This area is way outside the line and cannot be fished, yet is a legal depth. I propose a donut hole of fishable water be established.

Sincerely, E.Kramer

-------- Original Message --------
Subject: November Council Meeting Public Comment
Date: Thu, 13 Oct 2011 16:12:35 -0700
From: Leesa Cobb <leesa@oceanresourceteam.org>
To: pfmc.comments@noaa.gov

Dear Council Members,
I have commercial fished for 30 years in Oregon. I am writing to ask you to consider adding lingcod to the upcoming 2013-14 groundfish review.

The lingcod fishery is rebuilt. Fishermen are seeing more lingcod on the grounds -- which makes sense -- and discarding more fish as we reach our limit or fish during closed periods. We're seeing what your data shows -- the fish have come back.

A review of lingcod management would be timely and appropriate. There are several issues to address and analyze:

* What fishing level is appropriate for the rebuilt stock?
* Is the December - April spawning closure still needed? If so ,why is the sport season open during those months?
* How does the Council manage an increase in the lingcod limit and also prevent impact to overfished species?

A review of lingcod management is needed right away. Thank you for your consideration.

Sincerely,
Chris Aiello
F/V J&C

-------- Original Message --------

Subject: E.9. 2013-14 Biennial Management Process - Part 2

Date: Thu, 13 Oct 2011 11:04:10 -0700

From: Gene Fowler <geneandclaudia@gmail.com>

To: pfmc.comments@noaa.gov

Dear Chairman Wolford,

We have two boats that we commercial fish out of Port Orford, OR. Lingcod is an important fishery to us. We are glad that the lingcod fishery has recovered, however, we have not been given an increase in our quota. It would be beneficial for the nearshore fishermen if there were an increase in this fishery.

During the months that we are prohibited from retaining lingcod, we discard several hundred pounds of lingcod per fishing trip. Therefore, we support Jeff Miles' proposal of allowing fishermen to retain 250 pounds/50 pound daily limit of lingcod from January 1 - April 30. This would provide additional revenue to nearshore fishermen.

Sincerely,

Gene & Claudia Fowler, F/V Sea Hunt

F/V C Dawn

TO: Pacific Fisheries Management Council pfmc.comments@noaa.gov
REF: ITEM E.9.2013/14 Management Process

This email is forwarded in support of extending the length of the commercial lingcod season. The Nearshore fisherman listed below highly recommend extending the lingcod season to twelve months and provide the following comments accordingly:

A. During the current closed periods fisherman are often forced to release substantial quantities of lingcod that are worth more income than the days total catch. Conversely, there are a few months during the open season when monthly quotas are not filled due to poor weather or that feeding conditions are poor. Averaging through a 12 period will increase the effectiveness/efficiency/and financial situation for many near shore fisherman.

B. All lingcod that are gill hooked throughout the closed season will certainly perish -- the current 7 month season promotes needless waste.

C. Sports lingcod season is open all year -- why not commercial ?

D. During the winter months nearshore fishing is challenging and often sparse. A 12 month lingcod season would increasing income during that period.

E. With fuel prices at high levels the nearshore fishery should be working towards better efficiency and improved practices. A twelve month season fits this criteria.

F. The current 7 month lingcod season creates major market instabilities. When the lingcod season shuts down wholesale buyers, who also purchase other nearshore species, disappear and in some cases do not return the following year. For the town of Brookings this is a major problem in that all buyers come long distances to procure our products -- we have no "local buyers". Also consider that when lingcod is unavailable for extended periods, the end users will switch to products from Canada and local products eventually disappear from the market place. We are at the point that in this "tourist/fishing" town virtually all Brookings based restaurants do not serve "local caught fresh fish". A full 12 month season is mandatory in regards to maintaining an open and viable market. Providing product consistently throughout a 12 month period will promote buyer continuity and improve market stability.

Brookings Fisherman/Owners endorsements:

Name	F/V
James Pierce	Navmax
Shawn Roberts	Endless Wanderer.
Jim Piscitello	LiveFish
Jason Piscitello	LiveFish
Gerald Mikell	Fishbuster7
John Griffith	Sea Chicken Two
Wesly King	Evie
Steve Stringham	Kyrie Eleison
John Terebesi	Lady Louise

Howard Riegel	Beach King
Bill Woods	Resident

Cc: jandmiles@frontier.com
steve5455087@hotmail.com
foghorn@hughes.net

Port Orford Ocean Resource Team
PO Box 679
351 W 6th Street
Port Orford, OR97465
P: 541.332.0627
F: 541.332.1170
info@oceanresourceteam.org
oceanresourceteam.org

October 11, 2011

Mr. Dan Wolford
Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384

RE: Agenda Item E.9. 2013-14 Biennial Management Process – Part 2 (Adopt PPAs for a Range of Management Measures).

Dear Chairman Wolford:

Our organization works to ensure the long-term sustainability of Port Orford's ocean resources and our community that depends on them.

We understand it is necessary to restrict a fishery before a stock is over-fished, and we also look for increased fishing opportunity on healthy stocks. The lingcod fishery has rebuilt and the timing seems right to look for new management measures that will allow for additional harvest. We would greatly appreciate the Council adding a 2013-2014 Management Measure to address increased fishing opportunity for lingcod.

We understand that increased fishing opportunity for lingcod in the nearshore could impact overfished species and that analysis should be done to determine an appropriate level of lingcod fishing to minimize impacts. It is important to note that the nearshore fishery has an increasing rate of lingcod discards when the trip limit is reached or the season is closed. We support retention of lingcod bycatch – a goal of the Port Orford Stewardship Area is to reduce bycatch and discards in all of our fisheries.

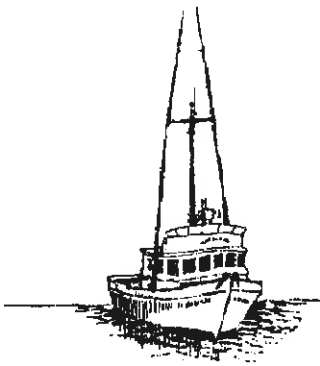
Thank you for considering including lingcod on your list for 2013-14 management measures for further analysis.

Sincerely,

Leesa Cobb

Leesa Cobb

Executive Director



Port of Port Orford
Post Office Box 490
Port Orford, Oregon 97465

Telephone (541) 332-7121
FAX (541) 332-7121
e-mail: portoffice@harborside.com

Port of Port Orford
PO Box 490
Port Orford, OR 97465

Mr. Dan Wolford
Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384

RE: Agenda Item E.9. 2013-14 Biennial Management Process-Part 2 (Adopt PPAs for a Range of Management Measures.)

Because Ports are mandated by ORS 777 to promote economic activity, this letter is written in support of increased commercial quotas for ling cod in the Port Orford area. It is reported to us, from all user groups, that lingcod stocks in the Port Orford area are robust. It makes good economic sense to expand this fishery. Although our data collection lacks any scientific basis, the anecdotal reports we hear on the dock would indicate there would be no adverse effects to the resource from this expansion. We are confident in this position because of the Port Orford fleets self-imposed ban on keeping gravid females. Thank you for your serious consideration of this proposal.

Gary Anderson

Port Manager
Port of Port Orford

10-13-11

Mr. Dan Wolford
Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384

RE: Agenda Item E.9. 2013-14 Biennial Management Process – Part 2 (Adopt PPAs for a Range of Management Measures.

Dear Chairman Wolford,

I am a Live Fish Buyer in Port Orford, OR. for Nor Cal Seafood, Inc. I have spent alot of time Talking To Commercial fisherman. And What I hear alot about is the Large amount of Ling Cod they have to release from Dec to May, Because they are not allowed to keep them.

I would like to see a Small Quota for Ling Cod in the Winter month. This Quota would Help the fisherman make a few Dollars but would Not impact the Ling Cod. Also it would help the Live Market in the winter month when there's not alot of fish out there. What a Live Buyer Needs is fish year Round to Keep the Market going.

Sincerely
Debbie Nowlin
Nor Cal Seafood Buyer

Agenda Item E 9.c
Supplemental Pub Cmt 2

Oregon
John A. Kitzhaber, Governor

Department of Fish and Wildlife
Marine Resources Program
2040 SE Marine Science Drive
Newport, OR 97365
(541) 867-4741
Fax: (541) 867-0311
www.dfw.state.or.us

Memorandum
To: Jeff Miles
Date: 11/1/2011
Re: Request for information

The Oregon Department of Fish and Wildlife (ODFW) conducted a preliminary analysis in response to your request for information about discard of lingcod by vessels with Oregon Limited-Entry Nearshore Commercial Groundfish Fishery (Nearshore Fishery) during the federal spawning season seasonal closure for lingcod retention. The Oregon Nearshore Fishery is considered part of the federal open access fixed gear fishery under federal regulations and is subject to the limits and closures for lingcod retention summarized in Table 1. The sport groundfish fishery and the IFQ program currently have exceptions to the spawning season closure.

Table 1: 2005-2011 Trip Limit Regulations for Open Access Fixed Gear Fisheries north of 40° 10' N. latitude.

Year	Open Access Trip Limits	Closed Months
2005	300 lbs/mo	Nov – Apr
2006	300 lbs/mo	Nov – Apr
2007	400 lbs/mo	Dec – Apr
2008 – 2011	400 lbs/mo	Dec – Apr

ODFW compared information recorded by fishermen in Nearshore logbooks received by the Department with data provided by the West Coast Groundfish Observer Program run by the National Marine Fisheries Service Northwest Fisheries Science Center. Total pounds of lingcod discard recorded during the current spawning closure period each year from January thru April and also in December were examined for years that comparable data were available, 2005 through 2008. Note that there are fundamental differences between these two data sets. For example, weights are measured by the West Coast

Groundfish Observer Program whereas weights recorded in logbooks are estimated by fishermen. Preliminary results for each data set are shown in Tables 2 and 3.

Table 2: Summary of 2005-2008 West Coast Groundfish Observer Program lingcod discards during winter spawning closure (Dec – Apr) for Oregon vessels in the Nearshore Fishery.

Year Trips Observed	**2005** (22)	**2006** (26)	**2007** (21)	**2008** (44)
Percent of trips observed with lingcod encountered	91%	77%	76%	87%
Average lbs lingcod discarded on trips encountered	117	55	57	78
Median lbs lingcod discarded on trips encountered	93	44	48	50
Percent of lingcod encounter trips with ≤50 lbs discarded	60%	65%	50%	51%

Table 2: Summary of 2005-2008 Logbook information on lingcod discards during winter spawning closure (Dec – Apr) for the Oregon Nearshore Fishery.

Year Logbook Trips Received	**2005** (729)	**2006** (285)	**2007** (274)	**2008** (370)
Percent of trips with lingcod reported to be encountered	65%	52%	63%	62%
Average lbs lingcod reported to be discarded when encountered	71	53	42	61
Median lbs lingcod reported to be discarded when encountered	40	34	28	30
Percent of lingcod encounter trips with ≤50 lbs discarded reported	58%	65%	74%	70%

If you have further questions, please feel free to contact the ODFW Marine Resources Program.