1 Revision and Corrections

1.1 Correction to recreational landings data

This section documents a correction to recreational landings data used in the stock assessment of South Atlantic red snapper.

As described in section 2.2 of the Assessment Workshop report, the assessment included observed recreational landings from Salt-Water Angling reports. These landings were reported to the level of species for red snapper in the years 1965 and 1970, and as unclassified snappers in 1960. Thus, the value in 1960 was estimated as the unweighted average ratios of red snapper to all snapper from 1965 and 1970. Linear interpolation was used to estimate the recreational landings stream in years surrounding the 1960, 1965, and 1970 point estimates.

After completion of the assessment, it was discovered that the recreational landings in 1965 and 1970 had been transposed when developing the recreational landings stream. Correction of these values affected not only the point estimates in 1965 and 1970, but also estimates in surrounding years that depended on the linear interpolations (Figure 1.1). Using the corrected recreational landings stream, the base assessment model was re-run, as described below.

1.2 Revised base run of the assessment model

This section describes results of the base assessment model incorporating the correction to recreational landings (§1.1). It also updates reference points for consistency with recommendations of the SEDAR-15 Review Panel.

1.2.1 Revisions

Using the corrected recreational landings stream, the base assessment model was re-run with no change in the weighting configuration of model components (methods and weighting configuration described fully in the Assessment Workshop report). Reference points were based on $F_{40\%}$ as a proxy for F_{MSY}, as recommended by the SEDAR-15 Review Panel. As before, these reference points depend on average selectivity across fisheries, weighted by recent fishing mortality rates. In the previous model run, average selectivity was re-scaled to a maximum of one. Because of the high discard mortalities combined with dome-shaped discard selectivity, that re-scaling of average selectivity made it difficult to compare full F and F_{MSY} (or its proxy). For improved consistency between the two, average selectivity is not re-scaled in this revised assessment. This change does not affect model fit to data or parameter estimates, but does affect the computation and value of F_{MSY} (or its proxy).

1.2.2 Results of revised base run

1.2.2.1 **Comparison of estimated time series** Figure 1.2 shows comparisons of estimated time series from the base model using either the previous recreational landings stream or the corrected recreational landings stream. The effect of the correction on estimated time series of recruitment, fishing mortality rate, and spawning biomass was generally small. The remainder of results focus on the model run with corrected landings.

1.2.2.2 **Measures of Overall Model Fit** Overall, the catch-at-age model fit well to the available data. Annual fits to length compositions from each fishery were reasonable in most years, as were fits to age compositions (Figure 1.3). Residuals of these fits, by year and fishery, are summarized with bubble plots; differences between annual observed and predicted vectors are summarized with angular deviation (Figure 1.4–1.11). Angular deviation is defined as the arc cosine of the dot product of two vectors.

The model was configured to fit observed commercial and recreational landings closely (Table 1.1; Figures 1.12–1.15). In addition, it fit well to observed discards (Table 1.2; Figures 1.16–1.18).

Fits to indices of abundance were reasonable (Figures 1.19–1.21). The three indices were positively correlated. Since the mid-1990s, indices showed an increasing trend in general, but during the last three years, a decreasing trend.

1.2.2.3 **Parameter Estimates** Estimates of all parameters from the catch-at-age model are shown in Appendix A. The estimated coefficient of variation of length at age was $\widehat{CV} = 11.56\%$ (Figure 1.22).

1.2.2.4 **Stock Abundance and Recruitment** Estimated abundance at age shows truncation of the oldest ages during the 1950s through 1970s, from which the stock has not yet recovered (Table 1.3). Annual number of recruits is shown in Table 1.3 (age-1 column) and in Figure 1.23. Notable strength in year classes was predicted to have occurred in 1983 and 1984, and again in 1998–2000.

1.2.2.5 **Stock Biomass (total and spawning stock)** Estimated biomass at age follows a similar pattern of truncation as did abundance (Tables 1.4,1.5). Total biomass and spawning biomass show nearly identical trends—decline during the 1950s through 1970s, and stable but low levels since 1980 (Figure 1.24, Table 1.6).

1.2.2.6 **Fishery Selectivity** Estimated selectivities of landings from commercial handline shift toward older fish with implementation of each new minimum size regulation (12-inch TL in 1984 and then 20-inch TL in 1992) (Figure 1.25). In the most recent period, fish were estimated to be almost fully selected by age 4. Selectivity of landings from commercial diving was estimated to be dome-shaped with a peak between ages 5 and 10 (Figure 1.26). Similar to commercial handline, landings from the headboat fishery showed a shift toward older fish, with full selection at age 4 in the most recent period (Figure 1.27), as did landings from the general recreational fishery, with full selection at age 3 in the most recent period (Figure 1.28).

Selectivities of discard mortalities were similar across the commercial handline, headboat, and general recreational fisheries (Figure 1.29 – Figure 1.31). These selectivities included age-1 and age-2 fish in the period 1984–1991, when the 12-inch TL size limit was in place. They additionally included age-3 fish in the period 1992–2006, when the 20-inch TL size limit was in place.

Average selectivities of landings and of discard mortalities were computed from F-weighted selectivities in the most recent period of regulations (Figure 1.32). These average selectivities were used to compute benchmarks and in projections. All selectivities from the most recent period, including average selectivities, are presented in Table 1.7.

1.2.2.7 **Fishing Mortality** The estimated time series of fishing mortality rate (F) shows a generally increasing trend from the 1950s through the late 1970s, and since 1980 has fluctuated around a mean near $F = 0.92$ (Figure 1.33). In the most recent years, the majority of full F comprised commercial handline landings, general recreational landings, and general recreational discard mortalities (Figure 1.33, Table 1.8).

Full F at age is shown in Table 1.9. In any given year, the maximum F at age may be less than that year's fully selected F. This inequality is due to the combination of two features of estimated selectivities: full selection occurs at different ages among gears and several sources of mortality (commercial diving, discards) have dome-shaped selectivity.

Throughout most of the assessment period, estimated landings and discard mortalities in number of fish have been dominated by the recreational sector (Figures 1.34, 1.35). Table 1.10 shows total landings at age in numbers, Table 1.11 in metric tons, and Table 1.12 in 1000 lb.

1.2.2.8 **Stock-Recruitment Parameters** The estimated Beverton–Holt spawner-recruit curve is shown in Figure 1.36. Variability about the curve was estimated only at low levels of spawning biomass, because composition data required for estimating recruitment deviations became available only after the stock was depleted. Estimated parameters were as follows: steepness $\hat{h} = 0.95$, $\widehat{R_0} = 638166.4$, first-order autocorrelation $\hat{\varrho} = 0.36$, and bias correction $\hat{\varsigma} = 1.1$.

The RW Report states, "One of the principal difficulties with the SCA model estimate of the stock recruitment parameters is that the steepness estimate appears unrealistically high." This was a primary reason why the Review Panel recommended using $F_{40\%}$ as a proxy for F_{MSY}. Because the Review Panel believed that the value of steepness estimated within the assessment model was "unrealistically high," a value was used here for consistency with the $F_{40\%}$ proxy. That is, assuming that $F_{40\%}$ is indeed the value of F_{MSY}, one can compute the corresponding value of steepness (Figure 1.37). The value corresponding to $F_{40\%} = F_{\mathrm{MSY}}$ is $h = 0.68$, and thus this value was used to compute equilibrium levels of landings and biomass.

1.2.2.9 **Per Recruit and Equilibrium Analyses** Static spawning potential ratio (static SPR) shows a trend of marked decrease from the beginning of the assessment period until the mid 1970's, and since has remained relatively constant at levels between 1% and 3% (Figure 1.38, Table 1.6). Static SPR of each year was computed as the asymptotic spawners per recruit given that year's fishery-specific Fs and selectivities, divided by spawners per recruit that would be obtained in an unexploited stock. In this form, static SPR ranges between zero and one, and represents SPR that would be achieved under an equilibrium age structure at the current F (hence the term *static*).

Yield per recruit and spawning potential ratio were computed as functions of F (Figure 1.39), as were equilibrium landings and spawning biomass (Figures 1.40). Equilibrium landings and discards were also computed as functions of biomass B, which itself is a function of F (Figure 1.41). Per recruit analyses applied the most recent selectivity patterns averaged across fisheries, weighted by F from the last three years (2004–2006).

1.2.2.10 **Reference Points** The SEDAR-15 Review Panel did not recommend using MSY-related reference points, because they thought that data were not adequate for reliable estimation of the spawner-recruit function. Instead, they recommended using $F_{40\%}$ as a proxy for F_{MSY}. To compute biomass proxies from $F_{40\%}$, however, one must know or assume productivity of the stock. Along these lines, the Review Panel did not reject the functional form of the Beverton–Holt spawner-recruit curve, but instead thought that the parameters were not well estimated. As stated previously, a steepness of $h = 0.68$ is consistent with the Review Panel's recommendation of $F_{40\%}$, but that proxy does not provide any information about the other key parameter of the Beverton–Holt function, unfished recruitment R_0. On this parameter, the RW Report provides seemingly conflicting advice. In Table 1 of the RW Report, biomass proxies assumed fixed recruitment at the bias-corrected unfished level ($\widehat{R_0}$), yet the report also states, "...there are no data in the assessment to adequately define the asymptote of the Beverton–Holt function and hence estimates of MSY indicators cannot be considered reliable." In this revision, an attempt is made to accommodate both pieces of advice in a consistent manner, by using the bias-corrected R_0 to compute biomass proxies, while also examining the effect of variation in $\widehat{R_0}$ by ±25%. In almost all sensitivity runs of the base assessment model, $\widehat{R_0}$ falls within this range.

Assuming the Beverton–Holt spawner-recruit function, biomass proxies were computed assuming equilibrium recruitment and age structure associated with $F_{40\%}$. The bias correction (ς) was computed from the estimated variance (σ^2) of recruitment deviation: $\varsigma = \exp(\sigma^2/2)$. Then, equilibrium recruitment (R_{eq}) associated with any F is,

$$R_{eq} = \frac{R_0\,[\varsigma 0.8 h \Phi_F - 0.2(1-h)]}{(h-0.2)\Phi_F} \tag{1}$$

where R_0 is recruitment at the unfished level, h is steepness, and Φ_F is spawning potential ratio given growth, maturity, and total mortality at age (including natural, fishing, and discard mortality rates).

The approach described above provides reference points that are consistent with rebuilding projections (i.e., fishing at $F_{40\%}$ yields $\text{MSY}_{F_{40\%}}$ from a stock size of $SSB_{F_{40\%}}$). Reference points estimated were the proxies for F_{MSY}, MSY, B_{MSY} and SSB_{MSY}. These values were computed using $h = 0.68$ (for which $F_{40\%} = F_{\text{MSY}}$), along with $\widehat{R_0} = 638166.4$ and $\hat{\varsigma} = 1.1$ from the assessment, in addition to $R_0 = \pm 25\%\widehat{R_0}$. Also, based on $F_{40\%}$, three possible values of F at optimum yield (OY) were considered—$F_{\text{OY}} = 65\%F_{40\%}$, $F_{\text{OY}} = 75\%F_{40\%}$, and $F_{\text{OY}} = 85\%F_{40\%}$—and for each, the corresponding equilibrium yield and dead discards. These values depend on equilibrium recruitment expected from the age structure at F_{OY}, given $h = 0.68$, $\widehat{R_0} = 638166.4$, and $\hat{\varsigma} = 1.1$.

Estimates of benchmarks are summarized in Table 1.13.

1.2.2.11 **Status of the Stock and Fishery** Estimated time series of B and SSB relative to their proxy reference points show similar patterns: initial status well above the MSY proxy, decline during the 1950s through 1970s, and stable at low levels since 1980 (Figure 1.42, Table 1.6). Current stock status was estimated to be $\text{SSB}_{2006}/\text{SSB}_{F_{40\%}} = 0.029$ and $\text{SSB}_{2006}/\text{MSST} = 0.031$, indicating that the stock is overfished (Table 1.13).

The estimated time series of F relative to $F_{40\%}$ shows a generally increasing trend from the 1950s through 1980, and since has fluctuated about a mean near 8.86 (Figure 1.43, Table 1.6). The time series indicates that overfishing has been occurring without break since 1967, with the current estimate at $F_{2006}/F_{40\%} = 7.658$ (Table 1.13).

1.2.3 Comments on Assessment Results

Estimated reference points play a central role in this assessment, to gauge status of the stock and fishery. If selectivity patterns change in the future, for example as a result of new management regulations, estimates of refence points would likely change as well.

The SEDAR-15 Review Panel recommended $F_{40\%}$ as a proxy for F_{MSY}, and corresponding proxies for biomass reference points. Computation of reference points is conditional on the combined selectivities from all modeled sources of fishing mortality. In this revised assessment, the selectivity on which reference points were based was not re-scaled to one, as it was in the previous assessment. This modification was to provide improved consistency between full F and $F_{40\%}$, in particular for computing the ratio $F/F_{40\%}$, and it accounts for the bulk of the difference between the previous estimate of $F_{40\%}$ and the revised estimate. Despite this difference, however, the modification would not affect fishing mortality rates associated with $F_{40\%}$, because the product $F_{40\%}$ times selectivity would be unchanged. Furthermore, this modification would not affect biomass reference points. Changes in those reference points are due primarily to relating recruitment to stock size (as opposed to Table 1 of the RW Report, which assumed recruitment always occurred at the unfished level, regardless of stock size). Correcting the error in early recreational landings had little effect on estimated reference points.

The base run of the age-structured assessment model indicated that the stock is overfished ($\mathrm{SSB}_{2006}/\mathrm{MSST} = 0.031$) and that overfishing is occurring ($F_{2006}/F_{40\%} = 7.658$). These results were invariant to the 31 different configurations used in sensitivity runs of the AW Report, to the five additional sensitivity runs requested by the Review Panel, and to this revised run with corrected recreational landings. In addition, the same qualitative findings resulted from the age-aggregated surplus production model and its various sensitivity runs.

1.3 Revised projections

This section describes revised projections where population parameter estimates come from the assessment model with corrected recreational landings. It also updates projections to be consistent with recommendations of the SEDAR-15 Review Panel.

1.3.1 Revisions

The methods of projection, initialization, and inclusion of stochasticity were identical to those described in the AW Report. Revisions were threefold. First, parameter estimates used in the projection came from the revised assessment with corrected recreational landings, with the exception of the estimate of steepness. Second, the estimate of steepness was assumed to be $h = 0.68$ (Figure 1.37), for consistency with the Review Panel's recommendation that $F_{40\%}$ is a proxy for F_{MSY}, and so that projections are consistent with the $F_{40\%}$ reference points. Third, the rebuilding time frame was based on achieving at least a 50% probability of stock recovery to $\mathrm{SSB}_{F_{40\%}}$ under $F = 0$ using $n = 2000$ Monte Carlo replications (previously, recovery was based on SSB of the deterministic projection). These revisions led to an increase in the allowable recovery time from 34 to 49 years.

1.3.2 Projection scenarios

Several constant-F projection scenarios were considered:

- Scenario R1: $F = 0$
- Scenario R2: $F = F_{40\%}$
- Scenario R3: $F = 65\%F_{40\%}$
- Scenario R4: $F = 75\%F_{40\%}$
- Scenario R5: $F = 85\%F_{40\%}$

In addition, several discard-only projections were considered. The discard-only projections included the following scenarios:

- Scenario R6: $F = F_{\text{current}}$ excluding commercial diving, but all fish caught were released and subjected to release mortality rates used in the assessment (0.9 in the commercial sector and 0.4 in the headboat and recreational sectors)
- Scenario R7: $F = F_{40\%}$, but all fish caught were released and subjected to release mortality rates used in the assessment (0.9 in the commercial sector and 0.4 in the headboat and recreational sectors)
- Scenario R8: $F = 65\%F_{40\%}$, but all fish caught were released and subjected to release mortality rates used in the assessment (0.9 in the commercial sector and 0.4 in the headboat and recreational sectors)
- Scenario R9: $F = 75\%F_{40\%}$, but all fish caught were released and subjected to release mortality rates used in the assessment (0.9 in the commercial sector and 0.4 in the headboat and recreational sectors)
- Scenario R10: $F = 85\%F_{40\%}$, but all fish caught were released and subjected to release mortality rates used in the assessment (0.9 in the commercial sector and 0.4 in the headboat and recreational sectors)

When interpreting the discard-only projections, one should keep in mind that the distribution of full F among the various fisheries is different from that in the assessment, which may lead to some inconsistency between projections and benchmarks from the assessment (e.g., fishing at $F_{40\%}$ may lead to an equilibrium stock size other than $\text{SSB}_{F_{40\%}}$).

1.3.3 Projection results

Projection scenario R1, in which $F = 0$, predicted at least a 50% probability of recovery in 2035 (Figure 1.44, Table 1.14). That duration plus the 20-year generation time (§III(2)) defined the rebuilding time frame such that recovery occurs by the end of 2055. Thus, all remaining projections were run through the year 2055.

Projection scenario R2, in which $F = F_{40\%}$, predicted the stock to begin, but not achieve, recovery by 2055 (Figure 1.45, Table 1.15). If F is reduced to 65% or 75% of $F_{40\%}$, as in scenarios R3 and R4, respectively, the stock was predicted to recover within the rebuilding time frame (Figures 1.46–1.47, Tables 1.16–1.17). However, full stock recovery was not predicted if F is reduced to 85% of $F_{40\%}$, as in scenario R5 (Figure 1.48, Table 1.18).

Discard-only projections predicted that, under $F = F_{\text{current}}$ (minus commercial diving), disallowing the retention of red snapper would not be sufficient to rebuild the stock (Figure 1.49, Table 1.19). These results suggest that to rebuild the stock, total catches of red snapper will need to be reduced, not just landings. The stock was predicted to recover in discard-only projections R7, R8, R9, and R10, with F reduced to $F_{40\%}$, 65% of $F_{40\%}$, 75% of $F_{40\%}$, and 85% of $F_{40\%}$, respectively (Figures 1.50– 1.53, Tables 1.20–1.23).

1.3.4 Comments on Projections

As usual, projections should be interpreted in light of the model assumptions and key aspects of the data. Some major considerations are the following:

- Initial abundance at age of the projections were based on estimates from the assessment. If those estimates are inaccurate, rebuilding will likely be affected.
- Fisheries were assumed to continue fishing at their estimated current proportions of total effort, using the estimated current selectivity patterns. New management regulations that alter those proportions or selectivities would likely affect rebuilding.
- The projections assumed no change in the selectivity applied to discards. As recovery generally begins with the smallest size classes, management action may be needed to meet that assumption.
- The projections assumed that the estimated spawner-recruit relationship applies in the future and that past residuals represent future uncertainty in recruitment. If changes in environmental or ecological conditions affect recruitment or life-history characteristics, rebuilding may be affected.
- Discard-only projections tacitly assumed that any individual fish would be caught only once per year. To the extent that this assumption is violated, discard-only projections may overestimate the velocity of recovery.
- Discard-only projections allocated sources of mortality in different proportions than those used in computing reference points. Thus discard-only projections are not consistent with reference points, in the sense that fishing at $F_{40\%}$ may lead to an equilibrium stock size other than $\mathrm{SSB}_{F_{40\%}}$.

1.3.5 Tables

Table 1.1. Red snapper: Estimated time series of landings (1000 lb) for commercial handline (L.c.hal), commercial diving (L.c.dv), headboat(L.hb), and general recreational (L.rec). General recreational includes headboat prior to 1972.

Year	L.c.hal	L.c.dv	L.hb	L.rec	Total
1945	240.87	.	.	.	240.87
1946	262.62	.	.	.	262.62
1947	284.36	.	.	292.44	576.80
1948	306.10	.	.	584.88	890.99
1949	327.84	.	.	877.32	1205.16
1950	349.59	.	.	1169.75	1519.34
1951	498.58	.	.	1462.18	1960.77
1952	374.76	.	.	1754.61	2129.37
1953	389.08	.	.	2047.02	2436.10
1954	576.87	.	.	2339.43	2916.31
1955	479.60	.	.	2631.84	3111.44
1956	469.98	.	.	2924.24	3394.22
1957	843.02	.	.	3216.63	4059.64
1958	594.66	.	.	3509.01	4103.67
1959	638.33	.	.	3801.38	4439.70
1960	652.29	.	.	4093.74	4746.02
1961	770.40	.	.	3662.58	4432.98
1962	575.91	.	.	3231.41	3807.32
1963	438.52	.	.	2800.22	3238.75
1964	486.31	.	.	2369.06	2855.37
1965	571.40	.	.	1937.88	2509.27
1966	643.46	.	.	2686.56	3330.02
1967	843.62	.	.	3435.24	4278.86
1968	938.69	.	.	4183.96	5122.66
1969	610.98	.	.	4932.76	5543.74
1970	559.14	.	.	5681.72	6240.85
1971	478.87	.	.	5191.17	5670.04
1972	414.29	.	91.92	4608.65	5114.85
1973	340.16	.	117.31	4092.66	4550.12
1974	555.20	.	77.06	3642.53	4274.78
1975	650.92	.	83.52	3145.40	3879.84
1976	547.38	.	109.28	2631.11	3287.77
1977	579.15	.	59.93	2173.90	2812.98
1978	544.96	.	62.98	1664.41	2272.34
1979	380.73	.	54.13	1207.13	1641.99
1980	352.90	.	54.66	721.87	1129.42
1981	347.26	.	116.60	283.78	747.64
1982	286.26	.	98.05	251.61	635.92
1983	290.10	.	74.01	335.49	699.61
1984	230.64	1.21	81.43	536.37	849.64
1985	223.03	2.27	132.10	568.19	925.59
1986	200.18	0.55	54.38	439.32	694.43
1987	172.78	0.42	81.83	246.47	501.50
1988	151.94	0.29	130.03	279.73	562.00
1989	242.34	1.10	70.78	304.26	618.48
1990	201.56	1.66	65.67	272.29	541.19
1991	125.38	5.27	72.02	216.35	419.00
1992	87.53	9.41	28.91	259.22	385.06
1993	206.32	5.74	42.72	258.22	513.00
1994	175.63	12.98	53.42	118.02	360.05
1995	164.06	10.16	57.47	110.01	341.71
1996	129.97	6.18	46.23	116.83	299.21
1997	98.87	7.49	51.20	113.56	271.12
1998	78.74	7.99	26.85	193.64	307.21
1999	78.95	9.88	43.56	275.98	408.38
2000	89.22	11.36	49.40	355.77	505.75
2001	169.88	19.97	68.39	364.32	622.56
2002	158.83	22.88	70.80	305.58	558.09
2003	117.18	17.27	41.35	299.24	475.05
2004	147.47	19.22	80.35	273.79	520.83
2005	115.01	9.41	58.70	275.28	458.41
2006	79.08	4.10	41.44	274.29	398.90

Table 1.2. Red snapper: Estimated time series of discard mortalities (1000 fish) for commercial handline (D.c.hal), headboat(D.hb), and general recreational (D.rec). Discards were assumed zero prior to implementation of regulations in 1984.

Year	D.c.hal	D.hb	D.rec	Total
1984	6.76	3.29	43.56	53.61
1985	3.34	2.77	29.11	35.22
1986	6.38	2.42	26.35	35.15
1987	13.81	8.17	20.64	42.62
1988	6.82	6.60	23.24	36.66
1989	2.52	1.43	9.11	13.06
1990	27.41	10.46	7.47	45.34
1991	3.70	2.15	7.19	13.04
1992	16.46	1.30	19.96	37.73
1993	16.08	9.84	21.88	47.79
1994	22.02	7.43	24.73	54.17
1995	21.74	11.32	17.97	51.03
1996	29.03	4.35	11.28	44.66
1997	30.35	1.37	8.15	39.88
1998	22.97	8.26	29.45	60.68
1999	20.66	7.31	62.20	90.18
2000	19.63	9.88	86.36	115.87
2001	21.31	18.92	79.91	120.15
2002	19.92	16.16	66.54	102.61
2003	17.04	10.24	63.92	91.20
2004	14.23	17.54	62.96	94.74
2005	13.75	15.87	60.14	89.76
2006	15.22	11.48	52.21	78.91

Table 1.3. Red snapper: Estimated abundance at age (1000 fish) at start of year

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1945	478.6	380.1	325.0	286.7	257.2	233.2	212.9	195.3	179.7	165.8	153.3	141.9	131.5	122.0	113.2	105.1	97.6	90.7	84.3	1116.4
1946	701.7	379.9	323.8	285.6	256.2	232.3	212.1	194.5	179.0	165.2	152.7	141.3	131.0	121.5	112.7	104.7	97.3	90.4	84.0	1112.0
1947	701.6	556.9	323.4	284.4	255.2	231.3	211.1	193.7	178.2	164.5	152.0	140.7	130.4	121.0	112.3	104.2	96.8	90.0	83.6	1107.3
1948	701.5	556.3	471.7	282.7	252.8	229.2	209.2	191.9	176.6	162.9	150.6	139.4	129.2	119.8	111.2	103.3	95.9	89.1	82.9	1097.0
1949	701.5	555.8	468.8	410.1	249.9	225.9	206.2	189.1	174.0	160.6	148.4	137.4	127.3	118.1	109.6	101.8	94.6	87.9	81.7	1081.2
1950	701.4	555.2	465.9	405.5	360.7	222.2	202.1	185.4	170.6	157.4	145.5	134.7	124.9	115.8	107.5	99.8	92.7	86.1	80.1	1060.0
1951	701.3	554.7	463.0	400.9	354.8	319.0	197.8	180.8	166.4	153.5	141.9	131.4	121.8	112.9	104.8	97.3	90.4	84.0	78.1	1033.8
1952	701.2	553.9	459.1	395.3	348.1	311.3	281.8	175.6	161.1	148.6	137.4	127.2	117.9	109.3	101.5	94.2	87.5	81.3	75.6	1000.6
1953	701.1	553.5	456.9	390.7	342.2	304.4	274.2	249.4	155.9	143.4	132.5	122.7	113.7	105.5	97.9	90.9	84.4	78.4	72.9	965.3
1954	700.8	552.8	453.9	386.6	336.2	297.5	266.5	241.2	220.1	138.0	127.1	117.7	109.1	101.1	93.9	87.2	81.0	75.2	69.9	925.9
1955	700.6	551.7	449.1	380.5	329.6	289.6	258.1	232.3	210.9	193.0	121.2	111.8	103.6	96.1	89.2	82.8	76.9	71.5	66.5	879.8
1956	700.2	551.0	446.1	374.6	322.8	282.5	249.9	223.8	202.2	184.0	168.7	106.1	98.0	90.9	84.3	78.3	72.8	67.6	62.8	831.9
1957	699.7	550.1	442.4	369.5	315.6	274.7	242.1	215.3	193.4	175.1	159.7	146.6	92.3	85.3	79.2	73.5	68.3	63.5	59.0	781.0
1958	699.1	548.3	434.8	360.8	306.4	264.5	231.8	205.3	183.1	165.0	149.7	136.7	125.6	79.1	73.2	68.0	63.1	58.7	54.5	722.0
1959	698.4	547.3	431.3	352.9	297.8	255.6	222.1	195.6	173.8	155.5	140.3	127.5	116.5	107.2	67.6	62.5	58.1	54.0	50.2	664.3
1960	697.5	545.6	425.5	345.9	287.8	245.4	212.1	185.2	163.7	145.8	130.6	118.1	107.4	98.2	90.4	57.0	52.8	49.1	45.6	603.9
1961	696.4	543.7	418.5	336.7	278.4	234.1	201.0	174.5	152.9	135.5	120.9	108.5	98.1	89.3	81.8	75.3	47.5	44.0	40.9	541.7
1962	695.2	542.9	417.1	331.2	271.0	226.4	191.7	165.4	144.1	126.6	112.4	100.4	90.2	81.7	74.4	68.1	62.8	39.6	36.7	486.0
1963	694.1	542.9	420.5	333.3	269.2	222.6	187.2	159.3	137.9	120.4	106.0	94.2	84.3	75.8	68.7	62.6	57.4	52.8	33.4	440.3
1964	693.3	543.0	425.2	339.8	274.0	223.6	186.1	157.3	134.3	116.5	102.0	89.9	80.0	71.6	64.4	58.4	53.3	48.8	45.0	403.5
1965	692.7	543.1	428.8	346.4	281.6	229.4	188.5	157.7	133.7	114.4	99.5	87.2	76.9	68.5	61.4	55.3	50.1	45.7	41.9	385.1
1966	692.3	543.4	432.5	352.3	289.5	237.8	195.0	161.0	135.2	114.9	98.5	85.8	75.3	66.5	59.2	53.1	47.8	43.4	39.6	369.8
1967	691.9	540.8	422.0	346.5	287.1	238.3	197.1	162.5	134.6	113.3	96.5	82.8	72.2	63.4	56.0	50.0	44.8	40.4	36.6	345.6
1968	690.8	537.3	406.2	327.0	273.1	228.6	191.1	158.8	131.3	109.1	92.0	78.4	67.4	58.8	51.7	45.7	40.8	36.6	32.9	312.2
1969	688.9	533.0	388.4	302.9	248.0	209.3	176.4	148.2	123.5	102.4	85.2	72.0	61.5	52.9	46.1	40.6	35.9	32.0	28.7	271.2
1970	686.1	528.3	371.9	279.6	221.8	183.5	155.9	132.0	111.3	93.0	77.3	64.4	54.4	46.5	40.0	35.0	30.8	27.2	24.3	227.6
1971	681.6	520.4	346.2	251.5	192.3	154.1	128.4	109.6	93.1	78.7	65.9	54.8	45.7	38.7	33.1	28.5	24.9	21.9	19.4	179.5
1972	675.2	514.9	332.8	228.4	168.7	130.3	105.2	88.0	75.4	64.3	54.4	45.6	38.0	31.7	26.8	23.0	19.8	17.3	15.2	138.3
1973	667.2	507.6	320.2	213.5	149.0	111.2	86.5	70.1	58.9	50.6	43.2	36.6	30.7	25.6	21.4	18.1	15.5	13.4	11.7	103.8
1974	461.3	499.2	306.9	199.7	135.4	95.5	71.8	56.1	45.7	38.4	33.1	28.3	24.0	20.2	16.8	14.1	11.9	10.2	8.8	75.9
1975	399.2	341.6	284.6	180.5	119.5	81.9	58.1	43.9	34.4	28.1	23.7	20.4	17.5	14.8	12.5	10.4	8.7	7.4	6.3	52.5
1976	467.7	291.6	179.8	154.5	99.7	66.7	46.0	32.8	24.9	19.6	16.0	13.5	11.6	10.0	8.5	7.1	6.0	5.0	4.2	33.7
1977	609.6	336.0	139.4	88.7	77.5	50.5	34.0	23.6	16.9	12.8	10.1	8.3	7.0	6.0	5.2	4.4	3.7	3.1	2.6	19.7
1978	668.1	425.0	135.0	57.8	37.4	33.0	21.7	14.7	10.2	7.3	5.6	4.4	3.6	3.0	2.6	2.3	1.9	1.6	1.4	9.7
1979	379.3	448.7	137.5	45.0	19.6	12.8	11.4	7.5	5.1	3.6	2.6	2.0	1.5	1.3	1.1	0.9	0.8	0.7	0.6	3.9
1980	703.4	250.1	130.3	41.2	13.7	6.0	4.0	3.5	2.3	1.6	1.1	0.8	0.6	0.5	0.4	0.3	0.3	0.3	0.2	1.4
1981	153.9	456.1	65.9	35.4	11.4	3.8	1.7	1.1	1.0	0.7	0.5	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.5
1982	310.3	107.7	186.6	27.8	15.2	4.9	1.7	0.7	0.5	0.4	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.2
1983	556.8	218.2	45.4	81.2	12.3	6.8	2.2	0.8	0.3	0.2	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1
1984	752.9	384.8	83.2	17.9	32.5	5.0	2.8	0.9	0.3	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1

Table 1.3. (continued)

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1985	212.9	462.8	144.0	27.8	6.1	11.1	1.7	1.0	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	281.1	131.4	173.3	49.8	9.7	2.1	4.0	0.6	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	352.0	168.4	49.9	68.5	20.0	4.0	0.9	1.6	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1988	281.0	228.6	75.3	22.8	31.8	9.4	1.9	0.4	0.8	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1989	283.7	182.6	98.0	32.7	10.1	14.2	4.2	0.8	0.2	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	247.7	188.9	82.0	37.1	12.6	3.9	5.5	1.7	0.3	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1991	334.1	153.7	74.7	32.5	14.9	5.1	1.6	2.3	0.7	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	169.2	230.1	78.7	35.8	15.7	7.3	2.5	0.8	1.1	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1993	130.4	124.3	137.0	41.5	17.1	7.5	3.5	1.2	0.4	0.5	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	127.6	91.2	67.7	64.1	15.8	6.5	2.9	1.3	0.5	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	129.3	84.1	48.6	34.8	30.6	7.6	3.1	1.4	0.7	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	177.7	84.6	43.8	24.2	16.1	14.3	3.5	1.5	0.7	0.3	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	184.5	121.5	47.0	22.5	11.1	7.5	6.6	1.7	0.7	0.3	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	394.0	131.3	73.3	25.3	10.5	5.2	3.5	3.1	0.8	0.3	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	454.3	279.4	73.5	37.2	12.0	5.0	2.5	1.7	1.5	0.4	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	365.5	320.8	151.4	35.3	16.6	5.4	2.3	1.1	0.8	0.7	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	253.7	252.2	166.7	72.0	16.3	7.7	2.5	1.1	0.5	0.4	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2002	302.3	168.1	122.7	75.0	30.9	7.0	3.4	1.1	0.5	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	212.7	200.0	83.5	58.1	35.3	14.7	3.4	1.6	0.5	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2004	259.5	141.1	99.9	41.4	30.6	18.8	7.9	1.8	0.9	0.3	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2005	274.2	168.6	67.8	46.3	19.6	14.6	9.0	3.8	0.9	0.4	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2006	279.6	181.5	82.6	32.0	22.6	9.7	7.3	4.5	1.9	0.4	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2007	285.9	191.4	95.4	42.0	17.0	12.2	5.2	3.9	2.5	1.0	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 1.4. Red snapper: Estimated biomass at age (mt) at start of year

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1945	108.6	305.8	542.0	769.1	960.1	1104.5	1202.6	1259.4	1282.2	1278.4	1254.8	1217.0	1169.5	1116.0	1059.1	1000.9	942.7	885.5	830.1	11064.0
1946	159.2	305.6	539.9	766.2	956.3	1100.3	1197.9	1254.5	1277.2	1273.4	1249.9	1212.2	1165.0	1111.7	1055.0	997.0	939.0	882.1	826.8	11021.1
1947	159.2	447.9	539.4	762.9	952.3	1095.6	1192.8	1249.2	1271.8	1268.0	1244.6	1207.1	1160.0	1106.9	1050.5	992.7	935.0	878.3	823.3	10974.2
1948	159.1	447.5	786.6	758.2	943.4	1085.4	1181.7	1237.5	1259.9	1256.2	1233.0	1195.8	1149.2	1096.6	1040.7	983.5	926.3	870.1	815.6	10871.9
1949	159.1	447.1	781.8	1100.1	932.8	1069.7	1164.6	1219.7	1241.8	1238.1	1215.2	1178.6	1132.7	1080.8	1025.7	969.3	912.9	857.6	803.9	10715.1
1950	159.1	446.6	777.0	1087.7	1346.4	1052.2	1141.9	1195.8	1217.5	1213.9	1191.5	1155.6	1110.5	1059.7	1005.7	950.4	895.1	840.8	788.2	10505.8
1951	159.1	446.2	772.1	1075.3	1324.1	1510.7	1117.2	1166.3	1187.4	1183.9	1162.0	1127.0	1083.1	1033.5	980.8	926.9	873.0	820.0	768.7	10246.0
1952	159.1	445.6	765.5	1060.5	1299.1	1474.5	1591.9	1132.5	1149.3	1145.9	1124.7	1090.8	1048.3	1000.3	949.3	897.1	844.9	793.7	744.0	9917.0
1953	159.0	445.2	761.9	1048.0	1277.1	1441.9	1548.7	1608.3	1112.3	1105.4	1085.0	1052.3	1011.3	965.0	915.8	865.5	815.1	765.7	717.8	9567.2
1954	159.0	444.7	757.0	1037.0	1254.6	1409.2	1505.7	1555.6	1570.5	1063.7	1040.7	1009.3	970.0	925.6	878.4	830.1	781.8	734.4	688.4	9176.1
1955	158.9	443.8	749.0	1020.6	1230.0	1371.6	1457.8	1498.3	1504.9	1487.9	992.1	959.1	921.7	879.5	834.7	788.8	742.9	697.8	654.1	8719.3
1956	158.8	443.3	743.9	1004.9	1204.6	1338.0	1412.0	1443.6	1442.4	1418.8	1380.9	909.8	871.5	831.6	789.2	745.8	702.4	659.8	618.5	8244.5
1957	158.7	442.5	737.7	991.1	1177.8	1301.2	1367.8	1388.4	1379.9	1350.3	1307.5	1257.5	820.9	780.8	741.0	700.2	659.5	619.5	580.7	7740.8
1958	158.6	441.0	725.1	967.8	1143.7	1252.6	1309.7	1324.2	1306.7	1271.9	1225.2	1172.3	1117.2	724.1	685.0	647.3	609.7	572.7	536.9	7156.0
1959	158.4	440.3	719.2	946.6	1111.3	1210.5	1254.7	1261.8	1240.3	1198.6	1148.5	1093.2	1036.4	980.7	632.2	595.5	560.9	526.9	493.9	6583.3
1960	158.2	438.9	709.5	927.8	1074.2	1162.3	1198.1	1194.5	1167.9	1124.2	1069.5	1012.6	955.1	899.1	846.1	543.1	509.9	479.0	449.0	5984.9
1961	158.0	437.4	697.9	903.2	1038.9	1108.6	1135.2	1125.5	1090.9	1044.5	989.8	930.5	873.0	817.5	765.4	717.3	458.9	429.7	402.8	5368.8
1962	157.7	436.7	695.6	888.6	1011.4	1072.3	1082.9	1066.6	1028.1	975.9	919.8	861.3	802.3	747.4	696.1	648.9	606.1	386.7	361.4	4816.8
1963	157.5	436.7	701.3	894.2	1004.9	1054.2	1057.7	1027.4	983.8	928.7	867.8	808.2	749.9	693.6	642.6	596.0	553.7	515.8	328.5	4363.9
1964	157.3	436.8	709.1	911.6	1022.5	1059.0	1051.5	1014.8	958.2	898.6	835.0	771.0	711.6	655.5	603.0	556.3	514.2	476.5	442.9	3998.6
1965	157.1	436.9	715.1	929.3	1051.0	1086.4	1064.9	1017.0	954.1	882.4	814.6	747.9	684.3	627.1	574.5	526.3	483.9	446.1	412.5	3816.4
1966	157.1	437.2	721.3	945.1	1080.4	1126.2	1101.7	1038.7	964.4	886.1	806.7	735.8	669.5	608.2	554.3	505.7	461.7	423.4	389.5	3664.7
1967	157.0	435.0	703.8	929.6	1071.4	1128.9	1113.5	1047.9	960.4	873.2	789.9	710.5	642.2	580.2	524.2	475.7	432.6	393.8	360.4	3425.6
1968	156.7	432.2	677.3	877.1	1019.2	1082.7	1079.5	1024.3	937.0	841.1	752.8	672.9	599.8	538.3	483.6	435.1	393.5	356.9	324.3	3093.9
1969	156.3	428.7	647.7	812.4	925.5	991.1	996.4	955.6	881.5	789.7	697.8	617.2	546.6	483.8	431.8	386.3	346.4	312.5	282.8	2688.1
1970	155.6	425.0	620.3	750.0	827.6	869.0	880.7	851.6	794.0	717.3	632.6	552.3	484.1	425.7	374.7	333.0	296.9	265.6	239.1	2255.8
1971	154.6	418.7	577.4	674.5	717.5	729.7	725.1	706.8	664.5	606.7	539.6	470.2	406.8	354.0	309.6	271.4	240.4	213.8	190.8	1778.9
1972	153.2	414.2	554.9	612.6	629.6	617.3	594.1	567.8	538.1	495.4	445.3	391.3	337.9	290.3	251.2	218.8	191.1	168.8	149.8	1370.3
1973	151.4	408.3	533.9	572.6	556.1	526.8	488.7	452.5	420.4	390.2	353.6	314.1	273.5	234.5	200.3	172.6	149.8	130.6	115.1	1028.5
1974	104.6	401.6	511.8	535.7	505.5	452.4	405.5	361.9	325.7	296.4	270.8	242.5	213.4	184.5	157.4	133.9	115.0	99.5	86.5	752.4
1975	90.6	274.8	474.6	484.3	445.9	387.8	328.4	283.2	245.7	216.6	194.0	175.1	155.4	135.8	116.8	99.2	84.1	72.0	62.2	520.5
1976	106.1	234.5	299.8	414.5	372.0	315.7	259.8	211.7	177.4	150.8	130.8	115.8	103.6	91.3	79.3	67.9	57.5	48.6	41.5	333.7
1977	138.3	270.3	232.4	237.8	289.2	239.3	192.2	152.1	120.5	98.9	82.7	70.9	62.2	55.3	48.4	41.9	35.8	30.2	25.5	195.2
1978	151.6	341.9	225.1	154.9	139.5	156.3	122.4	94.5	72.8	56.4	45.6	37.7	32.0	27.9	24.6	21.5	18.5	15.8	13.3	96.5
1979	86.0	361.0	229.3	120.8	73.2	60.7	64.4	48.5	36.4	27.4	21.0	16.7	13.7	11.6	10.0	8.8	7.7	6.6	5.6	38.6
1980	159.6	201.1	217.3	110.5	51.2	28.6	22.4	22.9	16.8	12.3	9.1	6.9	5.5	4.4	3.7	3.2	2.8	2.4	2.1	14.0
1981	34.9	366.9	110.0	95.1	42.5	18.2	9.6	7.2	7.2	5.2	3.7	2.7	2.0	1.6	1.3	1.1	0.9	0.8	0.7	4.6
1982	70.4	86.6	311.1	74.7	56.8	23.4	9.5	4.8	3.5	3.4	2.4	1.7	1.3	0.9	0.7	0.6	0.5	0.4	0.4	2.4
1983	126.3	175.5	75.7	217.8	46.0	32.2	12.6	4.9	2.4	1.7	1.7	1.2	0.8	0.6	0.4	0.3	0.3	0.2	0.2	1.3
1984	170.8	309.5	138.8	47.9	121.3	23.6	15.7	5.9	2.2	1.1	0.8	0.7	0.5	0.3	0.3	0.2	0.1	0.1	0.1	0.6
1985	48.3	372.2	240.2	74.6	22.6	52.7	9.7	6.2	2.3	0.8	0.4	0.3	0.3	0.2	0.1	0.1	0.1	0.1	0.0	0.2
1986	63.8	105.7	289.1	133.7	36.4	10.2	22.4	4.0	2.5	0.9	0.3	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.1
1987	79.9	135.4	83.3	183.7	74.7	18.7	5.0	10.5	1.8	1.1	0.4	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1
1988	63.7	183.9	125.6	61.1	118.6	44.4	10.5	2.7	5.5	0.9	0.6	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1989	64.4	146.9	163.5	87.7	37.5	67.1	23.8	5.4	1.3	2.7	0.5	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	56.2	152.0	136.7	99.4	46.8	18.5	31.2	10.7	2.4	0.6	1.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1991	75.8	123.6	124.6	87.1	55.6	24.1	9.0	14.7	4.9	1.1	0.3	0.5	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	38.4	185.1	131.2	96.0	58.6	34.4	14.1	5.1	8.0	2.6	0.6	0.1	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1993	29.6	100.0	228.5	111.4	63.7	35.6	19.8	7.8	2.7	4.2	1.4	0.3	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1994	28.9	73.4	113.0	171.8	58.8	30.6	16.2	8.6	3.3	1.1	1.7	0.6	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0
1995	29.3	67.7	81.0	93.3	114.3	35.8	17.6	9.0	4.7	1.8	0.6	0.9	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1996	40.3	68.1	73.1	64.8	60.3	67.6	20.0	9.5	4.7	2.4	0.9	0.3	0.5	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1997	41.9	97.8	78.5	60.3	41.5	35.3	37.5	10.7	4.9	2.4	1.2	0.4	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0
1998	89.4	105.6	122.3	67.9	39.1	24.6	19.8	20.2	5.6	2.5	1.2	0.6	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0
1999	103.1	224.8	122.5	99.9	44.7	23.6	14.0	10.9	10.8	2.9	1.3	0.6	0.3	0.1	0.0	0.1	0.0	0.0	0.0	0.0
2000	82.9	258.1	252.4	94.7	62.0	25.4	12.7	7.3	5.5	5.3	1.4	0.7	0.3	0.2	0.1	0.0	0.0	0.0	0.0	0.0
2001	57.6	202.9	278.0	193.1	60.7	36.5	14.2	6.8	3.8	2.8	2.7	0.7	0.3	0.2	0.1	0.0	0.0	0.0	0.0	0.0
2002	68.6	135.2	204.6	201.1	115.5	33.3	18.9	7.1	3.3	1.8	1.3	1.3	0.3	0.2	0.1	0.0	0.0	0.0	0.0	0.0
2003	48.3	160.9	139.3	155.8	131.9	69.5	18.9	10.4	3.8	1.7	0.9	0.7	0.7	0.2	0.1	0.0	0.0	0.0	0.0	0.0
2004	58.9	113.5	166.6	111.1	114.2	89.0	44.4	11.6	6.2	2.2	1.0	0.5	0.4	0.4	0.1	0.0	0.0	0.0	0.0	0.0
2005	62.2	135.6	113.1	124.1	73.2	69.1	51.0	24.4	6.2	3.2	1.2	0.5	0.3	0.2	0.2	0.1	0.0	0.0	0.0	0.0
2006	63.4	146.0	137.8	85.9	84.5	45.9	41.0	29.1	13.6	3.4	1.8	0.6	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.0
2007	64.8	154.0	159.0	112.6	63.5	57.7	29.6	25.5	17.6	8.0	2.0	1.0	0.4	0.2	0.1	0.1	0.1	0.0	0.0	0.0

Table 1.5. Red snapper: Estimated biomass at age (1000 lb) at start of year

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1945	239.4	674.1	1195.0	1695.7	2116.6	2435.1	2651.2	2776.5	2826.7	2818.4	2766.3	2683.0	2578.4	2460.4	2335.0	2206.5	2078.2	1952.2	1830.0	24392.1
1946	350.9	673.7	1190.3	1689.1	2108.4	2425.6	2640.9	2765.7	2815.8	2807.4	2755.6	2672.5	2568.4	2450.8	2325.9	2198.0	2070.1	1944.6	1822.9	24297.3
1947	350.9	987.5	1189.1	1681.9	2099.4	2415.3	2629.7	2754.0	2803.8	2795.5	2743.9	2661.2	2557.5	2440.4	2316.0	2188.6	2061.3	1936.3	1815.1	24194.1
1948	350.9	986.6	1734.2	1671.6	2079.8	2392.8	2605.2	2728.3	2777.6	2769.4	2718.3	2636.4	2533.6	2417.6	2294.4	2168.2	2042.1	1918.3	1798.2	23968.4
1949	350.8	985.6	1723.6	2425.3	2056.5	2358.3	2567.6	2688.9	2737.6	2729.5	2679.1	2598.3	2497.1	2382.8	2261.3	2136.9	2012.7	1890.6	1772.3	23622.8
1950	350.8	984.7	1713.0	2398.0	2968.2	2319.7	2517.4	2636.4	2684.1	2676.2	2626.7	2547.6	2448.3	2336.2	2217.2	2095.2	1973.3	1853.7	1737.6	23161.3
1951	350.8	983.7	1702.3	2370.6	2919.2	3330.5	2463.1	2571.2	2617.7	2610.0	2561.8	2484.6	2387.8	2278.4	2162.3	2043.4	1924.5	1807.8	1694.7	22588.6
1952	350.7	982.3	1687.7	2338.0	2864.1	3250.7	3509.6	2496.7	2533.7	2526.2	2479.5	2404.8	2311.1	2205.3	2092.9	1977.8	1862.7	1749.8	1640.2	21863.3
1953	350.6	981.6	1679.8	2310.4	2815.4	3178.9	3414.3	3545.8	2452.2	2437.1	2392.1	2320.0	2229.6	2127.5	2019.1	1908.0	1797.0	1688.1	1582.4	21092.1
1954	350.5	980.3	1668.8	2286.2	2766.0	3106.7	3319.5	3429.5	3462.4	2345.0	2294.3	2225.1	2138.4	2040.5	1936.5	1830.0	1723.6	1619.1	1517.7	20229.8
1955	350.4	978.5	1651.2	2250.1	2711.6	3023.8	3214.0	3303.3	3317.8	3280.3	2187.1	2114.4	2032.0	1938.9	1840.1	1738.9	1637.8	1538.5	1442.1	19222.7
1956	350.2	977.2	1640.0	2215.5	2655.8	2949.8	3112.9	3182.6	3180.0	3127.8	3044.4	2005.7	1921.3	1833.4	1739.9	1644.2	1548.6	1454.7	1363.6	18176.0
1957	350.0	975.5	1626.4	2185.0	2596.5	2868.7	3015.4	3060.8	3042.2	2976.8	2882.5	2772.2	1809.7	1721.3	1633.6	1543.8	1454.0	1365.8	1280.3	17065.5
1958	349.7	972.3	1598.6	2133.5	2521.3	2761.6	2887.3	2919.3	2880.8	2804.1	2701.1	2584.4	2462.9	1596.4	1510.2	1427.1	1344.1	1262.6	1183.6	15776.2
1959	349.3	970.7	1585.6	2086.9	2450.1	2668.6	2766.1	2781.8	2734.3	2642.4	2532.0	2410.1	2284.9	2162.1	1393.8	1312.9	1236.6	1161.6	1088.9	14513.8
1960	348.9	967.7	1564.2	2045.5	2368.1	2562.5	2641.3	2633.4	2574.7	2478.4	2357.9	2232.5	2105.6	1982.1	1865.4	1197.4	1124.2	1056.0	989.9	13194.4
1961	348.3	964.2	1538.7	1991.1	2290.4	2444.0	2502.7	2481.4	2405.1	2302.8	2182.2	2051.4	1924.6	1802.4	1687.5	1581.3	1011.7	947.3	888.0	11836.2
1962	347.7	962.8	1533.5	1958.9	2229.9	2364.1	2387.3	2351.5	2266.6	2151.4	2027.9	1898.8	1768.7	1647.7	1534.7	1430.7	1336.2	852.6	796.7	10619.2
1963	347.2	962.7	1546.1	1971.4	2215.3	2324.2	2331.9	2265.1	2169.0	2047.4	1913.2	1781.9	1653.3	1529.1	1416.7	1313.9	1220.8	1137.2	724.1	9620.8
1964	346.7	963.0	1563.3	2009.8	2254.3	2334.8	2318.1	2237.2	2112.5	1981.1	1840.9	1699.8	1568.7	1445.2	1329.4	1226.4	1133.6	1050.5	976.5	8815.3
1965	346.4	963.2	1576.5	2048.7	2316.9	2395.2	2347.6	2242.0	2103.5	1945.3	1795.8	1648.9	1508.6	1382.4	1266.7	1160.2	1066.8	983.5	909.5	8413.8
1966	346.3	963.8	1590.2	2083.7	2381.9	2482.8	2428.9	2289.9	2126.1	1953.5	1778.4	1622.2	1476.0	1340.8	1222.0	1114.9	1017.8	933.4	858.7	8079.3
1967	346.0	959.1	1551.5	2049.4	2362.1	2488.7	2454.9	2310.1	2117.3	1925.2	1741.3	1566.4	1415.9	1279.1	1155.7	1048.8	953.6	868.3	794.6	7552.1
1968	345.5	952.9	1493.3	1933.8	2246.9	2387.0	2379.9	2258.2	2065.8	1854.3	1659.7	1483.4	1322.2	1186.7	1066.2	959.2	867.6	786.8	714.9	6820.8
1969	344.6	945.2	1427.8	1791.1	2040.3	2185.1	2196.7	2106.8	1943.3	1741.0	1538.4	1360.6	1205.0	1066.5	952.0	851.7	763.7	688.9	623.5	5926.3
1970	343.1	937.0	1367.4	1653.6	1824.6	1915.8	1941.5	1877.5	1750.5	1581.3	1394.7	1217.7	1067.2	938.4	826.0	734.2	654.7	585.5	527.0	4973.2
1971	340.9	923.0	1272.9	1487.1	1581.9	1608.8	1598.5	1558.3	1465.0	1337.6	1189.5	1036.6	896.9	780.4	682.5	598.2	529.9	471.3	420.6	3921.8
1972	337.7	913.1	1223.4	1350.6	1388.0	1360.8	1309.7	1251.8	1186.3	1092.2	981.7	862.7	744.9	639.9	553.8	482.3	421.3	372.2	330.4	3021.0
1973	333.7	900.2	1177.1	1262.5	1226.0	1161.3	1077.5	997.5	926.8	860.2	779.6	692.4	602.9	516.9	441.7	380.6	330.3	287.8	253.8	2267.5
1974	230.7	885.3	1128.4	1181.1	1114.3	997.4	894.1	797.9	718.1	653.4	597.0	534.7	470.6	406.8	346.9	295.1	253.5	219.4	190.8	1658.8
1975	199.6	605.9	1046.4	1067.7	983.0	854.8	724.1	624.3	541.7	477.4	427.7	386.1	342.6	299.4	257.4	218.6	185.3	158.8	137.2	1147.5
1976	233.9	517.1	660.9	913.8	820.2	696.0	572.8	466.7	391.2	332.4	288.4	255.3	228.3	201.2	174.9	149.7	126.7	107.1	91.6	735.6
1977	304.9	595.9	512.4	524.3	637.7	527.5	423.6	335.3	265.6	218.0	182.4	156.4	137.1	121.8	106.7	92.4	78.8	66.5	56.2	430.3
1978	334.1	753.7	496.2	341.6	307.5	344.7	269.8	208.4	160.4	124.4	100.5	83.1	70.6	61.5	54.3	47.4	40.9	34.8	29.3	212.6
1979	189.7	795.8	505.4	266.4	161.3	133.8	141.9	106.9	80.3	60.5	46.2	36.9	30.2	25.5	22.1	19.4	16.9	14.5	12.3	85.2
1980	351.8	443.4	479.0	243.5	112.9	63.0	49.5	50.5	36.9	27.2	20.2	15.2	12.0	9.8	8.2	7.1	6.2	5.4	4.6	30.8
1981	77.0	808.9	242.4	209.6	93.7	40.1	21.2	16.0	15.8	11.4	8.2	6.0	4.5	3.5	2.9	2.4	2.1	1.8	1.6	10.2
1982	155.2	190.9	686.0	164.6	125.2	51.6	20.9	10.6	7.8	7.6	5.3	3.8	2.8	2.1	1.6	1.3	1.1	0.9	0.8	5.2
1983	278.5	387.0	166.9	480.1	101.3	71.0	27.7	10.8	5.3	3.8	3.7	2.6	1.8	1.3	1.0	0.7	0.6	0.5	0.4	2.8
1984	376.5	682.3	306.0	105.7	267.4	52.0	34.5	12.9	4.9	2.4	1.7	1.6	1.1	0.8	0.6	0.4	0.3	0.3	0.2	1.3
1985	106.5	820.7	529.5	164.5	49.9	116.2	21.4	13.7	5.0	1.8	0.9	0.6	0.6	0.4	0.3	0.2	0.1	0.1	0.1	0.5
1986	140.6	233.1	637.3	294.7	80.2	22.4	49.4	8.7	5.4	1.9	0.7	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.2
1987	176.1	298.6	183.6	405.0	164.7	41.3	10.9	23.2	4.0	2.4	0.9	0.3	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1
1988	140.5	405.3	276.9	134.7	261.4	97.9	23.2	5.9	12.2	2.1	1.2	0.4	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.1
1989	141.9	323.8	360.5	193.4	82.8	148.0	52.5	12.0	3.0	6.0	1.0	0.6	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1990	123.9	335.0	301.3	219.1	103.3	40.7	68.9	23.5	5.2	1.3	2.5	0.4	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1991	167.1	272.5	274.8	192.1	122.6	53.2	19.9	32.3	10.7	2.3	0.6	1.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1992	84.6	408.0	289.3	211.6	129.1	75.8	31.1	11.2	17.7	5.7	1.2	0.3	0.6	0.1	0.1	0.0	0.0	0.0	0.0	0.0
1993	65.2	220.4	503.7	245.5	140.4	78.4	43.6	17.2	6.0	9.3	3.0	0.6	0.2	0.3	0.0	0.0	0.0	0.0	0.0	0.0
1994	63.8	161.8	249.1	378.9	129.6	67.5	35.7	19.1	7.3	2.5	3.8	1.2	0.3	0.1	0.1	0.0	0.0	0.0	0.0	0.0
1995	64.6	149.2	178.6	205.7	252.1	78.9	38.9	19.8	10.3	3.9	1.3	2.0	0.6	0.1	0.0	0.1	0.0	0.0	0.0	0.0
1996	88.9	150.0	161.2	142.8	132.9	149.0	44.1	20.9	10.3	5.3	2.0	0.7	1.0	0.3	0.1	0.0	0.0	0.0	0.0	0.0
1997	92.3	215.5	173.0	133.0	91.5	77.9	82.6	23.5	10.8	5.3	2.7	1.0	0.3	0.5	0.2	0.0	0.0	0.0	0.0	0.0
1998	197.1	232.8	269.6	149.7	86.3	54.3	43.7	44.6	12.4	5.6	2.7	1.4	0.5	0.2	0.3	0.1	0.0	0.0	0.0	0.0
1999	227.2	495.5	270.1	220.2	98.5	52.0	31.0	24.0	23.8	6.5	2.9	1.4	0.7	0.3	0.1	0.1	0.0	0.0	0.0	0.0
2000	182.8	569.0	556.5	208.7	136.8	56.1	28.0	16.1	12.1	11.7	3.2	1.4	0.7	0.3	0.1	0.0	0.1	0.0	0.0	0.0
2001	126.9	447.2	612.9	425.8	133.9	80.6	31.3	15.0	8.4	6.2	6.0	1.6	0.7	0.3	0.2	0.1	0.0	0.0	0.0	0.0
2002	151.2	298.1	451.1	443.4	254.6	73.4	41.8	15.6	7.3	4.0	2.9	2.9	0.8	0.3	0.2	0.1	0.0	0.0	0.0	0.0
2003	106.4	354.7	307.1	343.5	290.8	153.3	41.8	22.9	8.3	3.8	2.1	1.5	1.5	0.4	0.2	0.1	0.0	0.0	0.0	0.0
2004	129.8	250.2	367.3	245.0	251.7	196.2	97.9	25.7	13.7	4.9	2.2	1.2	0.9	0.9	0.2	0.1	0.0	0.0	0.0	0.0
2005	137.1	299.0	249.4	273.6	161.3	152.3	112.4	53.9	13.7	7.2	2.5	1.2	0.6	0.5	0.4	0.1	0.1	0.0	0.0	0.0
2006	139.9	321.9	303.8	189.3	186.4	101.2	90.4	64.1	29.9	7.5	3.9	1.4	0.6	0.3	0.2	0.2	0.1	0.0	0.0	0.0
2007	143.0	339.4	350.6	248.3	140.1	127.1	65.3	56.1	38.7	17.7	4.4	2.2	0.8	0.4	0.2	0.1	0.1	0.0	0.0	0.0

Table 1.6. Red snapper: Estimated time series and status indicators. Fishing mortality rate is full F, which includes discard mortalities. Total biomass (B) is at the start of the year, and spawning biomass (SSB) at the midpoint; B and SSB are in units mt. $F_{40\%}$ and $SSB_{F_{40\%}}$ are used as proxies for MSY *reference points. The* MSST *is defined by* $\text{MSST} = (1-M)\text{SSB}_{F_{40\%}}$*, with constant* $M = 0.078$*. SPR is static spawning potential ratio.*

Year	F	$F/F_{40\%}$	B	B/B_{unfished}	SSB	$SSB/SSB_{F_{40\%}}$	SSB/MSST	SPR
1945	0.00389	0.0374	29352	0.7500	13985	2.0424	2.2152	0.64548
1946	0.00426	0.0409	29290	0.7484	13907	2.0310	2.2028	0.64305
1947	0.00937	0.0900	29312	0.7490	13856	2.0235	2.1947	0.61029
1948	0.01452	0.1395	29298	0.7486	13801	2.0155	2.1860	0.57936
1949	0.01973	0.1896	29247	0.7473	13736	2.0060	2.1757	0.55004
1950	0.02504	0.2405	29141	0.7446	13647	1.9930	2.1616	0.52208
1951	0.03263	0.3135	28963	0.7401	13510	1.9730	2.1399	0.48505
1952	0.03591	0.3450	28634	0.7316	13332	1.9470	2.1117	0.47012
1953	0.04174	0.4010	28269	0.7223	13120	1.9161	2.0782	0.44496
1954	0.05107	0.4905	27792	0.7101	12836	1.8746	2.0331	0.40817
1955	0.05599	0.5379	27113	0.6928	12487	1.8236	1.9779	0.39031
1956	0.06304	0.6056	26364	0.6737	12095	1.7663	1.9158	0.36646
1957	0.07856	0.7546	25504	0.6517	11604	1.6947	1.8380	0.32030
1958	0.08340	0.8012	24348	0.6221	11044	1.6128	1.7493	0.30745
1959	0.09531	0.9155	23193	0.5926	10449	1.5261	1.6552	0.27866
1960	0.10863	1.0435	21904	0.5597	9794	1.4303	1.5513	0.25055
1961	0.10850	1.0423	20494	0.5237	9153	1.3367	1.4498	0.25080
1962	0.09873	0.9484	19263	0.4922	8634	1.2610	1.3676	0.27105
1963	0.08766	0.8421	18367	0.4693	8269	1.2076	1.3098	0.29672
1964	0.07953	0.7640	17784	0.4544	8032	1.1730	1.2723	0.31765
1965	0.07105	0.6825	17428	0.4453	7900	1.1537	1.2513	0.34162
1966	0.09630	0.9251	17277	0.4415	7731	1.1290	1.2245	0.27642
1967	0.12972	1.2461	16756	0.4281	7369	1.0761	1.1672	0.21335
1968	0.16809	1.6147	15778	0.4032	6799	0.9930	1.0770	0.16283
1969	0.20318	1.9518	14378	0.3674	6076	0.8874	0.9624	0.13010
1970	0.26607	2.5559	12751	0.3258	5207	0.7604	0.8247	0.09114
1971	0.29068	2.7924	10751	0.2747	4316	0.6304	0.6837	0.08040
1972	0.31850	3.0595	8992	0.2298	3539	0.5168	0.5606	0.07034
1973	0.34654	3.3290	7474	0.1910	2879	0.4205	0.4560	0.06195
1974	0.40527	3.8931	6157	0.1573	2296	0.3352	0.3636	0.04856
1975	0.48547	4.6635	4847	0.1238	1736	0.2535	0.2749	0.03624
1976	0.58151	5.5861	3612	0.0923	1220	0.1782	0.1933	0.02677
1977	0.75546	7.2570	2619	0.0669	785	0.1146	0.1243	0.01702
1978	0.97213	9.3384	1849	0.0472	469	0.0684	0.0742	0.01091
1979	1.08018	10.3764	1248	0.0319	287	0.0419	0.0454	0.00905
1980	1.17629	11.2997	897	0.0229	184	0.0269	0.0292	0.00778
1981	0.73730	7.0826	716	0.0183	178	0.0261	0.0283	0.01776
1982	0.70673	6.7889	656	0.0167	181	0.0264	0.0287	0.01912
1983	0.80713	7.7534	702	0.0179	171	0.0249	0.0271	0.01515
1984	1.07205	10.2982	840	0.0215	178	0.0260	0.0282	0.01122
1985	1.03330	9.9261	831	0.0212	193	0.0281	0.0305	0.01164
1986	0.98506	9.4627	669	0.0171	176	0.0257	0.0279	0.01319
1987	0.82464	7.9216	595	0.0152	163	0.0237	0.0257	0.01998
1988	0.84583	8.1252	618	0.0158	164	0.0239	0.0260	0.01790
1989	0.90349	8.6791	601	0.0154	154	0.0225	0.0244	0.01593
1990	1.00768	9.6800	556	0.0142	142	0.0207	0.0225	0.01415
1991	0.67271	6.4622	521	0.0133	144	0.0210	0.0227	0.02561
1992	0.77002	7.3970	574	0.0147	169	0.0247	0.0267	0.03283
1993	1.10288	10.5944	605	0.0155	174	0.0253	0.0275	0.02206
1994	0.99546	9.5626	508	0.0130	157	0.0230	0.0249	0.02629
1995	1.04026	9.9929	456	0.0117	139	0.0203	0.0220	0.02428
1996	0.95771	9.1999	413	0.0105	122	0.0179	0.0194	0.02720
1997	0.86656	8.3243	413	0.0105	121	0.0177	0.0192	0.03185
1998	0.84933	8.1588	499	0.0128	137	0.0199	0.0216	0.02895
1999	0.91163	8.7572	660	0.0169	172	0.0251	0.0272	0.02555
2000	0.92516	8.8872	809	0.0207	220	0.0322	0.0349	0.02466
2001	1.08069	10.3813	861	0.0220	241	0.0352	0.0382	0.02028
2002	0.99186	9.5280	793	0.0203	233	0.0340	0.0368	0.02317
2003	0.87289	8.3851	743	0.0190	229	0.0334	0.0362	0.02748
2004	1.02364	9.8333	720	0.0184	214	0.0312	0.0339	0.02190
2005	0.94855	9.1119	665	0.0170	196	0.0286	0.0310	0.02382
2006	0.79722	7.6582	654	0.0167	197	0.0288	0.0312	0.03061
2007	.	.	696	0.0178	.	.	.	.

Table 1.7. Red snapper: Selectivity at age for commercial handline (c.hal), commercial diving (c.dv), headboat (hb), general recreational (rec), commercial handline discard mortalities (D.c.hal), headboat discard mortalities (D.hb), general recreational discard mortalities (D.rec), selectivity of landings averaged across fisheries (L.avg), and selectivity of discard mortalities averaged across fisheries (D.avg).

Age	Length (mm)	Length (in)	c.hal	c.dv	hb	rec	D.c.hal	D.hb	D.rec	L.avg	D.avg	L.avg+D.avg
1	262.8	10.3	0.0001	0.0020	0.0000	0.0369	0.5000	0.5000	0.5000	0.0122	0.1803	0.1925
2	395.2	15.6	0.0051	0.0306	0.0002	0.6852	1.0000	1.0000	1.0000	0.2269	0.3606	0.5876
3	499.8	19.7	0.2839	0.3279	0.5410	0.9920	0.6014	0.6814	0.5967	0.4397	0.2205	0.6602
4	582.5	22.9	0.9685	0.8827	0.9998	0.9999	0.0188	0.0004	0.0249	0.6311	0.0072	0.6383
5	647.9	25.5	0.9996	0.9915	1.0000	1.0000	0.0002	0.0000	0.0004	0.6391	0.0001	0.6393
6	699.6	27.5	1.0000	0.9994	1.0000	1.0000	0.0000	0.0000	0.0000	0.6394	0.0000	0.6394
7	740.4	29.2	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.6394	0.0000	0.6394
8	772.7	30.4	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.6394	0.0000	0.6394
9	798.3	31.4	1.0000	0.9998	1.0000	1.0000	0.0000	0.0000	0.0000	0.6394	0.0000	0.6394
10	818.5	32.2	1.0000	0.4576	1.0000	1.0000	0.0000	0.0000	0.0000	0.6304	0.0000	0.6304
11	834.4	32.9	1.0000	0.0001	1.0000	1.0000	0.0000	0.0000	0.0000	0.6229	0.0000	0.6229
12	847.1	33.3	1.0000	0.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.6228	0.0000	0.6228
13	857.0	33.7	1.0000	0.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.6228	0.0000	0.6228
14	864.9	34.1	1.0000	0.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.6228	0.0000	0.6228
15	871.2	34.3	1.0000	0.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.6228	0.0000	0.6228
16	876.1	34.5	1.0000	0.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.6228	0.0000	0.6228
17	880.0	34.6	1.0000	0.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.6228	0.0000	0.6228
18	883.1	34.8	1.0000	0.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.6228	0.0000	0.6228
19	885.5	34.9	1.0000	0.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.6228	0.0000	0.6228
20	887.4	34.9	1.0000	0.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.6228	0.0000	0.6228

Table 1.8. Red snapper: Estimated time series of fishing mortality rate for commercial handline (F.c.hal), commercial diving (F.c.dv), headboat (F.hb), general recreational (F.rec), commercial handline discard mortalities (F.c.hal.D), headboat discard mortalities (F.hb.D), general recreational discard mortalities (F.mrfss.D), and full F (F.full).

Year	F.c.hal	F.c.dv	F.hb	F.rec	F.c.hal.D	F.hb.D	F.rec.D	F.full
1945	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.004
1946	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.004
1947	0.005	0.000	0.000	0.005	0.000	0.000	0.000	0.009
1948	0.005	0.000	0.000	0.010	0.000	0.000	0.000	0.015
1949	0.005	0.000	0.000	0.014	0.000	0.000	0.000	0.020
1950	0.006	0.000	0.000	0.019	0.000	0.000	0.000	0.025
1951	0.008	0.000	0.000	0.024	0.000	0.000	0.000	0.033
1952	0.006	0.000	0.000	0.030	0.000	0.000	0.000	0.036
1953	0.007	0.000	0.000	0.035	0.000	0.000	0.000	0.042
1954	0.010	0.000	0.000	0.041	0.000	0.000	0.000	0.051
1955	0.009	0.000	0.000	0.047	0.000	0.000	0.000	0.056
1956	0.009	0.000	0.000	0.054	0.000	0.000	0.000	0.063
1957	0.016	0.000	0.000	0.062	0.000	0.000	0.000	0.079
1958	0.012	0.000	0.000	0.071	0.000	0.000	0.000	0.083
1959	0.014	0.000	0.000	0.082	0.000	0.000	0.000	0.095
1960	0.015	0.000	0.000	0.094	0.000	0.000	0.000	0.109
1961	0.019	0.000	0.000	0.090	0.000	0.000	0.000	0.108
1962	0.015	0.000	0.000	0.084	0.000	0.000	0.000	0.099
1963	0.012	0.000	0.000	0.076	0.000	0.000	0.000	0.088
1964	0.014	0.000	0.000	0.066	0.000	0.000	0.000	0.080
1965	0.016	0.000	0.000	0.055	0.000	0.000	0.000	0.071
1966	0.019	0.000	0.000	0.078	0.000	0.000	0.000	0.096
1967	0.026	0.000	0.000	0.104	0.000	0.000	0.000	0.130
1968	0.031	0.000	0.000	0.137	0.000	0.000	0.000	0.168
1969	0.022	0.000	0.000	0.181	0.000	0.000	0.000	0.203
1970	0.024	0.000	0.000	0.242	0.000	0.000	0.000	0.266
1971	0.025	0.000	0.000	0.266	0.000	0.000	0.000	0.291
1972	0.026	0.000	0.006	0.287	0.000	0.000	0.000	0.318
1973	0.026	0.000	0.009	0.312	0.000	0.000	0.000	0.347
1974	0.053	0.000	0.007	0.345	0.000	0.000	0.000	0.405
1975	0.081	0.000	0.010	0.394	0.000	0.000	0.000	0.485
1976	0.097	0.000	0.019	0.465	0.000	0.000	0.000	0.582
1977	0.156	0.000	0.016	0.584	0.000	0.000	0.000	0.755
1978	0.233	0.000	0.027	0.712	0.000	0.000	0.000	0.972
1979	0.250	0.000	0.036	0.794	0.000	0.000	0.000	1.080
1980	0.368	0.000	0.057	0.752	0.000	0.000	0.000	1.176
1981	0.342	0.000	0.115	0.280	0.000	0.000	0.000	0.737
1982	0.318	0.000	0.109	0.280	0.000	0.000	0.000	0.707
1983	0.335	0.000	0.085	0.387	0.000	0.000	0.000	0.807
1984	0.365	0.003	0.087	0.517	0.012	0.006	0.080	1.072
1985	0.303	0.007	0.122	0.509	0.009	0.007	0.077	1.033
1986	0.260	0.001	0.062	0.481	0.033	0.012	0.136	0.985
1987	0.265	0.001	0.103	0.292	0.053	0.032	0.080	0.825
1988	0.234	0.001	0.155	0.319	0.025	0.025	0.087	0.846
1989	0.386	0.003	0.091	0.370	0.010	0.006	0.038	0.903
1990	0.350	0.005	0.090	0.358	0.124	0.047	0.034	1.008
1991	0.219	0.015	0.101	0.285	0.015	0.009	0.029	0.673
1992	0.218	0.023	0.063	0.334	0.057	0.004	0.069	0.770
1993	0.463	0.013	0.079	0.317	0.078	0.046	0.106	1.103
1994	0.350	0.027	0.096	0.163	0.146	0.048	0.164	0.995
1995	0.355	0.022	0.115	0.174	0.160	0.082	0.132	1.040
1996	0.336	0.016	0.110	0.211	0.184	0.027	0.072	0.958
1997	0.294	0.023	0.138	0.207	0.156	0.007	0.042	0.867
1998	0.234	0.024	0.069	0.320	0.077	0.027	0.099	0.849
1999	0.214	0.027	0.103	0.359	0.048	0.017	0.144	0.912
2000	0.202	0.025	0.091	0.351	0.043	0.021	0.191	0.925
2001	0.287	0.034	0.096	0.325	0.060	0.052	0.226	1.081
2002	0.234	0.035	0.092	0.287	0.067	0.053	0.224	0.992
2003	0.167	0.025	0.054	0.287	0.064	0.038	0.238	0.873
2004	0.223	0.029	0.110	0.281	0.057	0.069	0.254	1.024
2005	0.190	0.016	0.090	0.311	0.052	0.060	0.229	0.949
2006	0.140	0.007	0.066	0.308	0.053	0.039	0.182	0.797

Table 1.9. Red snapper: Estimated instantaneous fishing mortality rate (per yr) at age, including discard mortality

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1945	0.001	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
1946	0.001	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
1947	0.002	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009
1948	0.003	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
1949	0.003	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
1950	0.004	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
1951	0.006	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033
1952	0.006	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036
1953	0.007	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042
1954	0.009	0.051	0.051	0.051	0.051	0.051	0.051	0.051	0.051	0.051	0.051	0.051	0.051	0.051	0.051	0.051	0.051	0.051	0.051	0.051
1955	0.010	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056
1956	0.011	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063
1957	0.014	0.079	0.079	0.079	0.079	0.079	0.079	0.079	0.079	0.079	0.079	0.079	0.079	0.079	0.079	0.079	0.079	0.079	0.079	0.079
1958	0.014	0.083	0.083	0.083	0.083	0.083	0.083	0.083	0.083	0.083	0.083	0.083	0.083	0.083	0.083	0.083	0.083	0.083	0.083	0.083
1959	0.016	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095
1960	0.019	0.109	0.109	0.109	0.109	0.109	0.109	0.109	0.109	0.109	0.109	0.109	0.109	0.109	0.109	0.109	0.109	0.109	0.109	0.109
1961	0.019	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108
1962	0.017	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099
1963	0.015	0.088	0.088	0.088	0.088	0.088	0.088	0.088	0.088	0.088	0.088	0.088	0.088	0.088	0.088	0.088	0.088	0.088	0.088	0.088
1964	0.014	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080
1965	0.012	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071
1966	0.017	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096
1967	0.022	0.130	0.130	0.130	0.130	0.130	0.130	0.130	0.130	0.130	0.130	0.130	0.130	0.130	0.130	0.130	0.130	0.130	0.130	0.130
1968	0.029	0.168	0.168	0.168	0.168	0.168	0.168	0.168	0.168	0.168	0.168	0.168	0.168	0.168	0.168	0.168	0.168	0.168	0.168	0.168
1969	0.035	0.203	0.203	0.203	0.203	0.203	0.203	0.203	0.203	0.203	0.203	0.203	0.203	0.203	0.203	0.203	0.203	0.203	0.203	0.203
1970	0.046	0.266	0.266	0.266	0.266	0.266	0.266	0.266	0.266	0.266	0.266	0.266	0.266	0.266	0.266	0.266	0.266	0.266	0.266	0.266
1971	0.050	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291
1972	0.055	0.318	0.318	0.318	0.318	0.318	0.318	0.318	0.318	0.318	0.318	0.318	0.318	0.318	0.318	0.318	0.318	0.318	0.318	0.318
1973	0.060	0.347	0.347	0.347	0.347	0.347	0.347	0.347	0.347	0.347	0.347	0.347	0.347	0.347	0.347	0.347	0.347	0.347	0.347	0.347
1974	0.070	0.405	0.405	0.405	0.405	0.405	0.405	0.405	0.405	0.405	0.405	0.405	0.405	0.405	0.405	0.405	0.405	0.405	0.405	0.405
1975	0.084	0.485	0.485	0.485	0.485	0.485	0.485	0.485	0.485	0.485	0.485	0.485	0.485	0.485	0.485	0.485	0.485	0.485	0.485	0.485
1976	0.100	0.581	0.582	0.582	0.582	0.582	0.582	0.582	0.582	0.582	0.582	0.582	0.582	0.582	0.582	0.582	0.582	0.582	0.582	0.582
1977	0.130	0.755	0.755	0.755	0.755	0.755	0.755	0.755	0.755	0.755	0.755	0.755	0.755	0.755	0.755	0.755	0.755	0.755	0.755	0.755
1978	0.168	0.972	0.972	0.972	0.972	0.972	0.972	0.972	0.972	0.972	0.972	0.972	0.972	0.972	0.972	0.972	0.972	0.972	0.972	0.972
1979	0.186	1.080	1.080	1.080	1.080	1.080	1.080	1.080	1.080	1.080	1.080	1.080	1.080	1.080	1.080	1.080	1.080	1.080	1.080	1.080
1980	0.203	1.176	1.176	1.176	1.176	1.176	1.176	1.176	1.176	1.176	1.176	1.176	1.176	1.176	1.176	1.176	1.176	1.176	1.176	1.176
1981	0.127	0.737	0.737	0.737	0.737	0.737	0.737	0.737	0.737	0.737	0.737	0.737	0.737	0.737	0.737	0.737	0.737	0.737	0.737	0.737
1982	0.122	0.707	0.707	0.707	0.707	0.707	0.707	0.707	0.707	0.707	0.707	0.707	0.707	0.707	0.707	0.707	0.707	0.707	0.707	0.707
1983	0.139	0.807	0.807	0.807	0.807	0.807	0.807	0.807	0.807	0.807	0.807	0.807	0.807	0.807	0.807	0.807	0.807	0.807	0.807	0.807
1984	0.256	0.826	0.971	0.973	0.973	0.973	0.973	0.973	0.973	0.971	0.970	0.970	0.970	0.970	0.970	0.970	0.970	0.970	0.970	0.970

Table 1.9. (continued)

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1985	0.252	0.825	0.936	0.940	0.940	0.940	0.940	0.940	0.940	0.937	0.934	0.934	0.934	0.934	0.934	0.934	0.934	0.934	0.934	0.934
1986	0.282	0.811	0.803	0.804	0.804	0.804	0.804	0.804	0.804	0.803	0.803	0.803	0.803	0.803	0.803	0.803	0.803	0.803	0.803	0.803
1987	0.201	0.648	0.659	0.660	0.660	0.660	0.660	0.660	0.660	0.659	0.659	0.659	0.659	0.659	0.659	0.659	0.659	0.659	0.659	0.659
1988	0.201	0.690	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709
1989	0.176	0.644	0.848	0.849	0.850	0.850	0.850	0.850	0.850	0.848	0.847	0.847	0.847	0.847	0.847	0.847	0.847	0.847	0.847	0.847
1990	0.247	0.771	0.800	0.803	0.803	0.803	0.803	0.803	0.803	0.801	0.798	0.798	0.798	0.798	0.798	0.798	0.798	0.798	0.798	0.798
1991	0.143	0.513	0.611	0.619	0.621	0.621	0.621	0.621	0.621	0.613	0.606	0.606	0.606	0.606	0.606	0.606	0.606	0.606	0.606	0.606
1992	0.078	0.362	0.514	0.632	0.639	0.639	0.639	0.639	0.639	0.626	0.615	0.615	0.615	0.615	0.615	0.615	0.615	0.615	0.615	0.615
1993	0.127	0.450	0.635	0.861	0.872	0.873	0.873	0.873	0.873	0.866	0.860	0.860	0.860	0.860	0.860	0.860	0.860	0.860	0.860	0.860
1994	0.186	0.474	0.541	0.629	0.636	0.636	0.636	0.636	0.636	0.622	0.610	0.610	0.610	0.610	0.610	0.610	0.610	0.610	0.610	0.610
1995	0.193	0.495	0.573	0.659	0.666	0.666	0.666	0.666	0.666	0.654	0.644	0.644	0.644	0.644	0.644	0.644	0.644	0.644	0.644	0.644
1996	0.149	0.430	0.542	0.667	0.674	0.674	0.674	0.674	0.674	0.666	0.658	0.658	0.658	0.658	0.658	0.658	0.658	0.658	0.658	0.658
1997	0.110	0.349	0.494	0.654	0.662	0.662	0.662	0.662	0.662	0.650	0.640	0.640	0.640	0.640	0.640	0.640	0.640	0.640	0.640	0.640
1998	0.113	0.424	0.553	0.640	0.646	0.646	0.646	0.646	0.646	0.634	0.623	0.623	0.623	0.623	0.623	0.623	0.623	0.623	0.623	0.623
1999	0.117	0.456	0.608	0.698	0.703	0.703	0.703	0.703	0.703	0.689	0.676	0.676	0.676	0.676	0.676	0.676	0.676	0.676	0.676	0.676
2000	0.141	0.498	0.618	0.666	0.669	0.669	0.670	0.670	0.670	0.656	0.644	0.644	0.644	0.644	0.644	0.644	0.644	0.644	0.644	0.644
2001	0.181	0.564	0.674	0.736	0.742	0.742	0.742	0.742	0.742	0.724	0.708	0.708	0.708	0.708	0.708	0.708	0.708	0.708	0.708	0.708
2002	0.183	0.543	0.623	0.644	0.648	0.648	0.648	0.648	0.648	0.629	0.614	0.614	0.614	0.614	0.614	0.614	0.614	0.614	0.614	0.614
2003	0.180	0.538	0.576	0.532	0.533	0.534	0.534	0.534	0.534	0.520	0.508	0.508	0.508	0.508	0.508	0.508	0.508	0.508	0.508	0.508
2004	0.201	0.576	0.644	0.640	0.642	0.643	0.643	0.643	0.643	0.627	0.613	0.613	0.613	0.613	0.613	0.613	0.613	0.613	0.613	0.613
2005	0.182	0.556	0.626	0.606	0.607	0.607	0.607	0.607	0.607	0.598	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591
2006	0.149	0.487	0.552	0.523	0.523	0.523	0.523	0.523	0.523	0.519	0.515	0.515	0.515	0.515	0.515	0.515	0.515	0.515	0.515	0.515

Table 1.10. Red snapper: Estimated total landings at age (1000 fish)

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1945	0.3	1.4	1.2	1.1	1.0	0.9	0.8	0.7	0.7	0.6	0.6	0.5	0.5	0.5	0.4	0.4	0.4	0.3	0.3	4.2
1946	0.5	1.5	1.3	1.2	1.0	0.9	0.9	0.8	0.7	0.7	0.6	0.6	0.5	0.5	0.5	0.4	0.4	0.4	0.3	4.6
1947	1.0	4.8	2.8	2.5	2.3	2.1	1.9	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1.0	0.9	0.9	0.8	0.8	10.0
1948	1.6	7.4	6.4	3.9	3.5	3.2	2.9	2.7	2.4	2.3	2.1	1.9	1.8	1.7	1.5	1.4	1.3	1.2	1.2	15.3
1949	2.1	10.1	8.6	7.6	4.7	4.2	3.9	3.5	3.3	3.0	2.8	2.6	2.4	2.2	2.1	1.9	1.8	1.7	1.5	20.4
1950	2.7	12.7	10.8	9.5	8.5	5.3	4.8	4.4	4.1	3.7	3.5	3.2	3.0	2.8	2.6	2.4	2.2	2.1	1.9	25.3
1951	3.5	16.5	14.0	12.2	10.9	9.8	6.1	5.6	5.1	4.7	4.4	4.1	3.8	3.5	3.2	3.0	2.8	2.6	2.4	32.0
1952	3.9	18.1	15.2	13.2	11.7	10.5	9.5	5.9	5.5	5.0	4.7	4.3	4.0	3.7	3.4	3.2	3.0	2.8	2.6	34.0
1953	4.5	21.0	17.6	15.1	13.3	11.9	10.7	9.8	6.1	5.6	5.2	4.8	4.5	4.2	3.9	3.6	3.3	3.1	2.9	38.1
1954	5.5	25.5	21.2	18.2	15.9	14.2	12.7	11.5	10.5	6.6	6.1	5.6	5.2	4.9	4.5	4.2	3.9	3.6	3.4	44.5
1955	6.0	27.8	23.0	19.6	17.1	15.1	13.5	12.1	11.0	10.1	6.4	5.9	5.4	5.0	4.7	4.3	4.0	3.8	3.5	46.2
1956	6.8	31.2	25.6	21.7	18.8	16.5	14.6	13.1	11.9	10.8	9.9	6.2	5.8	5.4	5.0	4.6	4.3	4.0	3.7	49.0
1957	8.4	38.5	31.4	26.5	22.7	19.8	17.5	15.6	14.0	12.7	11.6	10.7	6.7	6.2	5.8	5.4	5.0	4.6	4.3	56.9
1958	8.9	40.7	32.7	27.4	23.4	20.2	17.8	15.8	14.1	12.7	11.5	10.5	9.7	6.1	5.6	5.2	4.9	4.5	4.2	55.8
1959	10.2	46.1	36.9	30.4	25.8	22.2	19.4	17.1	15.2	13.6	12.3	11.2	10.2	9.4	5.9	5.5	5.1	4.7	4.4	58.3
1960	11.6	52.1	41.2	33.8	28.2	24.2	20.9	18.3	16.2	14.4	13.0	11.7	10.7	9.8	9.0	5.7	5.2	4.9	4.5	60.0
1961	11.5	51.8	40.5	32.8	27.3	23.0	19.8	17.2	15.1	13.4	12.0	10.7	9.7	8.9	8.1	7.5	4.7	4.4	4.1	53.8
1962	10.5	47.3	36.9	29.5	24.3	20.4	17.3	14.9	13.0	11.5	10.2	9.1	8.2	7.4	6.7	6.2	5.7	3.6	3.3	44.1
1963	9.3	42.2	33.2	26.5	21.5	17.9	15.1	12.8	11.1	9.7	8.6	7.6	6.8	6.1	5.6	5.1	4.6	4.3	2.7	35.7
1964	8.4	38.5	30.6	24.6	20.0	16.3	13.6	11.5	9.9	8.6	7.5	6.6	5.9	5.3	4.8	4.3	3.9	3.6	3.3	29.8
1965	7.5	34.5	27.7	22.5	18.4	15.0	12.4	10.4	8.8	7.6	6.6	5.8	5.1	4.5	4.1	3.7	3.3	3.0	2.8	25.5
1966	10.2	46.2	37.4	30.7	25.3	20.9	17.2	14.2	11.9	10.2	8.7	7.6	6.7	5.9	5.2	4.7	4.2	3.8	3.5	32.8
1967	13.7	61.0	48.3	40.0	33.3	27.7	23.0	19.0	15.7	13.3	11.3	9.7	8.5	7.4	6.6	5.9	5.3	4.7	4.3	40.6
1968	17.6	77.1	59.2	48.0	40.3	33.8	28.4	23.6	19.5	16.2	13.7	11.7	10.1	8.8	7.7	6.8	6.1	5.5	4.9	46.6
1969	21.2	91.0	67.3	52.9	43.5	36.8	31.1	26.2	21.9	18.1	15.1	12.8	10.9	9.4	8.2	7.2	6.4	5.7	5.1	48.2
1970	27.5	114.6	81.9	62.1	49.5	41.0	35.0	29.7	25.0	20.9	17.4	14.5	12.3	10.5	9.0	7.9	6.9	6.1	5.5	51.4
1971	29.8	122.0	82.3	60.3	46.3	37.2	31.1	26.6	22.6	19.1	16.0	13.3	11.1	9.4	8.1	6.9	6.1	5.3	4.7	43.7
1972	32.3	130.5	85.6	59.2	43.9	34.1	27.5	23.1	19.8	16.9	14.3	12.0	10.0	8.4	7.1	6.1	5.2	4.6	4.0	36.4
1973	34.6	138.2	88.4	59.4	41.7	31.2	24.3	19.8	16.6	14.3	12.2	10.3	8.7	7.2	6.1	5.1	4.4	3.8	3.3	29.4
1974	27.8	154.8	96.5	63.3	43.1	30.5	23.0	18.0	14.7	12.4	10.6	9.1	7.7	6.5	5.4	4.5	3.8	3.3	2.8	24.5
1975	28.7	122.4	103.4	66.1	43.9	30.2	21.5	16.3	12.8	10.4	8.8	7.6	6.5	5.5	4.6	3.9	3.2	2.7	2.4	19.5
1976	39.9	119.9	75.0	64.9	42.1	28.2	19.5	13.9	10.6	8.3	6.8	5.8	5.0	4.3	3.6	3.0	2.5	2.1	1.8	14.4
1977	66.7	166.5	70.0	44.8	39.4	25.7	17.4	12.1	8.6	6.6	5.2	4.2	3.6	3.1	2.7	2.3	1.9	1.6	1.3	10.1
1978	92.4	247.6	79.7	34.3	22.3	19.8	13.0	8.8	6.1	4.4	3.4	2.6	2.2	1.8	1.6	1.4	1.2	1.0	0.8	5.9
1979	57.8	278.1	86.3	28.5	12.4	8.2	7.3	4.8	3.3	2.3	1.6	1.2	1.0	0.8	0.7	0.6	0.5	0.4	0.4	2.5
1980	115.8	162.5	85.7	27.3	9.1	4.0	2.7	2.4	1.6	1.1	0.7	0.5	0.4	0.3	0.3	0.2	0.2	0.2	0.1	0.9
1981	16.4	222.3	32.6	17.6	5.7	1.9	0.9	0.6	0.5	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.2
1982	31.9	51.0	89.5	13.4	7.4	2.4	0.8	0.4	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1
1983	64.8	113.0	23.8	42.9	6.5	3.6	1.2	0.4	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
1984	123.4	178.2	49.1	10.6	19.4	3.0	1.7	0.5	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 1.10. (continued)

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1985	34.7	215.9	83.1	16.2	3.5	6.5	1.0	0.6	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	42.1	53.1	90.7	26.3	5.2	1.1	2.1	0.3	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	34.0	55.9	22.8	31.5	9.3	1.8	0.4	0.8	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1988	30.2	85.3	36.2	11.0	15.5	4.6	0.9	0.2	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1989	34.8	74.2	53.1	17.9	5.5	7.8	2.3	0.5	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	28.5	69.7	42.8	19.5	6.6	2.1	2.9	0.9	0.2	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1991	32.5	51.6	32.3	14.3	6.6	2.3	0.7	1.0	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	1.8	41.4	25.3	15.9	7.1	3.3	1.1	0.4	0.5	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1993	1.3	20.5	47.3	22.8	9.5	4.2	2.0	0.7	0.2	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.6	7.8	15.9	28.2	7.1	2.9	1.3	0.6	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.7	7.5	12.0	15.8	14.3	3.5	1.5	0.7	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	1.2	9.4	11.8	11.1	7.6	6.7	1.7	0.7	0.3	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	1.2	13.8	13.0	10.2	5.2	3.5	3.1	0.8	0.3	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	4.0	22.0	22.8	11.3	4.8	2.4	1.6	1.4	0.4	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	5.1	51.8	25.1	17.7	5.8	2.4	1.2	0.8	0.7	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	4.0	57.1	49.5	16.2	7.8	2.5	1.1	0.5	0.4	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	2.5	40.5	53.6	35.4	8.2	3.9	1.3	0.5	0.3	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2002	2.6	24.1	35.7	33.6	14.1	3.2	1.5	0.5	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	1.9	28.6	22.2	22.5	14.0	5.8	1.3	0.6	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2004	2.2	19.5	28.6	18.4	13.9	8.6	3.6	0.8	0.4	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2005	2.6	25.9	19.9	19.8	8.5	6.4	3.9	1.7	0.4	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2006	2.7	28.4	23.1	12.3	8.8	3.8	2.8	1.8	0.7	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 1.11. Red snapper: Estimated total landings at age (mt)

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1945	0.1	1.1	2.0	2.8	3.6	4.1	4.5	4.7	4.8	4.8	4.7	4.6	4.4	4.2	4.0	3.7	3.5	3.3	3.1	41.4
1946	0.1	1.2	2.2	3.1	3.9	4.5	4.9	5.1	5.2	5.2	5.1	5.0	4.8	4.6	4.3	4.1	3.8	3.6	3.4	45.2
1947	0.2	3.9	4.7	6.7	8.5	9.8	10.7	11.2	11.4	11.4	11.2	10.8	10.4	10.0	9.4	8.9	8.4	7.9	7.4	98.7
1948	0.4	6.0	10.7	10.4	13.0	15.0	16.3	17.1	17.5	17.4	17.1	16.6	16.0	15.2	14.5	13.7	12.9	12.1	11.3	151.2
1949	0.5	8.1	14.4	20.4	17.4	20.0	21.8	22.9	23.3	23.3	22.9	22.2	21.3	20.4	19.3	18.3	17.2	16.2	15.1	202.0
1950	0.6	10.2	18.1	25.5	31.7	24.9	27.1	28.4	28.9	28.9	28.4	27.5	26.5	25.3	24.0	22.7	21.3	20.0	18.8	250.6
1951	0.8	13.3	23.3	32.7	40.5	46.4	34.4	35.9	36.6	36.6	35.9	34.9	33.5	32.0	30.4	28.7	27.0	25.4	23.8	317.4
1952	0.9	14.6	25.4	35.5	43.7	49.7	53.8	38.3	39.0	38.9	38.2	37.1	35.6	34.0	32.3	30.5	28.7	27.0	25.3	337.5
1953	1.0	16.9	29.3	40.6	49.7	56.4	60.7	63.1	43.7	43.5	42.7	41.4	39.8	38.0	36.1	34.1	32.1	30.2	28.3	377.3
1954	1.2	20.5	35.4	48.9	59.5	67.1	71.8	74.3	75.1	50.9	49.9	48.4	46.5	44.4	42.2	39.9	37.5	35.3	33.1	440.7
1955	1.4	22.4	38.4	52.7	63.8	71.4	76.1	78.3	78.8	77.9	52.0	50.3	48.4	46.2	43.8	41.4	39.0	36.7	34.4	458.1
1956	1.5	25.1	42.7	58.2	70.1	78.2	82.7	84.7	84.7	83.4	81.2	53.5	51.3	49.0	46.5	43.9	41.4	38.9	36.5	486.0
1957	1.9	31.0	52.4	71.0	84.8	94.0	99.1	100.7	100.2	98.2	95.1	91.5	59.8	56.9	54.0	51.0	48.1	45.2	42.3	564.3
1958	2.0	32.7	54.6	73.4	87.2	95.9	100.5	101.7	100.5	97.9	94.4	90.4	86.2	55.9	52.9	50.0	47.1	44.2	41.5	552.6
1959	2.3	37.1	61.5	81.6	96.3	105.2	109.3	110.1	108.4	104.9	100.5	95.7	90.8	86.0	55.4	52.2	49.2	46.2	43.3	577.5
1960	2.6	41.9	68.7	90.6	105.4	114.4	118.2	118.1	115.6	111.4	106.0	100.4	94.8	89.2	84.0	53.9	50.6	47.6	44.6	594.6
1961	2.6	41.7	67.5	88.1	101.8	109.0	111.9	111.1	107.9	103.4	98.0	92.2	86.5	81.1	75.9	71.1	45.5	42.6	40.0	532.8
1962	2.4	38.1	61.5	79.2	90.6	96.4	97.6	96.3	92.9	88.3	83.3	78.0	72.7	67.7	63.1	58.9	55.0	35.1	32.8	437.0
1963	2.1	34.0	55.4	71.2	80.4	84.6	85.1	82.8	79.4	75.0	70.1	65.4	60.7	56.1	52.0	48.2	44.8	41.8	26.6	353.4
1964	1.9	30.9	51.0	66.1	74.5	77.4	77.1	74.5	70.4	66.1	61.5	56.8	52.4	48.3	44.5	41.0	37.9	35.1	32.7	295.0
1965	1.7	27.8	46.1	60.4	68.7	71.3	70.0	67.0	62.9	58.2	53.8	49.4	45.2	41.5	38.0	34.8	32.0	29.5	27.3	252.6
1966	2.3	37.2	62.3	82.3	94.6	98.9	97.0	91.6	85.1	78.3	71.3	65.1	59.2	53.8	49.1	44.8	40.9	37.5	34.5	324.7
1967	3.1	49.1	80.6	107.3	124.3	131.4	129.9	122.4	112.4	102.3	92.6	83.3	75.3	68.1	61.5	55.8	50.8	46.2	42.3	402.3
1968	4.0	62.0	98.7	128.8	150.4	160.3	160.2	152.3	139.5	125.3	112.2	100.3	89.5	80.3	72.2	65.0	58.8	53.3	48.4	462.1
1969	4.8	73.2	112.2	141.8	162.4	174.4	175.8	168.9	155.9	139.8	123.6	109.4	96.9	85.8	76.6	68.6	61.5	55.5	50.2	477.3
1970	6.2	92.2	136.6	166.5	184.6	194.4	197.5	191.3	178.5	161.4	142.5	124.5	109.1	96.0	84.5	75.1	67.0	59.9	53.9	509.1
1971	6.8	98.1	137.3	161.7	172.8	176.3	175.6	171.4	161.4	147.5	131.2	114.4	99.0	86.2	75.4	66.1	58.6	52.1	46.5	433.5
1972	7.3	105.0	142.7	158.8	164.0	161.3	155.6	148.9	141.3	130.2	117.1	103.0	89.0	76.4	66.2	57.6	50.4	44.5	39.5	361.2
1973	7.8	111.2	147.5	159.4	155.6	147.8	137.5	127.5	118.6	110.1	99.9	88.8	77.3	66.3	56.7	48.8	42.4	36.9	32.6	291.1
1974	6.3	124.5	161.0	169.8	161.0	144.5	129.8	116.1	104.6	95.2	87.1	78.0	68.7	59.4	50.7	43.1	37.0	32.1	27.9	242.4
1975	6.5	98.4	172.4	177.3	164.0	143.1	121.4	104.9	91.1	80.4	72.0	65.1	57.7	50.5	43.4	36.9	31.3	26.8	23.1	193.6
1976	9.1	96.5	125.0	174.1	157.0	133.6	110.2	89.9	75.5	64.2	55.7	49.3	44.2	38.9	33.8	29.0	24.5	20.7	17.7	142.4
1977	15.1	133.9	116.7	120.3	147.0	121.9	98.1	77.8	61.7	50.7	42.4	36.4	31.9	28.4	24.9	21.5	18.4	15.5	13.1	100.3
1978	21.0	199.2	132.8	92.1	83.2	93.6	73.4	56.8	43.7	34.0	27.5	22.7	19.3	16.8	14.8	13.0	11.2	9.5	8.0	58.2
1979	13.1	223.7	143.9	76.3	46.4	38.6	41.1	31.0	23.3	17.5	13.4	10.7	8.8	7.4	6.4	5.6	4.9	4.2	3.6	24.8
1980	26.3	130.7	142.9	73.1	34.0	19.1	15.0	15.3	11.2	8.3	6.1	4.6	3.7	3.0	2.5	2.2	1.9	1.6	1.4	9.4
1981	3.7	178.8	54.3	47.3	21.3	9.1	4.8	3.6	3.6	2.6	1.9	1.4	1.0	0.8	0.7	0.5	0.5	0.4	0.4	2.3
1982	7.2	41.0	149.3	36.1	27.6	11.4	4.6	2.3	1.7	1.7	1.2	0.8	0.6	0.5	0.4	0.3	0.2	0.2	0.2	1.2
1983	14.7	90.9	39.7	115.1	24.4	17.2	6.7	2.6	1.3	0.9	0.9	0.6	0.4	0.3	0.2	0.2	0.1	0.1	0.1	0.7
1984	28.0	143.3	81.9	28.5	72.4	14.1	9.4	3.5	1.3	0.6	0.5	0.4	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.4

Table 1.11. (continued)

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1985	7.9	173.7	138.5	43.4	13.2	30.9	5.7	3.6	1.3	0.5	0.2	0.2	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.1
1986	9.6	42.7	151.2	70.5	19.3	5.4	11.9	2.1	1.3	0.5	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1
1987	7.7	45.0	38.0	84.6	34.5	8.7	2.3	4.9	0.8	0.5	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1988	6.9	68.6	60.4	29.6	57.7	21.7	5.2	1.3	2.7	0.5	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1989	7.9	59.7	88.6	47.9	20.6	37.0	13.1	3.0	0.7	1.5	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	6.5	56.1	71.3	52.4	24.8	9.8	16.6	5.7	1.3	0.3	0.6	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1991	7.4	41.5	53.9	38.3	24.6	10.7	4.0	6.5	2.2	0.5	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	0.4	33.3	42.2	42.7	26.5	15.6	6.4	2.3	3.7	1.2	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1993	0.3	16.5	78.9	61.1	35.5	19.9	11.1	4.4	1.5	2.4	0.8	0.2	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.1	6.2	26.6	75.6	26.5	13.8	7.3	3.9	1.5	0.5	0.8	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.2	6.0	20.0	42.5	53.2	16.7	8.3	4.2	2.2	0.8	0.3	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.3	7.6	19.7	29.8	28.3	31.8	9.5	4.5	2.2	1.1	0.4	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.3	11.1	21.7	27.4	19.2	16.4	17.5	5.0	2.3	1.1	0.5	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.9	17.7	38.1	30.4	17.8	11.3	9.1	9.3	2.6	1.1	0.5	0.3	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0
1999	1.2	41.7	41.8	47.5	21.6	11.5	6.8	5.3	5.3	1.4	0.6	0.3	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.9	45.9	82.5	43.5	29.0	11.9	6.0	3.4	2.6	2.5	0.7	0.3	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.6	32.6	89.4	95.1	30.5	18.4	7.2	3.4	1.9	1.4	1.3	0.4	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0
2002	0.6	19.4	59.5	90.0	52.7	15.2	8.7	3.3	1.5	0.8	0.6	0.6	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.4	23.0	37.0	60.4	52.2	27.6	7.5	4.1	1.5	0.7	0.4	0.3	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0
2004	0.5	15.7	47.8	49.5	51.8	40.5	20.3	5.3	2.8	1.0	0.4	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0
2005	0.6	20.8	33.1	53.1	31.9	30.2	22.3	10.7	2.7	1.4	0.5	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
2006	0.6	22.8	38.5	32.9	32.9	17.9	16.0	11.4	5.3	1.3	0.7	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0

Table 1.12. Red snapper: Estimated total landings at age (1000 lb)

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1945	0.1	2.4	4.4	6.2	7.8	9.0	9.9	10.3	10.5	10.5	10.3	10.0	9.6	9.2	8.7	8.3	7.8	7.3	6.9	91.4
1946	0.2	2.6	4.8	6.8	8.5	9.9	10.8	11.3	11.5	11.5	11.3	10.9	10.5	10.0	9.5	9.0	8.5	8.0	7.5	99.6
1947	0.5	8.5	10.4	14.9	18.7	21.5	23.5	24.7	25.1	25.1	24.6	23.9	23.0	21.9	20.8	19.7	18.5	17.4	16.3	217.7
1948	0.8	13.2	23.5	22.8	28.6	33.0	36.0	37.8	38.5	38.4	37.7	36.6	35.2	33.6	31.9	30.1	28.4	26.7	25.0	333.3
1949	1.1	17.8	31.7	44.9	38.3	44.0	48.1	50.4	51.4	51.3	50.4	48.9	47.0	44.9	42.6	40.3	37.9	35.6	33.4	445.2
1950	1.3	22.5	39.8	56.2	69.9	54.8	59.6	62.6	63.8	63.6	62.5	60.7	58.3	55.7	52.8	49.9	47.1	44.2	41.4	552.4
1951	1.8	29.2	51.4	72.2	89.3	102.2	75.8	79.2	80.8	80.6	79.2	76.8	73.9	70.5	66.9	63.3	59.6	56.0	52.5	699.6
1952	1.9	32.1	56.0	78.2	96.3	109.6	118.6	84.5	85.9	85.7	84.2	81.7	78.5	75.0	71.2	67.3	63.4	59.5	55.8	744.0
1953	2.2	37.2	64.6	89.5	109.7	124.2	133.8	139.1	96.3	95.8	94.1	91.3	87.8	83.8	79.6	75.2	70.9	66.6	62.4	831.8
1954	2.7	45.2	78.1	107.9	131.2	147.9	158.4	163.9	165.7	112.3	110.0	106.7	102.6	97.9	93.0	87.9	82.8	77.7	72.9	971.6
1955	3.0	49.4	84.6	116.2	140.7	157.4	167.7	172.7	173.6	171.8	114.7	110.9	106.6	101.8	96.6	91.3	86.0	80.8	75.8	1009.9
1956	3.4	55.3	94.2	128.3	154.6	172.3	182.3	186.7	186.7	183.9	179.1	118.0	113.1	108.0	102.5	96.9	91.3	85.7	80.4	1071.4
1957	4.2	68.3	115.6	156.5	187.0	207.3	218.4	222.0	220.9	216.4	209.7	201.8	131.8	125.4	119.0	112.5	106.0	99.5	93.3	1244.1
1958	4.5	72.1	120.3	161.9	192.3	211.3	221.5	224.3	221.6	215.9	208.1	199.2	189.9	123.2	116.5	110.1	103.8	97.5	91.4	1218.2
1959	5.1	81.8	135.6	179.9	212.3	232.0	241.1	242.8	239.0	231.2	221.7	211.1	200.2	189.5	122.2	115.1	108.4	101.9	95.5	1273.3
1960	5.8	92.3	151.5	199.7	232.4	252.3	260.7	260.3	254.8	245.5	233.7	221.4	208.9	196.7	185.2	118.9	111.6	104.9	98.3	1310.8
1961	5.8	91.9	148.9	194.2	224.5	240.4	246.7	245.0	237.8	227.9	216.1	203.2	190.8	178.7	167.3	156.8	100.4	94.0	88.1	1174.5
1962	5.2	83.9	135.6	174.7	199.8	212.6	215.2	212.3	204.9	194.6	183.6	172.0	160.3	149.4	139.2	129.7	121.2	77.3	72.3	963.5
1963	4.7	74.9	122.1	156.9	177.2	186.6	187.6	182.5	175.0	165.3	154.6	144.1	133.7	123.7	114.7	106.4	98.8	92.1	58.6	779.2
1964	4.2	68.2	112.4	145.7	164.3	170.7	169.9	164.2	155.3	145.7	135.5	125.2	115.6	106.5	98.0	90.4	83.6	77.5	72.0	650.3
1965	3.8	61.2	101.7	133.2	151.5	157.1	154.3	147.6	138.7	128.4	118.6	108.9	99.7	91.4	83.8	76.7	70.6	65.1	60.2	556.8
1966	5.1	82.0	137.4	181.4	208.5	218.0	213.8	201.9	187.7	172.6	157.2	143.5	130.6	118.7	108.2	98.7	90.1	82.7	76.1	715.8
1967	6.8	108.2	177.6	236.5	274.0	289.7	286.4	269.9	247.7	225.4	204.0	183.6	166.1	150.1	135.6	123.1	111.9	101.9	93.3	886.8
1968	8.8	136.8	217.5	284.0	331.6	353.4	353.2	335.7	307.4	276.2	247.4	221.2	197.3	177.1	159.2	143.2	129.6	117.5	106.8	1018.8
1969	10.6	161.3	247.3	312.7	357.9	384.6	387.5	372.3	343.8	308.3	272.6	241.2	213.7	189.2	168.9	151.2	135.6	122.3	110.7	1052.2
1970	13.8	203.3	301.1	367.0	406.9	428.6	435.4	421.7	393.6	355.9	314.1	274.4	240.6	211.6	186.3	165.6	147.7	132.1	118.9	1122.3
1971	14.9	216.3	302.7	356.4	381.0	388.7	387.1	378.0	355.7	325.1	289.3	252.3	218.3	190.0	166.2	145.7	129.1	114.8	102.5	955.8
1972	16.1	231.5	314.7	350.1	361.5	355.6	343.0	328.4	311.6	287.1	258.2	227.0	196.1	168.5	145.9	127.1	111.0	98.1	87.1	796.2
1973	17.3	245.1	325.2	351.5	343.0	325.9	303.1	281.0	261.4	242.8	220.2	195.7	170.5	146.2	124.9	107.7	93.5	81.5	71.8	641.8
1974	13.9	274.5	354.9	374.3	354.8	318.6	286.2	255.8	230.5	209.9	191.9	172.0	151.4	130.9	111.7	95.0	81.6	70.7	61.5	534.4
1975	14.3	217.0	380.1	390.8	361.5	315.4	267.7	231.2	200.8	177.1	158.8	143.4	127.3	111.3	95.7	81.3	68.9	59.1	51.0	426.9
1976	20.0	212.6	275.6	383.8	346.1	294.6	243.0	198.3	166.4	141.5	122.8	108.8	97.3	85.8	74.6	63.9	54.1	45.7	39.1	313.9
1977	33.3	295.3	257.3	265.2	324.0	268.8	216.3	171.5	136.0	111.7	93.5	80.2	70.4	62.5	54.8	47.4	40.5	34.2	28.8	221.0
1978	46.2	439.2	292.9	203.0	183.5	206.3	161.8	125.2	96.4	74.9	60.5	50.0	42.5	37.1	32.7	28.6	24.6	21.0	17.7	128.2
1979	28.9	493.3	317.2	168.3	102.4	85.1	90.5	68.2	51.3	38.7	29.6	23.6	19.3	16.3	14.1	12.4	10.8	9.3	7.9	54.6
1980	57.9	288.1	315.1	161.3	75.1	42.0	33.0	33.8	24.7	18.2	13.5	10.2	8.1	6.6	5.5	4.8	4.2	3.6	3.1	20.7
1981	8.2	394.3	119.8	104.3	46.9	20.1	10.6	8.0	8.0	5.7	4.1	3.0	2.3	1.8	1.4	1.2	1.0	0.9	0.8	5.1
1982	15.9	90.4	329.1	79.5	60.8	25.1	10.2	5.2	3.8	3.7	2.6	1.9	1.4	1.0	0.8	0.6	0.5	0.5	0.4	2.6
1983	32.4	200.5	87.6	253.8	53.8	37.8	14.8	5.8	2.8	2.0	2.0	1.4	1.0	0.7	0.5	0.4	0.3	0.3	0.2	1.5
1984	61.7	316.0	180.5	62.8	159.7	31.2	20.7	7.8	2.9	1.4	1.0	1.0	0.7	0.5	0.3	0.2	0.2	0.2	0.1	0.8

Table 1.12. (continued)

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1985	17.3	382.9	305.4	95.7	29.2	68.2	12.6	8.0	2.9	1.1	0.5	0.4	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.3
1986	21.1	94.1	333.4	155.4	42.5	11.9	26.3	4.7	2.9	1.0	0.4	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1
1987	17.0	99.1	83.9	186.5	76.2	19.2	5.1	10.8	1.9	1.1	0.4	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1
1988	15.1	151.2	133.1	65.3	127.2	47.8	11.4	2.9	6.0	1.0	0.6	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1989	17.4	131.5	195.3	105.7	45.4	81.5	28.9	6.6	1.6	3.3	0.5	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	14.3	123.6	157.2	115.4	54.7	21.6	36.6	12.5	2.8	0.7	1.3	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1991	16.3	91.6	118.8	84.5	54.3	23.6	8.8	14.4	4.8	1.0	0.2	0.5	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	0.9	73.5	93.0	94.1	58.4	34.4	14.2	5.1	8.1	2.6	0.5	0.1	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1993	0.6	36.4	174.0	134.6	78.4	43.9	24.5	9.7	3.4	5.2	1.7	0.4	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.3	13.8	58.6	166.7	58.4	30.5	16.2	8.7	3.3	1.1	1.7	0.5	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0
1995	0.3	13.3	44.0	93.7	117.4	36.9	18.2	9.3	4.8	1.8	0.6	0.9	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.6	16.7	43.5	65.8	62.4	70.2	20.8	9.9	4.9	2.5	0.9	0.3	0.5	0.2	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.6	24.4	47.8	60.5	42.4	36.2	38.5	11.0	5.1	2.4	1.2	0.5	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0
1998	2.0	39.1	84.0	67.0	39.3	24.8	20.0	20.5	5.7	2.5	1.2	0.6	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0
1999	2.6	91.9	92.2	104.8	47.6	25.2	15.1	11.7	11.6	3.1	1.4	0.7	0.3	0.1	0.0	0.1	0.0	0.0	0.0	0.0
2000	2.0	101.2	181.9	95.9	63.9	26.3	13.2	7.6	5.7	5.5	1.5	0.7	0.3	0.2	0.1	0.0	0.0	0.0	0.0	0.0
2001	1.3	71.8	197.1	209.6	67.2	40.6	15.8	7.6	4.2	3.1	2.9	0.8	0.4	0.2	0.1	0.0	0.0	0.0	0.0	0.0
2002	1.3	42.7	131.1	198.4	116.3	33.6	19.2	7.2	3.4	1.8	1.3	1.3	0.3	0.2	0.1	0.0	0.0	0.0	0.0	0.0
2003	0.9	50.7	81.6	133.2	115.0	60.8	16.6	9.1	3.3	1.5	0.8	0.6	0.6	0.2	0.1	0.0	0.0	0.0	0.0	0.0
2004	1.1	34.5	105.3	109.0	114.2	89.4	44.7	11.7	6.2	2.2	1.0	0.5	0.4	0.4	0.1	0.0	0.0	0.0	0.0	0.0
2005	1.3	45.9	73.0	117.1	70.2	66.5	49.2	23.6	6.0	3.1	1.1	0.5	0.3	0.2	0.2	0.1	0.0	0.0	0.0	0.0
2006	1.3	50.4	84.8	72.6	72.5	39.5	35.4	25.1	11.7	2.9	1.5	0.5	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0

Table 1.13. Red snapper: Base run: Estimated status indicators, benchmarks, and related quantities from the catch-at-age model, conditional on estimated current selectivities averaged across fisheries. Values are those associated with $F_{40\%}$, the recommended proxy for F_{MSY}. They are presented for the base estimate of R_0, and also for $\pm 25\% R_0$. Estimates of yield (Y) do not include discard mortalities (D); equilibrium recruitment (R) includes bias correction. The MSST *is defined by* $\mathrm{MSST} = (1-M)\mathrm{SSB}_{F_{40\%}}$*, with constant* $M = 0.078$*. Rate estimates (F) are in units of per year; status indicators are dimensionless; and biomass estimates are in units of mt or pounds, as indicated. SPR is spawning potential ratio and YPR is yield per recruit.*

Quantity	Units	Base estimate	$+25\%R_0$	$-25\%R_0$
$F_{40\%}$	y^{-1}	0.104	–	–
$85\%F_{40\%}$	y^{-1}	0.089	–	–
$75\%F_{40\%}$	y^{-1}	0.078	–	–
$65\%F_{40\%}$	y^{-1}	0.068	–	–
SSB/R at $F = 0$	lb/fish	64.42	–	–
SPR at $F_{40\%}$	–	40.0%	–	–
SPR at $85\%F_{40\%}$	–	44.7%	–	–
SPR at $75\%F_{40\%}$	–	48.4%	–	–
SPR at $65\%F_{40\%}$	–	52.5%	–	–
YPR at $F_{40\%}$	lb	3.33	–	–
YPR at $85\%F_{40\%}$	lb	3.17	–	–
YPR at $75\%F_{40\%}$	lb	3.02	–	–
YPR at $65\%F_{40\%}$	lb	2.84	–	–
Y at $F_{40\%}$	1000 lb	1949	2436	1462
Y at $85\%F_{40\%}$	1000 lb	1926	2408	1445
Y at $75\%F_{40\%}$	1000 lb	1883	2353	1412
Y at $65\%F_{40\%}$	1000 lb	1811	2264	1358
Y at $F_{40\%}$	1000 fish	157	196	117
Y at $85\%F_{40\%}$	1000 fish	150	187	112
Y at $75\%F_{40\%}$	1000 fish	143	179	108
Y at $65\%F_{40\%}$	1000 fish	135	169	101
D at $F_{40\%}$	1000 lb	62	77	46
D at $85\%F_{40\%}$	1000 lb	55	69	41
D at $75\%F_{40\%}$	1000 lb	50	63	38
D at $65\%F_{40\%}$	1000 lb	45	56	34
D at $F_{40\%}$	1000 fish	33	41	25
D at $85\%F_{40\%}$	1000 fish	29	37	22
D at $75\%F_{40\%}$	1000 fish	27	33	20
D at $65\%F_{40\%}$	1000 fish	24	30	18
R bias correction	–	1.104	–	–
R at $F = 0$ (R_0)	1000 fish	638	798	479
R at $F_{40\%}$	1000 fish	586	732	439
R at $85\%F_{40\%}$	1000 fish	608	761	456
R at $75\%F_{40\%}$	1000 fish	623	779	467
R at $65\%F_{40\%}$	1000 fish	637	796	477
$\mathrm{B}_{F_{40\%}}$	mt	15063	18829	11297
$\mathrm{SSB}_{F_{40\%}}$	mt	6847	8559	5136
MSST	mt	6313	7892	4735
$F_{2006}/F_{40\%}$	–	7.658	–	–
$\mathrm{SSB}_{2006}/\mathrm{SSB}_{F_{40\%}}$	–	0.029	0.023	0.038
$\mathrm{SSB}_{2006}/\mathrm{MSST}$	–	0.031	0.025	0.042

*Table 1.14. Red snapper: Projection results under scenario R1—fishing mortality rate fixed at F = 0. F = fishing mortality rate (per year), Pr(recover) = proportion of cases reaching $SSB_{F_{40\%}}$, SSB = mid-year spawning stock biomass (*mt*), R = recruits (1000 fish), L = landings (1000* lb *whole weight), Sum L = cumulative landings (1000* lb*), and D = discard mortalities (1000 fish). For reference, estimated proxy reference points are $F_{40\%}$ = 0.104, $SSB_{F_{40\%}}$ = 6847, $R_{F_{40\%}}$ = 586, $MSY_{F_{40\%}}$ = 1949, and $D_{F_{40\%}}$ = 33, each in the same units as the relevant time series.*

Year	F(per yr)	Pr(recover)	SSB(mt)	R(1000)	L(1000 lb)	Sum L(1000 lb)	D(1000)
2007	0.918	0	204	286	450	450	98
2008	0.918	0	201	61	454	904	68
2009	0	0	175	60	0	904	0
2010	0	0	323	53	0	904	0
2011	0	0	410	92	0	904	0
2012	0	0	501	113	0	904	0
2013	0	0	602	134	0	904	0
2014	0	0	718	156	0	904	0
2015	0	0	853	179	0	904	0
2016	0	0	1010	204	0	904	0
2017	0	0	1190	231	0	904	0
2018	0	0	1397	259	0	904	0
2019	0	0	1631	287	0	904	0
2020	0	0	1895	316	0	904	0
2021	0	0	2190	346	0	904	0
2022	0	0	2515	374	0	904	0
2023	0	0	2870	402	0	904	0
2024	0	0	3255	428	0	904	0
2025	0	0	3668	453	0	904	0
2026	0	0	4106	476	0	904	0
2027	0	0	4567	497	0	904	0
2028	0	0.01	5049	517	0	904	0
2029	0	0.04	5547	535	0	904	0
2030	0	0.08	6060	552	0	904	0
2031	0	0.14	6582	566	0	904	0
2032	0	0.24	7111	580	0	904	0
2033	0	0.35	7643	592	0	904	0
2034	0	0.48	8175	603	0	904	0
2035	0	0.61	8704	612	0	904	0
2036	0	0.73	9228	621	0	904	0
2037	0	0.82	9744	629	0	904	0
2038	0	0.9	10,251	636	0	904	0
2039	0	0.94	10,746	643	0	904	0
2040	0	0.96	11,228	649	0	904	0
2041	0	0.98	11,696	654	0	904	0
2042	0	0.99	12,149	659	0	904	0
2043	0	1	12,587	663	0	904	0
2044	0	1	13,009	667	0	904	0
2045	0	1	13,414	671	0	904	0
2046	0	1	13,803	674	0	904	0
2047	0	1	14,176	677	0	904	0
2048	0	1	14,532	680	0	904	0
2049	0	1	14,872	682	0	904	0
2050	0	1	15,196	684	0	904	0

*Table 1.15. Red snapper: Projection results under scenario R2—fishing mortality rate fixed at $F = F_{40\%}$. F = fishing mortality rate (per year), Pr(recover) = proportion of cases reaching $SSB_{F_{40\%}}$, SSB = mid-year spawning stock biomass (*mt*), R = recruits (1000 fish), L = landings (1000* lb *whole weight), Sum L = cumulative landings (1000* lb*), and D = discard mortalities (1000 fish). For reference, estimated proxy reference points are $F_{40\%}$ = 0.104, $SSB_{F_{40\%}}$ = 6847, $R_{F_{40\%}}$ = 586, $MSY_{F_{40\%}}$ = 1949, and $D_{F_{40\%}}$ = 33, each in the same units as the relevant time series.*

Year	F(per yr)	Pr(recover)	SSB(mt)	R(1000)	L(1000 lb)	Sum L(1000 lb)	D(1000)
2007	0.918	0	204	286	450	450	98
2008	0.918	0	201	61	454	904	68
2009	0.104	0	175	60	60	964	4
2010	0.104	0	293	53	83	1047	3
2011	0.104	0	350	84	99	1146	4
2012	0.104	0	403	98	114	1259	5
2013	0.104	0	457	111	128	1388	6
2014	0.104	0	517	124	145	1533	6
2015	0.104	0	583	138	163	1696	7
2016	0.104	0	656	152	183	1879	8
2017	0.104	0	736	167	205	2084	9
2018	0.104	0	824	182	230	2315	9
2019	0.104	0	921	199	258	2572	10
2020	0.104	0	1026	216	287	2860	11
2021	0.104	0	1139	233	319	3179	12
2022	0.104	0	1260	251	353	3532	13
2023	0.104	0	1389	269	390	3922	14
2024	0.104	0	1527	286	429	4351	15
2025	0.104	0	1671	304	470	4821	16
2026	0.104	0	1823	321	513	5334	17
2027	0.104	0	1981	338	558	5891	18
2028	0.104	0	2144	354	604	6495	19
2029	0.104	0	2311	370	652	7147	20
2030	0.104	0	2483	385	700	7847	21
2031	0.104	0	2657	399	750	8597	22
2032	0.104	0	2833	413	800	9397	22
2033	0.104	0	3009	425	850	10,247	23
2034	0.104	0	3186	437	901	11,148	24
2035	0.104	0	3361	449	951	12,099	25
2036	0.104	0	3534	459	1000	13,099	25
2037	0.104	0	3705	469	1049	14,147	26
2038	0.104	0	3872	478	1096	15,244	26
2039	0.104	0	4035	486	1143	16,387	27
2040	0.104	0	4193	494	1188	17,575	27
2041	0.104	0	4346	501	1232	18,807	28
2042	0.104	0.01	4494	508	1274	20,081	28
2043	0.104	0.01	4637	514	1315	21,396	29
2044	0.104	0.01	4773	520	1354	22,750	29
2045	0.104	0.02	4903	525	1391	24,141	29
2046	0.104	0.03	5028	530	1427	25,568	30
2047	0.104	0.04	5146	534	1461	27,029	30
2048	0.104	0.05	5258	539	1493	28,521	30
2049	0.104	0.06	5364	542	1523	30,044	30
2050	0.104	0.07	5465	546	1552	31,596	31
2051	0.104	0.09	5559	549	1579	33,174	31
2052	0.104	0.1	5648	552	1604	34,778	31
2053	0.104	0.11	5732	555	1628	36,406	31
2054	0.104	0.12	5811	557	1650	38,057	31
2055	0.104	0.13	5884	559	1672	39,729	31

*Table 1.16. Red snapper: Projection results under scenario R3—fishing mortality rate fixed at F = 65%$F_{40\%}$. F = fishing mortality rate (per year), Pr(recover) = proportion of cases reaching $SSB_{F_{40\%}}$, SSB = mid-year spawning stock biomass (*mt*), R = recruits (1000 fish), L = landings (1000* lb *whole weight), Sum L = cumulative landings (1000* lb*), and D = discard mortalities (1000 fish). For reference, estimated proxy reference points are $F_{40\%}$ = 0.104, $SSB_{F_{40\%}}$ = 6847, $R_{F_{40\%}}$ = 586, $MSY_{F_{40\%}}$ = 1949, and $D_{F_{40\%}}$ = 33, each in the same units as the relevant time series.*

Year	F(per yr)	Pr(recover)	SSB(mt)	R(1000)	L(1000 lb)	Sum L(1000 lb)	D(1000)
2007	0.918	0	204	286	450	450	98
2008	0.918	0	201	61	454	904	68
2009	0.068	0	175	60	40	943	3
2010	0.068	0	303	53	56	999	2
2011	0.068	0	370	87	68	1067	2
2012	0.068	0	434	103	80	1147	3
2013	0.068	0	504	119	92	1239	4
2014	0.068	0	580	135	106	1345	4
2015	0.068	0	666	151	121	1466	5
2016	0.068	0	763	169	139	1604	6
2017	0.068	0	871	187	158	1762	6
2018	0.068	0	992	207	180	1943	7
2019	0.068	0	1125	228	205	2148	8
2020	0.068	0	1272	249	232	2380	9
2021	0.068	0	1433	270	262	2641	9
2022	0.068	0	1607	292	294	2935	10
2023	0.068	0	1794	314	328	3263	11
2024	0.068	0	1995	335	365	3628	12
2025	0.068	0	2207	356	404	4032	12
2026	0.068	0	2430	376	446	4478	13
2027	0.068	0	2664	395	489	4967	14
2028	0.068	0	2906	413	534	5500	15
2029	0.068	0	3155	430	580	6080	15
2030	0.068	0	3410	447	627	6707	16
2031	0.068	0	3669	462	675	7382	17
2032	0.068	0	3931	476	724	8106	17
2033	0.068	0	4193	489	772	8878	18
2034	0.068	0	4455	501	821	9699	18
2035	0.068	0.01	4714	513	869	10,569	19
2036	0.068	0.02	4970	523	917	11,485	19
2037	0.068	0.03	5221	532	963	12,449	19
2038	0.068	0.05	5466	541	1009	13,458	20
2039	0.068	0.07	5705	549	1053	14,511	20
2040	0.068	0.1	5936	556	1096	15,608	20
2041	0.068	0.14	6160	563	1138	16,746	21
2042	0.068	0.18	6375	569	1178	17,923	21
2043	0.068	0.23	6581	575	1216	19,140	21
2044	0.068	0.28	6779	580	1253	20,393	21
2045	0.068	0.35	6967	584	1288	21,681	22
2046	0.068	0.4	7146	589	1321	23,002	22
2047	0.068	0.46	7316	593	1353	24,355	22
2048	0.068	0.51	7477	596	1383	25,738	22
2049	0.068	0.56	7629	599	1411	27,149	22
2050	0.068	0.61	7773	602	1438	28,587	22
2051	0.068	0.66	7908	605	1463	30,050	22
2052	0.068	0.7	8036	608	1487	31,536	23
2053	0.068	0.74	8155	610	1509	33,045	23
2054	0.068	0.76	8268	612	1530	34,575	23
2055	0.068	0.79	8373	614	1549	36,124	23

*Table 1.17. Red snapper: Projection results under scenario R4—fishing mortality rate fixed at F = 75%$F_{40\%}$. F = fishing mortality rate (per year), Pr(recover) = proportion of cases reaching $SSB_{F_{40\%}}$, SSB = mid-year spawning stock biomass (*mt*), R = recruits (1000 fish), L = landings (1000* lb *whole weight), Sum L = cumulative landings (1000* lb*), and D = discard mortalities (1000 fish). For reference, estimated proxy reference points are $F_{40\%}$ =* 0.104, $SSB_{F_{40\%}}$ = 6847, $R_{F_{40\%}}$ = 586, $MSY_{F_{40\%}}$ = 1949, *and* $D_{F_{40\%}}$ = 33, *each in the same units as the relevant time series.*

Year	F(per yr)	Pr(recover)	SSB(mt)	R(1000)	L(1000 lb)	Sum L(1000 lb)	D(1000)
2007	0.918	0	204	286	450	450	98
2008	0.918	0	201	61	454	904	68
2009	0.078	0	175	60	46	949	3
2010	0.078	0	300	53	63	1013	2
2011	0.078	0	364	86	77	1090	3
2012	0.078	0	425	102	90	1180	4
2013	0.078	0	490	117	103	1283	4
2014	0.078	0	561	131	118	1401	5
2015	0.078	0	641	147	135	1536	6
2016	0.078	0	730	164	153	1689	6
2017	0.078	0	830	181	174	1863	7
2018	0.078	0	941	200	197	2060	8
2019	0.078	0	1063	219	223	2284	9
2020	0.078	0	1196	239	252	2535	9
2021	0.078	0	1342	259	282	2818	10
2022	0.078	0	1499	280	316	3133	11
2023	0.078	0	1668	300	352	3485	12
2024	0.078	0	1849	321	390	3875	13
2025	0.078	0	2039	341	431	4306	14
2026	0.078	0	2240	360	473	4779	15
2027	0.078	0	2449	379	518	5297	15
2028	0.078	0	2666	396	564	5862	16
2029	0.078	0	2889	413	612	6474	17
2030	0.078	0	3117	429	661	7134	18
2031	0.078	0	3349	444	710	7845	18
2032	0.078	0	3583	458	760	8605	19
2033	0.078	0	3817	471	811	9416	20
2034	0.078	0	4051	484	861	10,277	20
2035	0.078	0	4283	495	911	11,187	21
2036	0.078	0.01	4513	505	960	12,147	21
2037	0.078	0.01	4738	515	1008	13,155	22
2038	0.078	0.02	4958	524	1055	14,210	22
2039	0.078	0.03	5172	532	1101	15,311	22
2040	0.078	0.04	5380	539	1146	16,457	23
2041	0.078	0.06	5580	546	1189	17,646	23
2042	0.078	0.09	5773	553	1230	18,876	23
2043	0.078	0.12	5959	558	1270	20,145	24
2044	0.078	0.15	6136	564	1308	21,453	24
2045	0.078	0.18	6305	568	1344	22,797	24
2046	0.078	0.22	6466	573	1379	24,176	24
2047	0.078	0.27	6619	577	1411	25,587	24
2048	0.078	0.31	6764	581	1442	27,030	25
2049	0.078	0.35	6900	584	1472	28,501	25
2050	0.078	0.4	7030	587	1499	30,001	25
2051	0.078	0.43	7151	590	1526	31,526	25
2052	0.078	0.48	7266	593	1550	33,076	25
2053	0.078	0.52	7373	595	1573	34,650	25
2054	0.078	0.56	7474	597	1595	36,244	25
2055	0.078	0.59	7568	599	1615	37,859	26

*Table 1.18. Red snapper: Projection results under scenario R5—fishing mortality rate fixed at F = 85%$F_{40\%}$. F = fishing mortality rate (per year), Pr(recover) = proportion of cases reaching $SSB_{F_{40\%}}$, SSB = mid-year spawning stock biomass (*mt*), R = recruits (1000 fish), L = landings (1000* lb *whole weight), Sum L = cumulative landings (1000* lb*), and D = discard mortalities (1000 fish). For reference, estimated proxy reference points are $F_{40\%}$ = 0.104, $SSB_{F_{40\%}}$ = 6847, $R_{F_{40\%}}$ = 586, $MSY_{F_{40\%}}$ = 1949, and $D_{F_{40\%}}$ = 33, each in the same units as the relevant time series.*

Year	F(per yr)	Pr(recover)	SSB(mt)	R(1000)	L(1000 lb)	Sum L(1000 lb)	D(1000)
2007	0.918	0	204	286	450	450	98
2008	0.918	0	201	61	454	904	68
2009	0.088	0	175	60	52	955	4
2010	0.088	0	297	53	71	1026	3
2011	0.088	0	358	85	86	1113	3
2012	0.088	0	416	101	100	1213	4
2013	0.088	0	477	114	114	1326	5
2014	0.088	0	543	128	129	1456	6
2015	0.088	0	617	143	147	1603	6
2016	0.088	0	700	159	166	1769	7
2017	0.088	0	791	175	188	1956	8
2018	0.088	0	892	193	212	2169	9
2019	0.088	0	1004	211	239	2407	9
2020	0.088	0	1125	230	268	2675	10
2021	0.088	0	1257	249	300	2975	11
2022	0.088	0	1399	268	334	3309	12
2023	0.088	0	1551	288	370	3679	13
2024	0.088	0	1713	307	409	4088	14
2025	0.088	0	1884	326	451	4539	15
2026	0.088	0	2063	344	494	5033	16
2027	0.088	0	2250	362	539	5572	17
2028	0.088	0	2444	379	586	6158	17
2029	0.088	0	2643	396	634	6792	18
2030	0.088	0	2847	412	684	7475	19
2031	0.088	0	3054	426	734	8209	20
2032	0.088	0	3263	440	784	8993	21
2033	0.088	0	3473	453	835	9829	21
2034	0.088	0	3682	465	886	10,715	22
2035	0.088	0	3890	477	936	11,651	22
2036	0.088	0	4095	487	986	12,637	23
2037	0.088	0	4296	497	1035	13,672	23
2038	0.088	0.01	4494	506	1083	14,755	24
2039	0.088	0.01	4686	514	1130	15,885	24
2040	0.088	0.01	4872	522	1175	17,060	25
2041	0.088	0.02	5052	529	1219	18,279	25
2042	0.088	0.04	5226	535	1261	19,540	25
2043	0.088	0.05	5393	541	1301	20,841	26
2044	0.088	0.07	5552	547	1340	22,181	26
2045	0.088	0.09	5704	552	1377	23,558	26
2046	0.088	0.12	5849	556	1412	24,971	27
2047	0.088	0.14	5987	560	1446	26,417	27
2048	0.088	0.17	6117	564	1478	27,894	27
2049	0.088	0.2	6241	568	1508	29,402	27
2050	0.088	0.23	6357	571	1536	30,938	27
2051	0.088	0.25	6467	574	1563	32,500	28
2052	0.088	0.28	6570	577	1588	34,088	28
2053	0.088	0.32	6667	579	1611	35,699	28
2054	0.088	0.35	6758	582	1633	37,332	28
2055	0.088	0.38	6843	584	1654	38,986	28

*Table 1.19. Red snapper: Projection results under scenario R6—Discard-only projection with fishing rate fixed at $F = F_{current}$ minus commercial diving, and with release mortality rates of 0.9 in the commercial sector and 0.4 in the headboat and general recreational sectors. F = fishing rate (per year), Fmort = fishing rate leading to discard mortality (a portion of F), Pr(recover) = proportion of cases reaching $SSB_{F40\%}$, SSB = mid-year spawning stock biomass (*mt*), R = recruits (1000 fish), L = landings (1000* lb*), D = discard mortalities (1000 fish), D.wgt = discard mortalities in weight (1000 lb). For reference, the target for rebuilding is* $SSB_{F40\%} = 6847$.

Year	F(per yr)	Fmort(per yr)	Pr(recover)	SSB(mt)	R(1000)	L(1000 lb)	D(1000)	D.wgt(1000 lb)
2007	0.918	0.918	0	204	286	450	98	152
2008	0.918	0.918	0	201	61	454	68	136
2009	0.903	0.651	0	175	60	0	74	323
2010	0.903	0.651	0	195	53	0	57	298
2011	0.903	0.651	0	181	58	0	50	276
2012	0.903	0.651	0	163	54	0	45	251
2013	0.903	0.651	0	146	49	0	41	226
2014	0.903	0.651	0	130	44	0	37	202
2015	0.903	0.651	0	116	40	0	33	180
2016	0.903	0.651	0	104	36	0	30	161
2017	0.903	0.651	0	93	32	0	27	144
2018	0.903	0.651	0	83	29	0	24	129
2019	0.903	0.651	0	74	26	0	21	116
2020	0.903	0.651	0	67	23	0	19	104
2021	0.903	0.651	0	60	21	0	17	93
2022	0.903	0.651	0	54	19	0	16	84
2023	0.903	0.651	0	48	17	0	14	75
2024	0.903	0.651	0	43	15	0	13	68
2025	0.903	0.651	0	39	14	0	11	61
2026	0.903	0.651	0	35	12	0	10	55
2027	0.903	0.651	0	32	11	0	9	49
2028	0.903	0.651	0	28	10	0	8	44
2029	0.903	0.651	0	25	9	0	7	40
2030	0.903	0.651	0	23	8	0	7	36
2031	0.903	0.651	0	21	7	0	6	32
2032	0.903	0.651	0	19	7	0	5	29
2033	0.903	0.651	0	17	6	0	5	26
2034	0.903	0.651	0	15	5	0	4	23
2035	0.903	0.651	0	14	5	0	4	21
2036	0.903	0.651	0	12	4	0	4	19
2037	0.903	0.651	0	11	4	0	3	17
2038	0.903	0.651	0	10	4	0	3	15
2039	0.903	0.651	0	9	3	0	3	14
2040	0.903	0.651	0	8	3	0	2	13
2041	0.903	0.651	0	7	3	0	2	11
2042	0.903	0.651	0	7	2	0	2	10
2043	0.903	0.651	0	6	2	0	2	9
2044	0.903	0.651	0	5	2	0	2	8
2045	0.903	0.651	0	5	2	0	1	7
2046	0.903	0.651	0	4	2	0	1	7
2047	0.903	0.651	0	4	1	0	1	6
2048	0.903	0.651	0	3	1	0	1	5
2049	0.903	0.651	0	3	1	0	1	5
2050	0.903	0.651	0	3	1	0	1	4
2051	0.903	0.651	0	3	1	0	1	4
2052	0.903	0.651	0	2	1	0	1	4
2053	0.903	0.651	0	2	1	0	1	3
2054	0.903	0.651	0	2	1	0	1	3
2055	0.903	0.651	0	2	1	0	0	3

*Table 1.20. Red snapper: Projection results under scenario R7—Discard-only projection with fishing rate fixed at F = $F_{40\%}$ minus commercial diving, and with release mortality rates of 0.9 in the commercial sector and 0.4 in the headboat and general recreational sectors. F = fishing rate (per year), Fmort = fishing rate leading to discard mortality (a portion of F), Pr(recover) = proportion of cases reaching $SSB_{F40\%}$, SSB = mid-year spawning stock biomass (*mt*), R = recruits (1000 fish), L = landings (1000* lb*), D = discard mortalities (1000 fish), D.wgt = discard mortalities in weight (1000 lb). For reference, the target for rebuilding is* $SSB_{F40\%}$ = 6847.

Year	F(per yr)	Fmort(per yr)	Pr(recover)	SSB(mt)	R(1000)	L(1000 lb)	D(1000)	D.wgt(1000 lb)
2007	0.918	0.918	0	204	286	450	98	152
2008	0.918	0.918	0	201	61	454	68	136
2009	0.104	0.075	0	175	60	0	10	43
2010	0.104	0.075	0	304	53	0	10	53
2011	0.104	0.075	0	373	87	0	11	64
2012	0.104	0.075	0	440	104	0	12	76
2013	0.104	0.075	0	511	120	0	14	89
2014	0.104	0.075	0	590	136	0	16	103
2015	0.104	0.075	0	678	153	0	19	118
2016	0.104	0.075	0	778	171	0	21	135
2017	0.104	0.075	0	889	190	0	24	155
2018	0.104	0.075	0	1014	210	0	27	176
2019	0.104	0.075	0	1152	231	0	30	200
2020	0.104	0.075	0	1305	253	0	34	226
2021	0.104	0.075	0	1471	275	0	37	254
2022	0.104	0.075	0	1652	297	0	41	285
2023	0.104	0.075	0	1847	319	0	45	318
2024	0.104	0.075	0	2056	340	0	49	353
2025	0.104	0.075	0	2277	361	0	53	391
2026	0.104	0.075	0	2510	382	0	58	430
2027	0.104	0.075	0	2754	401	0	62	471
2028	0.104	0.075	0	3007	420	0	66	513
2029	0.104	0.075	0	3269	437	0	71	557
2030	0.104	0.075	0	3536	454	0	75	601
2031	0.104	0.075	0	3808	469	0	79	646
2032	0.104	0.075	0	4082	483	0	83	692
2033	0.104	0.075	0	4358	496	0	87	738
2034	0.104	0.075	0.01	4633	509	0	91	783
2035	0.104	0.075	0.01	4907	520	0	95	829
2036	0.104	0.075	0.03	5177	530	0	98	873
2037	0.104	0.075	0.04	5442	540	0	102	917
2038	0.104	0.075	0.07	5701	548	0	105	960
2039	0.104	0.075	0.1	5954	556	0	108	1001
2040	0.104	0.075	0.14	6200	563	0	111	1042
2041	0.104	0.075	0.19	6437	570	0	114	1081
2042	0.104	0.075	0.24	6665	576	0	117	1118
2043	0.104	0.075	0.3	6885	582	0	119	1155
2044	0.104	0.075	0.37	7095	587	0	122	1189
2045	0.104	0.075	0.44	7296	591	0	124	1222
2046	0.104	0.075	0.5	7488	596	0	126	1253
2047	0.104	0.075	0.56	7670	600	0	128	1283
2048	0.104	0.075	0.61	7842	603	0	130	1312
2049	0.104	0.075	0.66	8006	606	0	131	1338
2050	0.104	0.075	0.7	8160	609	0	133	1364
2051	0.104	0.075	0.75	8306	612	0	135	1388
2052	0.104	0.075	0.79	8443	615	0	136	1410
2053	0.104	0.075	0.82	8573	617	0	137	1431
2054	0.104	0.075	0.84	8694	619	0	139	1451
2055	0.104	0.075	0.87	8808	621	0	140	1470

*Table 1.21. Red snapper: Projection results under scenario R8—Discard-only projection with fishing rate fixed at F = 65%$F_{40\%}$, and with release mortality rates of 0.9 in the commercial sector and 0.4 in the headboat and general recreational sectors. F = fishing rate (per year), Fmort = fishing rate leading to discard mortality (a portion of F), Pr(recover) = proportion of cases reaching $SSB_{F40\%}$, SSB = mid-year spawning stock biomass (*mt*), R = recruits (1000 fish), L = landings (1000* lb*), D = discard mortalities (1000 fish), D.wgt = discard mortalities in weight (1000 lb). For reference, the target for rebuilding is* $SSB_{F40\%}$ = 6847.

Year	F(per yr)	Fmort(per yr)	Pr(recover)	SSB(mt)	R(1000)	L(1000 lb)	D(1000)	D.wgt(1000 lb)
2007	0.918	0.918	0	204	286	450	98	152
2008	0.918	0.918	0	201	61	454	68	136
2009	0.068	0.049	0	175	60	0	6	28
2010	0.068	0.049	0	311	53	0	6	35
2011	0.068	0.049	0	385	89	0	7	43
2012	0.068	0.049	0	460	107	0	8	52
2013	0.068	0.049	0	541	125	0	10	61
2014	0.068	0.049	0	632	143	0	11	72
2015	0.068	0.049	0	735	162	0	13	83
2016	0.068	0.049	0	852	182	0	15	96
2017	0.068	0.049	0	985	204	0	17	111
2018	0.068	0.049	0	1135	227	0	19	128
2019	0.068	0.049	0	1302	250	0	22	146
2020	0.068	0.049	0	1487	274	0	24	167
2021	0.068	0.049	0	1692	299	0	27	190
2022	0.068	0.049	0	1915	323	0	30	214
2023	0.068	0.049	0	2157	348	0	33	241
2024	0.068	0.049	0	2417	371	0	36	269
2025	0.068	0.049	0	2694	394	0	40	299
2026	0.068	0.049	0	2987	415	0	43	331
2027	0.068	0.049	0	3293	436	0	46	365
2028	0.068	0.049	0	3612	455	0	50	399
2029	0.068	0.049	0	3941	473	0	53	435
2030	0.068	0.049	0	4279	490	0	56	471
2031	0.068	0.049	0.01	4622	505	0	59	508
2032	0.068	0.049	0.01	4968	519	0	62	545
2033	0.068	0.049	0.03	5316	532	0	66	583
2034	0.068	0.049	0.05	5664	544	0	68	620
2035	0.068	0.049	0.1	6008	555	0	71	657
2036	0.068	0.049	0.14	6349	565	0	74	693
2037	0.068	0.049	0.2	6683	574	0	77	729
2038	0.068	0.049	0.27	7010	582	0	79	764
2039	0.068	0.049	0.37	7329	590	0	81	798
2040	0.068	0.049	0.46	7638	596	0	84	831
2041	0.068	0.049	0.54	7937	603	0	86	863
2042	0.068	0.049	0.62	8225	608	0	88	894
2043	0.068	0.049	0.7	8502	613	0	90	923
2044	0.068	0.049	0.76	8768	618	0	92	951
2045	0.068	0.049	0.82	9021	622	0	93	978
2046	0.068	0.049	0.86	9263	626	0	95	1004
2047	0.068	0.049	0.9	9494	630	0	96	1029
2048	0.068	0.049	0.92	9712	633	0	98	1052
2049	0.068	0.049	0.94	9920	636	0	99	1074
2050	0.068	0.049	0.95	10,116	639	0	100	1095
2051	0.068	0.049	0.97	10,302	641	0	102	1115
2052	0.068	0.049	0.98	10,477	643	0	103	1133
2053	0.068	0.049	0.99	10,642	646	0	104	1151
2054	0.068	0.049	0.99	10,798	647	0	105	1167
2055	0.068	0.049	0.99	10,944	649	0	106	1183

*Table 1.22. Red snapper: Projection results under scenario R9—Discard-only projection with fishing rate fixed at F = 75%$F_{40\%}$, and with release mortality rates of 0.9 in the commercial sector and 0.4 in the headboat and general recreational sectors. F = fishing rate (per year), Fmort = fishing rate leading to discard mortality (a portion of F), Pr(recover) = proportion of cases reaching $SSB_{F40\%}$, SSB = mid-year spawning stock biomass (*mt*), R = recruits (1000 fish), L = landings (1000* lb*), D = discard mortalities (1000 fish), D.wgt = discard mortalities in weight (1000 lb). For reference, the target for rebuilding is* $SSB_{F40\%}$ = 6847.

Year	F(per yr)	Fmort(per yr)	Pr(recover)	SSB(mt)	R(1000)	L(1000 lb)	D(1000)	D.wgt(1000 lb)
2007	0.918	0.918	0	204	286	450	98	152
2008	0.918	0.918	0	201	61	454	68	136
2009	0.078	0.056	0	175	60	0	7	32
2010	0.078	0.056	0	309	53	0	7	40
2011	0.078	0.056	0	382	88	0	8	49
2012	0.078	0.056	0	454	106	0	9	59
2013	0.078	0.056	0	532	123	0	11	69
2014	0.078	0.056	0	620	141	0	13	81
2015	0.078	0.056	0	718	159	0	15	94
2016	0.078	0.056	0	830	179	0	17	108
2017	0.078	0.056	0	957	200	0	19	125
2018	0.078	0.056	0	1099	222	0	22	143
2019	0.078	0.056	0	1257	245	0	24	163
2020	0.078	0.056	0	1433	268	0	27	186
2021	0.078	0.056	0	1626	292	0	30	210
2022	0.078	0.056	0	1836	316	0	34	237
2023	0.078	0.056	0	2064	339	0	37	266
2024	0.078	0.056	0	2308	362	0	41	297
2025	0.078	0.056	0	2568	385	0	44	330
2026	0.078	0.056	0	2843	406	0	48	364
2027	0.078	0.056	0	3130	426	0	51	400
2028	0.078	0.056	0	3429	445	0	55	438
2029	0.078	0.056	0	3737	463	0	59	476
2030	0.078	0.056	0	4053	480	0	62	515
2031	0.078	0.056	0	4374	495	0	66	555
2032	0.078	0.056	0.01	4699	509	0	69	596
2033	0.078	0.056	0.02	5024	522	0	73	636
2034	0.078	0.056	0.03	5349	534	0	76	676
2035	0.078	0.056	0.06	5672	545	0	79	716
2036	0.078	0.056	0.1	5991	555	0	82	756
2037	0.078	0.056	0.14	6304	564	0	85	794
2038	0.078	0.056	0.2	6610	573	0	88	832
2039	0.078	0.056	0.26	6908	580	0	90	869
2040	0.078	0.056	0.35	7197	587	0	93	905
2041	0.078	0.056	0.43	7477	594	0	95	939
2042	0.078	0.056	0.51	7747	599	0	97	972
2043	0.078	0.056	0.59	8006	605	0	99	1004
2044	0.078	0.056	0.66	8254	609	0	101	1034
2045	0.078	0.056	0.72	8491	614	0	103	1064
2046	0.078	0.056	0.78	8717	618	0	105	1091
2047	0.078	0.056	0.82	8932	621	0	107	1118
2048	0.078	0.056	0.86	9136	625	0	108	1143
2049	0.078	0.056	0.9	9329	628	0	110	1167
2050	0.078	0.056	0.92	9512	631	0	111	1189
2051	0.078	0.056	0.93	9685	633	0	112	1210
2052	0.078	0.056	0.95	9848	636	0	113	1230
2053	0.078	0.056	0.96	10,002	638	0	115	1249
2054	0.078	0.056	0.97	10,147	640	0	116	1267
2055	0.078	0.056	0.98	10,283	642	0	117	1284

*Table 1.23. Red snapper: Projection results under scenario R10—Discard-only projection with fishing rate fixed at F = 85%$F_{40\%}$, and with release mortality rates of 0.9 in the commercial sector and 0.4 in the headboat and general recreational sectors. F = fishing rate (per year), Fmort = fishing rate leading to discard mortality (a portion of F), Pr(recover) = proportion of cases reaching $SSB_{F_{40\%}}$, SSB = mid-year spawning stock biomass (*mt*), R = recruits (1000 fish), L = landings (1000* lb*), D = discard mortalities (1000 fish), D.wgt = discard mortalities in weight (1000 lb). For reference, the target for rebuilding is* $SSB_{F_{40\%}}$ = 6847.

Year	F(per yr)	Fmort(per yr)	Pr(recover)	SSB(mt)	R(1000)	L(1000 lb)	D(1000)	D.wgt(1000 lb)
2007	0.918	0.918	0	204	286	450	98	152
2008	0.918	0.918	0	201	61	454	68	136
2009	0.088	0.064	0	175	60	0	8	37
2010	0.088	0.064	0	307	53	0	8	46
2011	0.088	0.064	0	378	88	0	9	55
2012	0.088	0.064	0	448	105	0	11	66
2013	0.088	0.064	0	524	122	0	12	77
2014	0.088	0.064	0	607	139	0	14	90
2015	0.088	0.064	0	702	157	0	16	104
2016	0.088	0.064	0	809	176	0	19	120
2017	0.088	0.064	0	929	196	0	21	137
2018	0.088	0.064	0	1064	217	0	24	157
2019	0.088	0.064	0	1214	239	0	27	179
2020	0.088	0.064	0	1380	262	0	30	203
2021	0.088	0.064	0	1562	285	0	33	229
2022	0.088	0.064	0	1760	308	0	37	258
2023	0.088	0.064	0	1974	331	0	40	289
2024	0.088	0.064	0	2204	354	0	44	321
2025	0.088	0.064	0	2448	375	0	48	356
2026	0.088	0.064	0	2705	396	0	52	393
2027	0.088	0.064	0	2974	416	0	56	431
2028	0.088	0.064	0	3254	435	0	60	471
2029	0.088	0.064	0	3543	453	0	64	512
2030	0.088	0.064	0	3838	469	0	68	554
2031	0.088	0.064	0	4139	485	0	72	596
2032	0.088	0.064	0	4442	499	0	75	639
2033	0.088	0.064	0.01	4747	512	0	79	682
2034	0.088	0.064	0.02	5052	524	0	82	725
2035	0.088	0.064	0.03	5354	535	0	86	767
2036	0.088	0.064	0.06	5652	545	0	89	809
2037	0.088	0.064	0.1	5945	555	0	92	850
2038	0.088	0.064	0.14	6231	563	0	95	890
2039	0.088	0.064	0.19	6510	571	0	98	929
2040	0.088	0.064	0.25	6781	578	0	101	967
2041	0.088	0.064	0.32	7043	584	0	103	1004
2042	0.088	0.064	0.4	7295	590	0	106	1039
2043	0.088	0.064	0.47	7538	596	0	108	1073
2044	0.088	0.064	0.55	7770	601	0	110	1105
2045	0.088	0.064	0.62	7991	605	0	112	1136
2046	0.088	0.064	0.67	8203	609	0	114	1165
2047	0.088	0.064	0.72	8404	613	0	116	1193
2048	0.088	0.064	0.77	8594	616	0	117	1220
2049	0.088	0.064	0.82	8775	619	0	119	1245
2050	0.088	0.064	0.85	8946	622	0	121	1269
2051	0.088	0.064	0.88	9107	625	0	122	1291
2052	0.088	0.064	0.9	9259	627	0	123	1312
2053	0.088	0.064	0.92	9403	630	0	124	1332
2054	0.088	0.064	0.94	9537	632	0	126	1351
2055	0.088	0.064	0.95	9664	634	0	127	1369

1.3.6 Figures

Figure 1.1. Red snapper: Comparison of previous and corrected recreational landings. Headboat landings are separated from these general recreational landings starting in 1972, but are assumed included prior. The large solid circles in 1960, 1965, and 1970 represent values from Salt-Water Angling Surveys and served as anchor points for linear interpolations, as documented in the Assessment Workshop report.

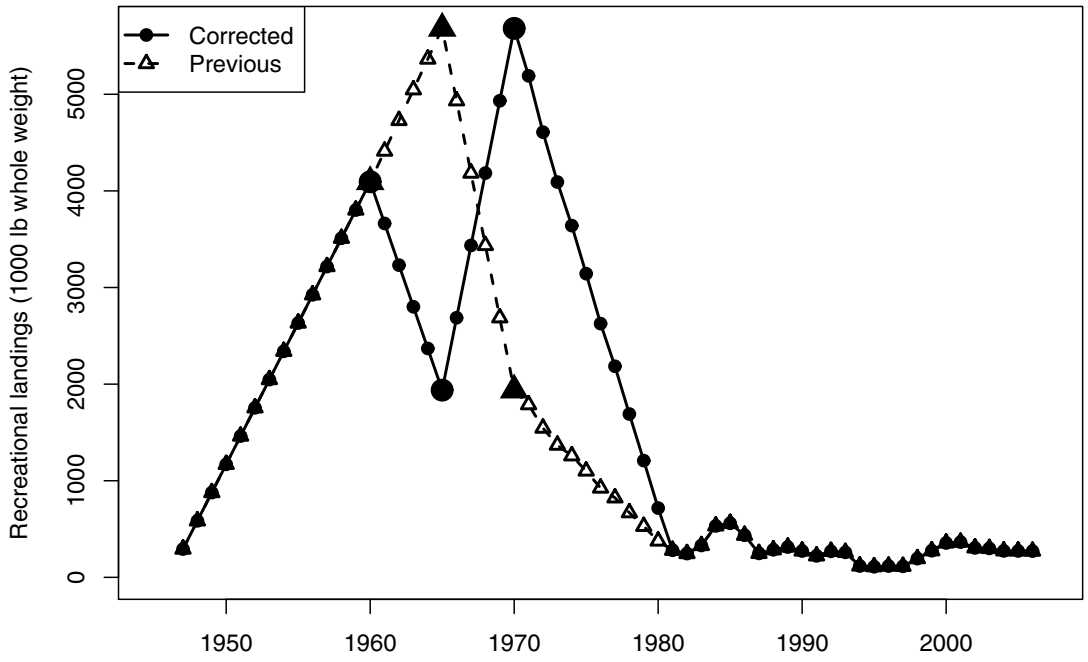


Figure 1.2. Red snapper: Comparison of predicted time series from the base assessment model using the previous and corrected recreational landings from the Salt-Water Angling reports.

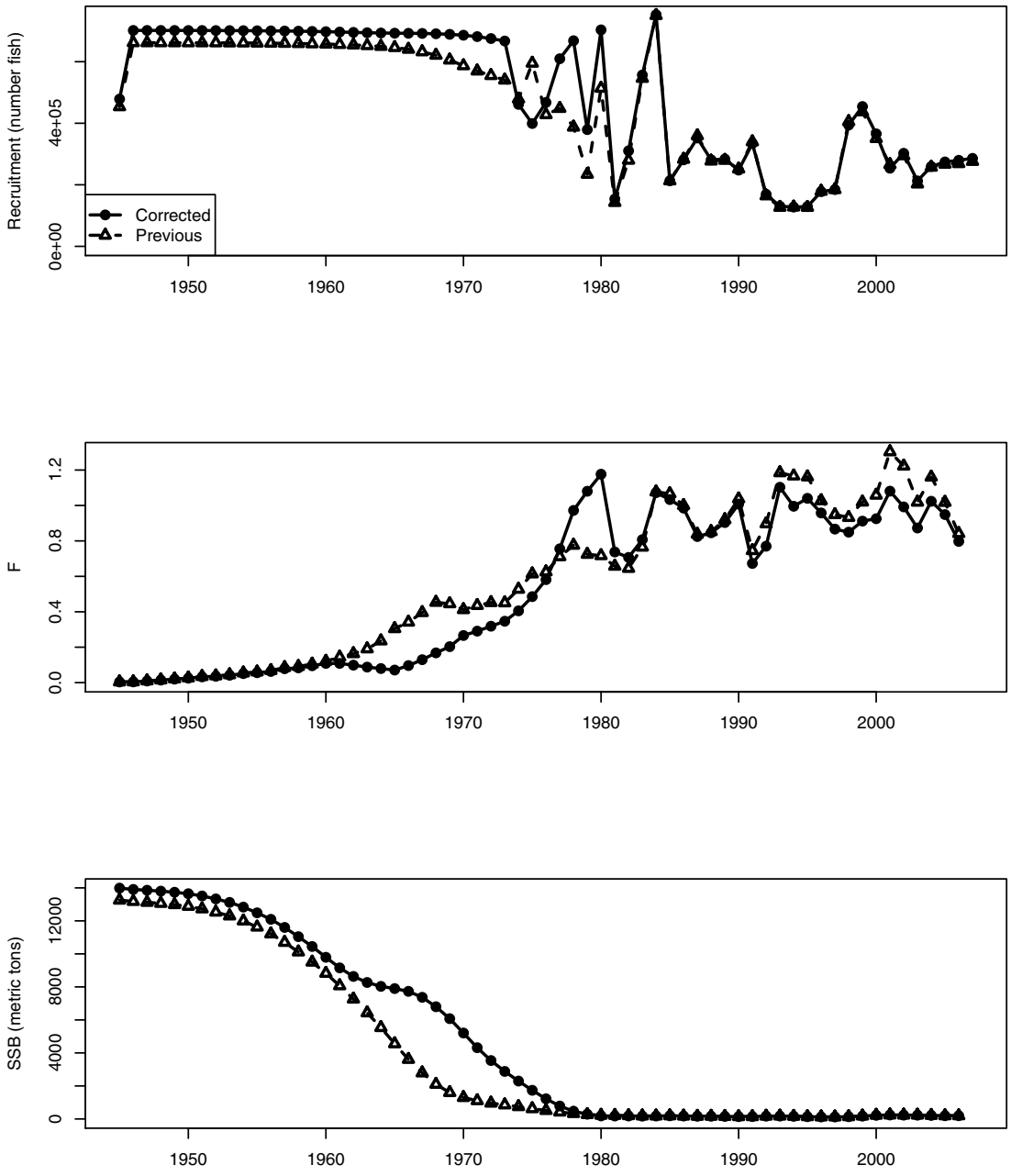


Figure 1.3. Red snapper: Observed (open circles) and estimated (solid line) annual length and age compositions by fishery. In panels indicating the data set, lcomp refers to length compositions, acomp to age compositions, c.hal to commercial handline, c.dv to commercial diving, hb to headboat, and rec to general recreational (MRFSS).

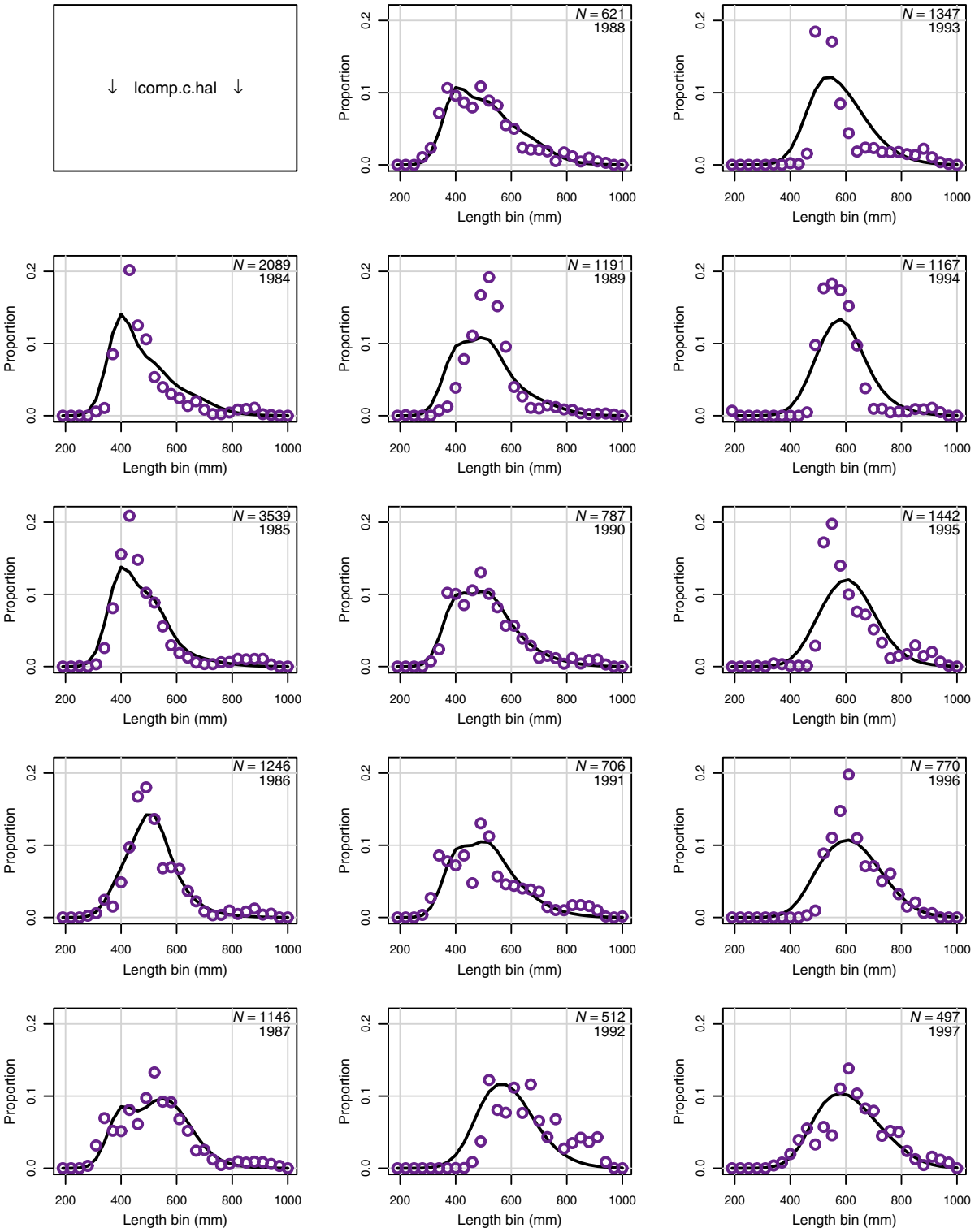


Figure 1.3. (cont.) Red snapper: Observed (open circles) and estimated (solid line) annual length and age compositions by fishery.

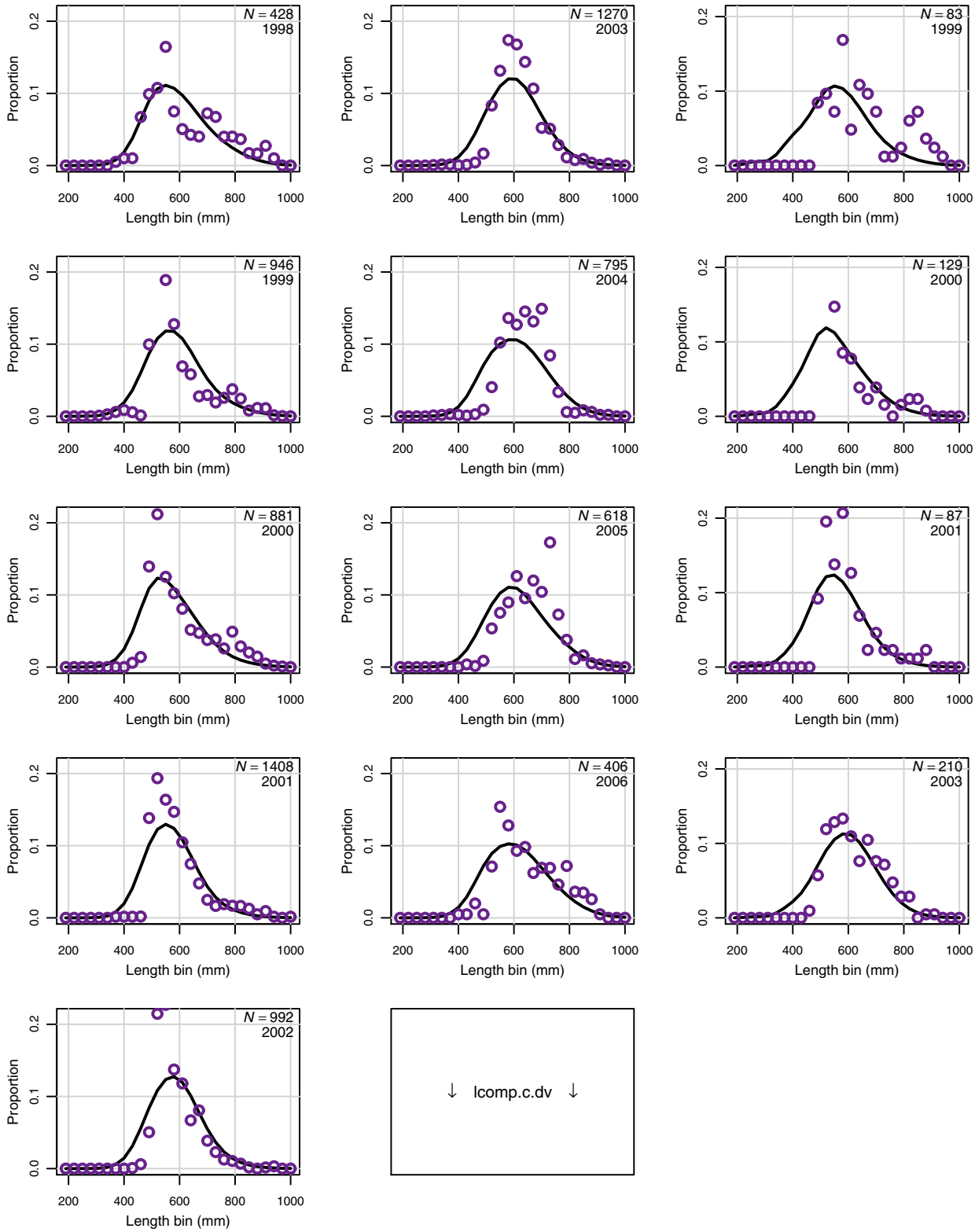


Figure 1.3. (cont.) Red snapper: Observed (open circles) and estimated (solid line) annual length and age compositions by fishery.

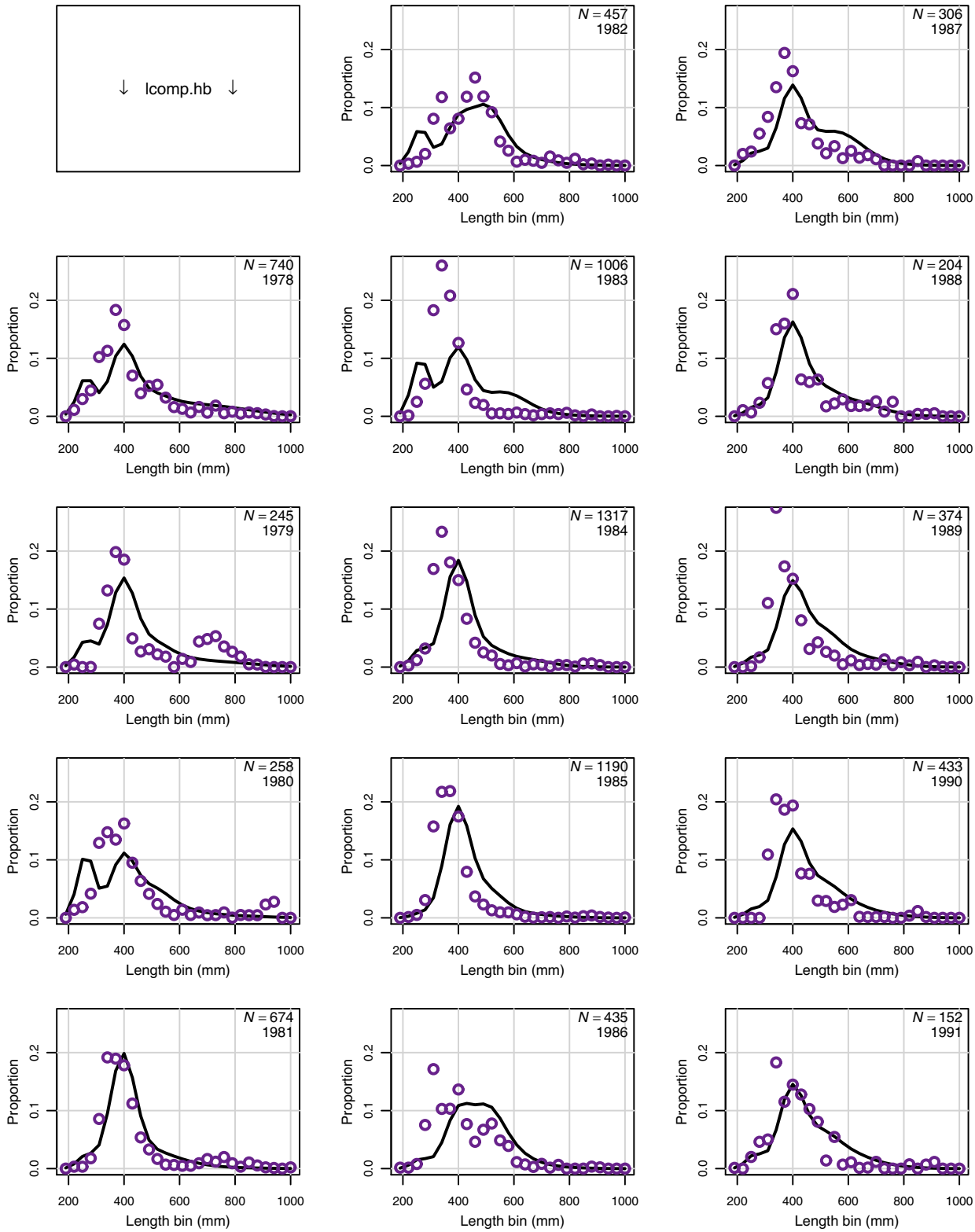


Figure 1.3. (cont.) Red snapper: Observed (open circles) and estimated (solid line) annual length and age compositions by fishery.

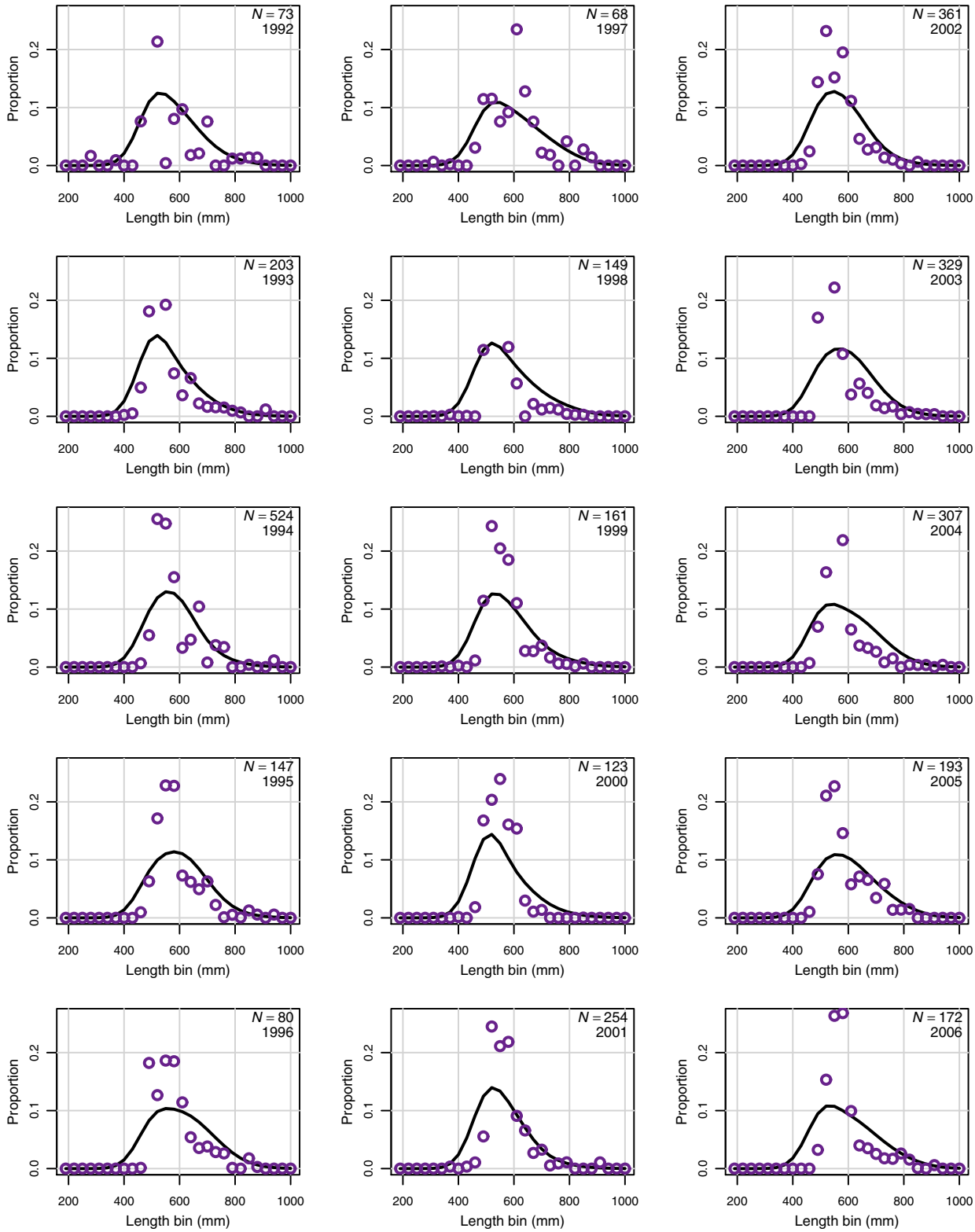


Figure 1.3. (cont.) Red snapper: Observed (open circles) and estimated (solid line) annual length and age compositions by fishery.

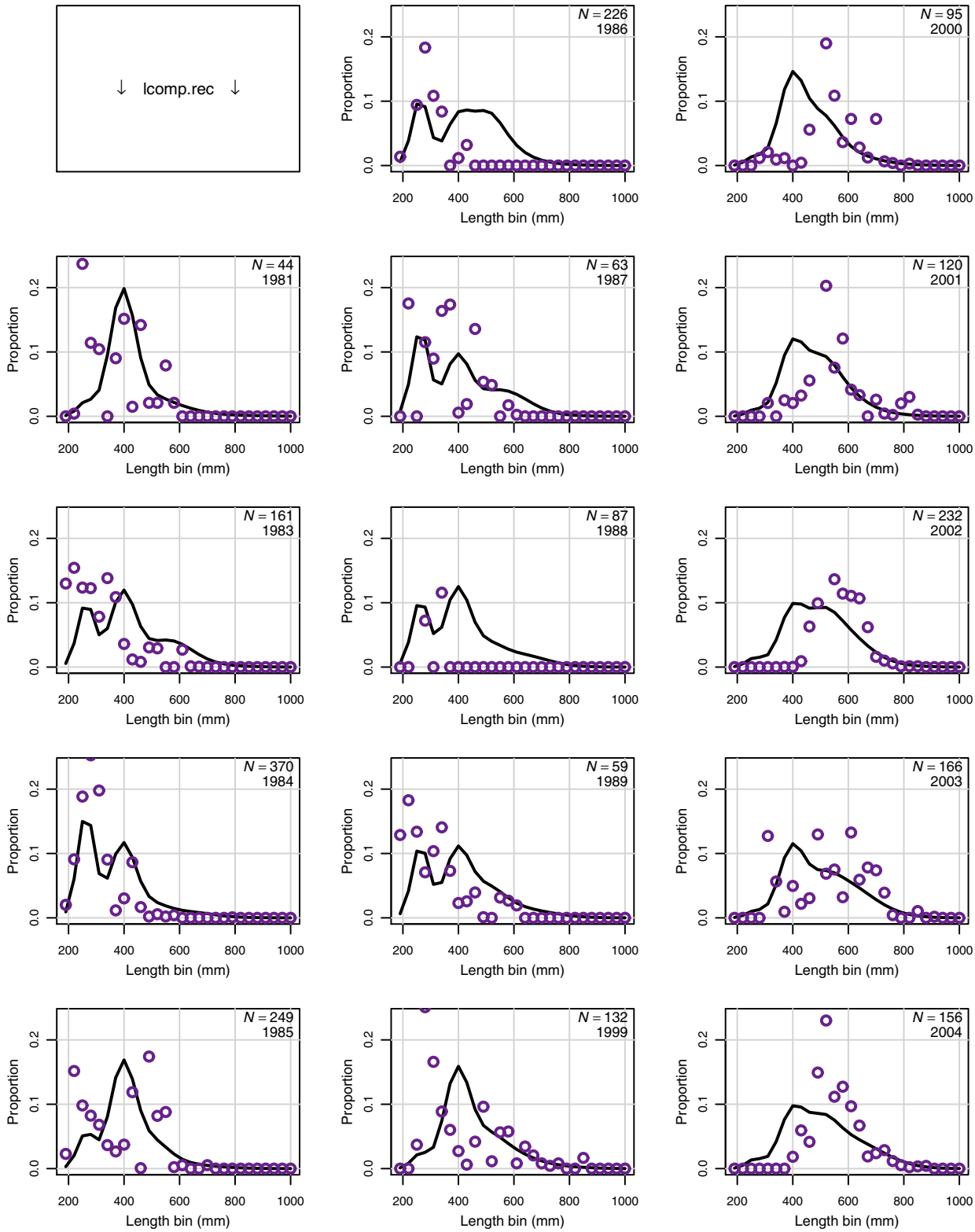


Figure 1.3. (cont.) Red snapper: Observed (open circles) and estimated (solid line) annual length and age compositions by fishery.

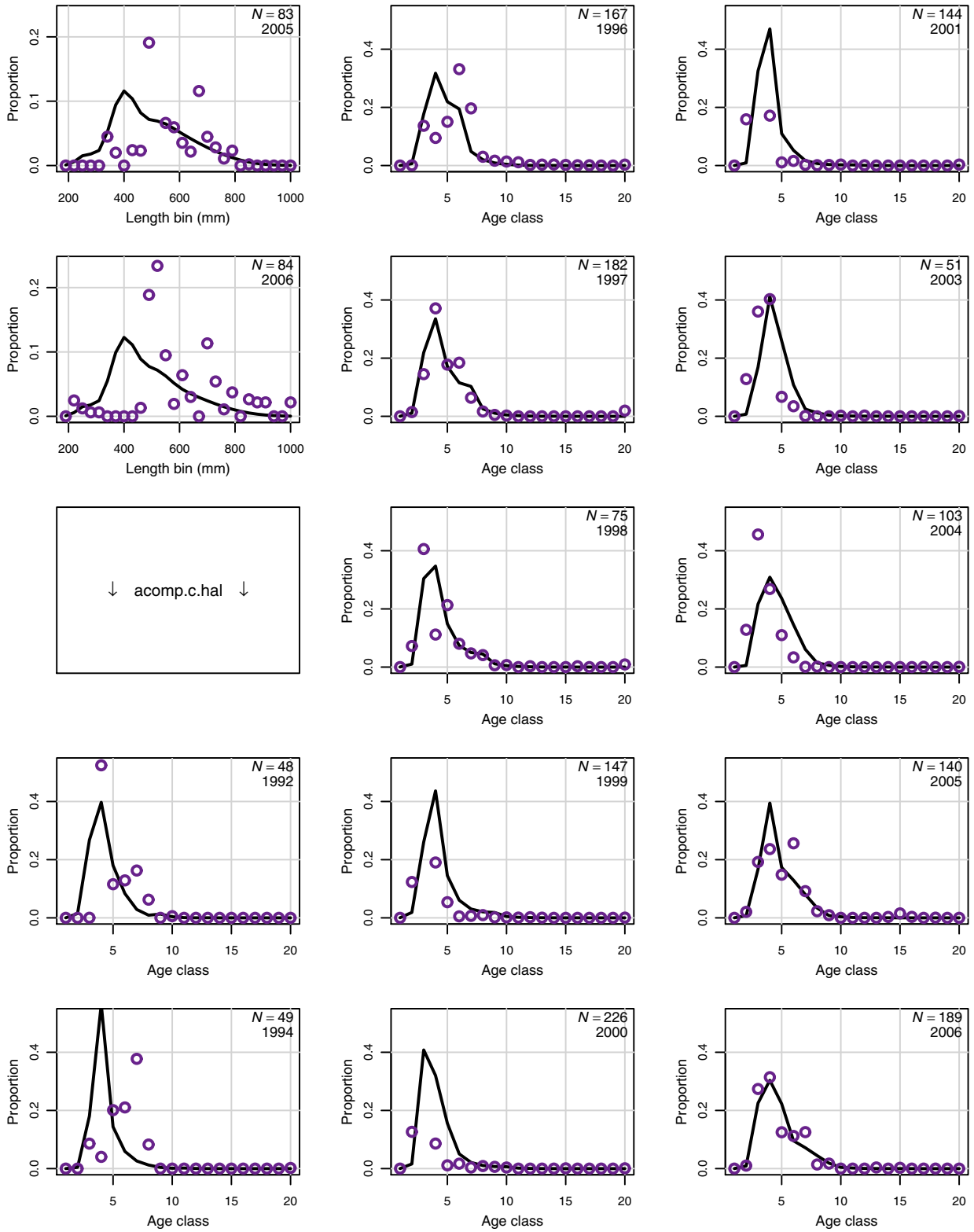


Figure 1.3. (cont.) Red snapper: Observed (open circles) and estimated (solid line) annual length and age compositions by fishery.

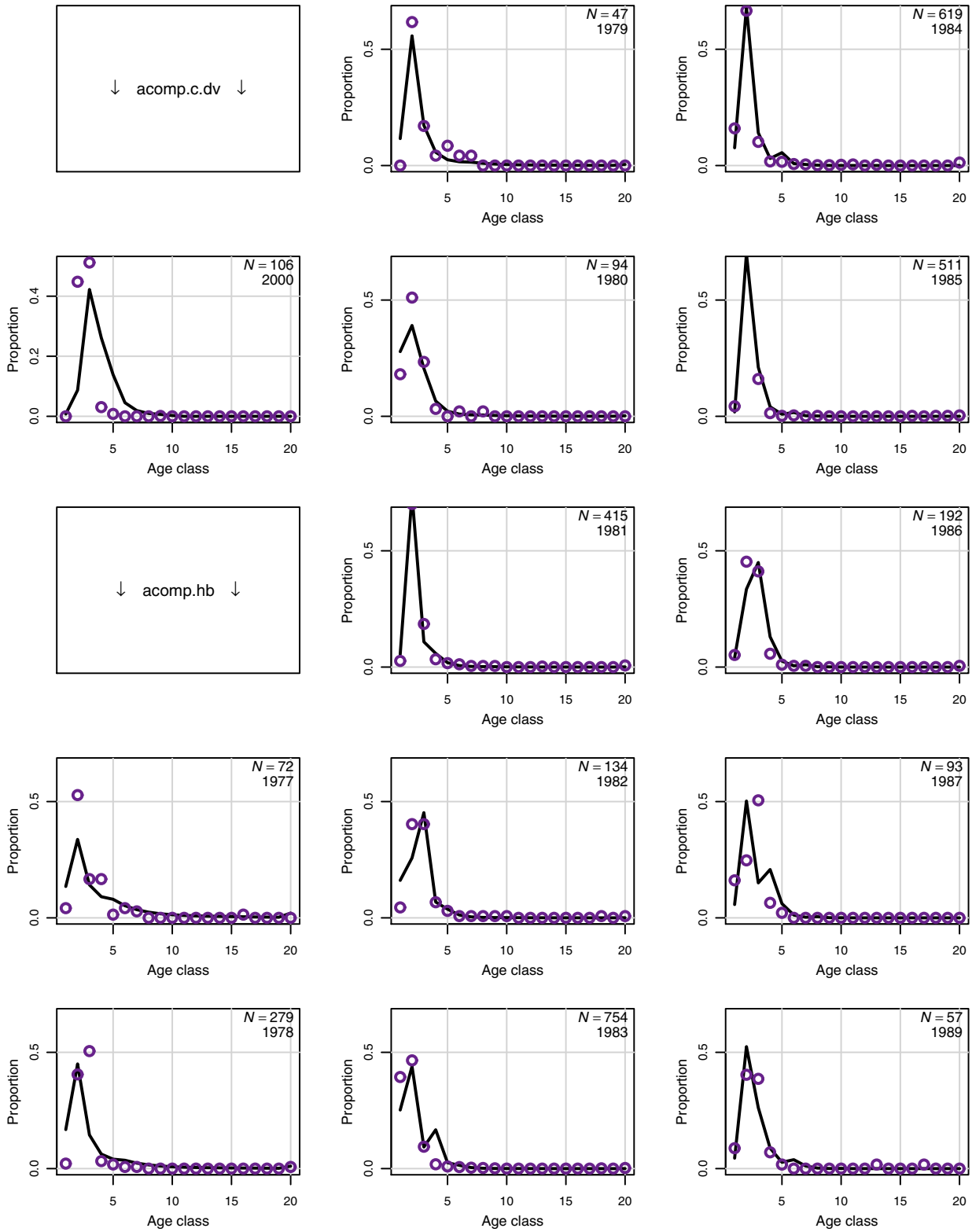


Figure 1.3. (cont.) Red snapper: Observed (open circles) and estimated (solid line) annual length and age compositions by fishery.

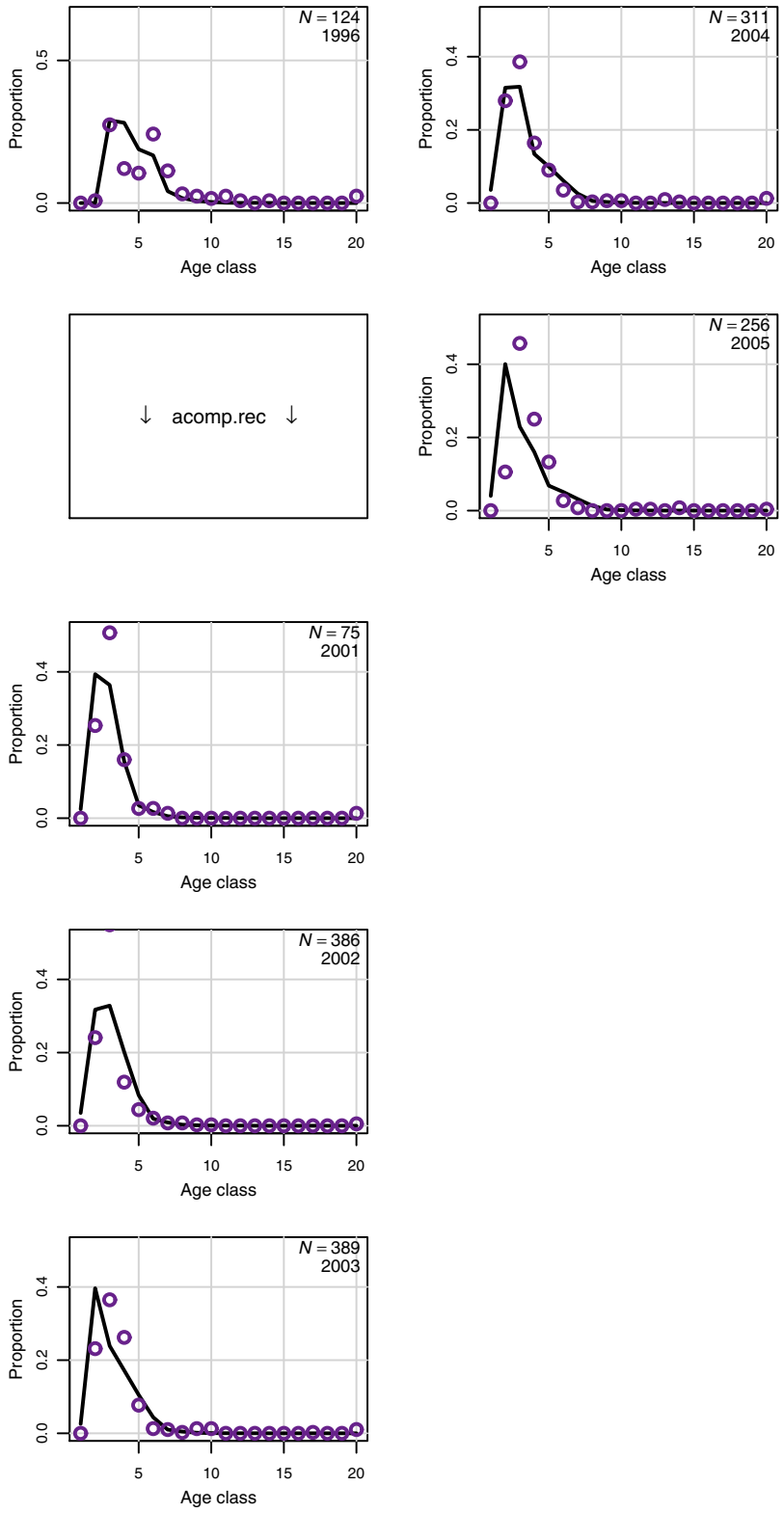


Figure 1.4. Red snapper: Top panel is a bubble plot of length composition residuals from the commercial hand-line fishery; Dark represents overestimates and light underestimates. Bottom panel shows the angle (in degrees) between vectors of observations and estimates, with a reference line at 20 degrees. Error is bounded between 0 and 90 degrees, with 0 indicating a perfect fit.

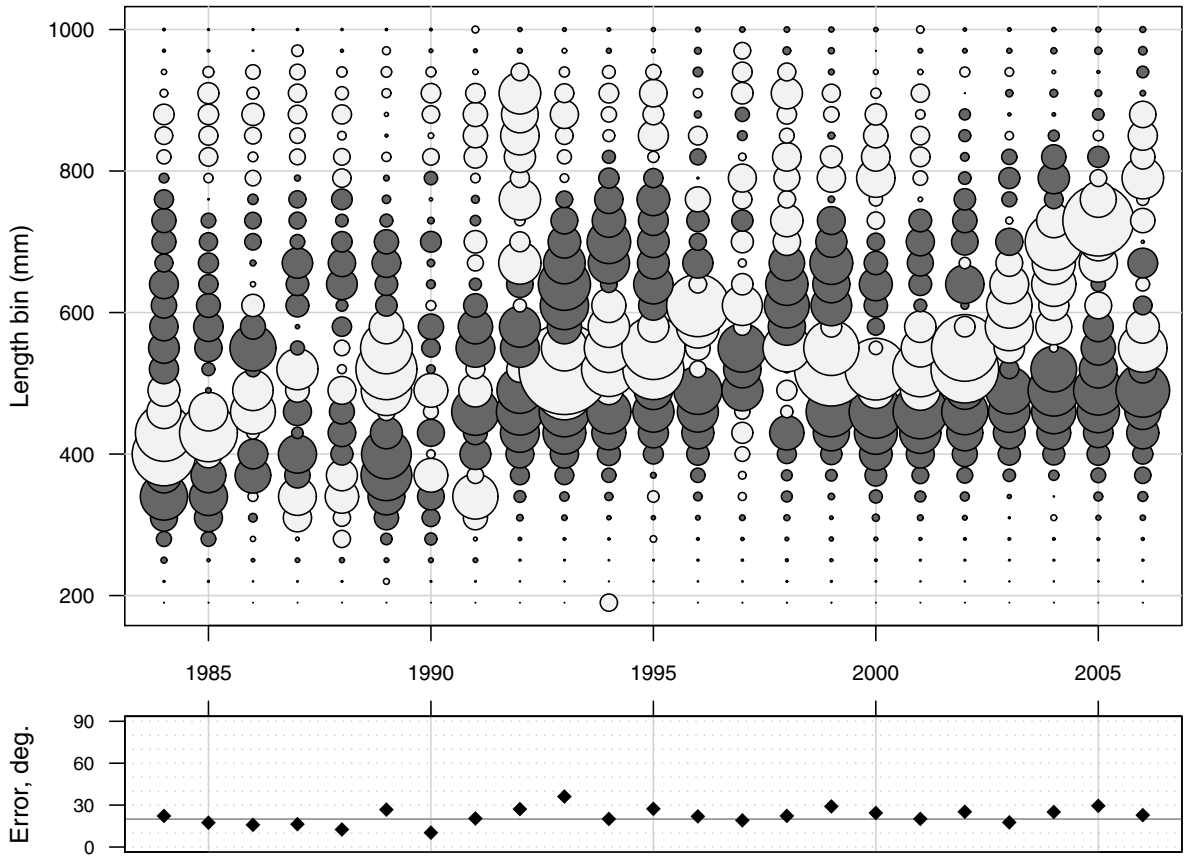


Figure 1.5. Red snapper: Top panel is a bubble plot of length composition residuals from the commercial diving fishery; Dark represents overestimates and light underestimates. Bottom panel shows the angle (in degrees) between vectors of observations and estimates, with a reference line at 20 degrees. Error is bounded between 0 and 90 degrees, with 0 indicating a perfect fit.

Figure 1.6. Red snapper: Top panel is a bubble plot of length composition residuals from the headboat fishery; Dark represents overestimates and light underestimates. Bottom panel shows the angle (in degrees) between vectors of observations and estimates, with a reference line at 20 degrees. Error is bounded between 0 and 90 degrees, with 0 indicating a perfect fit.

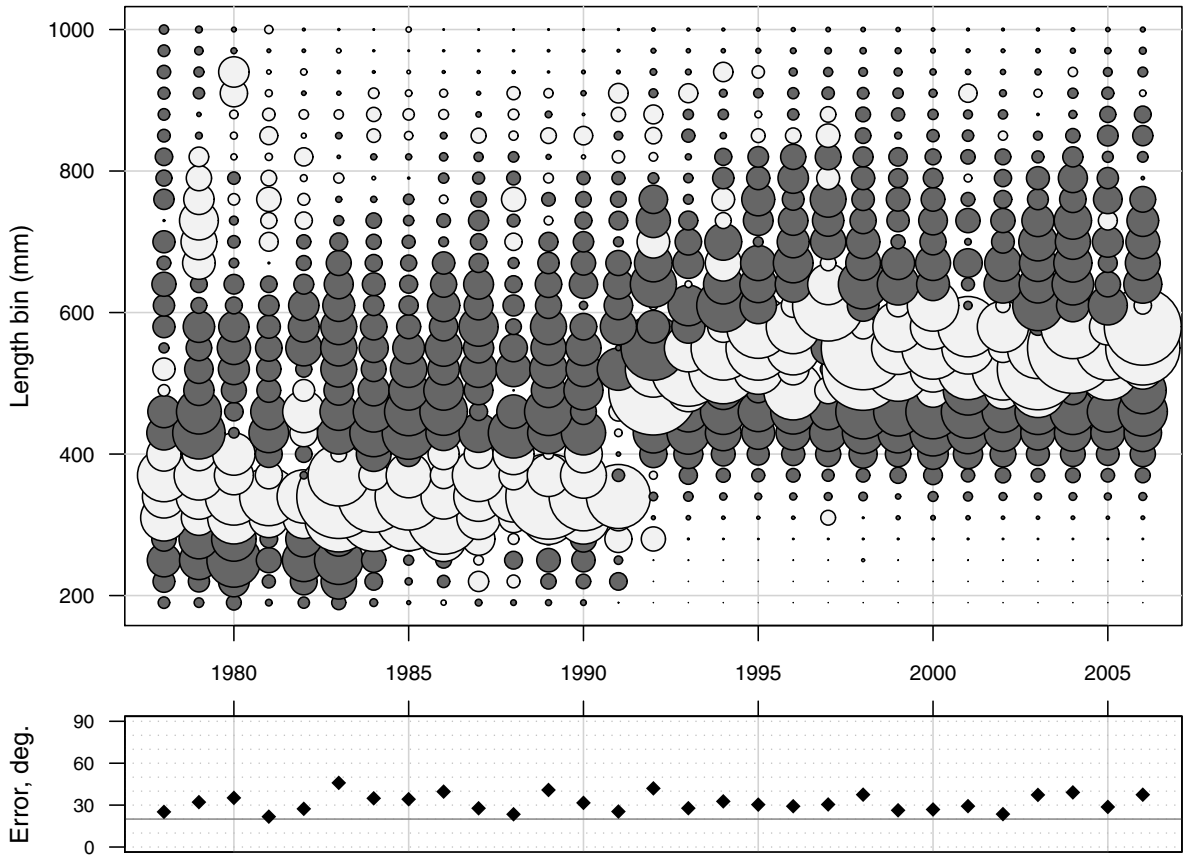


Figure 1.7. Red snapper: Top panel is a bubble plot of length composition residuals from the recreational fishery (MRFSS); Dark represents overestimates and light underestimates. Bottom panel shows the angle (in degrees) between vectors of observations and estimates, with a reference line at 20 degrees. Error is bounded between 0 and 90 degrees, with 0 indicating a perfect fit.

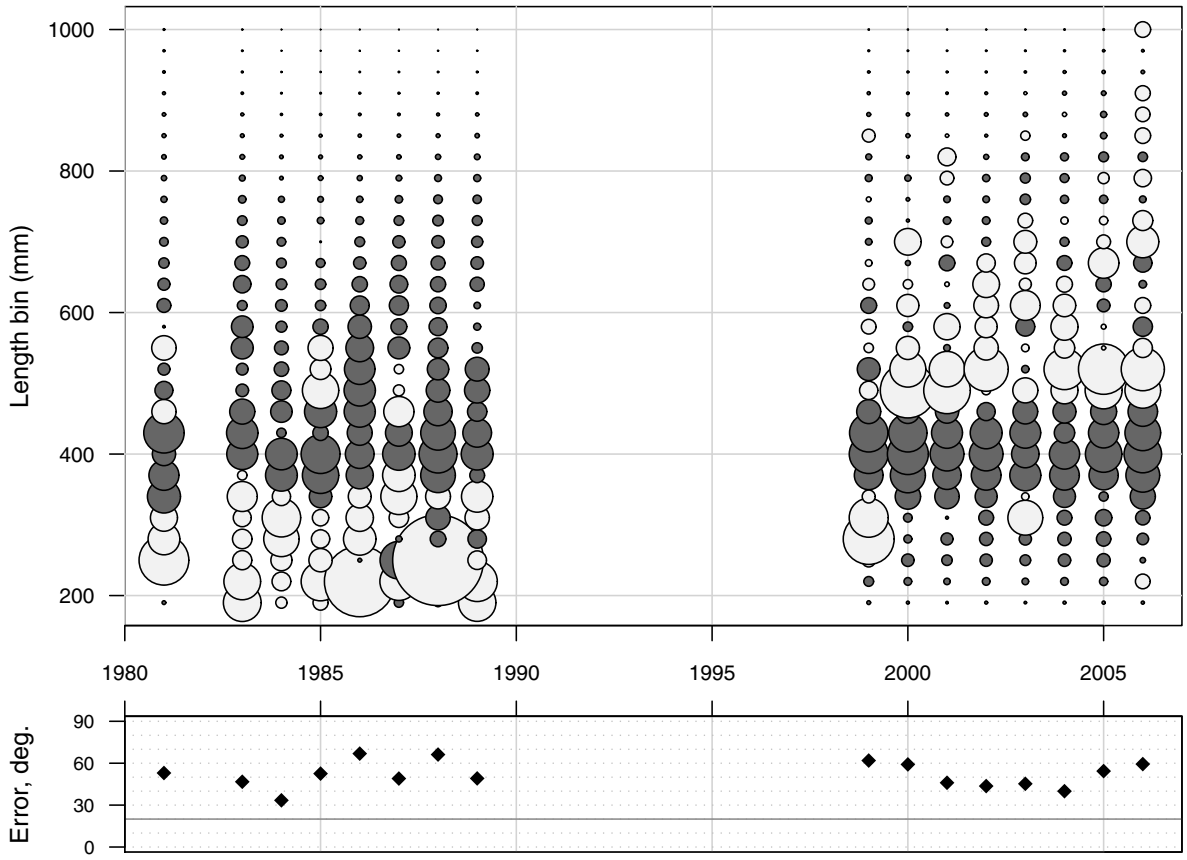


Figure 1.8. Red snapper: Top panel is a bubble plot of age composition residuals from the commercial handline fishery; Dark represents overestimates and light underestimates. Bottom panel shows the angle (in degrees) between vectors of observations and estimates, with a reference line at 20 degrees. Error is bounded between 0 and 90 degrees, with 0 indicating a perfect fit.

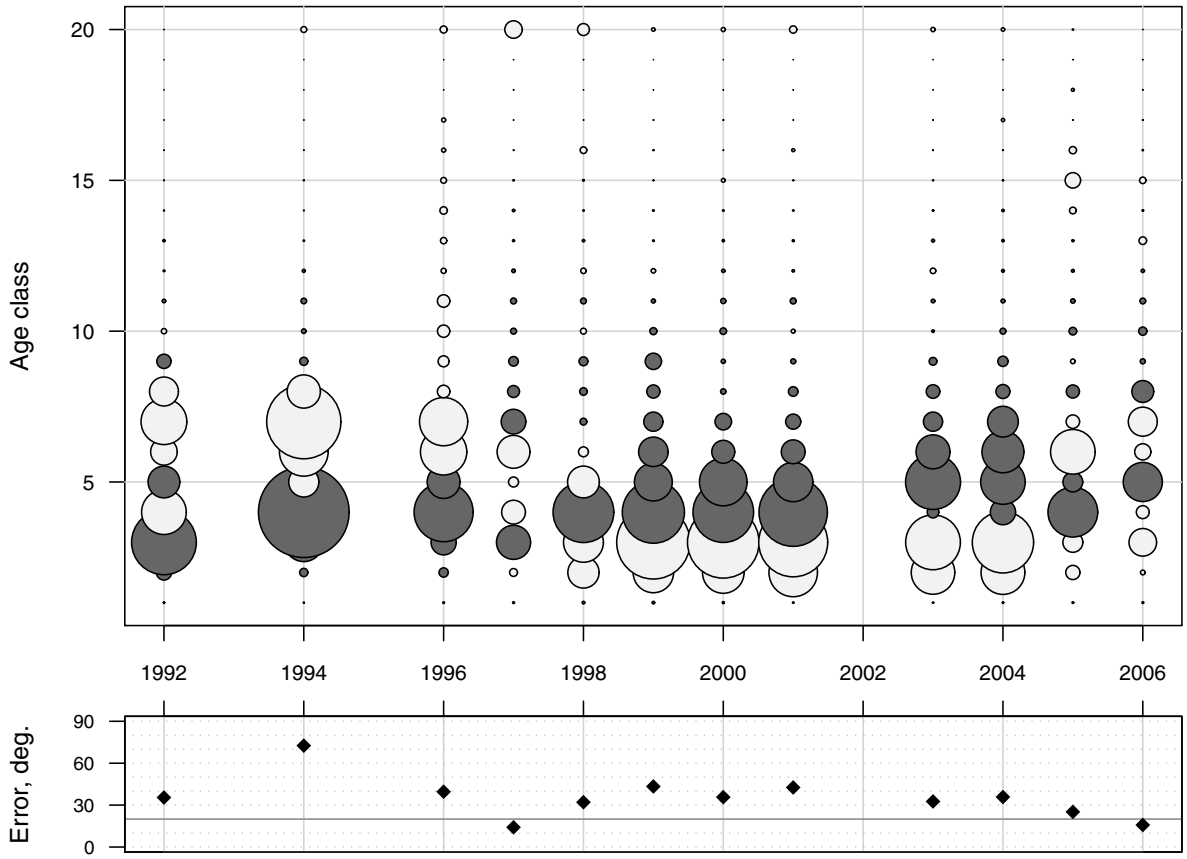


Figure 1.9. Red snapper: Top panel is a bubble plot of age composition residuals from the commercial diving fishery; Dark represents overestimates and light underestimates. Bottom panel shows the angle (in degrees) between vectors of observations and estimates, with a reference line at 20 degrees. Error is bounded between 0 and 90 degrees, with 0 indicating a perfect fit.

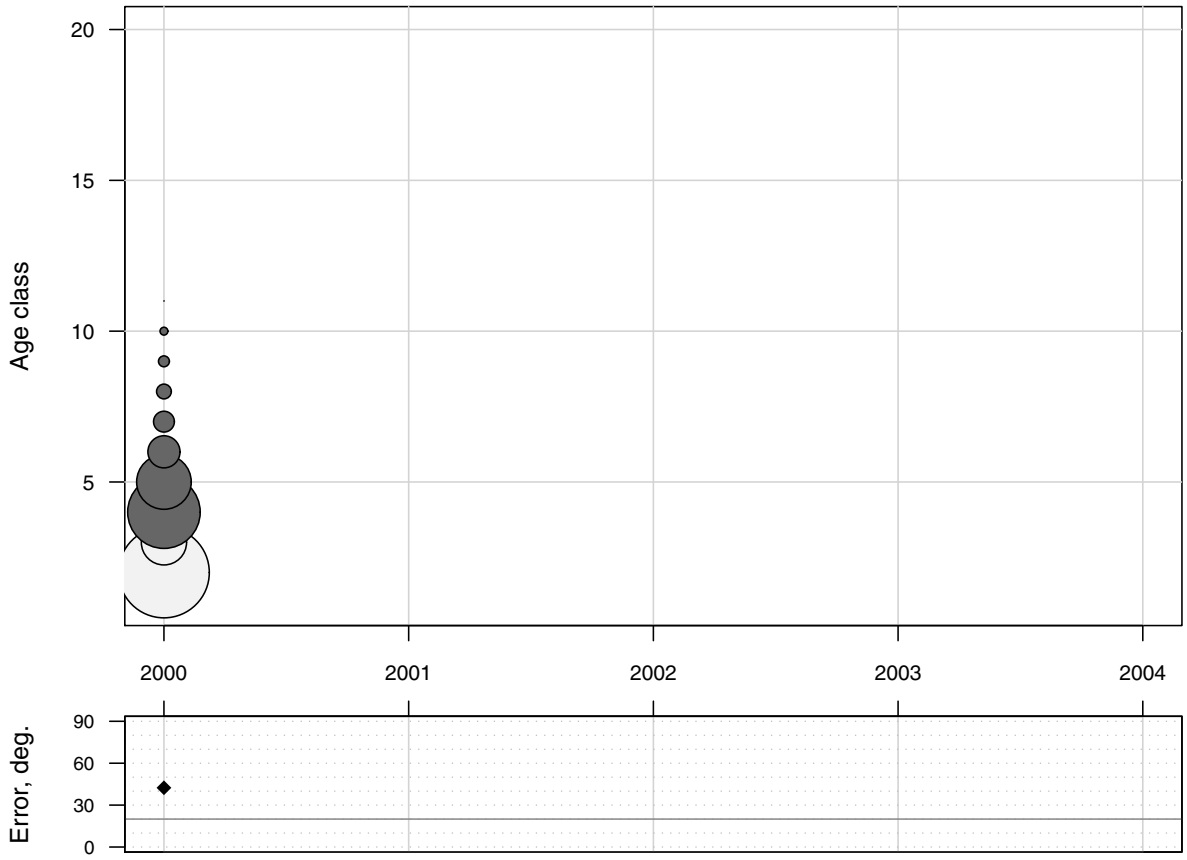


Figure 1.10. Red snapper: Top panel is a bubble plot of age composition residuals from the headboat fishery; Dark represents overestimates and light underestimates. Bottom panel shows the angle (in degrees) between vectors of observations and estimates, with a reference line at 20 degrees. Error is bounded between 0 and 90 degrees, with 0 indicating a perfect fit.

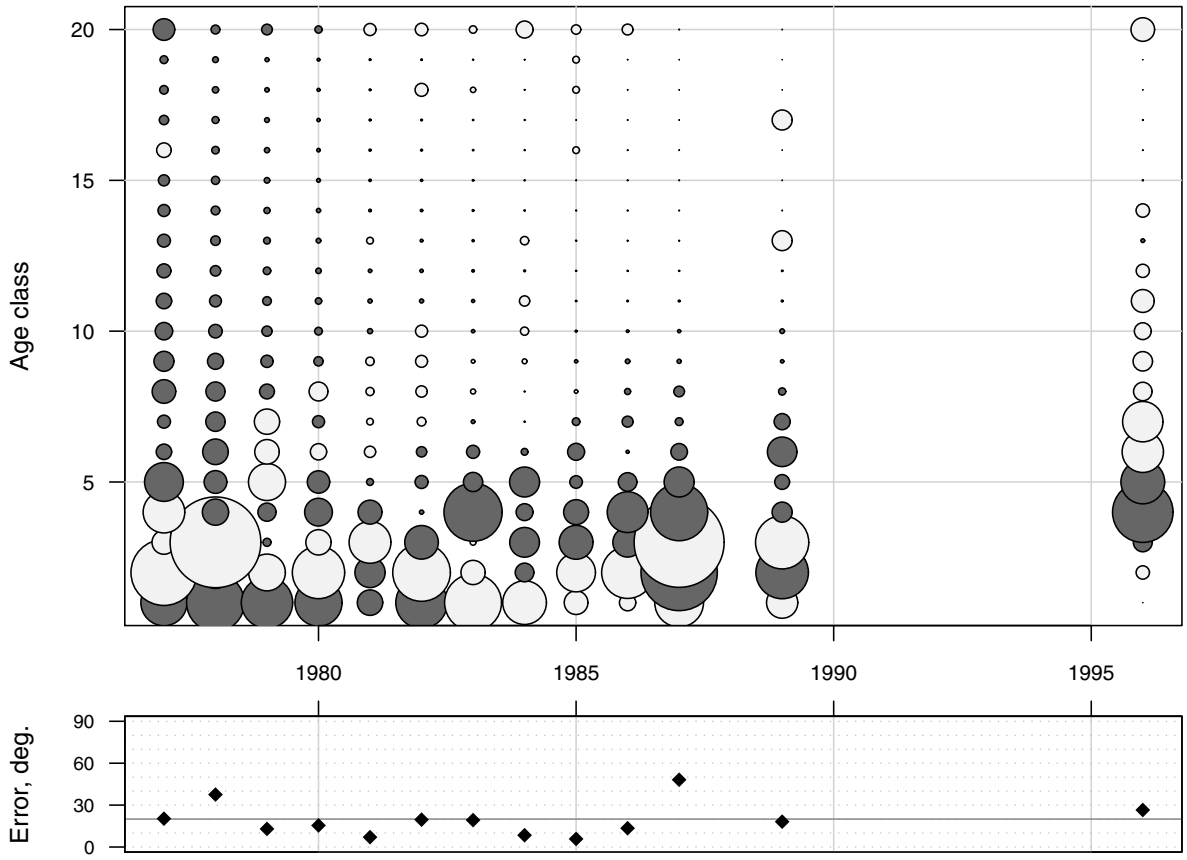


Figure 1.11. Red snapper: Top panel is a bubble plot of age composition residuals from the recreational fishery (MRFSS); Dark represents overestimates and light underestimates. Bottom panel shows the angle (in degrees) between vectors of observations and estimates, with a reference line at 20 degrees. Error is bounded between 0 and 90 degrees, with 0 indicating a perfect fit.

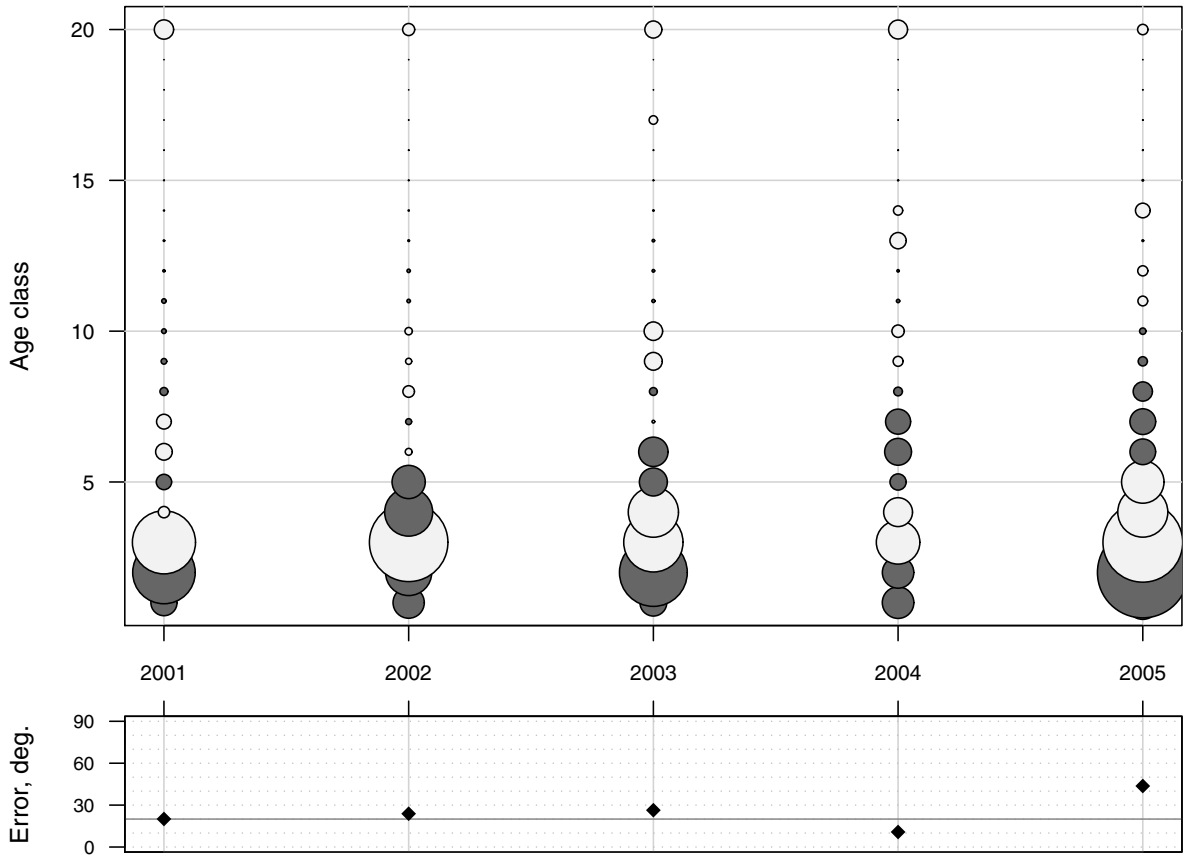


Figure 1.12. Red snapper: Observed (open circles) and estimated (solid line, circles) commercial handline landings (whole weight). Open and closed circles are indistinguishable.

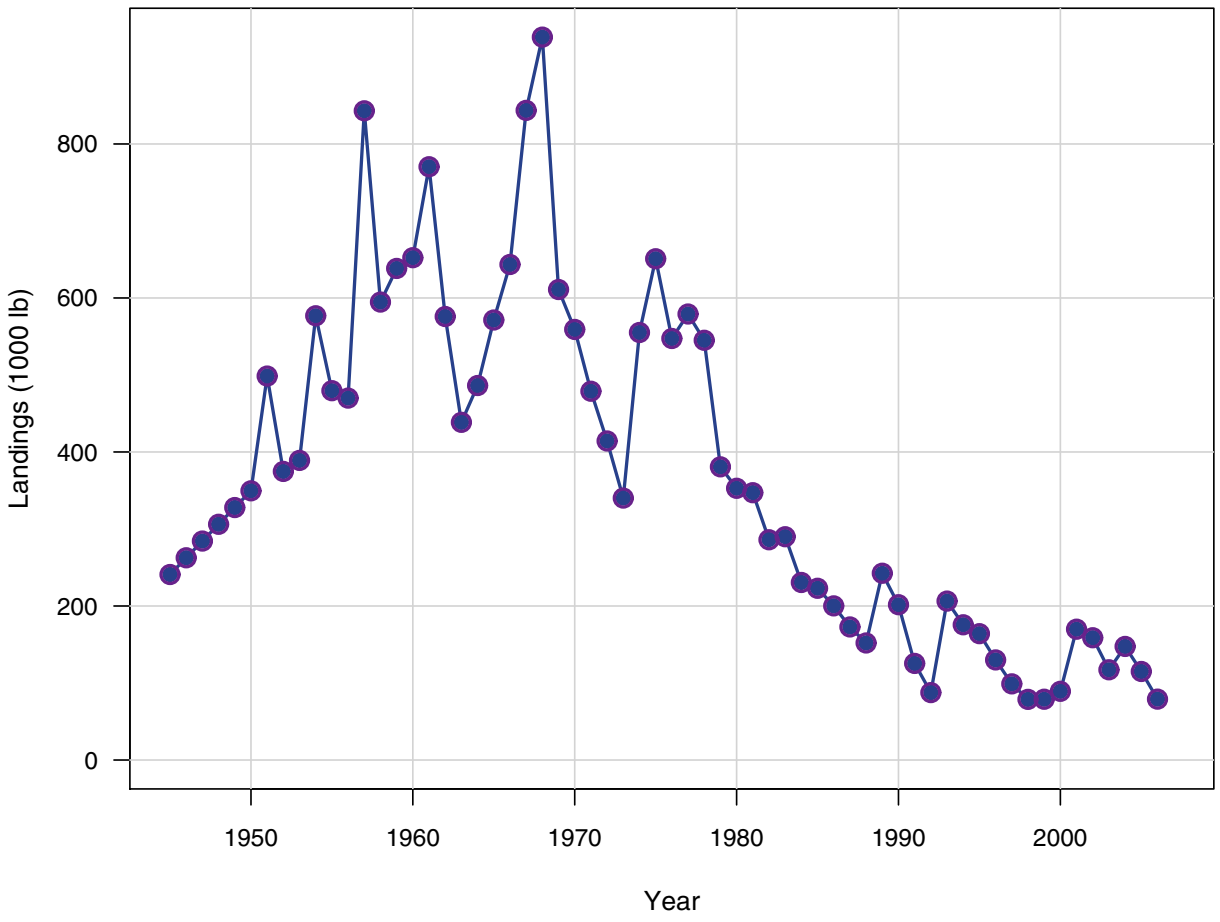


Figure 1.13. Red snapper: Observed (open circles) and estimated (solid line, circles) commercial diving landings (whole weight). Open and closed circles are indistinguishable.

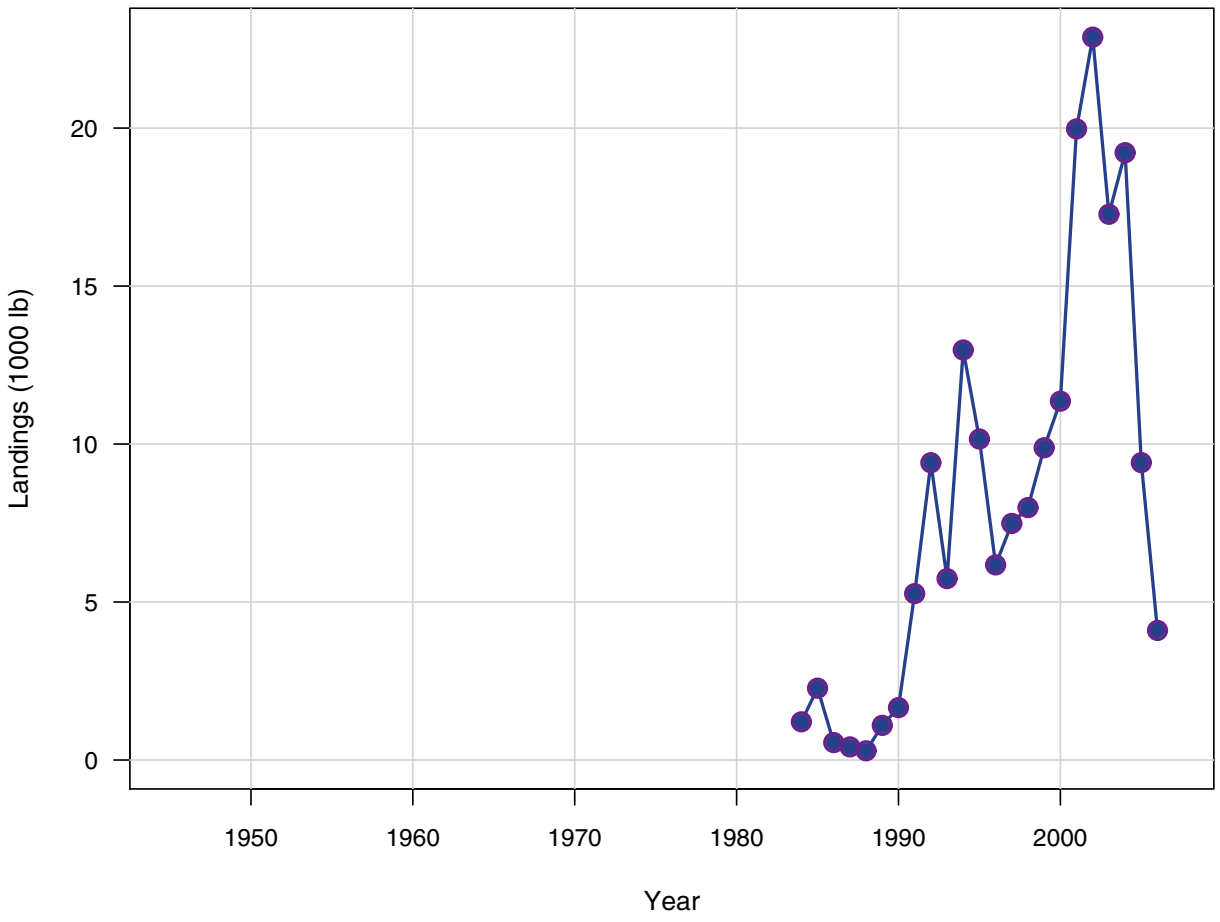


Figure 1.14. Red snapper: Observed (open circles) and estimated (solid line, circles) headboat landings (whole weight). Open and closed circles are indistinguishable.

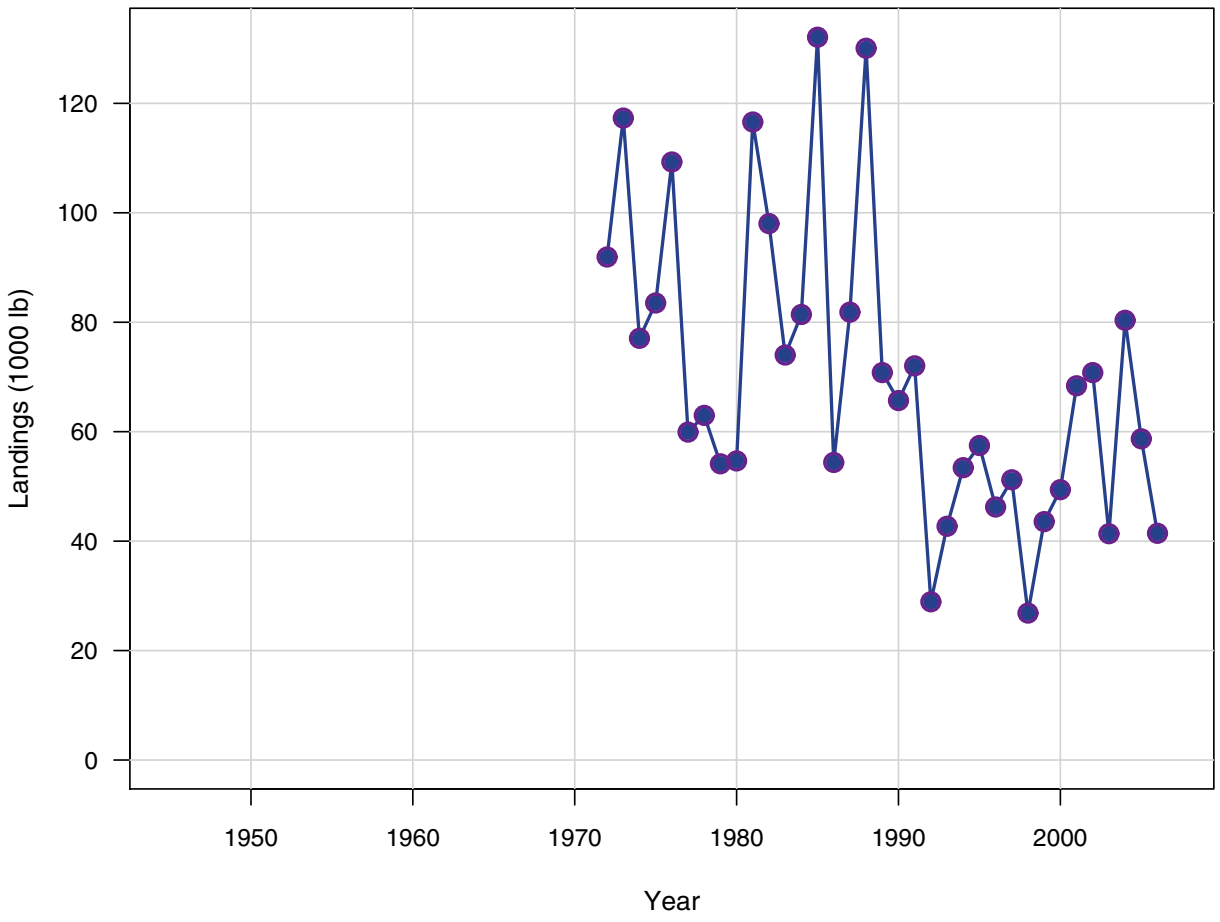


Figure 1.15. Red snapper: Observed (open circles) and estimated (solid line, circles) general recreational landings (whole weight). Open and closed circles are indistinguishable.

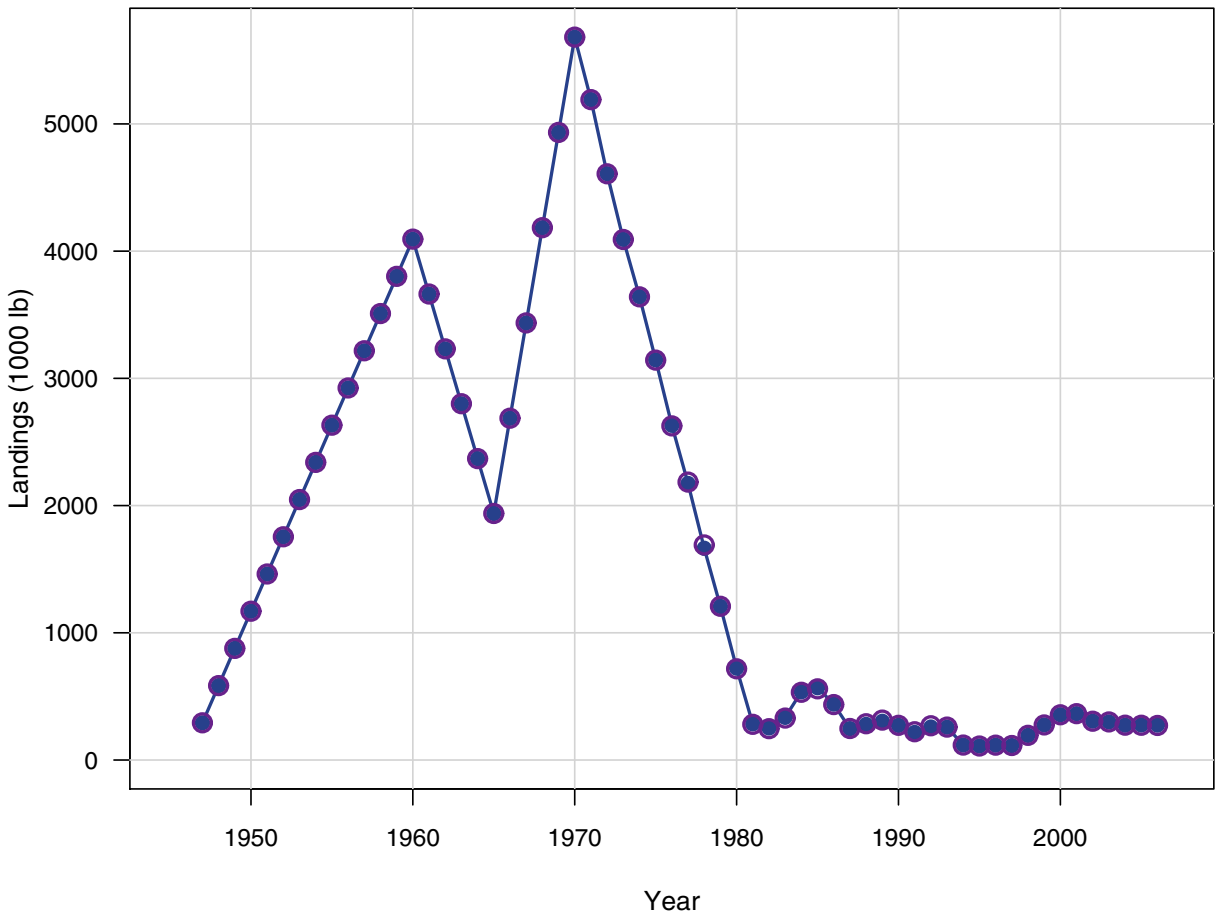


Figure 1.16. Red snapper: Observed (open circles) and estimated (solid line, circles) commercial handline discard mortalities. Open and closed circles are indistinguishable.

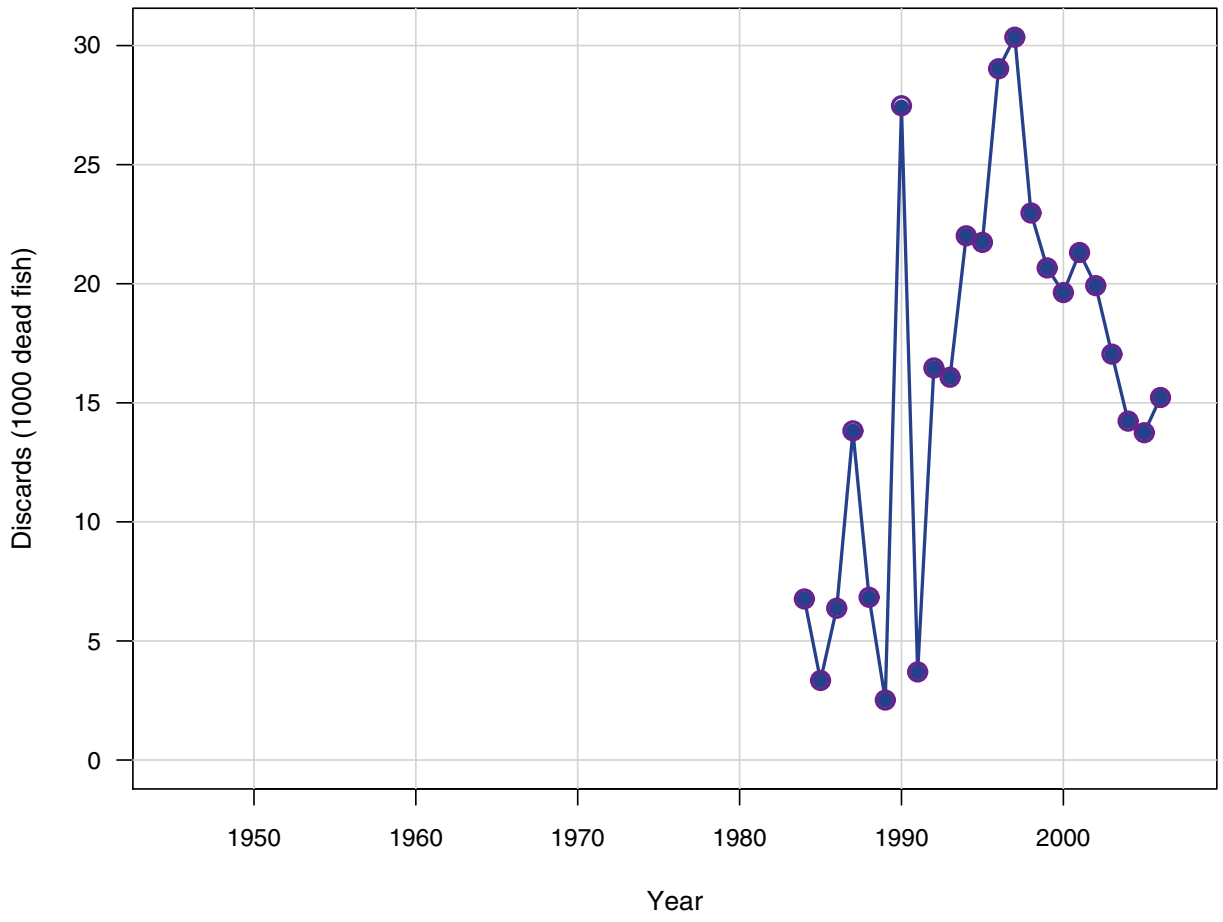


Figure 1.17. Red snapper: Observed (open circles) and estimated (solid line, circles) headboat discard mortalities. Open and closed circles are indistinguishable.

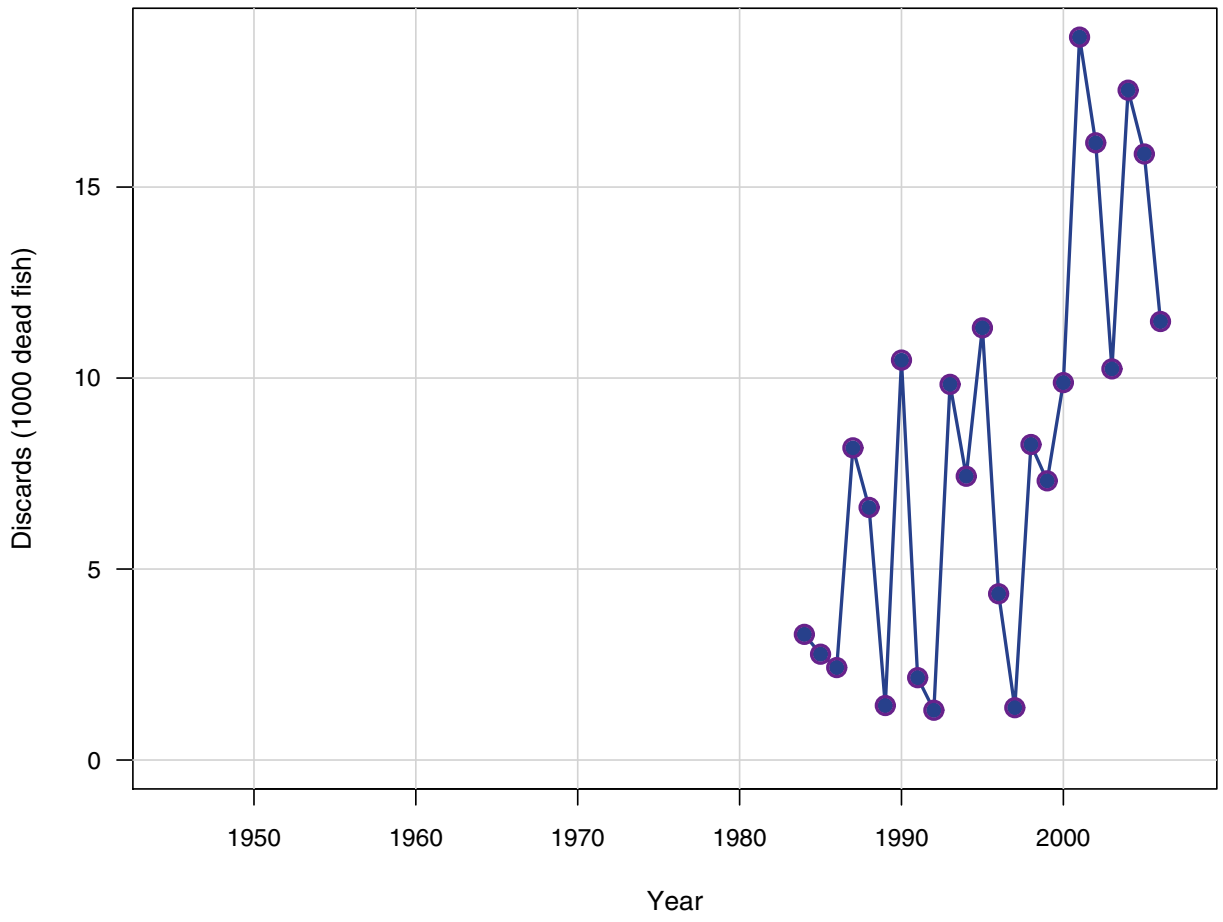


Figure 1.18. Red snapper: Observed (open circles) and estimated (solid line, circles) general recreational discard mortalities. Open and closed circles are indistinguishable.

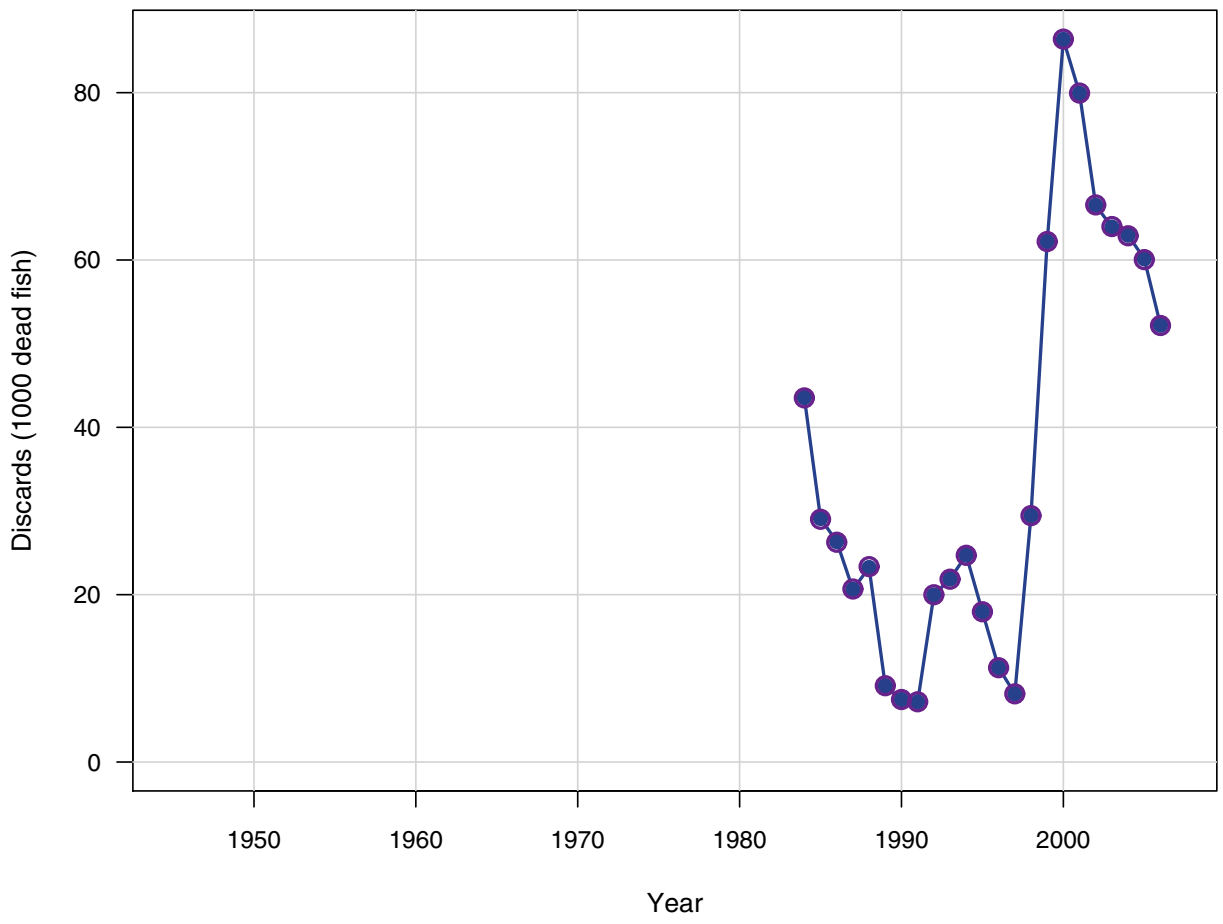


Figure 1.19. Red snapper: Fit of index of abundance from commercial handline; Observed (open circles) and estimated (solid line, circles).

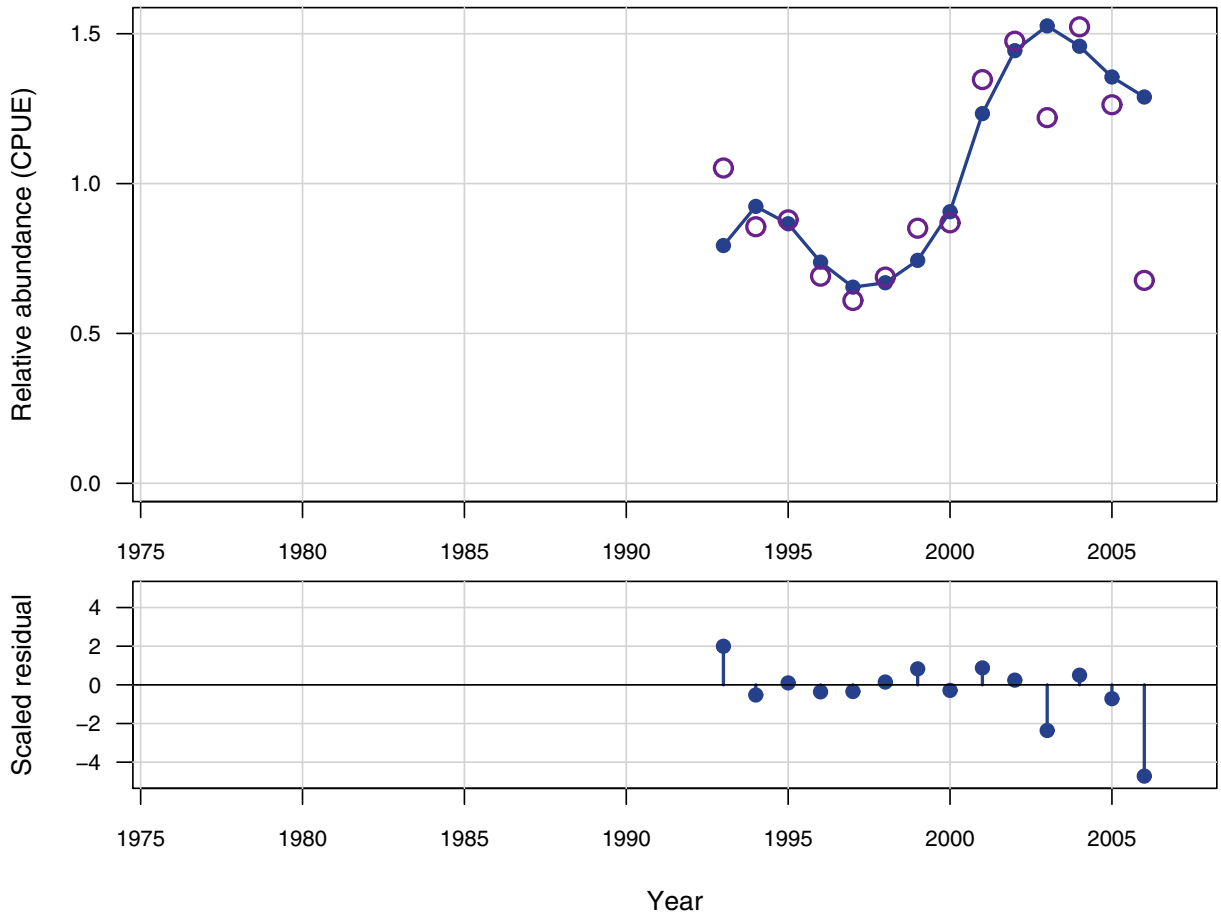


Figure 1.20. Red snapper: Fit of index of abundance from headboat; Observed (open circles) and estimated (solid line, circles).

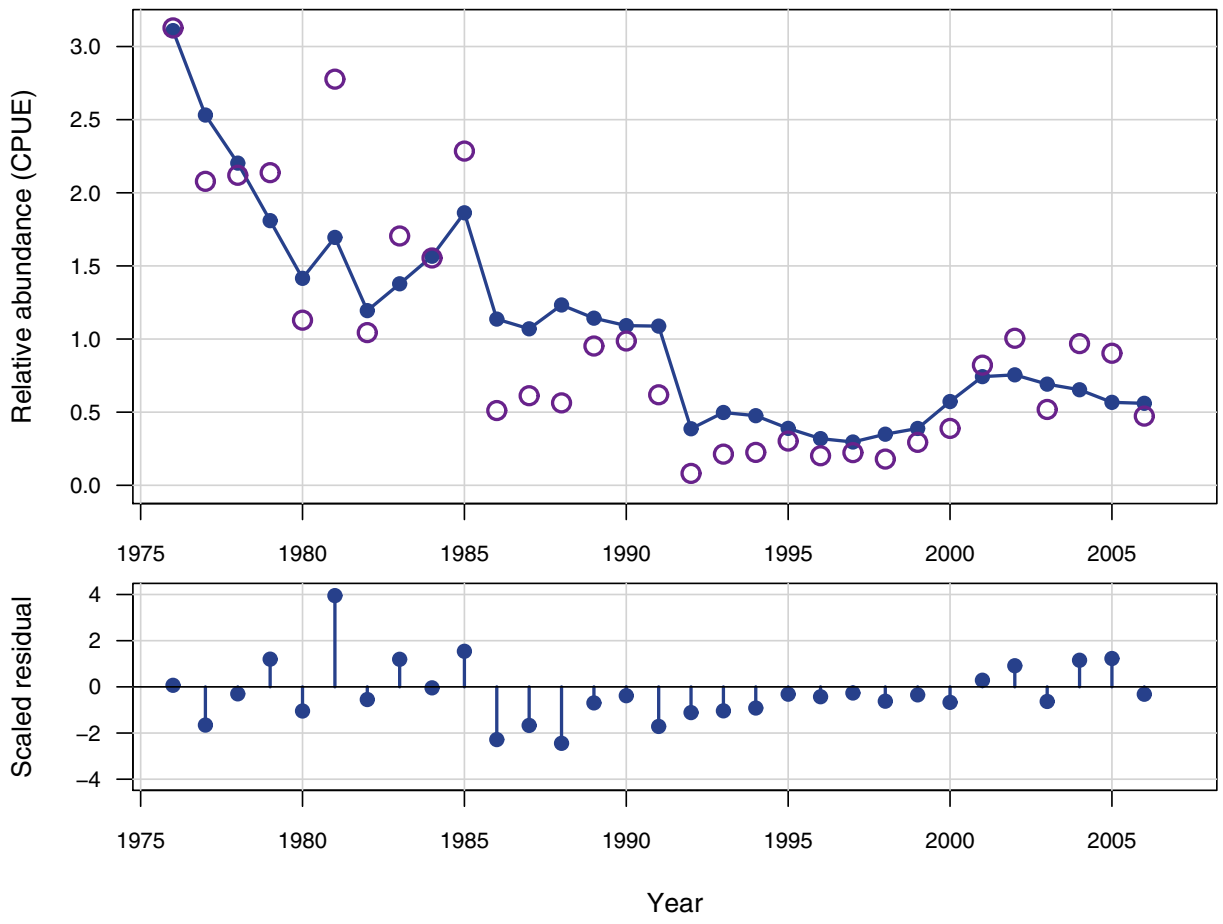


Figure 1.21. Red snapper: Fit of index of abundance from general recreational (MRFSS); Observed (open circles) and estimated (solid line, circles).

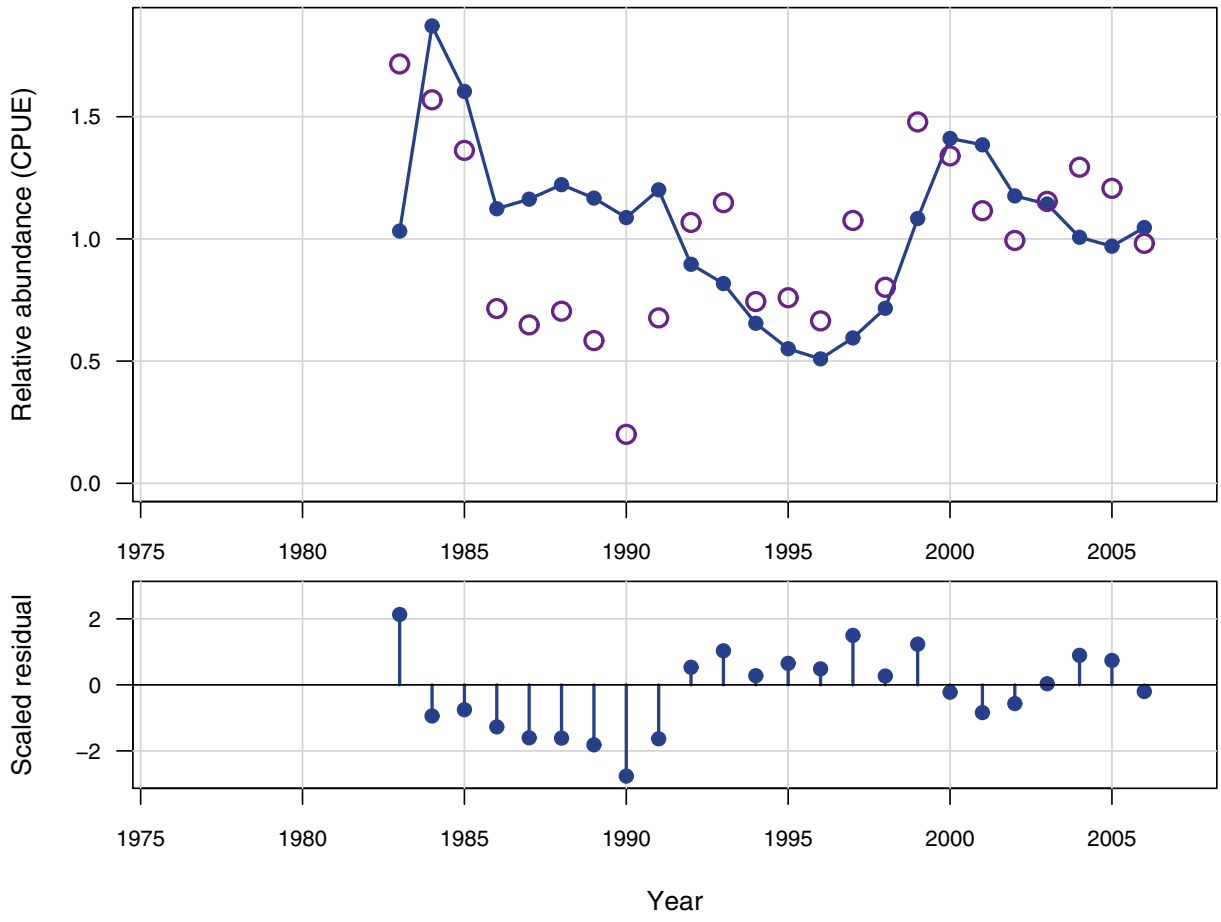


Figure 1.22. Red snapper: Mean length at age (mm) and estimated 95% confidence interval.

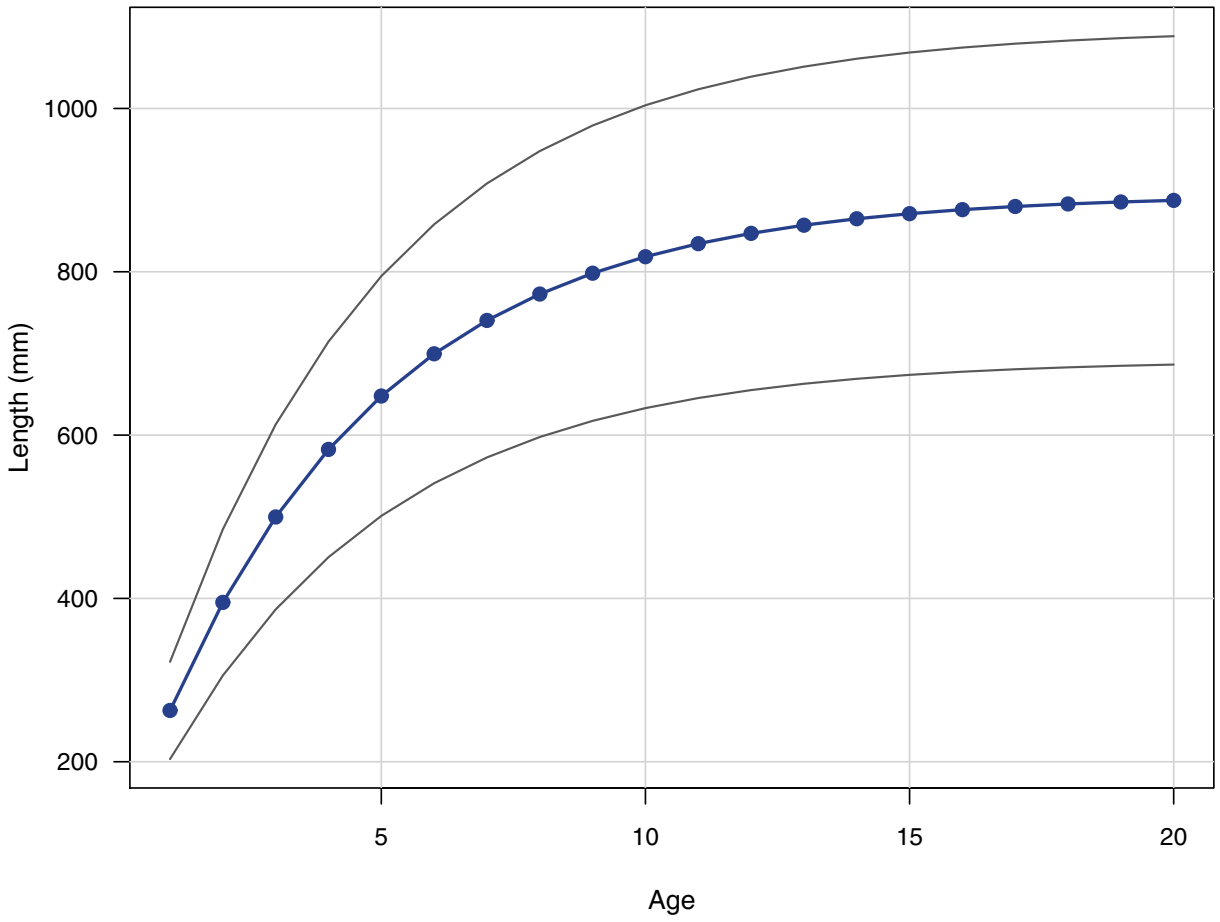


Figure 1.23. Red snapper: Top panel – Estimated recruitment of age-1 fish. Bottom panel – log recruitment residuals.

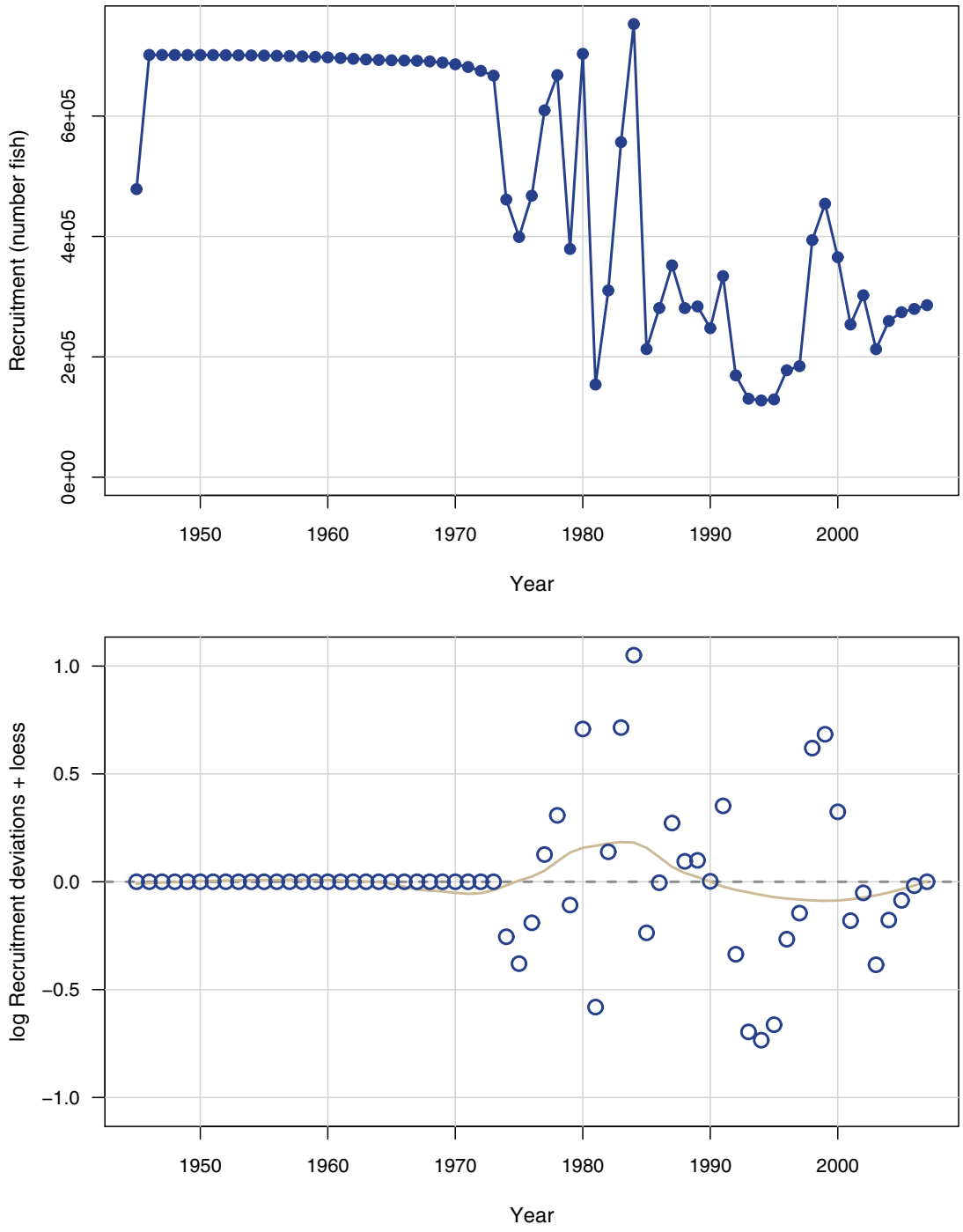
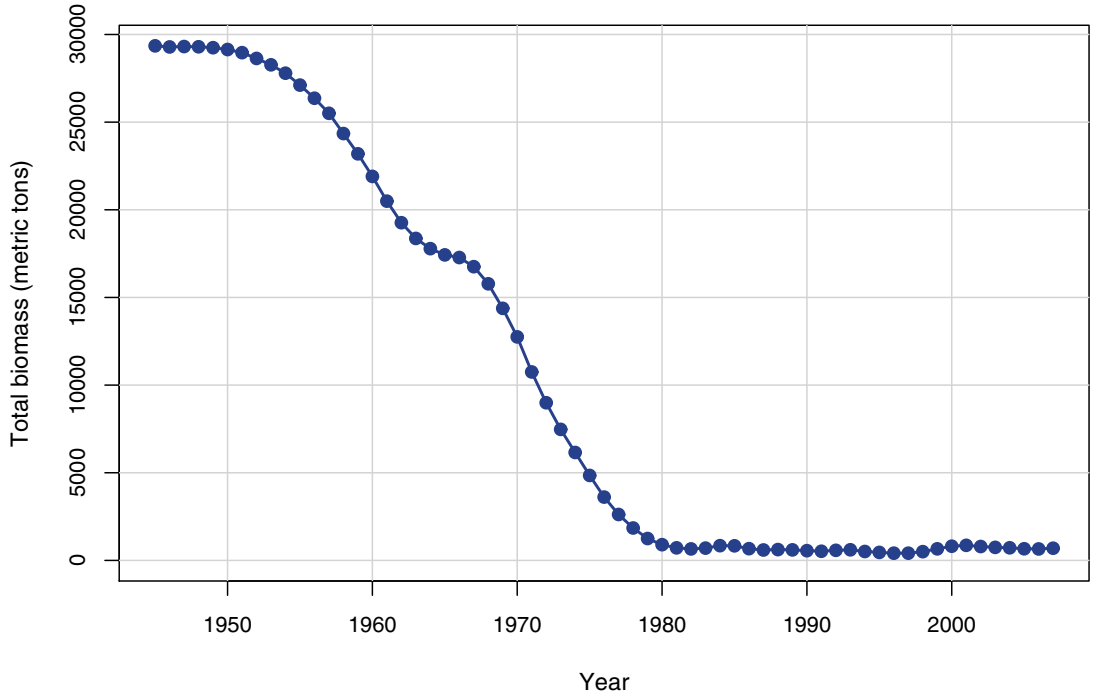


Figure 1.24. Red snapper: Top panel – Estimated total biomass (metric tons) at start of year. Bottom panel – Estimated spawning biomass (metric tons) at midpoint of year.



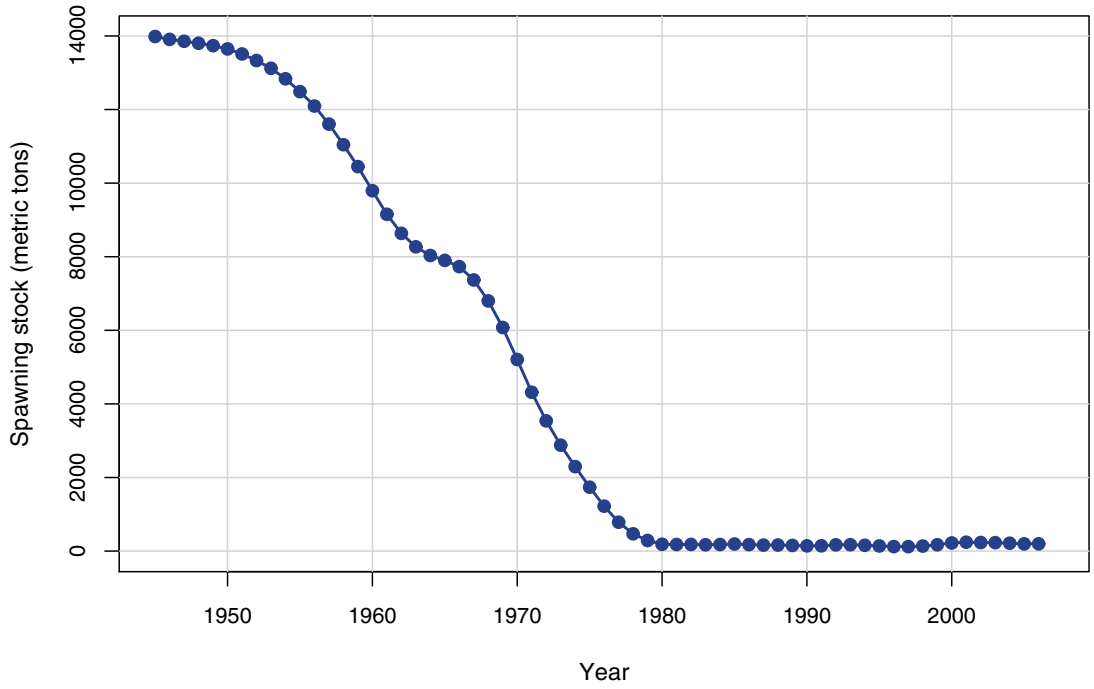


Figure 1.25. Red snapper: Estimated selectivities of commercial handline. Top panel – period 1 (prior to 1984, no regulations). Middle panel – period 2 (1984–1991, 12-inch limit). Bottom panel – period 3 (1992–2006, 20-inch limit).

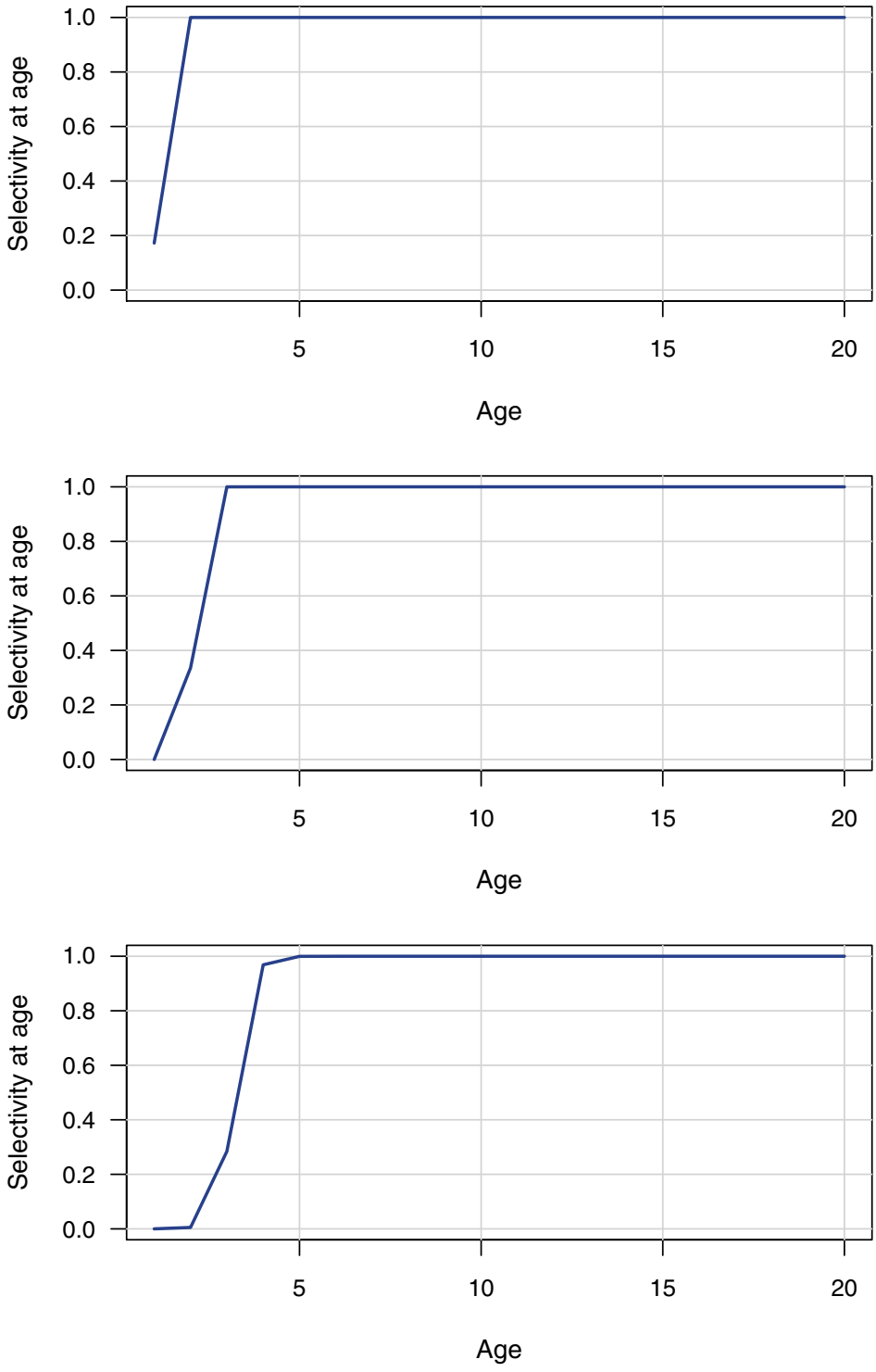


Figure 1.26. Red snapper: Estimated selectivity of commercial diving, assumed constant through time.

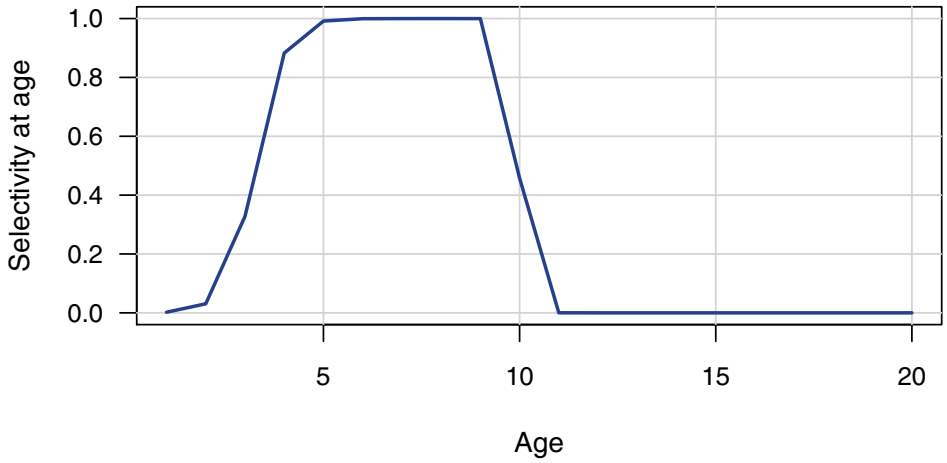


Figure 1.27. Red snapper: Estimated selectivities of the headboat fishery. Top panel – period 1 (prior to 1984, no regulations). Middle panel – period 2 (1984–1991, 12-inch limit). Bottom panel – period 3 (1992–2006, 20-inch limit).

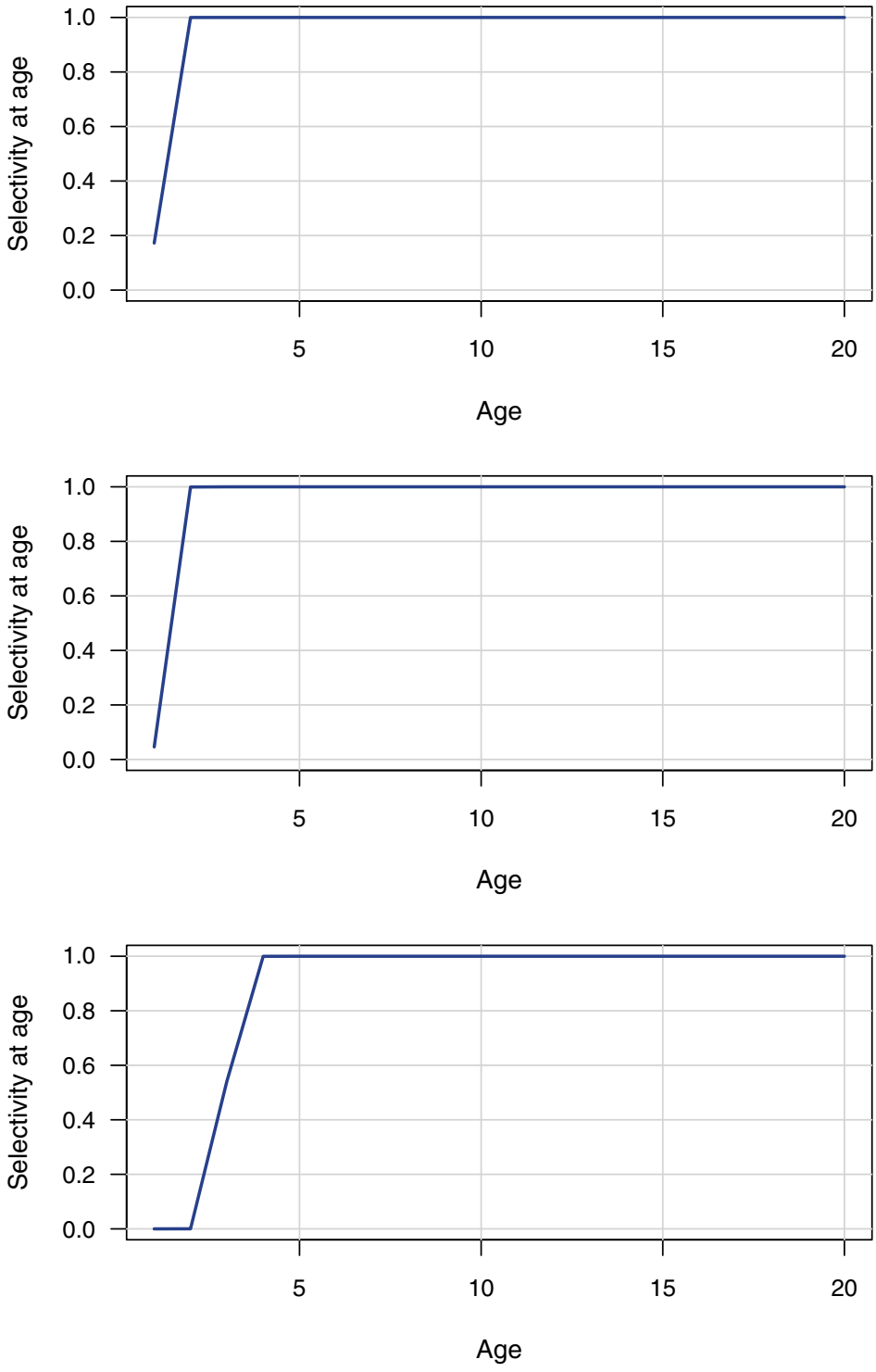


Figure 1.28. Red snapper: Estimated selectivities of the general recreational fishery. Top panel – period 1 (prior to 1984, no regulations). Middle panel – period 2 (1984–1991, 12-inch limit). Bottom panel – period 3 (1992–2006, 20-inch limit).

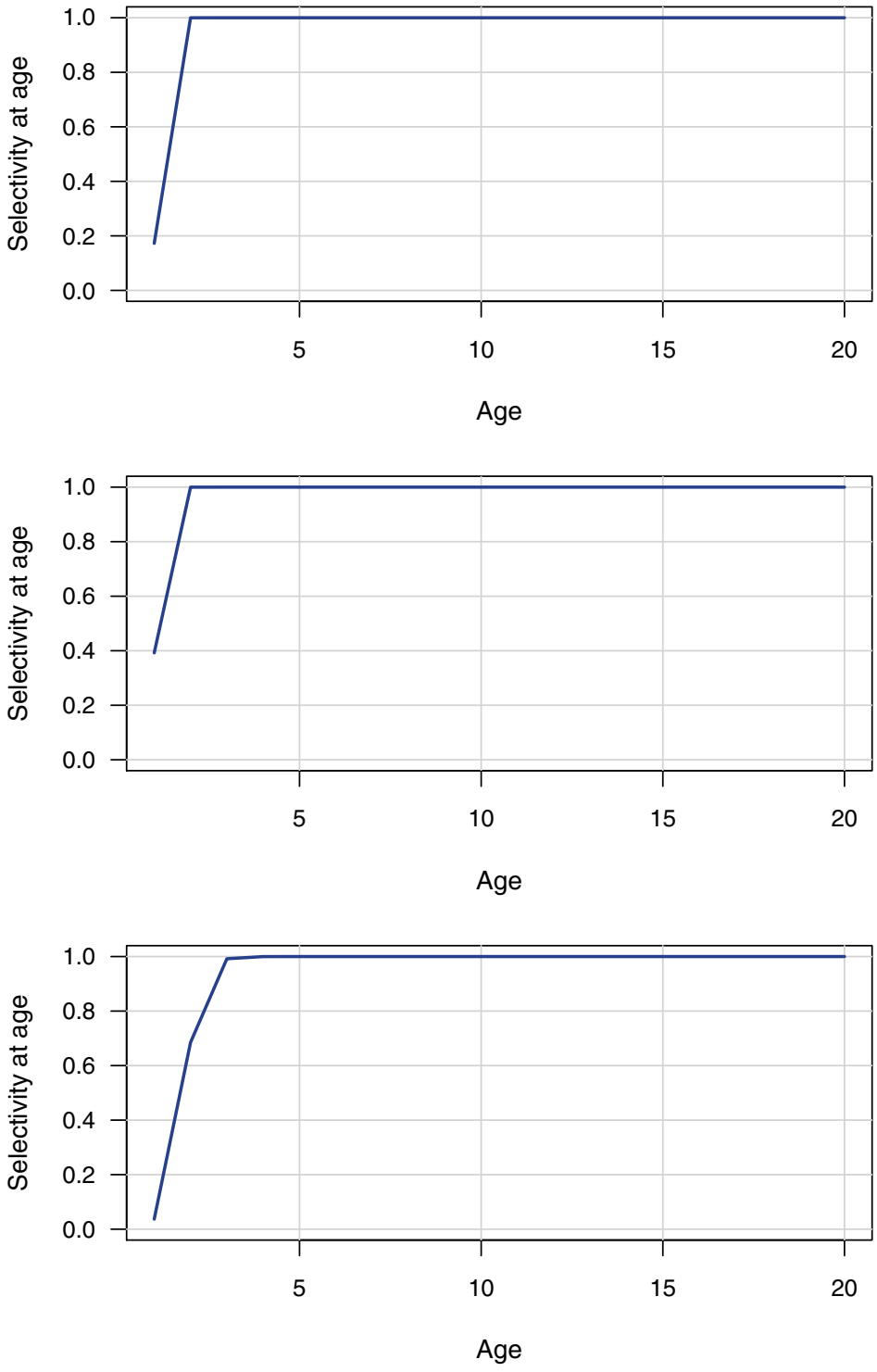


Figure 1.29. Red snapper: Estimated selectivities of discard mortalities from commercial handline. Discards were assumed negligible in period 1, the years prior to implementation of regulations. Top panel – period 2 (1984–1991, 12-inch limit). Bottom panel – period 3 (1992–2006, 20-inch limit).

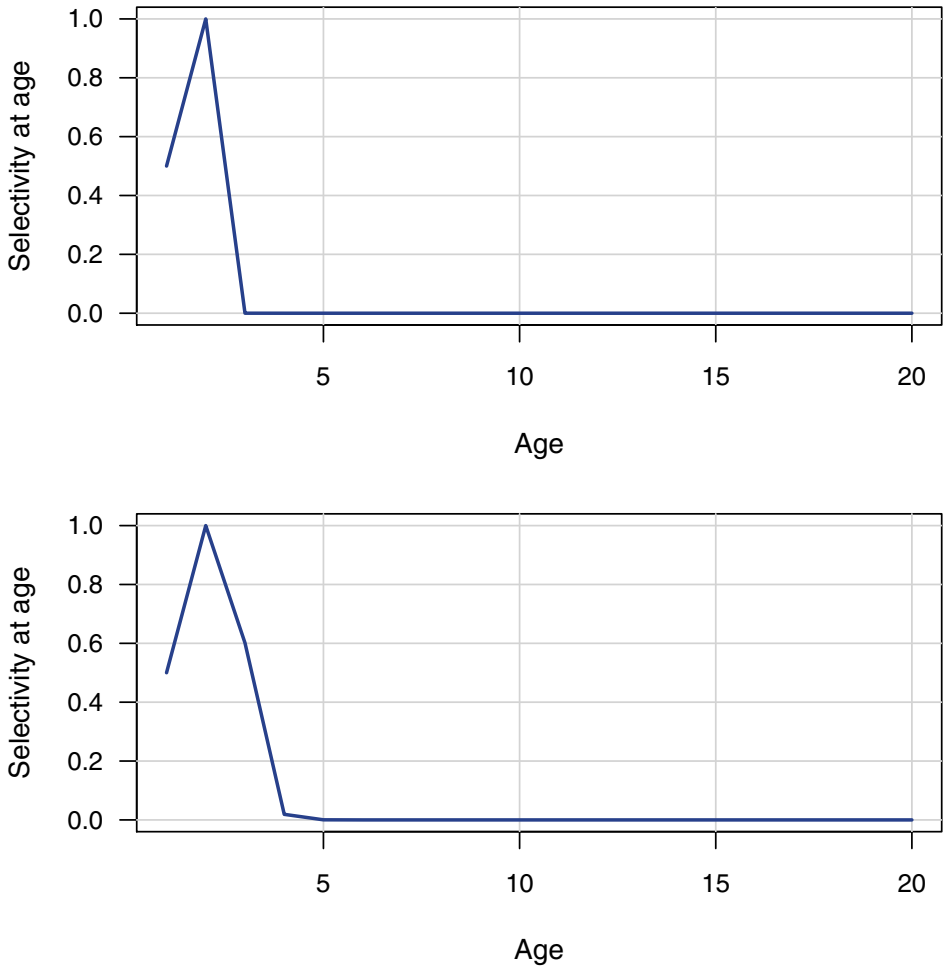


Figure 1.30. Red snapper: Estimated selectivities of discard mortalities from the headboat fishery. Discards were assumed negligible in period 1, the years prior to implementation of regulations. Top panel – period 2 (1984–1991, 12-inch limit). Bottom panel – period 3 (1992–2006, 20-inch limit).

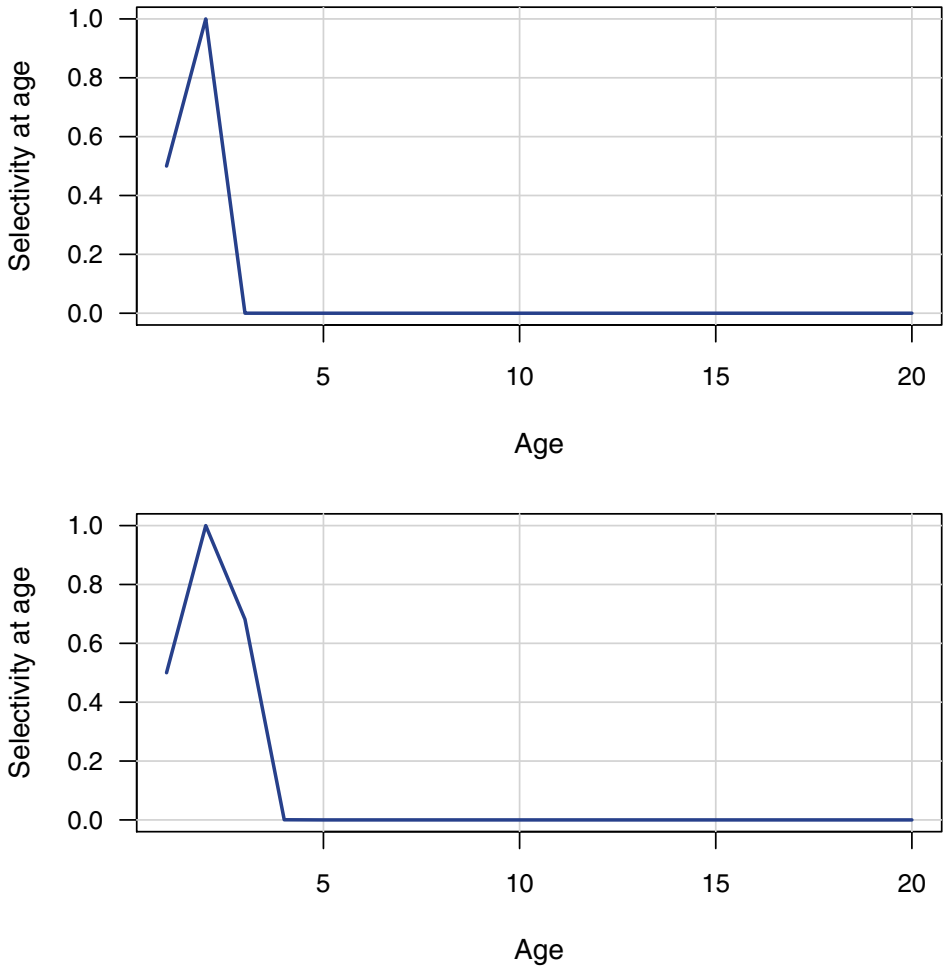


Figure 1.31. Red snapper: Estimated selectivities of discard mortalities from the general recreational fishery. Discards were assumed negligible in period 1, the years prior to implementation of regulations. Top panel – period 2 (1984–1991, 12-inch limit). Bottom panel – period 3 (1992–2006, 20-inch limit).

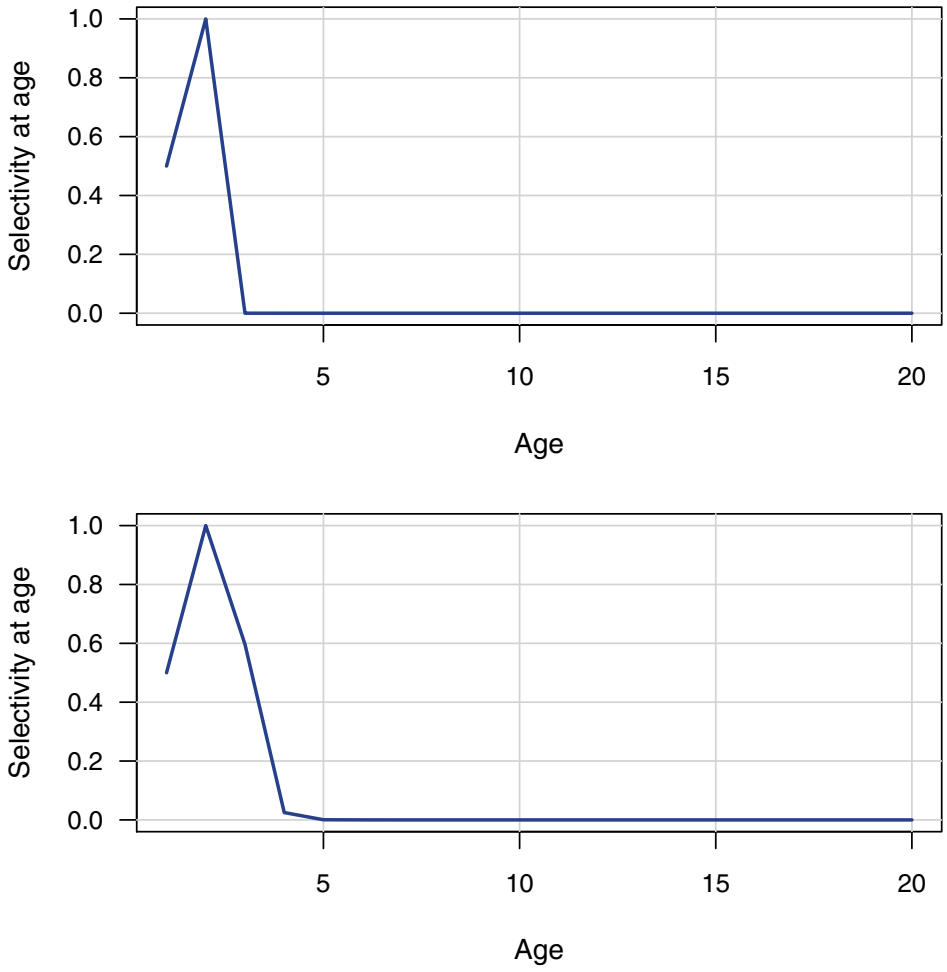


Figure 1.32. Red snapper: Average selectivities from period 3 (1992–2006, 20-inch limit), weighted by geometric mean Fs from the last three assessment years. and used in computation of benchmarks and projections. Top panel – Average selectivity applied to landings. Middle panel – Average selectivity applied to discard mortalities. Bottom panel – Total average selectivity.

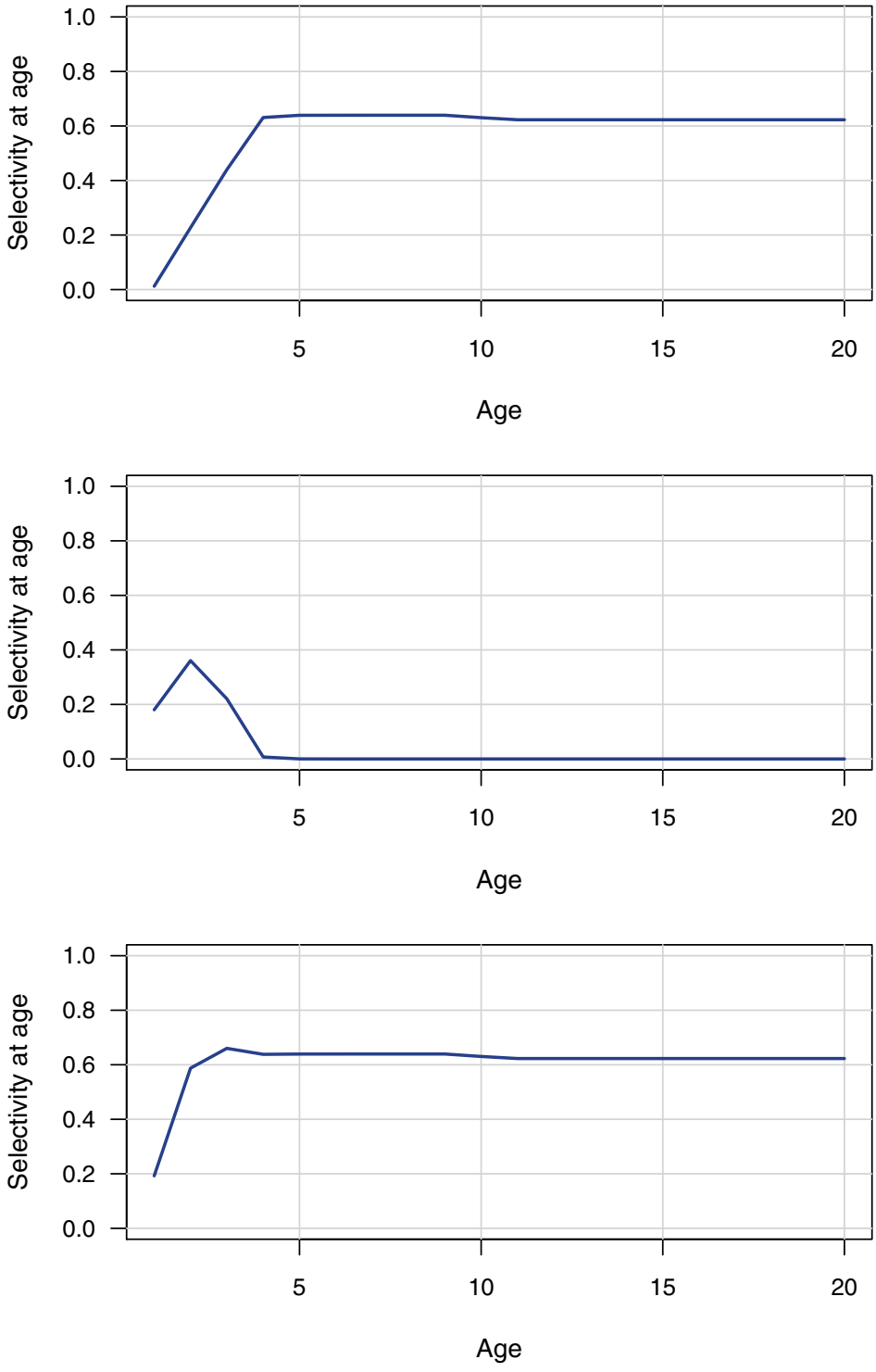


Figure 1.33. Red snapper: Estimated instantaneous fishing mortality rate (per year) by fishery. c.hal refers to commercial handline, c.dv to commercial diving, hb to headboat, rec to general recreational, c.hal.D to commercial discard mortalities, c.hb.D to headboat discard mortalities, and rec.D to general recreational discard mortalities.

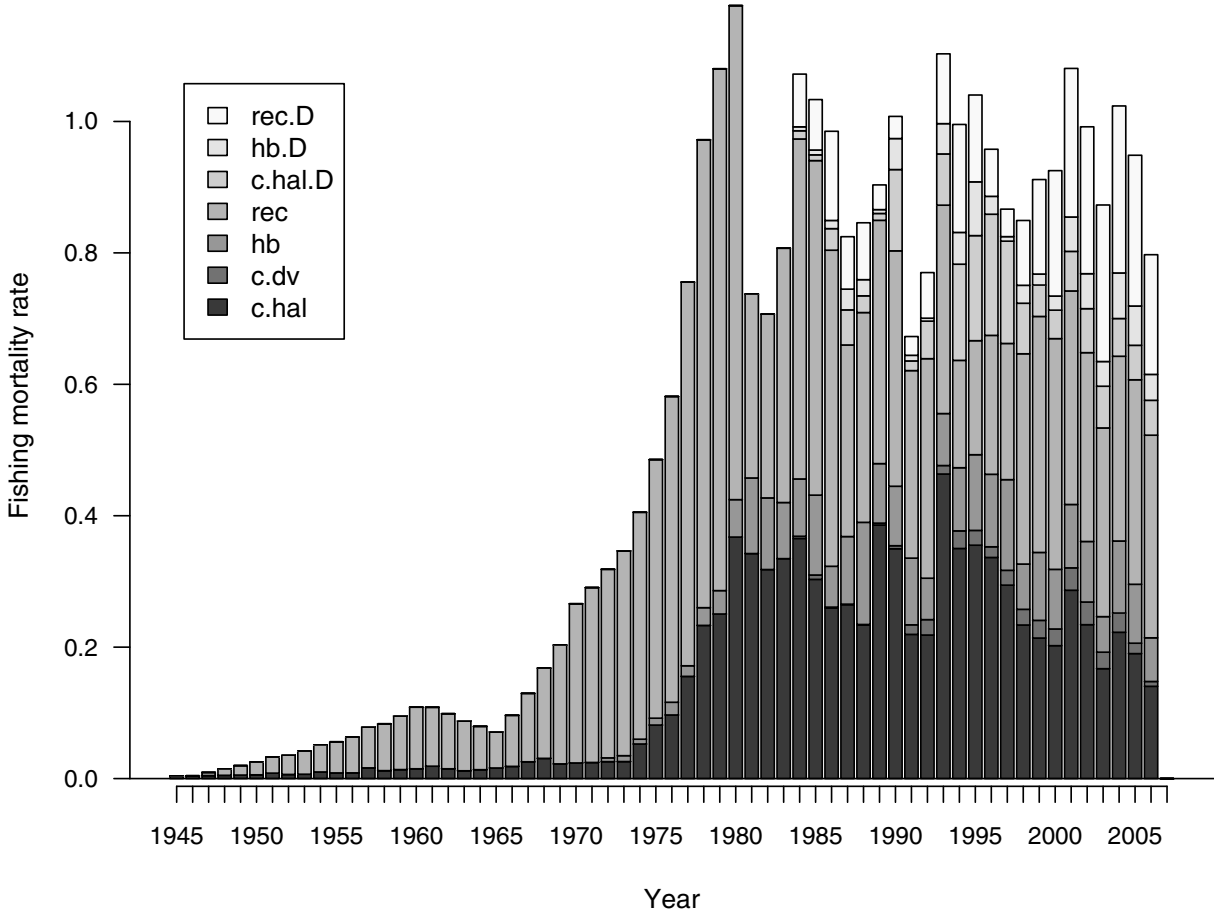


Figure 1.34. Red snapper: Estimated landings by fishery from the catch-at-age model. c.hal refers to commercial handline, c.dv to commercial diving, hb to headboat, rec to general recreational.

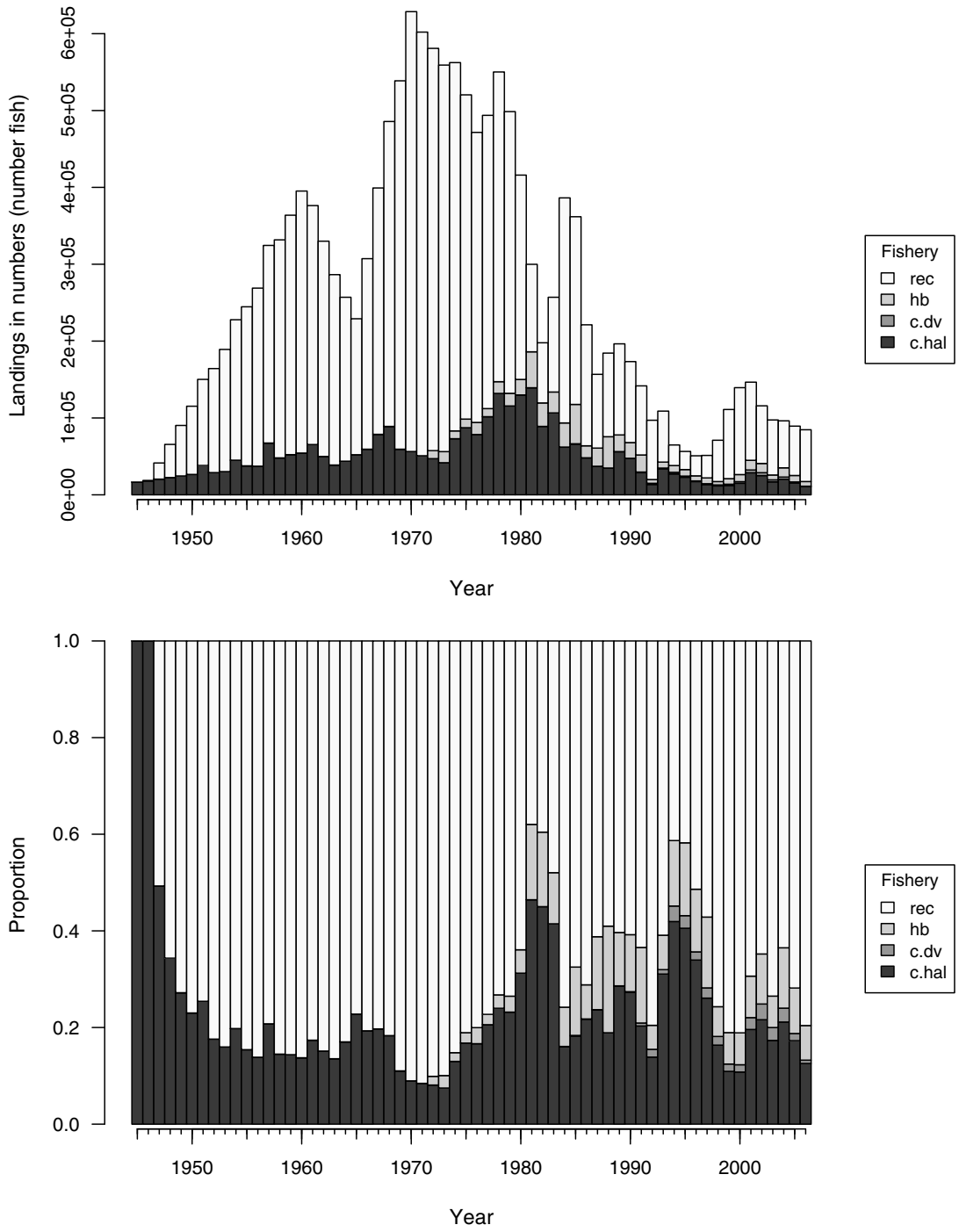


Figure 1.35. Red snapper: Estimated discard mortalities by fishery from the catch-at-age model. c.hal refers discard mortalities from commercial handline, hb from headboat, rec from general recreational.

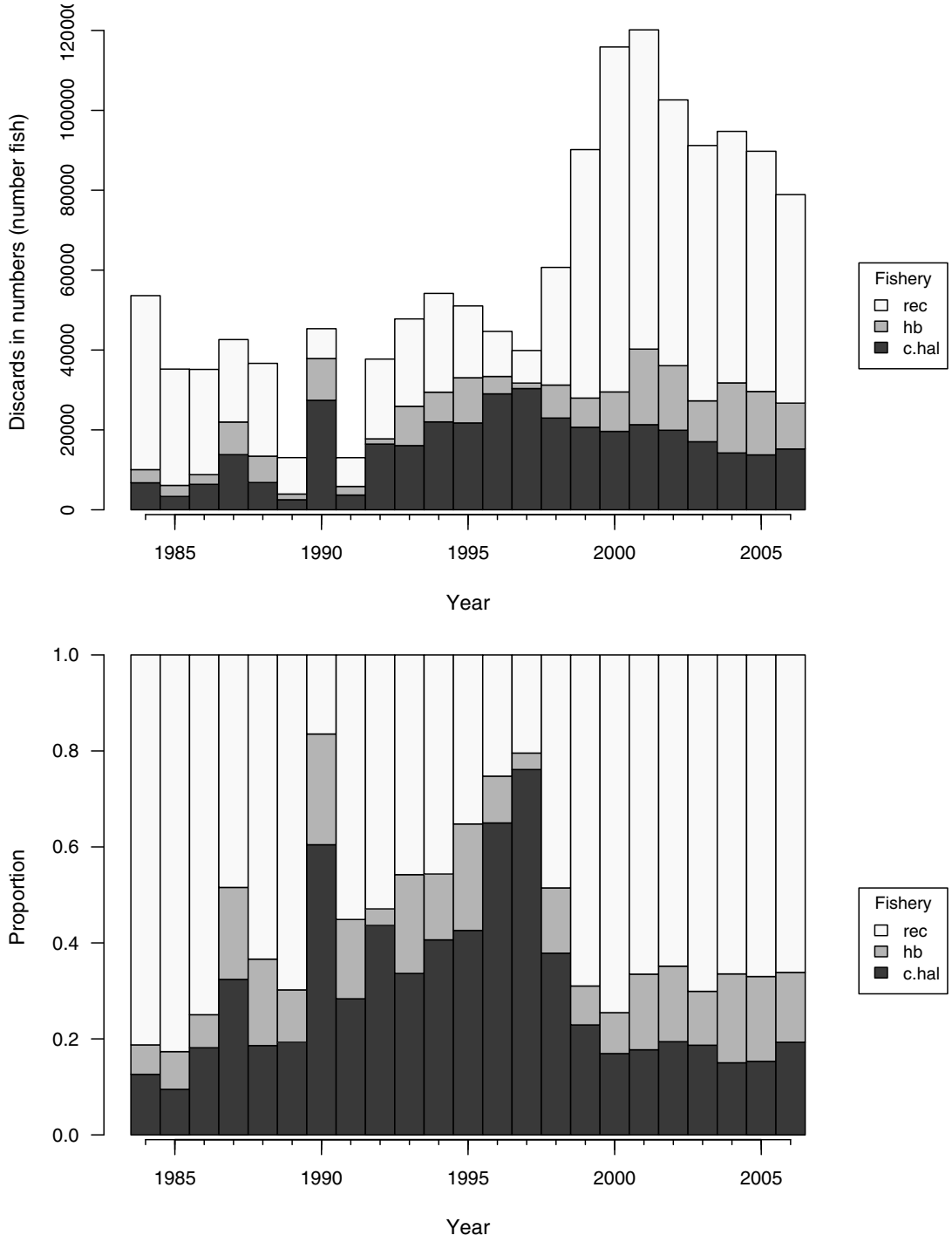


Figure 1.36. Red snapper: Estimated Beverton–Holt spawner-recruit curves, with and without lognormal bias correction.

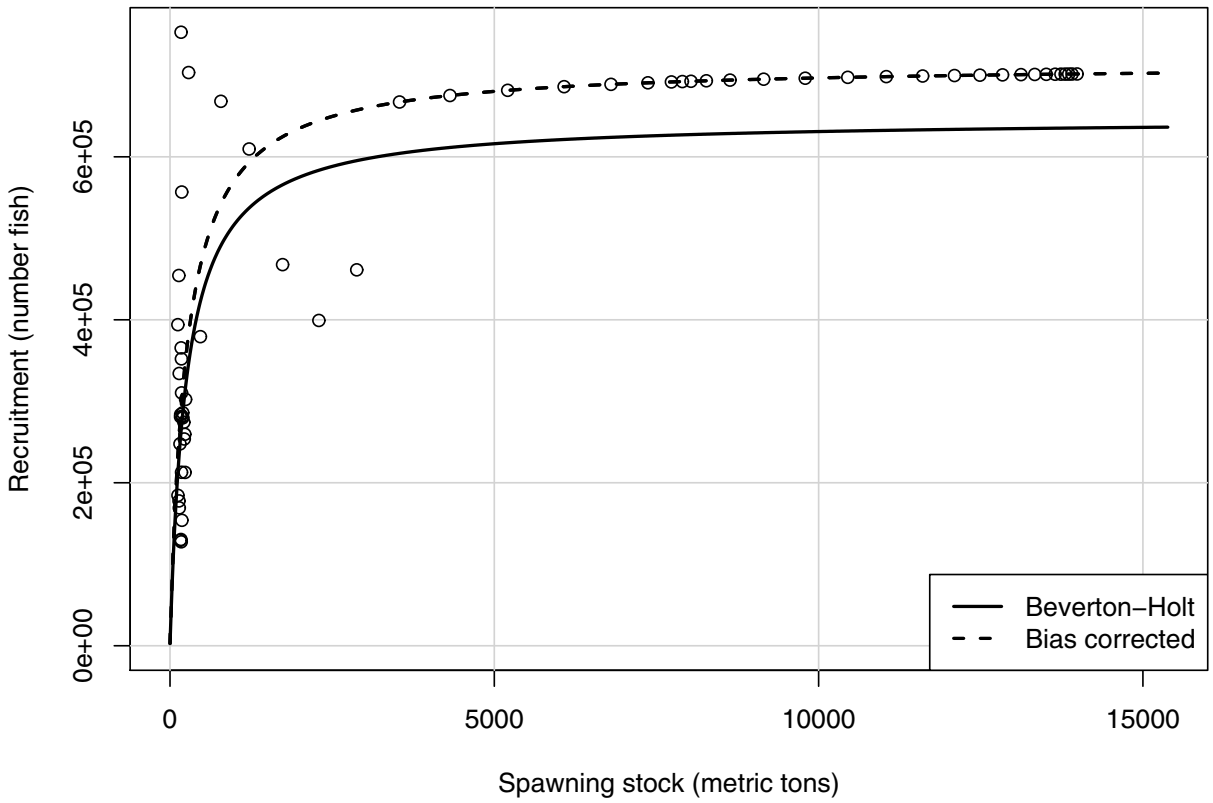


Figure 1.37. Red snapper: Relationship between %SPR and implied steepness (h), given that $F_{X\%} = F_{\mathrm{MSY}}$. SPR of $X = 40\%$ corresponds to $h = 0.68$.

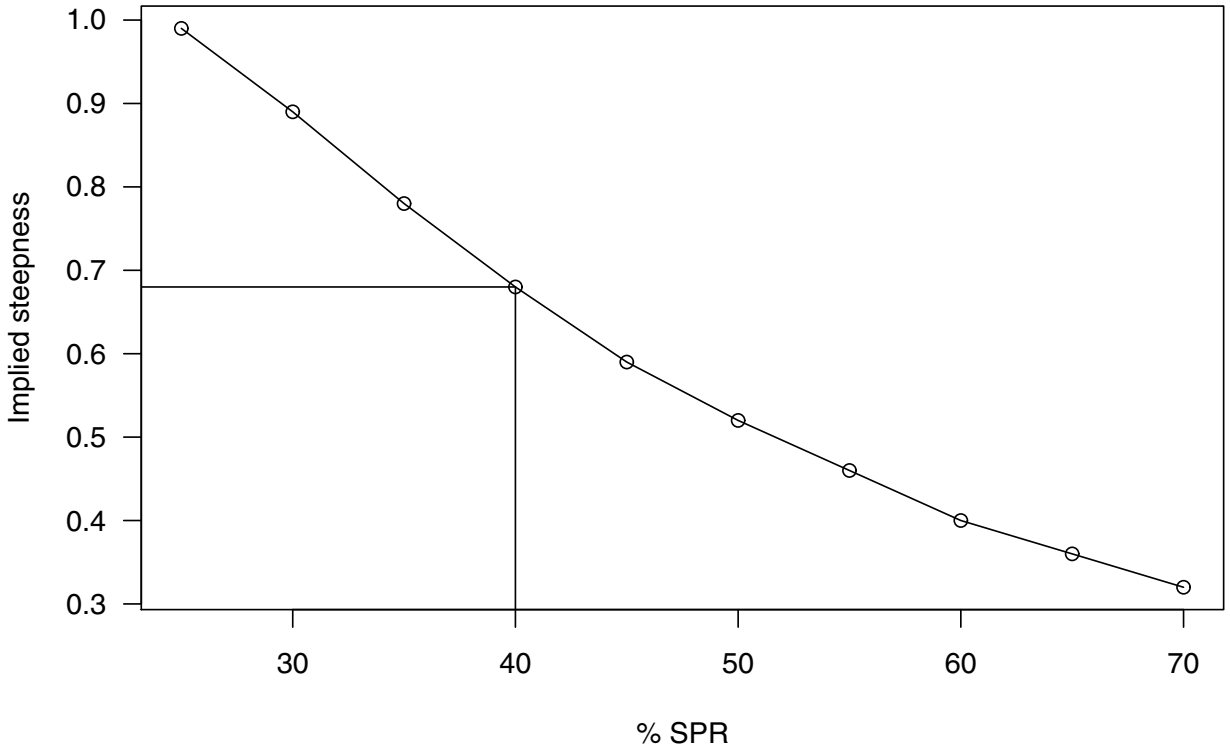


Figure 1.38. Red snapper: Estimated time series of static spawning potential ratio, the annual equilibrium spawners per recruit relative to that at the unfished level.

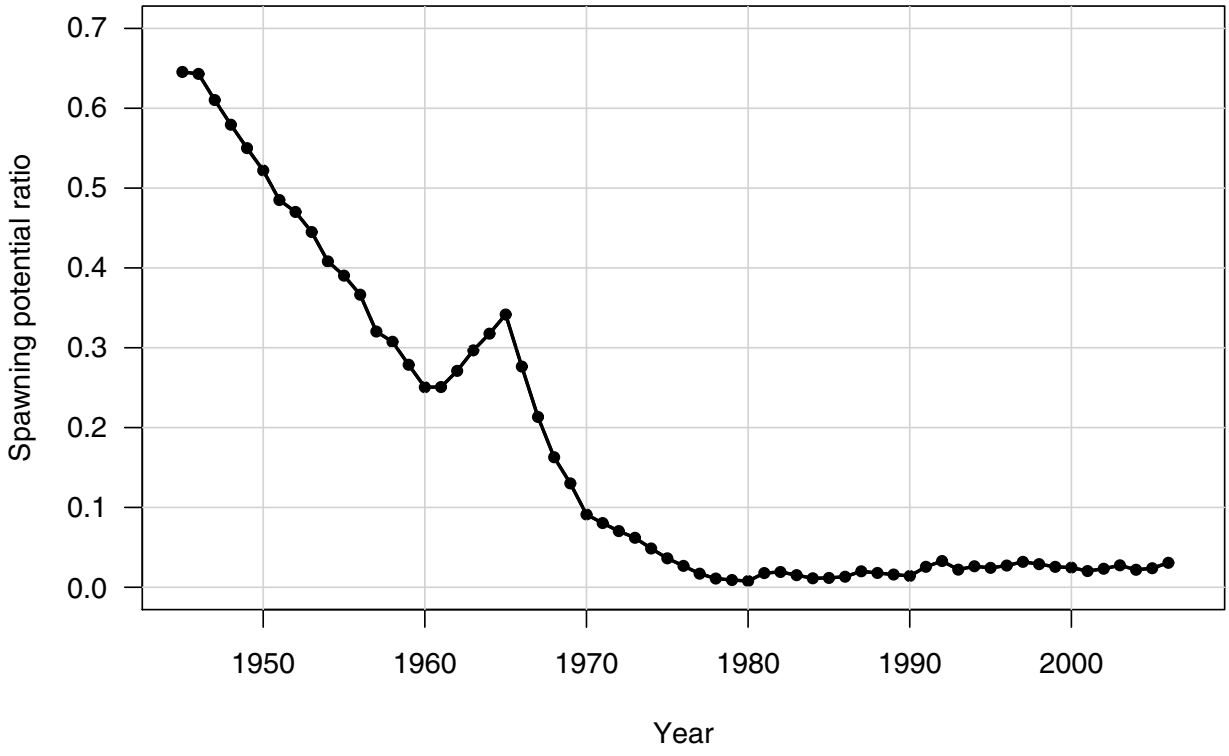


Figure 1.39. Red snapper: Top panel – Yield per recruit. Bottom panel – Spawning potential ratio (spawners per recruit relative to that at the unfished level), from which the 40% level provides $F_{40\%}$, the recommended proxy for F_{MSY}. Both curves are based on average selectivity from the end of the assessment period.

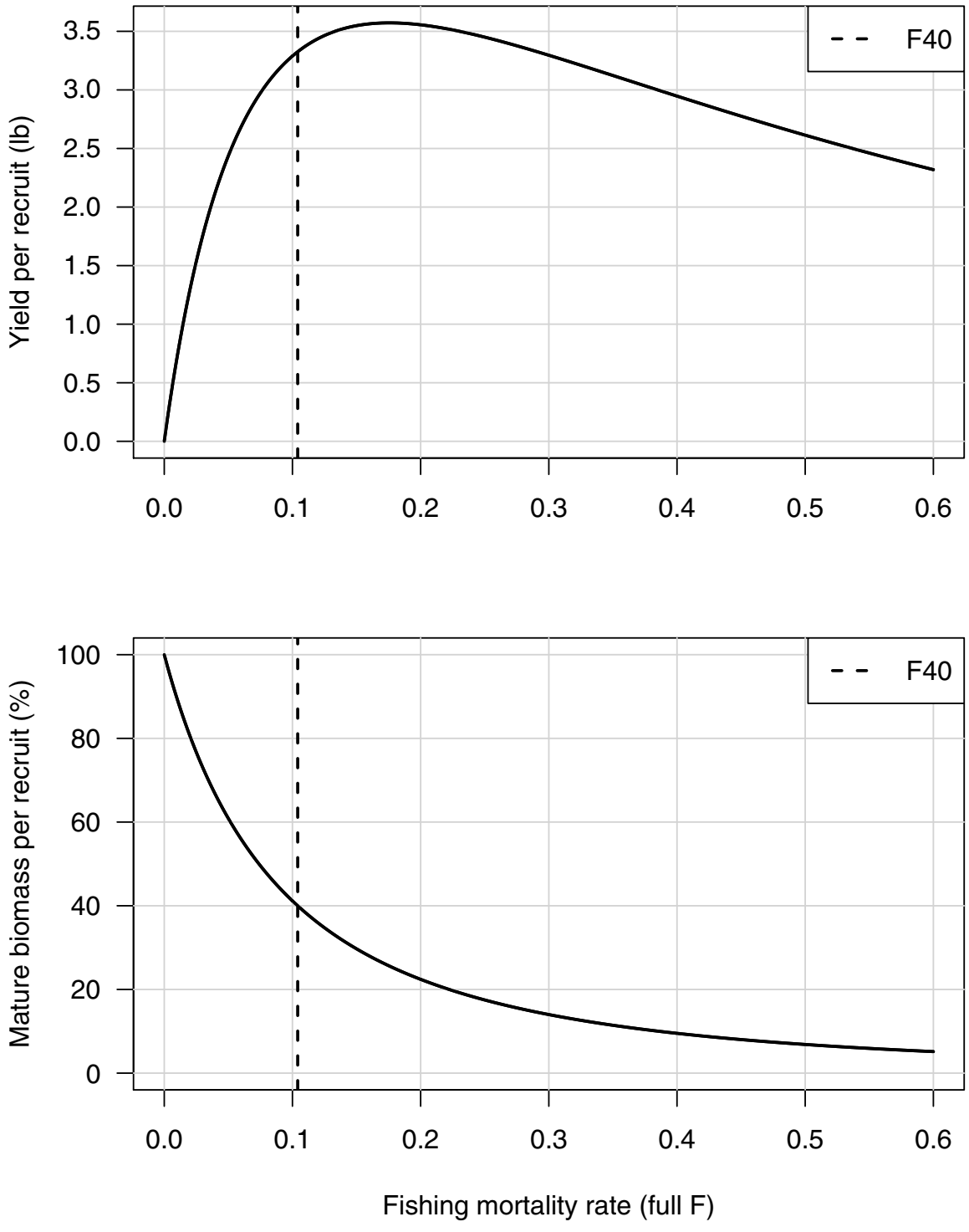


Figure 1.40. Red snapper: Top panel – Equilibrium landings. Bottom panel – Equilibrium spawning biomass. Both curves are based on average selectivity from the end of the assessment period.

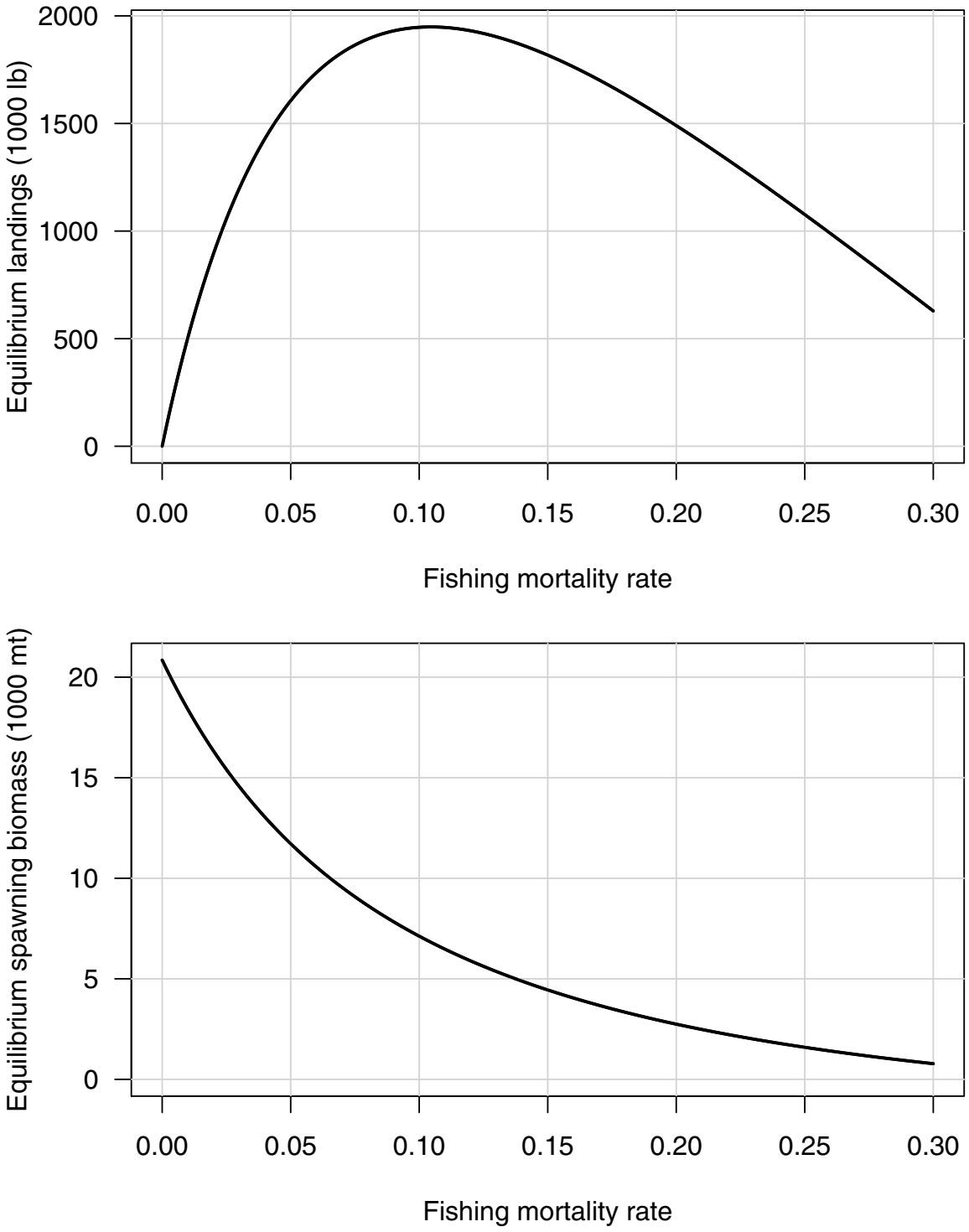


Figure 1.41. Red snapper: Top panel – Equilibrium landings as a function of equilibrium biomass, which itself is a function of fishing mortality rate. The peak occurs where equilibrium biomass is B = 15.06 1000 mt and equilibrium landings are 1949 1000 lb. Bottom panel – Equilibrium discard mortality as a function of equilibrium biomass.

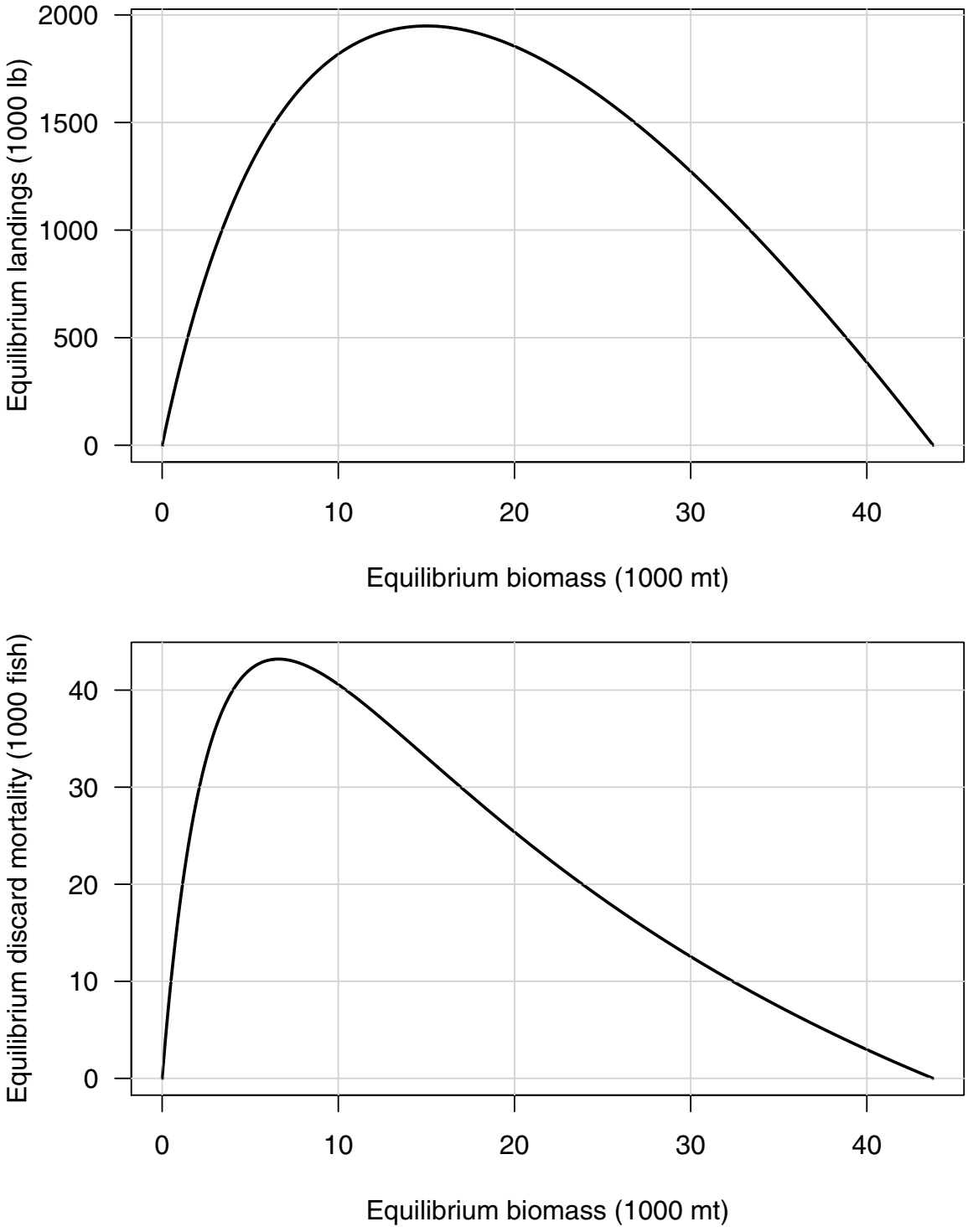
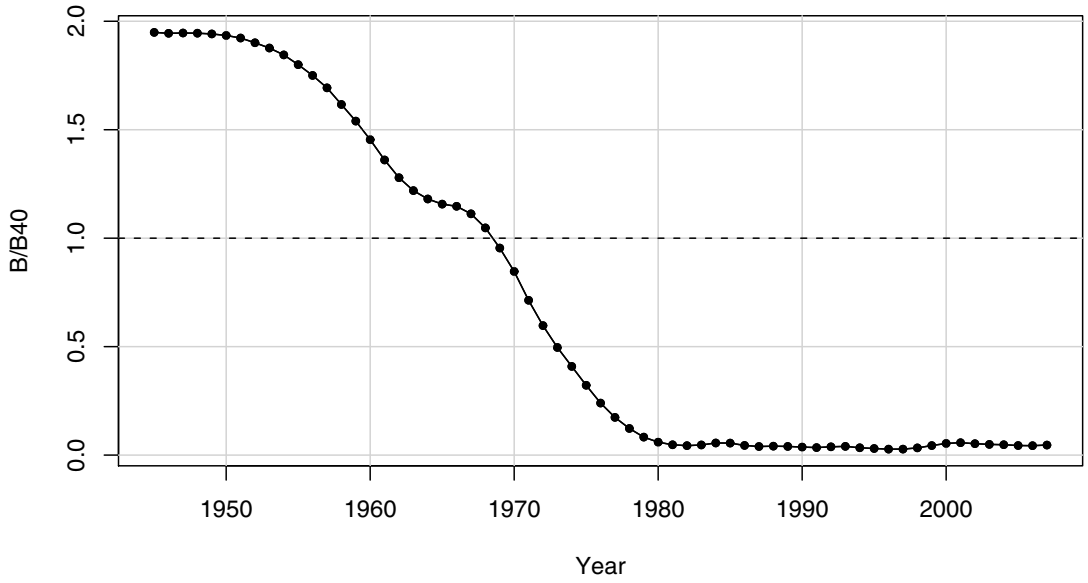


Figure 1.42. Red snapper: Estimated time series of biomass relative to reference points. Top panel – B relative to B_{MSY} proxy. Bottom panel – SSB *relative to* SSB_{MSY} *proxy. Proxies are based on* $F_{40\%}$.



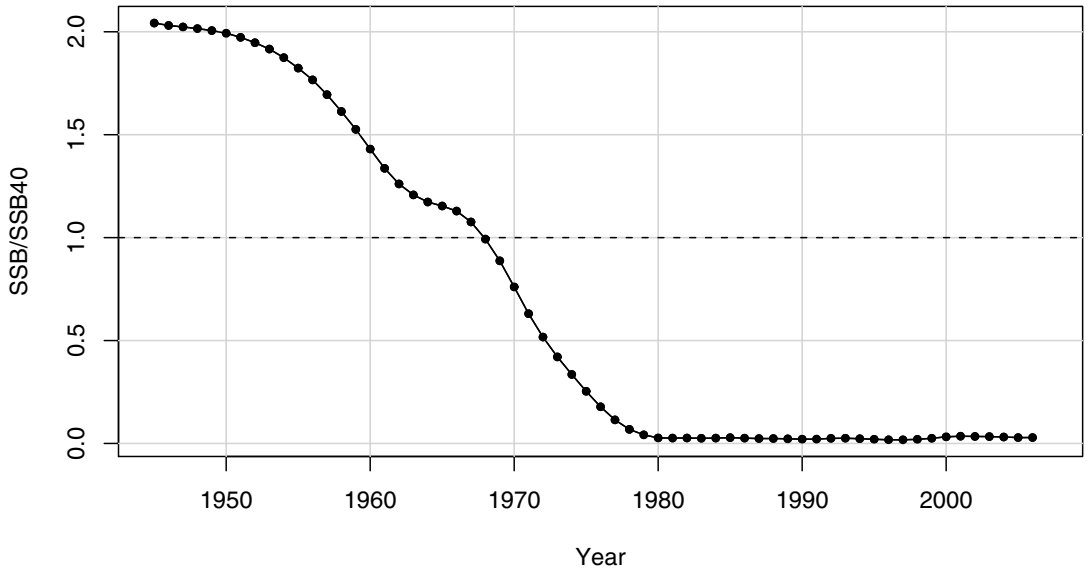


Figure 1.43. Red snapper: Estimated time series of full F relative to the F_{MSY} proxy, $F_{40\%}$.

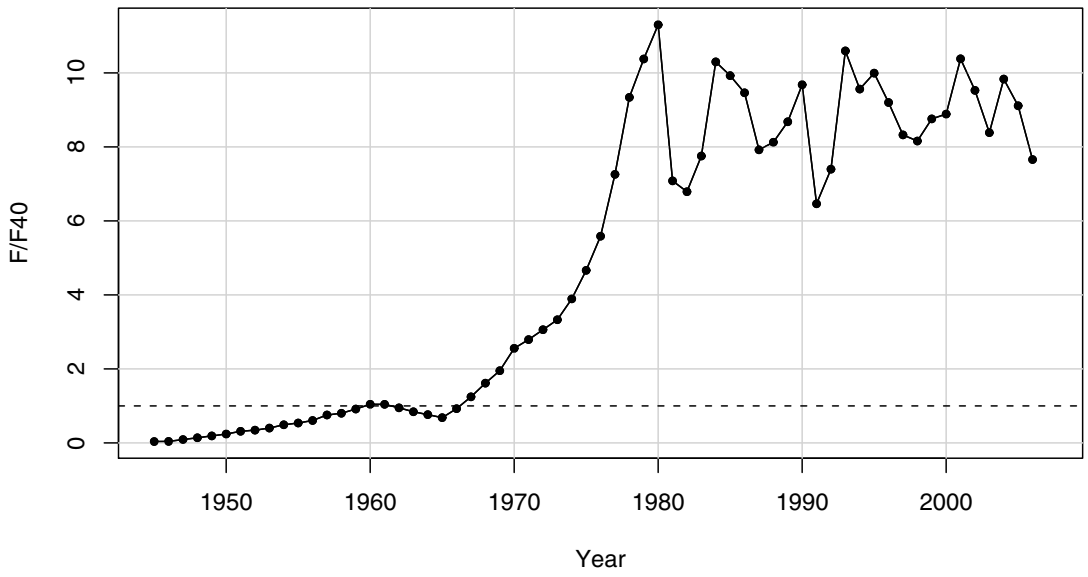


Figure 1.44. Red snapper: Projection results under scenario R1—fishing mortality rate fixed at $F = 0$. Expected values represented by dotted solid lines, and uncertainty represented by thin lines corresponding to 10^{th} and 90^{th} percentiles of 1000 replicate projections. Horizontal lines mark proxy reference points. Spawning stock biomass (SSB) is at mid-year.

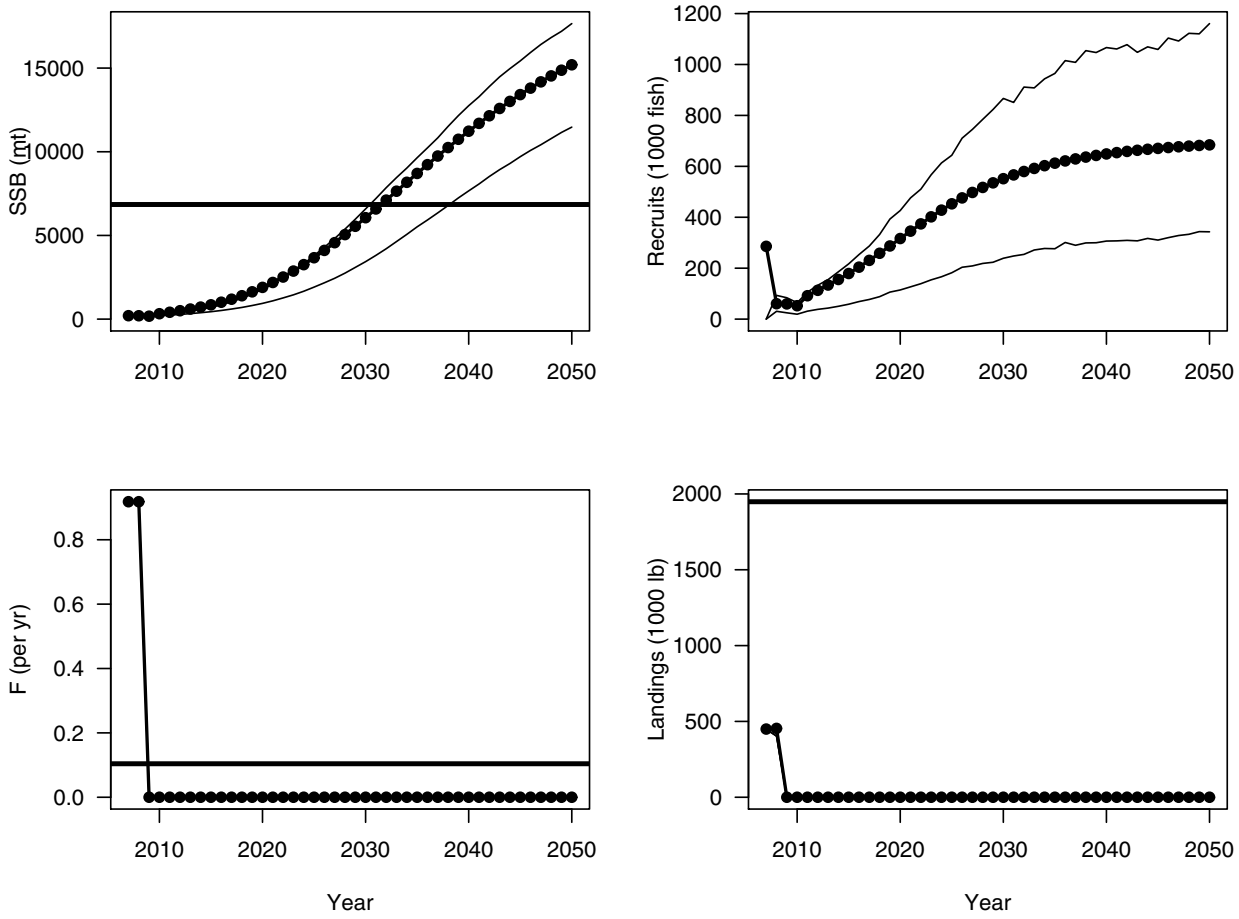


Figure 1.45. Red snapper: Projection results under scenario R2—fishing mortality rate fixed at $F = F_{40\%}$. Expected values represented by dotted solid lines, and uncertainty represented by thin lines corresponding to 10^{th} and 90^{th} percentiles of 1000 replicate projections. Horizontal lines mark proxy reference points. Spawning stock biomass (SSB) is at mid-year.

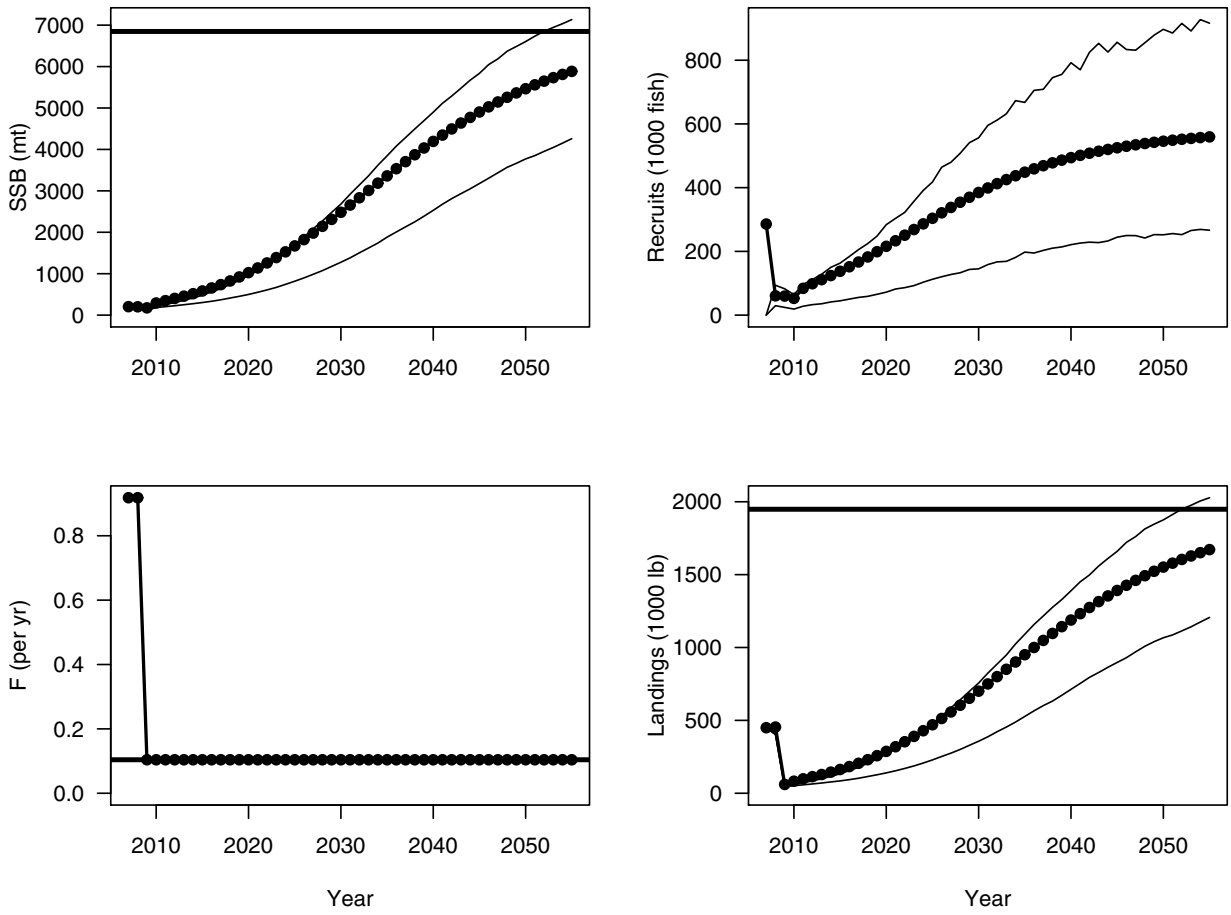


Figure 1.46. Red snapper: Projection results under scenario R3—fishing mortality rate fixed at $F = 65\%F_{40\%}$. Expected values represented by dotted solid lines, and uncertainty represented by thin lines corresponding to 10^{th} and 90^{th} percentiles of 1000 replicate projections. Horizontal lines mark proxy reference points. Spawning stock biomass (SSB) is at mid-year.

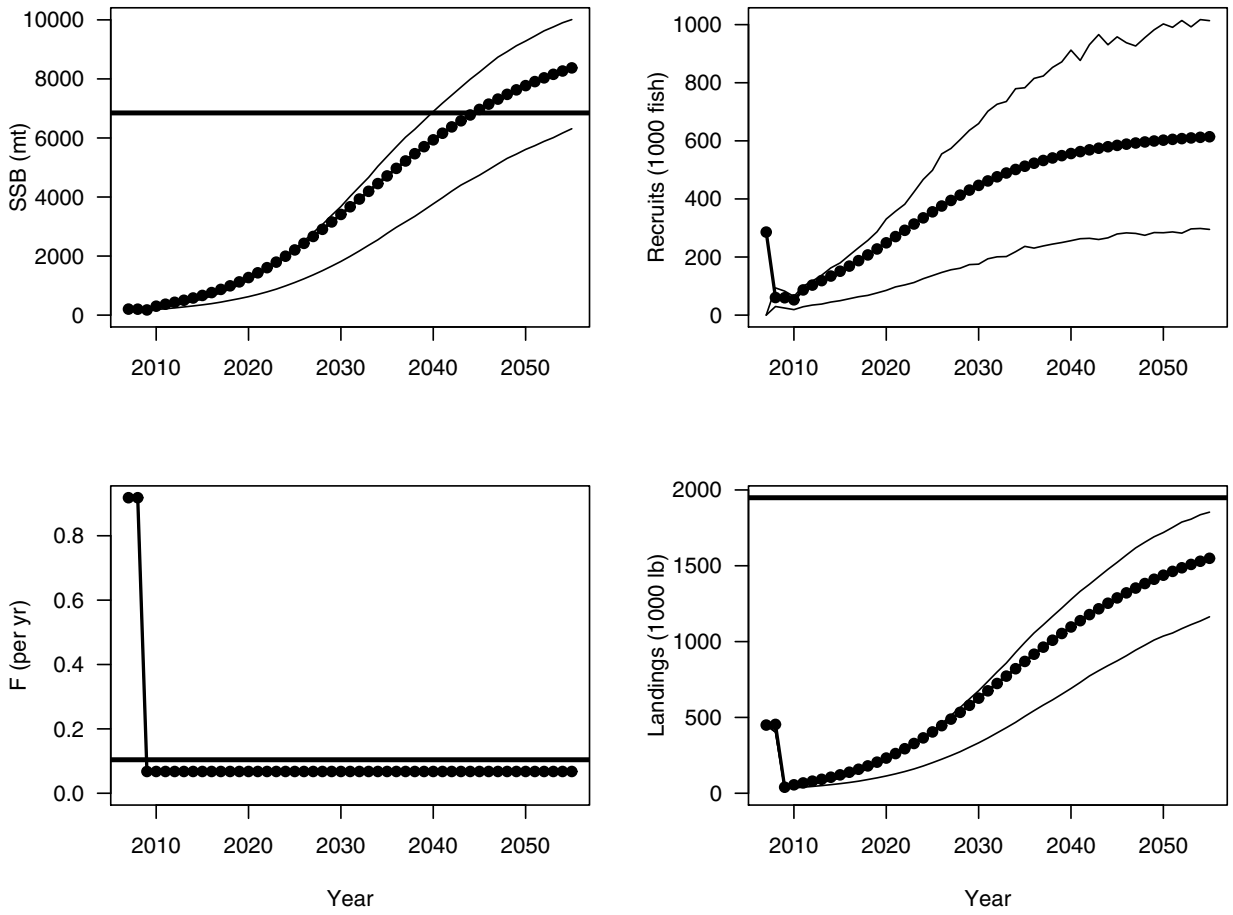


Figure 1.47. Red snapper: Projection results under scenario R4—fishing mortality rate fixed at $F = 75\%F_{40\%}$. Expected values represented by dotted solid lines, and uncertainty represented by thin lines corresponding to 10^{th} and 90^{th} percentiles of 1000 replicate projections. Horizontal lines mark proxy reference points. Spawning stock biomass (SSB) is at mid-year.

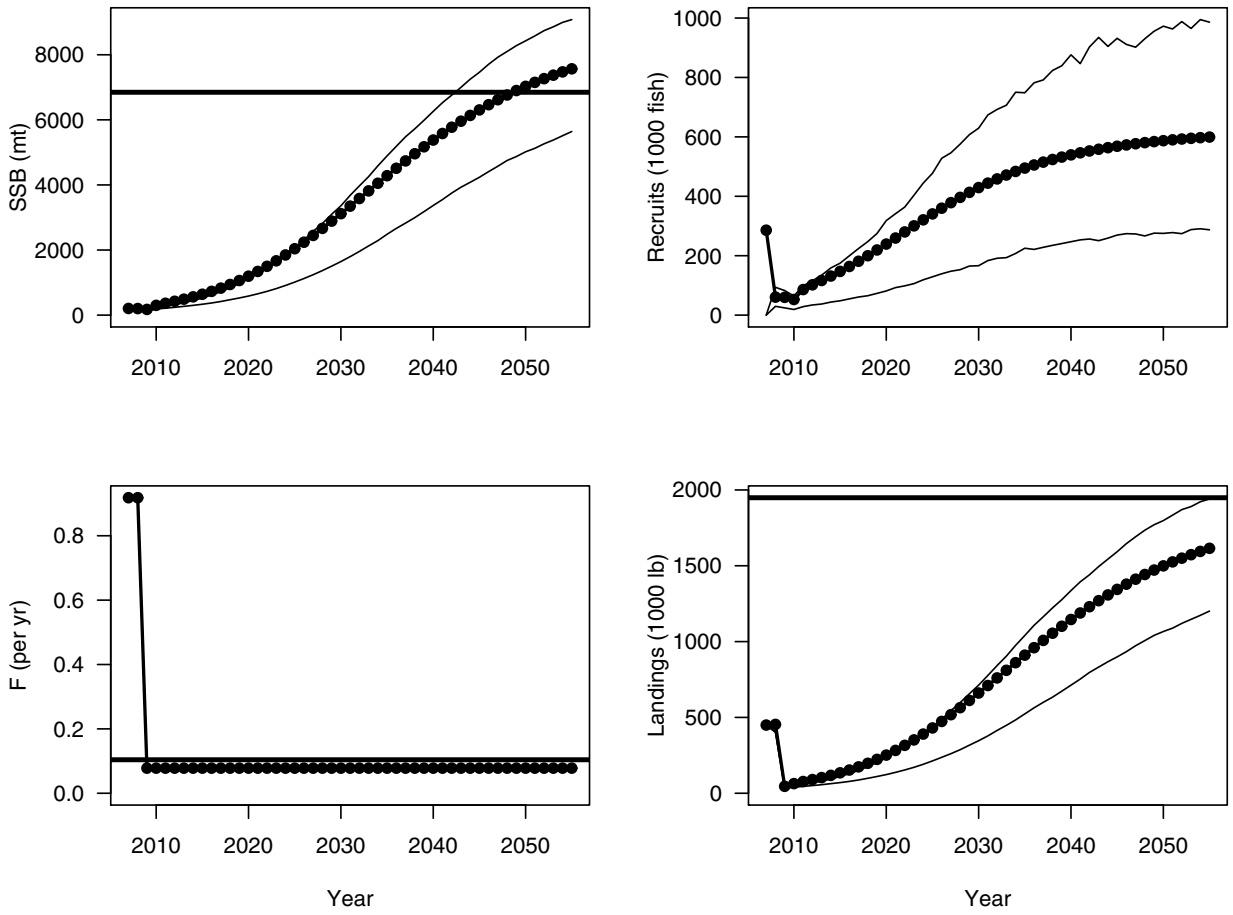


Figure 1.48. Red snapper: Projection results under scenario R5—fishing mortality rate fixed at $F = 85\%F_{40\%}$. Expected values represented by dotted solid lines, and uncertainty represented by thin lines corresponding to 10^{th} and 90^{th} percentiles of 1000 replicate projections. Horizontal lines mark proxy reference points. Spawning stock biomass (SSB) is at mid-year.

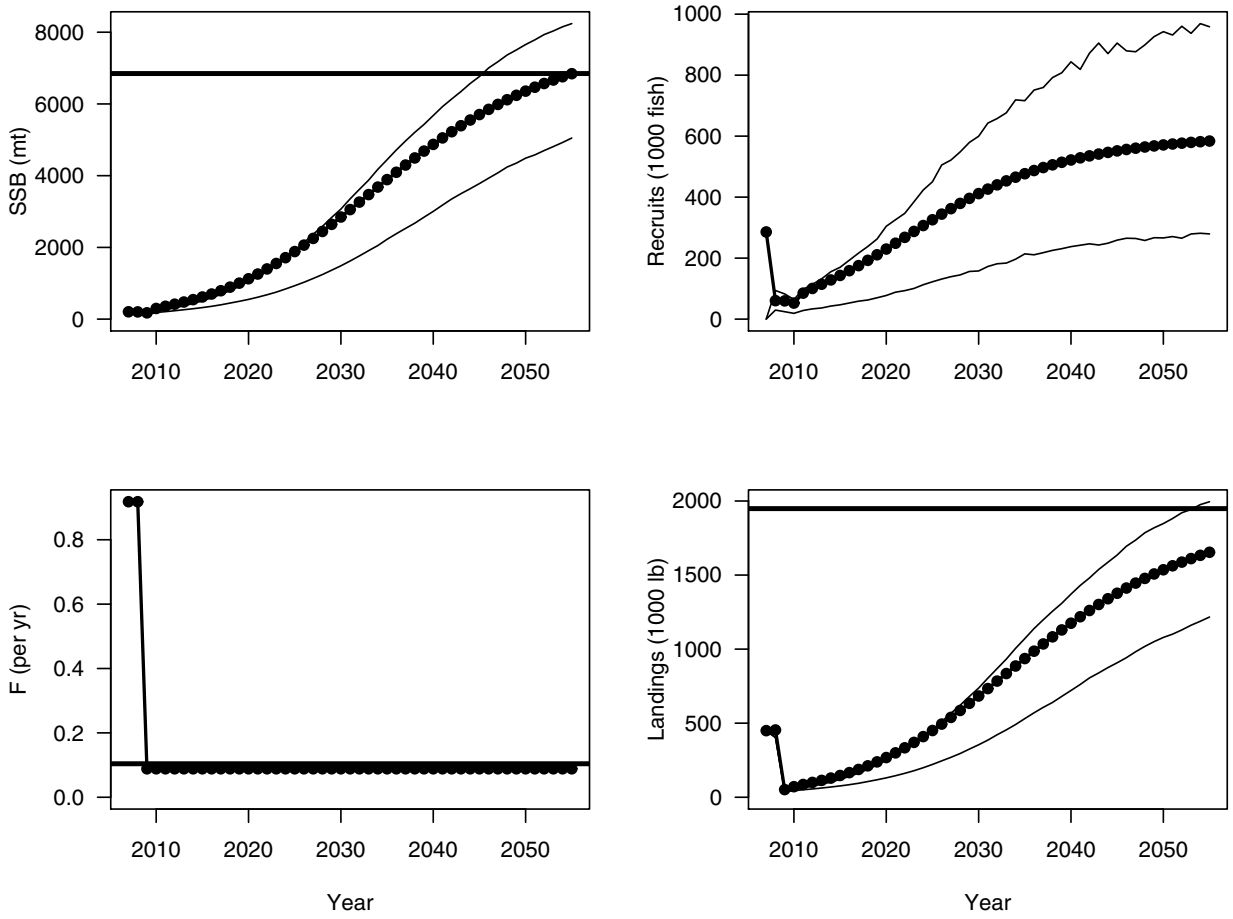


Figure 1.49. Red snapper: Projection results under scenario R6—Discard-only projection with fishing mortality rate fixed at $F = F_{\text{current}}$ minus that of commercial diving, and with release mortality rates of 0.9 in the commercial sector and 0.4 in the headboat and general recreational sectors. Expected values represented by dotted solid lines, and uncertainty represented by thin lines corresponding to 10^{th} and 90^{th} percentiles of 1000 replicate projections. Spawning stock biomass (SSB) is at mid-year. In the SSB panel, solid horizontal line marks $\text{SSB}_{F_{40\%}}$, the rebuilding target. In the F panel, the dashed horizontal line marks the fishing rate applied, of which only a portion (dotted solid line) leads to discard mortality.

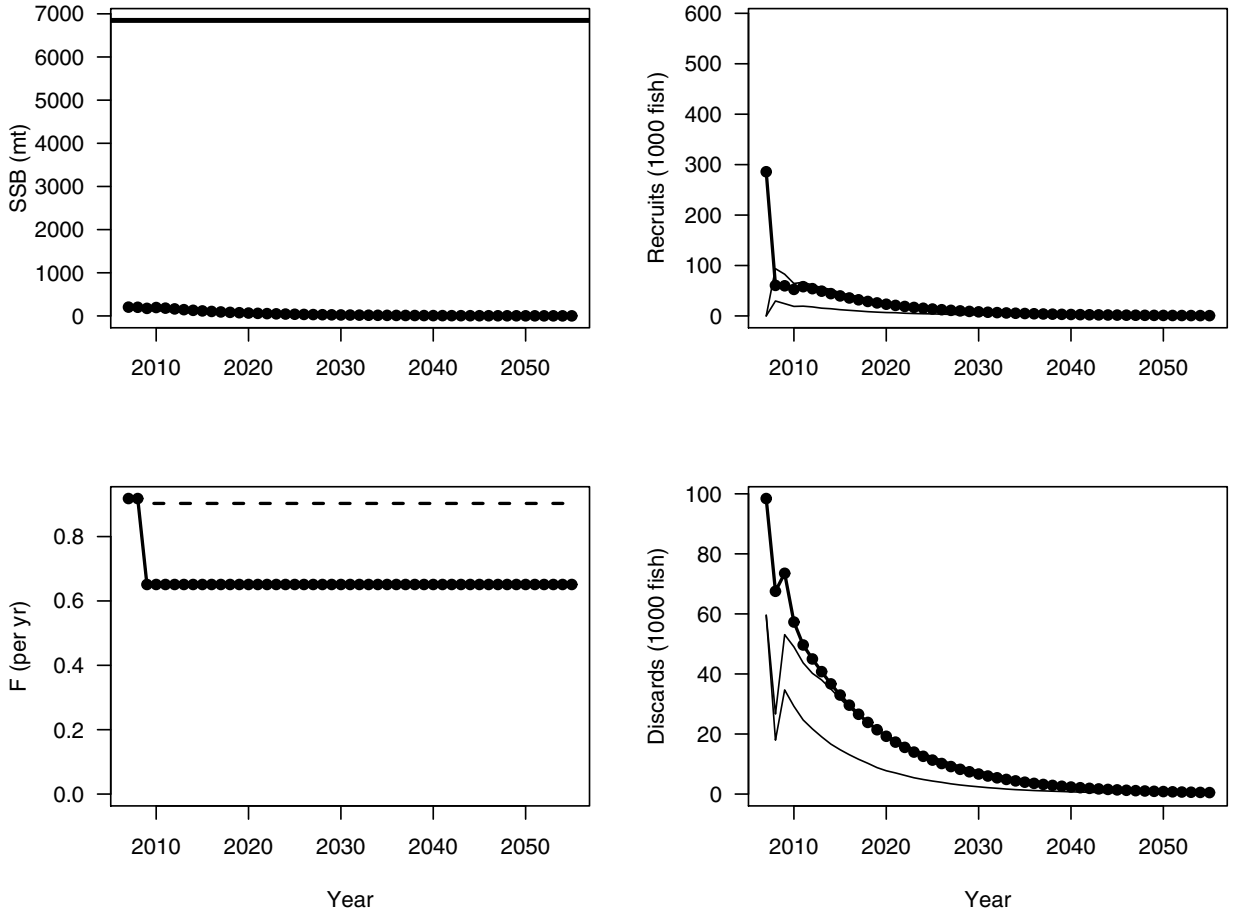


Figure 1.50. Red snapper: Projection results under scenario R7—Discard-only projection with fishing mortality rate fixed at $F = F_{40\%}$, and with release mortality rates of 0.9 in the commercial sector and 0.4 in the headboat and general recreational sectors. Expected values represented by dotted solid lines, and uncertainty represented by thin lines corresponding to 10^{th} and 90^{th} percentiles of 1000 replicate projections. Spawning stock biomass (SSB) is at mid-year. In the SSB *panel, solid horizontal line marks* $SSB_{F_{40\%}}$*, the rebuilding target. In the F panel, the dashed horizontal line marks the fishing rate applied, of which only a portion (dotted solid line) leads to discard mortality.*

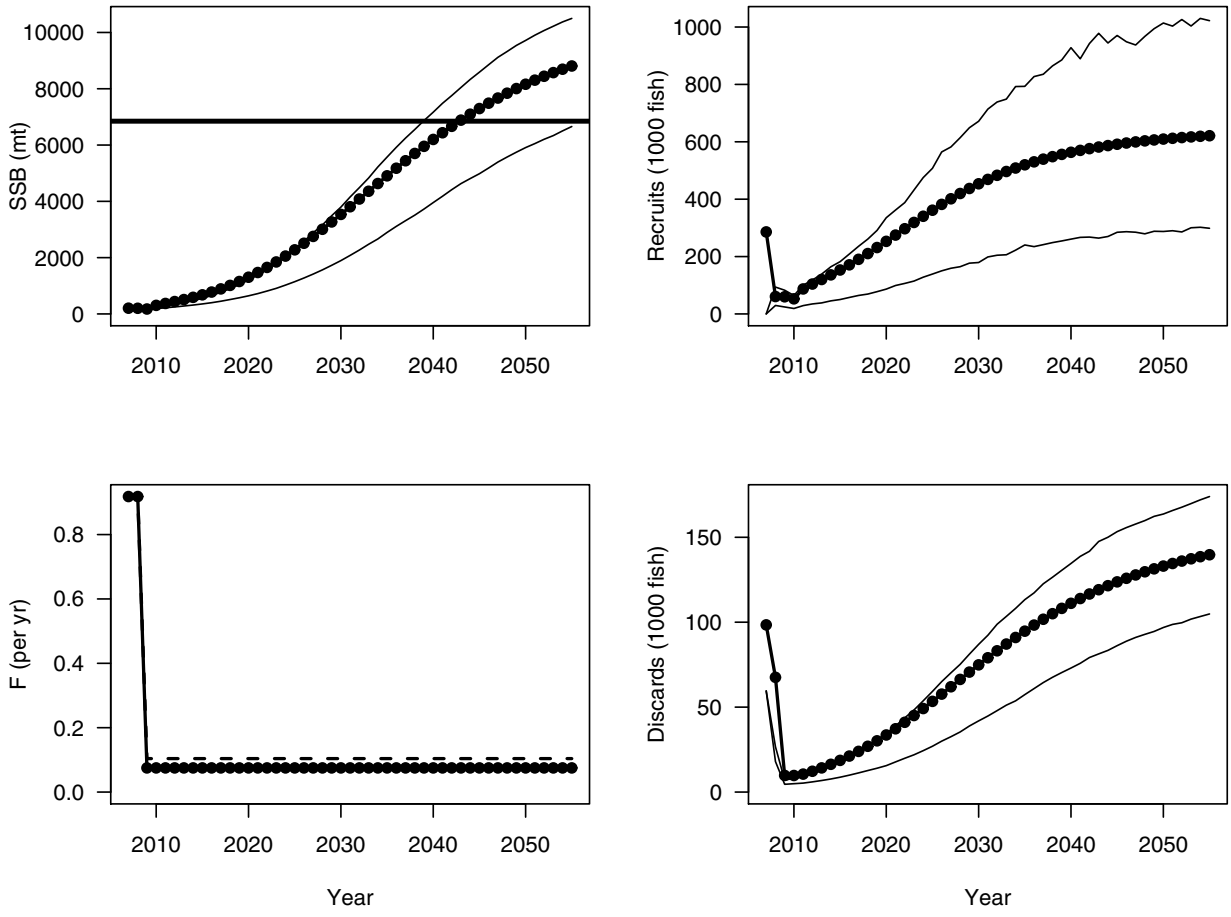


Figure 1.51. Red snapper: Projection results under scenario R8—Discard-only projection with fishing mortality rate fixed at $F = 65\%F_{40\%}$, and with release mortality rates of 0.9 in the commercial sector and 0.4 in the headboat and general recreational sectors. Expected values represented by dotted solid lines, and uncertainty represented by thin lines corresponding to 10^{th} and 90^{th} percentiles of 1000 replicate projections. Spawning stock biomass (SSB) is at mid-year. In the SSB *panel, solid horizontal line marks* $\text{SSB}_{F_{40\%}}$*, the rebuilding target. In the F panel, the dashed horizontal line marks the fishing rate applied, of which only a portion (dotted solid line) leads to discard mortality.*

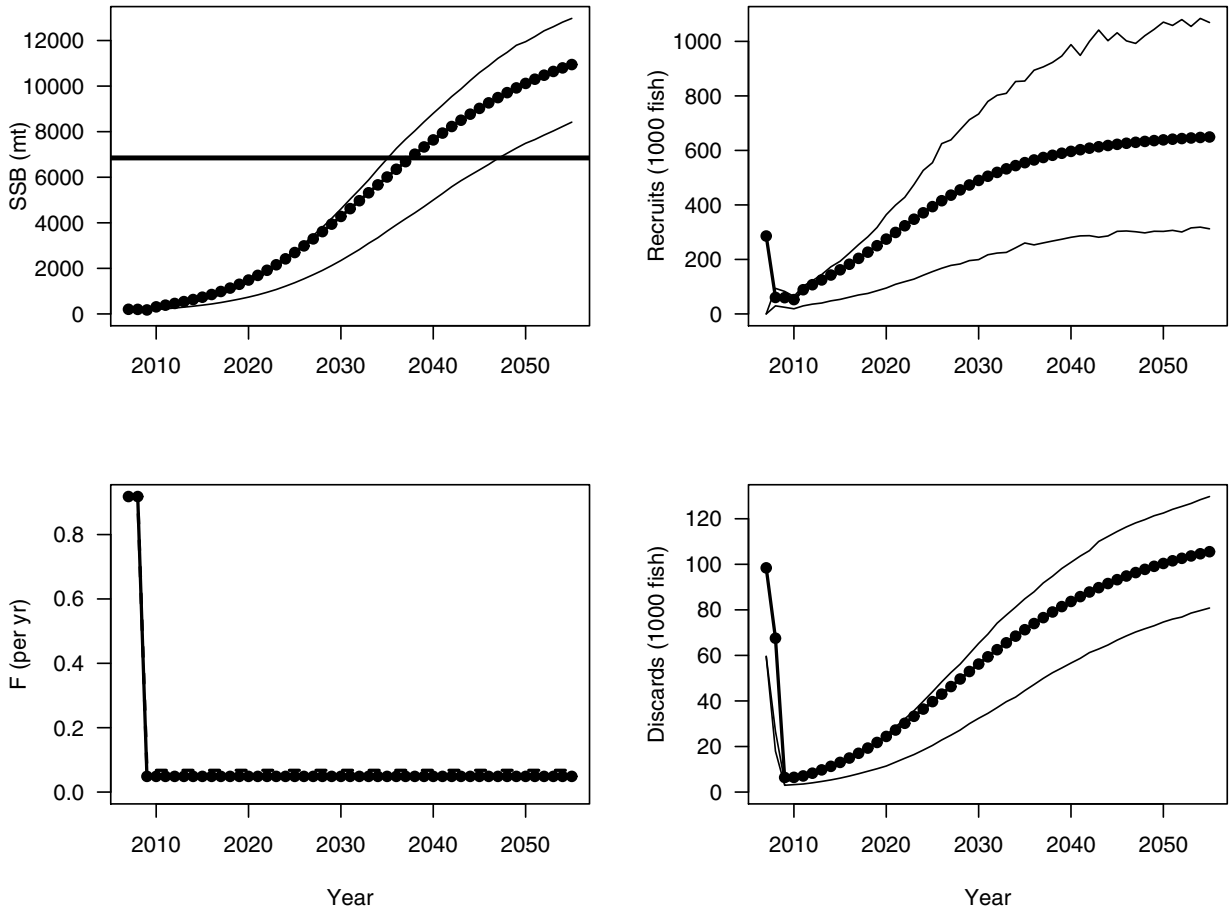


Figure 1.52. Red snapper: Projection results under scenario R9—Discard-only projection with fishing mortality rate fixed at $F = 75\%F_{40\%}$, and with release mortality rates of 0.9 in the commercial sector and 0.4 in the headboat and general recreational sectors. Expected values represented by dotted solid lines, and uncertainty represented by thin lines corresponding to 10^{th} and 90^{th} percentiles of 1000 replicate projections. Spawning stock biomass (SSB) is at mid-year. In the SSB *panel, solid horizontal line marks* $\text{SSB}_{F_{40\%}}$*, the rebuilding target. In the F panel, the dashed horizontal line marks the fishing rate applied, of which only a portion (dotted solid line) leads to discard mortality.*

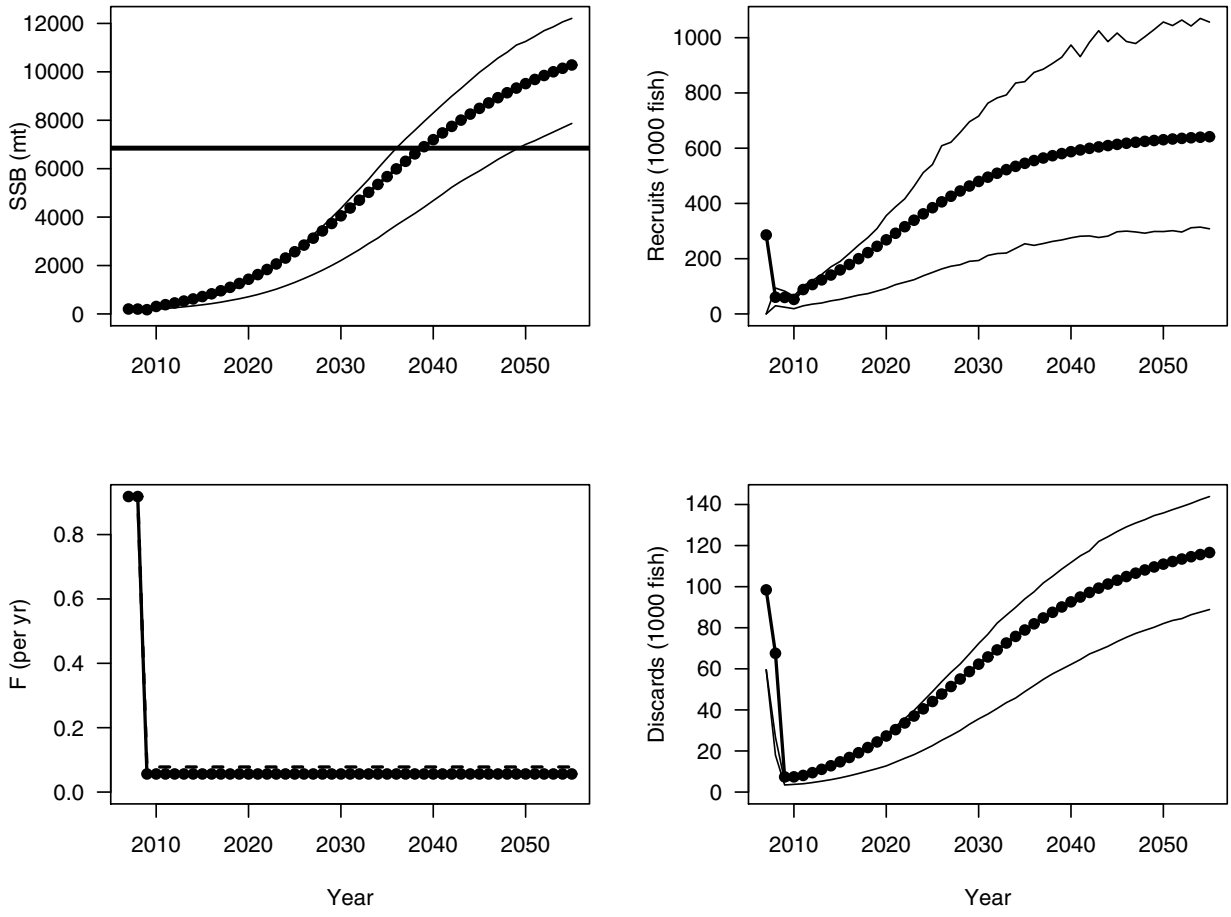
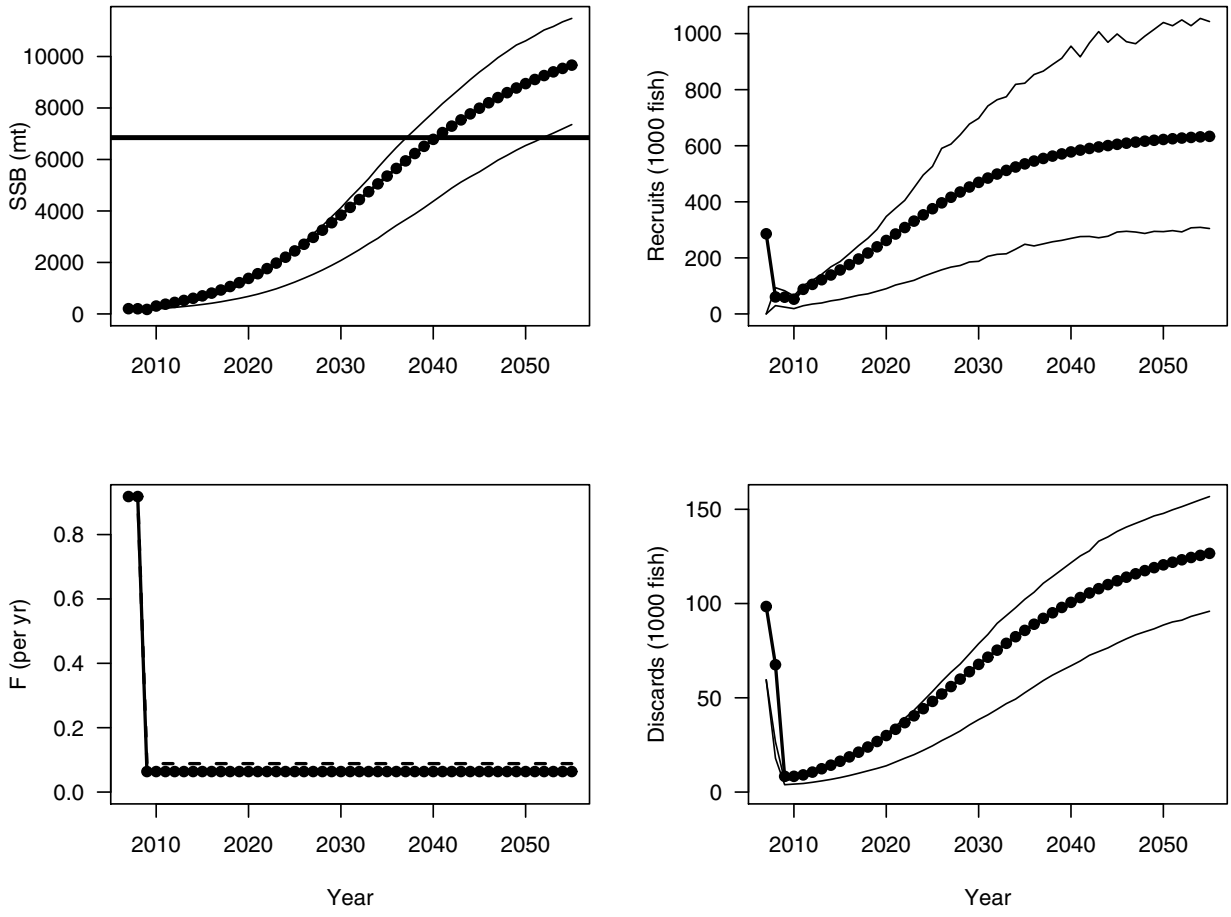


Figure 1.53. Red snapper: Projection results under scenario R10—Discard-only projection with fishing mortality rate fixed at $F = 85\%F_{40\%}$, and with release mortality rates of 0.9 in the commercial sector and 0.4 in the headboat and general recreational sectors. Expected values represented by dotted solid lines, and uncertainty represented by thin lines corresponding to 10^{th} and 90^{th} percentiles of 1000 replicate projections. Spawning stock biomass (SSB) is at mid-year. In the SSB *panel, solid horizontal line marks* $\text{SSB}_{F_{40\%}}$*, the rebuilding target. In the F panel, the dashed horizontal line marks the fishing rate applied, of which only a portion (dotted solid line) leads to discard mortality.*



Appendix A Parameter estimates from AD Model Builder implementation of catch-at-age assessment model

```
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# steep:
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# log_dev_N_rec:
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 0.0945005186071 0.0992925535824 0.00206039952609 0.351802375567 -0.336019242408 -0.696032633046 -0.734372395946
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# selpar_L50_commHAL2:
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# selpar_slope_commHAL3:
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# selpar_L50_commHAL3:
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# selpar_slope_commDV1:
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# selpar_L50_commDV1:
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# selpar_slope2_commDV1:
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# selpar_L502_commDV1:
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# selpar_L50_HB3:
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# selpar_slope_MRFSS3:
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# selpar_L50_MRFSS3:
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# log_q_HB:
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# log_F_dev_commHAL_2:
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# log_F_dev_commDV:
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 0.811687368351 0.931529871498 0.874348378219 1.16925731663 1.18122804200 0.863650862291 1.01726049031
 0.403665484011 -0.364870081353
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# log_F_dev_HB:
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0.415216573592 0.116407250062
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# log_F_dev_MRFSS:
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 -0.583019232799 -0.650446031321 -0.750874885589 -0.889387641294 -1.07386267968 -0.726080686875 -0.433107621276
 -0.156801479478 0.118471254121 0.411049192371 0.505140871659 0.580542631655 0.663188333222 0.765647177093
 0.896411604441 1.06396830492 1.29074013187 1.48928328334 1.59836210033
1.54363855647 0.555426488660 0.554588122376 0.879692131031 1.16983330676 1.15372321037 1.09696204095
0.596345365132 0.687089560507 0.835343981490 0.802372192310 0.574986139233 0.732422689915 0.680345828427
0.0173439208595 0.0775096379101 0.274978650539 0.254908326554 0.689452737265 0.804832165374 0.782249966097
0.704681864492 0.581922198694 0.581073360883 0.560035420655 0.661608329103 0.652241436507
# log_avg_F_commHAL_D:
-2.97766946971
# log_F_dev_commHAL_D:
 -1.40799150290 -1.75393513444 -0.438016834779 0.0475354005347 -0.694119847577 -1.58857016133 0.887738654068
 -1.24217113320 0.116428308146 0.426033672012 1.05579387997 1.14435639249 1.28676017512 1.11763655257
 0.412607871207 -0.0636658858339 -0.160840330972 0.168480635658 0.273231321681 0.220979040550 0.120397038286
 0.0294730546582 0.0418588340895
# log_avg_F_HB_D:
-3.76205178550
# log_F_dev_HB_D:
 -1.34427300878 -1.15664037253 -0.622937576792 0.306825074975 0.0574146729436 -1.37222653188 0.708786741310
 -0.997642455486 -1.64935214038 0.685274183198 0.733508528824 1.25887062791 0.159497679203 -1.20897113992
 0.161081183140 -0.327045719536 -0.0806251549870 0.810843461433 0.828437051591 0.480988296661 1.09363868581
 0.945466060770 0.529081852536
# log_avg_F_MRFSS_D:
-2.24840044056
# log_F_dev_MRFSS_D:
 -0.274705088622 -0.318487255963 0.251044389592 -0.279523416978 -0.198113186553 -1.03163945821 -1.14209736530
 -1.30654699330 -0.419437899856 0.00621333153448 0.442348823577 0.224773881023 -0.387693966462 -0.926095479756
 -0.0676756530221 0.309334664641 0.592219487605 0.761635177641 0.750368985493 0.813816000570 0.878699170244
 0.776132936240 0.545428915863
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