Status of the U.S. yelloweye rockfish resource in 2011
(Update of 2009 assessment model)

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Executive Summary

Stock

This update assessment reports the status of the yelloweye rockfish (*Sebastes ruberrimus*) resource off the coast of the United States from southern California to the U.S.-Canadian border using data through 2010. Each area is modeled simultaneously with its own unique catch history and fishing fleets (recreational and commercial) but the dynamics follow the current understanding of yelloweye stock structure: large stocks linked via a common stock-recruit relationship with negligible adult movement among areas.

Catches

Yelloweye rockfish catches were estimated from a variety of sources, but are very uncertain due to the relatively small contribution of yelloweye to rockfish market categories (prior to sorting requirements) and the relatively large scale of recreational removals (average 60% of the total in the past 10 years). The accuracy of estimates of rebuilding rates will therefore depend in part on the accuracy of the recreational catch data. Catches include estimates of discarding after 2001 when management restrictions resulted in nearly all yelloweye caught by recreational and commercial fishermen being discarded at sea. Recent catches were based on current total mortality estimates (2002-2009) and the GMT scorecard (2010). Estimated catches increased gradually throughout the first half of the 20th century, with the exception of a brief period of higher removals around World War II. Catches peaked in 1982 at 463 mt, an estimate that is slightly higher than the previous assessment due to the inclusion of a new catch reconstruction for Oregon. Removals were estimated as remaining in excess of 200 mt for all years between 1977 and 1997. Uncertainty in catches is treated explicitly throughout this analysis.

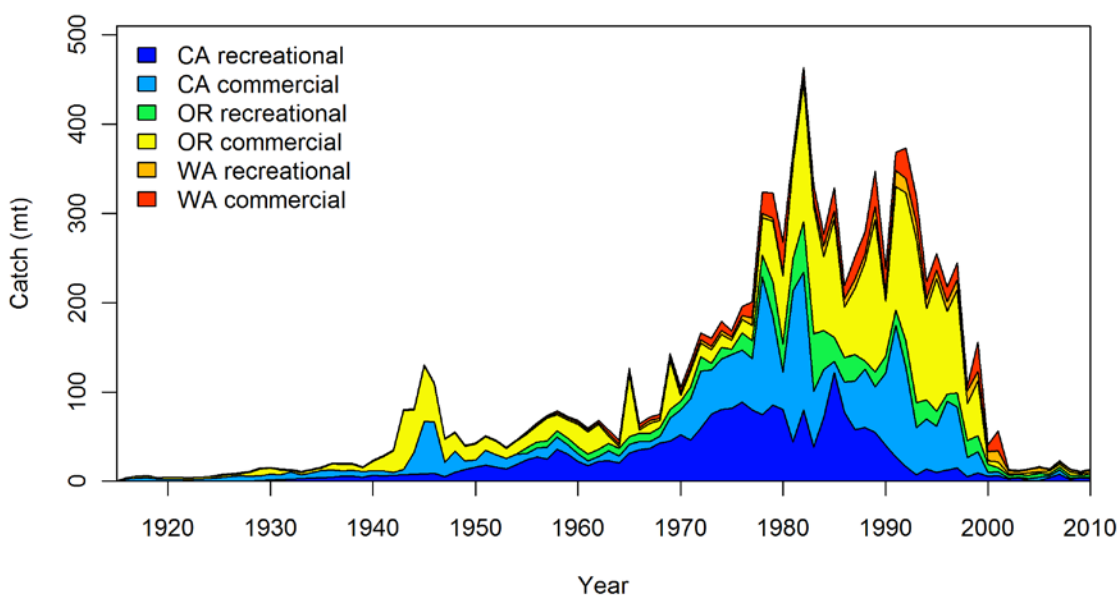

Figure a. Yelloweye rockfish estimated catch history, 1916-2010.

Table a. Recent yelloweye rockfish catches (mt) by fleet.

Year	California Recreational	California Commercial[1]	Oregon Recreational	Oregon Commercial[1]	Washington Recreational	Washington Commercial[1]
2001	6.37	4.35	4.83	6.23	12.50	21.84
2002	2.49	0.89	3.14	1.56	3.70	1.55
2003	3.74	0.70	3.02	0.92	2.60	0.98
2004	0.60	2.61	3.69	2.67	3.70	0.66
2005	0.90	3.43	4.30	1.69	5.20	0.74
2006	4.10	1.86	2.49	2.92	1.70	0.76
2007	8.00	4.81	2.85	3.28	2.49	1.61
2008	1.69	1.72	3.25	3.88	2.40	0.78
2009	3.84	0.61	2.05	1.61	1.63	1.15
2010	1.20	1.85	2.80	2.52	1.90	1.12

[1]Includes research catches.

Data and Assessment

This stock assessment used the newest version of Stock Synthesis available (3.21e, released 9 June 2011). The model data sources include catch, length- and age-frequency data from six state-specific recreational and commercial fishing fleets. Biological data are derived from both port and on-board observer sampling programs. Yelloweye catch in the IPHC long-line survey for Pacific halibut is also included via an index of relative abundance for Washington and for Oregon as well as length- and age-frequency data. Oregon recreational charter observer data for discarded yelloweye was used to construct a recent index of relative abundance (2004-2010) and included length-frequency observations. Relative biomass indices from the National Marine Fisheries Service (NMFS) Northwest Fisheries Science Center (NWFSC) bottom trawl survey and the Alaska Fisheries Science Center triennial trawl survey are included, along with biological data from the former.

Externally estimated model parameters, including those defining weight-length, maturity, and fecundity relationships, were kept at the values used in the previous assessment. The assessment explicitly accounts for the small degree of dimorphic growth as well as markedly different exploitation histories in waters off the three states. Due to sparse and poorly informative age- and length-frequency data, recruitment is modeled as a deterministic process. Key parameters including natural mortality, stock-recruitment steepness and all growth parameters are estimated.

Although the base case assessment model captures some uncertainty via asymptotic intervals, uncertainty from two sources is examined using alternate states of nature, which bracket the base case, with results reported in the decision table. The magnitude of the estimated-catch time-series was found to have a large influence on the perception of current 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 selected 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, were subjective, but reflect both the lack of a comprehensive catch reconstruction in Washington and the change in likelihood of the fit to data sources over a reasonable range of catch levels. For steepness the 12.5th and 87.5th percentiles were calculated from the likelihood profile as a proxy for the probability distribution about this point estimate. The most optimistic and pessimistic of the nine combinations from these two axes (weighted 6.25% each, relative to 25% for the best estimate on each dimension) are reported in this document. All nine combinations will be included in the rebuilding analysis, in order to more completely portray the uncertain impact of future harvest levels on stock status and rebuilding time.

Table b. Relative probabilities for combinations of the two alternate states of nature. Cells in bold denote those reported throughout this document.

		Historical catch		
		Low	Best estimate	High
Steepness	Low	**6.25%**	12.5%	6.25%
	Estimated value	12.5%	**<u>Base case</u>: 25%**	12.5%
	High	6.25%	12.5%	**6.25%**

Stock biomass

A fecundity relationship is used for yelloweye specifying that spawning output per unit weight increases with fish weight; therefore all reference to spawning output is in terms of eggs produced, instead of spawning biomass. Yelloweye rockfish are estimated to have been lightly exploited until the mid-1970's, when catches increased and a rapid decline in biomass and spawning output began. Spawning output is estimated to have reached a minimum in 2000, at 15.7% of unexploited levels (very similar to the 15.8% from the 2009 assessment). Yelloweye rockfish spawning output is estimated to have been gradually increasing since that time, in response to large reductions in harvest. Although the relative trend in spawning output is quite robust to uncertainty in the estimated removals, the absolute scale of the time series is very sensitive global shifts in removals. The estimated relative depletion level in 2009 is 20.2% (very similar to the estimate of 20.3% from the 2009 assessment) and 21.4% in 2011, corresponding to 219 million eggs. The range over states of nature indicates less uncertainty in level of depletion (18.9-24.0%) than in the absolute scale of the estimated spawning output: 146-371 million eggs in 2011. The portions of the total spawning output within each of the three states differs, with California and Oregon having very similar estimates of spawning output at unexploited equilibrium, with Washington considerably lower. Oregon is estimated to have the largest 2011 spawning output, followed by California, then Washington. Relative depletion also varies by state, with California estimated to be at 17.3% of unexploited conditions, Oregon, 23.9%, and Washington, 27.2%.

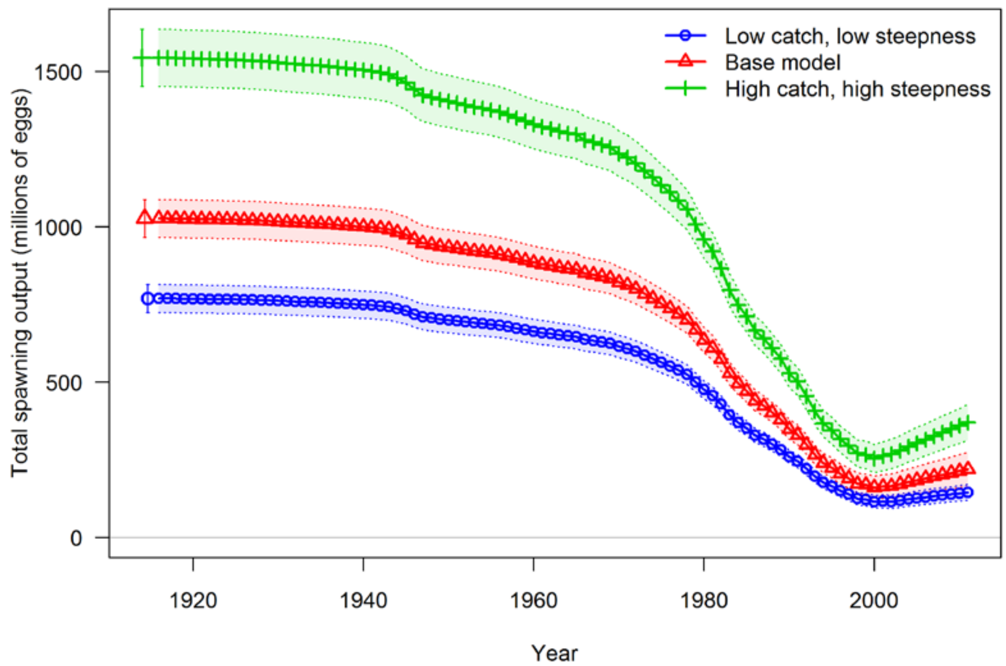

Figure b. Estimated total spawning output time-series (1916-2011, areas combined) for the base-case model with alternate states of nature. Shaded regions show 95% intervals.

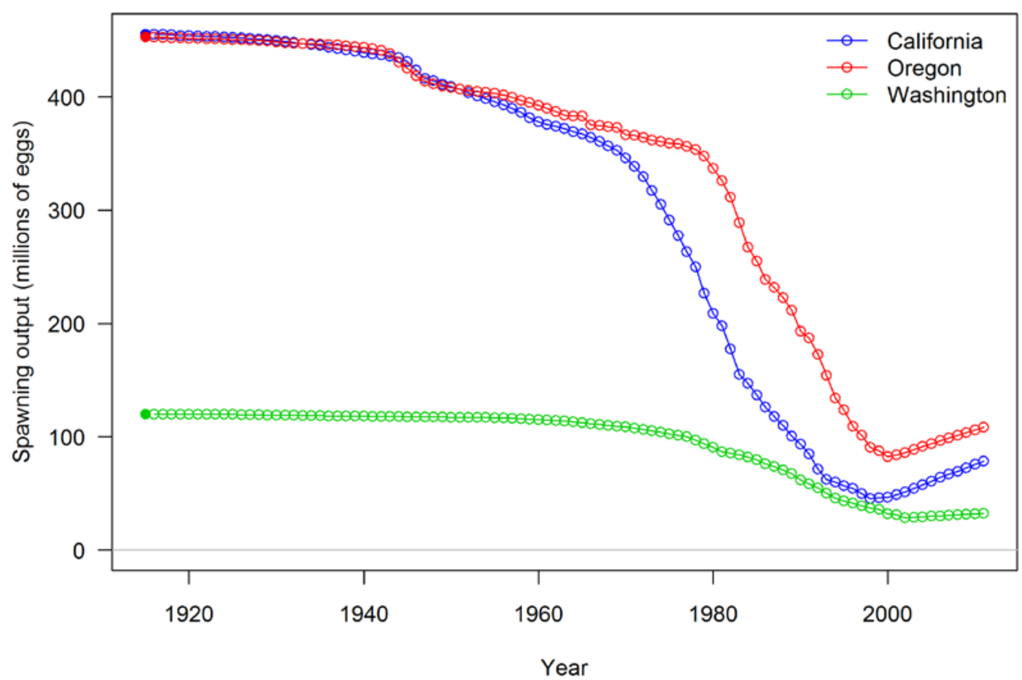

Figure c. Estimated spawning output time-series (1916-2011) by state for the base-case model.

Table c. Recent trend in estimated yelloweye rockfish spawning output, recruitment and relative depletion level.

Year	Spawning output (millions eggs)	Range of states of nature	Estimated recruitment (1000s)	Range of states of nature	Estimated depletion	Range of states of nature
2002	166	115-269	86	54-154	16.1%	15.0 - 17.4%
2003	172	119-280	89	56-158	16.7%	15.5 - 18.1%
2004	179	123-292	91	57-162	17.4%	16.0 - 18.9%
2005	185	127-303	93	59-166	18.0%	16.4 - 19.6%
2006	191	130-315	95	60-170	18.6%	16.9- 20.4%
2007	197	133-326	98	61-174	19.2%	17.3- 21.1%
2008	202	136-337	99	62-177	19.7%	17.7 - 21.8%
2009	208	139-348	101	63-181	20.2%	18.1 - 22.5%
2010	214	142-360	103	64-184	20.8%	18.5 - 23.3%
2011	219	146-371	105	65-187	21.4%	18.9 - 24.0%

Recruitment

Because year-class strength is modeled as a deterministic process in this assessment, the decline in estimated recruitment tracks closely that of the spawning output. The decline is especially pronounced given the low (and likely imprecise) estimate for steepness of the stock-recruit relationship in the base-case model (0.441), and alternate models (0.383, 0.508). However, the considerable uncertainty in absolute recruitment levels is illustrated by the broad range over the states of nature.

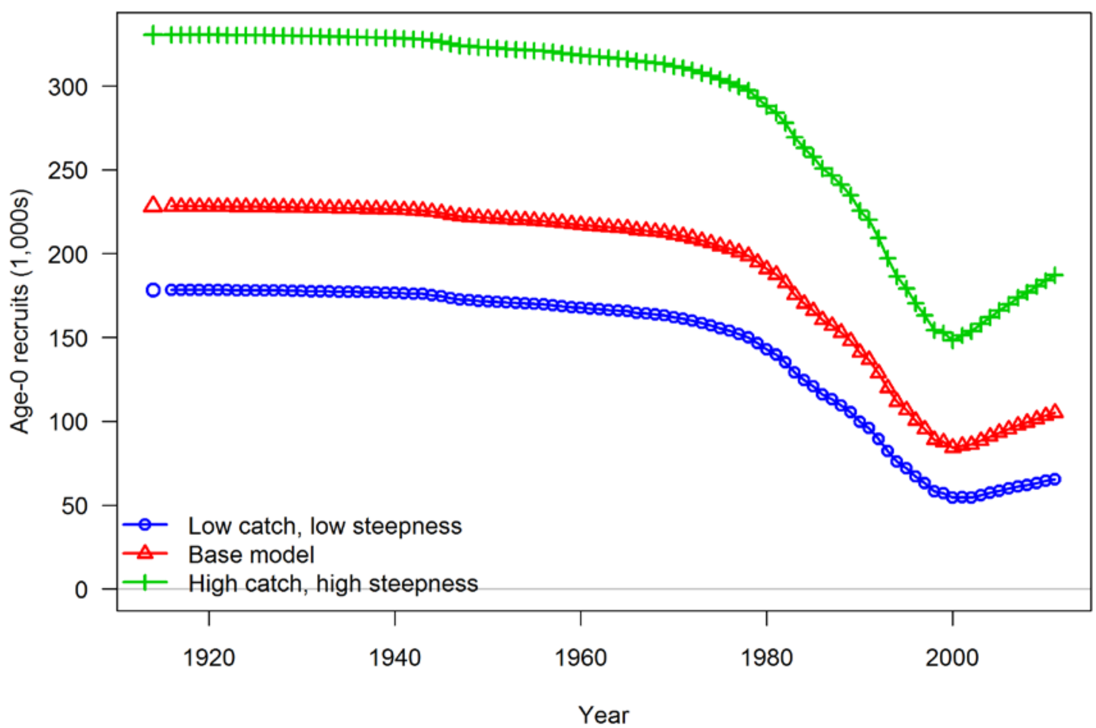

Figure d. Time series of estimated yelloweye rockfish recruitments for the base-case model and alternate states of nature.

Reference points

Unfished spawning output was estimated to be 1,028 million eggs (slightly higher than 994 million eggs estimated in the previous assessment). The target stock size ($SB_{40\%}$) is therefore 411 million eggs and the overfished threshold ($SB_{25\%}$) is 257 million eggs. Maximum sustainable yield (MSY), conditioned on current fishery selectivity and allocations, was estimated in the assessment model to occur at a spawning stock biomass of 392 million eggs and produce an MSY catch of 63 mt (slightly above the estimate from the 2009 assessment of 56 mt). However, the yield at MSY is extremely sensitive to the states of nature, resulting in a wide range for this value from 39 to 111 mt. Maximum sustainable yield is estimated to be achieved at an SPR of 57.7% (range of states of nature: 51.1-65.5%). This is nearly identical to the yield, 62 mt, generated by the SPR (59.0%) that stabilizes the stock at the $SB_{40\%}$ target. The fishing mortality target/overfishing level (SPR = 50.0%) results in a smaller equilibrium yield of 58 mt at a spawning output of 275 million eggs (26.7% of the unfished level).

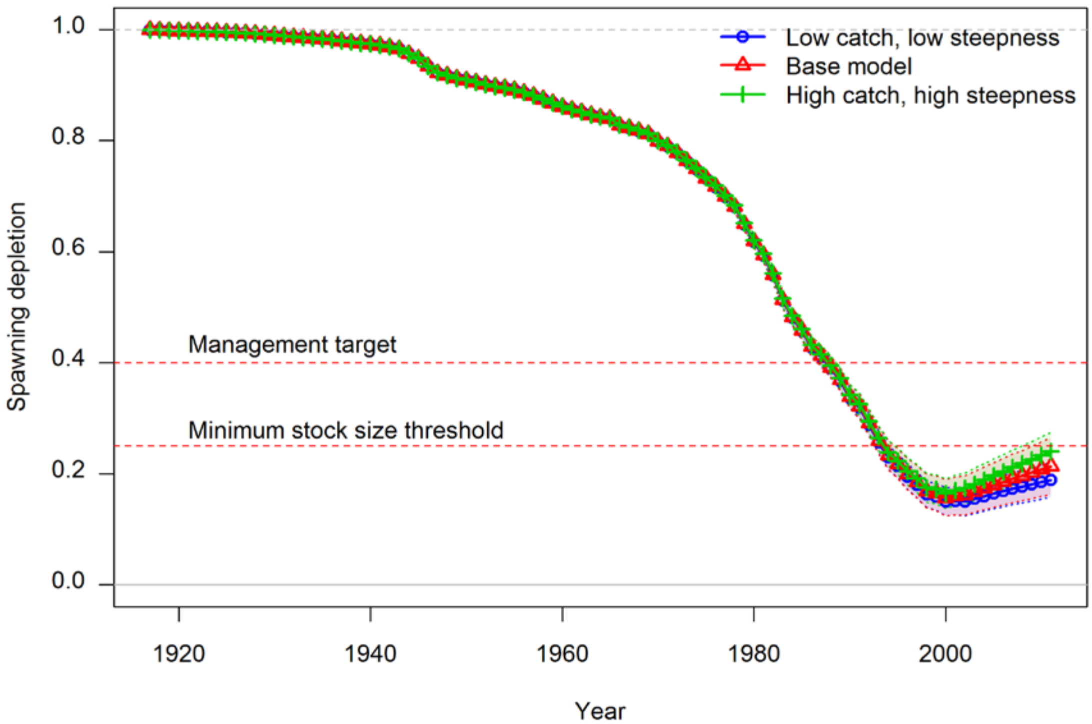

Figure e. Time series of relative spawning depletion as estimated in the base-case model and alternate states of nature. Light shading around each line shows 95% intervals.

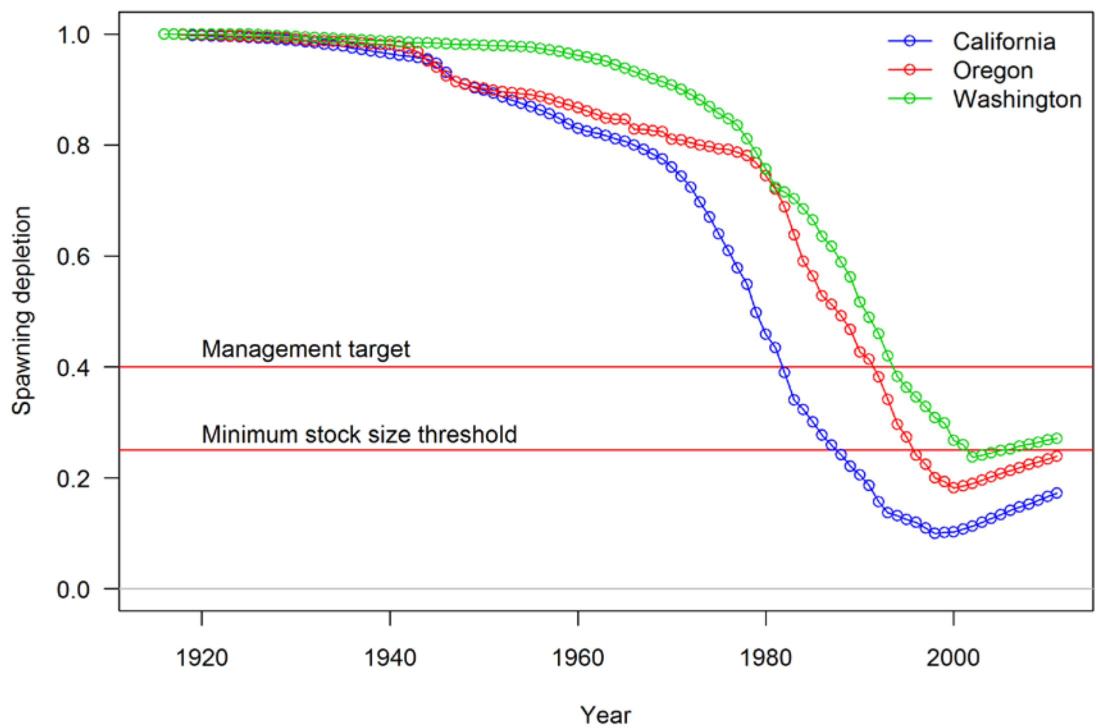

Figure f. Time series of relative spawning depletion by state for the base-case model.

Exploitation status

The coast-wide abundance of yelloweye rockfish is estimated to have dropped below the $SB_{40\%}$ management target in 1988 and the overfished threshold in 1994. In hindsight, the spawning output passed through the target and threshold levels with annual catch averaging almost five times the current estimate of the *MSY*. The coast-wide stock remains below the overfished threshold, although the spawning output is estimated to have been increased by 36% since 2000 (from 161 to 219 million eggs), in response to reductions in harvest. The degree of increase is largely insensitive to the magnitude of historical catch and only moderately sensitive to the value of steepness, but the absolute scale of the population reflects alternate removal series very closely. Fishing mortality rates are estimated to have been in excess of the current *F*-target for rockfish of $SPR_{50\%}$ from 1976 through 1999. Relative exploitation rates (catch/biomass of age-8 and older fish) are estimated to have peaked at 12.7% in 1992, but have been at or less than 1.1% after 2001. The alternate states of nature result in estimated exploitation rates ranging from less than 0.9% to less than 1.7% of the period 2002-2010.

Table d. Recent trend in spawning potential ratio (SPR) and relative exploitation rate (catch/biomass of age-8 and older fish).

Year	Estimated SPR (%)	Range of states of nature	Relative exploitation rate	Range of states of nature
2001	53.9%	44.7 - 65.2%	3.2%	2.0 - 4.5%
2002	78.7%	72.0 - 85.6%	0.7%	0.5 - 1.1%
2003	79.4%	72.6 - 86.3%	0.6%	0.4 - 0.9%
2004	78.6%	71.5 - 85.7%	0.7%	0.4 - 1.1%
2005	76.5%	69.0 - 84.2%	0.8%	0.5 - 1.2%
2006	77.5%	69.8 - 85.2%	0.7%	0.4 - 1.0%
2007	67.5%	58.3 - 77.7%	1.1%	0.7 - 1.7%
2008	79.9%	72.7 - 87.0%	0.7%	0.4 - 1.0%
2009	83.2%	76.6 - 89.3%	0.5%	0.3 - 0.8%
2010	83.5%	77.1 - 89.5%	0.5%	0.3 - 0.8%

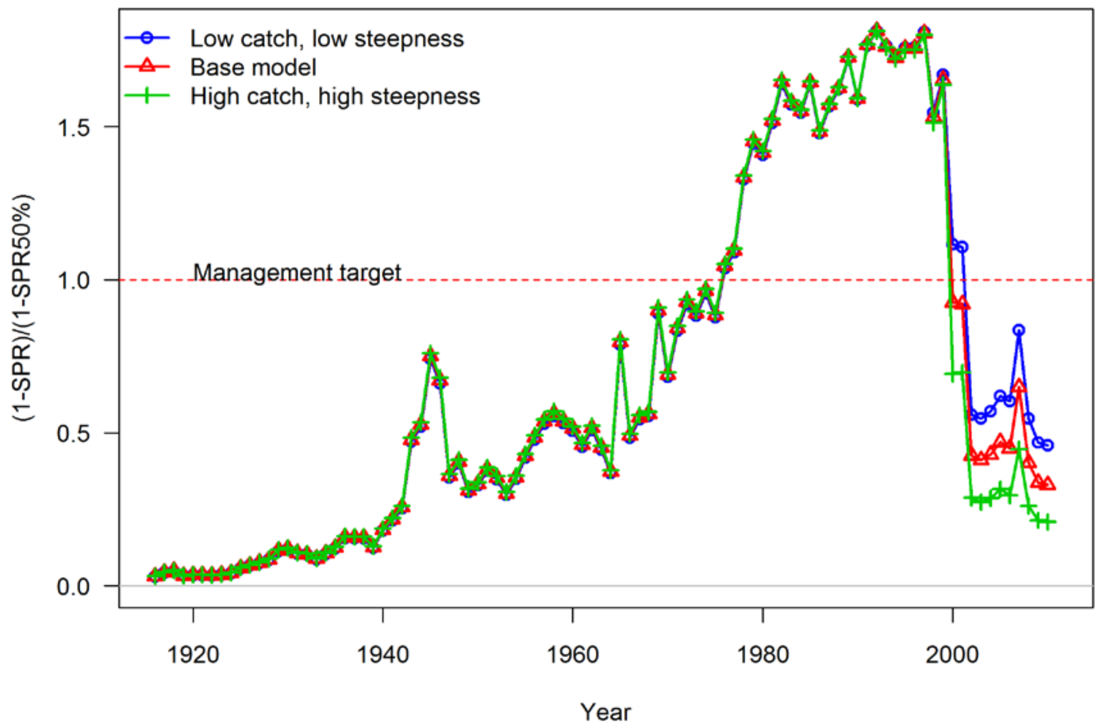

Figure g. Time series of relative spawning potential ratio (1-SPR/1-SPR$_{Target=0.5}$) for the base-case model and alternate states of nature. Values of relative SPR above 1.0 reflect harvests in excess of the current overfishing proxy.

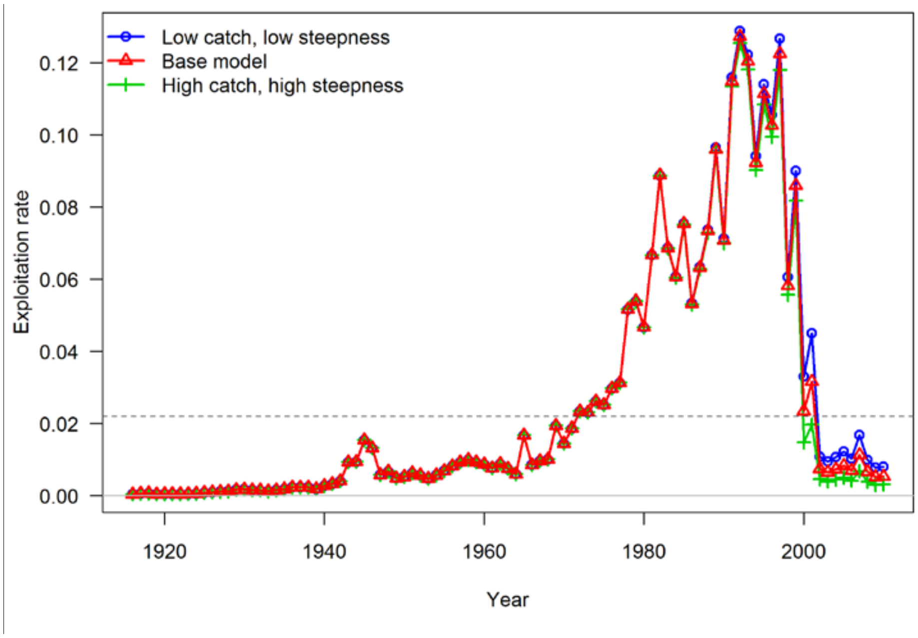

Figure h. Time series of estimated exploitation rate (catch/age 8 and older biomass) for the base-case model (circles) and alternate states of nature (light lines). Horizontal line indicates the overfishing limit/target ($F_{50\%}$) from the base case.

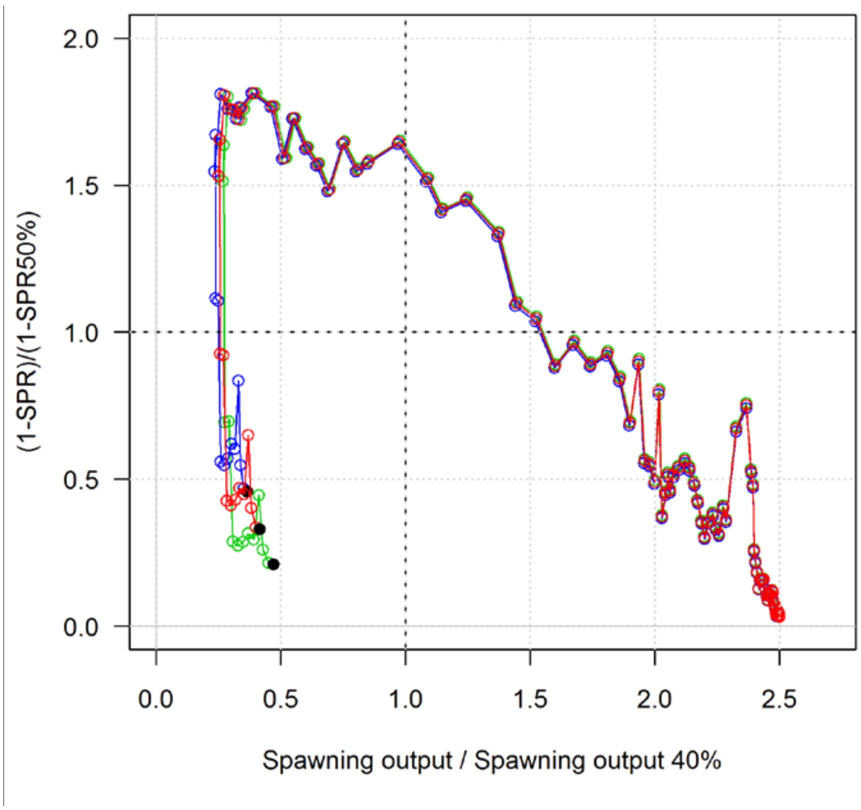

Figure i. Estimated relative spawning potential ratio relative to the proxy target/limit of 50% vs. estimated spawning output relative to the proxy 40% level from the base-case model. Higher spawning output occurs on the right side of the x-axis, higher exploitation rates occur on the upper side of the y-axis.

Management performance

Before 2000, yelloweye rockfish were managed as part of the *Sebastes* Complex, which included all *Sebastes* species without individual assessments, OFLs and ACLs (Previously termed ABCs and OYs but referred to under the current terms from here forward). In 2000, the *Sebastes* Complex was divided into three depth-based groups (for areas north and south of 40° 10' N. latitude), and yelloweye rockfish were managed as part of the minor shelf rockfish group until 2002. Since then, there has been species-specific management, and total catch has been below both the OFL and ACL for yelloweye each year. 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. Since 2002, the total 8-year catch (130 mt) has been only 70% of the sum of the ACLs for 2004-2010 and only 39% of the sum of the OFLs for that period. The total 2010 catch (11.4 mt) is estimated to be just 3% of the peak annual catch that occurred in the early 1980s.

Table e. Recent trend in yelloweye rockfish catch (mt) relative to management guidelines.

Year	OFL (mt)[1]	ACL (mt)[1]	Commercial Catch (mt)[2]	Recreational Catch (mt)	Total Catch (mt)
1999	39[3]	NA	117.8	38.1	155.8
2000	39[3]	NA	15.5	25.3	40.9
2001	29[4]	NA	32.5	23.7	56.1
2002	27[4]	13.5[4]	4.0	9.3	13.3
2003	52	22	2.6	9.4	12.0
2004	53	22	5.9	8.0	13.9
2005	54	26	5.9	10.4	16.3
2006	55	27	5.5	8.3	13.8
2007	47	23	9.7	13.3	23.0
2008	47	20	6.4	7.3	13.7
2009	31	17	3.4	7.5	10.9
2010	32	17[5]	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 and Vancouver INPFC areas only.
[4]Includes the Columbia, Vancouver and Eureka INPFC areas only.
[5]The 2010 ACL value of 17 mt is the NMFS preferred alternative.

Unresolved problems and major uncertainties

Data for yelloweye rockfish are sparse and relatively uninformative, especially regarding current trend. Historical catches are very uncertain, as yelloweye comprise a small percentage of overall rockfish removals and actual species-composition samples are infrequently available for historical analyses. Further, the relative contribution of recreational removals was very large, and there is high uncertainty in the exact magnitude of these removals. The management related quantities were found to be very sensitive to alternate catch time-series and this is presented as one of the primary axes of uncertainty.

The choice to model the yelloweye rockfish stock with explicit areas in the assessment model is based on the sedentary life-history of adult yelloweye, and the differences in population trends, as well as historical and current exploitation rates among the three states. The data do not clearly inform this choice, but it does have substantial ramifications for future projections and management decisions and should be considered a major uncertainty in the assessment.

Parameters that generally contribute significant uncertainty to stock assessments, including those defining steepness, natural mortality and growth are estimated, but may be poorly determined due to the short time-series of data, which are primarily available after the biggest period of removals from the stock. Steepness of the stock-recruitment relationship especially is often poorly estimated from a time series like that of yelloweye (a 'one-way trip'), but its value is very important in determining projected rebuilding. For this reason alternate values (from the likelihood profile) are included as a second axis of uncertainty in this assessment.

As in the 2009 assessment, process error in recruitment is not explicitly accounted for in this assessment. This choice was driven by several factors: the lack of substantial reduction in the estimates of uncertainty in recruitment deviations (when estimated) relative to the level of recruitment variability (σ_r), and the fact that, even when accounted for, recruitment variability did not represent the dominant axis of uncertainty with regard to current management quantities. Previous assessments have struggled with the lack of signal in recruitment deviations; the 2006 and 2007 models estimated deviations over only a short period of the time series (1968-1992).

Currently available fishery-independent indices of abundance are imprecise and not highly informative. It is unclear whether future stock recovery (or lack thereof) will be detectable without more precise survey methods applied over broad portions of the coast. Fishery data are also unlikely to produce conclusive information about the stock for the foreseeable future, due to lack of retention and active avoidance of yelloweye among all fleets. For these reasons, it is unlikely that the major uncertainties in this assessment will soon be resolved.

Forecasts

The forecast reported here will be replaced by the rebuilding analysis to be completed in September-October 2011. In the interim, the total catch in 2011 and 2012 is set equal to the NMFS preferred alternative ACL (17 mt), allocated between fleets according to the average catch over the years 2007-2009. The target exploitation rate for 2013 and beyond is based upon an SPR of 76%, which is the NMFS preferred alternative rate. This SPR-based forecast catch is allocated between fleets according to the average fishing mortality rate for the years 2007-2009 (which allows the forecast catch to respond to different trends in the biomass available to each fleet). Uncertainty in the rebuilding forecast will be included via integrating over all combinations of the alternate states of nature for catch history and steepness.

Current medium-term forecasts predict increases in coast-wide abundance under the SPR=76% rebuilding strategy, however these increases are largely driven by the California and Oregon portions of the stock. The estimated ACL values for 2013 and 2014 are only slightly larger (17.7, 18.0) than the 17.0 value set for 2011 and 2012 and less that that predicted from the 2009 rebuilding analysis (21.0, 20.5), which was based on a higher fishing mortality associated with a 71.9% SPR. Catch allocation in 2011-2012 among fleets (recreational, commercial) are as follows: for Washington (14%, 7%), Oregon (17%, 18%) and California (28%, 15%). Over the period 2013 to 2022, the where catch was based on average fishing mortality over the years 2007-2009, the greatest increase in allocation was for the California recreational fishery, which went from 28% to 31% of the total, while the greatest decrease was for Washington recreational, which decreased from 14% to 12%. These changes are due to differences in the rate of increase in forecast biomass for each state. The following table shows the projection of expected yelloweye rockfish catch, summary biomass, depletion and spawning output (by area). It would be desirable to evaluate specific alternative allocation scenarios if relative removals based on future management actions will be substantially different than recent values by state.

Table f. Projection of yelloweye rockfish under ACL values calculated from a 76% SPR rate. OFL values are calculated from a 50% SPR rate.

Year	OFL (mt) [1]	ACL (mt) [1]	Coast-wide Age 8+ biomass (mt)	Coast-wide Depletion	Spawning output (million eggs) Coast-wide	California	Oregon	Washington
2011	47.8	17.0	2,188	21.4%	219.5	78.7	108.3	32.6
2012	48.0	17.0	2,222	21.8%	224.4	81.2	110.3	32.9
2013	51.2	17.7	2,255	22.3%	229.1	83.7	112.3	33.2
2014	51.2	18.0	2,288	22.7%	233.5	86.0	114.1	33.4
2015	51.2	18.3	2,320	23.1%	237.8	88.3	115.9	33.6
2016	51.1	18.6	2,351	23.5%	241.9	90.4	117.6	33.8
2017	51.1	18.8	2,382	23.9%	245.8	92.5	119.3	34.0
2018	51.0	19.1	2,413	24.3%	249.6	94.5	120.9	34.2
2019	50.9	19.3	2,444	24.6%	253.3	96.5	122.4	34.4
2020	50.9	19.6	2,475	25.0%	256.9	98.5	124.0	34.5
2021	50.8	19.8	2,506	25.3%	260.5	100.4	125.5	34.6
2022	50.7	20.0	2,536	25.7%	264.0	102.2	127.0	34.8

[1]OFL and ACL values were called ABC and OY prior to 2010. These values for 2011 and 2012 have already been adopted, and are not based on the results of this assessment.

Decision table

Because yelloweye rockfish are currently managed under a rebuilding plan, this decision table is only intended to better evaluate the management implications of the considerable uncertainty in the base case assessment model. Various alternate management actions, including a range of SPR rates and fixed ACLs, will be compared in the rebuilding analysis. Landings in 2011-2012 are 17 mt and fleet allocation in all cases is as described above for the base case forecast.

Table g. Decision table of 12-year projections for alternate states of nature (columns) and management options (rows) beginning in 2013. Relative probabilities are based on the joint distribution of alternate historical catch levels and steepness values.

			State of nature					
			75% of annual base-case catches before 2000 and steepness = 0.383		Base case 100% of catches before 2000 and steepness = 0.441		150% of annual base-case catches before 2000 and steepness = 0.508	
Relative probability			0.0625		0.25		0.0625	
Management decision	Year	Catch (mt)	Depletion	Spawning output (millions eggs)	Depletion	Spawning output (millions eggs)	Depletion	Spawning output (millions eggs)
Forecast catch calculated from 76% SPR applied to low alternative model.	2013	11.7	19.5%	150	22.3%	229	25.3%	391
	2014	11.9	19.8%	153	22.8%	234	26.0%	402
	2015	12.0	20.1%	155	23.3%	239	26.6%	412
	2016	12.2	20.4%	157	23.7%	244	27.3%	422
	2017	12.3	20.7%	160	24.2%	248	27.9%	432
	2018	12.4	21.0%	162	24.6%	253	28.6%	441
	2019	12.6	21.3%	164	25.0%	257	29.2%	451
	2020	12.7	21.5%	166	25.5%	262	29.8%	460
	2021	12.8	21.8%	167	25.9%	266	30.4%	470
	2022	12.9	22.0%	169	26.3%	270	31.0%	479
Forecast catch calculated from 76% SPR applied to base-case model.	2013	17.7	19.5%	150	22.3%	229	25.3%	391
	2014	18.0	19.7%	152	22.7%	234	26.0%	401
	2015	18.3	20.0%	154	23.1%	238	26.6%	410
	2016	18.6	20.2%	155	23.5%	242	27.2%	420
	2017	18.8	20.4%	157	23.9%	246	27.8%	429
	2018	19.1	20.6%	158	24.3%	250	28.3%	438
	2019	19.3	20.7%	160	24.6%	253	28.9%	447
	2020	19.6	20.9%	161	25.0%	257	29.5%	456
	2021	19.8	21.0%	162	25.3%	260	30.1%	464
	2022	20.0	21.2%	163	25.7%	264	30.6%	473
Forecast catch calculated from 76% SPR applied to high alternative model.	2013	30.2	19.5%	150	22.3%	229	25.3%	391
	2014	30.7	19.6%	151	22.6%	232	25.9%	400
	2015	31.3	19.6%	151	22.9%	235	26.4%	408
	2016	31.8	19.7%	151	23.1%	238	26.9%	416
	2017	32.3	19.7%	151	23.4%	240	27.4%	423
	2018	32.8	19.7%	151	23.6%	243	27.9%	431
	2019	33.3	19.6%	151	23.8%	245	28.4%	438
	2020	33.8	19.6%	151	24.0%	247	28.8%	446
	2021	34.3	19.5%	150	24.2%	249	29.3%	453
	2022	34.7	19.5%	150	24.4%	251	29.8%	460

Research and data needs

The available data for yelloweye rockfish are very sparse and generally weakly informative about current status. The following research topics were suggested in the 2009 assessment and are repeated here with minor modifications and additions. Progress on these points could improve the ability of this assessment to reliably model the yelloweye rockfish population dynamics in the future and provide better monitoring of progress toward rebuilding:

1. Develop and implement a comprehensive visual survey.
2. Do a scientific review of current efforts to develop and improve stock size indices for yelloweye based on IPHC (including additional stations) and make recommendations on the best approaches to develop such indices.
3. Explore a recalculation of GLMM estimates in the IPHC survey that explores station effects which allows inclusion of stations that differ over time.
4. Investigate the development of a WA recreational yelloweye CPUE based on the recreational halibut fishery. Consider a full time series and one ending in 2002, since the yelloweye RCA in waters off northern WA was implemented in 2003.
5. Encourage the collection of samples to refine the estimate biological parameters, particularly maturity and fecundity.
6. Continue to evaluate the spatial aspects of the assessments, including growth, the number and placement of boundaries between areas, as well as the northern boundary with Canada.
7. Investigate alternative ways of re-weighting. This issue is relevant for all west coast stock assessments.
8. Investigate how best to account for the variability in dates in trawl surveys through a meta-analysis. This issue is relevant for all west coast stock assessments.
9. Conduct a historical catch reconstruction for WA to match those produced for OR and CA. This issue is relevant for all west coast stock assessments.
10. Access and processing of recreational data (catch and biological sampling) currently entails differing locations and formats for data from each of the three states and RecFIN. RecFIN is difficult to use and estimates from it don’t match the total mortality estimates also provided by the state agencies. A single database that holds all raw recreational data in a consistent format would reduce assessment time spent on processing these data and potential introduction of errors or alternate interpretations due to processing.
11. The IPHC data organization should be revisited. Currently biological samples cannot be linked to the station from which they were collected. Age data for 2003-2005 is disconnected from length and sex information and other unknown issues may persist in these data. A thorough evaluation of what data are reliable and a final determination of what information is lost, or can potentially be recovered, is needed.
12. Instigate discard sampling of yelloweye bycatch in the directed Pacific halibut fishery.
13. Different trends in CPUE of yelloweye in the CA recreational fishery have been identified. CPUE by port from 1980 to 2000 should be analyzed using clustering methods to identify regions with a similar demographic trajectory. This could lead to improvements in management of the stock as well as possibly inform refinements of the spatial structure of future assessment models.

Rebuilding projections

The rebuilding projections will be presented in a separate document after the assessment has been reviewed by the SSC in June 2011.

Table h. Summary of recent trends in estimated yelloweye rockfish exploitation and stock levels from the base-case model; all values reported at the beginning of the year.

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Commercial catch (mt)[1]	4.0	2.6	5.9	5.9	5.5	9.7	6.4	3.4	5.0	NA
Total catch (mt)	13.33	11.96	13.93	16.26	13.83	23.04	13.72	10.89	11.39	NA
OFL(mt)	273	52	53	54	55	47	47	31	31	32
ACL	13.53	22	22	26	27	23	20	17	17	17
SPR	78.7%	79.4%	78.6%	76.5%	77.5%	67.5%	79.9%	83.2%	83.5%	NA
Exploitation rate (catch/age 8+ biomass)	0.7%	0.6%	0.7%	0.8%	0.7%	1.1%	0.7%	0.5%	0.5%	NA
Age 8+ biomass (mt)	1789	1844	1898	1948	1991	2035	2067	2107	2148	2188
Spawning output (millions eggs)	166	172	179	185	191	197	202	208	214	219
(Range of states of nature)	115-269	119-280	123-292	127-303	130-315	133-326	136-337	139-348	142-360	146-371
Recruitment (1000s)	86.1	88.5	90.9	93.2	95.4	97.6	99.4	101.3	103.3	105.2
(Range of states of nature)	54-154	56-158	57-162	59-166	60-170	61-174	62-177	63-181	64-184	65-187
Depletion	16.1%	16.7%	17.4%	18.0%	18.6%	19.2%	19.7%	20.2%	20.8%	21.4%
(Range of states of nature)	15.0 - 17.4%	15.5 - 18.1%	16.0 - 18.9%	16.4 - 19.6%	16.9-20.4%	17.3-21.1%	17.7 - 21.8%	18.1 - 22.5%	18.5 - 23.3%	18.9 - 24.0%

[1]Includes research catches.
[2]Includes the Columbia and Vancouver INPFC areas only.
[3]Includes the Columbia, Vancouver and Eureka INPFC areas only.

Table i. Summary of yelloweye rockfish reference points from the base-case model.

Quantity	Estimate	Range of states of nature
Unfished spawning output (SB_0, millions eggs)	1,028	770-1,545
Unfished 8+ biomass (mt)	8,882	6,700-13,274
Unfished recruitment (R_0, thousands)	228	178-331
Reference points based on $SB_{40\%}$		
MSY Proxy Spawning output ($SB_{40\%}$, millions eggs)	411	308-618
Relative spawning depletion at $SB_{40\%}$	40.0%	40.0%
SPR resulting in $SB_{40\%}$ ($SPR_{SB40\%}$)	59.0%	54.5-64.1%
Exploitation rate resulting in $SB_{40\%}$	1.60%	1.36-1.87%
Yield with $SPR_{SB40\%}$ at $SB_{40\%}$ (mt)	62	39-110
Reference points based on SPR proxy for MSY		
Spawning output at $SPR_{MSY\text{-}proxy}$ (SB_{SPR}, millions eggs)	275	125-526
Relative spawning depletion at SB_{SPR}	26.70%	16.2-34.0%
$SPR_{MSY\text{-}proxy}$	50.0%	50.0%
Exploitation rate corresponding to SPR	2.20%	2.18-2.23%
Yield with $SPR_{MSY\text{-}proxy}$ at SB_{SPR} (mt)	58	27-111
Reference points based on estimated MSY values		
Spawning output at *MSY* (SB_{MSY}, millions eggs)	392	312-549
Relative spawning depletion at SB_{MSY}	38.10%	35.5-40.5%
SPR_{MSY}	57.70%	51.5-64.4%
Exploitation Rate corresponding to SPR_{MSY}	1.70%	1.34-2.09%
MSY (mt)	63	39-111

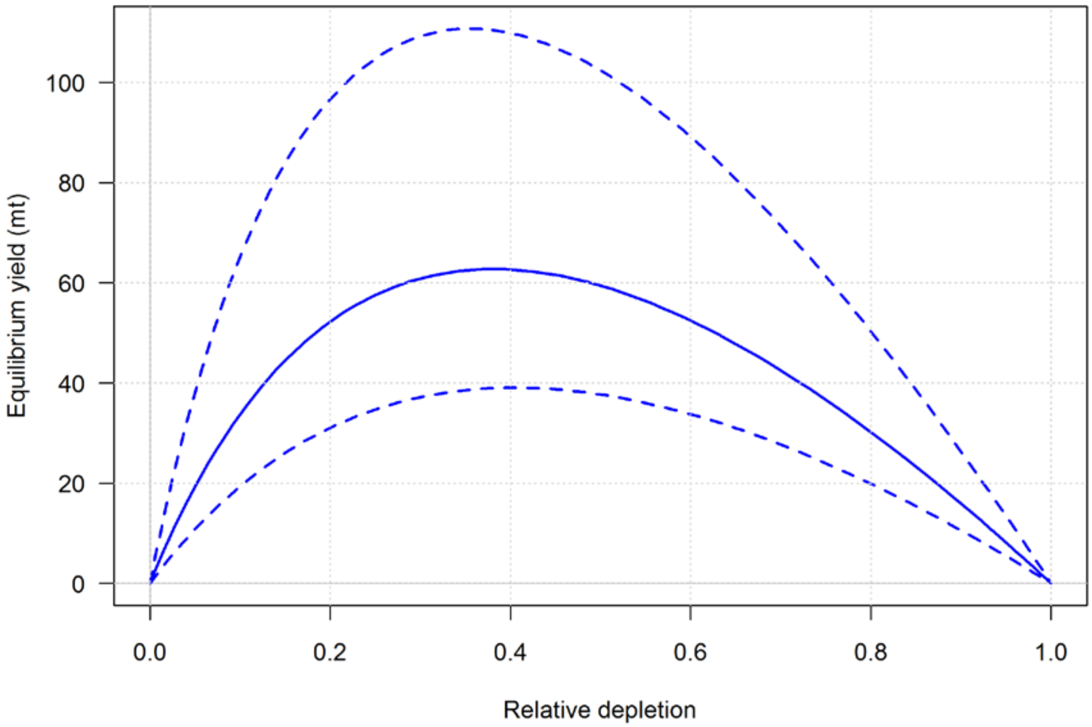

Figure j. Equilibrium yield curve for the base-case model (solid line) and alternate states of nature (dashed lines), reflecting the higher and lower values for historical catch prior to 2000 and for steepness.

1. Introduction

This updated assessment does not attempt to reiterate all background information for yelloweye rockfish presented in the 2009 assessment document. Instead, only a few key assumptions are restated, along with a detailed description of changes made during the course of the update. Those interested in a more complete description of yelloweye rockfish life-history and the details of previous assessments should refer to the 2009 assessment (Stewart et al. 2009).

1.1 Distribution and Stock Structure

Yelloweye rockfish (*Sebastes ruberrimus*) are distributed in the northeastern Pacific Ocean from the western Gulf of Alaska to northern Baja California (Hart 1973, Eschmeyer and Herald 1983, Love et al. 2002). The species is most abundant from southeast Alaska to central California (Love et al. 2002), with adults found along the continental shelf generally shallower than 400 m. Although smaller yelloweye tend to occur in shallower water, they do not show as pronounced an ontogenetic shift as do many eastern pacific rockfish species. Yelloweye are strongly associated with rocky bottom types, especially areas of high-relief such as caves and large boulders (Love et al. 2002). Mainly solitary, it is widely believed that yelloweye are very sedentary after settlement, with adults moving only short distances during their entire lifetime.

There is relatively little direct information regarding the stock structure of yelloweye rockfish off the U.S. and Canadian coasts. The pelagic larval phase exhibited by all rockfish promotes some mixing of reproductive output, dependent on ocean currents, the duration of the pelagic phase and the timing of annual spawning in relation to annually variable spring transition and upwelling events. However, the sedentary nature of yelloweye rockfish makes adult movement among major rocky habitat areas unlikely. An unpublished genetics study (Yamanaka et al. 2001) of yelloweye rockfish collected from northern Vancouver, B.C. and SE Alaskan waters found little variability among samples and suggested a panmictic stock in the study area. Preliminary results from an analysis of yelloweye collected off Oregon, Washington, Vancouver Island B.C., and the Strait of Georgia B.C. (Lynne Yamanaka, DFO, personal communication, cited in Wallace et al. 2006) suggest that there may be genetic separation between the Strait of Georgia (inside Vancouver Island) and the outer coast (Yamanaka et al. 2006). The yelloweye population residing in the waters of Puget Sound is also thought to be isolated from coastal waters. This Puget Sound stock was proposed for listing under the Endangered Species Act (Federal Register Vol. 73, No. 52, Monday, March 17, 2008, p. 14195-14200) with the result that the stock was considered distinct and proposed to have threatened status (Federal Register / Vol. 74, No. 77, Thursday, April 23, 2009, p. 18516-18542).

A study of otolith isotope levels (Gao et al. 2010) examined ratios of C^{13}/C^{12} and O^{18}/O^{16} in 200 yelloweye rockfish otoliths from the Washington and Oregon coasts. The centroids from these otoliths showed no consistent differences, and suggest there might be a single spawning stock for this portion of the yelloweye rockfish population. Isotopic differences between otolith nuclei and the fifth annual zones may reflect changes in diet from age-1 to age-5. The fifth annual otolith zones differed between Washington and

Oregon samples suggesting that the diet compositions of the two areas are slightly different, an unlikely result if appreciable numbers of age 5+ fish were moving between areas.

1.2 Life History and Ecosystem Interactions

Yelloweye rockfish spawn in late winter through the summer and possibly into the fall in SE Alaska (Love et al. 2002). Little is known about the pelagic juvenile phase, but recruiting juveniles settle in both shallow and deeper depths, often observed in the same areas as adults. These young juveniles are very conspicuous, and easy to identify, due to having markedly different coloration than adults.

Adult yelloweye rockfish are large-bodied, reaching lengths up to 91 cm (Eschmeyer and Herald 1983, Love et al. 2002). They are long-lived (the oldest observed age is 147 years, from Washington in 2005), late-maturing and slow growing. These life-history characteristics would suggest that yelloweye are relatively unproductive and very sensitive to exploitation. This is compounded by their status as an aggressive top-predator on rocky reefs, making hook-and-line gear highly effective, even gear designed for much larger species such as halibut and lingcod. Adult yelloweye are piscivorous predators eating most small pelagic and groundfish species as available.

The cohabitation of adult and juvenile yelloweye likely results in some cannibalism, and large changes in predator biomass (such as the rebuilding of lingcod, *Ophiodon elongatus*, in recent years) could have a strong feedback to juvenile survival and therefore stock productivity. Many rockfishes have shown decadal changes in productivity linked to ocean conditions, and it would not be surprising if yelloweye exhibited similar trends, although this is uncertain. There is evidence that changes in otolith ring width (and likely growth) are correlated with some of the leading environmental indicators of ocean conditions along the west coast (Black et al. 2008). It is very uncertain how future climate change will influence west coast yelloweye growth, productivity or distribution.

1.3 Historical and Current Fishery

Yelloweye rockfish have historically been a prized catch for both commercial and recreational fleets. They have generally yielded a higher price than other rockfish and have therefore largely been retained when encountered, except in recent years when all retention has been prohibited. Throughout the exploitation history, yelloweye were targeted primarily with line-gear due to their affinity for rocky, and largely untrawlable, habitat.

Rockfish catches are recorded back to the beginning of the 20th century, primarily in California, but appreciable quantities were not landed until an early peak around World War II (Ralston et al. 2010). A small fraction of these early catches were yelloweye rockfish. Total removals gradually increased until around 1970 and then increased very rapidly with increases in effort, advances in fishing technology, and the evolution of markets (Table 1, Figure 1). The late-1970s to the late-1990s saw the highest yelloweye catches of the time-series. Since 2002, when yelloweye were declared overfished, total catches have been maintained at much lower levels. Yelloweye are currently caught only incidentally in commercial hook-and-line and sport fisheries targeting other species that are found in association with yelloweye.

1.4 Management History and Performance

The management history is described in detail in the 2009 assessment (Stewart et al. 2009). Following the yelloweye assessment in 2001 (Oregon and California) which found the stock to be depleted and resulted in an overfished determination in 2002, an individual OY for the stock was established, at a small fraction of prior catches. In November 2001, the Council adopted a total annual catch limit (ACL) of 13.5 metric tons (mt) for yelloweye for all 2002 commercial, recreational, and tribal fisheries combined for Northern California (Eureka INPFC area), Oregon, and Washington. This was an interim level that allowed for fisheries to take place and potentially catch yelloweye along with other fish, but did not allow prosecution of fisheries that directly targeted yelloweye. Based on the 2002 assessment results (Methot et al. 2002), the Council adopted an ACL of 22 mt for 2003. Since 2002, total catch has been below both the annual OFL and ACLs, which were based on rebuilding analyses which indicated that very long time-periods would be required to rebuild the stock to target levels (Table 1). These catch levels represent a 95% reduction from average catches observed in the 1980s and 1990s. Since 2002, the total 8-year cumulative catch (130 mt) has been only 69% of the sum of the ACLs for 2002-2010 and only 39% of the sum of the OFLs for that period. The total 2010 catch (11.4 mt) is estimated to be just 3% of the peak annual catch that occurred in the early 1980s (Table 2).

1.5 Fisheries in Canada and Alaska

The background provided in the 2009 assessment on Canadian and Alaskan fisheries for yelloweye rockfish has not been updated for this assessment.

2. Assessment

The following sources of data were used in building this assessment:

1) Fishery independent data: including relative abundance indices, length and age data from the International Pacific Halibut Commission’s (IPHC) longline survey 1999-2010, and the NWFSC and Triennial bottom trawl surveys 2003-20010 (NWFSC survey) and 1980-2004 (Triennial survey).
2) Estimates of fecundity, maturity, length-weight relationships and ageing error from various sources.
3) Informative priors on natural mortality and stock recruit steepness derived from other fish and yelloweye stocks.
4) Commercial (targeted and bycatch) and recreational catch estimates from 1916-2010.
5) Commercial and recreational fishery biological data (age and length) from 1968-2010.
6) Fishery dependent catch-per-unit-effort series from recreational and charter observer programs from all three states.

Data availability by source and year is presented in Table 3. A description of each of the specific data sources is presented below.

2.1 Fishery-Independent Data

2.1.1 International Pacific Halibut Commission Survey

The International Pacific Halibut Commission (IPHC) has conducted an annual longline survey for Pacific halibut off the coast of Oregon and Washington (IPHC area "2C") since 1997 (no surveys were performed in 1998 or 2000). Beginning in 1999, this has been a fixed station design, with roughly 1,800 hooks deployed at 84 locations each year station locations differed in 1997 and are therefore not comparable with subsequent surveys. Rockfish bycatch, mainly yelloweye, has been recorded during this survey, although values for 1999 and 2001 are estimates based on subsampling the first 20 hooks of each 100-hook skate. The gear used to conduct this survey, while designed to efficiently sample Pacific halibut, is similar to that used in some earlier line fisheries that targeted yelloweye, and should be capable of sampling at least the adult population. Some variability in exact sampling location is practically unavoidable, and leeway is given in the IPHC methods to center the set on the target coordinates but to allow wind and currents to dictate the actual direction in which the gear is deployed. This can result in different habitats accessed at each fixed location among years.

Yelloweye catch has historically occurred at very few of the 84 stations in the design (Table 4). There are 27 stations in Washington waters, but yelloweye have been captured at only a small subset of these, with 476 fish being observed from 1999-2010. Similarly, in Oregon yelloweye are only observed at a small portion of the total station (57 total stations), with 1479 fish being observed from 1999-2010.

The IPHC longline survey catch data were standardized using a Generalized Linear Model (GLM) with binomial error structure. Catch-per-hook was modeled, rather than catch per station due to the variability in the number of hooks deployed each year. The binomial error structure was logical, given the binary nature of capturing a yelloweye rockfish on each longline hook or not. See the 2009 document (Stewart et. al 2009) for a more detailed description of survey design and methods. The re-analysis of the full time series with two years of additional data made little difference in the estimates for the years available at the time of the previous assessment.

As in 2009, the individual indices for Oregon and Washington are highly variable, with some mixed signals, but very little overall trend. The index trends were somewhat downward from 1999 through 2006, but have shown some increases since then. Given the small sample sizes in the surveys, substantial variability and uncertainty is to be expected. Nevertheless, this survey may be the best index of relative abundance available, as it is based upon sampling the adult yelloweye rockfish population in habitats where it is most abundant.

Biological samples were collected from yelloweye during the course of the IPHC survey. Length and sex information was recorded at sea, and age structures were retained for later ageing by Washington Department of Fish and Wildlife (WDFW) staff.

Length frequency distributions indicate that the IPHC survey caught very few fish smaller than 40 cm, consistent with the use of large hooks intended for halibut, the target species.

Age-frequency data from recent (2006-2010) IPHC surveys were compiled as conditional age-at-length distributions by state, sex and year. This treatment of age data from the survey is consistent with the previous full assessment in 2009. Age distributions included 64 bins from age 2 to age 65, with the last bin also including all fish of greater age. The choice of these bins reflects the lack of any source for fish younger than age 2, and the need to reduce the computational time by limiting the total number of age bins for each entry. Most data series in the assessment model included very few fish greater than 65 years old; however they were most common in the IPHC survey.

Nearly all fish sampled for length were also aged (Table 5). To aid in inspecting the full conditional age-at-length distributions, they are displayed graphically for each data set in this assessment via the entire matrix of age distribution-at-length. The IPHC age data show many fish older than 65 years in both states, with somewhat more older and larger fish present in Washington than in Oregon.

In aggregate, these age data appear relatively sparse, provide only a short time-series, show no coherent cohort structure and are unlikely to provide much more than estimates of the growth parameters and the diffuse information that there are more old fish remaining in Washington than in Oregon.

2.1.2 Triennial Bottom Trawl Survey

The triennial shelf trawl survey conducted by NMFS starting in 1977 (Dark and Wilkins 1994). The 2009 assessment contains a thorough description of the survey and methods for analyzing the data for use in the yelloweye assessment, which were used for Washington waters only. The data for this area are unchanged from those used in the 2009. As in 2009, the 1977 sample was excluded, and the remaining years were broken into two pieces (1980- 1992 and 1995-2004), due to differences in survey timing (Stewart et al. 2009).

As in 2007 and 2009, an index of abundance based on a Generalized Linear Mixed Model (GLMM), including vessel-specific differences in catchability (via inclusion of random effects), was calculated for the survey time series. The GLMM approach explicitly models both the zero catches as well as allows for skewness in the distribution of catch rates through the use of a Gamma or lognormal error structure. This update's GLMM index was generated using the same basic method, but reprogrammed by John Wallace using an R package which calls OpenBUGS (http://www.openbugs.info/) from the statistical language R. The changes in index values associated with this software update were minimal.

The updated index values were very similar to those used in the 2009 assessment, showing a relatively flat trend over both the early and late portions of the survey (Figure 2). Survey length-frequency distributions from the triennial survey are unchanged from those used in 2009.

2.1.3 NWFSC Bottom Trawl Survey

The NWFSC shelf and slope trawl survey time series has been extended through 2010. Three sources of information are produced by this survey: an index of relative abundance, length-frequency distributions, and age-frequency distributions. See the 2009 document (Stewart et. al 2009) for a more detailed description of survey design and methods.

The biomass index was analyzed using the updated GLMM software described above for the triennial survey. Following the 2009 assessment, this index was only computed for tows in Washington, which was a choice based on insufficient samples in Oregon and California. The data was insufficient to estimate vessel-specific differences in catchability, so the random effects were not included in this analysis. As in the previous assessment, the resulting index shows a relatively flat trend with the exception of a very large value for 2003, a function of the single very large catch in that year. The additional years (2009 and 2010), and small increases in the index values for 2009 and 2010 relative to 2008, with the estimate 2009 the greatest uncertainty of all points in the timeseries, due to having only 1 tow with yelloweye present, but catching 7 yelloweye in that tow, which is above average for this survey.

The length-frequency distributions for the NWFSC survey from 2003-2010 were constructed using the same size bins as other data sources. These observations are based on very few fish, between 7 and 35 per year. Most notably, the NWFSC length-frequency data show a very truncated size range; almost no fish larger than 60 cm were observed in any year of the survey. Fish less than 20 cm in length are rare, perhaps slightly more so than in the triennial survey. As is the case for the yelloweye length- and age-compositions from other fishery independent sources, neither clear trends, nor visible signs of cohorts appear in the biological data. Age structures were collected for nearly all yelloweye encountered by the NWFSC survey, but have not yet been read and are therefore unavailable for this assessment.

2.1.4 Visual Surveys

Yelloweye are a conspicuous member of the *Sebastes* genus, relatively easily identified during underwater visual surveys conducted by scuba-divers, manned or unmanned underwater vehicles. Density estimates for yelloweye rockfish have provided the basis for recent summaries of yelloweye rockfish population trends and abundance in both southeast Alaska and British Columbia waters (Yamanaka et al. 2006, Brylinsky et al. 2007, Brylinsky et al. 2008). An extensive effort was made specifically for this assessment to summarize existing density estimates from published and unpublished visual studies (W. Wakefield and J. Clemens, NWFSC, personal communication). These estimates, although not strictly comparable among all studies (in many cases the survey locations were non-random, or even selected based on predicted abundance of yelloweye and other species of interest), generally show lower—though variable—yelloweye density off the U.S. west coast compared to British Columbia or southeast Alaska (Stewart et al. 2009). Clear trends over time are not evident, but the observation that at least some locations in California may harbor relatively high densities suggests it is not outside the core range of the species.

2.1.5 Research Removals

Research catches have historically represented only a tiny fraction of the total removals from the yelloweye rockfish population. However, as total mortality has been substantially reduced in recent years, the relative contribution of research removals to the total has increased. This was particularly true in 2007, when research catches totaled 1.7 mt, or 8% of the total estimated removals from the stock. Research catches are included in estimates of total commercial catch, ensuring that all known sources of current mortality are accounted for in recent years.

2.2 Biological Data

A number of biological parameters were kept at the values used in the 2009 assessment, which were the result of estimates outside of the assessment model. These included the weight-length relationship, the maturity-at-length relationship, and the fecundity-at-weight relationship (Table 13). Values for these relationships are treated as fixed and therefore uncertainty reported for the stock assessment results does not include any uncertainty associated with these quantities. The ageing imprecision and bias estimates used for this update are also the same as those used in 2009. That document provides a description of the data and methods upon which they are based.

A sex-specific natural mortality rate was estimated in this update by applying the identical prior type, mean, and standard deviation to that used in 2009 (Figure 5).

2.3 Fishery-Dependent Data

2.3.1 Historical Commercial Catches

The historical commercial catch reconstruction used for this assessment represents an amalgamation of newly available data (unused in previous assessments), and portions of the reconstruction created for the 2009 (and earlier) assessment retained as the best estimates where no additional improvements could be made. The results of this effort, by modeled fishing fleet, are provided in Table 1 and Figure 1. The sources and methods used are summarized by state below.

As in the 2009 assessment, commercial landings in California for the period 1916-1968 relied on estimates from the recent reconstruction efforts by SWFSC and California DFG scientists (Ralston et al. 2010). From 1969 to 2008, CalCOM (documentation: 2004) estimates of yelloweye catch were used. These estimates were updated in June, 2009 to reflect the changes made during that month. Changes in this database among recent assessments illustrate how sensitive the annual totals for individual species are to application of sparse species-composition sampling data to time-varying market categories. A summary of the CalCOM catch estimation concluded that prior to 1992 “many of the landing estimates are not based on actual sampling, which could explain why they are highly erratic” (Pearson et al. 2008); they concluded those earlier landings were unreliable, but later years (from 1992 through 1996) were generally reliable.

Historical landings of yelloweye rockfish in Oregon were provided by Oregon Department of Fish and Wildlife (ODFW), which in collaboration with Northwest Fisheries Science Center (NWFSC), conducted a reconstruction of west coast groundfish landings in Oregon for the years 1892-1986. Catches were only 3.5 tons or less for the years 1892-1915, so the starting date for the model was kept in 1916 as used in the 2009 assessment. Future full assessments could extend the timeseries back to 1892, but this is likely to make very little differences in the results.

Historically, rockfish in Oregon were landed in three mixed species market categories, including ROCKFISH (also known as Other Rockfish or Unspecified Rockfish), POP (Pacific Ocean Perch) and ANIMAL FOOD (also called Mink Food or Miscellaneous by some sources).

The Oregon historical reconstruction included four steps:

1. Determine the annual landings in each market category by gear;
2. Derive species compositions for each market category by gear, year and spatial stratum (when available);
3. Apply the year and gear specific species compositions to the historical landings in each market category (from Step 1) to obtain a species-specific time-series of landings;

4. Sum the species-specific landings by gear across market categories to obtain a final per-species time-series of landings in Oregon.

A variety of data sources were used to reconstruct historical landings of each market category, including Oregon Department of Fish and Wildlife's pounds and value reports derived from the Oregon fish ticket line data (1969-1977), Fisheries Statistics of the United States (1927-1977), Fisheries statistics of Oregon (Cleaver 1951, Smith 1956), Reports of the Technical Sub-Committee of the International Trawl Fishery Committee (1942-1975) and many others.

Trawl species compositions of market categories were derived from historical sampling program of Oregon trawlers conducted by ODFW between 1963 and 1993 (Douglas 1998). The spatial strata used to derive trawl species compositions were defined by PMFC areas and depth of the catch (<50fm, 51-80fm, 81-120fm and >120fm). For non-trawl catches the earliest available species compositions were assumed for the historical period.

The detailed description of the sources used and the methodology employed in the Oregon reconstruction efforts is available in Gertseva et al. (2010) and Karnowski et al. (2011).

Beginning in 1987, the commercial catch estimates from the 2009 assessment were used, which were based on summary catch from the PacFIN system.

For the state of Washington there was also no comprehensive historical reconstruction that could be used directly for this assessment, so historical catch was kept identical to the values used in the 2009 assessment.

The net result of the historical catch reconstruction is shown in Figure 1 and Table 1. In aggregate, the estimated removals from commercial sources are based on sparse sampling of shifting market categories for a rare contributor to the total. Species compositions have been shared across years, areas and sectors, even in the decades. The degree of uncertainty in commercial catch should be an integral part of the conclusions drawn from this assessment.

2.3.2 Historical Recreational Catches

Estimates of recreational catch from 1981-2007 remain unchanged from the 2009 assessment. For the most recent years, 2008-2010, updated state estimates are included. Estimates of recreational catch must be far more uncertain than those from commercial sources, due to a much less rigorous sampling program until very recently. For many west coast rockfish species, uncertainty in the recreational removals is relatively less important due to the small magnitude of these removals relative to commercial fisheries; however this is not the case for yelloweye rockfish. Yelloweye have been, until as recently at 2002, one of the most sought-after groundfish species captured by recreational fishermen. Release mortality for yelloweye is generally assumed to be very high, although sample sizes for existing studies are extremely small (e.g., 2 fish in Hannah and Matteson 2007).

For this yelloweye assessment, the recreational catch in the years 2008-2009 have been updated using the values from the total mortality reports (Bellman et al. 2010a, Bellman et al. 2010b), which were provided by each state. These values differ from total mortality estimates calculated from the RecFIN database, but due to various inconsistencies and useability problems with the RecFIN database, the total mortality reports are a more reliable source.

2.3.3 Foreign Catches

Foreign catches are included in the catch estimates for trawl fleets by state (Table 1), as was done in the 2009 assessment.

2.3.4 Recent Removals (2002+)

Catches explicitly include discards beginning in 2002 when management restrictions have resulted in nearly all yelloweye caught by recreational and commercial fishermen being discarded at sea. Recent catches were based on current total mortality estimates (2002-2009) produced by the West Coast Groundfish Observer Program (WCGOP) and the GMT scorecard (2010). Although these sources are relatively comprehensive in covering all sources of mortality, incidental removals occurring in non-groundfish sectors, such as the fixed-gear halibut fishery are not routinely observed, nor included in these estimates. The methodology used by WCGOP for estimating total mortality has been revised and improved, so the commercial catch for the whole period (2002-2009) has been updated for this assessment. The differences in the overlapping years differ from the 2009 assessment by less than 2 tons for all combinations of year and state.

In aggregate, all sources of removals have been below both the OFL and ACL set for each year. 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 new gear restrictions intended to reduce trawling in rocky shelf habitats and the coincident catch of rockfish in shelf flatfish trawls. During 2002-2010, the total cumulative estimated yelloweye mortality (130 mt) represented only 69% of the summed ACLs and only 39% of the summed OFLs for that period. The total 2010 catch (11.4 mt) is just 3% of the peak annual catch that occurred in the early 1980s.

2.3.5 Fishery Catch-Per-Unit-Effort

There are four indices of recreational fishery catch per unit effort that were developed for previous assessments and are included in this update. Methods used to calculate these time-series are described in the 2006 document. The individual indices are described below by state.

The California recreational CPUE series begins in 1980 and ends in 1999 with a gap between 1986 and 1993. The data from this CPUE series remains unchanged from the 2009 assessment. The Oregon recreational CPUE series is unchanged from the 2009 assessment. This series begins in 1979 and ends in 1999 with gaps in 1985 and 1997. The Washington recreational CPUE series begins in 1990 and extends through 1999. The data from this CPUE series remains unchanged from the 2009 assessment.

A new fishery dependent CPUE series was developed for the 2009 assessment based on the recreational charter observing program in Oregon. This program sends samplers on charter sport fishing trips where they record the catch rates and size distributions of yelloweye rockfish for as many anglers as they are capable of monitoring. The CPUE series was updated with data from 2009 and 2010 and was included in the update assessment.

A relative index of abundance from these data was fit using the statistical approach that was applied to the IPHC survey (described in Stewart et al. 2009). Binary data of whether a yelloweye rockfish was captured on each hook of each drift was analyzed with a binomial GLM. Auxiliary variables considered included: port (with sparse observations included in an aggregate port category), day of the calendar year, and depth at which fishing was conducted. In the final model, year and port group were used as factors with a fourth degree polynomial of depth and a second degree polynomial of the number of days into the calendar year.

2.3.6 Fishery Biological Data

Length-frequency distributions were developed for each fleet (recreational or commercial) for which observations were available, following the methods used for the 2009 assessment. The same bin structure (2 cm) was used as for fishery independent observations. Sampling statistics (number of samples and number of individual fish) for each fleet and year (Table 9-10) clearly show the different sampling targets employed over different time periods and between state agencies.

The California recreational fishery has yielded a small but relatively consistent number of samples since the early 1990s. Only measured lengths, not length converted from other measurements, are included in the length-frequency observations (this excludes many observations from the earlier years in California). The recreational charter boat sampling program produced over 1,800 lengths during the period 1987-1998. Oregon has collected most of the recreational length data (both sexed and unsexed), while Washington provided samples beginning only in the late 1990s. California provides the majority of the commercial lengths from 1978 to 2007, with sampling in Oregon and Washington beginning only in the early 1990s.

As with the fishery independent data described above, ages from recreational or commercial fisheries, are compiled as conditional age-at-length observations by two cm size bin. There are very few yelloweye ages available from the recreational fisheries (Table 11), and no new recreational age data since the previous assessment. All three states have collected a few ages, but there have been only a total of 83 samples collected from all recreational sources available for this assessment. Commercial age data are not much more numerous than those from recreational sources. Sparse sampling was conducted in the 1980s in California (resulting in only 52 useful ages). Since 2001, the majority of commercial fishery age data were from Washington, including the only new samples since the 2009 assessment (Table 12).

2.4 History of Modeling Approaches

2.4.1 Previous Assessments

The 2009 assessment document contains a detailed description of the history of yelloweye rockfish assessments.

2.4.2 Pre-Assessment Workshop, GAP and GMT Input

Because this is an updated assessment, there was no formal or informal discussion of data, modeling or management issues for 2011. This has been a valuable part of the assessment process in recent years and should be continued in the future.

2.4.3 Response to STAR Panel Recommendations in 2006

The STAR panel report from the 2006 review (the 2007 assessment was an update, and did not go through the STAR process) identified a number of recommendations for future assessments. As this was an updated assessment these issues were not revisited, but are reiterated here for consideration in future yelloweye and other assessments. Although all these recommendations could not be addressed for 2009, progress on each is summarized below:

1) In the current assessment model, catches are assumed known without error. Because yelloweye rockfish are relatively rare in the fisheries, catches are estimated with considerable error. Ignoring this source of uncertainty will lead to an overestimation of model precision. Future assessments should allow catch to have some error to better propagate this key uncertainty to model estimates. SS2 should be modified to allow error in the catch data. This should not be difficult to code, although it may cause some problems with convergence that may require attention. Allowing for some autocorrelation in F might improve the estimation.

Preliminary investigation into the direct integration of uncertainty in catches via estimated parameters for annual *F*s indicated that it would not be feasible to integrate over the very broad distribution of possible catches in this manner. The method would probably be much more appropriate for assessments where only some portions of the catch has very great uncertainty associated with points estimates, however for yelloweye the entire time-series for all sectors is very uncertain. The choice of representing catch uncertainty via alternate states of nature represents an imperfect solution, but does attempt to provide those evaluating the results of this assessment with insight into the sensitivity of the model scale to historical catches.

2) Formal estimates of uncertainty in catch should be produced by modeling the species composition sampling process. This will require an extended analytical effort, but it should be doable. The analysis may lead to using model-based estimates for missing cells, rather than substitution, which may change the best estimates of catch somewhat. Estimates of uncertainties in the total unclassified rockfish landings and in the species fraction estimates in the earlier years may still have to be assumed.

This topic was not addressed specifically, but it should be noted that model-based catch estimators are an available tool for ongoing state-specific catch reconstructions. It is likely that all three states will have some level of comprehensive catch reconstruction completed for the 2011 assessment cycle; however, the authors are unaware of further exploration of model-based methods for these reconstructions.

3) Obtain data from Canada for a truly stockwide model.

This topic has been raised with Canadian scientists and may be more realistically possible after current (2009, L. Yamanaka, personal communication) assessment efforts for coastal waters of B.C. are completed.

4) Continue efforts on the fishery independent survey programs. The most promising should be expanded stockwide.

Although a number of projects are being evaluated in ‘pilot’ studies (e.g., open-ended trawls with cameras, AUV surveys, and others) it is likely to be several years (at a minimum) before any of these can produce results that might be directly useful as data in a stock assessment framework.

5) Consider an assessment model incorporating several rockfish species simultaneously.

The use of the meta-analysis for stock-recruit steepness is a step in this direction, but a formal process for developing (and reviewing) multiple-species assessments needs to be created before this will be a realistic option for stock assessment authors. The approach may be best tested in a 'research-mode' analysis before being applied to a 'production' assessment.

6) The panel recommends that aging error be explored again in future assessments. The panel was not completely comfortable with decreasing aging error as age increased as is currently in the base model. The panel discussed that it seemed counterintuitive that fish would become easier to age as they became older, and evidence for this pattern was sparse. However, removing the trend in aging error (to either a constant SD or CV) had small effects on model estimates.

This topic has been resolved using current double-read data and analysis software (see section 2.2.5 above).

7) Data are sparse in the most recent years of the model since the fisheries have been closed. Because of this, there is considerable uncertainty about current age and size structure of the population as well as uncertainty because most of the CPUE time series end in 2001. This uncertainty will become worse for future assessments if no new data streams are added. The best types of data to add would be surveys that estimate absolute abundance such as the submersible survey conducted in 2001. This survey would need to be expanded to include Oregon and California waters. Another option would be to continue and expand the IPHC survey.

As soon as actual data are produced by alternate survey methods it should be incorporated into the yelloweye stock assessment. It may be of little value to perform frequent full stock assessments if no new sources of (higher) quality data become available.

2.5 Model Description

2.5.1 Link from the 2009 to the updated assessment model

The bridge from the 2009 stock assessment model to the current base case followed two steps: 1) upgrade to the newest version of SS, and 2) add all new data inputs, including the new Oregon catch reconstruction, recent catch for each fleet, biological data, and extended and re-analyzed GLMM-based indices of survey abundance.

The Stock Synthesis version was updated from 3.03b used in the 2009 assessment to the latest version available (3.21e). The change due to updating the to the latest software version was extremely small, with changes in estimates of 2009 spawning biomass and depletion amounting to less than 0.01% of the values in the previous assessment when the model was configured in the same manner despite many new (and unused for this update) features.

The effect of the new composition data, extended indices, and the Oregon historical catch reconstruction on estimates of equilibrium biomass and current status were also quite small, and are described in detail below.

2.5.2 Summary of Fleets

As in the 2009 assessment, fishery removals were divided among six fleets: 1) California recreational, 2) California commercial, 3) Oregon recreational, 4) Oregon commercial, 5) Washington recreational, and 6) Washington commercial. The California CPFV index of relative abundance and the length frequency distributions from this source are assigned the selectivity from the California recreational fishery. The Oregon charter observer index is treated separately (selectivity estimated independently) from the Oregon recreational fleet. The IPHC data is modeled by state, with each survey utilizing separate selectivity and catchability parameters. There were only sufficient data for a Washington triennial survey index and an Oregon NWFSC survey index, so each had its own fleet. The data available for each fleet are described in Table 3.

2.5.3 Modeling Software

This assessment used the Stock Synthesis modeling framework written by Dr. Richard Methot at the NWFSC. The most recent version (3.21e) was used, since it included many improvements in the output statistics for producing assessment results and several corrections to the older version (3.03b) used during the 2009 assessments.

2.5.4 Priors

As in the 2009 assessment, uniform (and intended to be noninformative) priors were applied to all estimated parameters in the base-case model with only three exceptions where additional information was available (natural mortality, described in section 2.2.4, and steepness, described below). Parameter bounds were selected to be sufficiently wide to avoid truncating the searching procedure during maximum likelihood estimation. A list of all parameter bounds and priors are provided in this document (Table 14).

In addition to the priors for natural mortality, an informative prior for stock-recruitment steepness (h) is used for the base-case model. The use of a prior on stock-recruitment steepness based on meta-analysis of rockfish (original basis: Dorn 2002) has become standard practice for U.S. west coast stock assessments. This prior has been kept at the same value used in the 2009 assessment, which was found to be relatively uninformative in that analysis (less than two units of negative log-likelihood over most of the acceptable range for h, 0.2-1.0).

2.5.5 Sample Weighting

The approach to sample weighting remains unchanged from the 2009 assessment. The resulting changes in weighting adjustments (Table 15) were minor. This approach attempts to reduce the potential for particular data sources to have a disproportionate effect of total model fit, while creating estimates of uncertainty that are commensurate with the uncertainty inherent in the input data.

2.5.6 General Model Specifications

Stock synthesis has a broad suite of structural options available for each application. These options were configured in the newest version to almost exactly match the behavior of the 2009 model.

This assessment is structured to be sex-specific, including separate growth curves for males and females, and therefore tracks the spawning output of only females for use in calculating management quantities. Growth parameters describing the von Bertalanffy growth equation, as well as the spread of lengths for a given age, were estimated for each sex, except that the length at age one year was forced to be identical for males and females. The parameterization used by Stock Synthesis allows the user to specify the age for the two growth parameters (rather than the length at age zero and the implied length at infinite age). Ages one and 70 were selected to be close to the range of observed data. Based on preliminary analyses, this choice had little effect on estimated growth curves. A list of the growth parameters, bounds and priors is given in Table 14. Natural mortality was freely estimated for each sex, based on the *a priori* evidence that it might differ for males and females.

For the internal population dynamics, ages 0-100 are individually tracked, with the accumulator age of 100 determining when the 'plus-group' calculations are applied. This relatively large number of ages substantially increases the memory and computational requirements of the model. However, this specification is necessary to define a plus-group in which little individual fish growth is expected, since the model does not apply further growth increases to fish in the plus-group.

Three explicit areas are included in the base-case model, representing the three states: California, Oregon and Washington. Although these are political rather than strictly biological boundaries, the yelloweye population appears to be fragmented enough, and adult movement is likely small enough, that the exact placement of these lines is of little importance. What is known to be important (and related to states rather than biology) is the vastly different exploitation history among the three areas from the historical period to the current fishery. Growth is assumed to be identical among the three areas, largely due to the sparseness of the data. Recruitment dynamics are governed by a global stock-recruit function (using spawning output based on the fecundity relationship, rather than strictly spawning biomass as is common among assessments). This relationship is parameterized to include two estimated quantities: the log of unexploited equilibrium recruitment (R_0) and steepness (h). Recruitment is partitioned via estimation of one additional parameter for each area after the first, which are then renormalized to allocate the total recruits among the areas. The base case does not allow for process error in the stock recruitment relationships (either over time or areas) although this was investigated extensively during preliminary model building and via sensitivity analyses.

No seasons are used to structure removals or biological predictions, so data collection is assumed to be relatively continuous throughout the year. Fishery removals occur instantaneously at the mid-point of each year and recruitment on the 1st of January. Since the time-series is started in 1916, the stock is assumed to be in equilibrium at the beginning of the modeled period. The sex-ratio at birth is fixed at 1:1, although sex-specific natural mortality, size-based selectivity, and dimorphic growth can result in significant departure from equality due to differential mortality over age and sex.

2.5.7 Estimated and Fixed parameters

A full list of all estimated parameters and values of key parameters that are fixed is provided in Table 14, this parameter estimation framework remains unchanged from the 2009 assessment.

A two-parameter logistic function was used to represent the selectivity for all fishing fleets and for the IPHC survey. For all indices of abundance, catchability parameters were solved for analytically, except for the triennial survey, where allowing for a change (unrestricted) in catchability for the time-series including and after 1995 required the direct estimation of catchability for each period. For the historical fishery-dependent time series, where the basic assumptions of CPUE analysis were likely violated, there were four additional parameters estimated to allow for a non-linear relationship between the index and modeled population abundance.

In total, there were nine estimated growth and mortality parameters, four parameters governing the stock recruitment relationship, six catchability related parameters (and seven analytic solutions which could have been treated as estimated parameters), and 23 parameters describing selectivity curves.

2.6 Model Selection and Evaluation

2.6.1 Key Assumptions and Structural Choices

Following the terms of reference for an updated assessment, all assumptions and structural choices remained unchanged, and were not reevaluated for 2011.

2.6.2 Alternate Models Explored

A 'standard' update, ignoring the newly available historical catch reconstruction is presented for comparison with the base case presented here.

An extensive evaluation of dome-shaped vs. asymptotic selectivity curves for commercial, recreational and survey fleets was performed as part of the 2009 assessment. In the previous assessment, models very similar to the base case were fit while allowing each fleet to have dome-shaped selectivity. With only one exception, the NWFSC survey, all fleets produced asymptotic curves, requiring the application of informative priors on the descending limbs or fixed parameter values to ensure all parameters remained contributors to the objective function (i.e., when the final selectivity is estimated to be close to 1.0, then the descending width parameter is irrelevant to model fit and if not somehow informed can cause estimation instability). This exercise was repeated across fleets to determine whether additional flexibility was needed beyond a single parameter describing the ascending limb of the selectivity curve. This was found to be the case for the triennial survey, so an additional parameter was estimated, although little change was observed in model results. This exercise was repeated as part of the 2009 STAR panel review, focusing on the IPHC selectivity for Oregon which was found to fit slightly better with dome-shaped selectivity.

This exercise was not repeated here, but should be in the next full assessment.

2.7 Base-case model Results

The biological (growth and mortality) parameters estimated from the base case and alternate models appear to be quite reasonable (Table 16) and commensurate with inspection of the raw data. These parameters are relatively precisely estimated, both in terms of the asymptotic standard error estimates (Table 18) and the alternate states of nature (Table 16). Comparison between the 2009 assessment and the current analysis (Table 18), indicates very little change in parameter estimates due to the new data. Female and male yelloweye rockfish showed similar growth trajectories, beginning to diverge at approximately age 10; with males growing to a maximum size (66.7 cm) that was about 2.3 cm larger than females (Figure 7). The estimates of growth are almost identical to those in the 2009 assessment (Table 18).

The estimated natural mortality rates for males and females are nearly identical, with females slightly higher than males for both of the alternate states of nature. The estimated female value for the base case, 0.046, is just below the 0.047 estimate from the 2009 assessment and remains consistent with the very protracted age-structure observed in the population.

Estimated selectivity curves for the fishing fleets exhibit the expected pattern that the recreational sectors in all three states access somewhat smaller yelloweye than the commercial fisheries (Figure 8-10). This pattern is most pronounced in Oregon, and, also as expected, the recent charter fishing selectivity is shifted further toward smaller fish. Estimated selectivity curves for the IPHC surveys in both Oregon and Washington appear to access the largest yelloweye available, with Washington especially shifted slightly more than 10 cm larger than Oregon (Figure 11). The NWFSC trawl survey selects far more small yelloweye than did the triennial survey (Figure 12). The decline in selectivity in the NWFSC at about 60 cm is similar, but even more pronounced than the previous assessment.

The base-case model predicts a relatively flat trend through the yelloweye index from the IPHC survey both the Washington and Oregon (Figure 13). The poor residual pattern for the Oregon index (5 positive residuals followed by 5/6 negative residuals) seems unlikely to occur by chance, however, it also seems unlikely, given the life-history characteristics of yelloweye rockfish that any model could predict the negative offset seen between the 2004 and 2005 or 2008 and 2009 survey estimates. This seems likely to be the result of some interaction between survey design and availability of yelloweye at the relatively few stations where they are present in this survey.

The base-case model fits the NWFSC (Figure 14) and triennial (Figure 15) trawl survey indices as well as expected, given the small number of positive hauls on which they are based and the relatively small contribution to the total likelihood value.

Fits to the fishery CPUE series are generally good, tracking the declining trends in California through the 1990s (Figure 16). However, the model exhibits poor fit to the increasing trend in the 1980s portion of the California recreational index. For the Oregon recreational index, the model again tracked the overall decline in the 20-year index, but little of the interannual variability (Figure 17). The Oregon recreational observer index showed a small and very uncertain increasing trend, but during the extent of these observations (2004-2010) the estimated degree of rebuilding among fish available to this fishery has been almost imperceptible. With relatively large variances on many of the observations, the Washington recreational index provided a flat trend, which was largely matched by the slightly declining predictions (Figure 18).

The base case model fits the length distributions from the IPHC surveys in Oregon (Figure 19, Figure 20) and Washington (Figure 21, Figure 22) reasonably well. The few new length samples from the NWFSC survey are consistent with previous data, and the continued absence of samples over 60 cm explains the even stronger domed shape in the estimated selectivity curve (Figure 12).

The fit to the length compositions is similar to that in the 2009 assessment, as expected, given the similar estimates of population trends and the choice to not estimate annual deviations in recruitment. What little new length data has been collected is consistent with previous distributions for each data source. There appear to be few patterns in the residuals.

The unsexed Oregon recreational length data (unchanged since the 2009 assessment) continue to show a strong diagonal residual pattern through the 1990s (Figure 32, Figure 33). This residual pattern from 1985-2003 could be due to a strong cohort (or cohorts) in the mid-1980s, although growth would have to be slightly above predicted rates to achieve the observed increase in mean size of this mode during the 10-year span over which it is observed. It is possible that other factors are also influencing this pattern, such as a shift in the targeting by the recreational fleet; however time-varying selectivity was not included for this fishery. The extended Oregon recreational charter observer program also shows some indication of a cohort through the residual patterns (Figure 36).

The new age-frequency data are sparse, but consistent with previous years. Fits to the age-frequency data (Figure 42-52) are reasonably good and very similar to those from the 2009 assessment.

The estimated stock-recruitment relationship for the base case and alternate states of nature are very consistent in their predictions of little surplus production (steepness values 0.383, 0.441, 0.508 (Tables 20-21)), which are similar to the previous assessment. These model runs reveal an almost linear relationship between the magnitude of historical removals and the scale of the estimated population size (Table 20, Figure 53). Because no process error in recruitment is modeled and steepness is relatively low among the states of nature, the time-series' of total recruitment (Figure 54) and spawning output (Figure 55) track one another very tightly. Both show that the aggregate yelloweye population was rapidly reduced from near unexploited conditions to low levels from about 1970 to 2000 (Tables 18-23), and this result is quite conserved among the alternate states of nature (Tables 19 and 21).

The portions of the total spawning output within each of the three states differs, with California and Oregon having very similar estimates of spawning output at unexploited equilibrium, and with Washington having considerably less. Oregon is estimated to have the largest 2011 spawning output, followed by California, then Washington. Relative depletion also varies by state, with California estimated to be at 17.3% of unexploited conditions, Oregon, 23.9%, and Washington, 27.2% (Figure 57 and 59). The matrix of predicted numbers at age, by sex and area, is provided in Appendix A.

2.8 Uncertainty and Sensitivity Analysis

As in 2009, the base-case assessment model captures some uncertainty via asymptotic intervals. Uncertainty from two additional sources is characterized through consideration of alternate states of nature, in which assumptions regarding these two key areas of uncertainty bracket those of the base case, and key results are reported in the decision table. The two axes of uncertainty are the steepness of the stock-recruit relationship and the magnitude of the historical catch. The sensitivity of the model results to changes in these two dimensions were calculated for total of 9 combinations of low, base, and high assumptions for the two axes.

Alternate values of steepness and historical catch were selected 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, were subjective, but reflect the lack of a comprehensive catch reconstruction in Washington and the change in likelihood of the fit to data sources over a reasonable range of catch levels. For steepness the 12.5th and 87.5th percentiles were calculated from the likelihood profile using the X^2 critical value of 0.66 (Figure 62) as a proxy for the probability distribution about this point estimate. This results in alternate values for steepness of 0.344 and 0.508 about the maximum likelihood estimate. The most optimistic and pessimistic of the nine combinations from these two axes (weighted 6.25% each relative to 25% for the best estimate on each dimension) are reported in this document and all combinations used to provide a more realistic degree of uncertainty for future projections, decision tables and rebuilding analyses.

2.8.1 Retrospective Analysis

A 5-year retrospective analysis was conducted by running the model using data only through 2005 ("Retrospective in 2006"), 2006, 2007, 2008 and 2009 (Figure 60). Very little retrospective pattern is apparent through any of these removals, indicating that the new data is consistent with previous values or the sample sizes are too small to have any impact.

The changes between assessments over the past 10 years have been relatively small, with the change since the previous assessment the smallest difference between assessments yet (Figure 61).

2.8.2 Likelihood Profiles

A likelihood profile was conducted for steepness of the stock-recruit relationship (*h*) to elucidate conflicting information among various data sources, to determine how asymmetric the likelihood surfaces surrounding point estimates may be, and to provide an additional evaluation of how precisely parameters are being estimated.

Steepness appears to be informed by the length and age data (Figure 62), with a slight increase in the model estimate of 0.441 relative to the 0.417 value from the 2009 assessment. Correlation between steepness and natural mortality is similar to the previously estimated relationship (Figure 63), though the values are shifted slightly.

3. Rebuilding Parameters

Revised rebuilding projections will be presented in a separate document in September 2011. As in 2009, the base-case assessment model captures some uncertainty via asymptotic intervals; uncertainty from two sources is reported through alternate states of nature bracketing the base-case specifications and will be included explicitly in the decision table.

4. Reference Points

The spawning output of yelloweye rockfish was estimated to have dropped below the $SB_{40\%}$ management target in 1989 and the overfished threshold in 1994. In hindsight, the spawning output passed through the target and threshold levels with annual catch averaging almost five times the current estimate of the MSY. The coast-wide stock remains below the overfished threshold, although the spawning output is estimated to have been increasing since 2000 in response to reductions in harvest. The degree of increase is largely insensitive to the magnitude of historical catch and only moderately sensitive to the value for steepness, but the absolute scale of the population reflects alternate removal series very closely. Fishing mortality rates are estimated to have been in excess of the current F-target for rockfish of $SPR_{50\%}$ from 1976 through 1999 (Figure 64, Figure 65, Figure 66). Recent management actions have reduced the rate such that recent SPR values are in excess of 65% over the last ten years (Figure 67). Relative exploitation rates (catch/biomass of age-8 and older fish) are estimated to have been at or less than 1% after 2001. The alternate states of nature result in maximum estimated exploitation rates for the years after 2001 ranging from 1.7% to 0.7%.

Unfished spawning output was estimated to be 1,028 million eggs. The target stock size ($SB_{40\%}$) is therefore 411 million eggs and the overfished threshold ($SB_{25\%}$) is 257 million eggs. Maximum sustained yield (MSY), conditioned on current fishery selectivity and allocations, was estimated in the assessment model to occur at a spawning stock biomass of 392 million eggs and produce an MSY catch of 63 mt (slightly above the estimate from the 2009 assessment of 56.4mt). However, the yield at MSY is extremely sensitive to states of nature resulting in a wide range for this value from 39 to 111 mt. Maximum sustainable yield is estimated to be achieved at an SPR of 57.7% (range of states of nature: 51.1-64.4%). This is nearly identical to the yield, 62 mt, generated by the SPR (59.0%) that stabilizes the stock at the $SB_{40\%}$ target. The fishing mortality target/overfishing level (SPR = 50.0%) results in a smaller equilibrium yield of 58 mt at a spawning output of 275 million eggs (26.7% of the unfished level). In sum, although the estimated MSY spawning output is very close to the proxy level, the harvest rate needed to achieve equilibrium at 40% of the unfished level is lower than the MSY-proxy rate.

5. Harvest Projections and Decision Tables

The forecast reported here will be replaced by the rebuilding analysis to be completed in September-October 2011. In the interim, the total catch in 2011 and 2012 is set equal to the NMFS preferred alternative ACL (17 mt), allocated between fleets according to the average catch over the years 2007-2009. The target exploitation rate for 2013 and beyond is based upon an SPR of 76%, which is the NMFS preferred alternative. This SPR-based forecast catch is allocated between fleets according to the average fishing mortality rate for the years 2007-2009 (which allows the forecast catch to respond to different trends in the biomass available to each fleet). Uncertainty in the rebuilding forecast will be included via integrating over all combinations of the alternate states of nature for catch history and steepness.

Current medium-term forecasts predict increases in coast-wide abundance under the SPR=76% rebuilding strategy, however these increases are largely driven by the California and Oregon portions of the stock. The estimated ACL values for 2013 and 2014 are only slightly larger (17.7, 18.0) than the 17.0 value set for 2011 and 2012 and less that that predicted from the 2009 rebuilding analysis (21.0, 20.5), which was based on a higher fishing mortality associated with a 71.9% SPR. Catch allocation in 2011-2012 among fleets (recreational, commercial) for Washington (14%, 7%), Oregon (17%, 18%) and California (28%, 15%). Over the period 2013 to 2022, the where catch was based on average fishing mortality over the years 2007-2009, the greatest increase in allocation was for the California recreational fishery, which went from 28% to 31% of the total, while the greatest decrease was for Washington recreational, which decreased from 14% to 12%. These changes are due to differences in the rate of increase in forecast biomass for each state. The projection of expected yelloweye rockfish catch, summary biomass, depletion and spawning output (by area) are shown in Table 24. It would be desirable to evaluate specific alternative allocation scenarios if relative removals based on future management actions will be substantially different than recent values by state.

Because yelloweye rockfish are currently managed under a rebuilding plan, the decision table included here (Table 25) is only intended to better evaluate the management implications of the considerable uncertainty in the base case assessment model. Various alternate management actions including SPR rates and fixed ACLs will be evaluated in the rebuilding analysis. Landings in 2011-2012 are 17 mt for all cases. Catch allocation used for the forecast reflects the same proportions by fleet.

6. Regional Management Considerations

As in 2009, the choice to model the yelloweye rockfish stock with explicit areas in the assessment model is based on the sedentary life-history of adult yelloweye, and the markedly different population trends as well as historical and current exploitation rates among the three states. Current population status differs by state, with both near term forecasts as well as longer term the rates of recovery under ACL catches predicted to be quite different for each area. This information may be valuable for making management and allocation decisions; alternate future projections can easily be added to this assessment, as needed, to better describe the implications of these choices.

The use of area-specific vs. coast-wide assessment models and management tools should be considered a major source of uncertainty. Future efforts, including links to Canadian waters and alternate approaches to meta-population dynamics could produce differing results.

7. Research Needs

The available data for yelloweye rockfish are very sparse and generally weakly informative about current status. The following research topics were suggested in the 2009 assessment and are repeated here with minor modifications and additions. Progress on these points could improve the ability of this assessment to reliably model the yelloweye rockfish population dynamics in the future and provide better monitoring of progress toward rebuilding:

1. Develop and implement a comprehensive visual survey.
2. Do a scientific review of current efforts to develop and improve stock size indices for yelloweye based on IPHC (including additional stations) and make recommendations on the best approaches to develop such indices.
3. Explore a recalculation of GLMM estimates in the IPHC survey that explores station effects which allows inclusion of stations that differ over time.
4. Investigate the development of a WA recreational yelloweye CPUE based on the recreational halibut fishery. Consider a full time series and one ending in 2002, since the yelloweye RCA in waters off northern WA was implemented in 2003.
5. Encourage the collection of samples to refine the estimate biological parameters, particularly maturity and fecundity.
6. Continue to evaluate the spatial aspects of the assessments, including growth, the number and placement of boundaries between areas, as well as the northern boundary with Canada.
7. Investigate alternative ways of re-weighting. This issue is relevant for all west coast stock assessments.

8. Investigate how best to account for the variability in dates in trawl surveys through a meta-analysis. This issue is relevant for all west coast stock assessments.
9. Conduct a historical catch reconstruction for WA to match those produced for OR and CA. This issue is relevant for all west coast stock assessments.
10. Access and processing of recreational data (catch and biological sampling) currently entails differing locations and formats for data from each of the three states and RecFIN. RecFIN is difficult to use and estimates from it don't match the total mortality estimates also provided by the state agencies. A single database that holds all raw recreational data in a consistent format would reduce assessment time spent on processing these data and potential introduction of errors or alternate interpretations due to processing.
11. The IPHC data organization should be revisited. Currently biological samples cannot be linked to the station from which they were collected. Age data for 2003-2005 is disconnected from length and sex information and other unknown issues may persist in these data. A thorough evaluation of what data are reliable and a final determination of what information is lost, or can potentially be recovered, is needed.
12. Instigate discard sampling of yelloweye bycatch in the directed Pacific halibut fishery.
13. Different trends in CPUE of yelloweye in the CA recreational fishery have been identified. CPUE by port from 1980 to 2000 should be analyzed using clustering methods like those described in Cope and Punt (2009) to identify regions with a similar demographic trajectory. This could lead to improvements in management of the stock as well as possibly inform refinements of the spatial structure of future assessment models.

8. Acknowledgements

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10. Tables

Table 1. Total catches (mt) of yelloweye rockfish by fleet used in the assessment model. Foreign and research catches are included in commercial totals. See text for description of sources.

Year	California Recreational	California Commercial	Oregon Recreational	Oregon Commercial	Washington Recreational	Washington Commercial
1916	0.00	2.20	0.00	1.70	0.00	0.00
1917	0.00	3.62	0.00	1.79	0.00	0.00
1918	0.00	4.25	0.00	1.88	0.00	0.00
1919	0.00	2.16	0.00	1.97	0.00	0.00
1920	0.00	2.38	0.00	2.05	0.00	0.00
1921	0.00	2.30	0.00	2.14	0.00	0.00
1922	0.00	2.06	0.00	2.23	0.00	0.00
1923	0.00	2.21	0.00	2.32	0.00	0.00
1924	0.00	2.82	0.00	2.40	0.00	0.00
1925	0.00	3.86	0.00	2.49	0.00	1.00
1926	0.00	4.87	0.00	2.58	0.00	1.00
1927	0.00	5.92	0.00	2.67	0.00	1.00
1928	0.00	5.52	0.00	4.45	0.00	1.00
1929	0.73	5.66	0.00	7.46	0.00	1.00
1930	1.18	6.76	0.00	6.65	0.00	1.00
1931	1.76	5.62	0.00	5.21	0.00	1.00
1932	2.35	8.13	0.00	1.79	0.00	1.00
1933	2.94	4.45	0.00	2.74	0.00	1.00
1934	3.53	5.78	0.00	3.11	0.00	1.00
1935	4.12	7.99	0.00	2.84	0.00	1.00
1936	4.70	8.08	0.00	6.64	0.00	1.00
1937	5.61	6.08	0.00	7.57	0.00	1.00
1938	5.50	6.36	0.00	7.30	0.00	1.00
1939	4.81	6.43	0.00	3.82	0.00	1.00
1940	6.85	4.57	0.00	11.15	0.00	1.00
1941	6.25	5.35	0.00	15.98	0.00	1.00
1942	6.78	3.37	0.00	23.85	0.00	1.00
1943	7.30	5.89	0.00	66.05	0.00	1.00
1944	7.83	24.88	0.00	46.97	0.00	1.00
1945	8.36	58.56	0.00	62.52	0.00	1.00
1946	8.88	57.74	0.00	42.38	0.00	1.00
1947	5.02	16.28	0.00	25.53	0.00	1.00
1948	10.12	23.30	0.00	20.73	0.00	1.00
1949	13.09	9.89	0.00	15.93	0.00	1.00
1950	15.95	8.03	0.00	17.79	0.00	1.00
1951	17.91	16.99	0.00	15.10	0.00	1.00
1952	15.95	14.15	0.00	14.88	0.00	1.00
1953	13.97	11.77	0.00	11.32	0.00	1.00
1954	18.74	11.78	0.00	14.23	0.00	1.00
1955	24.06	6.98	6.20	15.04	1.00	2.00
1956	27.15	10.40	6.50	18.06	1.00	2.00
1957	24.78	13.17	6.70	25.89	1.00	2.00
1958	35.91	13.41	7.00	18.30	2.00	2.00
1959	30.41	10.25	7.20	20.64	2.00	2.00
1960	22.05	8.88	7.50	25.32	2.00	2.00

Table 1. Continued. Total catches (mt) of yelloweye rockfish by fleet used in the assessment model.

Year	California Recreational	California Commercial	Oregon Recreational	Oregon Commercial	Washington Recreational	Washington Commercial
1961	17.68	5.25	7.70	24.63	2.00	2.00
1962	22.08	5.43	8.00	28.28	2.00	2.00
1963	23.10	10.86	8.20	8.28	3.00	4.00
1964	20.82	7.52	8.50	1.94	3.00	4.00
1965	31.51	9.38	8.70	70.16	3.00	4.00
1966	35.34	8.97	9.00	3.86	3.00	4.00
1967	36.60	7.85	9.20	11.35	3.00	4.00
1968	42.79	7.66	9.50	7.93	3.00	4.00
1969	44.97	25.70	9.70	55.36	3.00	4.00
1970	51.89	27.70	10.00	6.31	4.00	5.10
1971	46.17	46.50	13.10	17.97	4.00	6.41
1972	59.61	63.66	16.30	14.82	4.00	7.31
1973	75.02	49.51	7.40	14.98	4.00	9.21
1974	80.47	56.38	12.80	14.86	4.00	10.31
1975	81.34	60.24	6.20	9.87	4.00	7.10
1976	88.56	57.96	19.40	14.86	4.30	10.30
1977	79.78	57.45	19.90	17.13	8.80	17.88
1978	74.46	154.20	24.50	41.91	4.50	23.90
1979	85.49	99.33	38.80	67.38	3.50	28.50
1980	80.19	42.07	31.50	76.22	2.40	35.06
1981	43.58	169.44	36.00	106.27	3.40	9.70
1982	79.60	154.33	56.90	156.56	3.40	12.60
1983	38.36	62.69	63.80	142.78	6.70	16.99
1984	71.26	53.66	43.70	82.56	12.20	13.42
1985	121.87	12.22	26.80	132.95	8.80	26.41
1986	77.31	33.51	27.40	56.89	9.00	14.94
1987	57.83	54.31	29.80	73.72	10.50	25.09
1988	60.07	65.44	9.40	110.73	8.30	25.56
1989	54.44	51.25	16.90	170.21	14.60	39.50
1990	40.06	81.32	18.70	61.12	9.90	26.27
1991	27.38	147.30	17.20	137.74	18.00	20.36
1992	16.41	111.10	29.40	165.88	16.20	33.85
1993	7.13	52.92	27.73	183.18	18.00	29.76
1994	13.78	56.02	21.57	102.19	10.30	19.58
1995	10.08	51.40	16.81	148.34	9.90	18.07
1996	12.74	76.54	8.17	92.52	10.80	16.89
1997	14.58	68.68	15.38	115.42	11.40	18.68
1998	4.84	21.89	18.78	41.47	14.40	5.57
1999	9.40	23.49	18.05	61.35	10.60	32.92
2000	5.71	4.02	9.52	3.64	10.10	7.86
2001	6.37	4.35	4.83	6.23	12.50	21.84
2002	2.49	0.89	3.14	1.56	3.70	1.55
2003	3.74	0.70	3.02	0.92	2.60	0.98
2004	0.60	2.61	3.69	2.67	3.70	0.66
2005	0.90	3.43	4.30	1.69	5.20	0.74

Table 1. Continued. Total catches (mt) of yelloweye rockfish by fleet used in the assessment model.

Year	California Recreational	California Commercial	Oregon Recreational	Oregon Commercial	Washington Recreational	Washington Commercial
2006	4.10	1.86	2.49	2.92	1.70	0.76
2007	8.00	4.81	2.85	3.28	2.49	1.61
2008	1.69	1.72	3.25	3.88	2.40	0.78
2009	3.84	0.61	2.05	1.61	1.63	1.15
2010	1.20	1.85	2.80	2.52	1.90	1.12

Table 2. Recent trend in yelloweye rockfish catch (mt) relative to management guidelines.

Year	OFL (mt)	ACL (mt)	Commercial Catch (mt)[1]	Recreational Catch (mt)	Total Catch (mt)
1999	39[2]	NA	117.8	38.1	155.8
2000	39[2]	NA	15.5	25.3	40.9
2001	29[3]	NA	32.5	23.7	56.1
2002	27[3]	13.5[3]	4.0	9.3	13.3
2003	52	22	2.6	9.4	12.0
2004	53	22	5.9	8.0	13.9
2005	54	26	5.9	10.4	16.3
2006	55	27	5.5	8.3	13.8
2007	47	23	9.7	13.3	23.0
2008	47	20	6.4	7.3	13.7
2009	31	17	3.4	7.5	10.9
2010	32	17	5.5	5.9	11.4

[1]Includes research, foreign and discarded catches after 2001.
[2]Includes the Columbia and Vancouver INPFC areas only.
[3]Includes the Columbia, Vancouver and Eureka INPFC areas only.

Table 3. Summary of data sources available in 2011. All data in the final 2 columns (2009 and 2010) is new for this update.

	1916-24	1925-27	1928	1929-54	1955-65	1966-76	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
Catches																																								
CA Recreational				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
CA Commercial	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
OR Recreational					X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
OR Commercial			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
WA Recreational					X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
WA Commercial		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Foreign						X																																		
Research							X			X			X			X			X			X			X			X			X		X	X	X	X	X	X	X	X
WCGOP discards																																X	X	X	X	X	X	X	X	X
Fishery Data																																								
CPUE																																								
CA Recreational										X	X	X	X	X	X	X							X	X	X	X	X	X	X											
CA Rec. Charter																		X	X	X	X	X	X	X	X	X	X	X												
OR Recreational									X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X		X	X											
WA Recreational																				X	X	X	X	X	X	X	X	X	X											
OR Rec. Charter																																		X	X	X	X	X	X	X
Age																																								
CA Recreational													X													X														
CA Commercial								X	X	X	X	X	X		X	X		X													X				X					
OR Recreational									X					X	X	X	X		X												X									
OR Commercial																															X	X	X	X	X	X	X			
WA Recreational																												X	X	X	X			X	X	X		X	X	
WA Commercial																							X								X	X	X	X	X	X	X	X	X	X
Length																																								
CA Recreational																							X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
CA Rec. Charter																	X	X	X	X	X	X	X	X	X	X	X	X												
CA Commercial								X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	
OR Recreational								X	X	X	X	X	X	X	X	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X							
OR Rec. Charter																																		X	X	X	X	X	X	X
OR Commercial																						X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
WA Recreational																												X	X	X	X			X	X	X		X		
WA Commercial										X														X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Table 3. Continued. Summary of data sources available in 2011.

	1916-24	1925-27	1928	1929-54	1955-65	1966-76	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
Survey data																																								
Index																																								
IPHC (OR)																													X	X	X	X	X	X	X	X	X	X	X	X
IPHC (WA)																													X	X	X	X	X	X	X	X	X	X	X	X
Triennial (WA)										X			X			X			X			X			X			X			X			X						
NWFSC (OR)																																	X	X	X	X	X	X	X	X
Age																																								
IPHC (OR)																																	X	X	X	X	X	X	X	X
IPHC (WA)																																	X	X	X	X	X	X	X	X
Length																																								
IPHC (OR)																																	X	X	X	X	X	X	X	X
IPHC (WA)																																	X	X	X	X	X	X	X	X
Triennial (WA)										X			X			X			X			X			X			X			X			X						
NWFSC (OR)																																	X	X	X	X	X	X	X	X

Table 4. Sample information contributing to the index of abundance from the IPHC long-line survey.

	Oregon (57 stations)		Washington (27 stations)	
Year	Positive stations	Number of fish	Positive stations	Number of fish
1999	6	325	2	11
2001	6	149	3	54
2002	7	125	2	16
2003	8	215	6	101
2004	7	151	6	19
2005	7	81	7	75
2006	5	68	5	22
2007	7	102	4	30
2008	9	122	6	13
2009	7	57	6	108
2010	8	84	4	27

Table 5. Number of fish contributing biological information caught in association with the IPHC long-line survey (Note that a few fish were ambiguously allocated to state in the available data).

	Lengths (sexed)		Ages (sexed > 2005)	
Year	Oregon	Washington	Oregon	Washington
1999	0	0	0	0
2001	0	0	0	0
2002	0	0	0	0
2003	217	99	215	99
2004	155	17	157	17
2005	68	72	62	72
2006	58	34	58	34
2007	103	268	101	268
2008	253	83	251	83
2009	57	32	57	32
2010	71	27	71	27

Table 6. Summary of sampling used in the calculation of yelloweye biomass indices for the shelf trawl surveys.

	Triennial (WA only)			NWFSC (OR only)		
Year	Number of tows	Positive tows	Number of fish	Number of tows	Positive tows	Number of fish
1980	101	3	16	NA	NA	NA
1983	176	13	13	NA	NA	NA
1986	263	21	114	NA	NA	NA
1989	113	14	66	NA	NA	NA
1992	107	7	90	NA	NA	NA
1995	83	3	38	NA	NA	NA
1998	87	7	11	NA	NA	NA
2001	87	8	26	NA	NA	NA
2003	NA	NA	NA	62	7	100
2004	75	5	23	83	5	11
2005	NA	NA	NA	118	6	13
2006	NA	NA	NA	123	8	35
2007	NA	NA	NA	118	5	14
2008	NA	NA	NA	105	8	14
2009	NA	NA	NA	103	1	7
2010	NA	NA	NA	104	8	22

Table 7. Summary of data used to produce NWFSC and Triennial trawl survey length-frequency data.

	Triennial (WA only)		NWFSC (OR only)	
Year	Number of Samples	Number of fish	Number of samples	Number of Fish
1980	0	0	NA	NA
1983	0	0	NA	NA
1986	13	51	NA	NA
1989	9	44	NA	NA
1992	4	7	NA	NA
1995	5	7	NA	NA
1998	10	19	NA	NA
2001	10	21	NA	NA
2003	NA	NA	7	24
2004	4	10	5	11
2005	NA	NA	6	12
2006	NA	NA	8	35
2007	NA	NA	5	14
2008	NA	NA	8	14
2009	NA	NA	1	7
2010	NA	NA	8	22

Table 8. Summary of sampling used to generate the Oregon charter observer CPUE index.

Year	Number of observed drifts	Number of observed angler-drifts	Number of yelloweye encountered
2004	905	41,529	22
2005	948	39,922	21
2006	1,100	40,132	41
2007	1,396	46,624	37
2008	1,349	42,508	52
2009	894	29,500	31
2010	968	29,219	17

Table 9. Summary of sampling effort generating length-frequency distributions used in the assessment model for the recreational fleets.

	California		California Charter		Oregon		Oregon Observer		Washington	
Year	N trips	N fish	N trips	N fish	N trips	N fish	N trips	N fish	N hauls	N fish
1978	0	0	0	0	NA	120	0	0	0	0
1979	0	0	0	0	NA	107	0	0	0	0
1980	0	0	0	0	13	25	0	0	0	0
1981	0	0	0	0	8	13	0	0	0	0
1982	0	0	0	0	24	61	0	0	0	0
1983	0	0	0	0	8	17	0	0	0	0
1984	0	0	0	0	53	348	0	0	0	0
1985	0	0	0	0	31	222	0	0	0	0
1986	0	0	0	0	14	175	0	0	0	0
1987	0	0	16	23	22	165	0	0	0	0
1988	0	0	61	276	25	38	0	0	0	0
1989	0	0	84	279	36	112	0	0	0	0
1990	0	0	31	89	0	0	0	0	0	0
1991	0	0	37	112	0	0	0	0	0	0
1992	0	0	81	164	0	0	0	0	0	0
1993	32	33	77	203	88	163	0	0	0	0
1994	37	61	75	189	84	151	0	0	0	0
1995	40	47	72	152	50	110	0	0	0	0
1996	65	75	64	164	38	73	0	0	0	0
1997	8	10	68	144	51	99	0	0	0	0
1998	16	18	31	55	74	147	0	0	1	25
1999	71	88	0	0	109	246	0	0	4	95
2000	41	47	0	0	37	62	0	0	7	189
2001	15	15	0	0	204	368	0	0	10	101
2002	9	13	0	0	278	448	0	0	0	0
2003	13	15	0	0	306	490	2	2	0	0
2004	11	15	0	0	0	0	11	21	5	12
2005	46	57	0	0	0	0	12	24	2	4
2006	60	95	0	0	0	0	24	46	1	1
2007	43	57	0	0	0	0	23	52	0	0
2008	19	27	0	0	0	0	21	59	3	6
2009	38	44	0	0	0	0	14	32	0	0
2010	10	12	0	0	0	0	12	20	0	0

Table 10. Summary of sampling effort generating length-frequency distributions used in the assessment model for the commercial fleets.

	California		Oregon		Washington	
Year	N trips	N fish	N trips	N fish	N trips	N fish
1978	2	15	0	0	0	0
1979	15	60	0	0	0	0
1980	18	35	0	0	2	4
1981	17	62	0	0	0	0
1982	10	18	0	0	0	0
1983	20	43	0	0	0	0
1984	19	30	0	0	0	0
1985	20	27	0	0	0	0
1986	20	23	0	0	0	0
1987	18	26	0	0	0	0
1988	14	21	0	0	0	0
1989	20	51	0	0	0	0
1990	15	28	0	0	0	0
1991	27	224	0	0	0	0
1992	75	493	13	1	0	0
1993	97	710	0	0	2	20
1994	82	736	0	0	0	0
1995	37	378	73	5	0	0
1996	80	526	129	7	24	298
1997	53	290	232	7	21	142
1998	18	62	95	3	13	63
1999	58	508	166	11	8	45
2000	14	26	141	34	20	361
2001	26	146	219	46	31	583
2002	9	12	8	14	36	195
2003	3	4	2	30	24	59
2004	24	71	14	61	18	51
2005	12	54	22	39	16	23
2006	6	28	6	15	24	102
2007	20	79	3	5	6	29
2008	0	0	3	16	1	1
2009	5	10	11	24	2	14
2010	0	0	0	0	3	27

Table 11. Summary of sampling effort generating age-frequency distributions used in the assessment model for the recreational fleets.

Year	California		Oregon		Oregon Observer		Washington	
	N trips	N fish	N trips	N fish	N trips	N fish	N trips	N fish
1978	0	0	0	0	0	0	0	0
1979	0	0	1	17	0	0	0	0
1980	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0
1983	1	1	0	0	0	0	0	0
1984	0	0	10	88	0	0	0	0
1985	0	0	8	54	0	0	0	0
1986	0	0	12	68	0	0	0	0
1987	0	0	9	63	0	0	0	0
1988	0	0	0	0	0	0	0	0
1989	0	0	4	17	0	0	0	0
1990	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0
1996	1	1	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	1	25
1999	0	0	0	0	0	0	4	95
2000	0	0	0	0	0	0	7	189
2001	0	0	4	28	0	0	10	101
2002	0	0	0	0	0	0	0	0
2003	0	0	0	0	0	0	0	0
2004	0	0	0	0	0	0	5	10
2005	0	0	0	0	0	0	2	4
2006	0	0	0	0	0	0	1	1
2007	0	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	3	6
2009	0	0	0	0	0	0	0	0
2010	0	0	0	0	0	0	0	0

Table 12. Summary of sampling effort generating age-frequency distributions used in the assessment model for the commercial fleets.

	California		Oregon		Washington	
Year	N trips	N fish	N trips	N fish	N trips	N fish
1978	2	6	0	0	0	0
1979	5	10	0	0	0	0
1980	5	8	0	0	0	0
1981	2	7	0	0	0	0
1982	1	1	0	0	0	0
1983	1	1	0	0	0	0
1984	0	0	0	0	0	0
1985	4	10	0	0	0	0
1986	2	4	0	0	0	0
1987	0	0	0	0	0	0
1988	1	5	0	0	0	0
1989	0	0	0	0	0	0
1990	0	0	0	0	0	0
1991	0	0	0	0	0	0
1992	0	0	0	0	0	0
1993	0	0	0	0	2	19
1994	0	0	0	0	0	0
1995	0	0	0	0	0	0
1996	0	0	0	0	0	0
1997	0	0	0	0	0	0
1998	0	0	0	0	0	0
1999	0	0	0	0	0	0
2000	0	0	0	0	0	0
2001	1	14	1	9	9	144
2002	0	0	3	4	12	104
2003	0	0	1	29	5	18
2004	0	0	7	16	13	41
2005	2	7	14	29	11	19
2006	0	0	11	12	24	96
2007	0	0	4	4	9	28
2008	0	0	0	0	1	1
2009	0	0	0	0	2	13
2010	0	0	0	0	3	27

Table 13. Summary of fixed biological parameters estimated externally and used as input for this update (identical to values in 2009 assessment).

Quantity	Value	Source
Female weight-length coefficient (*a*)	0.00000977	All available data pooled from fishery and survey sources.
Female weight-length exponent (*b*)	3.17	
Male weight-length coefficient (*a*)	0.0000170	
Male weight-length exponent (*b*)	3.03	
Female length at 50% maturity	38.78	Hannah et al., 2009
Female maturity logistic slope	-0.437	
Fecundity eggs/kilogram intercept	137,900	Dick, 2009
Fecundity slope	36,500	

Table 14. Description of model parameters in the base case assessment model.

Parameter	Number estimated	Bounds (low, high)	Prior (Mean, SD)
Natural mortality (*M*, female)	1	(0.01,0.15)	Normal (0.0517,0.0226)
Natural mortality (*M*, male)	1	(0.01,0.15)	Normal (0.0517,0.0226)
Stock and recruitment			
Ln(R_0)	1	(3,15)	Uniform
Ln(Mean recruitment offset Oregon, normalized)	1	(-5,5)	Uniform
Ln(Mean recruitment offset Washington, normalized)	1	(-5,5)	Uniform
Steepness (*h*)	1	(0.2,1.0)	Beta (0.73,0.189)
Catchability			
Surveys:			
Ln(*Q*) – IPHC Oregon	-	Analytic solution	
Ln(*Q*) – IPHC Washington	-	Analytic solution	
Ln(*Q*) – NWFSC survey (OR only)	-	Analytic solution	
Ln(*Q*) – Triennial survey (1980-1992, WA only)	1	(-10,0)	Uniform
Ln(*Q*) – Triennial survey offset (1995-2004) to early	1	(-4,4)	Uniform
Fisheries:			
Ln(*Q*) – Fisheries	-	Analytic solution	
Power coefficient for Ln(*Q*) relationship	4	(-6,6)	Uniform
Selectivity			
Fisheries (logistic):			
Length selectivity inflection	7	(10,70)	Uniform
95% width of selectivity logistic	7	(0.001,50)	Uniform
IPHC Surveys (logistic):			
Length selectivity inflection	2	(10,70)	Uniform
95% width of selectivity logistic	2	(0.001,50)	Uniform
Trawl Surveys (double-normal):			
Length at peak selectivity	1	(20,87)	Uniform
Width of top (as logistic)	-	Fixed at -4	
Ascending width (as exp[width])	2	(0,8)	Uniform
Descending width (as exp[width])	1	(0,12)	Uniform
Initial selectivity (as logistic)	1	(-10,10)	
Final selectivity (as logistic)	-	Fixed at 10, or not used	
Individual growth			
Females:			
Length at age 1	1	(10,35)	Uniform
Length at age 70	1	(40,120)	Uniform
von Bertalanffy *K*	1	(0.01,0.2)	Uniform
CV of length at age 1	1	(0.05,0.2)	Uniform
CV of length at age 70	1	(0.05,0.2)	Uniform
Males:			
Length at age 1 offset to females	-	NA	Fixed at 0.0
Length at age 70	1	(40,120)	Uniform
von Bertalanffy *K*	1	(0.01,0.2)	Uniform
CV of length at age 1	1	(0.05,0.2)	Uniform
CV of length at age 70	1	(0.05,0.2)	Uniform
Total: 44 estimated parameters			

Table 15. Input and effective sample sizes used for tuning the composition data in the base model.

Type of data	Fleet	Input adjustment	Average input after adjustment	Average effective N
Fishery independent:				
Length	IPHC (OR)	0.73	89.6	94.0
	IPHC (WA)	0.62	49.0	53.7
	Triennial (WA)	2.08	19.7	20.3
	NWFSC (OR)	2.79	20.2	21.9
Age	IPHC (OR)	0.74	6.3	6.8
	IPHC (WA)	0.9	5.7	6.0
Fishery dependent:				
Length	CA Recreational	1.28	48.0	48.0
	CA Rec. Charter	1.52	120.6	123.8
	CA Commercial	2.25	110.1	110.1
	OR Recreational	0.54	72.5	73.1
	OR Rec. Charter	1.44	120.6	33.3
	OR Commercial	2.16	48.4	50.1
	WA Recreational	5.49	63.6	64.5
	WA Commercial	1.57	48.9	51.7
Age	CA Recreational	1	1.0	1.0
	CA Commercial	1	1.2	1.5
	OR Recreational	1	1.9	2.4
	OR Commercial	1	1.5	2.4
	WA Recreational	1	3.2	4.0
	WA Commercial	1	2.7	3.3

[1]Length data with initial input sample sizes (before tuning) based on number of fish instead of number of samples.

Table 16. Estimated parameter values for the base-case model and alternate states of nature.

Parameter	Low	Base case	High
Natural mortality (*M*, female)	0.047	0.046	0.045
Natural mortality (*M*, male)	0.046	0.045	0.044
Ln(R_0)	5.184	5.430	5.801
Ln(Mean recruitment offset Oregon, normalized)	-0.005	-0.006	-0.005
Ln(Mean recruitment offset Washington, normalized)	-1.312	-1.336	-1.356
Steepness (*h*; not estimated in the low or high cases)	0.383	0.441	0.508
CA Rec. power coefficient for Ln(*Q*) relationship	-0.025	0.044	0.120
CA Rec. Obs. power coefficient for Ln(*Q*) relationship	0.398	0.528	0.677
OR Rec. power coefficient for Ln(*Q*) relationship	-0.073	-0.011	0.059
WA Rec. power coefficient for Ln(*Q*) relationship	-0.330	-0.317	-0.301
Ln(*Q*) – Triennial survey (1980-1992, WA only)	0.709	0.452	0.071
Ln(*Q*) – Triennial survey offset (1995-2004) to early	-0.585	-0.608	-0.636
CA Rec. length selectivity inflection	34.157	34.310	34.464
CA Comm. length selectivity inflection	36.277	36.364	36.444
OR Rec. length selectivity inflection	32.069	32.199	32.332
OR Rec. Obs. length selectivity inflection	23.308	23.534	23.751
OR Comm. length selectivity inflection	38.157	38.295	38.419
WA Rec. length selectivity inflection	38.157	38.295	38.419
WA Comm. length selectivity inflection	38.157	38.295	38.419
CA Rec. 95% width of selectivity logistic	14.106	14.009	13.898
CA Comm. 95% width of selectivity logistic	14.106	14.009	13.898
OR Rec. 95% width of selectivity logistic	8.124	8.145	8.158
OR Rec. Obs. 95% width of selectivity logistic	4.797	4.913	5.035
OR Comm. 95% width of selectivity logistic	11.714	11.670	11.594
WA Rec. 95% width of selectivity logistic	12.743	12.896	12.972
WA Comm. 95% width of selectivity logistic	12.743	12.896	12.972
OR IPHC length selectivity inflection	46.698	46.748	46.794
WA IPHC length selectivity inflection	58.003	58.169	58.295
OR IPHC 95% width of selectivity logistic	5.188	5.198	5.201
WA IPHC 95% width of selectivity logistic	9.621	9.654	9.681
NWFSC Length at peak selectivity	57.475	57.479	57.484
NWFSC ascending width (as exp[width])	7.017	6.935	6.857
Triennial ascending width (as exp[width])	6.621	6.627	6.634
NWFSC descending width (as exp[width])	0.000	0.000	0.000
Triennial initial selectivity (as logistic)	-3.079	-3.177	-3.278
Female length at age 1	18.796	18.717	18.614
Female length at age 70	62.300	62.265	62.233
Female von Bertalanffy *K*	0.047	0.047	0.048
Female CV of length at age 1	0.131	0.130	0.130
Female CV of length at age 70	0.072	0.072	0.072
Male length at age 70	64.630	64.594	64.562
Male von Bertalanffy *K*	0.047	0.047	0.047
Male CV of length at age 1	0.133	0.132	0.132
Male CV of length at age 70	0.060	0.060	0.060

Table 17. Estimated parameter values for the 2009 and 2011 base-case model.

Parameter	2009 Base Case	2011 Base Case
Natural mortality (M, female)	0.047	0.046
Natural mortality (M, male)	0.047	0.045
Ln(R0)	5.425	5.430
Ln(Mean recruitment offset Oregon, normalized)	-0.099	-0.006
Ln(Mean recruitment offset Washington, normalized)	-1.306	-1.336
Steepness (h; not estimated in the low or high cases)	0.417	0.441
CA Rec. power coefficient for Ln(Q) relationship	0.056	0.044
CA Rec. Obs. power coefficient for Ln(Q) relationship	0.546	0.528
OR Rec. power coefficient for Ln(Q) relationship	-0.078	-0.011
WA Rec. power coefficient for Ln(Q) relationship	-0.274	-0.317
Ln(Q) – Triennial survey (1980-1992, WA only)	0.355	0.452
Ln(Q) – Triennial survey offset (1995-2004) to early	-0.631	-0.608
CA Rec. length selectivity inflection	33.837	34.310
CA Comm. length selectivity inflection	36.149	36.364
OR Rec. length selectivity inflection	32.036	32.199
OR Rec. Obs. length selectivity inflection	22.727	23.534
OR Comm. length selectivity inflection	38.864	38.295
WA Rec. length selectivity inflection	42.643	38.295
WA Comm. length selectivity inflection	43.863	38.295
CA Rec. 95% width of selectivity logistic	13.697	14.009
CA Comm. 95% width of selectivity logistic	11.939	14.009
OR Rec. 95% width of selectivity logistic	8.021	8.145
OR Rec. Obs. 95% width of selectivity logistic	4.113	4.913
OR Comm. 95% width of selectivity logistic	12.189	11.670
WA Rec. 95% width of selectivity logistic	12.015	12.896
WA Comm. 95% width of selectivity logistic	10.466	12.896
OR IPHC length selectivity inflection	47.002	46.748
WA IPHC length selectivity inflection	57.989	58.169
OR IPHC 95% width of selectivity logistic	5.318	5.198
WA IPHC 95% width of selectivity logistic	9.829	9.654
NWFSC Length at peak selectivity	52.193	57.479
NWFSC ascending width (as exp[width])	6.346	6.935
Triennial ascending width (as exp[width])	6.67	6.627
NWFSC descending width (as exp[width])	3.169	0.000
Triennial initial selectivity (as logistic)	-3.093	-3.177
Female length at age 1	18.393	18.717
Female length at age 70	62.38	62.265
Female von Bertalanffy K	0.049	0.047
Female CV of length at age 1	0.128	0.130
Female CV of length at age 70	0.071	0.072
Male length at age 70	64.738	64.594
Male von Bertalanffy K	0.048	0.047
Male CV of length at age 1	0.13	0.132
Male CV of length at age 70	0.061	0.060

Table 18. Yelloweye rockfish stock-recruitment, mortality and growth parameter estimates (or derived values) and standard errors from the base-case model.

Parameter	Value	SD
R_0 – California (1000s Age-0)	101.1	NA
R_0 - Oregon (1000s Age-0)	100.5	NA
R_0 - Washington (1000s Age-0)	26.6	NA
Steepness (h)	0.441	0.054
Females:		
Natural mortality (M)	0.046	0.0015
Length at age 1 (cm)	18.717	0.6438
Length at age 70 (cm)	62.264	0.3767
von Bertalanffy K	0.0473	0.0017
CV of length at age 1	0.130	0.0117
CV of length at age 70	0.0718	0.0043
Males:		
Natural mortality (M)	0.045	0.001431
Length at age 1 (cm)		NA
Length at age 70 (cm)	64.594	0.3097
von Bertalanffy K	0.0472	0.0014
CV of length at age 1	0.132	0.0103
CV of length at age 70	0.060	0.0036

Table 19. Comparison of summary quantities among the base case and alternate states of nature.

Model	Low	Base case	High
Convergence			
Maximum gradient component	0.0000391	0.0000006	0.0000137
Negative log-likelihoods			
Total	6,699.05	6,695.62	6,693.50
Indices	-27.3843	-26.8025	-26.1329
Length-frequency data	2,688.28	2,686.12	2,684.67
Age-frequency data	4,037.06	4,035.46	4,034.34
Priors	1.09	0.84	0.62
Select parameters			
Equilibrium recruitment (R_0, 1000s age-0)	178	228	331
Steepness (*h*)	0.383	0.441	0.508
Male *M*	0.046	0.045	0.044
Management quantities			
Equilibrium spawning output (SB_0, millions eggs)	770	1028	1,545
2009 Spawning depletion	18.9%	21.3%	24.0%
2009 age-8+ biomass (mt)	1,439	2,186	3,723
2008 *SPR*	73.80%	81.0%	87.9%
MSY (mt)	27.4	58.9	110.8

Table 20. Comparison of summary quantities among the 2009 and 2011 base-case models.

Model	2009 Base Case	2011 Base Case
Convergence		
Maximum gradient component	0.0000018	0.0000006
Negative log-likelihoods		
Total	6,102.50	6,695.62
Indices	-28.3	-26.8
Length-frequency data	2,503.80	2,686.12
Age-frequency data	3,626.10	4,035.46
Priors	0.9	0.8
Select parameters		
Equilibrium recruitment (R0, 1000s age-0)	227	228
Steepness (h)	0.417	0.441
Male M	0.047	0.045
Management quantities		
Equilibrium spawning output (SB0, millions eggs)	994	1028
2009 Spawning depletion	20.3%	21.3%
2009 age-8+ biomass (mt)	2,008	2,186
2008 SPR	79.30%	81.0%
MSY (mt)	56.1	58.9

Table 21. Time-series of population estimates from the base-case model.

Year	Age-8+ biomass (mt)	Spawning output (millions eggs)	Spawning depletion	Age-0 recruits (1000s)	Total catch (mt)	SPR	Relative exploitation rate
1916	8883	1028	100.0%	228	3.9	98.4%	0.0%
1917	8879	1027	100.0%	228	5.4	97.8%	0.1%
1918	8874	1027	99.9%	228	6.1	97.5%	0.1%
1919	8868	1026	99.8%	228	4.1	98.3%	0.0%
1920	8864	1025	99.8%	228	4.4	98.2%	0.0%
1921	8860	1025	99.7%	228	4.4	98.2%	0.1%
1922	8856	1024	99.7%	228	4.3	98.3%	0.0%
1923	8853	1024	99.6%	228	4.5	98.2%	0.1%
1924	8849	1023	99.6%	228	5.2	97.9%	0.1%
1925	8844	1023	99.5%	228	7.4	97.1%	0.1%
1926	8838	1022	99.5%	228	8.5	96.6%	0.1%
1927	8831	1021	99.4%	228	9.6	96.2%	0.1%
1928	8822	1020	99.3%	228	11.0	95.7%	0.1%
1929	8813	1019	99.1%	228	14.9	94.2%	0.2%
1930	8800	1017	99.0%	227	15.6	93.9%	0.2%
1931	8786	1016	98.8%	227	13.6	94.6%	0.2%
1932	8775	1014	98.7%	227	13.3	94.8%	0.2%
1933	8764	1013	98.6%	227	11.1	95.6%	0.1%
1934	8755	1012	98.4%	227	13.4	94.7%	0.2%
1935	8745	1010	98.3%	227	16.0	93.8%	0.2%
1936	8732	1009	98.2%	227	20.4	92.0%	0.2%
1937	8715	1007	98.0%	227	20.3	92.1%	0.2%
1938	8699	1005	97.8%	227	20.2	92.1%	0.2%
1939	8683	1003	97.6%	226	16.1	93.6%	0.2%
1940	8671	1001	97.4%	226	23.6	90.8%	0.3%
1941	8652	999	97.2%	226	28.6	89.1%	0.3%
1942	8629	996	96.9%	226	35.0	87.1%	0.4%
1943	8600	992	96.5%	226	80.2	76.1%	0.9%
1944	8527	983	95.7%	225	80.7	73.6%	0.9%
1945	8455	974	94.8%	224	130.4	62.5%	1.5%
1946	8337	960	93.4%	223	110.0	66.4%	1.3%
1947	8240	948	92.2%	222	47.8	82.0%	0.6%
1948	8205	943	91.8%	222	55.2	79.7%	0.7%
1949	8164	938	91.3%	221	39.9	84.4%	0.5%
1950	8139	934	90.9%	221	42.8	83.3%	0.5%
1951	8112	931	90.6%	221	51.0	80.9%	0.6%
1952	8078	926	90.1%	221	46.0	82.3%	0.6%
1953	8049	922	89.8%	220	38.1	84.9%	0.5%
1954	8028	920	89.5%	220	45.8	82.3%	0.6%
1955	8000	916	89.1%	220	55.3	78.8%	0.7%
1956	7963	911	88.7%	219	65.1	75.7%	0.8%

Table 21. continued. Time-series of population estimates from the base-case model.

Year	Age-8+ biomass (mt)	Spawning output (millions eggs)	Spawning depletion	Age-0 recruits (1000s)	Total catch (mt)	SPR	Relative exploitation rate
1957	7917	906	88.1%	219	73.5	73.1%	0.9%
1958	7864	899	87.5%	218	78.6	71.9%	1.0%
1959	7807	892	86.8%	218	72.5	73.1%	0.9%
1960	7756	886	86.2%	217	67.8	74.3%	0.9%
1961	7711	880	85.6%	217	59.3	76.9%	0.8%
1962	7675	875	85.2%	216	67.8	74.2%	0.9%
1963	7632	870	84.6%	216	57.4	77.4%	0.8%
1964	7600	866	84.2%	215	45.8	81.3%	0.6%
1965	7579	863	84.0%	215	126.8	60.1%	1.7%
1966	7481	851	82.8%	214	64.2	75.4%	0.9%
1967	7444	846	82.3%	214	72.0	72.4%	1.0%
1968	7401	841	81.8%	213	74.9	71.9%	1.0%
1969	7355	835	81.2%	213	142.7	55.0%	1.9%
1970	7245	821	79.9%	211	105.0	65.4%	1.4%
1971	7172	813	79.1%	211	134.2	57.9%	1.9%
1972	7073	800	77.9%	209	165.7	53.6%	2.3%
1973	6944	785	76.4%	208	160.1	55.5%	2.3%
1974	6823	770	74.9%	206	178.8	51.8%	2.6%
1975	6685	753	73.3%	205	168.8	55.7%	2.5%
1976	6559	738	71.8%	203	195.4	47.7%	3.0%
1977	6410	719	70.0%	201	200.9	45.1%	3.1%
1978	6257	701	68.2%	199	323.5	33.3%	5.2%
1979	5988	668	65.0%	195	323.0	27.3%	5.4%
1980	5722	636	61.9%	191	267.4	29.2%	4.7%
1981	5514	611	59.4%	188	368.4	24.0%	6.7%
1982	5212	574	55.9%	182	463.4	17.6%	8.9%
1983	4822	528	51.4%	175	331.3	21.0%	6.9%
1984	4563	496	48.3%	170	276.8	22.4%	6.1%
1985	4362	471	45.9%	166	329.1	17.7%	7.5%
1986	4114	441	42.9%	160	219.1	25.8%	5.3%
1987	3975	424	41.2%	157	251.3	21.4%	6.3%
1988	3806	403	39.2%	153	279.5	18.6%	7.3%
1989	3612	380	36.9%	148	346.9	13.6%	9.6%
1990	3354	349	33.9%	141	237.4	20.4%	7.1%
1991	3203	331	32.2%	137	368.0	11.6%	11.5%
1992	2927	299	29.1%	129	372.8	9.4%	12.7%
1993	2647	267	26.0%	120	318.7	11.9%	12.0%
1994	2418	240	23.4%	112	223.4	13.7%	9.2%
1995	2284	224	21.8%	107	254.6	12.2%	11.1%
1996	2120	205	19.9%	100	217.7	12.2%	10.3%
1997	1992	190	18.5%	95	244.1	9.7%	12.3%

Table 21. continued. Time-series of population estimates from the base-case model.

Year	Age-8+ biomass (mt)	Spawning output (millions eggs)	Spawning depletion	Age-0 recruits (1000s)	Total catch (mt)	SPR	Relative exploitation rate
1998	1837	173	16.9%	89	107.0	23.5%	5.8%
1999	1812	170	16.5%	88	155.8	17.3%	8.6%
2000	1739	161	15.7%	84	40.9	53.7%	2.3%
2001	1772	164	16.0%	86	56.1	53.9%	3.2%
2002	1789	166	16.1%	86	13.3	78.7%	0.7%
2003	1844	172	16.7%	89	12.0	79.4%	0.6%
2004	1898	179	17.4%	91	13.9	78.6%	0.7%
2005	1948	185	18.0%	93	16.3	76.5%	0.8%
2006	1991	191	18.6%	95	13.8	77.5%	0.7%
2007	2035	197	19.2%	98	23.0	67.5%	1.1%
2008	2067	202	19.7%	99	13.7	79.9%	0.7%
2009	2107	208	20.2%	101	10.9	83.2%	0.5%
2010	2148	214	20.8%	103	11.4	83.5%	0.5%
2011	2188	219	21.3%	105	NA	NA	NA

Table 22. Time-series of population estimates from the low state of nature.

Year	Age-8+ biomass (mt)	Spawning output (millions eggs)	*Spawning depletion*	Age-0 recruits (1000s)	Total catch (mt)	SPR	Relative exploitation rate
1916	6,700	770	*100.0%*	178	2.9	98.5%	0.0%
1917	6,697	770	*100.0%*	178	4.1	97.9%	0.1%
1918	6,693	769	*99.9%*	178	4.6	97.6%	0.1%
1919	6,689	769	*99.8%*	178	3.1	98.4%	0.0%
1920	6,686	768	*99.8%*	178	3.3	98.2%	0.0%
1921	6,683	768	*99.7%*	178	3.3	98.2%	0.0%
1922	6,680	767	*99.7%*	178	3.2	98.3%	0.0%
1923	6,677	767	*99.6%*	178	3.4	98.2%	0.1%
1924	6,674	767	*99.6%*	178	3.9	97.9%	0.1%
1925	6,671	766	*99.5%*	178	5.5	97.1%	0.1%
1926	6,666	766	*99.5%*	178	6.3	96.7%	0.1%
1927	6,661	765	*99.4%*	178	7.2	96.3%	0.1%
1928	6,654	764	*99.3%*	178	8.2	95.8%	0.1%
1929	6,647	763	*99.2%*	178	11.1	94.3%	0.2%
1930	6,637	762	*99.0%*	178	11.7	94.0%	0.2%
1931	6,627	761	*98.8%*	178	10.2	94.7%	0.2%
1932	6,619	760	*98.7%*	178	10.0	94.9%	0.2%
1933	6,611	759	*98.6%*	177	8.3	95.6%	0.1%
1934	6,604	758	*98.5%*	177	10.1	94.8%	0.2%
1935	6,596	757	*98.3%*	177	12.0	93.9%	0.2%
1936	6,587	756	*98.2%*	177	15.3	92.2%	0.2%
1937	6,574	754	*98.0%*	177	15.2	92.2%	0.2%
1938	6,562	753	*97.8%*	177	15.1	92.2%	0.2%
1939	6,549	751	*97.6%*	177	12.0	93.8%	0.2%
1940	6,541	750	*97.4%*	177	17.7	91.0%	0.3%
1941	6,526	748	*97.2%*	176	21.4	89.3%	0.3%
1942	6,509	746	*96.9%*	176	26.3	87.3%	0.4%
1943	6,487	743	*96.6%*	176	60.2	76.5%	0.9%
1944	6,432	737	*95.7%*	175	60.5	74.0%	0.9%
1945	6,379	730	*94.8%*	175	97.8	63.0%	1.5%
1946	6,289	719	*93.4%*	174	82.5	66.9%	1.3%
1947	6,217	710	*92.3%*	173	35.9	82.3%	0.6%
1948	6,191	707	*91.8%*	172	41.4	80.1%	0.7%
1949	6,160	703	*91.3%*	172	29.9	84.6%	0.5%
1950	6,141	700	*91.0%*	172	32.1	83.6%	0.5%
1951	6,120	698	*90.6%*	171	38.3	81.3%	0.6%
1952	6,094	694	*90.2%*	171	34.5	82.6%	0.6%
1953	6,072	691	*89.8%*	171	28.5	85.2%	0.5%
1954	6,056	689	*89.5%*	170	34.3	82.6%	0.6%
1955	6,035	687	*89.2%*	170	41.5	79.1%	0.7%
1956	6,006	683	*88.7%*	170	48.8	76.1%	0.8%

Table 22. continued. Time-series of population estimates from the low state of nature.

Year	Age-8+ biomass (mt)	Spawning output (millions eggs)	Spawning depletion	Age-0 recruits (1000s)	Total catch (mt)	SPR	Relative exploitation rate
1957	5,971	679	88.2%	169	55.2	73.6%	0.9%
1958	5,931	674	87.5%	169	59.0	72.3%	1.0%
1959	5,887	669	86.8%	168	54.4	73.5%	0.9%
1960	5,849	664	86.2%	168	50.8	74.7%	0.9%
1961	5,814	660	85.7%	167	44.4	77.3%	0.8%
1962	5,786	656	85.2%	167	50.8	74.6%	0.9%
1963	5,753	652	84.7%	166	43.1	77.8%	0.7%
1964	5,728	649	84.3%	166	34.3	81.6%	0.6%
1965	5,711	647	84.0%	166	95.1	60.6%	1.7%
1966	5,636	637	82.8%	165	48.1	75.8%	0.9%
1967	5,608	634	82.3%	164	54.0	72.8%	1.0%
1968	5,574	630	81.8%	164	56.2	72.3%	1.0%
1969	5,538	625	81.2%	163	107.0	55.5%	1.9%
1970	5,454	615	79.9%	162	78.8	65.9%	1.4%
1971	5,399	608	79.0%	161	100.6	58.4%	1.9%
1972	5,323	599	77.8%	160	124.3	54.0%	2.3%
1973	5,225	587	76.3%	159	120.1	55.9%	2.3%
1974	5,132	576	74.8%	157	134.1	52.2%	2.6%
1975	5,028	564	73.2%	156	126.6	56.1%	2.5%
1976	4,932	552	71.7%	154	146.5	48.1%	3.0%
1977	4,818	538	69.9%	152	150.7	45.5%	3.1%
1978	4,702	524	68.1%	150	242.6	33.6%	5.2%
1979	4,498	500	64.9%	147	242.3	27.7%	5.4%
1980	4,298	476	61.8%	143	200.6	29.6%	4.7%
1981	4,140	457	59.3%	140	276.3	24.4%	6.7%
1982	3,911	429	55.8%	135	347.5	18.0%	8.9%
1983	3,617	394	51.2%	129	248.5	21.4%	6.9%
1984	3,421	371	48.1%	124	207.6	22.7%	6.1%
1985	3,268	352	45.7%	121	246.8	18.0%	7.6%
1986	3,080	329	42.8%	116	164.3	26.1%	5.3%
1987	2,973	316	41.1%	113	188.4	21.7%	6.3%
1988	2,844	300	39.0%	110	209.6	18.8%	7.4%
1989	2,695	283	36.7%	105	260.2	13.7%	9.7%
1990	2,498	259	33.7%	100	178.0	20.5%	7.1%
1991	2,381	246	31.9%	96	276.0	11.7%	11.6%
1992	2,170	222	28.8%	89	279.6	9.4%	12.9%
1993	1,955	197	25.6%	82	239.0	11.8%	12.2%
1994	1,780	177	23.0%	76	167.6	13.7%	9.4%
1995	1,674	165	21.4%	72	191.0	12.1%	11.4%
1996	1,546	150	19.5%	67	163.2	12.0%	10.6%
1997	1,445	139	18.0%	63	183.1	9.5%	12.7%

Table 22. continued. Time-series of population estimates from the low state of nature.

Year	Age-8+ biomass (mt)	Spawning output (millions eggs)	Spawning depletion	Age-0 recruits (1000s)	Total catch (mt)	SPR	Relative exploitation rate
1998	1,323	125	16.3%	58	80.2	22.7%	6.1%
1999	1,298	122	15.9%	57	116.9	16.5%	9.0%
2000	1,237	115	15.0%	54	40.9	44.2%	3.3%
2001	1,246	116	15.1%	55	56.1	44.7%	4.5%
2002	1,239	115	15.0%	54	13.3	72.0%	1.1%
2003	1,270	119	15.5%	56	12.0	72.6%	0.9%
2004	1,301	123	16.0%	57	13.9	71.5%	1.1%
2005	1,328	127	16.4%	59	16.3	69.0%	1.2%
2006	1,349	130	16.9%	60	13.8	69.8%	1.0%
2007	1,372	133	17.3%	61	23.0	58.3%	1.7%
2008	1,383	136	17.7%	62	13.7	72.7%	1.0%
2009	1,402	139	18.1%	63	10.9	76.6%	0.8%
2010	1,422	142	18.5%	64	11.4	77.1%	0.8%
2011	1,441	146	18.9%	65	NA	NA	NA

Table 23. Time-series of population estimates from the high state of nature.

Year	Age-8+ biomass (mt)	Spawning output (millions eggs)	Spawning depletion	Age-0 recruits (1000s)	Total catch (mt)	SPR	Relative exploitation rate
1916	13,274	1,545	100.0%	331	5.9	98.4%	0.0%
1917	13,268	1,544	100.0%	331	8.1	97.8%	0.1%
1918	13,260	1,543	99.9%	331	9.2	97.5%	0.1%
1919	13,252	1,542	99.8%	331	6.2	98.3%	0.0%
1920	13,246	1,542	99.8%	331	6.6	98.2%	0.1%
1921	13,240	1,541	99.7%	331	6.7	98.2%	0.1%
1922	13,234	1,540	99.7%	330	6.4	98.2%	0.0%
1923	13,229	1,539	99.6%	330	6.8	98.1%	0.1%
1924	13,223	1,539	99.6%	330	7.8	97.9%	0.1%
1925	13,216	1,538	99.5%	330	11.0	97.0%	0.1%
1926	13,207	1,537	99.5%	330	12.7	96.6%	0.1%
1927	13,196	1,535	99.4%	330	14.4	96.1%	0.1%
1928	13,183	1,534	99.3%	330	16.5	95.6%	0.1%
1929	13,169	1,532	99.1%	330	22.3	94.1%	0.2%
1930	13,149	1,529	99.0%	330	23.4	93.8%	0.2%
1931	13,129	1,527	98.8%	330	20.4	94.5%	0.2%
1932	13,112	1,525	98.7%	330	19.9	94.7%	0.2%
1933	13,096	1,523	98.5%	330	16.7	95.5%	0.1%
1934	13,083	1,521	98.4%	329	20.1	94.6%	0.2%
1935	13,067	1,519	98.3%	329	23.9	93.7%	0.2%
1936	13,048	1,516	98.1%	329	30.6	91.9%	0.2%
1937	13,023	1,513	97.9%	329	30.4	91.9%	0.2%
1938	12,998	1,510	97.7%	329	30.2	92.0%	0.2%
1939	12,974	1,507	97.5%	329	24.1	93.5%	0.2%
1940	12,957	1,505	97.4%	329	35.4	90.7%	0.3%
1941	12,929	1,501	97.2%	328	42.9	88.9%	0.3%
1942	12,894	1,497	96.9%	328	52.5	86.9%	0.4%
1943	12,850	1,491	96.5%	328	120.4	75.8%	0.9%
1944	12,742	1,478	95.7%	327	121.0	73.3%	0.9%
1945	12,634	1,464	94.8%	326	195.7	62.0%	1.5%
1946	12,456	1,443	93.4%	325	165.0	66.0%	1.3%
1947	12,311	1,424	92.2%	324	71.7	81.8%	0.6%
1948	12,259	1,418	91.7%	324	82.7	79.4%	0.7%
1949	12,198	1,409	91.2%	323	59.9	84.1%	0.5%
1950	12,161	1,404	90.9%	323	64.2	83.1%	0.5%
1951	12,120	1,399	90.5%	323	76.5	80.7%	0.6%
1952	12,069	1,392	90.1%	322	69.0	82.1%	0.6%
1953	12,026	1,386	89.7%	322	57.1	84.7%	0.5%
1954	11,996	1,382	89.5%	322	68.6	82.0%	0.6%
1955	11,954	1,377	89.1%	321	82.9	78.5%	0.7%
1956	11,900	1,370	88.6%	321	97.7	75.4%	0.8%

Table 23. continued. Time-series of population estimates from the high state of nature.

Year	Age-8+ biomass (mt)	Spawning output (millions eggs)	Spawning depletion	Age-0 recruits (1000s)	Total catch (mt)	SPR	Relative exploitation rate
1957	11,832	1,361	88.1%	320	110.3	72.8%	0.9%
1958	11,754	1,351	87.5%	320	117.9	71.5%	1.0%
1959	11,669	1,341	86.8%	319	108.8	72.8%	0.9%
1960	11,595	1,331	86.2%	318	101.6	74.0%	0.9%
1961	11,529	1,323	85.6%	318	88.9	76.7%	0.8%
1962	11,477	1,316	85.2%	317	101.7	73.9%	0.9%
1963	11,414	1,308	84.6%	317	86.2	77.1%	0.8%
1964	11,367	1,301	84.2%	316	68.7	81.1%	0.6%
1965	11,338	1,297	84.0%	316	190.1	59.7%	1.7%
1966	11,192	1,279	82.8%	315	96.3	75.2%	0.9%
1967	11,139	1,272	82.4%	314	108.0	72.1%	1.0%
1968	11,076	1,264	81.8%	314	112.3	71.6%	1.0%
1969	11,010	1,256	81.3%	313	214.1	54.6%	1.9%
1970	10,846	1,236	80.0%	312	157.5	65.1%	1.5%
1971	10,740	1,223	79.1%	311	201.2	57.5%	1.9%
1972	10,593	1,204	78.0%	310	248.6	53.2%	2.3%
1973	10,403	1,181	76.4%	308	240.2	55.2%	2.3%
1974	10,224	1,159	75.0%	306	268.2	51.5%	2.6%
1975	10,020	1,134	73.4%	304	253.1	55.5%	2.5%
1976	9,834	1,111	71.9%	302	293.1	47.4%	3.0%
1977	9,612	1,084	70.1%	300	301.4	44.9%	3.1%
1978	9,386	1,056	68.3%	297	485.2	33.0%	5.2%
1979	8,985	1,007	65.2%	293	484.5	27.1%	5.4%
1980	8,590	959	62.1%	288	401.2	29.0%	4.7%
1981	8,281	921	59.6%	284	552.6	23.7%	6.7%
1982	7,831	866	56.1%	278	695.1	17.4%	8.9%
1983	7,249	796	51.6%	269	497.0	20.8%	6.9%
1984	6,865	749	48.5%	263	415.2	22.2%	6.0%
1985	6,567	712	46.1%	258	493.6	17.6%	7.5%
1986	6,199	667	43.2%	251	328.6	25.6%	5.3%
1987	5,995	641	41.5%	247	376.9	21.3%	6.3%
1988	5,747	610	39.5%	241	419.3	18.5%	7.3%
1989	5,462	575	37.2%	235	520.4	13.6%	9.5%
1990	5,081	529	34.2%	226	356.1	20.4%	7.0%
1991	4,862	502	32.5%	220	552.0	11.6%	11.4%
1992	4,456	455	29.5%	209	559.3	9.4%	12.6%
1993	4,044	407	26.4%	197	478.1	12.0%	11.8%
1994	3,711	368	23.8%	186	335.2	13.9%	9.0%
1995	3,519	344	22.3%	179	381.9	12.5%	10.9%
1996	3,283	316	20.5%	170	326.5	12.4%	9.9%
1997	3,103	295	19.1%	163	366.2	10.0%	11.8%

Table 23. continued. Time-series of population estimates from the high state of nature.

Year	Age-8+ biomass (mt)	Spawning output (millions eggs)	Spawning depletion	Age-0 recruits (1000s)	Total catch (mt)	SPR	Relative exploitation rate
1998	2,882	270	17.5%	154	160.4	24.3%	5.6%
1999	2,856	266	17.2%	153	233.7	18.2%	8.2%
2000	2,760	254	16.4%	148	40.9	65.4%	1.5%
2001	2,843	262	17.0%	151	56.1	65.2%	2.0%
2002	2,910	269	17.4%	154	13.3	85.6%	0.5%
2003	3,015	280	18.1%	158	12.0	86.3%	0.4%
2004	3,117	292	18.9%	162	13.9	85.7%	0.4%
2005	3,215	303	19.6%	166	16.3	84.2%	0.5%
2006	3,304	315	20.4%	170	13.8	85.2%	0.4%
2007	3,394	326	21.1%	174	23.0	77.7%	0.7%
2008	3,471	337	21.8%	177	13.7	87.0%	0.4%
2009	3,555	348	22.5%	181	10.9	89.3%	0.3%
2010	3,640	360	23.3%	184	11.4	89.5%	0.3%
2011	3,725	371	24.0%	187	NA	NA	NA

Table 24. Projection of yelloweye rockfish under ACL values calculated from a 76% SPR rate. Total catch in 2011 and 2012 is set equal to the NMFS preferred alternative ACL (17 mt), allocated between fleets according to the average catch over the years 2007-2009. The target exploitation rate for 2013 and beyond is based upon an SPR of 76%, which is the NMFS preferred alternative. This SPR-based forecast catch is allocated between fleets according to the average fishing mortality rate for the years 2007-2009 (which allows the forecast catch to respond to different trends in the biomass available to each fleet). OFL values are based on a 50% SPR rate.

					Spawning output (million eggs)			
Year	OFL (mt) [1]	ACL (mt) [1]	Coast-wide Age 8+ biomass (mt)	Coast-wide Depletion	Coast-wide	California	Oregon	Washington
2011	47.8	17.0	2,188	21.4%	219.5	78.7	108.3	32.6
2012	48.0	17.0	2,222	21.8%	224.4	81.2	110.3	32.9
2013	51.2	17.7	2,255	22.3%	229.1	83.7	112.3	33.2
2014	51.2	18.0	2,288	22.7%	233.5	86.0	114.1	33.4
2015	51.2	18.3	2,320	23.1%	237.8	88.3	115.9	33.6
2016	51.1	18.6	2,351	23.5%	241.9	90.4	117.6	33.8
2017	51.1	18.8	2,382	23.9%	245.8	92.5	119.3	34.0
2018	51.0	19.1	2,413	24.3%	249.6	94.5	120.9	34.2
2019	50.9	19.3	2,444	24.6%	253.3	96.5	122.4	34.4
2020	50.9	19.6	2,475	25.0%	256.9	98.5	124.0	34.5
2021	50.8	19.8	2,506	25.3%	260.5	100.4	125.5	34.6
2022	50.7	20.0	2,536	25.7%	264.0	102.2	127.0	34.8

[1]OFL and ACL values were called ABC and OY prior to 2010. These values for 2011 and 2012 have already been adopted, and are not based on the results of this assessment.

Table 25. Decision table of 12-year projections for alternate states of nature (columns) and management options (rows) beginning in 2011. Relative probabilities are based on the joint distribution of alternate historical catch levels and steepness values.

			State of nature					
			75% of catch < 2000 and steepness = 0.383		Base case 100% of catch < 2000 and steepness = 0.441		150% of catch < 2000 and steepness = 0.508	
Relative probability			0.0625		0.25		0.0625	
Management decision	Year	Catch (mt)	Depletion	Spawning output (millions eggs)	Depletion	Spawning output (millions eggs)	Depletion	Spawning output (millions eggs)
Forecast catch calculated from 76% SPR applied to low alternative model.	2013	11.7	19.5%	150	22.3%	229	25.3%	391
	2014	11.9	19.8%	153	22.8%	234	26.0%	402
	2015	12.0	20.1%	155	23.3%	239	26.6%	412
	2016	12.2	20.4%	157	23.7%	244	27.3%	422
	2017	12.3	20.7%	160	24.2%	248	27.9%	432
	2018	12.4	21.0%	162	24.6%	253	28.6%	441
	2019	12.6	21.3%	164	25.0%	257	29.2%	451
	2020	12.7	21.5%	166	25.5%	262	29.8%	460
	2021	12.8	21.8%	167	25.9%	266	30.4%	470
	2022	12.9	22.0%	169	26.3%	270	31.0%	479
Forecast catch calculated from 76% SPR applied to base-case model.	2013	17.7	19.5%	150	22.3%	229	25.3%	391
	2014	18.0	19.7%	152	22.7%	234	26.0%	401
	2015	18.3	20.0%	154	23.1%	238	26.6%	410
	2016	18.6	20.2%	155	23.5%	242	27.2%	420
	2017	18.8	20.4%	157	23.9%	246	27.8%	429
	2018	19.1	20.6%	158	24.3%	250	28.3%	438
	2019	19.3	20.7%	160	24.6%	253	28.9%	447
	2020	19.6	20.9%	161	25.0%	257	29.5%	456
	2021	19.8	21.0%	162	25.3%	260	30.1%	464
	2022	20.0	21.2%	163	25.7%	264	30.6%	473
Forecast catch calculated from 76% SPR applied to high alternative model.	2013	30.2	19.5%	150	22.3%	229	25.3%	391
	2014	30.7	19.6%	151	22.6%	232	25.9%	400
	2015	31.3	19.6%	151	22.9%	235	26.4%	408
	2016	31.8	19.7%	151	23.1%	238	26.9%	416
	2017	32.3	19.7%	151	23.4%	240	27.4%	423
	2018	32.8	19.7%	151	23.6%	243	27.9%	431
	2019	33.3	19.6%	151	23.8%	245	28.4%	438
	2020	33.8	19.6%	151	24.0%	247	28.8%	446
	2021	34.3	19.5%	150	24.2%	249	29.3%	453
	2022	34.7	19.5%	150	24.4%	251	29.8%	460

11. Figures

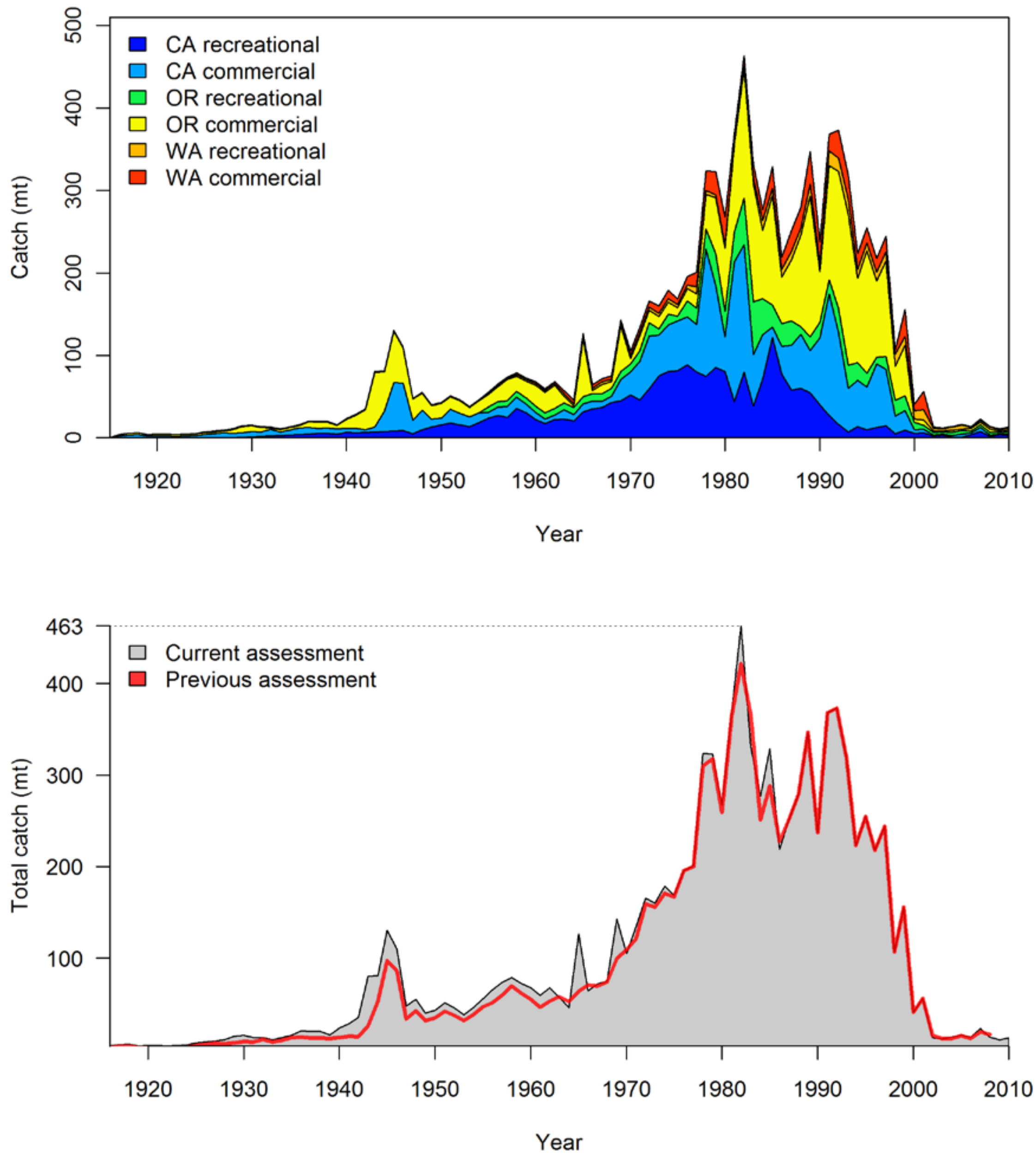


Figure 1. Yelloweye rockfish estimated catch history, 1916-2010 by sector (upper plot) and comparison with previous assessment showing the effect of the Oregon historical catch reconstruction for the years 1916-1986.

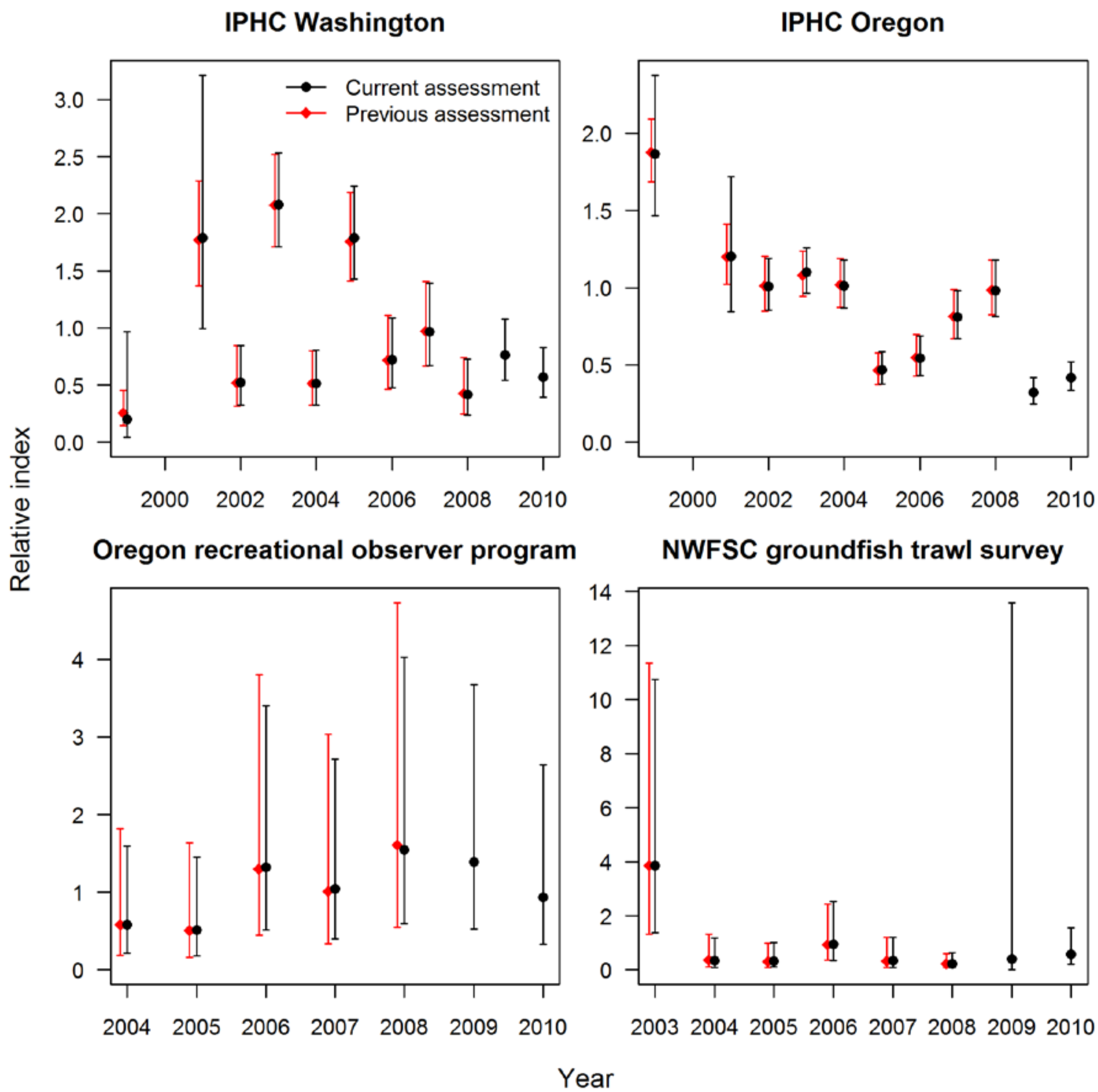
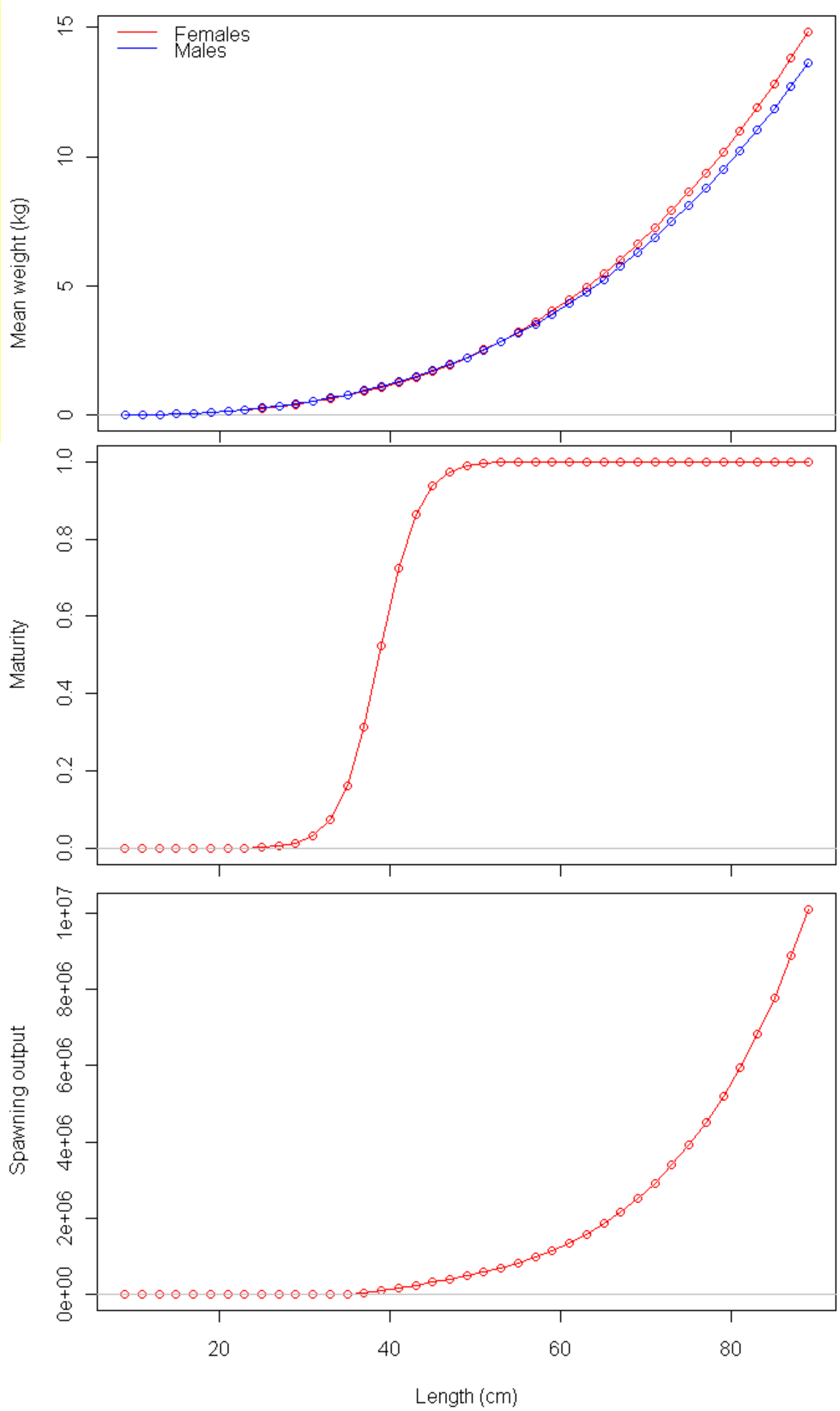


Figure 2. Comparison of indices of abundance that were extended with additional data (black) with those used in the 2009 assessment (red). For comparison, indices are standardized to have mean = 1 over the overlapping years. Increase in uncertainty of the 1999 and 2001 IPHC values is due to a new accounting for sampling only the first 20 out of every 100 hooks prior to 2002. Note that the years have been offset slightly to allow each point to be visible.



Females
Males
Mean weight (kg)
0
5
10
15
Maturity
0.0
0.2
0.4
0.6
0.8
1.0
Spawning output
0e+00
2e+06
4e+06
6e+06
8e+06
1e+07
20
40
60
80
Length (cm)

Figure 3. W-L relationship for male and female yelloweye (upper panel), female maturity curve (middle panel), and female spawning output at length (lower panel) illustrating the product of the female W-L, fecundity and maturity relationships.

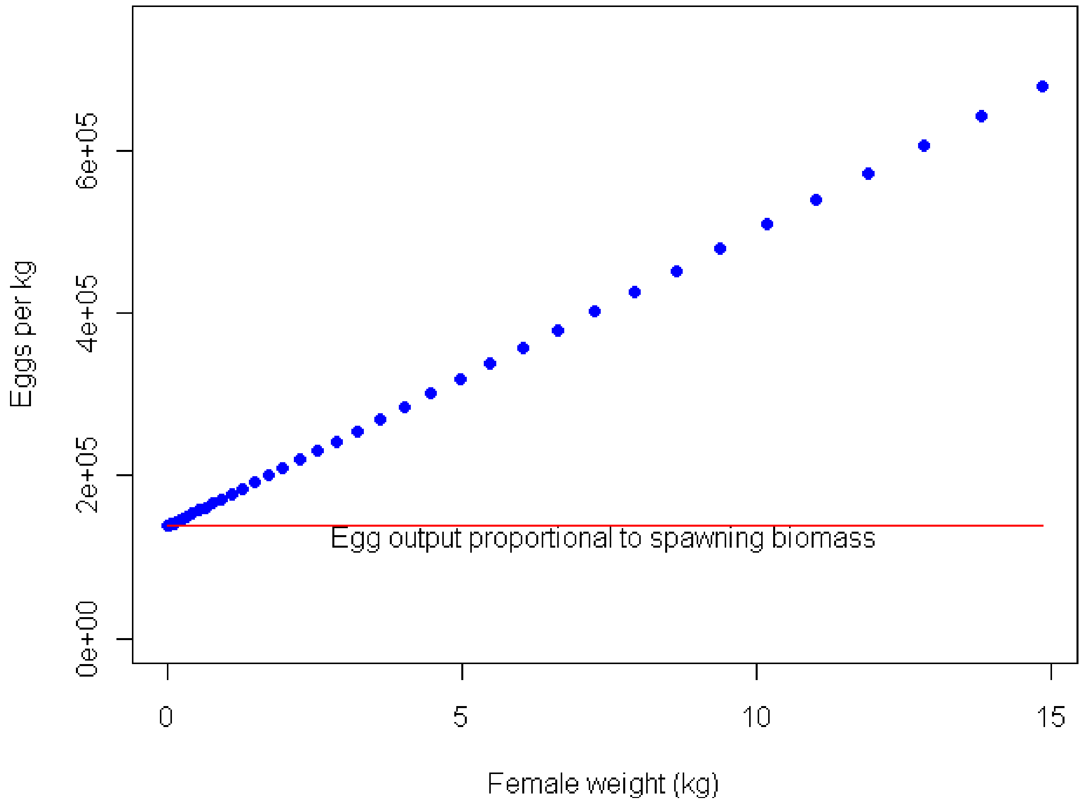


Figure 4. Female yelloweye fecundity relationship (Filled circles, From Dick, 2009). Horizontal line indicates no fecundity relationship (for comparison).

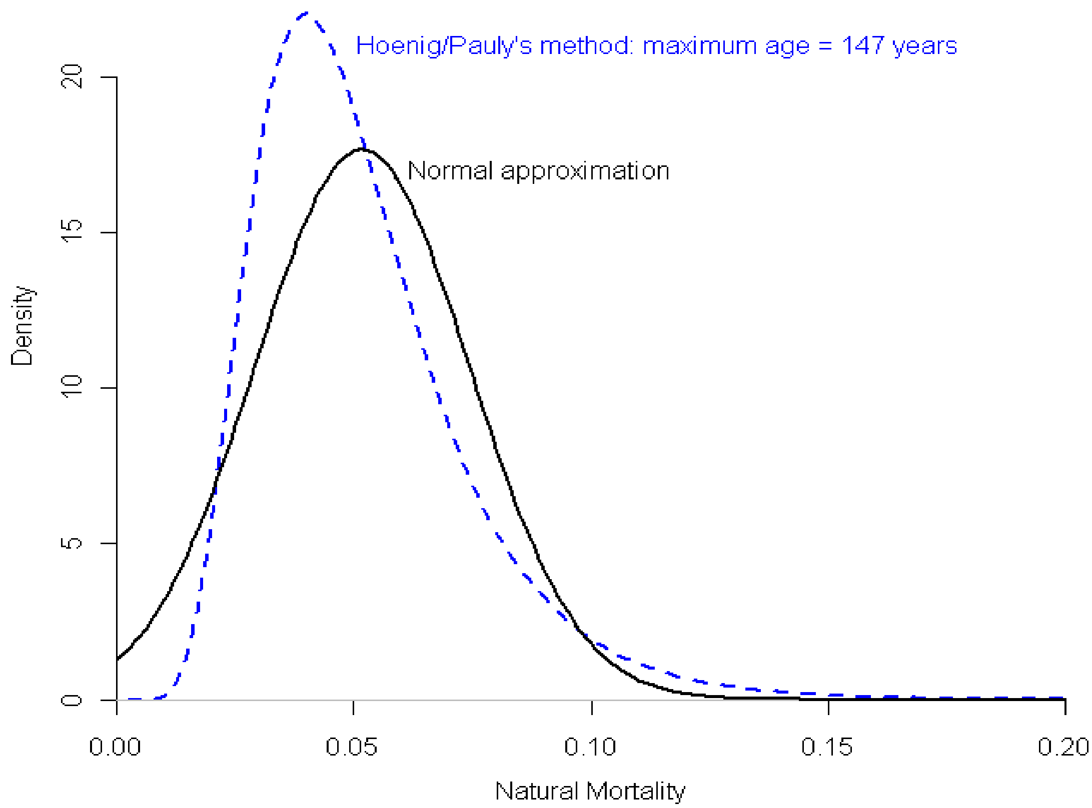


Figure 5. Prior for natural mortality (normal approximation) used in the base-case model, with original log-normal distribution for comparison.

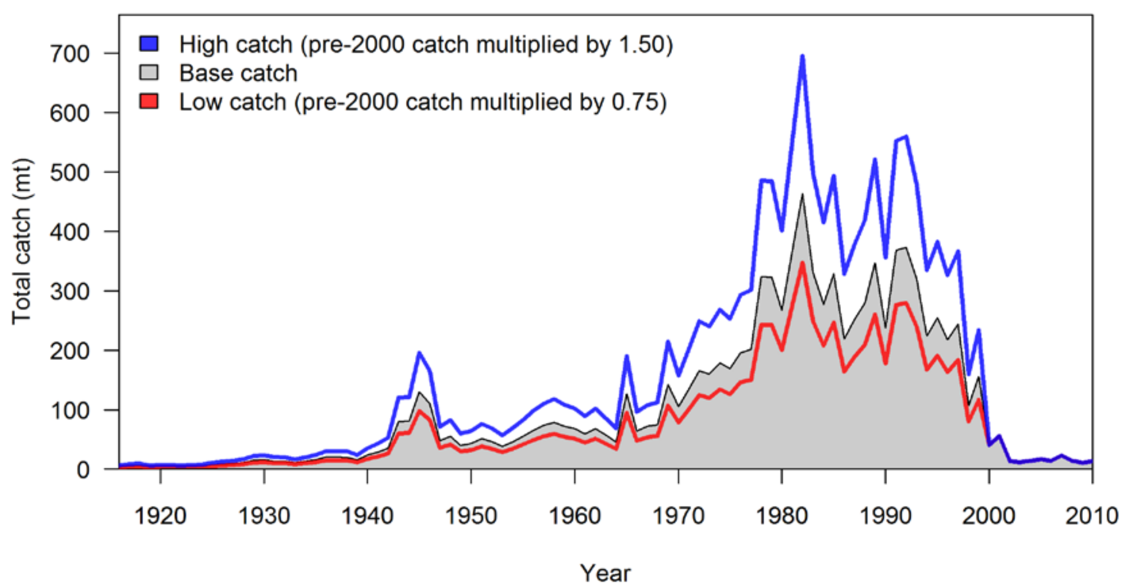


Figure 6. Catch series for the alternate states of nature.

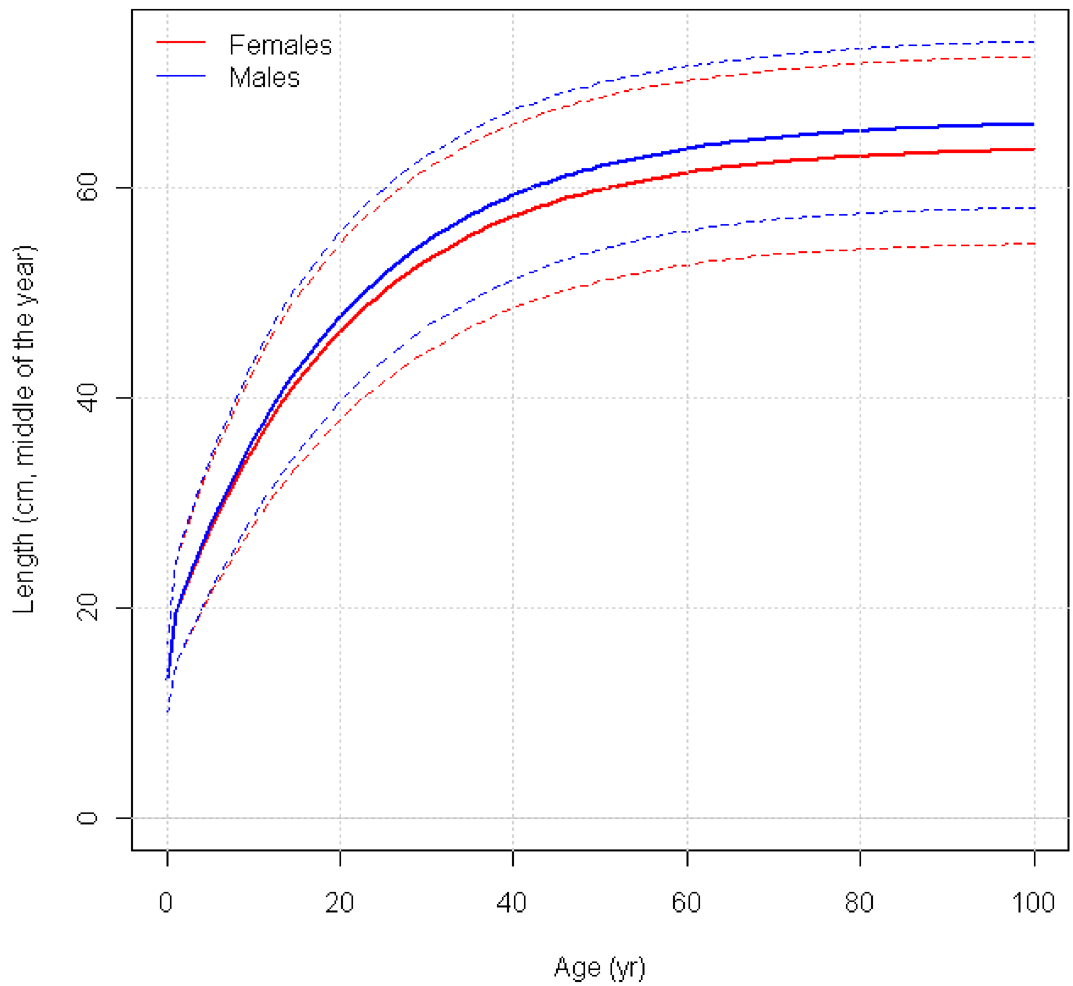


Figure 7. Growth curve for males (upper solid line) and females (lower solid line) with ~95% interval (dashed lines) indicating the expectation and individual variability of length-at-age for the base-case model.

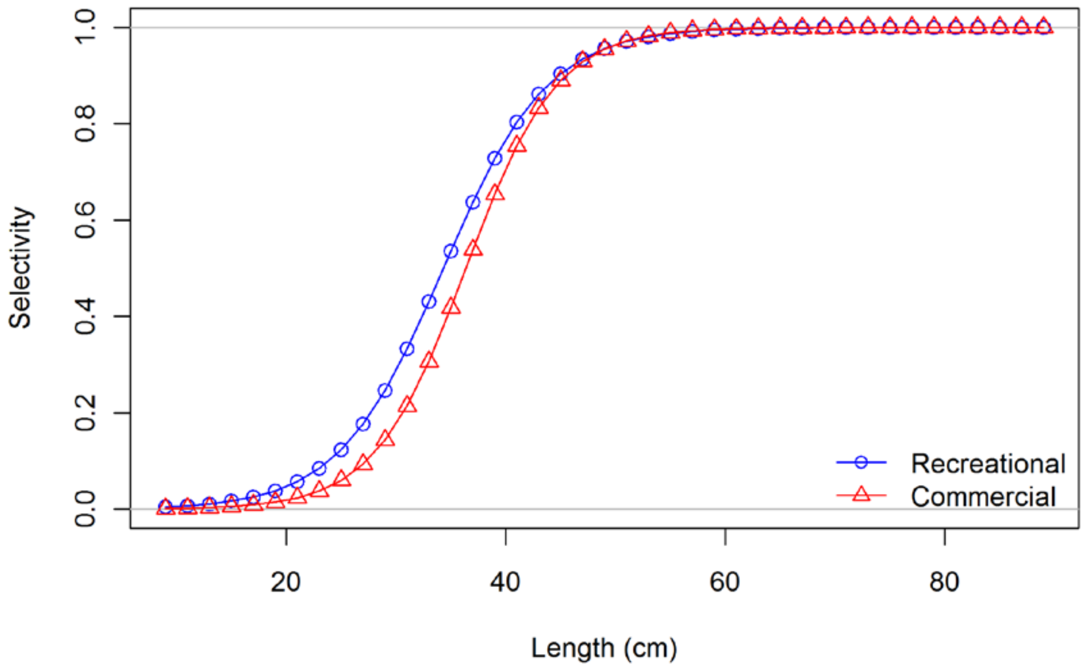


Figure 8. Estimated selectivity for the California fisheries.

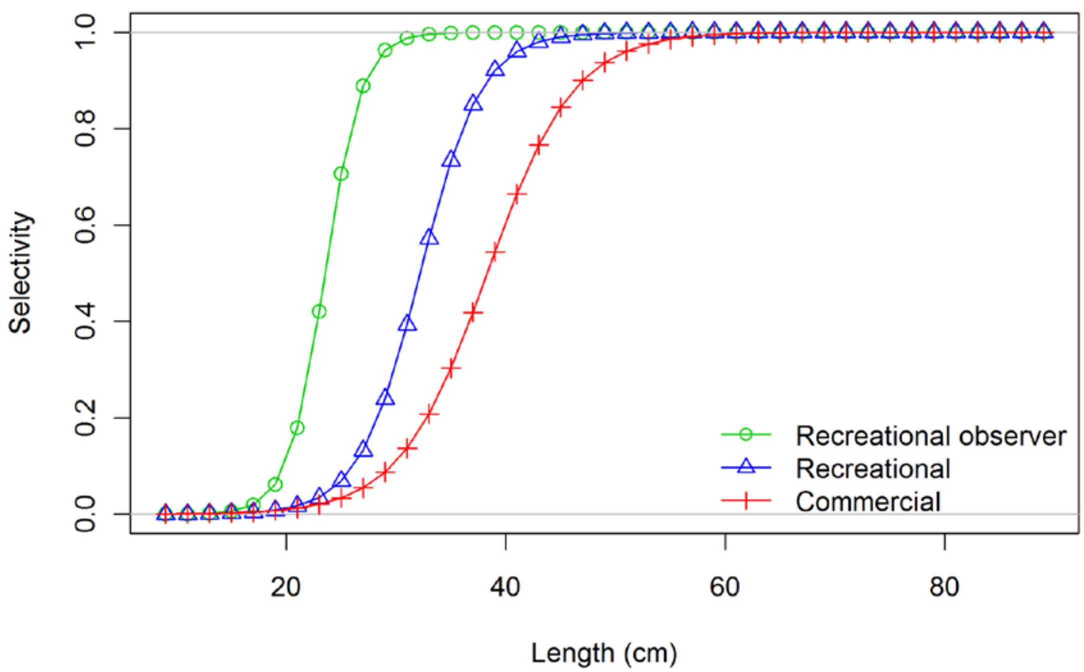


Figure 9. Estimated selectivity for Oregon fisheries.

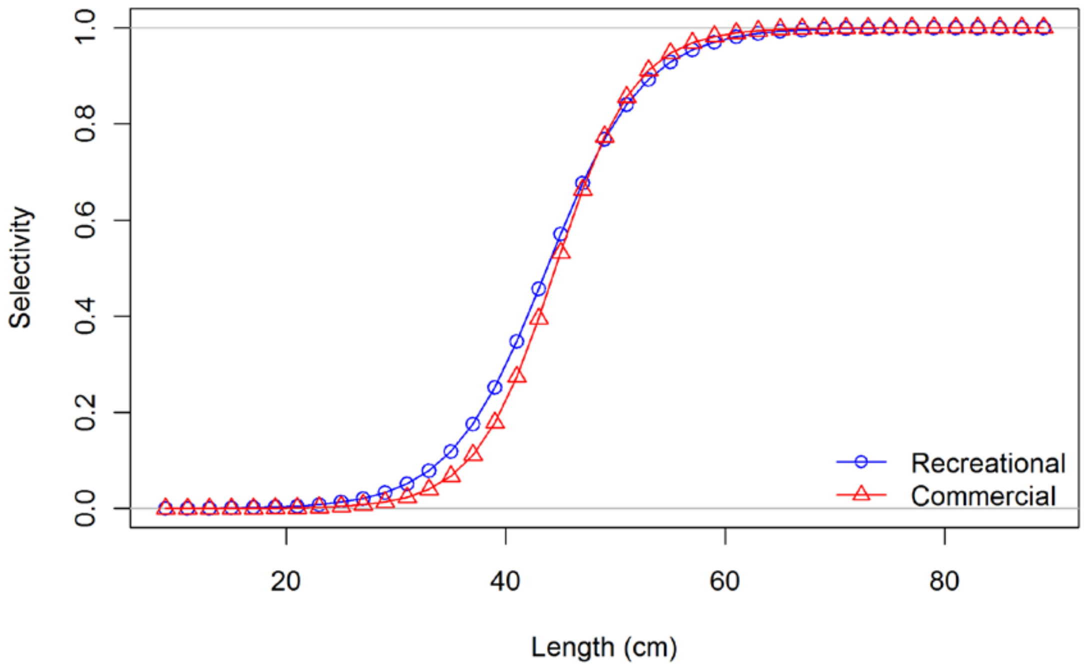


Figure 10. Estimated selectivity for Washington fisheries.

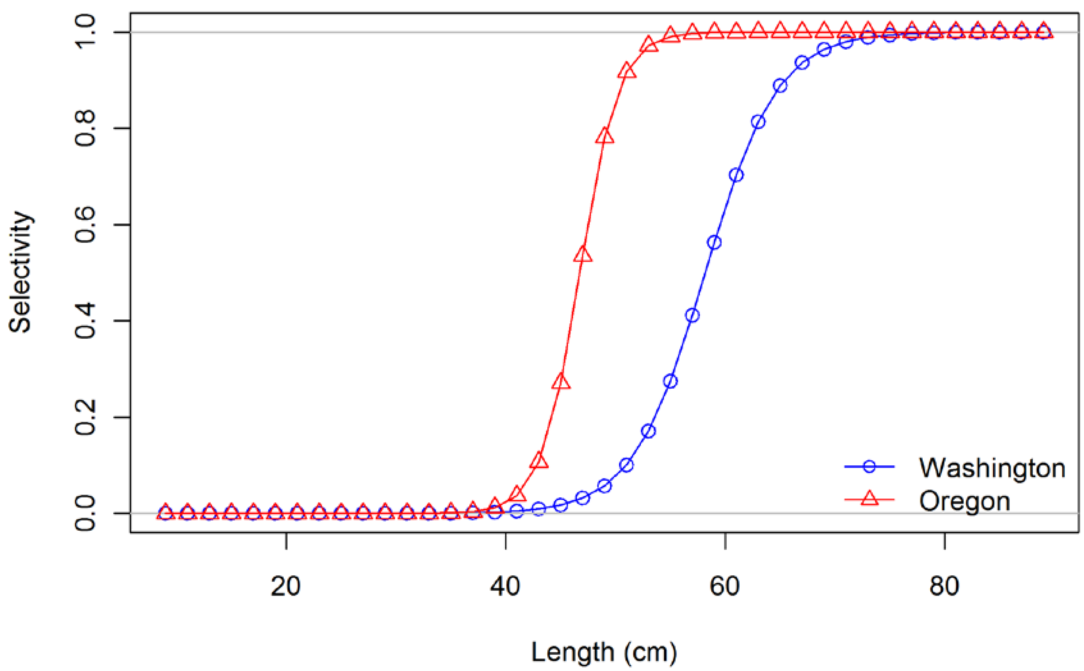


Figure 11. Estimated selectivity for IPHC surveys.

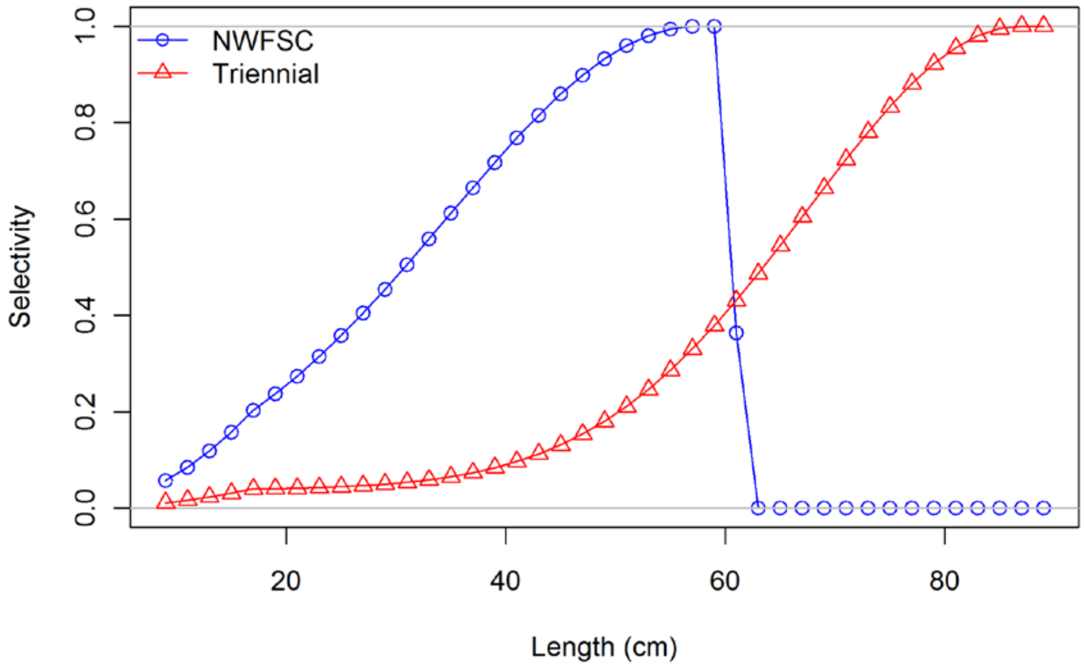


Figure 12. Estimated selectivity for trawl surveys.

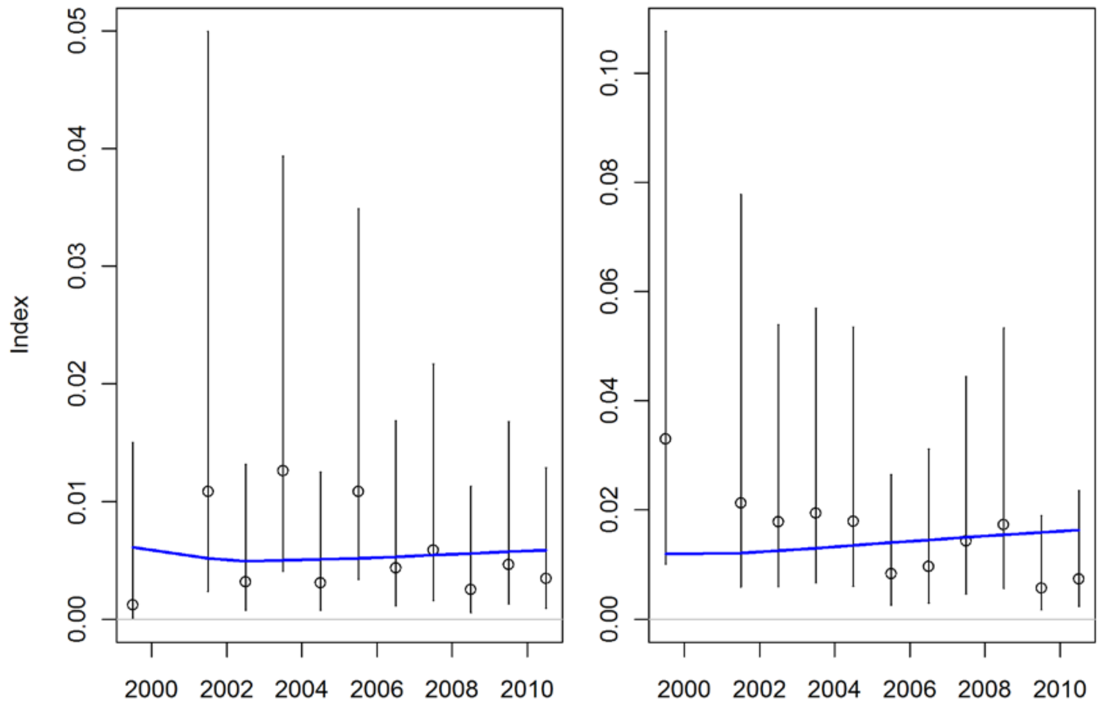


Figure 13. Fit to the IPHC survey index for Washington (left) and Oregon (right) in the base-case model.

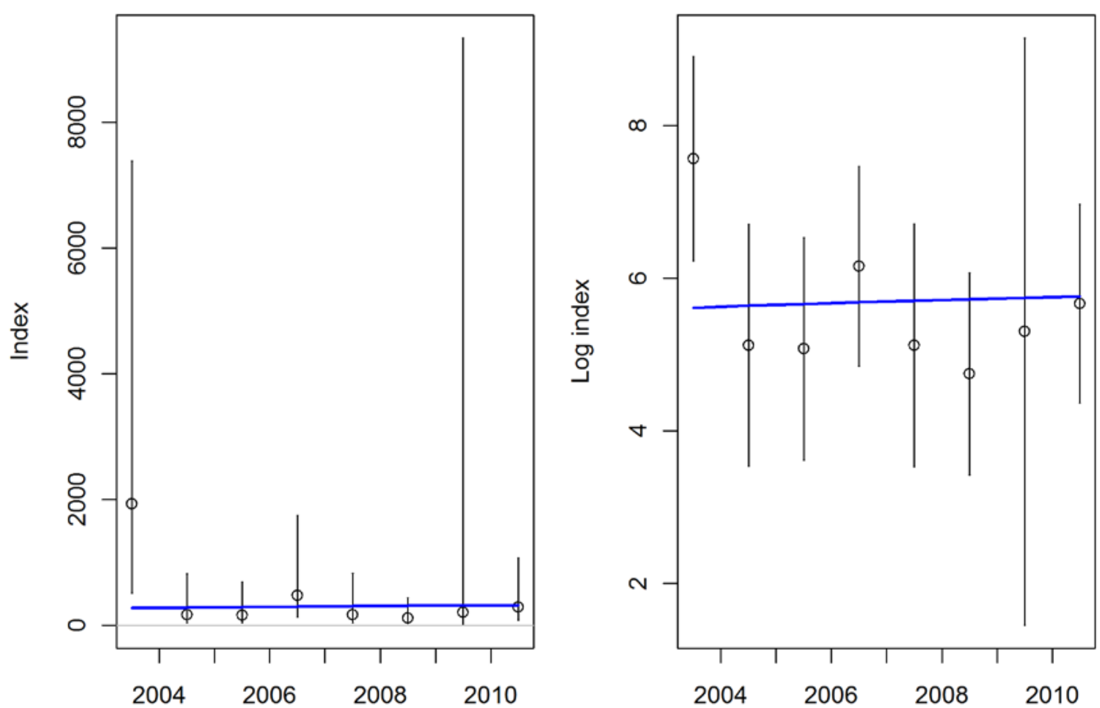


Figure 14. Fit to the NWFSC survey index for Oregon of relative biomass (left) and log(index) for easier evaluation (right) in the base-case model.

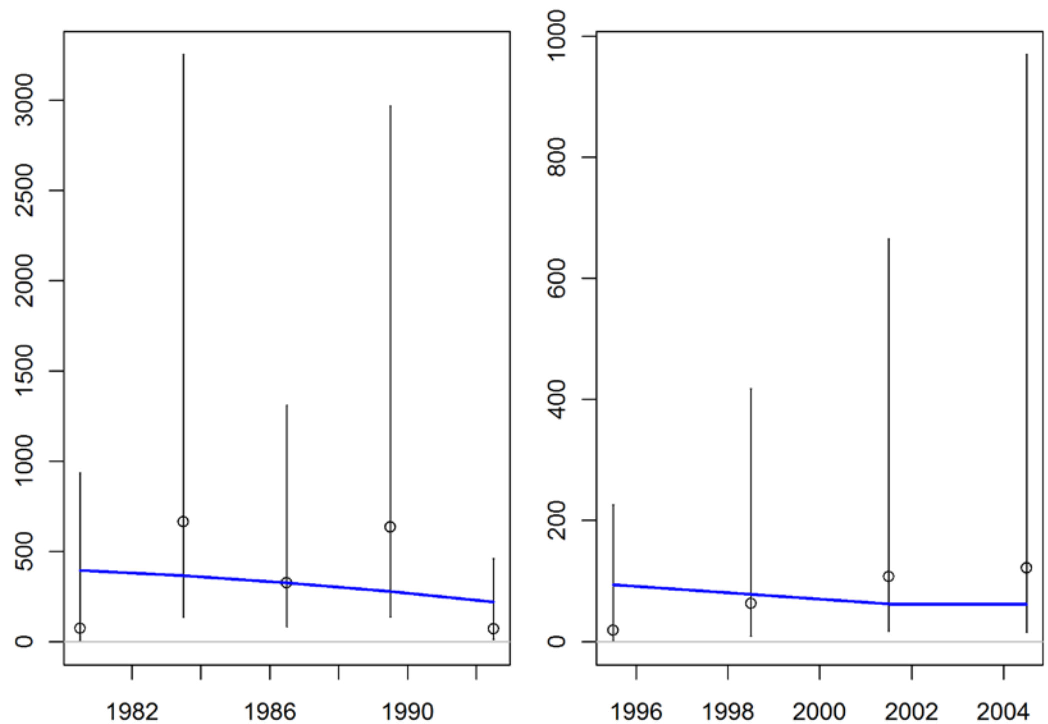


Figure 15. Fit to the early (left) and late (right) portions of the triennial survey index for Washington of relative biomass in the base-case model.

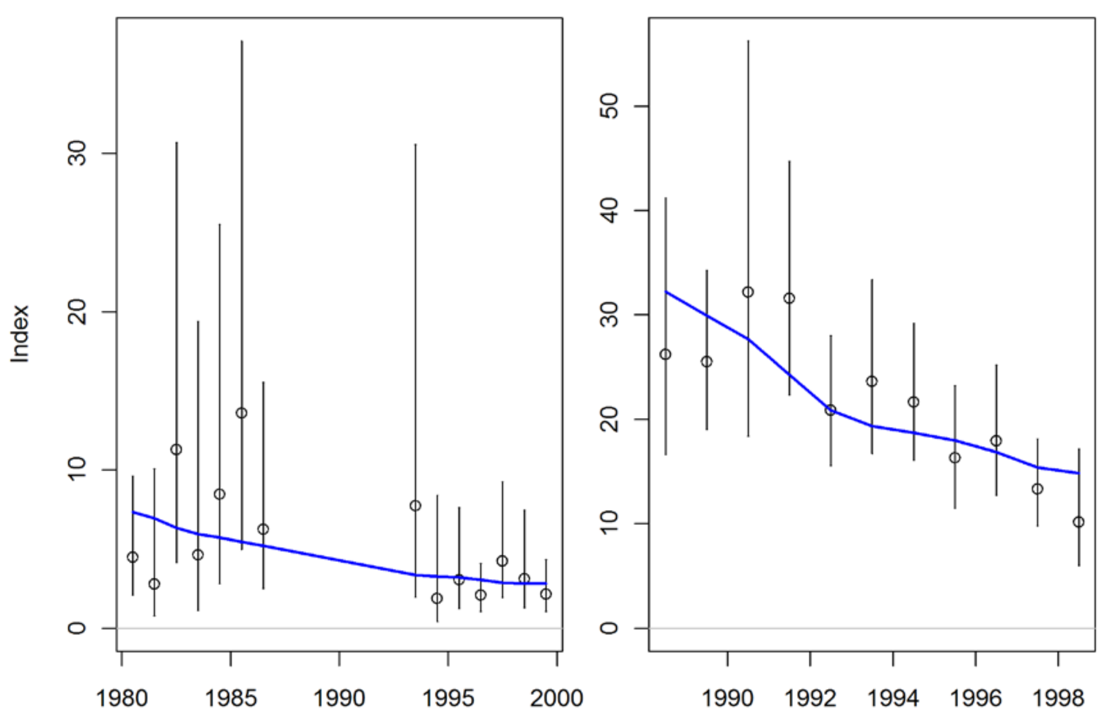


Figure 16. Fit to the California recreational CPUE index (left) and California recreational observer CPUE index (right) in the base-case model.

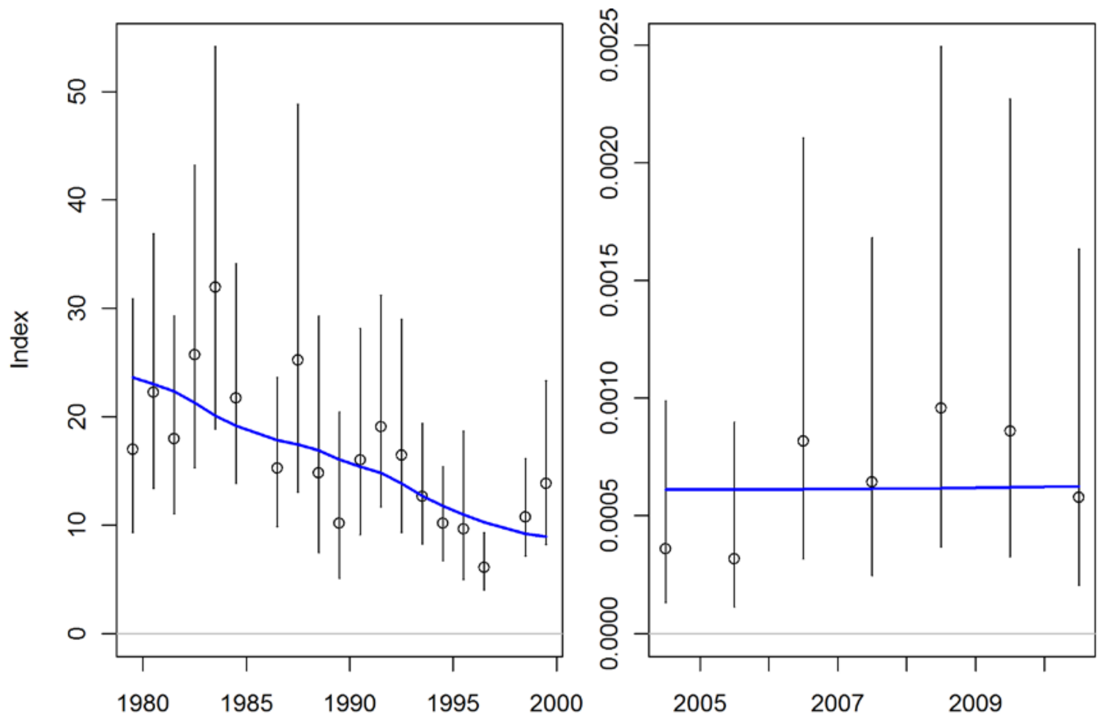


Figure 17. Fit to the Oregon recreational CPUE index (left) and Oregon recreational observer CPUE index (right) in the base-case model.

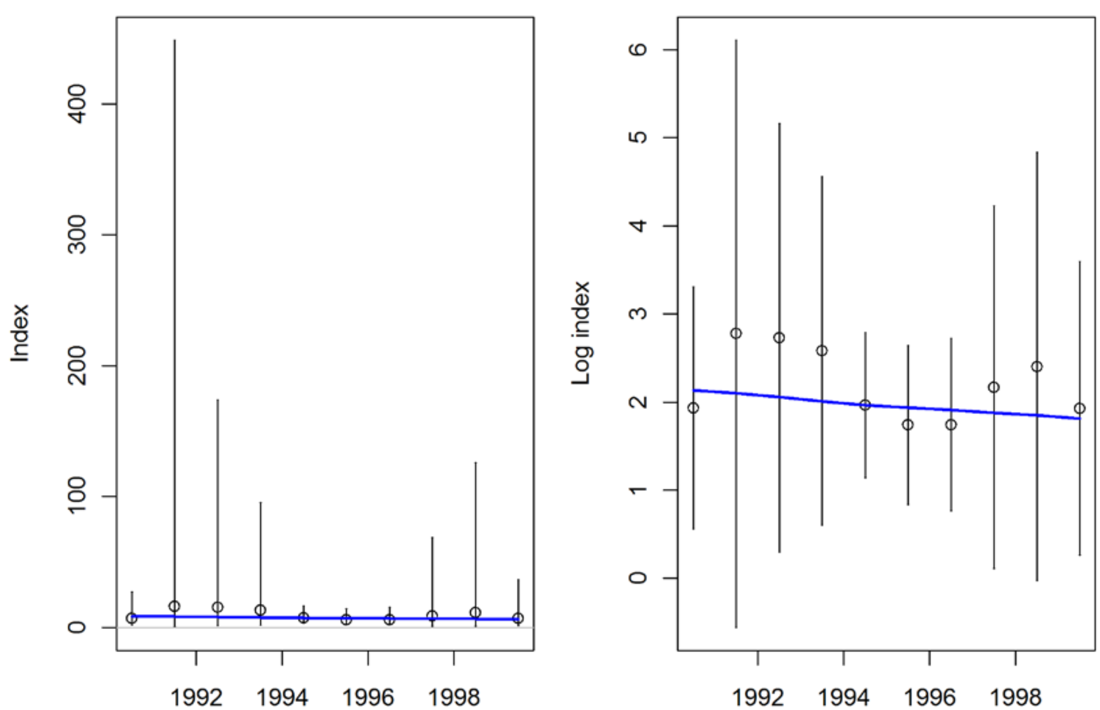


Figure 18. Fit to the Washington recreational CPUE index (left) and log(index) for easier evaluation (right) in the base-case model.

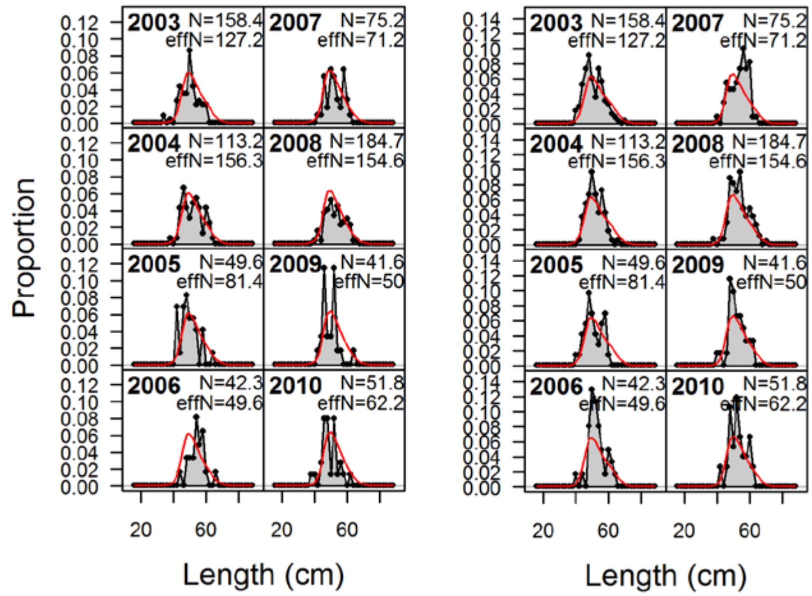


Figure 19. Fit to the Oregon IPHC female (left panels) and male (right panels) length frequencies.

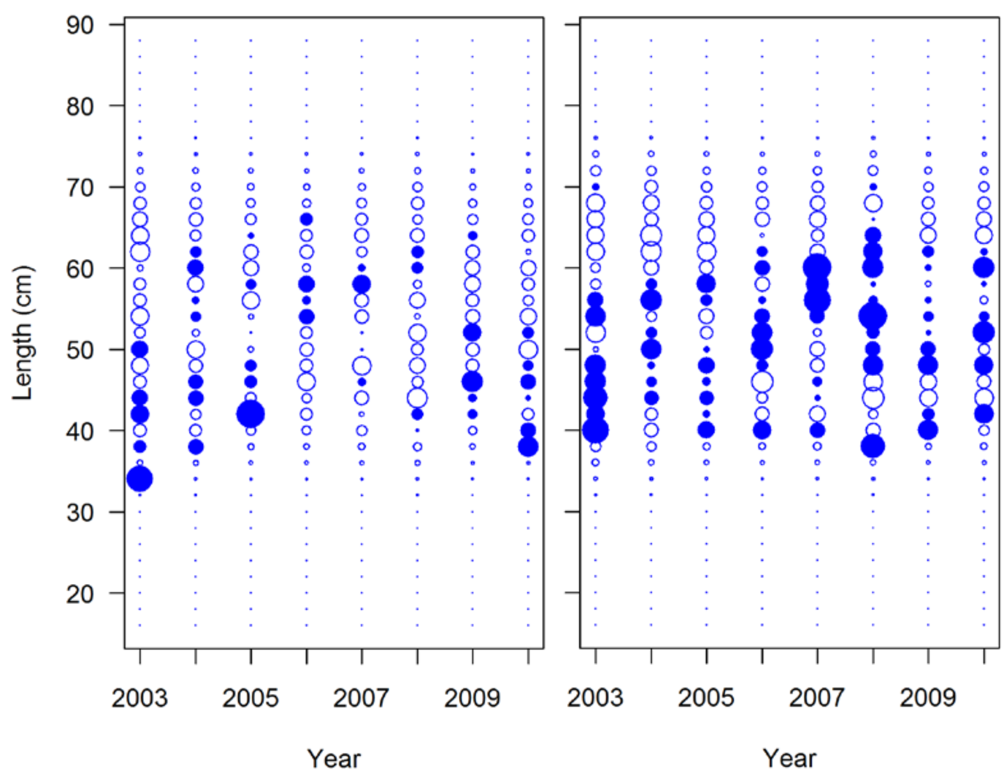


Figure 20. Pearson residuals for the fit to Oregon IPHC female (left, maximum = 3.75) and male (right, maximum = 2.69) length frequencies. Filled circles represent positive residuals (observed – expected).

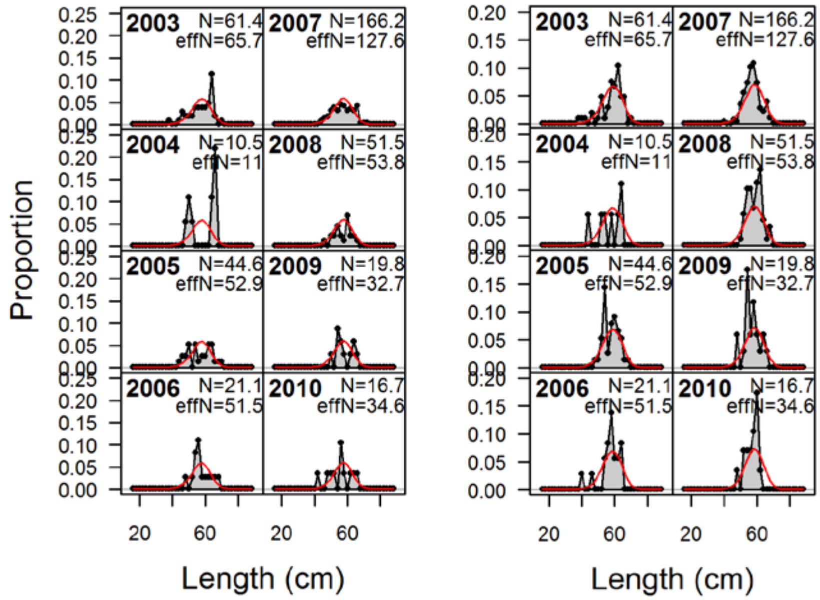


Figure 21. Fit to the Washington IPHC female (left panels) and male (right panels) length frequencies.

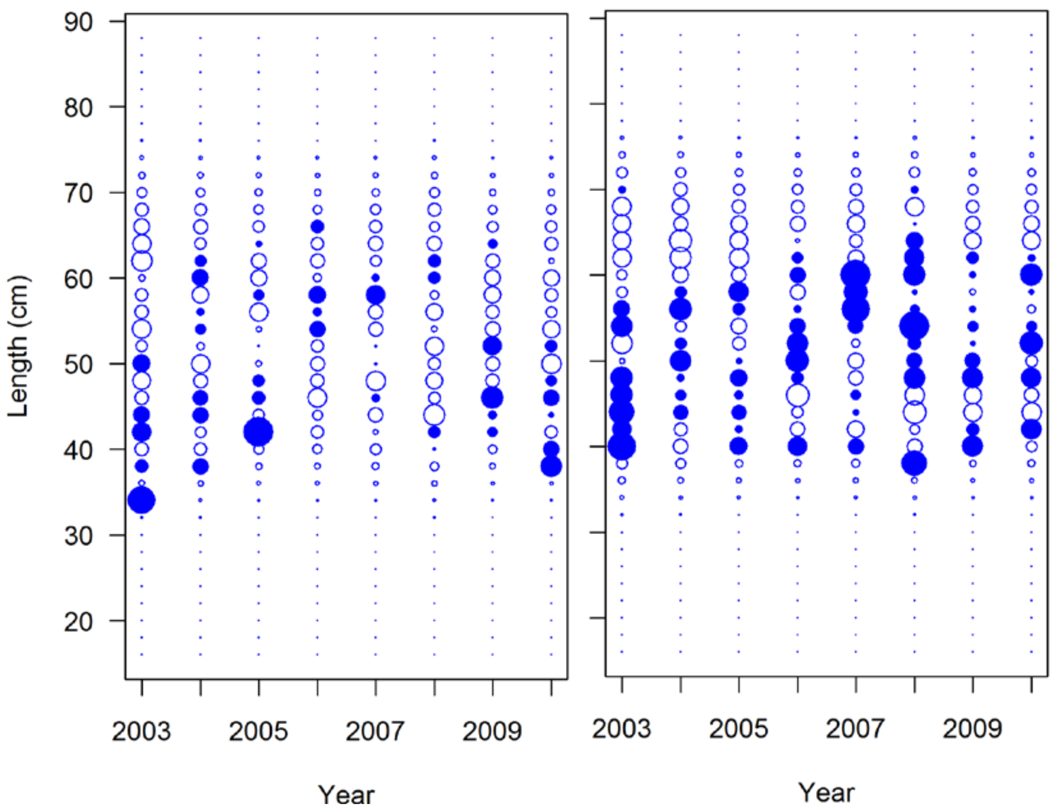


Figure 22. Pearson residuals for the fit to Washington IPHC female (left, maximum = 4.74) and male (right, maximum = 2.77) length frequencies. Filled circles represent positive residuals (observed – expected).

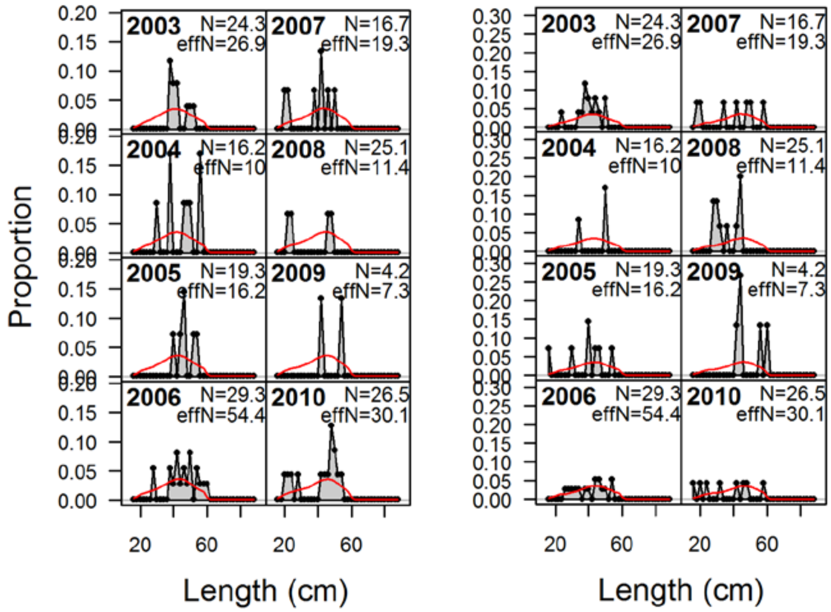


Figure 23. Fit to the Oregon NWFSC female (left panels) and male (right panels) length frequencies.

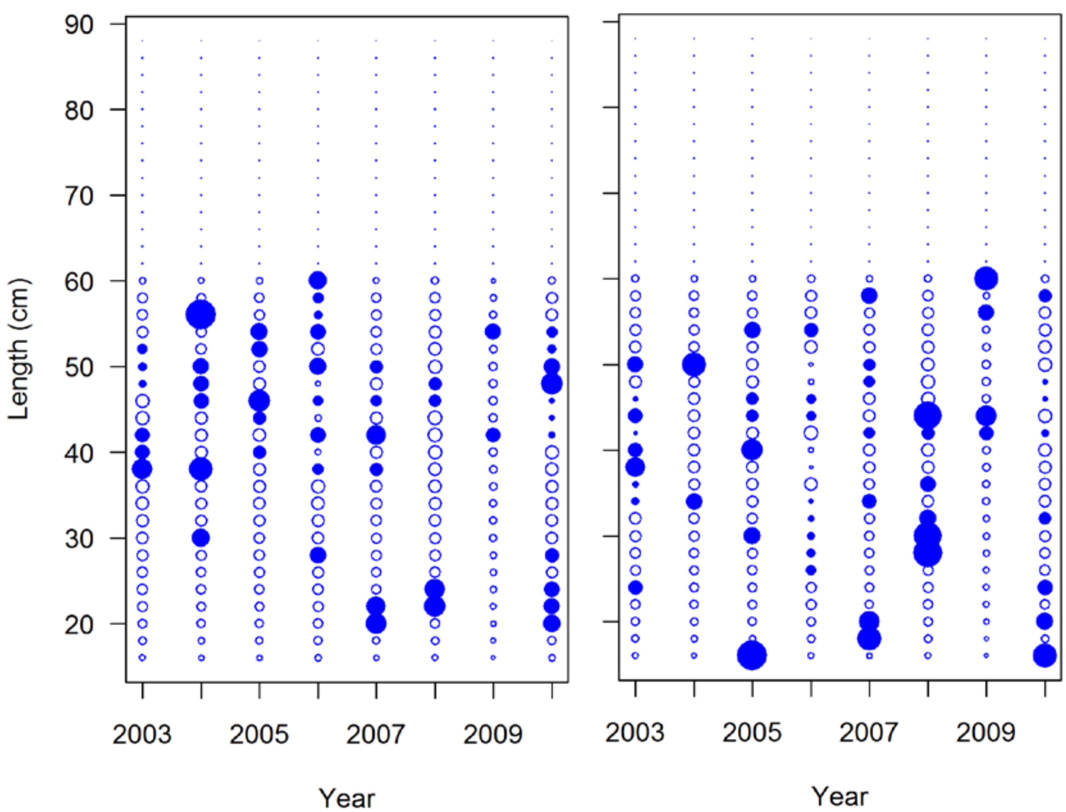


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Figure 24. Pearson residuals for the fit to Oregon NWFSC female (left, maximum = 4.89) and male (right, maximum = 5.24) length frequencies. Filled circles represent positive residuals (observed – expected).

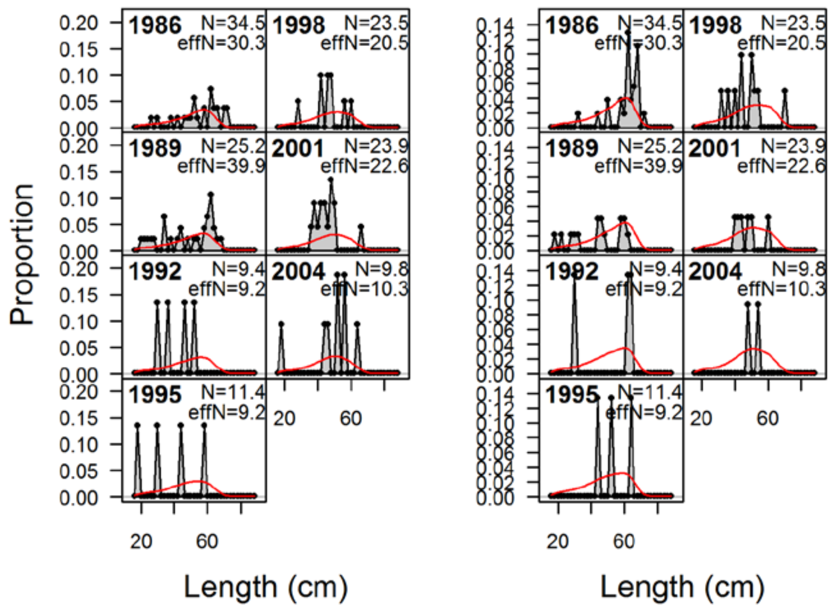

Figure 25. Fit to the Washington triennial female (left panels) and male (right panels) length frequencies.

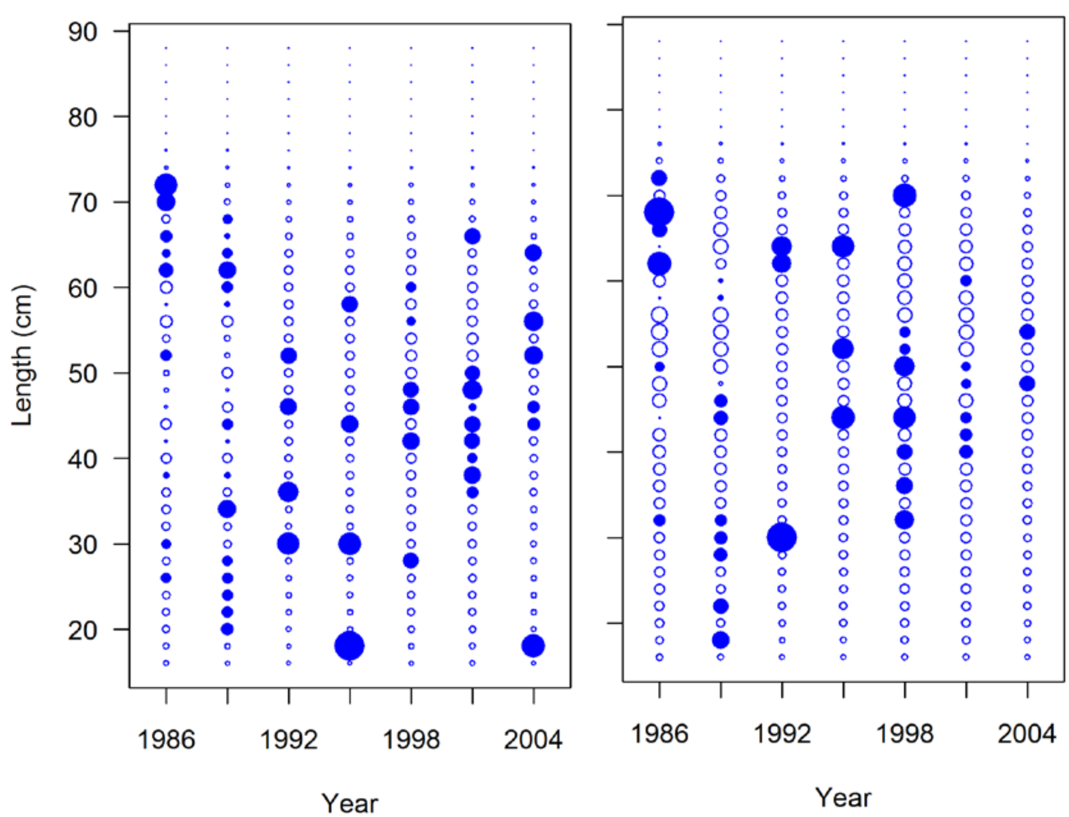

Figure 26. Pearson residuals for the fit to Washington triennial female (left, maximum = 6.65) and male (right, maximum = 4.06) length frequencies. Filled circles represent positive residuals (observed – expected).

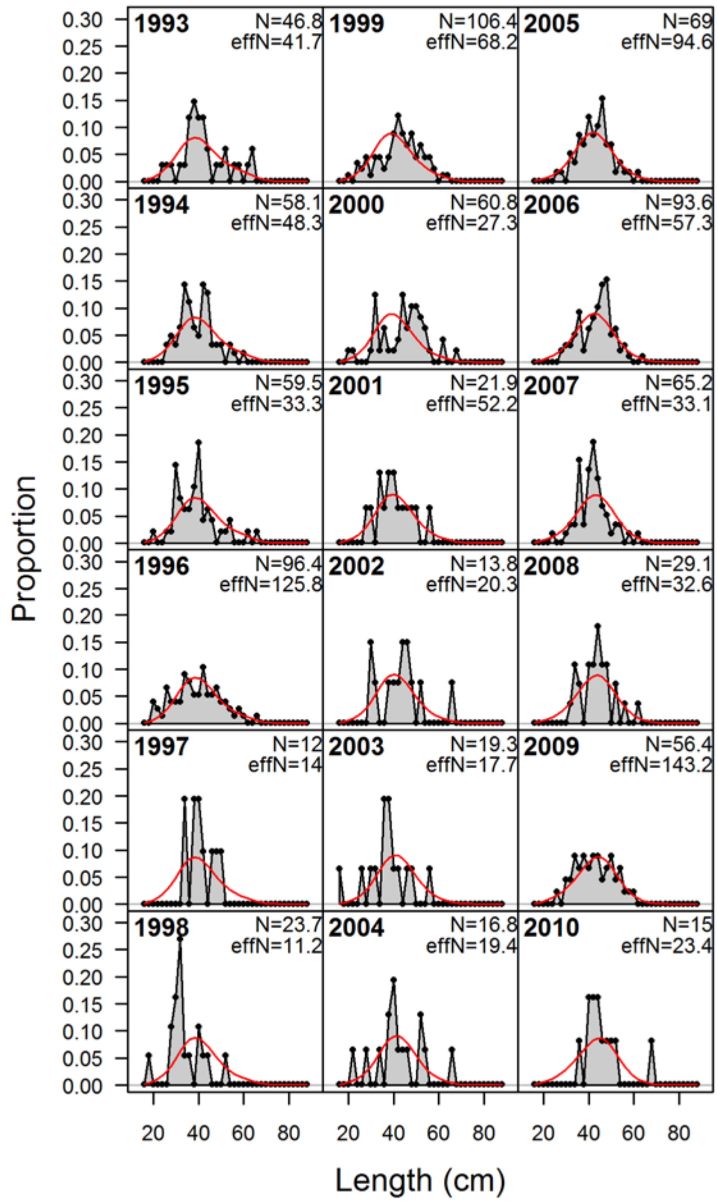

Figure 27. Fit to the California recreational sexes-combined length frequencies.

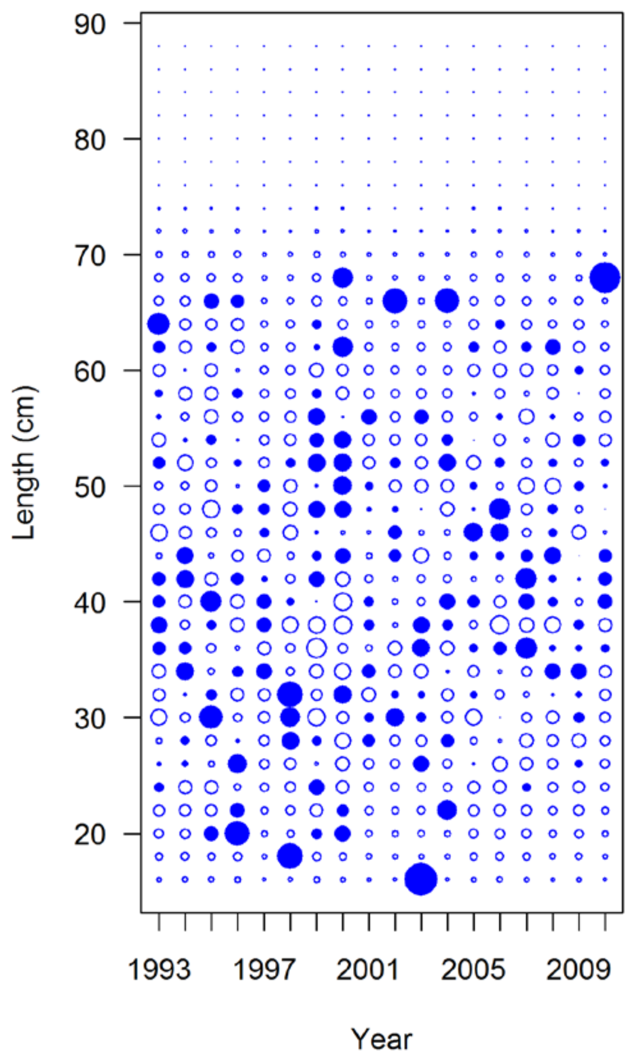

Figure 28. Pearson residuals for the fit to California recreational length frequencies (maximum = 6.66). Filled circles represent positive residuals (observed – expected).

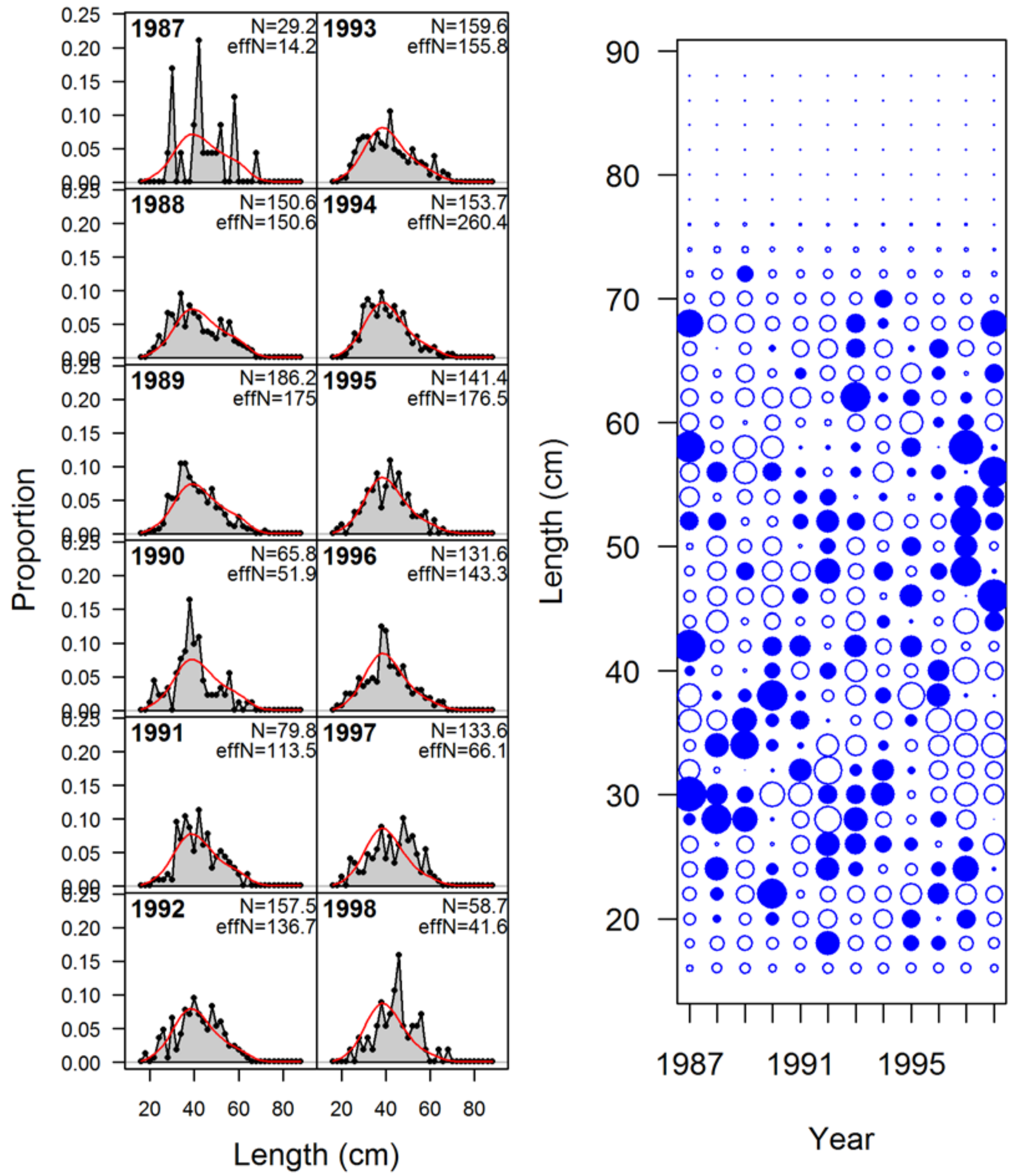

Figure 29. Fit to the California recreational charter vessel sexes-combined length frequencies (left panels) and Pearson residuals for the fit to California recreational length frequencies (right panel, maximum = 3.54). Filled circles represent positive residuals (observed – expected).

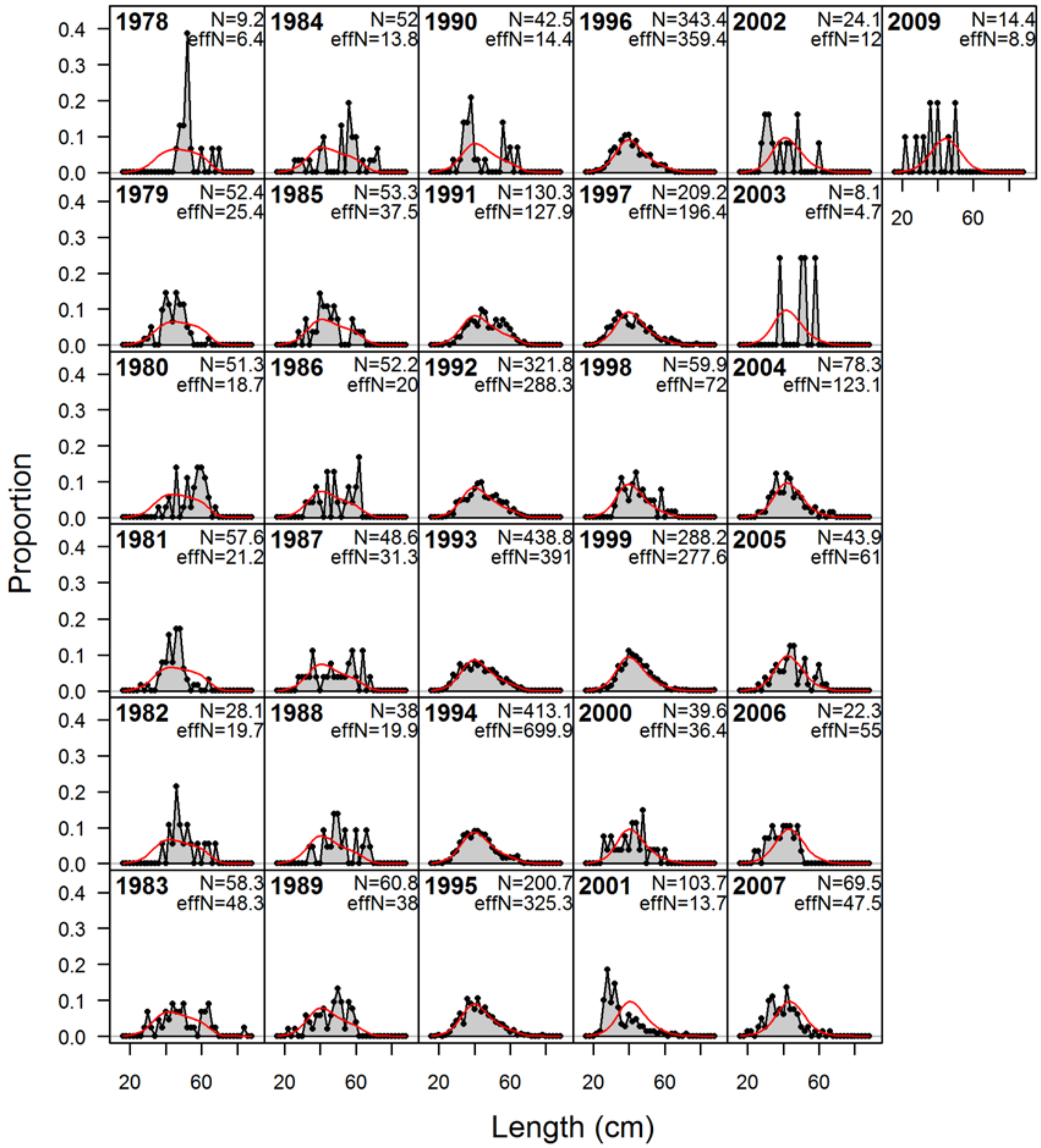

Figure 30. Fit to the California commercial sexes-combined length frequencies.

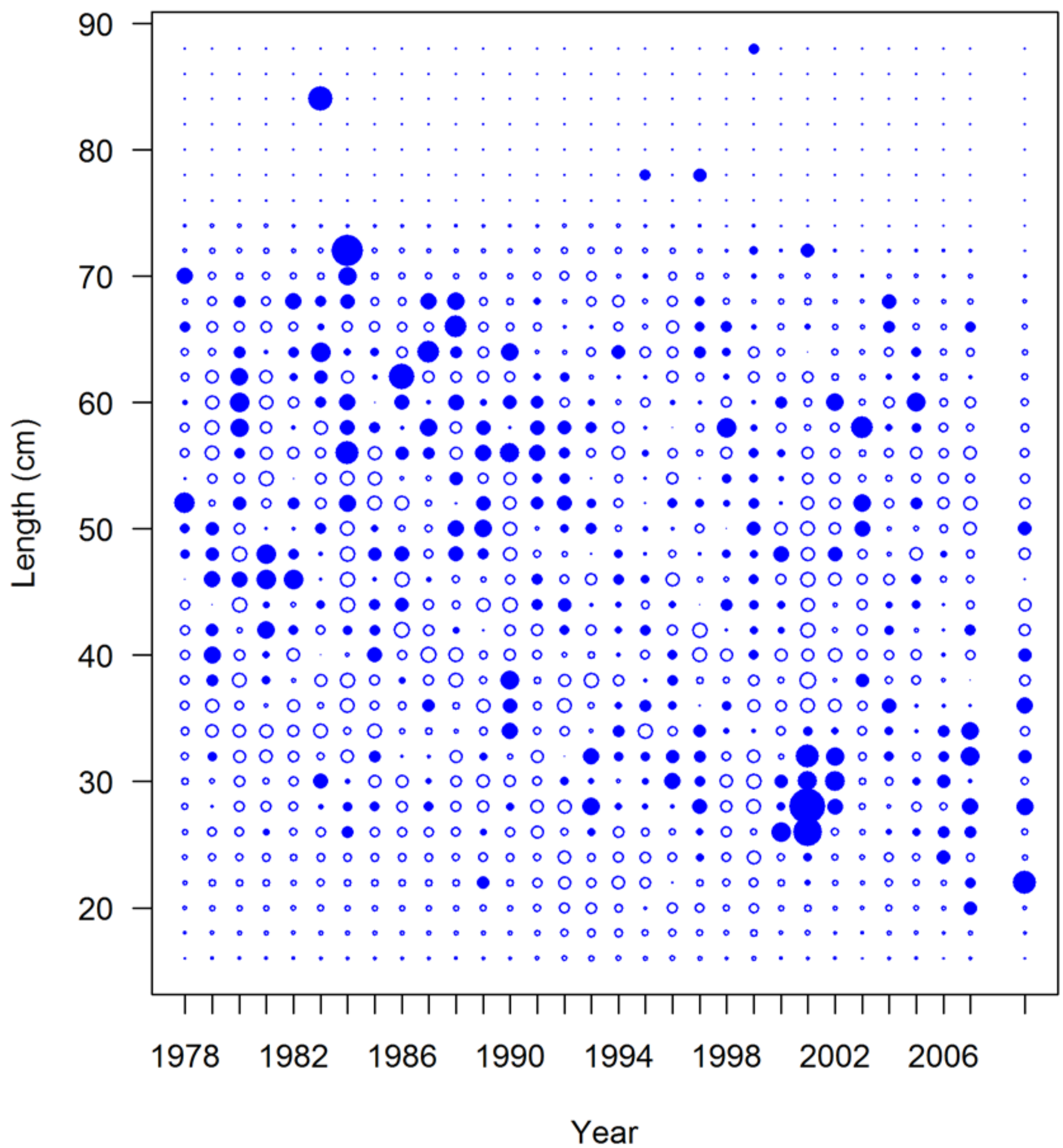

Figure 31. Pearson residuals for the fit to California commercial length frequencies (maximum = 11.95). Filled circles represent positive residuals (observed – expected).

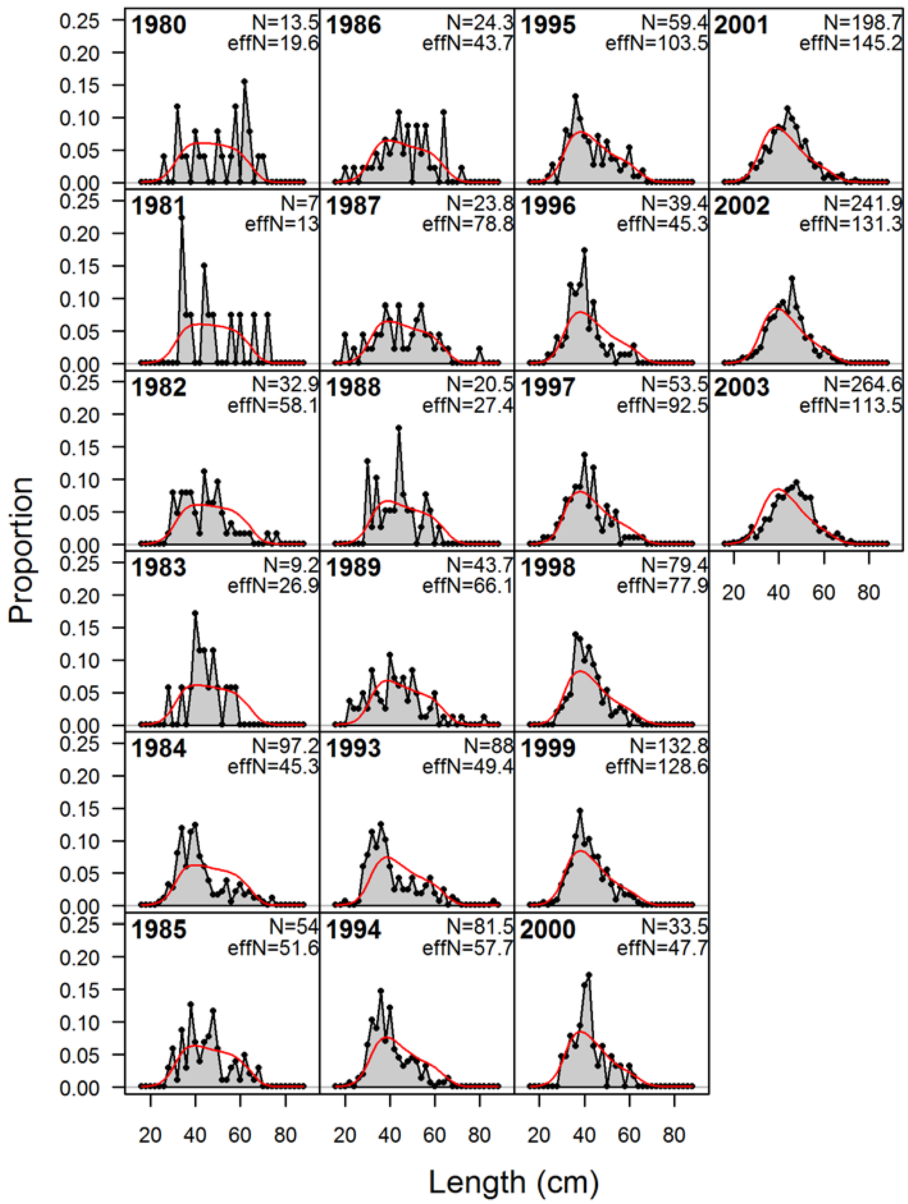

Figure 32. Fit to the Oregon recreational sexes-combined length frequencies.

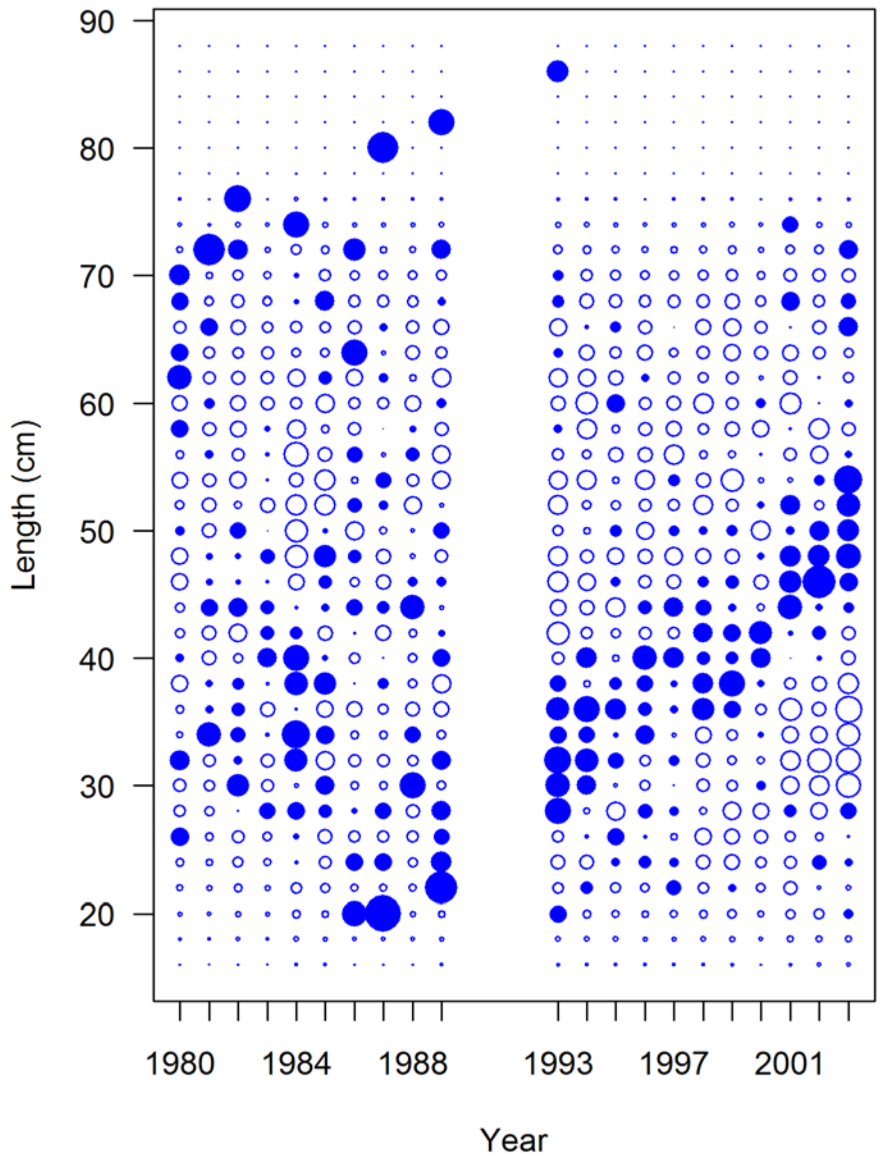

Figure 33. Pearson residuals for the fit to Oregon recreational length frequencies (maximum = 4.72). Filled circles represent positive residuals (observed – expected).

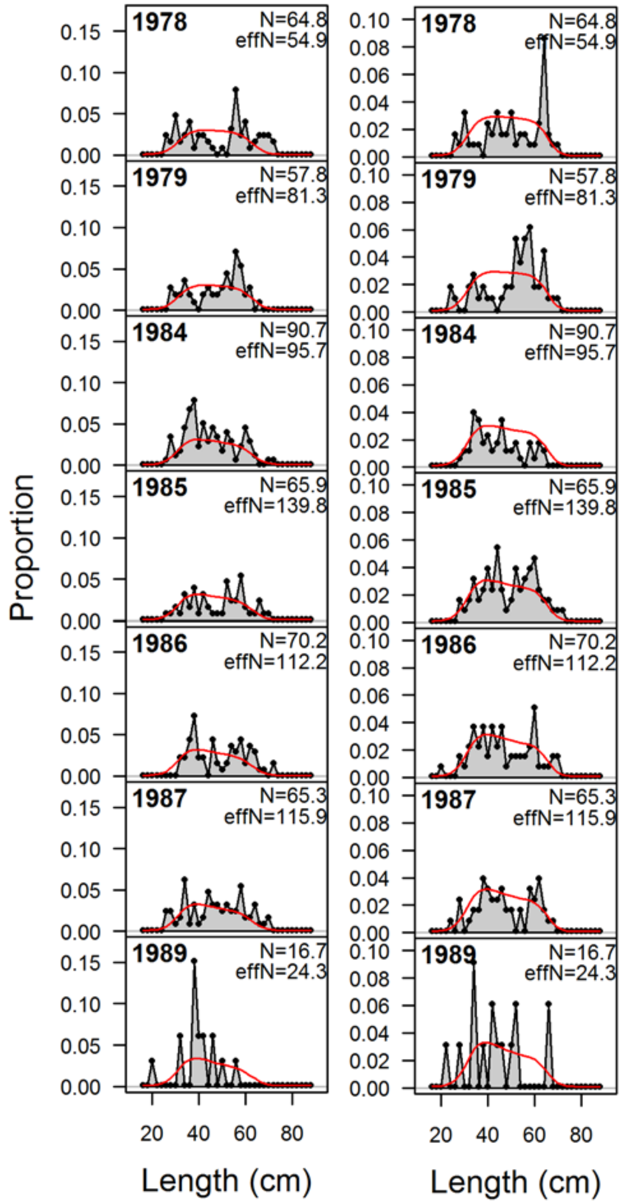

Figure 34. Fit to the Oregon recreational female (left panels) and male (right panels) length frequencies.

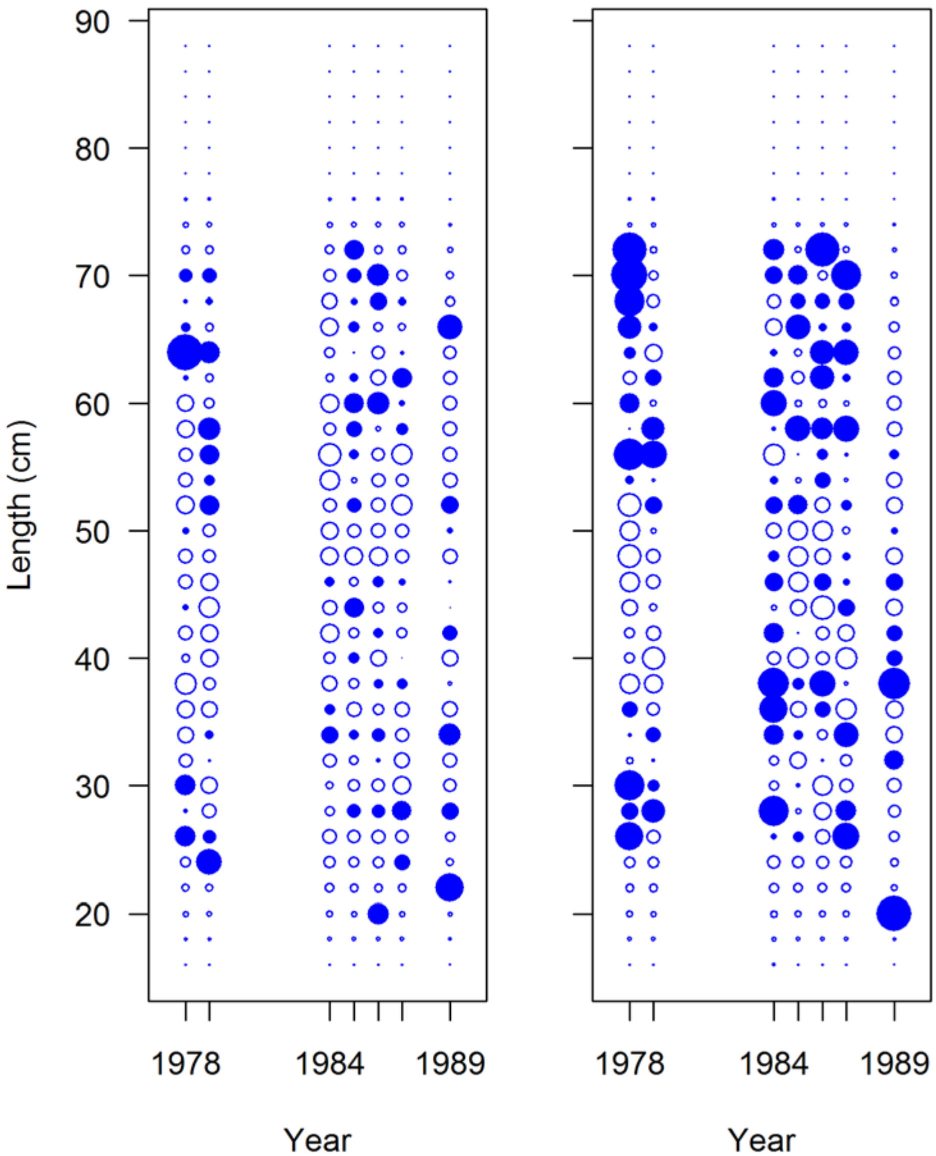

Figure 35. Pearson residuals for the fit to Oregon recreational female (left, maximum = 3.52) and male (right, maximum = 4.16) length frequencies. Filled circles represent positive residuals (observed – expected).

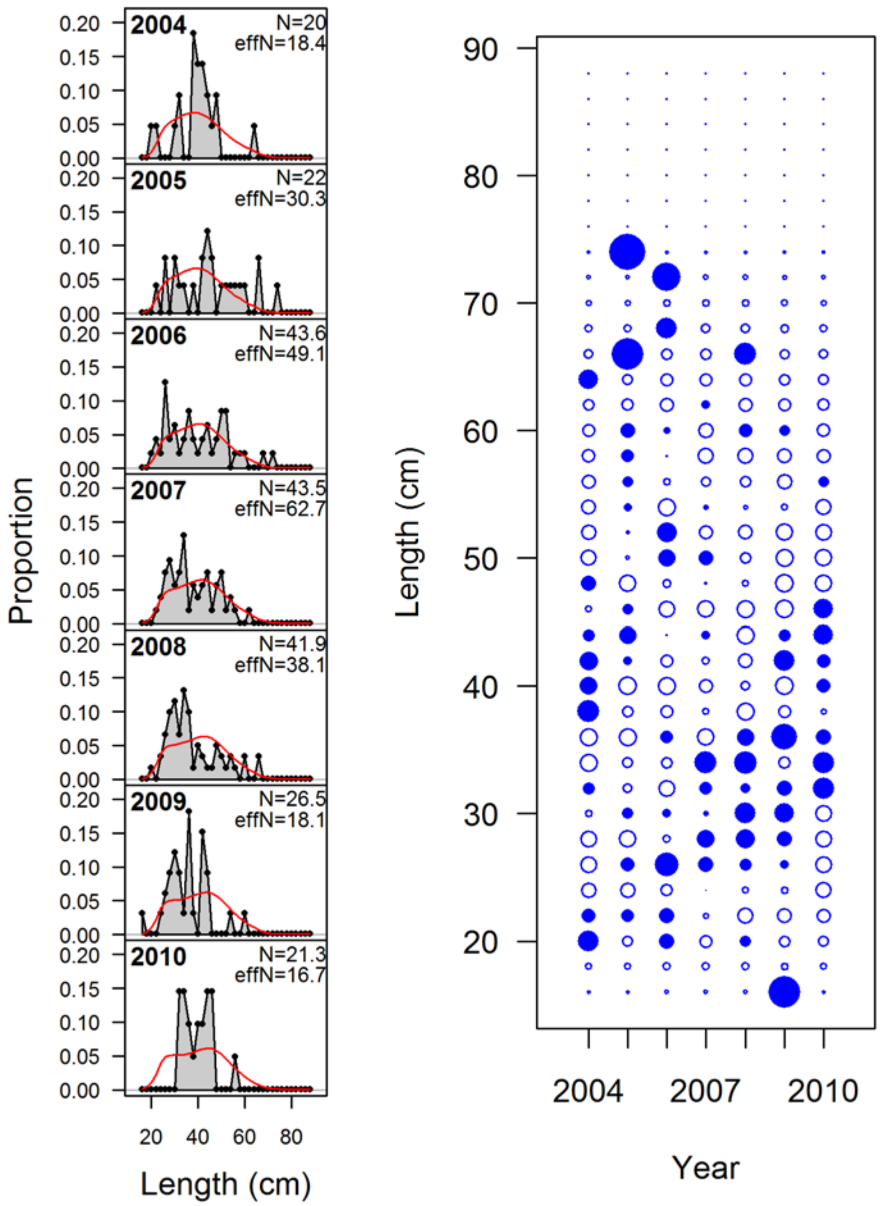

Figure 36. Fit to the Oregon recreational charter observer sexes-combined length frequencies and associated Pearson residuals (maximum = 5.56). Filled circles represent positive residuals (observed – expected).

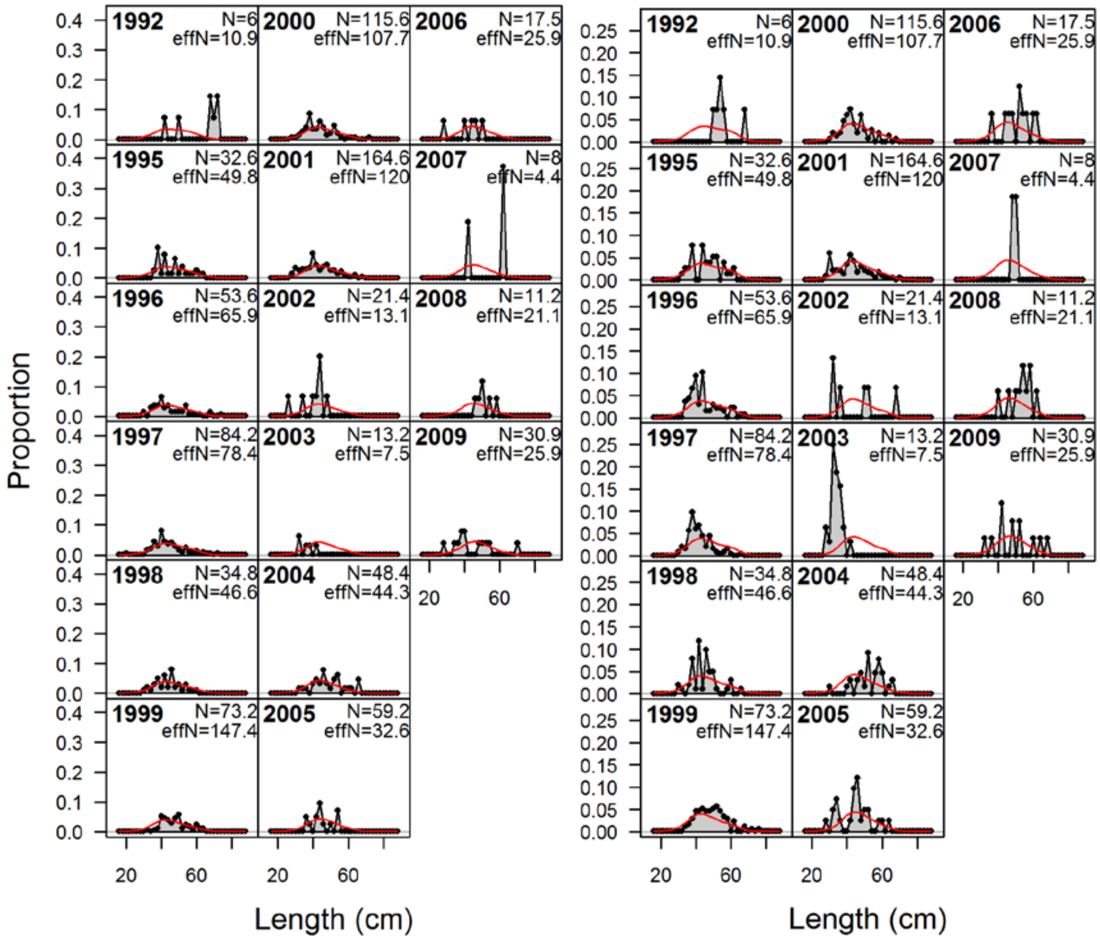

Figure 37. Fit to the Oregon commercial female (left panels) and male (right panels) length frequencies.

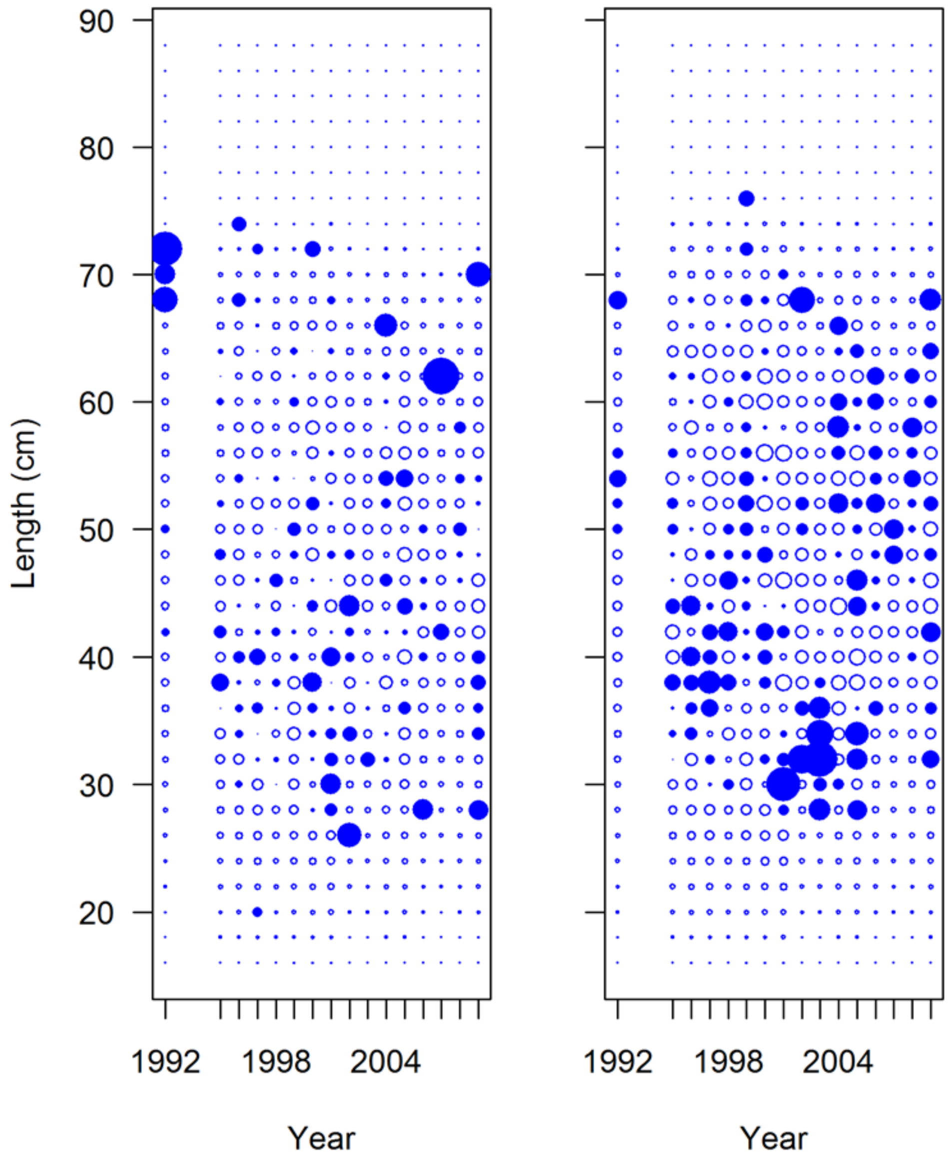

Figure 38. Pearson residuals for the fit to Oregon commercial female (left, maximum = 10.42) and male (right, maximum = 7.94) length frequencies. Filled circles represent positive residuals (observed – expected).

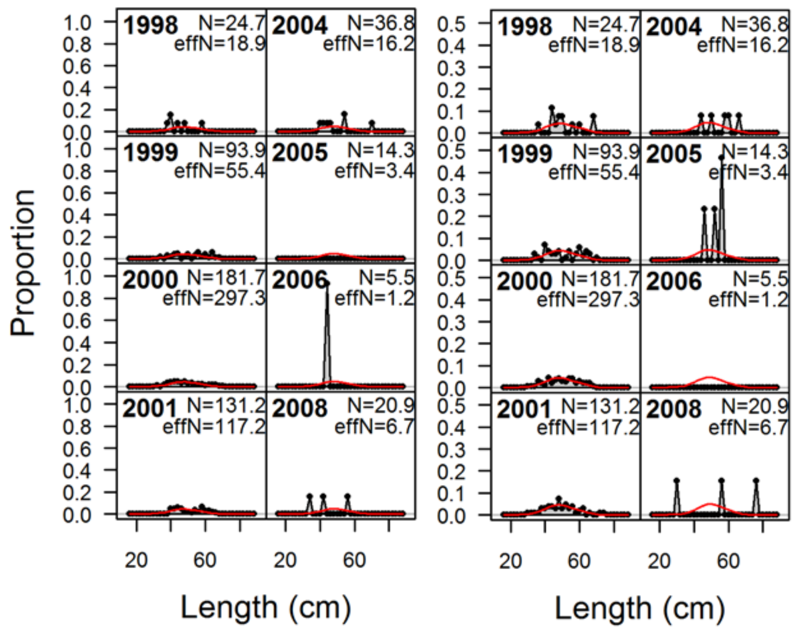

Figure 39. Fit to the Washington recreational female (left panels) and male (right panels) length frequencies.

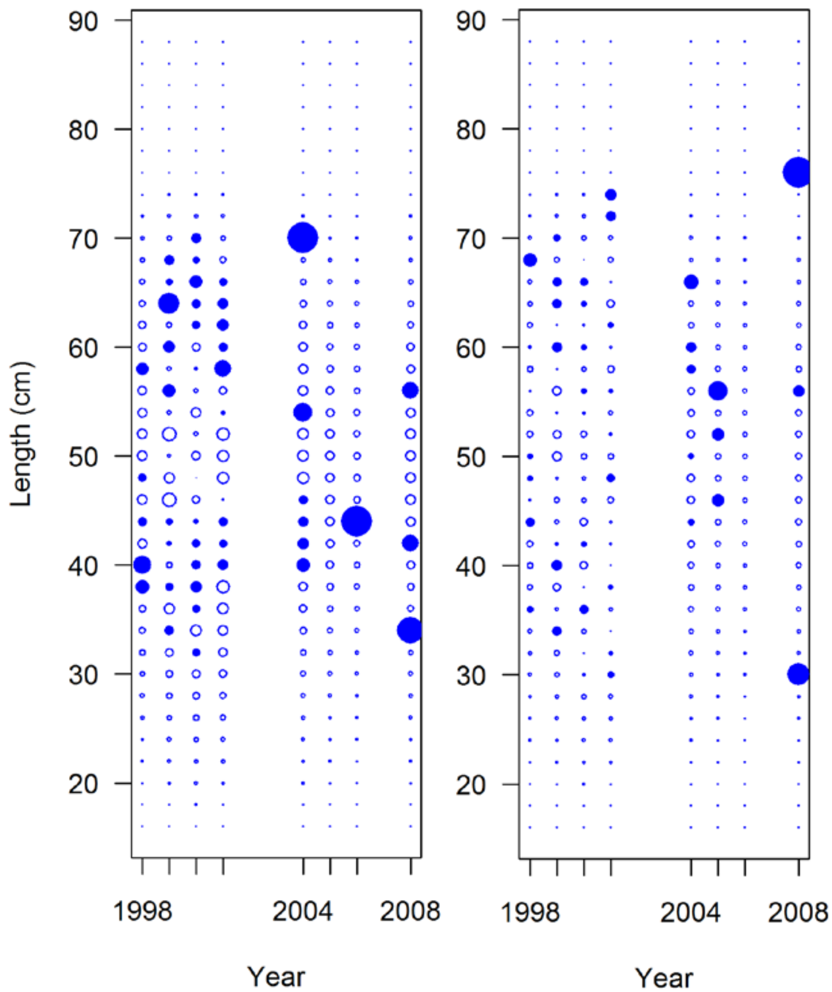

Figure 40. Pearson residuals for the fit to Washington recreational female (upper panel, maximum = 10.72) and male (lower panel, maximum = 22.6) length frequencies. Filled circles represent positive residuals (observed – expected).

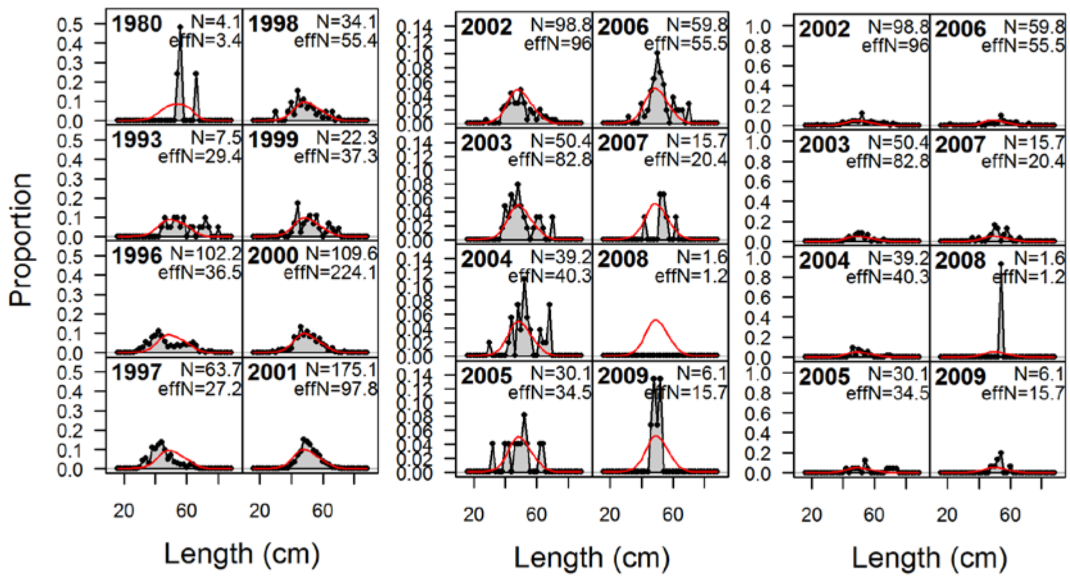

Figure 41. Fit to the Washington commercial sexes-combined (left), females (center) and males (right) length frequencies.

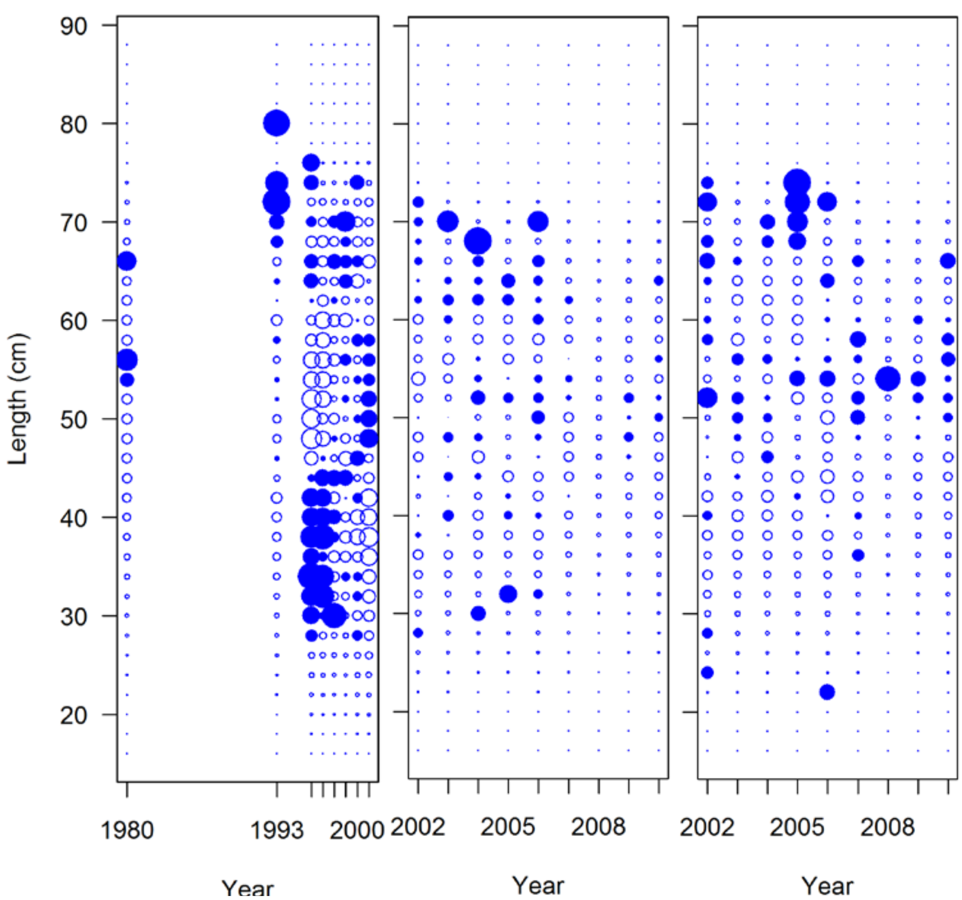

Figure 42. Pearson residuals for the fit to Washington commercial length frequencies for combined sex (left), females (center), and males (right), (maxima = 4.58, 7,79, and 6.46, respectively). Filled circles represent positive residuals (observed – expected).

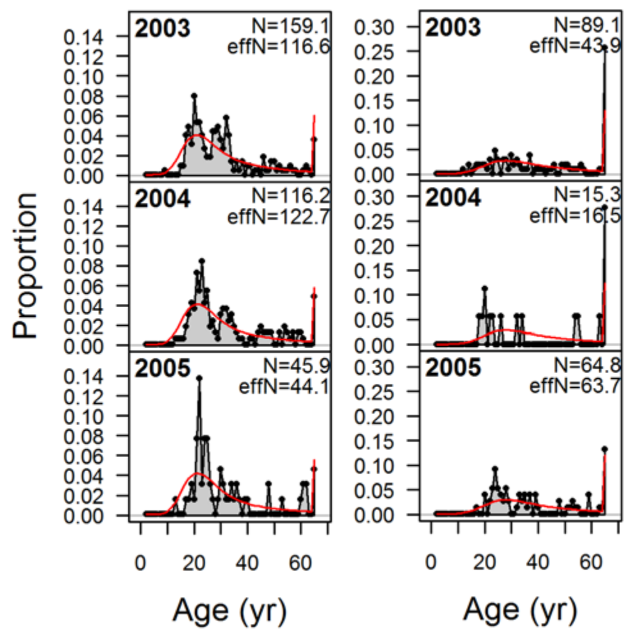

Figure 43. Fit to the Oregon (left panel) and Washington (right panel) IPHC sexes-combined age frequencies.

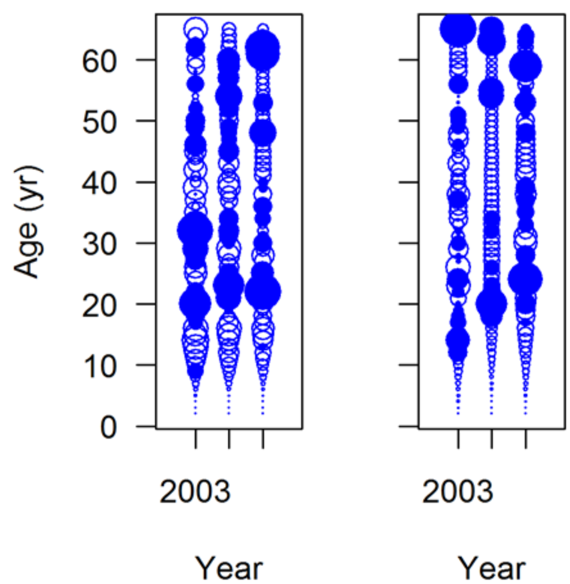

Figure 44. Pearson residuals for the fit to the Oregon (upper panel, maximum = 3.23) and Washington (lower panel, maximum = 3.6) IPHC sexes-combined age frequencies. Filled circles represent positive residuals (observed – expected).

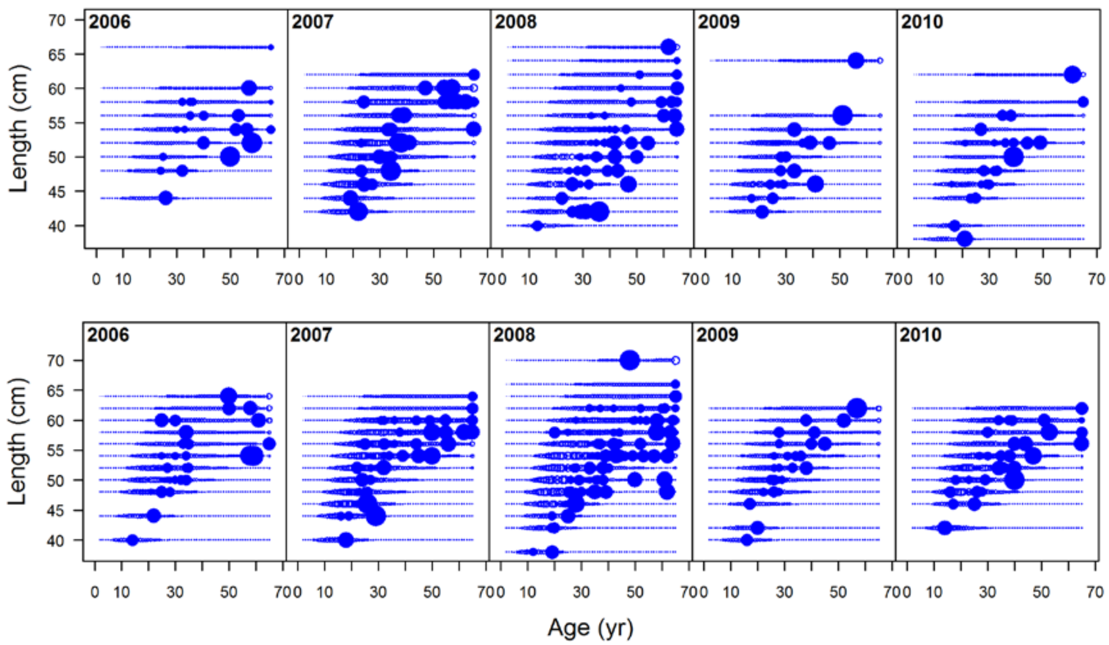

Figure 45. Pearson residuals for the fit to the Oregon female (upper panels, maximum = 12.41) and male (lower panels, maximum = 9.04) IPHC age frequencies. Filled circles

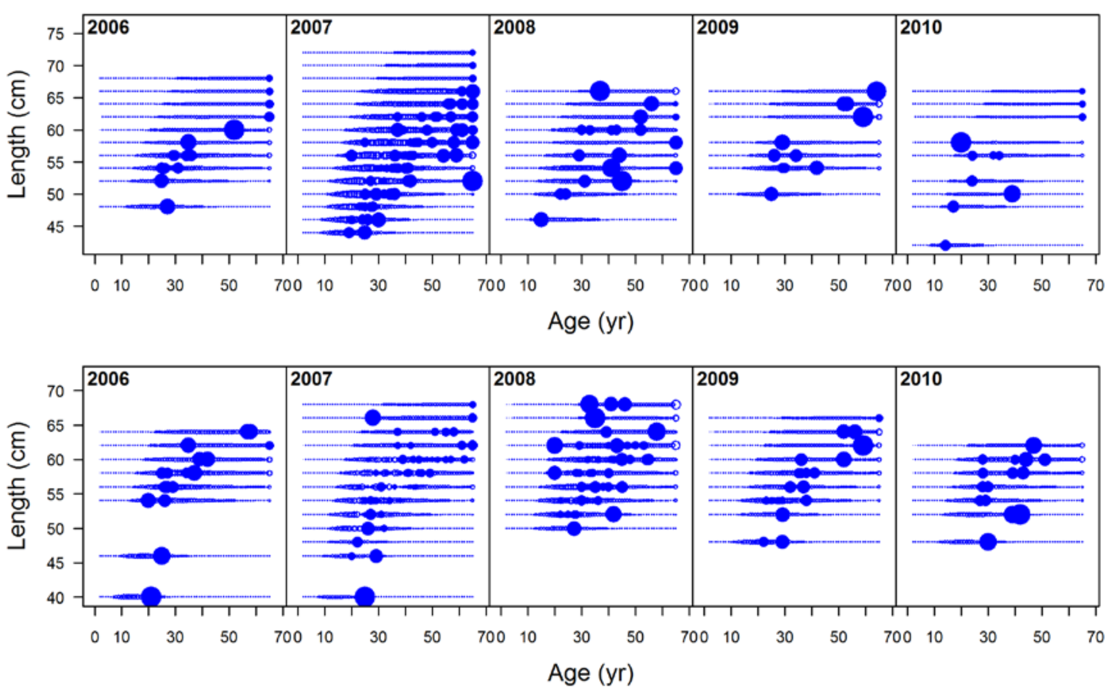

Figure 46. Pearson residuals for the fit to the Washington female (left panels, maximum = 12.99) and male (right panels, maximum = 12.98) IPHC age frequencies. Filled circles represent positive residuals (observed – expected).

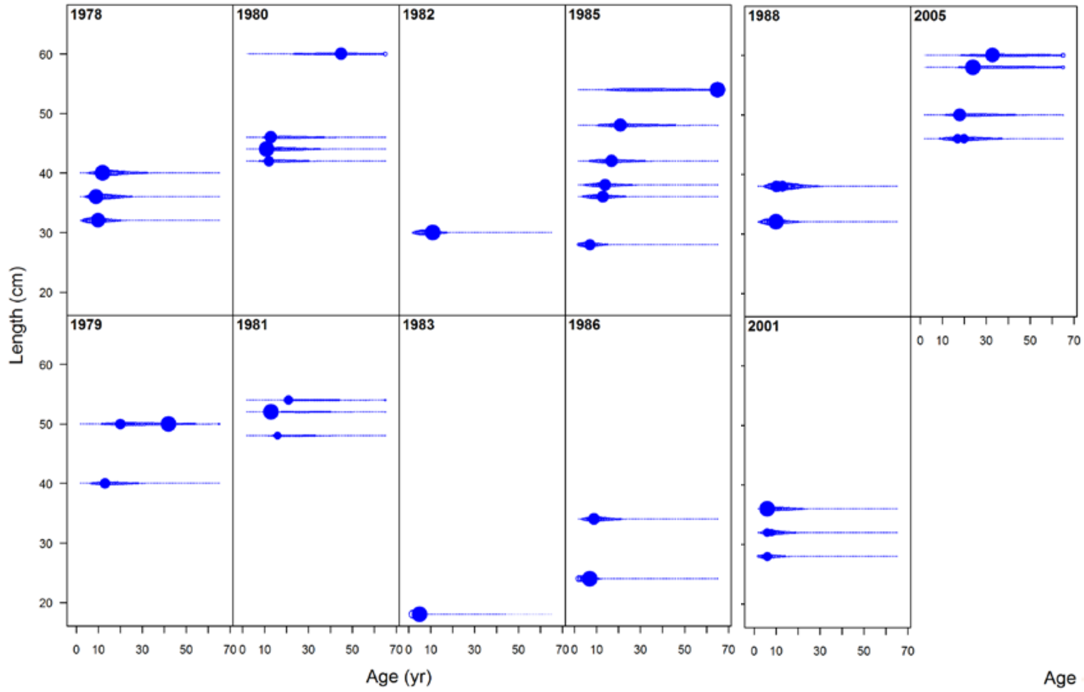

Figure 47. Pearson residuals for the fit to the California commercial female (maximum = 20.12) age frequencies. Filled circles represent positive residuals (observed – expected).

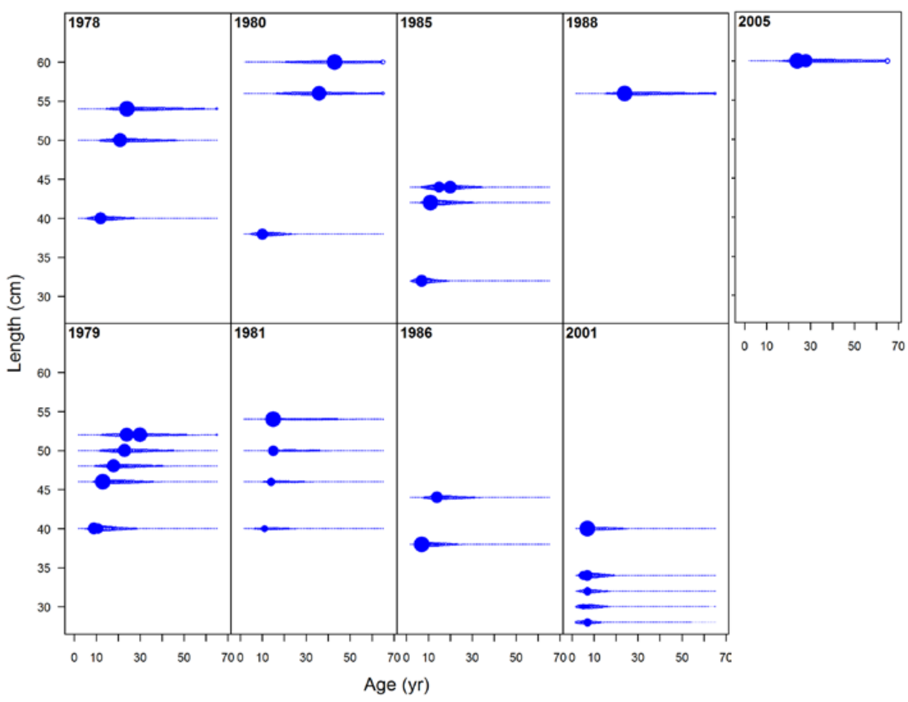

Figure 48. Pearson residuals for the fit to the California commercial male (maximum = 15.63) age frequencies. Filled circles represent positive residuals (observed – expected).

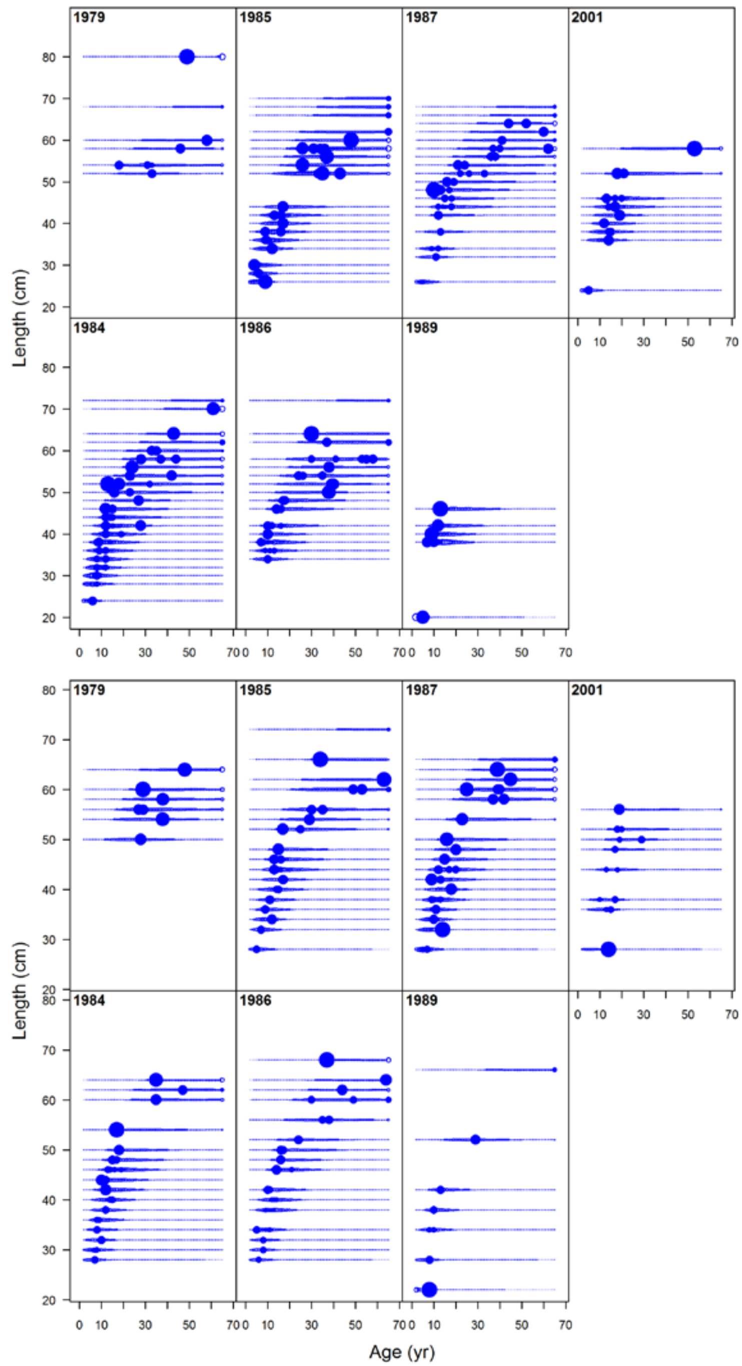

Figure 49. Pearson residuals for the fit to the Oregon recreational female (upper panels, maximum = 14.32) and male (lower panels, maximum = 16.7) age frequencies. Filled circles represent positive residuals (observed – expected).

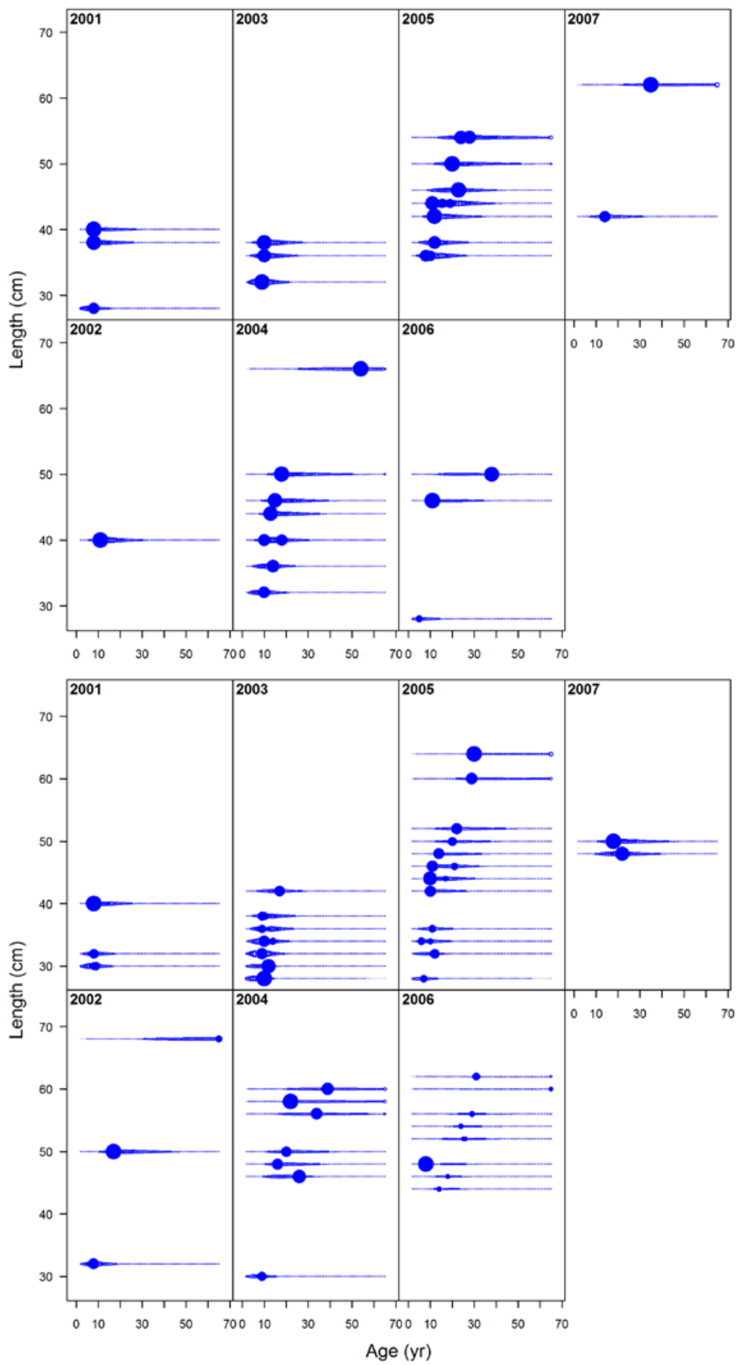

Figure 50. Pearson residuals for the fit to the Oregon commercial female (upper panels, maximum = 10.24) and male (lower panels, maximum = 28.72) age frequencies. Filled circles represent positive residuals (observed – expected).

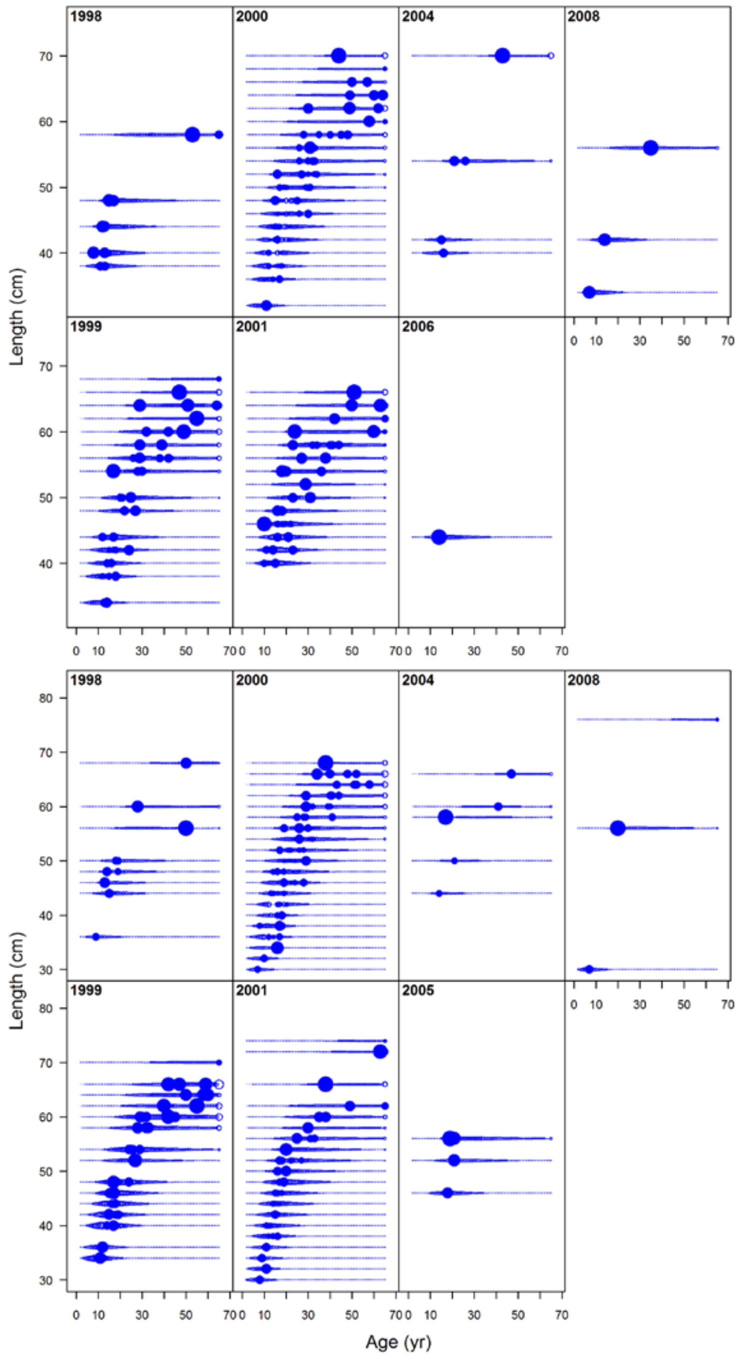

Figure 51. Pearson residuals for the fit to the Washington recreational female (upper panels, maximum = 9.38) and male (lower panels, maximum = 18.77) age frequencies. Filled circles represent positive residuals (observed – expected).

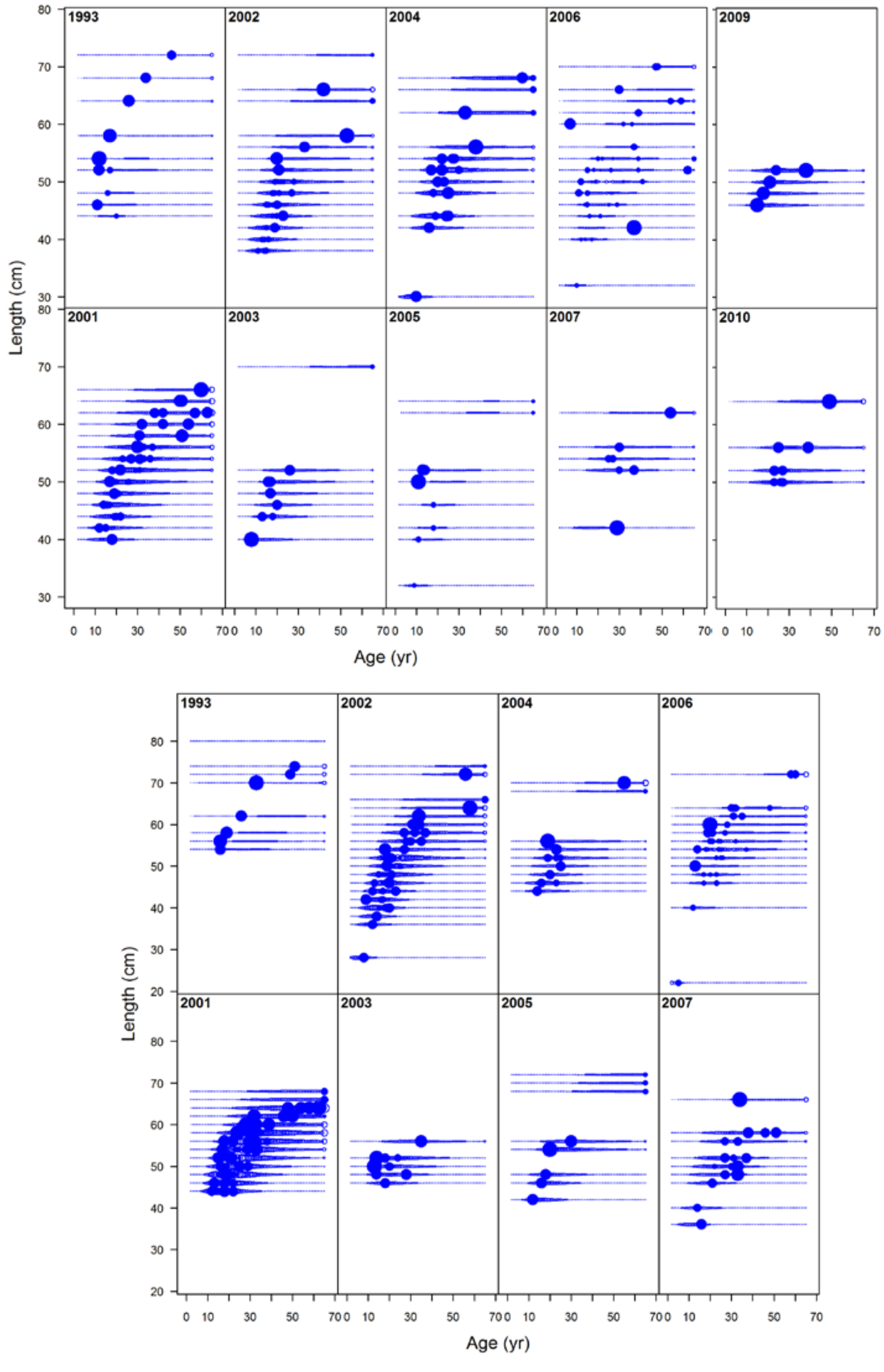

Figure 52. Pearson residuals for the fit to the Washington commercial female (upper panels, maximum =28.57) and male (lower panels, maximum = 20.77) age frequencies. Filled circles represent positive residuals (observed – expected).

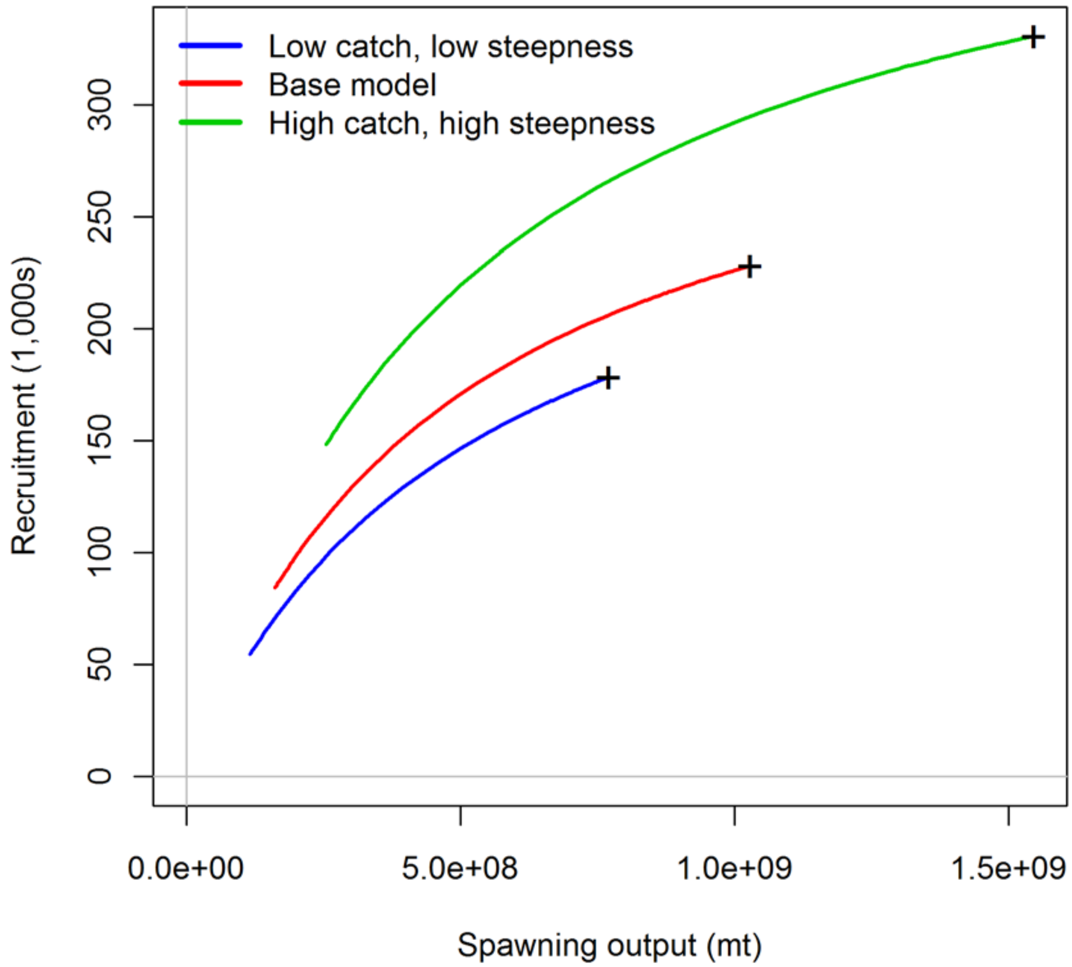

Figure 53. Estimated stock-recruit function for the base-case model, and alternate states of nature. Plus signs indicate estimate equilibrium values.

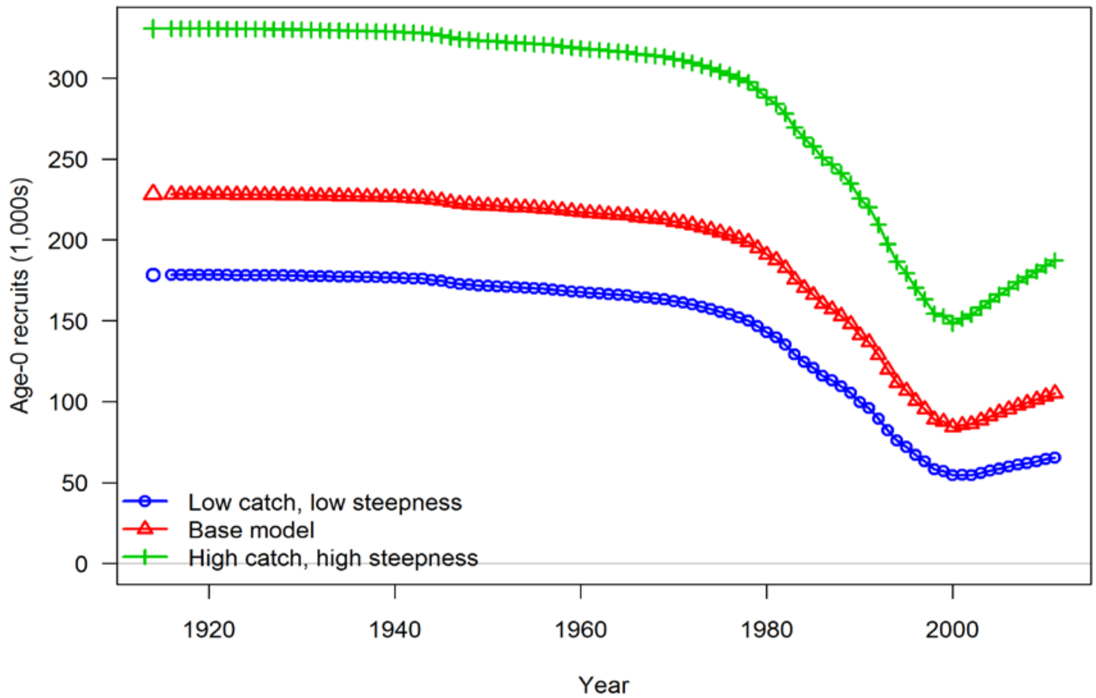

Figure 54. Time series of estimated yelloweye rockfish recruitments for the base-case model and alternate states of nature. Disconnected points at left indicate equilibrium.

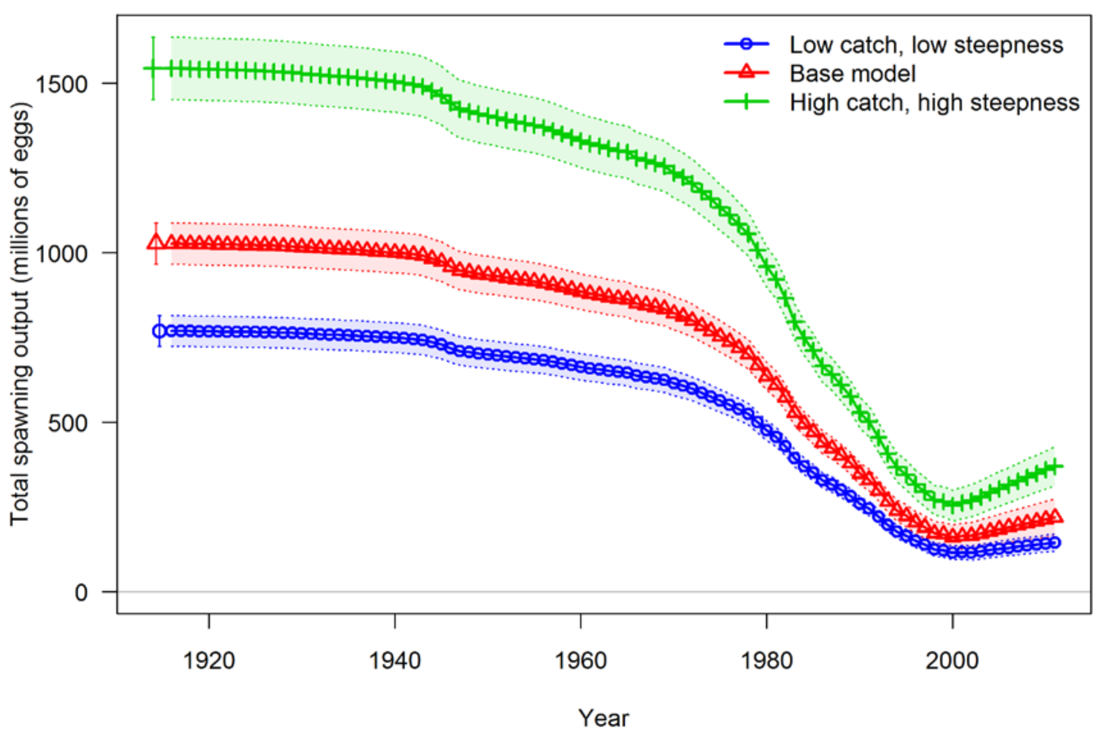

Figure 55. Estimated spawning output time-series (1916-2011) for the base-case model and alternate states of nature. Disconnected points at left indicate equilibrium.

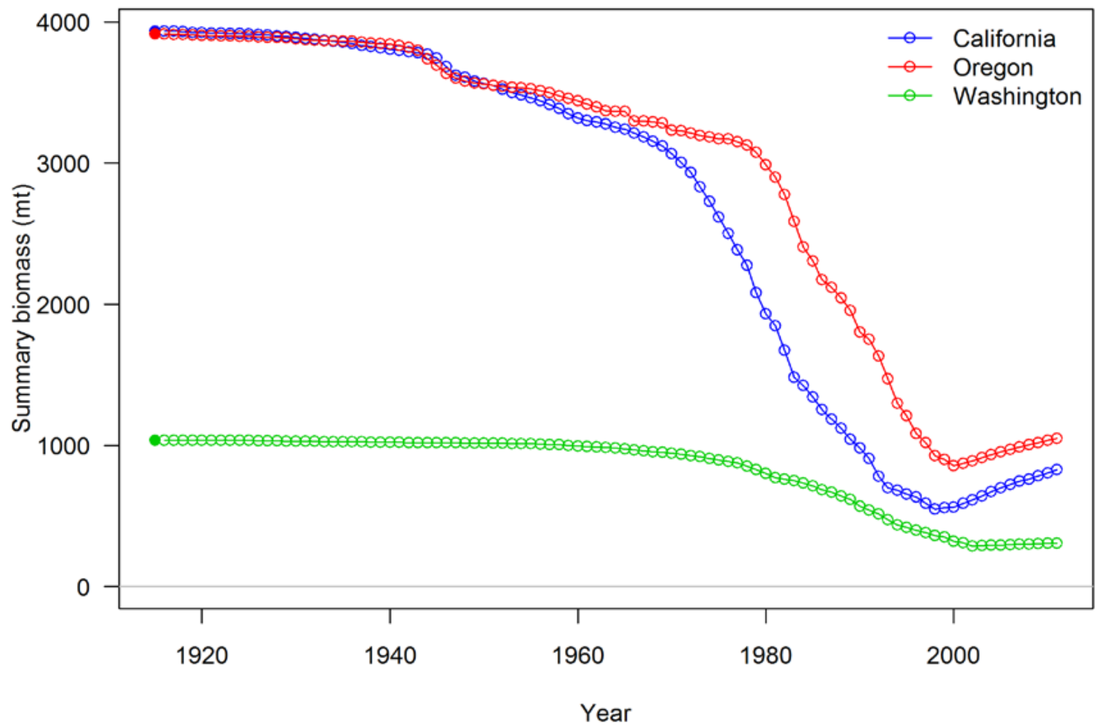

Figure 56. Estimated summary biomass (age-8+) time-series (1916-2011) by state for the base-case model.

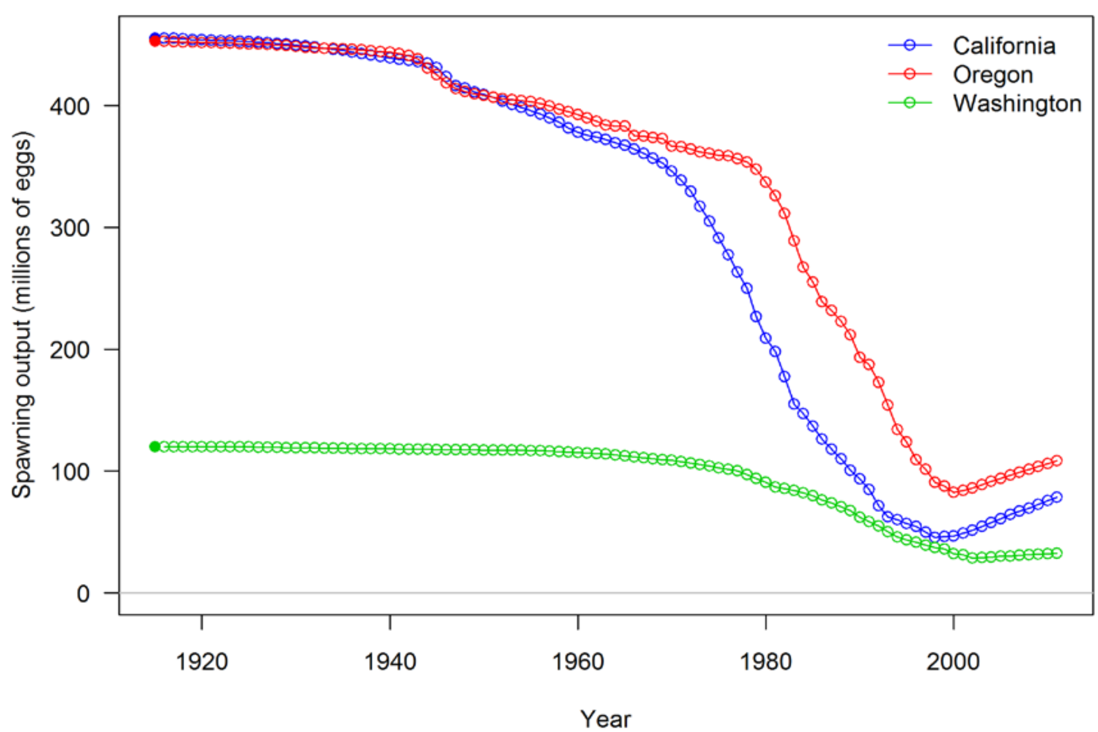

Figure 57. Estimated spawning output time-series (1916-2011) by state for the base-case model.

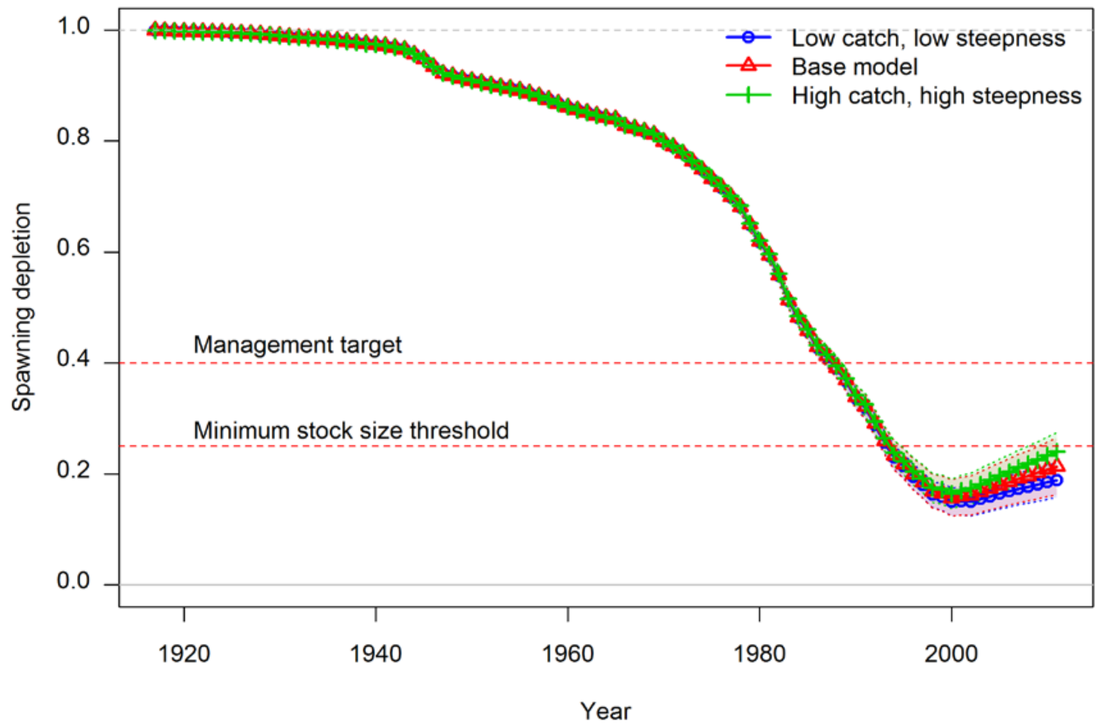

Figure 58. Time series of relative spawning depletion as estimated in the base-case model and alternate states of nature. Light shading around each line shows 95% intervals.

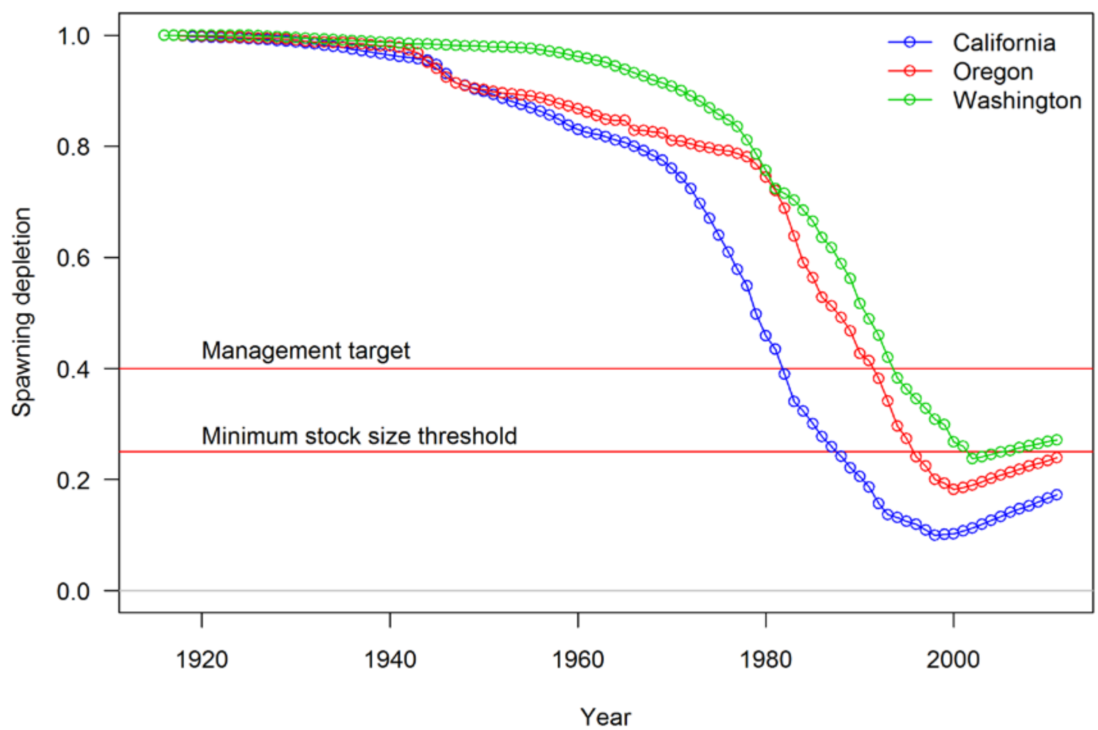

Figure 59. Time-series of relative spawning depletion by state for the base-case model.

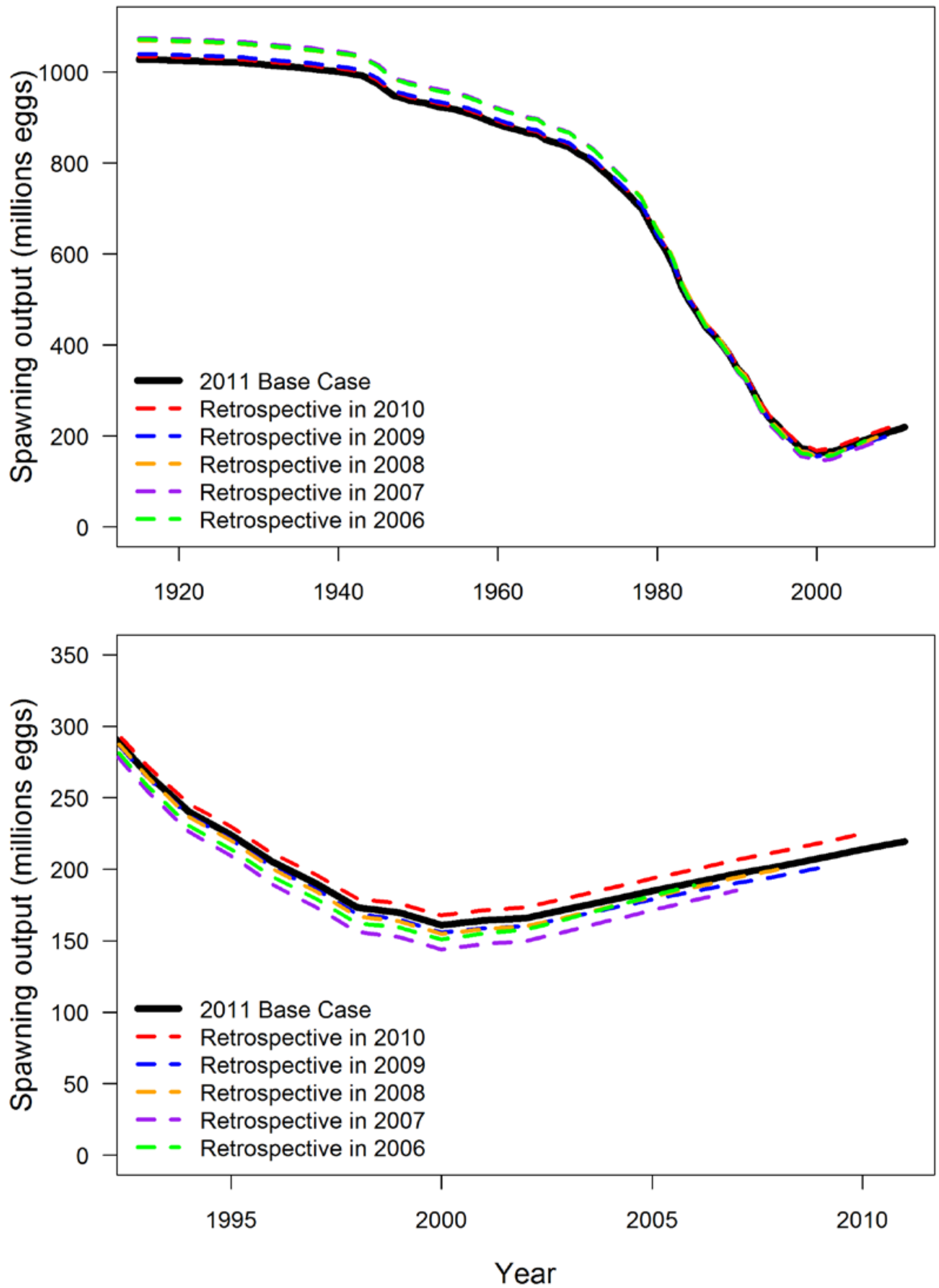

Figure 60. Results from a 5-year retrospective analysis. Each year of retrospective is performed as if the assessment were conducted in that year (i.e., retrospective in 2006 includes data through 2005). Upper panel represents the entire time-series of spawning output, lower panel only the most recent period for easier identification of effects on current status.

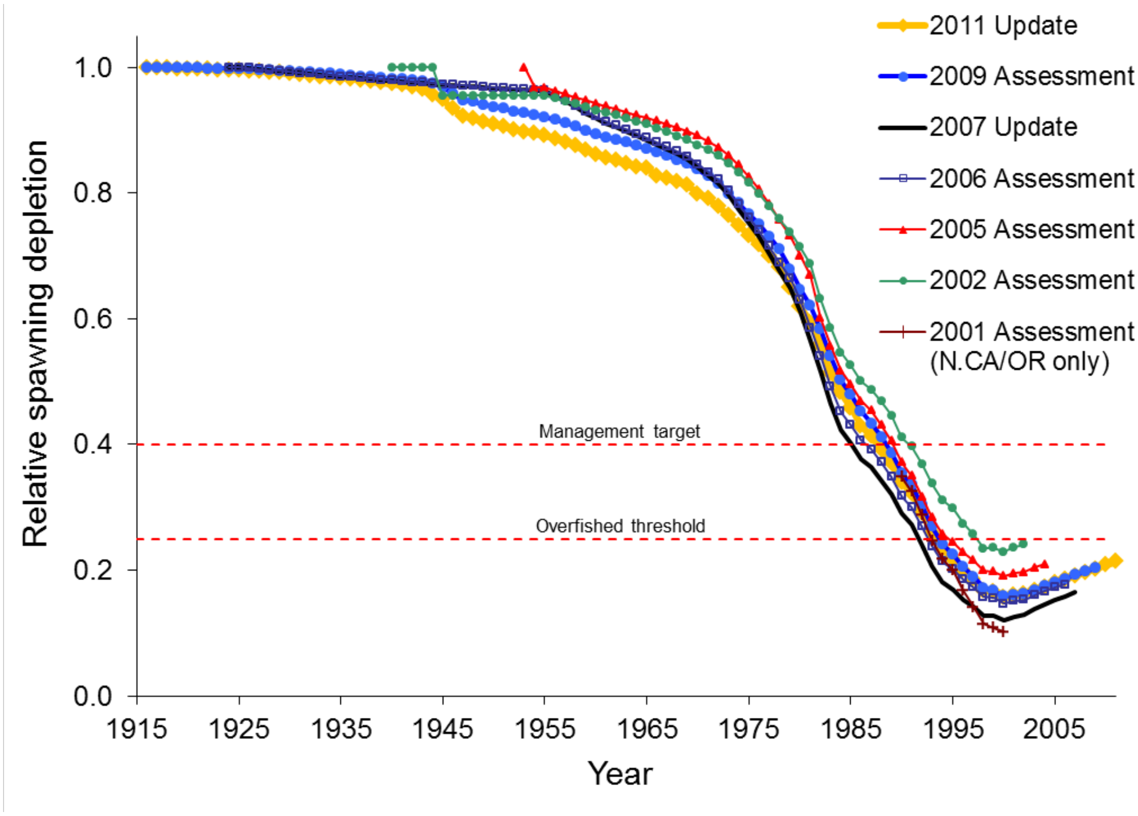

Figure 61. Retrospective pattern in relative depletion among yelloweye rockfish stock assessments.

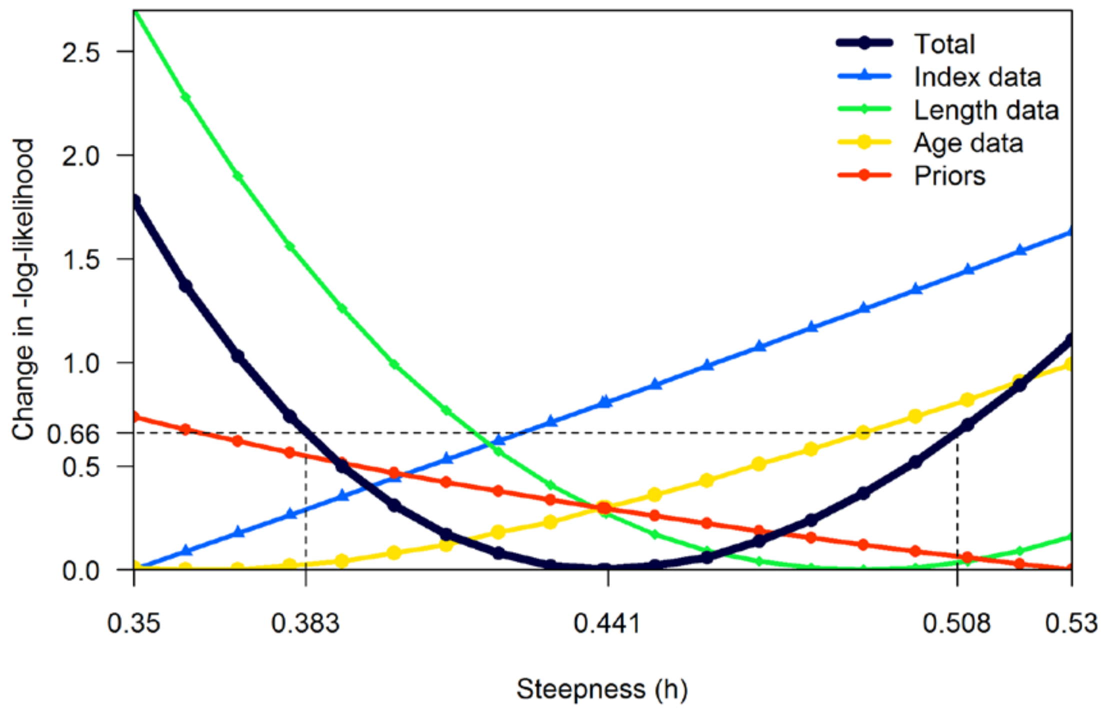

Figure 62. Results of a likelihood profile for steepness of the stock-recruit function, by data type. Dashed lines indicate interval used for low and high states of nature.

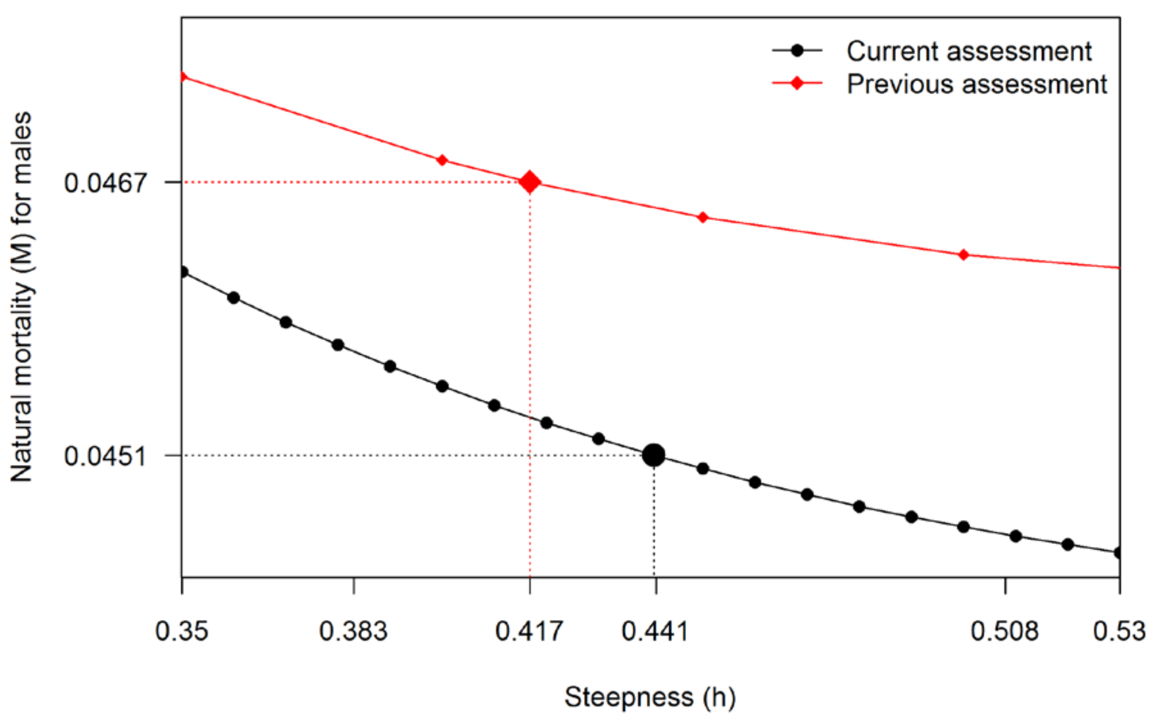

Figure 63. Relationship between steepness and estimated male natural mortality from the likelihood profile on steepness for the 2011 and 2009 assessments. Larger points and dashed lines indicate estimated values for each model.

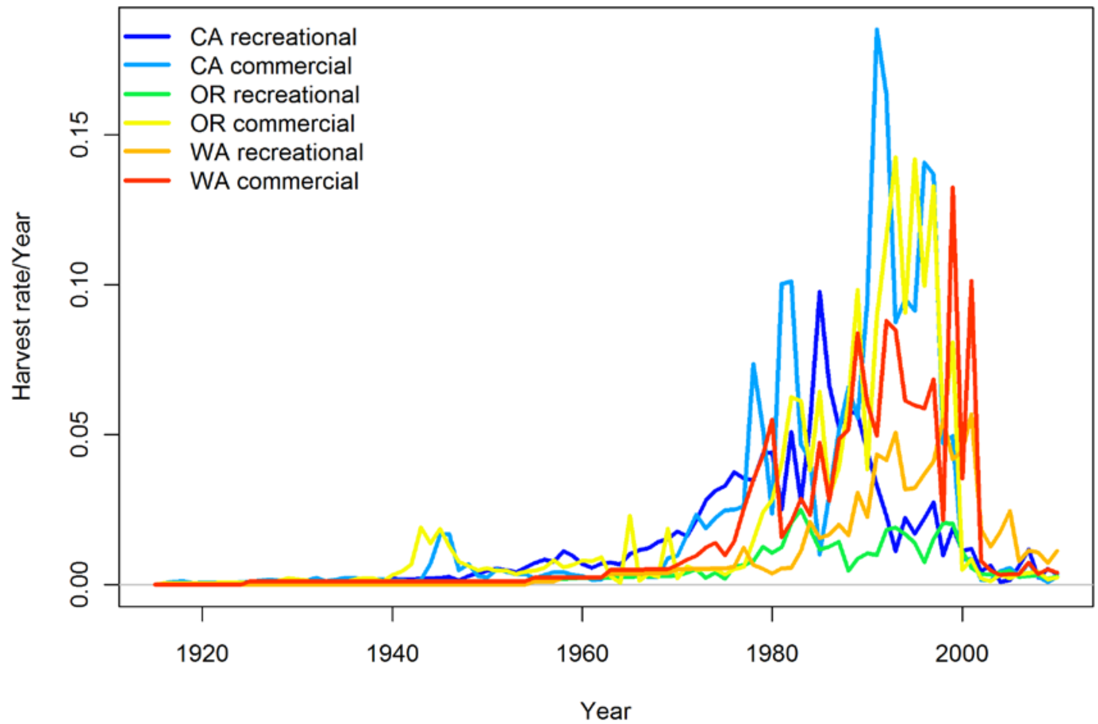

Figure 64. Time-series of harvest rate per year (*F*) for the fishing fleets in the base-case model.

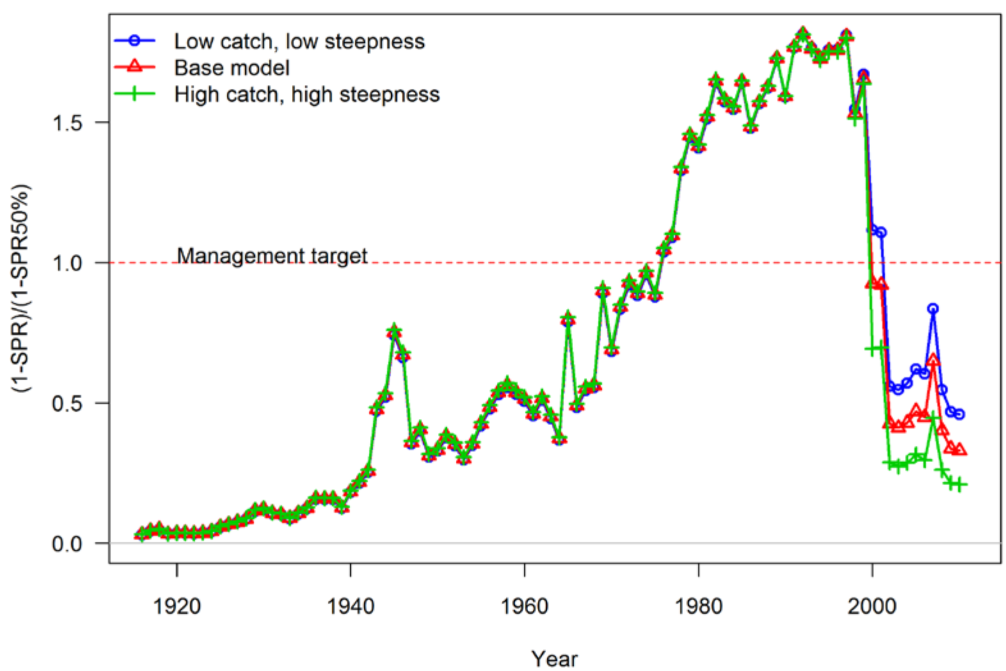

Figure 65. Time series of relative spawning potential ratio ($1\text{-SPR}/1\text{-SPR}_{Target=0.5}$) for the base-case model and alternate states of nature. Values of relative SPR above 100% reflect harvests in excess of the current overfishing proxy.

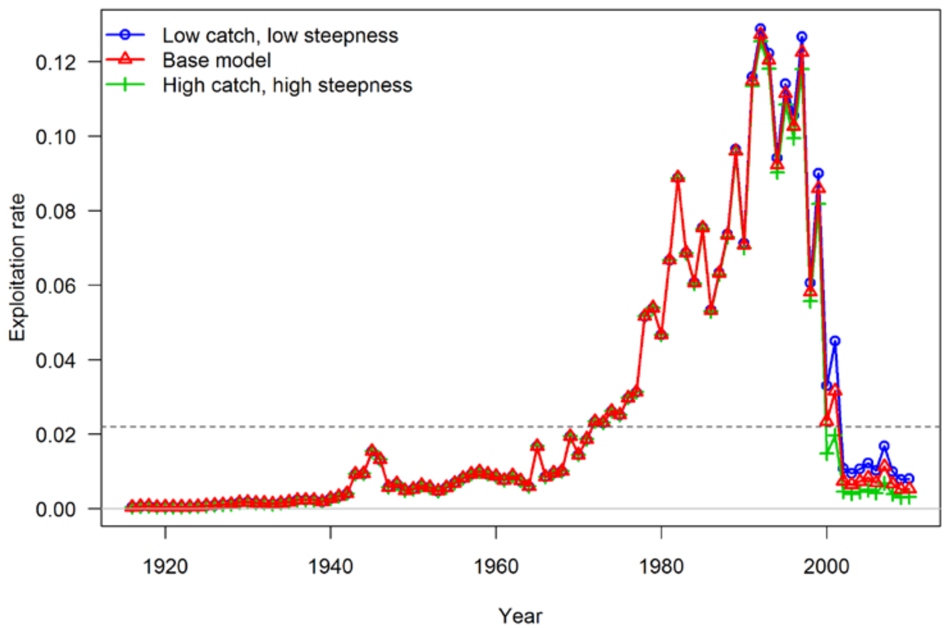

Figure 66. Time series of estimated exploitation rate (catch/age 8 and older biomass) for the base-case model and alternate states of nature. Horizontal line indicates the overfishing limit/target ($F_{50\%}$) from the base case.

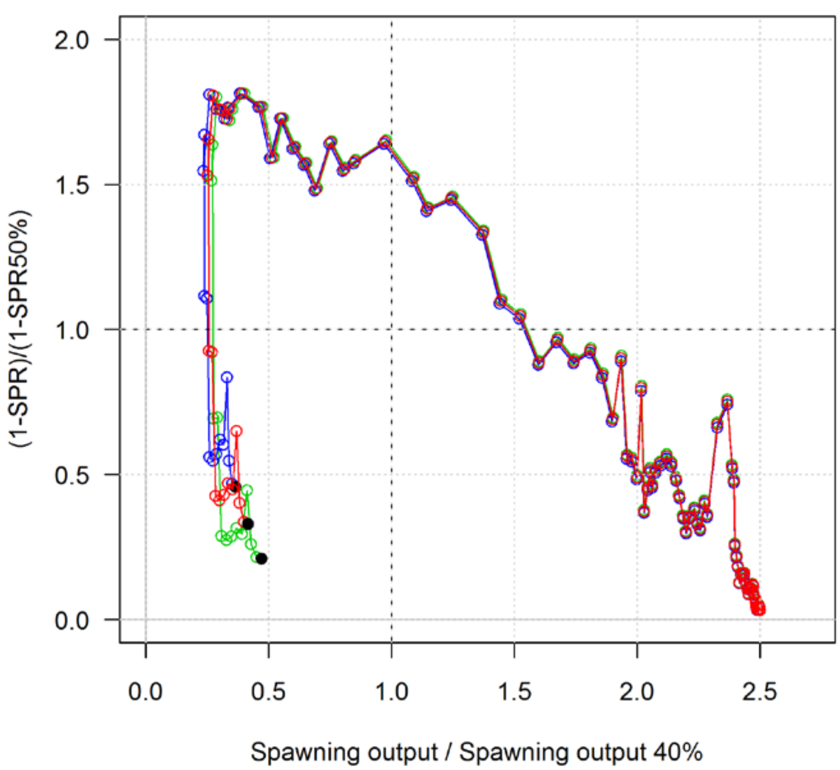

Figure 67. Estimated relative spawning potential ratio relative to the proxy target/limit of 50% vs. estimated spawning biomass relative to the proxy 40% level from the base-case model. Higher biomass occurs on the right side of the x-axis, higher exploitation rates occur on the upper side of the y-axis.

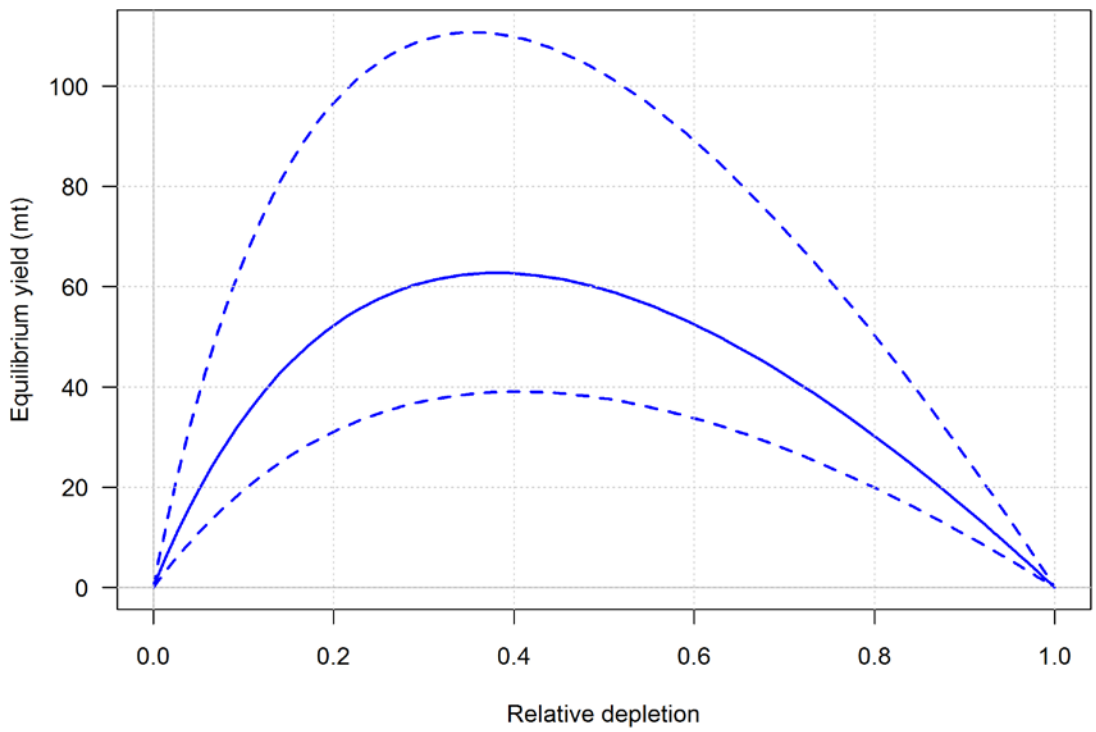

Figure 68. Equilibrium yield curve for the base-case model (solid line) and alternate states of nature (dashed lines).

12. Appendix A: Predicted numbers at age by sex and area

Table A.1. Female numbers at age in California (1000s) predicted by the base-case model.

Age (Yr)	0	1	2	3	4	5	6	7	8	9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90+
1916	49.8	47.6	45.4	43.4	41.4	39.5	37.8	36.1	34.4	32.9	257.5	162.5	102.5	64.7	40.8	25.7	16.2	10.2	17.5
1917	49.8	47.6	45.4	43.4	41.4	39.5	37.8	36.1	34.4	32.9	257.5	162.4	102.4	64.6	40.8	25.7	16.2	10.2	17.5
1918	49.8	47.5	45.4	43.4	41.4	39.5	37.8	36.1	34.4	32.9	257.3	162.2	102.3	64.6	40.7	25.7	16.2	10.2	17.5
1919	49.8	47.5	45.4	43.4	41.4	39.5	37.8	36.1	34.4	32.9	257.2	162.1	102.2	64.5	40.7	25.7	16.2	10.2	17.5
1920	49.8	47.5	45.4	43.4	41.4	39.5	37.8	36.1	34.4	32.9	257.1	162	102.2	64.4	40.7	25.6	16.2	10.2	17.4
1921	49.8	47.5	45.4	43.4	41.4	39.5	37.8	36.1	34.4	32.9	257.1	161.9	102.1	64.4	40.6	25.6	16.2	10.2	17.4
1922	49.7	47.5	45.4	43.3	41.4	39.5	37.8	36.1	34.4	32.9	257	161.8	102	64.4	40.6	25.6	16.2	10.2	17.4
1923	49.7	47.5	45.4	43.3	41.4	39.5	37.8	36.1	34.4	32.9	257	161.8	102	64.3	40.6	25.6	16.1	10.2	17.4
1924	49.7	47.5	45.4	43.3	41.4	39.5	37.7	36.1	34.4	32.9	257	161.7	101.9	64.3	40.6	25.6	16.1	10.2	17.4
1925	49.7	47.5	45.4	43.3	41.4	39.5	37.7	36	34.4	32.9	256.9	161.6	101.8	64.2	40.5	25.6	16.1	10.2	17.4
1926	49.7	47.5	45.4	43.3	41.4	39.5	37.7	36	34.4	32.9	256.9	161.5	101.7	64.2	40.5	25.5	16.1	10.2	17.4
1927	49.7	47.5	45.3	43.3	41.4	39.5	37.7	36	34.4	32.9	256.8	161.3	101.6	64.1	40.4	25.5	16.1	10.1	17.3
1928	49.7	47.5	45.3	43.3	41.4	39.5	37.7	36	34.4	32.8	256.6	161.1	101.5	64	40.4	25.5	16.1	10.1	17.3
1929	49.7	47.4	45.3	43.3	41.3	39.5	37.7	36	34.4	32.8	256.5	161	101.3	63.9	40.3	25.4	16	10.1	17.3
1930	49.6	47.4	45.3	43.3	41.3	39.5	37.7	36	34.4	32.8	256.3	160.8	101.2	63.8	40.2	25.4	16	10.1	17.3
1931	49.6	47.4	45.3	43.3	41.3	39.5	37.7	36	34.4	32.8	256.1	160.5	100.9	63.6	40.1	25.3	16	10.1	17.2
1932	49.6	47.4	45.3	43.2	41.3	39.5	37.7	36	34.4	32.8	256	160.3	100.8	63.5	40.1	25.3	15.9	10.1	17.2
1933	49.6	47.4	45.2	43.2	41.3	39.4	37.7	36	34.3	32.8	255.7	160	100.5	63.3	39.9	25.2	15.9	10	17.1
1934	49.5	47.3	45.2	43.2	41.3	39.4	37.6	35.9	34.3	32.8	255.5	159.8	100.3	63.2	39.9	25.1	15.9	10	17.1
1935	49.5	47.3	45.2	43.2	41.2	39.4	37.6	35.9	34.3	32.8	255.3	159.5	100.1	63	39.8	25.1	15.8	10	17.1
1936	49.5	47.3	45.2	43.2	41.2	39.4	37.6	35.9	34.3	32.7	255	159.2	99.8	62.8	39.6	25	15.8	9.9	17
1937	49.5	47.3	45.2	43.1	41.2	39.4	37.6	35.9	34.3	32.7	254.7	158.8	99.5	62.6	39.5	24.9	15.7	9.9	16.9
1938	49.4	47.2	45.1	43.1	41.2	39.3	37.6	35.9	34.2	32.7	254.5	158.5	99.2	62.4	39.4	24.8	15.7	9.9	16.9
1939	49.4	47.2	45.1	43.1	41.2	39.3	37.5	35.8	34.2	32.7	254.2	158.2	98.9	62.2	39.2	24.7	15.6	9.8	16.8
1940	49.4	47.2	45.1	43.1	41.1	39.3	37.5	35.8	34.2	32.6	254.1	157.9	98.7	62	39.1	24.7	15.6	9.8	16.8
1941	49.3	47.2	45	43	41.1	39.3	37.5	35.8	34.2	32.6	253.9	157.7	98.4	61.8	39	24.6	15.5	9.8	16.7
1942	49.3	47.1	45	43	41.1	39.3	37.5	35.8	34.2	32.6	253.7	157.4	98.2	61.7	38.9	24.5	15.5	9.8	16.7
1943	49.2	47.1	45	43	41.1	39.2	37.5	35.8	34.2	32.6	253.6	157.3	98	61.5	38.7	24.4	15.4	9.7	16.6
1944	49.1	47	44.9	43	41	39.2	37.4	35.7	34.1	32.6	253.3	157	97.7	61.3	38.6	24.3	15.4	9.7	16.6
1945	48.9	46.9	44.9	42.9	41	39.2	37.4	35.7	34.1	32.5	252.3	155.9	96.9	60.7	38.2	24.1	15.2	9.6	16.4
1946	48.7	46.7	44.7	42.8	40.9	39.1	37.3	35.6	33.9	32.3	249.8	153.5	95.2	59.6	37.5	23.7	14.9	9.4	16.1
1947	48.5	46.5	44.6	42.7	40.9	39	37.2	35.5	33.8	32.2	247.5	151.1	93.5	58.5	36.8	23.2	14.6	9.2	15.8
1948	48.4	46.3	44.4	42.6	40.8	39	37.2	35.5	33.8	32.2	247.5	150.6	93	58.1	36.6	23	14.5	9.2	15.7
1949	48.3	46.2	44.2	42.4	40.6	38.9	37.2	35.5	33.8	32.2	246.9	149.7	92.3	57.6	36.2	22.8	14.4	9.1	15.5
1950	48.3	46.1	44.1	42.2	40.4	38.8	37.1	35.5	33.8	32.2	246.9	149.2	91.8	57.2	36	22.7	14.3	9	15.4
1951	48.2	46.1	44	42.1	40.3	38.6	37	35.4	33.8	32.2	246.9	148.7	91.3	56.9	35.7	22.5	14.2	8.9	15.3
1952	48.1	46	44	42	40.2	38.4	36.8	35.2	33.7	32.2	246.3	147.8	90.5	56.3	35.3	22.3	14	8.9	15.1
1953	48	45.9	43.9	42	40.1	38.4	36.6	35.1	33.6	32.1	246.1	147.2	89.9	55.9	35	22.1	13.9	8.8	15
1954	48	45.9	43.9	41.9	40.1	38.3	36.6	34.9	33.4	32	245.9	146.8	89.4	55.5	34.8	21.9	13.8	8.7	14.9
1955	47.9	45.8	43.8	41.9	40	38.2	36.5	34.9	33.3	31.8	245.5	146.3	88.8	55	34.4	21.7	13.7	8.6	14.7
1956	47.8	45.8	43.7	41.8	39.9	38.2	36.4	34.8	33.2	31.7	244.9	145.8	88.2	54.6	34.1	21.5	13.5	8.5	14.6
1957	47.7	45.7	43.7	41.7	39.9	38.1	36.4	34.7	33.1	31.6	243.9	145	87.5	54	33.7	21.2	13.4	8.4	14.4

Table A.1. Continued. Female numbers at age in California (1000s) predicted by the base-case model.

Age (Yr)	0	1	2	3	4	5	6	7	8	9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90+
1958	47.6	45.6	43.6	41.7	39.8	38	36.3	34.6	33	31.5	242.9	144.3	86.7	53.4	33.4	21	13.2	8.3	14.2
1959	47.5	45.5	43.5	41.6	39.8	38	36.2	34.5	32.9	31.4	241.4	143.2	85.7	52.7	32.9	20.7	13	8.2	14
1960	47.4	45.3	43.4	41.5	39.7	37.9	36.2	34.5	32.9	31.3	240.3	142.4	84.9	52.1	32.5	20.4	12.8	8.1	13.8
1961	47.3	45.2	43.3	41.4	39.6	37.9	36.1	34.5	32.8	31.3	239.7	142.2	84.4	51.7	32.2	20.2	12.7	8	13.7
1962	47.2	45.1	43.2	41.3	39.5	37.8	36.1	34.4	32.8	31.3	239.6	142.2	84.2	51.4	32	20	12.6	8	13.6
1963	47.1	45	43.1	41.2	39.4	37.7	36	34.4	32.8	31.3	239.3	142.1	83.9	51.1	31.7	19.9	12.5	7.9	13.5
1964	47	44.9	43	41.1	39.3	37.6	35.9	34.3	32.7	31.2	238.6	141.7	83.4	50.6	31.4	19.7	12.4	7.8	13.3
1965	46.9	44.9	42.9	41	39.2	37.5	35.8	34.2	32.7	31.2	238.3	141.5	83.1	50.3	31.1	19.5	12.3	7.7	13.2
1966	46.7	44.8	42.8	40.9	39.1	37.4	35.7	34.1	32.6	31.1	237.4	140.8	82.5	49.8	30.7	19.2	12.1	7.6	13
1967	46.6	44.6	42.8	40.9	39	37.3	35.6	34	32.4	30.9	236.4	139.8	81.8	49.2	30.3	19	11.9	7.5	12.8
1968	46.5	44.5	42.6	40.8	39	37.2	35.5	33.9	32.3	30.8	235.4	138.8	81.2	48.6	29.9	18.7	11.7	7.4	12.6
1969	46.4	44.4	42.5	40.6	38.9	37.1	35.4	33.8	32.2	30.7	234	137.5	80.4	48	29.5	18.4	11.5	7.3	12.4
1970	46.1	44.3	42.4	40.5	38.7	37	35.3	33.6	32	30.5	231.7	135.4	79.1	47	28.8	17.9	11.3	7.1	12.1
1971	45.9	44	42.2	40.4	38.6	36.8	35.2	33.5	31.9	30.3	229.1	132.9	77.5	45.9	28.1	17.5	11	6.9	11.8
1972	45.6	43.8	42	40.3	38.5	36.7	35	33.4	31.7	30.1	225.9	129.9	75.6	44.6	27.2	16.9	10.6	6.7	11.4
1973	45.3	43.6	41.8	40	38.3	36.5	34.8	33.1	31.5	29.8	221.4	125.5	72.9	42.8	26	16.1	10.1	6.4	10.9
1974	45	43.3	41.6	39.8	38.1	36.4	34.6	32.9	31.2	29.6	217	121.2	70.1	41	24.8	15.4	9.6	6.1	10.4
1975	44.6	42.9	41.2	39.6	37.9	36.1	34.4	32.7	30.9	29.2	212.3	116.4	66.9	39	23.6	14.6	9.1	5.7	9.8
1976	44.2	42.6	40.9	39.3	37.6	35.9	34.2	32.5	30.7	28.9	207.5	111.4	63.6	37	22.3	13.7	8.6	5.4	9.2
1977	43.8	42.2	40.6	38.9	37.3	35.6	33.9	32.2	30.5	28.7	202.7	106.3	60.1	34.9	20.9	12.9	8	5.1	8.6
1978	43.3	41.8	40.2	38.6	37	35.3	33.7	32	30.2	28.5	198.8	101.7	57	32.9	19.7	12.1	7.5	4.7	8.1
1979	42.5	41.4	39.8	38.2	36.6	34.9	33.2	31.5	29.7	27.8	189.8	93	51.3	29.6	17.6	10.8	6.7	4.2	7.2
1980	41.6	40.6	39.4	37.8	36.2	34.6	32.9	31.1	29.3	27.4	183.5	86.4	46.9	26.9	15.9	9.8	6.1	3.8	6.5
1981	40.8	39.7	38.6	37.5	35.9	34.3	32.6	30.9	29.1	27.3	181.2	82.7	44.2	25.3	14.9	9.1	5.7	3.5	6.1
1982	39.7	39	37.8	36.7	35.5	33.9	32.2	30.4	28.6	26.7	173.2	74.9	39.1	22.3	13.1	8	4.9	3.1	5.3
1983	38.2	37.9	37.1	35.8	34.7	33.3	31.6	29.8	27.9	26	163.3	66.2	33.6	19	11.1	6.7	4.2	2.6	4.5
1984	37	36.5	36.2	35.3	34	32.8	31.5	29.7	27.9	26	163.1	63.7	31.5	17.8	10.3	6.2	3.9	2.4	4.1
1985	36.1	35.4	34.7	34.3	33.4	32.1	30.9	29.4	27.6	25.8	160.7	60.3	28.9	16.2	9.4	5.6	3.5	2.2	3.7
1986	34.9	34.5	33.6	32.9	32.4	31.4	30.1	28.7	27.1	25.3	156.8	56.5	26.3	14.6	8.4	5	3.1	1.9	3.3
1987	34.1	33.3	32.8	31.9	31.1	30.6	29.5	28.1	26.6	25	154.7	53.8	24.2	13.2	7.6	4.6	2.8	1.7	3
1988	33.2	32.6	31.7	31.1	30.2	29.4	28.7	27.5	26	24.5	152.3	51.2	22.1	12	6.9	4.1	2.5	1.6	2.7
1989	32.1	31.7	31	30.1	29.5	28.5	27.5	26.7	25.4	23.8	147.9	47.9	19.8	10.6	6	3.6	2.2	1.4	2.3
1990	30.6	30.7	30.2	29.4	28.5	27.8	26.7	25.6	24.7	23.3	144.7	45.6	18	9.4	5.4	3.2	1.9	1.2	2
1991	29.6	29.2	29.2	28.6	27.8	26.8	26	24.8	23.6	22.5	139.5	42.4	16	8.2	4.6	2.7	1.7	1	1.8
1992	27.8	28.3	27.7	27.6	27	26	24.8	23.8	22.4	21	127.6	36.2	12.8	6.4	3.6	2.1	1.3	0.8	1.4
1993	25.9	26.6	26.9	26.3	26	25.3	24.2	22.9	21.7	20.1	120	32.3	10.8	5.3	2.9	1.7	1	0.6	1.1
1994	24.1	24.7	25.3	25.6	24.9	24.6	23.8	22.7	21.3	20	120.1	31.9	10.1	4.8	2.7	1.5	0.9	0.6	1
1995	23	23	23.5	24.1	24.2	23.5	23.1	22.2	21	19.6	118.5	31	9.3	4.3	2.4	1.4	0.8	0.5	0.9
1996	21.6	21.9	21.9	22.4	22.8	22.9	22.1	21.6	20.7	19.4	117.4	30.5	8.7	3.9	2.1	1.2	0.7	0.4	0.8
1997	20.4	20.6	20.9	20.8	21.1	21.5	21.4	20.5	19.8	18.7	112.1	28.4	7.7	3.3	1.8	1	0.6	0.4	0.6
1998	19	19.5	19.6	19.8	19.6	19.9	20	19.8	18.7	17.9	107.1	26.5	6.8	2.8	1.5	0.8	0.5	0.3	0.5
1999	18.7	18.2	18.6	18.6	18.8	18.6	18.8	18.9	18.6	17.6	110	27.8	6.8	2.7	1.4	0.8	0.5	0.3	0.5

Table A.1. Continued. Female numbers at age in California (1000s) predicted by the base-case model.

Age (Yr)	0	1	2	3	4	5	6	7	8	9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90+
2000	18	17.9	17.3	17.7	17.7	17.8	17.6	17.7	17.7	17.4	111.1	28.9	6.8	2.5	1.3	0.7	0.4	0.3	0.4
2001	18.2	17.2	17.1	16.5	16.9	16.9	17	16.7	16.8	16.8	115.3	31.5	7.3	2.6	1.3	0.7	0.4	0.3	0.4
2002	18.4	17.4	16.4	16.3	15.7	16.1	16.1	16.1	15.9	15.9	118.2	34.4	7.7	2.6	1.3	0.7	0.4	0.3	0.4
2003	18.9	17.5	16.6	15.6	15.5	15	15.3	15.3	15.4	15.1	120.9	37.8	8.4	2.7	1.3	0.7	0.4	0.3	0.4
2004	19.4	18	16.8	15.9	14.9	14.8	14.3	14.6	14.6	14.6	121.9	41.4	9.2	2.8	1.3	0.7	0.4	0.3	0.4
2005	19.9	18.5	17.2	16	15.2	14.2	14.1	13.7	13.9	13.9	122.1	45.4	10.1	2.9	1.3	0.7	0.4	0.3	0.4
2006	20.4	19	17.7	16.4	15.3	14.5	13.6	13.5	13	13.3	121	49.3	11.1	3.1	1.3	0.7	0.4	0.3	0.4
2007	20.9	19.5	18.2	16.9	15.7	14.6	13.8	12.9	12.8	12.4	118.6	53.3	12.2	3.2	1.4	0.7	0.4	0.3	0.4
2008	21.3	19.9	18.6	17.3	16.1	15	13.9	13.1	12.3	12.2	114.2	56.6	13.3	3.4	1.4	0.7	0.4	0.2	0.4
2009	21.7	20.3	19	17.7	16.5	15.4	14.3	13.2	12.5	11.7	110.8	60.6	14.8	3.6	1.4	0.7	0.4	0.2	0.4
2010	22.1	20.7	19.4	18.2	16.9	15.8	14.7	13.6	12.6	11.9	107	64.1	16.3	3.9	1.4	0.7	0.4	0.2	0.4

Table A.2. Male numbers at age in California (1000s) predicted by the base-case model.

Age (Yr)	0	1	2	3	4	5	6	7	8	9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90+
1916	49.8	47.6	45.5	43.5	41.6	39.8	38	36.4	34.8	33.2	261.7	167	106.6	68	43.4	27.7	17.7	11.3	19.9
1917	49.8	47.6	45.5	43.5	41.6	39.8	38	36.4	34.8	33.2	261.6	166.9	106.5	68	43.4	27.7	17.7	11.3	19.9
1918	49.8	47.6	45.5	43.5	41.6	39.8	38	36.3	34.7	33.2	261.5	166.8	106.4	67.9	43.3	27.6	17.6	11.3	19.9
1919	49.8	47.6	45.5	43.5	41.6	39.8	38	36.3	34.7	33.2	261.3	166.6	106.3	67.8	43.3	27.6	17.6	11.2	19.8
1920	49.8	47.6	45.5	43.5	41.6	39.8	38	36.3	34.7	33.2	261.3	166.5	106.2	67.8	43.3	27.6	17.6	11.2	19.8
1921	49.8	47.6	45.5	43.5	41.6	39.8	38	36.3	34.7	33.2	261.2	166.4	106.2	67.7	43.2	27.6	17.6	11.2	19.8
1922	49.7	47.6	45.5	43.5	41.6	39.8	38	36.3	34.7	33.2	261.2	166.3	106.1	67.7	43.2	27.6	17.6	11.2	19.8
1923	49.7	47.6	45.5	43.5	41.6	39.8	38	36.3	34.7	33.2	261.1	166.3	106	67.7	43.2	27.5	17.6	11.2	19.8
1924	49.7	47.6	45.5	43.5	41.6	39.7	38	36.3	34.7	33.2	261.1	166.2	106	67.6	43.1	27.5	17.6	11.2	19.8
1925	49.7	47.5	45.5	43.5	41.6	39.7	38	36.3	34.7	33.2	261.1	166.1	105.9	67.6	43.1	27.5	17.6	11.2	19.8
1926	49.7	47.5	45.5	43.5	41.6	39.7	38	36.3	34.7	33.2	261	166	105.8	67.5	43.1	27.5	17.5	11.2	19.7
1927	49.7	47.5	45.4	43.5	41.6	39.7	38	36.3	34.7	33.2	260.9	165.8	105.7	67.4	43	27.4	17.5	11.2	19.7
1928	49.7	47.5	45.4	43.4	41.5	39.7	38	36.3	34.7	33.2	260.7	165.6	105.5	67.3	42.9	27.4	17.5	11.2	19.7
1929	49.7	47.5	45.4	43.4	41.5	39.7	38	36.3	34.7	33.2	260.6	165.4	105.3	67.2	42.9	27.4	17.5	11.1	19.6
1930	49.6	47.5	45.4	43.4	41.5	39.7	38	36.3	34.7	33.2	260.4	165.2	105.2	67.1	42.8	27.3	17.4	11.1	19.6
1931	49.6	47.5	45.4	43.4	41.5	39.7	37.9	36.3	34.7	33.1	260.2	164.9	104.9	66.9	42.7	27.2	17.4	11.1	19.6
1932	49.6	47.4	45.4	43.4	41.5	39.7	37.9	36.3	34.7	33.1	260	164.7	104.7	66.8	42.6	27.2	17.4	11.1	19.5
1933	49.6	47.4	45.3	43.4	41.5	39.7	37.9	36.2	34.6	33.1	259.7	164.3	104.5	66.6	42.5	27.1	17.3	11	19.5
1934	49.5	47.4	45.3	43.3	41.5	39.6	37.9	36.2	34.6	33.1	259.6	164.1	104.3	66.5	42.4	27.1	17.3	11	19.4
1935	49.5	47.4	45.3	43.3	41.4	39.6	37.9	36.2	34.6	33.1	259.3	163.9	104	66.3	42.3	27	17.2	11	19.4
1936	49.5	47.3	45.3	43.3	41.4	39.6	37.9	36.2	34.6	33.1	259	163.5	103.7	66.1	42.2	26.9	17.2	11	19.3
1937	49.5	47.3	45.3	43.3	41.4	39.6	37.8	36.2	34.6	33	258.7	163.1	103.4	65.8	42	26.8	17.1	10.9	19.2
1938	49.4	47.3	45.2	43.3	41.4	39.6	37.8	36.1	34.5	33	258.4	162.8	103.1	65.6	41.9	26.7	17	10.9	19.2
1939	49.4	47.3	45.2	43.2	41.4	39.5	37.8	36.1	34.5	33	258.2	162.4	102.8	65.4	41.7	26.6	17	10.8	19.1
1940	49.4	47.2	45.2	43.2	41.3	39.5	37.8	36.1	34.5	33	258	162.1	102.5	65.2	41.6	26.5	16.9	10.8	19.1
1941	49.3	47.2	45.1	43.2	41.3	39.5	37.8	36.1	34.5	33	257.8	161.9	102.3	65	41.5	26.5	16.9	10.8	19
1942	49.3	47.2	45.1	43.2	41.3	39.5	37.7	36.1	34.5	32.9	257.6	161.6	102	64.8	41.3	26.4	16.8	10.7	18.9
1943	49.2	47.1	45.1	43.1	41.3	39.4	37.7	36.1	34.5	32.9	257.5	161.4	101.8	64.6	41.2	26.3	16.8	10.7	18.9
1944	49.1	47.1	45	43.1	41.2	39.4	37.7	36	34.4	32.9	257.2	161.1	101.5	64.4	41.1	26.2	16.7	10.7	18.8
1945	48.9	46.9	45	43.1	41.2	39.4	37.6	36	34.4	32.8	256.1	160	100.6	63.8	40.7	26	16.6	10.6	18.6
1946	48.7	46.8	44.8	43	41.1	39.3	37.5	35.8	34.2	32.6	253.4	157.4	98.8	62.6	39.9	25.4	16.2	10.4	18.3
1947	48.5	46.6	44.7	42.8	41	39.2	37.5	35.8	34.1	32.5	250.9	154.8	97	61.4	39.1	25	15.9	10.2	17.9
1948	48.4	46.4	44.5	42.7	40.9	39.2	37.5	35.8	34.1	32.5	250.8	154.3	96.5	61.1	38.9	24.8	15.8	10.1	17.8
1949	48.3	46.3	44.3	42.5	40.8	39.1	37.4	35.7	34.1	32.5	250.2	153.3	95.7	60.5	38.5	24.5	15.7	10	17.6
1950	48.3	46.2	44.2	42.3	40.6	39	37.3	35.7	34.1	32.5	250.2	152.8	95.2	60.1	38.2	24.4	15.6	9.9	17.5
1951	48.2	46.1	44.2	42.3	40.5	38.8	37.2	35.6	34.1	32.5	250.2	152.3	94.7	59.7	38	24.2	15.4	9.9	17.4
1952	48.1	46.1	44.1	42.2	40.4	38.6	37	35.5	34	32.5	249.6	151.3	93.9	59.1	37.6	23.9	15.3	9.7	17.2
1953	48	46	44	42.1	40.3	38.6	36.9	35.3	33.9	32.4	249.3	150.6	93.2	58.6	37.2	23.7	15.1	9.7	17
1954	48	45.9	44	42.1	40.3	38.5	36.8	35.2	33.7	32.3	249.2	150.2	92.7	58.2	36.9	23.5	15	9.6	16.9
1955	47.9	45.9	43.9	42	40.2	38.4	36.7	35.1	33.5	32.1	248.8	149.6	92	57.7	36.6	23.3	14.9	9.5	16.7
1956	47.8	45.8	43.8	41.9	40.1	38.4	36.7	35	33.5	32	248.2	149.1	91.4	57.3	36.3	23.1	14.7	9.4	16.6
1957	47.7	45.7	43.8	41.9	40.1	38.3	36.6	35	33.4	31.9	247.2	148.3	90.6	56.7	35.9	22.8	14.6	9.3	16.4

Table A.2. Continued. Male numbers at age in California (1000s) predicted by the base-case model.

Age (Yr)	0	1	2	3	4	5	6	7	8	9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90+
1958	47.6	45.6	43.7	41.8	40	38.2	36.5	34.9	33.3	31.8	246.1	147.5	89.8	56.1	35.4	22.6	14.4	9.2	16.2
1959	47.5	45.5	43.6	41.7	39.9	38.2	36.5	34.8	33.2	31.7	244.5	146.3	88.7	55.3	34.9	22.2	14.2	9	15.9
1960	47.4	45.4	43.5	41.7	39.9	38.1	36.4	34.7	33.1	31.6	243.4	145.5	87.9	54.6	34.5	21.9	14	8.9	15.7
1961	47.3	45.3	43.4	41.6	39.8	38.1	36.4	34.7	33.1	31.6	242.8	145.2	87.3	54.2	34.2	21.7	13.8	8.8	15.6
1962	47.2	45.2	43.3	41.5	39.7	38	36.3	34.7	33.1	31.6	242.7	145.3	87.1	53.9	33.9	21.6	13.7	8.8	15.4
1963	47.1	45.1	43.2	41.4	39.6	37.9	36.3	34.7	33.1	31.5	242.4	145.2	86.7	53.5	33.7	21.4	13.6	8.7	15.3
1964	47	45	43.1	41.3	39.5	37.8	36.2	34.6	33	31.5	241.7	144.8	86.2	53	33.3	21.1	13.5	8.6	15.1
1965	46.9	44.9	43	41.2	39.4	37.7	36.1	34.5	33	31.5	241.4	144.6	85.8	52.7	33	20.9	13.3	8.5	15
1966	46.7	44.9	42.9	41.1	39.3	37.6	36	34.4	32.8	31.4	240.5	143.8	85.2	52.1	32.6	20.7	13.2	8.4	14.8
1967	46.6	44.6	42.9	41	39.2	37.5	35.9	34.3	32.7	31.2	239.4	142.7	84.5	51.5	32.2	20.4	13	8.3	14.6
1968	46.5	44.5	42.6	40.9	39.1	37.4	35.8	34.1	32.6	31.1	238.3	141.7	83.8	50.9	31.7	20.1	12.8	8.1	14.4
1969	46.4	44.4	42.6	40.7	39.1	37.3	35.7	34	32.5	30.9	236.9	140.4	83	50.2	31.3	19.7	12.6	8	14.1
1970	46.1	44.3	42.5	40.6	38.9	37.2	35.5	33.9	32.3	30.7	234.5	138.2	81.6	49.1	30.5	19.3	12.2	7.8	13.8
1971	45.9	44.1	42.3	40.5	38.8	37	35.4	33.7	32.1	30.6	231.6	135.6	80	48	29.7	18.7	11.9	7.6	13.4
1972	45.6	43.9	42.1	40.4	38.6	36.9	35.2	33.6	31.9	30.3	228.2	132.4	78	46.6	28.8	18.1	11.5	7.3	12.9
1973	45.3	43.6	41.9	40.1	38.5	36.7	35	33.3	31.7	30	223.4	127.8	75.1	44.7	27.6	17.3	11	7	12.3
1974	45	43.3	41.6	39.9	38.2	36.6	34.8	33.1	31.4	29.8	218.7	123.2	72.2	42.8	26.3	16.5	10.5	6.7	11.8
1975	44.6	43	41.3	39.7	38	36.3	34.6	32.9	31.1	29.4	213.6	118.2	68.9	40.7	24.9	15.6	9.9	6.3	11.1
1976	44.2	42.6	41	39.4	37.8	36.1	34.3	32.7	30.9	29.1	208.5	113	65.4	38.5	23.5	14.7	9.3	5.9	10.5
1977	43.8	42.3	40.7	39.1	37.4	35.8	34.1	32.3	30.6	28.8	203.3	107.6	61.8	36.3	22.1	13.8	8.7	5.6	9.8
1978	43.3	41.9	40.3	38.7	37.2	35.5	33.9	32.1	30.3	28.6	199.1	102.8	58.5	34.3	20.8	13	8.2	5.2	9.2
1979	42.5	41.4	39.9	38.4	36.7	35.1	33.4	31.6	29.8	27.9	189.5	93.6	52.6	30.8	18.6	11.6	7.3	4.6	8.2
1980	41.6	40.6	39.5	37.9	36.4	34.7	33	31.2	29.4	27.5	182.7	86.7	48	28	16.8	10.4	6.6	4.2	7.4
1981	40.8	39.8	38.7	37.6	36.1	34.5	32.8	31	29.2	27.3	180.3	82.8	45.2	26.3	15.7	9.7	6.1	3.9	6.9
1982	39.7	39.1	37.9	36.8	35.6	34	32.3	30.5	28.7	26.7	171.8	74.6	39.9	23.1	13.8	8.5	5.4	3.4	6
1983	38.2	38	37.2	36	34.8	33.5	31.7	29.9	27.9	25.9	161.2	65.6	34.1	19.7	11.7	7.2	4.5	2.9	5
1984	37	36.5	36.2	35.4	34.2	33	31.6	29.8	28	26	161	62.9	32	18.4	10.9	6.7	4.2	2.7	4.7
1985	36.1	35.4	34.8	34.5	33.6	32.3	31	29.5	27.7	25.8	158.5	59.3	29.3	16.8	9.8	6	3.8	2.4	4.2
1986	34.9	34.5	33.7	33	32.6	31.6	30.2	28.8	27.2	25.3	154.5	55.4	26.5	15	8.8	5.4	3.4	2.1	3.7
1987	34.1	33.3	32.9	32	31.3	30.7	29.6	28.1	26.6	25	152.5	52.6	24.4	13.7	8	4.9	3	1.9	3.4
1988	33.2	32.6	31.8	31.2	30.3	29.5	28.8	27.6	26.1	24.5	150	49.9	22.2	12.3	7.2	4.3	2.7	1.7	3
1989	32.1	31.7	31.1	30.2	29.6	28.6	27.6	26.8	25.4	23.8	145.4	46.5	19.8	10.9	6.3	3.8	2.4	1.5	2.6
1990	30.6	30.7	30.2	29.5	28.6	27.9	26.8	25.7	24.7	23.3	142.2	44.1	18	9.7	5.6	3.4	2.1	1.3	2.3
1991	29.6	29.2	29.2	28.7	27.9	26.9	26	24.8	23.6	22.4	136.8	40.9	15.9	8.4	4.9	2.9	1.8	1.1	2
1992	27.8	28.3	27.8	27.7	27	26.1	24.9	23.8	22.3	20.8	124.4	34.7	12.7	6.6	3.8	2.2	1.4	0.9	1.5
1993	25.9	26.6	26.9	26.4	26.1	25.4	24.3	22.9	21.6	20	116.4	30.7	10.6	5.4	3.1	1.8	1.1	0.7	1.2
1994	24.1	24.7	25.4	25.7	25	24.7	23.9	22.7	21.3	19.9	116.6	30.3	9.9	4.9	2.8	1.6	1	0.6	1.1
1995	23	23	23.6	24.1	24.3	23.6	23.2	22.3	21	19.5	115.1	29.3	9.1	4.3	2.5	1.4	0.9	0.6	1
1996	21.6	22	22	22.4	22.9	23	22.2	21.7	20.7	19.3	114.2	28.8	8.4	3.9	2.2	1.3	0.8	0.5	0.9
1997	20.4	20.6	20.9	20.8	21.2	21.5	21.4	20.5	19.8	18.6	108.9	26.7	7.4	3.3	1.8	1.1	0.6	0.4	0.7
1998	19	19.5	19.6	19.8	19.7	19.9	20.1	19.8	18.7	17.8	103.8	24.8	6.5	2.8	1.5	0.9	0.5	0.3	0.6
1999	18.7	18.2	18.6	18.7	18.9	18.7	18.9	19	18.6	17.5	107	26	6.5	2.7	1.4	0.8	0.5	0.3	0.5

Table A.2. Continued. Male numbers at age in California (1000s) predicted by the base-case model.

Age (Yr)	0	1	2	3	4	5	6	7	8	9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90+
2000	18	17.9	17.4	17.8	17.8	17.9	17.7	17.8	17.8	17.3	108.5	27.1	6.5	2.5	1.4	0.8	0.5	0.3	0.5
2001	18.2	17.2	17.1	16.6	17	17	17.1	16.8	16.9	16.8	113.2	29.6	6.9	2.6	1.3	0.8	0.5	0.3	0.5
2002	18.4	17.4	16.4	16.3	15.8	16.2	16.2	16.2	16	16	116.6	32.4	7.3	2.6	1.3	0.8	0.5	0.3	0.5
2003	18.9	17.6	16.7	15.7	15.6	15.1	15.4	15.4	15.5	15.2	119.8	35.8	8	2.7	1.3	0.8	0.5	0.3	0.5
2004	19.4	18.1	16.8	15.9	15	14.9	14.4	14.7	14.7	14.8	121.4	39.4	8.7	2.8	1.3	0.8	0.5	0.3	0.5
2005	19.9	18.6	17.3	16	15.2	14.3	14.2	13.8	14.1	14	122.1	43.3	9.5	2.9	1.4	0.8	0.5	0.3	0.5
2006	20.4	19.1	17.8	16.5	15.3	14.5	13.7	13.6	13.1	13.4	121.4	47.4	10.5	3	1.4	0.8	0.5	0.3	0.5
2007	20.9	19.5	18.2	17	15.8	14.6	13.9	13	12.9	12.5	119.3	51.5	11.5	3.1	1.4	0.8	0.5	0.3	0.5
2008	21.3	20	18.6	17.4	16.2	15	13.9	13.2	12.4	12.3	115.1	55.1	12.6	3.3	1.4	0.8	0.4	0.3	0.5
2009	21.7	20.3	19.1	17.8	16.6	15.5	14.4	13.3	12.6	11.8	111.9	59.3	13.9	3.5	1.4	0.8	0.4	0.3	0.5
2010	22.1	20.8	19.4	18.2	17	15.9	14.8	13.7	12.7	12	108.2	63.1	15.5	3.7	1.4	0.8	0.4	0.3	0.5

Table A.3. Female numbers at age in Oregon (1000s) predicted by the base-case model.

Age (Yr)	0	1	2	3	4	5	6	7	8	9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90+
1916	49.8	47.6	45.4	43.4	41.4	39.5	37.8	36.1	34.4	32.9	257.5	162.5	102.5	64.7	40.8	25.7	16.2	10.2	17.5
1917	49.8	47.6	45.4	43.4	41.4	39.5	37.8	36.1	34.4	32.9	257.5	162.4	102.4	64.6	40.8	25.7	16.2	10.2	17.5
1918	49.8	47.5	45.4	43.4	41.4	39.5	37.8	36.1	34.4	32.9	257.4	162.3	102.4	64.6	40.7	25.7	16.2	10.2	17.5
1919	49.8	47.5	45.4	43.4	41.4	39.5	37.8	36.1	34.4	32.9	257.4	162.3	102.3	64.6	40.7	25.7	16.2	10.2	17.5
1920	49.8	47.5	45.4	43.4	41.4	39.5	37.8	36.1	34.4	32.9	257.3	162.2	102.3	64.5	40.7	25.7	16.2	10.2	17.5
1921	49.8	47.5	45.4	43.4	41.4	39.5	37.8	36.1	34.4	32.9	257.3	162.1	102.2	64.5	40.7	25.7	16.2	10.2	17.5
1922	49.7	47.5	45.4	43.3	41.4	39.5	37.8	36.1	34.4	32.9	257.2	162.0	102.2	64.5	40.7	25.6	16.2	10.2	17.4
1923	49.7	47.5	45.4	43.3	41.4	39.5	37.8	36.1	34.4	32.9	257.2	162.0	102.1	64.4	40.6	25.6	16.2	10.2	17.4
1924	49.7	47.5	45.4	43.3	41.4	39.5	37.8	36.1	34.4	32.9	257.1	161.9	102.1	64.4	40.6	25.6	16.2	10.2	17.4
1925	49.7	47.5	45.4	43.3	41.4	39.5	37.7	36.0	34.4	32.9	257.1	161.8	102.0	64.3	40.6	25.6	16.1	10.2	17.4
1926	49.7	47.5	45.4	43.3	41.4	39.5	37.7	36.0	34.4	32.9	257.1	161.7	101.9	64.3	40.6	25.6	16.1	10.2	17.4
1927	49.7	47.5	45.3	43.3	41.4	39.5	37.7	36.0	34.4	32.9	257.1	161.7	101.9	64.2	40.5	25.6	16.1	10.2	17.4
1928	49.7	47.5	45.3	43.3	41.4	39.5	37.7	36.0	34.4	32.9	257.0	161.6	101.8	64.2	40.5	25.5	16.1	10.2	17.4
1929	49.7	47.4	45.3	43.3	41.3	39.5	37.7	36.0	34.4	32.9	256.9	161.5	101.7	64.1	40.4	25.5	16.1	10.2	17.3
1930	49.6	47.4	45.3	43.3	41.3	39.5	37.7	36.0	34.4	32.8	256.7	161.2	101.5	64.0	40.4	25.5	16.1	10.1	17.3
1931	49.6	47.4	45.3	43.3	41.3	39.5	37.7	36.0	34.4	32.8	256.6	161.0	101.3	63.9	40.3	25.4	16.0	10.1	17.3
1932	49.6	47.4	45.3	43.2	41.3	39.5	37.7	36.0	34.4	32.8	256.5	160.9	101.2	63.8	40.2	25.4	16.0	10.1	17.3
1933	49.6	47.4	45.2	43.2	41.3	39.5	37.7	36.0	34.4	32.8	256.5	160.9	101.1	63.7	40.2	25.4	16.0	10.1	17.2
1934	49.5	47.3	45.2	43.2	41.3	39.4	37.7	36.0	34.4	32.8	256.5	160.9	101.1	63.7	40.2	25.3	16.0	10.1	17.2
1935	49.5	47.3	45.2	43.2	41.3	39.4	37.7	36.0	34.4	32.8	256.5	160.8	101.0	63.6	40.1	25.3	16.0	10.1	17.2
1936	49.5	47.3	45.2	43.2	41.2	39.4	37.6	36.0	34.3	32.8	256.5	160.8	101.0	63.6	40.1	25.3	16.0	10.1	17.2
1937	49.5	47.3	45.2	43.1	41.2	39.4	37.6	35.9	34.3	32.8	256.3	160.7	100.8	63.5	40.0	25.3	15.9	10.0	17.2
1938	49.4	47.2	45.1	43.1	41.2	39.4	37.6	35.9	34.3	32.8	256.2	160.5	100.6	63.4	39.9	25.2	15.9	10.0	17.1
1939	49.4	47.2	45.1	43.1	41.2	39.3	37.6	35.9	34.3	32.7	256.0	160.3	100.5	63.2	39.9	25.1	15.9	10.0	17.1
1940	49.4	47.2	45.1	43.1	41.2	39.3	37.6	35.9	34.3	32.7	256.0	160.3	100.4	63.2	39.8	25.1	15.8	10.0	17.1
1941	49.3	47.2	45.0	43.0	41.1	39.3	37.5	35.9	34.2	32.7	255.6	160.0	100.2	63.0	39.7	25.0	15.8	10.0	17.0
1942	49.3	47.1	45.0	43.0	41.1	39.3	37.5	35.8	34.2	32.7	255.1	159.5	99.8	62.7	39.5	24.9	15.7	9.9	16.9
1943	49.2	47.1	45.0	43.0	41.1	39.2	37.5	35.8	34.2	32.6	254.4	158.6	99.2	62.3	39.3	24.8	15.6	9.9	16.8
1944	49.1	47.0	44.9	42.9	41.0	39.2	37.4	35.7	34.1	32.5	252.1	156.1	97.4	61.1	38.5	24.3	15.3	9.7	16.5
1945	48.9	46.9	44.9	42.9	41.0	39.2	37.4	35.7	34.0	32.5	250.8	154.5	96.2	60.3	38.0	24.0	15.1	9.5	16.3
1946	48.7	46.7	44.8	42.9	40.9	39.1	37.3	35.6	34.0	32.4	249.0	152.2	94.5	59.2	37.3	23.5	14.8	9.4	16.0
1947	48.5	46.5	44.6	42.7	40.9	39.1	37.3	35.6	33.9	32.4	248.2	150.8	93.5	58.5	36.8	23.2	14.6	9.2	15.8
1948	48.4	46.3	44.4	42.6	40.8	39.0	37.3	35.6	34.0	32.4	248.2	150.2	92.9	58.1	36.5	23.0	14.5	9.2	15.7
1949	48.3	46.2	44.2	42.4	40.7	38.9	37.3	35.6	34.0	32.4	248.5	149.8	92.4	57.7	36.3	22.9	14.4	9.1	15.6
1950	48.3	46.1	44.1	42.2	40.5	38.8	37.2	35.6	34.0	32.4	249.0	149.7	92.1	57.5	36.1	22.8	14.4	9.1	15.5
1951	48.2	46.1	44.1	42.2	40.3	38.6	37.1	35.5	33.9	32.4	249.3	149.6	91.8	57.2	35.9	22.6	14.3	9.0	15.4
1952	48.1	46.0	44.0	42.1	40.2	38.5	36.9	35.4	33.9	32.4	249.7	149.6	91.5	57.0	35.8	22.5	14.2	9.0	15.3
1953	48.0	45.9	43.9	42.0	40.2	38.4	36.7	35.2	33.8	32.3	250.1	149.7	91.3	56.8	35.6	22.4	14.2	8.9	15.3
1954	48.0	45.9	43.9	42.0	40.1	38.4	36.7	35.1	33.6	32.2	250.4	150.0	91.2	56.6	35.5	22.4	14.1	8.9	15.2
1955	47.9	45.8	43.8	41.9	40.1	38.3	36.6	35.0	33.5	32.1	250.5	150.3	91.0	56.5	35.4	22.3	14.0	8.9	15.1
1956	47.8	45.8	43.8	41.8	40.0	38.2	36.6	34.9	33.4	31.9	249.9	150.2	90.7	56.2	35.2	22.1	13.9	8.8	15.0
1957	47.7	45.7	43.7	41.8	39.9	38.2	36.5	34.9	33.3	31.8	249.1	150.1	90.3	55.8	34.9	22.0	13.8	8.7	14.9

Table A.3. Continued. Female numbers at age in Oregon (1000s) predicted by the base-case model.

Age (Yr)	0	1	2	3	4	5	6	7	8	9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90+
1958	47.6	45.6	43.6	41.7	39.9	38.1	36.4	34.8	33.2	31.7	247.9	149.6	89.7	55.3	34.6	21.7	13.7	8.6	14.8
1959	47.5	45.5	43.5	41.7	39.8	38.1	36.4	34.7	33.2	31.7	247.0	149.5	89.3	55.0	34.3	21.6	13.6	8.6	14.7
1960	47.4	45.3	43.4	41.6	39.8	38.0	36.3	34.7	33.1	31.6	246.0	149.3	88.9	54.6	34.0	21.4	13.5	8.5	14.5
1961	47.3	45.2	43.3	41.5	39.7	37.9	36.3	34.6	33.0	31.5	244.9	148.8	88.4	54.1	33.7	21.2	13.3	8.4	14.4
1962	47.2	45.1	43.2	41.3	39.6	37.9	36.2	34.6	33.0	31.5	243.8	148.3	87.9	53.7	33.4	21.0	13.2	8.3	14.2
1963	47.1	45.0	43.1	41.2	39.5	37.8	36.1	34.5	32.9	31.4	242.6	147.6	87.4	53.2	33.0	20.7	13.1	8.2	14.1
1964	47.0	44.9	43.0	41.1	39.4	37.7	36.0	34.5	32.9	31.4	242.4	147.7	87.4	53.0	32.9	20.6	13.0	8.2	14.0
1965	46.9	44.9	42.9	41.1	39.3	37.6	35.9	34.4	32.9	31.4	242.5	148.0	87.7	53.0	32.8	20.6	12.9	8.2	13.9
1966	46.7	44.8	42.8	41.0	39.2	37.5	35.8	34.2	32.7	31.2	239.7	145.2	86.0	51.8	32.0	20.1	12.6	8.0	13.6
1967	46.6	44.6	42.8	40.9	39.1	37.4	35.7	34.2	32.6	31.2	239.9	145.3	86.3	51.7	32.0	20.0	12.6	7.9	13.5
1968	46.5	44.5	42.6	40.9	39.0	37.3	35.7	34.1	32.6	31.1	239.8	145.0	86.3	51.6	31.8	19.9	12.5	7.9	13.4
1969	46.4	44.4	42.5	40.7	39.0	37.3	35.6	34.0	32.5	31.0	239.8	144.8	86.4	51.5	31.7	19.8	12.4	7.8	13.4
1970	46.1	44.3	42.4	40.6	38.8	37.2	35.5	33.9	32.4	30.9	237.6	142.6	85.2	50.6	31.0	19.3	12.2	7.7	13.1
1971	45.9	44.0	42.3	40.5	38.7	37.0	35.5	33.9	32.3	30.9	237.7	142.5	85.3	50.5	30.9	19.3	12.1	7.6	13.0
1972	45.6	43.8	42.0	40.4	38.6	36.9	35.3	33.8	32.3	30.8	237.1	141.8	85.0	50.3	30.7	19.1	12.0	7.5	12.9
1973	45.3	43.6	41.9	40.1	38.5	36.9	35.2	33.7	32.2	30.7	236.4	141.1	84.7	50.0	30.4	18.9	11.9	7.5	12.7
1974	45.0	43.3	41.6	40.0	38.3	36.8	35.2	33.6	32.1	30.7	236.2	140.9	84.6	49.9	30.2	18.8	11.8	7.4	12.7
1975	44.6	42.9	41.3	39.7	38.1	36.6	35.1	33.5	32.0	30.5	235.7	140.5	84.3	49.8	30.0	18.6	11.7	7.3	12.5
1976	44.2	42.6	41.0	39.4	37.9	36.4	34.9	33.5	32.0	30.5	235.7	140.7	84.3	49.8	30.0	18.5	11.6	7.3	12.5
1977	43.8	42.2	40.7	39.1	37.6	36.2	34.7	33.2	31.9	30.4	234.6	140.1	83.7	49.6	29.7	18.4	11.5	7.2	12.3
1978	43.3	41.8	40.3	38.8	37.4	35.9	34.5	33.1	31.6	30.3	233.4	139.4	83.1	49.3	29.4	18.2	11.3	7.1	12.2
1979	42.5	41.4	39.9	38.5	37.0	35.6	34.2	32.8	31.4	30.0	230.9	137.3	81.6	48.5	28.9	17.8	11.1	7.0	11.9
1980	41.6	40.6	39.5	38.1	36.7	35.3	33.9	32.4	31.1	29.6	226.5	133.5	79.0	47.1	27.9	17.1	10.7	6.7	11.5
1981	40.8	39.7	38.7	37.7	36.3	34.9	33.5	32.1	30.7	29.3	222.4	129.7	76.4	45.6	27.0	16.5	10.3	6.5	11.0
1982	39.7	39.0	37.9	36.9	35.9	34.6	33.2	31.8	30.3	28.9	216.8	124.4	72.8	43.5	25.7	15.7	9.7	6.1	10.4
1983	38.2	37.9	37.2	36.1	35.1	34.1	32.7	31.3	29.8	28.3	208.0	115.9	67.3	40.1	23.7	14.4	8.9	5.6	9.6
1984	37.0	36.5	36.2	35.5	34.4	33.4	32.2	30.8	29.3	27.7	199.6	107.8	62.0	36.9	21.8	13.2	8.2	5.1	8.7
1985	36.1	35.4	34.8	34.5	33.8	32.7	31.6	30.5	29.0	27.5	196.0	103.4	59.0	35.1	20.6	12.5	7.7	4.8	8.2
1986	34.9	34.5	33.7	33.2	32.9	32.1	31.0	29.9	28.7	27.1	191.2	97.6	55.0	32.6	19.2	11.5	7.1	4.5	7.6
1987	34.1	33.3	32.9	32.2	31.6	31.3	30.5	29.4	28.3	27.0	190.5	95.4	53.2	31.4	18.5	11.1	6.8	4.3	7.3
1988	33.2	32.6	31.8	31.4	30.7	30.1	29.7	28.9	27.7	26.6	188.7	92.3	50.9	29.9	17.7	10.5	6.5	4.1	6.9
1989	32.1	31.7	31.1	30.3	29.9	29.2	28.6	28.1	27.3	26.1	186.2	88.7	48.1	28.1	16.6	9.9	6.1	3.8	6.4
1990	30.6	30.7	30.2	29.6	28.8	28.4	27.6	26.9	26.4	25.4	179.4	82.1	43.6	25.2	15.0	8.9	5.4	3.4	5.7
1991	29.6	29.2	29.3	28.9	28.2	27.4	27.0	26.2	25.4	24.8	178.7	80.6	42.0	24.1	14.3	8.5	5.2	3.2	5.5
1992	27.8	28.3	27.8	27.9	27.5	26.8	26.0	25.4	24.5	23.7	172.8	75.7	38.4	21.9	13.0	7.7	4.7	2.9	4.9
1993	25.9	26.6	27.0	26.5	26.5	26.0	25.3	24.3	23.6	22.6	163.3	68.9	33.8	19.1	11.3	6.7	4.0	2.5	4.3
1994	24.1	24.7	25.3	25.7	25.2	25.1	24.5	23.6	22.5	21.7	152.3	61.2	28.9	16.2	9.6	5.6	3.4	2.1	3.6
1995	23.0	23.0	23.6	24.1	24.4	23.9	23.7	23.0	22.1	20.9	147.2	57.8	26.3	14.5	8.6	5.0	3.0	1.9	3.2
1996	21.6	21.9	21.9	22.4	22.9	23.1	22.5	22.2	21.3	20.3	138.5	52.2	22.7	12.4	7.3	4.3	2.6	1.6	2.7
1997	20.4	20.6	20.9	20.9	21.3	21.8	21.9	21.2	20.8	19.9	135.0	49.9	20.8	11.2	6.5	3.8	2.3	1.4	2.4
1998	19.0	19.5	19.6	19.9	19.8	20.2	20.5	20.5	19.7	19.1	128.3	45.8	18.2	9.6	5.6	3.3	2.0	1.2	2.0
1999	18.7	18.2	18.6	18.7	19.0	18.9	19.1	19.3	19.2	18.4	127.2	45.5	17.4	9.0	5.2	3.1	1.8	1.1	1.9

Table A.3. Continued. Female numbers at age in Oregon (1000s) predicted by the base-case model.

Age (Yr)	0	1	2	3	4	5	6	7	8	9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90+
2000	18.0	17.9	17.3	17.7	17.8	18.0	17.8	18.0	18.1	17.8	123.6	44.1	16.2	8.2	4.7	2.8	1.6	1.0	1.7
2001	18.2	17.2	17.1	16.5	16.9	17.0	17.1	16.9	17.1	17.1	126.0	46.5	16.5	8.2	4.6	2.7	1.6	1.0	1.7
2002	18.4	17.4	16.4	16.3	15.8	16.1	16.2	16.3	16.1	16.2	127.7	49.0	17.0	8.2	4.6	2.7	1.6	1.0	1.6
2003	18.9	17.5	16.6	15.6	15.5	15.1	15.4	15.4	15.6	15.4	128.8	52.0	17.7	8.3	4.6	2.7	1.6	1.0	1.6
2004	19.4	18.0	16.8	15.9	14.9	14.8	14.4	14.7	14.7	14.8	128.7	55.2	18.5	8.4	4.6	2.7	1.6	1.0	1.6
2005	19.9	18.5	17.2	16.0	15.2	14.3	14.2	13.7	14.0	14.0	127.4	58.3	19.3	8.5	4.6	2.7	1.6	1.0	1.6
2006	20.4	19.0	17.7	16.4	15.3	14.5	13.6	13.5	13.1	13.3	125.1	61.3	20.3	8.6	4.7	2.7	1.6	1.0	1.6
2007	20.9	19.5	18.2	16.9	15.7	14.6	13.8	13.0	12.9	12.4	122.0	64.5	21.5	8.8	4.7	2.7	1.6	1.0	1.6
2008	21.3	19.9	18.6	17.4	16.1	15.0	13.9	13.2	12.4	12.3	117.8	67.6	22.8	8.9	4.7	2.7	1.6	1.0	1.6
2009	21.7	20.3	19.0	17.8	16.6	15.4	14.3	13.3	12.5	11.8	113.5	70.3	24.1	9.1	4.7	2.7	1.6	1.0	1.6
2010	22.1	20.7	19.4	18.2	17.0	15.8	14.7	13.6	12.7	12.0	109.2	72.9	25.7	9.4	4.8	2.7	1.6	1.0	1.6

Table A.4. Male numbers at age in Oregon (1000s) predicted by the base-case model.

Age (Yr)	0	1	2	3	4	5	6	7	8	9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90+
1916	49.8	47.6	45.5	43.5	41.6	39.8	38.0	36.4	34.8	33.2	261.7	167.0	106.6	68.0	43.4	27.7	17.7	11.3	19.9
1917	49.8	47.6	45.5	43.5	41.6	39.8	38.0	36.4	34.8	33.2	261.7	167.0	106.5	68.0	43.4	27.7	17.7	11.3	19.9
1918	49.8	47.6	45.5	43.5	41.6	39.8	38.0	36.4	34.8	33.2	261.6	166.9	106.5	67.9	43.4	27.7	17.7	11.3	19.9
1919	49.8	47.6	45.5	43.5	41.6	39.8	38.0	36.4	34.8	33.2	261.5	166.8	106.4	67.9	43.3	27.7	17.6	11.3	19.9
1920	49.8	47.6	45.5	43.5	41.6	39.8	38.0	36.4	34.8	33.2	261.5	166.7	106.4	67.9	43.3	27.6	17.6	11.3	19.8
1921	49.8	47.6	45.5	43.5	41.6	39.8	38.0	36.4	34.8	33.2	261.4	166.6	106.3	67.8	43.3	27.6	17.6	11.2	19.8
1922	49.7	47.6	45.5	43.5	41.6	39.8	38.0	36.4	34.8	33.2	261.4	166.6	106.2	67.8	43.3	27.6	17.6	11.2	19.8
1923	49.7	47.6	45.5	43.5	41.6	39.8	38.0	36.4	34.8	33.2	261.3	166.5	106.2	67.8	43.2	27.6	17.6	11.2	19.8
1924	49.7	47.6	45.5	43.5	41.6	39.8	38.0	36.3	34.8	33.2	261.3	166.4	106.1	67.7	43.2	27.6	17.6	11.2	19.8
1925	49.7	47.5	45.5	43.5	41.6	39.7	38.0	36.3	34.7	33.2	261.3	166.3	106.0	67.7	43.2	27.5	17.6	11.2	19.8
1926	49.7	47.5	45.5	43.5	41.6	39.7	38.0	36.3	34.7	33.2	261.2	166.2	106.0	67.6	43.1	27.5	17.6	11.2	19.8
1927	49.7	47.5	45.4	43.5	41.6	39.7	38.0	36.3	34.7	33.2	261.2	166.2	105.9	67.6	43.1	27.5	17.6	11.2	19.8
1928	49.7	47.5	45.4	43.4	41.5	39.7	38.0	36.3	34.7	33.2	261.2	166.1	105.8	67.5	43.1	27.5	17.5	11.2	19.7
1929	49.7	47.5	45.4	43.4	41.5	39.7	38.0	36.3	34.7	33.2	261.1	165.9	105.7	67.4	43.0	27.5	17.5	11.2	19.7
1930	49.6	47.5	45.4	43.4	41.5	39.7	38.0	36.3	34.7	33.2	260.8	165.7	105.5	67.3	42.9	27.4	17.5	11.2	19.7
1931	49.6	47.5	45.4	43.4	41.5	39.7	38.0	36.3	34.7	33.2	260.6	165.4	105.3	67.2	42.9	27.3	17.4	11.1	19.6
1932	49.6	47.4	45.4	43.4	41.5	39.7	37.9	36.3	34.7	33.2	260.5	165.3	105.2	67.1	42.8	27.3	17.4	11.1	19.6
1933	49.6	47.4	45.3	43.4	41.5	39.7	37.9	36.3	34.7	33.2	260.6	165.3	105.1	67.0	42.8	27.3	17.4	11.1	19.6
1934	49.5	47.4	45.3	43.3	41.5	39.7	37.9	36.3	34.7	33.2	260.6	165.3	105.1	67.0	42.7	27.3	17.4	11.1	19.6
1935	49.5	47.4	45.3	43.3	41.4	39.6	37.9	36.3	34.7	33.2	260.6	165.2	105.0	66.9	42.7	27.2	17.4	11.1	19.6
1936	49.5	47.3	45.3	43.3	41.4	39.6	37.9	36.2	34.7	33.1	260.6	165.2	104.9	66.9	42.7	27.2	17.4	11.1	19.5
1937	49.5	47.3	45.3	43.3	41.4	39.6	37.9	36.2	34.6	33.1	260.4	165.1	104.8	66.8	42.6	27.2	17.3	11.1	19.5
1938	49.4	47.3	45.2	43.3	41.4	39.6	37.9	36.2	34.6	33.1	260.2	164.8	104.6	66.6	42.5	27.1	17.3	11.0	19.5
1939	49.4	47.3	45.2	43.3	41.4	39.6	37.8	36.2	34.6	33.1	260.0	164.7	104.4	66.5	42.4	27.1	17.3	11.0	19.4
1940	49.4	47.2	45.2	43.2	41.4	39.6	37.8	36.2	34.6	33.1	260.0	164.6	104.3	66.4	42.4	27.0	17.2	11.0	19.4
1941	49.3	47.2	45.2	43.2	41.3	39.5	37.8	36.1	34.6	33.0	259.7	164.3	104.1	66.2	42.2	26.9	17.2	11.0	19.3
1942	49.3	47.2	45.1	43.2	41.3	39.5	37.8	36.1	34.5	33.0	259.1	163.7	103.7	65.9	42.0	26.8	17.1	10.9	19.3
1943	49.2	47.1	45.1	43.1	41.3	39.5	37.7	36.1	34.5	33.0	258.3	162.9	103.0	65.5	41.8	26.6	17.0	10.8	19.1
1944	49.1	47.1	45.0	43.1	41.2	39.4	37.7	36.0	34.4	32.8	255.8	160.2	101.2	64.3	41.0	26.1	16.7	10.6	18.8
1945	48.9	46.9	45.0	43.1	41.2	39.4	37.6	35.9	34.3	32.8	254.3	158.4	99.9	63.4	40.4	25.8	16.4	10.5	18.5
1946	48.7	46.8	44.9	43.0	41.1	39.3	37.6	35.9	34.3	32.7	252.3	156.0	98.1	62.2	39.6	25.3	16.1	10.3	18.2
1947	48.5	46.6	44.7	42.9	41.1	39.3	37.6	35.9	34.2	32.7	251.5	154.5	97.0	61.5	39.1	25.0	15.9	10.2	17.9
1948	48.4	46.4	44.5	42.8	41.0	39.3	37.5	35.9	34.3	32.7	251.5	153.8	96.3	61.0	38.8	24.8	15.8	10.1	17.8
1949	48.3	46.3	44.3	42.5	40.9	39.2	37.5	35.9	34.3	32.7	251.7	153.4	95.9	60.6	38.6	24.6	15.7	10.0	17.7
1950	48.3	46.2	44.2	42.4	40.7	39.1	37.4	35.9	34.3	32.7	252.3	153.2	95.5	60.4	38.4	24.5	15.6	10.0	17.6
1951	48.2	46.1	44.2	42.3	40.5	38.9	37.3	35.8	34.2	32.7	252.7	153.0	95.1	60.1	38.2	24.4	15.5	9.9	17.5
1952	48.1	46.1	44.1	42.2	40.4	38.7	37.1	35.7	34.2	32.7	253.1	153.0	94.9	59.8	38.0	24.3	15.5	9.9	17.4
1953	48.0	46.0	44.0	42.2	40.4	38.6	37.0	35.5	34.1	32.6	253.5	153.1	94.6	59.6	37.9	24.1	15.4	9.8	17.3
1954	48.0	45.9	44.0	42.1	40.3	38.6	36.9	35.4	33.9	32.5	254.0	153.4	94.5	59.5	37.7	24.1	15.3	9.8	17.3
1955	47.9	45.9	43.9	42.0	40.3	38.5	36.9	35.3	33.8	32.4	254.1	153.6	94.2	59.2	37.6	24.0	15.3	9.7	17.2
1956	47.8	45.8	43.9	42.0	40.2	38.5	36.8	35.2	33.7	32.2	253.5	153.6	93.9	58.9	37.4	23.8	15.2	9.7	17.1
1957	47.7	45.7	43.8	41.9	40.1	38.4	36.7	35.1	33.6	32.1	252.7	153.4	93.4	58.5	37.1	23.6	15.1	9.6	16.9

Table A.4. Continued. Male numbers at age in Oregon (1000s) predicted by the base-case model.

Age (Yr)	0	1	2	3	4	5	6	7	8	9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90+
1958	47.6	45.6	43.7	41.9	40.1	38.3	36.7	35.1	33.5	32.0	251.4	153.0	92.8	58.0	36.7	23.4	14.9	9.5	16.8
1959	47.5	45.5	43.6	41.8	40.0	38.3	36.6	35.0	33.5	32.0	250.5	152.9	92.3	57.6	36.5	23.2	14.8	9.4	16.6
1960	47.4	45.4	43.5	41.7	39.9	38.2	36.6	34.9	33.4	31.9	249.5	152.6	91.9	57.2	36.2	23.0	14.7	9.4	16.5
1961	47.3	45.3	43.4	41.6	39.9	38.2	36.5	34.9	33.3	31.8	248.3	152.1	91.3	56.7	35.8	22.8	14.5	9.3	16.3
1962	47.2	45.2	43.3	41.5	39.8	38.1	36.4	34.8	33.3	31.8	247.1	151.7	90.8	56.2	35.5	22.5	14.4	9.2	16.2
1963	47.1	45.1	43.2	41.4	39.6	38.0	36.4	34.8	33.2	31.7	245.9	151.0	90.3	55.7	35.1	22.3	14.2	9.1	16.0
1964	47.0	45.0	43.1	41.3	39.5	37.9	36.3	34.7	33.2	31.7	245.7	151.1	90.3	55.5	34.9	22.2	14.1	9.0	15.9
1965	46.9	44.9	43.0	41.2	39.5	37.8	36.2	34.7	33.2	31.7	245.8	151.4	90.5	55.5	34.9	22.1	14.1	9.0	15.8
1966	46.7	44.9	42.9	41.1	39.4	37.7	36.0	34.5	33.0	31.5	242.8	148.5	88.8	54.2	34.0	21.5	13.7	8.8	15.4
1967	46.6	44.6	42.9	41.0	39.3	37.6	36.0	34.4	32.9	31.4	243.1	148.5	89.1	54.1	33.9	21.5	13.7	8.7	15.4
1968	46.5	44.5	42.7	41.0	39.2	37.5	35.9	34.4	32.8	31.4	243.0	148.2	89.1	53.9	33.7	21.3	13.6	8.7	15.3
1969	46.4	44.4	42.6	40.8	39.2	37.5	35.9	34.3	32.8	31.3	243.0	148.1	89.2	53.8	33.6	21.2	13.5	8.6	15.2
1970	46.1	44.3	42.5	40.7	39.0	37.4	35.8	34.2	32.6	31.2	240.7	145.7	88.0	52.8	32.9	20.8	13.2	8.4	14.9
1971	45.9	44.1	42.4	40.6	38.9	37.2	35.7	34.1	32.6	31.1	240.8	145.6	88.1	52.8	32.8	20.7	13.1	8.4	14.8
1972	45.6	43.9	42.1	40.5	38.8	37.2	35.5	34.1	32.5	31.1	240.2	144.9	87.8	52.5	32.5	20.5	13.0	8.3	14.6
1973	45.3	43.6	42.0	40.3	38.7	37.1	35.5	33.9	32.5	31.0	239.4	144.2	87.5	52.2	32.2	20.3	12.9	8.2	14.5
1974	45.0	43.3	41.7	40.1	38.5	37.0	35.4	33.9	32.4	31.0	239.3	144.0	87.4	52.1	32.0	20.2	12.8	8.2	14.4
1975	44.6	43.0	41.4	39.9	38.3	36.8	35.3	33.8	32.3	30.8	238.8	143.6	87.1	52.0	31.8	20.0	12.7	8.1	14.2
1976	44.2	42.6	41.1	39.6	38.1	36.6	35.1	33.7	32.2	30.8	238.8	143.8	87.1	52.0	31.7	19.9	12.6	8.0	14.2
1977	43.8	42.3	40.7	39.3	37.8	36.4	34.9	33.5	32.1	30.7	237.7	143.1	86.5	51.8	31.4	19.7	12.5	7.9	14.0
1978	43.3	41.9	40.4	38.9	37.5	36.1	34.7	33.3	31.9	30.6	236.5	142.4	85.8	51.5	31.1	19.5	12.3	7.8	13.8
1979	42.5	41.4	40.0	38.6	37.2	35.8	34.4	33.1	31.7	30.2	233.8	140.3	84.3	50.7	30.5	19.1	12.0	7.7	13.5
1980	41.6	40.6	39.6	38.2	36.9	35.4	34.1	32.7	31.3	29.9	229.1	136.3	81.6	49.2	29.5	18.4	11.6	7.4	13.0
1981	40.8	39.8	38.8	37.8	36.5	35.1	33.7	32.3	30.9	29.5	224.6	132.3	78.8	47.6	28.5	17.7	11.2	7.1	12.5
1982	39.7	39.1	38.0	37.1	36.1	34.7	33.4	31.9	30.5	29.1	218.6	126.7	75.1	45.4	27.1	16.8	10.6	6.7	11.8
1983	38.2	38.0	37.3	36.2	35.3	34.3	32.9	31.4	29.9	28.4	209.0	117.8	69.3	41.9	25.0	15.4	9.7	6.2	10.8
1984	37.0	36.5	36.3	35.6	34.5	33.5	32.4	30.9	29.4	27.8	200.0	109.2	63.8	38.5	22.9	14.1	8.9	5.6	9.9
1985	36.1	35.4	34.9	34.6	33.9	32.8	31.8	30.6	29.1	27.6	196.0	104.6	60.6	36.6	21.8	13.3	8.4	5.3	9.3
1986	34.9	34.5	33.8	33.3	33.0	32.3	31.1	30.0	28.8	27.2	190.9	98.4	56.5	34.0	20.2	12.3	7.7	4.9	8.6
1987	34.1	33.3	33.0	32.3	31.8	31.5	30.7	29.5	28.4	27.2	190.2	96.0	54.6	32.7	19.5	11.8	7.4	4.7	8.3
1988	33.2	32.6	31.9	31.5	30.8	30.2	29.9	29.1	27.9	26.7	188.3	92.7	52.2	31.1	18.6	11.2	7.0	4.4	7.8
1989	32.1	31.7	31.2	30.4	30.0	29.3	28.7	28.3	27.4	26.2	185.6	88.8	49.3	29.2	17.5	10.5	6.6	4.2	7.3
1990	30.6	30.7	30.3	29.7	29.0	28.5	27.8	27.0	26.5	25.5	178.4	81.8	44.5	26.2	15.7	9.4	5.9	3.7	6.5
1991	29.6	29.2	29.3	28.9	28.4	27.6	27.1	26.3	25.6	24.9	177.8	80.2	42.8	25.1	15.1	9.0	5.6	3.5	6.2
1992	27.8	28.3	27.9	28.0	27.6	27.0	26.1	25.5	24.7	23.8	171.6	75.0	39.0	22.7	13.7	8.2	5.0	3.2	5.6
1993	25.9	26.6	27.0	26.6	26.6	26.1	25.4	24.5	23.7	22.7	161.6	67.9	34.3	19.8	11.9	7.1	4.4	2.8	4.8
1994	24.1	24.7	25.4	25.7	25.3	25.2	24.6	23.7	22.6	21.7	150.0	59.9	29.2	16.7	10.0	6.0	3.7	2.3	4.0
1995	23.0	23.0	23.6	24.2	24.5	24.0	23.8	23.1	22.1	20.9	144.8	56.3	26.5	15.0	9.0	5.4	3.3	2.1	3.6
1996	21.6	22.0	22.0	22.5	23.0	23.2	22.6	22.2	21.4	20.3	135.8	50.6	22.8	12.8	7.6	4.5	2.8	1.7	3.0
1997	20.4	20.6	21.0	21.0	21.4	21.9	22.0	21.3	20.8	19.9	132.2	48.1	20.7	11.5	6.8	4.1	2.5	1.5	2.7
1998	19.0	19.5	19.7	20.0	19.9	20.3	20.6	20.5	19.7	19.1	125.4	44.0	18.1	9.9	5.8	3.5	2.1	1.3	2.3
1999	18.7	18.2	18.7	18.8	19.0	18.9	19.2	19.4	19.3	18.4	124.6	43.6	17.2	9.2	5.4	3.3	2.0	1.2	2.1

Table A.4. Continued. Male numbers at age in Oregon (1000s) predicted by the base-case model.

Age (Yr)	0	1	2	3	4	5	6	7	8	9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90+
2000	18.0	17.9	17.4	17.8	17.9	18.1	17.9	18.1	18.1	17.8	121.2	42.1	15.9	8.4	4.9	2.9	1.8	1.1	1.9
2001	18.2	17.2	17.1	16.6	17.0	17.0	17.2	17.0	17.2	17.2	124.1	44.4	16.2	8.3	4.9	2.9	1.7	1.1	1.9
2002	18.4	17.4	16.4	16.3	15.9	16.2	16.3	16.4	16.2	16.3	126.3	47.0	16.6	8.3	4.8	2.9	1.7	1.1	1.8
2003	18.9	17.6	16.7	15.7	15.6	15.1	15.5	15.5	15.7	15.5	128.0	49.9	17.2	8.4	4.8	2.9	1.7	1.1	1.8
2004	19.4	18.1	16.8	15.9	15.0	14.9	14.5	14.8	14.8	14.9	128.4	53.1	18.0	8.5	4.8	2.9	1.7	1.1	1.8
2005	19.9	18.6	17.3	16.1	15.2	14.3	14.3	13.8	14.1	14.1	127.5	56.3	18.8	8.6	4.8	2.9	1.7	1.1	1.8
2006	20.4	19.1	17.8	16.5	15.3	14.6	13.7	13.6	13.2	13.5	125.6	59.5	19.7	8.7	4.9	2.9	1.7	1.0	1.8
2007	20.9	19.5	18.2	17.0	15.8	14.7	13.9	13.1	13.0	12.6	122.8	62.9	20.8	8.8	4.9	2.9	1.7	1.0	1.8
2008	21.3	20.0	18.6	17.4	16.2	15.1	14.0	13.3	12.5	12.4	118.9	66.1	22.0	9.0	4.9	2.9	1.7	1.0	1.8
2009	21.7	20.3	19.1	17.8	16.6	15.5	14.4	13.4	12.7	11.9	114.6	69.2	23.3	9.1	4.9	2.9	1.7	1.0	1.8
2010	22.1	20.8	19.4	18.2	17.0	15.9	14.8	13.8	12.8	12.1	110.5	72.1	24.8	9.4	4.9	2.9	1.7	1.0	1.8

Table A.5. Female numbers at age in Washington (1000s) predicted by the base-case model.

Age (Yr)	0	1	2	3	4	5	6	7	8	9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90+
1916	13.2	12.6	12.0	11.5	10.9	10.5	10.0	9.5	9.1	8.7	68.1	43.0	27.1	17.1	10.8	6.8	4.3	2.7	4.6
1917	13.2	12.6	12.0	11.5	10.9	10.5	10.0	9.5	9.1	8.7	68.1	43.0	27.1	17.1	10.8	6.8	4.3	2.7	4.6
1918	13.2	12.6	12.0	11.5	10.9	10.5	10.0	9.5	9.1	8.7	68.1	43.0	27.1	17.1	10.8	6.8	4.3	2.7	4.6
1919	13.2	12.6	12.0	11.5	10.9	10.5	10.0	9.5	9.1	8.7	68.1	43.0	27.1	17.1	10.8	6.8	4.3	2.7	4.6
1920	13.2	12.6	12.0	11.5	10.9	10.5	10.0	9.5	9.1	8.7	68.1	43.0	27.1	17.1	10.8	6.8	4.3	2.7	4.6
1921	13.2	12.6	12.0	11.5	10.9	10.5	10.0	9.5	9.1	8.7	68.1	43.0	27.1	17.1	10.8	6.8	4.3	2.7	4.6
1922	13.2	12.6	12.0	11.5	10.9	10.5	10.0	9.5	9.1	8.7	68.1	43.0	27.1	17.1	10.8	6.8	4.3	2.7	4.6
1923	13.1	12.6	12.0	11.5	10.9	10.5	10.0	9.5	9.1	8.7	68.1	43.0	27.1	17.1	10.8	6.8	4.3	2.7	4.6
1924	13.1	12.6	12.0	11.5	10.9	10.4	10.0	9.5	9.1	8.7	68.1	43.0	27.1	17.1	10.8	6.8	4.3	2.7	4.6
1925	13.1	12.6	12.0	11.5	10.9	10.4	10.0	9.5	9.1	8.7	68.1	43.0	27.1	17.1	10.8	6.8	4.3	2.7	4.6
1926	13.1	12.6	12.0	11.5	10.9	10.4	10.0	9.5	9.1	8.7	68.1	42.9	27.1	17.1	10.8	6.8	4.3	2.7	4.6
1927	13.1	12.5	12.0	11.4	10.9	10.4	10.0	9.5	9.1	8.7	68.1	42.9	27.0	17.1	10.8	6.8	4.3	2.7	4.6
1928	13.1	12.5	12.0	11.4	10.9	10.4	10.0	9.5	9.1	8.7	68.0	42.9	27.0	17.0	10.7	6.8	4.3	2.7	4.6
1929	13.1	12.5	12.0	11.4	10.9	10.4	10.0	9.5	9.1	8.7	68.0	42.8	27.0	17.0	10.7	6.8	4.3	2.7	4.6
1930	13.1	12.5	12.0	11.4	10.9	10.4	10.0	9.5	9.1	8.7	68.0	42.8	27.0	17.0	10.7	6.8	4.3	2.7	4.6
1931	13.1	12.5	12.0	11.4	10.9	10.4	10.0	9.5	9.1	8.7	68.0	42.8	26.9	17.0	10.7	6.8	4.3	2.7	4.6
1932	13.1	12.5	12.0	11.4	10.9	10.4	10.0	9.5	9.1	8.7	68.0	42.8	26.9	17.0	10.7	6.7	4.3	2.7	4.6
1933	13.1	12.5	12.0	11.4	10.9	10.4	10.0	9.5	9.1	8.7	68.0	42.7	26.9	16.9	10.7	6.7	4.3	2.7	4.6
1934	13.1	12.5	12.0	11.4	10.9	10.4	10.0	9.5	9.1	8.7	68.0	42.7	26.9	16.9	10.7	6.7	4.2	2.7	4.6
1935	13.1	12.5	11.9	11.4	10.9	10.4	10.0	9.5	9.1	8.7	67.9	42.7	26.8	16.9	10.7	6.7	4.2	2.7	4.6
1936	13.1	12.5	11.9	11.4	10.9	10.4	10.0	9.5	9.1	8.7	67.9	42.7	26.8	16.9	10.6	6.7	4.2	2.7	4.6
1937	13.1	12.5	11.9	11.4	10.9	10.4	9.9	9.5	9.1	8.7	67.9	42.7	26.8	16.9	10.6	6.7	4.2	2.7	4.6
1938	13.1	12.5	11.9	11.4	10.9	10.4	9.9	9.5	9.1	8.7	67.9	42.7	26.8	16.9	10.6	6.7	4.2	2.7	4.6
1939	13.1	12.5	11.9	11.4	10.9	10.4	9.9	9.5	9.1	8.7	67.9	42.7	26.8	16.8	10.6	6.7	4.2	2.7	4.6
1940	13.1	12.5	11.9	11.4	10.9	10.4	9.9	9.5	9.1	8.7	67.9	42.6	26.7	16.8	10.6	6.7	4.2	2.7	4.5
1941	13.0	12.5	11.9	11.4	10.9	10.4	9.9	9.5	9.1	8.7	67.9	42.6	26.7	16.8	10.6	6.7	4.2	2.7	4.5
1942	13.0	12.5	11.9	11.4	10.9	10.4	9.9	9.5	9.1	8.7	67.8	42.6	26.7	16.8	10.6	6.7	4.2	2.7	4.5
1943	13.0	12.4	11.9	11.4	10.9	10.4	9.9	9.5	9.1	8.7	67.8	42.6	26.7	16.8	10.6	6.7	4.2	2.7	4.5
1944	13.0	12.4	11.9	11.4	10.9	10.4	9.9	9.5	9.1	8.6	67.8	42.6	26.7	16.8	10.6	6.7	4.2	2.6	4.5
1945	12.9	12.4	11.9	11.3	10.8	10.4	9.9	9.5	9.0	8.6	67.8	42.6	26.7	16.7	10.5	6.6	4.2	2.6	4.5
1946	12.9	12.4	11.8	11.3	10.8	10.4	9.9	9.5	9.0	8.6	67.7	42.6	26.7	16.7	10.5	6.6	4.2	2.6	4.5
1947	12.8	12.3	11.8	11.3	10.8	10.3	9.9	9.5	9.0	8.6	67.7	42.6	26.7	16.7	10.5	6.6	4.2	2.6	4.5
1948	12.8	12.2	11.7	11.3	10.8	10.3	9.9	9.4	9.0	8.6	67.7	42.6	26.7	16.7	10.5	6.6	4.2	2.6	4.5
1949	12.8	12.2	11.7	11.2	10.8	10.3	9.9	9.4	9.0	8.6	67.6	42.6	26.6	16.7	10.5	6.6	4.2	2.6	4.5
1950	12.8	12.2	11.7	11.2	10.7	10.3	9.8	9.4	9.0	8.6	67.6	42.6	26.6	16.7	10.5	6.6	4.2	2.6	4.5
1951	12.7	12.2	11.6	11.1	10.7	10.2	9.8	9.4	9.0	8.6	67.5	42.5	26.6	16.7	10.5	6.6	4.2	2.6	4.5
1952	12.7	12.2	11.6	11.1	10.6	10.2	9.8	9.4	9.0	8.6	67.5	42.5	26.6	16.7	10.5	6.6	4.2	2.6	4.5
1953	12.7	12.1	11.6	11.1	10.6	10.2	9.7	9.3	8.9	8.6	67.5	42.5	26.6	16.7	10.5	6.6	4.2	2.6	4.5
1954	12.7	12.1	11.6	11.1	10.6	10.1	9.7	9.3	8.9	8.5	67.4	42.5	26.6	16.6	10.4	6.6	4.1	2.6	4.5
1955	12.7	12.1	11.6	11.1	10.6	10.1	9.7	9.3	8.9	8.5	67.3	42.5	26.6	16.6	10.4	6.6	4.1	2.6	4.5
1956	12.6	12.1	11.6	11.1	10.6	10.1	9.7	9.3	8.9	8.5	67.1	42.4	26.6	16.6	10.4	6.5	4.1	2.6	4.4
1957	12.6	12.1	11.6	11.0	10.6	10.1	9.7	9.2	8.8	8.5	67.0	42.3	26.5	16.6	10.4	6.5	4.1	2.6	4.4

Table A.5. Continued. Female numbers at age in Washington (1000s) predicted by the base-case model.

Age (Yr)	0	1	2	3	4	5	6	7	8	9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90+
1958	12.6	12.1	11.5	11.0	10.6	10.1	9.6	9.2	8.8	8.4	66.8	42.2	26.4	16.5	10.3	6.5	4.1	2.6	4.4
1959	12.6	12.0	11.5	11.0	10.5	10.1	9.6	9.2	8.8	8.4	66.6	42.1	26.3	16.4	10.3	6.5	4.1	2.6	4.4
1960	12.5	12.0	11.5	11.0	10.5	10.1	9.6	9.2	8.8	8.4	66.4	42.0	26.2	16.4	10.3	6.4	4.1	2.6	4.4
1961	12.5	12.0	11.4	11.0	10.5	10.0	9.6	9.2	8.8	8.4	66.2	41.9	26.2	16.3	10.2	6.4	4.0	2.5	4.4
1962	12.5	11.9	11.4	10.9	10.5	10.0	9.6	9.2	8.8	8.4	66.0	41.8	26.1	16.3	10.2	6.4	4.0	2.5	4.3
1963	12.4	11.9	11.4	10.9	10.4	10.0	9.6	9.2	8.8	8.4	65.8	41.7	26.0	16.2	10.1	6.4	4.0	2.5	4.3
1964	12.4	11.9	11.4	10.9	10.4	10.0	9.5	9.1	8.7	8.4	65.6	41.5	25.8	16.1	10.0	6.3	4.0	2.5	4.3
1965	12.4	11.9	11.3	10.9	10.4	9.9	9.5	9.1	8.7	8.3	65.4	41.2	25.6	16.0	10.0	6.3	3.9	2.5	4.2
1966	12.3	11.8	11.3	10.8	10.4	9.9	9.5	9.1	8.7	8.3	65.3	41.0	25.5	15.9	9.9	6.2	3.9	2.5	4.2
1967	12.3	11.8	11.3	10.8	10.3	9.9	9.5	9.1	8.7	8.3	65.1	40.8	25.3	15.7	9.8	6.1	3.9	2.4	4.2
1968	12.3	11.8	11.3	10.8	10.3	9.9	9.5	9.0	8.7	8.3	65.0	40.6	25.1	15.6	9.7	6.1	3.8	2.4	4.1
1969	12.3	11.7	11.2	10.7	10.3	9.9	9.4	9.0	8.6	8.3	64.8	40.4	25.0	15.5	9.7	6.0	3.8	2.4	4.1
1970	12.2	11.7	11.2	10.7	10.3	9.9	9.4	9.0	8.6	8.2	64.7	40.2	24.8	15.4	9.6	6.0	3.8	2.4	4.1
1971	12.1	11.6	11.2	10.7	10.2	9.8	9.4	9.0	8.6	8.2	64.5	39.9	24.6	15.3	9.5	5.9	3.7	2.3	4.0
1972	12.1	11.6	11.1	10.7	10.2	9.8	9.4	9.0	8.6	8.2	64.3	39.6	24.4	15.1	9.4	5.9	3.7	2.3	4.0
1973	12.0	11.5	11.1	10.6	10.2	9.8	9.3	8.9	8.6	8.2	64.0	39.3	24.1	14.9	9.3	5.8	3.6	2.3	3.9
1974	11.9	11.4	11.0	10.6	10.1	9.7	9.3	8.9	8.5	8.2	63.8	39.0	23.8	14.7	9.1	5.7	3.6	2.2	3.8
1975	11.8	11.4	10.9	10.5	10.1	9.7	9.3	8.9	8.5	8.1	63.5	38.6	23.5	14.4	8.9	5.6	3.5	2.2	3.8
1976	11.7	11.3	10.8	10.4	10.0	9.6	9.2	8.9	8.5	8.1	63.4	38.4	23.2	14.2	8.8	5.5	3.4	2.2	3.7
1977	11.6	11.2	10.7	10.4	10.0	9.6	9.2	8.8	8.5	8.1	63.1	38.0	22.9	14.0	8.7	5.4	3.4	2.1	3.6
1978	11.5	11.1	10.7	10.3	9.9	9.5	9.1	8.8	8.4	8.1	62.6	37.3	22.2	13.5	8.4	5.2	3.3	2.0	3.5
1979	11.2	10.9	10.6	10.2	9.8	9.4	9.1	8.7	8.4	8.0	62.1	36.5	21.4	13.0	8.0	5.0	3.1	2.0	3.3
1980	11.0	10.7	10.4	10.1	9.7	9.4	9.0	8.7	8.3	8.0	61.6	35.6	20.6	12.5	7.7	4.8	3.0	1.9	3.2
1981	10.8	10.5	10.2	10.0	9.6	9.3	8.9	8.6	8.2	7.9	60.9	34.5	19.7	11.8	7.2	4.5	2.8	1.8	3.0
1982	10.5	10.3	10.0	9.8	9.5	9.2	8.9	8.5	8.2	7.9	60.9	34.4	19.4	11.6	7.1	4.4	2.7	1.7	2.9
1983	10.1	10.0	9.8	9.6	9.3	9.1	8.8	8.5	8.1	7.8	60.8	34.2	19.1	11.4	6.9	4.3	2.7	1.7	2.9
1984	9.8	9.6	9.6	9.4	9.1	8.9	8.7	8.4	8.1	7.7	60.4	33.8	18.6	11.0	6.7	4.1	2.6	1.6	2.7
1985	9.5	9.4	9.2	9.1	9.0	8.7	8.5	8.3	8.0	7.7	59.9	33.2	18.1	10.6	6.4	4.0	2.5	1.5	2.6
1986	9.2	9.1	8.9	8.8	8.7	8.6	8.3	8.1	7.9	7.6	59.1	32.4	17.2	10.0	6.0	3.7	2.3	1.4	2.5
1987	9.0	8.8	8.7	8.5	8.4	8.3	8.2	7.9	7.7	7.5	58.7	32.0	16.8	9.6	5.8	3.6	2.2	1.4	2.4
1988	8.8	8.6	8.4	8.3	8.1	8.0	7.9	7.8	7.6	7.3	57.9	31.1	16.0	9.0	5.4	3.3	2.1	1.3	2.2
1989	8.5	8.4	8.2	8.0	7.9	7.8	7.6	7.6	7.4	7.2	57.0	30.3	15.3	8.5	5.1	3.1	1.9	1.2	2.0
1990	8.1	8.1	8.0	7.9	7.7	7.6	7.4	7.3	7.2	7.0	55.5	28.6	14.0	7.6	4.5	2.8	1.7	1.1	1.8
1991	7.8	7.7	7.7	7.6	7.5	7.3	7.2	7.1	6.9	6.8	54.5	27.7	13.2	7.1	4.2	2.5	1.6	1.0	1.7
1992	7.4	7.5	7.4	7.4	7.3	7.1	7.0	6.9	6.7	6.6	53.3	26.8	12.4	6.5	3.8	2.3	1.4	0.9	1.5
1993	6.8	7.0	7.1	7.0	7.0	7.0	6.8	6.6	6.5	6.4	51.5	25.2	11.2	5.8	3.4	2.0	1.3	0.8	1.3
1994	6.4	6.5	6.7	6.8	6.7	6.7	6.6	6.5	6.3	6.2	49.8	23.7	10.2	5.1	2.9	1.8	1.1	0.7	1.1
1995	6.1	6.1	6.2	6.4	6.5	6.4	6.4	6.3	6.2	6.0	48.7	23.1	9.6	4.7	2.7	1.6	1.0	0.6	1.0
1996	5.7	5.8	5.8	6.0	6.1	6.2	6.1	6.1	6.0	5.9	47.5	22.6	9.2	4.4	2.5	1.5	0.9	0.6	0.9
1997	5.4	5.4	5.5	5.5	5.7	5.8	5.9	5.8	5.8	5.7	46.3	22.1	8.7	4.1	2.2	1.3	0.8	0.5	0.8
1998	5.0	5.2	5.2	5.3	5.3	5.4	5.6	5.6	5.5	5.5	44.9	21.4	8.2	3.7	2.0	1.2	0.7	0.5	0.8
1999	4.9	4.8	4.9	5.0	5.0	5.0	5.2	5.3	5.4	5.2	43.9	21.3	8.0	3.5	1.9	1.1	0.7	0.4	0.7

Table A.5. Continued. Female numbers at age in Washington (1000s) predicted by the base-case model.

Age (Yr)	0	1	2	3	4	5	6	7	8	9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90+
2000	4.8	4.7	4.6	4.7	4.7	4.8	4.8	4.9	5.0	5.1	41.7	19.7	7.1	3.0	1.6	0.9	0.6	0.3	0.6
2001	4.8	4.5	4.5	4.4	4.5	4.5	4.6	4.6	4.7	4.8	40.7	19.6	6.9	2.9	1.5	0.9	0.5	0.3	0.5
2002	4.9	4.6	4.3	4.3	4.2	4.3	4.3	4.4	4.3	4.4	38.7	18.4	6.3	2.5	1.3	0.7	0.4	0.3	0.4
2003	5.0	4.6	4.4	4.1	4.1	4.0	4.1	4.1	4.2	4.1	38.0	19.0	6.5	2.5	1.2	0.7	0.4	0.3	0.4
2004	5.1	4.8	4.4	4.2	3.9	3.9	3.8	3.9	3.9	4.0	37.2	19.7	6.8	2.6	1.2	0.7	0.4	0.3	0.4
2005	5.3	4.9	4.6	4.2	4.0	3.8	3.7	3.6	3.7	3.7	36.2	20.3	7.1	2.6	1.2	0.7	0.4	0.3	0.4
2006	5.4	5.0	4.7	4.3	4.0	3.8	3.6	3.6	3.5	3.5	34.9	20.7	7.4	2.7	1.2	0.7	0.4	0.2	0.4
2007	5.5	5.2	4.8	4.5	4.2	3.9	3.7	3.4	3.4	3.3	33.6	21.3	7.8	2.8	1.2	0.7	0.4	0.2	0.4
2008	5.6	5.3	4.9	4.6	4.3	4.0	3.7	3.5	3.3	3.3	32.1	21.7	8.2	2.8	1.2	0.7	0.4	0.2	0.4
2009	5.7	5.4	5.0	4.7	4.4	4.1	3.8	3.5	3.3	3.1	30.7	22.0	8.6	2.9	1.3	0.7	0.4	0.2	0.4
2010	5.9	5.5	5.1	4.8	4.5	4.2	3.9	3.6	3.4	3.2	29.4	22.3	9.1	3.1	1.3	0.7	0.4	0.2	0.4

Table A.6. Male numbers at age in Washington (1000s) predicted by the base-case model.

Age (Yr)	0	1	2	3	4	5	6	7	8	9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90+
1916	14.1	13.5	12.9	12.3	11.7	11.2	10.7	10.2	9.7	9.3	72.5	45.4	28.5	17.9	11.2	7.0	4.4	2.8	4.6
1917	14.1	13.5	12.9	12.3	11.7	11.2	10.7	10.2	9.7	9.3	72.5	45.4	28.5	17.9	11.2	7.0	4.4	2.8	4.6
1918	14.1	13.5	12.9	12.3	11.7	11.2	10.7	10.2	9.7	9.3	72.5	45.4	28.5	17.9	11.2	7.0	4.4	2.8	4.6
1919	14.1	13.5	12.9	12.3	11.7	11.2	10.7	10.2	9.7	9.3	72.5	45.4	28.5	17.9	11.2	7.0	4.4	2.8	4.6
1920	14.1	13.5	12.9	12.3	11.7	11.2	10.7	10.2	9.7	9.3	72.5	45.4	28.5	17.9	11.2	7.0	4.4	2.8	4.6
1921	14.1	13.5	12.9	12.3	11.7	11.2	10.7	10.2	9.7	9.3	72.5	45.4	28.5	17.9	11.2	7.0	4.4	2.8	4.6
1922	14.1	13.5	12.9	12.3	11.7	11.2	10.7	10.2	9.7	9.3	72.5	45.4	28.5	17.9	11.2	7.0	4.4	2.8	4.6
1923	14.1	13.5	12.9	12.3	11.7	11.2	10.7	10.2	9.7	9.3	72.5	45.4	28.5	17.9	11.2	7.0	4.4	2.8	4.6
1924	14.1	13.5	12.9	12.3	11.7	11.2	10.7	10.2	9.7	9.3	72.5	45.4	28.5	17.9	11.2	7.0	4.4	2.8	4.6
1925	14.1	13.5	12.9	12.3	11.7	11.2	10.7	10.2	9.7	9.3	72.5	45.4	28.5	17.9	11.2	7.0	4.4	2.8	4.6
1926	14.1	13.5	12.9	12.3	11.7	11.2	10.7	10.2	9.7	9.3	72.4	45.4	28.5	17.8	11.2	7.0	4.4	2.8	4.6
1927	14.1	13.5	12.9	12.3	11.7	11.2	10.7	10.2	9.7	9.3	72.4	45.4	28.4	17.8	11.2	7.0	4.4	2.8	4.6
1928	14.1	13.5	12.9	12.3	11.7	11.2	10.7	10.2	9.7	9.3	72.4	45.3	28.4	17.8	11.2	7.0	4.4	2.8	4.6
1929	14.1	13.5	12.9	12.3	11.7	11.2	10.7	10.2	9.7	9.3	72.4	45.3	28.4	17.8	11.2	7.0	4.4	2.8	4.6
1930	14.1	13.5	12.8	12.3	11.7	11.2	10.7	10.2	9.7	9.3	72.4	45.3	28.3	17.8	11.1	7.0	4.4	2.7	4.6
1931	14.1	13.5	12.8	12.3	11.7	11.2	10.7	10.2	9.7	9.3	72.3	45.2	28.3	17.7	11.1	7.0	4.4	2.7	4.6
1932	14.1	13.4	12.8	12.3	11.7	11.2	10.7	10.2	9.7	9.3	72.3	45.2	28.3	17.7	11.1	7.0	4.4	2.7	4.6
1933	14.1	13.4	12.8	12.3	11.7	11.2	10.7	10.2	9.7	9.3	72.3	45.2	28.3	17.7	11.1	7.0	4.4	2.7	4.6
1934	14.1	13.4	12.8	12.3	11.7	11.2	10.7	10.2	9.7	9.3	72.3	45.1	28.2	17.7	11.1	7.0	4.4	2.7	4.6
1935	14.1	13.4	12.8	12.2	11.7	11.2	10.7	10.2	9.7	9.3	72.3	45.1	28.2	17.7	11.1	6.9	4.4	2.7	4.6
1936	14.1	13.4	12.8	12.2	11.7	11.2	10.7	10.2	9.7	9.3	72.3	45.1	28.2	17.7	11.1	6.9	4.4	2.7	4.6
1937	14.1	13.4	12.8	12.2	11.7	11.2	10.6	10.2	9.7	9.3	72.3	45.1	28.2	17.6	11.1	6.9	4.3	2.7	4.6
1938	14.0	13.4	12.8	12.2	11.7	11.2	10.6	10.2	9.7	9.3	72.3	45.1	28.1	17.6	11.0	6.9	4.3	2.7	4.6
1939	14.0	13.4	12.8	12.2	11.7	11.1	10.6	10.2	9.7	9.3	72.3	45.1	28.1	17.6	11.0	6.9	4.3	2.7	4.6
1940	14.0	13.4	12.8	12.2	11.7	11.1	10.6	10.2	9.7	9.3	72.2	45.1	28.1	17.6	11.0	6.9	4.3	2.7	4.6
1941	14.0	13.4	12.8	12.2	11.7	11.1	10.6	10.2	9.7	9.3	72.2	45.1	28.1	17.6	11.0	6.9	4.3	2.7	4.6
1942	14.0	13.4	12.8	12.2	11.7	11.1	10.6	10.1	9.7	9.2	72.2	45.0	28.0	17.5	11.0	6.9	4.3	2.7	4.6
1943	14.0	13.4	12.8	12.2	11.7	11.1	10.6	10.1	9.7	9.2	72.2	45.0	28.0	17.5	11.0	6.9	4.3	2.7	4.6
1944	14.0	13.4	12.8	12.2	11.6	11.1	10.6	10.1	9.7	9.2	72.2	45.0	28.0	17.5	11.0	6.9	4.3	2.7	4.5
1945	14.0	13.4	12.8	12.2	11.6	11.1	10.6	10.1	9.7	9.2	72.2	45.0	28.0	17.5	11.0	6.9	4.3	2.7	4.5
1946	13.9	13.3	12.8	12.2	11.6	11.1	10.6	10.1	9.7	9.2	72.1	45.0	28.0	17.5	10.9	6.9	4.3	2.7	4.5
1947	13.9	13.3	12.7	12.2	11.6	11.1	10.6	10.1	9.7	9.2	72.1	45.0	28.0	17.5	10.9	6.9	4.3	2.7	4.5
1948	13.8	13.2	12.7	12.1	11.6	11.1	10.6	10.1	9.7	9.2	72.1	45.0	28.0	17.4	10.9	6.8	4.3	2.7	4.5
1949	13.8	13.2	12.6	12.1	11.6	11.1	10.6	10.1	9.7	9.2	72.0	45.0	28.0	17.4	10.9	6.8	4.3	2.7	4.5
1950	13.8	13.2	12.6	12.1	11.5	11.1	10.6	10.1	9.7	9.2	72.0	45.0	28.0	17.4	10.9	6.8	4.3	2.7	4.5
1951	13.8	13.2	12.6	12.0	11.5	11.0	10.6	10.1	9.6	9.2	72.0	45.0	28.0	17.4	10.9	6.8	4.3	2.7	4.5
1952	13.8	13.2	12.6	12.0	11.5	11.0	10.5	10.1	9.6	9.2	71.9	45.0	28.0	17.4	10.9	6.8	4.3	2.7	4.5
1953	13.7	13.1	12.6	12.0	11.5	11.0	10.5	10.0	9.6	9.2	71.9	45.0	27.9	17.4	10.9	6.8	4.3	2.7	4.5
1954	13.7	13.1	12.5	12.0	11.5	10.9	10.5	10.0	9.6	9.2	71.9	44.9	27.9	17.4	10.9	6.8	4.3	2.7	4.5
1955	13.7	13.1	12.5	12.0	11.4	10.9	10.4	10.0	9.5	9.1	71.8	44.9	27.9	17.4	10.8	6.8	4.3	2.7	4.5
1956	13.7	13.1	12.5	12.0	11.4	10.9	10.4	10.0	9.5	9.1	71.7	44.8	27.9	17.3	10.8	6.8	4.2	2.7	4.5
1957	13.7	13.1	12.5	11.9	11.4	10.9	10.4	10.0	9.5	9.1	71.5	44.7	27.8	17.3	10.8	6.7	4.2	2.7	4.5

Table A.6. Continued. Male numbers at age in Washington (1000s) predicted by the base-case model.

Age (Yr)	0	1	2	3	4	5	6	7	8	9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90+
1958	13.6	13.0	12.5	11.9	11.4	10.9	10.4	9.9	9.5	9.1	71.4	44.6	27.7	17.2	10.7	6.7	4.2	2.6	4.4
1959	13.6	13.0	12.4	11.9	11.4	10.9	10.4	9.9	9.5	9.1	71.2	44.5	27.7	17.2	10.7	6.7	4.2	2.6	4.4
1960	13.6	13.0	12.4	11.9	11.4	10.9	10.4	9.9	9.5	9.1	71.0	44.4	27.6	17.1	10.6	6.7	4.2	2.6	4.4
1961	13.5	12.9	12.4	11.9	11.3	10.8	10.4	9.9	9.5	9.0	70.8	44.2	27.5	17.0	10.6	6.6	4.2	2.6	4.4
1962	13.5	12.9	12.4	11.8	11.3	10.8	10.3	9.9	9.4	9.0	70.7	44.1	27.4	17.0	10.6	6.6	4.1	2.6	4.4
1963	13.5	12.9	12.3	11.8	11.3	10.8	10.3	9.9	9.4	9.0	70.5	44.0	27.3	16.9	10.5	6.6	4.1	2.6	4.3
1964	13.5	12.9	12.3	11.8	11.3	10.8	10.3	9.9	9.4	9.0	70.3	43.8	27.1	16.8	10.4	6.5	4.1	2.6	4.3
1965	13.4	12.8	12.3	11.7	11.2	10.7	10.3	9.8	9.4	9.0	70.0	43.6	26.9	16.7	10.4	6.5	4.0	2.5	4.3
1966	13.4	12.8	12.3	11.7	11.2	10.7	10.2	9.8	9.4	9.0	69.9	43.3	26.7	16.6	10.3	6.4	4.0	2.5	4.2
1967	13.4	12.8	12.2	11.7	11.2	10.7	10.2	9.8	9.3	8.9	69.7	43.1	26.5	16.4	10.2	6.4	4.0	2.5	4.2
1968	13.3	12.8	12.2	11.7	11.2	10.7	10.2	9.8	9.3	8.9	69.5	42.9	26.4	16.3	10.1	6.3	3.9	2.5	4.2
1969	13.3	12.7	12.2	11.6	11.1	10.7	10.2	9.7	9.3	8.9	69.4	42.6	26.2	16.2	10.0	6.3	3.9	2.5	4.1
1970	13.2	12.7	12.1	11.6	11.1	10.6	10.2	9.7	9.3	8.9	69.2	42.4	26.0	16.1	10.0	6.2	3.9	2.4	4.1
1971	13.2	12.6	12.1	11.6	11.1	10.6	10.1	9.7	9.3	8.9	69.0	42.2	25.8	15.9	9.9	6.1	3.8	2.4	4.0
1972	13.1	12.6	12.0	11.5	11.1	10.6	10.1	9.7	9.2	8.8	68.8	41.8	25.5	15.7	9.8	6.1	3.8	2.4	4.0
1973	13.0	12.5	12.0	11.5	11.0	10.5	10.1	9.7	9.2	8.8	68.5	41.5	25.2	15.5	9.6	6.0	3.7	2.3	3.9
1974	12.9	12.4	11.9	11.4	11.0	10.5	10.1	9.6	9.2	8.8	68.2	41.1	24.9	15.3	9.5	5.9	3.7	2.3	3.9
1975	12.8	12.3	11.8	11.4	10.9	10.5	10.0	9.6	9.2	8.8	67.9	40.7	24.5	15.1	9.3	5.8	3.6	2.3	3.8
1976	12.7	12.2	11.7	11.3	10.9	10.4	10.0	9.6	9.2	8.7	67.8	40.4	24.3	14.9	9.2	5.7	3.6	2.2	3.7
1977	12.5	12.1	11.6	11.2	10.8	10.4	9.9	9.5	9.1	8.7	67.5	40.0	23.9	14.6	9.0	5.6	3.5	2.2	3.7
1978	12.4	11.9	11.5	11.1	10.7	10.3	9.9	9.5	9.1	8.7	66.8	39.1	23.2	14.1	8.7	5.4	3.4	2.1	3.5
1979	12.1	11.8	11.4	11.0	10.6	10.2	9.8	9.4	9.0	8.6	66.2	38.2	22.4	13.6	8.4	5.2	3.2	2.0	3.4
1980	11.9	11.6	11.3	10.9	10.5	10.1	9.7	9.3	9.0	8.6	65.6	37.1	21.5	13.0	8.0	5.0	3.1	1.9	3.2
1981	11.6	11.3	11.0	10.8	10.4	10.0	9.6	9.3	8.9	8.5	64.8	35.9	20.5	12.3	7.6	4.7	2.9	1.8	3.1
1982	11.3	11.1	10.8	10.5	10.3	9.9	9.6	9.2	8.8	8.5	64.8	35.7	20.2	12.1	7.4	4.6	2.9	1.8	3.0
1983	10.9	10.8	10.6	10.3	10.1	9.8	9.4	9.1	8.8	8.4	64.7	35.5	19.9	11.9	7.3	4.5	2.8	1.7	2.9
1984	10.5	10.4	10.3	10.1	9.8	9.6	9.3	9.0	8.7	8.3	64.3	35.0	19.3	11.5	7.0	4.3	2.7	1.7	2.8
1985	10.2	10.0	9.9	9.8	9.6	9.4	9.1	8.9	8.6	8.2	63.7	34.4	18.7	11.0	6.7	4.2	2.6	1.6	2.7
1986	9.9	9.8	9.6	9.5	9.4	9.2	8.9	8.7	8.5	8.1	62.8	33.3	17.8	10.4	6.3	3.9	2.4	1.5	2.5
1987	9.7	9.5	9.3	9.1	9.0	8.9	8.8	8.5	8.3	8.1	62.3	32.9	17.3	10.1	6.1	3.8	2.3	1.5	2.4
1988	9.4	9.3	9.0	8.9	8.7	8.6	8.5	8.4	8.1	7.9	61.3	31.9	16.5	9.5	5.7	3.5	2.2	1.4	2.3
1989	9.1	9.0	8.8	8.6	8.5	8.3	8.2	8.1	7.9	7.7	60.3	31.0	15.7	8.9	5.4	3.3	2.0	1.3	2.1
1990	8.6	8.7	8.6	8.4	8.2	8.1	7.9	7.8	7.7	7.5	58.4	29.1	14.4	8.0	4.8	3.0	1.8	1.1	1.9
1991	8.3	8.2	8.3	8.2	8.0	7.8	7.7	7.5	7.4	7.3	57.3	28.2	13.5	7.5	4.5	2.7	1.7	1.1	1.8
1992	7.8	8.0	7.9	7.9	7.8	7.7	7.5	7.3	7.1	7.0	55.9	27.1	12.7	6.9	4.1	2.5	1.6	1.0	1.6
1993	7.3	7.5	7.6	7.5	7.5	7.4	7.3	7.1	7.0	6.7	53.8	25.3	11.5	6.2	3.6	2.2	1.4	0.8	1.4
1994	6.7	6.9	7.1	7.3	7.1	7.2	7.1	6.9	6.7	6.6	51.8	23.7	10.4	5.5	3.2	1.9	1.2	0.7	1.2
1995	6.4	6.4	6.6	6.8	6.9	6.8	6.8	6.7	6.6	6.4	50.6	23.1	9.9	5.1	2.9	1.8	1.1	0.7	1.1
1996	6.0	6.1	6.1	6.3	6.5	6.6	6.5	6.5	6.4	6.2	49.5	22.5	9.4	4.7	2.7	1.6	1.0	0.6	1.0
1997	5.7	5.7	5.8	5.8	6.0	6.2	6.3	6.2	6.2	6.1	48.2	22.0	8.9	4.4	2.5	1.5	0.9	0.6	1.0
1998	5.2	5.4	5.5	5.6	5.6	5.7	5.9	6.0	5.9	5.8	46.8	21.3	8.4	4.0	2.3	1.4	0.8	0.5	0.9
1999	5.2	5.0	5.2	5.2	5.3	5.3	5.5	5.6	5.7	5.6	45.7	21.2	8.1	3.8	2.1	1.3	0.8	0.5	0.8

Table A.6. Continued. Male numbers at age in Washington (1000s) predicted by the base-case model.

Age (Yr)	0	1	2	3	4	5	6	7	8	9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90+
2000	4.9	4.9	4.8	4.9	5.0	5.1	5.1	5.2	5.3	5.4	43.3	19.5	7.2	3.3	1.8	1.1	0.7	0.4	0.7
2001	5.0	4.7	4.7	4.6	4.7	4.7	4.8	4.8	4.9	5.0	42.2	19.4	7.1	3.1	1.7	1.0	0.6	0.4	0.6
2002	5.0	4.8	4.5	4.5	4.3	4.5	4.5	4.6	4.6	4.6	40.1	18.2	6.4	2.8	1.5	0.9	0.5	0.3	0.5
2003	5.2	4.8	4.6	4.3	4.3	4.1	4.3	4.3	4.4	4.3	39.4	18.7	6.6	2.8	1.4	0.8	0.5	0.3	0.5
2004	5.3	4.9	4.6	4.4	4.1	4.1	4.0	4.1	4.1	4.1	38.6	19.4	6.8	2.8	1.4	0.8	0.5	0.3	0.5
2005	5.5	5.1	4.7	4.4	4.2	3.9	3.9	3.8	3.9	3.9	37.6	20.0	7.1	2.8	1.4	0.8	0.5	0.3	0.5
2006	5.6	5.2	4.8	4.5	4.2	4.0	3.7	3.7	3.6	3.7	36.2	20.4	7.3	2.8	1.4	0.8	0.5	0.3	0.5
2007	5.7	5.3	5.0	4.6	4.3	4.0	3.8	3.6	3.5	3.4	34.9	21.1	7.7	2.9	1.4	0.8	0.5	0.3	0.5
2008	5.8	5.5	5.1	4.7	4.4	4.1	3.8	3.6	3.4	3.4	33.4	21.6	8.0	3.0	1.4	0.8	0.5	0.3	0.5
2009	5.9	5.6	5.2	4.9	4.5	4.2	3.9	3.6	3.4	3.2	31.7	21.8	8.3	3.0	1.4	0.8	0.5	0.3	0.5
2009	4.9	4.9	4.8	4.9	5.0	5.1	5.1	5.2	5.3	5.4	43.3	19.5	7.2	3.3	1.8	1.1	0.7	0.4	0.7

13. Appendix B: SS Data file

```
#C Data file for 2011 yelloweye assessment

#C updated from 2009 model by Ian Taylor
#C designed to run in SSv3.21e
#
### Global model specifications ###
#
1916  # Start year
2010  # End year
1 # Number of seasons/year
12  # Number of months/season (vector, by season)
1 # Spawning occurs at beginning of season
6 # Number of fishing fleets
6 # Number of surveys
3 # Number of areas
#
### Fleet Section ###
1_CARC%2_CACM%3_ORRC%4_ORCM%5_WARC%6_WACM%7_ORRCOB%8_CACPFV%9_IPHCWA%10_NWFSCOR
%11_IPHCOR%12_WATRI
0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 # Fleet timing (proportion of
season)
1 1 2 2 3 3 2 1 3 2 2 3 # Area of each fleet
1 1 1 1 1 1             # Units for catch by fishing fleet:
1=Biomass(mt),2=Numbers(1000s)
0.1 0.1 0.1 0.1 0.1 0.1             # SE of log(catch) by fishing fleet
#
### More global specs ###
2 # Number of genders (1=combined,2=females and males)
100 # Accumulator age (plus group for population dynamics)
#
### Catch section ###
# Initial equilibrium catch (landings + discard) by fishing fleet
0 0 0 0 0 0
#
95  # Number of lines catch data
# Catch (by fleet) Year Season
#CA rec CA comm OR rec  OR comm WA rec  WA comm Year  Season
0.00  2.20  0.00  1.70  0.00  0.00  1916  1
0.00  3.62  0.00  1.79  0.00  0.00  1917  1
0.00  4.25  0.00  1.88  0.00  0.00  1918  1
0.00  2.16  0.00  1.97  0.00  0.00  1919  1
0.00  2.38  0.00  2.05  0.00  0.00  1920  1
0.00  2.30  0.00  2.14  0.00  0.00  1921  1
0.00  2.06  0.00  2.23  0.00  0.00  1922  1
0.00  2.21  0.00  2.32  0.00  0.00  1923  1
0.00  2.82  0.00  2.40  0.00  0.00  1924  1
0.00  3.86  0.00  2.49  0.00  1.00  1925  1
0.00  4.87  0.00  2.58  0.00  1.00  1926  1
0.00  5.92  0.00  2.67  0.00  1.00  1927  1
0.00  5.52  0.00  4.45  0.00  1.00  1928  1
0.73  5.66  0.00  7.46  0.00  1.00  1929  1
1.18  6.76  0.00  6.65  0.00  1.00  1930  1
1.76  5.62  0.00  5.21  0.00  1.00  1931  1
2.35  8.13  0.00  1.79  0.00  1.00  1932  1
2.94  4.45  0.00  2.74  0.00  1.00  1933  1
3.53  5.78  0.00  3.11  0.00  1.00  1934  1
4.12  7.99  0.00  2.84  0.00  1.00  1935  1
4.70  8.08  0.00  6.64  0.00  1.00  1936  1
5.61  6.08  0.00  7.57  0.00  1.00  1937  1
5.50  6.36  0.00  7.30  0.00  1.00  1938  1
4.81  6.43  0.00  3.82  0.00  1.00  1939  1
```

6.85	4.57	0.00	11.15	0.00	1.00	1940	1
6.25	5.35	0.00	15.98	0.00	1.00	1941	1
6.78	3.37	0.00	23.85	0.00	1.00	1942	1
7.30	5.89	0.00	66.05	0.00	1.00	1943	1
7.83	24.88	0.00	46.97	0.00	1.00	1944	1
8.36	58.56	0.00	62.52	0.00	1.00	1945	1
8.88	57.74	0.00	42.38	0.00	1.00	1946	1
5.02	16.28	0.00	25.53	0.00	1.00	1947	1
10.12	23.30	0.00	20.73	0.00	1.00	1948	1
13.09	9.89	0.00	15.93	0.00	1.00	1949	1
15.95	8.03	0.00	17.79	0.00	1.00	1950	1
17.91	16.99	0.00	15.10	0.00	1.00	1951	1
15.95	14.15	0.00	14.88	0.00	1.00	1952	1
13.97	11.77	0.00	11.32	0.00	1.00	1953	1
18.74	11.78	0.00	14.23	0.00	1.00	1954	1
24.06	6.98	6.20	15.04	1.00	2.00	1955	1
27.15	10.40	6.50	18.06	1.00	2.00	1956	1
24.78	13.17	6.70	25.89	1.00	2.00	1957	1
35.91	13.41	7.00	18.30	2.00	2.00	1958	1
30.41	10.25	7.20	20.64	2.00	2.00	1959	1
22.05	8.88	7.50	25.32	2.00	2.00	1960	1
17.68	5.25	7.70	24.63	2.00	2.00	1961	1
22.08	5.43	8.00	28.28	2.00	2.00	1962	1
23.10	10.86	8.20	8.28	3.00	4.00	1963	1
20.82	7.52	8.50	1.94	3.00	4.00	1964	1
31.51	9.38	8.70	70.16	3.00	4.00	1965	1
35.34	8.97	9.00	3.86	3.00	4.00	1966	1
36.60	7.85	9.20	11.35	3.00	4.00	1967	1
42.79	7.66	9.50	7.93	3.00	4.00	1968	1
44.97	25.70	9.70	55.36	3.00	4.00	1969	1
51.89	27.70	10.00	6.31	4.00	5.10	1970	1
46.17	46.50	13.10	17.97	4.00	6.41	1971	1
59.61	63.66	16.30	14.82	4.00	7.31	1972	1
75.02	49.51	7.40	14.98	4.00	9.21	1973	1
80.47	56.38	12.80	14.86	4.00	10.31	1974	1
81.34	60.24	6.20	9.87	4.00	7.10	1975	1
88.56	57.96	19.40	14.86	4.30	10.30	1976	1
79.78	57.45	19.90	17.13	8.80	17.88	1977	1
74.46	154.20	24.50	41.91	4.50	23.90	1978	1
85.49	99.33	38.80	67.38	3.50	28.50	1979	1
80.19	42.07	31.50	76.22	2.40	35.06	1980	1
43.58	169.44	36.00	106.27	3.40	9.70	1981	1
79.60	154.33	56.90	156.56	3.40	12.60	1982	1
38.36	62.69	63.80	142.78	6.70	16.99	1983	1
71.26	53.66	43.70	82.56	12.20	13.42	1984	1
121.87	12.22	26.80	132.95	8.80	26.41	1985	1
77.31	33.51	27.40	56.89	9.00	14.94	1986	1
57.83	54.31	29.80	73.72	10.50	25.09	1987	1
60.07	65.44	9.40	110.73	8.30	25.56	1988	1
54.44	51.25	16.90	170.21	14.60	39.50	1989	1
40.06	81.32	18.70	61.12	9.90	26.27	1990	1
27.38	147.30	17.20	137.74	18.00	20.36	1991	1
16.41	111.10	29.40	165.88	16.20	33.85	1992	1
7.13	52.92	27.73	183.18	18.00	29.76	1993	1
13.78	56.02	21.57	102.19	10.30	19.58	1994	1
10.08	51.40	16.81	148.34	9.90	18.07	1995	1
12.74	76.54	8.17	92.52	10.80	16.89	1996	1
14.58	68.68	15.38	115.42	11.40	18.68	1997	1
4.84	21.89	18.78	41.47	14.40	5.57	1998	1
9.40	23.49	18.05	61.35	10.60	32.92	1999	1
5.71	4.02	9.52	3.64	10.10	7.86	2000	1
6.37	4.35	4.83	6.23	12.50	21.84	2001	1
2.49	0.89	3.14	1.56	3.70	1.55	2002	1

```
3.74  0.70  3.02  0.92  2.60  0.98  2003  1
0.60  2.61  3.69  2.67  3.70  0.66  2004  1
0.90  3.43  4.30  1.69  5.20  0.74  2005  1
4.10  1.86  2.49  2.92  1.70  0.76  2006  1
8.00  4.81  2.85  3.28  2.49  1.61  2007  1
1.69  1.72  3.25  3.88  2.40  0.78  2008  1
3.84  0.61  2.05  1.61  1.63  1.15  2009  1
1.20  1.85  2.80  2.52  1.90  1.12  2010  1
#
### Abundance indices ###
100 # Total number of observations (all fleets) #_N_cpue
#_Units:  0=numbers; 1=biomass; 2=F
#_Errtype:  -1=normal; 0=lognormal; >0=T
#_Fleet Units Errtype
1 0 0 # 1_CARC
2 0 0 # 2_CACM
3 0 0 # 3_ORRC
4 0 0 # 4_ORCM
5 0 0 # 5_WARC
6 0 0 # 6_WACM
7 0 0 # 7_ORRCOB
8 0 0 # 8_CACPFV
9 0 0 # 9_IPHCWA
10  1 0 # 10_NWFSCOR
11  0 0 # 11_IPHCOR
12  1 0 # 12_WATRI
#
# Year  Seas    Type    Value   s(log space)
# 2009 CA Recreational CPUE from WDFW (unchanged for 2011; N=14)
1980  1 1 4.48  0.240
1981  1 1 2.78  0.506
1982  1 1 11.27 0.361
1983  1 1 4.64  0.579
1984  1 1 8.46  0.413
1985  1 1 13.57 0.363
1986  1 1 6.25  0.314
1993  1 1 7.72  0.552
1994  1 1 1.87  0.616
1995  1 1 3.06  0.314
1996  1 1 2.08  0.193
1997  1 1 4.23  0.249
1998  1 1 3.12  0.295
1999  1 1 2.14  0.211
# 2009 Oregon Recreational CPUE from WDFW (unchanged for 2011; N=19)
1979  1 3 16.99 0.225
1980  1 3 22.24 0.178
1981  1 3 17.98 0.169
1982  1 3 25.7  0.185
1983  1 3 31.95 0.189
1984  1 3 21.75 0.150
1986  1 3 15.27 0.143
1987  1 3 25.23 0.257
1988  1 3 14.81 0.268
1989  1 3 10.17 0.276
1990  1 3 16.02 0.208
1991  1 3 19.08 0.171
1992  1 3 16.46 0.209
1993  1 3 12.66 0.137
1994  1 3 10.17 0.132
1995  1 3 9.65  0.257
1996  1 3 6.1 0.134
1998  1 3 10.76 0.127
1999  1 3 13.84 0.186
```

```
# 2009 WA Recreational CPUE from WDFW (unchanged for 2011; N=10)
1990  1 5 6.9 0.700
1991  1 5 16.03 1.700
1992  1 5 15.29 1.240
1993  1 5 13.19 1.010
1994  1 5 7.15  0.420
1995  1 5 5.7 0.460
1996  1 5 5.72  0.500
1997  1 5 8.75  1.050
1998  1 5 11.06 1.240
1999  1 5 6.88  0.850
# 2011 Oregon Recreational Charter observer CPUE (logit MCMC run with 2
additional years; N=7)
2004  1 7 0.00036 0.515
2005  1 7 0.000317  0.532
2006  1 7 0.000817  0.483
2007  1 7 0.000644  0.490
2008  1 7 0.000958  0.488
2009  1 7 0.000861  0.495
2010  1 7 0.000578  0.530
# 2009 CA CPFV CPUE from WDFW (unchanged for 2011; N=11)
1988  1 8 26.19 0.211
1989  1 8 25.52 0.130
1990  1 8 32.16 0.265
1991  1 8 31.59 0.157
1992  1 8 20.88 0.130
1993  1 8 23.63 0.156
1994  1 8 21.67 0.132
1995  1 8 16.33 0.159
1996  1 8 17.9  0.154
1997  1 8 13.31 0.137
1998  1 8 10.13 0.248
# 2011 IPHC Washington-only (logit MCMC run with 2 additional years; N=11)
1999  1 9 0.001212  0.804
2001  1 9 0.010848  0.299
2002  1 9 0.003173  0.245
2003  1 9 0.012624  0.100
2004  1 9 0.003107  0.230
2005  1 9 0.010863  0.115
2006  1 9 0.004373  0.209
2007  1 9 0.005872  0.186
2008  1 9 0.002519  0.286
2009  1 9 0.004642  0.175
2010  1 9 0.003463  0.189
# 2009 NWFSC Trawl survey Oregon-only (updated for 2011 with 2 additional
years; N=8)
2003  1 10  1932.07 0.524
2004  1 10  167.55  0.648
2005  1 10  159.98  0.583
2006  1 10  472.51  0.506
2007  1 10  167.14  0.652
2008  1 10  115.32  0.515
2009  1 10  200.33  1.800
2010  1 10  289.57  0.505
# 2011 IPHC Oregon-only (logit MCMC run with 2 additional years; N=11)
1999  1 11  0.033 0.123
2001  1 11  0.021291  0.181
2002  1 11  0.017846  0.084
2003  1 11  0.019456  0.068
2004  1 11  0.017913  0.078
2005  1 11  0.008298  0.111
2006  1 11  0.009636  0.119
2007  1 11  0.014336  0.097
```

```
2008  1 11  0.017317  0.094
2009  1 11  0.005687  0.135
2010  1 11  0.007392  0.111
# 2009 Triennial Trawl survey Washington-only (updated for 2011 by running in
new GLMM software, separating between 92/95; N=9)
1980  1 12  72.24 0.896
1983  1 12  664.57  0.400
1986  1 12  327.13  0.298
1989  1 12  635.54  0.376
1992  1 12  71.47 0.538
1995  1 12  18.96 0.854
1998  1 12  63.08 0.554
2001  1 12  107.21  0.521
2004  1 12  121.86  0.648
#
### Discard observation section ###
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 # Number of discard observations all fleets and years # N_discard_obs
#
### Mean body weight observation section ###
0 # Number of mean body weight observations # N_meanbodywt_obs
1000  #_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
41  # N population bins
# Lower edge of bins
8 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  66  68  70  72  74  76  78  80  82  84  86
88
#
-1  # Minimum proportion for compressing tails of observed compositional  data
0.001 # Constant added to expected frequencies
0 # Combine males and females at and below this bin number
#
37  # Number of data length bins
# Lower edge of data length bins by bin
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  70  72  74  76  78  80  82  84  86  88
#
168 # Total number of length observations all fleets and years
# Partition: 1=discarded catch, 2=retained catch, 0=whole catch (R+D)
# Gender: 0=sexes combined into length bins, 1=females only (0s male bins),
2=males only (0s for female bins), 3=both males and females, total should sum
to 1.0
# Year  Seas  Type  Gender  Partition Nsamp Data: females then  males
# Fleet 1: 2009 CA recreational (updated for 2011 with 2 additional years, and
recalculated sample sizes; N=18)
1993  1 1 0 0 36.6  0 0 0 0 1 1 1 0 1 1 4 5 4 4 2 0 1 1 2 0 1 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 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
1994  1 1 0 0 45.4  0 0 0 0 0 2 3 2 4 9 7 4 3 9 8 2 2 2 0 2 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 0 0
1995  1 1 0 0 46.5  0 0 1 0 0 1 1 7 4 3 3 5 9 2 3 2 0 1 1 2 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 0 0 0 0 0 0 0
0 0 0 0
```

```
1996  1 1 0 0 75.3  0 0 3 2 1 5 3 3 3 7 6 4 4 8 4 4 5 3 3 2 1 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 0 0 0 0 0 0 0 0 0
0 0 0 0
1997  1 1 0 0 9.4 0 0 0 0 0 0 0 0 0 2 0 2 2 1 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
1998  1 1 0 0 18.5  0 1 0 0 0 0 2 3 5 1 1 0 2 1 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
1999  1 1 0 0 83.1  0 0 1 0 3 2 4 1 4 4 2 4 8 11  8 6 8 4 6 4 4 2 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 0 0 0 0 0 0 0 0
0 0 0 0 0
2000  1 1 0 0 47.5  0 0 1 1 0 0 0 1 6 1 3 1 1 2 6 3 5 5 4 3 1 0 0 2 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
2001  1 1 0 0 17.1  0 0 0 0 0 0 1 1 0 2 1 2 2 1 1 1 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 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 0 10.8  0 0 0 0 0 0 0 2 1 0 0 1 1 1 2 2 1 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 0 0 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 0 0 15.1  1 0 0 0 0 1 0 1 1 0 3 3 1 1 0 1 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
2004  1 1 0 0 13.1  0 0 0 1 0 0 1 0 0 1 0 2 3 1 1 1 0 0 2 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
2005  1 1 0 0 53.9  0 0 0 0 0 1 1 0 3 2 5 4 7 5 6 9 4 4 1 2 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 0
2006  1 1 0 0 73.1  0 0 0 0 0 0 2 3 3 5 9 2 6 8 10  14  15  5 6 2 3 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 0 0
0 0 0 0 0 0 0
2007  1 1 0 0 50.9  0 0 0 0 1 0 0 1 2 2 9 2 8 11  7 4 3 1 2 2 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 0 0 0 0 0 0 0 0
0 0 0 0 0
2008  1 1 0 0 22.7  0 0 0 0 0 0 0 0 1 3 2 0 3 3 5 3 3 0 2 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 0 0 0 0 0 0
0 0 0 0
2009  1 1 0 0 44.1  0 0 0 0 0 1 0 2 2 4 3 4 3 4 4 2 3 4 2 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
2010  1 1 0 0 11.7  0 0 0 0 0 0 0 0 0 0 1 0 2 2 2 1 1 1 1 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
# Fleet 2: 2009 CA commercial: Port and observer (updated for 2011 with
additional observations in 2009, but 0 samples from 2008 and 2010; N=31)
1978  1 2 0 0 4.1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 2 6 1 0 0 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
1979  1 2 0 0 23.3  0 0 0 0 0 0 1 1 3 0 0 6 9 7 4 9 7 7 3 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
1980  1 2 0 0 22.8  0 0 0 0 0 0 0 0 0 0 1 0 1 2 0 5 0 1 4 1 3 5 5 4 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 0 0 0
1981  1 2 0 0 25.6  0 0 0 0 0 1 0 1 0 0 3 5 5 10  5 11  11  4 2 0 1 1 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 0 0 0 0 0
0 0 0 0 0 0 0
1982  1 2 0 0 12.5  0 0 0 0 0 0 0 0 0 0 0 1 0 2 1 4 2 1 2 1 0 1 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
1983  1 2 0 0 25.9  0 0 0 0 0 0 1 3 1 0 2 1 3 2 4 3 3 4 1 1 1 0 3 3 4 1 1 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
1984 1 2 0 0 23.1 0 0 0 0 0 1 1 1 0 1 0 0 2 3 0 0 0 0 4 0 6 3 3 0 1 0 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 0 0 0 0 0 0 0 0
0 0 0 0
1985 1 2 0 0 23.7 0 0 0 0 0 0 1 0 2 0 1 1 4 3 3 2 3 2 0 0 0 2 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
1986 1 2 0 0 23.2 0 0 0 0 0 0 0 0 1 1 1 2 1 0 3 0 3 1 0 1 2 1 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
1987 1 2 0 0 21.6 0 0 0 0 0 0 1 1 1 1 3 1 0 1 1 2 1 1 1 1 2 3 1 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
1988 1 2 0 0 16.9 0 0 0 0 0 0 0 0 0 1 1 0 0 2 1 1 3 3 1 2 0 0 2 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
1989 1 2 0 0 27 0 0 0 1 0 1 0 0 3 2 1 3 3 4 1 3 5 7 5 1 5 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
1990 1 2 0 0 18.9 0 0 0 0 0 0 1 0 1 4 4 6 1 1 0 1 0 0 0 0 4 1 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 0 0 0 0 0 0
0 0 0 0
1991 1 2 0 0 57.9 0 0 0 0 1 0 1 5 5 11 13 16 15 12 23 21 11 11 16
12 16 13 10 6 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
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1992 1 2 0 0 143 0 0 0 0 1 6 5 21 24 26 25 32 41 48 50 29 27 29 32
23 21 21 8 12 6 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
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1993 1 2 0 0 195 0 0 0 2 5 14 33 28 54 45 52 43 59 52 57 39 42 43
35 25 17 24 17 11 6 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
1994 1 2 0 0 183.6 0 0 1 0 4 7 21 26 44 60 63 54 69 69 62 61 49 33
25 21 12 11 13 12 15 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
1995 1 2 0 0 89.2 0 0 1 0 1 4 11 16 24 13 40 35 29 41 26 31 22 20
15 13 12 8 4 6 1 2 1 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
1996 1 2 0 0 152.6 0 0 0 3 3 7 14 32 37 30 48 56 57 40 47 26 28 25
26 11 10 11 10 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1997 1 2 0 0 93 0 0 0 1 4 6 14 15 21 27 24 24 17 15 24 19 17 11
14 9 6 4 5 2 5 3 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
1998 1 2 0 0 26.6 0 0 0 0 0 0 0 0 2 5 7 5 3 6 8 4 5 3 3 3 0 5 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 0 0 0 0 0 0 0 0 0
0 0 0 0
1999 1 2 0 0 128.1 0 0 0 1 0 6 4 7 16 36 31 39 58 53 50 45 36 36 26
19 16 11 8 2 1 3 1 1 1 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
2000 1 2 0 0 17.6 0 0 0 0 0 2 1 2 1 1 1 2 1 3 3 1 4 0 1 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 0 0
2001 1 2 0 0 46.1 0 0 0 1 2 15 28 14 22 12 5 4 9 6 7 4 4 2 2 2 1 2 1 0 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 0 0 0 0 0
0 0 0 0 0 0 0 0 0
2002 1 2 0 0 10.7 0 0 0 0 0 0 1 2 2 1 0 1 0 1 1 0 2 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
2003 1 2 0 0 3.6 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
2004 1 2 0 0 34.8 0 0 0 0 0 1 1 1 4 5 9 5 5 9 8 4 5 4 2 2 1 2 0 1 0 1 1 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
2005  1 2 0 0 19.5  0 0 0 0 0 1 0 2 1 3 4 3 3 5 7 7 1 3 5 1 0 2 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
2006  1 2 0 0 9.9 0 0 0 0 1 1 0 2 2 3 2 2 3 3 3 2 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
2007  1 2 0 0 30.9  0 0 1 1 0 2 4 2 8 9 5 6 5 11  6 6 5 2 1 2 0 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 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0
2009  1 2 0 0 6.4 0 0 0 1 0 0 1 0 1 0 2 0 2 0 0 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 # new for 2011
# Fleet 3: 2009 OR recreational lengths (no new data for 2011; N=28)
# Sexed
1978  1 3 3 0 120 0 0 0 0 0 3 2 6 2 3 5 1 3 3 2 1 0 1 0 4 10  3 5 1 2 3 3 3 2 0
0 0 0 0 0 0 0 0 0 0 0 0 2 1 4 1 1 1 0 3 2 4 2 2 4 1 2 2 1 1 3 11  2 1 1 0 0 0 0
0 0 0 0 0
1979  1 3 3 0 107 0 0 0 0 0 0 3 2 2 4 2 1 0 2 3 2 2 3 5 3 8 6 2 3 0 1 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 2 1 0 0 2 3 1 2 1 1 0 1 2 2 6 4 6 7 2 2 5 1 1 1 0 0 0 0 0 0
0 0 0
1984  1 3 3 0 168 0 0 0 0 0 1 6 2 3 8 12  14  4 9 5 8 6 3 7 5 1 4 8 5 2 0 0 1 1
0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 2 7 6 3 4 2 3 6 2 2 3 1 0 3 1 3 2 0 0 0 0 0 0 0
0 0 0 0 0
1985  1 3 3 0 122 0 0 0 0 0 1 1 2 1 4 2 5 1 4 2 1 1 1 6 3 3 7 2 1 1 3 1 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 2 1 2 4 2 3 5 3 7 3 1 2 5 3 4 5 6 3 2 2 1 1 1 0 0 0 0 0
0 0 0
1986  1 3 3 0 130 0 0 0 0 0 0 0 0 3 3 6 10  3 3 0 6 2 1 2 5 4 6 2 5 4 1 1 0 2 0
0 0 0 0 0 0 0 0 0 1 0 0 0 2 1 3 5 3 5 2 5 3 5 1 2 2 2 2 3 7 1 1 1 2 2 0 0 0 0 0
0 0 0 0
1987  1 3 3 0 121 0 0 0 0 0 3 3 1 2 8 1 4 1 2 6 4 4 3 4 3 3 7 2 2 4 1 1 2 0 0 0
0 0 0 0 0 0 0 0 0 0 1 0 3 0 1 2 2 5 4 3 3 4 2 2 0 2 0 4 3 5 2 1 1 0 0 0 0 0 0 0
0 0 0
1989  1 3 3 0 31  0 0 1 0 0 0 0 0 2 0 0 5 2 2 0 2 0 1 0 0 1 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 1 0 0 1 0 0 3 0 1 0 2 1 1 0 1 2 0 0 0 0 0 0 2 0 0 0 0 0 0 0 0
0 0 0
# Unsexed
1980  1 3 0 0 25  0 0 0 0 0 1 0 0 3 1 1 0 2 1 1 0 0 2 1 0 1 3 0 4 2 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 0 0 0 0 0 0 0
0 0 0
1981  1 3 0 0 13  0 0 0 0 0 0 0 0 0 3 1 1 0 0 2 1 1 0 0 0 1 0 1 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 0 0
0 0 0
1982  1 3 0 0 61  0 0 0 0 0 0 1 5 3 5 5 5 3 1 7 4 4 6 3 1 2 1 1 1 1 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 0 0 0
0 0 0
1983  1 3 0 0 17  0 0 0 0 0 0 1 0 0 1 0 1 3 2 2 1 2 1 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
1984  1 3 0 0 180 0 0 0 0 1 2 6 5 15  22  11  21  23  14  11  7 3 3 4 7 1 4 6 3
4 2 2 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 0 0
0 0 0 0 0 0 0 0 0 0
1985  1 3 0 0 100 0 0 0 0 0 0 3 6 1 9 3 13  7 4 7 8 12  6 1 1 3 4 1 5 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 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0
1986  1 3 0 0 45  0 0 1 0 1 0 1 1 1 2 1 3 2 3 5 2 4 0 4 2 4 1 1 0 5 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
1987  1 3 0 0 44  0 0 2 0 1 0 2 1 1 2 2 4 3 1 4 1 1 2 3 4 2 2 1 2 1 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
1988  1 3 0 0 38  0 0 0 0 0 0 0 5 1 4 1 2 2 2 7 3 2 2 0 1 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 0 0 0
0 0 0
1989  1 3 0 0 81  0 0 0 3 2 2 4 2 7 4 3 2 9 6 5 6 3 7 4 1 1 2 4 0 1 0 1 0 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
1993  1 3 0 0 163 0 0 1 0 0 1 10  13  19  15  21  17  10  4 7 4 4 7 3 3 5 7 3 1
4 0 2 1 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
1994  1 3 0 0 151 0 0 0 1 0 2 3 10  16  14  23  11  19  9 7 5 6 7 6 2 5 1 0 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 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0
1995  1 3 0 0 110 0 0 0 0 1 3 0 4 9 8 15  11  8 7 3 8 3 7 4 4 2 3 6 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 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0
1996  1 3 0 0 73  0 0 0 0 1 1 3 2 3 9 8 9 13  4 7 3 2 1 2 0 1 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 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
1997  1 3 0 0 99  0 0 0 1 1 1 3 4 7 7 9 9 14  6 12  4 2 6 3 5 0 1 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 0 0 0 0 0 0 0 0 0
0 0 0 0 0
1998  1 3 0 0 147 0 0 0 0 0 0 3 4 6 7 21  20  15  18  14  11  5 8 2 3 4 3 0 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
1999  1 3 0 0 246 0 0 0 1 0 1 2 8 13  16  27  37  24  26  19  19  10  14  8 2 7
4 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 0 0 0 0 0 0 0 0 0 0 0
2000  1 3 0 0 62  0 0 0 0 0 0 0 3 3 5 4 6 10  11  4 2 4 0 3 2 2 0 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
2001  1 3 0 0 368 0 0 0 0 1 3 10  8 12  20  18  29  32  31  43  37  32  20  24
13  9 10  2 4 2 3 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
2002  1 3 0 0 448 0 0 0 1 4 4 5 8 11  24  31  33  40  43  36  60  40  32  18
19  9 5 10  8 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 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2003  1 3 0 0 490 0 0 1 1 3 5 13  5 11  19  19  30  37  36  42  44  48  39  36
36  17  10  12  7 5 8 4 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
# Fleet 4: 2009 OR commercial (updated for 2011 with 2009 data, but no samples
in 2010; N=16)
1992  1 4 3 0 2.8 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 2 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 1 1 2 1 0 0 0 0 0 1 0 0 0 0 0 0 0
0 0 0
1995  1 4 3 0 15.1  0 0 0 0 0 0 0 0 0 0 2 8 1 6 1 1 5 1 3 1 1 1 2 1 1 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 2 6 0 0 6 3 3 4 4 0 3 1 1 2 0 0 0 0 0 0 0 0 0
0 0 0 0
1996  1 4 3 0 24.8  0 0 0 0 0 0 0 2 0 4 5 5 9 4 5 2 2 2 2 5 1 1 1 1 0 0 2 0 0 1
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 6 9 13  4 14  2 2 4 3 3 2 0 3 3 0 1 1 0 0 0 0
0 0 0 0 0 0
1997  1 4 3 0 39  0 0 1 0 0 0 0 0 4 5 11  7 20  11  9 10  7 4 2 6 2 1 3 1 2 1 1
0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 5 4 14  24  15  17  11  5 11  4 2 1 2 4 1 0
0 1 0 0 0 0 0 0 0 0 0 0 0 0
1998  1 4 3 0 16.1  0 0 0 0 0 0 0 1 2 1 3 5 2 6 2 8 2 3 1 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 2 1 0 2 8 1 12  1 10  5 5 1 0 0 1 3 0 0 1 0 0 0 0 0
0 0 0 0 0 0
1999  1 4 3 0 33.9  0 0 0 0 0 0 0 0 0 1 0 1 2 9 8 7 5 8 10  2 4 3 1 4 2 2 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 3 5 8 8 9 8 8 9 10  8 6 5 0 4 0 0 2 0 1 0 1
0 0 0 0 0 0
2000  1 4 3 0 53.5  0 0 0 0 0 0 1 1 2 4 6 13  5 5 9 6 2 3 7 3 1 0 1 1 1 0 0 0 1
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 3 2 3 7 9 11  6 3 9 4 1 4 0 3 0 0 2 0 1 0 0 0 0
0 0 0 0 0 0
2001  1 4 3 0 76.2  0 0 0 0 0 0 3 8 6 7 7 8 19  10  6 9 10  6 6 3 5 2 1 1 2 0 1
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 14  5 5 5 3 8 13  10  4 7 5 4 3 1 4 2 1 1 1 0
```

```
1 0 0 0 0 0 0 0 0 0
2002  1 4 3 0 9.9 0 0 0 0 0 1 0 0 0 1 0 0 1 1 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 2 0 1 0 0 0 0 0 1 1 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0
0 0 0
2003  1 4 3 0 6.1 0 0 0 0 0 0 0 0 2 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 2 1 8 6 5 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
2004  1 4 3 0 22.4  0 0 0 0 0 0 0 0 1 1 1 0 2 3 2 5 2 1 3 4 0 1 1 1 0 3 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 1 2 0 2 3 1 6 0 3 5 3 0 1 2 0 0 0 0 0 0 0
0 0 0 0
2005  1 4 3 0 27.4  0 0 0 0 0 0 0 0 0 0 2 1 0 2 4 1 0 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 1 0 2 3 1 0 0 1 4 5 1 2 2 0 0 1 1 0 1 0 0 0 0 0 0 0 0
0 0 0 0
2006  1 4 3 0 8.1 0 0 0 0 0 0 1 0 0 0 0 0 1 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 1 0 0 0 1 1 1 0 2 1 1 0 1 1 0 0 0 0 0 0 0 0 0 0
0 0 0
2007  1 4 3 0 3.7 0 0 0 0 0 0 0 0 0 0 0 0 0 1 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 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
2008  1 4 3 0 5.2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 2 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 1 0 0 1 0 1 1 2 1 2 0 1 0 0 0 0 0 0 0 0 0 0
0 0 0
2009  1 4 3 0 14.3  0 0 0 0 0 0 1 0 0 1 1 2 2 0 0 0 1 1 1 1 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 1 0 1 0 0 3 0 0 2 0 2 0 0 0 1 0 1 0 1 0 0 0 0 0 0
0 0 0 0 # new for 2011
# Fleet 5: 2009 WA recreational (no new data for 2009 or 2010; N=8)
1998  1 5 3 0 4.5 0 0 0 0 0 0 0 0 0 0 0 2 4 0 2 0 2 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 1 0 0 0 3 1 2 2 0 0 1 0 1 0 0 0 2 0 0 0 0 0 0 0
0 0 0
1999  1 5 3 0 17.1  0 0 0 0 0 0 0 0 0 2 0 3 2 4 5 0 2 4 0 3 6 2 4 1 6 1 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 1 0 7 4 3 3 4 0 1 4 0 3 6 2 4 3 0 1 0 0 0 0 0
0 0 0 0
2000  1 5 3 0 33.1  0 0 0 0 0 0 0 0 2 0 4 7 8 9 9 7 9 6 7 4 5 5 2 4 3 3 1 1 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 6 4 2 9 4 7 8 6 5 8 8 4 6 4 4 4 1 0 0 0 0 0 0
0 0 0 0
2001  1 5 3 0 23.9  0 0 0 0 0 0 0 0 0 0 0 0 5 5 6 5 2 2 1 4 2 7 3 3 2 1 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 3 3 4 4 3 8 3 5 3 4 1 2 3 0 1 0 0 1 1 0 0 0
0 0 0 0
2004  1 5 3 0 6.7 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 0 0 0 2 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 1 0 0 1 0 0 0 1 1 0 0 1 0 0 0 0 0 0 0 0
0 0 0
2005  1 5 3 0 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 1 0 0 1 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
2006  1 5 3 0 1 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 0
0 0
2008  1 5 3 0 3.8 0 0 0 0 0 0 0 0 0 1 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 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 1 0 0 0
0 0 0
# Fleet 6: 2009 WA commercial (updated with 2009 and 2010 observations for
2011; N=17)
# unsexed
1980  1 6 0 0 2.6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 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
1993  1 6 0 0 4.8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 1 1 2 2 1 2 0 1 1 0 1 1 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 0 0 0
0 0 0
1996  1 6 0 0 65.1  0 0 0 0 0 0 2 5 8 17  13  24  27  34  26  18  9 11  9 12
10  13  12  13  16  11  1 3 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1997  1 6 0 0 40.6  0 0 0 0 0 0 0 1 6 8 4 16  15  18  20  14  7 10  5 4 3 3 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 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0
1998  1 6 0 0 21.7  0 0 0 0 0 0 0 3 0 0 0 3 6 2 10  5 7 4 5 4 2 3 1 3 1 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
1999  1 6 0 0 14.2  0 0 0 0 0 0 0 0 0 1 0 0 1 3 8 1 3 4 5 3 5 2 0 1 3 2 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 0 0 0 0 0 0 0 0 0
0 0 0 0
2000  1 6 0 0 69.8  0 0 0 0 0 0 2 0 4 6 4 3 8 29  28  50  34  40  30  32  21
27  16  12  3 9 1 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 0 0 0 0 0 0 0
2001  1 6 0 0 111.5 0 0 0 0 0 0 0 0 0 1 1 2 13  20  42  52  91  83  74  56  50
40  21  17  13  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 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
# sexed
2002  1 6 3 0 62.9  0 0 0 0 0 0 1 0 0 0 0 4 5 6 9 6 6 10  6 1 4 3 1 4 2 2 1 1 1
0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 1 1 7 3 7 10  10  9 25  6 6 9 6 3 4 6 3 0 3
1 0 0 0 0 0 0 0
2003  1 6 3 0 32.1  0 0 0 0 0 0 0 0 0 0 0 1 3 2 4 3 5 3 2 1 0 1 2 2 1 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 1 3 1 4 5 5 2 4 0 1 0 0 1 0 0 0 0 0 0 0
0 0 0 0
2004  1 6 3 0 25  0 0 0 0 0 0 1 0 0 0 0 0 1 3 0 4 2 6 3 2 0 0 2 1 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 1 5 1 4 3 1 3 1 0 0 0 0 1 1 0 0 0 0 0 0
0 0 0
2005  1 6 3 0 19.2  0 0 0 0 0 0 0 0 1 0 0 0 1 1 0 1 1 1 2 1 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 1 0 1 1 1 0 3 1 0 0 0 0 0 1 1 1 1 0 0 0
0 0 0 0
2006  1 6 3 0 38.1  0 0 0 0 0 0 0 0 1 0 0 0 3 1 2 5 7 11  8 6 2 0 4 2 2 2 0 3 0
0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 2 0 0 3 3 1 3 11  5 3 3 2 4 0 0 0 2 0 0
0 0 0 0 0 0
2007  1 6 3 0 10  0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 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 1 0 1 0 0 1 2 5 4 0 2 4 1 0 0 1 0 0 0 0 0 0 0 0
0 0 0
2008  1 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
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
2009  1 6 3 0 3.9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 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 0 1 1 2 3 0 0 1 0 0 0 0 0 0 0 0 0 0 0
0 0 0 # new for 2011
2010  1 6 3 0 6.7 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 2 0 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 1 3 3 2 4 3 1 0 0 2 0 0 0 0 0 0 0 0
0 0 0 # new for 2011
# Fleet 7: 2009 Oregon recreational observer (updated with 2009 and 2010
observations for 2011; N=7)
2004  1 7 0 0 13.9  0 0 1 1 0 0 0 1 2 0 0 4 3 3 2 1 2 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
2005  1 7 0 0 15.3  0 0 0 1 0 2 0 2 1 1 0 1 0 2 3 2 0 1 1 1 1 1 1 0 0 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
2006  1 7 0 0 30.3  0 0 1 2 1 6 2 3 1 2 4 2 1 2 3 1 2 4 4 0 1 1 1 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 0 0 0 0
0 0 0 0
2007  1 7 0 0 30.2  0 0 0 1 2 4 5 3 4 7 1 3 2 3 4 1 3 4 1 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 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2008  1 7 0 0 29.1  0 0 1 0 2 4 6 7 4 8 6 1 3 2 1 1 3 2 1 2 1 0 2 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 0 0 0 0 0 0 0
0 0 0 0
2009  1 7 0 0 18.4  1 0 0 0 1 2 3 4 3 1 6 1 0 5 3 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 0 0 0 0 0 0 0
0 0 0 0 # new for 2011
2010  1 7 0 0 14.8  0 0 0 0 0 0 0 0 3 3 2 1 2 2 3 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 # new for 2011
# Fleet 8: 2009 CA recreational CPFV (unchanged for 2011; N=12)
1987  1 8 0 0 19.2  0 0 0 0 0 0 1 4 0 1 0 0 2 5 1 1 1 1 2 0 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
1988  1 8 0 0 99.1  0 0 2 4 9 6 19  18  14  27  13  22  19  17  11  11  10  8
16  10  15  7 6 5 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 0 0 0 0 0 0 0 0 0 0 0 0 0
1989  1 8 0 0 122.5 0 0 1 1 2 4 16  15  15  30  30  24  21  18  18  13  19  11
11  8 4 3 7 3 2 2 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
1990  1 8 0 0 43.3  0 0 1 4 2 2 3 0 5 7 8 15  9 10  4 2 2 2 3 2 5 0 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0
1991  1 8 0 0 52.5  0 0 0 1 1 1 2 1 11  8 12  10  6 13  7 9 3 5 6 5 4 3 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 0 0
0 0 0 0 0 0 0 0
1992  1 8 0 0 103.6 0 2 0 1 6 8 1 11  3 7 13  12  16  12  10  8 14  9 10  7 4 4
3 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
1993  1 8 0 0 105 0 0 1 1 5 9 13  14  14  10  15  12  11  22  10  9 8 6 10  6 6
5 2 8 1 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 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0
1994  1 8 0 0 101.1 0 0 0 1 3 7 5 15  17  15  12  19  14  12  15  11  13  7 4 6
2 3 2 3 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 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0
1995  1 8 0 0 93  0 1 2 0 2 5 5 7 10  10  14  6 11  17  11  14  7 9 4 4 4 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
1996  1 8 0 0 86.6  0 1 1 4 4 4 8 6 7 8 7 21  20  11  11  9 11  6 4 5 5 3 3 1 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 0 0 0 0
0 0 0 0 0 0 0 0 0
1997  1 8 0 0 87.9  0 0 2 0 6 5 3 3 7 6 8 13  6 11  5 9 15  10  11  7 3 8 3 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
1998  1 8 0 0 38.6  0 0 0 0 1 0 2 1 2 1 3 5 3 4 6 9 3 2 3 3 4 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
#Fleet 9: 2009 WA IPHC (updated with 2009 and 2010 observations for 2011; N=8)
2003  1 9 3 0 99  0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 3 2 2 2 4 4 4 4 5 12  2 0 1 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 0 2 0 1 5 1 3 8 7 11  5 5 0 1 0 0 0 0 0
0 0 0 0 0
2004  1 9 3 0 17  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 1 0 0 0 0 0 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 1 0 0 0 1 1 0 1 0 1 2 0 0 0 0 0 0 0 0 0
0 0 0
2005  1 9 3 0 72  0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 2 4 0 4 1 2 2 4 4 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 1 1 4 11  2 6 7 5 4 1 1 0 0 0 0 0 0
0 0 0 0
2006  1 9 3 0 34  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 3 4 1 1 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 1 0 0 1 0 0 0 2 3 5 2 2 3 0 0 0 0 0 0 0 0 0
0 0 0
2007  1 9 3 0 268 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 4 5 9 11  9 13  12  9 10  9 12
1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 2 1 10  16  21  29  31  21
8 6 11  3 0 0 0 0 0 0 0 0 0 0
2008  1 9 3 0 83  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 2 2 4 2 1 6 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 1 5 9 9 6 10  12  4 1 3 0 0 0 0 0
0 0 0 0 0
2009  1 9 3 0 32  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 3 2 1 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 2 0 1 6 2 4 2 1 2 1 0 0 0 0 0 0 0 0
0 0 0
2010  1 9 3 0 27  0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 1 1 0 3 1 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 1 0 2 2 2 3 5 1 0 0 0 0 0 0 0 0 0 0
```

```
0 0 0
#Fleet 10: 2009 NWFSC OR only (updated with 2009 and 2010 observations for
2011--early values unchanged by elimination of stations; N=8)
2003  1 10  3 0 8.7 0 0 0 0 0 0 0 0 0 0 0 0 3 2 2 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 1 0 0 0 0 1 1 3 2 1 2 1 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2004  1 10  3 0 5.8 0 0 0 0 0 0 0 1 0 0 0 2 0 0 0 1 1 1 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 1 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
2005  1 10  3 0 6.9 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 2 0 0 1 1 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 1 0 0 0 0 2 0 1 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2006  1 10  3 0 10.5  0 0 0 0 0 0 2 0 0 0 0 2 1 3 1 2 1 3 0 2 1 1 1 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 0 1 1 0 2 2 1 1 0 2 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0
2007  1 10  3 0 6 0 0 1 1 0 0 0 0 0 0 0 1 0 2 0 1 0 1 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 1 0 0 0 1 0 0 1 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
2008  1 10  3 0 9 0 0 0 1 1 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 2 2 1 0 1 0 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
2009  1 10  3 0 1.5 0 0 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 1 2 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2010  1 10  3 0 9.5 0 0 1 1 1 0 1 0 0 0 0 0 0 1 1 1 3 2 1 1 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 1 0 1 0 1 0 0 0 1 0 0 0 0 1 0 1 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
#Fleet 11: 2009 OR IPHC (updated with 2009 and 2010 observations for 2011; N=6)
2003  1 11  3 0 217 0 0 0 0 0 0 0 0 0 0 2 0 1 0 6 10  8 8 20  10  5 6 5 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 4 5 12  17  21  14  8 17  13  7 6 3
2 1 0 1 0 0 0 0 0 0 0 0 0 0
2004  1 11  3 0 155 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 7 11  7 5 8 9 7 2 7 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 1 6 9 11  16  11  7 12  7 3 1 0 1 0 0
0 0 0 0 0 0 0 0 0 0
2005  1 11  3 0 68  0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 1 5 6 4 4 3 0 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 1 1 3 4 7 5 3 2 4 5 1 0 0 0 0 0 0 0 0 0
0 0 0 0
2006  1 11  3 0 58  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 2 2 2 5 3 4 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 1 0 1 0 5 8 7 5 3 1 3 2 1 0 0 0 0 0 0 0
0 0 0 0
2007  1 11  3 0 103 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 6 2 7 6 3 2 7 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 1 0 3 6 5 5 6 8 11  8 9 1 1 0 0 0 0 0 0
0 0 0 0 0
2008  1 11  3 0 253 0 0 0 0 0 0 0 0 0 0 0 0 1 4 1 10  11  14  9 12  6 7 8 6 1 1
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 2 2 8 24  22  19  26  13  10
13  10  7 3 0 1 0 0 0 0 0 0 0 0 0
2009  1 11  3 0 57  0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 7 2 2 7 1 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 1 1 0 1 7 6 4 4 3 2 2 2 0 0 0 0 0 0 0 0
0 0 0 0
2010  1 11  3 0 71  0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 2 6 6 1 6 1 2 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 2 0 2 8 4 9 5 3 3 5 2 0 0 0 0 0 0 0 0
0 0 0 0
#Fleet 12: 2009 WA Triennial (unchanged for 2011; N=7)
1986  1 12  3 0 16.6  0 0 0 0 0 1 0 1 0 0 0 1 0 1 0 1 1 1 3 1 0 2 0 4 2 2 0 2 2
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 1 0 0 2 0 0 0 2 1 7 2 3 6 0 1 0 0 0
0 0 0 0 0
1989  1 12  3 0 12.1  0 0 1 1 1 1 1 0 0 3 0 1 0 1 2 0 1 0 1 1 0 2 3 5 2 1 1 0 0
0 0 0 0 0 0 0 0 0 1 0 1 0 0 1 1 1 0 0 0 0 0 2 2 1 0 0 0 0 2 2 1 0 0 0 0 0 0 0 0
0 0 0 0 0
1992  1 12  3 0 4.5 0 0 0 0 0 0 0 1 0 0 1 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 1 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
1995  1 12  3 0 5.5 0 1 0 0 0 0 0 1 0 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 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 1 0 0 0 0 0 0 0 0
0 0 0 0
1998  1 12  3 0 11.3  0 0 0 0 0 0 1 0 0 0 0 0 0 2 0 2 2 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 1 0 1 0 1 0 2 0 0 2 1 1 0 0 0 0 0 0 0 1 0 0 0 0
0 0 0 0 0
2001  1 12  3 0 11.5  0 0 0 0 0 0 0 0 0 0 1 2 1 2 2 1 3 2 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 1 1 1 0 1 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0
0 0 0 0 0
2004  1 12  3 0 4.7 0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 2 0 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 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
#
64  # Number of age bins for data inputs
# Lower edge of age bins (first is a minus group, last is a plus group)
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
#
1 # Number of ageing error types
# Vectors of: Average age at true age (to accumulator age)
#              SD of ageing precision at true age
# Accumulator age = 100
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  46.5  47.5  48.5  49.5  50.5  51.5  52.5  53.5  54.5
55.5  56.5  57.5  58.5  59.5  60.5  61.5  62.5  63.5  64.5  65.5  66.5  67.5
68.5  69.5  70.5  71.5  72.5  73.5  74.5  75.5  76.5  77.5  78.5  79.5  80.5
81.5  82.5  83.5  84.5  85.5  86.5  87.5  88.5  89.5  90.5  91.5  92.5  93.5
94.5  95.5  96.5  97.5  98.5  99.5  100.5
0.343 0.343 0.439 0.534 0.628 0.721 0.812 0.903 0.993 1.082 1.17  1.257 1.343
1.428 1.512 1.595 1.677 1.758 1.839 1.918 1.997 2.075 2.152 2.228 2.304 2.378
2.452 2.525 2.597 2.668 2.739 2.808 2.877 2.946 3.013 3.08  3.146 3.211 3.276
3.34  3.403 3.466 3.527 3.589 3.649 3.709 3.768 3.827 3.885 3.942 3.998 4.055
4.11  4.165 4.219 4.273 4.326 4.378 4.43  4.481 4.532 4.582 4.632 4.681 4.73
4.778 4.825 4.872 4.919 4.965 5.01  5.055 5.1 5.144 5.187 5.23  5.273 5.315
5.357 5.398 5.439 5.479 5.519 5.558 5.597 5.636 5.674 5.712 5.749 5.786 5.822
5.859 5.894 5.93  5.965 5.999 6.033 6.067 6.101 6.134 6.167
#
906 # Number of age comp observations
2 # Length bin refers to: 1=population length bin indices; 2=data length bin
indices; 3= actual lengths
0 #_combine males into females at or below this bin number
#
# Year  Season  Type    Gender  Partition  ageerr Lbin_lo Lbin_hi Nsamps Data:
females then males
# Fleet 1: 2009 CA recreational (no new data for 2011; N=4)
# Conditional
1983  1 1 1 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 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
1996  1 1 1 0 1 21  21  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 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
# Ghost marginals
1983  1 1 3 0 1 1 37  -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 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
1996  1 1 3 0 1 1 37  -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 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
# Fleet 2: 2009 CA commercial (no new data for 2011; N=70)
# Conditional
1978  1 2 1 0 1 9 9 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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 2 1 0 1 11  11  1 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 0 0 0 0 0 0 0 0 0 0 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
2005  1 2 1 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 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
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2005  1 2 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
# Ghost marginals
1978  1 2 3 0 1 1 37  -1  0 0 0 0 0 0 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 0 0 0 0 0 0 0
0 0 0 0 0 0 0 1 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
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1979  1 2 3 0 1 1 37  -1  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 0 0
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0 0 0 0 1 0 1 0 1 0 0 0 0 1 0 0 0 0 1 1 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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1980  1 2 3 0 1 1 37  -1  0 0 0 0 0 0 0 0 0 2 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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1981  1 2 3 0 1 1 37  -1  0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 0 0 0 0 1 0 0 0 0 0 0 0
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# Fleet 3: 2009 OR recreational (no new data for 2011; N=187)
# Conditional
1979  1 3 1 0 1 19  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
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1979  1 3 1 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
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2001  1 3 2 0 1 21  21  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 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
# Ghost marginals
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1979  1 3 3 0 1 1 37  -1  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 2 1 2 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 0 0 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 0 0 0 0 0 0 0 0 0 0 0 1 1 2 0 0 0 0 0 0 0 0 2 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
1984  1 3 3 0 1 1 37  -1  0 0 0 1 1 3 9 4 1 2 11  2 2 3 1 0 2 2 0 0 0 2 1 0 0 1
2 0 0 0 1 1 0 1 0 1 0 0 0 0 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 3 0 0
0 0 0 2 3 1 2 0 5 1 2 2 1 2 1 1 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 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1
1985  1 3 3 0 1 1 37  -1  0 0 1 0 1 0 0 3 1 0 1 1 0 0 2 2 0 0 0 0 0 0 0 0 2 0 0
0 0 1 0 1 1 2 1 1 0 0 0 0 0 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 0 0 0
1 0 1 0 1 0 1 1 3 1 3 2 2 0 0 0 0 0 0 0 1 0 0 0 1 1 0 0 0 1 1 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 1 0 3
1986  1 3 3 0 1 1 37  -1  0 0 0 0 0 1 1 1 4 2 2 1 1 0 2 1 1 0 0 0 0 0 1 0 1 0 0
0 2 0 0 0 0 1 0 1 2 1 1 1 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 1 0 0 0 0 0 0 6 0 0 0
1 1 0 2 2 1 3 2 2 3 0 2 1 0 0 0 1 0 0 1 0 0 0 0 0 1 0 0 0 0 1 0 1 1 0 0 0 0 0 1
0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2
1987  1 3 3 0 1 1 37  -1  0 0 1 1 0 0 0 1 1 1 3 2 1 2 1 1 3 1 0 1 1 0 1 0 1 0 0
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1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1
1989  1 3 3 0 1 1 37  -1  0 0 0 1 0 1 1 1 2 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 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 1
2001  1 3 3 0 1 1 37  -1  0 0 0 1 0 0 0 0 0 0 1 1 3 1 0 3 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 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 1 0 0 2 1 1 0 2 2 2 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
# Fleet 4: 2009 OR commercial (no new data for 2011; N=75)
# Conditional
2001  1 4 1 0 1 7 7 2 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 0 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 12  12  2 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
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2001  1 4 1 0 1 13  13  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
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2001  1 4 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
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2001  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
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2002  1 4 1 0 1 13  13  1 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
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2002  1 4 2 0 1 18  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
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0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1
2007  1 4 3 0 1 1 37  -1  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 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 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
# Fleet 5: 2009 WA rec (no new data for 2009 or 2010; N=143)
# Conditional
1998  1 5 1 0 1 12  12  2 0 0 0 0 0 0 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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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1998  1 5 1 0 1 13  13  4 0 0 0 0 0 0 1 0 0 0 0 2 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0
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1998  1 5 1 0 1 15  15  2 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
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1998  1 5 1 0 1 17  17  2 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0
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1998  1 5 1 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
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1998  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
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2001 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
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2001 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
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2001 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
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2004 1 5 1 0 1 13 13 1 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
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2004 1 5 2 0 1 18 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
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2005  1 5 2 0 1 16  16  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
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2006  1 5 1 0 1 15  15  1 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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2008  1 5 1 0 1 10  10  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
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2008  1 5 1 0 1 14  14  1 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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2008  1 5 1 0 1 21  21  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
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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
2008  1 5 2 0 1 8 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
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2008  1 5 2 0 1 21  21  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
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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
2008  1 5 2 0 1 31  31  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 0 0 0 0 0 0 0 0 1
# Ghost marginals
1998  1 5 3 0 1 1 37  -1  0 0 0 0 0 0 1 0 0 1 1 4 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 1 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0
0 0 0 0 1 0 0 0 1 1 2 1 0 1 2 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 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1
1999  1 5 3 0 1 1 37  -1  0 0 0 0 0 0 0 0 0 0 2 1 2 2 2 4 3 0 1 1 1 0 1 2 1 1 1
4 2 0 1 0 0 0 0 0 1 1 0 0 2 0 0 0 0 1 0 2 1 2 0 0 0 1 0 0 0 0 0 0 0 0 1 2 0 0 0
0 0 0 0 0 0 2 2 1 2 3 2 7 3 2 0 0 0 0 2 1 1 1 1 2 1 0 2 1 0 0 0 0 0 0 1 0 3 0 0
1 0 1 0 0 1 0 0 0 0 1 0 0 1 1 1 0 0 0 0 2
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2000  1 5 3 0 1 1 37  -1  0 0 0 0 0 0 0 0 1 4 5 3 4 6 8 8 5 4 1 4 1 0 0 2 4 2 2
1 5 4 1 3 1 1 0 0 0 0 1 0 0 0 1 1 0 0 1 3 1 0 0 0 0 0 0 1 1 0 1 0 1 0 1 3 0 0 0
0 0 1 1 0 1 1 2 3 4 2 8 6 3 8 2 2 3 1 3 2 7 2 4 6 3 1 2 0 1 0 0 0 1 1 3 2 0 1 1
0 0 0 1 0 0 1 2 0 0 0 0 0 1 0 0 0 0 0 0 0
2001  1 5 3 0 1 1 37  -1  0 0 0 0 0 0 0 0 2 1 1 1 2 4 4 1 3 2 1 2 1 3 1 0 0 1 0
1 0 1 1 0 1 0 1 0 1 0 1 1 1 0 1 0 0 0 0 0 1 1 0 0 0 0 0 0 0 1 0 0 1 0 4 0 0 0
0 0 0 1 1 0 3 2 1 3 4 6 4 4 3 4 1 1 1 0 2 0 1 0 0 1 1 0 1 0 1 0 0 2 0 0 0 0 0 0
0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 3
2004  1 5 3 0 1 1 37  -1  0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 1 0 0 0 0 1 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 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 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
2005  1 5 3 0 1 1 37  -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 1 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 0 0 0 0 0 0 0 0 0 0 0 0
2006  1 5 3 0 1 1 37  -1  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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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 3 0 1 1 37  -1  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
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 1 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 1
# Fleet 6: 2009 WA commercial (updated for 2011 with 21 new obs in 2009 and
2010  + 2 marginals; N=200)
# Conditional
1993  1 6 1 0 1 15  15  1 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 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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 6 1 0 1 16  16  2 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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 6 1 0 1 17  17  1 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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 6 1 0 1 19  19  2 0 0 0 0 0 0 0 0 0 0 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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 6 1 0 1 20  20  1 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
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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 6 1 0 1 22  22  1 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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 6 1 0 1 25  25  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 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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 6 1 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 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
1993  1 6 1 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 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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1993  1 6 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1993  1 6 2 0 1 21  21  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 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
1993  1 6 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 0 0 0 0 0 0 0 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
1993  1 6 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
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1993  1 6 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
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1993  1 6 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
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1993  1 6 2 0 1 30  30  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
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2010   1 6 1 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 1 0 0 0
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2010   1 6 1 0 1 25   25   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
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2010   1 6 2 0 1 17   17   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
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2010   1 6 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
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2010  1 6 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
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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 # new for 2026
2010  1 6 2 0 1 20  20  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
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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 1 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 # new for 2027
2010  1 6 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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 1 0 0 0 0 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 # new for 2028
2010  1 6 2 0 1 22  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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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
1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 # new for 2029
2010  1 6 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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 # new for 2030
2010  1 6 2 0 1 26  26  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 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 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 1 0 0 # new for 2011
# Ghost marginals
1993  1 6 3 0 1 1 37  -1  0 0 0 0 0 0 0 0 0 2 2 0 0 0 1 2 0 0 1 0 0 0 0 0 1 0 0
0 0 0 0 0 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 2 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 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 1
2001  1 6 3 0 1 1 37  -1  0 0 0 0 0 0 0 0 0 0 1 0 1 2 1 3 3 4 3 1 4 2 0 1 1 2 0
1 3 6 1 2 0 0 1 1 1 0 0 0 2 0 0 0 0 0 0 0 1 2 0 0 1 0 0 1 0 0 1 0 0 1 0 0 0 0 0
0 0 0 0 0 0 0 1 1 2 2 2 3 7 4 5 5 8 2 5 4 1 1 3 6 3 4 2 5 1 1 0 0 1 1 0 0 0 0 0
0 1 0 1 0 1 0 0 0 1 0 0 0 1 0 0 0 1 1 0 3
2002  1 6 3 0 1 1 37  -1  0 0 0 0 0 0 0 0 0 1 0 1 2 3 2 0 3 4 7 4 1 3 0 0 0 1 1
0 0 0 0 1 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 2 0 0 0
0 0 0 1 1 0 0 2 1 1 2 1 5 5 7 9 6 4 2 0 3 0 2 1 0 1 1 1 0 2 1 0 1 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 4
2003  1 6 3 0 1 1 37  -1  0 0 0 0 0 0 1 0 0 0 0 1 0 0 1 2 1 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 1 0 0 0
0 0 0 0 0 0 0 0 1 2 0 0 0 2 0 1 0 0 0 1 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2004  1 6 3 0 1 1 37  -1  0 0 0 0 0 0 0 0 1 0 0 0 0 0 1 1 1 1 1 0 3 2 2 3 0 1 1
0 1 0 0 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 1 0 0 0 0 5 0 0 0
0 0 0 0 0 0 0 0 0 1 0 2 1 0 2 1 0 0 3 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 1 0 0 0 0 0 0 0 0 0 1
2005  1 6 3 0 1 1 37  -1  0 0 0 0 0 0 0 1 0 2 0 1 1 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 0 0 0 0 0 0 0 0 0 2 0 0 0
0 0 0 0 0 0 0 1 0 0 0 1 0 1 0 2 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 3
2006  1 6 3 0 1 1 37  -1  0 0 0 0 0 1 0 0 1 1 2 0 2 5 1 2 1 2 1 3 2 2 0 4 4 2 0
1 1 0 2 0 0 0 1 2 0 3 0 1 0 0 0 0 0 1 1 0 0 0 0 0 1 0 0 0 0 1 0 0 1 0 0 3 0 0 0
1 0 0 0 0 0 0 1 1 1 0 0 2 1 2 4 3 0 4 3 4 1 1 1 0 2 2 2 0 0 1 0 1 0 0 0 0 0 0 0
0 0 0 1 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0
2007  1 6 3 0 1 1 37  -1  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 0
1 2 0 0 0 0 0 0 1 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 1 0 1 0 0 0 0 1 1 0 0 0 0 4 0 0 1 2 0 4 1 0 0 1 2 0 0 0 0 0 0
0 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2008  1 6 3 0 1 1 37  -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 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
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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
2009  1 6 3 0 1 1 37  -1  0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 0 0 1 0 0 1 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 1 1 1 2 0 1 0 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 # new for 2011
2010  1 6 3 0 1 1 37  -1  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 1 1 2 0
0 0 0 0 0 0 0 0 0 0 1 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 1 0 1 2 1 0 2 0 0 2 0 1 0 0 1 0 1 0 0 1 0 1 1
1 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 # new for 2011
# Fleet 9: 2009 WA IPHC marginal age (updated for 2011 with 32 new observations
+ 2 ghost marginals; N=106)
# Marginal
2003  1 9 0 0 1 1 37  99  0 0 0 0 0 0 0 0 0 0 1 0 2 0 1 2 2 2 2 1 3 0 5 3 0 3 3
1 4 2 3 2 1 1 1 4 0 1 1 1 1 0 1 1 2 0 0 2 2 2 1 1 1 1 2 1 0 0 0 0 0 1 1 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 0 0 0 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 9 0 0 1 1 37  17  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 2 0 1 1 0 0 1 0 0
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 1 1 0 0 0 0 0 0 0 1 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 0 0 0 0 0 0
2005  1 9 0 0 1 1 37  72  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 3 0 2 4 7 4 3 2 4
2 0 0 1 3 2 3 1 3 0 3 1 0 0 0 0 0 0 0 2 0 0 1 1 2 1 1 0 0 0 3 0 0 0 1 1 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 0 0 0 0 0 0 0
# Conditional
2006  1 9 1 0 1 17  17  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 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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 9 1 0 1 19  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 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
2006  1 9 1 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 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 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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 9 1 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
1 1 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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 9 1 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 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
2006  1 9 1 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 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
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2006  1 9 1 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 0 0 0 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 0 0 0 0 0 0 0 0 0 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 9 1 0 1 25  25  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 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
2006  1 9 1 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 0 0 0 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 0 0 0 0 0 0 0 0 0 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 9 1 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 0 0 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
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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 0 0 0 0 0 0 0 0 0
2006 1 9 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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 0 0 0 0 0 0 0 0 0 0 0 0 0
2006 1 9 2 0 1 16 16 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 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
2006 1 9 2 0 1 20 20 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 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
2006 1 9 2 0 1 21 21 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 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 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
2006 1 9 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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 0 0 0 0 0 0 1 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
2006 1 9 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 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 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 9 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 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 1
2006 1 9 2 0 1 25 25 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 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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 1
2007 1 9 1 0 1 15 15 2 0 0 0 0 0 0 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 0 0 0 0
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2007 1 9 1 0 1 16 16 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 1 0 1 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
2007 1 9 1 0 1 17 17 5 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 1 1
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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
2007 1 9 1 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 2 0 1 0
2 0 0 1 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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 9 1 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 1 1 2
1 0 0 1 1 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 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 0 0 0 0 0 0 0
2007 1 9 1 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
1 1 1 0 1 0 1 1 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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 9 1 0 1 21 21 13 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 1 0 0 0 1 2 0 1 1 1 1 1 1 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 1 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
2007 1 9 1 0 1 22 22 12 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

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0 0 0 0 0 0 1 0 0 0 0 0 0 0 1 1 1 1 0 0 0 0 1 0 0 0 0 0 0 0 1 0 0 0 0 0 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2007  1 9 1 0 1 23  23  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 2 0 1 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 1 0 1 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 0 0 0 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 9 1 0 1 24  24  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 1 0 0 0 0 0 0 0 0 1 0 0 0 0 1 1 0 0 0 0 1 0 0 0 0 0 0 0 5 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
2007  1 9 1 0 1 25  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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 1 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 0 0 0 0 0 0 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 9 1 0 1 26  26  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 0 0 0 0 0 0 0 0 1 0 0 0 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2007  1 9 1 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
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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
2007  1 9 1 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 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 0 0 0 0 0 0 0 0
2007  1 9 1 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 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
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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
2007  1 9 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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 0 0 0 0 0 0 0 0 0
2007  1 9 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 0 0 0 0 0 0 0 0 0 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
2007  1 9 2 0 1 17  17  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 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
2007  1 9 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
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2010  1 9 2 0 1 17  17  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
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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 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
2010  1 9 2 0 1 19  19  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 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 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 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 9 2 0 1 20  20  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 0 0 0 0 0 0 0 0 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 0 0 0 0 0 0 0 0 0 0 0 0 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 9 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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 0 0 0 0 0 0 0 0 0 0 0 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 9 2 0 1 22  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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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 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
2010  1 9 2 0 1 23  23  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 0 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 1 0 0 0 2
0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2010  1 9 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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
# Ghost marginals
2006  1 9 3 0 1 1 37  -1  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 3 2 1 0
1 2 1 2 1 1 3 2 0 0 0 2 0 0 0 0 0 0 0 0 0 1 0 2 1 0 0 1 1 1 0 0 0 0 0 0 7 0 0 0
0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 2 2 1 1 0 8 5 5 2 1 3 0 1 1 5 3 0 2 0 1 0 0 1 0 0
0 0 0 0 0 2 0 0 0 0 0 0 1 3 1 0 1 0 0 0 3
2007  1 9 3 0 1 1 37  -1  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 2 0 1 5 6 7 3 5 2
3 4 4 3 2 5 3 4 7 3 3 2 4 3 2 1 1 1 1 1 0 1 1 1 0 3 0 1 4 1 3 0 3 1 0 0 38  0 0
0 0 0 0 0 0 0 0 0 0 0 0 2 0 1 2 2 1 7 7 5 11  17  15  10  9 6 10  8 4 6 3 4 4 5
6 4 4 4 3 5 5 2 1 1 3 4 1 1 0 0 4 1 1 1 0 0 1 2 0 0 29
2008  1 9 3 0 1 1 37  -1  0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 1 0 1 2 1 2 3 7 3 2
6 2 5 1 4 2 3 3 1 3 1 3 3 5 2 2 1 1 1 2 0 1 1 2 0 1 0 1 0 0 1 1 0 1 1 1 27  0 0
0 0 0 0 0 0 0 0 1 0 0 0 0 0 2 3 5 1 3 1 7 10  11  11  14  7 7 3 4 13  5 6 8 3 6
6 4 5 7 6 4 4 2 1 2 2 3 0 3 2 2 1 0 2 6 1 1 2 2 1 2 19
2009  1 9 3 0 1 1 37  -1  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
2 1 0 0 0 1 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0 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 1 1 0 1 0 1 1 3 0 0 1 0 0 1 2 1 2 0 0 1 0 0 0
0 0 0 0 0 0 0 2 0 0 0 1 0 0 1 0 0 0 0 0 1
2010  1 9 3 0 1 1 37  -1  0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 0 0 1 0 0 0 2 0 0 0 0
0 0 0 1 0 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 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 3 1 2 0 0 0 0 0 0 0 0 2 1 0 1 1 2
0 0 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0
# Fleet 11: 2009 OR IPHC (updated for 2011 with 41 new observations + 2 ghost
marginals; N=121)
# Marginal
```

```
2003  1 11  0 0 1 1 37  215 0 0 0 0 0 0 0 1 0 0 0 0 0 2 2 9 11  7 18  12  12  9
6 4 4 10  10  11  8 6 13  9 3 1 3 1 3 0 2 2 0 1 1 0 4 1 1 3 3 1 2 1 1 1 2 1 1 0
0 1 2 1 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 0 0 0 0 0 0 0 0
2004  1 11  0 0 1 1 37  157 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 3 5 7 6 12  9 14  7 9
3 4 2 1 5 6 6 4 5 3 2 1 1 0 0 1 1 0 2 3 2 2 2 2 0 0 2 0 3 2 1 2 0 2 2 1 0 0 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 0 0 0 0 0 0 0 0
2005  1 11  0 0 1 1 37  62  0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 1 1 2 1 5 9 2 5 5 2 1
0 1 3 2 1 1 2 1 2 1 0 1 1 0 0 0 0 0 0 0 2 0 0 0 0 1 0 0 0 0 0 0 1 2 2 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 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
# Conditional
2006  1 11  1 0 1 15  15  1 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 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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 11  1 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 1 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 0 0 0 0 0 0 0 0 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 11  1 0 1 18  18  2 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 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
2006  1 11  1 0 1 19  19  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 1 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 0 0 0 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 11  1 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 1 0 0 1 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 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
2006  1 11  1 0 1 21  21  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 1 0 0 0 0 1 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2006  1 11  1 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 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 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
2006  1 11  1 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 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 0 0 0 0 0 0 0 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 11  1 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 0 0 0 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 0 0 0 0 0 0 0 0 0 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 11  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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2006  1 11  2 0 1 15  15  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 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
2006  1 11  2 0 1 17  17  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 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 2 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
2006  1 11  2 0 1 18  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 0 0 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 1 0 0 0 0 1 1 1 1 0 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
2006  1 11  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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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 2 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
2006  1 11  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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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 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 1 1 0 0 0 0 0 0
2006  1 11  2 0 1 21  21  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 0
0 0 0 0 0 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 0 0 0 0 0 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
2006  1 11  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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 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 11  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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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 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 0 0 0 0
2006  1 11  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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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 1 0 0 0 0 0 0 0
2006  1 11  2 0 1 25  25  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 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2007  1 11  1 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 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
2007  1 11  1 0 1 15  15  1 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 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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 11  1 0 1 16  16  6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 1 1 1
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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
2007  1 11  1 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 1 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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 11  1 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 1 1 0 0 0
0 0 2 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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 11  1 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 1 0 0 0 0
0 0 0 0 0 0 0 0 0 2 2 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 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 11  1 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 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 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
2007  1 11  1 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 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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 11  1 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 1 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 1 0 0 1 0 1 0 0 1 0 0 2 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
2007 1 11 1 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 0 0 0 0 0 0 0 0 0 0 0 0 1 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 0 0 0 0 0 0 0 0 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 11 1 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 0 0 0 0 0 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
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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
2007 1 11 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
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2007 1 11 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
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2007 1 11 2 0 1 16 16 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
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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
2007 1 11 2 0 1 17 17 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 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
2007 1 11 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 0 0 0 0 0 0 0 0 0 0 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
2007 1 11 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 0 0 0 0 0 0 0 0 0 0 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
2007 1 11 2 0 1 20 20 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 0 0 0 0 0 0 0 0 0 0 0 0
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0 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2007 1 11 2 0 1 21 21 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
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0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 2 0 1 0 0 0 0 2 0 1 0 1 0 0 0 0 0 0
0 1 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0
2007 1 11 2 0 1 22 22 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
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2010 1 11 1 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 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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 11 1 0 1 16 16 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 0 0 1 0 0 0 0 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 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 11 1 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 1
2 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 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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 11 1 0 1 18 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
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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 11 1 0 1 19 19 6 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 1 0 0 0 1 0 0 1 0 0 0 0 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 0 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 11 1 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 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
2010 1 11 1 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
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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 0 0 0 0 0 0 0 0 0 0
2010 1 11 1 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 0 0 0 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 0 0 0 0 0 0 0 0 0 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 11 1 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 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
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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 11 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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 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 11 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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 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 11 2 0 1 17 17 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 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 1 0 1 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 0 0 0 0 0 0 0 0 0
2010 1 11 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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 1 0 0 0 0 0 1 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

```
2010  1 11  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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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 1 1 1 0 0 0 0 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
2010  1 11  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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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 0 0 0 0 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
2010  1 11  2 0 1 21  21  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 0
0 0 0 0 0 0 0 0 0 0 0 0 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 0 0 0 0 0 0 0 0 0 0 0 1
2010  1 11  2 0 1 22  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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 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 1 0 0 0 0 0 0 0 0 0 0 0 1
2010  1 11  2 0 1 23  23  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 0
0 0 0 0 0 0 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 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 1
2010  1 11  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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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
# Ghost marginals
2006  1 11  3 0 1 1 37  -1  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 1 0 2 1 0 2 1 0 0 0 2 0 0 0 0 0 0 0 0 0 1 0 1 1 0 0 1 1 1 0 0 0 0 0 0 3 0 0
0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 1 1 1 1 0 6 3 3 2 0 3 0 1 1 4 2 0 0 0 0 0 0 0 0
0 0 0 0 0 0 2 0 0 0 0 0 0 0 2 1 0 1 0 0 0 1
2007  1 11  3 0 1 1 37  -1  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 4 4 1 1 1
0 0 2 1 1 1 3 0 0 3 2 1 0 1 0 0 0 0 0 1 0 0 0 0 0 0 2 0 0 2 0 1 0 0 1 0 0 4 0 0
0 0 0 0 0 0 0 0 0 0 0 0 2 0 1 2 0 1 4 3 3 3 5 4 1 1 0 1 6 0 2 0 2 0 1 1 0 0 0 0
2 1 0 0 0 1 3 0 0 0 0 2 1 0 0 0 0 0 1 0 0 8
2008  1 11  3 0 1 1 37  -1  0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 1 0 1 1 1 1 3 7 3
2 5 1 4 1 3 2 3 3 0 3 1 2 0 5 1 1 0 1 1 2 0 1 1 0 0 1 0 0 0 0 1 1 0 1 1 1 22  0
0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 2 3 3 1 1 1 6 8 11  8 12  4 3 2 2 10  4 3 6 3 5 5
1 2 4 3 4 0 1 0 1 2 2 0 3 1 1 0 0 2 4 1 1 2 2 1 2 17
2009  1 11  3 0 1 1 37  -1  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 1 1 0 2 2 1 2
2 1 1 0 0 2 0 0 1 0 0 2 0 1 0 0 0 0 1 0 0 0 0 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 1 1 0 0 1 0 2 0 0 3 6 1 5 1 0 1 0 1 1 0 1 0 2 0 1 1 0 0
0 1 0 0 0 0 0 0 1 0 0 0 0 2 0 0 0 0 0 0 0 0
2010  1 11  3 0 1 1 37  -1  0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 1 0 2 1 1 0 1 0 3
2 2 1 0 2 1 0 1 1 0 1 2 0 0 0 0 1 0 0 0 0 1 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 2 0 2 1 1 0 1 0 1 1 1 3 3 2 1 1 2 0 0 1 3 1 1 0 2 1 3 0 0 0
1 0 0 1 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 5
#
0 # No 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
```

14. Appendix C: SS Control file

```
#C Yelloweye 2011 control file
#C updated to run in SSv3.21e

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

# Area setup
3 # Number of recruitment assignments
0 # Recruitment interaction flag
# For each recruitment assignment
# GP seas area
  1  1    1
  1  1    2
  1  1    3
0 # Number of movement parameters

# Time block setup
1       # Number of block designs
1       # N blocks in each design
1993 2009 # Blocks in design 1

# 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_withseasinterpolate
1       # Number of M breakpoints
4       # 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       # Age for growth Lmin
70      # Age for growth Lmax or 999 = Linf
0       # 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       # Hermaphroditic option
1       # mg parm offset option: 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
1       # mg parm adjust method 1=do V1.23 approach, 2=use logistic transform
between bounds

# Mortality and growth parameters
# Lo    Hi      Init    Prior   Prior   Prior   Param   Env     Use     Dev
Dev     Dev     Block   block
# bnd   bnd     value   mean    type    SD      phase   var     dev     minyr
maxyr   SD      design  switch
0.01    0.15    0.044   0.0517  0       0.0226  6       0       0       0
0       0       0       0       #F_natM_young
10      35      23      30      -1      99      2       0       0       0
0       0       0       0       #F_Lmin
40      120     61      66      -1      99      2       0       0       0
0       0       0       0       #F_Lmax
0.01    0.2     0.05    0.05    -1      99      2       0       0       0
0       0       0       0       #F_VBK
0.05    0.2     0.13    0.19    -1      99      3       0       0       0
0       0       0       0       #F_CV-young
```

```
0.05    0.2     0.09    0.1     -1      99      3       0       0       0
0       0       0       0       #F_CV-old

0.01    0.15    0.056   0.0517  0       0.0226  6       0       0       0
0       0       0       0       #M_natM_young
-1      1       0       0       -1      99      -50     0       0       0
0       0       0       0       #M_Lmin
40      120     63      66      -1      99      2       0       0       0
0       0       0       0       #M_Lmax
0.01    0.2     0.05    0.05    -1      99      2       0       0       0
0       0       0       0       #M_VBK
0.05    0.2     0.11    0.14    -1      99      3       0       0       0
0       0       0       0       #M_CV-young
0.05    0.2     0.08    0.4     -1      99      3       0       0       0
0       0       0       0       #M_CV-old

# Lo    Hi      Init    Prior   Prior   Prior   Param   Env     Use     Dev
Dev     Dev     Block   block
# bnd   bnd     value   mean    type    SD      phase   var     dev     minyr
maxyr   SD      design  switch
# 2009 Female W-L
-3      3       0.0000097659 0.000020873 -1 99  -50     0       0       0
0       0       0       0       #Female wt-len-1
-3      4       3.17125028   2.96956    -1 99   -50     0       0       0
0       0       0       0       #Female wt-len-2
# 2009 Maturity
38      39      38.78   40      -1      99      -50     0       0       0
0       0       0       0       #Female mat-len-1
-3      3       -0.437  -0.4    -1      99      -50     0       0       0
0       0       0       0       #Female mat-len-2
# 2009 Fecundity
-3      300000  137900  137900  0       1.0     -6      0       0       0
0       0       0       0       #Female eggs/gm intercept
-3      39000   36500   36500   0       1.0     -6      0       0       0
0       0       0       0       #Female eggs/gm slope
# 2009 Male W-L
-3      3       0.0000170424 0.000020873 -1 99  -50     0       0       0
0       0       0       0       #male   wt-len-1
-3      4       3.02814697 2.96956      -1 99   -50     0       0       0
0       0       0       0       #male   wt-len-2


# Distribute recruitment (log scale fractions) among growth pattern x area x
season
# Lo    Hi      Init    Prior   Prior   Prior   Param   Env     Use     Dev
Dev     Dev     Block   block
# bnd   bnd     value   mean    type    SD      phase   var     dev     minyr
maxyr   SD      design  switch
  0     2       1       1       -1      99      -50     0       0       0
0       0       0       0 # RecrDist_GP_1

  -4    4       0       0       -1      99      -50     0       0       0
0       0       0       0 # RecrDist_Area_1
  -4    4       -0.1    0       -1      99      1       0       0       1916
2008    0.3     0       0 # RecrDist_Area_2
  -4    4       -0.4    0       -1      99      1       0       0       1916
2008    0.3     0       0 # RecrDist_Area_3

  0     2       1       1       -1      99      -50     0       0       0
0       0       0       0 # RecrDist_Seas_1

  0     2       1       1       -1      99      -50     0       0       0
0       0       0       0 # Cohort growth deviation parameter
```

```
# Cohort growth deviation
 0 0 0 0 0 0 0 0 0 0

#9 # Recruitment split annual deviation phase

# Spawner-recruit parameters
3       # S-R function: 1=B-H w/flat top, 2=Ricker, 3=standard B-H, 4=no
steepness or bias adjustment
# Lo    Hi      Init    Prior   Prior   Prior   Param
# bnd   bnd     value   mean    type    SD      phase
3       15      7       5       -1      99      1       # Ln(R0)
### Martins 2009 prior
0.2     1       0.55    0.73    2       0.189   7       # Steepness
###
0       5       0.001   1       -1      99      -50     # Sigma R
-5      5       0       0       -1      99      -50     # Environmental link
coefficient
-5      5       0       0       -1      99      -50     # Initial equilibrium
offset to virgin
-1      2       0       1       -1      99      -50     # Autocorrelation in
rec devs
0       # Index of environmental variable to be used for S-R parameter
0       # Env. target parameter: 0=none, 1=rec devs, 2=R0, 3=steepness

# Recruitment residuals
1 # Dev type: 0=none, 1=zero-sum, 2=simple deviations (no sum constraint)
1916    # Start year recruitment residuals
1916    # End year recruitment residuals
-8      # Phase
1       # Use advanced recruitment options: 0=no, 1=yes
0       # First year for early rec devs
-8      # Phase for early rec devs
-8      # Phase for forecast recruit deviations
1       # Lambda for forecast recr devs before endyr+1
-1965   # Last year with no bias correction in MPD
-1970   # First year with full bias correction (linear ramp from entry above)
-1990   # Last year for full bias correction in MPD
-1995   # First recent year with no bias correction in MPD
1.0     # max bias adjustment
0       # placeholder
-4      # Lower bound rec devs
4       # Upper bound rec devs
0       # Read N initial values for rec devs

# Fishing mortality setup
0.09    # F ballpark for tuning early phases
1999    # F ballpark year (neg value to disable)
1       # F method:  1=Pope's; 2=Instan. F; 3=Hybrid
0.9     # max F or harvest rate, depends on F_Method
#5      # F method=3: N iterations for tuning

# Initial F by fleet
# Lo    Hi      Init    Prior   P_type  SD      Phase
0       1       0.00    0.01    -1      99      -1
0       1       0.00    0.01    -1      99      -1
0       1       0.00    0.01    -1      99      -1
0       1       0.00    0.01    -1      99      -1
0       1       0.00    0.01    -1      99      -1
0       1       0.00    0.01    -1      99      -1

#_Q_setup
 # Q_type options:  <0=mirror, 0=median_float, 1=mean_float, 2=parameter, #
```

```
#Den-dep env-var extra_se Q_type
1       0       0       0       #       1_CARC
0       0       0       0       #       2_CACM
1       0       0       0       #       3_ORRC
0       0       0       0       #       4_ORCM
1       0       0       0       #       5_WARC
0       0       0       0       #       6_WACM
0       0       0       0       #       7_ORRCOB
1       0       0       0       #       8_CACPFV
0       0       0       0       #       9_IPHCWA
0       0       0       0       #       10_NWFSCOR
0       0       0       0       #       11_IPHCOR
0       0       0       4       #       12_WATRI

# Q parameters
1 # Par setup: 0=read one parm for each fleet with random q; 1=read a parm for
each year of index

# Lo    Hi      Init    Prior   Prior   Prior   Param
# bnd   bnd     value   mean    type    SD      phase
# Non-linear parameters
  -6    6       0       0       -1      99      1 #1_CARC
  -6    6       0       0       -1      99      1 #3_ORRC
  -6    6       0       0       -1      99      8 #5_WARC
  -6    6       0       0       -1      99      1 #8_CACPFV
# Early period
  -10   2       -0.0003 0       -1      99      1   # Triennial (log) base
parameter (1980)
  -4    4       0       0       -1      99      -50 # Triennial 1983 deviation
  -4    4       0       0       -1      99      -50 # Triennial 1986 deviation
  -4    4       0       0       -1      99      -50 # Triennial 1989 deviation
  -4    4       0       0       -1      99      -50 # Triennial 1992 deviation
# Late period
  -4    4       -0.6    0       -1      99      1   # Triennial 1995 deviation
  -4    4       0       0       -1      99      -50 # Triennial 1998 deviation
  -4    4       0       0       -1      99      -50 # Triennial 2001 deviation
  -4    4       0       0       -1      99      -50 # Triennial 2004 deviation

# Selectivity section
# Size-based setup
# A=Selex option: 1-24
# B=Do_retention: 0=no, 1=yes
# C=Male offset to female: 0=no, 1=yes
# D=Mirror selex (#)
# A  B C D
  1  0 0 0      #1_CARC
  1  0 0 0      #2_CACM
  1 0 0 0       #3_ORRC
  1  0 0 0      #4_ORCM
  1  0 0 0      #5_WARC
  1  0 0 0      #6_WACM
  1  0 0 0      #7_ORRCOB
  5  0 0 1      #8_CACPFV
  1  0 0 0      #9_IPHCWA
  24 0 0 0      #10_NWFSCOR
  1  0 0 0      #11_IPHCOR
  24  0 0 0     #12_WATRI
#_Age selex
  10 0 0 0      #1_CARC
  10 0 0 0      #2_CACM
  10 0 0 0      #3_ORRC
  10 0 0 0      #4_ORCM
  10 0 0 0      #5_WARC
```

```
  10 0 0 0      #6_WACM
  10 0 0 0      #7_ORRCOB
  10 0 0 0      #8_CACPFV
  10 0 0 0      #9_IPHCWA
  10 0 0 0      #10_NWFSCOR
  10 0 0 0      #11_IPHCOR
  10 0 0 0      #12_WATRI

# Selectivity and retention parameters
# Lo    Hi      Init    Prior   Prior   Prior   Param   Env     Use     Dev
Dev     Dev     Block   block
# bnd   bnd     value   mean    type    SD      phase   var     dev     minyr
maxyr   SD      design  switch
#1_CARC
  10    70      30      30      -1      99      4       0       0       0
0       0       0       0       #infl_for_logistic
  0.001 50      11      15      -1      99      5       0       0       0
0       0       0       0       #95%width_for_logistic
#2_CACM
  10    70      38      30      -1      99      4       0       0       0
0       0       0       0       #infl_for_logistic
  0.001 50      14      15      -1      99      5       0       0       0
0       0       0       0       #95%width_for_logistic
#3_ORRC
  10    70      36      30      -1      99      4       0       0       0
0       0       0       0       #infl_for_logistic
  0.001 50      11      15      -1      99      5       0       0       0
0       0       0       0       #95%width_for_logistic
#4_ORCM
  10    70      36      30      -1      99      4       0       0       0
0       0       0       0       #infl_for_logistic
  0.001 50      11      15      -1      99      5       0       0       0
0       0       0       0       #95%width_for_logistic
#5_WARC
  10    70      33      30      -1      99      4       0       0       0
0       0       0       0       #infl_for_logistic
  0.001 50      31      15      -1      99      5       0       0       0
0       0       0       0       #95%width_for_logistic
#6_WACM
  10    70      52      30      -1      99      4       0       0       0
0       0       0       0       #infl_for_logistic
  0.001 50      18      15      -1      99      5       0       0       0
0       0       0       0       #95%width_for_logistic
#7_ORRCOB
  10    70      22.1792 22.1792 -1      5       4       0       0       0
0       0       0       0       #infl_for_logistic
  0.001 50      3.6938  3.6938  -1      5       5       0       0       0
0       0       0       0       #95%width_for_logistic
#8_CACPFV
 -2     0       -1      5       -1      99      -50     0       0       0
0       0       0       0       #minsizeBinCaCPFV_8
 -2     0       -1      6       -1      99      -50     0       0       0
0       0       0       0       #maxsizeBinCaCPFV_8
#9_IPHCWA
  10    70      62      30      -1      99      4       0       0       0
0       0       0       0       #infl_for_logistic
  0.001 60      10      15      -1      99      5       0       0       0
0       0       0       0       #95%width_for_logistic
#10_NWFSCOR
  20    70      46      30      -1      99      4       0       0       0
0       0       0       0       #Peak
  -4    4       -4      0       -1      99      -50     0       0       0
0       0       0       0       #Top
```

```
  0     8       6       4       -1      99      4       0       0       0
0       0       0       0       #Asc width
  0     12      4.5     4       -1      99      5       0       0       0
0       0       0       0       #Desc width
  -1000 -998    -999    0       -1      99      -50     0       0       0
0       0       0       0       #Init
  -1000 -998    -999    0       -1      99      -50     0       0       0
0       0       0       0       #Final
#11_IPHCOR
  10    70      47      30      -1      99      4       0       0       0
0       0       0       0       #infl_for_logistic
  0.001 60      6       15      -1      99      5       0       0       0
0       0       0       0       #95%width_for_logistic
#12_WATRI
  20    87      87      30      -1      99      -4      0       0       0
0       0       0       0       #Peak
  -4    4       -4      0       -1      99      -50     0       0       0
0       0       0       0       #Top
  0     8       6       4       -1      99      4       0       0       0
0       0       0       0       #Asc width
  0     12      12      4       -1      99      -5      0       0       0
0       0       0       0       #Desc width
  -10   10      -2.88182        -2.88182        -1      2       4       0
0       0       0       0       0       0       #Init
  -10   10      10      0       -1      99      -50     0       0       0
0       0       0       0       #Final

#1 # selex block setup: 0=read one line for all, 1=read one line for each
# Time block parameters
#1 # Selex parameter adjustment method: 1=standard,2=logistic transform

0  # Tagging flag: 0=none,1=read parameters for tagging

### Likelihood related quantities ###
# variance/sample size adjustment by fleet
1 # Do variance adjustments
#1    2     3     4    5     6    7     8    9    10   11   12
 0.15 0 0.08 0 0.00 0 0.00 0.02 0.48 0.16 0.48 0.41  # constant added to survey
CV
 0    0     0     0    0     0    0     0    0    0    0    0    # constant
added to discard SD
 0    0     0     0    0     0    0     0    0    0    0    0    # constant
added to body weight SD
 1.28 2.25  0.54  2.16 5.49  1.57 1.44  1.52 0.62 2.79 0.73 2.08 #
multiplicative scalar for length comps
 1.0  1.0   1.0   1.0  1.0   1.0  1.0   1.0  0.90 1    0.74 1    #
multiplicative scalar for age comps
 1    1     1     1    1     1    1     1    1    1    1    1    #
multiplicative scalar for length at age obs

# removed for SSv3.20: 1000     # DF discard_like fraction data t-distribution
# removed for SSv3.20: 1000     # DF mean body weight data t-distribution
DF_for_meanbodywt_like
1       # Max N lambda phases: read this N values for each item below
1       # 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 reporting placeholder

999 # end of control file
```

15. Appendix D: SS Starter file

```
#C Yelloweye 2011 starter file

yelloweye_data.SS       # Data file
yelloweye_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
0       # 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)
1       # 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 (-1 for styr, init, virgin)
-2      # Max year for spbio sd_report (-1 for endyr; -2 for
endyr+Nforecastyrs)
0       # N individual SD years
0.0001  # Ending convergence criteria
0       # Retrospective year relative to end year
8       # 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=(1-SPR)/(1-SPR_tgt); 2=(1-SPR)/(1-
SPR_MSY); 3=(1-SPR)/(1-SPR_Btarget); 4=rawSPR
1       # F_std reporting: 0=skip; 1=exploit(Bio); 2=exploit(Num);
3=sum(frates)
0       # F_report_basis: 0=raw; 1=F/Fspr; 2=F/Fmsy ; 3=F/Fbtgt

999 # end of file marker
```

15. Appendix E: SS Forecast file

```
#C Yelloweye 2011 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
1 # MSY: 1= set to F(SPR); 2=calc F(MSY); 3=set to F(Btgt); 4=set to F(endyr)
0.76 # 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 -3 -1
#  2010 2010 2010 2010 2007 2009 # 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
0.2 # 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 -1
#  2010 2010 2007 2009 # after processing
1 # Control rule method (1=catch=f(SSB) west coast; 2=F=f(SSB) )
# next two inputs for 40-10 rule turned off (set low) for SPR-based projections
```

```
0.02 # Control rule Biomass level for constant F (as frac of Bzero, e.g. 0.40);
(Must be > the no F level below)
0.01 # 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)
0 #_Forecast loop control #5 (reserved for future bells&whistles)
2013  #FirstYear for caps and allocations (should be after years with fixed
inputs)
0.0001 # 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)
2013 # 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:  1_CARC 2_CACM 3_ORRC 4_ORCM 5_WARC 6_WACM
#  0.20728 0.114339 0.0873403 0.106986 0.312051 0.172003
# 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 -1 -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
# no allocation groups
12 # 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
#Year Seas Fleet Catch(or_F)
 2011 1 1 4.83
 2011 1 2 2.55
 2011 1 3 2.91
 2011 1 4 3.13
 2011 1 5 2.33
 2011 1 6 1.26
 2012 1 1 4.83
 2012 1 2 2.55
 2012 1 3 2.91
 2012 1 4 3.13
 2012 1 5 2.33
 2012 1 6 1.26
#
999 # verify end of input
```