Agenda Item D.8
Attachment 6 (Entire Document Electronic Only)
June 2015

Review Draft May 20, 2015

Status of the Chilipepper Rockfish, *Sebastes goodei*, in the California Current for 2015

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EXECUTIVE SUMMARY

Stock

The stock boundary for the 2007 Chilipepper Rockfish assessment, and for this update, is the U.S./Mexico border in the south, to the Columbia River in the north.

Catches

Chilipepper Rockfish have long been one of the most important targets of California commercial rockfish fisheries (including trawl, hook and line and setnet gears), and a fairly important component of recreational fisheries, with total catches ranging from 2500 to 3500 tons from the mid-1970s through the early 1990s. However, since the mid-1990s catches have been greatly reduced as a consequence of trip limit reductions and area closures implemented to reduce catches and rebuild populations of overfished species, particularly Bocaccio and Canary Rockfish, which often co-occur with Chilipepper. Over the past five years, catches have averaged approximately 350 tons per year, primarily from bottom trawl fisheries (Figure E1).

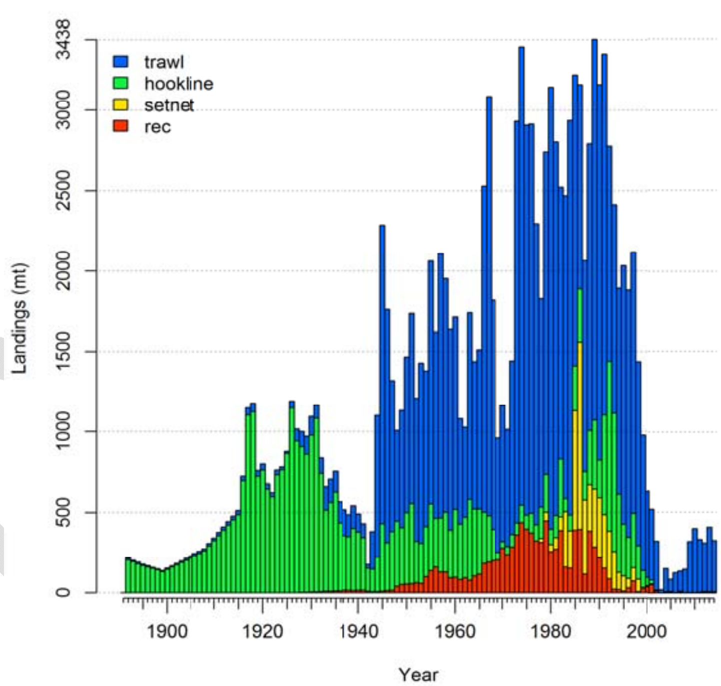

Figure E1: Catches by fishery for Chilipepper rockfish over the past 120 years

Data and Assessment

The 2015 Chilipepper update maintains the same fundamental model structure as the 2007 assessment. New estimates of historical catch data from catch reconstructions were included in the model. Commercial and recreational age and length composition data from 2007-2014, as well as a revised NWFSC bottom trawl survey index, and a revised pelagic juvenile survey abundance index (as an indicator of year class strength) were included in the update. Age composition data not available in 2007, primarily from bottom trawl surveys, were included. Some refinements to life history data (relative fecundity, maturity relationship) were also made. Most data revisions or additions had some influence on model estimates of stock status, but very few resulted in substantive changes to the model estimate of relative stock status. Steepness remains fixed at the point estimate used in the 2007 stock assessment.

Stock Spawning Output and Depletion

As a result of updating the fecundity relationship, spawning output is now reported in the 1000s of larvae produced, rather than spawning stock biomass. For the executive summary, relative depletion (larvae produced relative to the mean estimated unfished level of larvae produced) is reported. Since the strong 1999 year class, abundance has increased to above target levels.

Table E1: Spawning output, summary biomass and depletion for the base model in 2015

	Spawning Output (millions larvae)	CV Spawning Output	Summary Biomass (age 1+)	Depletion
2005	4177	0.146	53433	0.5931
2006	4484	0.146	53414	0.6367
2007	4621	0.146	51654	0.6561
2008	4601	0.146	50607	0.6534
2009	4459	0.145	51073	0.6331
2010	4259	0.146	50379	0.6048
2011	4041	0.147	48390	0.5738
2012	4000	0.147	48726	0.568
2013	4163	0.148	35349	0.5911
2014	4351	0.151	35168	0.6178
2015	*4502*	0.153	*35039*	*0.6393*

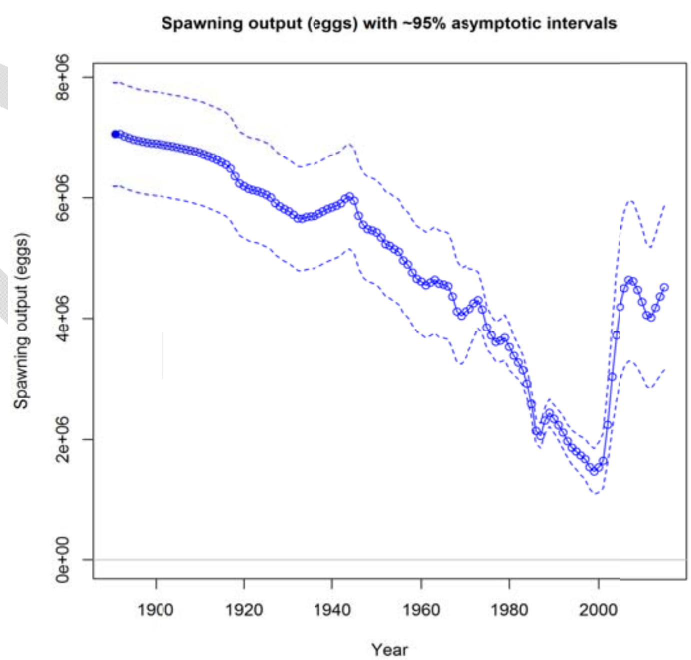

Figure E2: Spawning output (larvae, in 1000s) with approximate 95% confidence intervals

Recruitment

Recruitment for Chilipepper Rockfish is highly variable, with a small number of year classes tending to dominate the catch in any given fishery or region. As age and length data are only available for the late 1970s onward, estimates of year class strength are most informative from the 1970s to the present. The 1984 and 1999 year classes were among the strongest in that time period, however several very strong year classes have been observed in recent years (2009-2010, 2013-2014) and are already leading to a fast rate of increase in abundance and larval production.

Table E2: Recruitment estimates and CV of recruitment estimates for the base model

	Recruitment (1000s)	CV Recruitment
2005	3745	0.37
2006	4566	0.35
2007	14433	0.24
2008	12824	0.27
2009	88159	0.18
2010	61167	0.21
2011	13824	0.32
2012	17857	0.32
2013	47280	0.31
2014	69631	0.77
2015	*37736*	1.00

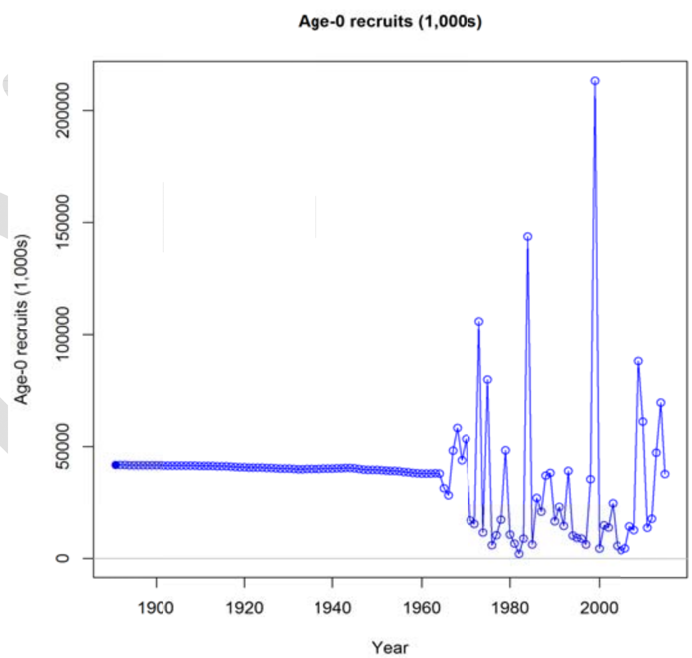

Figure E3: Recruitment estimates for the base model

Reference Points

Reference points, including estiates of yield under target SPR and relative biomass target levels, are reported in Table E3. The model estimated an unfished larval production (spawning biomass) (SSB0) 7.04 billion larvae (labeled as eggs in figures), an unfished summary biomass of 54,491 tons, and a 2015 larval output of 4.5 billion larvae, which results in a relative depletion estimate of 63.9% (of the unfished spawning output). The summary biomass for 2015 was 35,039 tons, corresponding to 69.5% of the estimated unfished summary biomass. Estimates of equilibrium yields in the 2015 base mode, which range from 2113 to 2165 metric tons (depending on whether SPR, SSB or MSY reference was used to estimate) are highly consistent with those from the 2007 assessment (2099 to 2165 metric tons).

Table E3: Reference Points for the 2015 Base Model

	Estimate	St.Dev	Lower ~95% CL	Upper ~95% CL
SSB_Unfished (millions larvae)	7041	436	6605	7477
SmryBio_Unfished	54491	3375	51116	57866
Recr_Unfished	41750	2585	39165	44335

	Yield	Depletion	SSB	SPR	F
Btarget	2133	0.400	2816	0.485	0.082
SPR target	2113	0.420	2958	0.500	0.077
MSY	2165	0.339	2390	0.438	0.095

Exploitation Status and Management Performance

Since 2005, total catches have been well below the established ABC/OY(pre-2011) and ACL/OFL (post 2010) levels, and SPR and exploitation rates have been correspondingly low through this period.

Table E4: Exploitation status and Management Performance, 2005- 2016

	OFL (ABC prior to 2011, south 40 10 only from 2011 onward)	ACL (OY prior 2011) south of 40 10 only from 2011 onward	Chilipepper contribution to minor shelf rock north (OFL), 2011 onward	Total Catch	Catch as % of combined OFL	SPR	Exploitation Rate
2005	2,700	2,000		85	0.03	0.978	0.001
2006	2,700	2,000		126	0.05	0.969	0.002
2007	2,700	2,000		137	0.05	0.966	0.002
2008	2,700	2,000		148	0.05	0.963	0.002
2009	3,037	2885		318	0.10	0.921	0.006
2010	2,576	2,447		397	0.15	0.896	0.007
2011	2,073	1,981	156	331	0.16	0.905	0.006
2012	1,872	1,789	140.9	307	0.16	0.905	0.006
2013	1768	1,690	133.1	405	0.23	0.869	0.011
2014	1722	1,647	129.6	325	0.19	0.888	0.009
2015	1,703	1,628	*129.6*				
2016	1,694	1,619	*129.6*				

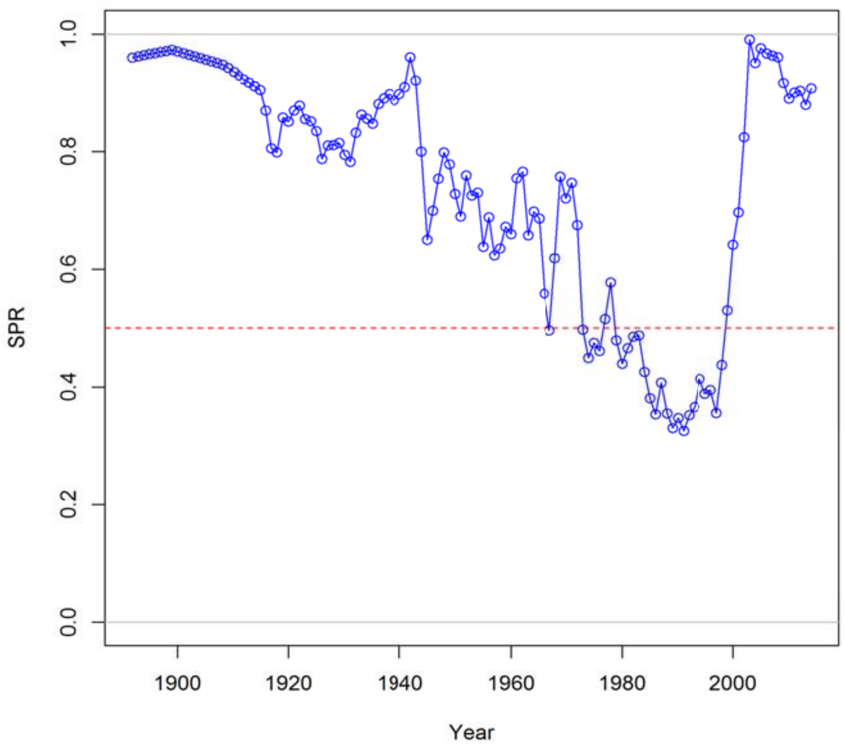

Figure E4: Model estimated Spawning Potential Ratio (SPR)

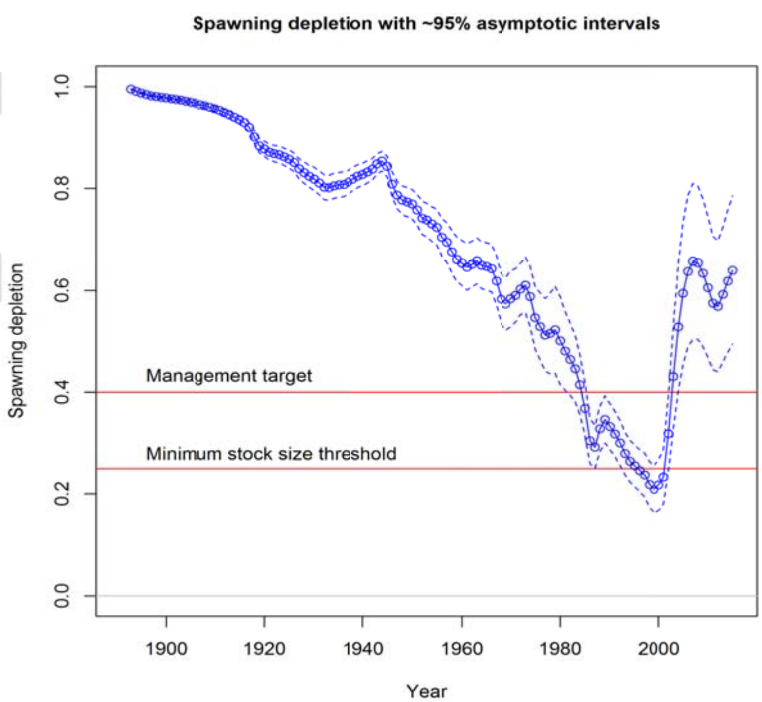

Figure E5: Depletion estimate with reference points and approximate 95% confidence intervals

Forecast

As the current spawning output is above target levels, catches have been below target levels, and several strong year classes are contributing to a forecast for high biomass, the forecast ACL and OFL levels (for 2017 onward, assuming 2015-2016 catches are achieved as adopted for that management cycle) are greater than the equilibrium catch levels reported in Table E5.

Table E5: Base model estimates of 2017-2026 ACL and OFL levels, assuming 2015-16 catches are achieved at set ACL levels

	Base model ACL catches (existing 2015-16)	Base model OFL catches (existing 2015-16)	Depletion (assuming ACL)
2015	*1758*	*1833*	0.64
2016	*1749*	*1824*	0.62
2017	2803	2932	0.62
2018	2707	2820	0.6
2019	2671	2773	0.58
2020	2635	2727	0.57
2021	2583	2666	0.55
2022	2521	2595	0.54
2023	2457	2525	0.52
2024	2397	2458	0.51
2025	2343	2399	0.5
2026	2294	2346	0.49

Unresolved Problems and Major Uncertainties

A number of technical issues discussed in the review of the 2007 model have not yet been resolved in this update (as resolution will require changes to model structure outside of the terms of reference for assessment updates). These include how weightings were assigned for length and age composition data, how the time varying growth is estimated, the length bin structure, and selectivity parameterization issues for both fisheries and fishery independent surveys. Steepness remains a key uncertainty, interestingly when profiled or estimated with a prior, the model has a slightly better fit with lower steepness values (approximately 0.4), in contrast to the results of the 2007 model, which had a better fit with higher steepness values.

Decision Table

The decision table follows the 2007 assessment format, with the two alternative states of nature equating to low (steepness set to 0.34) and high (steepness set to 0.81) productivity assumptions. Catches are based on either the status quo for the “low” catch scenario (average catch over the past 5 years), on the adopted 2015-2016 ACLs and forecast 2017-2026 ACLs for the moderate catch level, and the combined 2015-2016 ACLs and forecast 2017-2026 OFLs for the “high” catch level. As Chilipepper is considered a category 1 stock with a P* = 0.45 in recent years (translating to a 4.4% buffer for the ACL to be set below the OFL), the difference between ACL and OFL catch streams is not terribly large. Recent year average catch seems a good low end catch stream for the decision table. Under the base and high productivity scenarios, none of these catch streams lead to conservation concerns, however under the low productivity scenario (h=0.34), the stock rebuilds to target levels with status quo catches, but declines below the overfished threshold by 2019 with ACL or OFL catches.

Table E6: Decision Table

Year	Status quo catches	State 1 (h=0.34)	Base (h=0.57)	State 2 (h=0.81)
2015	346	0.32	0.64	0.79
2016	346	0.32	0.65	0.80
2017	346	0.33	0.67	0.83
2018	346	0.33	0.70	0.86
2019	346	0.34	0.73	0.88
2020	346	0.35	0.75	0.90
2021	346	0.36	0.77	0.92
2022	346	0.37	0.79	0.93
2023	346	0.38	0.80	0.93
2024	346	0.39	0.81	0.94
2025	346	0.40	0.82	0.94
2026	346	0.41	0.83	0.94
	ACL catches	State 1	Base	State 2
2015	1758	0.32	0.64	0.79
2016	1749	0.30	0.62	0.77
2017	2803	0.28	0.62	0.76
2018	2707	0.26	0.60	0.74
2019	2671	0.23	0.58	0.72
2020	2635	0.21	0.57	0.7
2021	2583	0.19	0.55	0.68
2022	2521	0.18	0.54	0.65
2023	2457	0.16	0.52	0.63
2024	2397	0.15	0.51	0.61
2025	2343	0.13	0.50	0.59
2026	2294	0.11	0.49	0.58
	OFL catches	State 1	Base	State 2
2015	1758	0.32	0.64	0.79
2016	1749	0.30	0.62	0.77
2017	2932	0.29	0.62	0.76
2018	2820	0.26	0.59	0.74
2019	2773	0.23	0.58	0.71
2020	2727	0.21	0.56	0.69
2021	2666	0.19	0.54	0.66
2022	2595	0.17	0.53	0.64
2023	2525	0.16	0.51	0.62
2024	2458	0.14	0.50	0.60
2025	2399	0.12	0.49	0.58
2026	2346	0.11	0.48	0.56

C. INTRODUCTION

This update stock assessment maintains the same spatial and temporal structure as the 2007 assessment (except, of course, that the end year is extended 8 years to 2014 rather than 2006), and the 2007 assessment should be referred to for details regarding any data or model aspect not updated or re-analyzed for this update. Moreover, dataset descriptions, diagnostics and model fits are included only for time series and dateasets that were extended in this update, as the model results and fits for other time series changed only modestly for these datasets. However, complete sets of all model results and diagnostics (e.g., the “r4ss” outputs) for either the base model or for any intermediate or sensitivity runs are available on request in pdf format.

The latin name for Chilipepper Rockfish, *Sebastes goodie*, honors that 19th century ichthyologist and fisheries biologist David Brown Goode (Love et al. 2002), while the common name was derived from the observation that long strings of these bright red fish resemble a string of drying chilis (Davis 1978). They have been one of the most important commercial target species in California waters since the 1880s, particularly in central California. The distribution ranges from Queen Charlotte Sound (British Columbia) to Bahia Magdalena (Baja California Sur), however the region of greatest abundance is found between Point Conception and Cape Mendocino, California. The stock boundary for the 2007 assessment and for this update is the U.S./Mexico border in the south, to the Columbia River (Oregon/Washington border) in the north (north of which Chilipepper are very uncommon). Adult fish tend to be most abundant in large schools between 100 and 300 meters, often in midwater.

Growth, Maturity and Fecundity

The 2007 assessment included time varying growth, manifest by the estimation of “offset” parameters to the von-Bertelanffy growth coefficient (K). This is maintained in this assessment, and alternative configurations to the time blocks are discussed in the modeling section. Note that the addition of very large numbers of survey age estimates, for both the triennial trawl survey (1983, 1992, 1998 and 2001) and the combined bottom trawl survey (2003-2014, only 2004 age data were available in the 2007 assessment) have a strong influence on the temporal growth variability trends observed in the model. Possible regional differences in growth, between Southern and Central California in particular, may complicate the ability of the model to best detect temporal patterns. A more comprehensive evaluation of the drivers and consequences of variable growth in this population is beyond the scope of this update, but is anticipated as key to ongoing research efforts for this species.

Maturity and Fecundity parameters were re-examined in light of newly available data collected from ongoing reproductive ecology studies (Beyer et al. 2015). For fecundity, over 200 samples were taken from a range of locations throughout the range of Chilipepper rockfish in the period from 2009-2013 (sampling is ongoing, but more recent data are not yet included). Methods and results are described in Beyer et al. (included in supporting documents or available on request), the fecundity relationship from that publication was used to update the size-dependent fecundity relationship (to one of no relationship to one of a moderately strong relationship) in the assessment update. The size dependent fecundity relationship developed for Chilipepper rockfish was not among the strongest (Figure 1); much stronger relationships are observed for

Yellowtail Rockfish and Blackgill Rockfish. The effect of including these relationships in assessments on the perception of relative stock status and on other reference points has recently been evaluated using both these empirical examples and simulation studies (He et al. 2015), for which the overall impact on Chilipepper relative stock status and associated reference points was fairly minor, while the effect on Blackgill Rockfish (a slower life history and stronger relative fecundity relationship) was substantial.

However, Chilipepper Rockfish (like Bocaccio, Cowcod, Rosy and as many as 12 other generally southern *Sebastes* species) are also known to produce multiple broods, which could increase overall reproductive effort considerably. This phenomena has been the subject of recent investigations using both microscopic and histological methods (Beyer et al. 2015; also S. Sogard, S. Beyer, D. Stafford, N. Kashef, L. Lefebvre and J. Field; unpublished data). Over the past five years, secondary broods in Chilipepper rockfish have been documented as common in most years in Southern California waters, starting in December, and there is some evidence of more than two broods in some individuals. In Central California, multiple broods have been less common, although in some years (such as 2013) the phenomena seemed to be more widespread. Assessments of total fecundity of second broods suggest that they are comparable to the size of the "first" broods (when the distinction can be made), however given the strong spatial and temporal variability in the phenomena, the extent to which multiple broods relate to the relative size or age of fish has not yet been fully resolved. Although females of all sizes appear to be capable of producing a secondary brood, current data suggest a greater frequency among mid- to larger sized females, a phenomena that may ultimately require greater consideration in future assessments as the effect would be to increase the slope of the size-dependent relative fecundity relationship. Additional benefits to the population of multiple brooding likely also include greater probability of encountering optimal environmental conditions for broods, by widening the time period at which larvae are released (although quantifying such benefits presents new challenges).

For maturity, the previous full assessment for Chilipepper rockfish used commercial port sampling and fishery-independent survey data (n=10774 females; n=4830 males) to develop maturity at length curves, for which the majority of these data were collected annually between 1992 and 2004. Based on those results, the previous assessment applied a maturity relationship in which 50% of females matured at a length of 25.7 cm. Additional data on female maturity from fishery-independent hook-and-line collections which occurred between August and March 2009 to 2015 (see Beyer et al. for methods) were available for this assessment (n=1792). Maturity status was assigned by gross macroscopic evaluation of gonads (1=immature, 2=early developing, 3=developing, 4=fertilized eggs, 5=eyed-larvae, 6=spent, 7=recovering; stages 2-7 generally considered mature [see below]). The same logistic equation used in the 2007 assessment was revisited using these new data, and regional differences were explored between females collected from Bodega Bay to Pt. Conception (Central CA; n=936) and those collected south of Point Conception in the Southern California Bight (Southern CA; n=856), although those were not included in the model.

When regions were combined for all available months (Aug to Mar) in the new dataset, 50% of females were estimated mature at 23.5 cm and 95% were mature by 28.6 cm. Separated by region, L_{50} and L_{95} were slightly higher (3 and 2 cm, respectively) in Central compared to

Southern CA. Estimates obtained by temporally restricting samples to the period of peak ovarian development before peak parturition (September to January), when assignment of maturity based on macroscopic evaluation is most accurate, resulted in small a decrease (0.5 cm) in the length of 50% maturity. A subset of ovarian tissue samples collected beginning in August 2013 was processed histologically (n=250) to inform macroscopic assignments of maturity, detect abortive maturation (mass resorption of developing oocytes), and determine if secondary broods (see fecundity discussion) may be identified at early or later stages than possible macroscopically. This analysis is ongoing; however, sections from all stage 2 ovaries (early developing; n=30) collected during this period have been examined and have suggested some interesting results. Specifically, for females collected in September and October (n=17), all ovaries of this stage showed normal development for the current reproductive season. However, in females collected in November and December (n=13), when the vast majority of mature females have vitellogenic (stage 3) or eyed larvae (stage 4), abortive maturation was found to be occurring in 92% (n=12) of the fish identified macroscopically as stage 2 (pre-vitellogenisis), indicating these females were likely incapable of successfully producing a brood of larvae in the current season. To evaluate how sensitive maturity estimates were to this anomaly, using the temporally restricted subsamples, females with stage 1 ovaries were considered immature, as were those with stage 2 ovaries from November – January. The result was a negligible decrease in the combined and Southern CA L_{50} estimates, and a counter-intuitive increase in the Central CA L_{50}. The most substantive change was an increase in L_{95} estimates for all areas.

These results reflect ongoing analyses, and results related to the potential impact of abortive maturation in smaller, younger fish were not explicitly incorporated into the revised maturity curve. Instead, considering the minor changes in L_{50} estimates in sensitivity analyses, the historic data was combined with the recent data (from all regions) in order to update maturity estimates. Females with stage 1 ovaries were considered immature; the rest were considered mature. The L_{50} and L_{95} were 24.4 and 35.2 cm for females (Fig. 2), corresponding to a slope of -0.27. It is unknown if the decrease in female L_{50} between this and the value used in the previous assessment (25.7 cm) is due to increased sample size or reflects changes in growth, however given an increased awareness and appreciation for the potential biases in macroscopic maturity evaluations outside of the reproductive season, or within the reproductive season for what might in fact be functionally immature fishes (Lefebvre and Field 2015), we intend to continue to evaluate temporal and spatial patterns in observed and functional maturity to better inform future assessments.

Natural Mortality

Based on model estimates and model profiles of alternative natural mortality rates conducted prior to and during the stock assessment review, M was fixed at 0.16 for females, and 0.202 for males. These values are unchanged in the stock assessment update.

Aging Precision

In the 2007 model, the precision of the age determination process was measured by both comparing the independent readings of two age readers of samples collected in 2004 (n=95), as well as comparing independent readings by the same reader (n=97), as reported in the 1998 assessment). Since that time, additional readers (particularly Beyer) have done the majority of the aging, primarily of the Combined trawl survey and triennial trawl survey age structures (N ~ 10,000), including an additional 993 within reader comparisons and 590 between reader comparisons. These data were input into the aging error analysis software developed by Punt et al. (2008) and subsequently adapted by J. Thorson. The results indicated a greater degree of aging error than used in the 2007 assessment (Figure 3), including a slight bias towards underestimating age between the primary reader and others, and a greater standard deviation around age estimates (from 0.1 to age 1-2 fish to 1.8 for age 15 fish) than estimated for the 2007 assessment. This aging error matrix was used in the updated model.

Regulatory History

The Rockfish Conservation Area closures to commercial fishing, and corresponding constraints on recreational fishing to exclude most deeper waters (particularly in central California) have dramatically reduced fishing opportunities for Chilipepper Rockfish since the early 2000s. Landings (or retention) are permitted in all existing fishing activities, for bottom trawl fishing trip limits have recently been constrained to approximately 5000 lbs per trip (these numbers may vary slightly over time and space), primarily as Bocaccio Rockfish (an overfished species) co-occurs with chilipepper rockfish. Trawl landings of Chilipepper tend to be greatest south of 40º10’ during periods in which the seaward line of the RCA is set at 150 fm, although there are occasional catches of Chilipepper shoreward of the RCA as well. As most of the Chilipepper biomass is found in the core area of the RCAs, catches have been far lower than OFLs, generally less than 20% since the mid 2000s (Table 1), and the likelihood of catches increasing substantially in the near term is likely to be fairly low.

D. DATA

Commercial Fisheries Landings

Chilipepper have historically been one of the most important rockfish species in California fisheries. Commercial landings from 1978 to the present were obtained directly from the California Cooperative Survey (CALCOM) database using expansion procedures from sampling commercial market categories. The minor discrepancies between the 2007 and recent catch estimates (for the 1981-2006 period) amount to a very negligible difference of less than 400 tons (48,902 tons in the 2007 model, 49,268 tons in this model).

For historical landings prior to 1978, the 2007 assessment included landings estimates based on an assessment-specific estimation method for partitioning out the fraction of total rockfish catches in California waters that was likely to be chilipepper, based on the species composition of “rockfish” catch from the more recent era. Following the 2007 assessment, a major effort to comprehensively estimate the species composition of the historical “rockfish” catch in both commercial and recreational fisheries was undertaken (Ralston et al. 2010). Those estimates are now used in this update assessment. Table 2 and Figure 4-5 present the catch estimates from the 2007 assessment and those used in this assessment.

The revised catch reconstruction increased the fraction of total historical California rockfish catch that was estimated to be Chilipepper. Between 1892 and 1980, the 2007 model were 80,790 metric tons, while total landings based on the revised catch estimates were 95,383 metric tons over the same period. The vast majority of the difference is from the commercial fishery, primary an increase in estimated trawl landings during the 1940s in the historical reconstruction, and increased hook and line landings from the 1940s through the 1960s. Revised catch estimates from the Oregon catch reconstruction effort (Karnowski et al. 2011) were also used to replace the estimates for the Oregon catch used in the 2007 assessment; these too estimated slightly higher historical landings, although total Oregon catches still represent a very small fraction of both historical and recent coastwide catches.

Landings in the 2007-2014 period are based entirely on NWFSC total mortality reports (inclusive of landed catch and discards), reported by fishery in Table 3 of most reports (e.g., Bellman et al. 2010, Somers et al. 2014). CalCOM estimates of landed catch in California are highly comparable, but not inclusive of discards. Most landings in the last ten years have come from the trawl fishery, for which total catches have increased, from 125 tons in 2007 (consistent with low catches in 2004-2006) to a high of nearly 400 tons in 2013 (dropping slightly to 325 tons in 2014). In most years, 97 to 99% of the total catch is from trawl fisheries, with trace landings in hook and line fisheries (0 to just over 1 ton) and recreational fisheries (2 to 8 tons).

Commercial Discards

Total mortality reports produced by the Northwest Fisheries Science Center suggest that over the past 6-7 years, discards have accounted for approximately 20% of the total catch of Chilipepper Rockfish, most of which are from the Commercial trawl fishery. This presumably reflects a mixture of size-based and regulatory discards.

Recreational Fishery Landings

The historical (pre-1980) catches of Chilipepper Rockfish in recreational fisheries in California were also revised as part of the California catch reconstruction project, which resulted in a modest increase in those catches. Additionally, a minor error in the interpolation of estimated catches between 1990 and 1993 (for which RecFIN catch estimates are not available) was corrected, resulting in a minor change in the catch estimates for those years. Total recreational catch estimates for the 2006-2014 period were taken from NWFSC Total Mortality reports, while length composition data were downloaded from the RecFIN website for the 2006-2012 period, and provided from CDFW for the years 2013-2014. Virtually all length observations since the early 2000s have been from southern California recreational fisheries, which are concentrated in shallower depths since the early 2000s as a result of management measures.

Commercial age and length composition data

Age determination of age structures collected from Commercial port sampling efforts was conducted throughout 2013 and 2014, for structures collected from 2006 to the present, although sample sizes were low. Those data were the basis for age composition data for the trawl fishery, age structures were not available from sampling efforts for other fisheries. Length composition data for the trawl fishery was also updated, and there was very limited length composition data for hook and line fisheries (small sample sizes for 2007, 2008 only).

Recreational CPUE time series

The central California recreational index from the 2007 model was unchanged, although improvements in the spatial resolution of the data, and on the corresponding habitat information, should provide the means to revisit and improve on this index in the next full assessment. Moreover, an index of relative abundance could likely be developed from CDFW onboard observer data collected in southern (and central) California waters since 1999.

Triennial Trawl Survey

The triennial trawl survey index was unchanged from the 2007 assessment, but should be revisited in the next full stock assessment. In recent years, many assessment authors have also chosen to split the triennial survey index into two time periods, however this was not done in 2007 and is considered to be outside of the terms of reference for an update. However, all available otoliths from the survey (1983, 1992, 1998 and 2001) were aged (N ~1900) to support this update and incorporated as traditional age composition data. Otoliths from other years of this survey (e.g., 1980, 1986, 1989 and 1995) were surfaced aged historically but the structures have not been able to be relocated from either the NWFSC or AFSC. For consistency with how the combined age and length composition data were treated in other fisheries, the length composition data from this survey were downweighted (lambda 0.1) relative to the age composition data (lambda 1).

Northwest Center Trawl Survey

All otoliths from the 2003-2014 NWFSC Combined Shelf/Slope bottom trawl survey were aged at the SWFSC (N~ 8013) and the age data were provided to the NWFSC in order to do age composition expansions. In the 2007 assessment, age data were only available for one year (2004) for this survey. Haul specific CPUE data from 2003 to 2014, with associated expanded length and age frequency compositions, were provided by Beth Horness (NWFSC), as were estimates of abundance based on swept area methods. The most recent standard Delta GLM, developed by the NWFSC, was used to arrive at annual abundance indices, which were treated as relative (rather than absolute) abundance in the model, as they were in 2007. Stratification was comparable, but not identical to that used in 2007, as the addition of a strata boundary at 34.5 N (Point Conception) was strongly recommended by the NWFSC to accommodate differing sampling densities north and south of that feature. All other boundaries (32° N as the southern boundary, 36° N, 40° N and 43° N as the northern boundary; with depth stratified between 55 and 150 meters, and 150 to 400 meters) were as used in the 2007 GLMM for the NWFSC trawl survey data. The stratification is shown graphically in Figure 6, and the frequency of positive tows and of tow values by depth and latitude (total, and by year) are shown in Figures 7-8, while maps of catch rates spatially are shown as Figures 9-12. The area swept biomass estimates by year and latitudinal strata (and including the percentage of positive tows by year and latitudinal strata) are reported in Table 4.

Model selection criteria indicated that a lognormal (rather than Gamma) distribution provided the best fit to the data, and corresponded to a lower average CV (Figure 13), the model was run with 100,000 MCMC iterations and diagnostics did not indicate convergence problems. A comparison of the 2007 index (4 years) and the most recent index (12 years) using the 2007 software could not be developed as the index in the 2007 assessment was directly provided by T. Helser at the NWFSC in the 2007 round of stock assessments, however a comparison of the 2007 index and this (2015) index is shown (Figure 14). The indices are clearly quite different, however the area swept indices (also shown) are far more consistent with the 2015 GLMM index.

Juvenile rockfish survey

The Fishery Ecology Division of the Southwest Fishery Science Center has conducted a standardized midwater trawl survey in central California waters during May-June aboard the NOAA R/V David Starr Jordan every year since 1983 (Ralston et al. 2013). The primary purpose of the survey is to estimate the abundance of pelagic juvenile rockfishes (*Sebastes* spp.) and to develop indices of year-class strength for use in groundfish stock assessments on the U. S. west coast. In response concerns regarding the appropriate spatial scale of data to inform such indices, a combination of a PWCC/NWFSC surveys and an expanded spatial and temporal scope of the SWFSC survey, have led to coastwide coverage in most years since 2001. This survey has encountered substantial interannual variability in the abundance of the ten species that are routinely indexed, as well as high apparent synchrony in abundance among the ten most frequently encountered species (Ralston et al. 2013, Ralston and Stewart 2013).

The 2007 assessment included a combined juvenile abundance index from 2001-2006 that used both SWFSC and NWFSC/PWCC survey data, and estimated relative abundance of age-0 rockfish by integrating the results of both surveys in an ANOVA model with year, latitude, period, and depth as fixed effects, and vessels as random effects. This update continues that usage, with the documentation of the data, methods, results and diagnostics for the indices available in Ralston et al. (unpublished data; to be included in review materials). Importantly, the variance in the 2007 index was unrealistically tight, and constrained estimates of year class strength even in the face of conflicting age composition data in early runs of the model. The variance in the 2015 indices is considerably greater (CVs of approximately 0.5), leading to far more realistic behavior in the model. Also notable is the extremely high magnitude of the 2013 year class predicted by the juvenile index, roughly two orders of magnitude greater than the average index value for the preceding ten years, followed by a high value in 2014 of roughly one order of magnitude greater than those in the 2001-2012 period (Figure 15). This reflects the very high abundance of juvenile rockfish observed in 2013, such that in the core area (sampled consistently since 1983) total juvenile rockfish abundance was the highest observed throughout the entire time series. The extent to which the predicted value may truly be accurate is unclear, as consideration of density dependent processes suggests that a power coefficient to transform the index could lead to improved performance. This was not done in the 2007 assessment due to the short duration of the time series and other factors, as such this was not explored in this assessment to be consistent with the terms of reference. Yet this remains an uncertainty that should be explored more robustly in future research and assessments.

E. MODEL

Description of the 2007 Assessment Model

The 2007 stock assessment was developed in Stock Synthesis II (SS2), version 2.00c, an age and size structured statistical model that was the standard for most West Coast groundfish assessments in 2007. The model included a revised (at that time) catch reconstruction, with the catch history extended back to 1892. Length and age composition data were available for commercial trawl, hook and line and setnet fleets for a mix of years (in which the fleets were operational) between 1978 and 2006, although data were not available in some years and were considered unreliable in others. The 2007 model also included relative abundance indices developed using commercial trawl logbook data (1980-1996), CPFV observer data (1987-1998), the triennial trawl survey (1980-2004) and the NWFSC combined shelf and slope bottom trawl survey (2003-2006). Juvenile survey indices were included based on a new coastwide index for the last six years of the model (2001-2006). Steepness in the 2007 model was fixed at 0.57, natural mortality fixed at 0.16 for females, 0.20 for males, and selectivity curves were based on logistic curves for the trawl fishery, the hook and line fishery, and the two surveys, while the double-normal selectivity curve was used for setnet and recreational fisheries. Time varying growth was estimated internally in the model, implemented with time block offsets for the growth coefficient, K, using time period blocks that were informed by major shifts in the signal for the Pacific Decadal Oscillation.

The 2007 base model had equal emphasis factors (lambdas=1.0) for most likelihood components, with the exception that lambdas were set at 0.1 for length composition data in fisheries and surveys for which (traditional) age composition data were available (trawl, hook and line, setnet fisheries, as well as the NWFSC Combined survey). This downweighting was acknowledged to be an ad-hoc approach, to lessen the possible effects of double-use of data from the same fish. It was recognized at the time that a more appropriate approach would be to use conditional age-at-length compositions, which would also facilitate the estimation of growth (including time-varying growth) internally. This was outside of the terms of reference for an assessment update, but remains a priority for future assessment and research efforts.

Prior Probabilities

In the 2007 model, a prior probability for steepness was made available to assessment authors from an updated meta-analysis based on Dorn (2002). The prior developed for chilipepper rockfish in 2007 had a mean value of 0.573 with a CV of 0.183. By contrast, the prior values of steepness available for the 2015 assessment cycle were considerably higher, 0.773 with a CV of 0.147. In the 2007 model, steepness was fixed at the 2007 point estimate, and no other prior probabilities were used in the model, although the standard deviation of the prior probability was used to bracket uncertainty in the decision table. Based on the results of a likelihood profile on steepness following the updating of data and time series in this model, the 2007 point estimate for steepness was left unchanged in the base model.

F. BASE MODEL SELECTION AND EVALUATION

Comparison with the last assessment

This section sequentially tracks the changes in model results between the 2007 assessment and the final version of this assessment update.

Update from SS2 to SS3

The first change was to move to a newer version of stock synthesis. The 2007 model used SS2 Version 2.00c; the starter, data, control and forecast file were altered to conform to the format required to run SS3 Version 3.24O, without changing the fundamental model structure of the last assessment. The first improvement was in the time required to complete the run, which declined from nearly 10 minutes in SS2 to 3-4 minutes in SS3. However, in comparing the resulting time series and likelihood estimates between the two base model runs, it was clear that some non-trivial changes in the model parameter estimates and resulting outputs had taken place. First, the total likelihood was greater (by about 20 points) in the SS3 model, inferring that some means by which age compositional data (which accounted for most of the increase) is fit between the two model versions (Table 4). Second, the starting unfished spawning biomass was higher in the SS3 model than in the SS2 model (33,395 metric tons in SS2; 37,751 metric tons in SS3; Figure 16a), resulting in a noticeably more pessimistic perception of stock status (from 71% to 57% in 2015, although the 2007 depletion point estimates are highly comparable, at 71% versus 69%).

Through the comparison of parameter estimates among the two models, it became clear that the primary driver of these disparities was the time-varying growth function. Specifically, the SS3 version of the model estimated a smaller growth coefficient (K) offset in the 1970-1979 period than the SS2 model had (effective K's were 0.32 in SS2 and 0.23 in SS3 respectively). Both of these were higher than the "baseline" K initially estimated in the 2007 model (0.1945), but the effective K estimate in the 2007 model was by far the highest growth rate in the time series for that model, while the re-estimated parameter in the SS3 version of that model was within the mean of the range of values estimated for later (more data informed) periods (range 0.20 to 0.26 for the various 1980-2006 time periods).

The best interpretation for this is that the 2007 model was estimating a higher growth rate during a time period in which compositional data (e.g., the data that would be informative with respect to an actual growth rate) were minimal, in order to alias higher productivity during the period in which landings were increasing substantially in the 1970s. In fact, the 2007 model estimated an increase in SSB between 1970 and 1979 of nearly 6000 metric tons, while in the SS3 version the stock was declining modestly (by approximately 900 metric tons) during the same period. The suspicion that the estimation of the time-varying growth parameters was the key factor in the differences between models was confirmed by running both the SS2 and SS3 versions of the 2007 model without the time varying growth, for which population trajectories and associated parameter estimates were nominally identical (Figure 16b). Although the slight differences in overall likelihood remained (Table 5), these differences were assumed to be a consequence of internal changes in the synthesis framework that did not warrant additional concern with respect to this update.

Updates to Fishery Dependent Data

Following conversion to SS3, the 2007 model in SS3 was extended through 2014, revised data and time series were sequentially added, the differences in model results explored and discussed, in order to link the 2007 model to the base model in this update. The first revision was to the historical catch history. As mentioned earlier, California historical catches (both commercial and recreational) were updated from the estimates developed in the 2007 assessment to those developed by Ralston et al. (2010). Figures 17a-b show the time series of spawning biomass, depletion, exploitation rate and recruitment for the model in SS3 run through 2007 with the 2007 and the updated 2015 catch estimates, respectively (key model outputs and likelihood estimates by component for all substantive changes are also tracked in Table 5). The slightly greater catches in the 2015 model result in no appreciable change to the starting spawner biomass, however they did alter the biomass trajectory, with a greater dip in the spawning biomass and relative depletion estimates from the 1940s through the mid-1960s, as well as (of course) the (1-SPR) relative fishing rate (Figure 18a), which is now estimated to have been greater in the time period during which catches were greater. From the mid-1960s through the present, the biomass trajectory and recruitment estimates are essentially unchanged between the two model versions.

Following the revisions of the catch history and the updating of catches from 2006 through 2014, new commercial and recreational compositional data were added. Commercial data included age composition data from 2007-2014 (trawl fishery only), length composition data from the same time period in the trawl fishery, and a very small number of samples from the hook and line fishery, and recreational length composition data for the entire 2006-2014 period (Figures 19-20). The addition of the commercial age and length compositional data had very minor influence on the model result; the model trajectory, depletion, recruitment and relative SPR rate changed only to a trivial extent with the addition of those data (there was a very slightly more optimistic perception of 2015 stock status, from 57 to 59%). However, the addition of the recreational length composition had what seemed to be an unrealistically strong effect on model results, particularly with respect to a shift to a considerably more pessimistic perspective on depletion in the early 2000s and a series of extremely high year classes from 2009 through 2014. This was determined to be primarily a consequence of the depth and area closures implemented to constrain recreational fishing, particularly in Central California, where historically recreational catches were the greatest. From 2002 onward, only a small fraction of the length compositional data came from north of Point Conception, where depth closures have ranged from 20 to 40 fathoms in most years and areas since 2002. However, Chilipepper have continued to be taken in the waters South of Point Conception during that period, where depth restrictions are also in place but less severe than those in Central California (typically 40-50 fathoms). As a consequence of the ontogenetic shift in Chilipepper to deeper water with size and age (described in detail in the 2007 assessment), the shift in both the latitudinal and depth-based effort distribution has altered the selectivity of the recreational fishery.

Thus, a selectivity offset for the 2003-2014 period was incorporated into the model, which resulted in a strongly dome-shaped selectivity curve for the 2003-2014 period, shifted far to the left of the curve estimated for the pre-2003 data. This addition resulted in an improvement of approximately 130 likelihood units (the addition of the recreational length data had increased the total likelihood by 183 likelihood points), with model trajectories and depletion very comparable to the models that did not include the updated recreational fishery length composition data. Key differences included a slight increase in the unfished spawning biomass and recruitment levels, slightly more depleted stock status in the late 1990s, and signs of strong recruitment in the 2009-2014 period. Future assessments should consider separate northern and southern recreational fisheries, as well as greater exploration of time varying selectivity for these fisheries. With the selectivity time block, fits to the recent recreational length composition data improved substantially, the extreme high recruitments indicated without the selectivity adjustment were reduced to more plausible levels (indeed there is considerable evidence for strong recruitment during this period, as shall be seen shortly), and the overall patterns in the spawning biomass and depletion trends in the post-2000 period became more aligned with the estimated trends prior to the addition of the recreational composition data (albeit with a slightly more pessimistic trend). As the addition of selectivity time blocks when there is a strong basis for a shift in selectivity is consistent with the terms of reference for updated stock assessments, this selectivity offset was maintained in the base update model.

Updates to Fishery Independent Data

The next set of data to be added to the update included the 2003-2014 Northwest Fisheries Science Center combined trawl survey index and associated age and length compositional data (Figures 21-22). The combination of the trawl survey index and compositional data resulted in very little change to the overall spawning biomass and depletion trajectories, but led to a considerably more optimistic estimate of recent (post-2000) stock status, largely in response to inflation of the relative size of the 1999 year class which dominated survey (and other) catches over most of the survey time period. The estimated recruitment deviation was already the largest in the time series for the stock, but increased even more with the additional survey data (note that this inflation is perceptible in the recruitment and recruitment deviation figures, but in the latter the deviation estimates are partially masked by the legend). Moreover, the strong year classes suggested by the recreational compositional data for recent years became more apparent from the survey age and length composition data, with substantial increases in the size of 2009, 2010, and 2013 year classes (this was at least partially offset by declines in the estimated magnitude of 2011 and 2012 year classes). Although fits to the survey abundance time series were not outstanding, they are consistent with those observed in other fishery-independent and fishery dependent time series for this stock, and the stock trajectory does follow the general trends in the survey index (see model results section). Fits to both the age and length compositional data are also reasonable.

The addition of four years of triennial trawl survey age compositional data (1983, 1992, 1998 and 2001) did led to some modest, but very perceptible changes to the stock trajectory, with a higher absolute spawning biomass historically, modest declines in the magnitude of several year classes in the 1970s, and lower relative abundance over the past 15 years. It is very plausible that this is related to some of the issues related to selectivity in this survey, which was fixed in the 2007 assessment due to model instability when freely estimated. Indeed, when freely estimated in this model, the Hessian was not positive definite and the poor model performance continued. The poor spatial overlap of the triennial trawl survey with the core areas of this stock (Southern and Central California) is very likely to be among the key contributing factors, as is the simple fact that this semipelagic species may not be well represented in terms of abundance by bottom trawl surveys.

Finally, the addition of the 2001-2014 pelagic young-of-the-year (YOY) index should be viewed in the context of the index it replaced. The 2001-2006 index used in the 2007 model had very (unrealistically) tight coefficients of variation (CV's), an unexpected consequence of how the indices were modeled following a shift from a delta-GLM approach to a ANOVA approach. The indices for 2001-2014 developed for the 2015 assessment cycle (Ralston et al., unpublished data) had considerably more "realistic" CVs (averaging approximately 0.5). As a consequence of both that fact and the more informative age compositional data from the survey, there were nontrivial shifts in the relative strength of several year classes in the early 2000s that were now better informed by survey compositional data. As the recruitment index was dominated by an extremely high (roughly two orders of magnitude over the previous 10 years) recruitment in 2013, and a very strong recruitment (only an order of magnitude greater than the previous 10 years) in 2014, the recruitment index had the most influence on those two years, inflating the already strong 2013 recruitment and informing a very strong 2014 recruitment as well.

Note that the 2013 recruitment was also informed by a large number of age 1 fish in the combined trawl survey. Moreover, as the base model from 2007 did not include age 0 fish in the age composition matrix, the large number of age 0 fish actually observed in 2013 (which help validate the magnitude of the 2013 year class in the juvenile survey) could not be included. A sensitivity analysis in which the structure of the age compositional data was altered to include age 0 fish (presumed to be outside of the terms of reference for strict assessment updates) was developed and demonstrated that the magnitude of the 2013 year class was indeed inflated when the age 0 fish from 2013 were included in the model, even when the pelagic juvenile index was excluded (Figures 23-24). However, the combined trawl survey data had only a modest number of age 0 fish in 2014, thus it remains to be seen whether the high magnitude of the 2014 year class predicted by the juvenile survey will be manifest. Regardless of that particular uncertainty, it is very clear that the relatively modest recruitment that followed the 1999 year class has been more than offset by a suite of 3-4 very strong year classes since 2009.

Updates of Life History Data

Continuing with the model that included all updated commercial and recreational compositional data and indices, the life history data were updated next (Figures 25-26). The update of the fecundity relationship had the predictable effect of changing the units of spawning biomass (note that the units are actually billions of larvae, not millions of eggs), and of estimated a very slightly more pessimistic view of stock status (as larger, older fish are less abundant in response to fishing but more productive than their smaller counterparts). The updating of the maturity relationship had very little effect, but resulted in a (very) slightly more optimistic estimate of stock status. The updating of the aging error matrix actually had a fairly substantial impact on model behavior, with an increase in the degree of variability in the recruitment deviation values that is likely a consequence of the recognition of a greater extent of aging error than that quantified in the 2007 assessment. This in turn resulted in a more optimistic perception of stock status (Figures 25-26).

Finally, consideration of how to continue or alter the time blocks for the time-varying growth took some considerable effort. First, the existing block from 1999 to 2006 was simply extended to 2014, which led to very trivial changes in the stock relative abundance trajectory and end year status. Given that the 2007 model based the time intervals on major shifts in the Pacific Decadal Oscillation (PDO), as an indicator of productivity in the California Current, the addition of both one and two more time blocks that represented major shifts in the mean values of the PDO (generally negative from 1999-2003, positive from 2003-2008, negative from 2009-2014) was also explored (Figure 27-28). However, the consequences of these extensions were counterintuitive, with the effective estimated growth coefficient (K) dropping to what were considered to be unrealistically low levels (0.11-0.12) from a baseline level of approximately 0.2. In the model, the 2003-2014 period in the model was associated with large numbers of age composition data from surveys in which age 1-3 fish were highly abundant, such data were not available in most earlier years, and this seemed to be a major contributing factor to this result. Additionally, the survey data included a high fraction of fish were from south of Point Conception, where age data were previously all but fully unavailable for either surveys or fisheries and where growth and maturity patterns appear to differ. For these reasons, the 2007 model structure was maintained with 5 time blocks, such that the last extended from 1999-2014 rather than 1999-2006.

A final determination for the base update model was how to treat steepness. In the 2007 model, steepness (h) was fixed at the mean of the steepness prior updated from Dorn (2002), a value of 0.57 with a standard deviation of 0.18. However, the prior available for the 2015 assessment cycle (0.77) was considerably higher. While the terms of reference for assessment updates states that it is acceptable to use updated parameter priors, it does not recommend updating priors over maintaining previous values. Interestingly, although the 2007 model likelihood profile indicated a slightly better fit at high steepness values (although the data were poorly informative at values of steepness greater than about 0.5), the updated 2015 model demonstrated a better fit at lower steepness values, and when steepness was estimated, using either prior, the resulting point estimate was approximately 0.40 (Figures 29-30). Consequently the STAT decided to maintain steepness at the point estimate that was adopted in the 2007 assessment, of 0.57. Figures 29-31 show model estimated larval output, depletion, recruitment and recruitment deviation values for the base, higher and lower steepness values used in the 2007 model, as well as when the 2007 prior was used to estimate steepness in the model.

G. POINT BY POINT RESPONSE TO STAR PANEL RECOMMENDATIONS

This section is not relevant to a stock assessment update. However, we note that most of the 2007 STAR Panel recommendations that could be accommodated within the terms of reference for an assessment update have been done. Specifically, this assessment uses the results of comprehensive catch reconstructions for California and Oregon, and uses age estimates developed for all available fisheries-independent surveys (4 years of triennial trawl survey age composition data, 11 additional years of NWFSC bottom trawl survey age composition data).

H. BASE MODEL RESULTS

The 2015 update of the 2007 stock assessment was developed in Stock Synthesis 3 (SS3), version V3.24O, and as described earlier, maintained the same structure as the 2007 model, with updates to select life history information, catch histories, fishery-independent surveys, and age and length composition data from commercial and recreational fisheries. Time varying growth was estimated internally in the model, implemented with a time-varying growth coefficient, K, using five time period blocks that were informed by major shifts in the signal for the Pacific Decadal Oscillation. As in the 2007 model, the 2015 base model had equal emphasis factors (lambdas=1.0) for most likelihood components, with the exception that lambdas were set at 0.1 for length composition data in fisheries and surveys for which (traditional) age composition data were available (trawl, hook and line, setnet fisheries, as well as the NWFSC Combined survey). For the final base model, the total number of parameters estimated in this model was 88, including R_0, time-varying growth (K offsets, 5), parameters for logistic selectivity curves for trawl and hook and line fisheries and the two trawl surveys (8), parameters for the double-normal selectivity curves for the setnet fishery, recreational fishery, and recreational CPUE index (18), parameters for double-normal age selectivity for the recreational CPUE index (6), and recruitment deviation values for the years 1965-2006 (50). All were also estimated in the 2007 model, except of course for the 2007-2014 recruitment deviation estimates. Table 6 provides the estimates for all of these parameters, and compares each to the values estimated in the 2007 model.

As in the 2007 model, convergence required that the selectivity for the triennial trawl survey as well as the age selectivity for the recreational CPUE index to be fixed at their estimated values. Also as in the last model, the likelihood surface was found to be quite irregular, model results and total likelihood values often varied slightly when the model was re-run, although as in 2007, the effect on the core trends and estimated output values was typically negligible. The life history relationships that changed between the 2007 and the 2015 base model are shown in Figures 32 a-d, total catches and relative exploitation rates are shown in Figures 33a-b, and fits to age and length compositional data (including only those datasets in which new data were included in the 2015 model) are shown in Figures 34-51. The fits to survey indices are shown in Figures 52-53. Age and length selectivity curves are shown for all fisheries in Figure 54, and by fishery in Figures 55-56. The base model estimates of total larval production, summary biomass, recruitment, depletion, spawning biomass per recruit (SPR), total catch, and fishing mortality rate are provided in Table 7, and in figures 57-63.

I. EVALUATION OF UNCERTAINTY

Sensitivity Analysis

The sequential addition of new datasets and life history information provide the basis for most sensitivity considerations in this update. Although steepness remains poorly resolved in this model, the likelihood profile suggests a considerably lower value than was suggested by profiles in the 2007 assessment, for which the model preferred a high steepness value (but the profile was quite uninformative between values of approximately 0.6 and 1). The likelihood in this model remains fairly uninformative, with a change of less than 2 likelihood units across the range of steepness values (Figure 64 a-b), however the best value seemed to be approximately 0.4. Not surprisingly, the different sources of data were in conflict with respect to fitting better with a lower or higher steepness; length data and recruitment penalties had an improved fit with very high steepness values, while index and age data had an improved fit with lower steepness values.

The poor fit to the NWFSC bottom trawl survey index was explored further, and sensitivity tests suggested that a better fitting selectivity curve would be dome-shaped rather than asymptotic (Figures 65 a-d). As the end result changed little with this change (Table 7), and as changes in the selectivity functions were considered to be outside of the bounds of an assessment update (a bit of a Pandora's box for this model in particular), this change was not made in the base model.

Retrospective analysis

A retrospective analysis was conducted by sequentially removing the most recent two years of data, such that models included data through 2012 and 2009 only (Figure 66-67). The two year retrospective is slightly more pessimistic with respect to stock status, while the five year retrospective is somewhat more optimistic. In the STAT's view, this is a consequence of the very large year classes estimated in recent years, as played out in the recruitment penalty (which attempts to "sum" recruitment deviation values to 0 over the time series). Without the 2013 and 2014 year classes, the magnitude of the 2009 and 2010 year classes is greater and relatively little else is changed (meaning that historical recruitments are all very slightly reduced). Without the 2009-2014 year classes (retro-5), the year classes in the mid-2000s are all slightly higher (although still relatively small, with negative recruitment deviation estimates) and all historical recruitment deviation estimates are slightly higher, leading to a more optimistic perception of stock status. This illustrates the counterintuitive consequence of strong, recent recruitment in assessment models, such that to balance recent strong year classes which have typically not yet matured and become reproductively active) in populations with very high recruitment variability (e.g., sigma R ~ 1, as it is for Chilipepper), the model must "balance" earlier recruitment deviations and typically the entire depletion time series is scaled down modestly to substantially.

Technical Challenges

During the 2007 STAR Panel review, the length composition data were down-weighted when associated age-composition data were available, however the approach (a lambda of 0.1 for length data where age data also exist, and 1 for the associated age data) was acknowledged to be ad-hoc and lacking a solid theoretical basis. A more appropriate approach is to use conditional age-at-length compositions, which was attempted in early runs but led to a suite of problems in model tuning. The estimated growth curves had kinks that could probably be eliminated by reducing the lower bound of the smallest length bin, which would also help the fit to the two fisheries independent trawl surveys, both of which sample high numbers of fish smaller than 16 cm. Ideally, this would negate the need to fix the parameters for the triennial survey selectivity, which was necessary to invert the Hessian matrix, and would better utilize survey data.

A closely related problem is that selectivity functions for the fishery independent bottom trawl surveys should be revisited (as discussed above). Selectivity for commercial and recreational fisheries should also be carefully considered in future models. The results from the convergence tests with randomly jittered starting parameter values continue to indicate that the likelihood surface is very irregular. However, as in the 2007 model, biomass trajectories and other critical results do not appear to be sensitive to these differences. Although there is a clear progression from shallow to deeper water with age and size, the application of a combined age- and length-based selectivity curve for the recreational CPFV data developed for the 2007 model is somewhat non-traditional and would benefit by either more detailed investigation or an alternative selectivity configuration. The tension between index and length data (which are better fit with high steepness values) and age data (better fit with low steepness values), needs to be better understood. Finally, a more comprehensive evaluation of time varying growth for this species, ideally using conditional age at length data rather than traditional age composition data, should be explored, including alternatives to the assumption that the growth coefficient (K) is the appropriate parameter to estimate as time varying. Spatial differences in growth and other life history characteristics should also be explored.

K. REFERENCE POINTS

Reference points, including estimates of yield under target SPR and relative biomass target levels, are reported in Table 8. The model estimated an unfished larval production (spawning biomass) (SSB_0) 7.04 billion larvae (labeled as eggs in figures), an unfished summary biomass of 54,491 tons, and a 2015 larval output of 4.5 billion larvae, which results in a relative depletion estimate of 63.9% (of the unfished spawning output). The summary biomass for 2015 was 35,039 tons, corresponding to 69.5% of the estimated unfished summary biomass. The depletion level at its lowest point (1999) was estimated to be 20.8% of the unfished larval output. Results of the updated base model suggest that the current perception of stock status at the time of the last assessment (e.g, 2006-2007), as well as currently, is of a population significantly above target biomass levels. The 1999 year class dominated both fishery and survey catches throughout most of the 2000s, as the following ten years (until 2009) were associated with low recruitment (all but one recruitment deviation parameter was negative). Thus, the stock declined slightly following a peak around 2005-2006, although a series of strong recruitments in 2009-2010 have shifted the population trajectory again to increased abundance, and two more strong year classes in 2013-2014 are poised to send the stock and larval production to an even greater increased level of abundance.

As seen in Table 8, as well as in the yield curve in Figure 58a, the estimates of potential yield are fairly flat between approximately 30 and 50% of the unfished spawning output, and this is consistent with the estimates of yield based on the spawning biomass reference point proxy (40% of unfished; associated yield is 2133 metric tons), the SPR target reference point (0.5, yield is 2113) and the estimated MSY (associated with an SPR of 0.44 and depletion of 0.34; corresponding yield is only 52 tons greater than that at SPR=0.5, estimated at 2165). These values are highly consistent with the estimates from the 2007 assessment, which were 2155, 2099 and 2165 for the SB40%, SPR0.50 and MSY based yield estimates respectively.

L. HARVEST PROJECTIONS AND DECISION TABLE

The decision table follows the 2007 assessment format, with the two alternative states of nature equating to low (steepness set to 0.34) and high (steepness set to 0.81) productivity assumptions.

Catches are based on either the status quo for the "low" catch scenario (average catch over the past 5 years), on the adopted 2015-2016 ACLs and forecast 2017-2026 ACLs for the moderate catch level, and the combined 2015-2016 ACLs and forecast 2017-2026 OFLs for the "high" catch level. As Chilipepper is considered a category 1 stock with a P* = 0.45 in recent years (translating to a 4.4% buffer for the ACL to be set below the OFL), the difference between ACL and OFL catch streams is not terribly large. Figures 68-71 show the total biomass, spawning biomass, depletion (with reference 25% and 40% of unfished biomass references), and depletion with a twelve year forecast from 2015 onward. Under the base and high productivity scenarios, none of these catch streams lead to conservation concerns, however under the low productivity scenario (h=0.34), the stock rebuilds to target levels with status quo catches, but declines below the overfished threshold by 2019 with ACL or OFL catches.

M. REGIONAL MANAGEMENT CONSIDERATIONS

The 2007 STAT and STAR Panel concluded that data were insufficient to consider spatial structure in the model, consequently the resource continues to be modeled as a single stock. Ongoing life history suggest that growth, maturity and other reproductive parameters (e.g., extent of multiple brooding) may be different in southern areas.

N. RESEARCH AND DATA NEEDS

Although considerable information on the reproductive ecology of this species has been compiled, the possible significance of multiple brood production and the spatial or physical drivers of such factors is highly uncertain and should be explored. Greater exploration of methods for modeling time-varying growth are essential, there remains a need to explore a model that uses conditional age-at-length data and a need to explore other possible drivers of variable growth rates. Continued evaluation of the coastwide juvenile index should be an important element of both future research and future assessments, particularly with respect to the mechanisms that drive such strong variability in cohort strength, and the potential use of a compensatory relationship between pelagic YOY and the population at later ages.

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Table 1: Management Performance, estimated catches relative to OFL (ABC) and ACL (OY) harvest levels for the 2005-2016 period.

	OFL (ABC prior to 2011, south 40 10 only from 2011 onward)	ACL (OY prior 2011)	Chilipepper contribution to minor shelf rockfish north (OFL), 2011 onward	Total Catch (see Table 3)	Catch as % of combined OFL
2005	2,700	2,000		85	0.03
2006	2,700	2,000		126	0.05
2007	2,700	2,000		137	0.05
2008	2,700	2,000		148	0.05
2009	3,037	2885		318	0.10
2010	2,576	2,447		397	0.15
2011	2,073	1,981	156	331	0.16
2012	1,872	1,789	140.9	307	0.16
2013	1768	1,690	133.1	405	0.23
2014	1722	1,647	129.6	325	0.19
2015	1,703	1,628	*129.6*		
2016	1,694	1,619	*129.6*		

Table 2: Revised historical catch estimates

	California trawl	hook.line	rec	Oregon trawl	hook.line	CA and OR foreign
1916	28.9	694.8	0.0			
1917	44.8	1104.0	0.0			
1918	52.5	1123.5	0.0			
1919	36.5	722.5	0.0			
1920	37.2	760.7	0.0			
1921	30.7	647.0	0.0			
1922	26.4	598.3	0.0			
1923	28.6	732.4	0.0			
1924	16.4	763.8	0.0			
1925	13.5	864.7	0.0			
1926	40.3	1149.1	0.0			
1927	73.8	943.2	0.0			
1928	94.7	903.9	1.7			
1929	112.0	855.2	3.5			
1930	117.2	973.2	4.2		0.0	
1931	80.5	1079.4	5.6		0.0	
1932	95.6	733.5	6.9		0.0	
1933	146.2	508.4	8.3	0.0		
1934	140.9	553.2	9.7	0.0	0.0	
1935	125.7	617.3	11.1	0.0	0.0	
1936	133.4	422.5	12.2	0.0		
1937	161.5	341.5	16.3	0.0	0.0	
1938	136.4	334.8	15.5	0.0	0.0	
1939	141.2	388.2	13.5		0.1	
1940	111.7	363.6	16.8	0.0	0.1	
1941	86.5	328.0	15.6	0.1	0.1	
1942	22.4	147.1	8.3	0.1	0.0	
1943	233.7	139.8	7.9	0.3	0.1	
1944	878.6	216.3	6.5	1.1	0.1	
1945	1852.8	421.9	8.7	1.9	0.1	
1946	1445.6	298.2	14.9	2.4	0.1	
1947	935.1	364.1	17.2	1.7	0.1	
1948	562.0	405.0	40.7	1.5	0.0	
1949	725.8	353.7	52.7	3.2	0.1	

Table 2 (continued)

	California			Oregon		CA and OR
	trawl	hook.line	rec	trawl	hook.line	foreign
1950	963.5	446.1	54.9	3.4	0.1	
1951	1177.1	500.4	55.9	2.2	0.0	
1952	885.5	258.6	62.2	3.1	0.0	
1953	1118.9	248.5	59.8	4.5	0.1	
1954	965.4	311.8	101.0	2.6	0.0	
1955	1508.6	414.0	140.4	11.6	0.0	
1956	1155.9	300.9	162.9	10.5	0.0	
1957	1640.2	335.6	130.3	24.8	0.0	
1958	1450.8	372.0	130.2	13.4	0.0	
1959	1243.7	297.4	93.8	4.2	0.0	
1960	1191.2	424.7	97.3	3.8	0.0	
1961	653.3	346.5	82.5	8.9	0.0	
1962	555.6	377.5	94.7	7.9	0.0	
1963	1142.2	502.6	80.0	8.5	0.0	
1964	913.1	418.9	105.1	17.9	0.0	
1965	986.6	407.5	116.6	7.6	0.0	
1966	1041.0	320.0	183.3	3.4	0.1	985.0
1967	967.8	286.0	193.6	3.0	0.0	1634.0
1968	751.0	193.7	202.4	3.8	0.1	671.0
1969	655.5	43.6	207.6	2.5	0.1	53.0
1970	842.3	40.3	279.4	2.3	0.2	1.0
1971	724.6	50.4	237.9	1.8	0.1	2.0
1972	1051.9	78.5	284.2	1.8	0.3	26.0
1973	1587.4	72.6	362.3	0.8	0.3	907.0
1974	1440.2	110.5	437.5	0.6	0.4	1403.0
1975	1686.5	86.6	398.0	0.5	0.5	734.0
1976	1886.4	123.4	373.0	1.7	0.2	529.0
1977	1867.8	100.7	324.2	0.4	0.3	
1978	1292.9	194.9	313.7	0.1	0.4	
1979	2003.2	230.7	448.1	0.1	0.5	
1980				0.5	0.3	
1981				2.4	0.3	
1982				3.1	0.2	
1983				28.0	0.2	
1984				26.0	0.2	
1985				2.9	0.2	
1986				3.0	0.3	

Table 3: Total mortality estimates for 2004-2014 period

	trawl*	fixed gear	recreational
2004	145	2	6
2005	76	3	6
2006	124.3	0	1.6
2007	125	4	8
2008	145	0	3
2009	314.8	0.6	2.1
2010	394.1	0.2	2.8
2011	325.3	0.7	5.0
2012	298.5	1.2	7.7
2013	397.2	0.9	7.3
2014**	316.9	0.9	6.7

Table 4: Total area swept biomass from NWFSC Trawl Survey (with CV and % positive)

Total Biomass (metric tons) in 55-400 m depth strata

	U.S./ Mexico Border to Point Conception	Point Conception to Cape Mendocino	Cape Mendocino to Cape Blanco	Cape Blanco to U.S./ Canada Border	Total South of Cape Blanco	Total Coastwide
2003	14401	91908	946	3	107256	107259
2004	537	73025	5441	1665	79003	80668
2005	6992	104165	6405	226	117562	117789
2006	279	63484	5686	713	69449	70162
2007	1070	44696	11456	4438	57222	61660
2008	555	27725	100	1010	28380	29390
2009	694	18054	143	896	18890	19786
2010	1763	7323	1824	27	10909	10936
2011	638	36241	4869	1083	41749	42832
2012	1195	34273	792	43	36260	36303
2013	1174	27968	12095	505	41237	41742
2014	12031	57475	4781	629	74287	74916

CV of Total Biomass (metric tons) in 55-400 m depth strata

	U.S./ Mexico Border to Point Conception	Point Conception to Cape Mendocino	Cape Mendocino to Cape Blanco	Cape Blanco to U.S./ Canada Border	Total South of Cape Blanco	Total Coastwide
2003	1.07	2.37	1.57	1.00	2.62	2.62
2004	1.87	2.61	1.79	1.06	2.81	2.86
2005	1.37	1.53	1.89	1.29	1.72	1.72
2006	2.40	2.08	2.06	1.44	2.27	2.29
2007	1.92	2.30	1.26	1.03	2.66	2.82
2008	2.72	2.95	2.32	1.00	3.02	3.11
2009	2.77	2.39	2.43	1.01	2.50	2.60
2010	2.70	3.63	1.03	1.70	3.95	3.96
2011	2.53	1.77	1.13	1.18	1.99	2.04
2012	2.67	2.55	1.43	1.60	2.69	2.70
2013	2.16	2.99	1.59	1.21	3.42	3.46
2014	1.14	1.29	1.61	1.06	1.61	1.63

Percentage of Positive Tows in 55-400 meter depth strata

	U.S./ Mexico Border to Point Conception	Point Conception to Cape Mendocino	Cape Mendocino to Cape Blanco	Cape Blanco to U.S./ Canada Border	Total South of Cape Blanco	Total Coastwide
2003	44%	65%	22%	1%	45%	26%
2004	33%	62%	34%	3%	48%	26%
2005	31%	52%	25%	3%	39%	22%
2006	16%	44%	29%	4%	33%	19%
2007	23%	41%	27%	2%	32%	17%
2008	40%	44%	18%	1%	38%	21%
2009	42%	38%	21%	1%	35%	20%
2010	46%	57%	20%	2%	45%	25%
2011	34%	44%	18%	4%	36%	21%
2012	44%	51%	21%	4%	42%	26%
2013	51%	76%	43%	3%	62%	33%
2014	53%	62%	49%	2%	57%	30%

Table 5: Tracking of likelihood components and key model outputs with sequential updates to modeling platform and model data

		2007 base model	2007 no time varying growth	2015.SS3 base model	2015.SS3 no time varying growth	2015 update catches	Update com age, length comps	Update rec length comps	Update rec length comps, add selectivity block
SSB0		33390	39879	37751	40582	37713.5	37717	41562	39907.9
R0		34490	41193	39022	41949	38983.7	38987	42962	41252
2015 depletion		0.68	0.62	0.57	0.54	0.57	0.59	0.80	0.59
Total	lambdas	1972.2	2067.1	1998.7	2091.1	1999.3	2106.7	2290.6	2159.9
Likelihood									
indices		43.6	54.2	44.6	58.4	45.9	47.2	40.5	43.8
length_comps		430.1	509.8	435.4	529.0	434.0	445.8	605.8	496.3
age_comps		1479	1484.4	1500.2	1485.2	1501.5	1593.4	1616.8	1598.9
Recruitment		19.5	18.7	18.5	18.5	17.9	20.3	27.5	20.9
Indices									
Fleet		surv_like							
trawl	1	9.9	9.2	9.5	9.3	9.3	9.5	11.5	10.2
triennial	1	8.7	8.7	9.1	8.7	9.7	10.7	7.1	8.9
combined	1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
juvenile	1	0.2	0.2	0.2	0.2	0.2	0.2	0.5	0.5
rec.CPUE	1	23.8	35.1	44.6	34.7	45.9	34.7	40.5	43.8
Length									
trawl	0.1	468.9	679.5	531.9	716.6	528.2	650.6	670.6	656.7
hook	0.1	171.9	170.4	173.7	171.1	173.0	176.1	180.5	177.7
setnet	0.1	228.7	173.8	157.8	163.3	158.4	158.0	159.8	157.5
recreational	1	126.1	111.9	117.4	115.0	117.6	117.0	267.6	162.9
triennial	1 (0.1)	146.4	186.2	158.7	191.4	157.8	157.6	162.9	160.6
combined	0.1	33.6	59.2	33.6	60.5	34.0	33.8	38.6	36.9
rec.CPUE	1	67.4	103.4	69.6	111.5	69.3	69.3	70.4	69.9
Age									
trawl	1	672.7	677	673.6	676.8	675.7	766.5	786.3	770.4
hook	1	266.1	272.6	267.5	270.8	267.4	267.5	266.6	267.7
setnet	1	531.9	526.1	550.7	528.7	550.1	551.8	556.0	553.2
triennial	1								
combined	1	8.2	8.7	8.4	8.9	8.3	7.6	8.0	7.5

Table 5 (continued): Tracking of likelihood components and key model outputs with sequential updates to modeling platform and model data

		Update rec length comps, add selectivity block	Update NWFSC survey index and LF, AF data	Update Triennial Age data	Update YOY rockfish index	Update size-dep fecundity relation	Update maturity relationship	Update aging error matrix	Extend 1999-2006 block to 2014
SSB0		39908	39223	41210	40772	7276980	7433470	6984200	6996180
R0		41252	40544	42598	42145	43381	44073	41410	41481
2015 depletion		0.59	0.75	0.67	0.58	0.55	0.57	0.63	0.63
Total Likelihood	lambdas	2159.9	2400.0	2320.2	2298.2	2313.1	2329.9	2695.2	2696.2
indices		43.8	52.7	48.6	80.4	78.4	78.3	80.7	80.7
length_comps		496.3	507.2	392.2	364.5	379.6	395.9	375.8	377.6
age_comps		1598.9	1817.3	1857.6	1828.7	1830.4	1830.8	2208.9	2208.1
Recruitment		20.9	22.8	21.8	24.5	24.7	24.8	29.8	29.8
Indices									
Fleet									
trawl	1	10.2	10.2	9.5	9.5	9.8	9.7	9.2	9.2
triennial	1	8.9	10.9	8.6	8.8	8.1	8.1	9.3	9.2
combined	1	1.0	6.3	6.6	6.4	6.5	6.4	6.4	6.5
juvenile	1	0.5	1.8	1.1	32.9	32.3	32.1	33.3	33.3
rec.CPUE	1	43.8	52.7	48.6	80.4	78.4	78.3	80.7	80.7
Length									
trawl	0.1	656.7	660.6	719.7	717.1	722.4	733.1	738.8	743.0
hook	0.1	177.7	177.7	182.2	181.8	182.9	183.3	186.1	186.5
setnet	0.1	157.5	157.6	150.8	150.9	150.9	150.1	151.9	151.8
recreational	1	162.9	159.9	175.9	150.0	162.8	178.1	150.6	150.8
triennial	1 (0.1)	160.6	159.0	186.9	175.2	179.8	180.1	182.4	187.3
combined	0.1	36.9	185.2	203.5	201.6	209.2	208.7	203.2	209.4
rec.CPUE	1	69.9	70.2	71.9	71.9	72.3	72.3	79.0	79.0
Age									
trawl	1	770.4	770.7	766.3	756.9	757.7	757.8	931.8	931.0
hook	1	267.7	267.5	266.7	266.7	266.8	266.9	281.1	281.1
setnet	1	553.2	553.4	550.1	550.0	550.5	550.0	672.5	672.5
triennial	1			43.2	43.3	43.2	43.2	42.6	42.6
combined	1	7.5	225.6	231.2	211.8	212.3	212.9	281.0	280.8

Table 5 (continued) Tracking of likelihood components and key model outputs with sequential updates to modeling platform and model data

		Extend 1999-2006 block to 2014	Set all lambdas to 0.5 when both AF and LF data (sense)	Retune all indices and comps (BASE MODEL)	Steep ness fixed at 0.34	Steep ness fixed at 0.81	Estimate steepness with 2015 prior	Retrospective (-2 years)	Retrospective (-5 years)
SSB0		6996180	6934760	7052870	9300090	6222560	8659690	7082750	6716950
R0		41481	41117	41817	55141	36894	51344	41994	39825
2015 depletion		0.63	0.57	0.64	0.32	0.79	0.38 (h=0.4)	0.68	0.51
Total Likelihood	lambdas	2696.2	2111.2	1657.6	1656.9	1659.4	1657.1	1531.6	1435.1
indices		80.7	75.6	50.6	47.6	51.9	48.9	44.3	43.1
length_comps		377.6	860.6	387.2	391.4	387.3	387.9	357.5	326.8
age_comps		2208.1	1152.0	1195.0	1190.7	1195.5	1194.1	1106.4	1044.1
Recruitment		29.8	23.0	24.8	27.2	24.7	26.2	23.3	21.0
Indices									
Fleet									
trawl	1	9.2	10.3	8.5	9.3	8.2	9.1	8.4	8.0
triennial	1	9.2	8.9	9.3	7.4	10.0	7.9	8.9	9.6
combined	1	6.5	6.4	5.9	6.0	5.9	6.2	5.4	4.9
juvenile	1	33.3	31.1	8.7	9.3	8.8	9.3	3.6	1.4
rec.CPUE	1	80.7	75.6	50.6	47.6	51.9	48.9	44.3	43.1
Length									
trawl	0.1	743.0	626.0	708.6	719.1	703.0	716.4	689.0	668.3
hook	0.1	186.5	167.4	182.7	184.8	182.3	184.0	182.8	182.0
setnet	0.1	151.8	163.7	148.7	155.5	156.2	148.3	155.7	156.1
recreational	1	150.8	155.3	151.0	152.8	151.5	152.2	141.5	128.3
triennial	1 (0.1)	187.3	151.2	174.9	177.1	174.0	176.6	173.6	172.0
combined	0.1	209.4	163.7	488.8	479.9	488.4	465.0	301.0	151.8
rec.CPUE	1	79.0	69.3	65.8	67.0	65.4	66.6	65.8	65.5
Age									
trawl	1	931.0	970.1	657.4	653.8	658.6	654.3	639.4	619.6
hook	1	281.1	285.1	53.3	53.4	53.2	53.4	53.2	53.1
setnet	1	672.5	703.0	166.6	166.5	166.0	166.8	166.0	165.6
triennial	1	42.6	41.7	43.1	42.5	43.2	42.7	42.1	41.7
combined	1	280.8	304.1	274.5	274.5	274.5	276.9	205.6	164.0

Table 6: Comparison of 2007 base model and 2015 update parameter values for estimated (or key fixed) parameters

Parameter	2007	2015	% change	parameter	2007	2015	% change
ln R0	10.45	10.64	2%	1965 rec dev	-0.50	0.31	-161%
K (1970-1979)	0.32	0.17	-47%	1966 rec dev	-0.93	0.21	-122%
K (1980-1988)	0.25	0.24	-1%	1967 rec dev	0.89	0.75	-16%
K (1989-1991)	0.23	0.22	-4%	1968 rec dev	1.05	0.96	-9%
K (1992-1998)	0.20	0.19	-8%	1969 rec dev	-0.89	0.68	-176%
K (1999-2006)	0.26	0.22	-15%	1970 rec dev	1.17	0.87	-26%
Trawl sel inflection	32.65	32.865	1%	1971 rec dev	0.60	-0.27	-146%
Trawl sel width 95% inflection	8.46	8.10	-4%	1972 rec dev	-1.66	-0.37	-77%
Hook sel inflection	37.27	36.23	-3%	1973 rec dev	1.47	1.54	4%
Hook sel width 95% inflection	7.20	6.46	-10%	1974 rec dev	-1.04	-0.66	-36%
Setnet sel peak	59.43	51.00	-14%	1975 rec dev	1.40	1.29	-8%
Setnet sel top	-2.19	-2.19	0%	1976 rec dev	-0.20	-1.28	544%
Setnet sel asc-width	4.99	4.40	-12%	1977 rec dev	-0.27	-0.72	169%
Setnet sel desc-width	1.98	4.24	114%	1978 rec dev	-0.42	-0.21	-50%
Setnet sel init	-44.77	-12.31	-72%	1979 rec dev	0.87	0.80	-7%
Setnet sel final	-13.05	-20.50	57%	1980 rec dev	-0.38	-0.68	81%
Rec sel peak	41.25	41.10	0%	1981 rec dev	-0.78	-1.14	45%
Rec sel top	-15.76	-11.21	-29%	1982 rec dev	-1.78	-2.28	28%
Rec sel asc-width	4.92	4.87	-1%	1983 rec dev	-1.54	-0.82	-47%
Rec sel desc-width	2.59	3.05	18%	1984 rec dev	1.95	1.97	1%
Rec sel init	-8.25	-8.53	3%	1985 rec dev	-0.74	-1.12	52%
Rec sel final	-0.64	-0.26	-60%	1986 rec dev	0.57	0.43	-25%
Triennial sel size inflect (fixed)	*15.70*	*15.70*	0%	1987 rec dev	0.39	0.19	-51%
width 95% inflect (fixed)	*0.00*	*0.00*	0%	1988 rec dev	0.71	0.71	-1%
Combo sel size inflect	13.34	13.40	0%	1989 rec dev	0.78	0.72	-8%
Combo sel width 95% inflect	12.88	13.13	2%	1990 rec dev	0.02	-0.10	-562%
Rec CPUE sel peak	39.34	38.71	-2%	1991 rec dev	0.57	0.25	-56%
Rec CPUE sel top	-6.00	-4.93	-18%	1992 rec dev	-0.37	-0.18	-50%
Rec CPUE sel asc-width	3.76	3.69	-2%	1993 rec dev	0.97	0.83	-14%
Rec CPUE sel desc-width	3.45	3.37	-2%	1994 rec dev	-0.15	-0.48	221%
Rec CPUEsel init	-7.66	-7.50	-2%	1995 rec dev	0.04	-0.57	-1385%
Rec CPUE sel final	-1.32	-0.95	-28%	1996 rec dev	-0.78	-0.59	-24%
Rec CPUE age sel peak	1.11	1.11	0%	1997 rec dev	-0.63	-0.93	49%
Rec CPUE age sel top	-60.00	-59.90	0%	1998 rec dev	-0.09	0.85	-1000%
Rec CPUE age sel asc-width	-24.80	-24.80	0%	1999 rec dev	2.42	2.67	10%
Rec CPUE age sel desc-width	-0.12	-0.12	-3%	2000 rec dev	-1.32	-1.22	-8%
Rec CPUE age sel init	-33.55	-33.50	0%	2001 rec dev	0.06	-0.05	-184%
Rec CPUE age sel final	-4.11	-4.11	0%	2002 rec dev	0.40	-0.27	-167%
Rec sel peak - block offset		-0.59		2003 rec dev	-0.23	0.20	-187%
Rec sel top - block offset		-0.02		2004 rec dev	0.33	-1.35	-507%
Rec sel asc-width - block offset		-1.29		2005 rec dev	-0.91	-1.79	96%
Rec sel desc-width - block offset		-0.13		2006 rec dev	-1.07	-1.61	51%
Rec sel init - block offset		-1.17		2007 rec dev		-0.47	
Rec sel final - block offset		1.99		2008 rec dev		-0.59	
				2009 rec dev		1.35	
				2010 rec dev		1.00	
				2011 rec dev		-0.47	
				2012 rec dev		-0.22	
				2013 rec dev		0.75	
				2014 rec dev		1.12	

Table 7: Summary results from base model

	Larval Output (millions larvae)	Std dev larval Output	Summary Biomass (age 1+)	Recruits (1000s)	Recruits StdDev	SPR	Exploitation rate	Depletion	Total Catch
Virgin	7042	436	50416	41750	2585		0	1	0
Initial	7042	436	50492	41750	2585		0	1	0
1892	7042	436	50570	41750	2585	0.958	0.004	1	217
1893	7007	436	50657	41712	2585	0.960	0.004	0.9951	205
1894	6978	436	50717	41678	2586	0.962	0.003	0.9909	193
1895	6953	436	50793	41650	2586	0.965	0.003	0.9873	180
1896	6932	436	50855	41626	2586	0.966	0.003	0.9844	171
1897	6915	436	50933	41607	2586	0.968	0.003	0.982	160
1898	6902	436	50823	41592	2586	0.970	0.002	0.9801	151
1899	6891	436	50721	41579	2586	0.972	0.002	0.9786	140
1900	6884	436	50603	41570	2586	0.969	0.003	0.9775	155
1901	6874	436	50493	41560	2586	0.966	0.003	0.9762	169
1902	6864	436	50383	41547	2586	0.963	0.003	0.9747	185
1903	6852	436	50280	41533	2586	0.960	0.003	0.9729	200
1904	6838	436	50169	41517	2586	0.957	0.004	0.971	215
1905	6823	436	50058	41500	2586	0.955	0.004	0.969	229
1906	6808	436	49947	41482	2586	0.952	0.004	0.9668	244
1907	6792	436	49710	41462	2586	0.949	0.005	0.9644	259
1908	6774	436	49459	41442	2586	0.946	0.005	0.962	274
1909	6756	436	49208	41420	2586	0.940	0.006	0.9594	307
1910	6735	436	48963	41395	2586	0.933	0.006	0.9564	342
1911	6710	436	48719	41364	2586	0.926	0.007	0.9528	377
1912	6681	436	48473	41330	2587	0.920	0.008	0.9488	411
1913	6650	436	48220	41292	2587	0.913	0.009	0.9444	445
1914	6617	436	46853	41251	2587	0.907	0.01	0.9396	479
1915	6581	436	44329	41207	2587	0.900	0.011	0.9346	514
1916	6543	436	44042	41159	2588	0.864	0.016	0.9292	724
1917	6476	436	46376	41074	2589	0.798	0.024	0.9196	1149
1918	6347	436	46091	40907	2590	0.790	0.025	0.9014	1176
1919	6226	436	46833	40744	2592	0.851	0.016	0.8841	759
1920	6181	436	47174	40682	2593	0.844	0.016	0.8778	798
1921	6136	436	46265	40620	2594	0.863	0.014	0.8713	678
1922	6114	436	46120	40589	2594	0.872	0.013	0.8682	625
1923	6103	436	45472	40573	2595	0.848	0.016	0.8666	761
1924	6071	437	43574	40529	2596	0.844	0.017	0.8621	780
1925	6039	437	44454	40483	2597	0.827	0.019	0.8576	878
1926	5994	437	44481	40418	2598	0.778	0.026	0.8512	1189
1927	5904	437	44600	40286	2600	0.801	0.022	0.8384	1017
1928	5849	437	43799	40204	2602	0.802	0.022	0.8305	1000
1929	5801	437	43328	40132	2604	0.806	0.022	0.8238	971
1930	5763	437	45300	40074	2605	0.785	0.024	0.8184	1095
1931	5709	437	46471	39990	2607	0.772	0.025	0.8107	1165
1932	5648	438	46205	39893	2610	0.824	0.018	0.802	836
1933	5643	438	45878	39886	2610	0.855	0.014	0.8014	663
1934	5667	438	47202	39924	2610	0.848	0.014	0.8048	704
1935	5683	438	47578	39949	2610	0.840	0.015	0.807	754
1936	5689	439	47859	39958	2610	0.875	0.011	0.8078	568
1937	5722	439	47469	40011	2609	0.885	0.01	0.8126	519
1938	5761	439	47870	40071	2608	0.892	0.01	0.8181	487
1939	5801	439	48365	40131	2607	0.882	0.011	0.8237	543

Table 7 (continued): Summary results from base model

	Spawning Output (millions larvae)	Std dev Spawning Output	Summary Biomass (age 1+)	Recruitment	Recruits StdDev	SPR	Exploitation rate	Depletion	Total Catch
1940	5828	440	50421	40173	2607	0.892	0.009	0.8276	492
1941	5860	440	48755	40221	2606	0.905	0.008	0.8321	430
1942	5898	440	43724	40278	2605	0.959	0.004	0.8376	178
1943	5973	440	37426	40387	2603	0.917	0.01	0.8481	381
1944	6011	440	39504	40442	2602	0.791	0.027	0.8536	1101
1945	5938	440	41817	40337	2604	0.636	0.054	0.8433	2283
1946	5693	440	43725	39964	2612	0.687	0.04	0.8084	1759
1947	5542	440	42838	39724	2618	0.742	0.03	0.787	1316
1948	5469	440	40752	39602	2621	0.789	0.024	0.7766	1008
1949	5449	440	39110	39568	2622	0.767	0.028	0.7737	1132
1950	5415	440	41987	39512	2624	0.715	0.034	0.7689	1464
1951	5335	440	40536	39375	2628	0.675	0.042	0.7576	1733
1952	5221	440	40753	39174	2635	0.747	0.029	0.7414	1206
1953	5195	440	36834	39127	2637	0.712	0.038	0.7377	1427
1954	5139	441	38907	39026	2641	0.717	0.035	0.7298	1378
1955	5094	441	36135	38943	2645	0.622	0.057	0.7234	2063
1956	4952	441	36652	38673	2656	0.673	0.044	0.7032	1620
1957	4884	442	38221	38540	2662	0.606	0.055	0.6936	2106
1958	4751	442	37705	38271	2675	0.618	0.051	0.6747	1953
1959	4649	442	41748	38057	2686	0.656	0.039	0.6602	1635
1960	4601	443	42239	37954	2693	0.642	0.04	0.6534	1713
1961	4545	444	37670	37831	2701	0.740	0.028	0.6454	1082
1962	4585	445	39351	37918	2699	0.752	0.026	0.651	1028
1963	4631	446	38836	38017	2696	0.640	0.044	0.6575	1740
1964	4570	447	33238	37885	2705	0.681	0.043	0.6489	1437
1965	4555	448	30446	31277	24614	0.669	0.049	0.6468	1511
1966	4528	446	35770	28199	24206	0.538	0.07	0.643	2529
1967	4355	443	41711	48077	46052	0.474	0.073	0.6184	3082
1968	4105	425	40275	58090	54276	0.599	0.045	0.5829	1818
1969	4034	405	41239	43747	43933	0.744	0.023	0.5728	960
1970	4106	385	38150	53316	30852	0.709	0.03	0.5831	1163
1971	4151	336	30660	17028	12411	0.740	0.033	0.5895	1015
1972	4241	284	28587	15496	10920	0.669	0.05	0.6023	1441
1973	4294	236	29683	105370	12649	0.493	0.098	0.6097	2929
1974	4136	198	29114	11557	7556	0.447	0.116	0.5873	3391
1975	3838	175	31433	79699	7616	0.474	0.092	0.545	2907
1976	3713	162	34057	6012	3401	0.461	0.085	0.5272	2912
1977	3597	163	29988	10430	3745	0.518	0.076	0.5108	2293
1978	3619	174	28206	17387	4187	0.581	0.064	0.5139	1827
1979	3670	188	30199	48262	4655	0.483	0.09	0.5211	2736
1980	3514	192	31747	10741	3367	0.443	0.098	0.499	3141
1981	3373	160	32423	6740	1947	0.470	0.086	0.4789	2800
1982	3257	138	29678	2128	936	0.489	0.084	0.4625	2521
1983	3127	124	27980	8984	2324	0.491	0.088	0.444	2469
1984	2907	115	27090	143640	6369	0.428	0.108	0.4128	2934
1985	2577	108	29770	6242	2191	0.384	0.108	0.3659	3217
1986	2130	101	27093	27075	3429	0.358	0.116	0.3025	3157
1987	2048	101	25932	20952	4296	0.414	0.079	0.2907	2065
1988	2304	107	26630	37017	5838	0.362	0.104	0.3272	2790
1989	2433	115	25473	38196	5337	0.337	0.134	0.3455	3438

Table 7 (continued): Summary results from base model

	Spawning Output (millions larvae)	Std dev Spawning Output	Summary Biomass (age 1+)	Recruitment (1000s)	Recruits StdDev	SPR	Exploitation rate	Depletion	Total Catch
1990	2333	117	27173	16655	3701	0.354	0.116	0.3313	3156
1991	2231	125	27505	23070	4061	0.332	0.121	0.3168	3347
1992	2110	138	29290	14635	4133	0.360	0.094	0.2996	2774
1993	1963	138	27795	39059	6501	0.376	0.086	0.2787	2412
1994	1856	143	27932	10286	3228	0.426	0.067	0.2635	1891
1995	1793	149	26111	9264	3209	0.401	0.077	0.2546	2034
1996	1724	159	29892	8863	3127	0.410	0.062	0.2448	1880
1997	1665	171	33758	6210	2480	0.372	0.062	0.2364	2116
1998	1534	181	38995	35286	10185	0.458	0.036	0.2178	1435
1999	1464	190	41751	212635	32838	0.554	0.023	0.2079	978
2000	1527	210	47233	4454	2384	0.666	0.013	0.2168	632
2001	1638	232	53862	14793	4258	0.721	0.009	0.2326	518
2002	2233	320	52601	13761	3846	0.841	0.006	0.3171	320
2003	3024	441	53662	24707	5088	0.992	0.000	0.4293	21
2004	3713	542	53502	5639	1892	0.955	0.002	0.5273	153
2005	4177	612	53433	3745	1382	0.978	0.001	0.5931	85
2006	4484	656	53414	4566	1590	0.969	0.002	0.6367	126
2007	4621	676	51654	14433	3422	0.966	0.002	0.6561	137
2008	4601	672	50607	12824	3493	0.963	0.002	0.6534	148
2009	4459	650	51073	88159	16180	0.921	0.006	0.6331	318
2010	4259	623	50379	61167	12805	0.896	0.007	0.6048	397
2011	4041	595	48390	13824	4406	0.905	0.006	0.5738	331
2012	4000	591	48726	17857	5652	0.905	0.006	0.568	307
2013	4163	619	35349	47280	14884	0.869	0.011	0.5911	405
2014	4351	658	35168	69631	53638	0.888	0.009	0.6178	325
2015	*4502*	*689*	*35039*	*37736*	*37857*				
2016	*4298*	*658*	*34950*	*37264*	*37387*				
2017	*4197*	*645*	*34886*	*37017*	*37144*				
2018	*4165*	*678*	*34840*	*36938*	*37072*				
2019	*4148*	*751*	*34817*	*36895*	*37040*				
2020	*4120*	*835*	*34802*	*36825*	*36982*				
2021	*4078*	*915*	*34793*	*36719*	*36889*				
2022	*4028*	*990*	*34786*	*36587*	*36771*				
2023	*3973*	*1059*	*34784*	*36441*	*36640*				
2024	*3917*	*1123*	*34783*	*36291*	*36507*				
2025	*3864*	*1182*	*34781*	*36145*	*36379*				
2026	*3815*	*1235*	*34780*	*36007*	*36258*				

Table 8: Base model reference points

	Estimate	St.Dev	Lower ~95% CL	Upper ~95% CL
SSB_Unfished (millions larvae)	7041	436	6605	7477
SmryBio_Unfished	54491	3375	51116	57866
Recr_Unfished	41750	2585	39165	44335

	Yield	Depletion	SSB	SPR	F
Btarget	2133	0.400	2816	0.485	0.082
SPR target	2113	0.420	2958	0.500	0.077
MSY	2165	0.339	2390	0.438	0.095

Table 9: Forecast catches

	ACL catches	OFL catches
2015	1758	1833
2016	1749	1824
2017	2803	2932
2018	2707	2820
2019	2671	2773
2020	2635	2727
2021	2583	2666
2022	2521	2595
2023	2457	2525
2024	2397	2458
2025	2343	2399
2026	2294	2346

Table 10: Decision table, with the 2007 steepness point estimate (base) and +/- standard deviation (low and high productivity) as states of nature, and catch streams based on status quo (average of past five years), revised ACL and OFL catch limits from the base (2015) assessment.

Year	Status quo catches	State 1 (h=0.34)	Base (h=0.57)	State 2 (h=0.81)
2015	346	0.32	0.64	0.79
2016	346	0.32	0.65	0.80
2017	346	0.33	0.67	0.83
2018	346	0.33	0.70	0.86
2019	346	0.34	0.73	0.88
2020	346	0.35	0.75	0.90
2021	346	0.36	0.77	0.92
2022	346	0.37	0.79	0.93
2023	346	0.38	0.80	0.93
2024	346	0.39	0.81	0.94
2025	346	0.40	0.82	0.94
2026	346	0.41	0.83	0.94
	ACL catches	State 1	Base	State 2
2015	1758	0.32	0.64	0.79
2016	1749	0.30	0.62	0.77
2017	2803	0.28	0.62	0.76
2018	2707	0.26	0.60	0.74
2019	2671	0.23	0.58	0.72
2020	2635	0.21	0.57	0.7
2021	2583	0.19	0.55	0.68
2022	2521	0.18	0.54	0.65
2023	2457	0.16	0.52	0.63
2024	2397	0.15	0.51	0.61
2025	2343	0.13	0.50	0.59
2026	2294	0.11	0.49	0.58
	OFL catches	State 1	Base	State 2
2015	1758	0.32	0.64	0.79
2016	1749	0.30	0.62	0.77
2017	2932	0.29	0.62	0.76
2018	2820	0.26	0.59	0.74
2019	2773	0.23	0.58	0.71
2020	2727	0.21	0.56	0.69
2021	2666	0.19	0.54	0.66
2022	2595	0.17	0.53	0.64
2023	2525	0.16	0.51	0.62
2024	2458	0.14	0.50	0.60
2025	2399	0.12	0.49	0.58
2026	2346	0.11	0.48	0.56

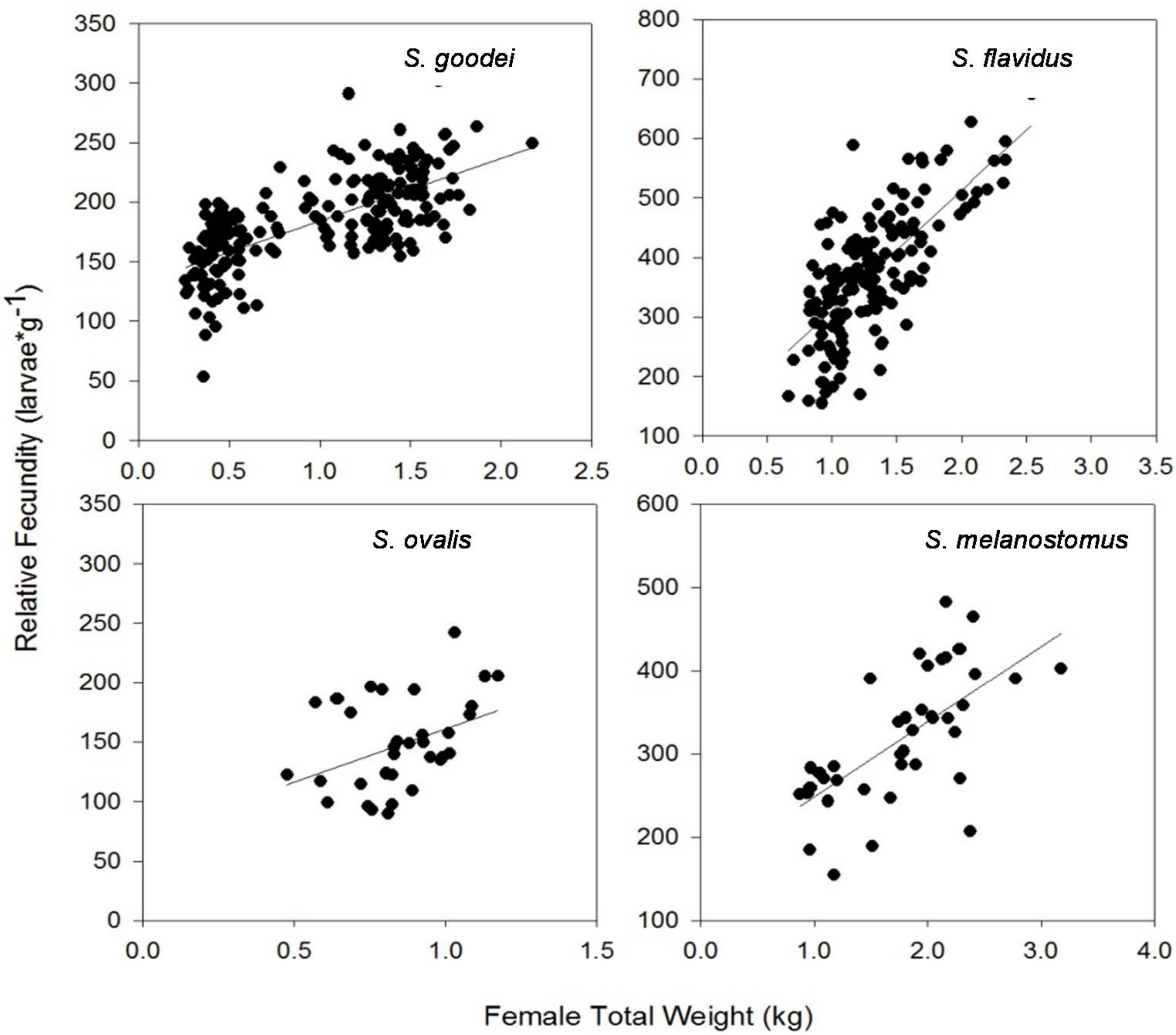


Fig. 1 Increase in relative fecundity (Φrel) with maternal size (W; kg) for Chilipepper (a), Yellowtail rockfish (b), Speckled rockfish (c), and Blackgill rockfish (d), taken from Beyer et al. (2015). Other species are shown solely for comparative purposes.

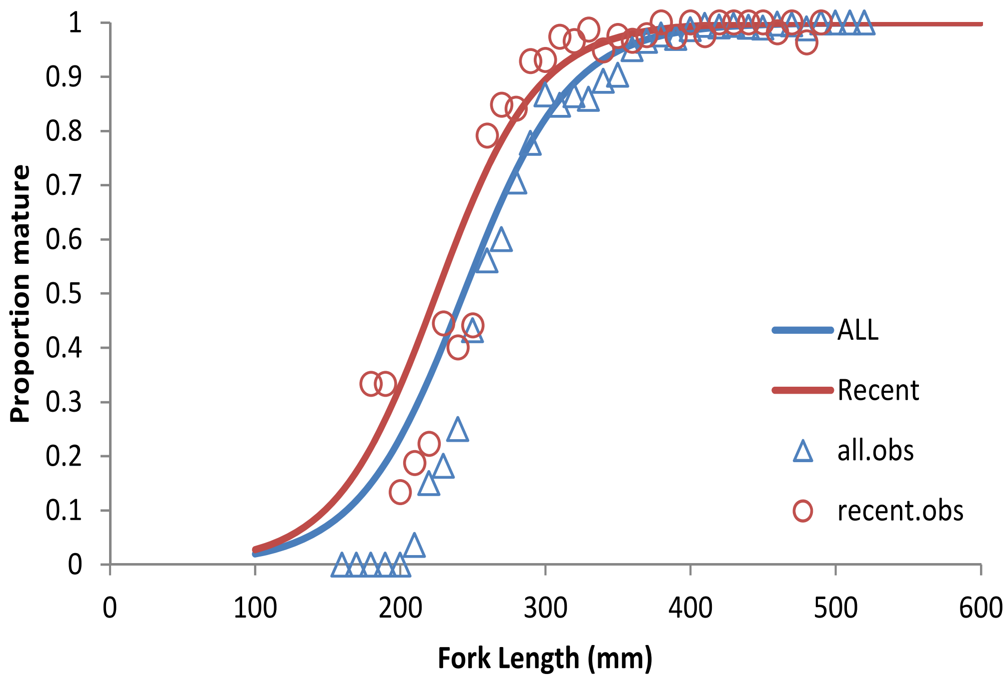


Figure 2: Re-estimated maturity curve for female Chilipepper Rockfsih

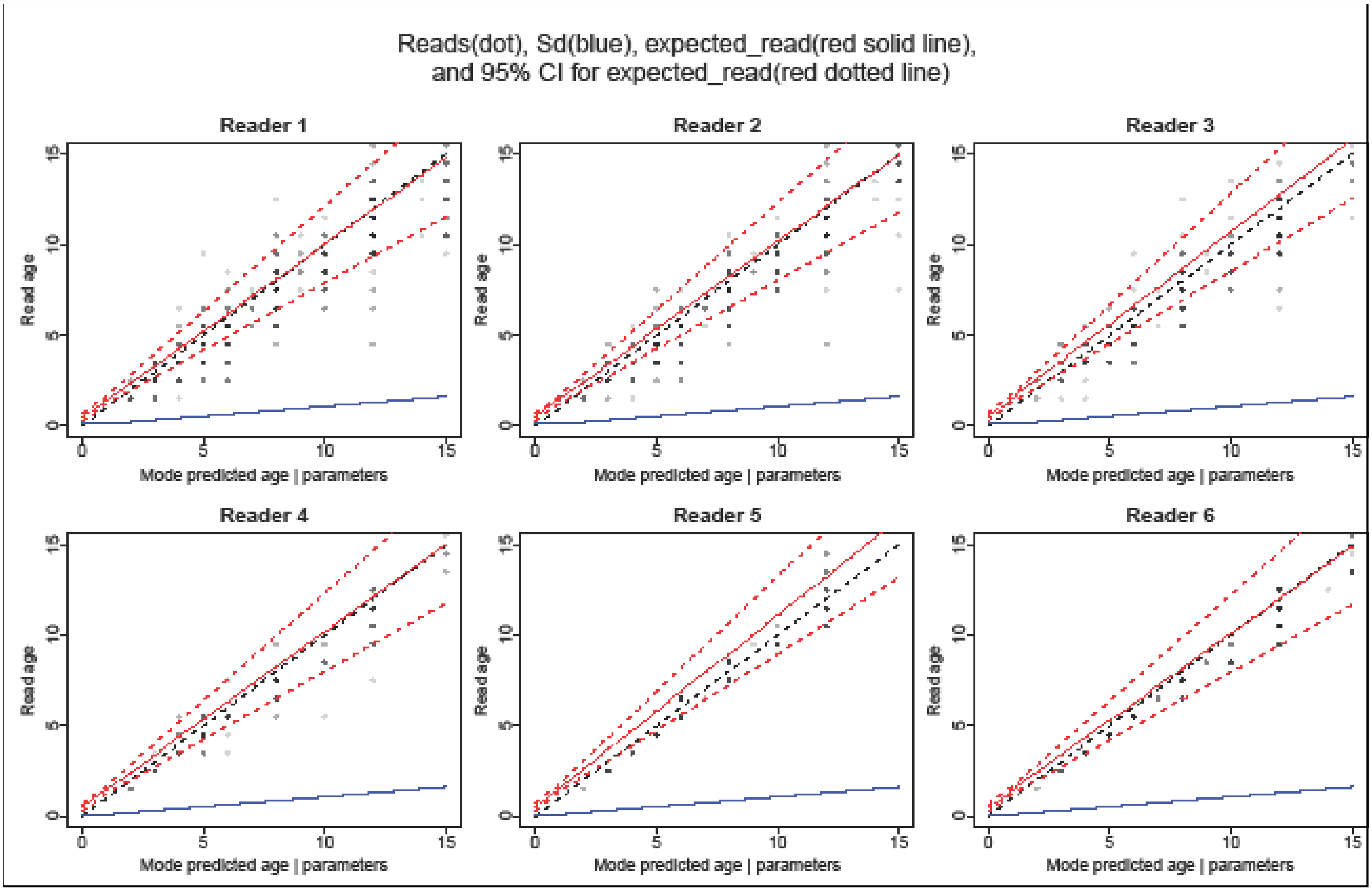
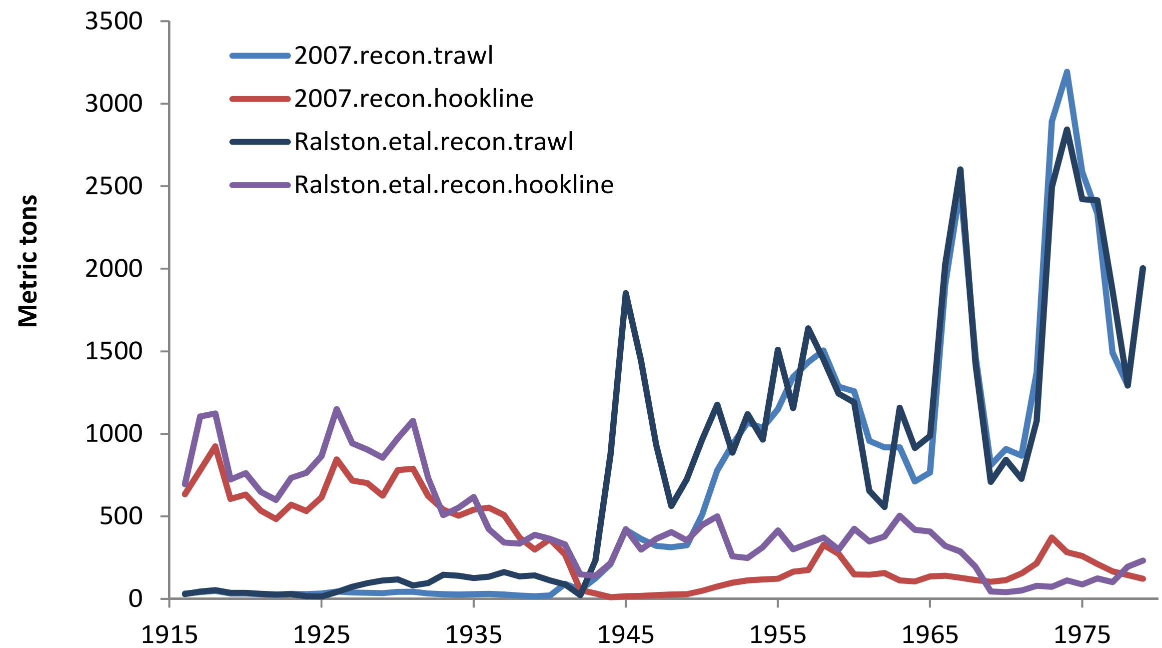


Figure 3: Diagnostics from age error analysis.



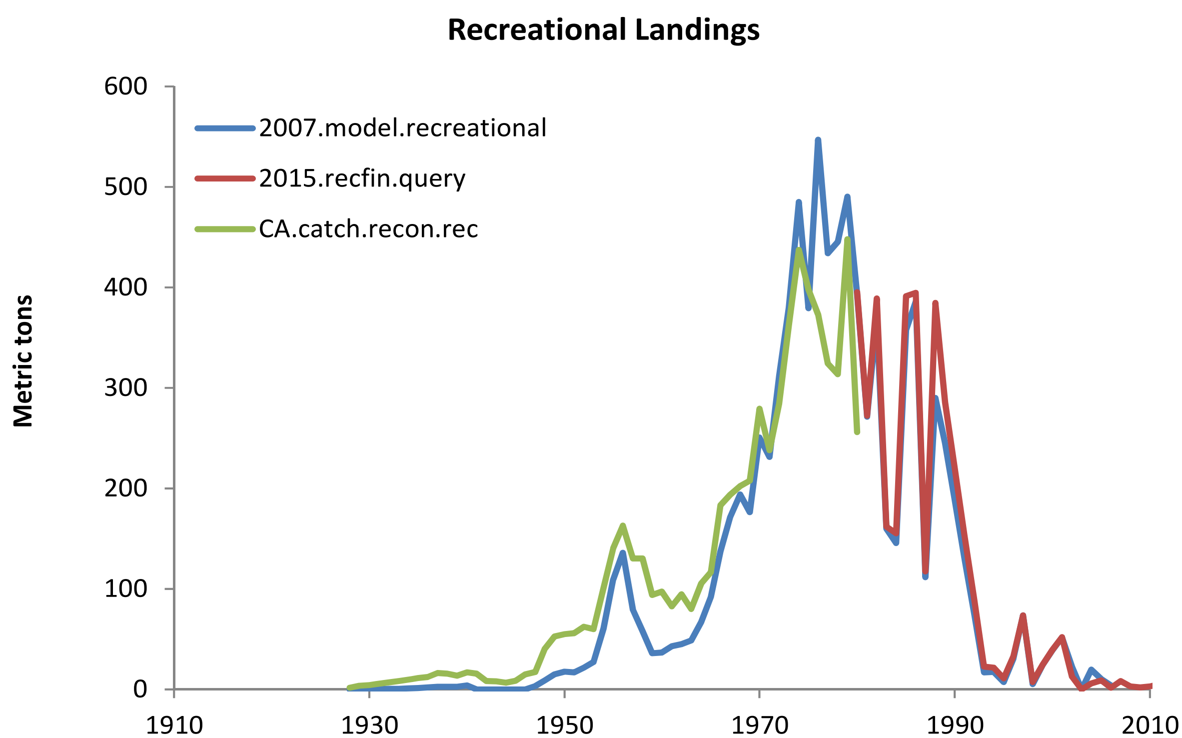


Figure 4a (top) and b (bottom): 2007 and 2015 catch estimates for commercial (top) and recreational (bottom) fisheries. .

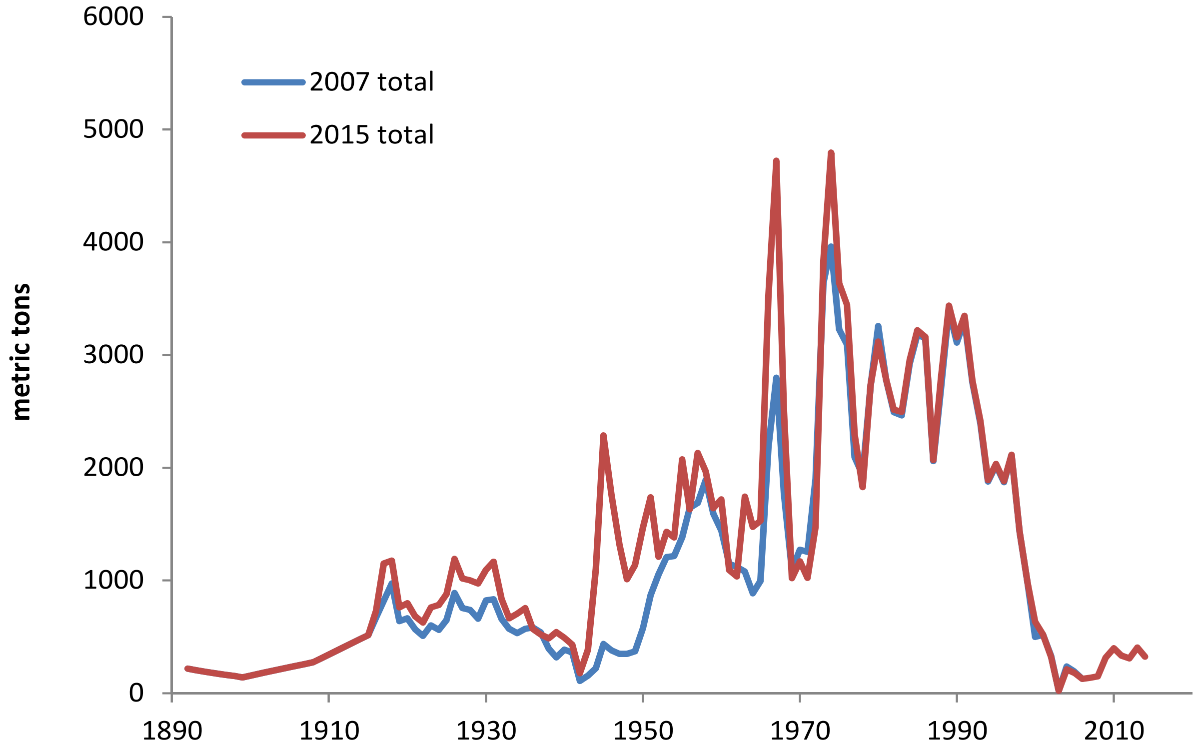


Figure 5: Changes in total catch estimates between the 2007 and 2015 model

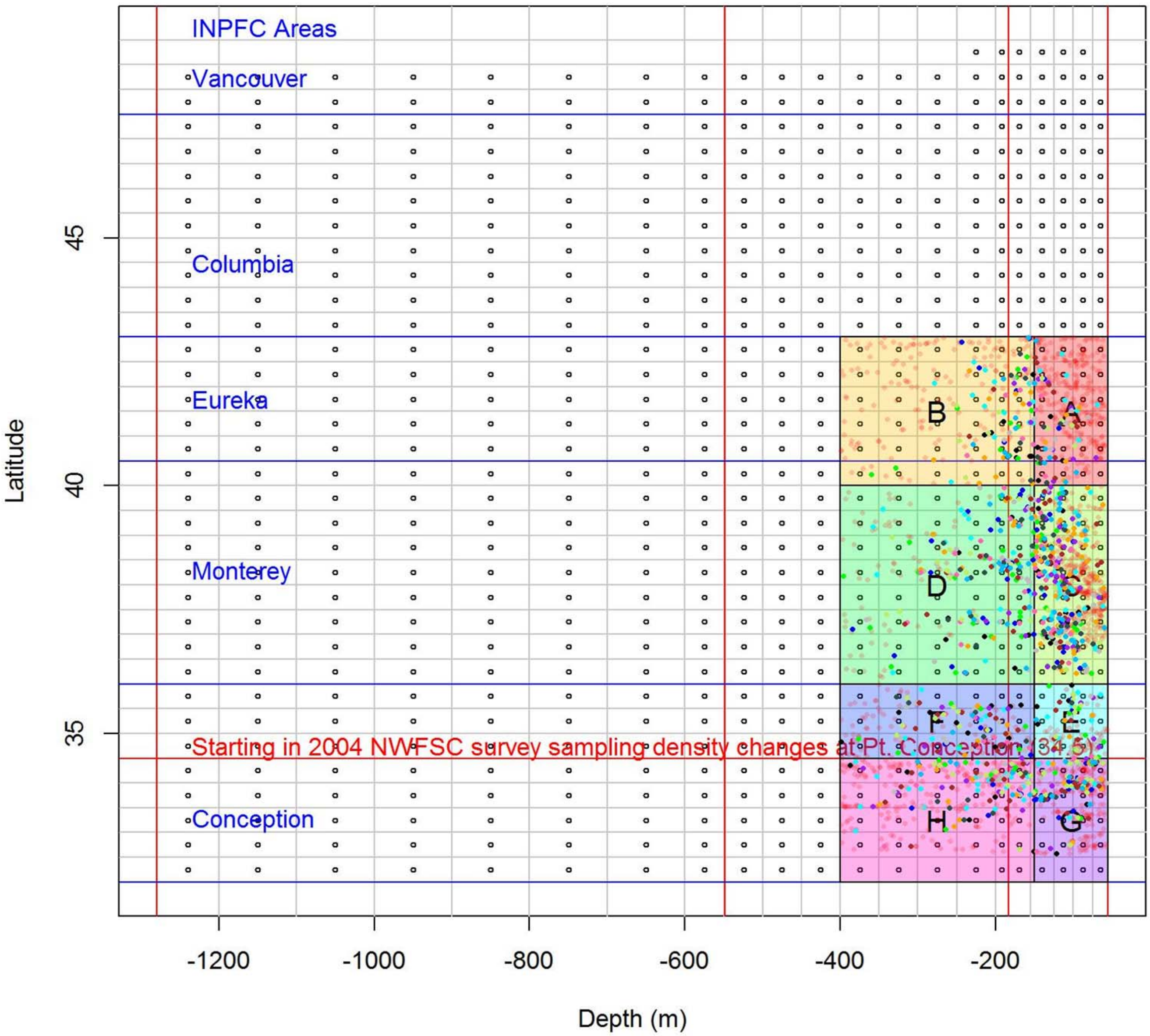


Figure 6: Depth and latitude stratification for the NWFSC Combined Trawl survey Delta-GLM model.

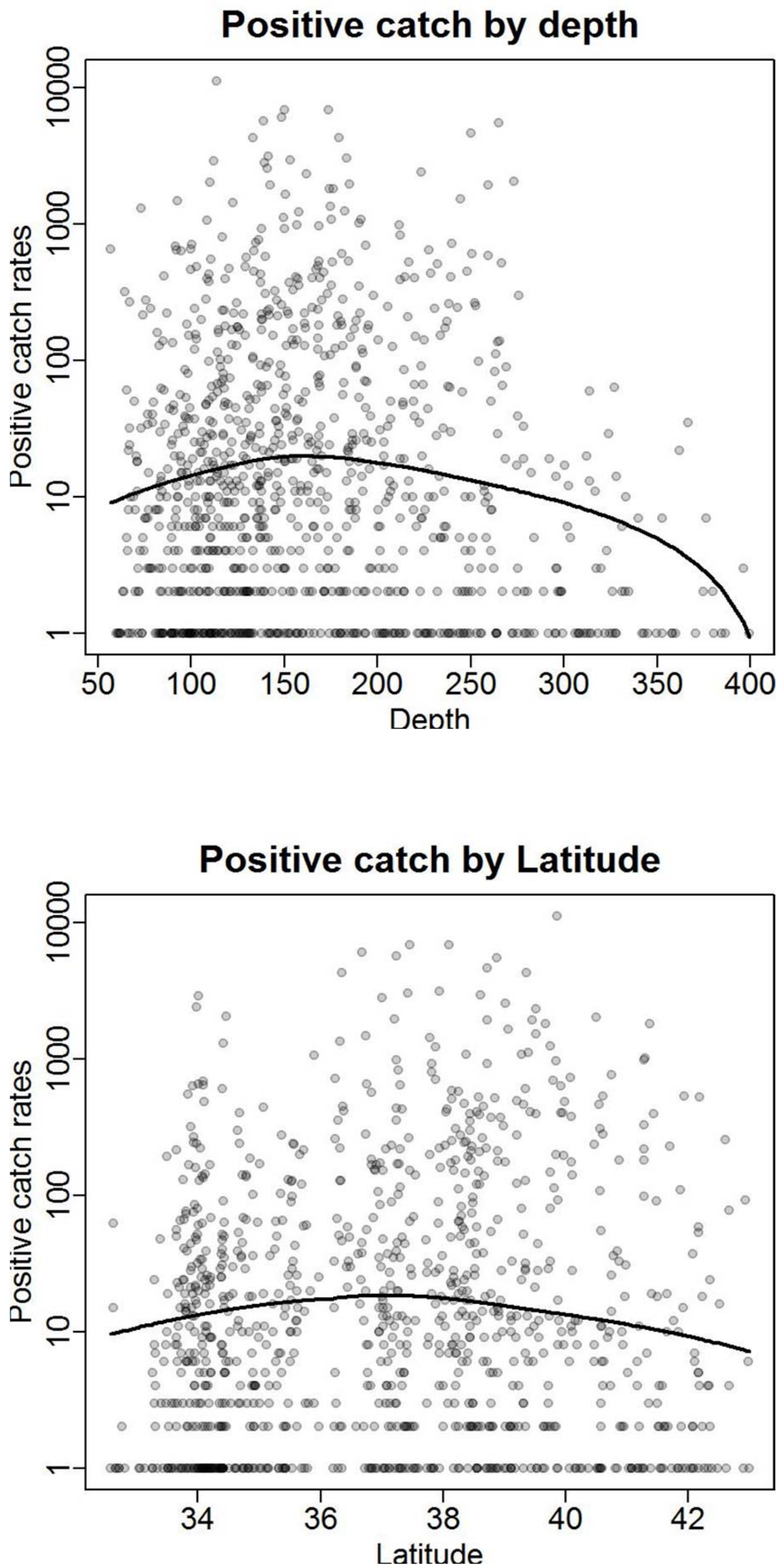


Figure 7a (top) and b (bottom): Catches (log scale) of Chilipepper rockfish by depth and latitude (from within the stratification boundaries).

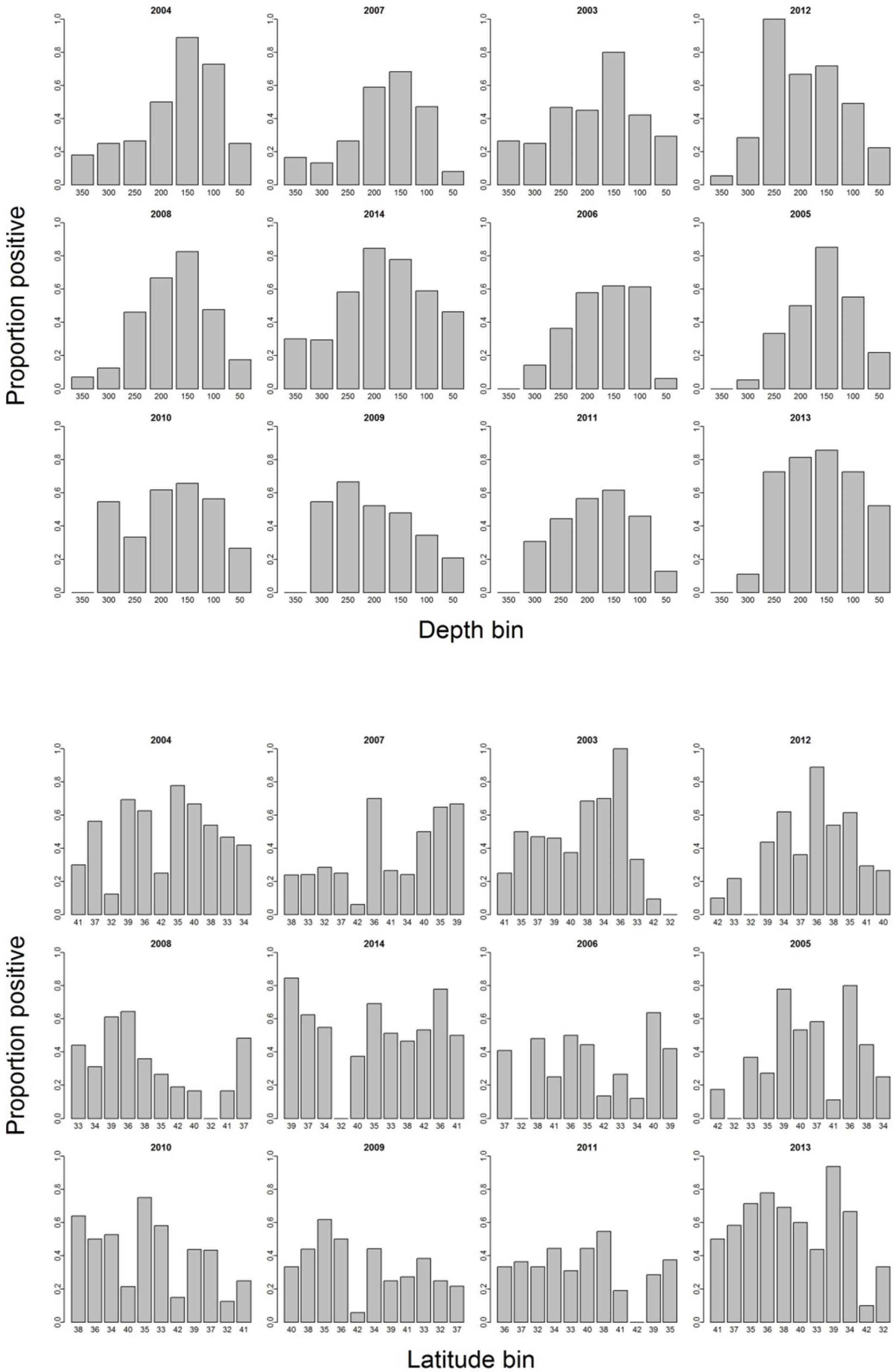


Figure 8a (top) and b (bottom): Proportion of positive tows (within stratification boundaries) for Chilipepper Rockfish by year and depth, and year and latitude, from the Combined NWFSC trawl survey

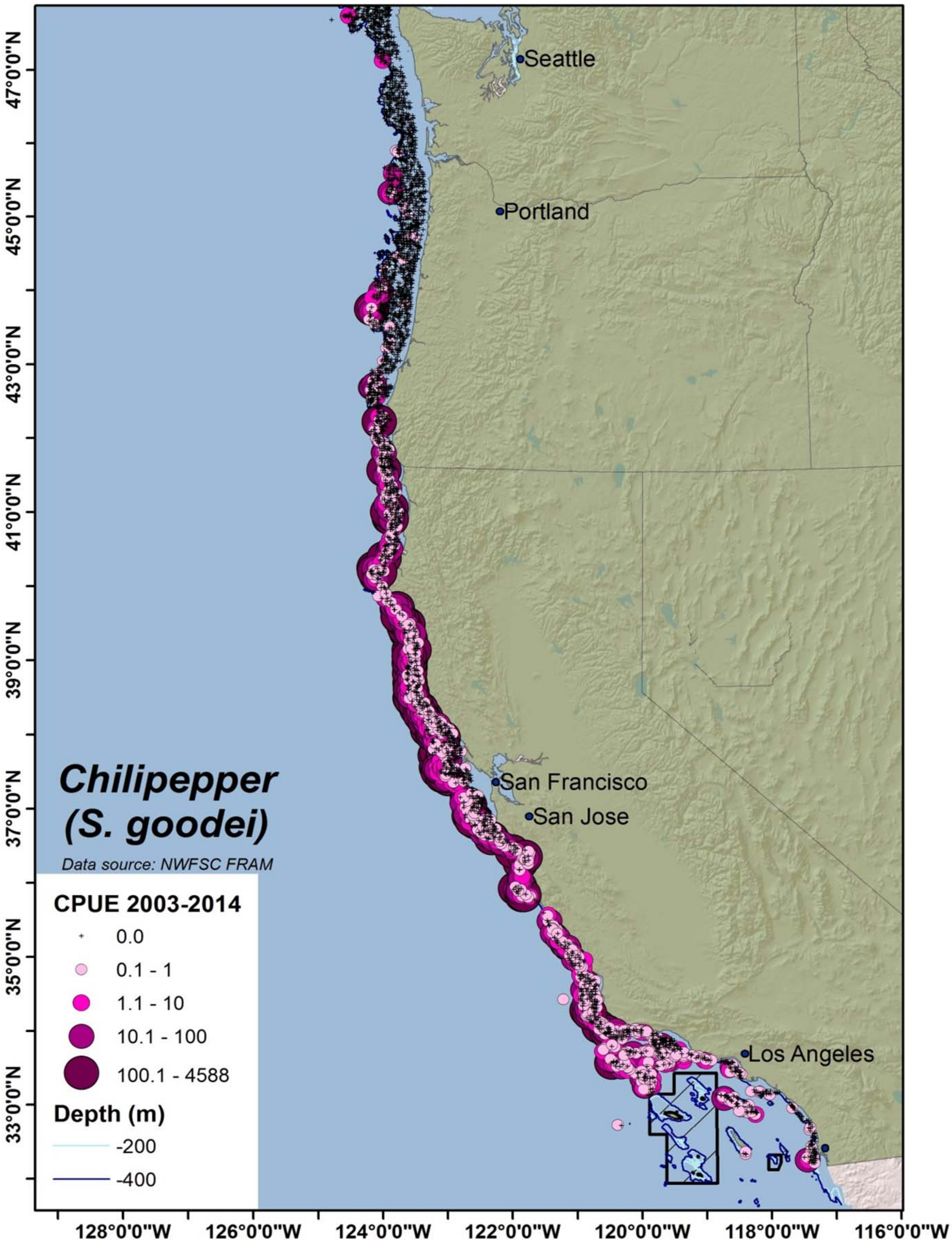


Figure 9: Coatwide view of catch rates of Chilipepper rockfish from the NWFSC combined trawl survey (within depth stratification used in Delta-GLOM, of 55-400 meters).

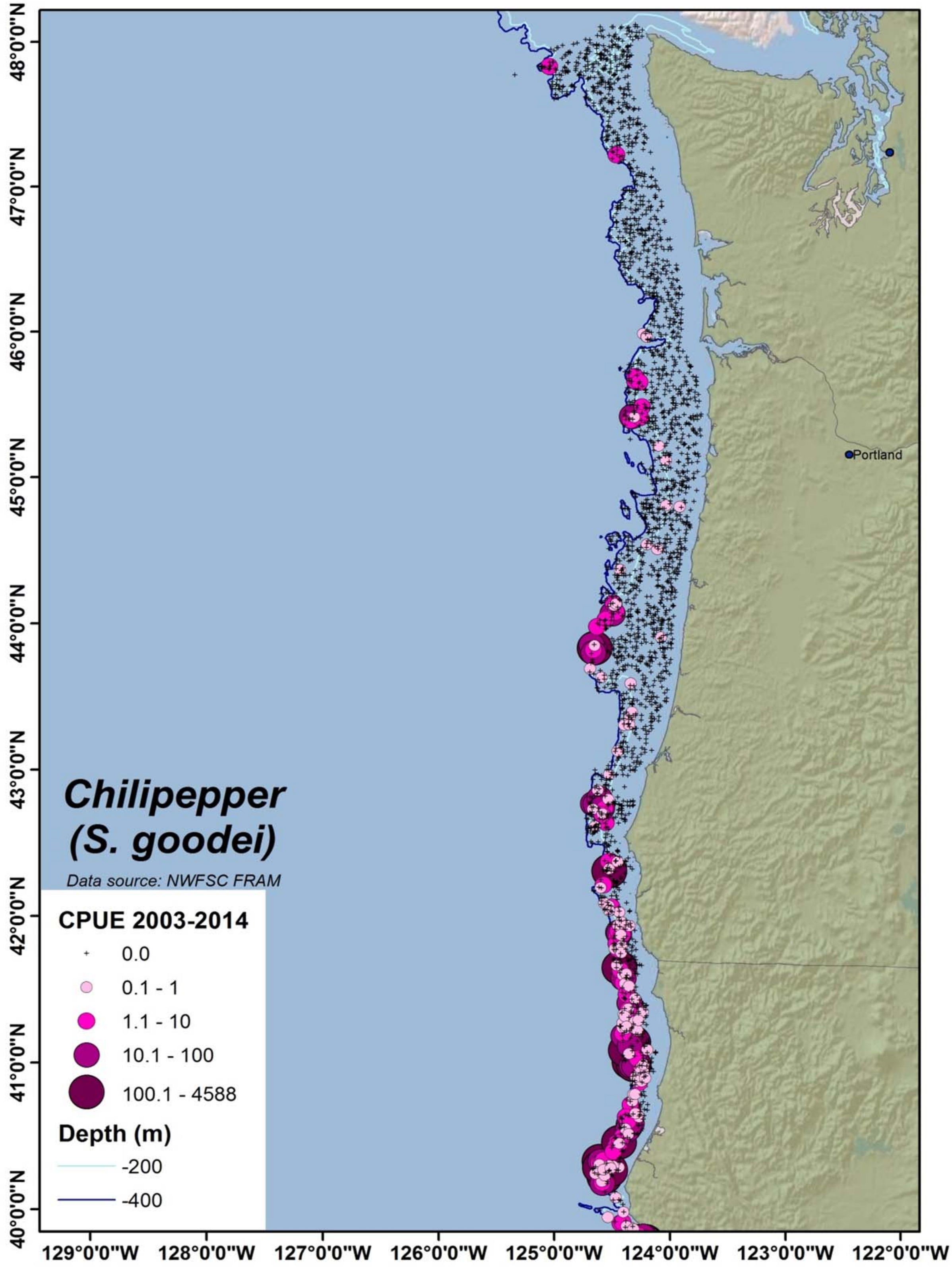


Figure 10: Cape Mendocino to Cape Flattery view of catch rates of Chilipepper rockfish from the NWFSC combined trawl survey (within depth stratification used in Delta-GLOM, of 55-400 meters).

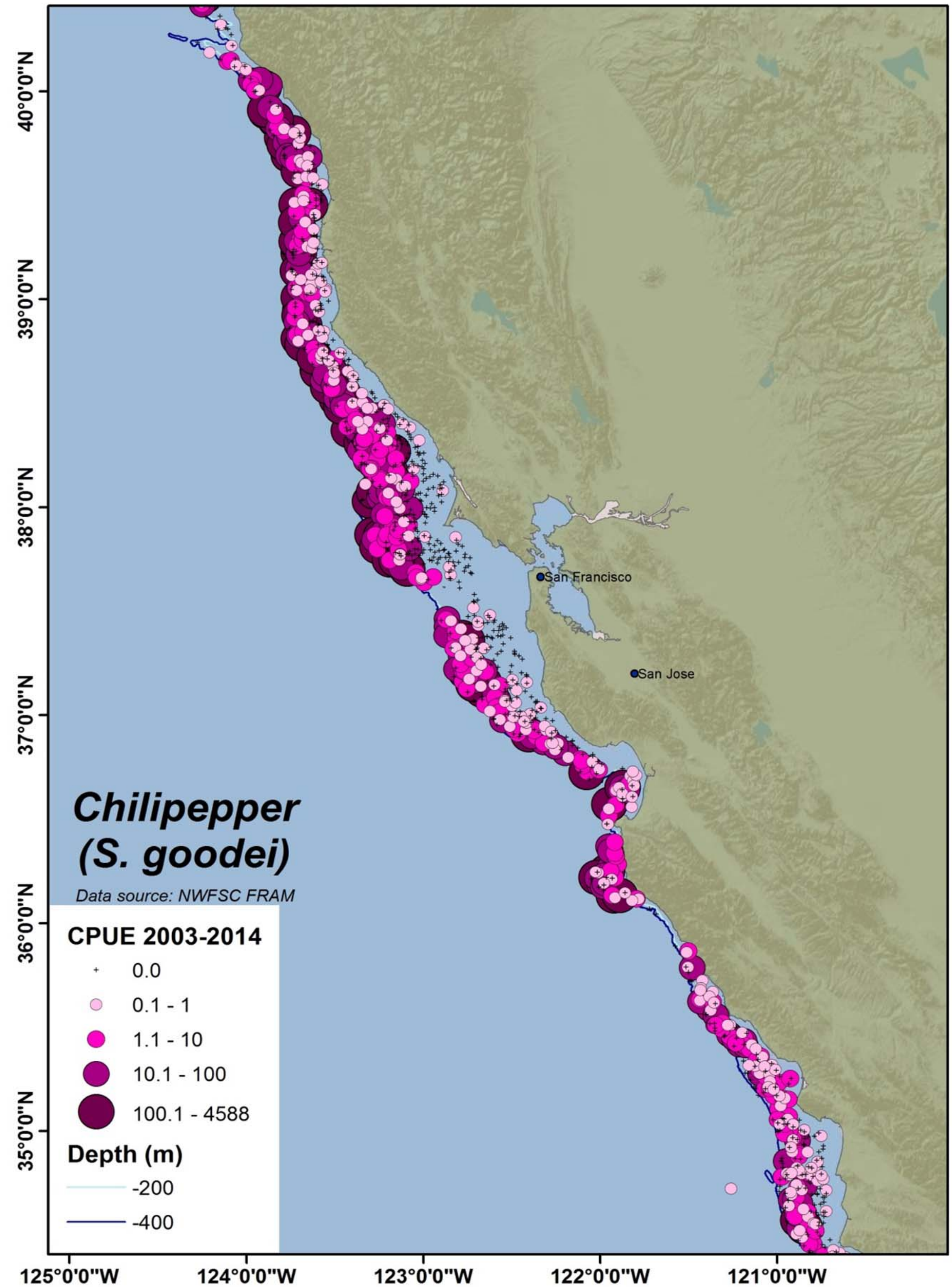


Figure 11: Point Conception to Cape Mendocino view of catch rates of Chilipepper rockfish from the NWFSC combined trawl survey (within depth stratification used in Delta-GLOM, of 55-400 meters).

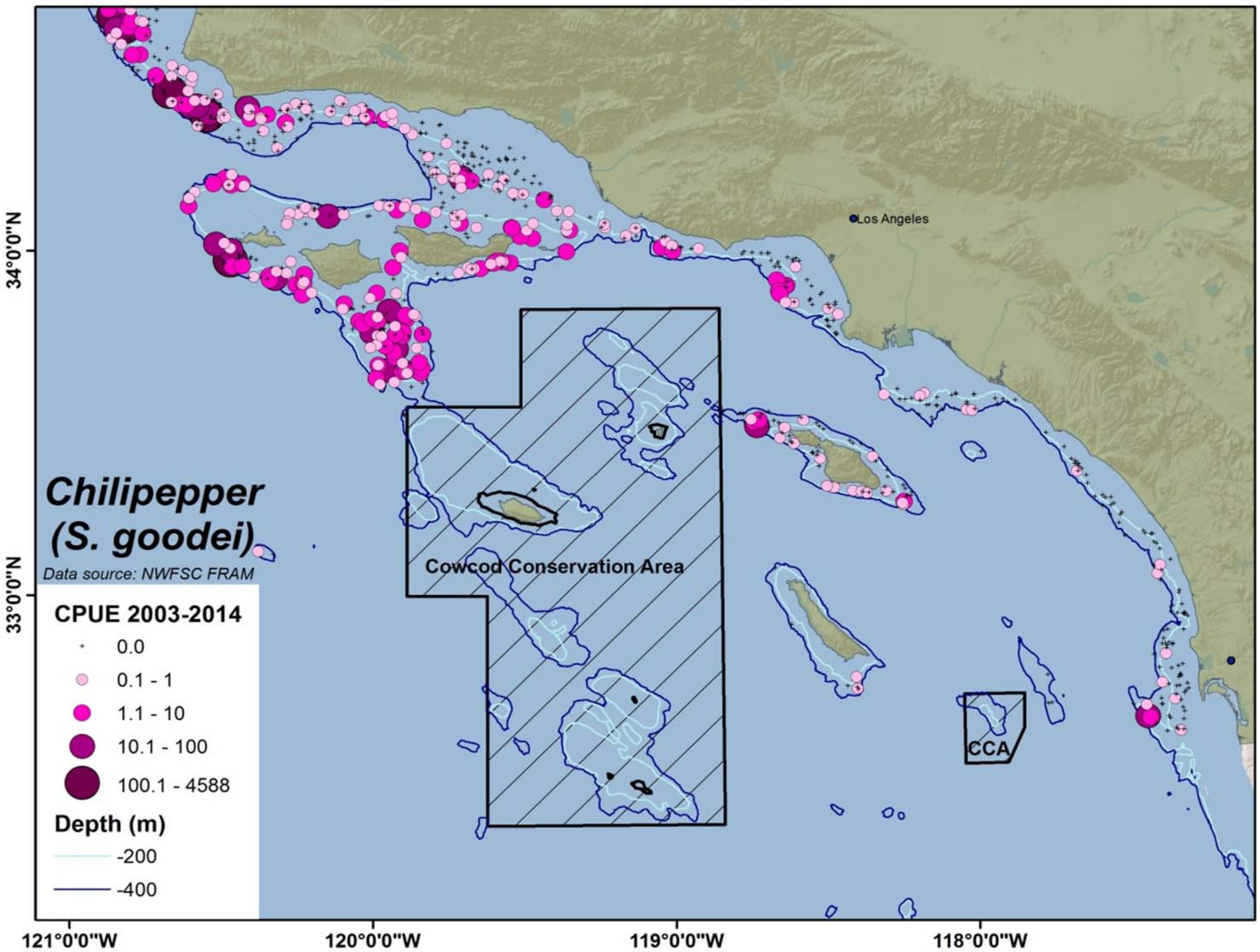
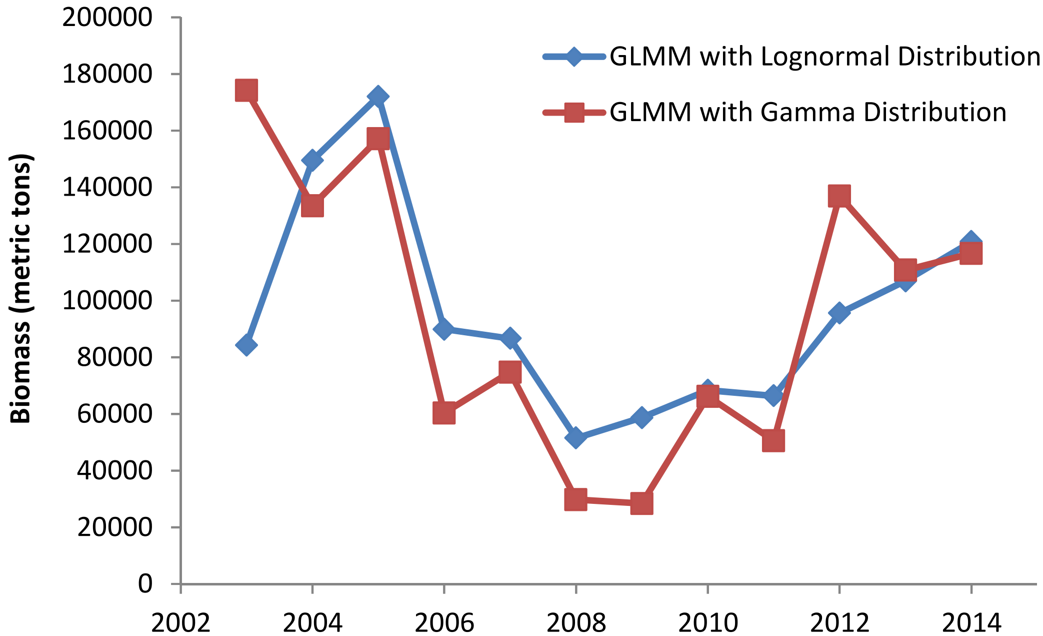


Figure 12: Southern California Bight view of catch rates of Chilipepper rockfish from the NWFSC combined trawl survey (within depth stratification used in Delta-GLOM, of 55-400 meters).



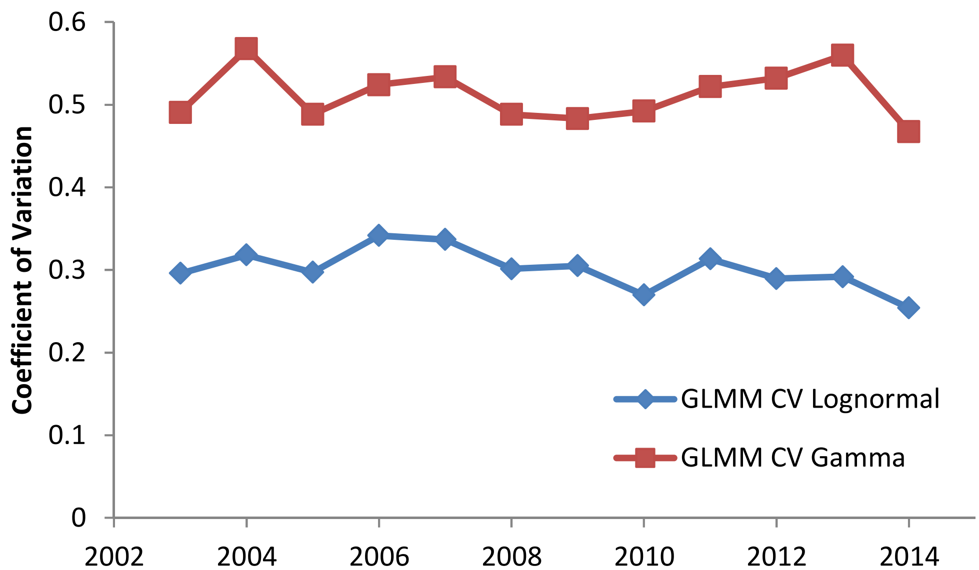


Figure 13a (top) and b (bottom): Relative abundance indices and estimated CVs from the NWFSC Combined bottom trawl survey based on alternative error structures in the Delta-GLM.

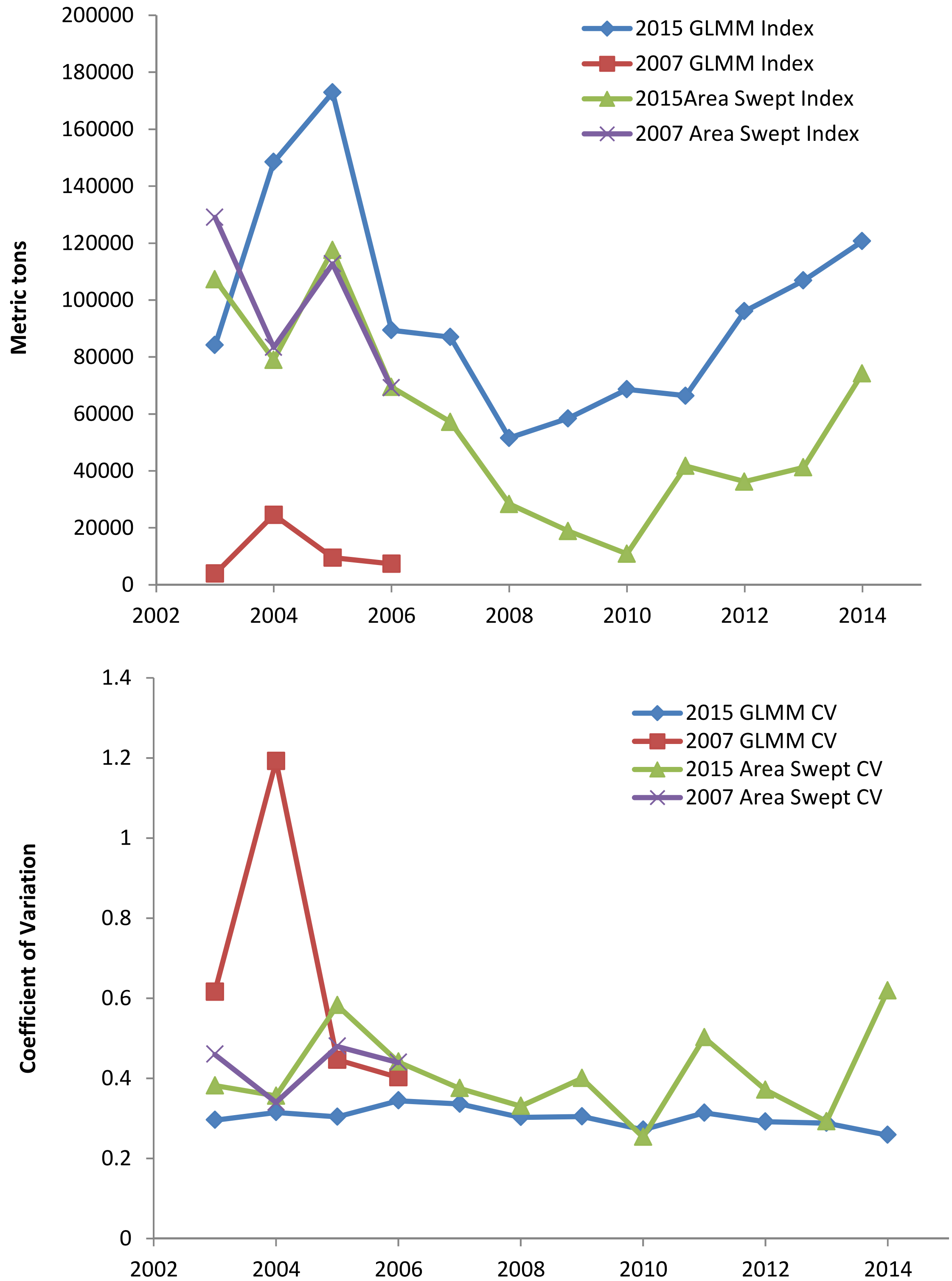


Figure 14a (top) and b (bottom): Relative abundance indices and estimated CVs from the NWFSC Combined bottom trawl survey indices from the 2007 model and the 2015 model.

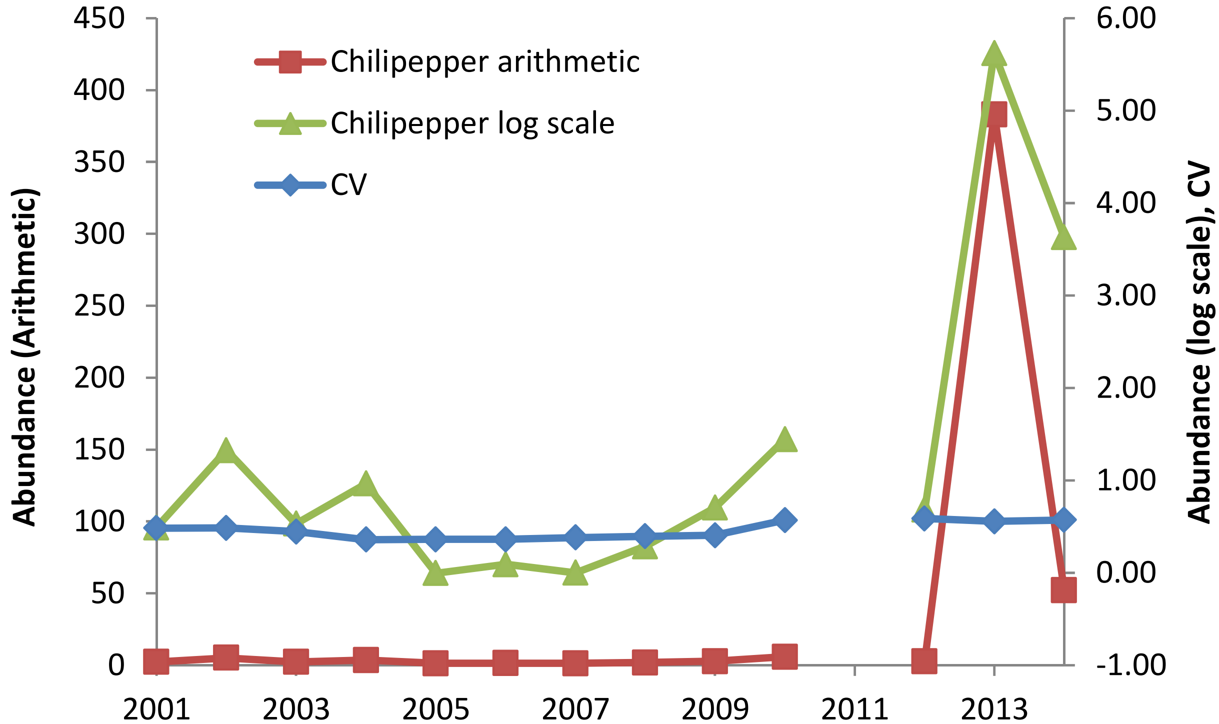
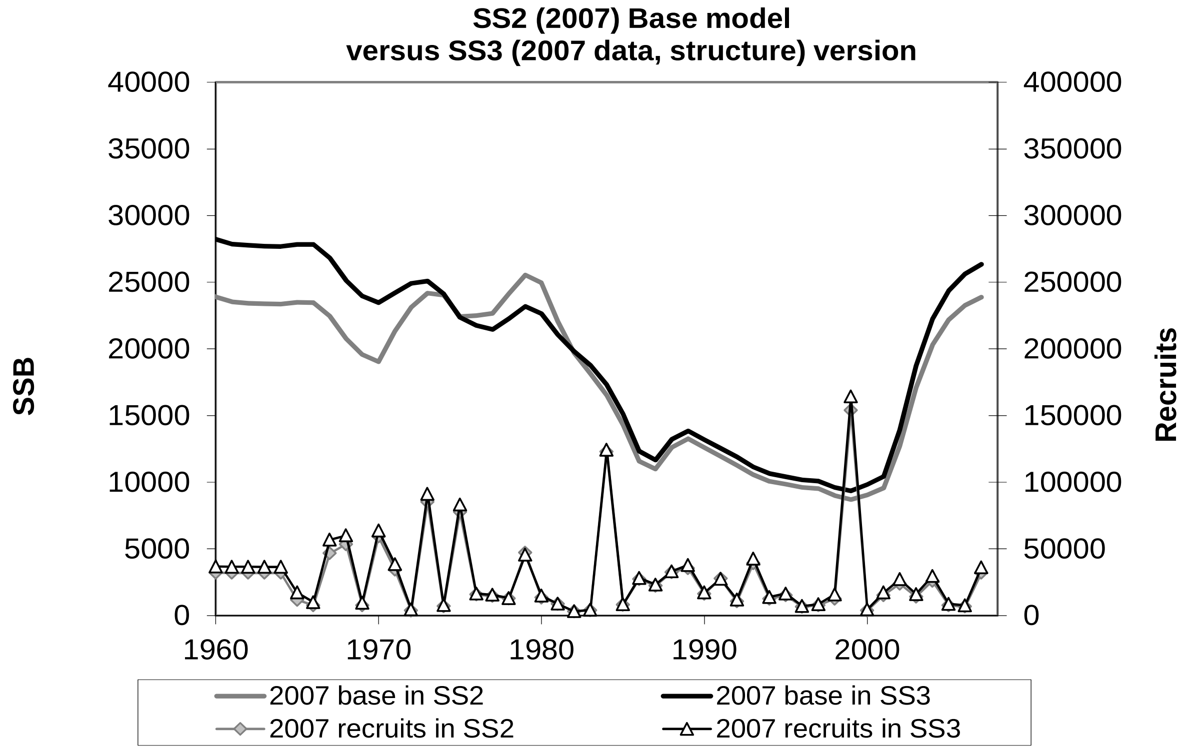


Figure 15: Coastwide juvenile abundance index (in arithmetic and log scale) and associated coefficient of varation for Chilipepper Rockfish (from Ralston et al.).



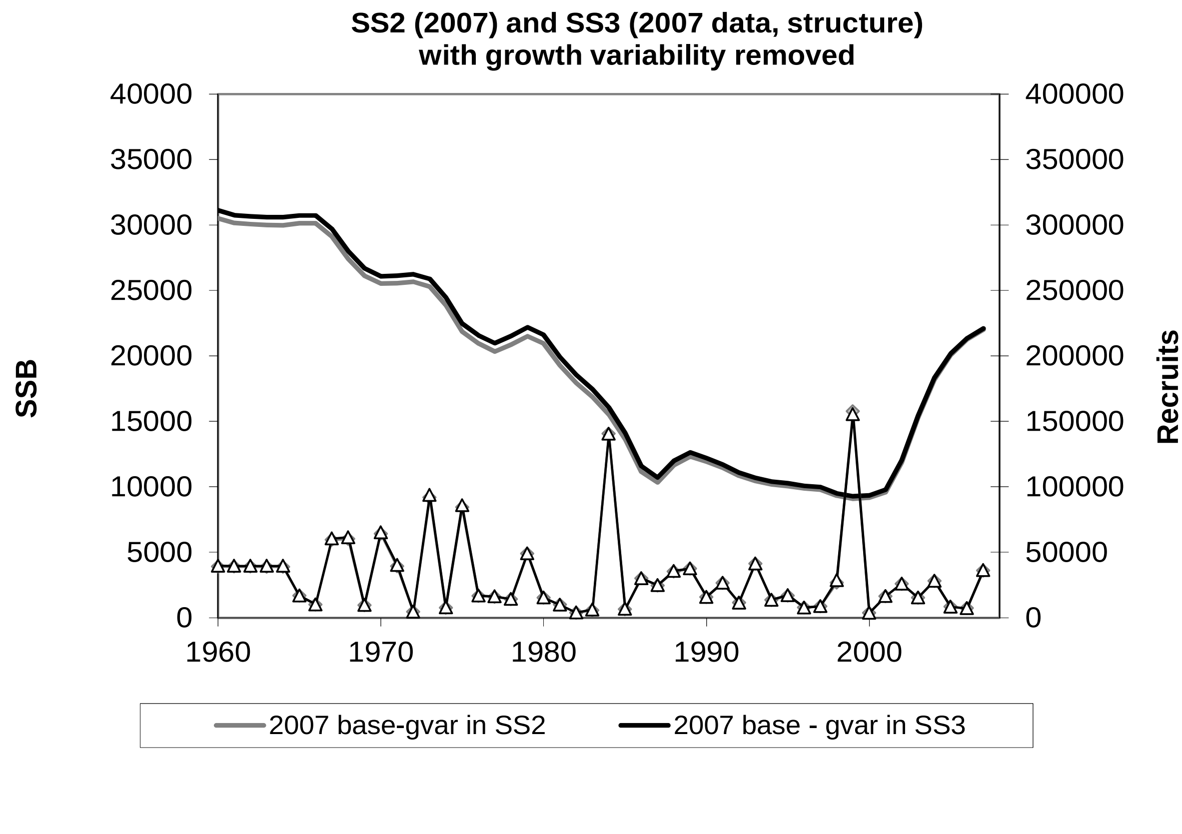


Figure 16. SS2 and SS3 versions of the 2007 model and data, with (top) and without (bottom) the time varying growth component of the model..

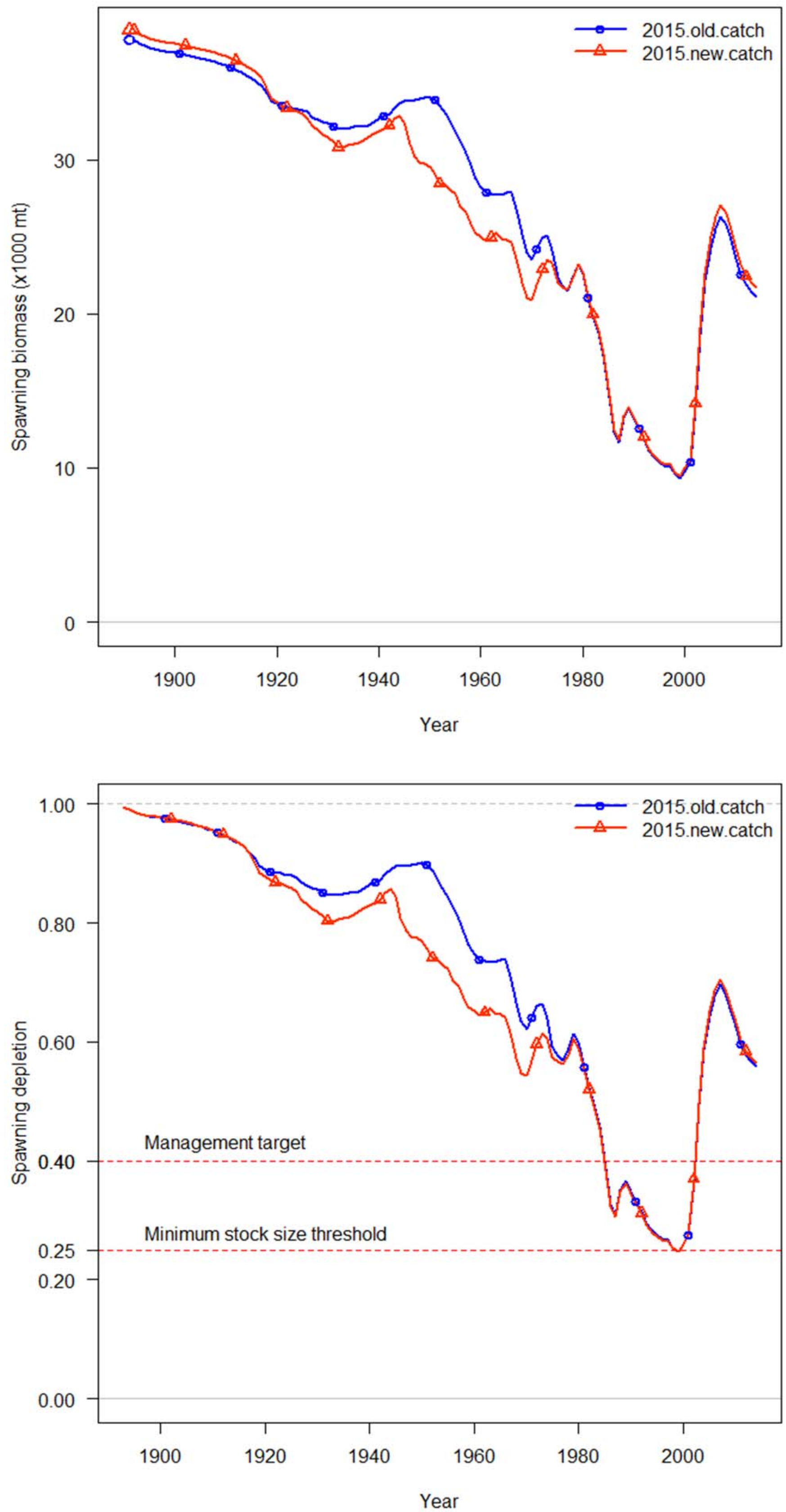
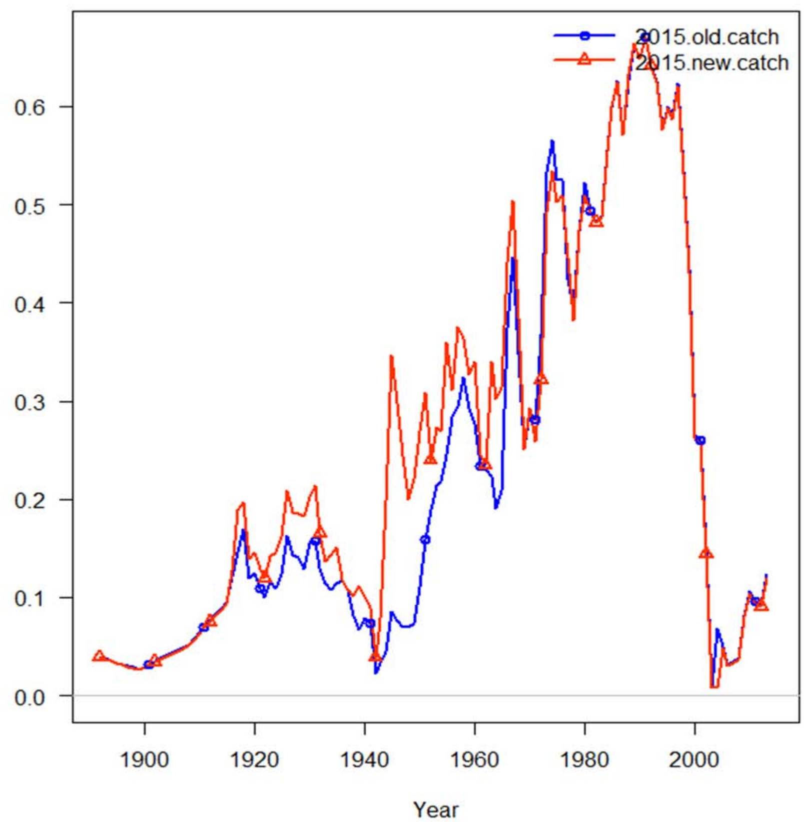


Figure 17a (top) and b (bottom): Model trajectories with the 2007 and with the 2015 catch time series..



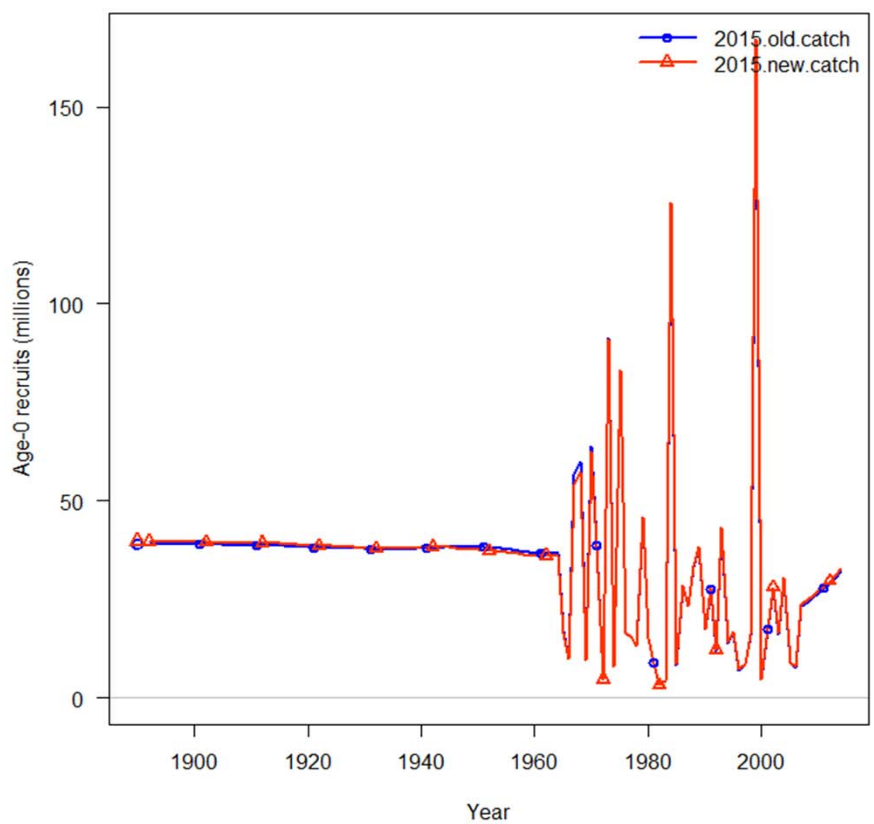
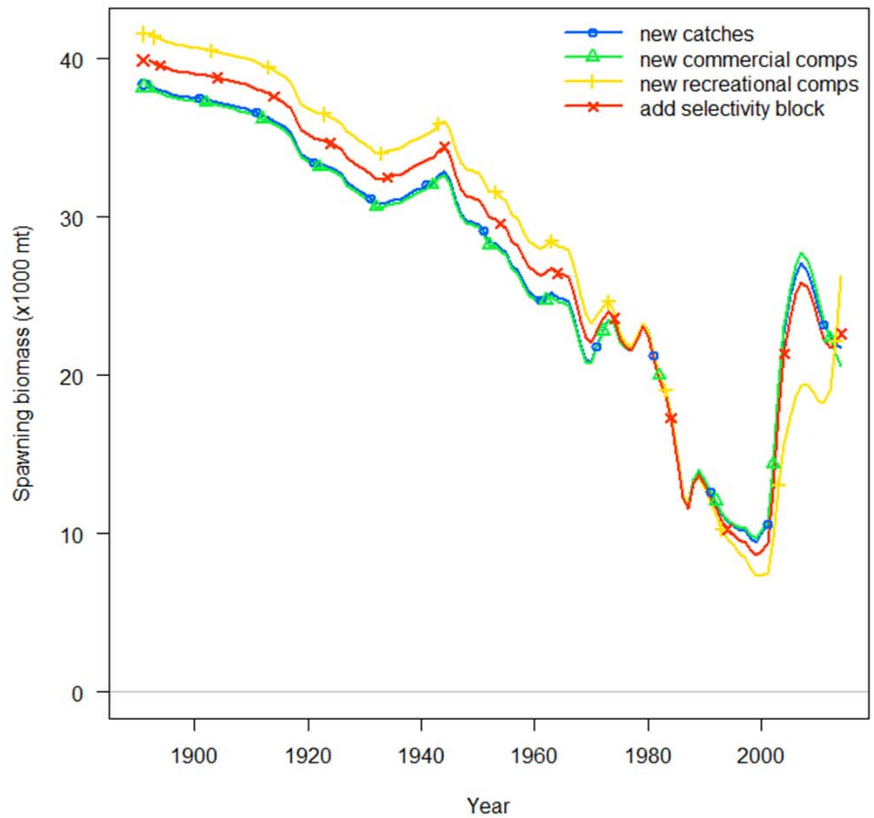


Figure 18a (top) and b (bottom): Estimates of exploitation rate and recruitmeent based on the 2007 and 2015 model catch histories..



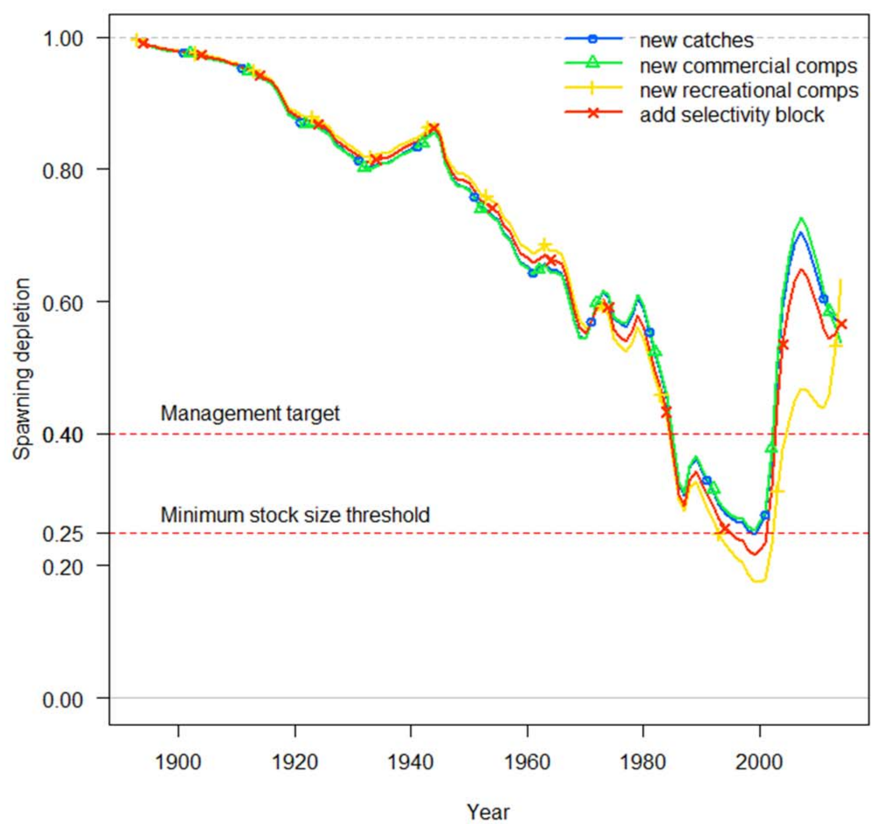


Figure 19a (top) and 1b (bottom): Estimated spawning biomass and spawning depletion level for base model when new commercial and recreational compositional data are sequentially added.

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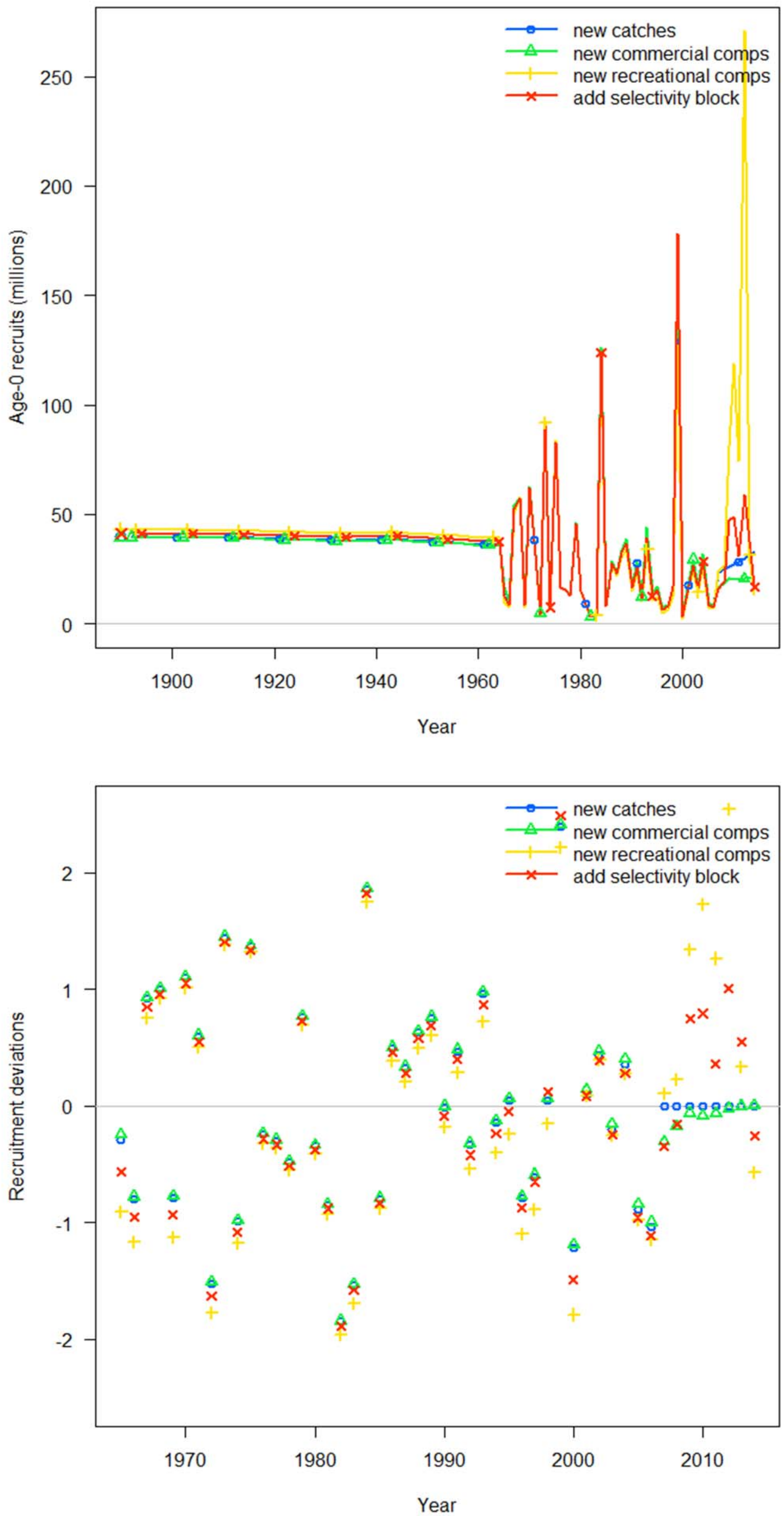

Figure 20a (top) and b (bottom): Estimated recruitments and recruitment deviations for base model when new commercial and recreational compositional data are sequentially added..

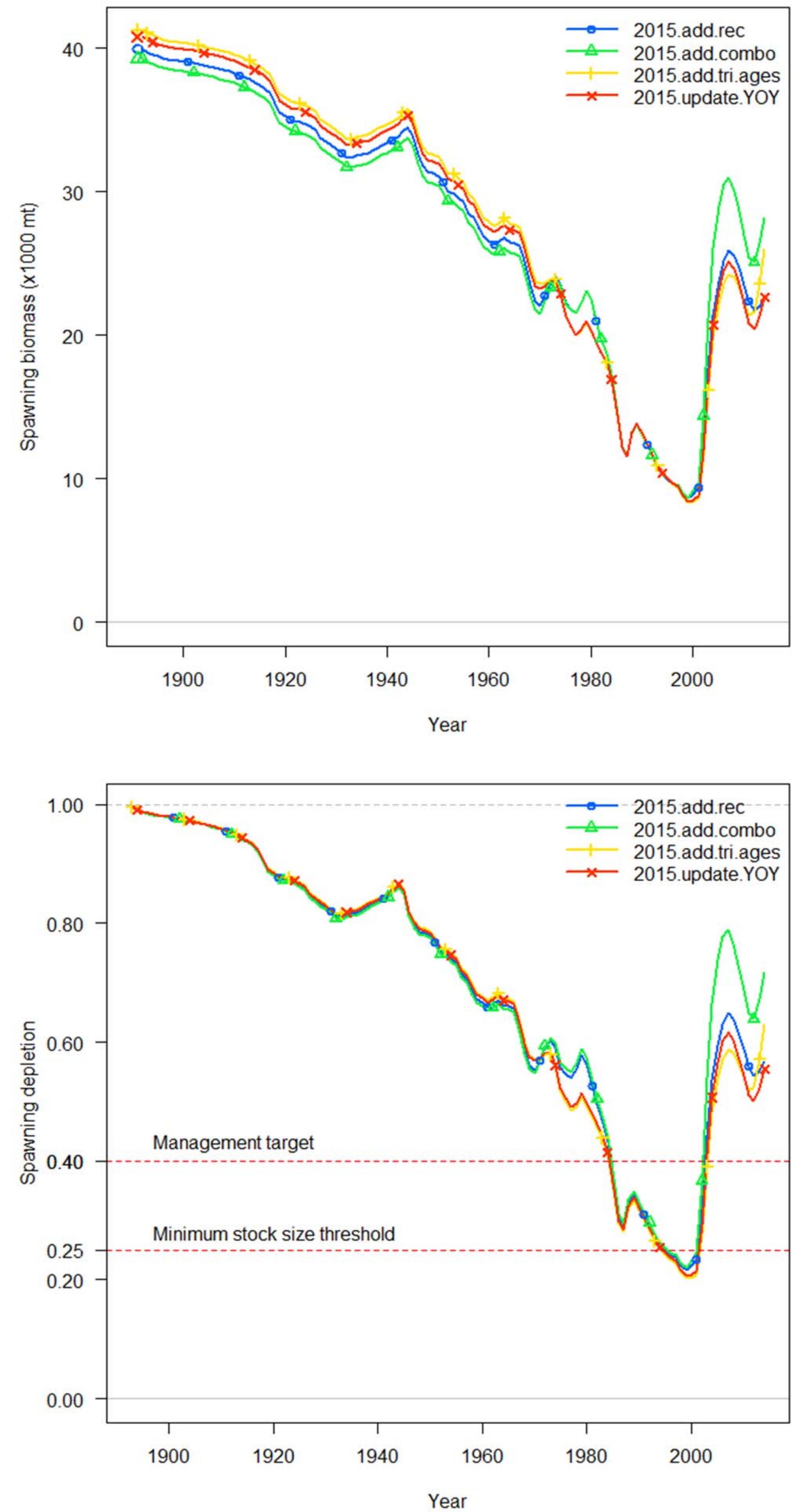

Figure 21a (top) and b (bottom): Estimated spawning biomass and spawning depletion level for base model when new survey data are sequentially added.

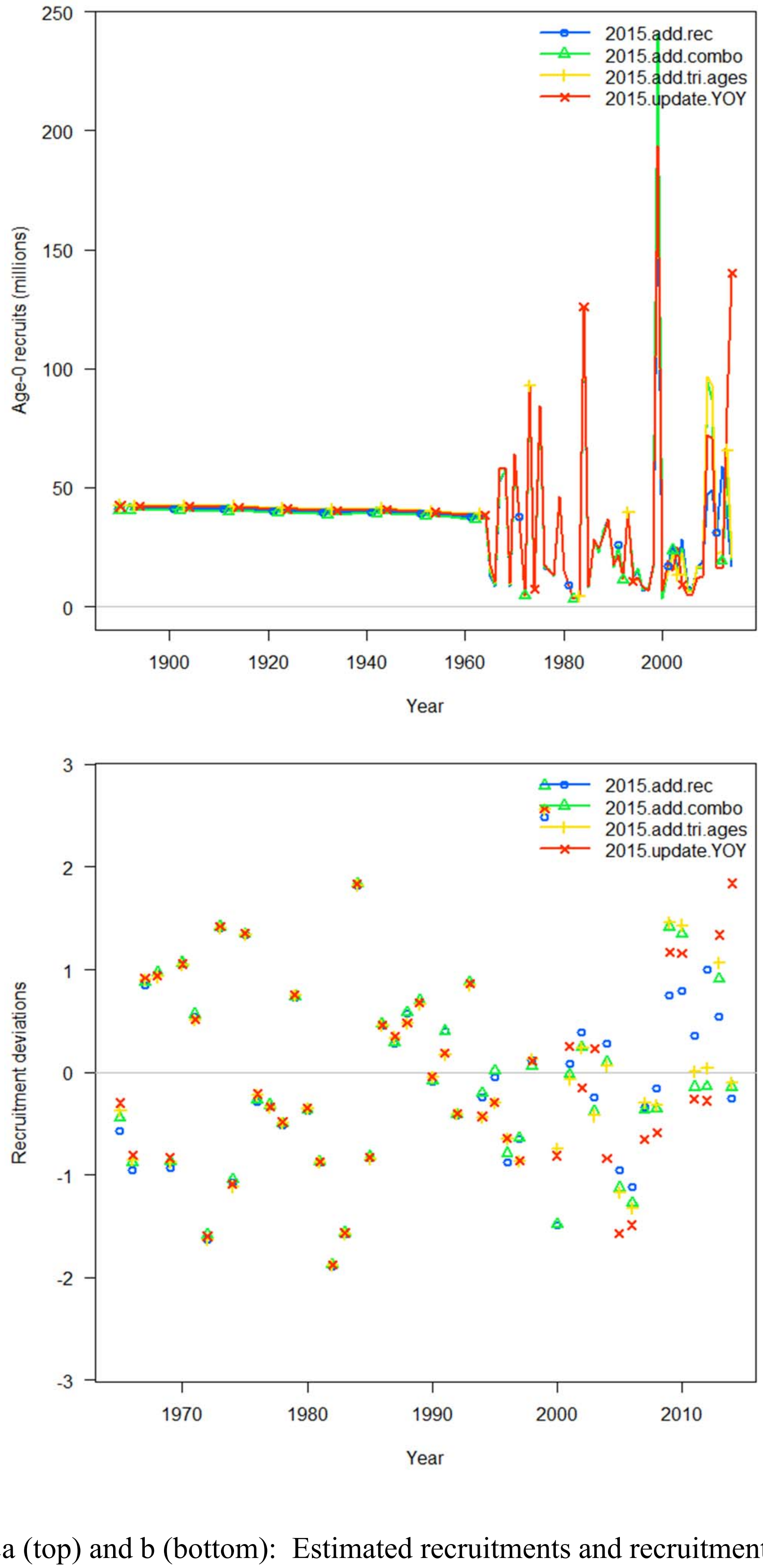

Figure 22a (top) and b (bottom): Estimated recruitments and recruitment deviations for base model when new survey data are sequentially added.

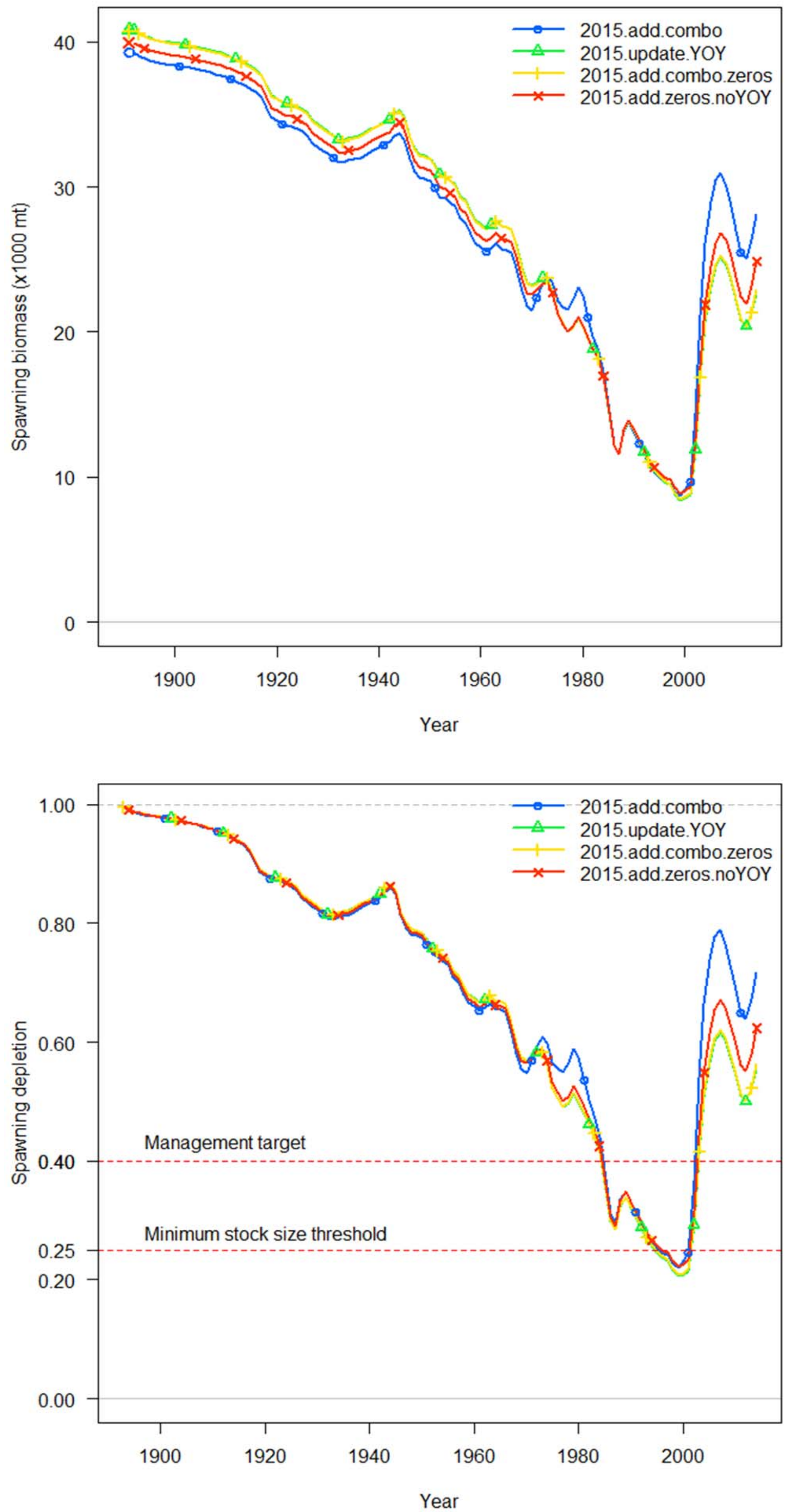

Figure 23a (top) and b (bottom): Sensitivity tests to interim base model to evaluate effect of adding age 0 age bins to include survey age 0 catches, with and without inclusion o f the juvenile abundance index.

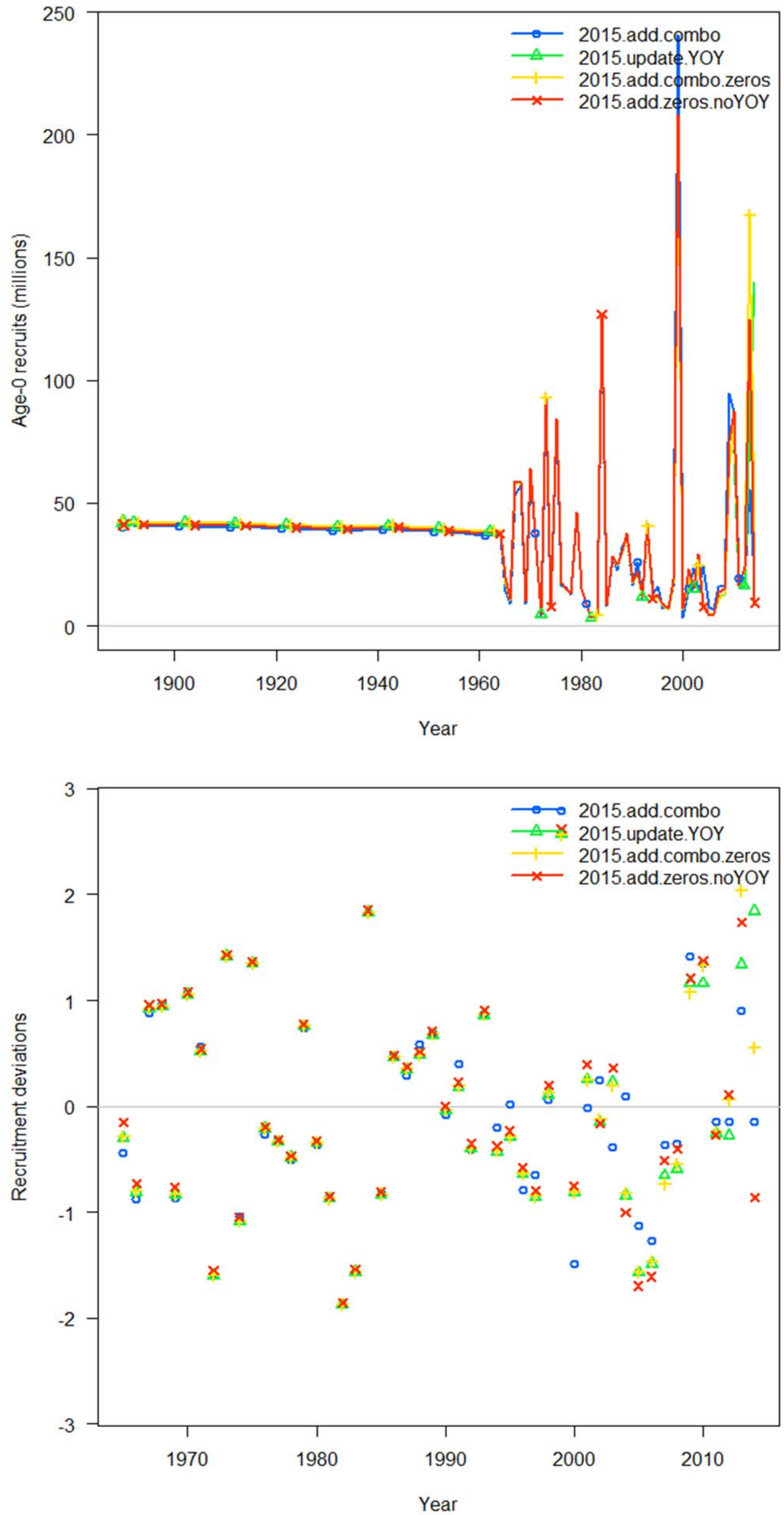

Figure 24a (top) and b (bottom): Sensitivity tests to interim base model to evaluate effect of adding age 0 age bins to include survey age 0 catches, with and without inclusion o f the juvenile abundance index.

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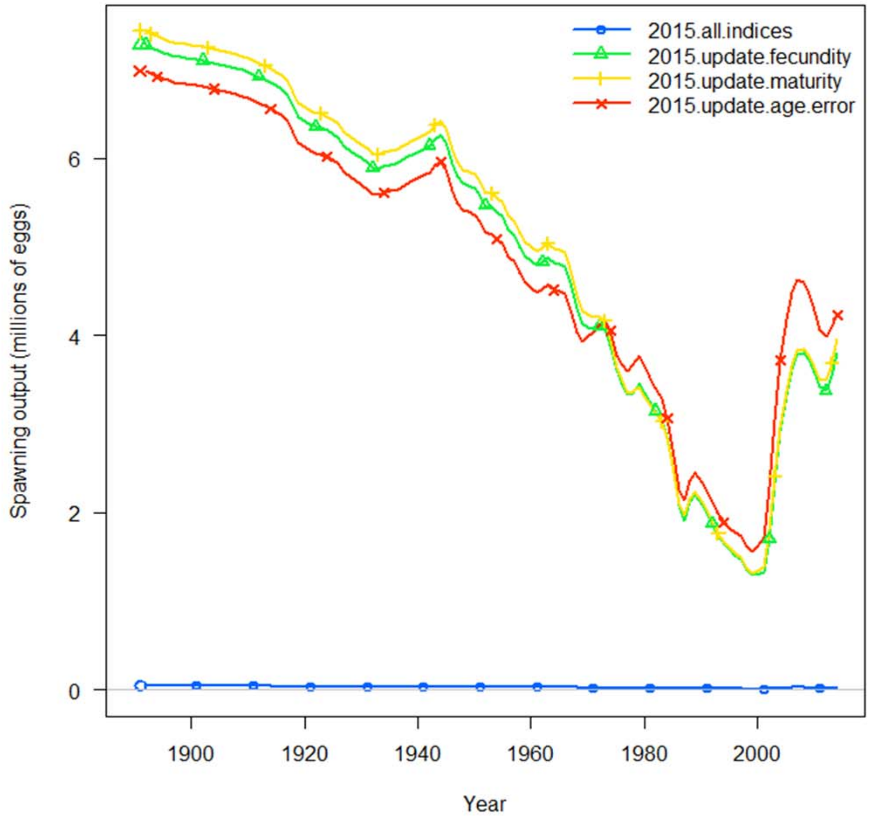


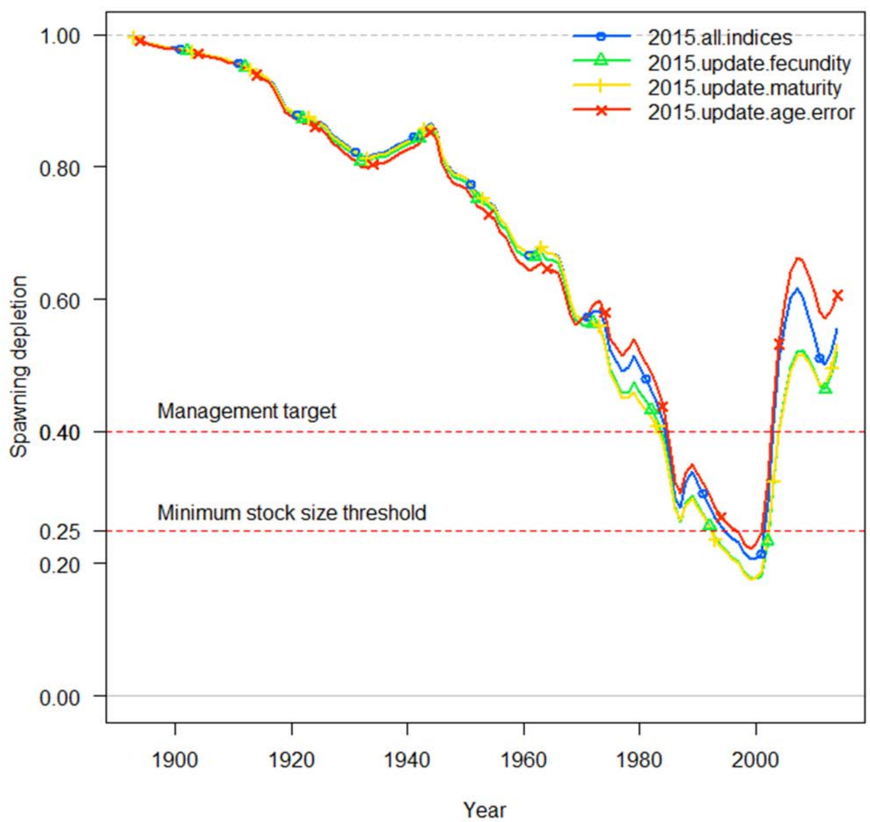
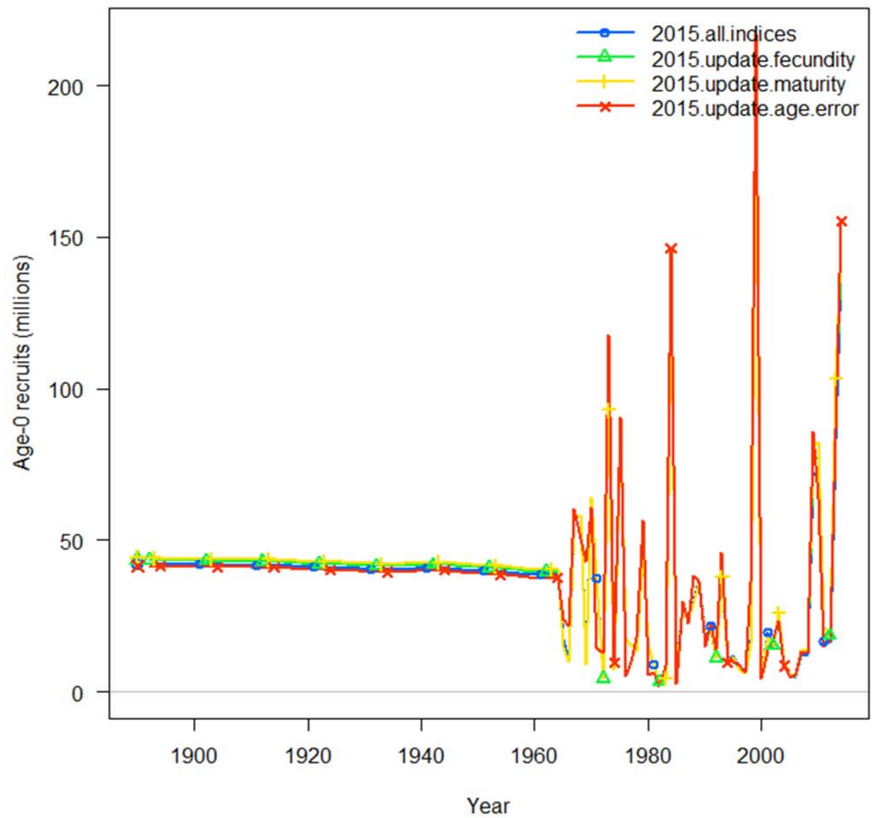


Figure 25a (top) and b (bottom): Estimated spawning biomass (larval output) and spawning depletion level for base model when new life history data are sequentially added (note that the flat blue line in 24a reflects spawning biomass before fecundity added to account for larval production).



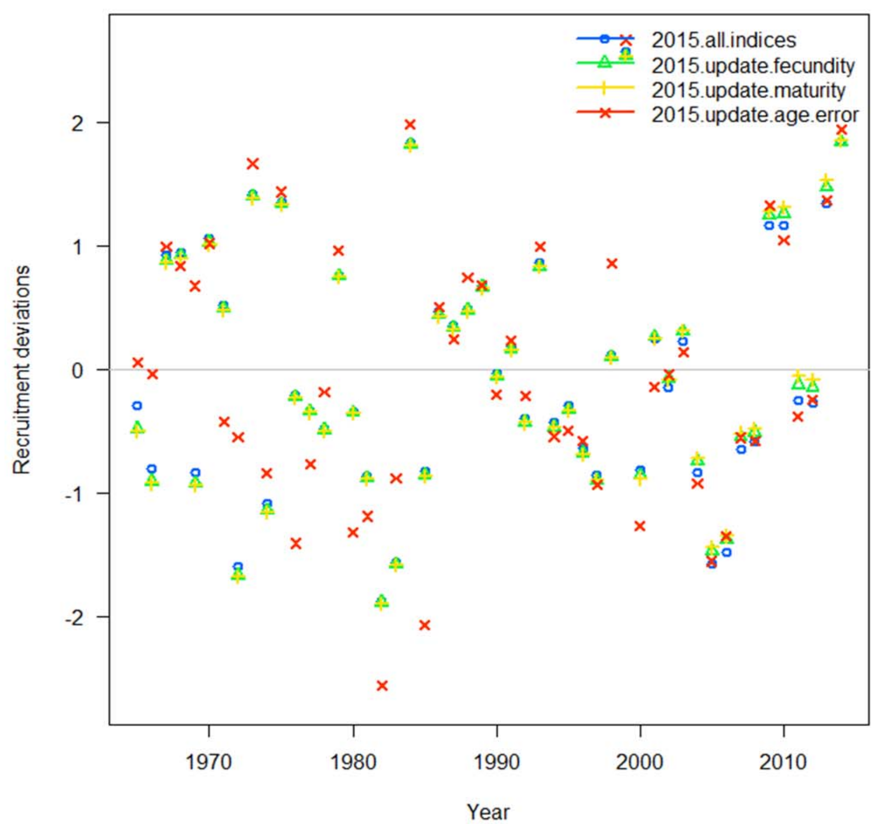


Figure 26a (top) and b (bottom): Estimated recruitments and recruitment deviations for base model when new life history data are sequentially added.

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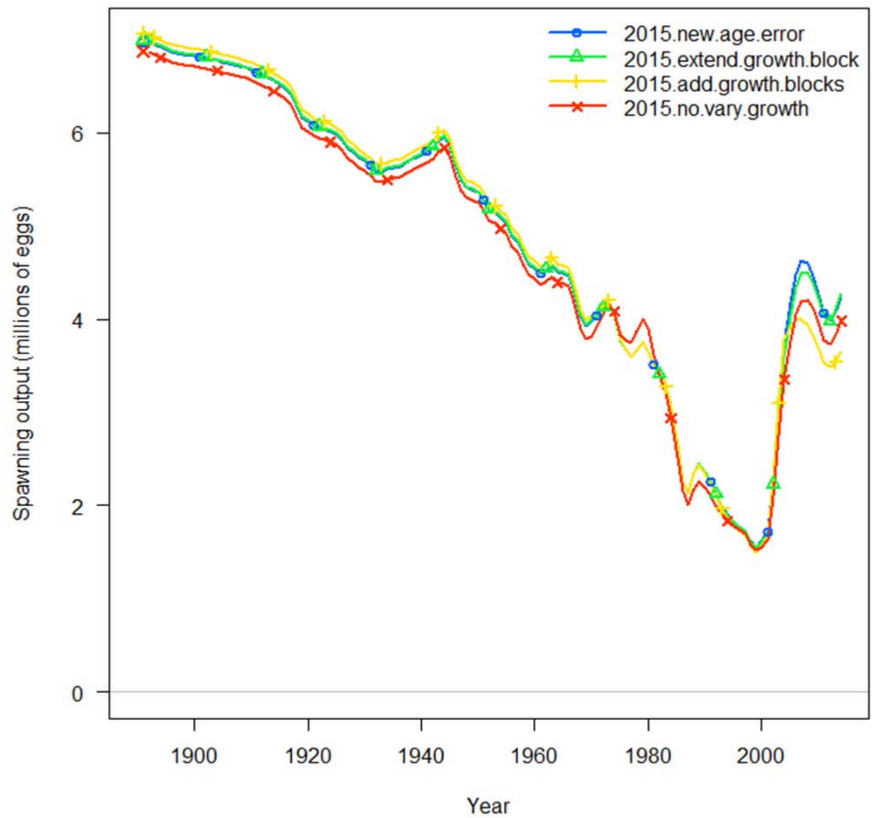


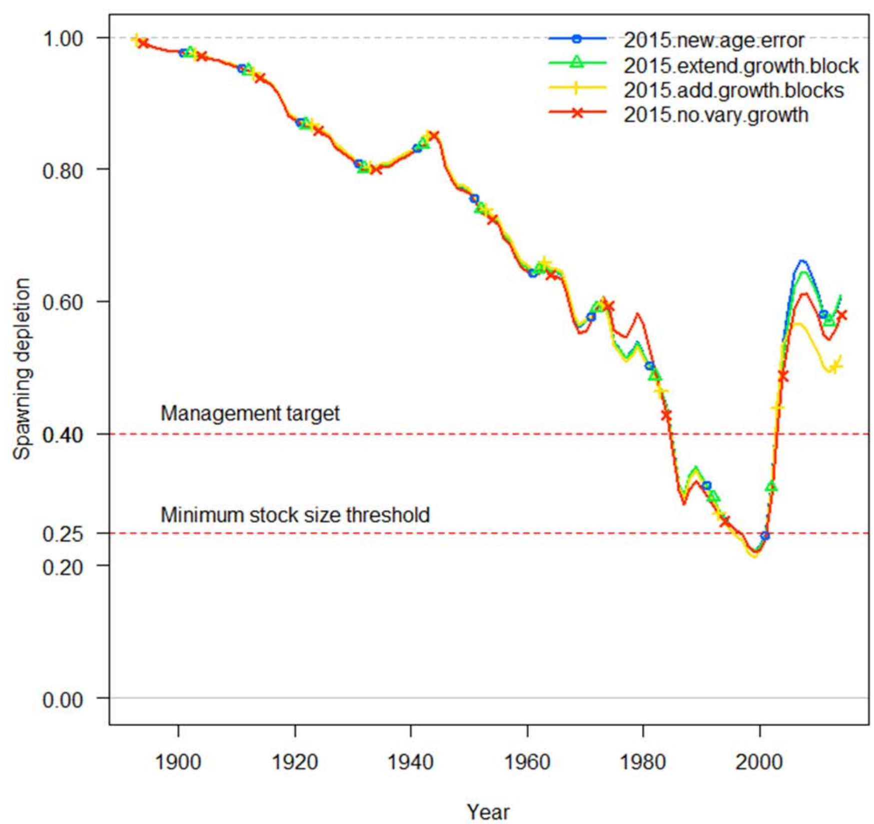
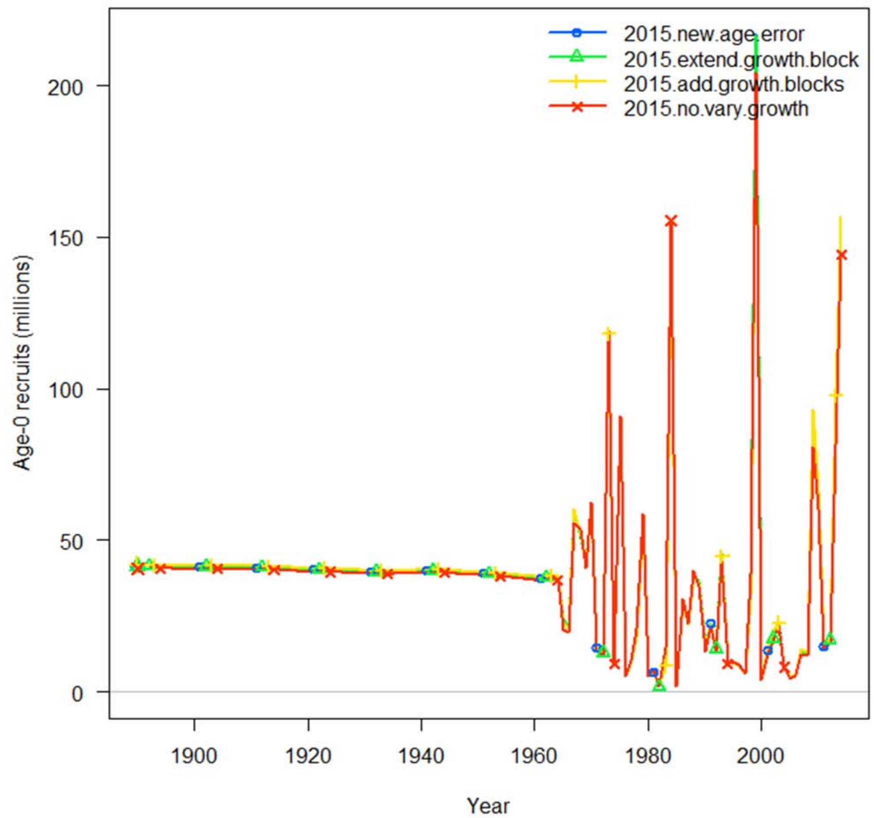


Figure 27a (top) and b (bottom): Estimated larval output and relative depletion for base model when alternative means of estimating growth are explored as a sensitivity test.



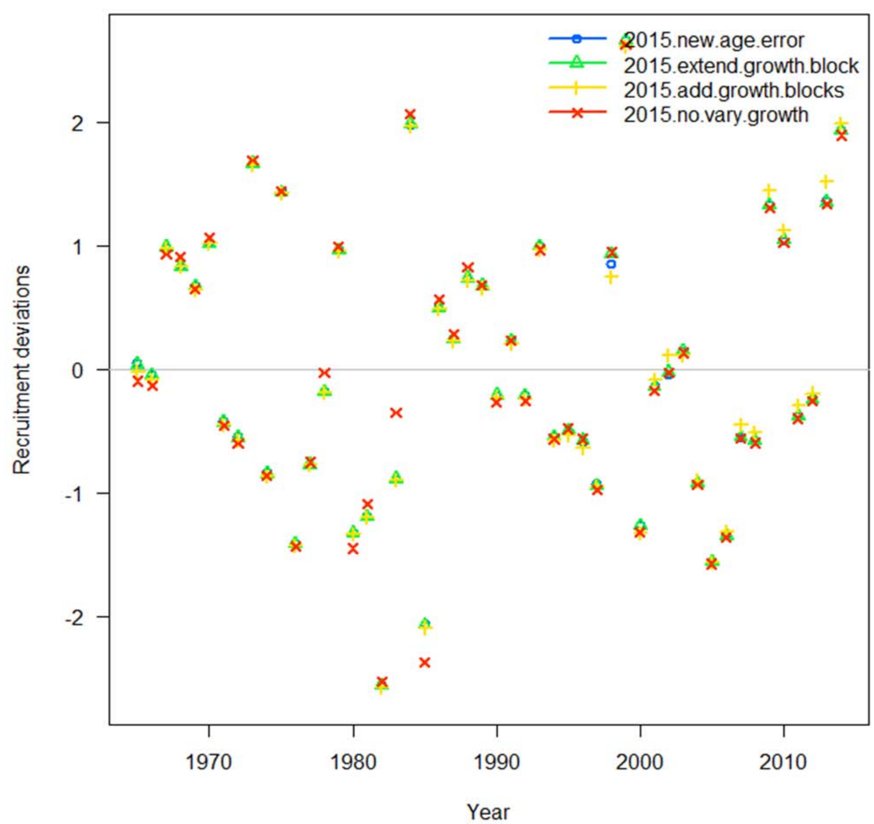
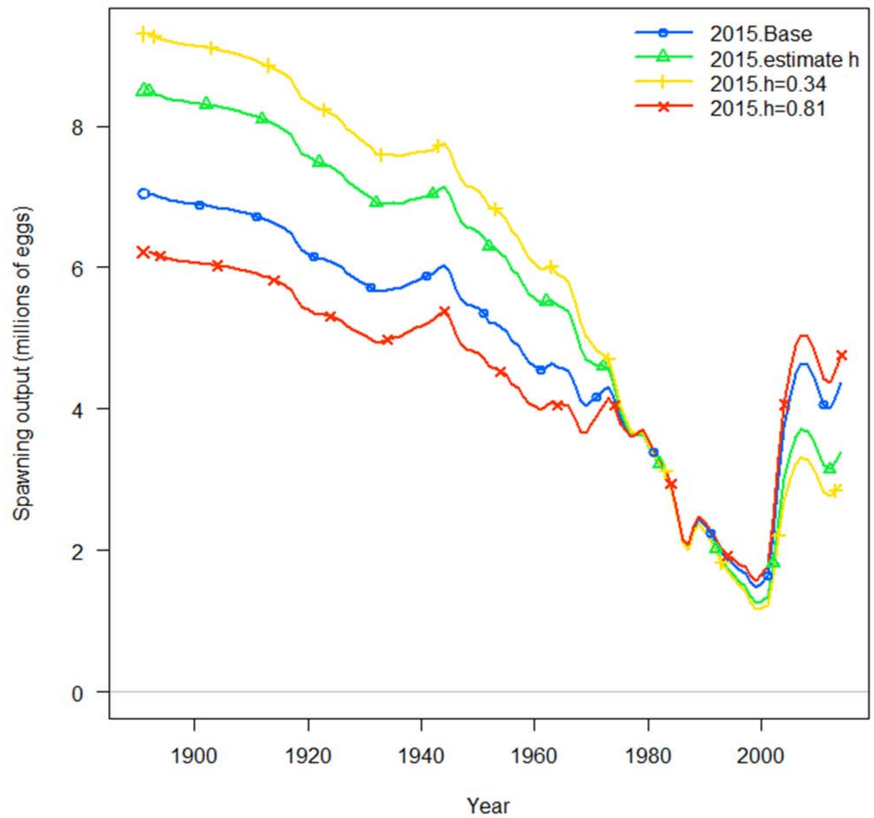


Figure 28a (top) and b (bottom): Estimated recruitments and recruitment deviations for base model when alternative means of estimating growth are explored as a sensitivity test.



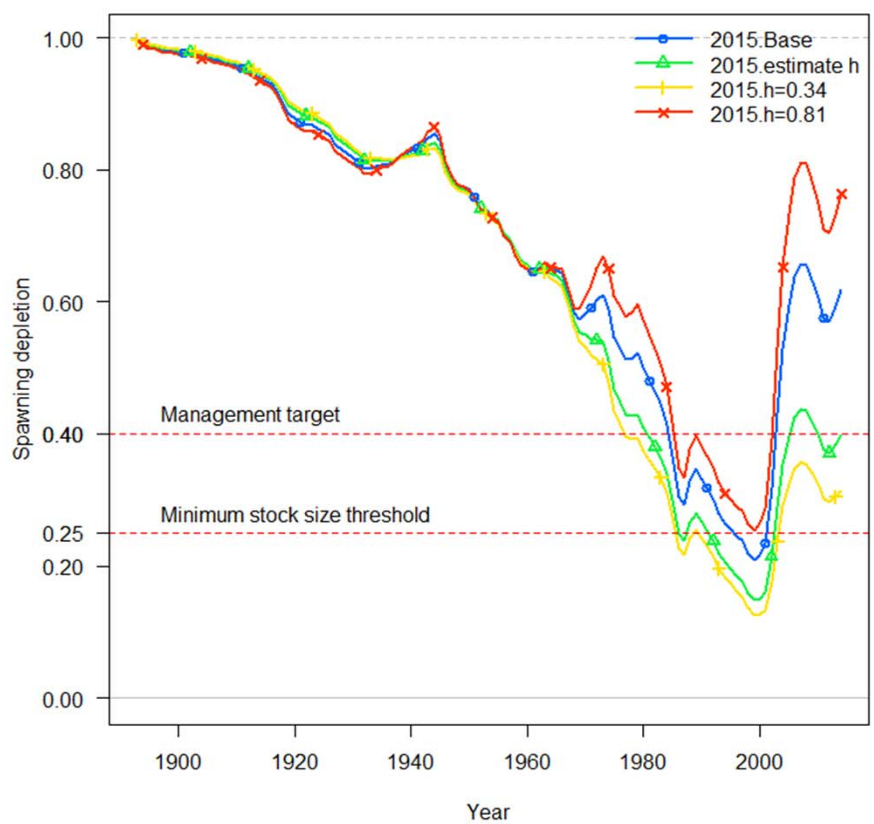
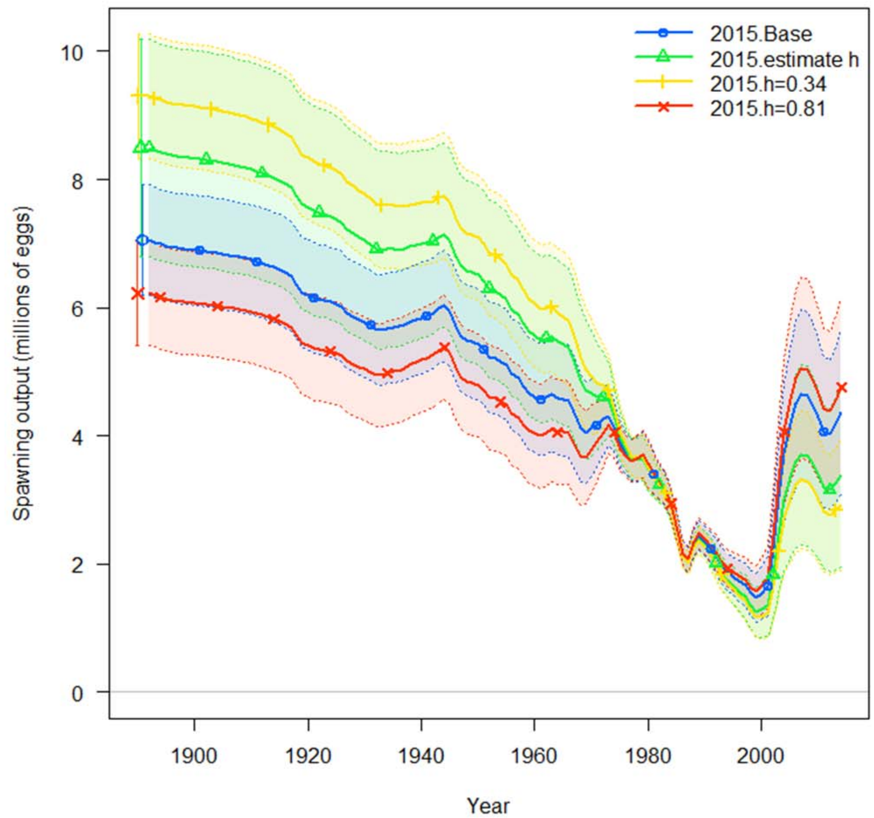


Figure 29a (top) and b (bottom): Estimated larval output and relative depletion for base model when alternative steepness values are applied.



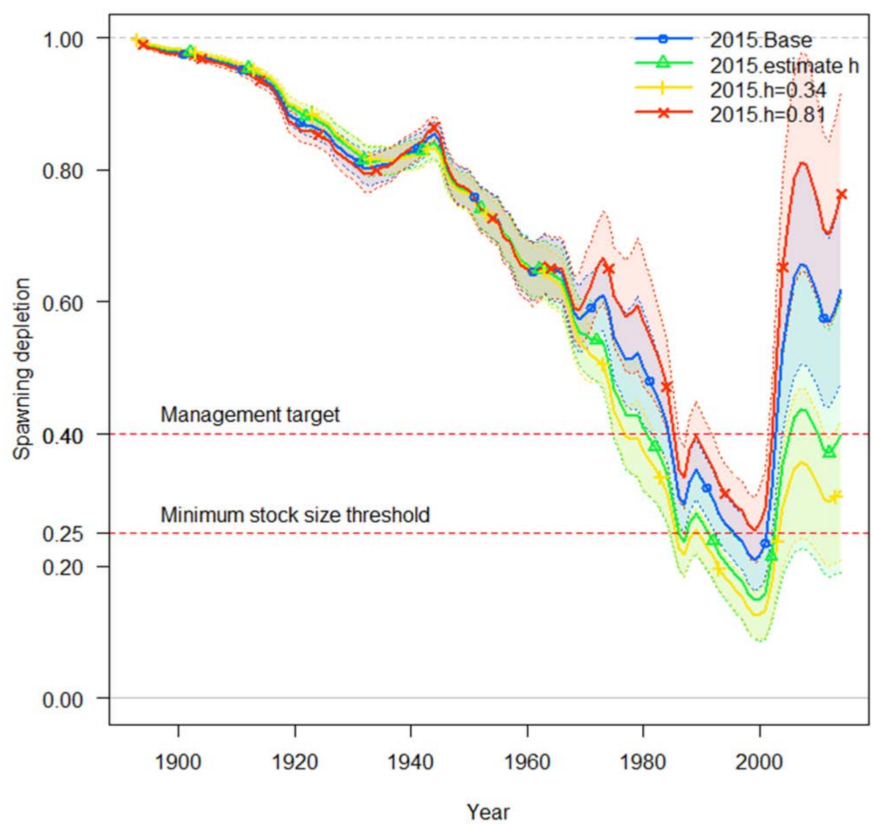
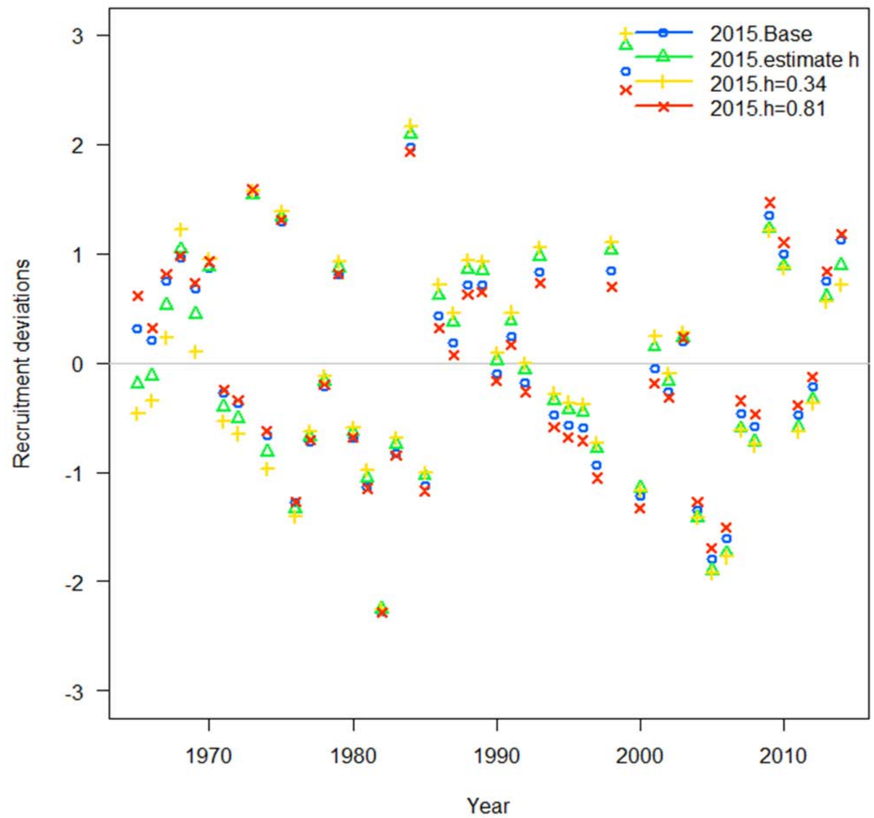


Figure 30a (top) and b (bottom): Estimated larval output and relative depletion for base model when alternative steepness estimates are applied, including approximate 95% confidence limits.



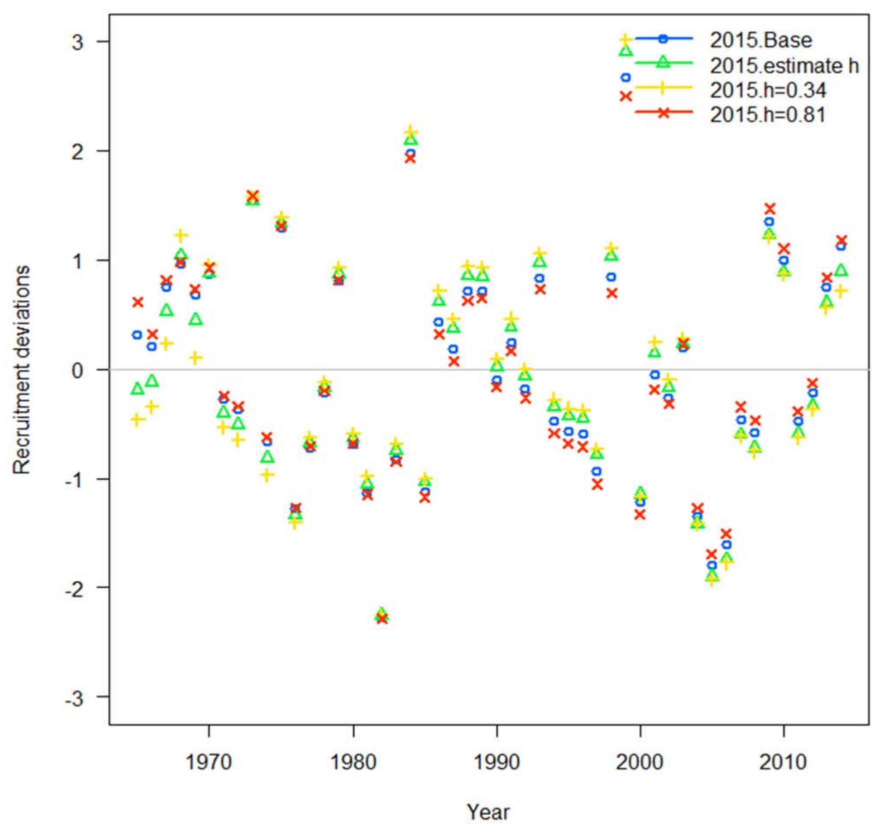


Figure 31a (top) and b (bottom): Estimated recruitments and recruitment deviations for base model when alternative steepness values are applied.

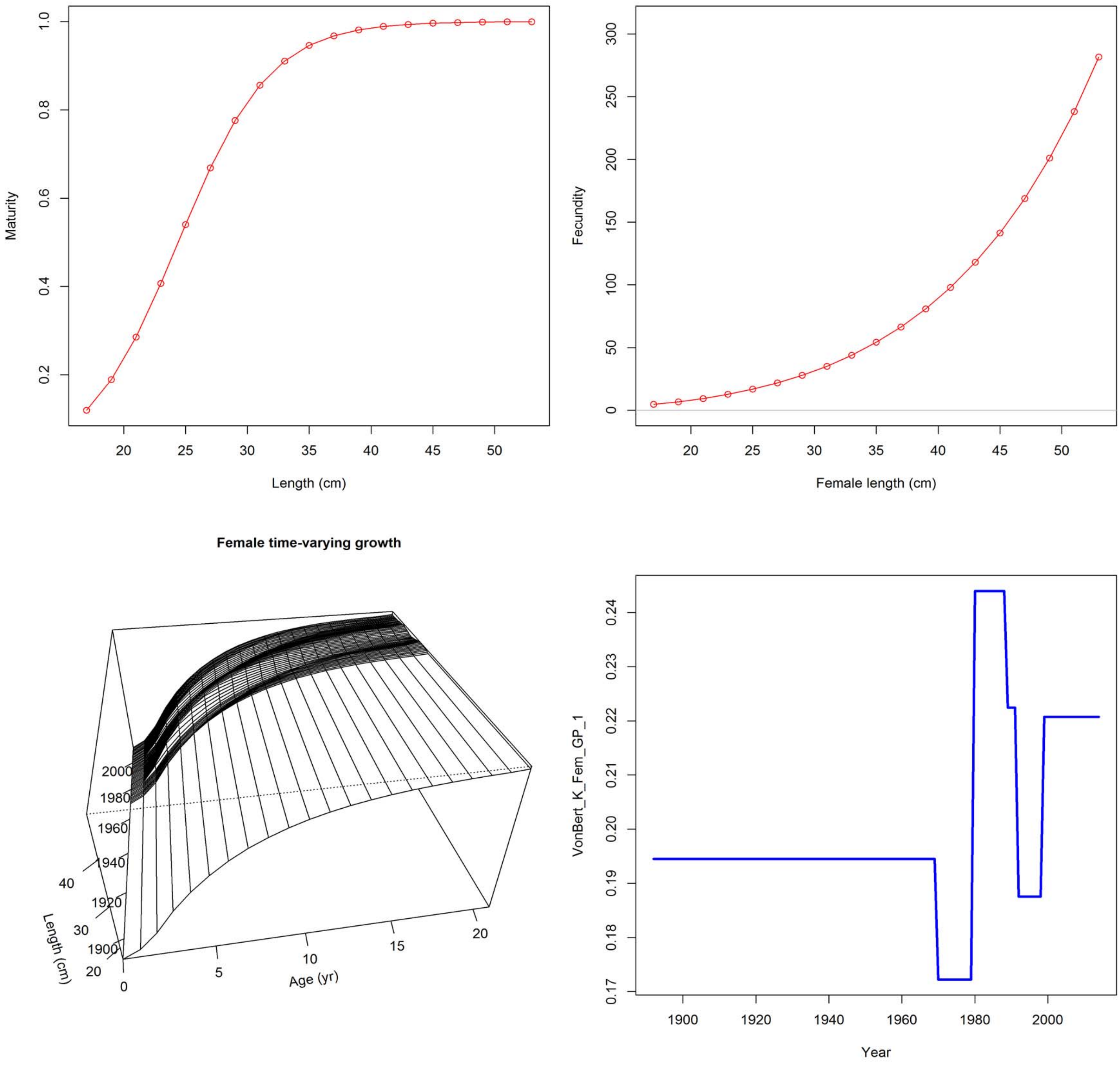


Figure 32a-d: Maturity, fecundity,and time varying growth estimates in the base model (reflect new estimates of these relationships).

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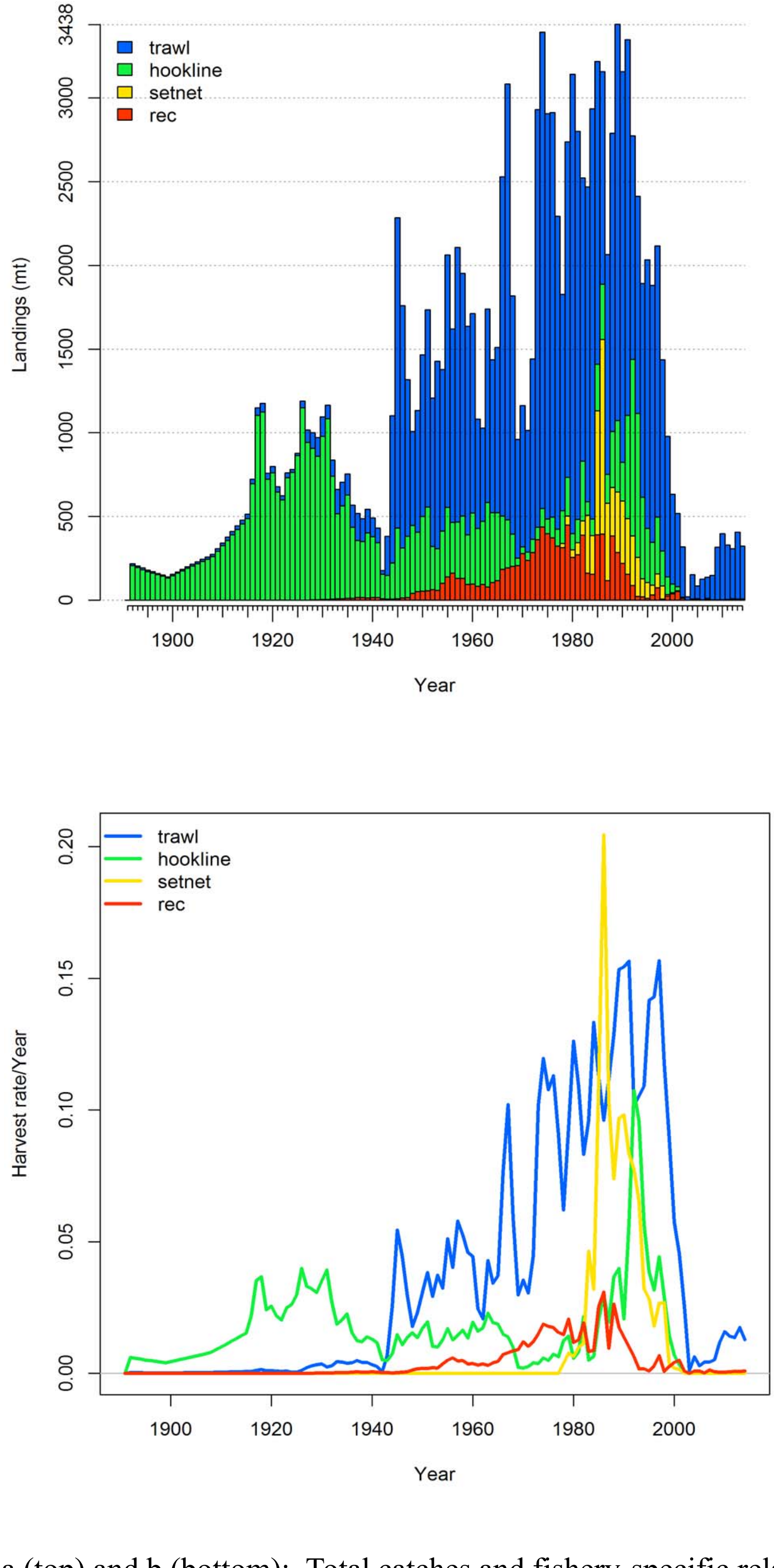

Figure 33a (top) and b (bottom): Total catches and fishery-specific relative exploitation rates in the base model.

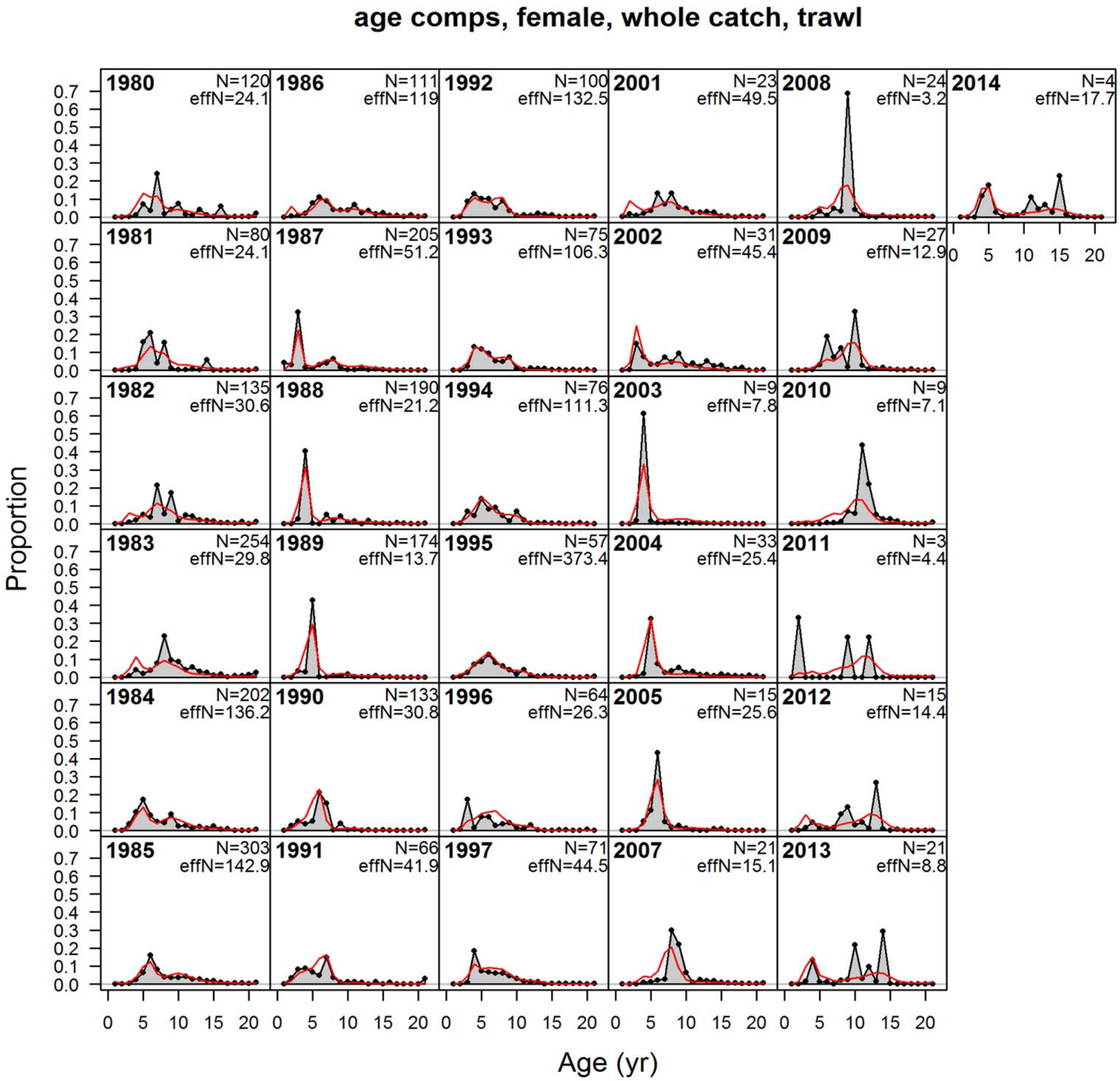

Figure 34: Fits to female length composition data from the trawl fishery, including new length composition data for the 2007-2014 period.

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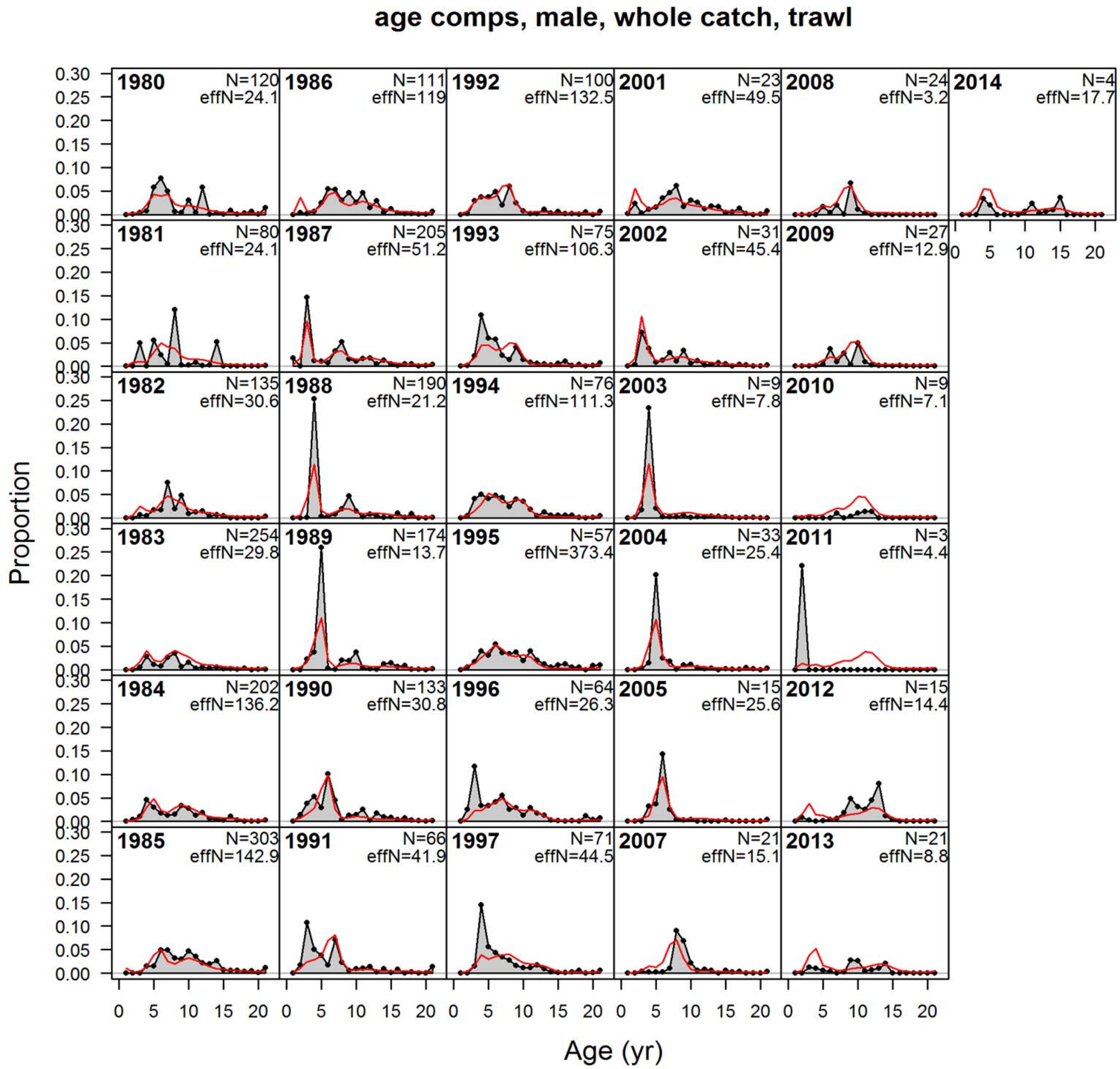

Figure 35: Fits to male length composition data from the trawl fishery, including new length composition data for the 2007-2014 period.

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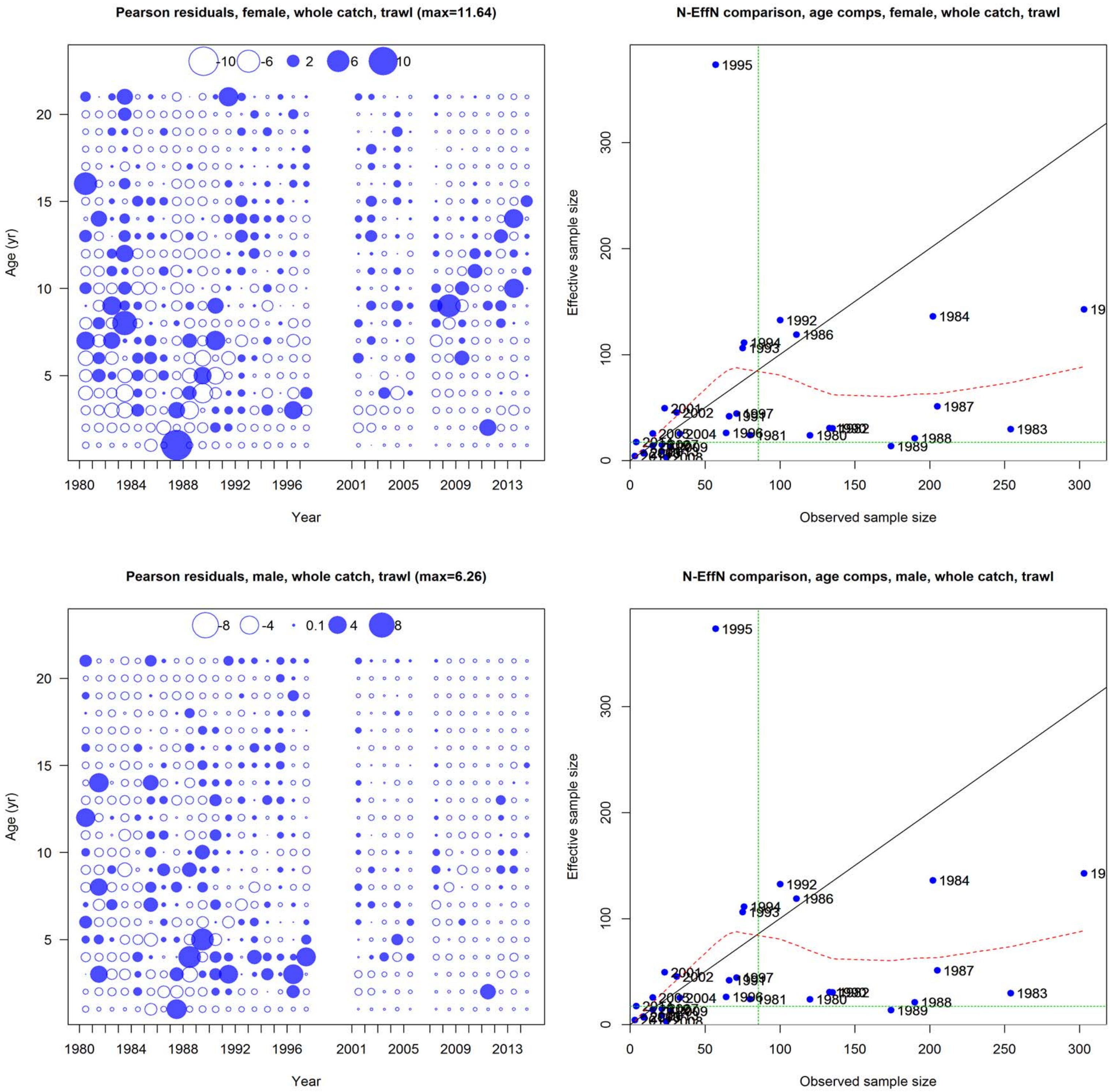

Figure 36a-d: Residuals and effective sample size comparisons associated with the fits to female length composition data from the trawl fishery.

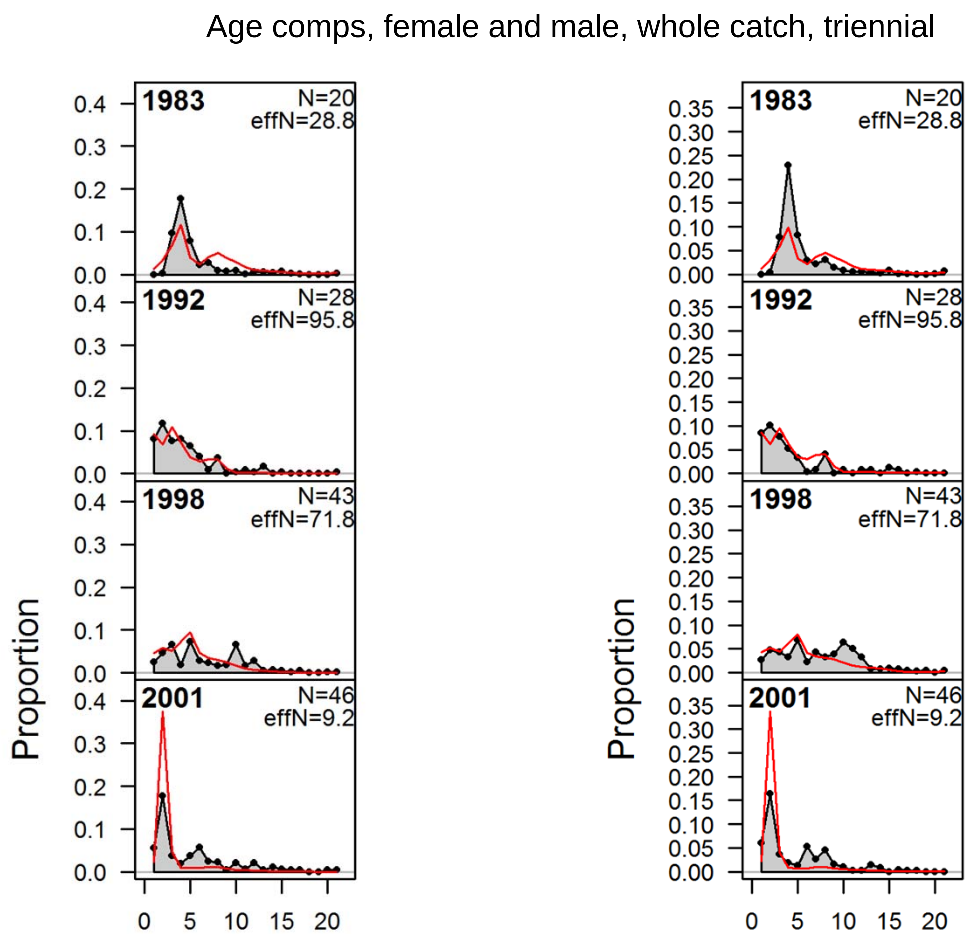

Figure 37a (left) and b (right): Fits to new age composition data from the triennial trawl survey

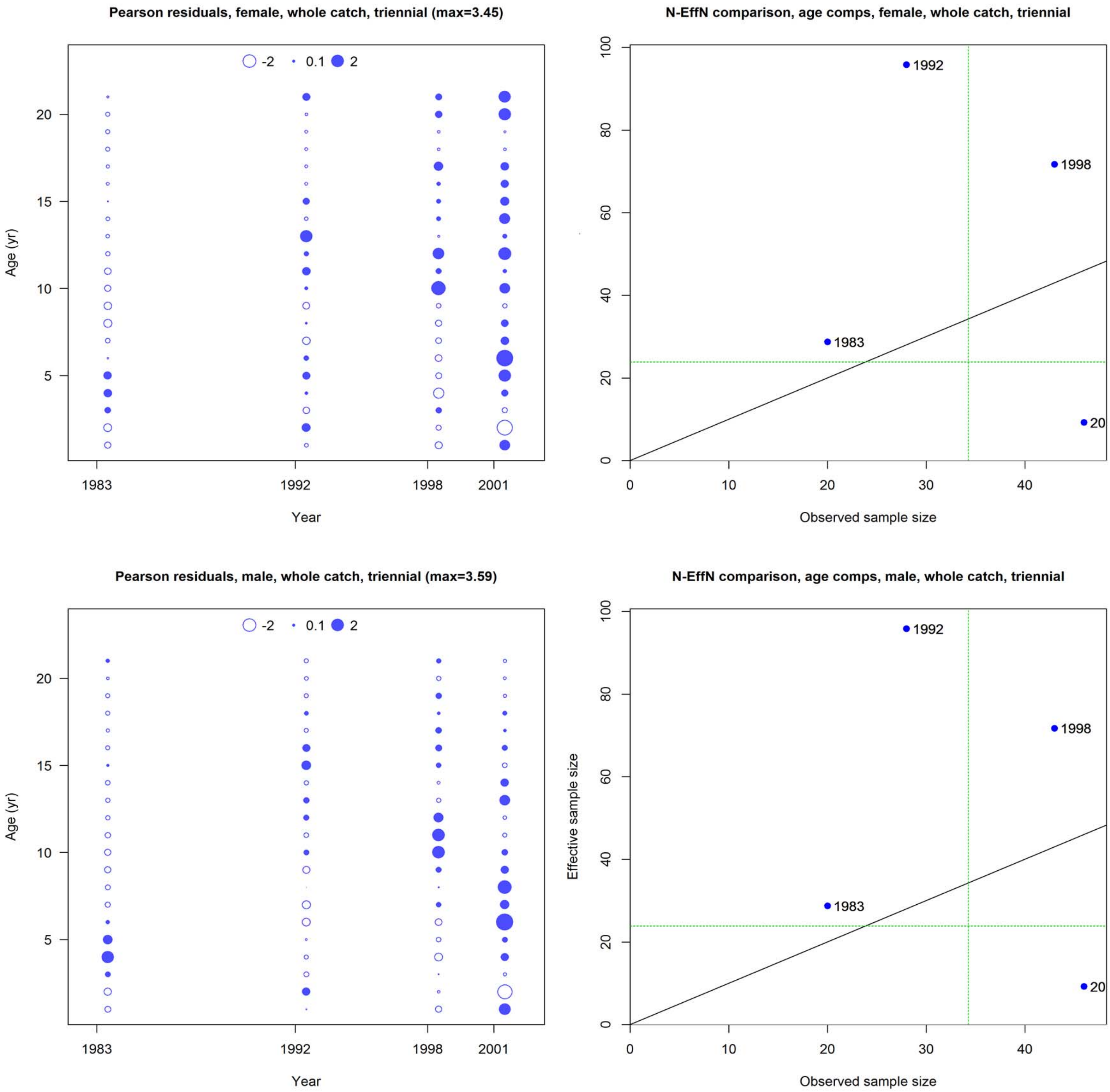

Figure 38a-d Residuals and effective sample size comparisons associated with the fits to female length composition data from the trawl fishery.

Age comps, female and male, whole catch, combo survey

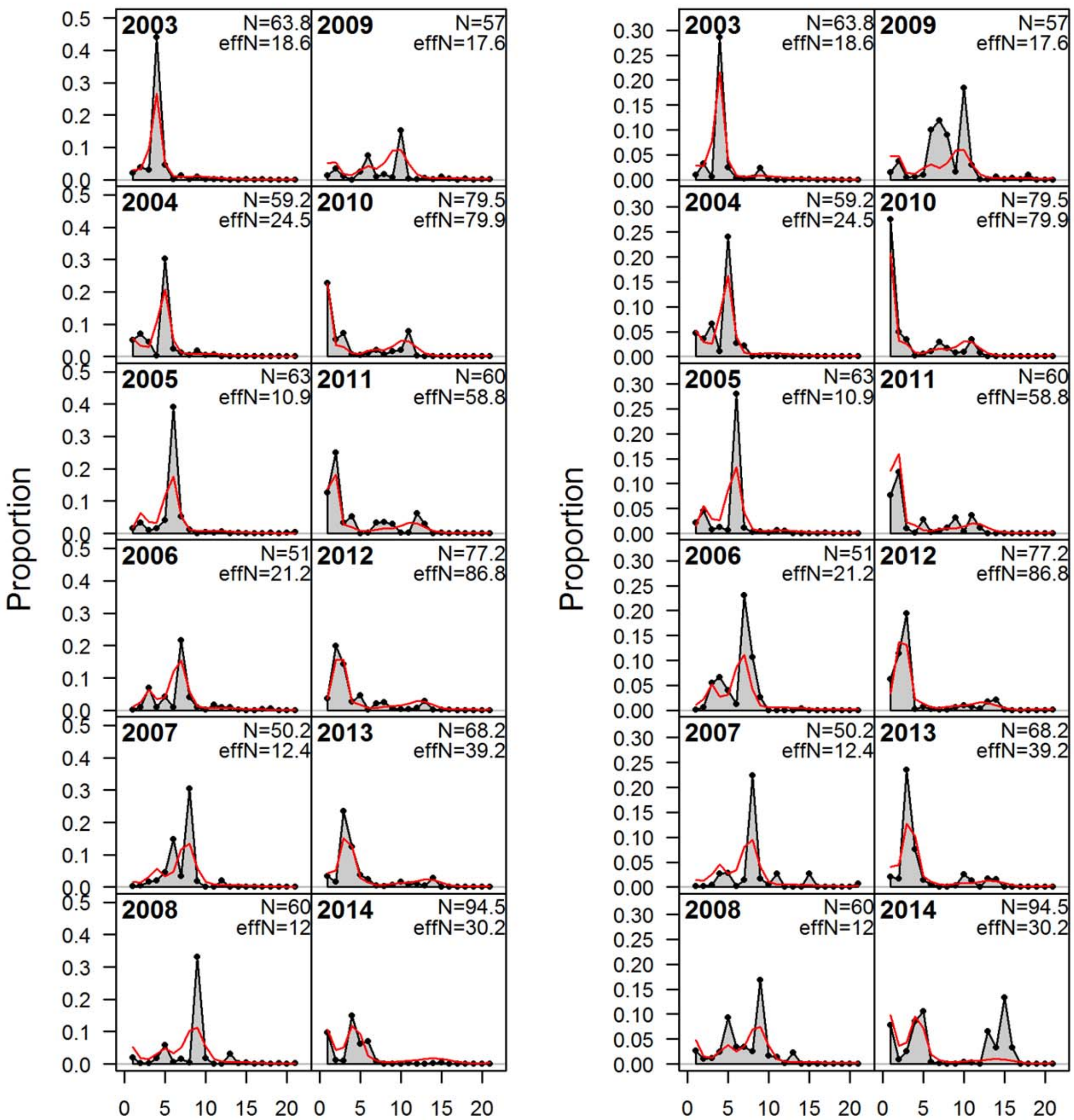

Figure 39a (top) and 1b (bottom): Observed and predicted age composition data from the NWFSC bottom trawl survey.

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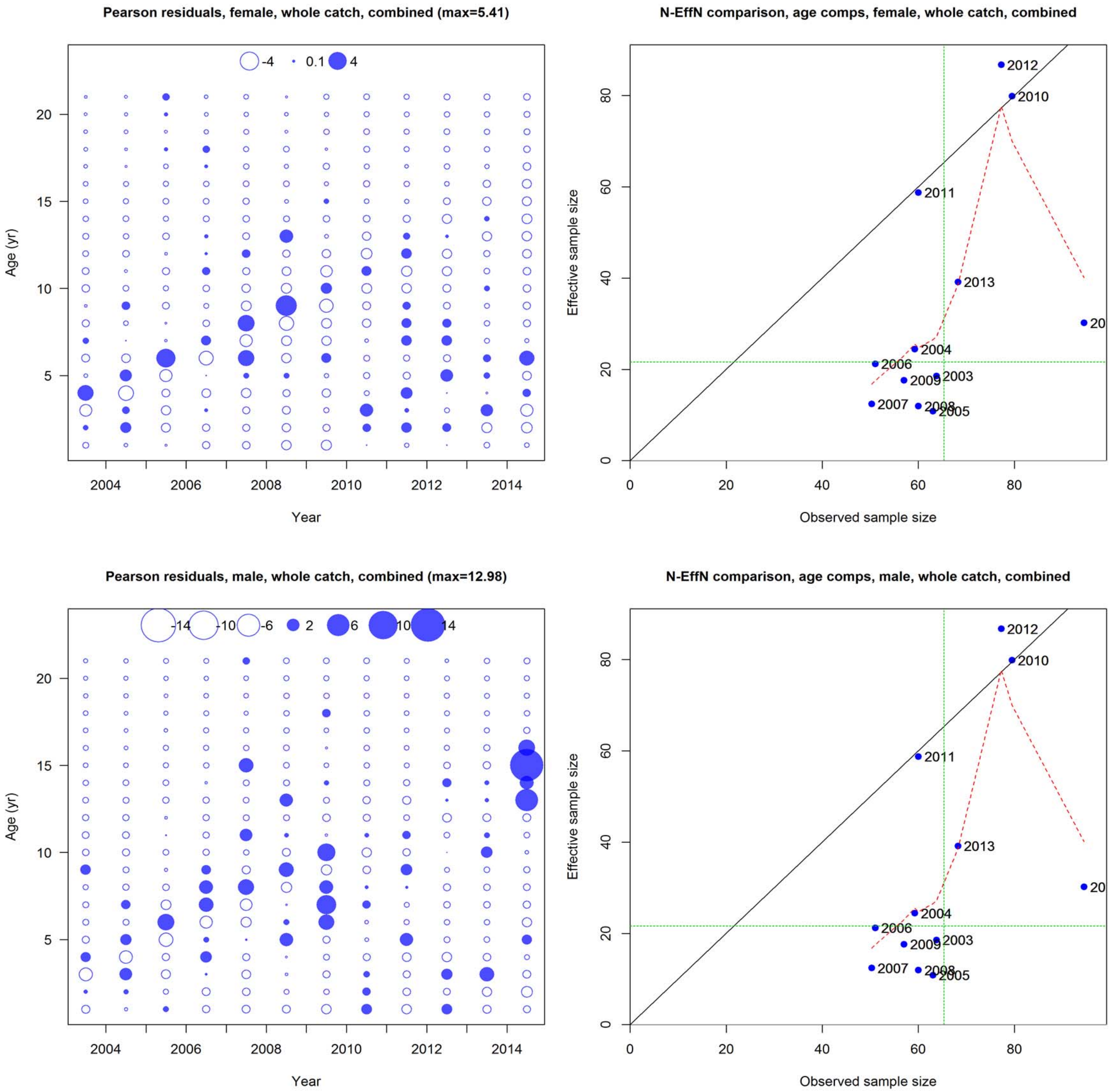
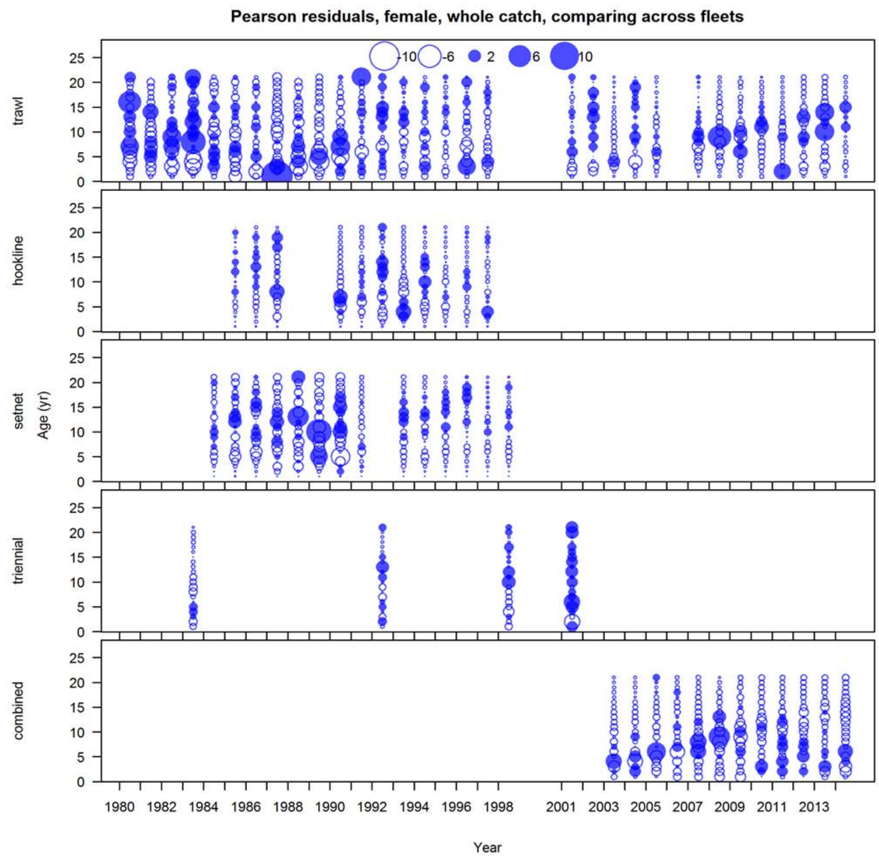


Figure 40a (top) and 1b (bottom): Residuals and effective sample size comparisons associated with the fits to age composition data from the NWFSC bottom trawl survey



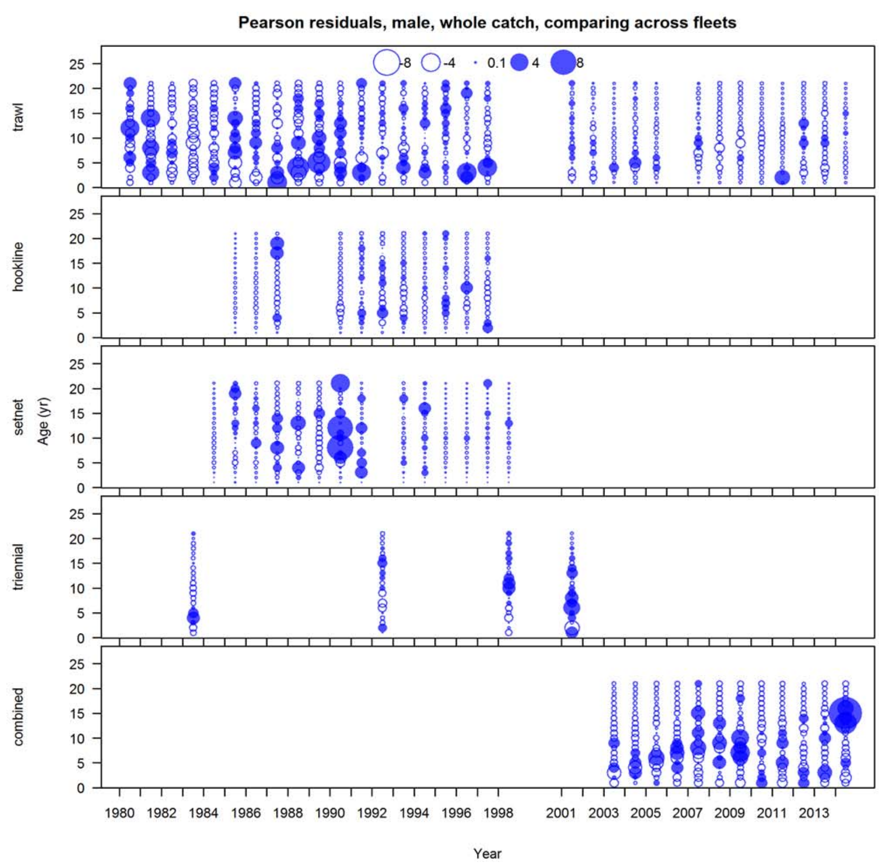
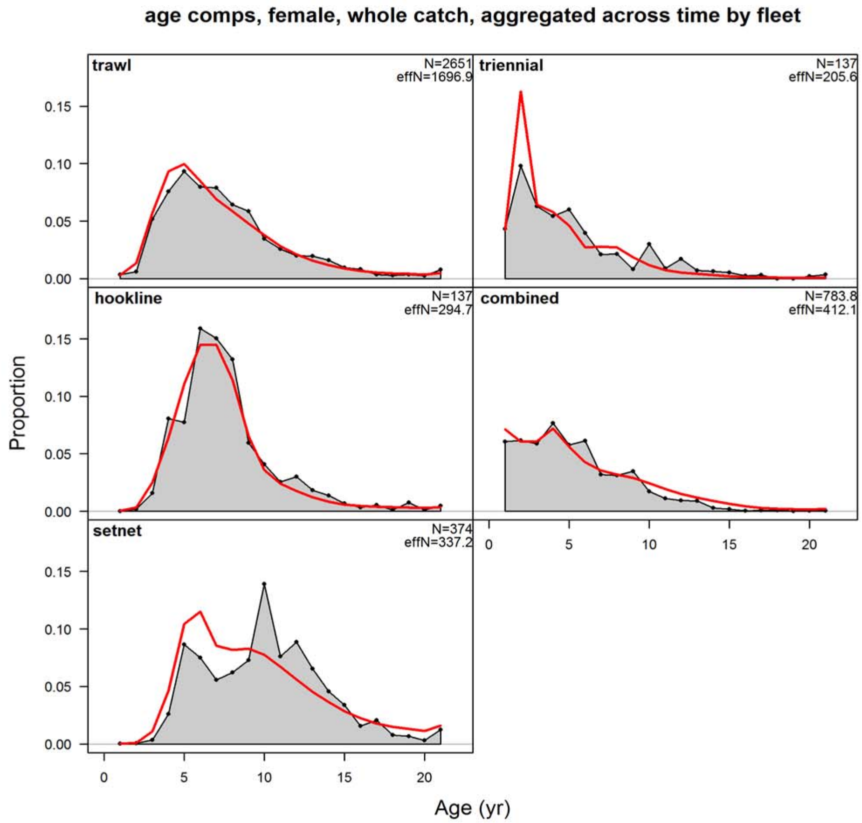


Figure 41a (top) and 1b (bottom): Residuals and effective sample size comparisons associated with the fits to female length composition data from the trawl fishery.



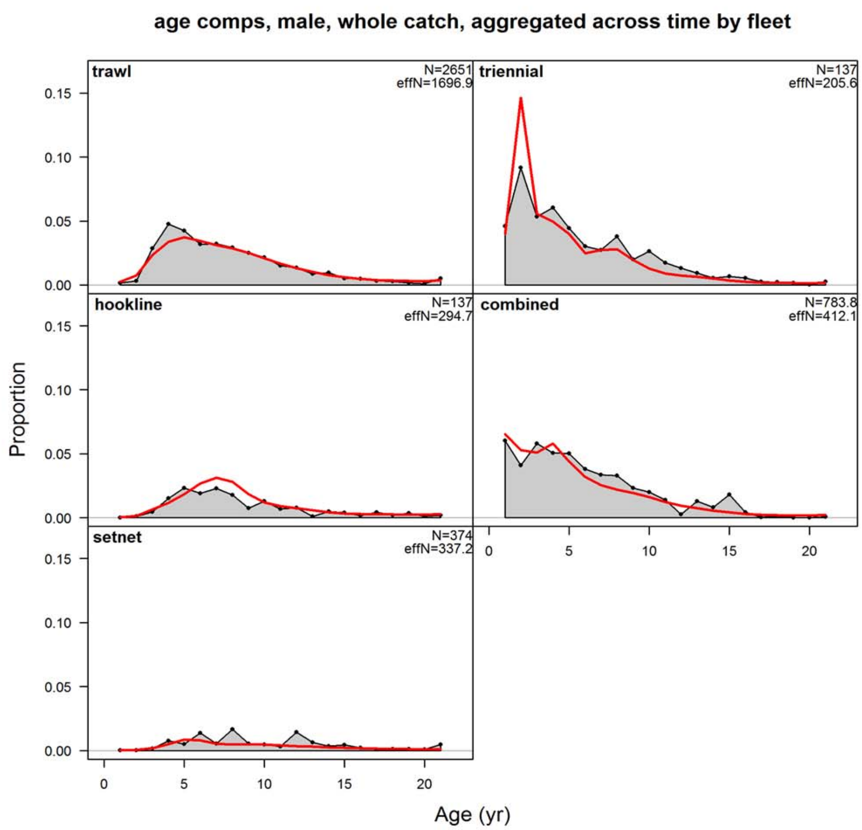


Figure 42a (top) and 1b (bottom): Estimated recruitments and recruitment deviations for base model when new survey data are sequentially added.

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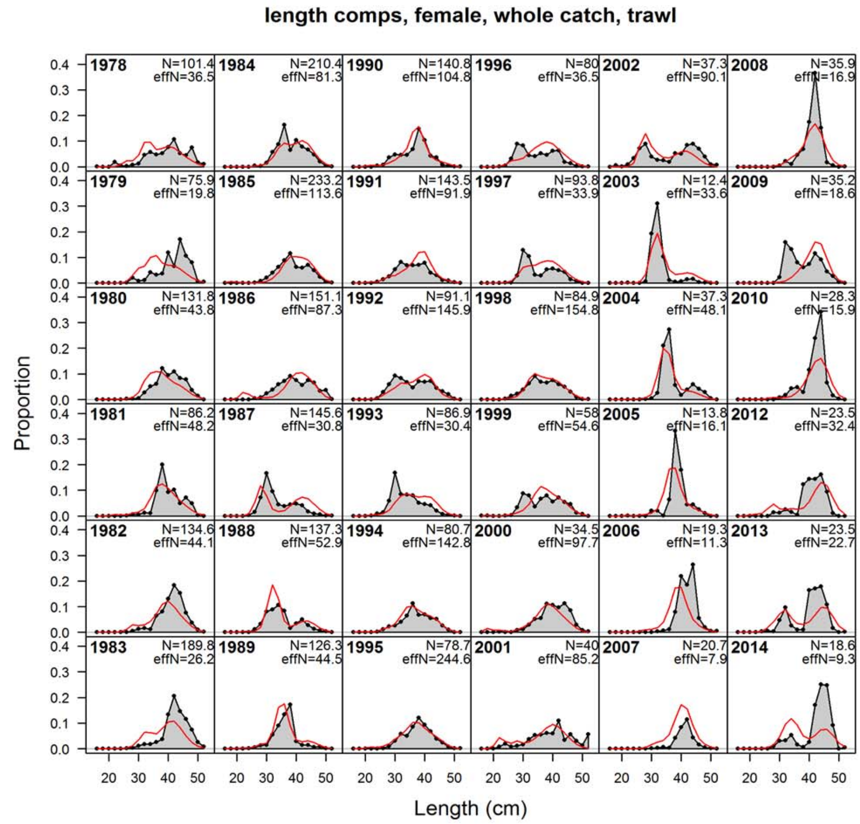

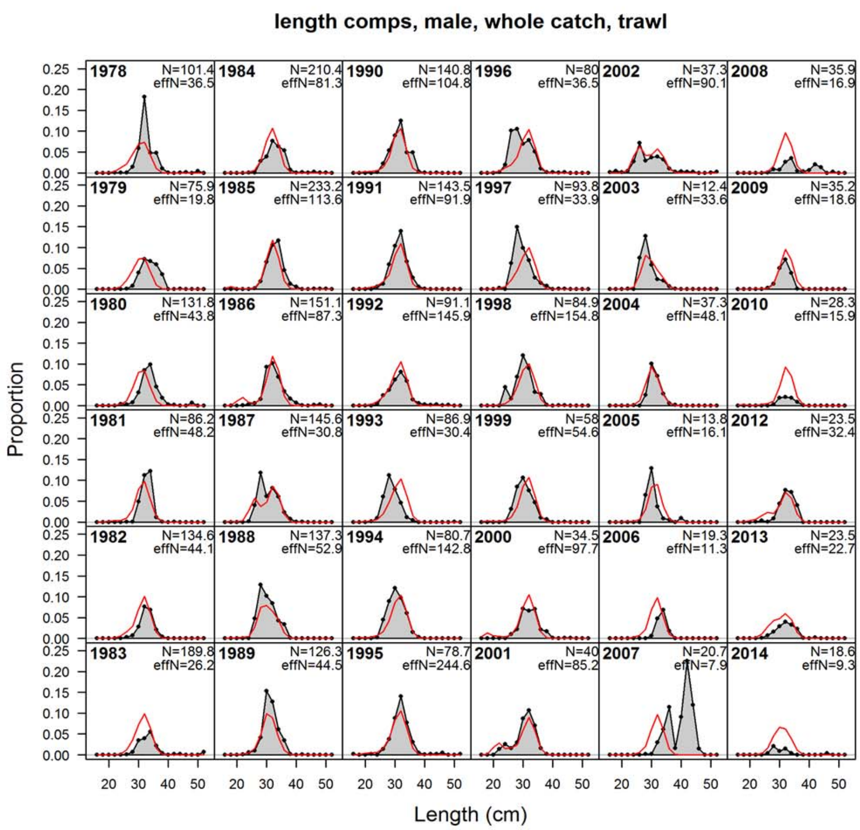

Figure 43a (top) and 1b (bottom): Estimated recruitments and recruitment deviations for base model when new survey data are sequentially added.

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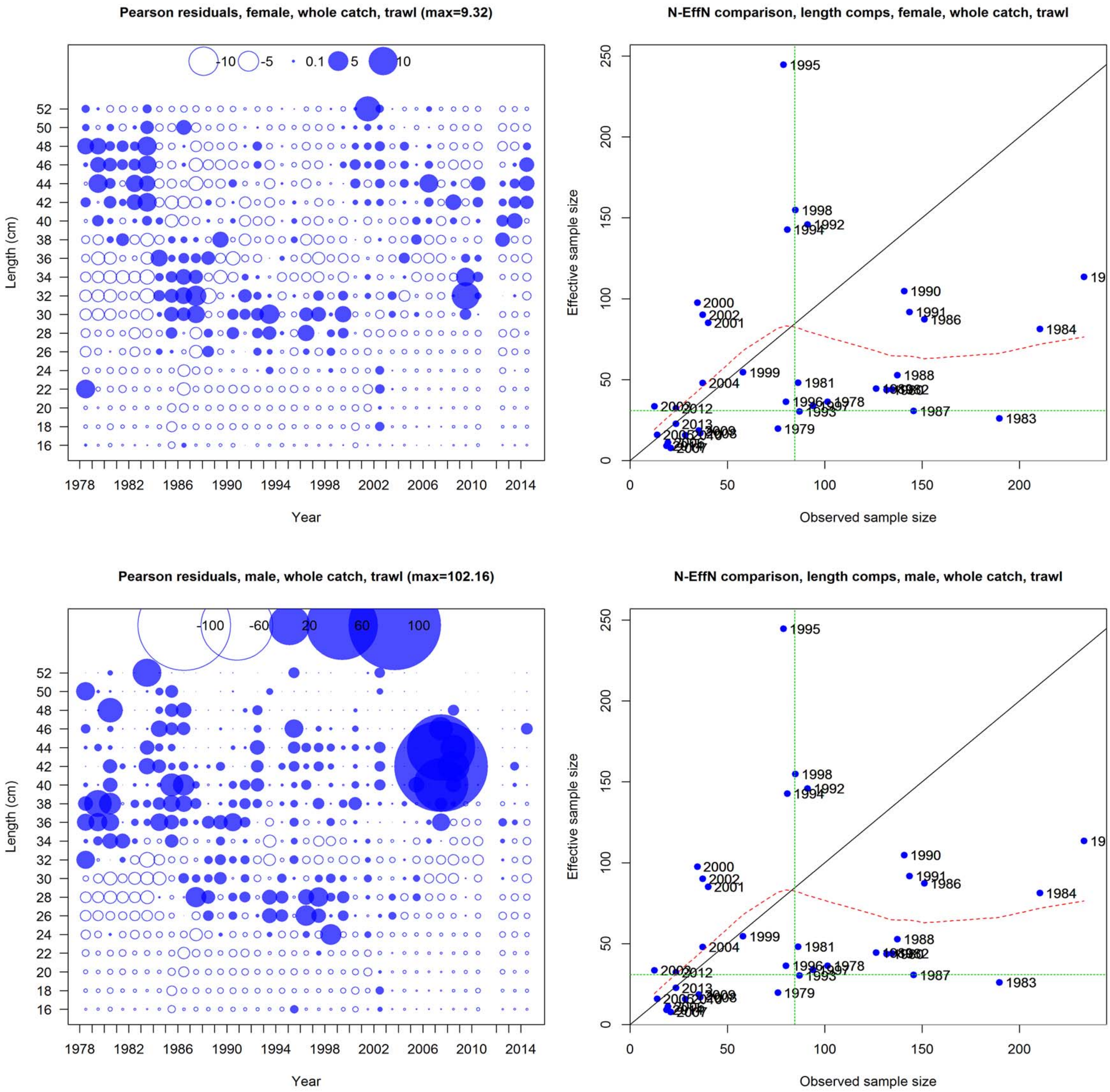

Figure 44a (top) and 1b (bottom Residuals and effective sample size comparisons associated with the fits to female length composition data from the trawl fishery.

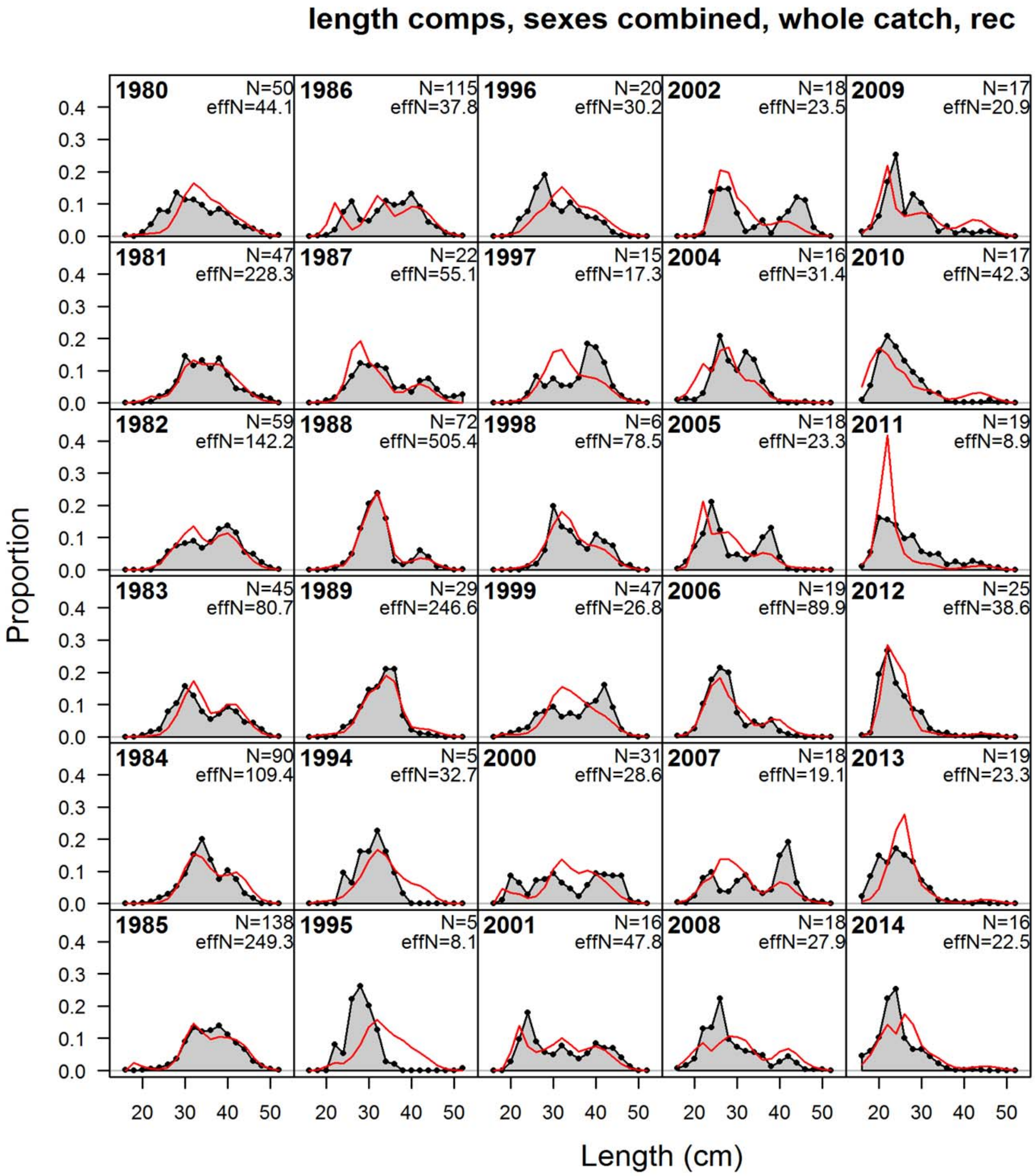

Figure 45a (top) and 1b (bottom): Estimated recruitments and recruitment deviations for base model when new survey data are sequentially added.

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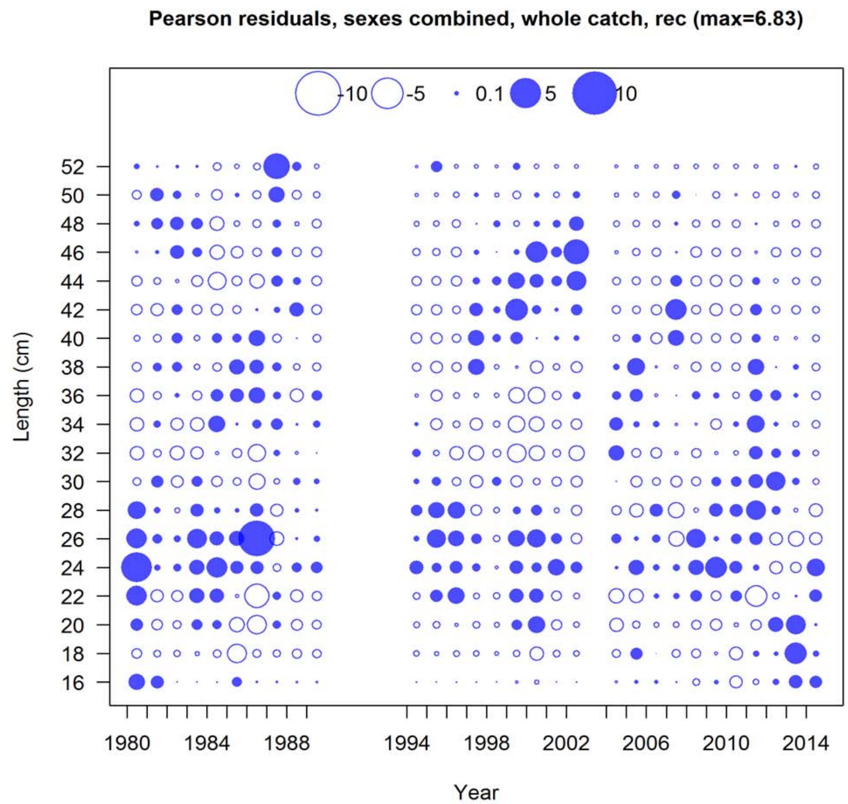

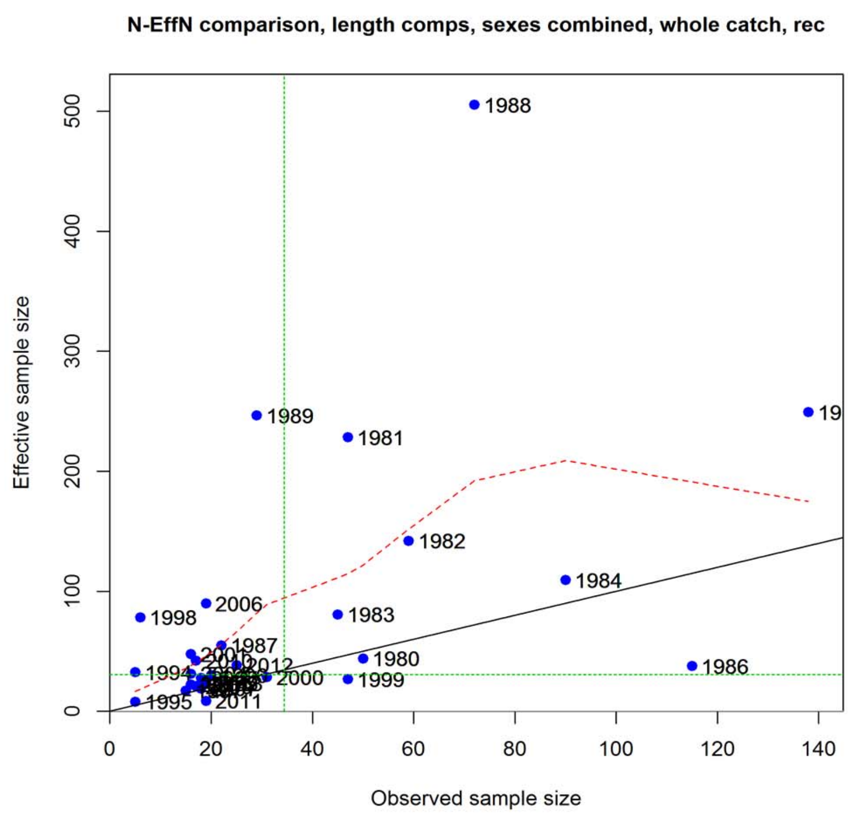

Figure 46a (top) and 1b (bottom): Residuals and effective sample size comparisons associated with the fits to female length composition data from the trawl fishery.

Length comps, female and male, whole catch, triennial

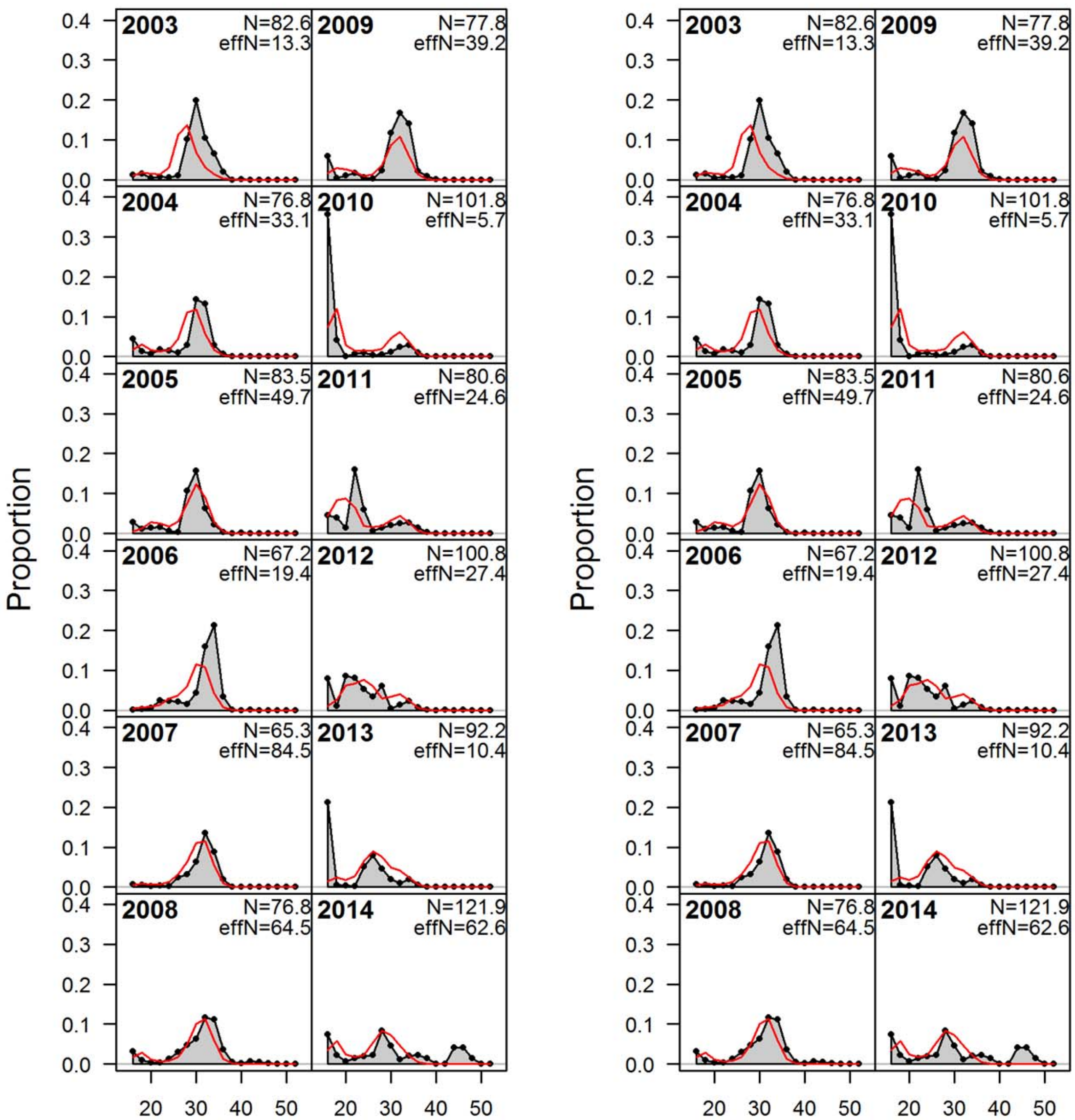

Figure 47a (top) and 1b (bottom): Observed and predicted female and male length composition data from the NWFSC combined bottom trawl survey.

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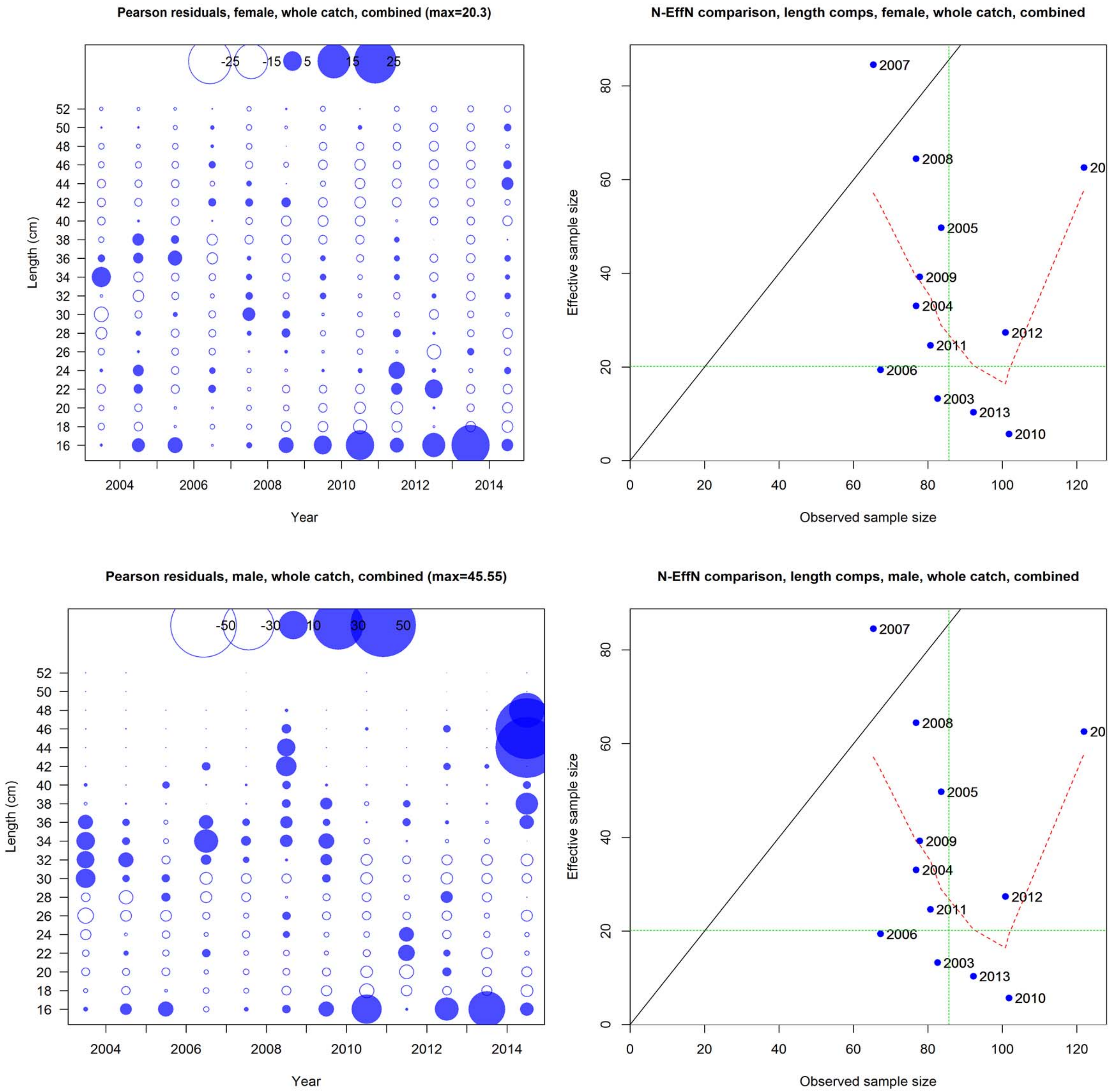
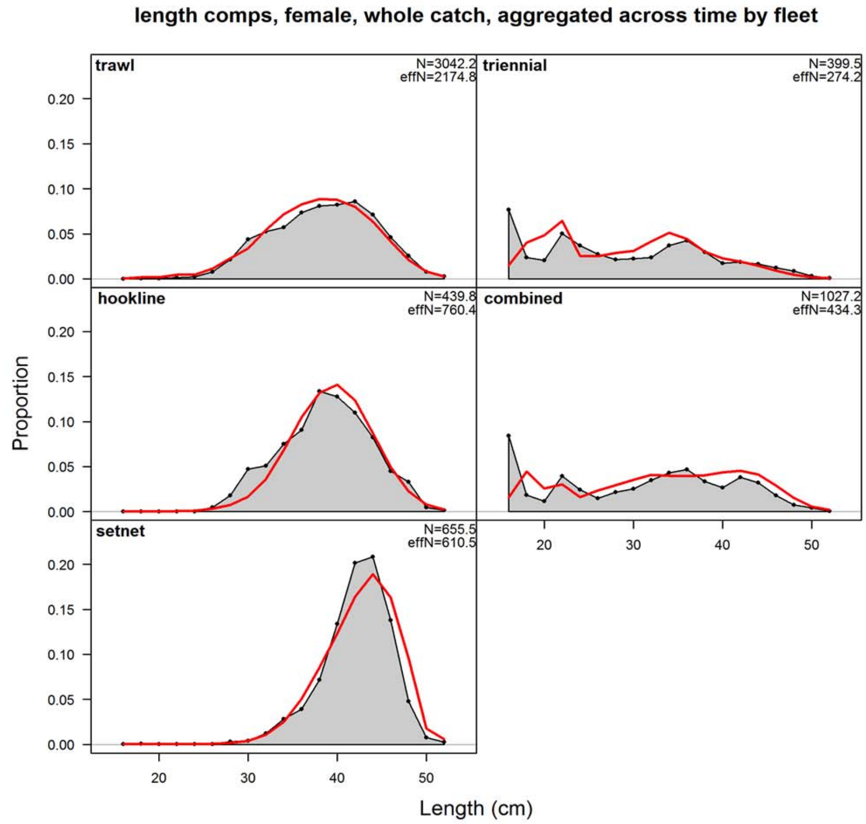


Figure 48a (top) and 1b (bottom): Residuals and effective sample size comparisons associated with the fits to female length composition data from the trawl fishery



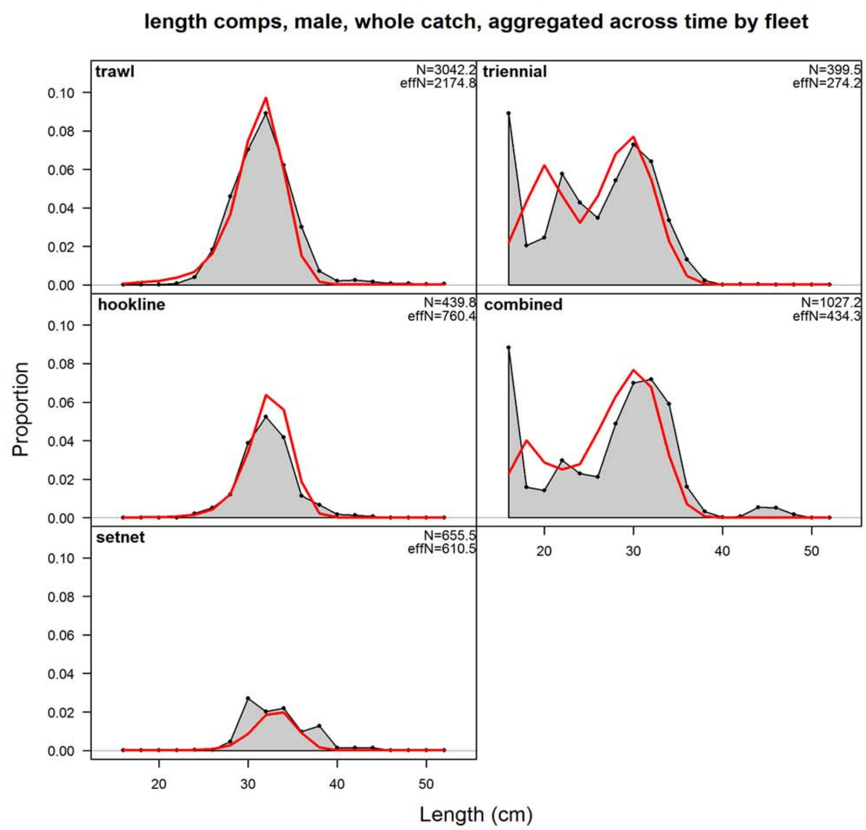


Figure 49a (top) and 1b (bottom): Observed and predicted length composition data for all years combined by fishery and survey.

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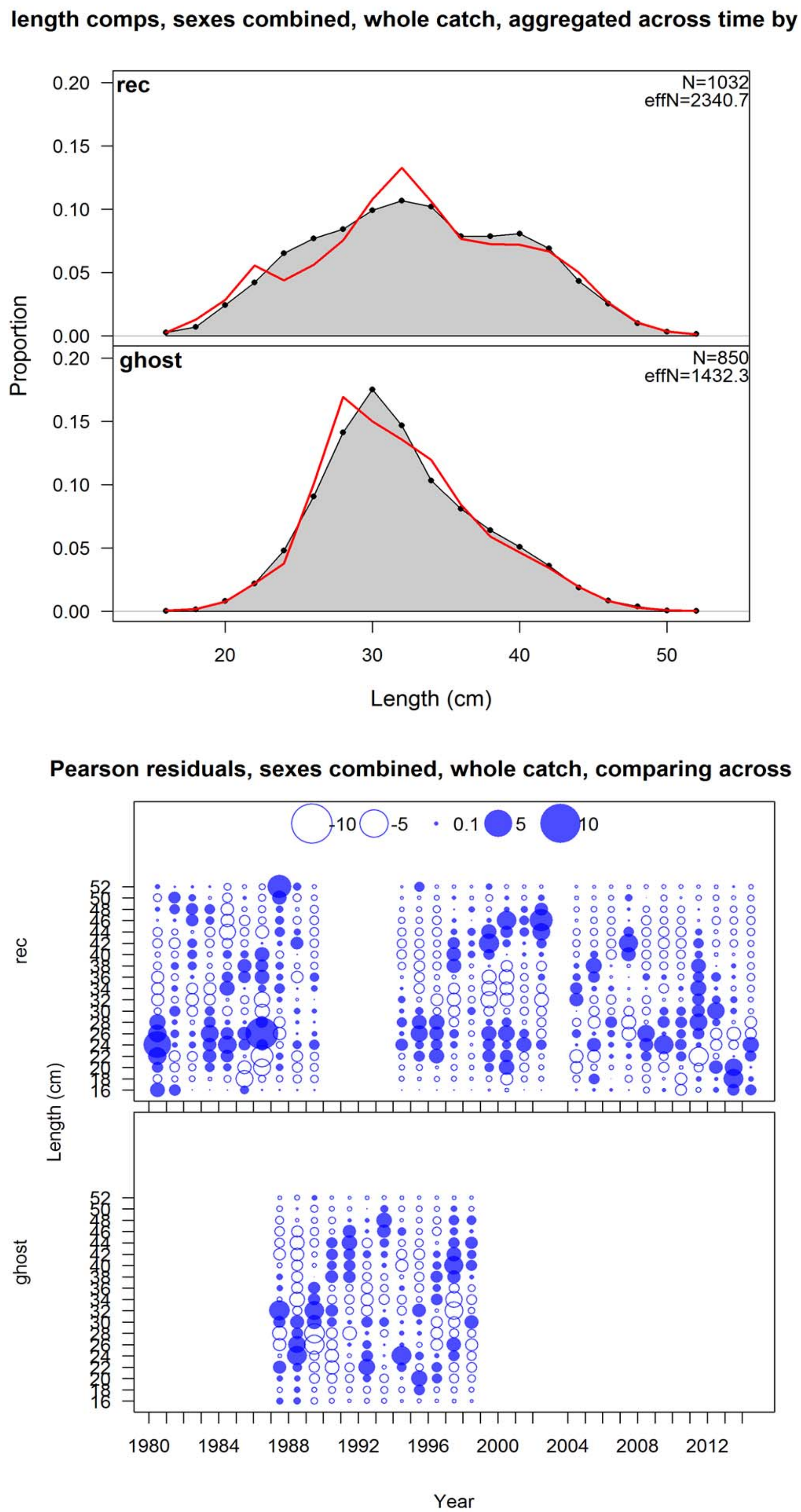

Figure 50a (top) and b (bottom): Observed and predicted fits to length composition data for all years combined for recreational fisheries (sexes combined) with model residuals.

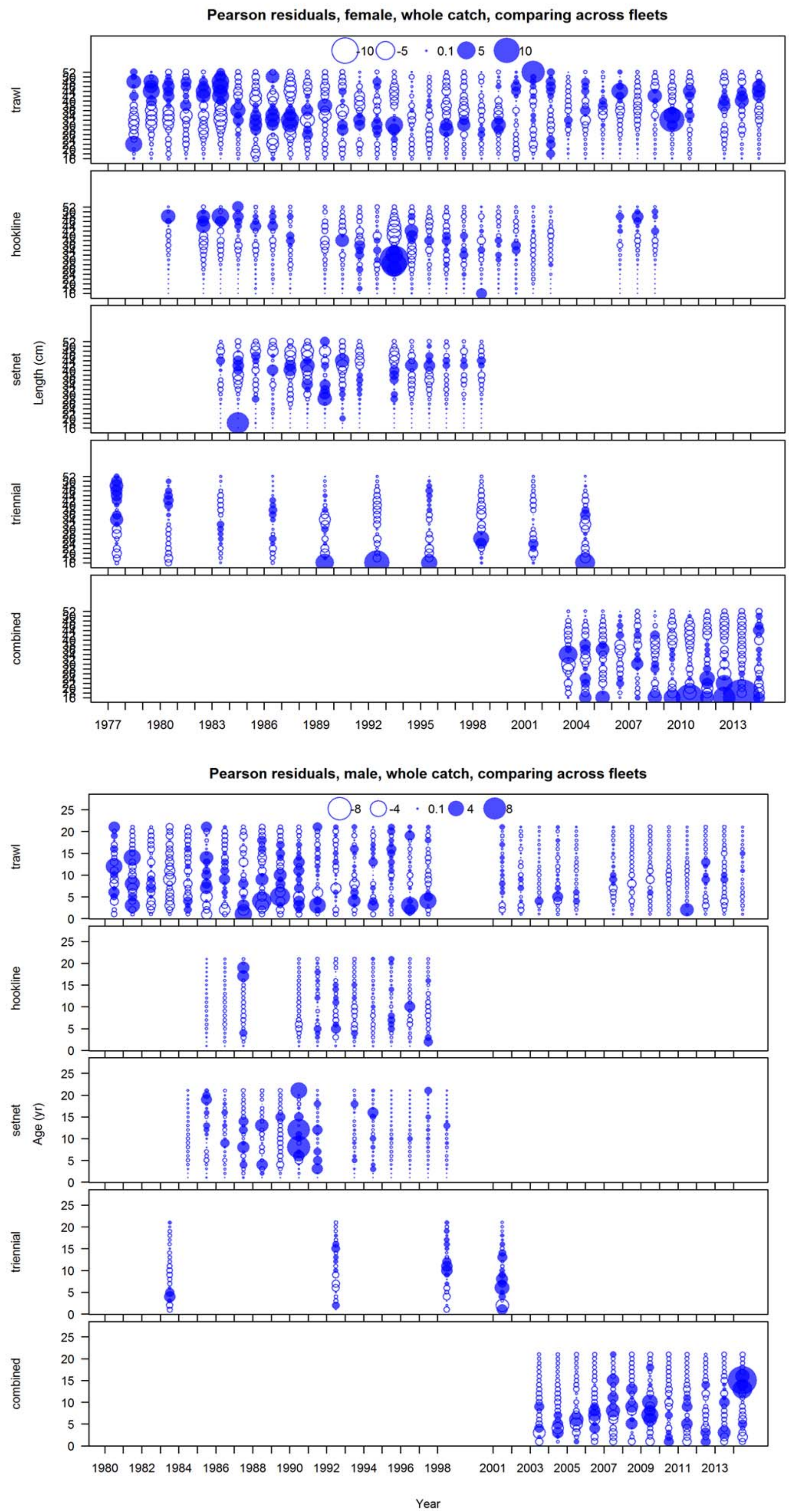

Figure 51a (top) and 1b (bottom): Residuals associated with fits to all years of length composition data (by sex) for commercial fisheries and surveys.

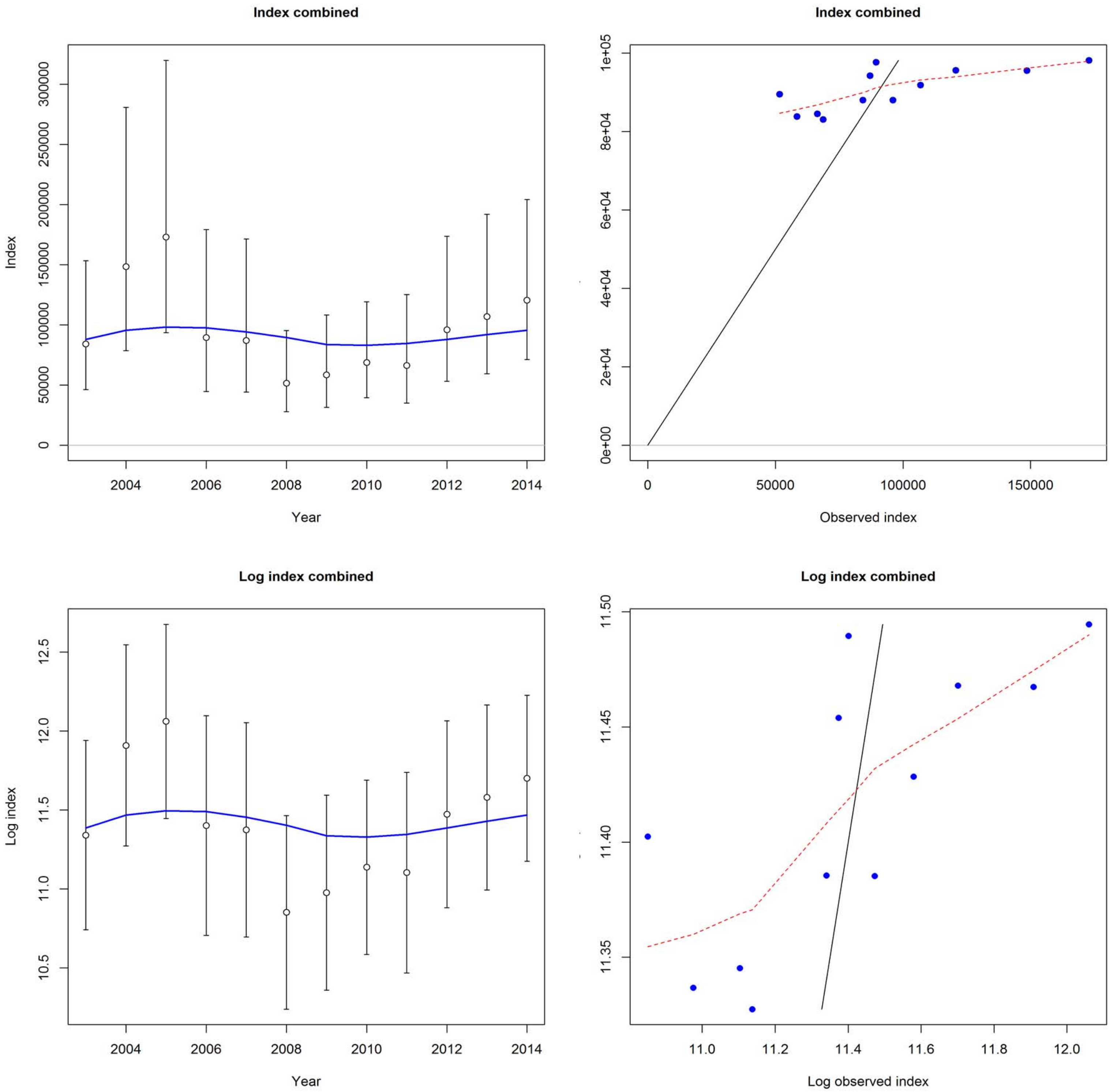

Figure 52a - d: Fits to Combined bottom trawl survey index in arithmetic (top) and log scale (bottom).

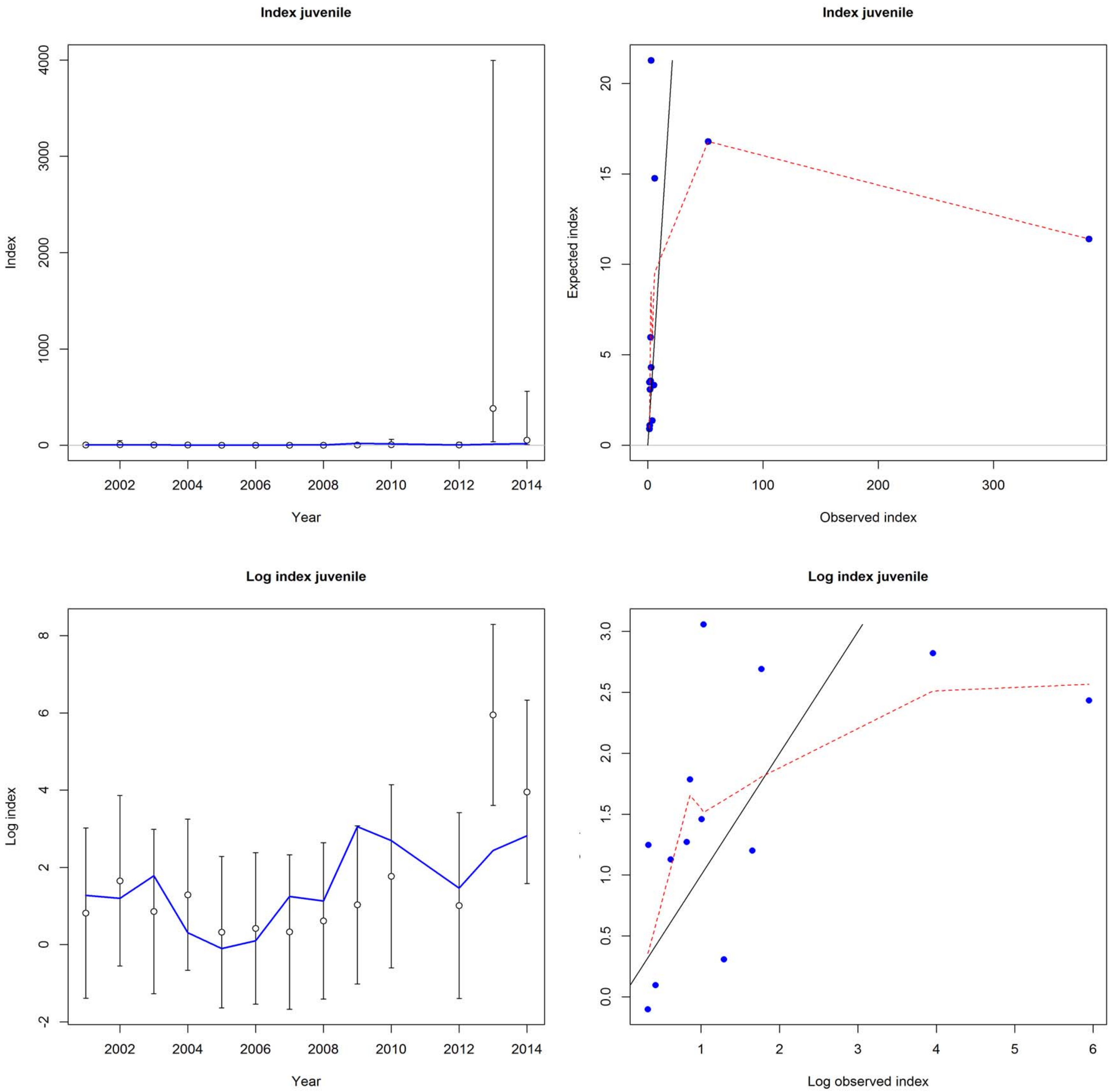

Figure 53a - d: Fits to SWFSC/NWFSC juvenile (age 0) abundance index in arithmetic (top) and log scale (bottom).

.

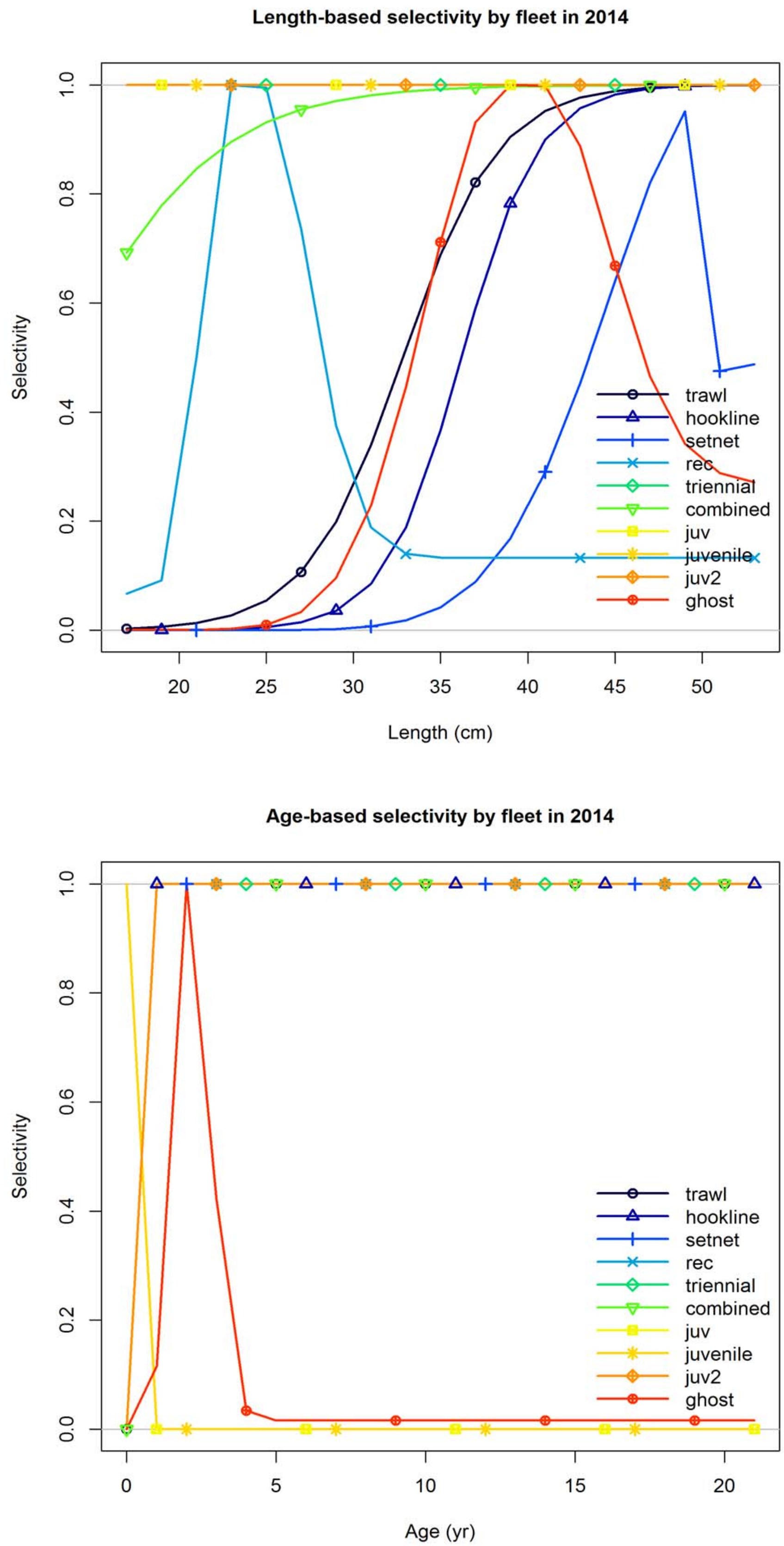

Figure 54a (top) and b (bottom): Estimated length and age selectivity for fisheries and survey s in the base model.

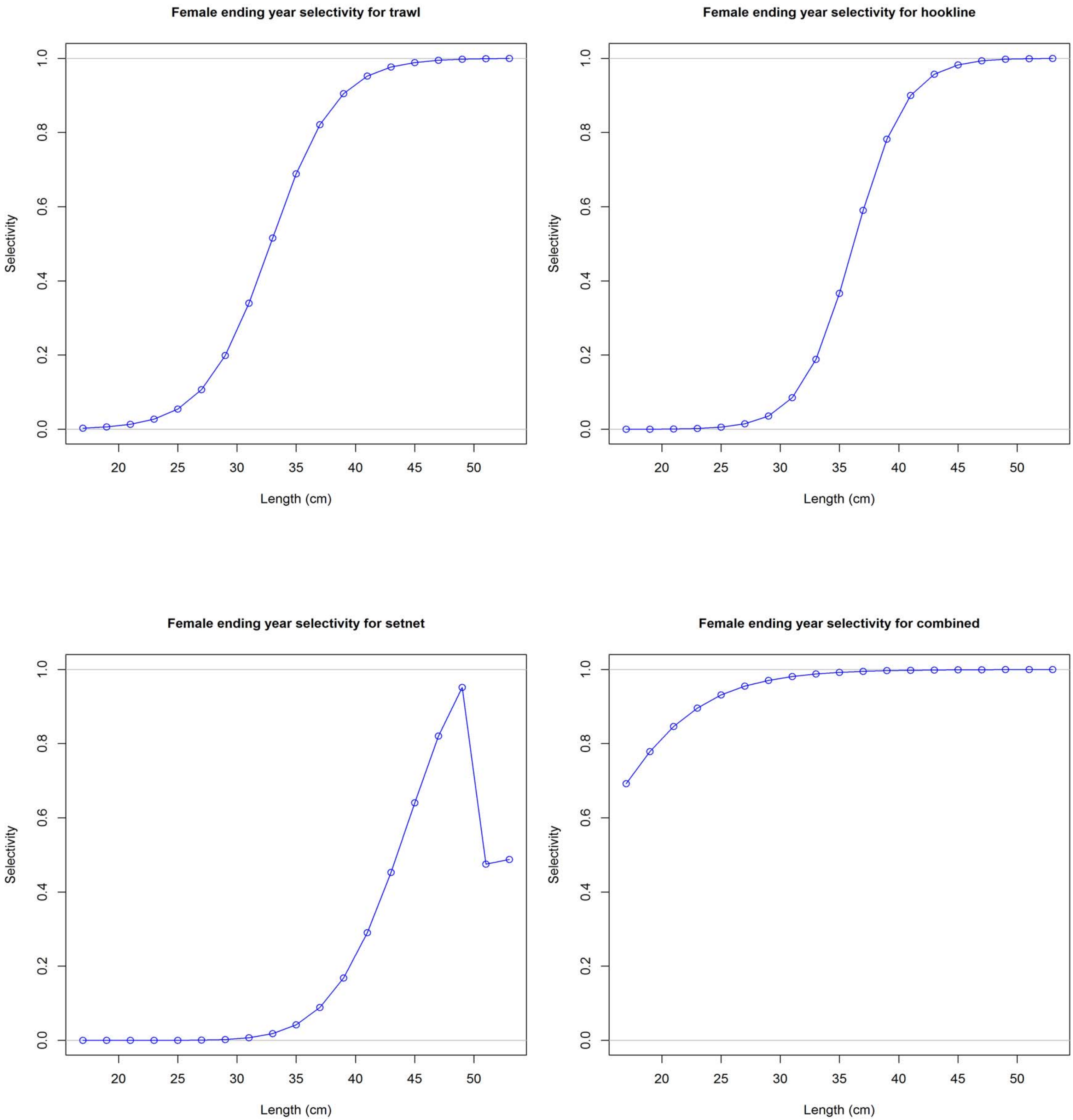

Figure 55a-d: Estimated (or fixed) length and age selectivity for fisheries and survey s in the base model.

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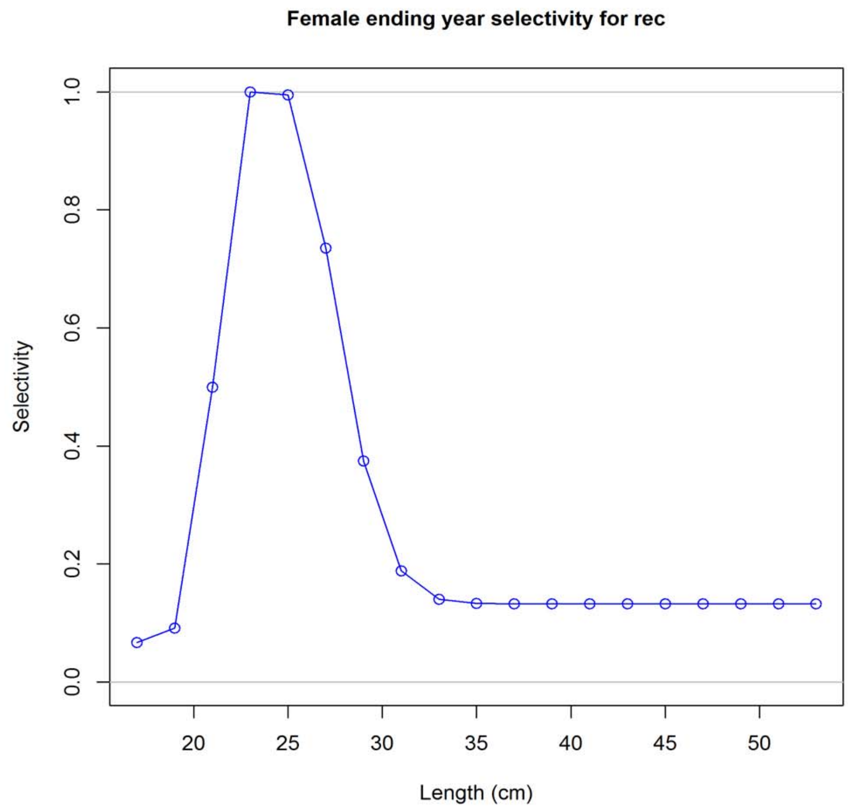


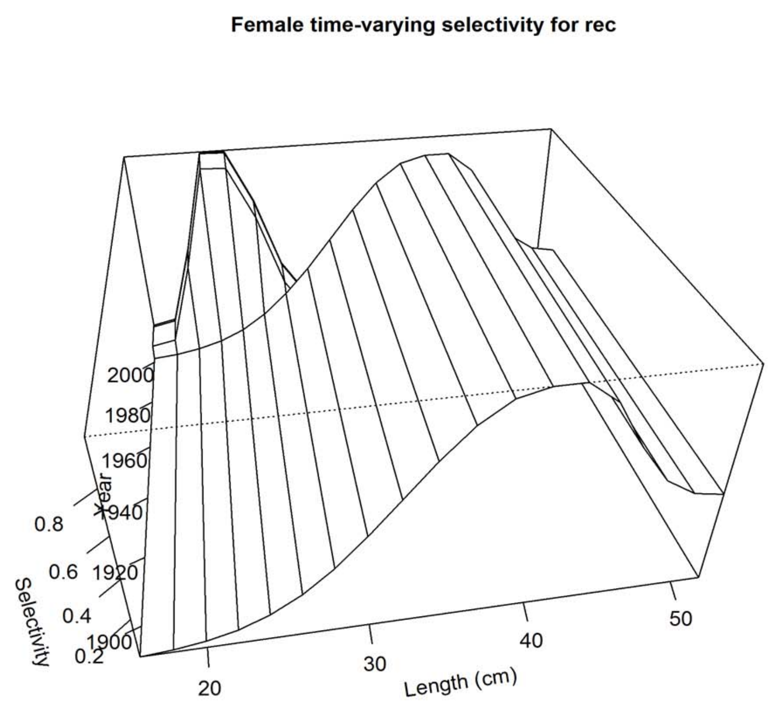


Figure 56a (top) and b (bottom): Estimated selectivity for the recreational fishery, ending time block (top) from 2003-2014, over time (bottom) showing the selectivity curve for the period prior to 2003.

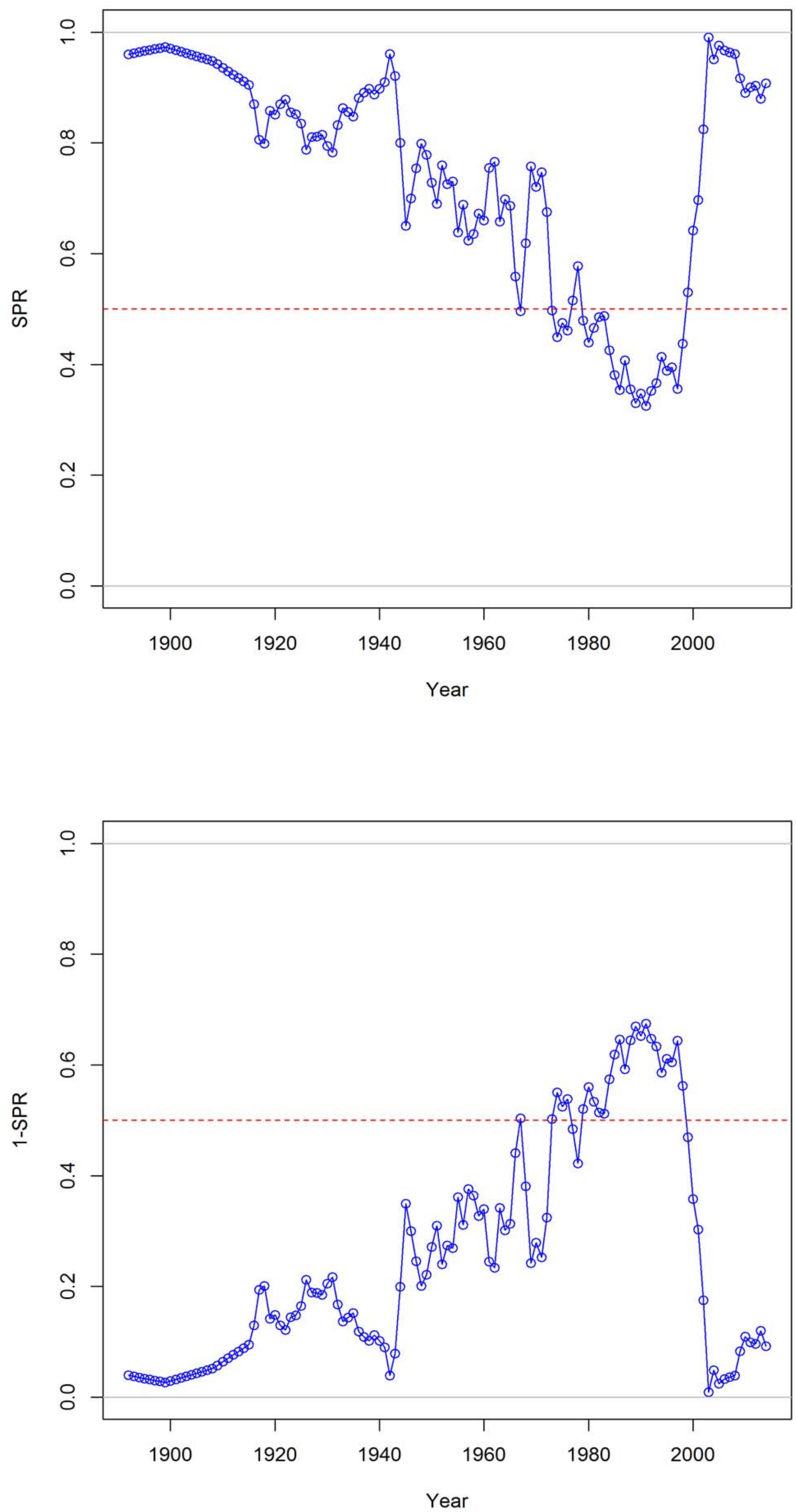


Figure 57a (top) and b (bottom): Estimated SPR and 1-SPR time series for 2015 base model.

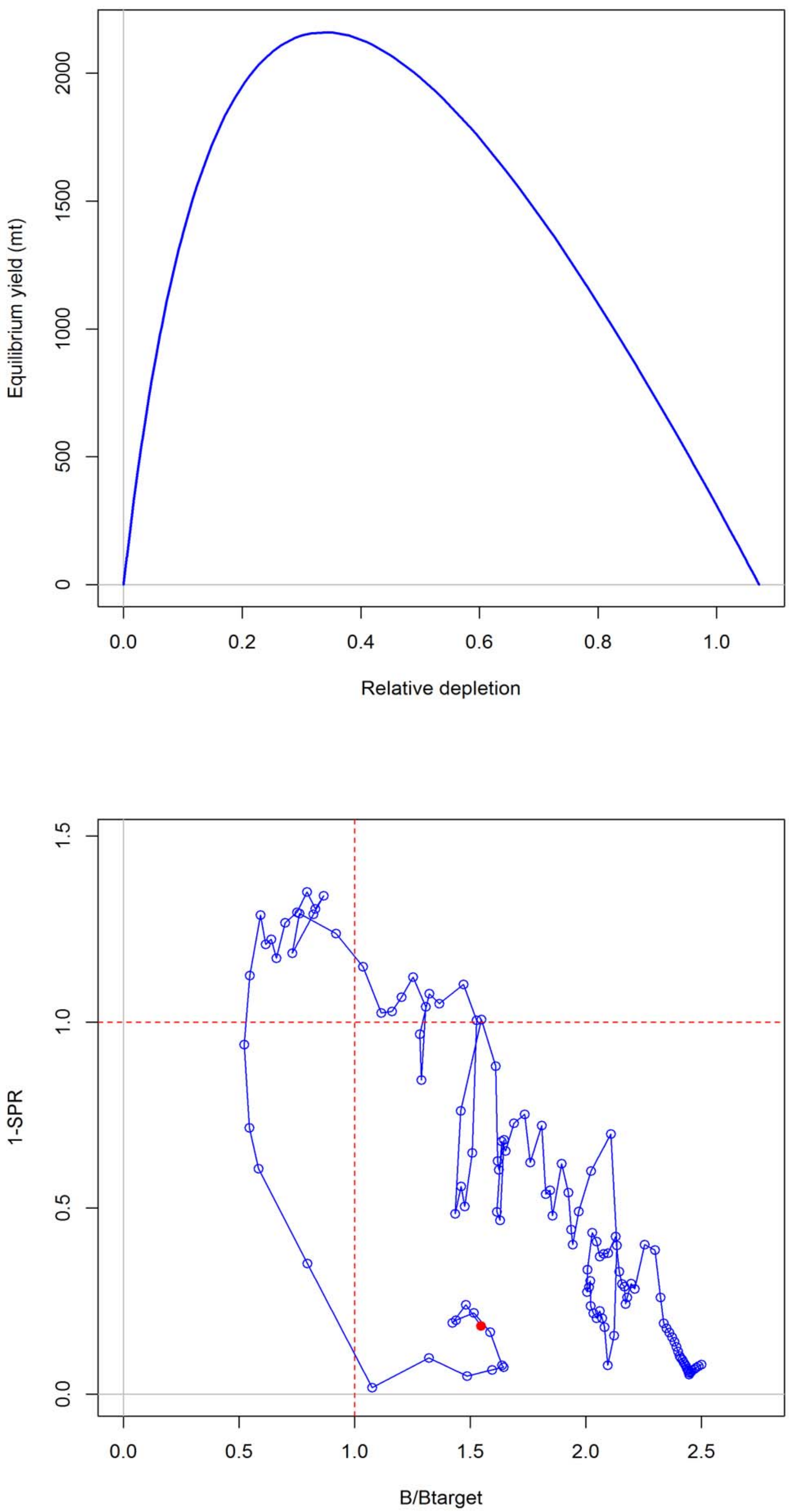


Figure 58a (top) and b (bottom): Estimated yield curve and phase plot for 2015 base model

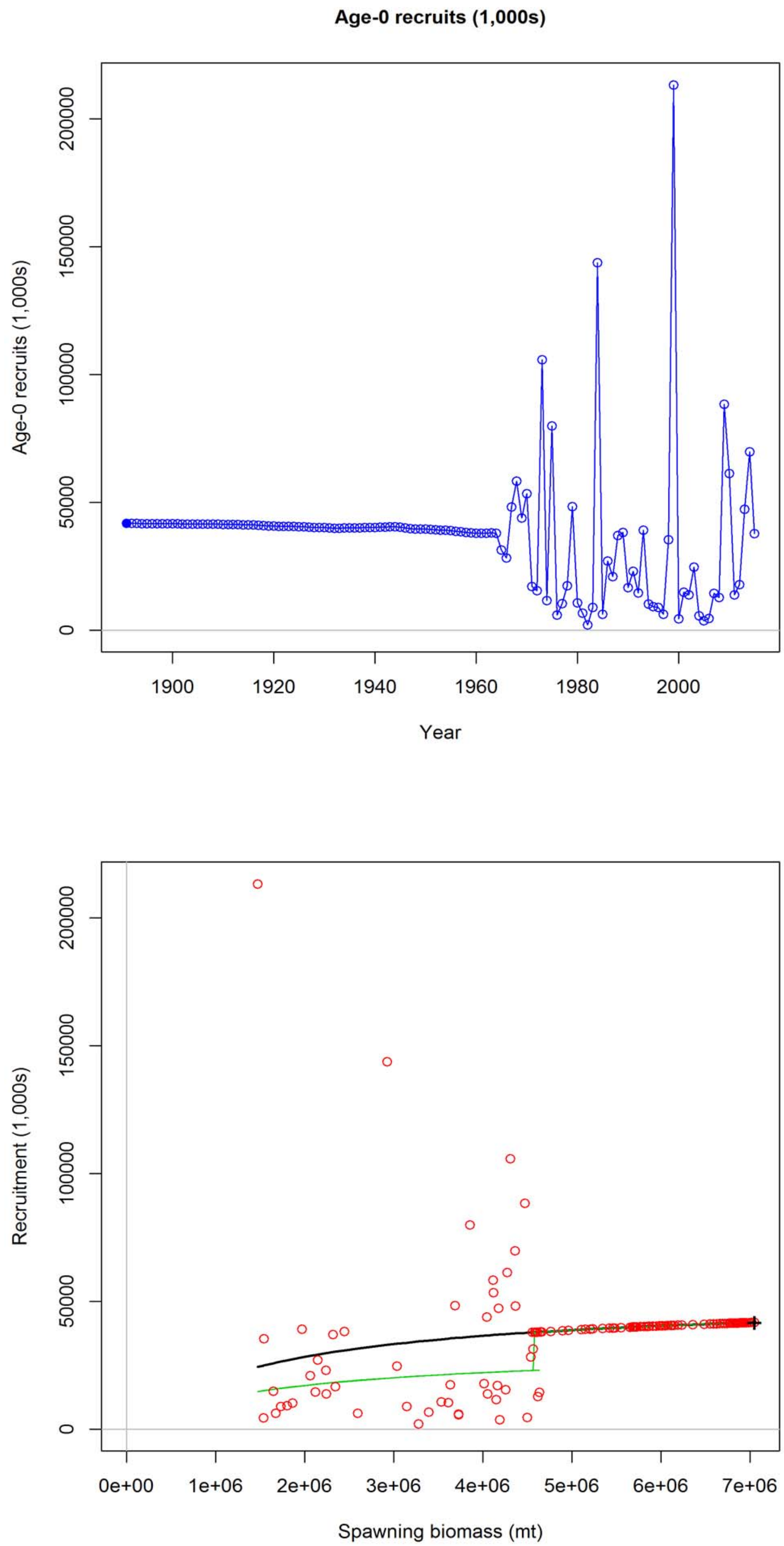
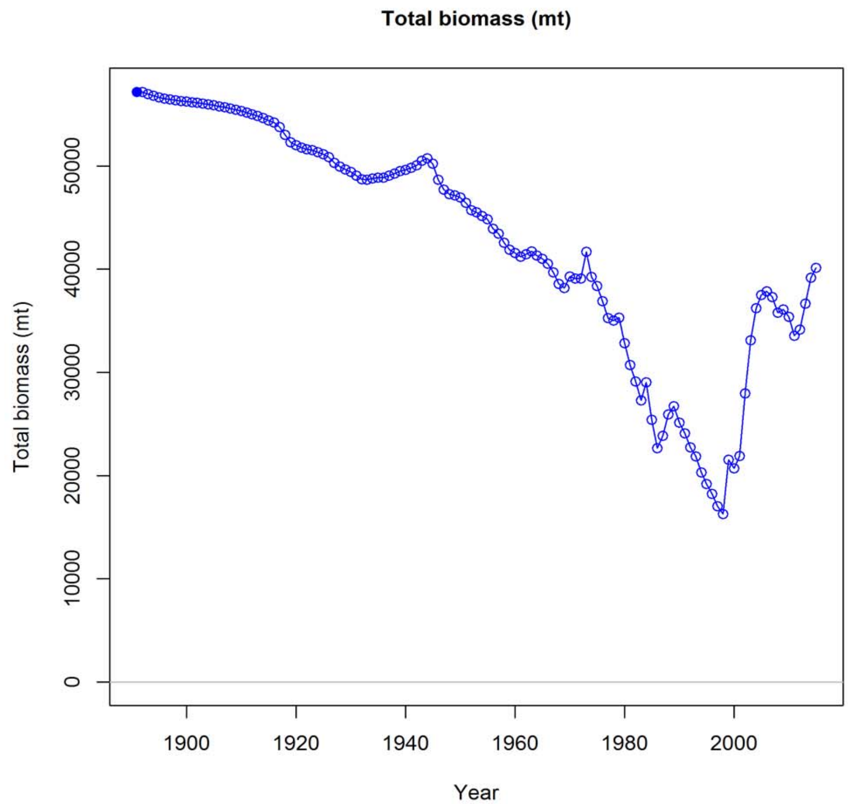


Figure 59a (top) and b (bottom): Estimated recruitments and spawner recruit curve for the 2015 base model.



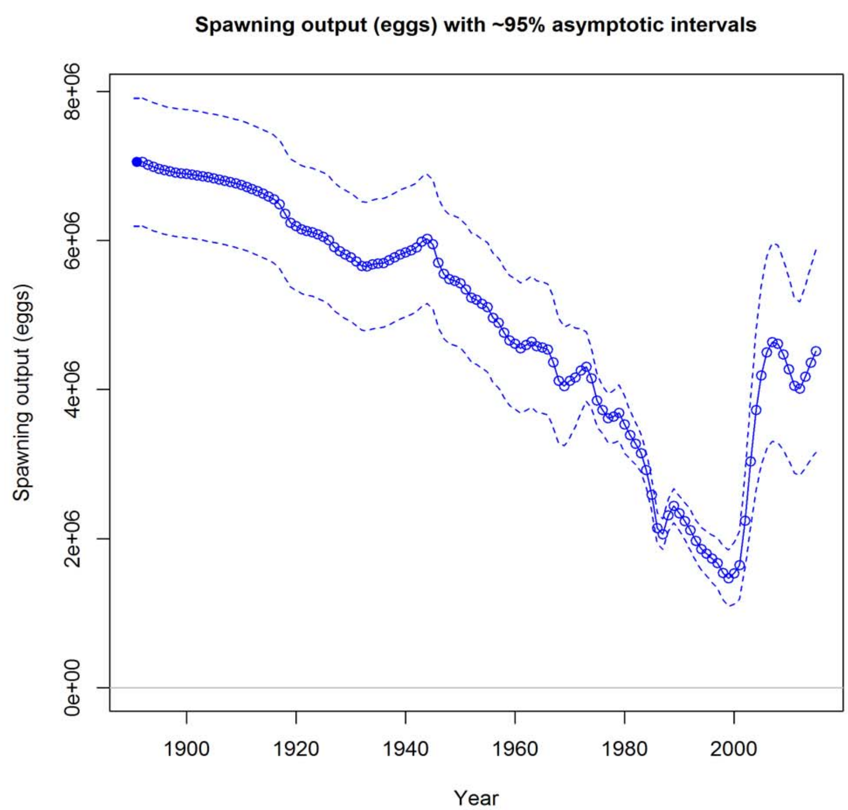


Figure 60a (top) and b (bottom): Estimated total biomas and spawning output time series for the 2015 base model.

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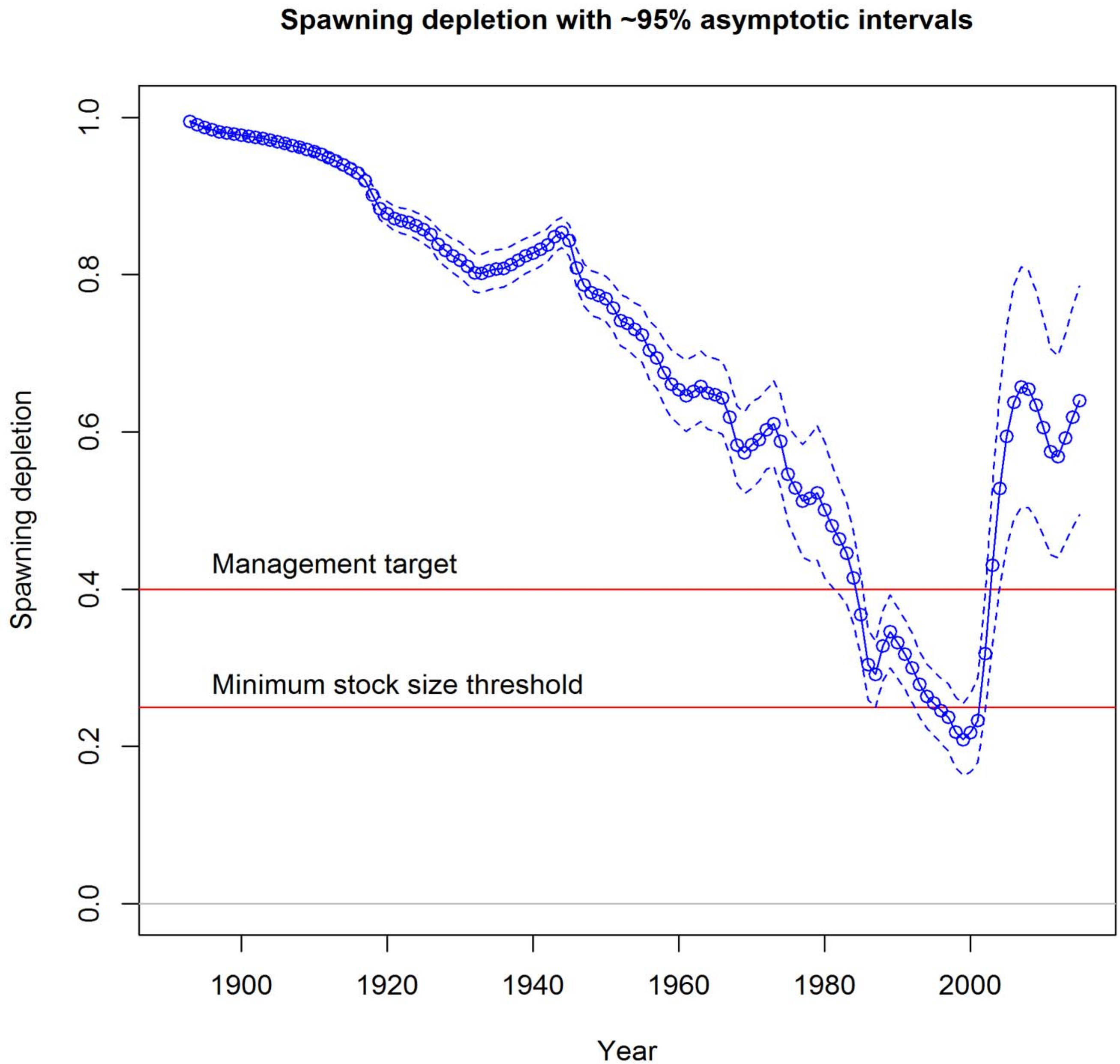


Figure 61: Estimated depletion for the 2015 base model

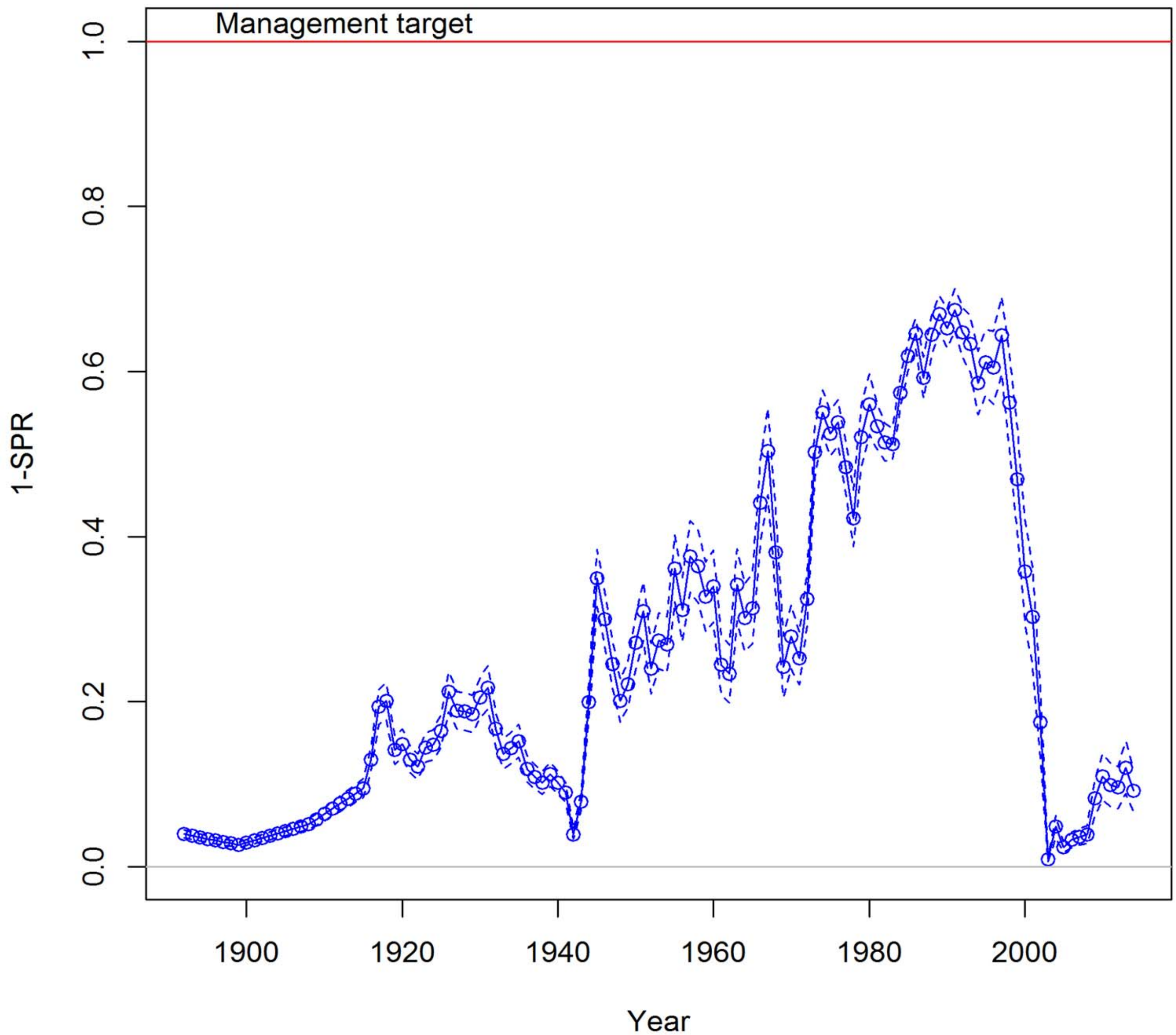
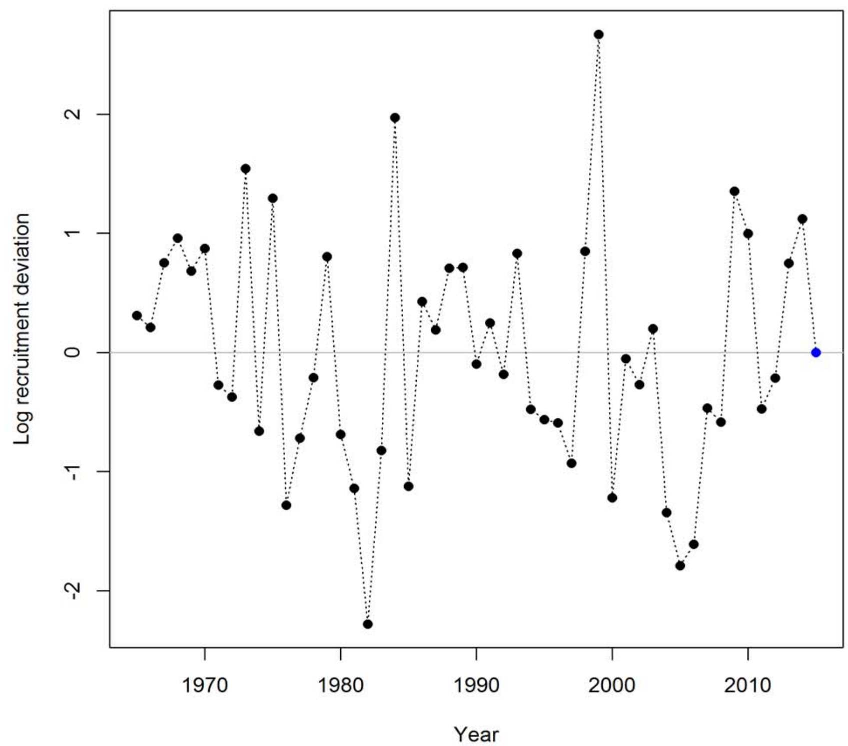


Figure 62: Estimates of 1-SPR for the 2015 base model

.



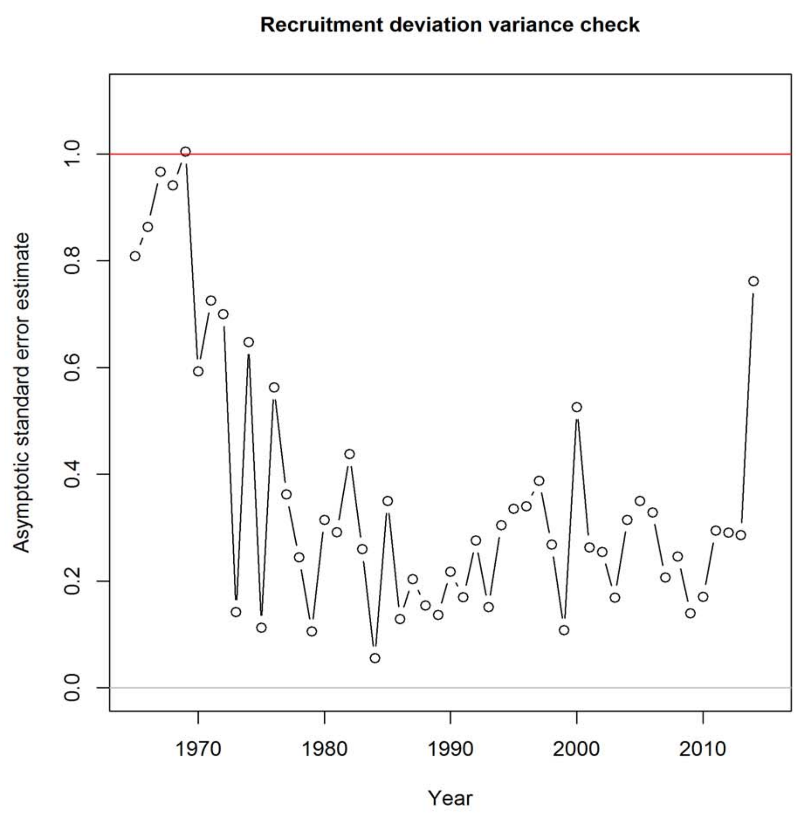
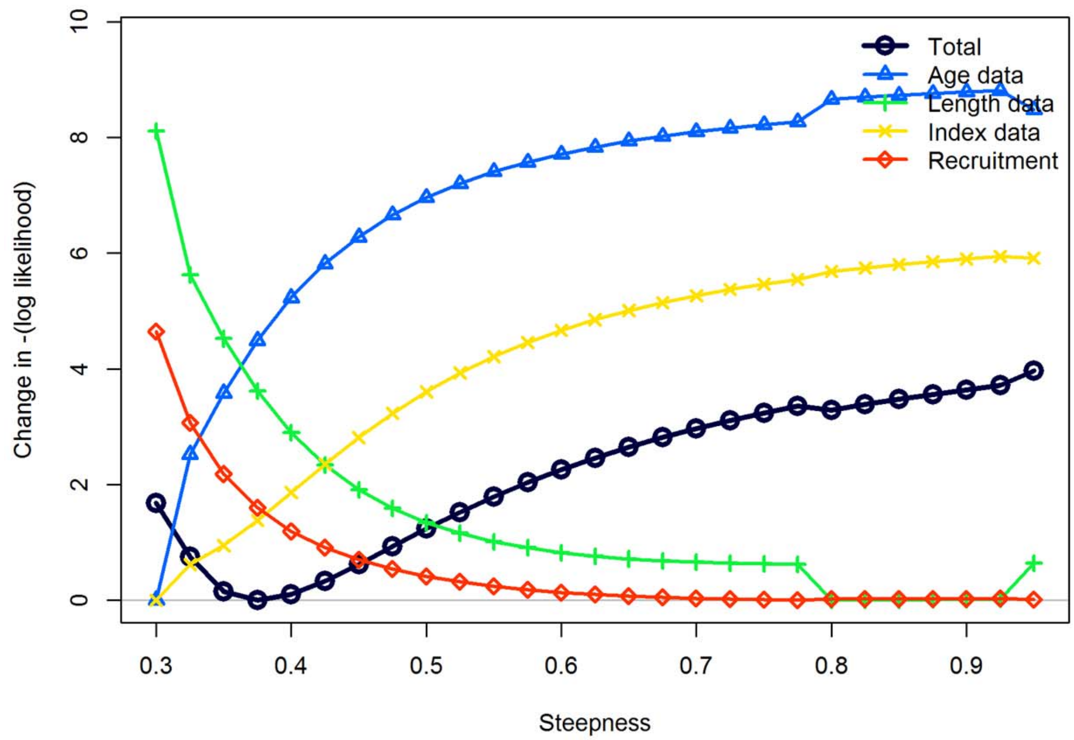


Figure 63a (top) and b (bottom): Estimated recruitment deviation and recruitment deviation variance estimates for the base model.



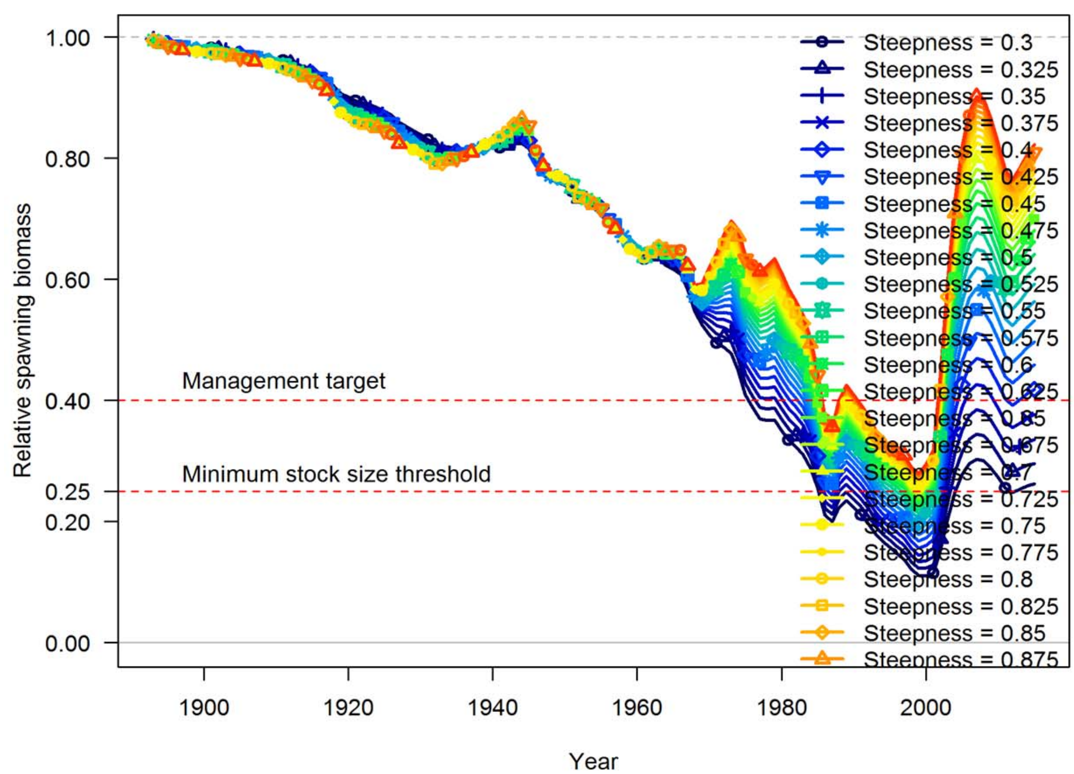


Figure 64a (top) and b : Likelihood profile across steepness and resulting depletion estimates.

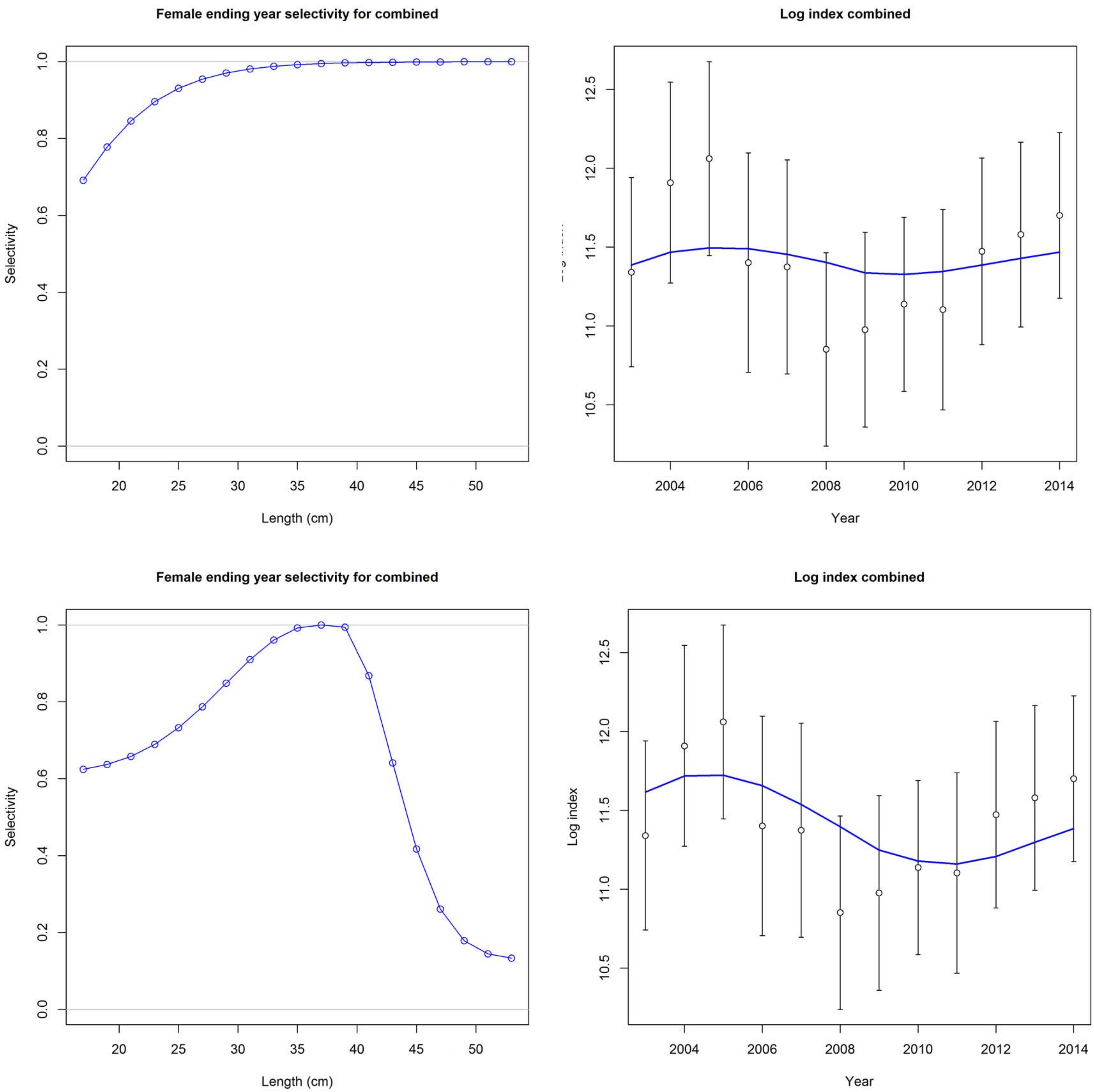


Figure 67a-d: Estimated selectivity curves for the NWFSC bottom trawl survey, and associated fits to the bottom trawl index, using dome shaped versus asymptotic selectivity.

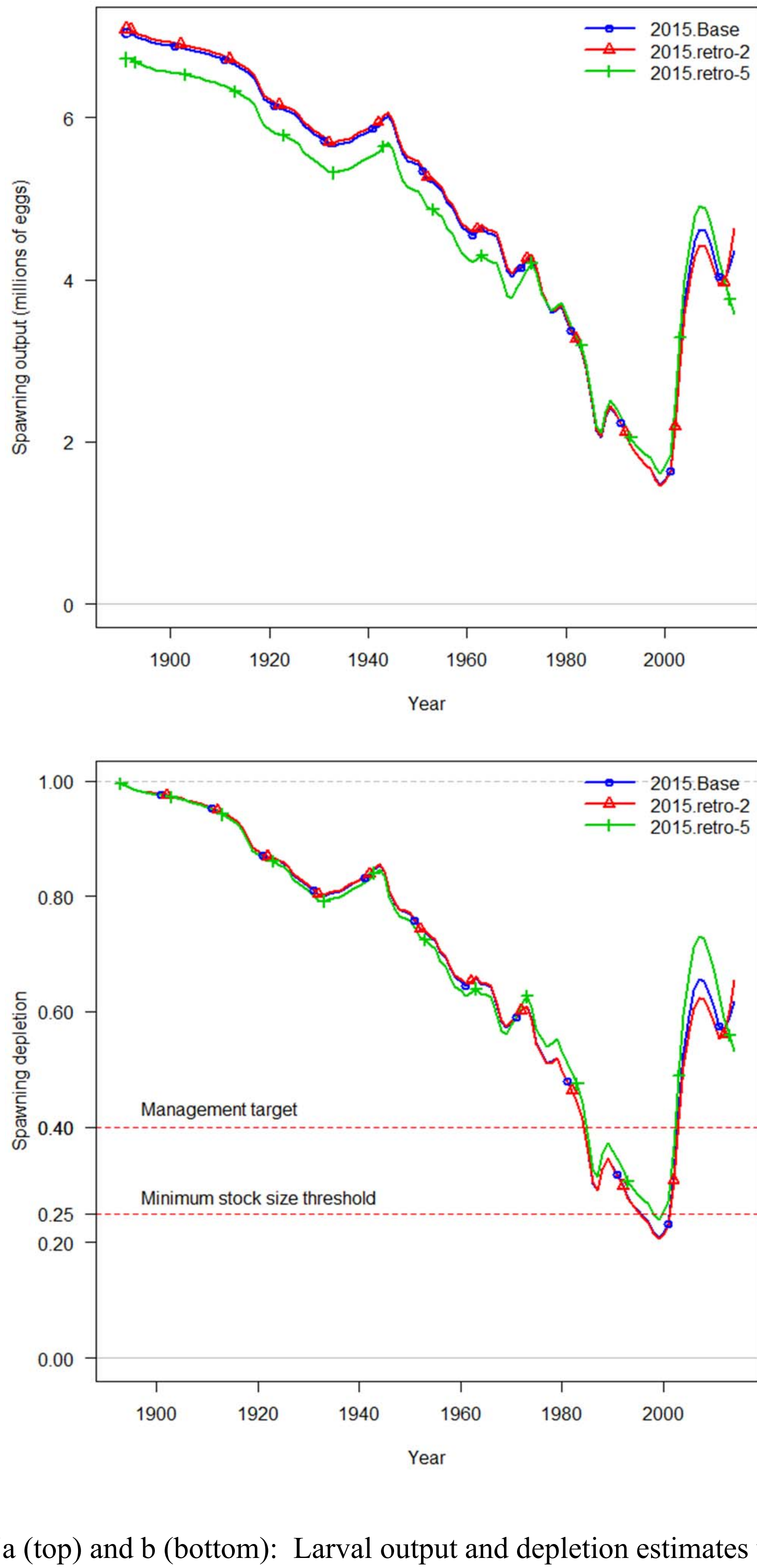
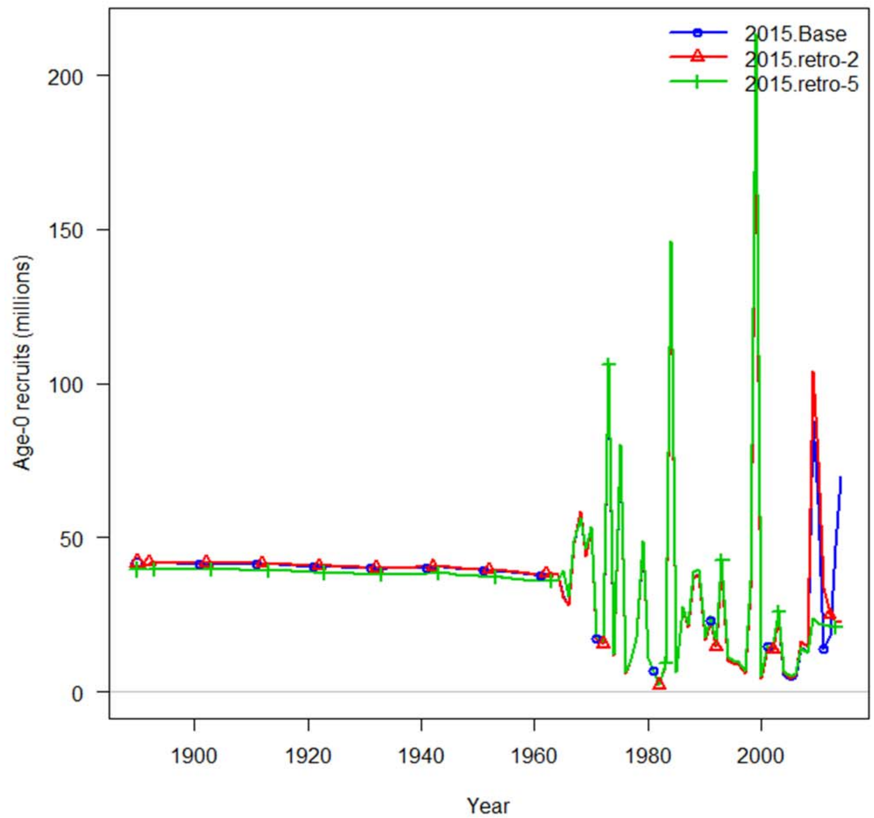


Figure 65a (top) and b (bottom): Larval output and depletion estimates with retrospective analyses



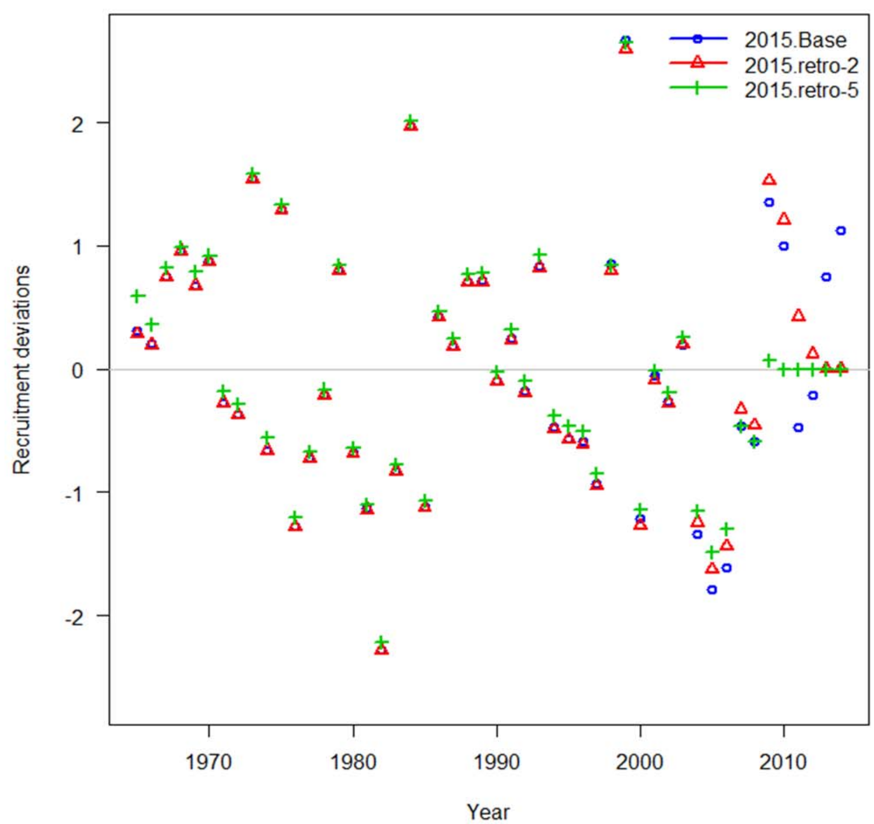


Figure 66a (top) and b (bottom): Recruitment and recruit deviation estimates with retrospective analyses

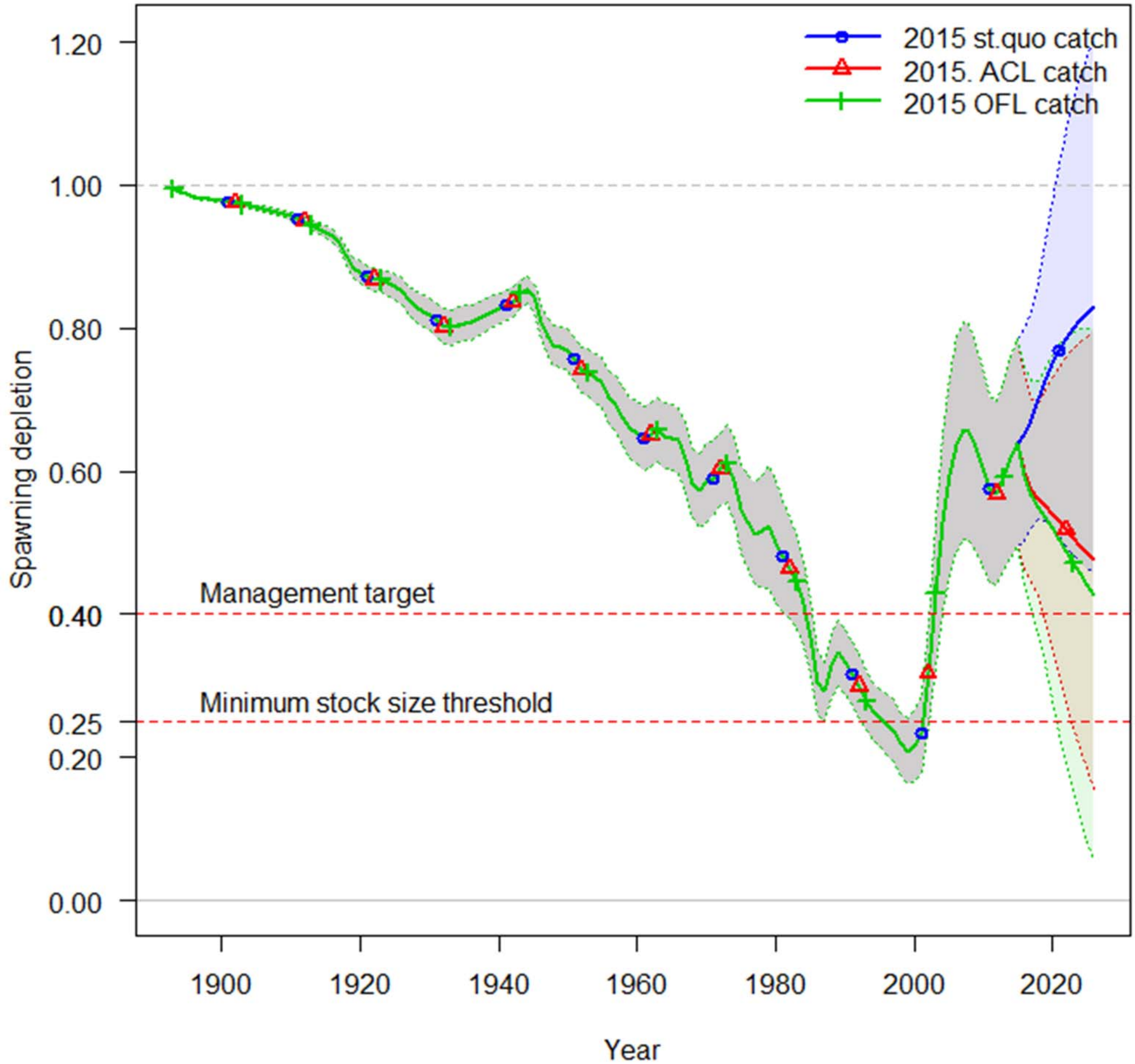


Figure 68: Estimated and forecast relative depletion in base model with alternative catch streams

.

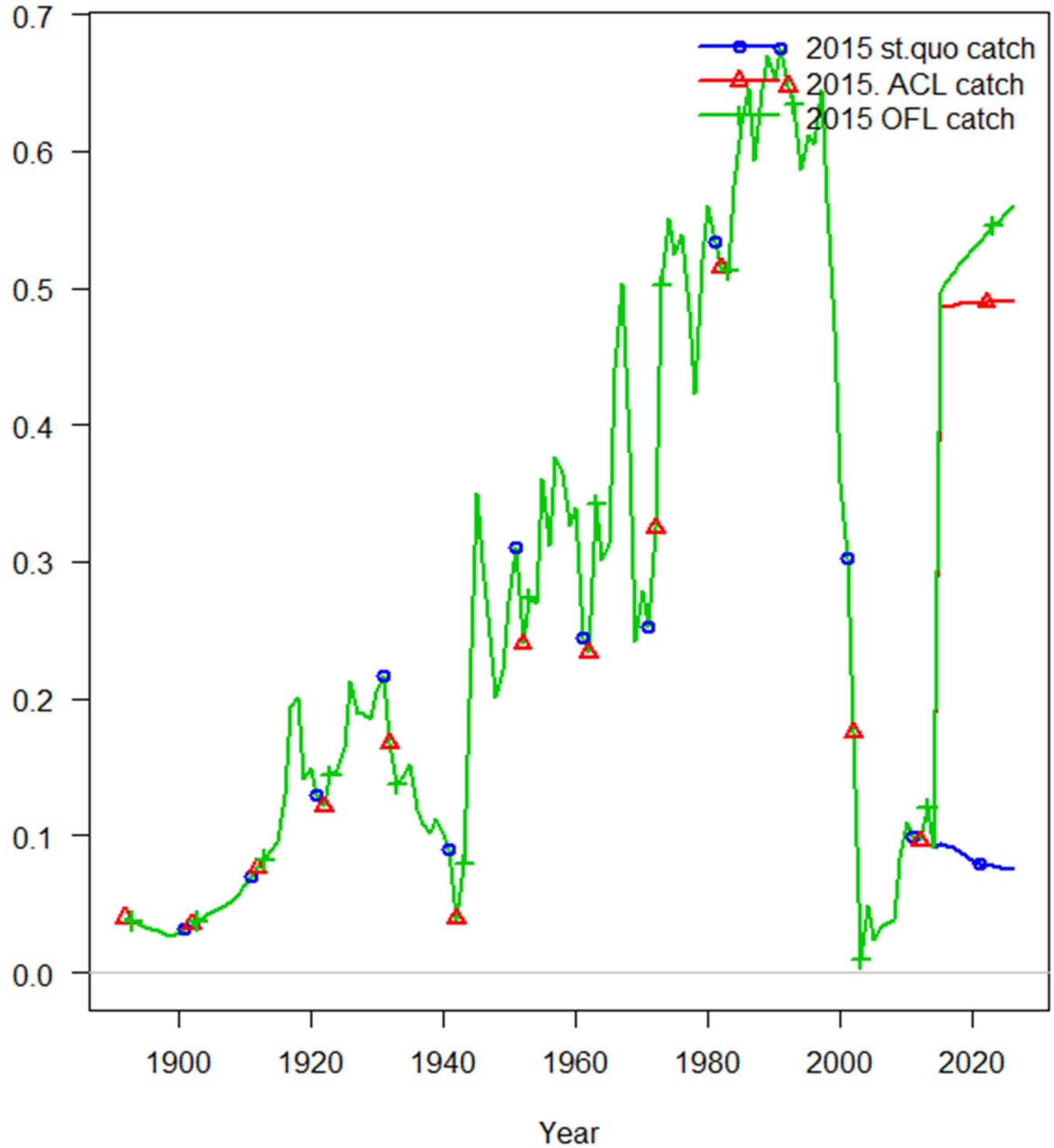


Figure 69: Estimated and forecast (to 2026) 1-SPR for base model with alternative catch streams

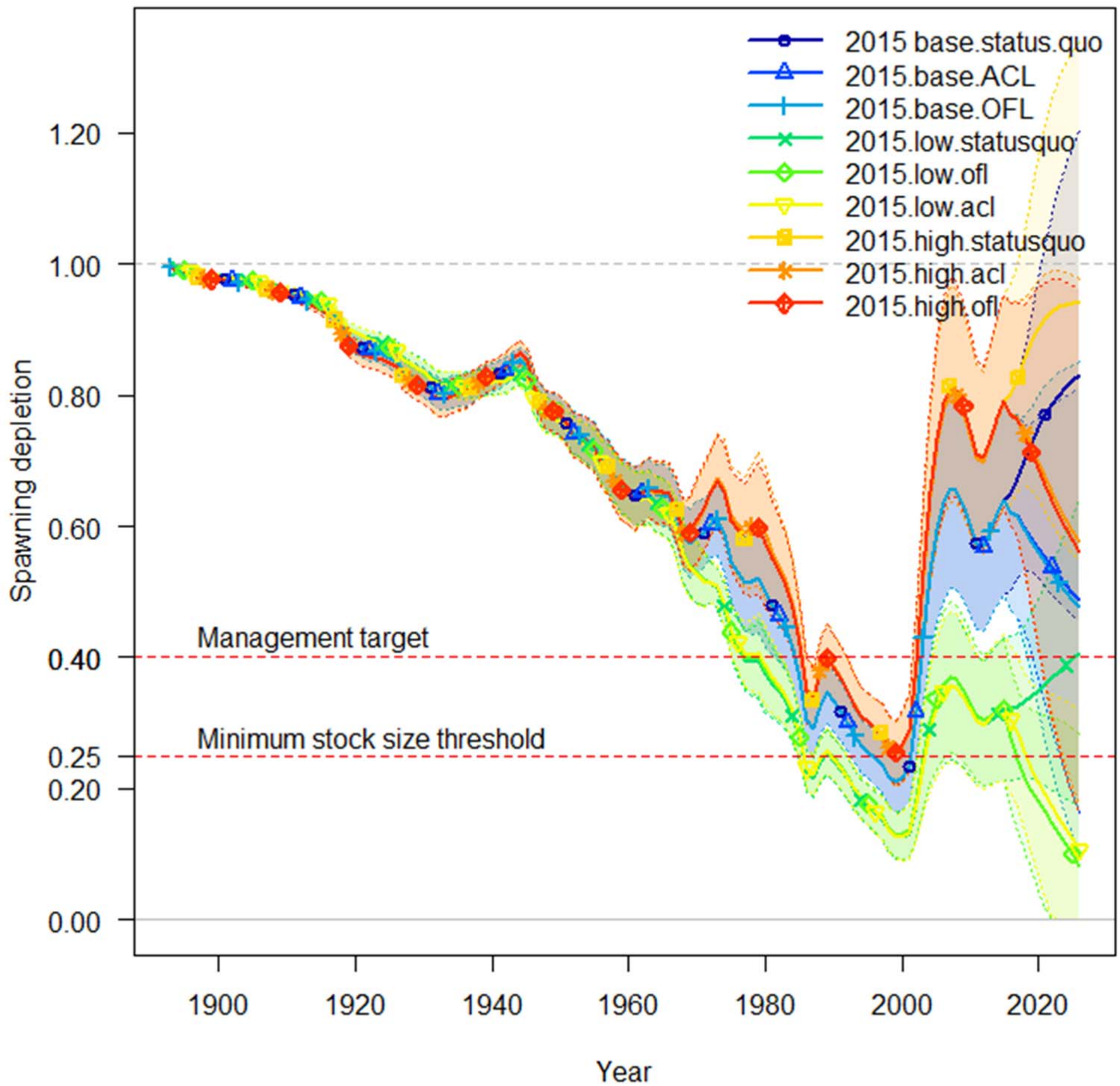


Figure 70: Estimated and forecast relative depletion with alternative states of nature (productivity) and catch streams

.

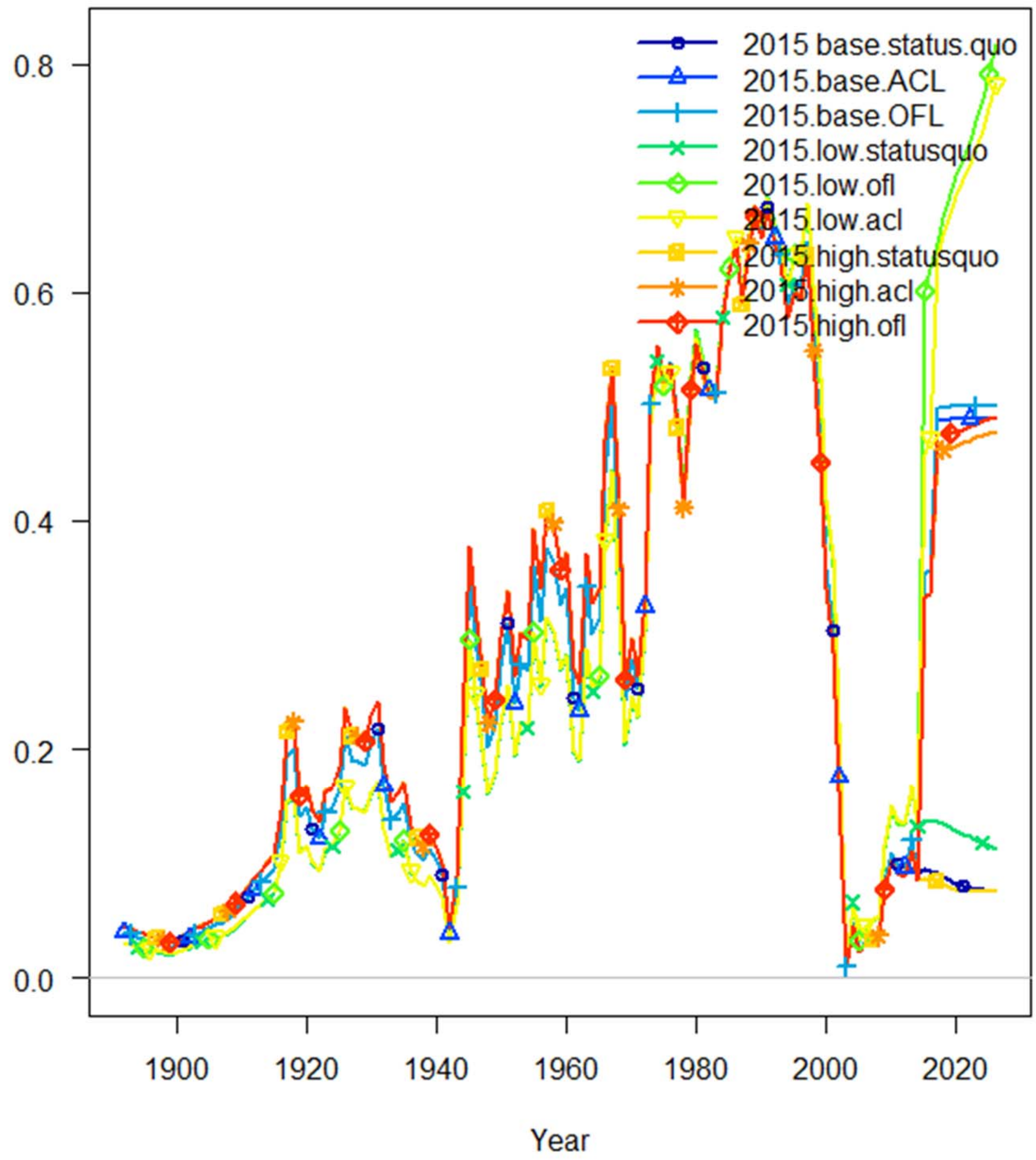


Figure 71: Estimated and forecast (to 2026) 1-SPR for base model and alternative states of nature models with alternative catch streams

Q: SS3 MODEL CODE FOR 2015 CHILIPEPPER ASSESSMENT UPDATE

Starter file

```
##  SS3 Version 3.20
##
##  Data & Control Files
chili.2015.v16.dat
chili.2015.v16.ctl
##
0       # 0=use init values in control file; 1=use ss2.par
0       # run display detail (0,1,2)
2       # detailed age-structured reports in SS2.rep (0,1)
1       # write detailed checkup.sso file (0,1)
1       # write parm values to ParmTrace.sso (0=no,1=good,active; 2=good,all; 3=every_iter,all_parms)
0       # write to cumreport.sso (0=no,1=like&timeseries; 2=add survey fits)
0       # Include prior_like for non-estimated parameters (0,1)
1       # Use Soft Boundaries to aid convergence (0,1) (recommended)
1       # Number of bootstrap datafiles to produce
9       # Turn off estimation for parameters entering after this phase
0       # MCMC burn interval
1       # MCMC thin interval
0.01    # jitter initial parm value by this fraction
-1      # begin annual SD report in start year
-2      # end annual SD report in end year (-2=end of annual SD report in last forecast year
0       # N individual STD years (0=none)

#vector of year values

0.001   # final convergence criteria (e.g. 1.0e-04)
0       # retrospective year relative to end year (e.g. -4)
2       # min age for calc of summary biomass
1       # Depletion basis:  denom is: 0=skip; 1=rel X*B0; 2=rel X*Bmsy; 3=rel X*B_styr
1       # Fraction (X) for Depletion denominator (e.g. 0.4)
4       # (1-SPR)_reporting:  0=skip; 1=rel(1-SPR); 2=rel(1-SPR_MSY); 3=rel(1-SPR_Btarget); 4=no denominator (report actural 1-SPR values)
```

1 # F_std reporting: 0=skip; 1=exploit(Bio); 2=exploit(Num); 3=sum(frates)
0 # F_report_basis: 0=raw; 1=rel Fspr; 2=rel Fmsy ; 3=rel Fbtgt

999 # check value for end of file

Forecast file

SS3 Version 3.20
for all year entries except rebuilder; enter either: actual year, -999 for styr, 0 for endyr, neg number for rel. endyr
1 # Benchmarks: 0=skip; 1=F(SPR); 2=F(MSY);3=F(Btarget); 4=F(endyr); 5=Ave recent F (not implemented); 6= read Fmult (not implemented)
2 # MSY: 1= set to F(SPR); 2=calc F(MSY); 3=set to F(Btgt); 4=set to F(endyr)
0.5 # SPR target (e.g. 0.40), 0.5 for west coast groundfish
0.4 # Biomass target (e.g. 0.40)
#_Bmark_years: beg_bio, end_bio, beg_selex, end_selex, beg_relF, end_relF (enter actual year, or values of 0 or -integer to be rel. endyr)
0 0 0 0 0 0
2 #Bmark_relF_Basis: 1 = use year range; 2 = set relF same as forecast below

1 # Forecast: 0=none; 1=F(SPR); 2=F(MSY) 3=F(Btgt); 4=F(endyr); 5=Ave F (enter yrs); 6=read Fmult
12 # N foreast year
1 # F scaler (only used for Do_Forecast==5)
#_Fcast_years: beg_selex, end_selex, beg_relF, end_relF (enter actual year, or values of 0 or -integer to be rel. endyr)
0 0 -10 0
1 # Control rule method (1=catch=f(SSB) west coast; 2=F=f(SSB))
0.04 # Control rule Biomass level for constant F (as frac of Bzero, e.g. 0.40)
0.01 # Control rule Biomass level for no F (as frac of Bzero, e.g. 0.10)
#0.956 # Control rule target as fraction of Flimit (e.g. 0.75)
1
3 #_N forecast loops (1-3) (fixed at 3 for now)
3 #_First forecast loop with stochastic recruitment
0 #_Forecast loop control #3 (reserved for future bells&whistles)
0 #_Forecast loop control #4 (reserved for future bells&whistles)
0 #_Forecast loop control #5 (reserved for future bells&whistles)
2007 #FirstYear for caps and allocations (should be after years with fixed inputs)
0.0 # stddev of log(realized catch/target catch) in forecast (set value>0.0 to cause active impl_error) (if=0, there will be N_forecase_years less parameters estimated)
0 # Do West Coast gfish rebuilder output (0/1)
-1 # Rebuilder: first year catch could have been set to zero (Ydecl)(-1 to set to 1999)
-1 # Rebuilder: year for current age structure (Yinit) (-1 to set to endyear+1)
1 # fleet relative F: 1=use first-last alloc year; 2=read seas(row) x fleet(col) below
Note that fleet allocation is used directly as average F if Do_Forecast=4
2 # basis for fcast catch tuning and for fcast catch caps and allocation (2=deadbio; 3=retainbio; 5=deadnum; 6=retainnum)

```
# Conditional input if relative F choice = 2
# Fleet relative F:  rows are seasons, columns are fleets
# max totalcatch by fleet (-1 to have no max) must enter value for each fleet
-1 -1 -1 -1
# max totalcatch by area (-1 to have no max); must enter value for each fleet
-1
# fleet assignment to allocation group (enter group ID# for each fleet, 0 for not included in an alloc group)
0 0 0 0
#_Conditional on >1 allocation group
# allocation fraction for each of: 0 allocation groups
# no allocation groups
48            # 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	season	fishery	OFL
2015	1	1	1724.337991
2015	1	2	3.922547609
2015	1	3	0
2015	1	4	29.33946143
2016	1	1	1715.508313
2016	1	2	3.902461737
2016	1	3	0
2016	1	4	29.18922523
2017	1	1	2876.35588
2017	1	2	6.543173636
2017	1	3	0
2017	1	4	48.94094595
2018	1	1	2766.68147
2018	1	2	6.293684789
2018	1	3	0
2018	1	4	47.07484536
2019	1	1	2720.031338
2019	1	2	6.187564432
2019	1	3	0
2019	1	4	46.28109742

2020	1	1	2675.461086
2020	1	2	6.086175414
2020	1	3	0
2020	1	4	45.52273844
2021	1	1	2615.20344
2021	1	2	5.949100497
2021	1	3	0
2021	1	4	44.49745981
2022	1	1	2546.224034
2022	1	2	5.792185202
2022	1	3	0
2022	1	4	43.3237812
2023	1	1	2476.862008
2023	1	2	5.63439952
2023	1	3	0
2023	1	4	42.14359235
2024	1	1	2411.855957
2024	1	2	5.486522867
2024	1	3	0
2024	1	4	41.03752002
2025	1	1	2353.177842
2025	1	2	5.353041089
2025	1	3	0
2025	1	4	40.03911698
2026	1	1	2301.161228
2026	1	2	5.234712986
2026	1	3	0
2026	1	4	39.15405881

999 # verify end of input

Data File

```
# ****************************************************************
#  Chilipepper rockfish .dat file
#  final model May 2015 assessment update
# SS3 Version 3.20 by_Richard_Methot_(NOAA);_using_Otter_Research_ADMB_7.0.1
# ****************************************************************
#

1892    #_start year
2014    #_end year
1       #_number of seasons per year
12      # vector with N months in each season
1       #_spawning occurs at the beginning of this season
4       #_number of fishing fleets
6       #_number of surveys
1       #_N_areas

# string containing names for all fisheries and
# surveys, delimited by the % character
trawl%hookline%setnet%rec%triennial%combined%juv%juvenile%juv2%ghost

# fraction of season elapsed before CPUE measured or survey conducted
0.5   0.5   0.5   0.5   0.5   0.5   0.5   0.1   0.5   0.5     #_Catch or survey timing_in_season
1     1     1     1     1     1     1     1     1     1       #_area_assignments_for_each_fishery_and_survey

# Fishery information
1           1   1       1       #_units of catch:  1=bio; 2=num
0.05  0.05  0.05  0.05  #_se of log(catch) only used for init_eq_catch and for Fmethod 2 and 3; use -1 for discard only fleets

2     # number of genders
21    # accumulator age

#_initial equilibrium catch for each fishery
0     0     0     0     # init equil
```

123		#_N_lines_of_catch_to_read			
#trawl	hook.line		setnet	recreational	
11	206	0	0	1892	1
10	195	0	0	1893	1
10	183	0	0	1894	1
9	171	0	0	1895	1
9	162	0	0	1896	1
8	152	0	0	1897	1
8	143	0	0	1898	1
7	133	0	0	1899	1
8	147	0	0	1900	1
8	161	0	0	1901	1
9	176	0	0	1902	1
10	190	0	0	1903	1
11	204	0	0	1904	1
11	218	0	0	1905	1
12	232	0	0	1906	1
13	246	0	0	1907	1
14	260	0	0	1908	1
15	292	0	0	1909	1
17	325	0	0	1910	1
19	358	0	0	1911	1
21	390	0	0	1912	1
22	423	0	0	1913	1
24	455	0	0	1914	1
26	488	0	0	1915	1
28.86	694.83	0	0	1916	1
44.84	1104.04	0	0	1917	1
52.47	1123.49	0	0	1918	1
36.51	722.48	0	0	1919	1
37.23	760.66	0	0	1920	1
30.73	646.96	0	0	1921	1
26.43	598.27	0	0	1922	1
28.55	732.43	0	0	1923	1

16.42	763.79	0	0	1924	1
13.48	864.75	0	0	1925	1
40.31	1149.06	0	0	1926	1
73.78	943.18	0	0	1927	1
94.7	903.91	0	1.73	1928	1
112.01	855.24	0	3.46	1929	1
117.2	973.19	0	4.17	1930	1
80.45	1079.43	0	5.55	1931	1
95.61	733.51	0	6.94	1932	1
146.24	508.41	0	8.33	1933	1
140.92	553.22	0	9.72	1934	1
125.66	617.27	0	11.11	1935	1
133.36	422.47	0	12.22	1936	1
161.54	341.48	0	16.33	1937	1
136.39	334.8	0	15.46	1938	1
141.24	388.17	0	13.47	1939	1
111.67	363.62	0	16.83	1940	1
86.55	328	0	15.55	1941	1
22.44	147.05	0	8.26	1942	1
233.7	139.8	0	7.9	1943	1
878.61	216.29	0	6.49	1944	1
1852.83	421.93	0	8.65	1945	1
1445.58	298.17	0	14.89	1946	1
935.13	364.1	0	17.17	1947	1
562.03	404.97	0	40.72	1948	1
725.82	353.72	0	52.73	1949	1
963.53	446.11	0	54.85	1950	1
1177.06	500.41	0	55.93	1951	1
885.53	258.65	0	62.16	1952	1
1118.92	248.53	0	59.79	1953	1
965.36	311.76	0	101.01	1954	1
1508.65	414	0	140.43	1955	1
1155.92	300.92	0	162.88	1956	1
1640.19	335.63	0	130.25	1957	1
1450.82	372.02	0	130.19	1958	1

1243.68	297.44	0	93.84	1959	1
1191.18	424.67	0	97.26	1960	1
653.35	346.45	0	82.47	1961	1
555.56	377.53	0	94.67	1962	1
1157.15	502.58	0	80.01	1963	1
913.16	418.89	0	105.14	1964	1
986.63	407.54	0	116.56	1965	1
2025.99	320.03	0	183.29	1966	1
2602.08	285.98	0	193.61	1967	1
1421.98	193.67	0	202.41	1968	1
708.53	43.55	0	207.55	1969	1
843.29	40.28	0	279.41	1970	1
726.58	50.44	0	237.85	1971	1
1077.91	78.54	0	284.23	1972	1
2494.42	72.58	0	362.34	1973	1
2843.4	110.49	0	437.45	1974	1
2421.96	86.62	0	397.98	1975	1
2415.36	123.37	0	373.03	1976	1
1867.8	100.66	0	324.21	1977	1
1292.87	194.95	25.83	313.73	1978	1
2003.15	230.73	54.19	448.1	1979	1
2744.26	95.87	45.38	255.89	1980	1
2317.83	139.13	71.28	272.22	1981	1
1690.53	356.35	85.42	389.02	1982	1
1881.55	80.23	345.21	162.08	1983	1
2449.75	98.1	231.04	155.19	1984	1
1808.16	278.99	738.69	391.4	1985	1
1269.64	330.88	1161.46	394.75	1986	1
1314.05	172.61	461.11	117.27	1987	1
1782.41	333.47	289.36	384.63	1988	1
2365.6	425.58	361.37	285.69	1989	1
2331.2	232.12	372.77	219.9	1990	1
2242.12	618.32	332.08	154.1	1991	1
1335.89	1052.67	296.72	88.31	1992	1
1296.02	860.86	232.91	22.51	1993	1

1276.62	484.99	107.71	21.43	1994	1
1603.88	324.9	94.05	10.87	1995	1
1535.38	254.23	57.67	32.84	1996	1
1619.77	339.29	82.97	73.64	1997	1
1141.27	208.84	77.62	7.28	1998	1
839.31	104.18	9.67	24.51	1999	1
536.08	50.6	6.11	39.21	2000	1
435.87	25.18	4.9	51.87	2001	1
300.73	6.22	0.42	12.62	2002	1
20.33	0.25	0.05	0.01	2003	1
145	2	0	6	2004	1
76	3	0	6	2005	1
124.3	0	0	1.6	2006	1
125	4	0	8	2007	1
145	0	0	3	2008	1
314.8	0.6	0	2.1	2009	1
394.12	0.18	0	2.79	2010	1
325.32	0.71	0	5.02	2011	1
298.45	1.17	0	7.74	2012	1
397.21	0.94	0	7.25	2013	1
316.91	0.94	0	6.67	2014	1

Abundance indices
63 # number of observations

#_Units: 0=numbers; 1=biomass; 2=F
#_Errtype: -1=normal; 0=lognormal; >0=T
#_Fleet Units Errtype
1 1 0
2 1 0
3 1 0
4 1 0
5 1 0
6 1 0
7 1 0

8 1 0
9 1 0
10 0 0

#year	season	type	value	SD
1980	1	1	249	0.25
1981	1	1	150	0.25
1982	1	1	121	0.25
1983	1	1	116	0.25
1984	1	1	91	0.25
1985	1	1	88	0.25
1986	1	1	76	0.25
1987	1	1	116	0.25
1988	1	1	158	0.25
1989	1	1	172	0.25
1990	1	1	149	0.25
1991	1	1	146	0.25
1992	1	1	109	0.25
1993	1	1	80	0.25
1994	1	1	112	0.25
1995	1	1	126	0.25
1996	1	1	96	0.25

#

triennial GLM tuned

1980	1	5	3954.37	1.625
1983	1	5	1994.42	0.613
1986	1	5	1166.33	1.213
1989	1	5	2400.58	0.300
1992	1	5	368.77	0.581
1995	1	5	1545.10	0.264
1998	1	5	945.46	0.341
2001	1	5	806.63	0.285
2004	1	5	2157.54	0.254

#NWC combo survey glm tuned

#2003	1	6	3932	0.61654
#2004	1	6	24559	1.19248
#2005	1	6	9540	0.4466
#2006	1	6	7384	0.40252
#new.index				
2003	1	6	84198.01909	0.295756252
2004	1	6	148524.7909	0.315046881
2005	1	6	172935.2143	0.3039165
2006	1	6	89442.99718	0.344710154
2007	1	6	87020.10752	0.336344769
2008	1	6	51589.24928	0.303109767
2009	1	6	58430.6456	0.304917031
2010	1	6	68688.831	0.271744734
2011	1	6	66377.24644	0.314254431
2012	1	6	96084.09041	0.291915674
2013	1	6	106867.0214	0.288733564
2014	1	6	120686.8358	0.25839602

juvenile survey- FED

#year	season	type	value	SD
#2001	1	8	1.7161	0.0401
#2002	1	8	2.7629	0.0451
#2003	1	8	1.5719	0.0367
#2004	1	8	2.9379	0.0360
#2005	1	8	0.8658	0.0346
#2006	1	8	0.7523	0.0301

juvenile survey- FED

#year	season	type	value	SD
2001	1	8	2.25776	0.48388
2002	1	8	5.21742	0.48574
2003	1	8	2.35769	0.44485
2004	1	8	3.63883	0.35855
2005	1	8	1.3791	0.36056
2006	1	8	1.51723	0.36088

```
2007	1	8	1.38526	0.38096
2008	1	8	1.8446	0.39339
2009	1	8	2.79921	0.40496
2010	1	8	5.86269	0.56904
2012	1	8	2.73777	0.58768
2013	1	8	382.993	0.55651
2014	1	8	52.190	0.57157
#
#
# CalCOFI survey
#year	season	type	Index	CV
# rec cpue
#year	season	type	index	jack.cv
1987	1	10	0.166856206	0.1631351
1988	1	10	0.083010716	0.1794928
1989	1	10	0.054122438	0.1633441
1990	1	10	0.031462634	0.4267126
1991	1	10	0.040173333	0.3545357
1992	1	10	0.064866103	0.5545214
1993	1	10	0.026517113	0.2333201
1994	1	10	0.023850668	0.2796596
1995	1	10	0.024610012	0.4197283
1996	1	10	0.015093027	0.4449115
1997	1	10	0.008328447	0.3430329
1998	1	10	0.006612019	0.421573


#	DISCARD BIOMASS currently I have no discard data
0	#_1=biomass(mt) discarded; 2=fraction of total catch discarded
0	#_number of observations
#

#_MEAN BODY WEIGHT
#_-----------------
0	#_number of observations
```

30 #_DF_for_meanbodywt_T-distribution_like
1 # length bin method: 1=use databins; 2=generate from width, min,max below; 3=read nbins, then vector
#

COMPOSITION CONDITIONERS

-1 # negative value causes no compression
0.0001 #_constant added to proportions at length & age (renormalized to sum to 1 after constant is added)
0 #_combine males into females at or below this bin number
#

#_LENGTH COMPOSITION
#_------------------
#_vector containing lower edge of length bins
19 #_number of length bins
16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50
52

note: new SS3 reading error if nsample is negative, use negative year in new SS3
140 #_number of lines of length comp observations

#
Trawl fishery Females first, then males females
males

#year season type gender partition # samples 16 18 20 22 24 26 28 30 32 34 36
38 40 42 44 46 48 50 52 16 18 20 22 24 26 28 30 32
34 36 38 40 42 44 46 48 50 52
LFs seemed to differ between aged and unaged comps- so LFs turned off
1978 1 1 3 0 147 0.00022 0 0 0.01818 0.00388 0.00229 0.00744 0.01194 0.04564 0.05786 0.04806 0.05182
0.07637 0.10655 0.05257 0.04429 0.07482 0.01717 0.01018 0 0 0 0.00021 0.00069 0.00102 0.01447 0.05906 0.18275 0.04776
0.04849 0.01021 0.00039 0 0.00018 0.00121 0 0.00429 0
1979 1 1 3 0 110 0 0 0.00049 0 0.00004 0.00132 0.02087 0.0092 0.01246 0.04269 0.03287 0.03745
0.1193 0.066 0.17126 0.10614 0.08089 0.00735 0.00528 0 0 0 0 0.00041 0.00095 0.00821 0.04017 0.0724 0.06751
0.05974 0.03585 0.00011 0.00001 0.0008 0 0.00008 0.00017 0

1980	1	1	3	0	191	0	0	0.00039	0	0	0.00349	0.00287	0.0041	0.02768	0.05072	0.06043	0.1232
	0.09582	0.10987	0.08439	0.07823	0.03707	0.0149	0.00063	0	0	0	0	0.00342	0.00256	0.00799	0.03147	0.08474	0.09921
	0.04584	0.01837	0.00273	0.00223	0.00025	0.00042	0.0066	0.00008	0.0003								
1981	1	1	3	0	125	0	0	0	0	0	0.00088	0.00667	0.00529	0.01266	0.01064	0.09861	0.2005
	0.09316	0.10213	0.0487	0.07159	0.04917	0.00273	0.00009	0	0	0	0	0	0.00064	0.00026	0.04874	0.11222	0.12205
	0.0119	0.00084	0.00005	0.00046	0	0.00002	0	0	0								
1982	1	1	3	0	195	0	0	0	0.00035	0.00022	0.00067	0.00525	0.01354	0.01678	0.0125	0.06505	0.08043
	0.13048	0.18373	0.15391	0.076	0.03757	0.01085	0.00174	0	0	0	0.00078	0.00005	0.00359	0.00727	0.02841	0.07633	0.06915
	0.02099	0.00408	0.00023	0.00006	0	0	0	0	0								
1983	1	1	3	0	275	0	0	0	0	0.0002	0.00113	0.00338	0.01176	0.01812	0.01728	0.02633	0.03683
	0.13454	0.20614	0.14642	0.11552	0.07491	0.02504	0.00759	0	0	0	0.00004	0.0001	0.00066	0.00736	0.03449	0.03921	0.05539
	0.02184	0.00391	0.00018	0.00244	0.00191	0.00005	0.00001	0.00007	0.00715								
1984	1	1	3	0	305	0	0	0	0.00003	0.00006	0.00369	0.00333	0.01501	0.05746	0.08824	0.16352	0.06524
	0.10441	0.07823	0.06725	0.04769	0.02093	0.00477	0.0017	0.00002	0	0	0	0.00009	0.00102	0.02879	0.03878	0.0771	0.06447
	0.05422	0.00792	0.00032	0.00166	0.00061	0.00242	0.00049	0.00052	0.00002								
1985	1	1	3	0	338	0	0	0	0.001	0.00035	0.00128	0.00832	0.02207	0.04019	0.06271	0.08883	0.11605
	0.06376	0.05989	0.07079	0.04972	0.02535	0.00534	0.00193	0	0	0	0.00009	0.00011	0.00232	0.01902	0.06599	0.10678	0.1175
	0.04632	0.01314	0.00603	0.00042	0.00045	0.00138	0.0015	0.00138	0								
1986	1	1	3	0	219	0.00044	0.0001	0	0.00022	0.00009	0.00458	0.00832	0.02425	0.0379	0.0594	0.07245	0.09209
	0.07529	0.05696	0.07571	0.06683	0.03424	0.03705	0.00078	0	0.00004	0	0.00093	0.0034	0.00564	0.01592	0.09321	0.10176	0.06953
	0.03448	0.01659	0.00662	0.00095	0	0.0018	0.00244	0	0								
1987	1	1	3	0	211	0.00016	0	0.00012	0.00003	0.00189	0.01545	0.07235	0.16683	0.09549	0.04457	0.03733	0.04516
	0.04761	0.04209	0.0179	0.00896	0.00521	0.00057	0.00056	0	0	0	0	0.00112	0.04064	0.1188	0.06182	0.08213	0.06136
	0.02295	0.00782	0.00086	0.00019	0.00001	0.00001	0	0	0								
1988	1	1	3	0	199	0	0	0	0	0.00003	0.01118	0.03265	0.08052	0.0893	0.10642	0.08444	0.01661
	0.03359	0.05067	0.02813	0.01291	0.00676	0.00425	0.0009	0	0	0	0.00003	0.00014	0.04746	0.12885	0.10265	0.08427	0.0428
	0.03387	0.00139	0	0.00016	0.00001	0	0	0	0								
1989	1	1	3	0	183	0.00007	0	0	0	0.00207	0.00491	0.0133	0.01524	0.05436	0.09059	0.13372	0.17294
	0.02935	0.01437	0.01396	0.00704	0.00758	0.00131	0	0	0	0	0.00096	0.00612	0.00994	0.0414	0.15366	0.12776	0.06141
	0.03496	0.00173	0.00017	0.00098	0	0.00009	0	0	0								
1990	1	1	3	0	204	0.00001	0	0.00006	0	0.00355	0.00738	0.03629	0.04755	0.04567	0.04607	0.06876	0.14846
	0.10491	0.043	0.03709	0.00822	0.00432	0.00119	0.00018	0	0	0	0	0.00195	0.02245	0.05403	0.08982	0.12547	0.04891
	0.04953	0.004	0.00087	0	0.00021	0	0.00002	0.00005	0								

1991	1	1	3	0	208	0.00017	0	0.0005	0.00091	0.00456	0.01515	0.02599	0.05384	0.08291	0.06996	0.06904	0.07213
	0.07997	0.04056	0.03088	0.01192	0.0107	0.00363	0.00104	0	0	0.00015	0.00013	0.00662	0.01265	0.05956	0.10457	0.13979	0.06707
	0.02766	0.00608	0.00157	0	0.00009	0	0.0002	0	0								
1992	1	1	3	0	132	0	0	0	0.00005	0.00405	0.0288	0.05881	0.09328	0.08427	0.06824	0.04726	0.07089
	0.06935	0.07266	0.04536	0.03254	0.02026	0.00379	0	0	0	0.00001	0.00008	0.00384	0.02468	0.03734	0.0624	0.08162	0.05922
	0.01503	0.00609	0.00293	0.00213	0.00284	0.00075	0.00142	0	0								
1993	1	1	3	0	126	0	0.00012	0.00001	0.00064	0.00864	0.01402	0.05882	0.16809	0.08456	0.08385	0.08023	0.05142
	0.04641	0.04061	0.02042	0.00764	0.00506	0.00094	0	0	0	0	0.00203	0.00957	0.06125	0.11245	0.07924	0.04639	0.01194
	0.00498	0.00006	0	0	0	0	0	0.0006	0								
1994	1	1	3	0	117	0	0	0	0	0.00167	0.0112	0.02259	0.02581	0.04153	0.06489	0.1126	0.06874
	0.07034	0.05595	0.05194	0.02649	0.01075	0.00073	0.0009	0	0	0	0	0.00184	0.04468	0.08946	0.12132	0.0972	0.06042
	0.01519	0.0029	0.00021	0.00068	0	0	0	0	0								
1995	1	1	3	0	114	0	0	0	0.00035	0.00078	0.00111	0.00893	0.03026	0.05741	0.05007	0.08525	0.12008
	0.09374	0.06827	0.0388	0.02381	0.00884	0.00242	0.00119	0.00175	0	0	0.00205	0	0.01412	0.03783	0.08782	0.14094	0.0774
	0.03078	0.00468	0.00073	0.00171	0.00223	0.0049	0	0	0.00175								
1996	1	1	3	0	116	0	0	0	0.00033	0.00445	0.03196	0.08891	0.08369	0.0443	0.04167	0.05217	0.04535
	0.06299	0.06357	0.01947	0.01333	0.00335	0.00023	0.00019	0	0	0	0.00168	0.01966	0.10183	0.10599	0.06959	0.07843	0.0509
	0.01033	0.00186	0.00194	0.0005	0.00132	0	0	0	0								
1997	1	1	3	0	136	0	0	0	0.00077	0.00202	0.00216	0.02881	0.12925	0.10512	0.03317	0.02917	0.05403
	0.05664	0.04962	0.04472	0.01526	0.00855	0.0007	0.00001	0	0	0	0.0033	0.00045	0.06268	0.14975	0.09977	0.06919	0.02845
	0.01467	0.00857	0.0001	0.00137	0.00127	0.00042	0	0	0								
#																	
1998	1	1	3	0	123	0	0	0	0	0.00397	0.01444	0.0224	0.03925	0.06226	0.09141	0.0686	0.06555
	0.07515	0.05957	0.04919	0.03089	0.00886	0.00108	0.0018	0	0	0	0	0.04411	0.01694	0.06933	0.12133	0.08988	0.03285
	0.02736	0.00183	0.00042	0.0005	0.00085	0.00014	0.00003	0.00001	0								
1999	1	1	3	0	84	0.00047	0.00112	0	0	0.00036	0.00233	0.03304	0.08849	0.0807	0.03665	0.06671	0.08052
	0.05581	0.07201	0.05503	0.04537	0.01173	0.00715	0.00016	0	0	0	0	0.00011	0.03147	0.08443	0.10657	0.07571	0.04674
	0.01023	0.00673	0	0.00002	0.00035	0	0	0	0								
2000	1	1	3	0	50	0	0	0	0.00228	0.00019	0.00019	0.00928	0.01157	0.02875	0.05166	0.05578	0.11252
	0.10642	0.09753	0.11272	0.08519	0.03014	0.00908	0.00308	0.00002	0	0	0.00031	0	0.01031	0.02243	0.0715	0.0666	0.07021
	0.0207	0.01719	0.0016	0.00051	0.00101	0.00089	0.00033	0	0								
2001	1	1	3	0	58	0	0	0	0.0083	0.01993	0.00771	0.01187	0.01642	0.03758	0.0536	0.05483	0.06074
	0.05892	0.10988	0.03332	0.05608	0.0312	0.0132	0.05663	0	0	0	0.01426	0.02615	0.01599	0.02994	0.0876	0.10742	0.0699
	0.01551	0.0022	0.00032	0	0.0004	0	0	0	0.00011								

2002	1	1	3	0	54	0	0.00586	0.00114	0.00864	0.03363	0.07192	0.09017	0.0404	0.02739	0.0244	0.01947	0.05204
	0.05112	0.08519	0.0902	0.07081	0.04005	0.00877	0.00706	0.00113	0.00452	0.00124	0.0041	0.02706	0.07152	0.02883	0.03737	0.03884	0.03246
	0.01081	0.00224	0.00322	0.00246	0.00284	0	0	0.00083	0.0023								
2003	1	1	3	0	18	0	0	0	0.00218	0.00084	0.00031	0.00632	0.19441	0.31227	0.10404	0.01206	0.00536
	0.00727	0.01577	0.01604	0.00329	0.00214	0	0.00096	0	0.00023	0.00011	0.00084	0.00011	0.07587	0.12785	0.0586	0.02396	0.02086
	0.00712	0.00119	0	0	0	0	0	0	0								
2004	1	1	3	0	54	0	0	0	0.00012	0.00048	0.00063	0.00095	0.00524	0.02633	0.21118	0.27406	0.05632
	0.01742	0.03838	0.05902	0.04136	0.02919	0.0043	0	0	0	0	0.00023	0.00058	0.00026	0.02585	0.10078	0.07134	0.02827
	0.00561	0.00212	0	0	0	0	0	0	0								
2005	1	1	3	0	20	0	0	0	0.00095	0	0	0	0.01986	0.0208	0.00037	0.06466	0.3323
	0.18004	0.04388	0.04495	0.02574	0.01096	0	0	0	0	0	0	0	0	0.06488	0.12996	0.03707	0.00865
	0.00543	0	0.00949	0	0	0	0	0	0								
# new to update assessment																	
#year	season	type	gender	part	#samp	16	18	20	22	24	26	28	30	32	34	36	38
	40	42	44	46	48	50	52	16	18	20	22	24	26	28	30	32	34
	36	38	40	42	44	46	48	50	52								
2006	1	1	3	0	28	0	0	0	0	0	0	0	0.00128	0.00403	0.00696	0.01185	0.07985
	0.21999	0.18547	0.26428	0.05523	0.02004	0.00501	0.00513	0	0	0	0	0	0	0.00006	0.0058	0.0479	0.06867
	0.01833	0	0.00012	0	0	0	0	0	0								
2007	1	1	3	0	30	0	0.00007	0	0	0	0	0.00078	0.00213	0.00341	0.00683	0.00292	0.04219
	0.08381	0.11369	0.0429	0.01665	0.00548	0.00149	0.00014	0	0	0	0	0	0	0.00178	0.00213	0.02924	0.06182
	0.1149	0.01615	0.09078	0.22553	0.12009	0.01508	0	0	0								
2008	1	1	3	0	52	0	0	0	0	0	0	0.00017	0.00455	0.02146	0.0105	0.04584	0.06877
	0.17524	0.36671	0.15241	0.01787	0.00584	0.00013	0.00043	0	0	0	0	0	0.00019	0.00884	0.00746	0.0265	0.03517
	0.00484	0.00399	0.00627	0.02021	0.0139	0	0.00272	0	0								
2009	1	1	3	0	51	0	0	0	0	0	0	0	0.02281	0.16014	0.13279	0.0812	0.06143
	0.07439	0.11706	0.09248	0.04629	0.02826	0.00383	0	0	0	0	0	0	0.00305	0.0134	0.05116	0.07145	0.0387
	0.00156	0	0	0	0	0	0	0	0								
2010	1	1	3	0	41	0	0	0	0	0	0	0	0.00725	0.01785	0.04414	0.04789	0.02832
	0.1154	0.23989	0.3425	0.06672	0.01578	0.00391	0	0	0	0	0	0	0.00009	0.0026	0.01836	0.0206	0.01897
	0.00924	0.00051	0	0	0	0	0	0	0								
2012	1	1	3	0	34	0	0	0	0.00003	0	0.00009	0.01332	0.01227	0.02472	0.01612	0.00373	0.12329
	0.14518	0.14506	0.16249	0.09472	0.01065	0	0	0	0	0	0.00096	0.00402	0.00043	0.00877	0.04394	0.07715	0.07226
	0.04073	0	0.00006	0	0	0	0	0	0								

2013	1	1	3	0	34	0	0	0	0.00005	0.00355	0.00581	0.003	0.04751	0.09696	0.02696	0.00942	0.00966
	0.16413	0.1711	0.17901	0.10856	0.01655	0.00021	0.00226	0	0	0	0.00069	0.00133	0.00771	0.01637	0.02858	0.03985	0.03338
	0.02319	0.00133	0.0007	0.00214	0	0	0	0	0								
2014	1	1	3	0	27	0	0	0	0	0	0.00039	0.00979	0.03044	0.03263	0.05349	0.0165	0.00665
	0.02658	0.17088	0.25166	0.24853	0.09171	0.00006	0.0041	0	0	0	0	0	0.00425	0.02035	0.00865	0.01468	0.00438
	0.00017	0	0	0	0	0.0041	0	0	0								
#																	

# Hook and line fishery								females									
									males								
#year	season	type	gender	partition	# samples		16	18	20	22	24	26	28	30	32	34	36
	38	40	42	44	46	48	50	52	16	18	20	22	24	26	28	30	32
	34	36	38	40	42	44	46	48	50	52							
1980	1	2	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0.05346
	0.0004	0.0002	0.10731	0.21581	0.62144	0.0004	0	0	0	0	0	0	0	0	0	0	0
	0.0002	0	0	0	0	0.0002	0.0004	0	0								
1982	1	2	3	0	20	0	0	0	0	0	0	0	0	0	0	0	0.02656
	0.07327	0.14654	0.35618	0.19872	0.17263	0.02609	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0								
1983	1	2	3	0	8	0	0	0	0	0	0	0	0	0	0	0	0.01666
	0.14961	0.06663	0.09964	0.26559	0.38521	0	0	0	0	0	0	0	0	0	0	0.01666	0
	0	0	0	0	0	0	0	0	0								
1984	1	2	3	0	9	0	0	0	0	0	0	0	0	0	0	0	0.05882
	0.11765	0.17647	0.23529	0.17647	0.17647	0	0.05882	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0								
1985	1	2	3	0	14	0	0	0	0	0	0	0	0	0	0.00023	0.0222	0.10922
	0.15438	0.09717	0.3143	0.15556	0.0774	0.01025	0	0	0	0	0	0	0	0	0	0.01315	0.02107
	0.0246	0	0	0	0.00047	0	0	0	0								
1986	1	2	3	0	8	0	0	0	0	0	0	0	0.00138	0	0.00204	0.00836	0.02555
	0.14258	0.10739	0.35049	0.17396	0.11928	0.04642	0.0002	0	0	0	0	0	0	0.00003	0	0	0.01824
	0.0004	0	0	0.00191	0	0.00178	0	0	0								

1987	1	2	3	0	9	0	0	0	0	0	0	0.00657	0.02064	0.0066	0	0.05516	0.17066
	0.23488	0.1451	0.10775	0.05923	0.1022	0.00734	0.00004	0	0	0	0	0	0	0.00319	0.00657	0.00657	0.00319
	0	0.06432	0	0	0	0	0	0	0								
1989	1	2	3	0	16	0	0	0	0	0	0	0	0	0.03538	0.08849	0.08298	0.02435
	0.0592	0.01779	0.01218	0.01826	0.02435	0	0	0	0	0	0	0	0	0.01769	0.08846	0.05308	0.33615
	0.12388	0.01769	0	0.00007	0	0	0	0	0								
1990	1	2	3	0	16	0	0	0	0	0	0	0	0.00205	0	0.05716	0.16326	0.58683
	0.16725	0	0.0032	0.00326	0	0	0	0	0	0	0	0	0	0	0.00483	0	0.00526
	0.00689	0	0	0	0	0	0	0	0								
1991	1	2	3	0	41	0	0.00143	0	0	0.00003	0.01129	0.00118	0.01025	0.06023	0.08648	0.19366	0.08308
	0.15067	0.07261	0.05628	0.01759	0.00397	0.00164	0	0	0	0	0	0.00003	0.00045	0.02487	0.04852	0.09975	0.06582
	0.00883	0.00088	0.00025	0.00019	0	0	0	0	0								
1992	1	2	3	0	84	0	0	0	0	0	0.00081	0.00155	0.03048	0.03815	0.08563	0.08881	0.1549
	0.11131	0.13644	0.08134	0.03369	0.01247	0.00425	0	0	0	0	0	0	0.00315	0.01819	0.07305	0.05973	0.05016
	0.01027	0.00158	0.00079	0.00311	0	0	0	0	0								
1993	1	2	3	0	87	0	0	0.00036	0	0	0.0251	0.10349	0.25814	0.18048	0.14098	0.08223	0.05605
	0.00957	0.0072	0.0021	0.001	0.00086	0	0	0	0	0	0.00036	0.01122	0.02667	0.02754	0.02959	0.03582	0.00116
	0.00007	0	0	0	0	0	0	0	0								
1994	1	2	3	0	86	0	0	0	0	0	0	0	0.00284	0.01322	0.04427	0.08209	0.16641
	0.19531	0.21998	0.08578	0.03136	0.03328	0.00023	0	0	0	0	0	0	0	0	0.03582	0.05304	0.02098
	0.00407	0.0113	0	0	0	0	0	0	0								
1995	1	2	3	0	23	0	0	0	0	0	0	0	0.02018	0.02427	0.02279	0.10374	0.2622
	0.10859	0.0662	0.02693	0.0042	0.00013	0	0	0	0	0	0	0	0	0.01229	0.03623	0.0747	0.04455
	0.06782	0.05856	0.03752	0.00387	0.01682	0	0	0	0								
1996	1	2	3	0	41	0	0	0	0	0	0	0.01667	0.0016	0.01394	0.08846	0.1179	0.22555
	0.21468	0.07447	0.04815	0.03936	0.00221	0.00204	0	0	0	0	0	0	0	0	0.01948	0.05499	0.06521
	0.00247	0.01121	0	0.0016	0	0	0	0	0								
1997	1	2	3	0	38	0	0	0	0	0.00215	0.00078	0	0.01598	0.08748	0.09409	0.08517	0.14414
	0.19467	0.10841	0.07685	0.04188	0.01266	0.00378	0	0	0	0	0	0	0.00303	0.03014	0.04673	0.02531	0.02327
	0.00078	0.00239	0.00003	0.00027	0	0	0	0	0								
1998	1	2	3	0	38	0.00326	0	0	0	0	0	0.00563	0.0064	0.03196	0.13658	0.09991	0.06159
	0.11968	0.13457	0.07747	0.04899	0.00844	0.00774	0.00391	0	0	0	0	0.00461	0.00326	0.00226	0.06047	0.09318	0.07127
	0.01461	0.00047	0	0.00372	0	0	0	0	0								

1999	1	2	3	0	11	0	0	0	0	0	0	0	0.02659	0.06492	0.07368	0.17232	0.24041
	0.09193	0.11931	0.06458	0.02409	0.00238	0	0	0	0	0	0	0	0.00467	0.00517	0.02843	0.04026	0.02993
	0.01134	0	0	0	0	0	0	0	0								
# samp size for hook lengths from 1997 through 2001 set neg. as length comps for aged and unaged fish somewhat different..																	
2000	1	2	3	0	9	0	0	0	0	0	0.00031	0.00031	0.01411	0.02543	0.13084	0.25728	0.12122
	0.16961	0.077	0.05276	0.0226	0.02131	0	0	0	0	0	0	0	0.00031	0.01034	0.01534	0.04837	0.02074
	0.00626	0	0	0.00587	0	0	0	0	0								
2001	1	2	3	0	12	0	0	0	0	0	0	0	0.00132	0	0.01175	0.03414	0.0829
	0.11837	0.1749	0.12195	0.05119	0.02052	0.01335	0	0	0	0	0	0	0	0.01026	0.06216	0.17562	0.10756
	0.01241	0	0	0.0016	0	0	0	0	0								
2002	1	2	3	0	3	0	0	0	0	0	0.02632	0.10526	0	0	0	0	0.02632
	0	0	0.05263	0.02632	0.02632	0	0	0	0	0	0	0.02632	0.02632	0	0.15789	0.39474	0.13158
	0	0	0	0	0	0	0	0	0								
2006	1	2	3	0	3	0	0	0	0	0	0	0	0	0	0.01272	0	0.16185
	0.23815	0.25318	0.10867	0.05549	0.10636	0	0	0	0	0	0	0	0	0	0	0.02543	0
	0	0	0.02543	0.01272	0	0	0	0	0								
# new to update assessment																	
#year	season	type	gender	partition	# samples												
2007	1	2	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0
	0.09233	0.25667	0.17493	0.19949	0.21177	0.03812	0	0	0	0	0	0	0	0	0	0	0.00805
	0.00805	0	0	0.01059	0	0	0	0	0								
2008	1	2	3	0	6	0	0	0	0	0	0	0	0	0	0	0	0.01504
	0.1411	0.3924	0.18704	0.09707	0.07219	0.04403	0	0	0	0	0	0	0	0	0	0.00848	0.04266
	0	0	0	0	0	0	0	0	0								
#																	
#Net fishery							females										

#year	season	type	gender	partition	# samples		16	18	20	22	24	26	28	30	32	34	36
	38	40	42	44	46	48	50	52	16	18	20	22	24	26	28	30	32
	34	36	38	40	42	44	46	48	50	52							
1983	1	3	3	0	24	0	0	0	0	0	0	0	0	0	0	0.01248	0.06211
	0.14868	0.19754	0.332	0.13685	0.02443	0	0.00307	0	0	0	0	0	0	0	0.01248	0.03545	0.02297
	0	0.01195	0	0	0	0	0	0	0								
1984	1	3	3	0	68	0	0.01047	0	0	0	0	0	0	0	0	0	0
	0.16667	0.29147	0.32045	0.10306	0.09742	0.01047	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0								
1985	1	3	3	0	155	0	0	0	0	0	0	0.00122	0	0.00021	0.00467	0.02343	0.07395
	0.09334	0.15591	0.24592	0.23791	0.06391	0.00509	0.00302	0	0	0	0	0	0	0.00015	0.00273	0.02204	0.03686
	0.01733	0.01211	0	0.0002	0	0	0	0	0								
1986	1	3	3	0	113	0	0	0	0	0	0	0.00023	0.0004	0.00057	0.00026	0.01582	0.06056
	0.18991	0.18421	0.21071	0.20903	0.05679	0.00621	0	0	0	0	0	0	0	0	0.00011	0.00566	0.02964
	0.00568	0.00403	0.00343	0.00667	0	0	0	0	0								
1987	1	3	3	0	92	0	0	0	0	0	0	0.00079	0.00162	0.00036	0.00232	0.00897	0.01165
	0.19355	0.2855	0.17057	0.1123	0.0467	0.01564	0.00089	0	0	0	0	0	0	0.00347	0.04653	0.01944	0.01772
	0.01386	0.04378	0.00194	0.00186	0	0	0	0	0								
1988	1	3	3	0	70	0	0	0	0	0	0.00041	0.00044	0.00117	0.0638	0.12296	0.00271	0.00163
	0.00385	0.31123	0.257	0.09212	0.01448	0.00127	0	0	0	0	0	0.00006	0.00015	0.00097	0.11848	0.00267	0.00138
	0.00279	0.00013	0.00005	0	0	0	0	0	0								
1989	1	3	3	0	82	0	0	0	0	0	0	0.01848	0.01832	0.03839	0.12987	0.14382	0.11016
	0.07334	0.12715	0.10056	0.13359	0.01859	0.01313	0.01893	0	0	0	0	0	0	0.0123	0.01375	0.01428	0.00822
	0.00655	0.00043	0.00014	0	0	0	0	0	0								
1990	1	3	3	0	99	0	0	0.00078	0	0	0.00057	0.0025	0.00785	0.01569	0.01327	0.0751	0.1624
	0.13408	0.04108	0.2186	0.08537	0.05356	0.00613	0.00021	0	0	0	0	0	0	0.00171	0.0388	0.04572	0.02568
	0.01163	0.04536	0.00371	0	0.0102	0	0	0	0								
1991	1	3	3	0	35	0	0	0	0	0	0.00144	0.00352	0.00863	0.0187	0.03612	0.08646	0.16717
	0.23046	0.13553	0.04859	0.03628	0.00927	0	0	0	0	0	0	0	0.00016	0.02781	0.06585	0.05945	0.04155
	0.00943	0.00767	0	0.00591	0	0	0	0	0								

1992 length comps had several large males from Morro Bay area - probably mis-ID'd sex or species- thus sample size turned to negative 1

-1992	1	3	3	0	1	0	0	0	0	0	0	0.00216	0.01539	0.00683	0.04506	0.07463	0.09314
	0.14088	0.16453	0.10951	0.10248	0.06281	0.00667	0	0	0	0	0	0	0.00139	0.01445	0.02481	0.08037	0.03203
	0.01596	0.00178	0.00095	0.00059	0.00027	0	0	0	0								

1993	1	3	3	0	35	0	0	0	0	0	0.00102	0.00848	0.01798	0.0186	0.03445	0.10195	0.15712
	0.24255	0.15447	0.09174	0.01546	0	0	0	0	0	0	0	0.00473	0.00358	0.04126	0.06158	0.02809	0.01171
	0.00428	0	0.00097	0	0	0	0	0	0								
1994	1	3	3	0	47	0	0	0	0	0	0	0	0	0.00085	0.01046	0.03534	0.05834
	0.11516	0.34256	0.15397	0.0921	0.05238	0.00712	0	0	0	0	0	0	0	0.00085	0.02841	0.03954	0.0351
	0.0278	0	0	0	0	0	0	0	0								
1995	1	3	3	0	32	0	0	0	0	0	0	0	0	0	0.00906	0	0.0436
	0.08736	0.31989	0.22707	0.20206	0.07282	0.02	0	0	0	0	0	0	0	0	0	0	0.01813
	0	0	0	0	0	0	0	0	0								
1996	1	3	3	0	21	0	0	0	0	0	0	0	0	0	0.01626	0.03252	0.0813
	0.1626	0.26016	0.25203	0.09756	0.07317	0	0	0	0	0	0	0	0	0	0	0.01626	0
	0	0	0	0	0.00813	0	0	0	0								
1997	1	3	3	0	14	0	0	0	0	0	0	0	0	0.01361	0.00537	0.00956	0.05249
	0.15283	0.29519	0.25541	0.11019	0.01381	0.01074	0	0	0	0	0	0	0	0	0.00517	0.01829	0.03229
	0.02504	0	0	0	0	0	0	0	0								
1998	1	3	3	0	11	0	0	0	0	0	0	0	0	0	0.01304	0.0087	0.01739
	0.14783	0.27391	0.33913	0.07826	0.02609	0	0	0	0	0	0	0	0	0	0.02174	0	0.04783
	0.01304	0	0.01304	0	0	0	0	0	0								

#

Recfin length comps Coastwide (N and S)

#year	season	type	gender	part	Nsamp	16	18	20	22	24	26	28	30	32	34	36	38
	40	42	44	46	48	50	52	16	18	20	22	24	26	28	30	32	34
	36	38	40	42	44	46	48	50	52								
1980	1	4	0	0	50	0.00255	0	0.01278	0.0358	0.07928	0.07672	0.13554	0.11253	0.11253	0.09718	0.07161	0.08439
	0.07161	0.04092	0.02813	0.02301	0.01278	0	0.00255	0.00255	0	0.01278	0.0358	0.07928	0.07672	0.13554	0.11253	0.11253	0.09718
	0.07161	0.08439	0.07161	0.04092	0.02813	0.02301	0.01278	0	0.00255								
1981	1	4	0	0	47	0.00127	0	0	0.00508	0.02033	0.0343	0.06607	0.14485	0.11689	0.13214	0.10673	0.1385
	0.08767	0.04447	0.04066	0.02668	0.02033	0.0127	0.00127	0.00127	0	0	0.00508	0.02033	0.0343	0.06607	0.14485	0.11689	0.13214
	0.10673	0.1385	0.08767	0.04447	0.04066	0.02668	0.02033	0.0127	0.00127								
1982	1	4	0	0	59	0	0	0	0	0.02427	0.05663	0.07605	0.08252	0.09061	0.06796	0.08576	0.12621
	0.13754	0.11488	0.05501	0.05016	0.02427	0.00647	0.00161	0	0	0	0	0.02427	0.05663	0.07605	0.08252	0.09061	0.06796
	0.08576	0.12621	0.13754	0.11488	0.05501	0.05016	0.02427	0.00647	0.00161								

1983 1 4 0 0 45 0 0 0.00464 0.01547 0.02321 0.07739 0.10371 0.15634 0.12848 0.07894 0.05417 0.0712
0.09287 0.07739 0.04489 0.04334 0.02321 0.00309 0.00154 0 0 0.00464 0.01547 0.02321 0.07739 0.10371 0.15634 0.12848 0.07894
0.05417 0.0712 0.09287 0.07739 0.04489 0.04334 0.02321 0.00309 0.00154
1984 1 4 0 0 90 0 0 0.00254 0.00636 0.01908 0.03053 0.0547 0.0916 0.15267 0.20101 0.13613 0.07506
0.10432 0.07633 0.0318 0.01653 0.00127 0 0 0 0 0.00254 0.00636 0.01908 0.03053 0.0547 0.0916 0.15267 0.20101
0.13613 0.07506 0.10432 0.07633 0.0318 0.01653 0.00127 0 0
1985 1 4 0 0 138 0.00099 0.00049 0.00198 0.00596 0.00994 0.01838 0.03628 0.09045 0.1332 0.12176 0.12524 0.14015
0.11282 0.08697 0.0656 0.02932 0.01391 0.00546 0.00099 0.00099 0.00049 0.00198 0.00596 0.00994 0.01838 0.03628 0.09045 0.1332 0.12176
0.12524 0.14015 0.11282 0.08697 0.0656 0.02932 0.01391 0.00546 0.00099
1986 1 4 0 0 115 0 0.00095 0.00381 0.01858 0.07435 0.10724 0.05052 0.04718 0.07769 0.1101 0.0958 0.10247
0.13203 0.09103 0.04385 0.0305 0.01096 0.00238 0.00047 0 0.00095 0.00381 0.01858 0.07435 0.10724 0.05052 0.04718 0.07769 0.1101
0.0958 0.10247 0.13203 0.09103 0.04385 0.0305 0.01096 0.00238 0.00047
1987 1 4 0 0 22 0 0 0.00761 0.01776 0.04568 0.08375 0.12436 0.11675 0.11675 0.10659 0.04568 0.05076
0.03299 0.06852 0.07614 0.04314 0.01776 0.0203 0.02538 0 0 0.00761 0.01776 0.04568 0.08375 0.12436 0.11675 0.11675 0.10659
0.04568 0.05076 0.03299 0.06852 0.07614 0.04314 0.01776 0.0203 0.02538
1988 1 4 0 0 72 0 0 0 0.00323 0.02047 0.04956 0.12931 0.20474 0.23922 0.16056 0.02693 0.01724
0.02693 0.06142 0.03987 0.01185 0.00646 0 0.00215 0 0 0 0.00323 0.02047 0.04956 0.12931 0.20474 0.23922 0.16056
0.02693 0.01724 0.02693 0.06142 0.03987 0.01185 0.00646 0 0.00215
1989 1 4 0 0 29 0 0 0 0.00219 0.0307 0.04495 0.0921 0.14692 0.1546 0.21052 0.21052 0.06469
0.02083 0.00986 0.00877 0.00328 0 0 0 0 0 0 0.00219 0.0307 0.04495 0.0921 0.14692 0.1546 0.21052
0.21052 0.06469 0.02083 0.00986 0.00877 0.00328 0 0 0
1994 1 4 0 0 5 0 0 0 0 0.09677 0.06451 0.16129 0.16129 0.2258 0.16129 0.09677 0.03225
0 0 0 0 0 0 0 0 0 0 0 0.09677 0.06451 0.16129 0.16129 0.2258 0.16129
0.09677 0.03225 0 0 0 0 0 0 0
1995 1 4 0 0 5 0 0 0 0.08053 0.05369 0.22147 0.26174 0.20134 0.12751 0.02684 0.02013 0
0 0 0 0 0 0 0.00671 0 0 0 0.08053 0.05369 0.22147 0.26174 0.20134 0.12751 0.02684
0.02013 0 0 0 0 0 0 0 0.00671
1996 1 4 0 0 20 0 0 0.00359 0.05215 0.07553 0.14928 0.19064 0.09892 0.07553 0.10431 0.07913 0.05935
0.05575 0.04136 0.01258 0.00179 0 0 0 0 0 0.00359 0.05215 0.07553 0.14928 0.19064 0.09892 0.07553 0.10431
0.07913 0.05935 0.05575 0.04136 0.01258 0.00179 0 0 0
1997 1 4 0 0 15 0 0 0 0.00338 0.0305 0.08305 0.05254 0.07627 0.05423 0.05423 0.07796 0.18474
0.17288 0.12542 0.05254 0.02203 0.00677 0.00338 0 0 0 0 0.00338 0.0305 0.08305 0.05254 0.07627 0.05423 0.05423
0.07796 0.18474 0.17288 0.12542 0.05254 0.02203 0.00677 0.00338 0

1998	1	4	0	0	6	0	0	0	0	0.0114	0.01901	0.06083	0.19771	0.13307	0.12167	0.08365	0.06463
	0.11026	0.08745	0.07604	0.01901	0.0152	0	0	0	0	0	0	0.0114	0.01901	0.06083	0.19771	0.13307	0.12167
	0.08365	0.06463	0.11026	0.08745	0.07604	0.01901	0.0152	0	0								
1999	1	4	0	0	47	0	0.00516	0.01204	0.02065	0.02925	0.07056	0.07917	0.09294	0.06196	0.07228	0.06196	0.0981
	0.11187	0.16179	0.09122	0.02409	0.00516	0	0.00172	0	0.00516	0.01204	0.02065	0.02925	0.07056	0.07917	0.09294	0.06196	0.07228
	0.06196	0.0981	0.11187	0.16179	0.09122	0.02409	0.00516	0	0.00172								
2000	1	4	0	0	31	0	0.01086	0.08695	0.06521	0.02898	0.07246	0.07608	0.0942	0.06521	0.0471	0.02173	0.05797
	0.0942	0.09057	0.08695	0.08695	0.01086	0.00362	0	0	0.01086	0.08695	0.06521	0.02898	0.07246	0.07608	0.0942	0.06521	0.0471
	0.02173	0.05797	0.0942	0.09057	0.08695	0.08695	0.01086	0.00362	0								
2001	1	4	0	0	16	0	0	0.02675	0.09698	0.1806	0.0903	0.05685	0.05016	0.07692	0.05351	0.03678	0.05351
	0.08361	0.07023	0.07023	0.04013	0.01337	0	0	0	0	0.02675	0.09698	0.1806	0.0903	0.05685	0.05016	0.07692	0.05351
	0.03678	0.05351	0.08361	0.07023	0.07023	0.04013	0.01337	0	0								
2002	1	4	0	0	18	0	0	0	0.00888	0.13777	0.14666	0.14666	0.07111	0.01333	0.02666	0.04888	0.00888
	0.05333	0.07555	0.12	0.11111	0.02666	0.00444	0	0	0	0	0.00888	0.13777	0.14666	0.14666	0.07111	0.01333	0.02666
	0.04888	0.00888	0.05333	0.07555	0.12	0.11111	0.02666	0.00444	0								
#2004	1	4	0	0	41	0.00429	0.01716	0.01287	0.03433	0.11587	0.21459	0.13304	0.09442	0.1545	0.11158	0.07296	0.02575
	0.00429	0	0	0.00429	0	0	0	0.00429	0.01716	0.01287	0.03433	0.11587	0.21459	0.13304	0.09442	0.1545	0.11158
	0.07296	0.02575	0.00429	0	0	0.00429	0	0	0								
#2005	1	4	0	0	16	0	0.07547	0.30188	0.09433	0.01886	0.07547	0.0566	0.09433	0.03773	0.01886	0.13207	0.0566
	0.03773	0	0	0	0	0	0	0	0.07547	0.30188	0.09433	0.01886	0.07547	0.0566	0.09433	0.03773	0.01886
	0.13207	0.0566	0.03773	0	0	0	0	0	0								
#year	season	type	gender	part	Nsamp	16	18	20	22	24	26	28	30	32	34	36	38
	40	42	44	46	48	50	52	16	18	20	22	24	26	28	30	32	34
	36	38	40	42	44	46	48	50	52								
2004	1	4	0	0	16	0.01	0.0134	0.01	0.0302	0.104	0.208	0.1308	0.1006	0.1577	0.1342	0.0671	0.0268
	0.0033	0	0	0.0033	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0								
2005	1	4	0	0	18	0.0036	0.0254	0.0727	0.1127	0.2109	0.1236	0.0436	0.0472	0.0327	0.0509	0.1018	0.1309
	0.04	0.0036	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0								
2006	1	4	0	0	19	0.0031	0.0062	0.0248	0.1024	0.177	0.2142	0.1987	0.0745	0.0341	0.0465	0.0341	0.0527
	0.0186	0.0093	0.0031	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0								

2007	1	4	0	0	18	0.0041	0.002	0.0248	0.0788	0.0975	0.0394	0.0373	0.0705	0.0892	0.0477	0.0311	0.0435
	0.1493	0.1908	0.0643	0.0145	0.0082	0.0062	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0								
2008	1	4	0	0	18	0.0066	0.0167	0.0367	0.1304	0.1337	0.224	0.0969	0.0735	0.0602	0.0568	0.0468	0.0133
	0.0267	0.0434	0.0234	0.0033	0.0033	0.0033	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0								
2009	1	4	0	0	17	0.0133	0.0266	0.0622	0.1688	0.2533	0.0711	0.1288	0.1022	0.0622	0.0133	0.0311	0.0088
	0.0177	0.0088	0.0133	0.0133	0.0044	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0								
2010	1	4	0	0	17	0.009	0.0543	0.1601	0.2084	0.1752	0.1299	0.0966	0.0694	0.0332	0.0302	0.006	0.003
	0.003	0.003	0.003	0.009	0.003	0.003	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0								
2011	1	4	0	0	19	0.0112	0.0544	0.1616	0.1552	0.1392	0.0976	0.1072	0.056	0.048	0.0496	0.016	0.0256
	0.0144	0.0272	0.0208	0.0096	0.0064	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0								
2012	1	4	0	0	25	0.0056	0.0127	0.1943	0.2666	0.1659	0.1262	0.0865	0.0765	0.0255	0.0113	0.0113	0.0028
	0.0028	0.0014	0.007	0	0.0028	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0								
2013	1	4	0	0	19	0.023	0.0853	0.149	0.1273	0.1707	0.1504	0.13	0.0718	0.0487	0.0121	0.0094	0.0067
	0.004	0	0.0054	0.0013	0.0013	0.0013	0.0013	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0								
2014	1	4	0	0	16	0.0466	0.0601	0.1022	0.224	0.2526	0.1007	0.0661	0.0661	0.0436	0.0225	0.0075	0.0015
	0.0015	0.003	0.0015	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0								

#
Triennial survey length data-

1977	1	5	3	0	56	0.00132	0.0028	0.01864	0.04554	0.02555	0.01866	0.01316	0.01863	0.04304	0.08371	0.05878	0.02463
	0.03757	0.05619	0.05998	0.05109	0.04681	0.02098	0.00456	0.00157	0.0026	0.01833	0.04147	0.01525	0.01458	0.01431	0.06889	0.08181	0.06158
	0.03506	0.00853	0.00065	0.00107	0.00148	0.00043	0.00057	0	0								
1980	1	5	3	0	17	0	0	0	0	0	0.00102	0.00022	0.00442	0.03417	0.0489	0.06656	0.04987
	0.08431	0.09185	0.06391	0.0378	0.0108	0.01103	0.00138	0	0	0.00092	0.00123	0.00056	0.00021	0.01013	0.06132	0.15277	0.18459
	0.06082	0.00831	0.00208	0.00842	0.00156	0.00056	0.00014	0	0								

1983	1	5	3	0	17	0.00147	0.00236	0.00222	0.00237	0.01546	0.03155	0.05519	0.09165	0.11927	0.04888	0.01741	0.01022
	0.02294	0.02131	0.01335	0.01473	0.01341	0.00281	0.00054	0.00129	0.00236	0.00082	0.00187	0.01964	0.04507	0.13632	0.1805	0.0633	0.03084
	0.02869	0.00197	0	0	0.00003	0	0	0	0								
1986	1	5	3	0	14	0.00021	0.00021	0.054	0.09675	0.10531	0.03826	0.00166	0.00191	0.00319	0.01658	0.03826	0.06103
	0.04773	0.04995	0.01422	0.00968	0.00458	0.00138	0	0	0.00214	0.042	0.0741	0.12401	0.01268	0.01143	0.06192	0.07889	0.03768
	0.0074	0.00226	0.00044	0	0	0	0	0	0								
1989	1	5	3	0	91	0.14115	0.08542	0.00522	0.01077	0.0188	0.01236	0.02578	0.03328	0.01295	0.01263	0.03708	0.04408
	0.00765	0.01092	0.01361	0.00611	0.00323	0.00099	0.00065	0.15814	0.07824	0.00423	0.01606	0.01862	0.03192	0.05855	0.05072	0.05481	0.02932
	0.01254	0.00347	0.00022	0.00004	0.00005	0	0	0.00009	0.00009								
1992	1	5	3	0	59	0.24397	0.02135	0.01956	0.025	0.00991	0.0186	0.04261	0.03886	0.01397	0.00795	0.00448	0.00373
	0.00244	0.00253	0.00212	0.00026	0.00065	0.00006	0	0.2715	0.01878	0.02134	0.02997	0.01546	0.0718	0.06547	0.0214	0.01717	0.00594
	0.00245	0.00024	0.00006	0	0	0	0.00012	0.00006	0								
1995	1	5	3	0	79	0.07182	0.0105	0.02365	0.03701	0.03052	0.00774	0.01664	0.03555	0.02933	0.02137	0.02177	0.04439
	0.03114	0.02686	0.02366	0.01874	0.00794	0.00212	0.00033	0.08029	0.0065	0.02289	0.03343	0.02708	0.04323	0.06932	0.08634	0.09242	0.05937
	0.01576	0.00175	0.00006	0.00016	0.00008	0.00008	0	0	0								
1998	1	5	3	0	81	0.01317	0.03329	0.02219	0.01371	0.05545	0.10907	0.02906	0.01489	0.0305	0.05614	0.00735	0.00612
	0.01038	0.01613	0.00776	0.00386	0.00265	0.00042	0	0.00908	0.02868	0.02244	0.03439	0.12487	0.07326	0.08847	0.09834	0.06031	0.02068
	0.00673	0.00042	0	0	0	0.00003	0	0	0								
2001	1	5	3	0	77	0.00367	0.01002	0.05792	0.2417	0.11619	0.00883	0.00665	0.00424	0.00695	0.00655	0.00921	0.00452
	0.00343	0.00301	0.00261	0.00244	0.00065	0.00001	0	0.00531	0.00575	0.09168	0.27631	0.08195	0.00664	0.01412	0.018	0.00695	0.00373
	0.00063	0.00013	0	0.00001	0	0	0	0	0								
2004	1	5	3	0	88	0.11449	0.00173	0.00278	0.00155	0.00074	0.0159	0.01839	0.00552	0.01475	0.07254	0.14576	0.06047
	0.01188	0.00359	0.00538	0.00669	0.00589	0.00154	0.00022	0.1552	0.00081	0.0029	0.0018	0.00745	0.01609	0.05755	0.12913	0.1032	0.02382
	0.01048	0.00153	0.00004	0	0	0.00004	0	0	0								
#																	
# NWC combo survey																	
#year	season	type	gender	part	#_samp	16	18	20	22	24	26	28	30	32	34	36	38
	40	42	44	46	48	50	52	16	18	20	22	24	26	28	30	32	34
	36	38	40	42	44	46	48	50	52								
2003	1	6	3	0	86	0.00791	0.00989	0.00795	0.00224	0.0081	0.00512	0.01166	0.03314	0.12573	0.19161	0.03388	0.00762
	0.00262	0.00155	0.00085	0.00315	0.00076	0.00165	0	0.01267	0.01439	0.00438	0.00656	0.006	0.01057	0.10126	0.1985	0.10436	0.06571
	0.01977	0.00001	0.0002	0	0	0.00002	0	0	0								
2004	1	6	3	0	80	0.04404	0.01369	0.00472	0.03525	0.02799	0.01465	0.01927	0.01316	0.03029	0.0799	0.14514	0.08653
	0.02008	0.00372	0.00344	0.00324	0.00297	0.00211	0.00011	0.04495	0.01289	0.00742	0.01816	0.01508	0.01046	0.02821	0.143	0.13338	0.02808
	0.00745	0.00044	0	0	0	0.00004	0	0	0								

2005 1 6 3 0 87 0.02407 0.0093 0.01775 0.01466 0.00372 0.00516 0.00377 0.02036 0.01414 0.04223 0.21656 0.14043
0.03212 0.01323 0.00496 0.00421 0.00225 0.00086 0.00032 0.02749 0.01076 0.01335 0.01627 0.00679 0.00303 0.10675 0.15658 0.06235 0.02254
0.00276 0.00032 0.00075 0 0 0 0 0 0
2006 1 6 3 0 70 0.00203 0.00398 0.00552 0.02027 0.01898 0.0162 0.01346 0.00799 0.01636 0.01809 0.01738 0.05072
0.1083 0.09014 0.02235 0.02541 0.00979 0.00467 0.00087 0.00083 0.00259 0.00524 0.02529 0.02382 0.02134 0.01556 0.04352 0.16058 0.21343
0.03339 0.00055 0 0.00118 0 0 0 0 0
2007 1 6 3 0 68 0.00694 0.00498 0.00225 0.00466 0.00199 0.0082 0.02121 0.07737 0.04765 0.03895 0.04959 0.04502
0.08783 0.1312 0.06906 0.01145 0.00483 0.00062 0 0.00748 0.00531 0.00229 0.00354 0.00286 0.02366 0.03255 0.06361 0.13585 0.08918
0.01884 0.00072 0.00015 0 0 0 0 0 0
2008 1 6 3 0 80 0.0525 0.00721 0.00604 0.00028 0.00324 0.00703 0.01813 0.02166 0.01324 0.01451 0.01361 0.02326
0.04604 0.15283 0.08107 0.03308 0.01564 0.00388 0.00182 0.03163 0.00915 0.00343 0.00295 0.0132 0.03037 0.04733 0.0635 0.11672 0.11197
0.03643 0.00494 0.00112 0.00584 0.00462 0.00139 0.00018 0 0
2009 1 6 3 0 81 0.0658 0.00339 0.00526 0.0125 0.01259 0.00621 0.00363 0.00586 0.01648 0.02718 0.04003 0.02169
0.02812 0.05753 0.0778 0.02552 0.00907 0.00291 0.00019 0.05909 0.0041 0.01079 0.01667 0.00584 0.00231 0.02267 0.11744 0.16747 0.14053
0.02207 0.00893 0.00018 0 0 0 0 0 0
2010 1 6 3 0 106 0.29939 0.0549 0.008 0.00317 0.0129 0.00933 0.00413 0.00381 0.00368 0.0041 0.00407 0.00723
0.01253 0.01723 0.02504 0.01062 0.00814 0.00846 0.00175 0.35807 0.04169 0.00091 0.00705 0.00986 0.00345 0.00562 0.01133 0.02472 0.0291
0.00925 0.00017 0 0 0 0.00015 0 0 0
2011 1 6 3 0 84 0.08495 0.04076 0.01536 0.16185 0.10881 0.01095 0.02466 0.00714 0.0035 0.01056 0.01115 0.01739
0.02143 0.01288 0.01679 0.01724 0.00626 0 0 0.0458 0.03999 0.01361 0.15985 0.05987 0.00563 0.01428 0.02029 0.02578 0.02624
0.01411 0.00274 0 0 0 0 0 0 0
2012 1 6 3 0 105 0.07067 0.0216 0.04496 0.19184 0.0522 0.00761 0.06991 0.00539 0.01781 0.00115 0.00058 0.01
0.00658 0.01156 0.01748 0.01149 0.00253 0.00013 0 0.07963 0.01119 0.08674 0.08155 0.05255 0.03383 0.06017 0.00346 0.01439 0.02289
0.00806 0.0006 0 0.00063 0 0.00067 0 0 0
2013 1 6 3 0 96 0.21987 0.00358 0.00506 0.00457 0.01956 0.07651 0.05492 0.05832 0.03449 0.0168 0.00028 0.00072
0.00437 0.01203 0.01371 0.01437 0.00482 0.00142 0 0.21259 0.0046 0.00303 0.00252 0.05165 0.07954 0.04636 0.01941 0.00989 0.01868
0.0053 0.00054 0 0.00031 0 0 0 0 0
2014 1 6 3 0 127 0.0522 0.02886 0.0063 0.00563 0.01611 0.00677 0.00808 0.04705 0.08093 0.07156 0.05188 0.02092
0.00143 0.01479 0.05969 0.0452 0.01682 0.01489 0 0.07331 0.02127 0.00601 0.01423 0.01824 0.02237 0.08382 0.04607 0.01124 0.02091
0.02169 0.01445 0.00075 0 0.04132 0.04127 0.01375 0 0

#
#Recreational Length data - June 15 fix to TL-> FL conversion!!

#year	season	type	gender	part	numsamp		16	18	20	22	24	26	28	30	32	34	36
	38	40	42	44	46	48	50	52	16	18	20	22	24	26	28	30	32
	34	36	38	40	42	44	46	48	50	52							
1987	1	10	0	0	43	0.0007	0	0.00141	0.01131	0.03182	0.13932	0.30622	0.31046	0.13649	0.01909	0.01202	0.01202
	0.01131	0.00353	0.00353	0.0007	0	0	0	0.0007	0	0.00141	0.01131	0.03182	0.13932	0.30622	0.31046	0.13649	0.01909
	0.01202	0.01202	0.01131	0.00353	0.00353	0.0007	0	0	0								
1988	1	10	0	0	44	0.0011	0.00221	0.00832	0.03329	0.07103	0.07047	0.12042	0.22031	0.24028	0.15149	0.04495	0.00832
	0.00998	0.00887	0.00277	0.00166	0.00332	0.0011	0	0.0011	0.00221	0.00832	0.03329	0.07103	0.07047	0.12042	0.22031	0.24028	0.15149
	0.04495	0.00832	0.00998	0.00887	0.00277	0.00166	0.00332	0.0011	0								
1989	1	10	0	0	58	0	0.00122	0.00183	0.01102	0.02205	0.03063	0.09803	0.19852	0.17401	0.1734	0.17095	0.06617
	0.02205	0.0147	0.00857	0.00428	0.00183	0	0.00061	0	0.00122	0.00183	0.01102	0.02205	0.03063	0.09803	0.19852	0.17401	0.1734
	0.17095	0.06617	0.02205	0.0147	0.00857	0.00428	0.00183	0	0.00061								
1990	1	10	0	0	16	0	0	0	0	0.00716	0.04659	0.09318	0.15412	0.17204	0.07526	0.10394	0.17921
	0.09318	0.04659	0.02508	0.00358	0	0	0	0	0	0	0	0.00716	0.04659	0.09318	0.15412	0.17204	0.07526
	0.10394	0.17921	0.09318	0.04659	0.02508	0.00358	0	0	0								
1991	1	10	0	0	15	0	0	0.00256	0.01794	0.04615	0.12564	0.11794	0.14871	0.07948	0.05128	0.04871	0.12051
	0.10769	0.06923	0.04358	0.01794	0.00256	0	0	0	0	0.00256	0.01794	0.04615	0.12564	0.11794	0.14871	0.07948	0.05128
	0.04871	0.12051	0.10769	0.06923	0.04358	0.01794	0.00256	0	0								
1992	1	10	0	0	32	0	0	0.00941	0.04143	0.05775	0.15379	0.20966	0.17137	0.09165	0.05963	0.03766	0.04331
	0.04959	0.05524	0.00941	0.0069	0.00251	0.00062	0	0	0	0.00941	0.04143	0.05775	0.15379	0.20966	0.17137	0.09165	0.05963
	0.03766	0.04331	0.04959	0.05524	0.00941	0.0069	0.00251	0.00062	0								
1993	1	10	0	0	37	0	0.00061	0.00553	0.02642	0.0381	0.08358	0.09649	0.13952	0.16041	0.11124	0.07682	0.05777
	0.06883	0.06084	0.03749	0.02274	0.01167	0.00184	0	0	0.00061	0.00553	0.02642	0.0381	0.08358	0.09649	0.13952	0.16041	0.11124
	0.07682	0.05777	0.06883	0.06084	0.03749	0.02274	0.01167	0.00184	0								
1994	1	10	0	0	26	0.0008	0.00161	0.00726	0.03069	0.10904	0.1155	0.1357	0.1042	0.10339	0.10985	0.11227	0.07108
	0.0315	0.02827	0.02019	0.01615	0.00242	0	0	0.0008	0.00161	0.00726	0.03069	0.10904	0.1155	0.1357	0.1042	0.10339	0.10985
	0.11227	0.07108	0.0315	0.02827	0.02019	0.01615	0.00242	0	0								
1995	1	10	0	0	22	0	0.00892	0.05535	0.03928	0.06428	0.07142	0.10535	0.10892	0.18214	0.10892	0.08571	0.06785
	0.05357	0.02321	0.01607	0.00714	0.00178	0	0	0	0.00892	0.05535	0.03928	0.06428	0.07142	0.10535	0.10892	0.18214	0.10892
	0.08571	0.06785	0.05357	0.02321	0.01607	0.00714	0.00178	0	0								
1996	1	10	0	0	19	0	0	0.01167	0.02918	0.0642	0.11867	0.13035	0.0642	0.09533	0.13424	0.09338	0.10894
	0.07782	0.05058	0.01945	0.00194	0	0	0	0	0	0.01167	0.02918	0.0642	0.11867	0.13035	0.0642	0.09533	0.13424
	0.09338	0.10894	0.07782	0.05058	0.01945	0.00194	0	0	0								

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1997	1	10	0	0	19	0	0	0	0.00523	0.04712	0.12565	0.08115	0.09162	0.04973	0.0445	0.06806	0.1335
	0.17015	0.10471	0.04712	0.01832	0.01047	0.00261	0	0	0	0	0.00523	0.04712	0.12565	0.08115	0.09162	0.04973	0.0445
	0.06806	0.1335	0.17015	0.10471	0.04712	0.01832	0.01047	0.00261	0
1998	1	10	0	0	9	0	0	0	0	0.00955	0.01592	0.0605	0.18471	0.13057	0.10828	0.08917	0.09554
	0.12101	0.08598	0.07006	0.01592	0.01273	0	0	0	0	0	0	0.00955	0.01592	0.0605	0.18471	0.13057	0.10828
	0.08917	0.09554	0.12101	0.08598	0.07006	0.01592	0.01273	0	0
#


# Age composition data
21	# number of age bins
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	19	20	21

1	# number of unique ageing error matrices to generate
# ageing error matrix- no bias, has imprecision (st dev)
#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
#0.03	0.091	0.153	0.214	0.275	0.336	0.398	0.459	0.52	0.581	0.643	0.704	0.765	0.826	0.888	0.949	1.01	1.072
	1.133	1.194	1.255	1.317
0.4768	1.4304	2.384	3.3376	4.2912	5.2447	6.1983	7.1519	8.1055	9.0591	10.0127	10.9663	11.9199	12.8735	13.8271	14.7806	15.8	16.8
	17.8	18.8	19.8	20.8
0.107	0.107	0.2141	0.3211	0.4282	0.5352	0.6423	0.7493	0.8564	0.9634	1.0705	1.1775	1.2845	1.3916	1.4986	1.6057	1.61	1.61
	1.61	1.61	1.61	1.61


84	#_number of age observations
2	#_Lbin_method: 1=poplenbins; 2=datalenbins; 3=lengths
0	#_combine males into females at or below this bin number

# this run goes back to traditional age comps-
#year	season	type	gender	part	errmat	Lbinlo	LbinHi	# samp	1	2	3	4	5	6	7	8	9
	10	11	12	13	14	15	16	17	18	19	20	plus	1	2	3	4	5
	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	plus
```

-1978	1	1	3	0	1	1	52	1	0	0	0.00378	0.00192	0.05193	0.06229	0.08103	0.11205	0.0285
	0.02318	0.1395	0.04135	0.00805	0.00451	0.01162	0.01389	0.03325	0.01976	0.03987	0.0299	0.0635	0	0	0.00086	0.00094	0.01108
	0.03327	0.03173	0.02462	0.00872	0.00288	0.01137	0.02357	0.02161	0.04333	0.00117	0.00127	0.00263	0.00019	0.00142	0.0035	0.00597	
-1979	1	1	3	0	1	1	52	1	0	0	0.02289	0.04417	0.03256	0.12065	0.06067	0.05047	0.1531
	0.09065	0.03673	0.0262	0.01061	0.00285	0.02734	0.01818	0.01339	0.00627	0.02685	0.00403	0.00893	0	0	0.01917	0.05047	0.03043
	0.00964	0.00342	0.0042	0.02474	0.00362	0	0.00462	0.00335	0.01917	0.00044	0.00141	0.05746	0.00223	0.00531	0.00335	0.00044	
1980	1	1	3	0	1	1	52	120	0	0	0.00079	0.01116	0.07118	0.03558	0.24243	0.01848	0.04077
	0.07396	0.01513	0.0116	0.04232	0.01038	0.00231	0.05865	0.00011	0.00244	0.0029	0.00044	0.01973	0	0.00102	0.00435	0.007	0.05788
	0.07713	0.04955	0.00622	0.00431	0.03101	0.00437	0.05813	0.00071	0.00266	0.00096	0.00918	0.00028	0.00333	0.00621	0.00103	0.01431	
1981	1	1	3	0	1	1	52	80	0	0	0.00121	0.00551	0.15777	0.20849	0.03943	0.15607	0.01213
	0.00378	0.00498	0.00835	0.0039	0.05709	0.00182	0.00056	0.00245	0.00194	0.00101	0.00021	0.00806	0	0	0.04975	0.00037	0.05482
	0.02426	0.00489	0.12049	0.00215	0.00208	0.00777	0.00153	0.00261	0.05139	0.0007	0.00008	0.00007	0.00024	0	0.00015	0.00187	
1982	1	1	3	0	1	1	52	135	0	0.00006	0.00795	0.02247	0.05293	0.03563	0.21462	0.053	0.17273
	0.01588	0.04724	0.04183	0.0206	0.01731	0.01459	0.00567	0.00705	0.002	0.01187	0.00069	0.01252	0	0	0.00646	0.00462	0.01703
	0.01767	0.07607	0.01949	0.04761	0.00885	0.01292	0.01438	0.00282	0.00729	0.00479	0.00001	0.00012	0	0	0.00026	0.00296	
1983	1	1	3	0	1	1	52	254	0	0	0.00712	0.04191	0.02014	0.03882	0.07728	0.22797	0.09597
	0.08751	0.04105	0.05616	0.0338	0.02631	0.00968	0.01863	0.00111	0.00751	0.00826	0.01526	0.02535	0	0.00006	0.00528	0.02822	0.01055
	0.00792	0.02584	0.03455	0.00701	0.01561	0.00306	0.00564	0.00299	0.00495	0.00147	0.00218	0.00057	0.00277	0	0.00071	0.00073	
1984	1	1	3	0	1	1	52	202	0	0.00002	0.03783	0.10336	0.17369	0.086	0.05089	0.04349	0.09149
	0.02664	0.02702	0.01316	0.02271	0.01373	0.02425	0.00804	0.00912	0.00185	0.00051	0.00106	0.00579	0	0.00335	0.01033	0.04641	0.03068
	0.01707	0.013	0.01551	0.03336	0.02777	0.01319	0.01903	0.00578	0.00412	0.00282	0.01028	0.00259	0.00077	0.00085	0.00012	0.00234	
1985	1	1	3	0	1	1	52	303	0	0.00002	0.00279	0.02507	0.06476	0.16204	0.08104	0.0408	0.03527
	0.0363	0.04287	0.02739	0.02872	0.0188	0.01871	0.00889	0.00452	0.00542	0.00493	0.00236	0.00932	0	0.00006	0.00011	0.01536	0.01544
	0.04936	0.04948	0.03218	0.02924	0.04719	0.03604	0.0216	0.01902	0.02613	0.00676	0.00622	0.00532	0.00345	0.00422	0.00134	0.01145	
1986	1	1	3	0	1	1	52	111	0	0.00466	0.0088	0.02095	0.07726	0.1109	0.08903	0.04127	0.03736
	0.03883	0.06767	0.02447	0.03381	0.01699	0.02167	0.009	0.00728	0.00213	0.0115	0.00149	0.00566	0	0.00432	0.00224	0.00663	0.02418
	0.05423	0.05353	0.03077	0.04701	0.02541	0.04662	0.01493	0.02899	0.00422	0.01179	0.00263	0.00212	0.00145	0.00082	0.00062	0.00677	
1987	1	1	3	0	1	1	52	205	0.04462	0.03154	0.32482	0.01466	0.01095	0.03123	0.04142	0.06563	0.01636
	0.00299	0.00499	0.01538	0.00375	0.00637	0.0031	0.0003	0.00124	0.0015	0.00091	0.00021	0.00033	0.01785	0.00009	0.14746	0.01224	0.01089
	0.00733	0.03271	0.05213	0.01475	0.01071	0.01644	0.0176	0.0049	0.01238	0.00473	0.00156	0.00458	0.00502	0.00004	0.00111	0.00318	
1988	1	1	3	0	1	1	52	190	0	0.00014	0.02819	0.4067	0.00423	0.00113	0.05054	0.01579	0.04125
	0.00992	0.01415	0.00033	0.01861	0.00391	0.00258	0.00003	0.006	0.00209	0.00002	0.00026	0.00374	0	0.00029	0.00118	0.25377	0.00371
	0.00355	0.0084	0.01968	0.04651	0.01432	0.00167	0.00778	0.00472	0.00051	0.00218	0.01048	0.00127	0.00903	0.00018	0.00018	0.00099	

1989	1	1	3	0	1	1	52	174	0	0.00011	0.03457	0.03029	0.42988	0.00165	0.00067	0.00855	0.00895
	0.01759	0.00249	0.00141	0.00068	0.00803	0.0001	0.00207	0	0.00005	0.00022	0.00004	0.00045	0	0.00009	0.0226	0.03778	0.26056
	0.00339	0.0004	0.02036	0.01849	0.03719	0.00432	0.00165	0.00124	0.01195	0.0142	0.00599	0.00869	0.00042	0.0009	0.00006	0.00193	
1990	1	1	3	0	1	1	52	133	0	0.02742	0.05254	0.03834	0.05285	0.21303	0.15181	0.00314	0.03976
	0.00441	0.00642	0.00111	0.00497	0.00056	0.00317	0.00028	0.00123	0.00031	0.0009	0.00119	0.00411	0.00003	0.01388	0.03816	0.0536	0.02873
	0.10087	0.04477	0.00425	0.01313	0.01413	0.0257	0.00296	0.01804	0.00942	0.0079	0.00345	0.00728	0.00259	0.0012	0.00036	0.00199	
1991	1	1	3	0	1	1	52	66	0	0.03237	0.08143	0.08939	0.06549	0.04964	0.15004	0.03589	0.00976
	0.01119	0.01278	0.00956	0.00144	0.0128	0	0.00836	0	0.00124	0	0	0.03012	0	0.01674	0.10708	0.05087	0.03811
	0.01699	0.07145	0.02294	0.00555	0.0088	0.01073	0.01334	0.00211	0.00911	0.00072	0.00827	0.0001	0.00199	0.00012	0	0.01349	
1992	1	1	3	0	1	1	52	100	0	0.00306	0.088	0.12952	0.10098	0.10262	0.05166	0.09095	0.03579
	0.00788	0.01178	0.00858	0.0194	0.01313	0.01225	0.00157	0.00301	0.00157	0.00611	0.00128	0.00551	0	0.0016	0.02928	0.03758	0.03687
	0.04847	0.02022	0.06001	0.02501	0.0074	0.0019	0.00156	0.01092	0.00271	0.0066	0.00209	0.00136	0.00054	0.00501	0.00004	0.00615	
1993	1	1	3	0	1	1	52	75	0.00025	0.00174	0.02104	0.1297	0.118	0.09357	0.05244	0.0481	0.07239
	0.01097	0.00529	0.01416	0.0095	0.01103	0.00428	0.0025	0.00186	0.00289	0.00071	0.00513	0.00153	0	0.00166	0.02201	0.10917	0.05945
	0.05701	0.02266	0.01381	0.04	0.01438	0.00794	0.00644	0.00507	0.00306	0.00583	0.01028	0.00096	0.00355	0.00057	0.00192	0.00717	
1994	1	1	3	0	1	1	52	76	0	0.00248	0.07104	0.0454	0.13842	0.08056	0.09087	0.04623	0.01417
	0.06873	0.02104	0.00153	0.00473	0.0061	0.00337	0.00383	0.00147	0.00061	0.00588	0.00062	0.00098	0	0.0046	0.04132	0.04996	0.04147
	0.04859	0.04356	0.02342	0.03959	0.03571	0.01772	0.00435	0.01236	0.00557	0.0056	0.0057	0.0051	0.00122	0.00013	0.00105	0.00494	
1995	1	1	3	0	1	1	52	57	0	0.00404	0.02541	0.0728	0.08673	0.12557	0.08214	0.06132	0.04067
	0.01859	0.04225	0.01223	0.00378	0.00687	0.00515	0.00146	0.00288	0.00047	0	0.00172	0.00367	0	0.00544	0.01632	0.03919	0.03082
	0.05457	0.03673	0.03411	0.03743	0.01884	0.03969	0.02024	0.01218	0.00496	0.00986	0.01253	0.00477	0.00522	0.00009	0.00915	0.01012	
1996	1	1	3	0	1	1	52	64	0	0.00763	0.1728	0.01501	0.07585	0.07577	0.02908	0.0377	0.04358
	0.01553	0.00983	0.03194	0.00415	0	0.00155	0.00496	0.00284	0.00158	0	0.00624	0.00107	0	0.02565	0.11716	0.03339	0.034
	0.04137	0.05519	0.02609	0.02877	0.01265	0.02855	0.01731	0.01346	0.00214	0.00171	0.00015	0.00179	0.00063	0.01215	0.00359	0.00716	
1997	1	1	3	0	1	1	52	71	0	0.00132	0.01069	0.18465	0.07381	0.06563	0.06212	0.05927	0.04544
	0.03139	0.01655	0.01236	0.01119	0.00124	0.00447	0.00364	0.00324	0.00406	0.00196	0	0.00173	0	0	0.0152	0.14505	0.05635
	0.04362	0.03408	0.02759	0.01579	0.01125	0.01111	0.0176	0.00923	0.00209	0.00123	0.00056	0.0022	0.00571	0.00007	0.00099	0.00552	
-1998	1	1	3	0	1	1	52	1	0	0.00185	0.01358	0.01991	0.11579	0.06233	0.08108	0.07869	0.07642
	0.05378	0.04527	0.02623	0.01928	0.01991	0.00429	0.00127	0.00187	0.0018	0.0023	0.00021	0.00795	0.00031	0.00093	0.01815	0.01496	0.06433
	0.01016	0.04198	0.04395	0.03572	0.03541	0.01461	0.01351	0.03056	0.00985	0.01385	0.00231	0.00231	0.00326	0.00503	0.00238	0.00265	
-1999	1	1	3	0	1	1	52	1	0	0.00006	0.00173	0.10925	0.06315	0.13796	0.04408	0.0662	0.04837
	0.05063	0.04667	0.01942	0.01212	0.00903	0.0089	0.00263	0.00008	0.00094	0.00205	0.0029	0.00533	0	0.00332	0.00007	0.05304	0.03379
	0.10262	0.02641	0.04117	0.02579	0.02087	0.01269	0.00879	0.00482	0.0069	0.00728	0.00496	0.00373	0.00287	0.00227	0.0001	0.00702	

-2000	1	1	3	0	1	1	52	1	0	0.00002	0.00014	0.01344	0.06178	0.06835	0.11776	0.06001	0.07294
	0.03955	0.07104	0.05061	0.04365	0.02505	0.0218	0.01716	0.00218	0.00061	0.00321	0.00504	0.00363	0	0.00003	0.0051	0.00683	0.04577
	0.02892	0.05689	0.01984	0.03343	0.00977	0.0231	0.01241	0.03636	0.00292	0.00904	0.00465	0.00715	0.00008	0.00178	0.00268	0.01525	
2001	1	1	3	0	1	1	52	23	0.0009	0.01761	0.0093	0.02139	0.03552	0.13228	0.07052	0.13274	0.05431
	0.04817	0.02637	0.02695	0.028	0.02513	0.00513	0.00408	0	0.00405	0.00102	0	0.00518	0.0018	0.02358	0.00336	0.01142	0.01598
	0.03543	0.04657	0.06113	0.01708	0.02996	0.0256	0.01227	0.01829	0.01634	0.00428	0.00515	0.01275	0.0018	0	0.00071	0.00784	
2002	1	1	3	0	1	1	52	31	0.00126	0.00519	0.14825	0.07593	0.03391	0.03431	0.07351	0.04639	0.09528
	0.02917	0.04017	0.02066	0.05252	0.0251	0.02963	0.00392	0.01029	0.01613	0.00166	0.00083	0.00317	0.0003	0.00388	0.07294	0.03825	0.00824
	0.01287	0.02868	0.01071	0.03351	0.00561	0.01174	0.00248	0.00351	0.00683	0.00442	0.00052	0.00317	0.00247	0	0.00006	0.00257	
2003	1	1	3	0	1	1	52	9	0	0.00016	0.01887	0.61473	0.01414	0.00693	0.00484	0.00961	0.00441
	0.0041	0.00512	0.00221	0.00276	0.00221	0.00102	0.00307	0.00102	0.00118	0.00102	0	0	0	0.00063	0.01768	0.23438	0.0206
	0.00197	0.00228	0.00221	0.00607	0.00087	0.0026	0.00173	0.00347	0.00347	0.00189	0.00087	0	0.00087	0.00102	0	0	
2004	1	1	3	0	1	1	52	33	0	0.00099	0.00483	0.02117	0.32677	0.07346	0.02548	0.03422	0.05385
	0.02661	0.03364	0.01354	0.01335	0.00763	0.01656	0.01126	0.00744	0.00654	0.0117	0.00401	0.00143	0	0	0.00313	0.01417	0.20207
	0.02458	0.0176	0.00118	0.00983	0.01118	0.00368	0.00148	0.00346	0	0.00203	0.00074	0.00074	0.00434	0.00203	0	0.00327	
2005	1	1	3	0	1	1	52	15	0	0.00082	0	0.05207	0.11353	0.4349	0.04918	0.01954	0.02939
	0.01235	0.00348	0.00256	0.0001	0.00985	0.0098	0.00251	0.00256	0.00005	0.00251	0	0	0	0	0	0.03266	0.0368
	0.14335	0.02588	0.00343	0.00251	0.00343	0	0	0	0.00082	0.00251	0	0	0	0	0	0.00343	

new data for 2015 update

#year	season	type	gender	part	errmat	Lbinlo	LbinHi	#samples		1	2	3	4	5	6	7	8
	9	10	11	12	13	14	15	16	17	18	19	20	plus	1	2	3	4
	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	plus
2007	1	1	3	0	1	1	52	21	0	0	0	0.00791	0.01186	0.02174	0.02767	0.3004	0.22134
	0.06522	0.00791	0.02372	0.01976	0.01779	0.00988	0.00593	0.00593	0.00395	0.00198	0.00395	0.00593	0	0	0.00395	0.00198	0.00198
	0.00198	0.00988	0.09091	0.06917	0.02174	0.00593	0.00791	0.00593	0	0.00593	0.00198	0.00395	0	0	0	0.00395	
2008	1	1	3	0	1	1	52	24	0	0	0	0	0.03283	0.00897	0.04885	0.03108	0.68929
	0.04218	0.00763	0.00121	0.00017	0.0068	0	0.00058	0.0015	0.00092	0.00213	0.00092	0.0015	0	0	0	0	0.01702
	0.00375	0.02015	0.00104	0.0675	0.0108	0.00317	0	0	0	0	0	0	0	0	0	0	
2009	1	1	3	0	1	1	52	27	0	0	0	0.00281	0.03094	0.18847	0.07314	0.12377	0.01969
	0.32771	0.02954	0.00563	0.00985	0.01547	0.00563	0.00422	0.00141	0.00563	0.00141	0	0.00422	0	0	0	0.00141	0.00422
	0.03657	0.00985	0.02813	0.00422	0.04923	0.00985	0.00281	0.00141	0.00141	0	0.00141	0	0	0	0	0	
2010	1	1	3	0	1	1	52	9	0	0	0	0	0	0.00662	0.00662	0.01325	0.06954
	0.05629	0.4404	0.22185	0.05298	0.02649	0.02649	0.01656	0.00331	0	0	0	0.00993	0	0	0	0	0
	0	0.00993	0	0.00331	0.00993	0.01325	0.01325	0	0	0	0	0	0	0	0	0	

2011	1	1	3	0	1	1	52	3	0	0.33333	0	0	0	0	0	0	0.22222
	0	0	0.22222	0	0	0	0	0	0	0	0	0	0	0.22222	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2012	1	1	3	0	1	1	52	15	0	0	0.016	0.04623	0.0134	0.01405	0.0162	0.092	0.13213
	0.03105	0.0475	0.014	0.26862	0.01126	0	0.00819	0.00105	0	0	0	0	0	0.00817	0.00307	0	0.00105
	0.00412	0.00603	0.01899	0.04799	0.03176	0.02571	0.04532	0.08062	0.01133	0.00416	0	0	0	0	0	0	
2013	1	1	3	0	1	1	52	21	0	0	0.01651	0.13235	0.01206	0.01152	0	0.02	0.02285
	0.21725	0.0293	0.0957	0.01595	0.29409	0.0026	0	0	0	0	0	0	0	0.00003	0.01261	0.00992	0.00539
	0.0035	0	0.00172	0.02754	0.02631	0.00446	0.00742	0.00973	0.02115	0.00005	0	0	0	0	0	0	
2014	1	1	3	0	1	1	52	4	0	0	0	0.11667	0.17667	0.02667	0.00333	0.00667	0.01
	0.02333	0.11	0.04333	0.07	0.02667	0.23	0.01333	0	0.00333	0	0	0	0	0	0	0.03333	0.02
	0	0	0	0	0.00667	0.02333	0.00333	0.00667	0.01	0.03667	0	0	0	0	0	0	
#																	
#																	
#									Hook-line - females								
														Hook-line males			
#Hook and Line									# samples		1	2	3	4	5	6	7
	8	9	10	11	12	13	14	15	16	17	18	19	20	plus	1	2	3
	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	plus																
1985	1	2	3	0	1	1	52	1	0	0	0	0	0	0.04536	0.05328	0.19343	0.05236
	0.11135	0.05757	0.2199	0.01276	0.10755	0.01731	0.05256	0.01011	0.00383	0	0.0445	0.01204	0	0	0	0	0
	0	0	0.00179	0	0	0	0	0.00086	0.00343	0	0	0	0	0	0	0	
1986	1	2	3	0	1	1	52	3	0	0	0.00204	0.00148	0	0.03329	0.04987	0.02766	0.1301
	0.09393	0.15182	0.082	0.19844	0.00591	0.07306	0.04547	0.0265	0.0038	0.04702	0.00225	0.00148	0.00004	0	0	0	0
	0	0.00732	0	0	0.00394	0.00183	0.00028	0.00232	0.00408	0.0019	0.00014	0.00204	0	0	0	0	
1987	1	2	3	0	1	1	52	7	0	0.02078	0	0.01888	0	0	0.00618	0.46082	0.0254
	0.0622	0.0127	0.0876	0.0127	0	0	0	0.0622	0	0.0622	0	0.00618	0	0	0	0.03158	0
	0	0	0	0	0	0	0.00618	0	0	0	0	0.0622	0	0.0622	0	0	

1990	1	2	3	0	1	1	52	11	0	0	0	0.1	0	0.6	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	
1991	1	2	3	0	1	1	52	17	0	0.00476	0.01476	0.02609	0.08713	0.10463	0.33351	0.06743	0.02424
	0.02449	0.02101	0.02871	0	0.01271	0.00142	0.00539	0	0.00273	0	0	0	0	0.00057	0.01381	0.02257	0.04766
	0.02672	0.06108	0.0148	0	0.0044	0.00532	0.01512	0	0.00692	0	0.00791	0	0.0099	0	0.00419	0	
1992	1	2	3	0	1	1	52	38	0	0	0.0014	0.03133	0.07605	0.13621	0.0988	0.22181	0.05191
	0.01575	0.02486	0.03549	0.02768	0.02943	0.00976	0.00214	0.00497	0.00063	0.008	0.0009	0.01247	0	0.00099	0.00055	0.01498	0.04606
	0.03756	0.02124	0.03045	0.00864	0.00296	0.01137	0.01003	0.00167	0.00978	0.00704	0.00023	0.00298	0.00272	0.00049	0	0.00066	
1993	1	2	3	0	1	1	52	20	0	0	0.06322	0.28475	0.18681	0.18307	0.08329	0.03099	0.04344
	0.00095	0.00031	0.00033	0.00986	0.00056	0.00009	0.00034	0.00006	0.00036	0.00041	0.00009	0.00029	0	0	0.00892	0.03631	0.00024
	0.00054	0.01886	0.01789	0.00957	0.00017	0.00014	0.00892	0.00008	0.00002	0.00879	0.00005	0	0.00002	0.0003	0	0	
1994	1	2	3	0	1	1	52	11	0	0	0.00204	0.01527	0.05033	0.06699	0.12842	0.13083	0.12713
	0.22705	0.03146	0.00527	0.02674	0.02452	0.01832	0.00342	0	0	0.00379	0	0.00629	0	0	0	0.0049	0.00981
	0.00833	0.01471	0.0049	0.01739	0.04386	0.00972	0	0.0049	0	0.0049	0	0	0	0	0	0.0087	
1995	1	2	3	0	1	1	52	8	0	0	0.00187	0.01532	0.02451	0.15618	0.20948	0.10585	0.06084
	0.01692	0.0284	0.00986	0	0.00475	0	0.00403	0	0	0.00029	0.00073	0	0	0	0	0	0.05106
	0.06784	0.07469	0.05575	0.02552	0.01207	0.02556	0.00579	0	0.01021	0.00402	0	0.00402	0	0.00029	0.00873	0.01542	
1996	1	2	3	0	1	1	52	11	0	0	0.00672	0.0158	0.08338	0.10917	0.13115	0.12225	0.13751
	0.06567	0.0743	0.0743	0.0139	0.00463	0	0	0	0	0.00427	0.00463	0	0	0	0	0.00336	0.01008
	0	0.00672	0.01553	0.01035	0.08919	0.00854	0.00854	0	0	0	0	0	0	0	0	0	
1997	1	2	3	0	1	1	52	10	0	0	0.04794	0.20447	0.08564	0.13285	0.15286	0.08235	0.08854
	0.03996	0.0217	0.02629	0.01015	0.00295	0.00769	0.00139	0	0.00729	0.00711	0	0.00121	0	0.01006	0.02013	0.00768	0
	0.01006	0.00768	0	0	0.00057	0	0.00768	0	0.00768	0	0.00809	0	0	0	0	0	
-1998	1	2	3	0	1	1	52	1	0	0	0.00213	0.02347	0.05733	0.06901	0.06024	0.08737	0.13578
	0.15112	0.08453	0.04459	0.03388	0.02155	0.005	0.00189	0.00189	0.00402	0.00991	0	0.00927	0	0	0	0	0
	0.01595	0.00601	0.02622	0.035	0.02812	0.02959	0.01547	0.00991	0.01179	0.01004	0.00189	0.00301	0.00213	0.00189	0	0	
-1999	1	2	3	0	1	1	52	1	0	0	0	0.04742	0.08607	0.37575	0.09088	0.0561	0.0608
	0.0513	0.07462	0.0102	0.00748	0.00669	0.00669	0	0.00079	0	0	0	0	0	0	0	0	0.00739
	0.05183	0.00942	0.01883	0.00079	0.00942	0	0.01338	0.00669	0.00079	0.00669	0	0	0	0	0	0	
-2000	1	2	3	0	1	1	52	1	0	0.00132	0.02549	0.0523	0.09041	0.13052	0.10797	0.0791	0.05472
	0.09137	0.01976	0.03555	0.00624	0.00059	0.00566	0.0152	0	0	0.00059	0	0	0	0	0	0.01373	0.01241
	0.05369	0.01579	0.01711	0.02931	0.03335	0.02255	0.0282	0.01579	0.01645	0	0.01241	0	0	0	0	0.01241	

-2001	1	2	3	0	1	1	52	1	0	0	0	0.00172	0.01954	0.01552	0.01753	0.10458	0.04813
	0.07298	0.04295	0.00172	0.01451	0.01451	0.00891	0.00891	0	0	0	0	0.00891	0	0	0	0.00891	0.01781
	0.04683	0.09869	0.12771	0.03793	0.08648	0.04683	0.02902	0.05804	0	0.01451	0.02342	0	0.02342	0	0	0	
-2002	1	2	3	0	1	1	52	1	0	0	0.02632	0	0.05263	0	0.05263	0.05263	0.02632
	0	0	0	0	0	0	0.02632	0	0.02632	0	0	0	0	0	0	0	0
	0.07895	0	0.10526	0.18421	0.13158	0.07895	0.10526	0	0.02632	0	0	0.02632	0	0	0	0	
#																	
#																	
#									Net - females								
													net - males				
#Net								# samples		1	2	3	4	5	6	7	8
	9	10	11	12	13	14	15	16	17	18	19	20	plus	1	2	3	4
	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	plus
-1983	1	3	3	0	1	1	52	-1	0	0	0	0	0.02676	0.04003	0.09744	0.18161	0.13584
	0.15997	0.09485	0.05798	0.01296	0.08973	0	0.0265	0	0	0	0	0	0	0	0	0	0
	0.01353	0	0.03788	0	0.02491	0	0	0	0	0	0	0	0	0	0	0	
1984	1	3	3	0	1	1	52	7	0	0	0	0	0	0	0.10225	0.10225	0.23027
	0.23108	0.14895	0.05153	0	0.05636	0.02576	0	0.01047	0	0	0.04106	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	3	0	1	1	52	36	0	0	0	0	0.0004	0.04985	0.03887	0.06337	0.05768
	0.11556	0.11659	0.18543	0.13259	0.06512	0.02013	0.01098	0.04088	0.0085	0.02041	0.00005	0.00264	0	0	0	0.00033	0
	0.00323	0.00046	0.00367	0.00463	0.00705	0.00807	0.00897	0.0089	0.00199	0	0.0041	0.00195	0	0.00965	0.00523	0.00269	
1986	1	3	3	0	1	1	52	41	0	0.00039	0.0003	0.00022	0.00023	0.01824	0.10149	0.0392	0.1235
	0.14438	0.12603	0.08913	0.05311	0.01379	0.07571	0.0592	0.02077	0.03545	0.00555	0.00722	0.02524	0	0	0	0.00006	0.00006
	0.00502	0.00612	0.00573	0.01498	0.00355	0.00317	0.0015	0.00735	0.00351	0.00049	0.00555	0	0.00269	0.00026	0.00057	0.00026	
1987	1	3	3	0	1	1	52	63	0	0	0.00408	0.0086	0.02549	0.02475	0.06117	0.20162	0.06769
	0.03134	0.10648	0.17654	0.04042	0.0921	0.00948	0.01664	0.01234	0.00956	0	0.00945	0.00641	0.00019	0	0.00204	0.00496	0.00241
	0.00048	0.00582	0.03464	0.00774	0.00259	0.00245	0.01552	0.00274	0.01393	0	0.00007	0.00019	0	0	0.00007	0	

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1988 1 3 3 0 1 1 52 42 0 0 0.00067 0.1144 0.00112 0.00482 0.02916 0.03724 0.14749
0.04565 0.03701 0.07402 0.26009 0.00213 0.04172 0 0.02535 0 0.01009 0 0.07133 0 0.00101 0 0.04744 0.00101
0.00168 0 0.00168 0.00594 0.00202 0 0.00112 0.0323 0.00112 0.00101 0 0 0.00135 0 0 0
1989 1 3 3 0 1 1 52 68 0 0 0.00031 0.04789 0.41627 0 0.00348 0.00234 0.03069
0.33092 0.00052 0.03721 0.01504 0.04579 0.01175 0.01738 0.00009 0 0.01224 0 0 0 0 0 0.00006 0.01467
0.00003 0 0.00003 0.00031 0.00065 0 0.00003 0.00043 0 0.01153 0 0.00012 0.00022 0 0 0
1990 1 3 3 0 1 1 52 79 0 0.00227 0.00965 0.01093 0.0132 0.27502 0.04884 0.00185 0.00554
0.12338 0.09399 0.04657 0.01903 0.0389 0.06318 0.00014 0.03748 0.00043 0 0 0.00014 0 0 0.00099 0.00426 0.00114
0.05594 0.00852 0.04089 0.00057 0.00781 0.00753 0.04572 0.00142 0.0017 0.00838 0.00199 0.00227 0.00014 0.00014 0.00057 0.01945
1991 1 3 3 0 1 1 52 7 0 0 0.01502 0.01502 0.08834 0.11352 0.40592 0.08216 0
0.02606 0.00221 0.01193 0 0.00928 0 0.02385 0 0 0 0 0 0 0 0.03004 0.00221 0.04373
0.01413 0.06537 0.00707 0 0 0 0.03224 0 0 0 0 0 0.01193 0 0 0
-1992 1 3 3 0 1 1 52 1 0 0 0 0.01552 0.06707 0.03244 0.08285 0.26658 0.07167
0.01541 0.07176 0.04182 0.03368 0.0175 0.01385 0.01981 0.02353 0.01624 0.01472 0 0.00251 0 0 0.00048 0.01162 0.00295
0.01433 0.02943 0.07371 0.00964 0.00145 0 0.016 0.00531 0.00491 0.01054 0 0.00645 0.00075 0.00546 0 0
1993 1 3 3 0 1 1 52 12 0 0 0 0.01679 0.03743 0.04886 0.10278 0.11866 0.28306
0.04927 0.02559 0.05382 0.05969 0.05412 0.01487 0.02802 0.00344 0.01325 0 0 0 0 0 0.00233 0.00465 0.017
0.01254 0.00718 0.00799 0.02226 0 0 0.00303 0 0 0.00132 0.00223 0 0.00981 0 0 0
1994 1 3 3 0 1 1 52 9 0 0 0 0 0.01278 0.07036 0.10557 0.13574 0.12117
0.23743 0.02058 0.02415 0.05076 0.04652 0.01438 0.00504 0.0153 0.00719 0 0 0 0 0 0.00633 0.00922 0.00596
0.00547 0.01008 0.02065 0.00922 0.03343 0 0 0 0 0.00811 0.01997 0 0 0 0 0.00461
1995 1 3 3 0 1 1 52 3 0 0 0 0 0.0212 0.0212 0.0424 0.09385 0.0212
0.16669 0.30604 0.05738 0.03618 0.05955 0.04381 0.04787 0.03072 0.03072 0 0 0 0 0 0 0 0
0 0 0 0 0.0212 0 0 0 0 0 0 0 0 0 0 0
1996 1 3 3 0 1 1 52 2 0 0 0 0 0.03388 0 0.03388 0.13553 0.11862
0.08474 0.06776 0.23737 0 0.03388 0 0.03388 0.06783 0.05092 0.05086 0 0.01697 0 0 0 0 0
0 0 0 0 0.03388 0 0 0 0 0 0 0 0 0 0 0
1997 1 3 3 0 1 1 52 2 0 0 0 0 0.05571 0 0.02455 0.09254 0.13598
0.23513 0.09537 0.16619 0 0.03683 0.03399 0 0.01228 0 0.01228 0 0 0 0 0 0 0
0 0 0.02172 0 0.02172 0 0.02172 0 0 0.01228 0 0 0 0 0 0.02172
1998 1 3 3 0 1 1 52 3 0 0 0 0 0 0 0.0377 0.06604 0.16985
0.11951 0.19811 0.0786 0.10374 0.11006 0 0 0 0 0.02513 0 0.00945 0 0 0 0 0
0 0.00945 0 0.02201 0 0 0.00945 0.03146 0.00945 0 0 0 0 0 0 0
#
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#year	season	type	gender	part	errmat	Lbinlo	LbinHi	#samples		1	2	3	4	5	6	7	8
	9	10	11	12	13	14	15	16	17	18	19	20	21	1	2	3	4
	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1983	1	5	3	0	1	1	52	20	0	0.00272	0.09673	0.17847	0.07901	0.02316	0.02724	0.00953	0.00681
	0.00953	0.00136	0.00545	0.00545	0.00408	0.00681	0.00272	0.00136	0	0	0	0.00272	0	0.00408	0.07901	0.23024	0.0831
	0.02861	0.02179	0.02997	0.01498	0.00817	0.00545	0.00545	0.00408	0.00272	0.00817	0.00136	0.00136	0	0	0.00136	0.00681	
1992	1	5	3	0	1	1	52	28	0.0813	0.11788	0.07723	0.0813	0.06504	0.04065	0.00813	0.03658	0
	0.00406	0.00813	0.00406	0.01626	0	0.00406	0	0	0	0	0	0.00406	0.08536	0.10162	0.07723	0.05284	0.03252
	0.00406	0.00813	0.04065	0	0.00813	0	0.00813	0.00813	0	0.01219	0.00813	0	0.00406	0	0	0	
1998	1	5	3	0	1	1	52	43	0.02517	0.04576	0.06636	0.0183	0.07322	0.02746	0.02288	0.01601	0.0183
	0.06636	0.01601	0.02746	0.00457	0.00686	0.00457	0.00228	0.00457	0	0	0.00228	0.00228	0.02746	0.04805	0.04347	0.03203	0.06865
	0.02288	0.04347	0.03203	0.0389	0.06407	0.05034	0.03203	0.00686	0.00686	0.00915	0.00686	0.00457	0.00228	0.00457	0	0.00457	
2001	1	5	3	0	1	1	52	46	0.05567	0.17732	0.03711	0.01855	0.03711	0.05773	0.02474	0.02268	0.00412
	0.02061	0.00618	0.02061	0.00412	0.01031	0.00618	0.00412	0.00412	0	0	0.00412	0.00412	0.05979	0.16494	0.03711	0.01855	0.01237
	0.0536	0.0268	0.04536	0.01649	0.01031	0.00206	0.00206	0.01443	0.00824	0	0.00412	0.00206	0.00206	0	0	0	

combo survey

#year	season	type	gender	part	errmat	Lbinlo	LbinHi	#samples		1	2	3	4	5	6	7	8
	9	10	11	12	13	14	15	16	17	18	19	20	21	1	2	3	4
	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
2003	1	6	3	0	1	1	52	85	0.02057	0.03889	0.03122	0.44215	0.04533	0.00106	0.01377	0.00119	0.00874
	0.00068	0.00055	0.00092	0.00000	0.00000	0.00039	0.00000	0.00025	0.00000	0.00000	0.00000	0.00000	0.01014	0.03218	0.00622	0.28680	0.02409
	0.00356	0.00163	0.00302	0.02404	0.00147	0.00007	0.00000	0.00020	0.00035	0.00050	0.00003	0.00000	0.00000	0.00000	0.00000	0.00000	
2004	1	6	3	0	1	1	52	79	0.05116	0.07041	0.04561	0.00241	0.30410	0.02337	0.01191	0.00445	0.01883
	0.00351	0.00648	0.00036	0.00066	0.00000	0.00015	0.00000	0.00083	0.00041	0.00000	0.00005	0.00011	0.04695	0.03601	0.06583	0.01059	0.24146
	0.02737	0.02189	0.00078	0.00130	0.00000	0.00037	0.00037	0.00000	0.00000	0.00050	0.00082	0.00053	0.00037	0.00000	0.00005	0.00000	
2005	1	6	3	0	1	1	52	84	0.01539	0.03333	0.00958	0.01603	0.04164	0.39247	0.05223	0.01149	0.00090
	0.00389	0.00100	0.00629	0.00022	0.00102	0.00000	0.00004	0.00024	0.00210	0.00038	0.00140	0.00352	0.02172	0.04526	0.00721	0.01242	0.00594
	0.28139	0.01113	0.00249	0.00403	0.00171	0.00647	0.00467	0.00007	0.00020	0.00030	0.00007	0.00090	0.00038	0.00042	0.00003	0.00004	
2006	1	6	3	0	1	1	52	68	0.00093	0.00977	0.06893	0.00942	0.04112	0.00985	0.21720	0.03947	0.00861
	0.00094	0.01745	0.00943	0.00914	0.00034	0.00012	0.00008	0.00359	0.00560	0.00000	0.00000	0.00023	0.00083	0.00558	0.05537	0.06580	0.03992
	0.01264	0.23115	0.10689	0.02607	0.00000	0.00015	0.00000	0.00009	0.00321	0.00000	0.00008	0.00000	0.00000	0.00000	0.00000	0.00000	

2007	1	6	3	0	1	1	52	67	0.00267	0.00377	0.01543	0.02084	0.04447	0.14753	0.03351	0.30620	0.01851
	0.00000	0.00000	0.01918	0.00012	0.00036	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00110	0.00126	0.00360	0.02662	0.02833
	0.00196	0.01435	0.22538	0.01722	0.00483	0.02635	0.00021	0.00082	0.00000	0.02707	0.00000	0.00000	0.00082	0.00021	0.00000	0.00728	
2008	1	6	3	0	1	1	52	80	0.01959	0.00170	0.00218	0.01662	0.05900	0.00678	0.01620	0.00461	0.33240
	0.01783	0.00022	0.00000	0.03040	0.00170	0.00386	0.00099	0.00180	0.00000	0.00162	0.00083	0.00179	0.02622	0.00989	0.01087	0.02380	0.09340
	0.03365	0.03386	0.02500	0.16862	0.01667	0.01398	0.00077	0.02251	0.00016	0.00049	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	
2009	1	6	3	0	1	1	52	76	0.01378	0.03502	0.01012	0.00000	0.02393	0.07512	0.00805	0.01613	0.00644
	0.15363	0.00295	0.00130	0.00511	0.00040	0.00946	0.00318	0.00000	0.00280	0.00000	0.00072	0.00050	0.01401	0.03723	0.00397	0.00528	0.01011
	0.10005	0.11882	0.08999	0.01647	0.18501	0.02922	0.00023	0.00028	0.00620	0.00123	0.00280	0.00099	0.00946	0.00000	0.00000	0.00000	
2010	1	6	3	0	1	1	52	106	0.22787	0.05341	0.07275	0.00593	0.00355	0.01070	0.01936	0.00630	0.01593
	0.01950	0.07768	0.00200	0.00016	0.00000	0.00145	0.00000	0.00114	0.00000	0.00000	0.00000	0.00000	0.27674	0.04893	0.03475	0.00127	0.00513
	0.01064	0.02897	0.01621	0.00833	0.00953	0.03443	0.00734	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	
2011	1	6	3	0	1	1	52	80	0.12652	0.25154	0.03229	0.05244	0.00006	0.00164	0.03282	0.03532	0.02853
	0.00139	0.00159	0.06286	0.02935	0.00064	0.00143	0.00000	0.00127	0.00000	0.00000	0.00000	0.00000	0.07659	0.12389	0.01021	0.00078	0.02738
	0.00184	0.00486	0.01185	0.03202	0.00339	0.03612	0.01130	0.00004	0.00000	0.00004	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	
2012	1	6	3	0	1	1	52	103	0.03678	0.19865	0.14359	0.02736	0.04659	0.00076	0.02024	0.02418	0.00578
	0.00399	0.00286	0.00783	0.02851	0.00104	0.00158	0.00143	0.00017	0.00006	0.00000	0.00000	0.00000	0.06250	0.11427	0.19457	0.00263	0.00697
	0.00197	0.00041	0.00129	0.00543	0.00920	0.00691	0.00270	0.01671	0.02143	0.00024	0.00013	0.00000	0.00000	0.00000	0.00000	0.00125	
2013	1	6	3	0	1	1	52	91	0.03330	0.01677	0.23603	0.12445	0.03790	0.02487	0.00373	0.00289	0.00595
	0.01705	0.00782	0.01018	0.00420	0.02775	0.00122	0.00000	0.00158	0.00000	0.00000	0.00007	0.00009	0.02012	0.01734	0.23582	0.07632	0.01423
	0.00590	0.00022	0.00000	0.00243	0.02567	0.01262	0.00080	0.01639	0.01591	0.00038	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	
2014	1	6	3	0	1	1	52	126	0.09755	0.01237	0.00900	0.14920	0.06309	0.07030	0.00832	0.00055	0.00010
	0.00079	0.00193	0.00094	0.00018	0.00133	0.00326	0.00028	0.00000	0.00000	0.00000	0.00000	0.00000	0.07820	0.00828	0.02550	0.08522	0.10635
	0.00343	0.00151	0.00004	0.00055	0.00365	0.00253	0.00000	0.06564	0.03311	0.13390	0.03280	0.00010	0.00000	0.00000	0.00000	0.00000	

#

#
MEAN SIZE-AT-AGE

-1 #_number of size-at-age observations; negative value excludes from likelihood
ENVIRONMENTAL DATA
----
0 #_number of environmental variables
0 #_number of environmental observations
0 # no wtfreq data

```
0       # no tag data
0       # no morphcomp data

#
999     #_end of data file
```

CONTROL FILE

```
# ***************************************************************
#  Chilipepper rockfish .ctl file
#  final model from May 2015 assessment update
#  SS3 Version 3.20 by_Richard_Methot_(NOAA);_using_Otter_Research_ADMB_7.0.1
# ***************************************************************
#
#
1       #_N_Growth_Patterns
1       #_N_submorphs
3       #_Nblock_Designs
5 10 1  #_blocks_per_pattern

# block design 1
1970 1979
1980 1988
1989 1991
1992 1998
1999 2014
#2004 2014
#2009 2015

# block design 2
1972 1977
1978 1980
1981 1983
1984 1986
1987 1989
1990 1992
1993 1995
1996 1998
1999 2001
2002 2006
```

block design 3
2003 2014

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

1 # GrowthModel: 1=vonBert with L1&L2; 2=Richards with L1&L2; 3=not implemented; 4=not implemented
2 #_Growth_Age-at-L1 (Amin)
18 #_Growth_Age-at-L2 (Amax)
0 #_SD_add_to_LAA (set equal to 0.1 to mimic SS2 v1.xx)
0 #_CV_Growth_Pattern (0: CV=f(LAA) 1: CV=f(A) 2: SD=f(LAA) 3: SD=f(A))

1 #_maturity_option: 1=length logistic; 2=age logistic; 3=read age-maturity matrix by growth_pattern; 4=read age-fecundity; 5=read fec and wt from wtatage.ss
1 #_First_Mature_Age
1 #_fecundity option:(1)eggs=Wt*(a+b*Wt);(2)eggs=a*L^b;(3)eggs=a*Wt^b
0 #_hermaphroditism option: 0=none; 1=age-specific fxn
2 #_parameter_offset_approach (1=none, 2= M, G, CV_G as offset from female-GP1, 3=like SS2 V1.x)
1 #_env/block/dev_adjust_method (1=standard; 2=logistic transform keeps in base parm bounds; 3=standard w/ no bound check)

#_growth_parms

#_LO	HI	INIT	PRIOR	PR_type	SD	PHASE	env-var	use_dev	dev_minyr	dev_maxyr	dev_stddev	Block	Block_Fxn	
0.05	0.3	0.16	0.22	0	0.8	-4	0	0	0	0	0.5	0	0	#_Gpattern:_1_Gender:_1
15	30	19.659	19.659	0	20	-4	0	0	0	0	0.5	0	0	
25	70	47.3	47.3	0	20	-2	0	0	0	0	0.5	0	0	
0.05	0.3	0.1945	0.1945	0	0.8	-2	0	0	0	0	0.5	1	0	
0.02	0.3	0.06	0.06	0	0.8	-2	0	0	0	0	0.5	0	0	
0.02	0.3	0.06	0.06	0	0.8	-2	0	0	0	0	0.5	0	0	
-6	3	0.232	0.1279	0	0.8	-4	0	0	0	0	0.5	0	0	#_Gpattern:_1_Gender:_2
-6	3	-0.03	-0.03	0	0.8	-4	0	0	0	0	0.5	0	0	
-3	3	-0.35	-0.35	0	0.8	-2	0	0	0	0	0.5	0	0	
-3	3	0.605	0.605	0	0.8	-2	0	0	0	0	0.5	0	0	
-3	3	0	0	0	0.8	-2	0	0	0	0	0.5	0	0	
-3	3	0	0	0	0.8	-2	0	0	0	0	0.5	0	0	

```
-3 3 4.05e-006 4.1e-006 0 0 -3 0 0 0 0 0.5 0 0 #_wt-len-intercept female
-3 10 3.2 3.25 0 0.5 -3 0 0 0 0 0.5 0 0 #_wt-len-exponent female
1 50 24.4 25 0 0.8 -3 0 0 0 0 0.5 0 0 #_Maturity: Length-inflection
-3 3 -0.27 -0.3 0 0.8 -3 0 0 0 0 0.5 0 0 #_Maturity: Slope; negative value required
#1 50 25.713 25 0 0.8 -3 0 0 0 0 0.5 0 0 #_Maturity: Length-inflection
#-3 3 -0.316 -0.3 0 0.8 -3 0 0 0 0 0.5 0 0 #_Maturity: Slope; negative value required
-3 300 132.355 132.355 0 0.8 -3 0 0 0 0 0.5 0 0 #_Fecundity: eggs/gm intercept - from Beyer et al., He et al.
-3 100 59 59 0 0.8 -3 0 0 0 0 0.5 0 0 #_Fecundity: eggs/gm slope from Beyer et al., He et al.
#-3 3 1 1 0 0.8 -3 0 0 0 0 0.5 0 0 #_Fecundity: eggs/gm intercept
#-3 3 0 0 0 0.8 -3 0 0 0 0 0.5 0 0 #_Fecundity: eggs/gm slope
-3 3 2.24e-006 2.2e-006 0 0 -3 0 0 0 0 0.5 0 0 #_wt-len-intercept male
-3 10 3.32 3.32 0 0.05 -3 0 0 0 0 0.5 0 0 #_wt-len-exponent male

-4 4 0 0 -1 99 -3 0 0 0 0 0.5 0 0 #_recrdistribution_by_growth_pattern
-4 4 0 0 -1 99 -3 0 0 0 0 0.5 0 0 #_recrdistribution_by_area 1
-4 4 4 0 -1 99 -3 0 0 0 0 0.5 0 0 #_recrdistribution_by_season 1
1 1 1 1 -1 99 -3 0 0 0 0 0.5 0 0 #_cohort_growth_deviation

#
#_Cond 0  #custom_MG-env_setup (0/1)
#_Cond -2 2 0 0 -1 99 -2 #_placeholder when no MG-environ parameters
#
#_Cond 0  #custom_MG-block_setup (0/1)
#_Cond -2 2 0 0 -1 99 -2 #_placeholder when no MG-block parameters
#_Cond No MG parm trends
#

# Growth K blocks
1  #custom_MG-block_setup (0/1)
```

```
#_LO    HI      INIT    PRIOR   PR_type SD      PHASE
-10     10      0       0       0       0.5     5
-10     10      0       0       0       0.5     5
-10     10      0       0       0       0.5     5
-10     10      0       0       0       0.5     5
-10     10      0       0       0       0.5     5
#-10    10      0       0       0       0.5     5
#-10    10      0       0       0       0.5     5

#_seasonal_effects_on_biology_parms
0 0 0 0 0 0 0 0 0 0 #_femwtlen1,femwtlen2,mat1,mat2,fec1,fec2,Malewtlen1,malewtlen2,L1,K

#_Spawner-Recruitment
3       #_SR_function: 2=Ricker; 3=std_B-H; 4=SCAA; 5=Hockey; 6=B-H_flattop; 7=survival_3Parm
#_LO    HI      INIT    PRIOR   PR_type SD      PHASE
5       15      10.5    10.5    0       5       1       # SR_LN(R0)
0.2     1       0.81    0.573   0       0.183   -4      # SR_BH_steep
0       2       1       1       0       1       -3      # SR_sigmaR
-5      5       0       0       0       1       -3      # SR_envlink
-5      5       0       0       0       1       -3      # SR_R1_offset
0       0.5     0       0       -1      99      -2      # SR_autocorr
0               #_SR_env_link
0               #_SR_env_target_0=none;1=devs;_2=R0;_3=steepness

1               # do_recdev:  0=none; 1=devvector; 2=simple deviations
1965    # first year of main recr_devs; early devs can preceed this era
2014    # last year of main recr_devs; forecast devs start in following year
2               #_recdev phase

0               # (0/1) to read 13 advanced options
#1950   #_recdev_early_start (0=none; neg value makes relative to recdev_start)
#3              #_recdev_early_phase
#0              #_forecast_recruitment phase (incl. late recr) (0 value resets to maxphase+1)
#1              #_lambda for Fcast_recr_like occurring before endyr+1
#1950           #_last_early_yr_nobias_adj_in_MPD
```

#1950 #_first_yr_fullbias_adj_in_MPD
#2006 #_last_yr_fullbias_adj_in_MPD
#2006 #_first_recent_yr_nobias_adj_in_MPD
#1.0 #_max_bias_adj_in_MPD (-1 to override ramp and set biasadj=1.0 for all estimated recdevs)
#0 #_period of cycles in recruitment (N parms read below)
#-3 #min rec_dev
#3 #max rec_dev
#0 #_read_recdevs
#_end of advanced SR options
#

#Fishing Mortality info
0.5 # F ballpark for tuning early phases
2006 # F ballpark year
1 # F_Method: 1=Pope; 2=instan. F; 3=hybrid (hybrid is recommended)
0.9 # max F or harvest rate, depends on F_Method
no additional F input needed for Fmethod 1
read overall start F value; overall phase; N detailed inputs to read for Fmethod 2
read N iterations for tuning for Fmethod 3 (recommend 3 to 7)
if FMethod=2 (instan.), active next line
0.1 4 0 # overall start F value; overall phase; N detailed inputs to read

Number of tuning iterations in hybrid F: 4 or 5 may be good - check how catches data match estimated catches
if FMethod=3 (hybrid), active next line: phase for FMothod=3
4 #_Phase for FMethod=3

#_initial_F_parms

#_LO	HI	INIT	PRIOR	PR_type	SD	PHASE
0	0.1	0	0.01	0	0.2	-1
0	0.1	0	0.05	0	0.2	-1
0	1	0	0	0	0.2	-1
0	1	0	0	0	0.2	-1

Q_setup details: for columns A, B, C, D
A = do power: 0=skip, index is proportional to abundance, 1= add an extra parameter for non-linearity

B = envir links: 0=skip, 1= add parameter for envior effect on Q
C = extra SD: 0=skip, 1= add additional parameter for additive constant to input SE (in ln space)
D = Q type: <0=mirror lower abs(#) fleet, 0=no par Q is median unbiased, 1=no par Q is mean unbiased, 2=estimate par for ln(Q)
3 = ln(Q) + set of devs about ln(Q) for all years. 4=ln(Q) + set of devs about Q for indexyr-1

D definition in SS3 (devtype): <0=mirror, 0=float_nobiasadj, 1=float_biasadj, 2=parm_nobiasadj, 3=parm_w_random_dev, 4=parm_w_randwalk, 5=mean_unbiased_float_assign_to_parm
#_for_env-var:_enter_index_of_the_env-var_to_be_linked

#_Q_setup
Q_type options: <0=mirror, 0=float_nobiasadj, 1=float_biasadj, 2=parm_nobiasadj, 3=parm_w_random_dev, 4=parm_w_randwalk, 5=mean_unbiased_float_assign_to_parm
#_for_env-var:_enter_index_of_the_env-var_to_be_linked
#_Den-dep env-var extra_se Q_type
#_A B C D
0 0 0 0 # 1 trawl
0 0 0 0 # 2 hookline
0 0 0 0 # 3 setnet
0 0 0 0 # 4 rec
0 0 0 0 # 5 triennial
0 0 0 0 # 6 combined
0 0 0 0 # 7 juvsurvey
0 0 0 0 # 8 calcofi
0 0 0 0 # 9 juv2
0 0 0 0 # 10 ghost

#_size_selex_types
#_Pattern Discard Male Special
1 0 1 0 # 1
1 0 1 0 # 2
24 0 0 0 # 3
24 0 0 0 # 4
1 0 0 0 # 5
1 0 0 0 # 6

0	0	0	0	# 7
0	0	0	0	# 8
30	0	0	0	# 9
24	0	0	0	# 10

#_age_selex_types
#_Pattern Discard Male Special
10 0 0 0 # 1
10 0 0 0 # 2
10 0 0 0 # 3
10 0 0 0 # 4
10 0 0 0 # 5
10 0 0 0 # 6
11 0 0 0 # 7
11 0 0 0 # 8
10 0 0 0 # 9
20 0 1 0 # 10

#_selex_parms
#_size_sel: 1
#size sel 1 logistic

#LO	HI	INIT	PRIOR	PR_type	SD	PHASE	enVar	use_dev	dvMiYr	dvMxYr	dvStd	Block	Block_Fxn	
5	50	40.28	30	0	100	2	0	0	0	0	0	0	0	#
0.0001	35	14.31	5	0	10	3	0	0	0	0	0	0	0	#
1	60	10	11	0	100	-5	0	0	0	0	0.5	0	0	# male offset size@dogleg
-10	10	0	0	0	10	-5	0	0	0	0	0.5	0	0	# male offset log(relmalesel) at minL
-10	10	0	0	0	10	-5	0	0	0	0	0.5	0	0	# male offset log(relmalesel) at dogleg
-10	10	0	0	0	10	-5	0	0	0	0	0.5	0	0	# male offset log(relmalesel) at maxL

#_size_sel: 2

#LO	HI	INIT	PRIOR	PR_type	SD	PHASE	enVar	use_dev	dvMiYr	dvMxYr	dvStd	Block	Block_Fxn	
5	45	45	40	0	10	2	0	0	0	0	0	0	0	#

0.0001 35 14.31 5 0 10 2 0 0 0 0 0 0 0 #
1 60 16 20 0 10 -5 0 0 0 0 0.5 0 0 # male offset size@dogleg
-10 10 0 0 0 10 -5 0 0 0 0 0.5 0 0 # male offset log(relmalesel)at
minL
-10 10 0 0 0 10 -5 0 0 0 0 0.5 0 0 # male offset log(relmalesel)at
dogleg
-10 10 0 0 0 10 -5 0 0 0 0 0.5 0 0 # male offset log(relmalesel) at
maxL

size sel 3
#5 45 45 40 0 10 2 0 0 0 0 0 0 0 #
#0.0001 35 14.31 5 0 10 2 0 0 0 0 0 0 0 #
#LO HI INIT PRIOR PR_type SD PHASE enVar use_dev dvMiYr dvMxYr dvStd Block Block_Fxn
19 51 45.17 50 0 100 2 0 0 0 0 0.5 0 0 # PEAK value
-6 6 -2.19 -0.75 0 10 4 0 0 0 0 0.5 0 0 # TOP logistic
-1 9 3.87 3.5 0 10 2 0 0 0 0 0.5 0 0 # WIDTH exp
-1 9 1.98 5 0 10 4 0 0 0 0 0.5 0 0 # WIDTH exp
-50 9 -4.76 -4.5 0 10 2 0 0 0 0 0.5 0 0 # INIT logistic
-50 9 -0.54 2.9 0 10 2 0 0 0 0 0.5 0 0 # FINAL logistic

#1 60 16 20 0 10 -5 0 0 0 0 0.5 0 0 # male offset size@dogleg
#-10 10 0 0 0 10 -5 0 0 0 0 0.5 0 0 # male offset log(relmalesel)at
minL
#-10 10 0 0 0 10 -5 0 0 0 0 0.5 0 0 # male offset log(relmalesel)at
dogleg
#-10 10 0 0 0 10 -5 0 0 0 0 0.5 0 0 # male offset log(relmalesel) at
maxL

#_size_sel: 4
#LO HI INIT PRIOR PR_type SD PHASE enVar use_dev dvMiYr dvMxYr dvStd Block Block_Fxn
19 51 33.85 32 0 10 2 0 0 0 0 0.5 3 0 # PEAK value
-20 4 -1.27 -0.75 0 10 2 0 0 0 0 0.5 3 0 # TOP logistic
-10 9 3.4 3.5 0 10 2 0 0 0 0 0.5 3 0 # WIDTH exp
-10 9 3.68 5 0 10 2 0 0 0 0 0.5 3 0 # WIDTH exp
-10 9 -3.37 -4.5 0 10 2 0 0 0 0 0.5 3 0 # INIT logistic

-10	9	0.79	2.9	0	10	2	0	0	0	0	0.5	3	0	#	FINAL	logistic

#_size_sel: 5

#LO	HI	INIT	PRIOR	PR_type	SD	PHASE	enVar	use_dev	dvMiYr	dvMxYr	dvStd	Block	Block_Fxn	
5	35	15.7	25.7	0	10	-2	0	0	0	0	0	0	0	#
0.0001	35	0.0002	5	0	10	-2	0	0	0	0	0	0	0	#

size sel 6

#LO	HI	INIT	PRIOR	PR_type	SD	PHASE	enVar	use_dev	dvMiYr	dvMxYr	dvStd	Block	Block_Fxn	
5	35	20	15	0	100	2	0	0	0	0	0	0	0	#
0.0001	35	14	5	0	10	2	0	0	0	0	0	0	0	#

#_size_sel: 7,8 - none- pre recruit survey
#_size_sel: 9 set to maturity-
#_size_sel: 10 Rec CPUE

#LO	HI	INIT	PRIOR	PR_type	SD	PHASE	enVar	use_dev	dvMiYr	dvMxYr	dvStd	Block	Block_Fxn			
19	51	33.85	32	0	100	2	0	0	0	0	0.5	0	0	#	PEAK	value
-6	4	-1.27	-0.75	0	10	2	0	0	0	0	0.5	0	0	#	TOP	logistic
-1	9	3.4	3.5	0	10	2	0	0	0	0	0.5	0	0	#	WIDTH	exp
-1	9	3.68	5	0	10	2	0	0	0	0	0.5	0	0	#	WIDTH	exp
-10	9	-3.37	-4.5	0	10	2	0	0	0	0	0.5	0	0	#	INIT	logistic
-10	9	0.79	2.9	0	10	2	0	0	0	0	0.5	0	0	#	FINAL	logistic

size_se1: 10- male offsets- 4 lines

#1	60	16	20	0	10	-5	0	0	0	0	0.5	0	0	#	size@dogleg
#-10	10	0	0	0	10	-5	0	0	0	0	0.5	0	0	#	log(relmalesel)at minL
#-10	10	0	0	0	10	-5	0	0	0	0	0.5	0	0	#	log(relmalesel)at dogleg
#-10	10	0	0	0	10	-5	0	0	0	0	0.5	0	0	#	log(relmalesel) at maxL

#
#
#_age_sel: 1
#_age_sel: 2
#_age_sel: 3
#_age_sel: 5
#_age_sel: 6

#_age_sel: 7 - juv survey 1

#LO	HI	INIT	PRIOR	PR_type	SD	PHASE	enVar	use_dev	dvMiYr	dvMxYr	dvStd	Block	Block_Fxn
0	0	0	0	0	10	-3	0 0 0 0 0 0 0 # 39						
0	0	0	0	0	10	-3	0 0 0 0 0 0 0 # 40						

#_age_sel: 8 - juv survey 2

#LO	HI	INIT	PRIOR	PR_type	SD	PHASE	enVar	use_dev	dvMiYr	dvMxYr	dvStd	Block	Block_Fxn
0	0	0	0	0	10	-3	0 0 0 0 0 0 0 # 39						
0	0	0	0	0	10	-3	0 0 0 0 0 0 0 # 40						

#LO	HI	INIT	PRIOR	PR_type	SD	PHASE	enVar	use_dev	dvMiYr	dvMxYr	dvStd	Block	Block_Fxn			
1	10	1.113	1	0	1	-2	0	0	0	0	0.5	0	0	#	PEAK	value
-60	60	-59.9	-23	0	1	-2	0	0	0	0	0.5	0	0	#	TOP	logistic
-40	20	-24.8	-20	0	1	-2	0	0	0	0	0.5	0	0	#	WIDTH	exp
-40	10	-0.12	0	0	1	-3	0	0	0	0	0.5	0	0	#	WIDTH	exp
-40	10	-33.5	-17	0	1	-2	0	0	0	0	0.5	0	0	#	INIT	logistic
-40	20	-4.11	-4.5	0	1	-2	0	0	0	0	0.5	0	0	#	FINAL	logistic

agesel 10- male offsets- 4 lines

#LO	HI	INIT	PRIOR	PR_type	SD	PHASE	enVar	use_dev	dvMiYr	dvMxYr	dvStd	Block	Block_Fxn		
1	60	2	2	0	1	-5	0	0	0	0	0.5	0	0	#	size@dogleg
-10	10	0	0	0	1	-5	0	0	0	0	0.5	0	0	#	log(relmalesel)at minL
-10	10	0	0	0	1	-5	0	0	0	0	0.5	0	0	#	log(relmalesel)at dogleg
-10	10	0	0	0	1	-5	0	0	0	0	0.5	0	0	#	log(relmalesel) at maxL

#1 #_env/block/dev_adjust_method (1=standard; 2=logistic trans to keep in base parm bounds; 3=standard w/ no bound check)

1 #custom_MG-block_setup (0/1)

-3	2	0	0	-1	99	4 #
-3	2	0	0	-1	99	4 #
-3	2	0	0	-1	99	4 #
-3	2	0	0	-1	99	4 #
-3	2	0	0	-1	99	4 #
-3	2	0	0	-1	99	4 #

1 #_env/block/dev_adjust_method (1=standard; 2=logistic trans to keep in base parm bounds; 3=standard w/ no bound check)

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

1 #_Variance_adjustments_to_input_values
#_fleet: 1 2 3 4 5 6 7 8 9 10
0.036251 0 0 0.19632 -0.049828 0.01 0 0.64 0 0 #_add_to_survey_CV
0 0 0 0 0 0 0 0 0 0 #_add_to_discard_stddev
0 0 0 0 0 0 0 0 0 0 #_add_to_bodywt_CV
0.69 0.75 0.73 1 0.69 0.96 1 1 1 2.5 #_mult_by_lencomp_N
1 1 1 1 1 0.75 1 1 1 1 #_mult_by_agecomp_N
1 1 1 1 1 1 1 1 1 1 #_mult_by_size-at-age_N

6 #_maxlambdaphase
0 #_sd_offset

lambda settings to match the 2007 model
56 # number of changes to make to default Lambdas (default value is 1.0)
lambdas
Like_comp codes: 1=surv; 2=disc; 3=mnwt; 4=length; 5=age; 6=SizeFreq; 7=sizeage; 8=catch; 9=init_equ_catch;
10=recrdev; 11=parm_prior; 12=parm_dev; 13=CrashPen; 14=Morphcomp; 15=Tag-comp; 16=Tag-negbin; 17=F_ballpark
#like_comp fleet/survey phase value sizefreq_method

survey

1	1	1	1.0	1
1	2	1	0.0	1
1	3	1	0.0	1
1	4	1	0.0	1
1	5	1	1.0	1
1	6	1	1.0	1
1	7	1	0.0	1
1	8	1	1.0	1
1	9	1	0.0	1

```
1	10	1	1.0	1

# length comps
4	1	1	0.1	1
4	2	1	0.1	1
4	3	1	0.1	1
4	4	1	1.0	1
4	5	1	0.1	1
4	6	1	0.1	1
4	7	1	0.0	1
4	8	1	0.0	1
4	9	1	0.0	1
4	10	1	1.0	1

# age comps
5	1	1	1.0	1
5	2	1	1.0	1
5	3	1	1.0	1
5	4	1	0.0	1
5	5	1	1.0	1
5	6	1	1.0	1
5	7	1	0.0	1
5	8	1	0.0	1
5	9	1	0.0	1
5	10	1	0.0	1

# init equ catch
9	1	1	0.0	1
9	2	1	0.0	1
9	3	1	0.0	1
9	4	1	0.0	1
9	5	1	0.0	1
9	6	1	0.0	1
9	7	1	0.0	1
9	8	1	0.0	1
```

9	9	1	0.0	1
9	10	1	0.0	1

parameter priors

11	1	1	0.0	1
11	2	1	0.0	1
11	3	1	0.0	1
11	4	1	0.0	1
11	5	1	0.0	1
11	6	1	0.0	1
11	7	1	0.0	1
11	8	1	0.0	1
11	9	1	0.0	1
11	10	1	0.0	1

parameter dev

12	1	1	1.0	1

crush penalty

13	1	1	100.0	1

F ball park

17	1	1	0.0	1
17	2	1	0.0	1
17	3	1	0.0	1
17	4	1	0.0	1

0 # (0/1) read specs for more stddev reporting

999

Appendix 1: Population numbers at age by year and sex (in 1000s)

Females

Time	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1890	20875	17789	15159	12917	11007	9380	7993	6811	5804	4946	4215	3591	3060	2608	2222	1894	1614	1375	1172	999	851	4904
1891	20875	17789	15159	12917	11007	9380	7993	6811	5804	4946	4215	3591	3060	2608	2222	1894	1614	1375	1172	999	851	4904
1892	20875	17789	15159	12917	11007	9380	7993	6811	5804	4946	4215	3591	3060	2608	2222	1894	1614	1375	1172	999	851	4904
1893	20856	17789	15158	12917	11006	9373	7977	6788	5778	4920	4191	3570	3042	2592	2209	1882	1604	1367	1165	992	846	4873
1894	20839	17772	15158	12917	11006	9372	7973	6776	5759	4899	4170	3551	3025	2577	2196	1871	1594	1358	1158	986	841	4844
1895	20825	17758	15144	12917	11006	9372	7972	6773	5750	4885	4153	3535	3010	2564	2184	1861	1585	1351	1151	981	836	4817
1896	20813	17746	15132	12905	11006	9373	7974	6774	5749	4879	4143	3522	2997	2552	2173	1851	1577	1344	1145	976	831	4792
1897	20804	17736	15122	12895	10996	9373	7974	6776	5752	4879	4138	3513	2986	2541	2164	1843	1570	1337	1140	971	827	4768
1898	20796	17728	15113	12886	10987	9365	7976	6778	5754	4882	4140	3511	2980	2533	2155	1835	1563	1331	1134	966	823	4745
1899	20790	17721	15106	12879	10979	9358	7969	6780	5757	4885	4143	3513	2979	2529	2149	1829	1557	1326	1130	962	820	4724
1900	20785	17716	15101	12873	10973	9352	7964	6776	5760	4889	4147	3517	2982	2528	2146	1824	1552	1321	1125	959	817	4705
1901	20780	17712	15096	12868	10968	9346	7958	6769	5755	4890	4149	3519	2984	2529	2145	1820	1547	1316	1121	954	813	4683
1902	20774	17707	15093	12864	10964	9341	7952	6763	5748	4883	4148	3519	2984	2530	2145	1819	1544	1312	1116	950	809	4660
1903	20767	17702	15089	12861	10961	9337	7946	6756	5740	4875	4140	3516	2983	2529	2144	1818	1541	1308	1112	946	805	4635
1904	20759	17696	15085	12858	10958	9334	7942	6750	5732	4867	4132	3509	2979	2527	2143	1817	1540	1306	1108	942	801	4608
1905	20750	17689	15080	12854	10955	9331	7938	6744	5725	4858	4123	3500	2971	2523	2140	1814	1538	1304	1105	938	797	4580
1906	20741	17682	15074	12850	10952	9328	7935	6739	5718	4851	4114	3491	2963	2515	2135	1811	1536	1302	1103	936	794	4551
1907	20731	17674	15068	12845	10948	9325	7931	6735	5712	4843	4106	3482	2954	2507	2128	1807	1532	1299	1101	933	791	4522
1908	20721	17666	15061	12839	10944	9321	7927	6730	5706	4836	4098	3473	2945	2498	2120	1799	1528	1295	1098	931	789	4492
1909	20710	17657	15054	12834	10939	9317	7922	6725	5700	4829	4090	3465	2936	2489	2112	1792	1521	1291	1095	928	787	4464
1910	20697	17648	15046	12828	10934	9312	7916	6717	5692	4820	4081	3455	2926	2480	2102	1783	1513	1284	1090	924	784	4433
1911	20682	17637	15039	12821	10928	9306	7910	6708	5681	4808	4069	3444	2915	2469	2092	1773	1504	1276	1083	919	780	4399
1912	20665	17624	15029	12815	10923	9300	7902	6698	5669	4795	4055	3430	2902	2456	2080	1762	1494	1267	1075	912	774	4362
1913	20646	17610	15018	12807	10917	9294	7895	6688	5656	4780	4039	3415	2888	2443	2067	1750	1483	1257	1066	904	768	4322
1914	20626	17594	15006	12797	10909	9288	7887	6677	5643	4764	4023	3398	2872	2428	2054	1738	1471	1247	1057	896	760	4278
1915	20603	17576	14992	12787	10901	9281	7879	6667	5629	4749	4006	3381	2855	2412	2039	1725	1459	1235	1047	887	752	4230
1916	20580	17557	14977	12775	10892	9273	7870	6656	5615	4733	3988	3363	2837	2395	2023	1710	1446	1224	1036	878	744	4178
1917	20537	17537	14961	12762	10880	9258	7847	6624	5579	4695	3951	3327	2803	2364	1995	1685	1425	1205	1019	863	731	4099
1918	20453	17500	14944	12747	10866	9234	7801	6555	5496	4610	3870	3252	2736	2304	1943	1639	1385	1170	990	837	709	3967
1919	20372	17429	14912	12733	10853	9220	7777	6511	5433	4535	3794	3180	2670	2245	1891	1594	1345	1135	960	811	686	3833
1920	20341	17360	14852	12707	10844	9222	7796	6537	5448	4533	3778	3157	2645	2220	1867	1571	1324	1117	944	797	674	3755
1921	20310	17334	14793	12655	10821	9213	7795	6548	5464	4540	3771	3139	2622	2196	1843	1549	1304	1099	927	783	662	3675
1922	20295	17307	14771	12605	10778	9198	7796	6561	5489	4568	3790	3145	2617	2185	1830	1535	1291	1086	915	772	652	3612
1923	20287	17294	14748	12586	10736	9163	7787	6568	5506	4595	3819	3166	2626	2185	1824	1527	1281	1077	906	764	644	3557
1924	20264	17287	14737	12566	10719	9123	7747	6544	5493	4592	3826	3177	2632	2182	1815	1515	1268	1064	894	753	634	3489
1925	20241	17268	14731	12557	10702	9108	7712	6508	5471	4578	3820	3179	2638	2185	1811	1506	1257	1052	883	742	624	3421

1926	20209	17249	14715	12552	10694	9091	7692	6466	5426	4545	3796	3164	2632	2183	1807	1498	1246	1040	870	730	613	3344
1927	20143	17221	14698	12538	10686	9072	7651	6410	5348	4467	3731	3111	2591	2154	1786	1478	1225	1019	850	711	597	3235
1928	20102	17165	14674	12523	10674	9069	7645	6394	5323	4423	3686	3075	2562	2132	1772	1469	1216	1007	838	699	585	3151
1929	20066	17130	14626	12503	10661	9057	7642	6389	5310	4403	3651	3038	2533	2109	1755	1458	1209	1000	829	689	575	3073
1930	20037	17099	14596	12462	10643	9046	7633	6389	5309	4396	3637	3012	2505	2087	1738	1445	1201	995	824	682	567	3003
1931	19995	17074	14570	12436	10607	9026	7612	6365	5290	4378	3615	2987	2472	2054	1711	1424	1185	984	816	675	559	2926
1932	19947	17039	14549	12414	10586	8995	7590	6338	5259	4351	3590	2960	2444	2021	1679	1398	1164	968	804	666	551	2846
1933	19943	16997	14519	12396	10569	8986	7589	6360	5282	4368	3607	2973	2450	2022	1671	1388	1156	962	800	665	551	2808
1934	19962	16995	14484	12370	10553	8974	7593	6379	5324	4411	3643	3006	2476	2040	1683	1391	1156	962	801	666	553	2796
1935	19975	17011	14481	12340	10531	8960	7581	6378	5335	4442	3674	3032	2500	2059	1696	1399	1157	961	800	666	554	2784
1936	19979	17021	14495	12338	10505	8940	7565	6362	5328	4444	3693	3053	2518	2075	1709	1408	1161	960	797	664	552	2769
1937	20005	17025	14504	12350	10505	8924	7563	6372	5340	4463	3719	3089	2552	2104	1734	1428	1176	970	802	666	554	2774
1938	20035	17048	14507	12357	10514	8923	7552	6376	5356	4481	3742	3116	2587	2137	1762	1452	1196	985	812	671	558	2787
1939	20066	17073	14526	12360	10521	8934	7556	6372	5364	4499	3761	3138	2613	2169	1792	1477	1217	1002	825	681	563	2803
1940	20086	17099	14548	12377	10524	8939	7561	6368	5354	4499	3769	3149	2627	2186	1815	1499	1236	1018	838	690	570	2816
1941	20110	17116	14570	12395	10539	8944	7570	6379	5358	4497	3775	3161	2640	2202	1833	1521	1256	1036	853	703	579	2837
1942	20139	17137	14585	12414	10556	8960	7581	6396	5376	4509	3781	3173	2656	2218	1850	1539	1278	1055	870	717	590	2869
1943	20193	17161	14603	12428	10576	8987	7619	6438	5426	4558	3821	3204	2688	2250	1879	1567	1304	1082	894	737	607	2930
1944	20221	17208	14623	12441	10580	8986	7615	6441	5433	4575	3841	3219	2698	2264	1895	1582	1320	1098	911	753	620	2978
1945	20168	17231	14661	12453	10567	8931	7525	6336	5337	4492	3777	3169	2655	2225	1866	1562	1304	1088	905	751	620	2966
1946	19982	17186	14678	12476	10539	8825	7332	6093	5086	4263	3578	3004	2518	2109	1766	1481	1240	1035	863	718	596	2845
1947	19862	17028	14641	12494	10572	8834	7298	5998	4950	4116	3443	2886	2422	2029	1698	1423	1193	998	833	695	578	2770
1948	19801	16925	14507	12466	10605	8904	7365	6031	4928	4054	3365	2811	2355	1976	1655	1385	1160	973	814	679	566	2730
1949	19784	16873	14421	12355	10594	8963	7466	6131	4996	4071	3344	2773	2316	1940	1627	1362	1140	955	801	670	559	2713
1950	19756	16859	14376	12280	10492	8937	7494	6195	5061	4112	3345	2745	2275	1899	1591	1334	1117	935	783	657	549	2683
1951	19687	16835	14363	12239	10418	8825	7430	6167	5063	4121	3341	2714	2226	1845	1540	1289	1081	905	758	635	532	2619
1952	19587	16777	14342	12226	10374	8737	7298	6070	4998	4085	3316	2684	2180	1787	1480	1235	1034	867	726	608	509	2528
1953	19563	16691	14293	12211	10375	8734	7284	6034	4992	4098	3344	2712	2195	1782	1460	1210	1009	845	709	594	497	2482
1954	19513	16671	14219	12167	10352	8712	7248	5986	4929	4064	3330	2715	2201	1780	1445	1184	981	819	685	575	481	2415
1955	19471	16628	14202	12104	10317	8699	7237	5963	4894	4016	3305	2706	2205	1787	1445	1173	961	796	665	556	466	2351
1956	19336	16592	14164	12083	10237	8605	7128	5844	4770	3895	3187	2620	2143	1745	1414	1144	928	761	630	526	440	2230
1957	19270	16477	14134	12053	10231	8570	7102	5816	4734	3848	3136	2563	2106	1722	1403	1137	919	746	612	507	423	2147
1958	19136	16421	14035	12024	10186	8516	7000	5714	4634	3752	3042	2475	2021	1660	1357	1105	896	724	588	482	399	2025
1959	19028	16306	13987	11940	10167	8492	6974	5649	4568	3686	2975	2409	1958	1599	1313	1073	874	708	573	465	381	1917
1960	18977	16215	13890	11903	10108	8503	6995	5673	4559	3671	2955	2382	1927	1566	1279	1050	858	699	566	458	372	1838
1961	18916	16171	13813	11821	10077	8453	6997	5678	4564	3650	2930	2355	1898	1534	1247	1018	835	683	556	451	365	1759
1962	18959	16119	13777	11761	10033	8489	7049	5783	4665	3737	2983	2392	1922	1548	1252	1017	830	682	557	454	368	1732
1963	19008	16156	13733	11731	9985	8460	7091	5838	4762	3828	3061	2441	1957	1572	1266	1024	832	679	557	456	371	1717
1964	18943	16198	13763	11688	9934	8354	6965	5756	4695	3809	3053	2438	1942	1556	1250	1006	814	661	540	443	362	1660
1965	15639	16142	13799	11715	9906	8335	6916	5699	4673	3795	3072	2459	1962	1563	1252	1005	810	654	532	434	356	1627
1966	14100	13326	13751	11744	9925	8302	6887	5645	4614	3767	3051	2467	1973	1574	1254	1004	806	649	525	427	348	1591

1967	24038	12015	11349	11690	9898	8198	6691	5443	4408	3579	2911	2354	1901	1521	1213	966	774	621	500	404	329	1494
1968	29045	20484	10231	9642	9820	8102	6502	5177	4149	3332	2693	2186	1765	1425	1139	909	723	580	465	375	303	1366
1969	21874	24751	17447	8701	8141	8161	6604	5221	4120	3284	2631	2124	1723	1392	1123	898	716	570	457	367	296	1316
1970	26658	18640	21085	14848	7373	6838	6786	5450	4290	3377	2689	2154	1739	1411	1140	920	736	587	467	375	301	1321
1971	8514	22717	15878	17941	12570	6176	5658	5563	4444	3488	2742	2183	1748	1412	1146	926	748	598	477	380	305	1320
1972	7748	7255	19351	13513	15211	10564	5134	4664	4562	3635	2849	2239	1783	1428	1154	936	757	611	489	390	311	1329
1973	52685	6602	6180	16463	11437	12735	8709	4180	3768	3671	2919	2287	1797	1431	1146	926	752	608	491	393	314	1319
1974	5779	44895	5621	5249	13846	9407	10174	6773	3197	2856	2770	2199	1721	1352	1077	863	698	567	458	370	296	1231
1975	39849	4924	38218	4772	4404	11311	7421	7787	5073	2367	2102	2034	1612	1262	992	790	633	512	416	337	272	1123
1976	3006	33957	4192	32456	4009	3612	8988	5739	5915	3811	1768	1567	1514	1200	940	739	589	472	382	310	251	1041
1977	5215	2561	28909	3560	27252	3283	2861	6917	4333	4416	2827	1308	1157	1118	887	694	546	435	349	283	230	956
1978	8694	4444	2181	24563	2997	22479	2636	2245	5345	3318	3366	2149	993	879	849	674	528	415	331	266	215	903
1979	24131	7408	3785	1854	20739	2492	18314	2109	1773	4188	2589	2620	1671	772	683	660	524	410	323	258	207	870
1980	5371	20563	6307	3215	1559	17048	1988	14219	1607	1335	3133	1929	1949	1242	573	507	491	389	305	240	192	802
1981	3370	4577	17506	5350	2690	1268	13387	1516	10643	1189	982	2295	1410	1423	906	418	370	358	284	222	175	724
1982	1064	2872	3896	14854	4451	2175	995	10266	1146	7968	885	728	1699	1043	1051	669	309	273	264	210	164	664
1983	4492	907	2445	3307	12389	3584	1706	765	7789	862	5967	661	543	1266	776	783	498	230	203	197	156	617
1984	71820	3828	772	2076	2762	10001	2802	1311	581	5861	644	4435	489	401	931	570	574	365	168	149	144	566
1985	3121	61201	3259	655	1722	2187	7590	2071	957	420	4216	461	3165	348	285	661	404	407	258	119	105	502
1986	13537	2660	52097	2762	542	1358	1641	5477	1452	661	286	2843	309	2104	230	188	435	265	267	169	78	397
1987	10476	11536	2264	44161	2288	428	1014	1165	3729	955	425	181	1773	190	1286	140	113	262	159	160	101	283
1988	18508	8927	9822	1921	36735	1824	326	746	836	2624	662	292	124	1204	129	867	94	76	176	107	107	257
1989	19098	15772	7598	8320	1585	28642	1341	230	511	562	1744	436	192	81	786	84	565	61	50	114	69	236
1990	8327	16274	13423	6439	6859	1228	20752	924	153	332	360	1101	273	120	50	488	52	349	38	31	70	188
1991	11535	7096	13851	11379	5335	5373	905	14616	630	102	218	233	709	175	76	32	310	33	221	24	19	164
1992	7318	9829	6040	11743	9424	4181	3917	623	9695	408	65	137	145	439	108	47	20	190	20	136	15	112
1993	19530	6236	8369	5131	9823	7553	3148	2773	423	6390	264	41	87	91	275	67	29	12	118	13	84	79
1994	5143	16642	5310	7112	4311	7949	5767	2276	1922	285	4234	173	27	56	59	176	43	19	8	76	8	104
1995	4632	4383	14171	4512	5976	3522	6193	4307	1652	1369	201	2960	120	19	39	41	122	30	13	5	52	77
1996	4432	3947	3731	12033	3779	4840	2723	4571	3084	1161	951	138	2031	82	13	26	28	83	20	9	4	88
1997	3105	3776	3360	3168	10075	3059	3744	2025	3299	2187	816	664	96	1408	57	9	18	19	57	14	6	63
1998	17643	2646	3214	2851	2645	8092	2329	2718	1422	2262	1479	547	442	64	933	38	6	12	13	38	9	46
1999	106317	15034	2253	2731	2396	2162	6370	1775	2024	1043	1640	1065	392	316	46	663	27	4	9	9	27	39
2000	2227	90598	12803	1915	2299	1975	1736	5008	1376	1557	799	1253	812	298	240	35	505	20	3	7	7	50
2001	7397	1898	77169	10890	1615	1912	1615	1402	4015	1099	1240	635	995	645	237	191	27	401	16	2	5	45
2002	6881	6303	1616	65655	9204	1347	1574	1318	1138	3249	888	1001	513	803	520	191	154	22	323	13	2	41
2003	12353	5863	5370	1376	55720	7756	1127	1312	1096	945	2697	736	830	425	666	431	158	128	18	268	11	35
2004	2819	10527	4996	4576	1173	47458	6604	959	1117	933	805	2295	627	707	362	567	367	135	109	16	228	39
2005	1872	2403	8969	4254	3894	996	40264	5597	813	946	790	681	1943	531	598	306	480	311	114	92	13	226
2006	2283	1595	2047	7637	3622	3314	847	34224	4756	690	803	671	579	1651	451	508	260	408	264	97	78	204
2007	7217	1945	1359	1744	6503	3080	2815	719	29047	4036	586	682	569	491	1401	382	431	221	346	224	82	239

2008	6412	6150	1657	1157	1484	5530	2617	2390	611	24643	3424	497	578	483	416	1188	324	366	187	293	190	272
2009	44080	5464	5240	1412	985	1262	4695	2220	2027	518	20894	2903	421	490	409	353	1007	275	310	159	249	392
2010	30584	37562	4656	4462	1200	835	1067	3962	1872	1708	436	17599	2445	355	413	345	297	848	232	261	134	539
2011	6912	26062	32003	3964	3792	1016	704	897	3328	1571	1433	366	14762	2051	298	346	289	249	711	194	219	564
2012	8929	5890	22204	27247	3369	3212	858	593	754	2798	1320	1204	307	12402	1723	250	291	243	209	597	163	658
2013	23640	7609	5018	18903	23161	2855	2712	723	499	635	2352	1110	1012	258	10425	1448	210	244	204	176	502	690
2014	34816	20145	6482	4271	16058	19591	2404	2278	606	418	532	1970	930	848	216	8728	1212	176	205	171	147	998
2015	18868	29668	17162	5518	3631	13609	16549	2027	1918	510	352	447	1657	782	713	182	7341	1020	148	172	144	964

Males

1890	20875	17061	13943	11396	9313	7612	6221	5084	4155	3396	2775	2268	1854	1515	1238	1012	827	676	552	451	369	1650
1891	20875	17061	13943	11396	9313	7612	6221	5084	4155	3396	2775	2268	1854	1515	1238	1012	827	676	552	451	369	1650
1892	20875	17061	13943	11396	9313	7612	6221	5084	4155	3396	2775	2268	1854	1515	1238	1012	827	676	552	451	369	1650
1893	20856	17061	13943	11395	9313	7610	6218	5081	4151	3392	2772	2265	1851	1513	1236	1010	826	675	552	451	368	1648
1894	20839	17045	13943	11395	9313	7610	6217	5079	4149	3389	2769	2263	1849	1511	1235	1009	824	674	551	450	368	1645
1895	20825	17031	13930	11395	9313	7610	6217	5078	4148	3388	2767	2260	1847	1509	1233	1007	823	673	550	449	367	1643
1896	20813	17020	13919	11385	9313	7610	6217	5078	4147	3387	2766	2259	1845	1507	1232	1006	822	672	549	449	367	1640
1897	20804	17010	13910	11376	9304	7610	6217	5079	4147	3387	2765	2258	1844	1506	1230	1005	821	671	548	448	366	1638
1898	20796	17002	13902	11368	9297	7603	6218	5079	4148	3387	2765	2258	1843	1505	1230	1004	821	670	548	448	366	1636
1899	20790	16996	13895	11362	9290	7597	6212	5079	4148	3387	2766	2258	1843	1505	1229	1004	820	670	547	447	365	1634
1900	20785	16991	13890	11356	9285	7592	6207	5075	4149	3388	2766	2258	1843	1505	1229	1003	819	669	547	447	365	1632
1901	20780	16987	13886	11352	9281	7587	6203	5071	4145	3388	2766	2258	1844	1505	1229	1003	819	669	546	446	365	1631
1902	20774	16983	13883	11349	9277	7584	6199	5067	4141	3385	2766	2258	1844	1505	1228	1003	819	668	546	446	364	1629
1903	20767	16978	13880	11346	9275	7581	6196	5064	4138	3381	2763	2258	1843	1505	1228	1003	818	668	546	446	364	1626
1904	20759	16972	13875	11343	9272	7578	6193	5061	4135	3378	2760	2255	1843	1504	1228	1002	818	668	545	445	364	1624
1905	20750	16966	13871	11340	9270	7577	6191	5058	4132	3376	2758	2253	1841	1504	1228	1002	818	668	545	445	363	1622
1906	20741	16959	13865	11336	9267	7575	6190	5056	4130	3373	2755	2250	1838	1502	1227	1002	817	667	545	445	363	1619
1907	20731	16951	13860	11332	9264	7572	6188	5055	4128	3371	2753	2248	1836	1500	1225	1001	817	667	544	444	363	1617
1908	20721	16943	13854	11327	9260	7569	6186	5053	4127	3370	2751	2246	1834	1498	1223	999	816	666	544	444	362	1614
1909	20710	16935	13847	11322	9256	7566	6183	5051	4125	3368	2749	2244	1832	1496	1222	998	815	666	543	444	362	1612
1910	20697	16926	13840	11317	9252	7563	6180	5049	4123	3366	2748	2243	1830	1494	1220	996	813	664	543	443	362	1609
1911	20682	16915	13833	11311	9248	7559	6177	5046	4120	3364	2745	2241	1828	1492	1218	994	812	663	542	442	361	1607
1912	20665	16903	13824	11305	9243	7555	6174	5043	4117	3361	2743	2238	1826	1490	1216	993	810	662	540	441	361	1603
1913	20646	16889	13814	11298	9238	7551	6170	5039	4114	3358	2740	2236	1824	1488	1214	991	809	660	539	440	359	1600
1914	20626	16874	13803	11290	9232	7547	6166	5036	4111	3354	2737	2233	1821	1486	1212	989	807	659	538	439	358	1595
1915	20603	16857	13790	11280	9225	7542	6162	5032	4107	3351	2734	2230	1819	1483	1210	987	805	657	536	438	357	1591
1916	20580	16839	13777	11270	9218	7536	6158	5028	4104	3348	2730	2226	1816	1481	1207	985	803	655	535	436	356	1585
1917	20537	16819	13762	11259	9209	7528	6151	5021	4097	3341	2724	2221	1810	1476	1203	981	800	653	532	434	355	1577
1918	20453	16784	13746	11246	9198	7518	6139	5009	4084	3328	2711	2209	1800	1467	1196	975	795	648	528	431	352	1564
1919	20372	16716	13717	11233	9188	7509	6130	4999	4072	3316	2700	2198	1790	1458	1188	968	789	643	524	428	349	1550
1920	20341	16649	13661	11210	9178	7503	6128	4998	4071	3314	2697	2195	1786	1454	1184	965	786	641	522	426	347	1542

1921	20310	16624	13607	11165	9159	7495	6122	4995	4070	3312	2695	2192	1783	1451	1181	961	783	638	520	424	346	1533
1922	20295	16599	13587	11120	9122	7481	6117	4992	4069	3313	2695	2192	1782	1449	1179	959	781	636	518	422	344	1526
1923	20287	16586	13566	11104	9086	7451	6106	4989	4069	3314	2697	2193	1783	1449	1178	958	780	635	517	421	343	1520
1924	20264	16580	13555	11086	9072	7421	6080	4978	4063	3311	2695	2192	1782	1448	1177	957	778	633	516	420	342	1513
1925	20241	16562	13550	11078	9058	7409	6055	4957	4054	3307	2692	2191	1781	1447	1176	956	777	632	514	418	341	1506
1926	20209	16543	13535	11074	9051	7397	6045	4935	4035	3297	2687	2187	1779	1446	1174	954	775	630	513	417	339	1498
1927	20143	16516	13520	11061	9047	7389	6031	4921	4011	3276	2674	2177	1771	1440	1170	950	772	627	510	414	337	1486
1928	20102	16463	13498	11048	9036	7385	6025	4911	4002	3258	2658	2168	1765	1435	1166	947	769	625	508	413	336	1476
1929	20066	16429	13454	11031	9026	7376	6021	4905	3993	3250	2644	2155	1757	1430	1162	944	767	623	506	411	334	1466
1930	20037	16400	13426	10994	9011	7367	6014	4902	3988	3243	2637	2144	1747	1424	1158	941	765	621	504	410	333	1457
1931	19995	16376	13403	10972	8981	7354	6004	4893	3983	3236	2629	2136	1735	1414	1152	937	761	618	502	408	331	1447
1932	19947	16341	13383	10952	8963	7330	5994	4886	3975	3231	2623	2129	1729	1404	1143	931	757	615	500	406	330	1437
1933	19943	16302	13355	10937	8947	7317	5977	4882	3974	3231	2624	2128	1727	1402	1138	927	755	614	499	405	329	1431
1934	19962	16299	13323	10913	8934	7304	5967	4869	3973	3232	2625	2131	1728	1402	1138	924	752	612	498	405	329	1428
1935	19975	16315	13320	10887	8915	7293	5956	4860	3962	3230	2626	2132	1730	1403	1137	923	749	610	497	404	328	1425
1936	19979	16325	13333	10885	8894	7277	5947	4851	3954	3221	2624	2132	1730	1404	1138	922	749	608	495	403	327	1421
1937	20005	16328	13341	10896	8892	7261	5936	4846	3950	3218	2619	2133	1733	1406	1140	924	749	608	493	402	327	1420
1938	20035	16350	13344	10902	8901	7259	5922	4838	3946	3214	2617	2130	1734	1408	1142	927	751	609	494	401	326	1419
1939	20066	16374	13362	10905	8906	7267	5922	4828	3940	3213	2616	2129	1732	1410	1145	929	753	610	495	401	326	1419
1940	20086	16399	13382	10919	8908	7271	5928	4827	3931	3207	2613	2127	1730	1408	1145	930	754	612	496	402	326	1417
1941	20110	16416	13402	10936	8921	7274	5933	4833	3932	3201	2610	2126	1730	1407	1144	931	756	613	497	403	327	1417
1942	20139	16436	13416	10952	8935	7285	5936	4839	3939	3204	2607	2125	1730	1408	1145	931	758	615	499	405	328	1419
1943	20193	16459	13432	10964	8950	7300	5951	4848	3950	3215	2615	2127	1734	1412	1149	934	760	618	502	407	330	1425
1944	20221	16504	13451	10976	8956	7306	5954	4850	3949	3216	2617	2127	1730	1410	1148	934	760	618	503	408	331	1427
1945	20168	16526	13486	10988	8956	7292	5933	4824	3921	3188	2594	2109	1713	1393	1135	924	752	611	497	404	328	1414
1946	19982	16483	13502	11011	8948	7260	5878	4758	3852	3122	2532	2057	1670	1356	1102	897	730	594	483	393	319	1376
1947	19862	16331	13468	11026	8973	7265	5868	4731	3817	3083	2494	2020	1639	1330	1079	877	714	581	472	384	312	1349
1948	19801	16233	13345	11001	8993	7299	5891	4744	3816	3073	2478	2002	1621	1315	1067	865	703	572	466	378	308	1331
1949	19784	16183	13265	10902	8978	7326	5933	4778	3840	3085	2481	2000	1615	1307	1060	859	697	566	461	375	305	1320
1950	19756	16169	13224	10836	8894	7308	5947	4804	3860	3098	2485	1997	1609	1299	1051	852	691	560	455	370	301	1305
1951	19687	16146	13212	10801	8835	7231	5920	4802	3868	3102	2485	1991	1599	1287	1039	840	681	552	448	364	296	1284
1952	19587	16090	13193	10790	8802	7175	5847	4767	3854	3096	2478	1983	1587	1274	1025	827	668	542	439	356	289	1256
1953	19563	16008	13148	10775	8799	7159	5816	4725	3844	3101	2488	1990	1591	1273	1021	821	663	536	434	352	285	1238
1954	19513	15989	13080	10737	8783	7148	5792	4689	3798	3083	2483	1990	1590	1271	1016	815	655	529	427	346	281	1215
1955	19471	15947	13064	10682	8752	7136	5786	4673	3772	3049	2471	1988	1592	1271	1015	812	651	524	422	341	276	1194
1956	19336	15913	13029	10665	8695	7090	5748	4635	3727	2999	2418	1956	1572	1258	1004	802	641	514	413	333	269	1160
1957	19270	15803	13002	10638	8687	7054	5724	4620	3713	2978	2391	1926	1556	1250	1000	797	637	509	408	328	264	1134
1958	19136	15749	12911	10613	8656	7030	5673	4577	3677	2945	2356	1888	1519	1226	984	787	627	501	400	321	258	1100
1959	19028	15639	12867	10539	8638	7011	5661	4543	3649	2922	2334	1864	1492	1199	968	776	620	495	395	315	253	1070
1960	18977	15551	12778	10505	8584	7006	5657	4546	3635	2911	2327	1856	1480	1184	951	767	615	492	392	313	250	1048
1961	18916	15509	12706	10433	8556	6961	5653	4543	3637	2899	2317	1849	1473	1174	939	754	608	487	389	310	248	1028

1962	18959	15459	12673	10378	8509	6960	5645	4571	3665	2928	2331	1861	1484	1182	942	753	604	487	391	312	249	1022
1963	19008	15495	12633	10352	8466	6924	5648	4569	3691	2954	2358	1875	1496	1192	949	756	604	485	391	314	251	1020
1964	18943	15535	12660	10315	8433	6868	5590	4538	3657	2946	2352	1874	1489	1187	946	753	599	479	384	310	248	1006
1965	15639	15481	12694	10338	8406	6848	5554	4503	3644	2929	2355	1878	1495	1187	946	753	599	477	381	306	247	999
1966	14100	12781	12649	10365	8423	6823	5534	4470	3611	2915	2339	1878	1496	1190	945	752	599	477	379	303	243	990
1967	24038	11523	10441	10321	8421	6795	5459	4394	3527	2836	2282	1826	1464	1165	926	734	585	465	370	295	235	958
1968	29045	19646	9412	8514	8371	6768	5402	4297	3431	2738	2193	1759	1405	1124	894	710	563	448	356	283	226	913
1969	21874	23738	16050	7681	6924	6769	5436	4313	3414	2716	2162	1728	1384	1104	883	702	557	442	352	280	222	893
1970	26658	17877	19396	13105	6258	5623	5475	4383	3468	2740	2177	1731	1383	1107	883	706	561	445	353	281	223	891
1971	8514	21787	14606	15835	10671	5075	4539	4402	3512	2773	2187	1735	1379	1101	881	702	562	446	354	281	223	886
1972	7748	6958	17801	11926	12905	8667	4105	3658	3538	2817	2220	1749	1387	1101	879	703	561	448	356	283	224	885
1973	52685	6332	5685	14531	9710	10464	6989	3293	2923	2817	2238	1761	1386	1098	872	695	556	443	354	281	223	877
1974	5779	43058	5172	4636	11791	7815	8338	5509	2573	2268	2176	1722	1352	1062	841	667	531	425	339	271	215	840
1975	39849	4723	35161	4215	3756	9462	6197	6535	4270	1978	1733	1655	1306	1023	803	635	503	401	320	255	204	794
1976	3006	32568	3857	28666	3418	3019	7523	4875	5096	3304	1522	1328	1264	996	779	610	482	382	304	243	194	757
1977	5215	2457	26596	3144	23240	2746	2398	5910	3794	3936	2536	1163	1011	961	756	591	462	365	289	230	184	719
1978	8694	4262	2006	21691	2553	18725	2192	1898	4641	2962	3059	1964	898	779	740	581	454	355	280	222	177	693
1979	24131	7105	3482	1637	17638	2064	15037	1749	1505	3664	2330	2400	1538	702	609	577	453	354	277	219	173	678
1980	5371	19722	5803	2839	1328	14189	1644	11858	1367	1169	2832	1794	1843	1178	537	465	441	346	270	211	167	648
1981	3370	4389	16105	4727	2298	1064	11234	1287	9195	1052	895	2158	1363	1397	891	406	351	332	261	203	159	614
1982	1064	2754	3585	13123	3816	1837	842	8803	1001	7108	810	686	1651	1041	1066	679	309	267	253	198	155	588
1983	4492	870	2249	2921	10606	3046	1453	661	6866	777	5498	625	528	1270	800	818	521	237	205	194	152	568
1984	71820	3671	710	1834	2363	8476	2405	1139	515	5334	602	4249	482	407	977	615	629	400	182	157	149	553
1985	3121	58697	2998	579	1478	1874	6613	1853	872	393	4049	455	3210	364	307	736	463	473	301	137	118	528
1986	13537	2551	47930	2441	466	1170	1459	5080	1410	661	296	3048	342	2409	273	230	551	347	354	225	102	483
1987	10476	11064	2083	39026	1966	369	912	1122	3871	1068	499	223	2291	257	1806	204	172	413	259	265	169	438
1988	18508	8562	9036	1697	31513	1564	289	707	862	2958	813	379	169	1737	195	1368	155	130	312	196	200	459
1989	19098	15126	6990	7354	1364	24839	1209	220	532	645	2201	603	281	125	1284	144	1010	114	96	230	145	486
1990	8327	15608	12350	5691	5910	1074	19128	915	165	394	475	1617	442	205	92	939	105	738	83	70	168	461
1991	11535	6806	12744	10056	4584	4668	831	14556	688	123	293	352	1193	326	151	67	691	77	543	61	52	463
1992	7318	9427	5557	10377	8101	3626	3611	631	10902	511	91	215	258	873	238	111	49	504	56	396	45	375
1993	19530	5980	7699	4532	8403	6474	2852	2796	482	8265	385	68	161	193	652	178	82	37	376	42	295	313
1994	5143	15961	4885	6280	3677	6737	5112	2220	2149	367	6257	290	51	121	144	489	133	62	28	282	32	455
1995	4632	4203	13036	3984	5096	2956	5341	3999	1718	1650	280	4759	220	39	92	109	369	101	47	21	213	368
1996	4432	3786	3433	10627	3227	4081	2334	4149	3067	1306	1245	211	3565	165	29	68	81	275	75	35	15	433
1997	3105	3622	3091	2798	8606	2583	3220	1816	3187	2333	986	936	158	2666	123	22	51	61	205	56	26	334
1998	17643	2537	2957	2519	2263	6867	2028	2488	1385	2401	1743	733	692	116	1963	90	16	37	45	151	41	264
1999	106317	14419	2072	2412	2044	1818	5455	1593	1936	1070	1843	1332	559	527	88	1490	69	12	28	34	114	231
2000	2227	86891	11778	1691	1959	1647	1453	4324	1254	1516	835	1434	1035	433	408	68	1153	53	9	22	26	267
2001	7397	1820	70988	9613	1375	1584	1325	1163	3445	996	1202	661	1133	817	342	322	54	909	42	7	17	231
2002	6881	6045	1487	57951	7823	1113	1277	1064	930	2751	794	957	525	901	649	271	255	43	722	33	6	197

2003	12353	5623	4940	1215	47263	6364	903	1034	860	751	2219	640	771	423	726	523	219	206	35	581	27	164
2004	2819	10096	4596	4037	993	38619	5199	738	845	702	614	1813	523	630	346	593	427	179	168	28	475	155
2005	1872	2304	8250	3753	3295	810	31499	4239	601	688	572	500	1477	426	513	282	483	348	145	137	23	513
2006	2283	1530	1883	6739	3065	2691	661	25711	3459	491	562	467	408	1205	348	419	230	394	284	119	112	437
2007	7217	1866	1251	1539	5504	2503	2196	540	20974	2821	400	458	381	333	982	283	341	187	321	231	97	448
2008	6412	5898	1525	1021	1256	4492	2042	1792	440	17102	2300	326	373	310	271	801	231	278	153	262	189	444
2009	44080	5241	4820	1245	834	1025	3665	1665	1461	359	13941	1875	266	304	253	221	653	188	227	124	213	515
2010	30584	36025	4282	3937	1017	680	835	2983	1354	1187	291	11325	1523	216	247	205	179	530	153	184	101	592
2011	6912	24995	29438	3498	3213	828	553	678	2421	1099	963	236	9179	1234	175	200	166	145	429	124	149	561
2012	8929	5649	20425	24043	2854	2618	674	450	551	1966	892	781	192	7445	1001	142	162	135	118	348	100	576
2013	23640	7297	4616	16680	19617	2326	2131	548	365	447	1596	724	634	156	6040	812	115	132	109	96	282	549
2014	34816	19320	5963	3769	13605	15977	1892	1731	445	296	363	1293	586	513	126	4890	657	93	107	89	77	673
2015	18868	28454	15787	4869	3075	11089	13008	1538	1407	361	241	294	1049	476	417	102	3968	533	76	87	72	609