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 $F = 0$ (previously, recovery was based on SSB of the deterministic projection). These revisions led to an increase in the allowable recovery time from 34 to 48 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 2034 (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 2054. Thus, all remaining projections were run through the year 2054.

Projection scenario R2, in which $F = F_{40\%}$, predicted the stock to begin, but not achieve, recovery by 2054 (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. Abbreviations are F = fishing mortality rate (per year), Pr(recover) = proportion of cases reaching $SSB_{F40\%}$, 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, $SSB_{F40\%}$ = 6847, $R_{F40\%}$ = 586, $MSY_{F40\%}$ = 1949, and $D_{F40\%}$ = 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	191	280	423	423	93
2008	0.918	0	189	57	424	847	65
2009	0	0	165	56	0	847	0
2010	0	0	305	50	0	847	0
2011	0	0	388	87	0	847	0
2012	0	0	474	108	0	847	0
2013	0	0	571	128	0	847	0
2014	0	0	682	149	0	847	0
2015	0	0	811	172	0	847	0
2016	0	0	960	196	0	847	0
2017	0	0	1133	223	0	847	0
2018	0	0	1332	250	0	847	0
2019	0	0	1558	279	0	847	0
2020	0	0	1813	308	0	847	0
2021	0	0	2098	337	0	847	0
2022	0	0	2414	366	0	847	0
2023	0	0	2760	393	0	847	0
2024	0	0	3137	420	0	847	0
2025	0	0	3541	446	0	847	0
2026	0	0	3972	469	0	847	0
2027	0	0.01	4427	491	0	847	0
2028	0	0.02	4902	511	0	847	0
2029	0	0.05	5396	530	0	847	0
2030	0	0.1	5905	547	0	847	0
2031	0	0.17	6425	562	0	847	0
2032	0	0.27	6952	576	0	847	0
2033	0	0.39	7483	588	0	847	0
2034	0	0.54	8016	600	0	847	0
2035	0	0.66	8546	610	0	847	0
2036	0	0.75	9072	619	0	847	0
2037	0	0.85	9590	627	0	847	0
2038	0	0.91	10,100	634	0	847	0
2039	0	0.95	10,599	641	0	847	0
2040	0	0.97	11,085	647	0	847	0
2041	0	0.98	11,557	652	0	847	0
2042	0	0.99	12,015	657	0	847	0
2043	0	1	12,457	662	0	847	0
2044	0	1	12,884	666	0	847	0
2045	0	1	13,294	669	0	847	0
2046	0	1	13,688	673	0	847	0
2047	0	1	14,065	676	0	847	0
2048	0	1	14,427	679	0	847	0
2049	0	1	14,772	681	0	847	0
2050	0	1	15,101	684	0	847	0

*Table 1.15. Red snapper: Projection results under scenario R2—fishing mortality rate fixed at $F = F_{40\%}$. Abbreviations are 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	191	280	423	423	93
2008	0.918	0	189	57	424	847	65
2009	0.104	0	165	56	57	904	4
2010	0.104	0	277	50	78	982	3
2011	0.104	0	331	80	94	1076	3
2012	0.104	0	381	94	108	1184	4
2013	0.104	0	434	106	122	1305	5
2014	0.104	0	491	119	137	1443	6
2015	0.104	0	554	132	155	1598	7
2016	0.104	0	623	145	174	1772	7
2017	0.104	0	700	160	195	1967	8
2018	0.104	0	785	176	219	2186	9
2019	0.104	0	878	192	246	2432	10
2020	0.104	0	979	208	274	2706	11
2021	0.104	0	1089	226	305	3011	12
2022	0.104	0	1207	243	338	3350	13
2023	0.104	0	1333	261	374	3724	14
2024	0.104	0	1467	279	412	4135	15
2025	0.104	0	1608	296	452	4587	16
2026	0.104	0	1757	314	494	5082	17
2027	0.104	0	1912	331	538	5620	18
2028	0.104	0	2073	347	584	6203	19
2029	0.104	0	2239	363	631	6834	20
2030	0.104	0	2409	378	679	7513	20
2031	0.104	0	2582	393	728	8242	21
2032	0.104	0	2757	407	778	9020	22
2033	0.104	0	2933	420	829	9849	23
2034	0.104	0	3110	432	879	10,728	24
2035	0.104	0	3286	444	929	11,657	24
2036	0.104	0	3460	455	979	12,636	25
2037	0.104	0	3632	465	1028	13,664	26
2038	0.104	0	3800	474	1076	14,740	26
2039	0.104	0	3965	483	1123	15,863	27
2040	0.104	0.01	4125	491	1169	17,032	27
2041	0.104	0.01	4281	498	1213	18,245	28
2042	0.104	0.01	4431	505	1256	19,501	28
2043	0.104	0.02	4576	512	1298	20,799	28
2044	0.104	0.02	4715	518	1337	22,136	29
2045	0.104	0.03	4848	523	1375	23,512	29
2046	0.104	0.04	4975	528	1412	24,923	29
2047	0.104	0.05	5096	533	1446	26,370	30
2048	0.104	0.06	5211	537	1479	27,849	30
2049	0.104	0.07	5319	541	1510	29,359	30
2050	0.104	0.08	5422	544	1539	30,898	30
2051	0.104	0.09	5519	548	1567	32,465	31
2052	0.104	0.1	5611	551	1593	34,059	31
2053	0.104	0.12	5697	553	1618	35,676	31
2054	0.104	0.14	5777	556	1641	37,317	31

*Table 1.16. Red snapper: Projection results under scenario R3—fishing mortality rate fixed at F = 65%$F_{40\%}$. Abbreviations are 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	191	280	423	423	93
2008	0.918	0	189	57	424	847	65
2009	0.068	0	165	56	37	885	3
2010	0.068	0	286	50	53	937	2
2011	0.068	0	350	82	64	1002	2
2012	0.068	0	411	99	76	1077	3
2013	0.068	0	477	113	87	1164	4
2014	0.068	0	550	129	100	1265	4
2015	0.068	0	632	145	115	1380	5
2016	0.068	0	725	162	132	1511	5
2017	0.068	0	829	180	150	1662	6
2018	0.068	0	945	200	172	1834	7
2019	0.068	0	1074	220	195	2029	7
2020	0.068	0	1216	241	222	2251	8
2021	0.068	0	1371	262	250	2501	9
2022	0.068	0	1540	284	281	2782	10
2023	0.068	0	1723	306	315	3097	11
2024	0.068	0	1918	327	351	3448	11
2025	0.068	0	2126	348	389	3837	12
2026	0.068	0	2346	368	430	4267	13
2027	0.068	0	2575	388	472	4740	14
2028	0.068	0	2814	406	517	5256	14
2029	0.068	0	3061	424	562	5819	15
2030	0.068	0	3314	441	609	6428	16
2031	0.068	0	3572	456	657	7085	16
2032	0.068	0	3833	471	706	7791	17
2033	0.068	0.01	4095	484	754	8545	18
2034	0.068	0.01	4357	497	803	9348	18
2035	0.068	0.02	4617	509	851	10,199	19
2036	0.068	0.03	4875	519	899	11,098	19
2037	0.068	0.05	5128	529	946	12,044	19
2038	0.068	0.07	5375	538	992	13,036	20
2039	0.068	0.1	5617	546	1037	14,073	20
2040	0.068	0.14	5851	554	1081	15,154	20
2041	0.068	0.18	6077	561	1123	16,276	21
2042	0.068	0.23	6296	567	1163	17,440	21
2043	0.068	0.28	6505	573	1202	18,642	21
2044	0.068	0.33	6706	578	1239	19,881	21
2045	0.068	0.4	6898	583	1275	21,156	22
2046	0.068	0.45	7080	587	1309	22,465	22
2047	0.068	0.49	7253	591	1341	23,807	22
2048	0.068	0.54	7418	595	1372	25,178	22
2049	0.068	0.57	7573	598	1401	26,579	22
2050	0.068	0.62	7720	601	1428	28,007	22
2051	0.068	0.66	7859	604	1454	29,461	22
2052	0.068	0.7	7989	607	1478	30,939	23
2053	0.068	0.75	8111	609	1501	32,440	23
2054	0.068	0.78	8226	611	1522	33,962	23

*Table 1.17. Red snapper: Projection results under scenario R4—fishing mortality rate fixed at $F = 75\%F_{40\%}$. Abbreviations are 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	191	280	423	423	93
2008	0.918	0	189	57	424	847	65
2009	0.078	0	165	56	43	890	3
2010	0.078	0	284	50	60	950	2
2011	0.078	0	344	82	73	1023	3
2012	0.078	0	403	97	85	1109	3
2013	0.078	0	464	111	98	1207	4
2014	0.078	0	533	126	112	1319	5
2015	0.078	0	609	141	128	1446	5
2016	0.078	0	694	157	145	1592	6
2017	0.078	0	790	174	165	1757	7
2018	0.078	0	896	193	188	1945	7
2019	0.078	0	1014	212	213	2158	8
2020	0.078	0	1143	231	240	2398	9
2021	0.078	0	1284	252	270	2669	10
2022	0.078	0	1437	272	303	2971	11
2023	0.078	0	1601	293	338	3309	12
2024	0.078	0	1777	313	375	3684	13
2025	0.078	0	1964	333	415	4098	13
2026	0.078	0	2161	352	457	4555	14
2027	0.078	0	2366	371	500	5055	15
2028	0.078	0	2580	389	546	5601	16
2029	0.078	0	2801	407	593	6195	17
2030	0.078	0	3028	423	642	6836	17
2031	0.078	0	3258	439	691	7527	18
2032	0.078	0	3491	453	741	8268	19
2033	0.078	0	3726	467	791	9060	19
2034	0.078	0.01	3960	479	841	9901	20
2035	0.078	0.01	4193	491	891	10,792	20
2036	0.078	0.02	4424	501	941	11,733	21
2037	0.078	0.02	4651	511	989	12,722	21
2038	0.078	0.03	4873	520	1037	13,759	22
2039	0.078	0.05	5089	529	1083	14,843	22
2040	0.078	0.06	5300	537	1128	15,971	23
2041	0.078	0.1	5503	544	1172	17,143	23
2042	0.078	0.12	5699	550	1214	18,357	23
2043	0.078	0.15	5888	556	1255	19,612	24
2044	0.078	0.19	6068	562	1293	20,905	24
2045	0.078	0.22	6240	567	1330	22,235	24
2046	0.078	0.27	6404	571	1365	23,601	24
2047	0.078	0.32	6560	575	1399	25,000	24
2048	0.078	0.37	6708	579	1431	26,430	25
2049	0.078	0.41	6848	583	1461	27,891	25
2050	0.078	0.44	6980	586	1489	29,380	25
2051	0.078	0.48	7105	589	1516	30,895	25
2052	0.078	0.51	7222	592	1541	32,436	25
2053	0.078	0.55	7332	594	1564	34,000	25
2054	0.078	0.58	7435	596	1586	35,587	25

*Table 1.18. Red snapper: Projection results under scenario R5—fishing mortality rate fixed at F = 85%$F_{40\%}$. Abbreviations are 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	191	280	423	423	93
2008	0.918	0	189	57	424	847	65
2009	0.088	0	165	56	49	896	4
2010	0.088	0	281	50	67	963	3
2011	0.088	0	339	81	82	1045	3
2012	0.088	0	394	96	95	1139	4
2013	0.088	0	452	109	108	1247	5
2014	0.088	0	515	123	123	1370	5
2015	0.088	0	586	137	139	1509	6
2016	0.088	0	665	152	158	1667	7
2017	0.088	0	753	169	179	1846	7
2018	0.088	0	850	186	202	2048	8
2019	0.088	0	957	204	228	2276	9
2020	0.088	0	1075	222	256	2531	10
2021	0.088	0	1202	241	287	2818	11
2022	0.088	0	1340	260	320	3138	12
2023	0.088	0	1488	280	355	3493	13
2024	0.088	0	1646	299	393	3886	14
2025	0.088	0	1813	318	434	4320	14
2026	0.088	0	1990	337	476	4796	15
2027	0.088	0	2174	355	521	5316	16
2028	0.088	0	2365	373	567	5883	17
2029	0.088	0	2562	389	614	6498	18
2030	0.088	0	2764	405	663	7161	19
2031	0.088	0	2970	420	713	7874	20
2032	0.088	0	3178	435	764	8638	20
2033	0.088	0	3388	448	815	9453	21
2034	0.088	0	3597	461	865	10,318	22
2035	0.088	0	3806	472	916	11,234	22
2036	0.088	0.01	4012	483	966	12,200	23
2037	0.088	0.01	4215	493	1015	13,216	23
2038	0.088	0.02	4414	502	1064	14,280	24
2039	0.088	0.02	4609	511	1111	15,391	24
2040	0.088	0.03	4797	519	1157	16,547	25
2041	0.088	0.03	4980	526	1201	17,749	25
2042	0.088	0.06	5156	533	1244	18,993	25
2043	0.088	0.07	5326	539	1285	20,278	26
2044	0.088	0.09	5488	545	1325	21,603	26
2045	0.088	0.12	5644	550	1362	22,965	26
2046	0.088	0.15	5792	554	1398	24,364	26
2047	0.088	0.17	5932	559	1433	25,796	27
2048	0.088	0.2	6066	563	1465	27,261	27
2049	0.088	0.23	6192	566	1496	28,757	27
2050	0.088	0.26	6311	570	1525	30,281	27
2051	0.088	0.29	6423	573	1552	31,833	27
2052	0.088	0.31	6529	576	1578	33,411	28
2053	0.088	0.34	6629	578	1602	35,013	28
2054	0.088	0.37	6722	581	1625	36,638	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. Abbreviations are 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	191	280	423	93	140
2008	0.918	0.918	0	194	311	426	100	149
2009	0.903	0.651	0	202	313	0	159	418
2010	0.903	0.651	0	279	320	0	175	504
2011	0.903	0.651	0	331	378	0	194	581
2012	0.903	0.651	0	382	408	0	217	667
2013	0.903	0.651	0	434	433	0	238	754
2014	0.903	0.651	0	485	454	0	256	836
2015	0.903	0.651	0	534	472	0	271	913
2016	0.903	0.651	0	580	487	0	285	984
2017	0.903	0.651	0	621	500	0	297	1048
2018	0.903	0.651	0	659	510	0	307	1106
2019	0.903	0.651	0	692	518	0	315	1157
2020	0.903	0.651	0	721	525	0	323	1201
2021	0.903	0.651	0	745	531	0	329	1239
2022	0.903	0.651	0	767	536	0	333	1271
2023	0.903	0.651	0	785	539	0	338	1298
2024	0.903	0.651	0	800	542	0	341	1321
2025	0.903	0.651	0	813	545	0	344	1341
2026	0.903	0.651	0	824	547	0	346	1357
2027	0.903	0.651	0	833	549	0	348	1370
2028	0.903	0.651	0	840	550	0	349	1382
2029	0.903	0.651	0	846	551	0	351	1391
2030	0.903	0.651	0	851	552	0	352	1398
2031	0.903	0.651	0	855	553	0	353	1405
2032	0.903	0.651	0	859	553	0	353	1410
2033	0.903	0.651	0	862	554	0	354	1414
2034	0.903	0.651	0	864	554	0	354	1417
2035	0.903	0.651	0	866	555	0	355	1420
2036	0.903	0.651	0	867	555	0	355	1422
2037	0.903	0.651	0	869	555	0	355	1424
2038	0.903	0.651	0	870	555	0	355	1426
2039	0.903	0.651	0	871	555	0	356	1427
2040	0.903	0.651	0	871	555	0	356	1428
2041	0.903	0.651	0	872	556	0	356	1429
2042	0.903	0.651	0	872	556	0	356	1430
2043	0.903	0.651	0	873	556	0	356	1430
2044	0.903	0.651	0	873	556	0	356	1431
2045	0.903	0.651	0	873	556	0	356	1431
2046	0.903	0.651	0	873	556	0	356	1432
2047	0.903	0.651	0	874	556	0	356	1432
2048	0.903	0.651	0	874	556	0	356	1432
2049	0.903	0.651	0	874	556	0	356	1432
2050	0.903	0.651	0	874	556	0	356	1432
2051	0.903	0.651	0	874	556	0	356	1432
2052	0.903	0.651	0	874	556	0	356	1432
2053	0.903	0.651	0	874	556	0	356	1433
2054	0.903	0.651	0	874	556	0	356	1433

*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. Abbreviations are 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	191	280	423	93	140
2008	0.918	0.918	0	194	311	426	100	149
2009	0.104	0.075	0	202	313	0	21	56
2010	0.104	0.075	0	437	320	0	28	89
2011	0.104	0.075	0	667	455	0	36	128
2012	0.104	0.075	0	957	520	0	47	180
2013	0.104	0.075	0	1316	567	0	57	244
2014	0.104	0.075	0	1738	601	0	67	316
2015	0.104	0.075	0	2211	625	0	77	395
2016	0.104	0.075	0	2722	642	0	85	480
2017	0.104	0.075	0	3255	654	0	93	568
2018	0.104	0.075	0.01	3799	663	0	101	657
2019	0.104	0.075	0.02	4341	670	0	107	746
2020	0.104	0.075	0.05	4872	675	0	113	833
2021	0.104	0.075	0.12	5385	679	0	118	917
2022	0.104	0.075	0.23	5874	683	0	123	997
2023	0.104	0.075	0.35	6336	685	0	128	1072
2024	0.104	0.075	0.49	6770	687	0	132	1143
2025	0.104	0.075	0.61	7174	689	0	135	1208
2026	0.104	0.075	0.68	7548	690	0	138	1269
2027	0.104	0.075	0.77	7892	691	0	141	1325
2028	0.104	0.075	0.85	8208	692	0	144	1377
2029	0.104	0.075	0.9	8498	693	0	146	1424
2030	0.104	0.075	0.93	8762	694	0	149	1467
2031	0.104	0.075	0.95	9002	694	0	150	1506
2032	0.104	0.075	0.97	9220	695	0	152	1542
2033	0.104	0.075	0.98	9417	695	0	154	1574
2034	0.104	0.075	0.99	9596	696	0	155	1603
2035	0.104	0.075	0.99	9758	696	0	156	1629
2036	0.104	0.075	1	9905	696	0	158	1653
2037	0.104	0.075	1	10,037	697	0	159	1675
2038	0.104	0.075	1	10,156	697	0	160	1694
2039	0.104	0.075	1	10,264	697	0	160	1711
2040	0.104	0.075	1	10,361	697	0	161	1727
2041	0.104	0.075	1	10,449	697	0	162	1742
2042	0.104	0.075	1	10,528	698	0	163	1754
2043	0.104	0.075	1	10,599	698	0	163	1766
2044	0.104	0.075	1	10,663	698	0	164	1776
2045	0.104	0.075	1	10,721	698	0	164	1786
2046	0.104	0.075	1	10,773	698	0	164	1794
2047	0.104	0.075	1	10,820	698	0	165	1802
2048	0.104	0.075	1	10,863	698	0	165	1809
2049	0.104	0.075	1	10,901	698	0	165	1815
2050	0.104	0.075	1	10,935	698	0	166	1821
2051	0.104	0.075	1	10,966	698	0	166	1826
2052	0.104	0.075	1	10,994	698	0	166	1830
2053	0.104	0.075	1	11,019	698	0	166	1834
2054	0.104	0.075	1	11,042	698	0	166	1838

*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. Abbreviations are 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	191	280	423	93	140
2008	0.918	0.918	0	194	311	426	100	149
2009	0.068	0.049	0	202	313	0	14	37
2010	0.068	0.049	0	446	320	0	19	59
2011	0.068	0.049	0	689	459	0	24	86
2012	0.068	0.049	0	999	525	0	31	122
2013	0.068	0.049	0	1386	572	0	39	167
2014	0.068	0.049	0	1845	606	0	46	217
2015	0.068	0.049	0	2365	629	0	52	274
2016	0.068	0.049	0	2931	646	0	58	335
2017	0.068	0.049	0	3528	658	0	64	399
2018	0.068	0.049	0.02	4142	667	0	69	464
2019	0.068	0.049	0.06	4759	674	0	74	530
2020	0.068	0.049	0.13	5370	679	0	78	595
2021	0.068	0.049	0.26	5965	683	0	82	658
2022	0.068	0.049	0.41	6538	686	0	86	719
2023	0.068	0.049	0.57	7085	688	0	89	777
2024	0.068	0.049	0.7	7604	690	0	92	831
2025	0.068	0.049	0.8	8091	692	0	95	883
2026	0.068	0.049	0.88	8547	693	0	97	931
2027	0.068	0.049	0.94	8972	694	0	100	976
2028	0.068	0.049	0.97	9366	695	0	102	1018
2029	0.068	0.049	0.98	9731	696	0	104	1056
2030	0.068	0.049	0.99	10,067	696	0	105	1092
2031	0.068	0.049	1	10,376	697	0	107	1125
2032	0.068	0.049	1	10,659	697	0	108	1155
2033	0.068	0.049	1	10,919	698	0	110	1182
2034	0.068	0.049	1	11,157	698	0	111	1207
2035	0.068	0.049	1	11,375	699	0	112	1230
2036	0.068	0.049	1	11,574	699	0	113	1251
2037	0.068	0.049	1	11,756	699	0	114	1271
2038	0.068	0.049	1	11,922	699	0	115	1288
2039	0.068	0.049	1	12,073	700	0	116	1304
2040	0.068	0.049	1	12,211	700	0	116	1319
2041	0.068	0.049	1	12,337	700	0	117	1332
2042	0.068	0.049	1	12,452	700	0	117	1344
2043	0.068	0.049	1	12,557	700	0	118	1355
2044	0.068	0.049	1	12,653	700	0	118	1365
2045	0.068	0.049	1	12,740	700	0	119	1375
2046	0.068	0.049	1	12,819	700	0	119	1383
2047	0.068	0.049	1	12,892	701	0	120	1391
2048	0.068	0.049	1	12,958	701	0	120	1398
2049	0.068	0.049	1	13,018	701	0	120	1404
2050	0.068	0.049	1	13,073	701	0	121	1410
2051	0.068	0.049	1	13,123	701	0	121	1415
2052	0.068	0.049	1	13,168	701	0	121	1420
2053	0.068	0.049	1	13,209	701	0	121	1424
2054	0.068	0.049	1	13,247	701	0	121	1428

*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. Abbreviations are 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	191	280	423	93	140
2008	0.918	0.918	0	194	311	426	100	149
2009	0.078	0.056	0	202	313	0	16	42
2010	0.078	0.056	0	444	320	0	21	67
2011	0.078	0.056	0	683	458	0	28	98
2012	0.078	0.056	0	987	524	0	36	139
2013	0.078	0.056	0	1366	570	0	44	189
2014	0.078	0.056	0	1814	604	0	52	247
2015	0.078	0.056	0	2320	628	0	59	310
2016	0.078	0.056	0	2870	645	0	66	379
2017	0.078	0.056	0	3448	657	0	73	450
2018	0.078	0.056	0.01	4041	666	0	78	523
2019	0.078	0.056	0.04	4635	673	0	84	596
2020	0.078	0.056	0.1	5222	678	0	89	668
2021	0.078	0.056	0.22	5792	682	0	93	738
2022	0.078	0.056	0.35	6340	685	0	97	805
2023	0.078	0.056	0.5	6861	687	0	101	869
2024	0.078	0.056	0.65	7354	689	0	104	929
2025	0.078	0.056	0.75	7816	691	0	107	985
2026	0.078	0.056	0.83	8247	692	0	110	1038
2027	0.078	0.056	0.91	8647	693	0	112	1087
2028	0.078	0.056	0.94	9017	694	0	115	1132
2029	0.078	0.056	0.97	9358	695	0	117	1173
2030	0.078	0.056	0.98	9671	696	0	119	1212
2031	0.078	0.056	0.99	9958	696	0	120	1247
2032	0.078	0.056	0.99	10,221	697	0	122	1279
2033	0.078	0.056	1	10,462	697	0	123	1308
2034	0.078	0.056	1	10,681	698	0	125	1335
2035	0.078	0.056	1	10,881	698	0	126	1359
2036	0.078	0.056	1	11,063	698	0	127	1381
2037	0.078	0.056	1	11,229	698	0	128	1402
2038	0.078	0.056	1	11,380	699	0	129	1420
2039	0.078	0.056	1	11,517	699	0	129	1437
2040	0.078	0.056	1	11,642	699	0	130	1452
2041	0.078	0.056	1	11,756	699	0	131	1466
2042	0.078	0.056	1	11,859	699	0	131	1479
2043	0.078	0.056	1	11,953	699	0	132	1490
2044	0.078	0.056	1	12,038	700	0	132	1500
2045	0.078	0.056	1	12,115	700	0	133	1510
2046	0.078	0.056	1	12,186	700	0	133	1518
2047	0.078	0.056	1	12,250	700	0	134	1526
2048	0.078	0.056	1	12,308	700	0	134	1533
2049	0.078	0.056	1	12,360	700	0	134	1540
2050	0.078	0.056	1	12,408	700	0	135	1546
2051	0.078	0.056	1	12,452	700	0	135	1551
2052	0.078	0.056	1	12,491	700	0	135	1556
2053	0.078	0.056	1	12,527	700	0	135	1560
2054	0.078	0.056	1	12,560	700	0	135	1564

*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. Abbreviations are 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	191	280	423	93	140
2008	0.918	0.918	0	194	311	426	100	149
2009	0.088	0.064	0	202	313	0	18	48
2010	0.088	0.064	0	441	320	0	24	76
2011	0.088	0.064	0	677	457	0	31	111
2012	0.088	0.064	0	975	522	0	40	156
2013	0.088	0.064	0	1345	569	0	49	212
2014	0.088	0.064	0	1783	603	0	58	275
2015	0.088	0.064	0	2276	627	0	66	345
2016	0.088	0.064	0	2809	644	0	74	421
2017	0.088	0.064	0	3369	656	0	81	499
2018	0.088	0.064	0.01	3942	665	0	87	579
2019	0.088	0.064	0.03	4515	672	0	93	659
2020	0.088	0.064	0.08	5079	677	0	99	737
2021	0.088	0.064	0.17	5625	681	0	103	813
2022	0.088	0.064	0.29	6149	684	0	108	885
2023	0.088	0.064	0.44	6646	686	0	112	954
2024	0.088	0.064	0.58	7114	688	0	115	1019
2025	0.088	0.064	0.69	7551	690	0	119	1080
2026	0.088	0.064	0.78	7958	691	0	122	1136
2027	0.088	0.064	0.86	8335	692	0	124	1188
2028	0.088	0.064	0.92	8682	693	0	127	1236
2029	0.088	0.064	0.95	9002	694	0	129	1280
2030	0.088	0.064	0.97	9294	695	0	131	1321
2031	0.088	0.064	0.98	9562	696	0	133	1358
2032	0.088	0.064	0.99	9805	696	0	134	1392
2033	0.088	0.064	0.99	10,028	696	0	136	1422
2034	0.088	0.064	0.99	10,230	697	0	137	1450
2035	0.088	0.064	1	10,413	697	0	139	1476
2036	0.088	0.064	1	10,580	697	0	140	1499
2037	0.088	0.064	1	10,732	698	0	141	1520
2038	0.088	0.064	1	10,869	698	0	142	1539
2039	0.088	0.064	1	10,994	698	0	142	1556
2040	0.088	0.064	1	11,106	698	0	143	1571
2041	0.088	0.064	1	11,209	698	0	144	1586
2042	0.088	0.064	1	11,302	699	0	144	1598
2043	0.088	0.064	1	11,386	699	0	145	1610
2044	0.088	0.064	1	11,462	699	0	145	1621
2045	0.088	0.064	1	11,531	699	0	146	1630
2046	0.088	0.064	1	11,593	699	0	146	1639
2047	0.088	0.064	1	11,649	699	0	147	1647
2048	0.088	0.064	1	11,701	699	0	147	1654
2049	0.088	0.064	1	11,747	699	0	147	1660
2050	0.088	0.064	1	11,789	699	0	148	1666
2051	0.088	0.064	1	11,827	699	0	148	1671
2052	0.088	0.064	1	11,861	699	0	148	1676
2053	0.088	0.064	1	11,892	699	0	148	1680
2054	0.088	0.064	1	11,920	699	0	148	1684

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.

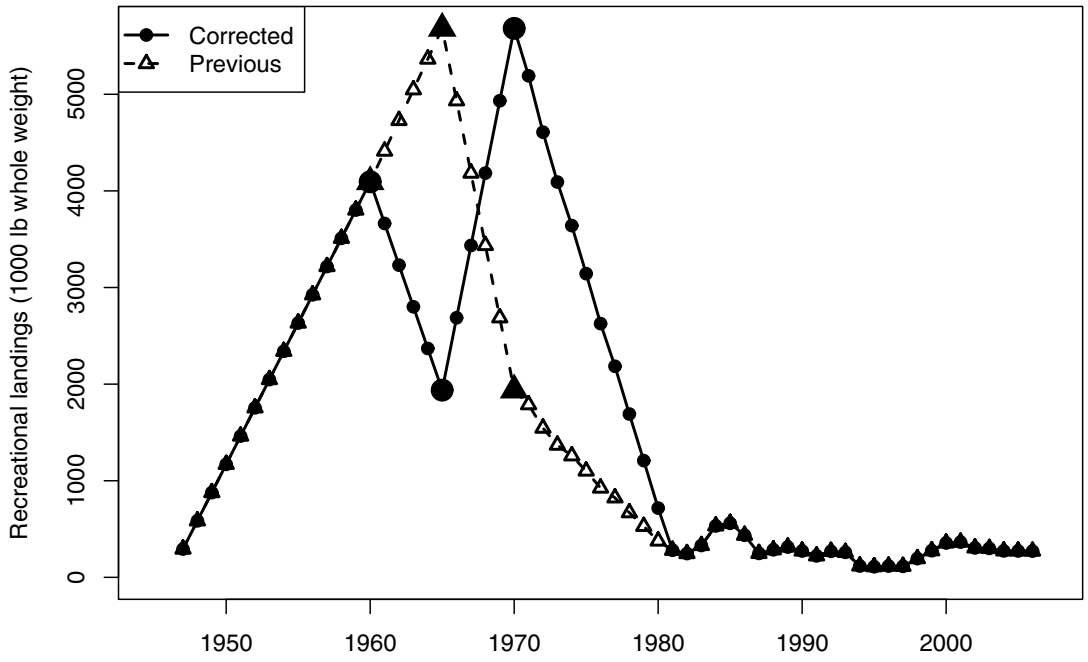


Figure 1.2. Red snapper: Comparison of predicted time series from the base assessment model using the previous and corrected recreational landings from the Salt-Water Angling reports.

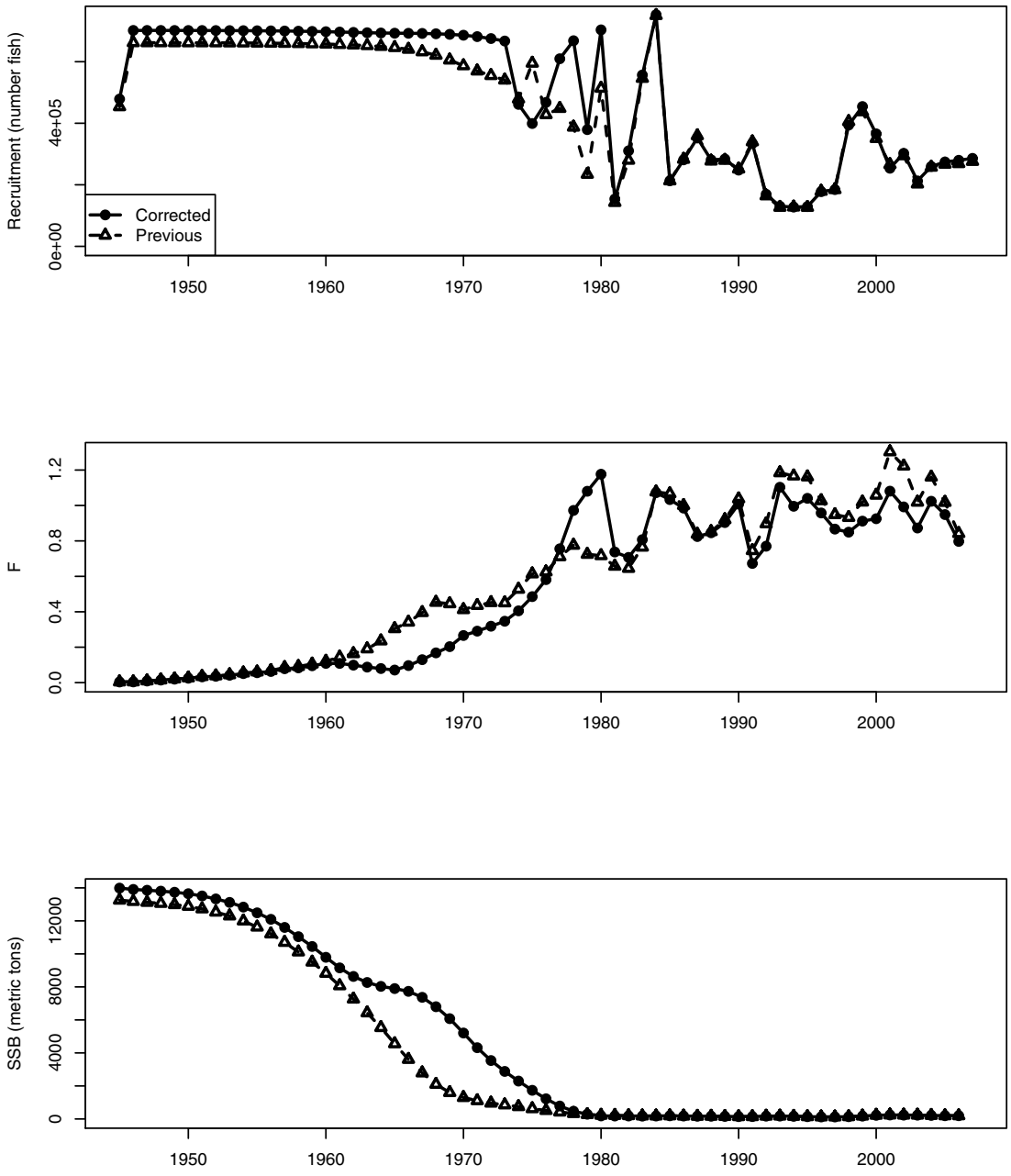


Figure 1.3. Red snapper: Observed (open circles) and estimated (solid line) annual length and age compositions by fishery. In panels indicating the data set, lcomp refers to length compositions, acomp to age compositions, c.hal to commercial handline, c.dv to commercial diving, hb to headboat, and rec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

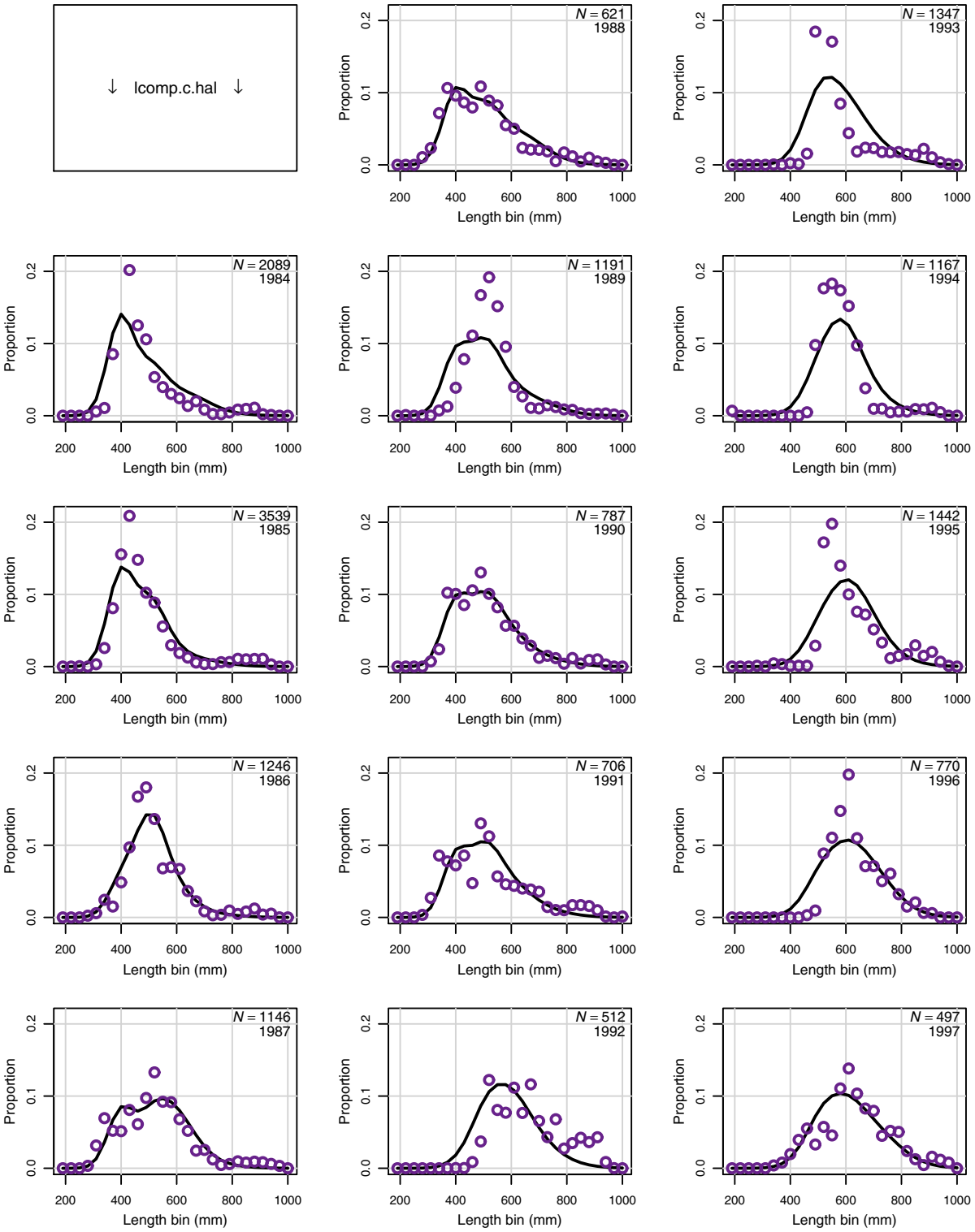


Figure 1.3. (cont.) Red snapper: Observed (open circles) and estimated (solid line) annual length and age compositions by fishery.

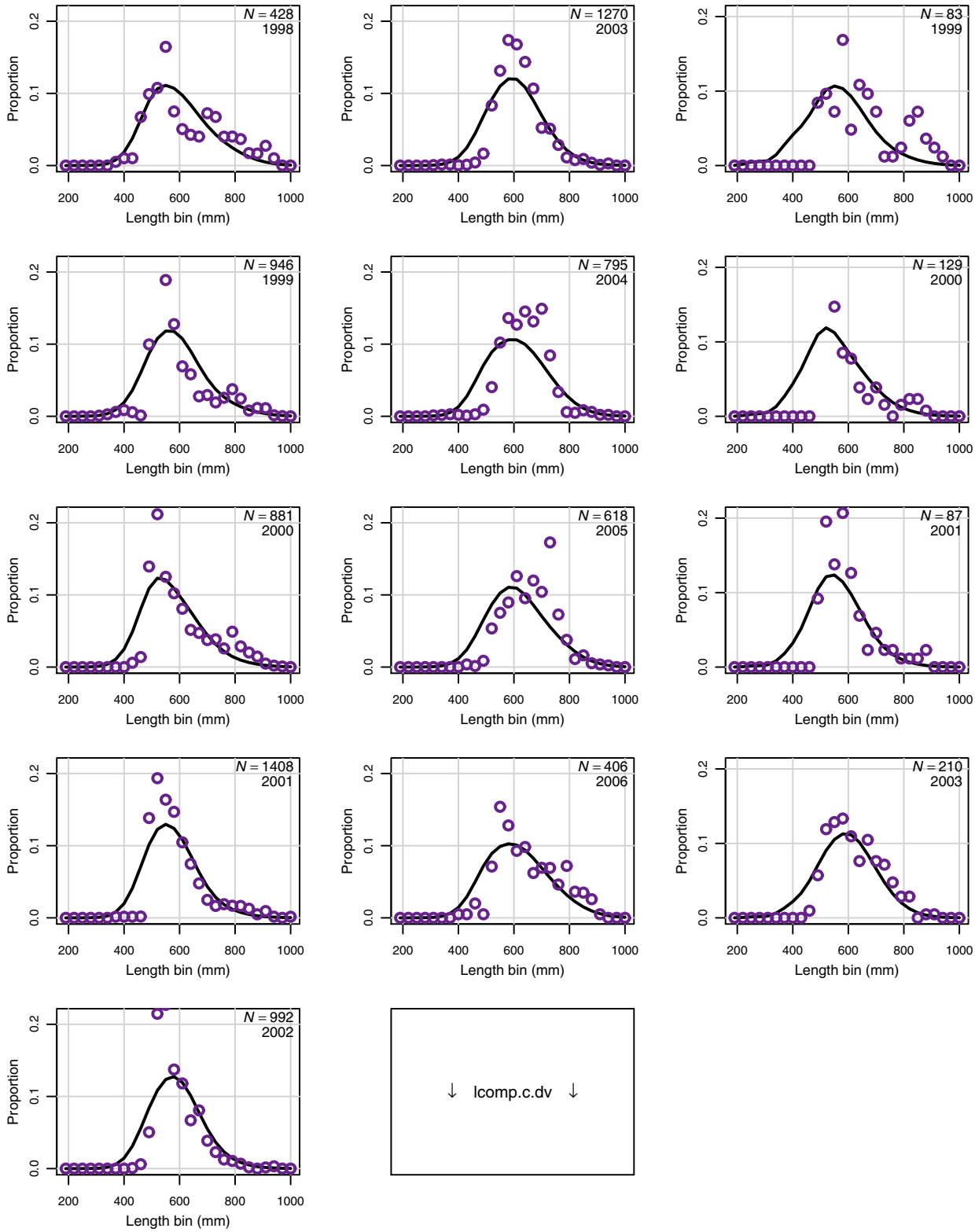


Figure 1.3. (cont.) Red snapper: Observed (open circles) and estimated (solid line) annual length and age compositions by fishery.

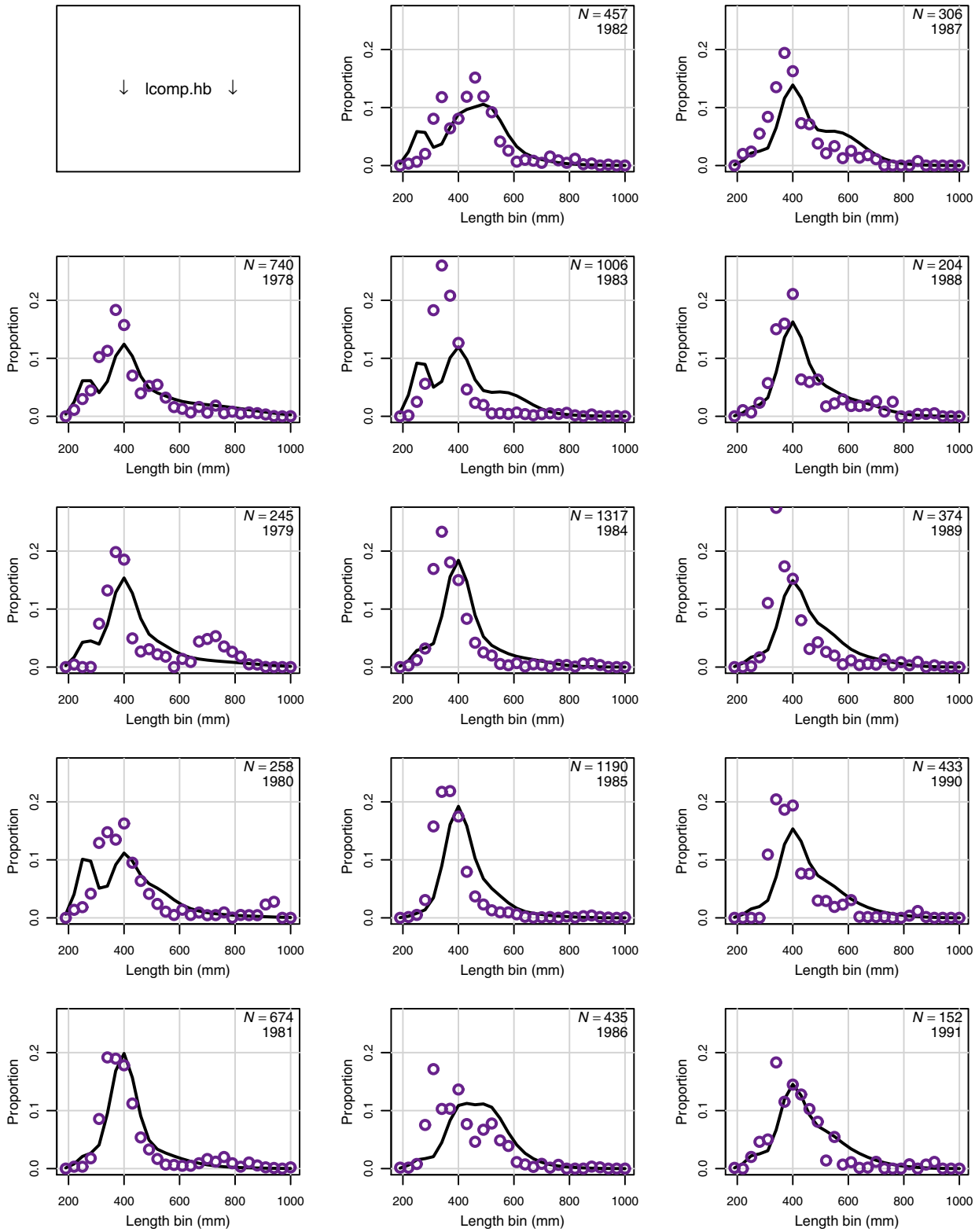


Figure 1.3. (cont.) Red snapper: Observed (open circles) and estimated (solid line) annual length and age compositions by fishery.

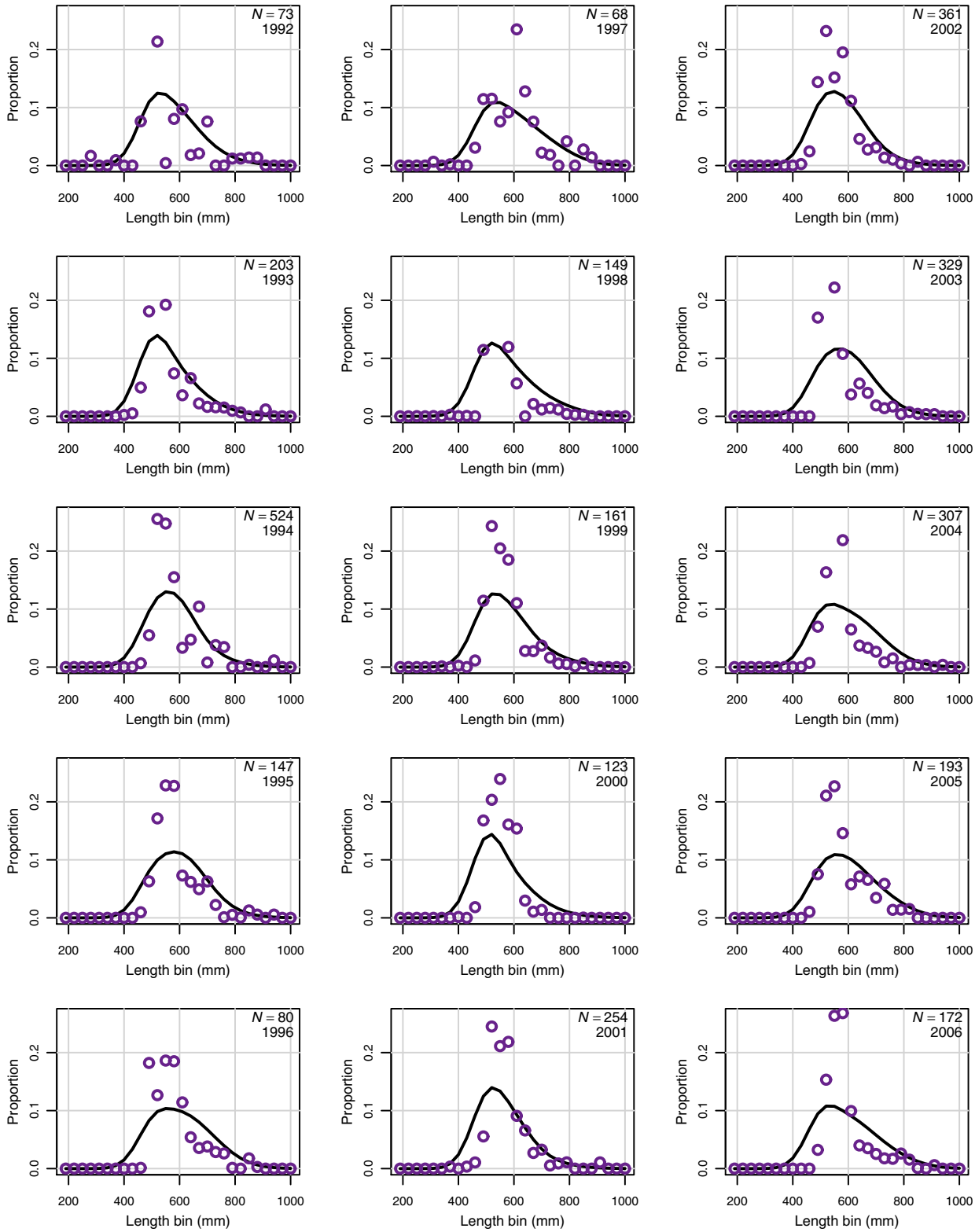


Figure 1.3. (cont.) Red snapper: Observed (open circles) and estimated (solid line) annual length and age compositions by fishery.

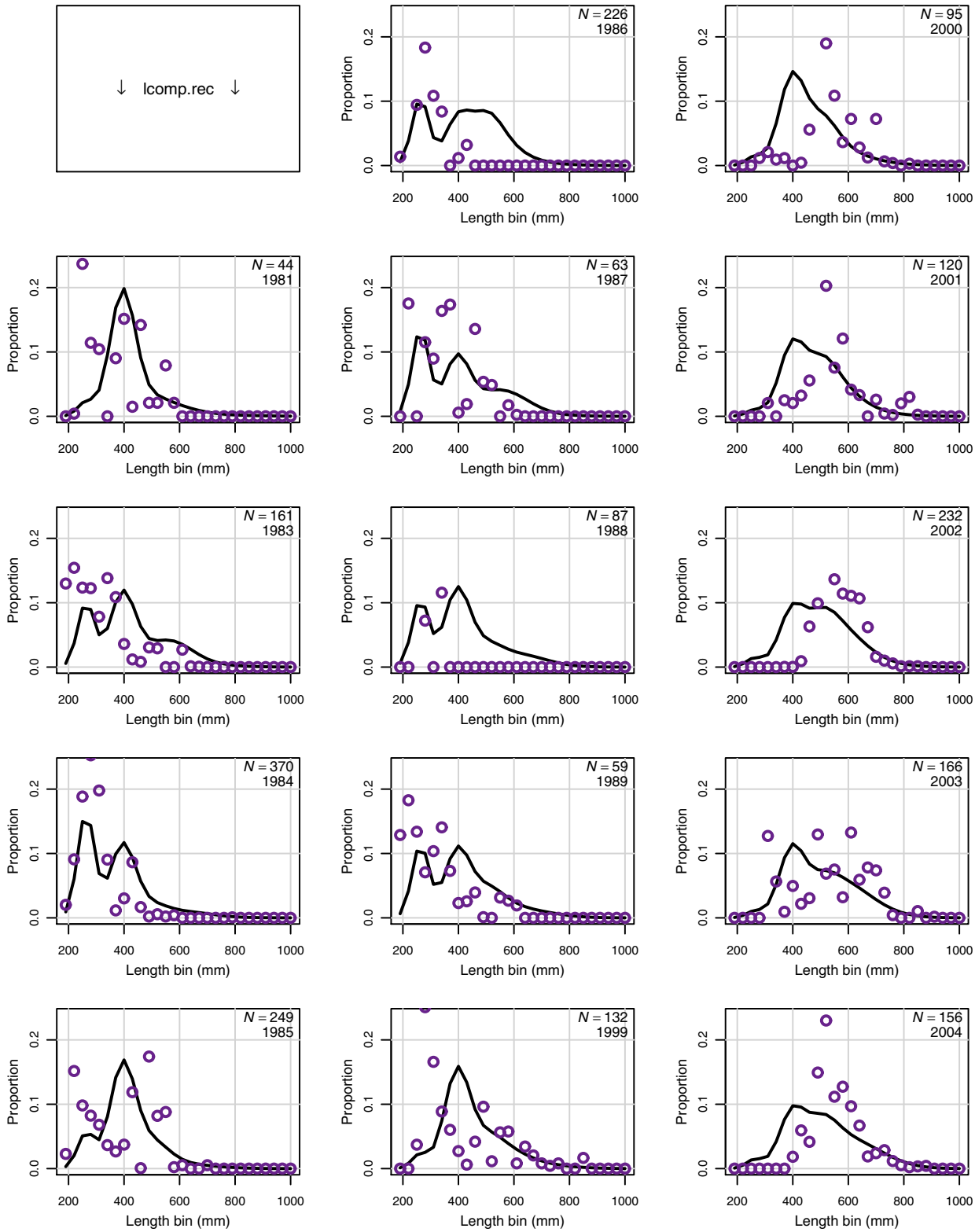


Figure 1.3. (cont.) Red snapper: Observed (open circles) and estimated (solid line) annual length and age compositions by fishery.

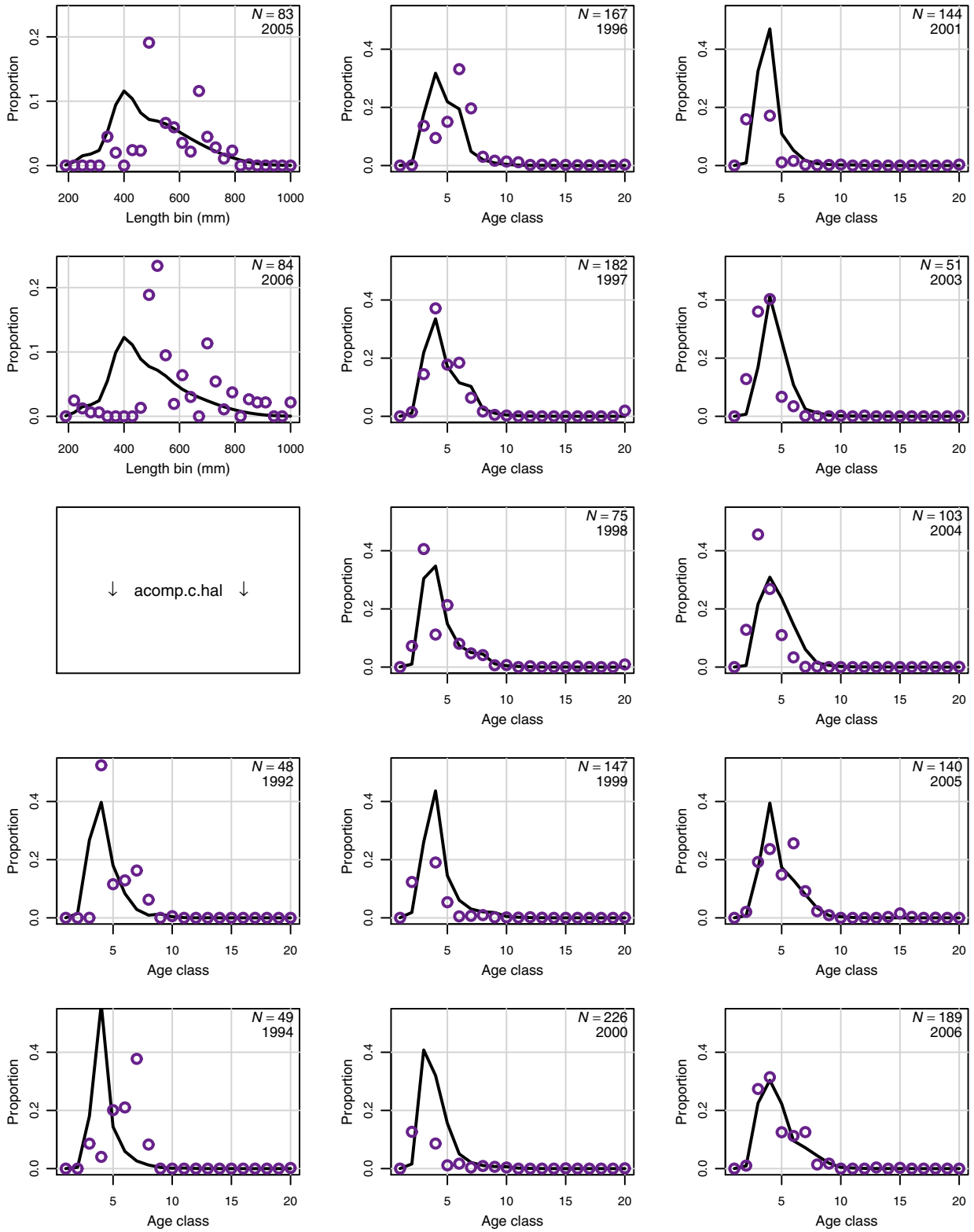


Figure 1.3. (cont.) Red snapper: Observed (open circles) and estimated (solid line) annual length and age compositions by fishery.

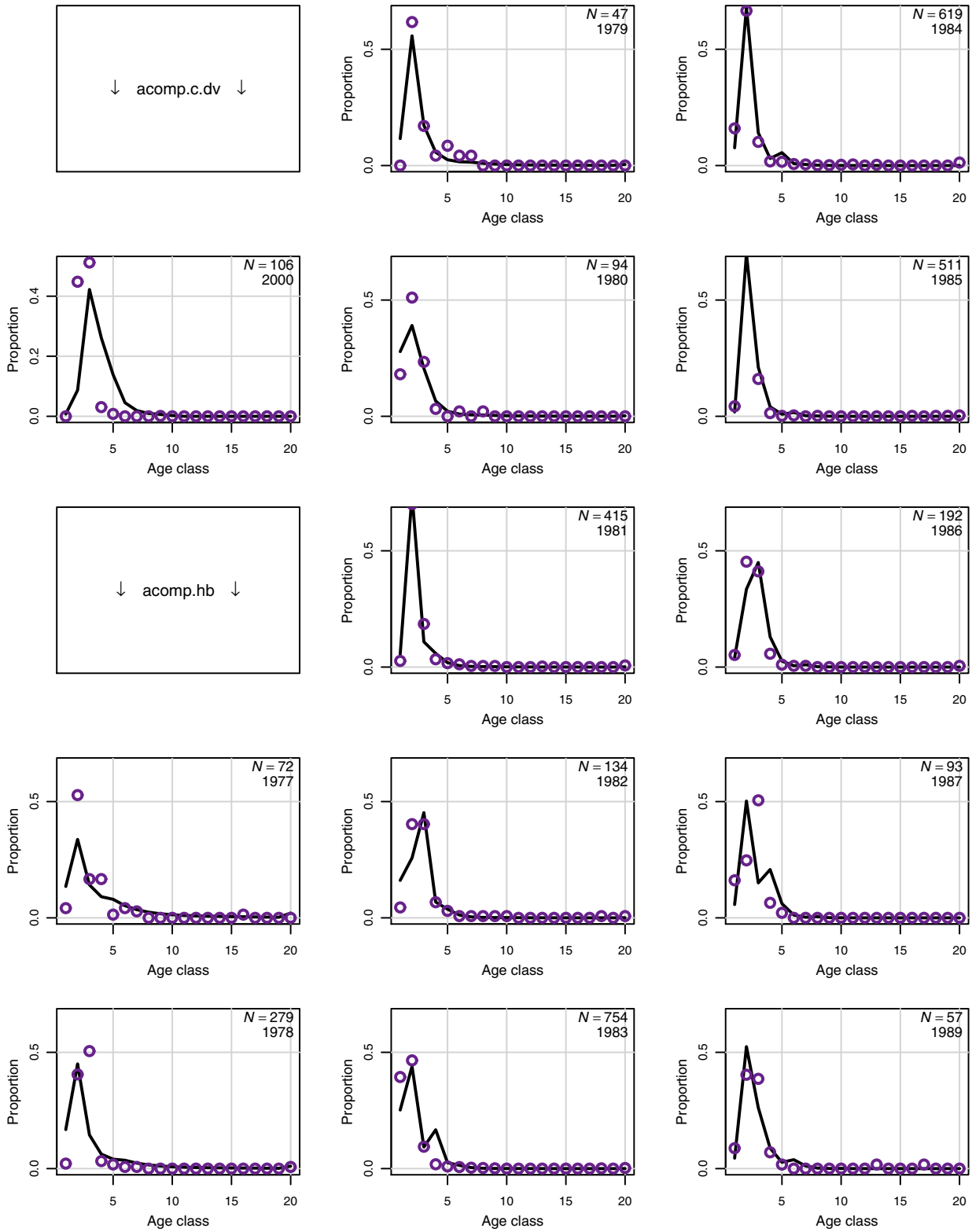


Figure 1.3. (cont.) Red snapper: Observed (open circles) and estimated (solid line) annual length and age compositions by fishery.

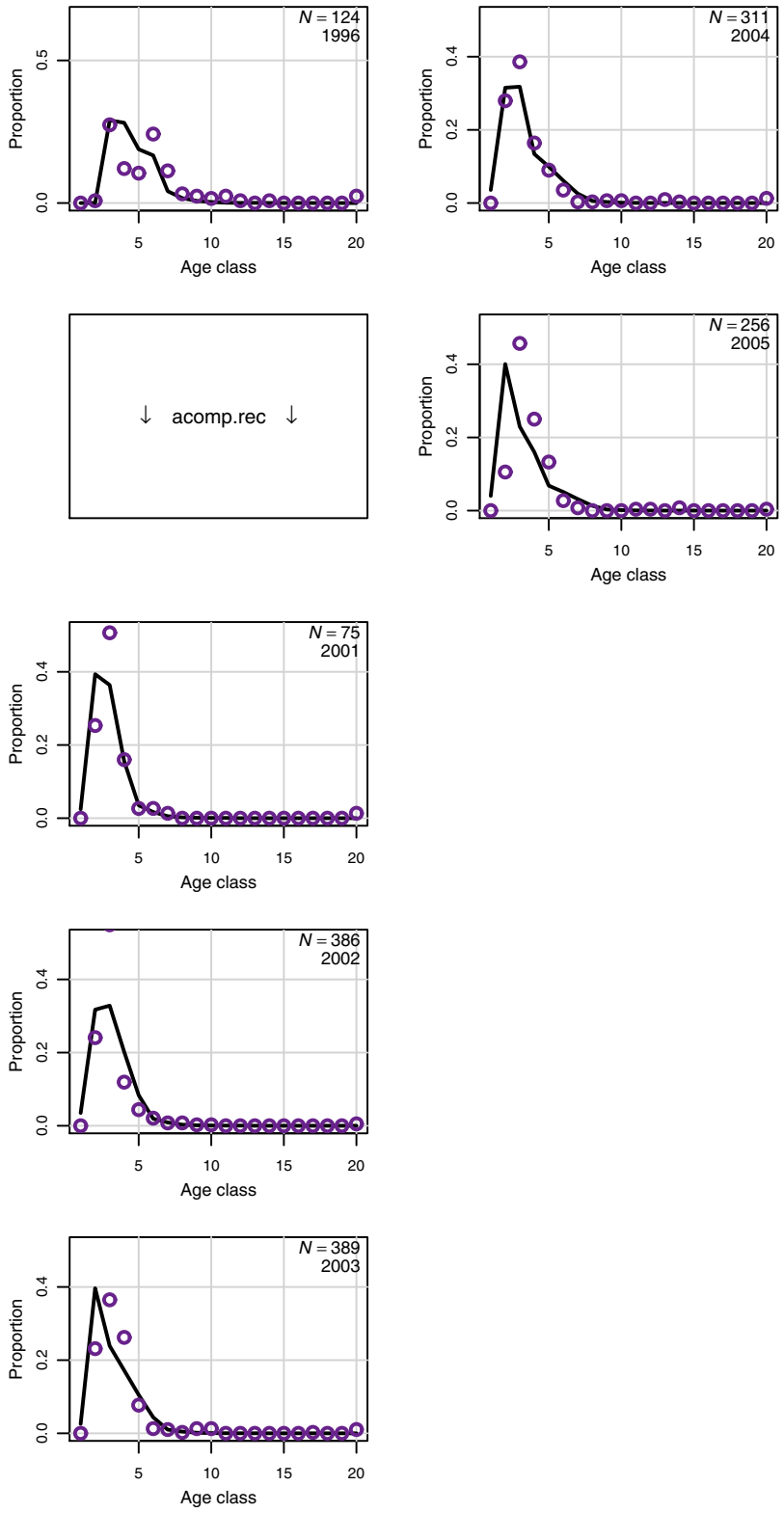


Figure 1.4. Red snapper: Top panel is a bubble plot of length composition residuals from the commercial hand-line fishery; Dark represents overestimates and light underestimates. Bottom panel shows the angle (in degrees) between vectors of observations and estimates, with a reference line at 20 degrees.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

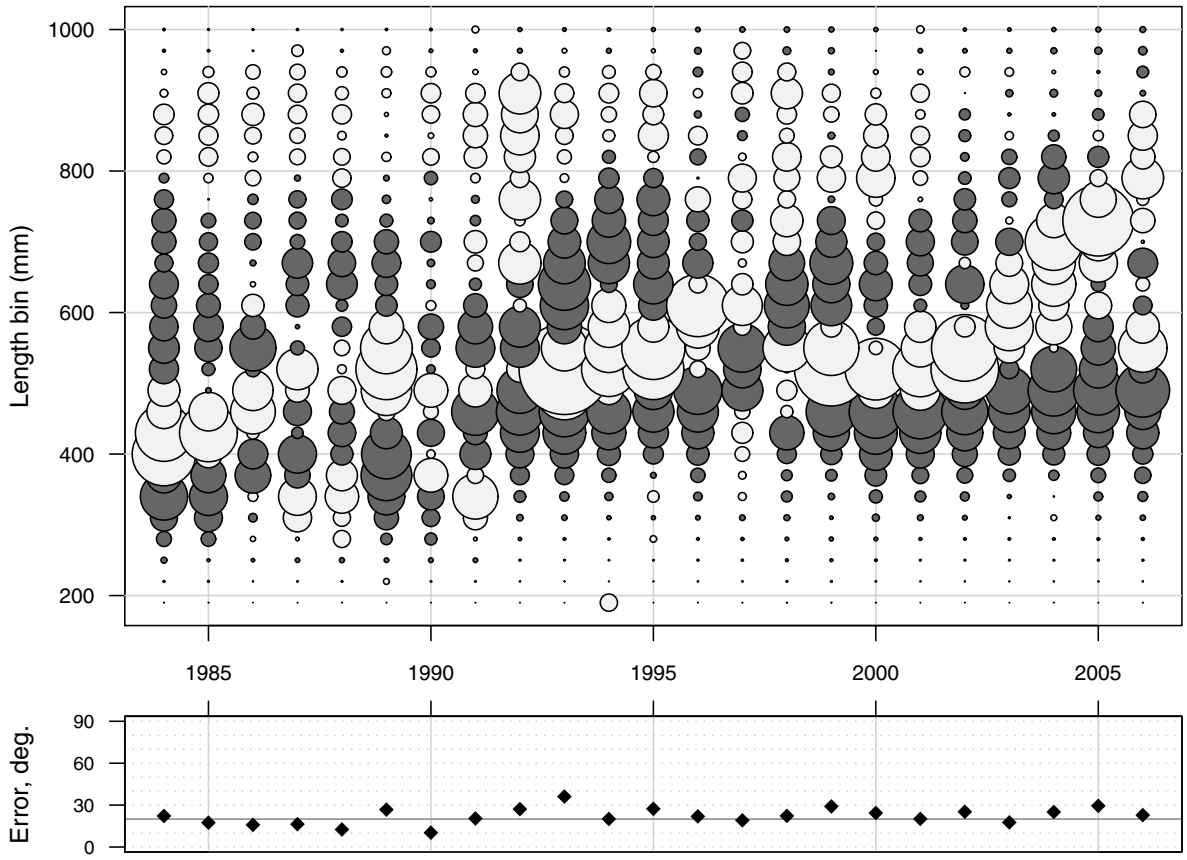


Figure 1.5. Red snapper: Top panel is a bubble plot of length composition residuals from the commercial diving fishery; Dark represents overestimates and light underestimates. Bottom panel shows the angle (in degrees) between vectors of observations and estimates, with a reference line at 20 degrees.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

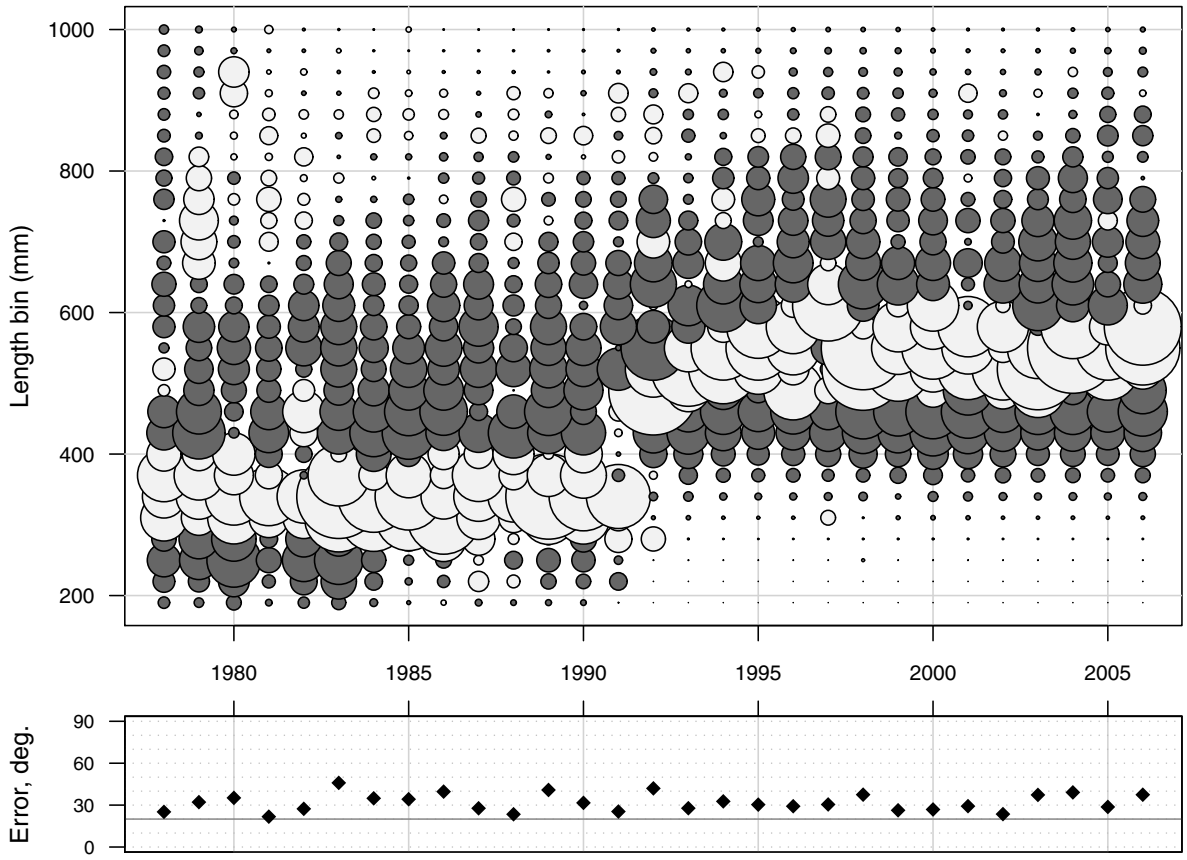


Figure 1.7. Red snapper: Top panel is a bubble plot of length composition residuals from the recreational fishery (MRFSS); Dark represents overestimates and light underestimates. Bottom panel shows the angle (in degrees) between vectors of observations and estimates, with a reference line at 20 degrees.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

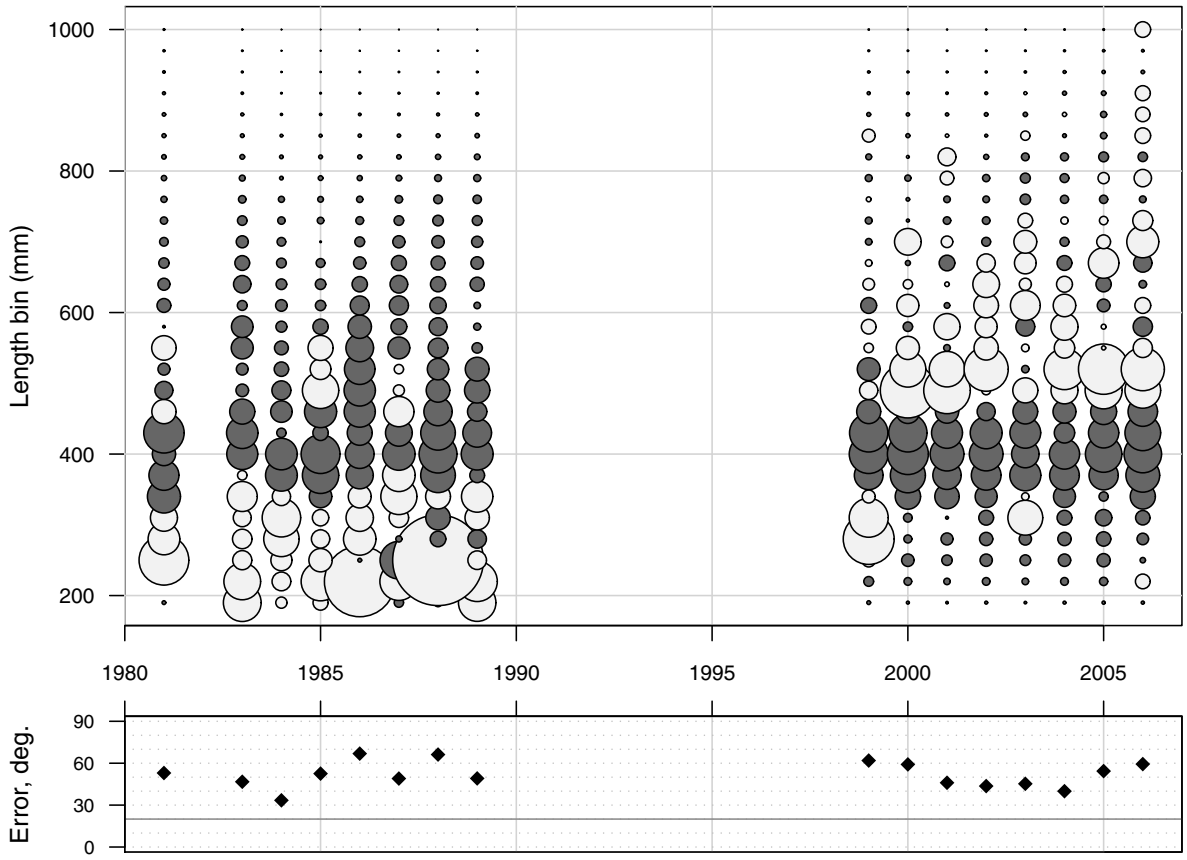


Figure 1.8. Red snapper: Top panel is a bubble plot of age composition residuals from the commercial handline fishery; Dark represents overestimates and light underestimates. Bottom panel shows the angle (in degrees) between vectors of observations and estimates, with a reference line at 20 degrees.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

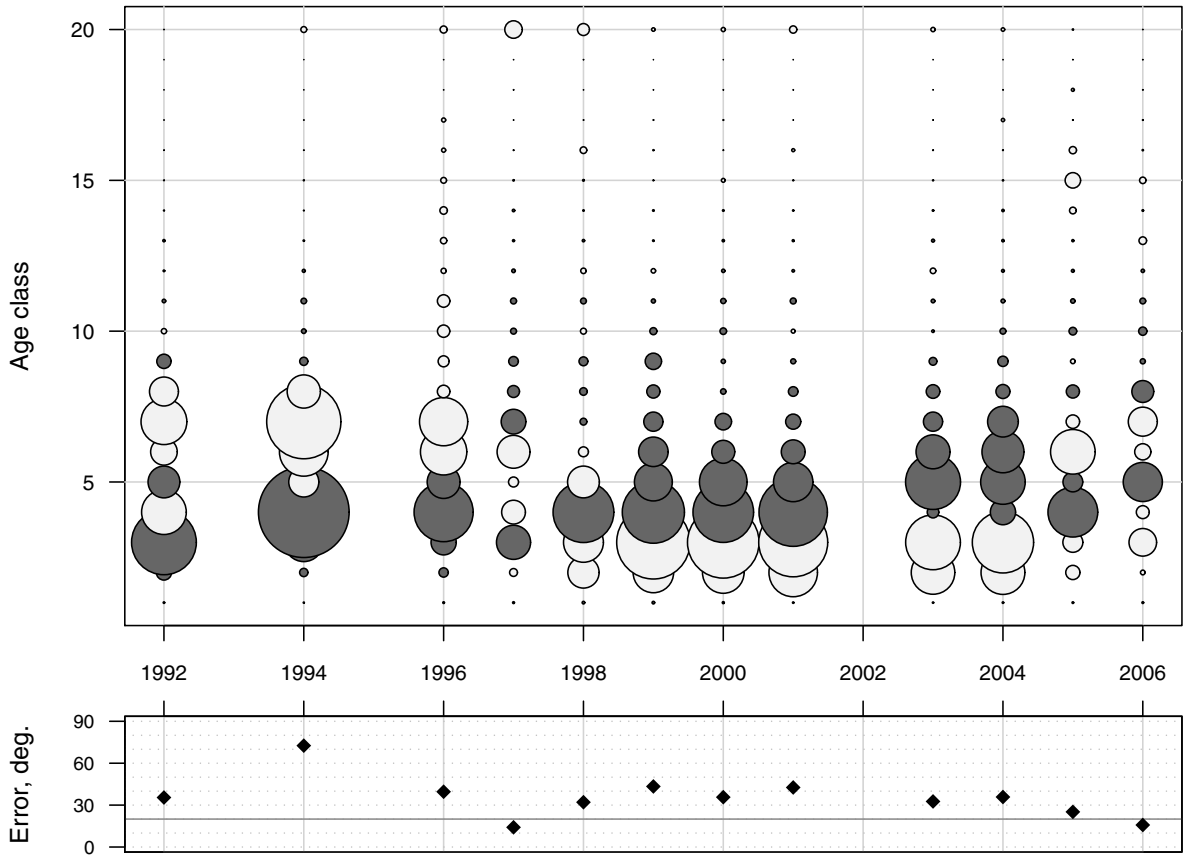


Figure 1.9. Red snapper: Top panel is a bubble plot of age composition residuals from the commercial diving fishery; Dark represents overestimates and light underestimates. Bottom panel shows the angle (in degrees) between vectors of observations and estimates, with a reference line at 20 degrees. Error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

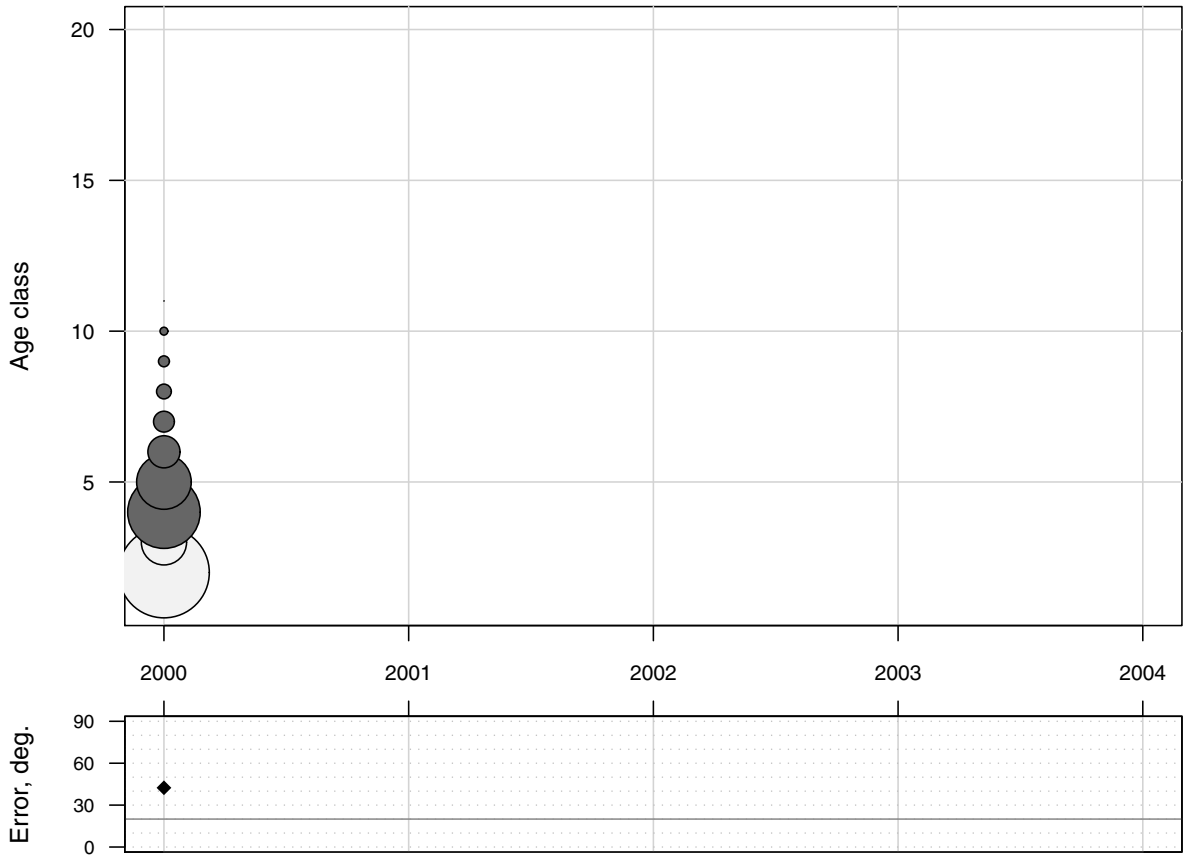


Figure 1.10. Red snapper: Top panel is a bubble plot of age composition residuals from the headboat fishery; Dark represents overestimates and light underestimates. Bottom panel shows the angle (in degrees) between vectors of observations and estimates, with a reference line at 20 degrees. Error is bounded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

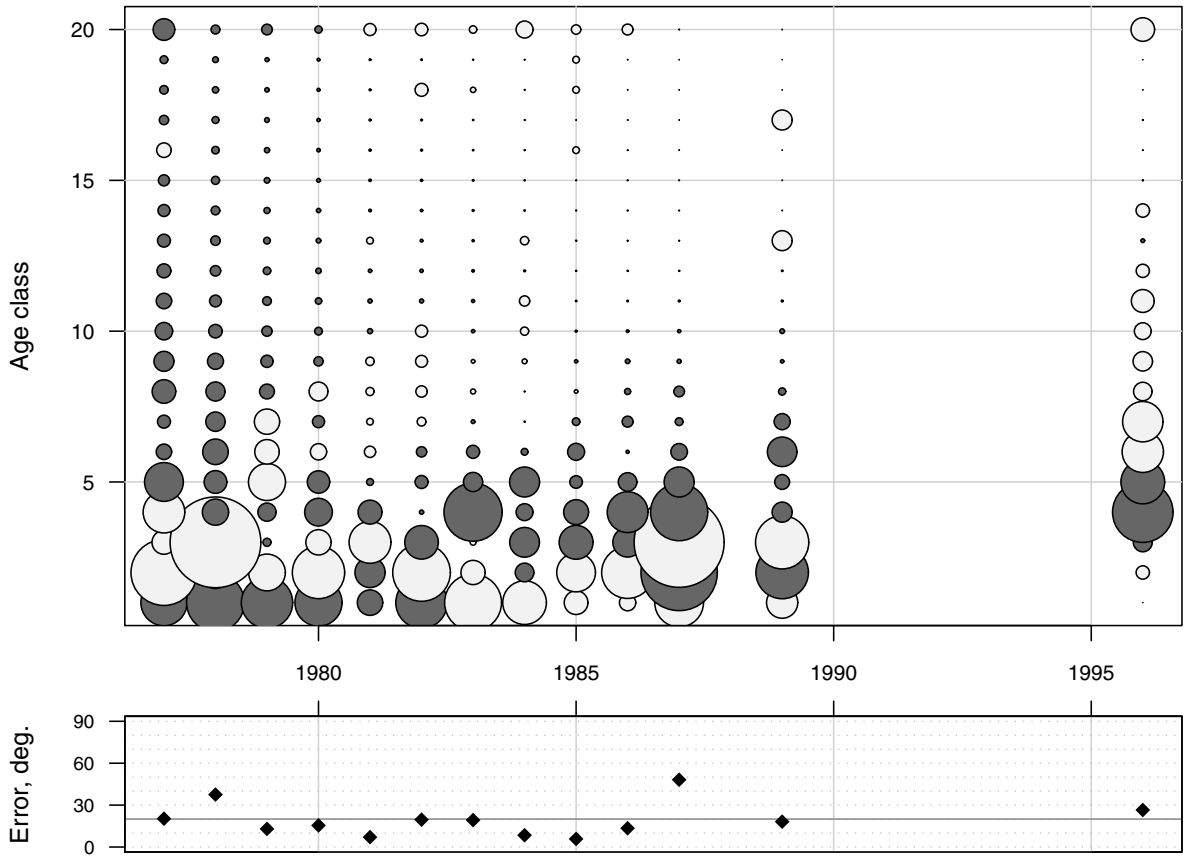


Figure 1.11. Red snapper: Top panel is a bubble plot of age composition residuals from the recreational fishery (MRFSS); Dark represents overestimates and light underestimates. Bottom panel shows the angle (in degrees) between vectors of observations and estimates, with a reference line at 20 degrees.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

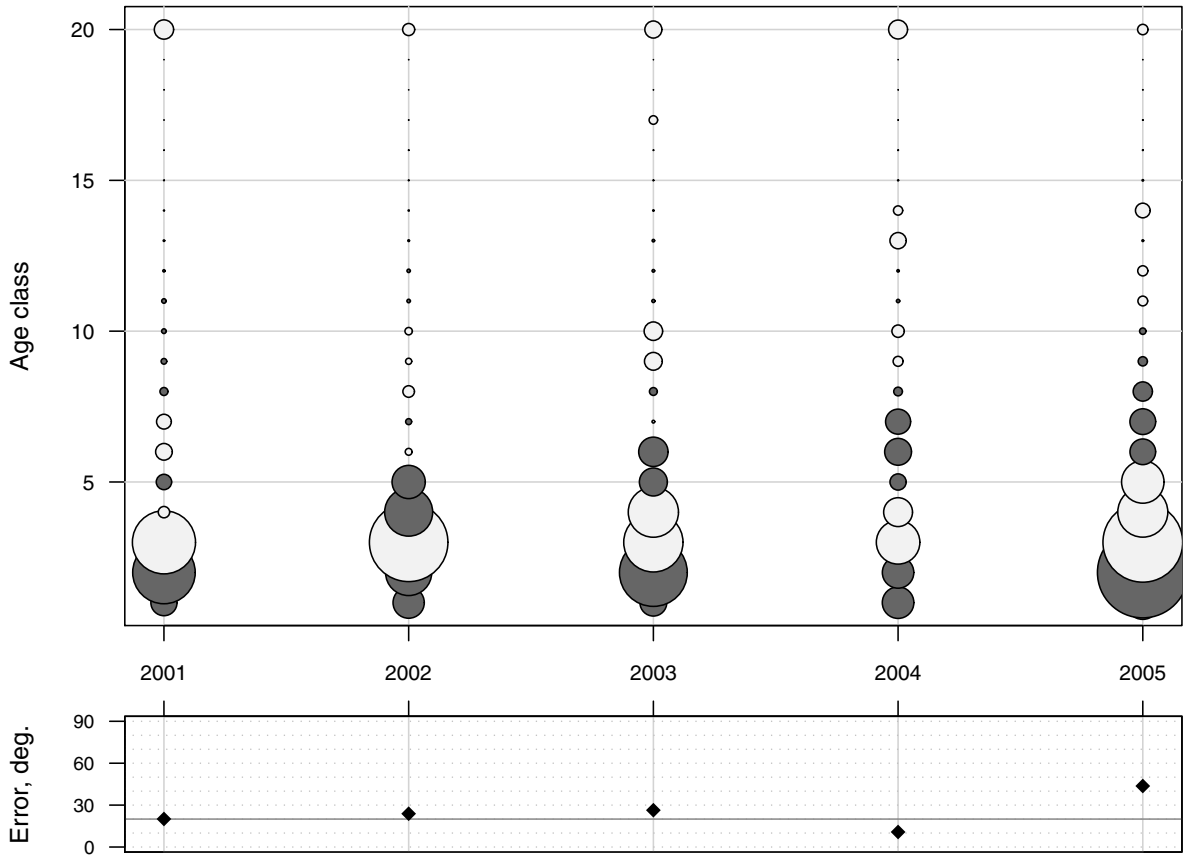


Figure 1.12. Red snapper: Observed (open circles) and estimated (solid line, circles) commercial handline landings (whole weight). Open and closed circles are indistinguishable.

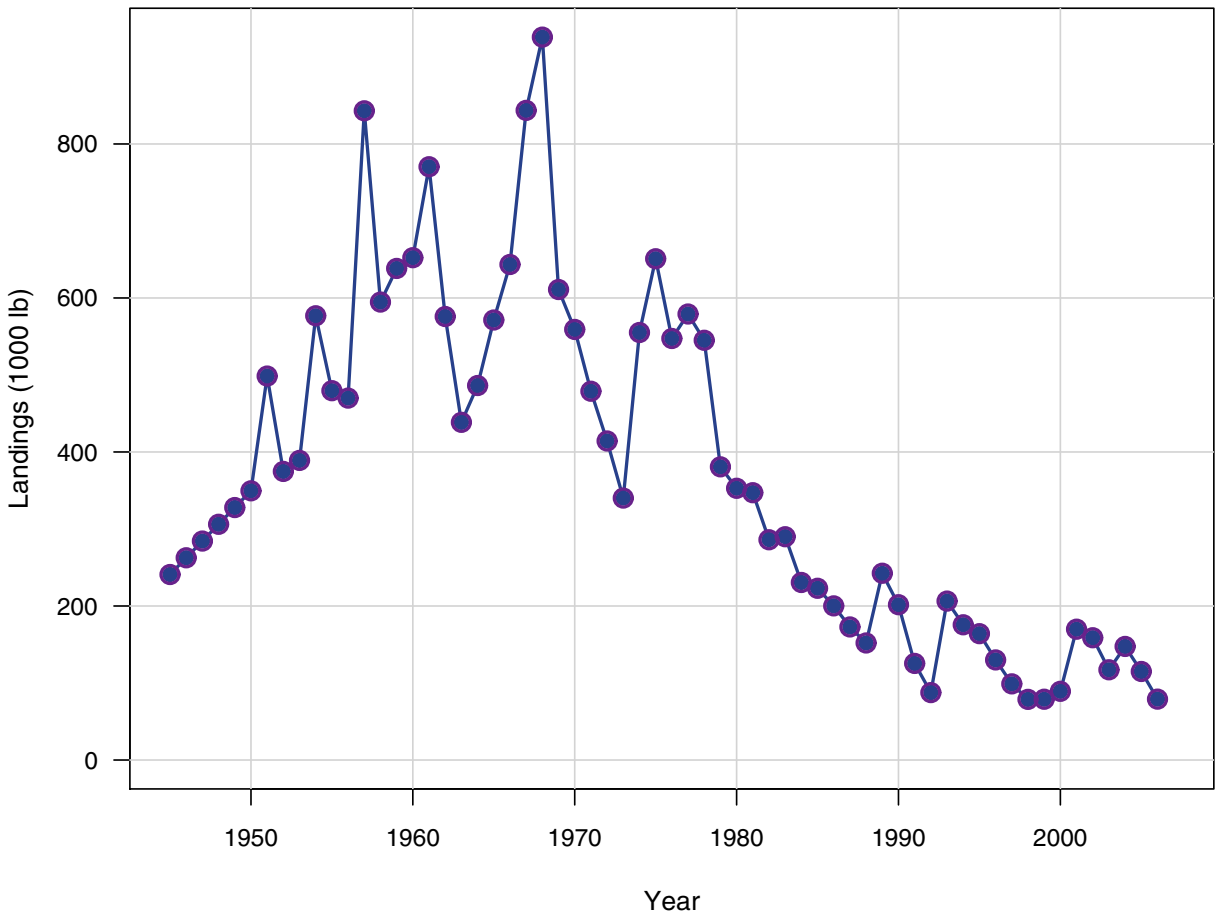


Figure 1.13. Red snapper: Observed (open circles) and estimated (solid line, circles) commercial diving landings (whole weight). Open and closed circles are indistinguishable.

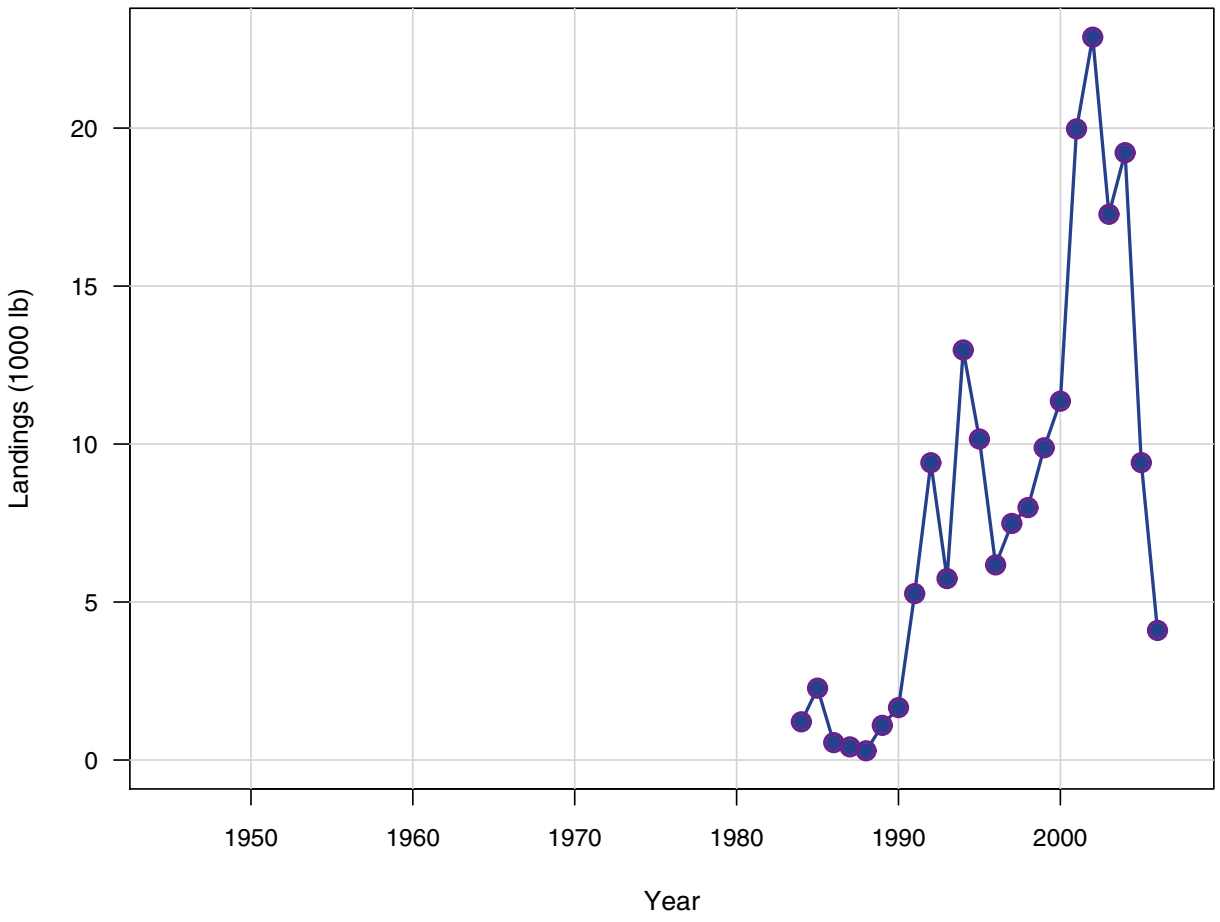


Figure 1.14. Red snapper: Observed (open circles) and estimated (solid line, circles) headboat landings (whole weight). Open and closed circles are indistinguishable.

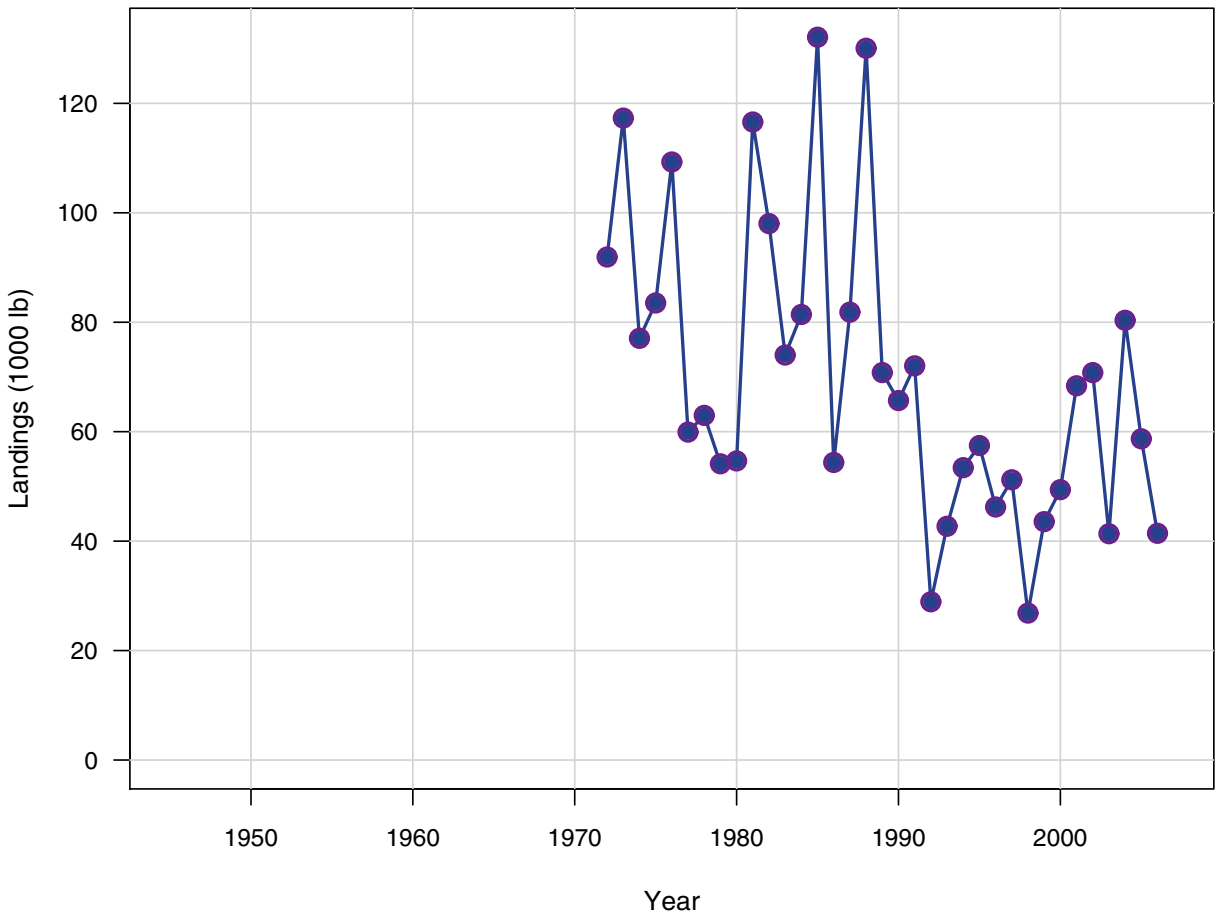


Figure 1.15. Red snapper: Observed (open circles) and estimated (solid line, circles) general recreational landings (whole weight). Open and closed circles are indistinguishable.

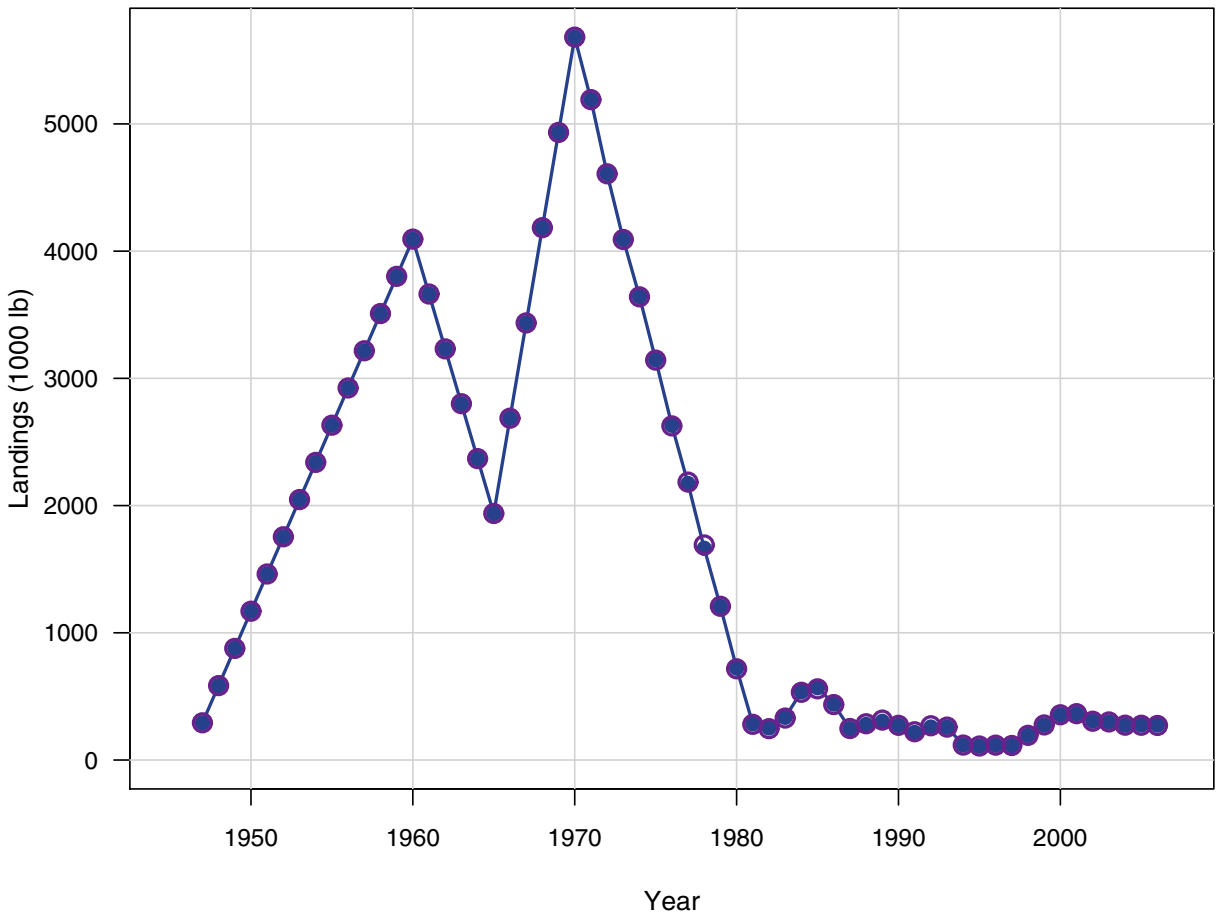


Figure 1.16. Red snapper: Observed (open circles) and estimated (solid line, circles) commercial handline discard mortalities. Open and closed circles are indistinguishable.

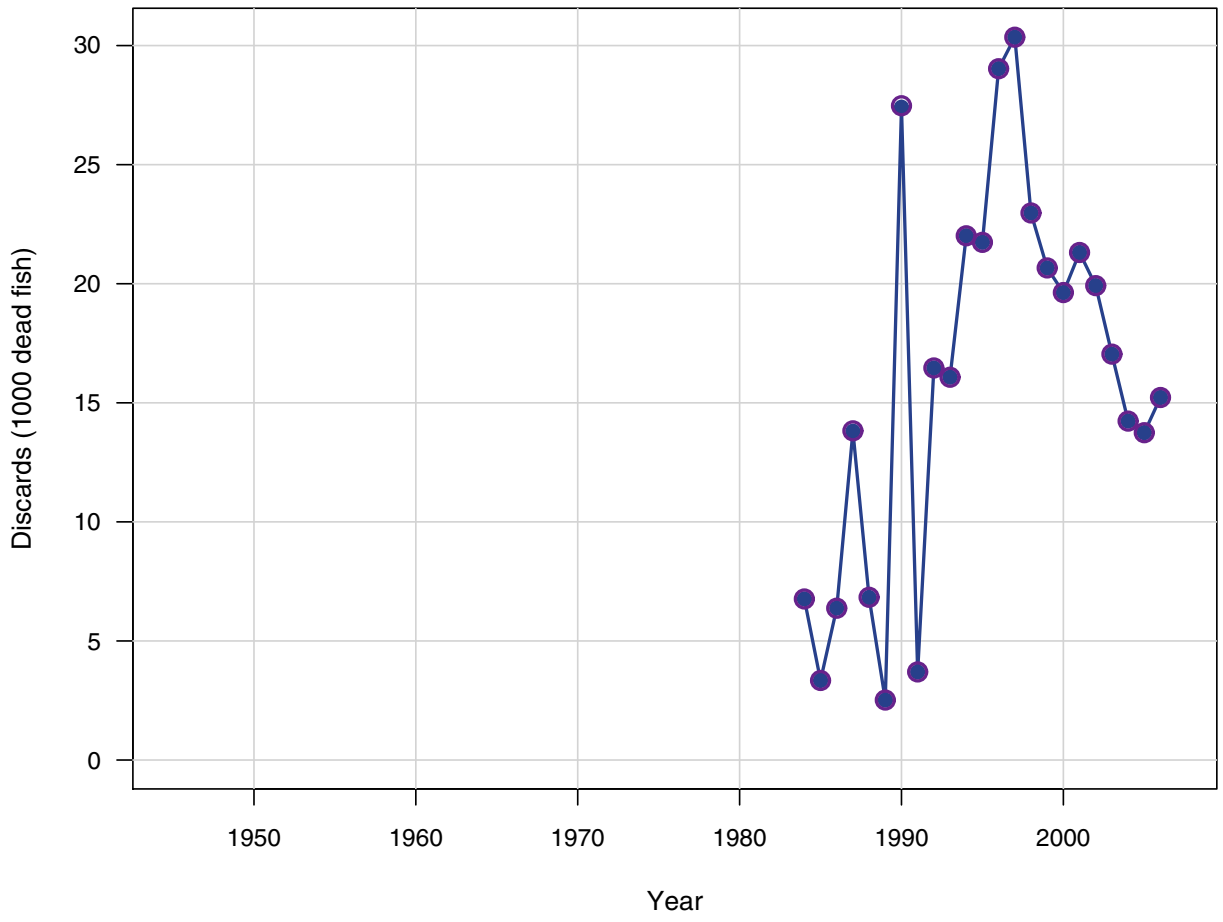


Figure 1.17. Red snapper: Observed (open circles) and estimated (solid line, circles) headboat discard mortalities. Open and closed circles are indistinguishable.

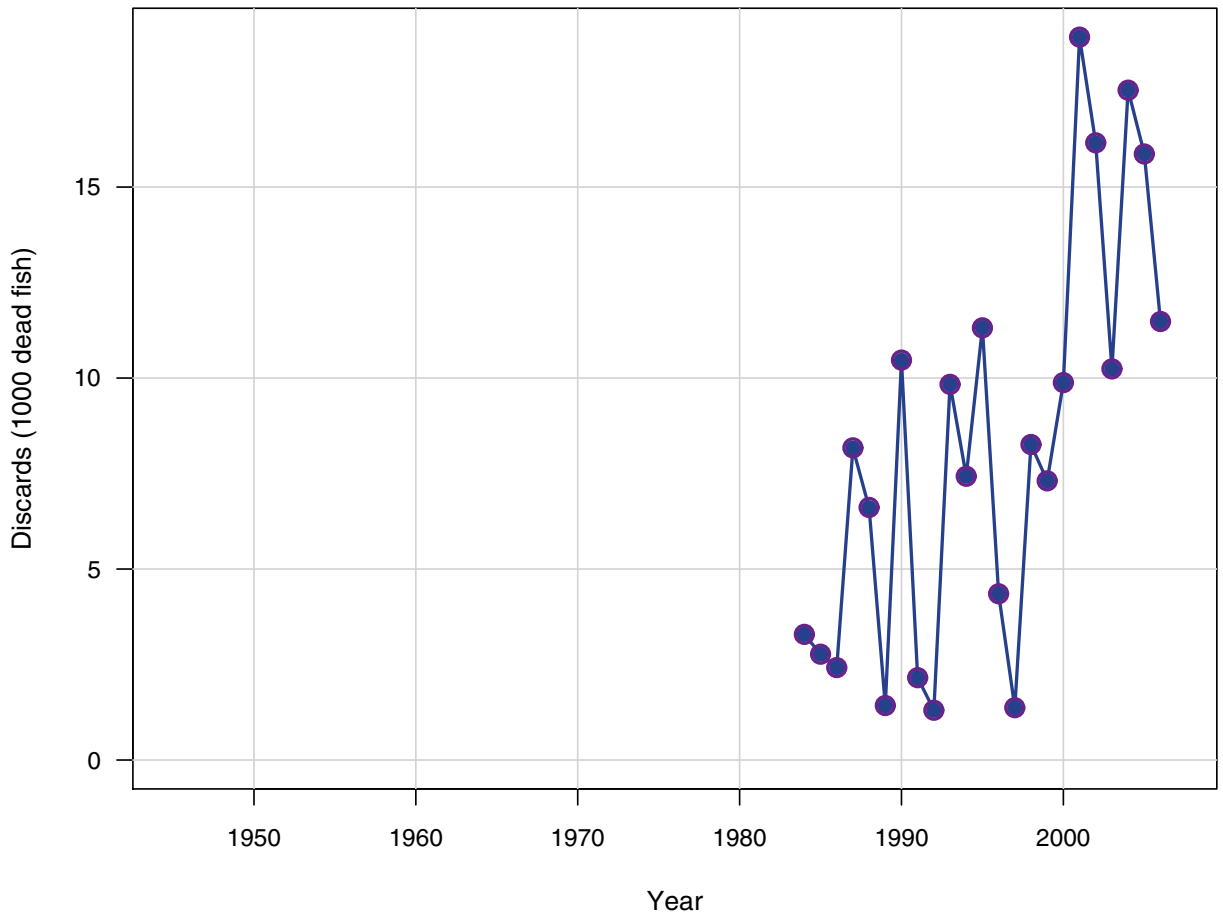


Figure 1.18. Red snapper: Observed (open circles) and estimated (solid line, circles) general recreational discard mortalities. Open and closed circles are indistinguishable.

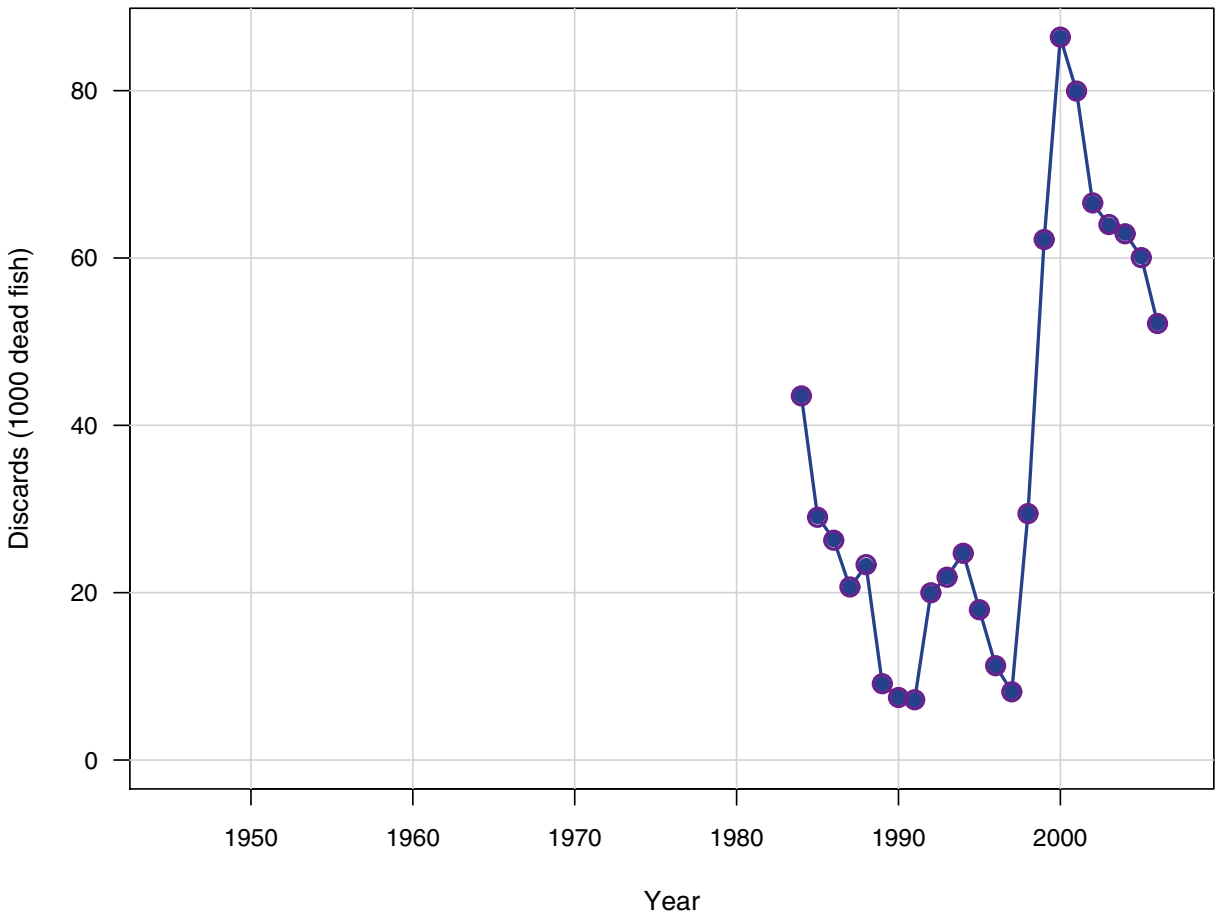


Figure 1.19. Red snapper: Fit of index of abundance from commercial handline; Observed (open circles) and estimated (solid line, circles).

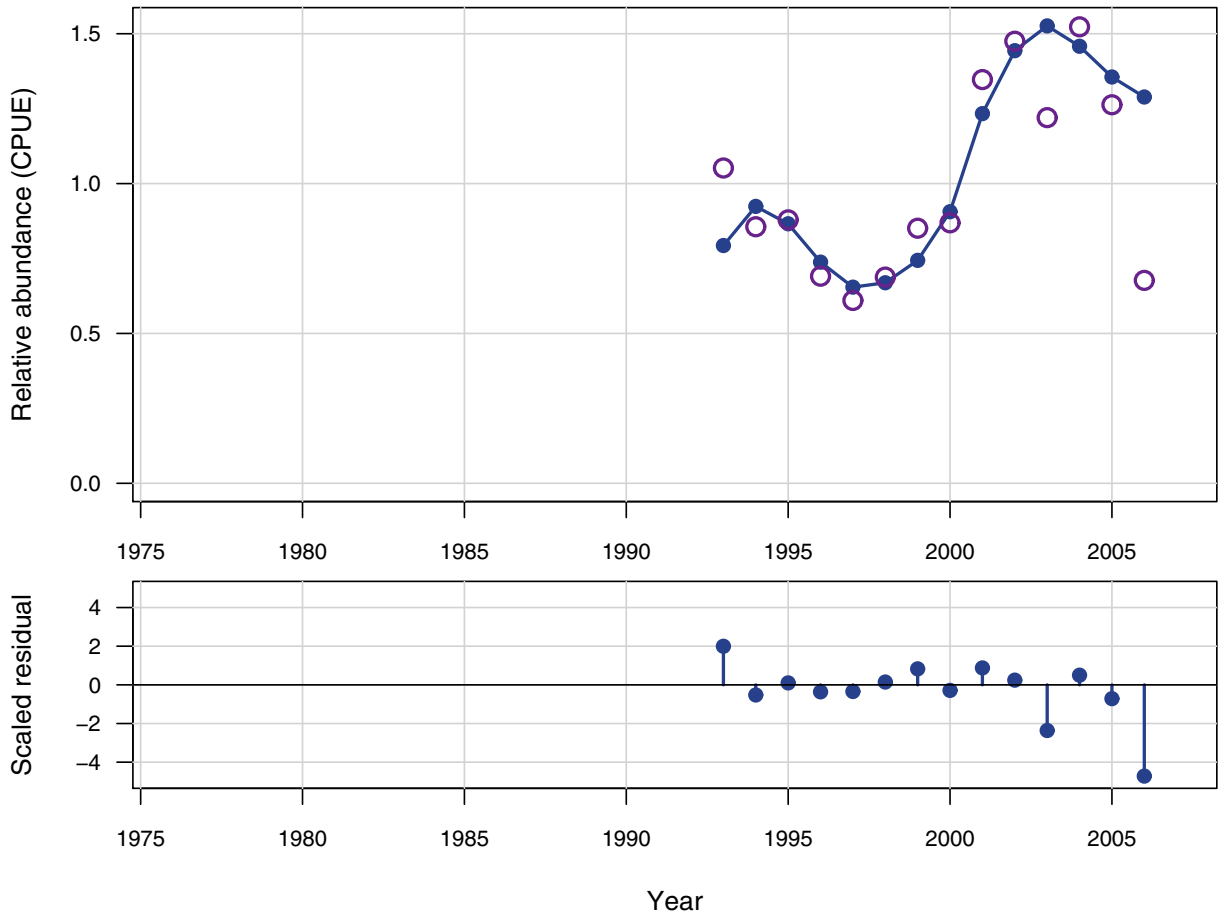


Figure 1.20. Red snapper: Fit of index of abundance from headboat; Observed (open circles) and estimated (solid line, circles).

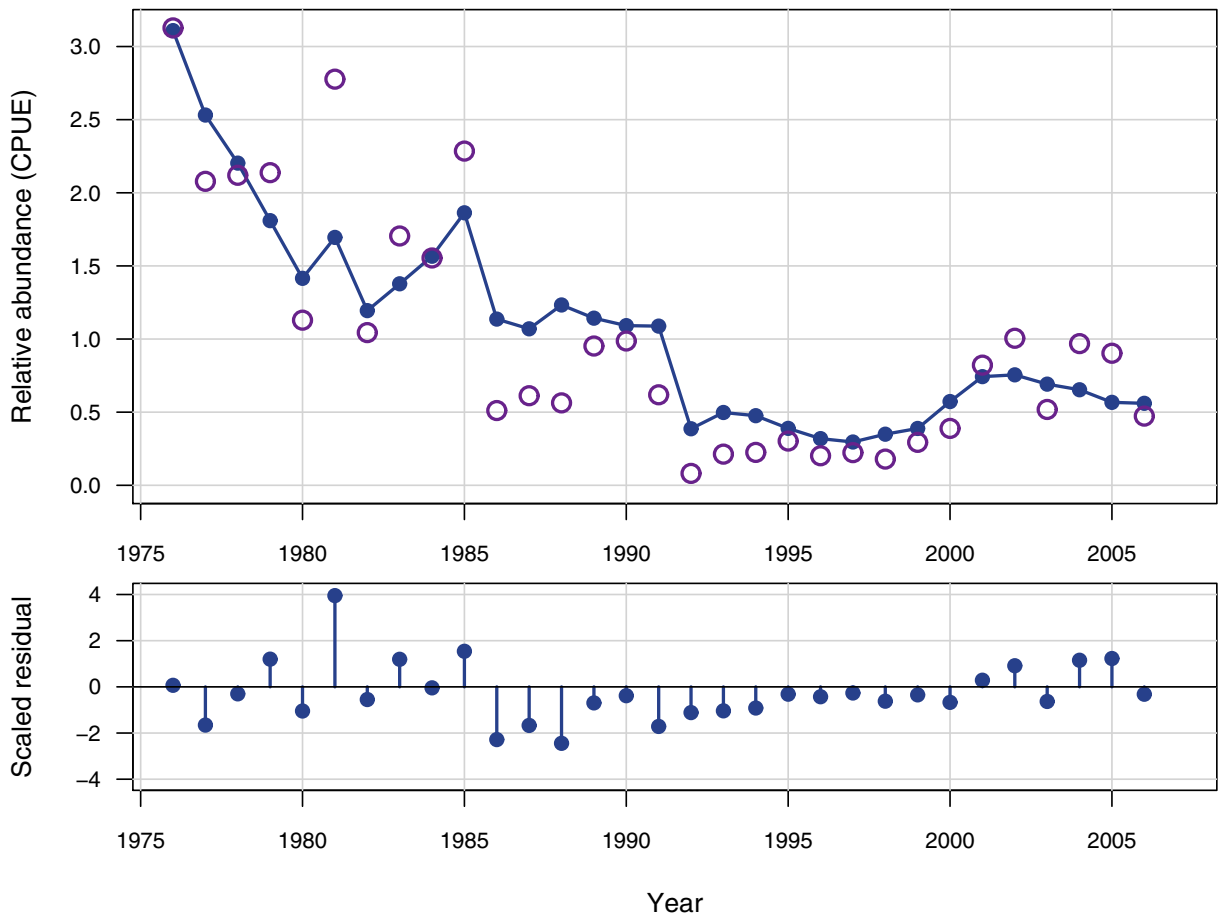


Figure 1.21. Red snapper: Fit of index of abundance from general recreational (MRFSS); Observed (open circles) and estimated (solid line, circles).

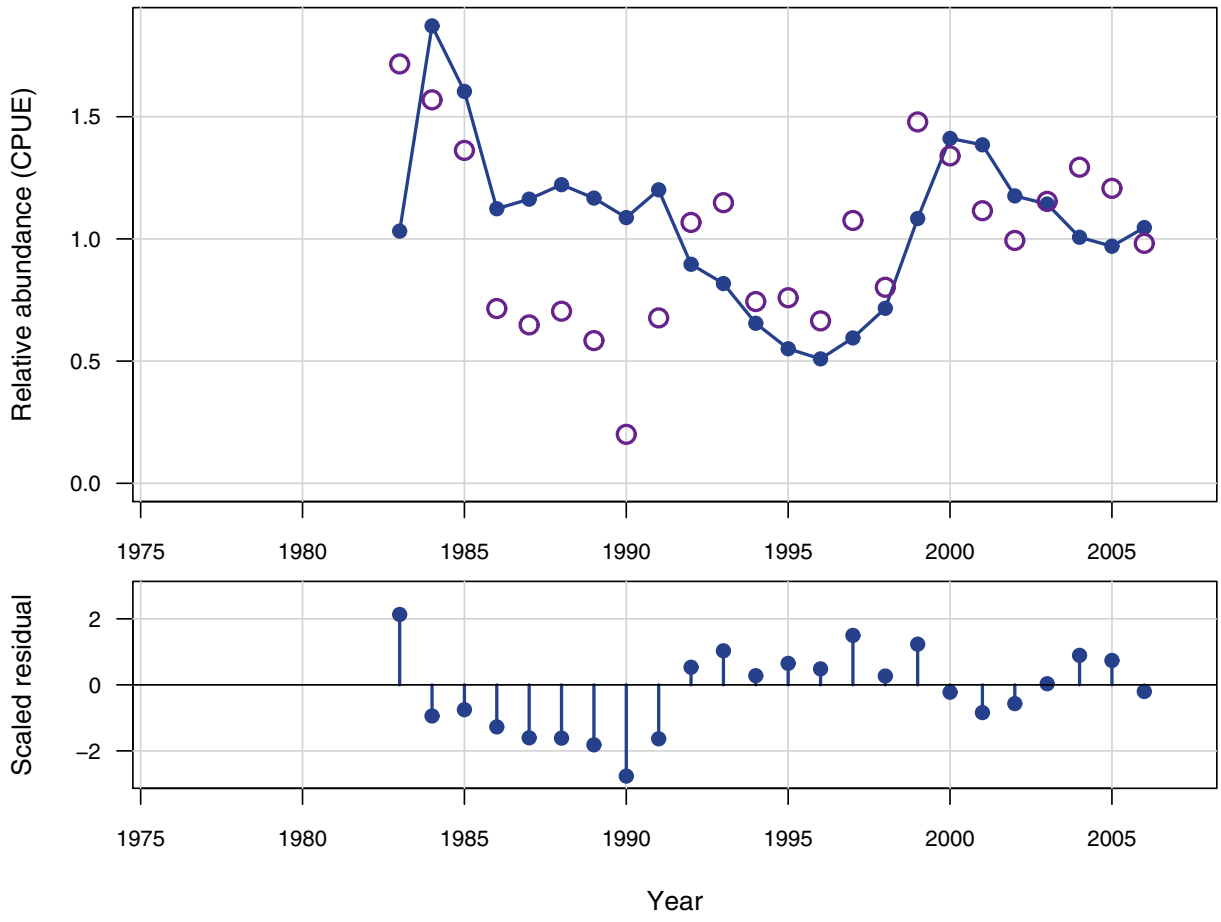


Figure 1.22. Red snapper: Mean length at age (mm) and estimated 95% confidence interval.

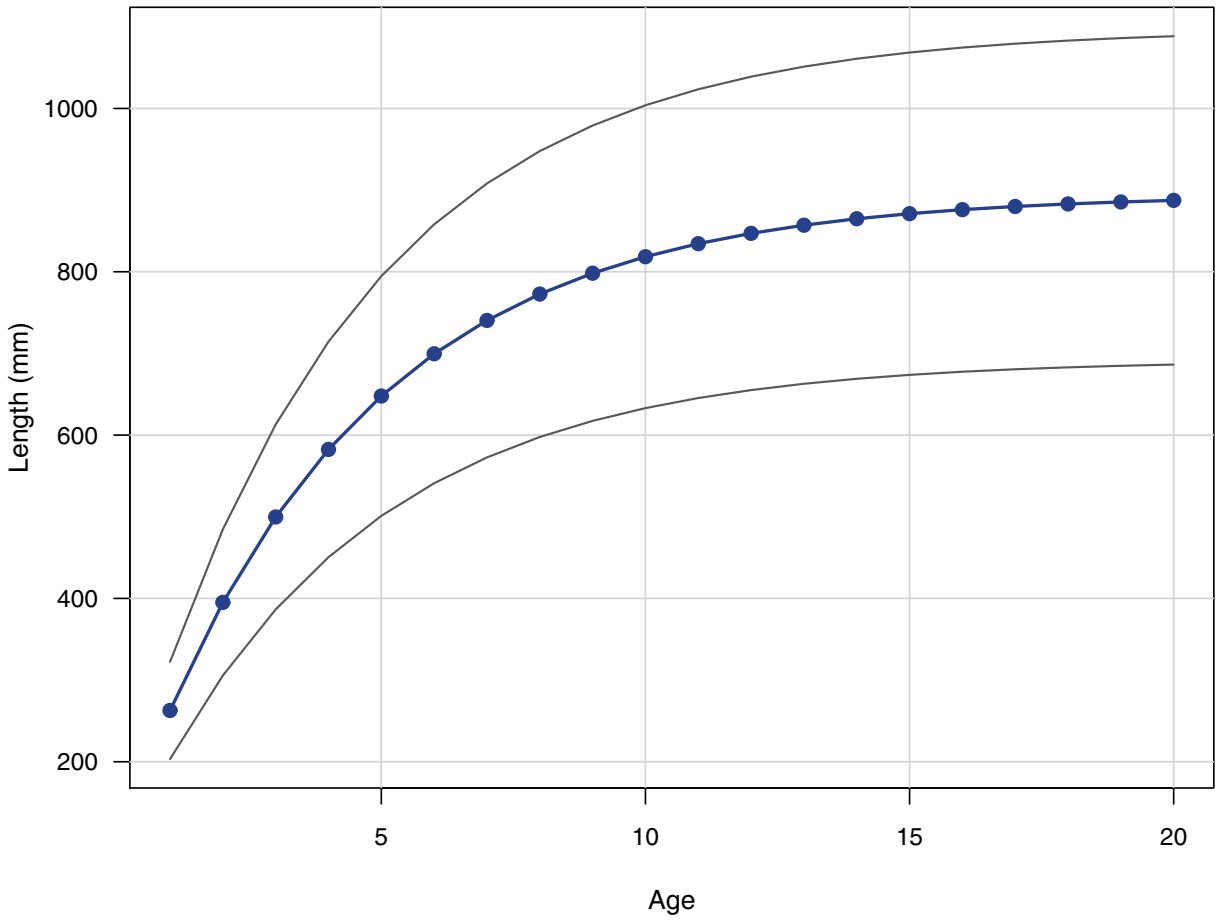


Figure 1.23. Red snapper: Top panel – Estimated recruitment of age-1 fish. Bottom panel – log recruitment residuals.

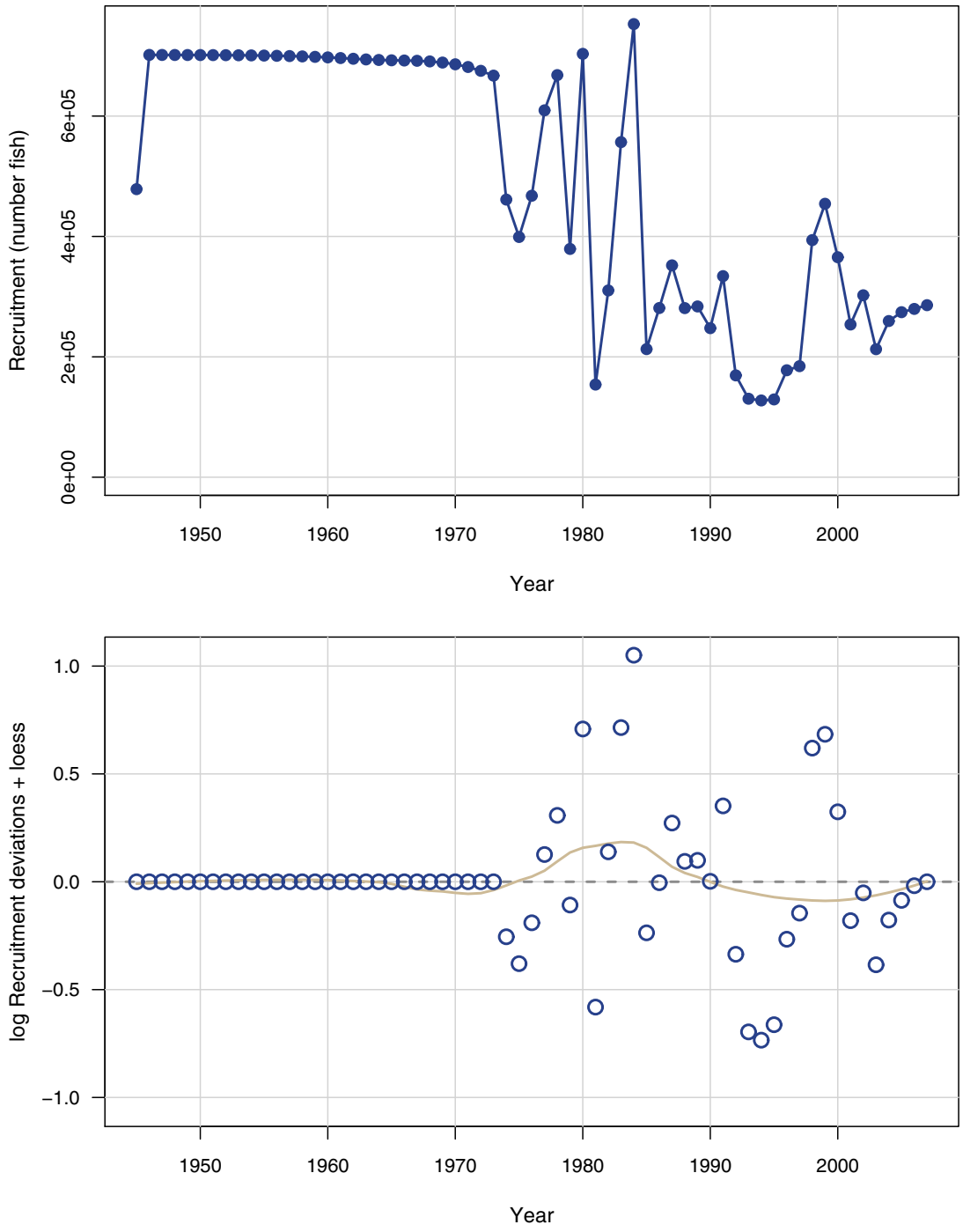
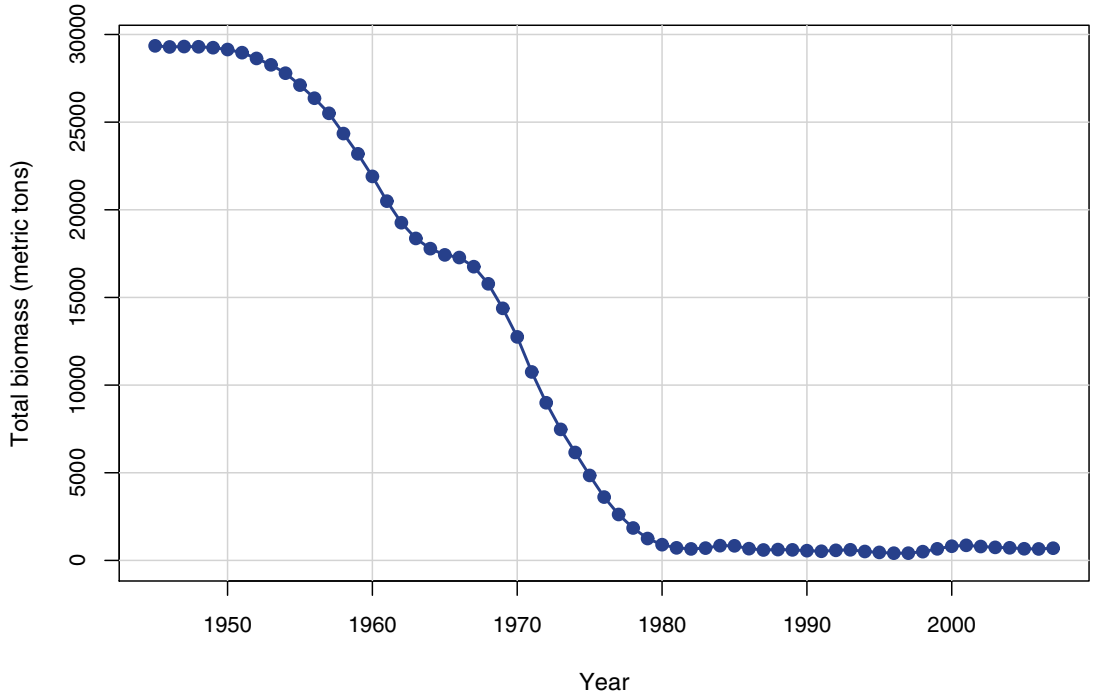


Figure 1.24. Red snapper: Top panel – Estimated total biomass (metric tons) at start of year. Bottom panel – Estimated spawning biomass (metric tons) at midpoint of year.



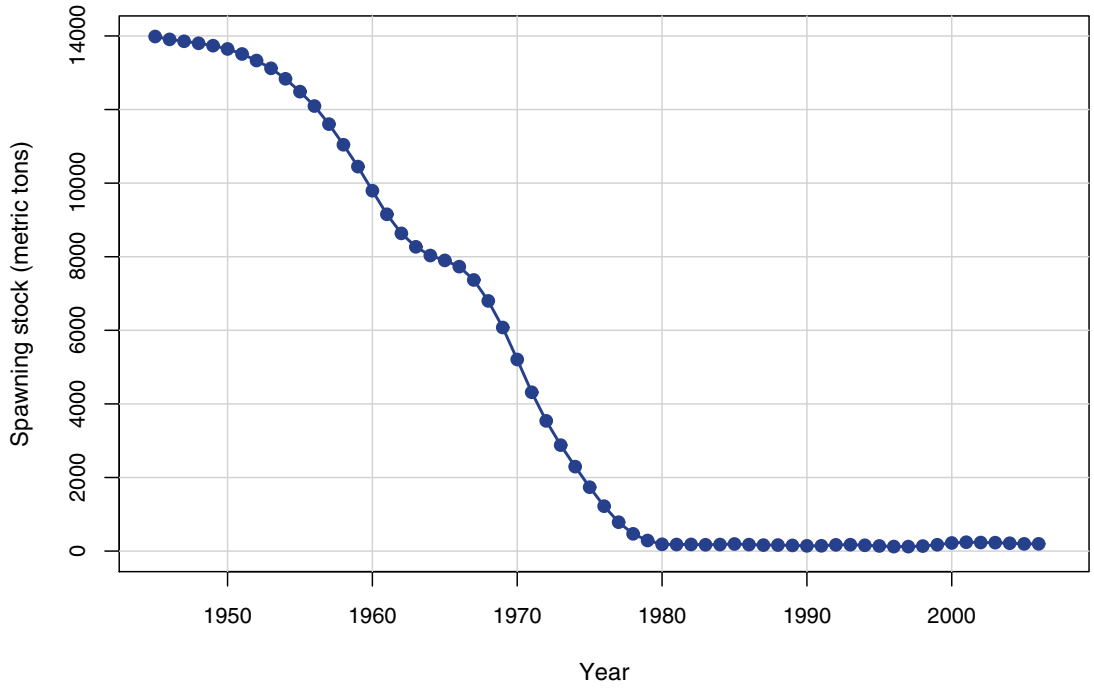


Figure 1.25. Red snapper: Estimated selectivities of commercial handline. Top panel – period 1 (prior to 1984, no regulations). Middle panel – period 2 (1984–1991, 12-inch limit). Bottom panel – period 3 (1992–2006, 20-inch limit).

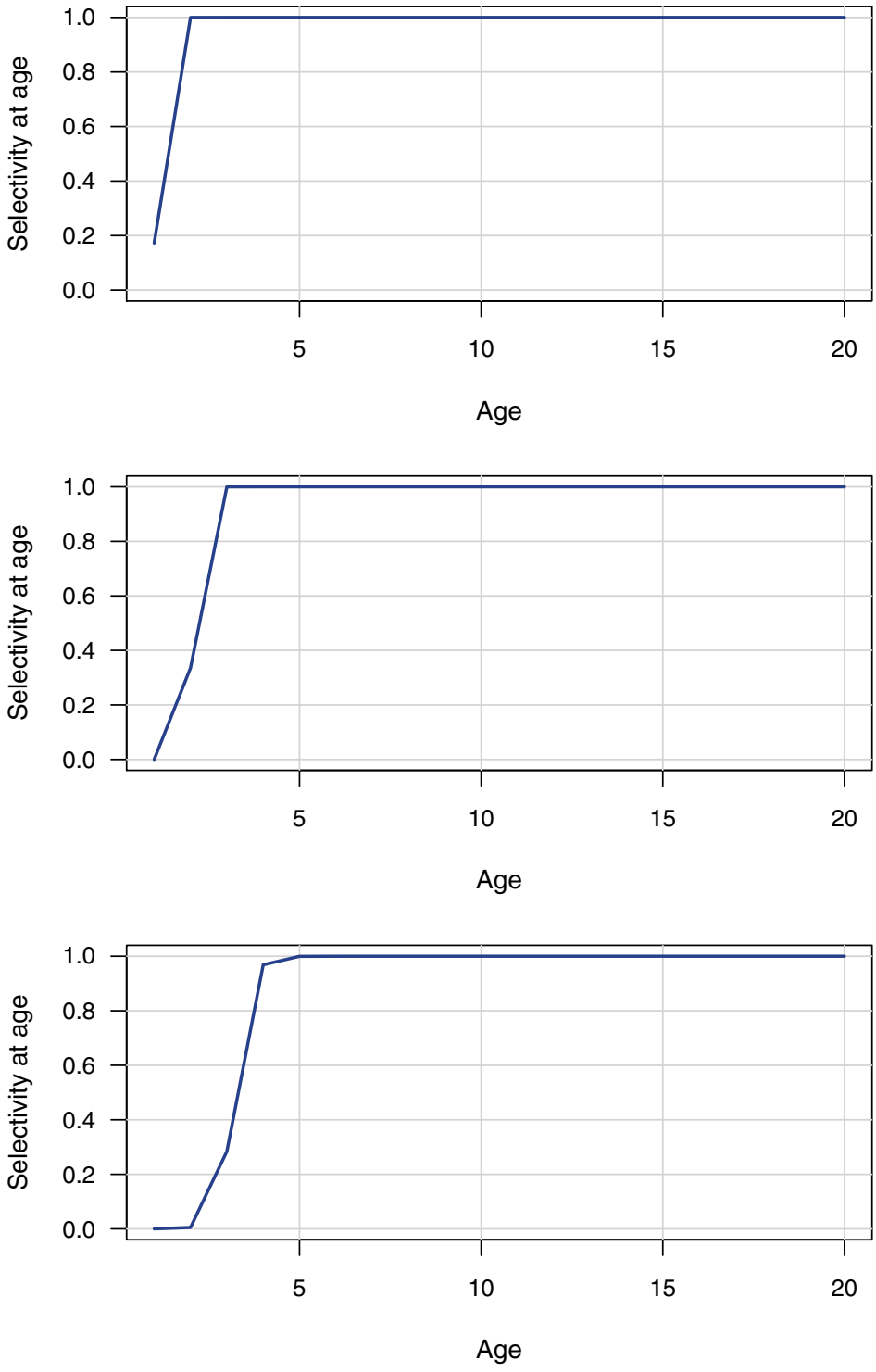


Figure 1.26. Red snapper: Estimated selectivity of commercial diving, assumed constant through time.

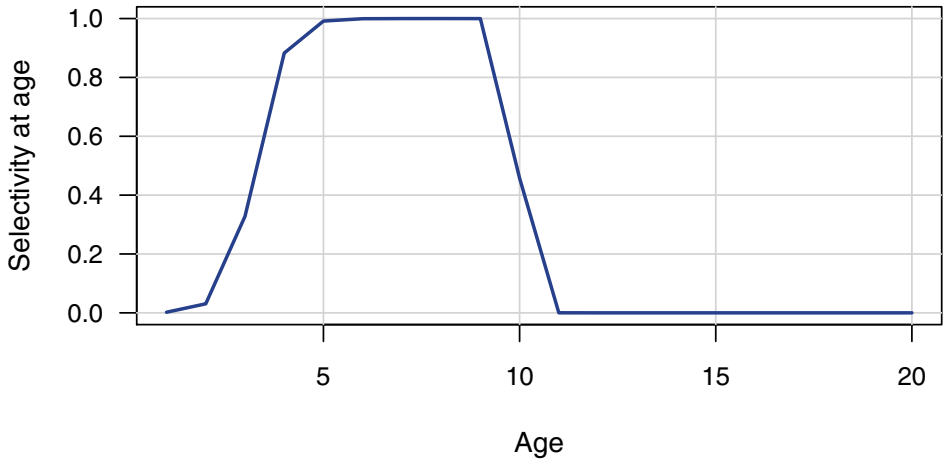


Figure 1.27. Red snapper: Estimated selectivities of the headboat fishery. Top panel – period 1 (prior to 1984, no regulations). Middle panel – period 2 (1984–1991, 12-inch limit). Bottom panel – period 3 (1992–2006, 20-inch limit).

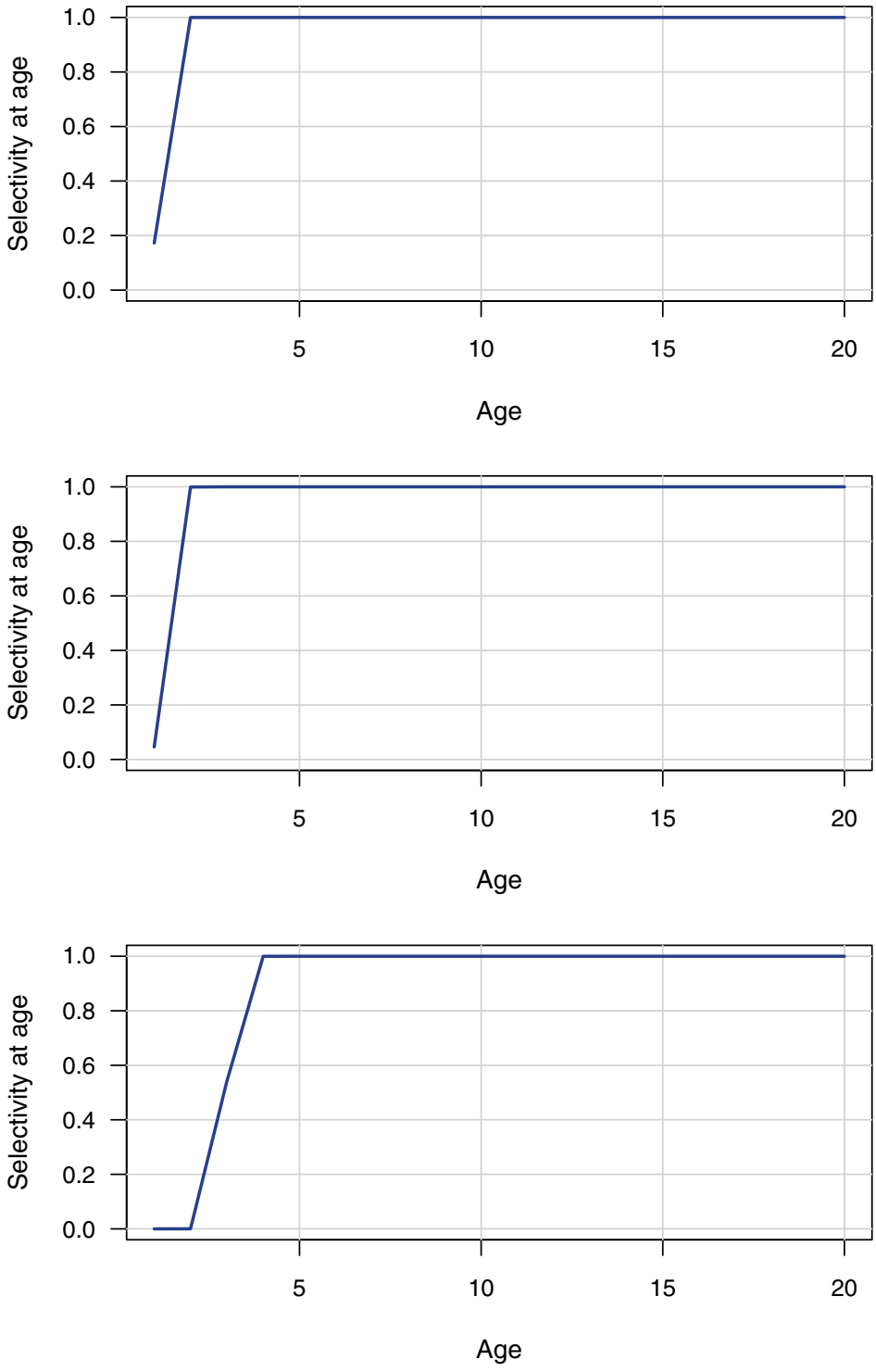


Figure 1.28. Red snapper: Estimated selectivities of the general recreational fishery. Top panel – period 1 (prior to 1984, no regulations). Middle panel – period 2 (1984–1991, 12-inch limit). Bottom panel – period 3 (1992–2006, 20-inch limit).

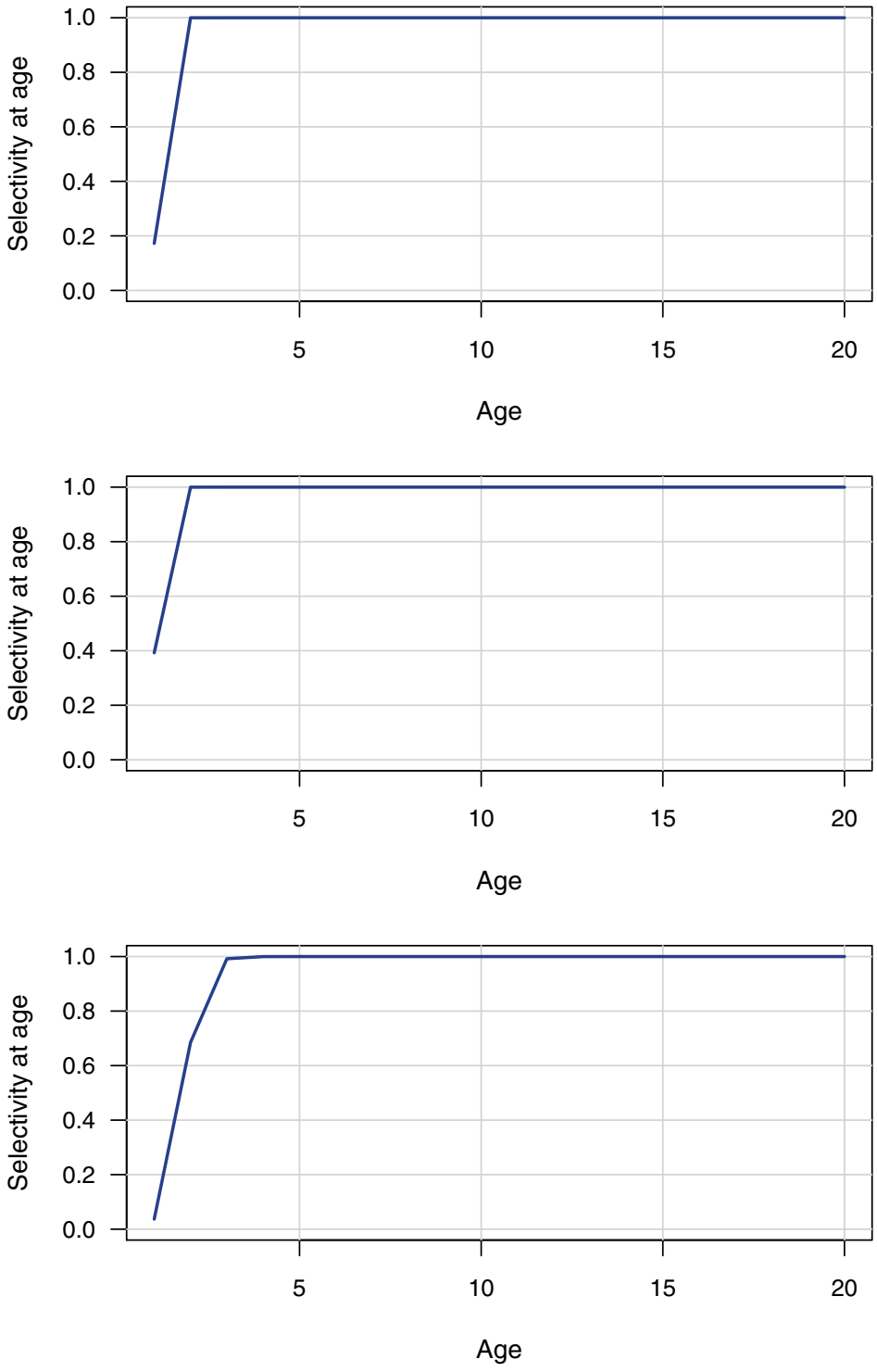


Figure 1.29. Red snapper: Estimated selectivities of discard mortalities from commercial handline. Discards were assumed negligible in period 1, the years prior to implementation of regulations. Top panel – period 2 (1984–1991, 12-inch limit). Bottom panel – period 3 (1992–2006, 20-inch limit).

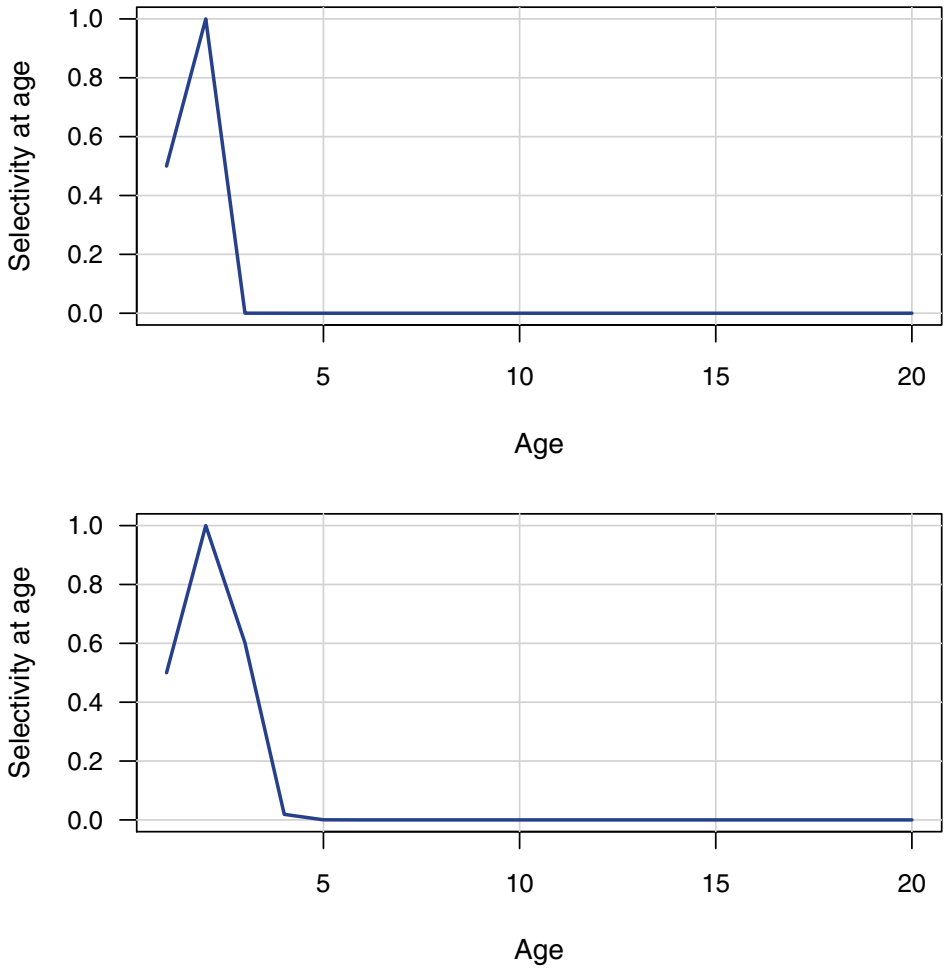


Figure 1.30. Red snapper: Estimated selectivities of discard mortalities from the headboat fishery. Discards were assumed negligible in period 1, the years prior to implementation of regulations. Top panel – period 2 (1984–1991, 12-inch limit). Bottom panel – period 3 (1992–2006, 20-inch limit).

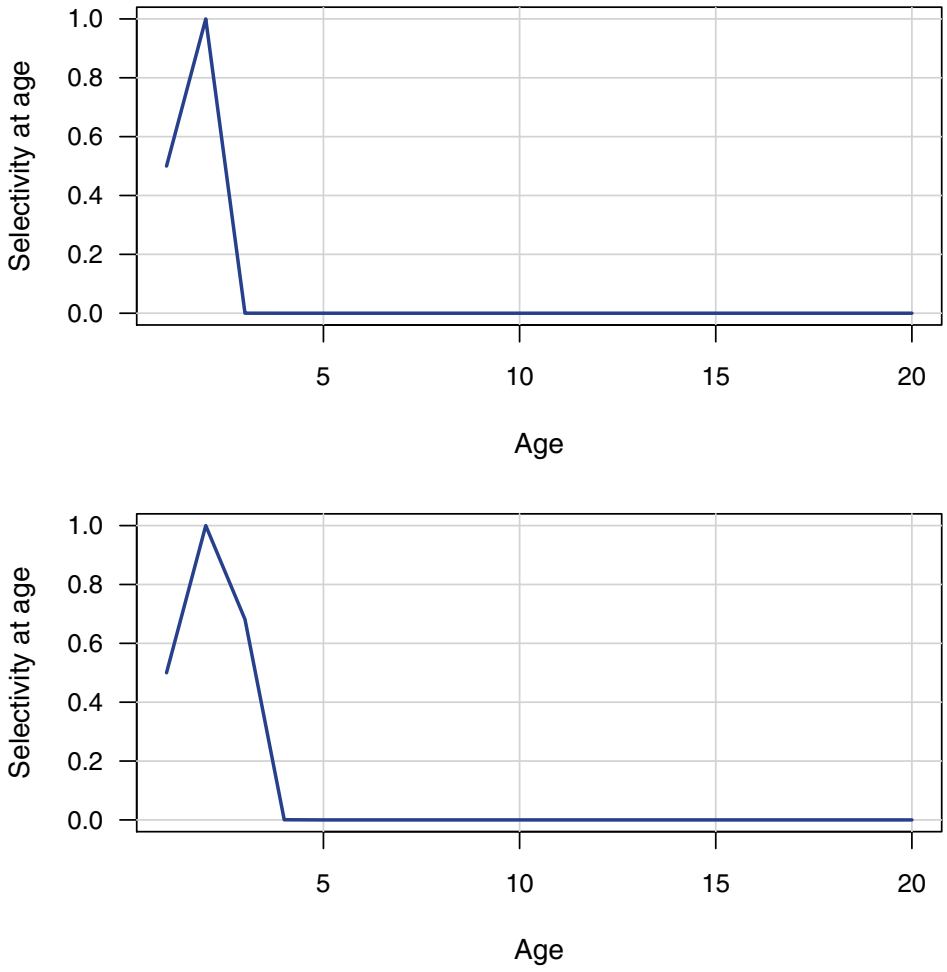


Figure 1.31. Red snapper: Estimated selectivities of discard mortalities from the general recreational fishery. Discards were assumed negligible in period 1, the years prior to implementation of regulations. Top panel – period 2 (1984–1991, 12-inch limit). Bottom panel – period 3 (1992–2006, 20-inch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

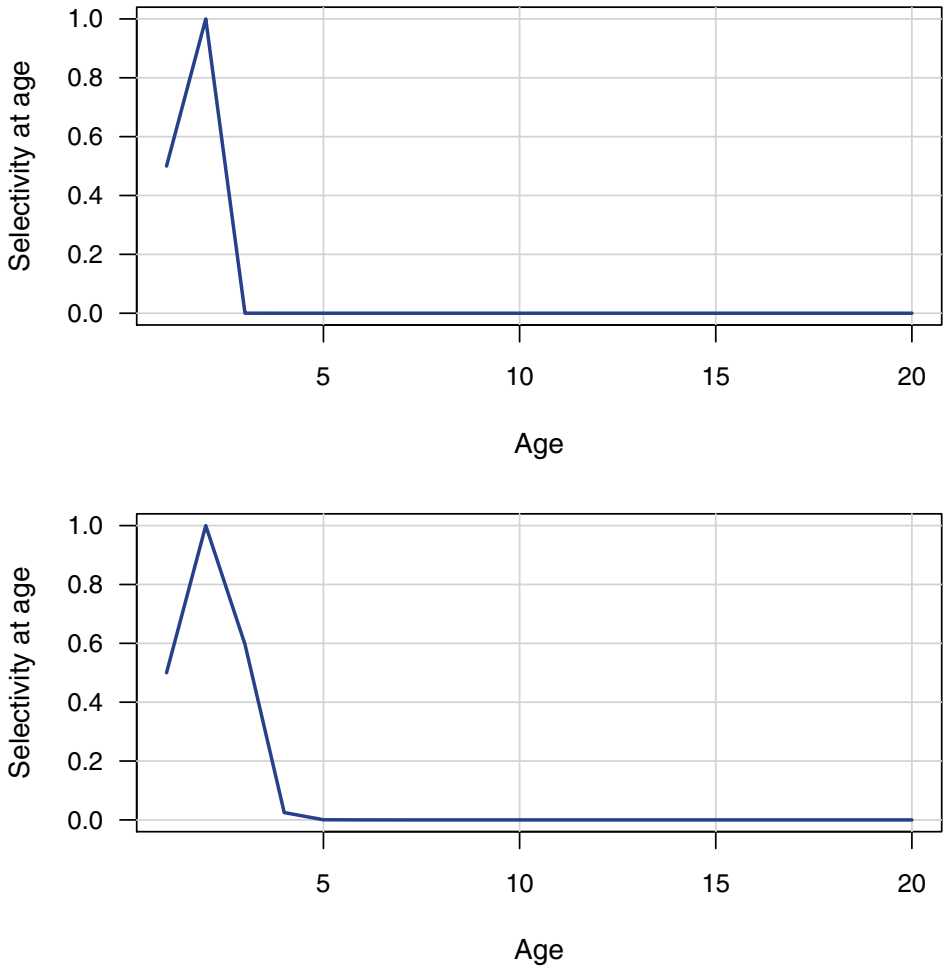


Figure 1.32. Red snapper: Average selectivities from period 3 (1992–2006, 20-inch limit), weighted by geometric mean Fs from the last three assessment years. and used in computation of benchmarks and projections. Top panel – Average selectivity applied to landings. Middle panel – Average selectivity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

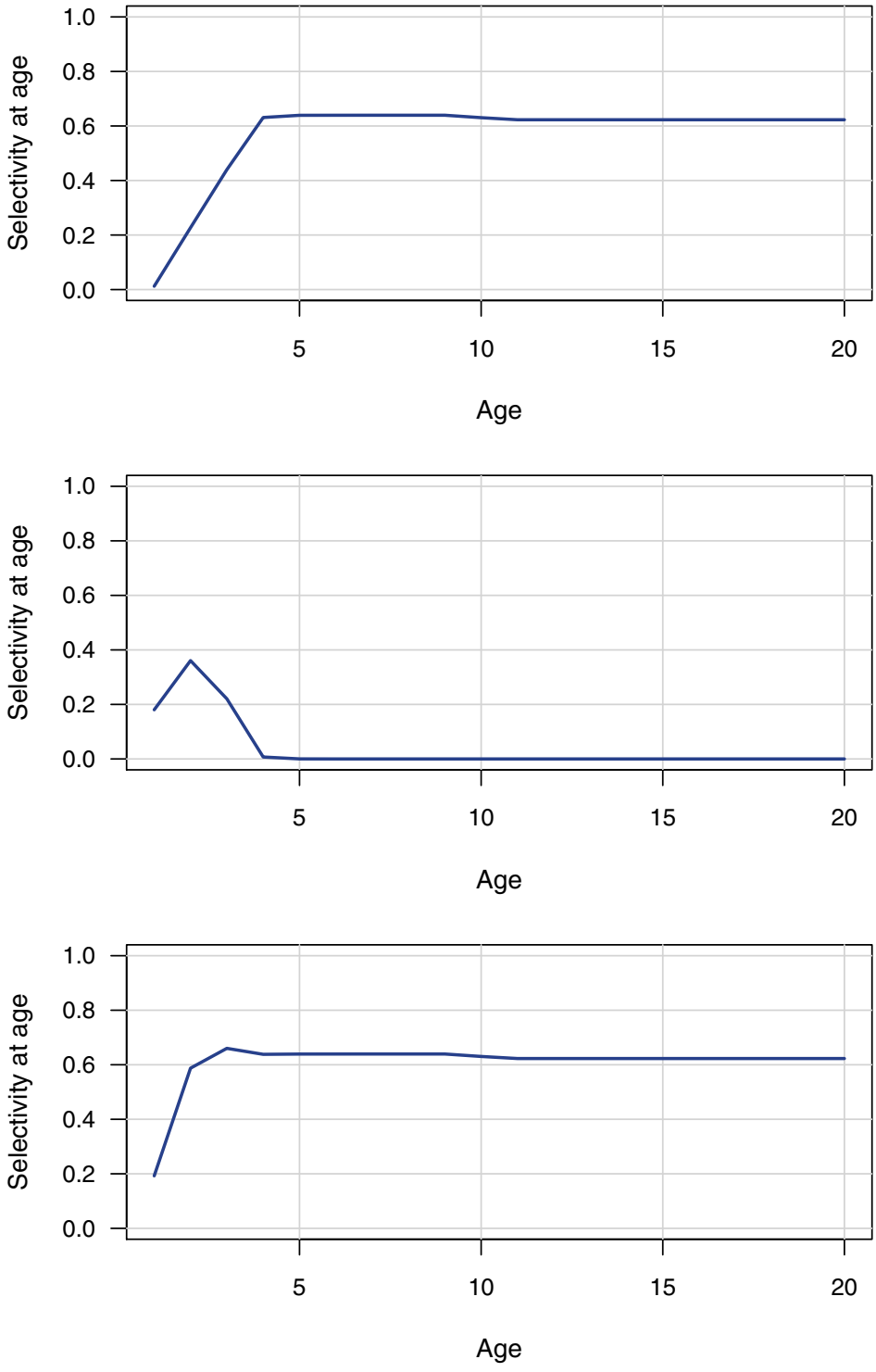


Figure 1.33. Red snapper: Estimated instantaneous fishing mortality rate (per year) by fishery. c.hal refers to commercial handline, c.dv to commercial diving, hb to headboat, rec to general recreational, c.hal.D to commercial discard mortalities, c.hb.D to headboat discard mortalities, and rec.D to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

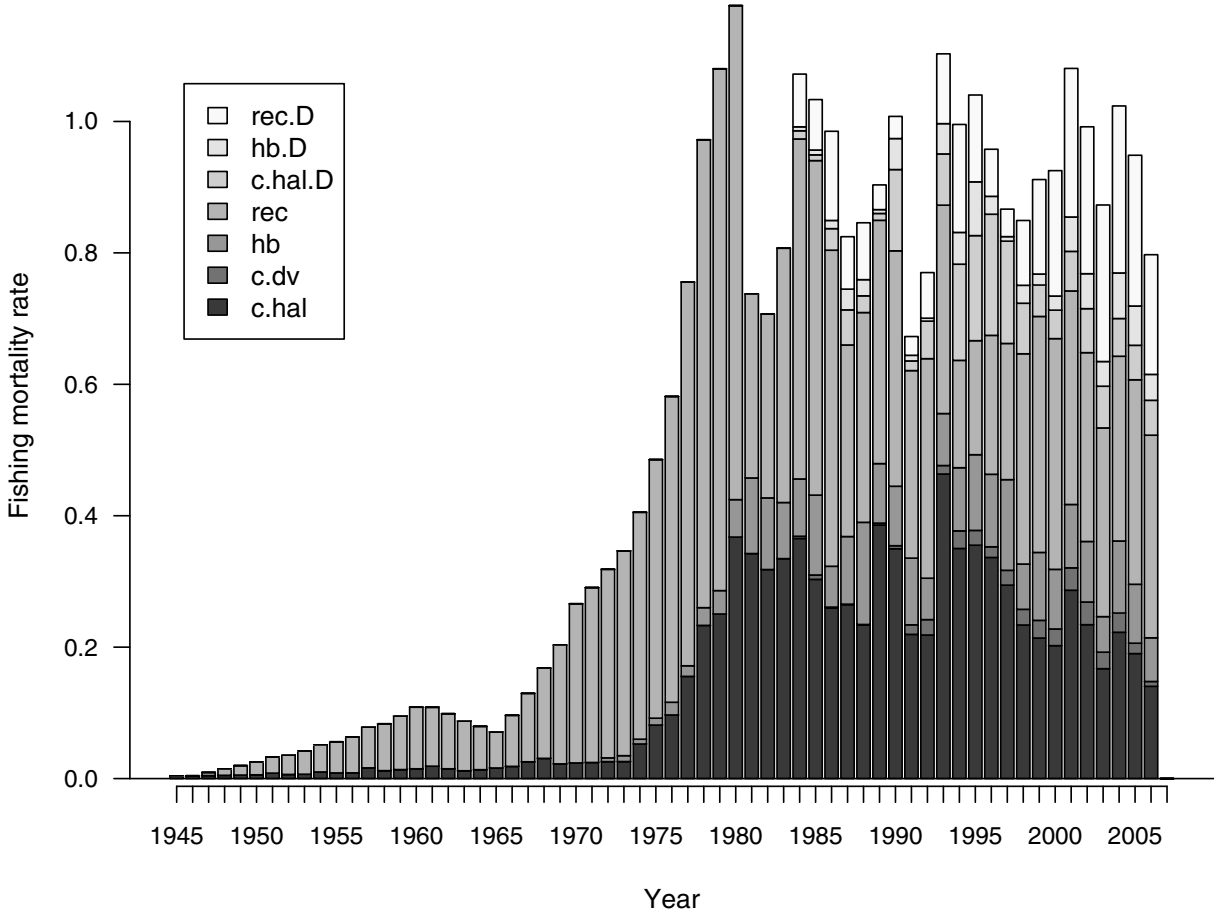


Figure 1.34. Red snapper: Estimated landings by fishery from the catch-at-age model. c.hal refers to commercial handline, c.dv to commercial diving, hb to headboat, rec to general recreational.

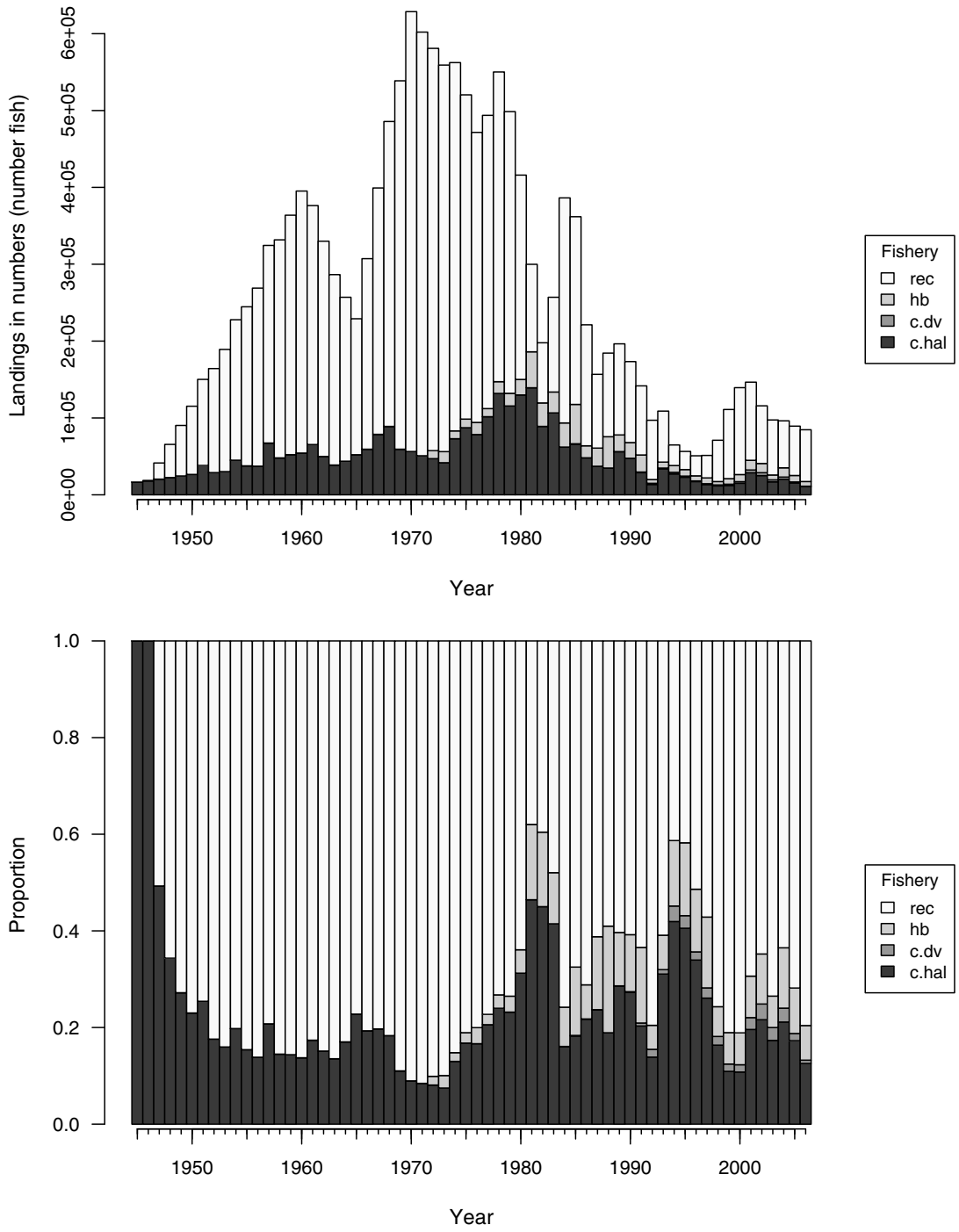


Figure 1.35. Red snapper: Estimated discard mortalities by fishery from the catch-at-age model. c.hal refers discard mortalities from commercial handline, hb from headboat, rec from general recreational.

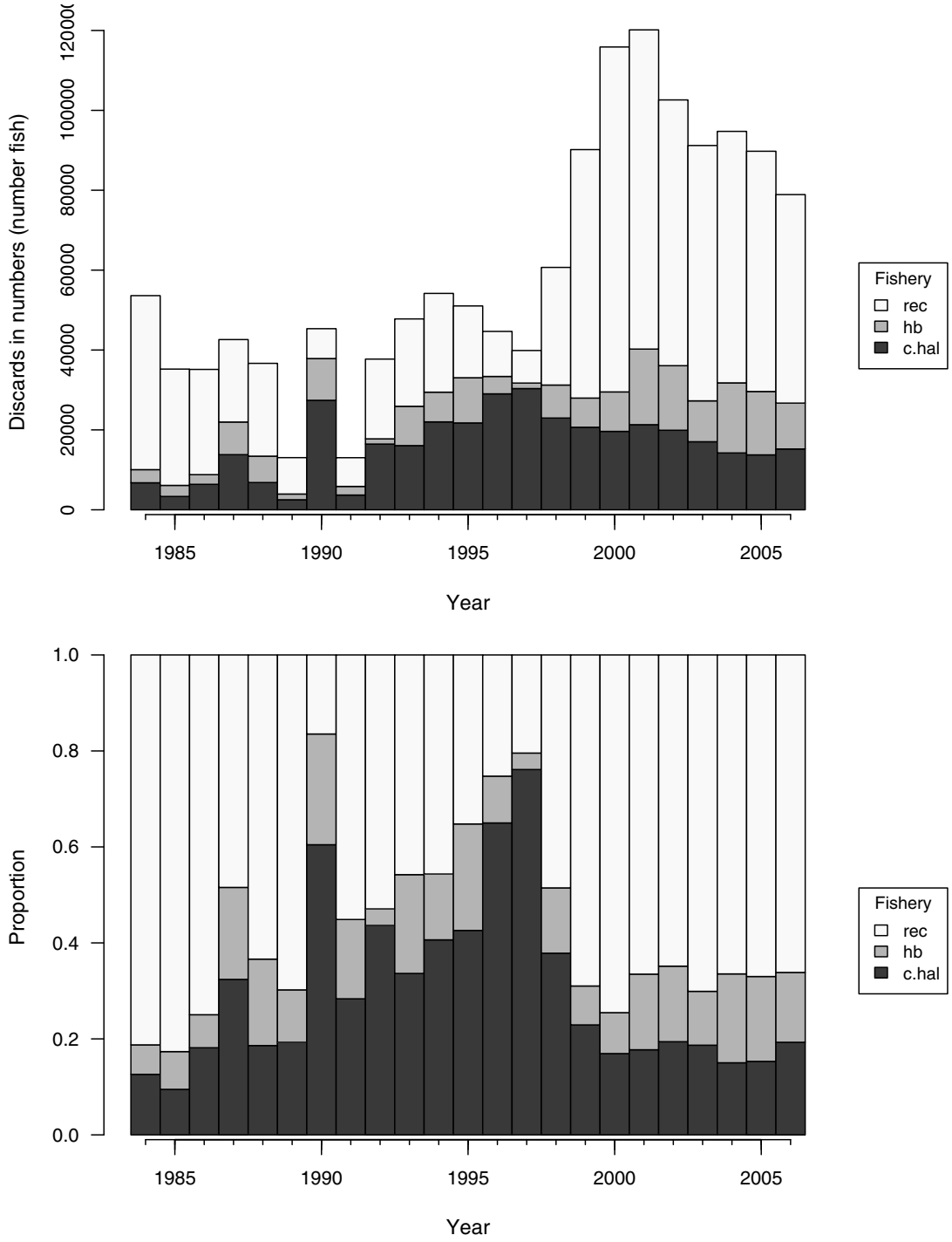


Figure 1.36. Red snapper: Estimated Beverton–Holt spawner-recruit curves, with and without lognormal bias correction.

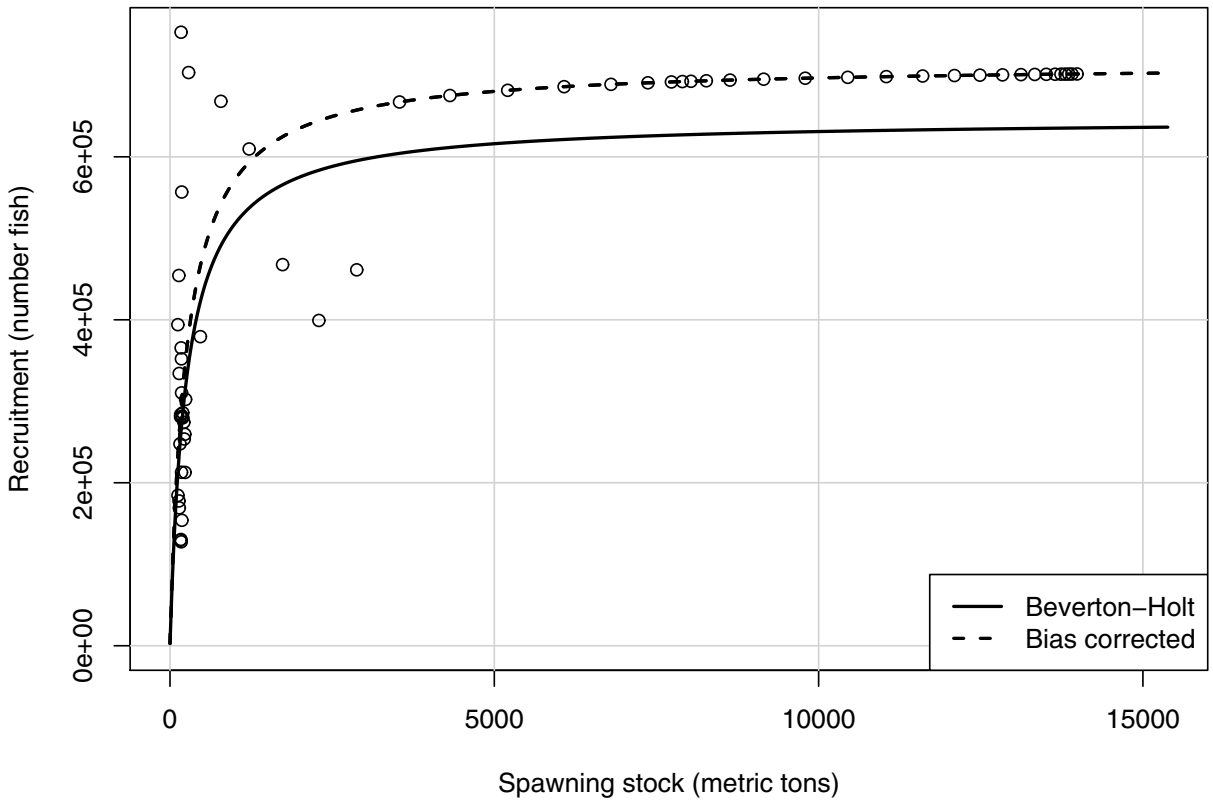


Figure 1.37. Red snapper: Relationship between %SPR and implied steepness (h), given that $F_{X\%} = F_{\mathrm{MSY}}$. SPR of $X = 40\%$ corresponds to $h = 0.68$.

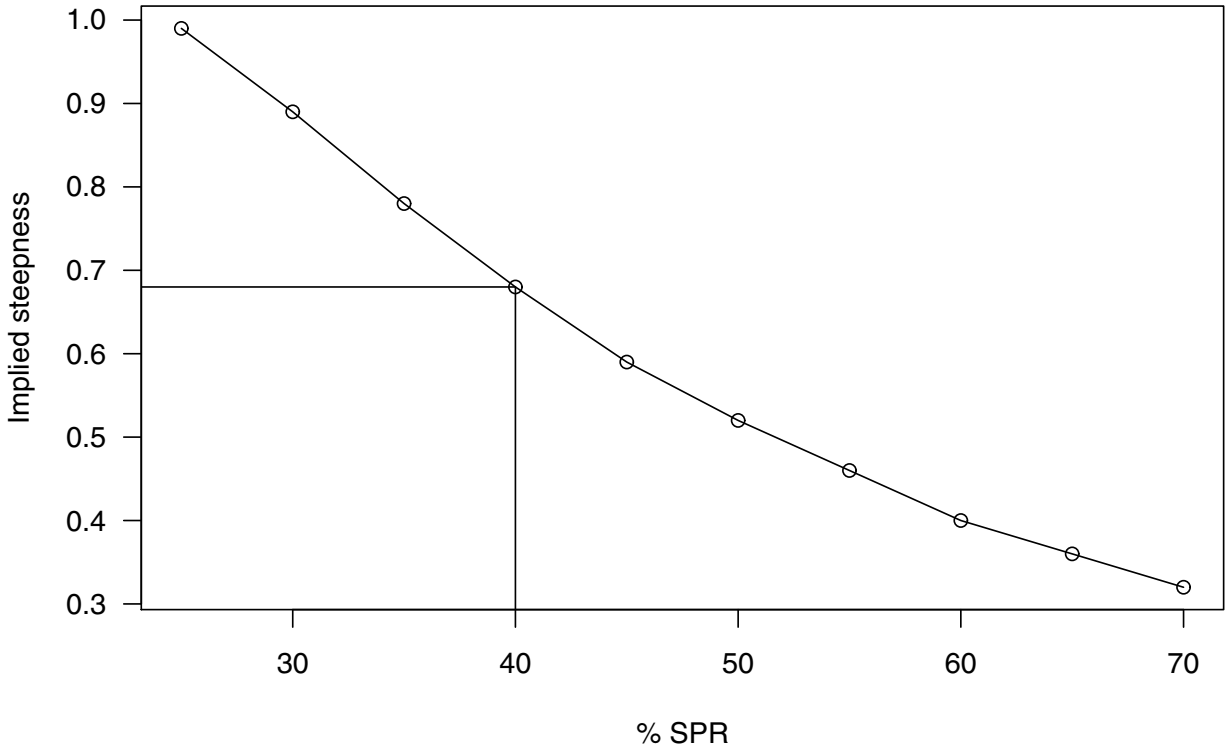


Figure 1.38. Red snapper: Estimated time series of static spawning potential ratio, the annual equilibrium spawners per recruit relative to that at the unfished level.

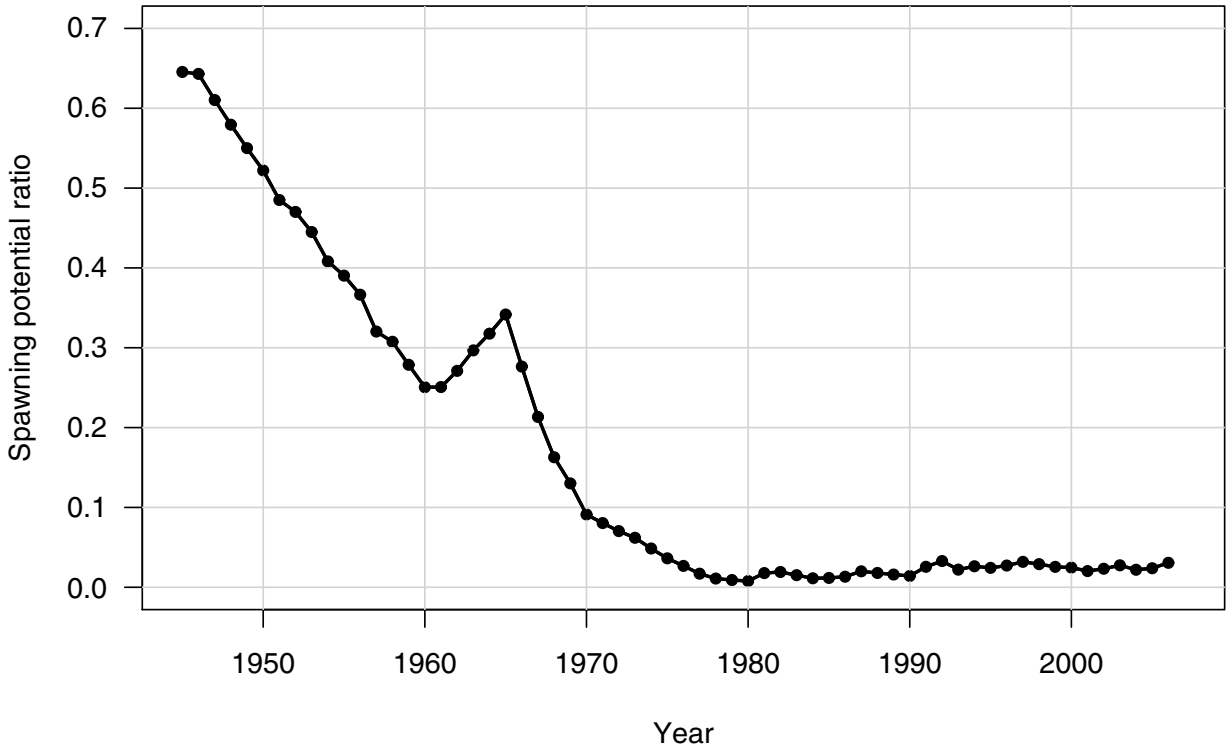


Figure 1.39. Red snapper: Top panel – Yield per recruit. Bottom panel – Spawning potential ratio (spawners per recruit relative to that at the unfished level), from which the 40% level provides $F_{40\%}$, the recommended proxy for F_{MSY}. Both curves are based on average selectivity from the end of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

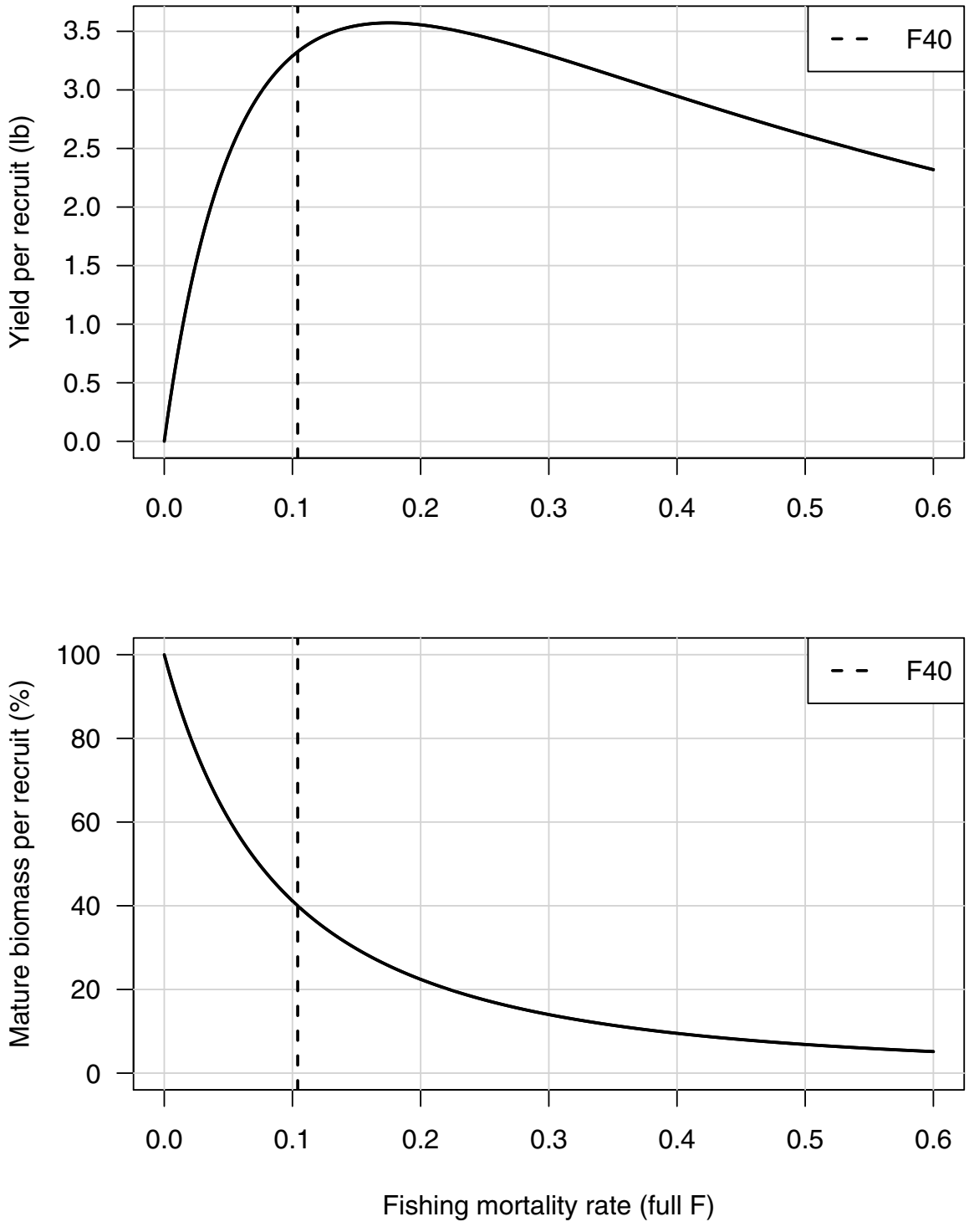


Figure 1.40. Red snapper: Top panel – Equilibrium landings. Bottom panel – Equilibrium spawning biomass. Both curves are based on average selectivity from the end of the assessment period.

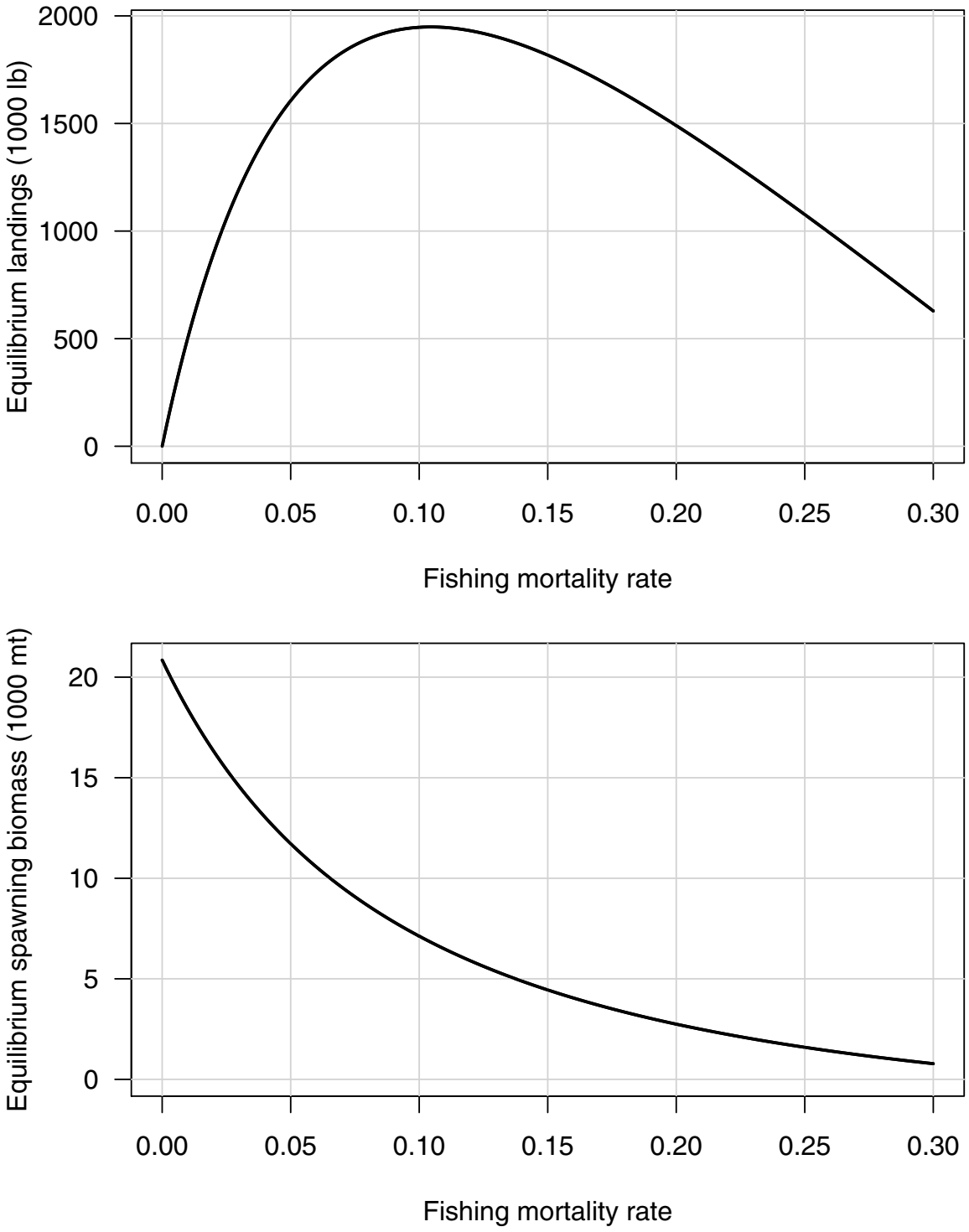


Figure 1.41. Red snapper: Top panel – Equilibrium landings as a function of equilibrium biomass, which itself is a function of fishing mortality rate. The peak occurs where equilibrium biomass is B = 15.06 1000 mt and equilibrium landings are 1949 1000 lb. Bottom panel – Equilibrium discard mortality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

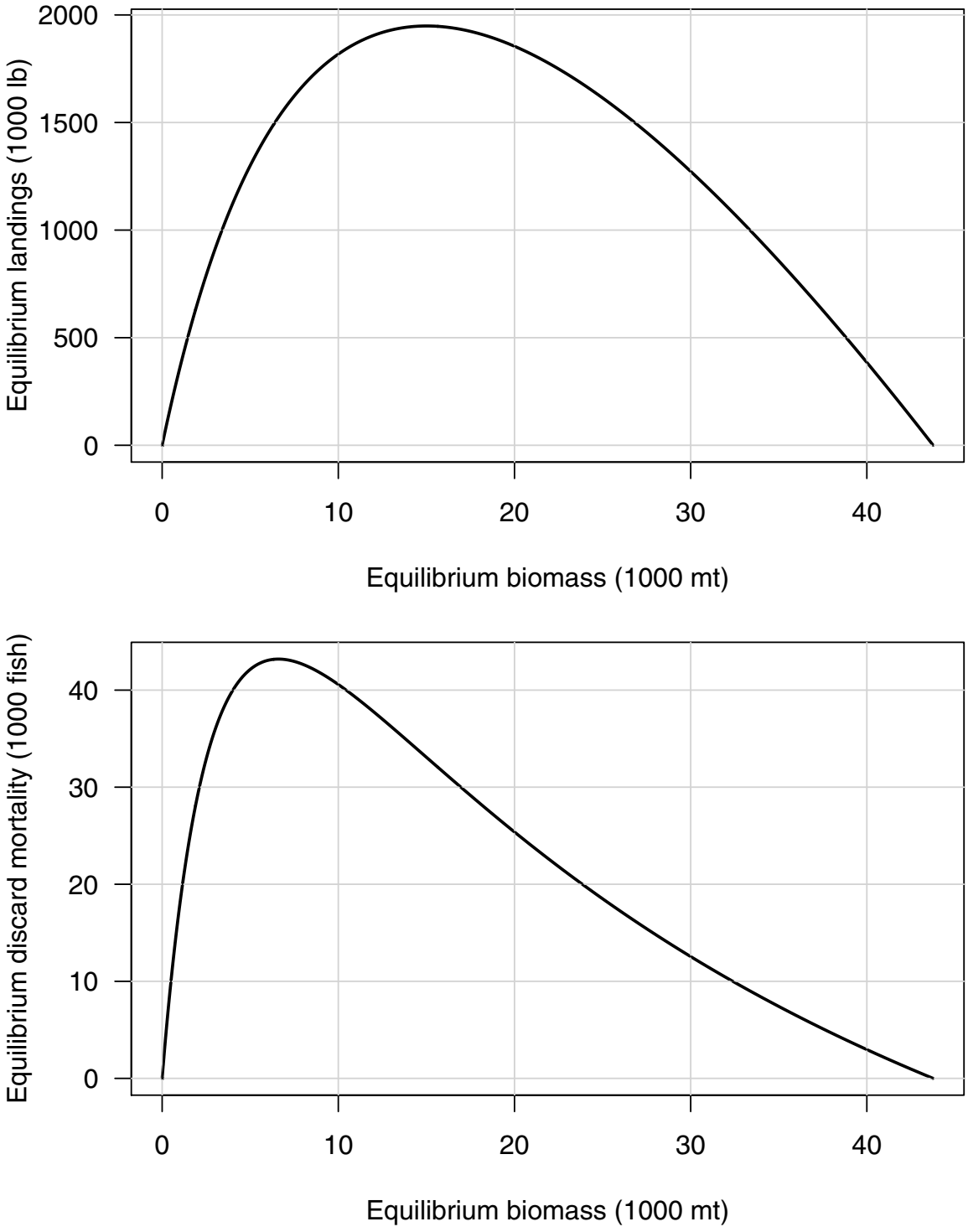
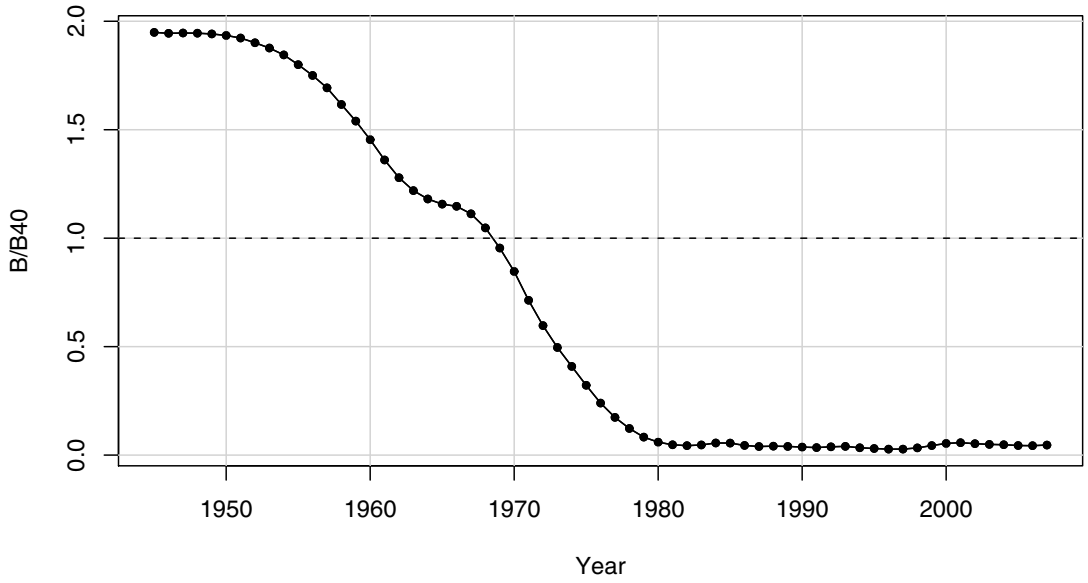


Figure 1.42. Red snapper: Estimated time series of biomass relative to reference points. Top panel – B relative to B_{MSY} proxy. Bottom panel – SSB *relative to* SSB_{MSY} *proxy. Proxies are based on* $F_{40\%}$.



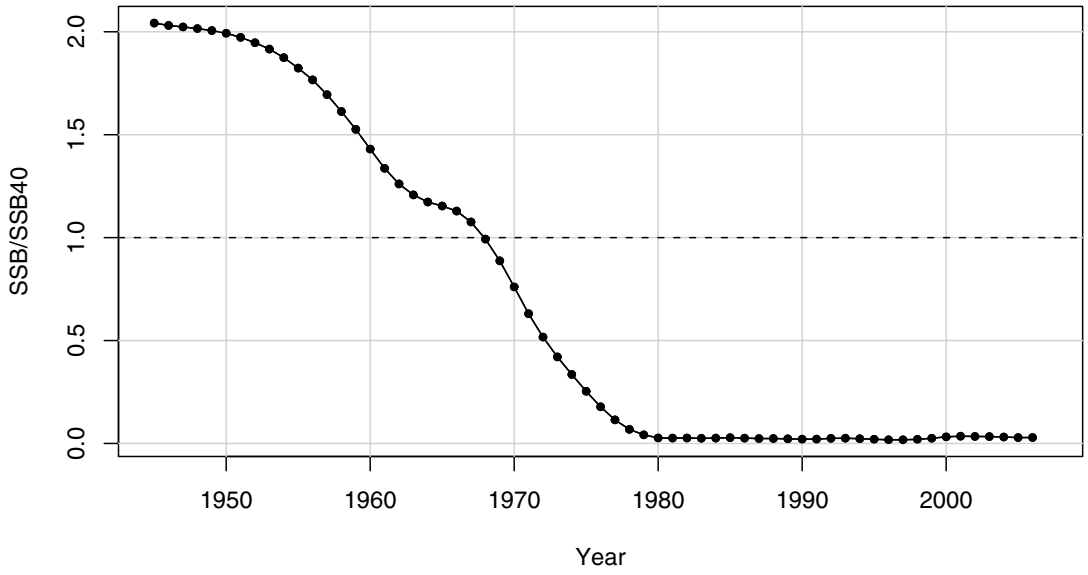


Figure 1.43. Red snapper: Estimated time series of full F relative to the F_{MSY} proxy, $F_{40\%}$.

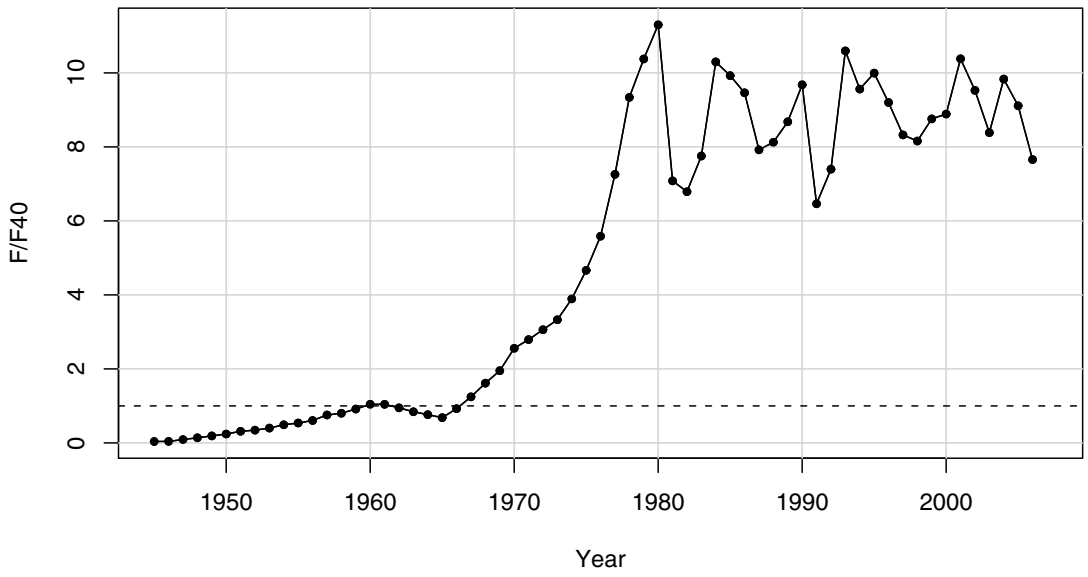


Figure 1.44. Red snapper: Projection results under scenario R1—fishing mortality rate fixed at $F = 0$. Expected values represented by dotted solid lines, and uncertainty represented by thin lines corresponding to 10^{th} and 90^{th} percentiles of 1000 replicate projections. Horizontal lines mark proxy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

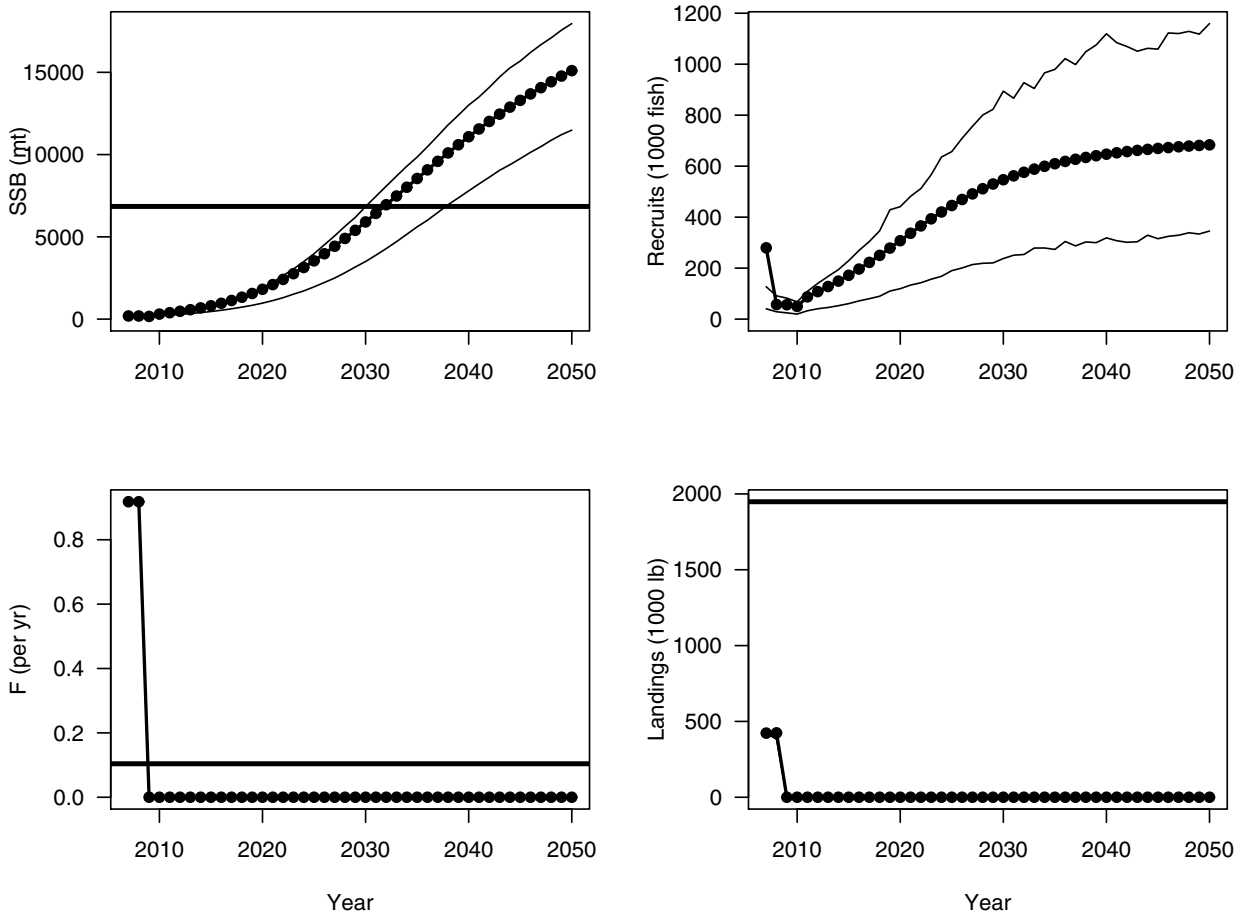


Figure 1.45. Red snapper: Projection results under scenario R2—fishing mortality rate fixed at $F = F_{40\%}$. Expected values represented by dotted solid lines, and uncertainty represented by thin lines corresponding to 10^{th} and 90^{th} percentiles of 1000 replicate projections. Horizontal lines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

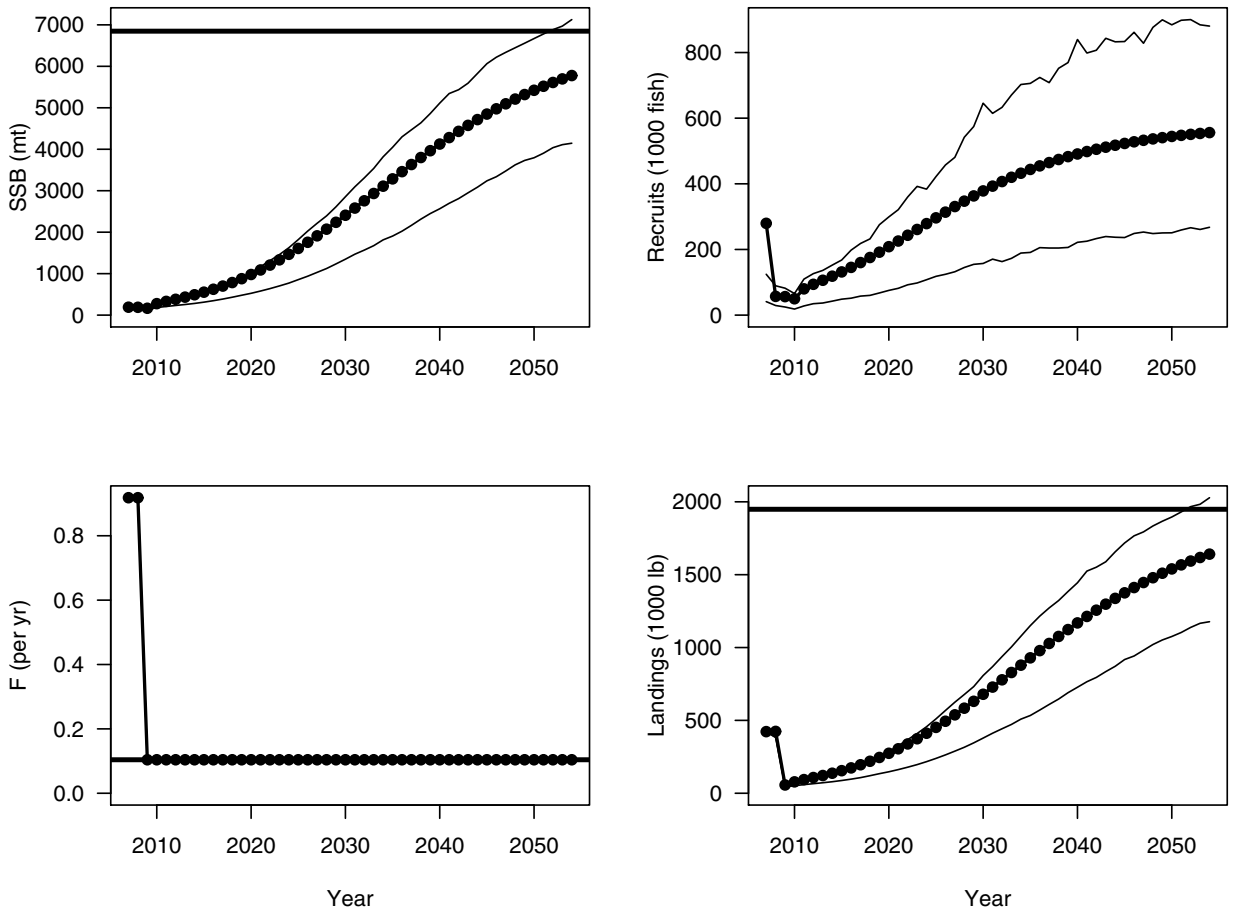


Figure 1.46. Red snapper: Projection results under scenario R3—fishing mortality rate fixed at $F = 65\%F_{40\%}$. Expected values represented by dotted solid lines, and uncertainty represented by thin lines corresponding to 10^{th} and 90^{th} percentiles of 1000 replicate projections. Horizontal lines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

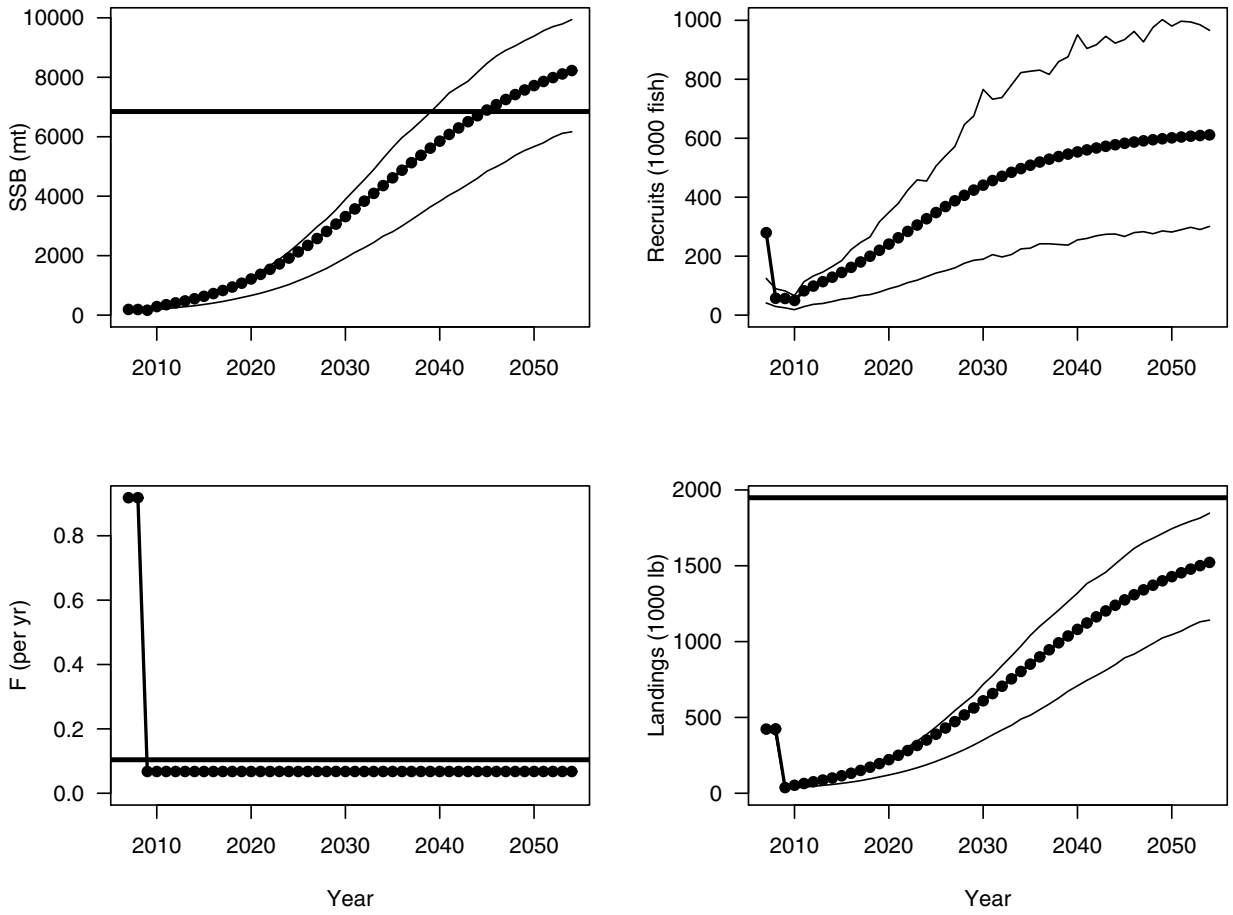


Figure 1.47. Red snapper: Projection results under scenario R4—fishing mortality rate fixed at $F = 75\%F_{40\%}$. Expected values represented by dotted solid lines, and uncertainty represented by thin lines corresponding to 10^{th} and 90^{th} percentiles of 1000 replicate projections. Horizontal lines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

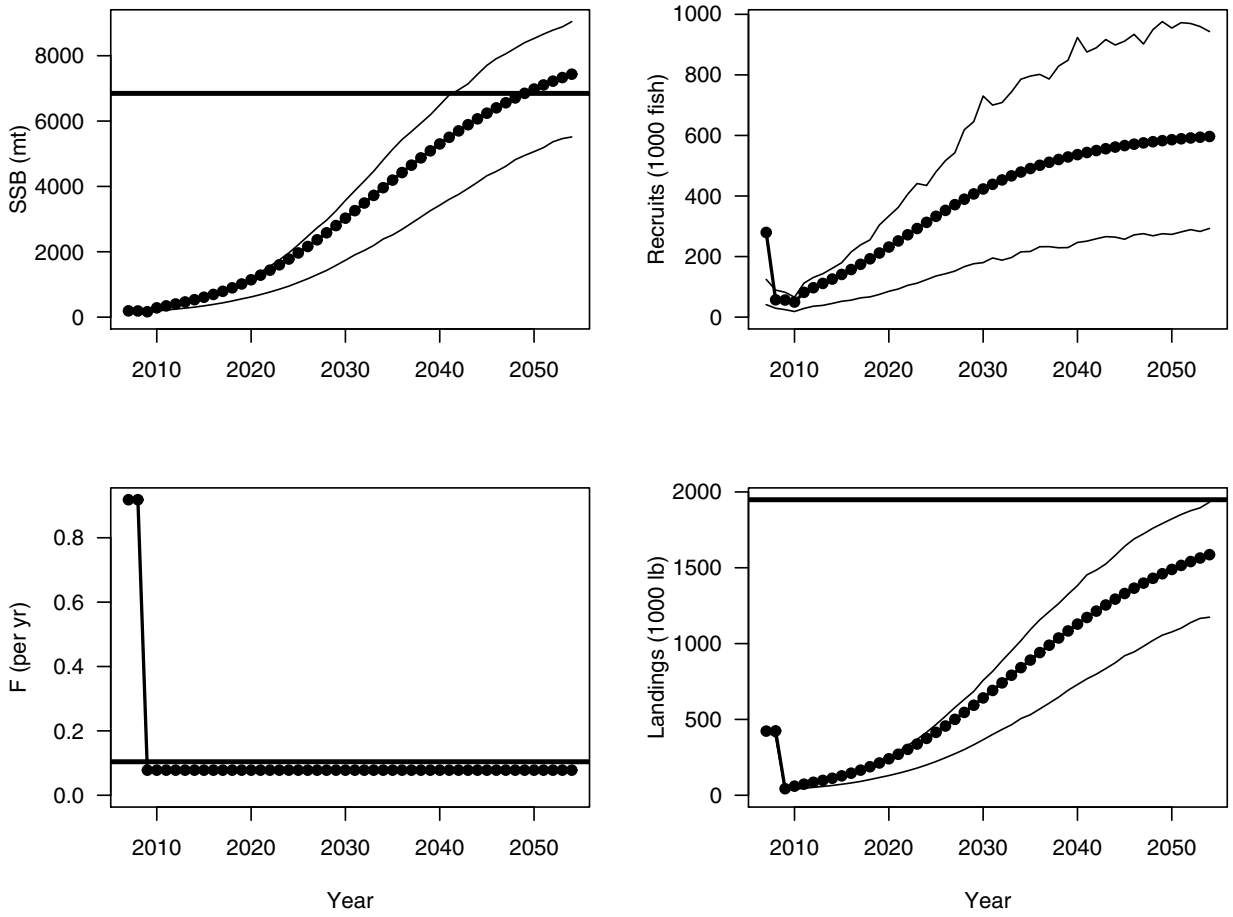


Figure 1.48. Red snapper: Projection results under scenario R5—fishing mortality rate fixed at $F = 85\%F_{40\%}$. Expected values represented by dotted solid lines, and uncertainty represented by thin lines corresponding to 10^{th} and 90^{th} percentiles of 1000 replicate projections. Horizontal lines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

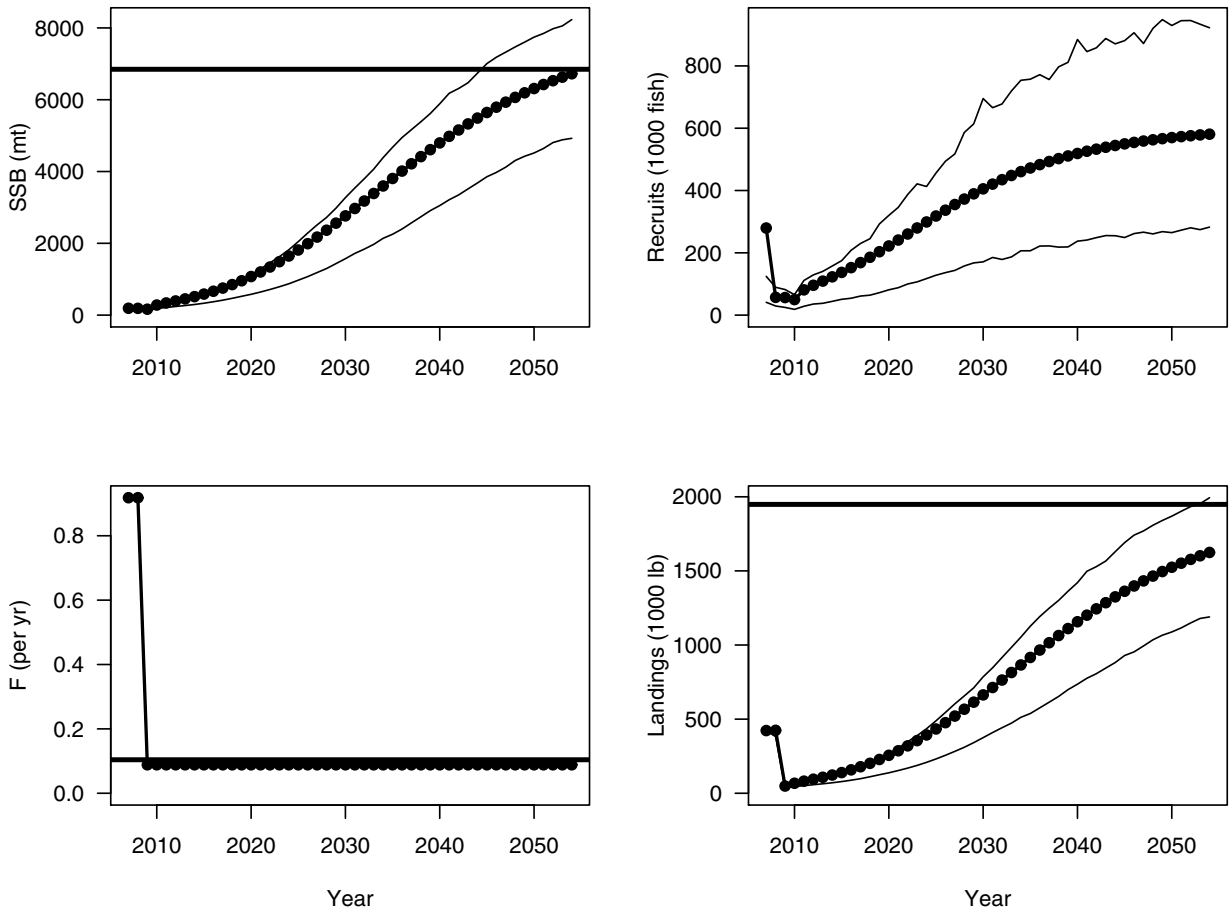


Figure 1.49. Red snapper: Projection results under scenario R6—Discard-only projection with fishing mortality rate fixed at $F = F_{\text{current}}$ minus that of commercial diving, and with release mortality rates of 0.9 in the commercial sector and 0.4 in the headboat and general recreational sectors. 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.*

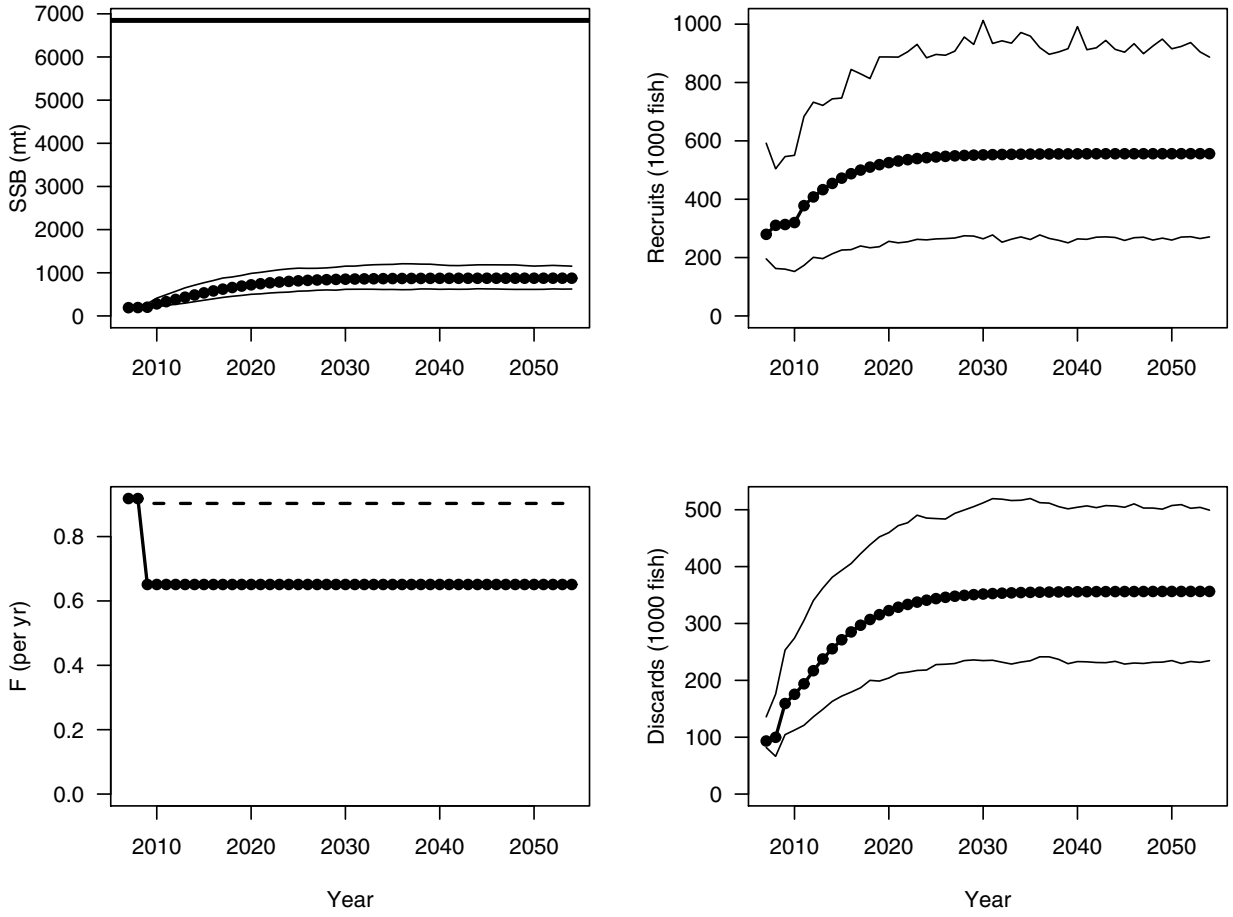


Figure 1.50. Red snapper: Projection results under scenario R7—Discard-only projection with fishing mortality rate fixed at $F = F_{40\%}$, and with release mortality rates of 0.9 in the commercial sector and 0.4 in the headboat and general recreational sectors. Expected values represented by dotted 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.*

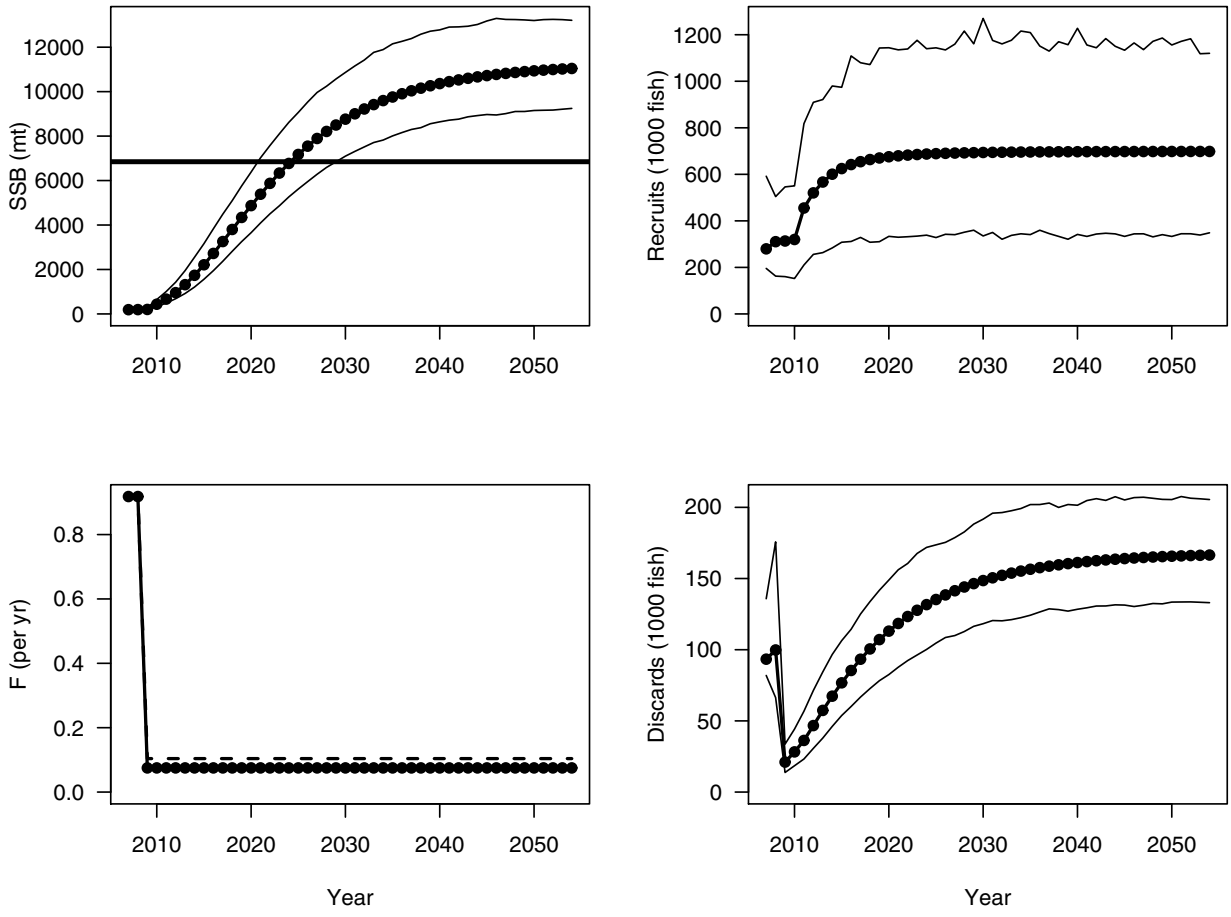


Figure 1.51. Red snapper: Projection results under scenario R8—Discard-only projection with fishing mortality rate fixed at $F = 65\%F_{40\%}$, and with release mortality rates of 0.9 in the commercial sector and 0.4 in the headboat and general recreational sectors. Expected values represented by dotted 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.*

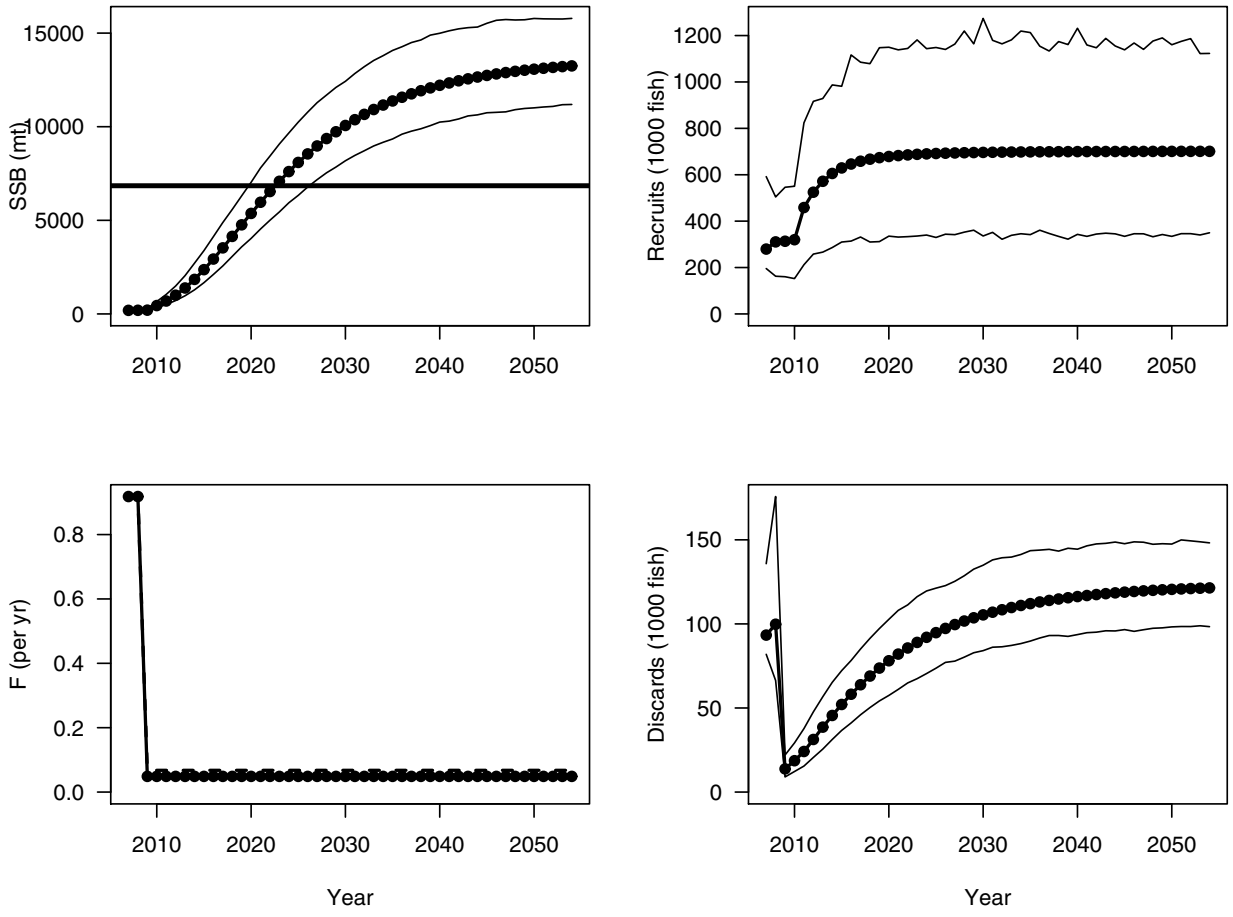


Figure 1.52. Red snapper: Projection results under scenario R9—Discard-only projection with fishing mortality rate fixed at $F = 75\%F_{40\%}$, and with release mortality rates of 0.9 in the commercial sector and 0.4 in the headboat and general recreational sectors. Expected values represented by dotted 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.*

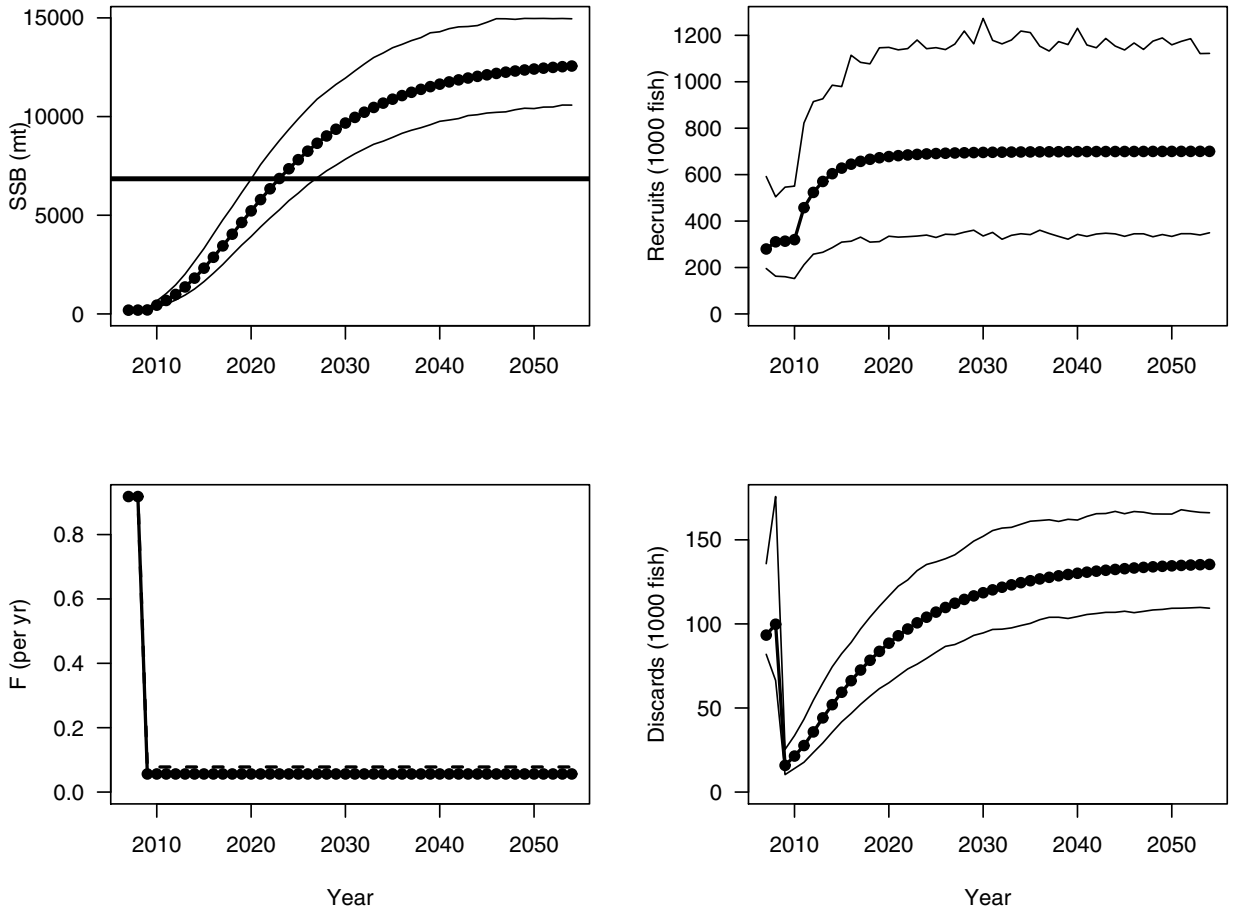
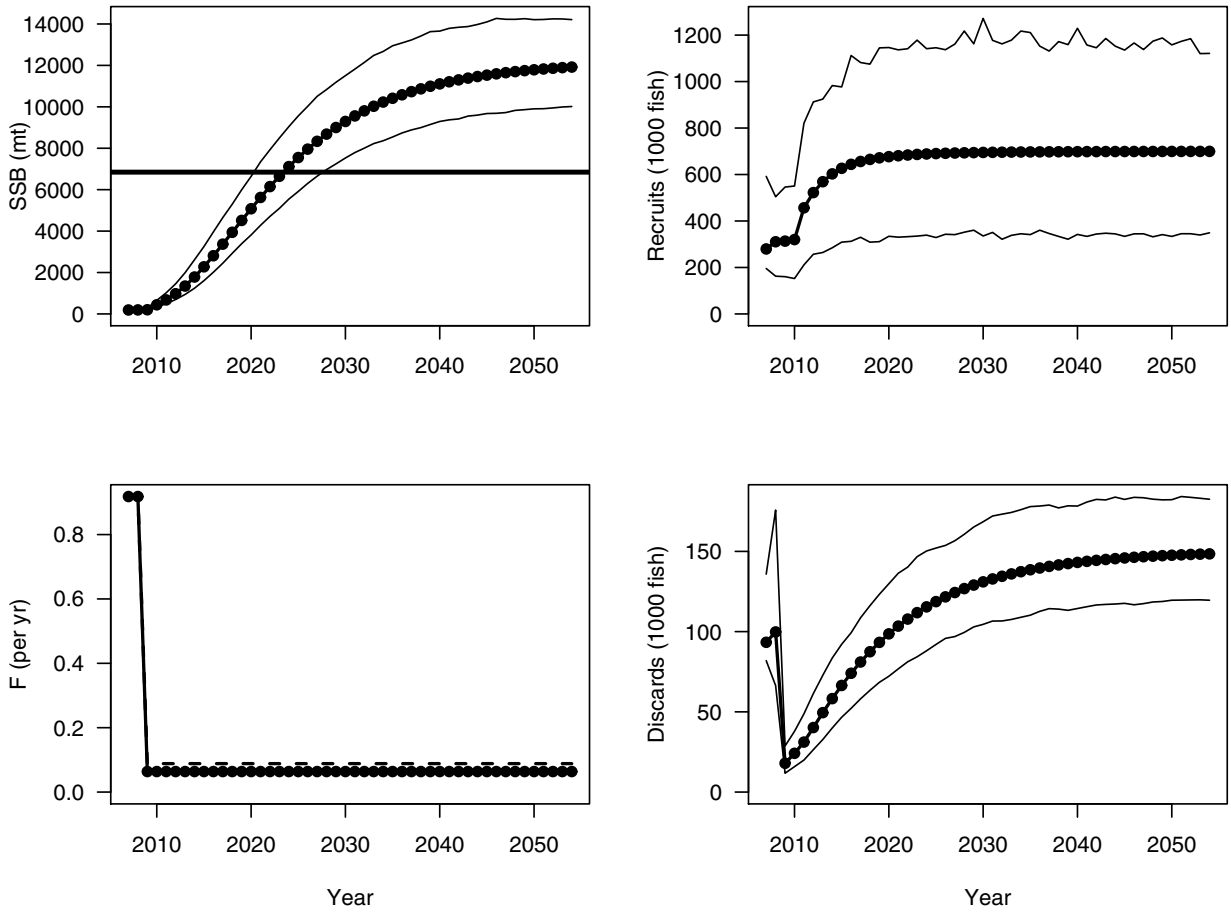


Figure 1.53. Red snapper: Projection results under scenario R10—Discard-only projection with fishing mortality rate fixed at $F = 85\%F_{40\%}$, and with release mortality rates of 0.9 in the commercial sector and 0.4 in the headboat and general recreational sectors. Expected values represented by dotted 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

```
# Number of parameters = 312  Objective function value = 16047.2  Maximum gradient component = 0.408814
# log_len_cv:
-2.15769619869
# log_R0:
13.3663543952
# steep:
0.949999990955
# log_dev_N_rec:
 -0.254996750809 -0.379623311925 -0.190213311866 0.126354890662 0.307816649257 -0.107892334307 0.708337402028
 -0.581067147162 0.138705887356 0.714856182239 1.05046399868 -0.236659635159 -0.00445886982242 0.272310526845
 0.0945005186071 0.0992925535824 0.00206039952609 0.351802375567 -0.336019242408 -0.696032633046 -0.734372395946
 -0.662683327319 -0.266375829826 -0.145316308582 0.619815983919 0.683780452813 0.324317778988 -0.180338786149
 -0.0514184989972 -0.384819830466 -0.177554030848 -0.0862797498879
-0.0182936055461
# R_autocorr:
0.362286381914
# selpar_slope_commHAL2:
11.9999994962
# selpar_L50_commHAL2:
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# selpar_slope_commHAL3:
4.35161494456
# selpar_L50_commHAL3:
3.21259302029
# selpar_slope_commDV1:
2.73640926278
# selpar_L50_commDV1:
3.26229726579
# selpar_slope2_commDV1:
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# selpar_L502_commDV1:
6.71805072022
# selpar_slope_HB1:
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# selpar_L50_HB1:
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# selpar_L50_HB2:
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# selpar_slope_HB3:
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# selpar_L50_HB3:
2.98062105069
# selpar_L50_MRFSS2:
1.04211026702
# selpar_slope_MRFSS3:
4.04022573166
# selpar_L50_MRFSS3:
1.80753810057
# log_q_HAL:
-6.29480137989
# log_q_HB:
-12.4528223070
# log_q_MRFSS:
-12.6107857200
# log_avg_F_commHAL_2:
-2.84382366203
# log_F_dev_commHAL_2:
 -2.70518932319 -2.61500799099 -2.53350184153 -2.45662698816 -2.38348677013 -2.31289280525 -1.94786741593
 -2.22015591710 -2.16684835152 -1.75127360863 -1.90861938564 -1.89724760578 -1.27197595025 -1.57188760016
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  -1.14031084165 -0.822322652289 -0.636394842197 -0.955194934911 -0.892636888258 -0.863212050378
  -0.813662740763 -0.809411614239 -0.100532006040 0.336038966304 0.508870167136 0.982954023507
1.38769684924 1.45937415716 1.84291157802 1.77221077801 1.69853429937 1.74926350171 1.83700399640
1.65019681303 1.49532493258 1.51420897721 1.39067581853 1.89159470890 1.79320185795 1.32704705427
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1.30141332180 1.24574427330 1.59406771349 1.39218834672 1.05542767930 1.34146239414 1.18412378766 0.880611018632
# log_avg_F_commDV:
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# log_F_dev_commDV:
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 0.319346741506 0.795654092219 0.198113449162 0.928882952895 0.752092959830 0.427583741678 0.755648637503
 0.811687368351 0.931529871498 0.874348378219 1.16925731663 1.18122804200 0.863650862291 1.01726049031
 0.403665484011 -0.364870081353
# log_avg_F_HB:
-2.82723502465
# log_F_dev_HB:
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 -0.507905201989 -0.0387359465089 0.664305064916 0.610557009507 0.366692400050 0.388186364742 0.719967407644
 0.0488017507856 0.552573481435 0.965683988884 0.425932167222 0.424645151336 0.539308884130 0.0628489164229
 0.290203851827 0.484468711448 0.665993475287 0.622868715367 0.846562379817 0.152024777047 0.557894724710
 0.427257469431 0.488812764329 0.442468046121 -0.0894885178072 0.616539293286
0.415216573592 0.116407250062
# log_avg_F_MRFSS:
-1.82889351083
# log_F_dev_MRFSS:
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 -1.36616247166 -1.22107346737 -1.08408758540 -0.947805187885 -0.811721397585 -0.676970953948 -0.538767735985
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 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
```