NOAA FISHERIES

SEDAR 76 Update

April 2025

Summary

- April 2023 - SEDAR76 Overfished & overfishing using F_{MLY} (Maximum Landed Yield), mean recruitment model
- July 2023 – Fit to 2022 landings/discards, F landings & discards projections assume reduction in both, $F_{0.1}$ reference point
  - Concerns over high 2022 Fs, use average F for projections
- October 2 2023 – Change SPR calculation to mature biomass and used 40%, use new P^{*}=30%, projections with current discard F levels
- October 24 2023 – SPR 40% overfished, not overfishing, rebuilding projections 10 year time frame, short-term, long-term and autocorrelated recruitment scenarios $F_{Discards}=F_{current}$ and $F_{Landings}=0$

Summary Continued

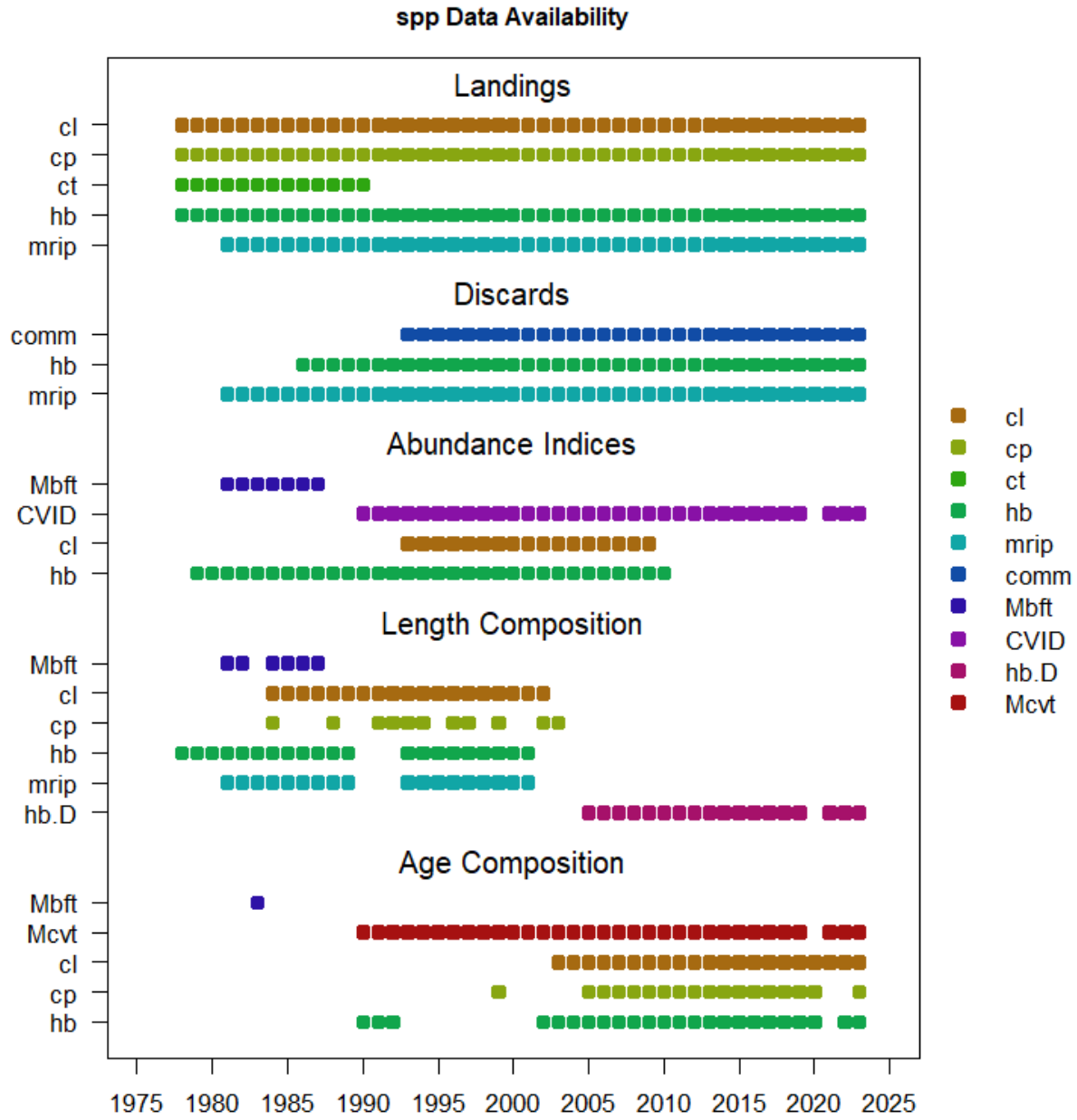
- February 2024 - OFL scenario: Long-term recruitment $F_{Discards}=F_{current}$ $F_{Landings}$ that gives 70% probability rebuild in 10 years; ABC scenario: same as OFL but recent average recruitment
- March 2024 – Presented projections to Council
- July 2024 – Council requested for 11”, 12” and 13” minimum size limits and scenario where discard F is reallocated to landings F (Closed season and show recreational discards exceed allocation)
- October 2024 – Concluded projections do not match trends observed for 2022 and 2023, requested ‘enhanced projections’ using all available data to provide ABC and OFL projections

SEDAR 76 Update

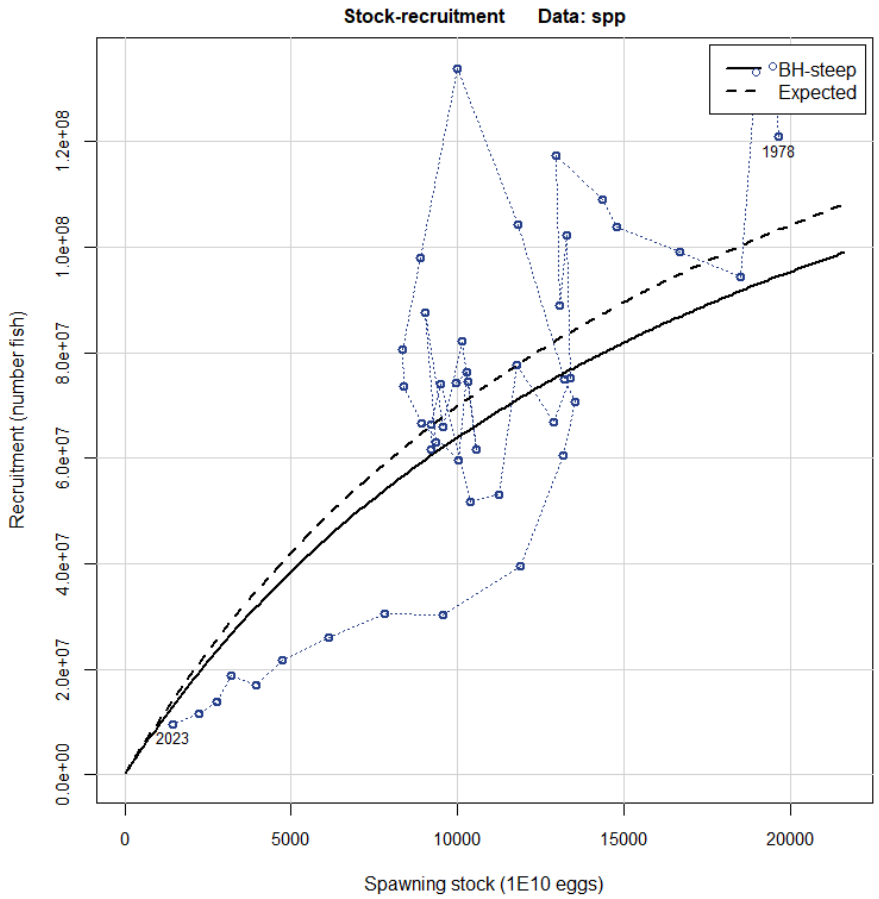
- Minor changes:
  - Data processing (e.g., length & age compositions)
  - Terminal year 2023
- Major model changes
  - General recreational and headboat fleets share selectivity curve
  - Use Beverton-Holt stock recruitment relationship
  - Estimate steepness of BH SRR
  - Recruitment in last 2 years (2022-2023) calculated by BH SRR and mean recruitment deviate from 2014-2021
  - Reference points from F_{MSY} for total harvest in weight (landings and discards)

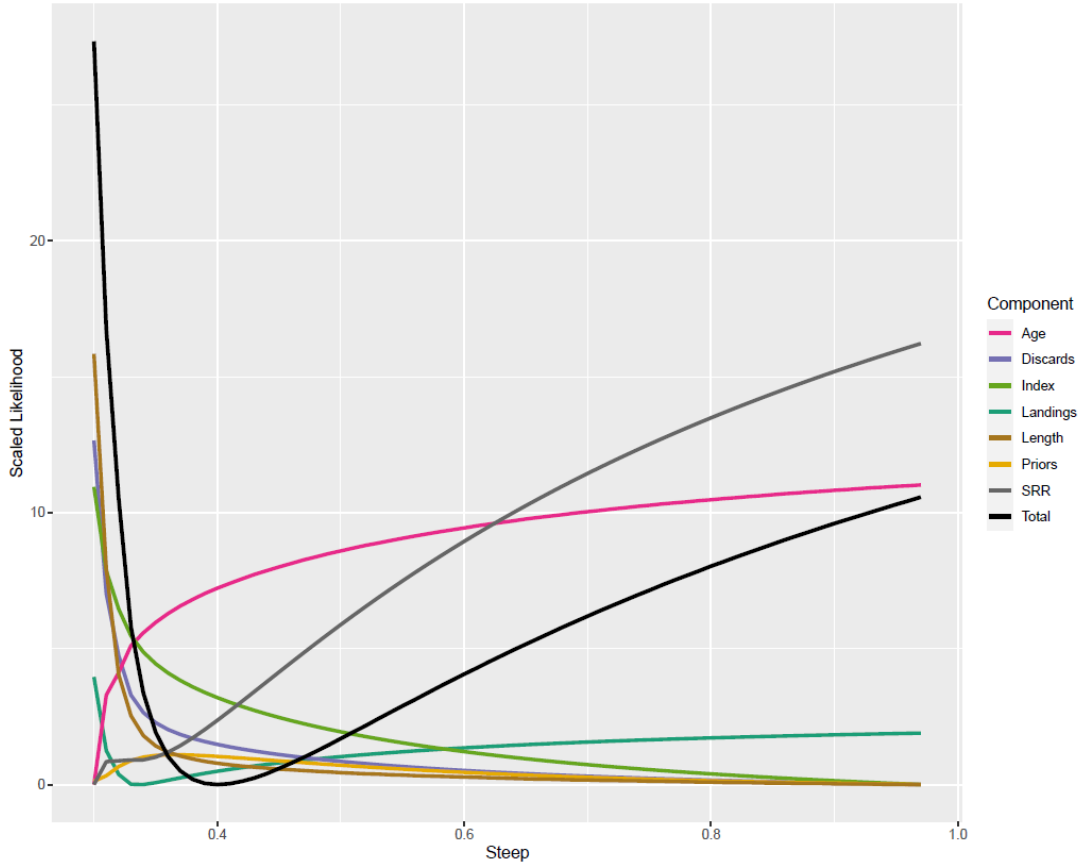
Updated data

- New terminal assessment year of 2023
- Landings and discards available for all fleets
- Updated CVID index
- Age and length compositions updated
  - Methods changed to follow SEDAR 56 methods that were incorrectly implemented in SEDAR 76

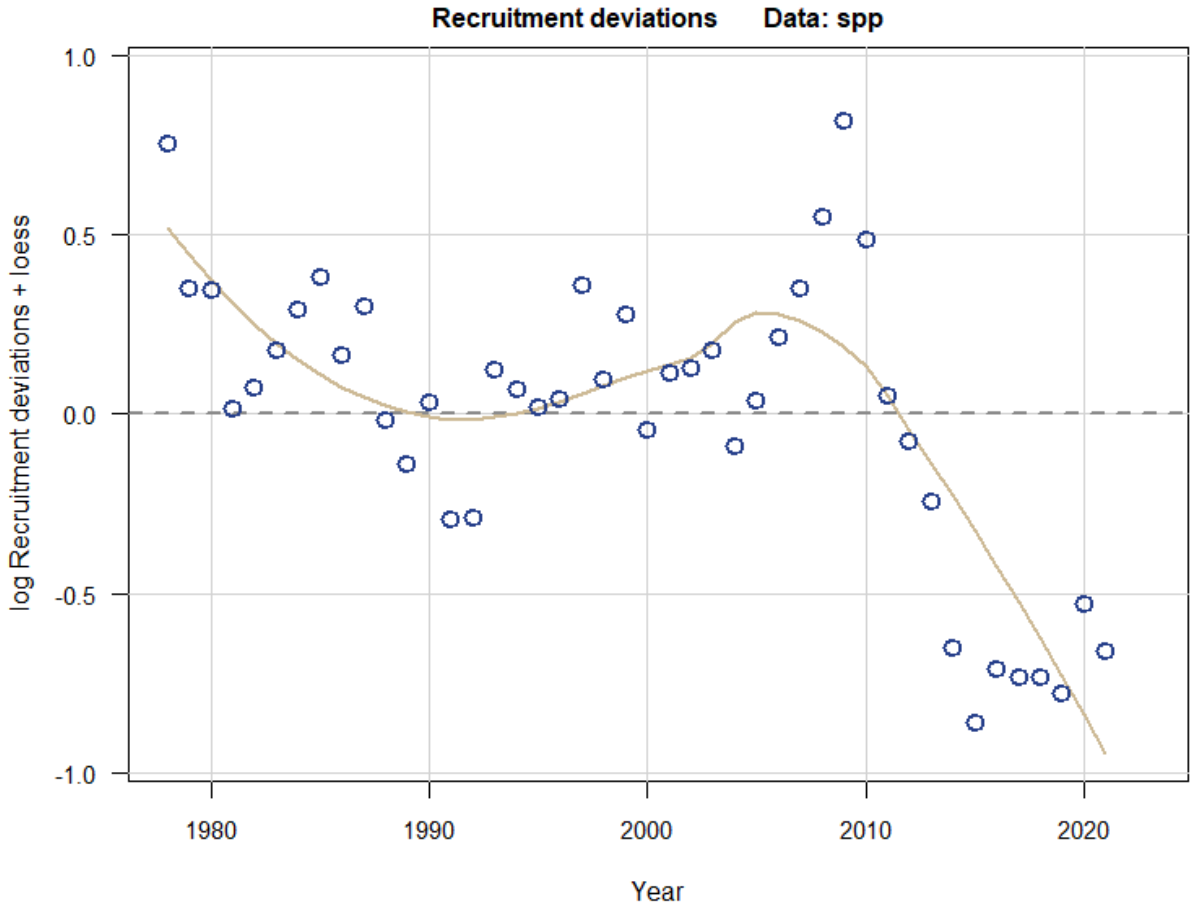


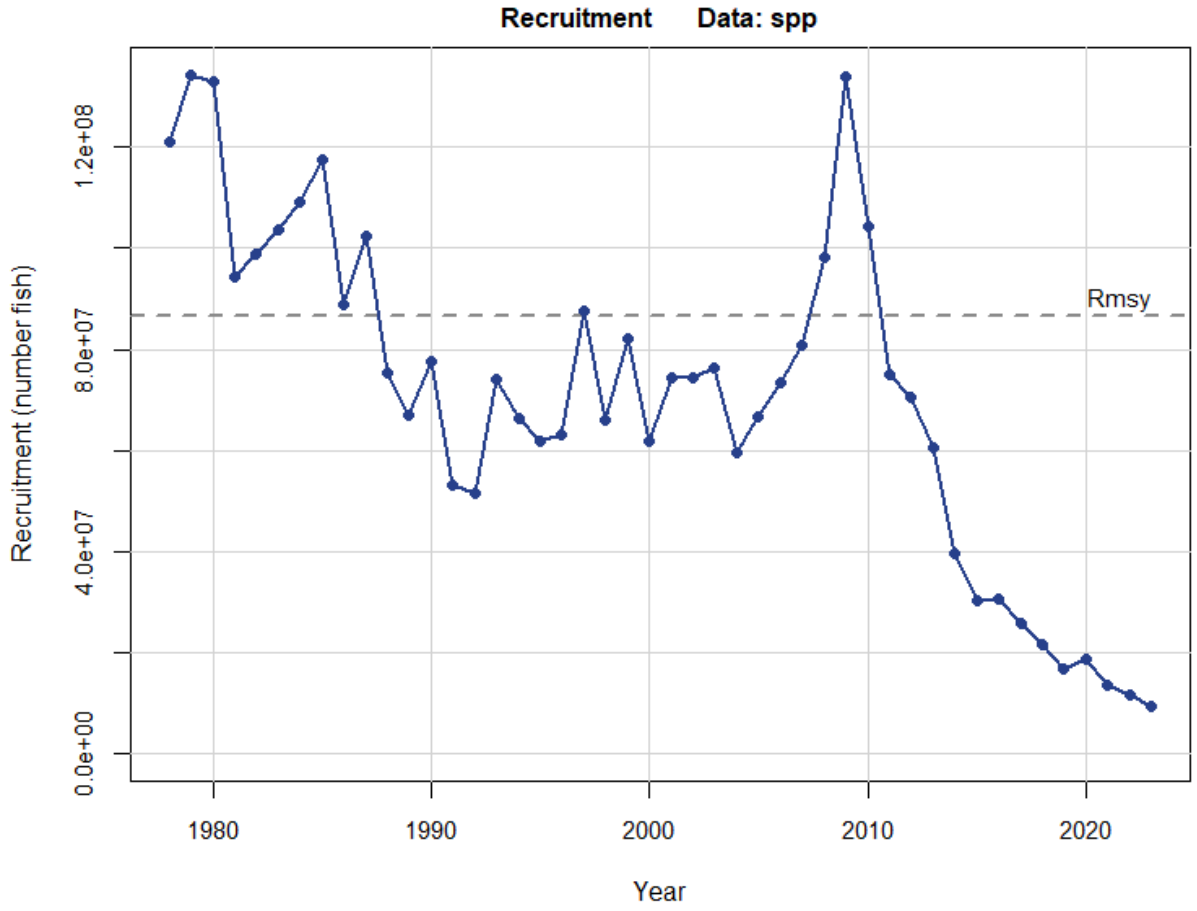
Beverton-Holt Stock Recruitment Relationship





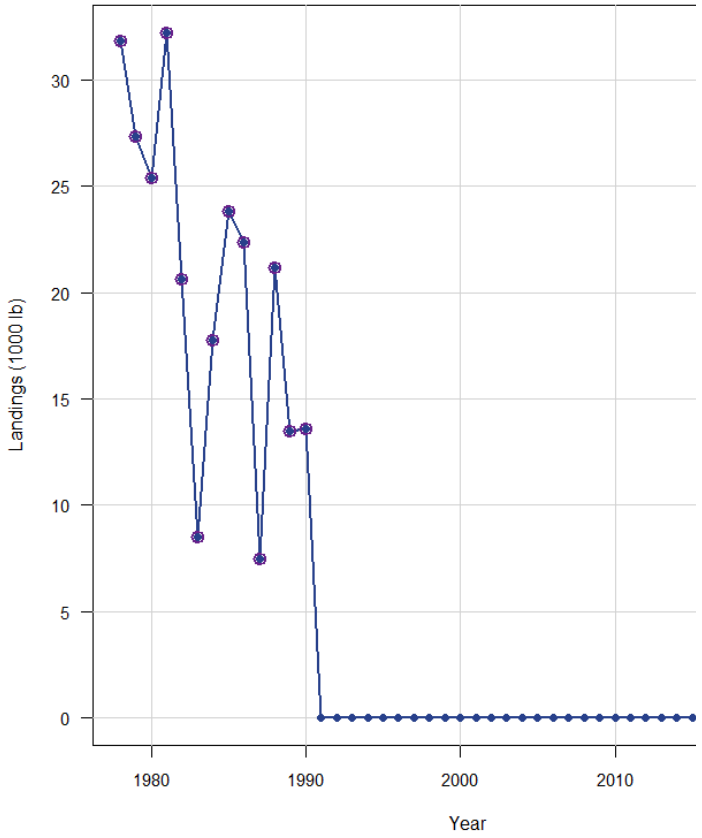
BAM base model – Recruitment



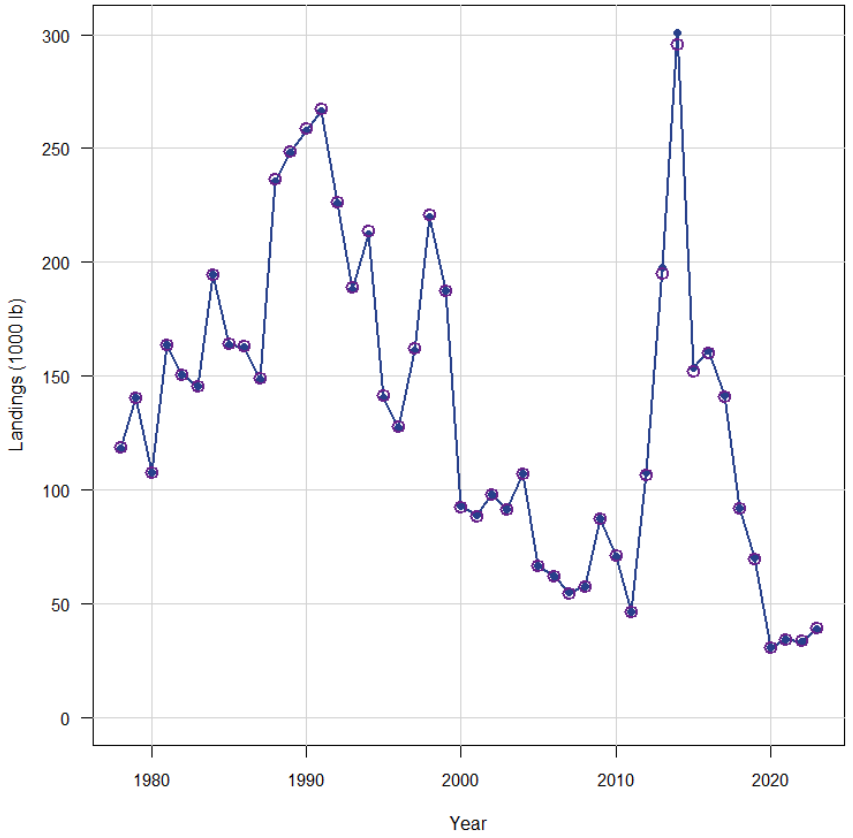


BAM base model – fits to comm landings

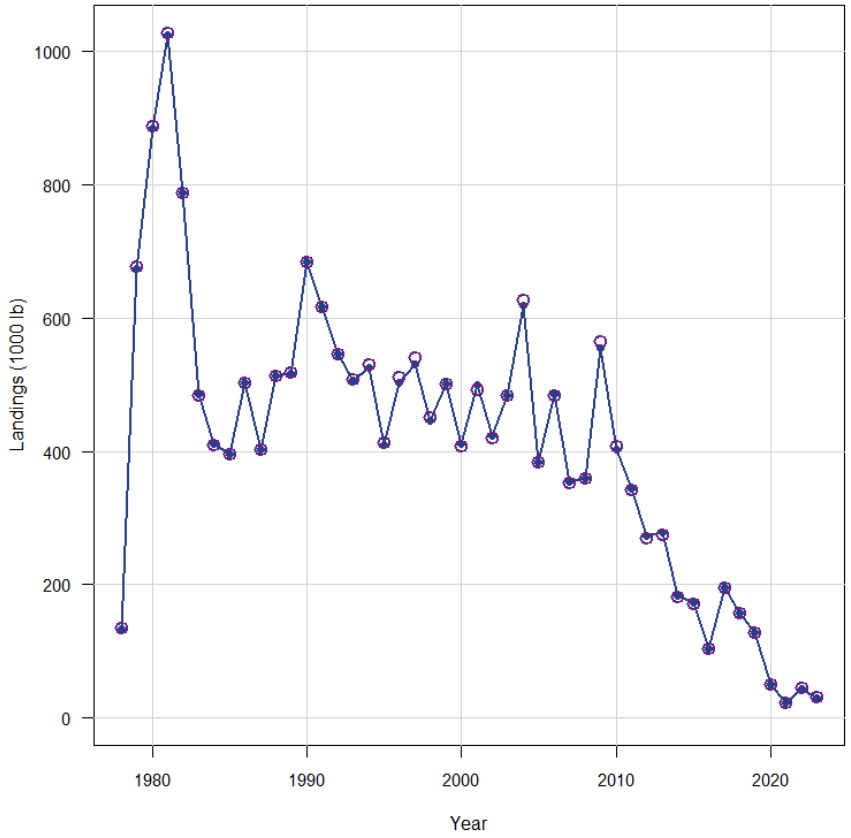
Commercial trawl



Commercial handline

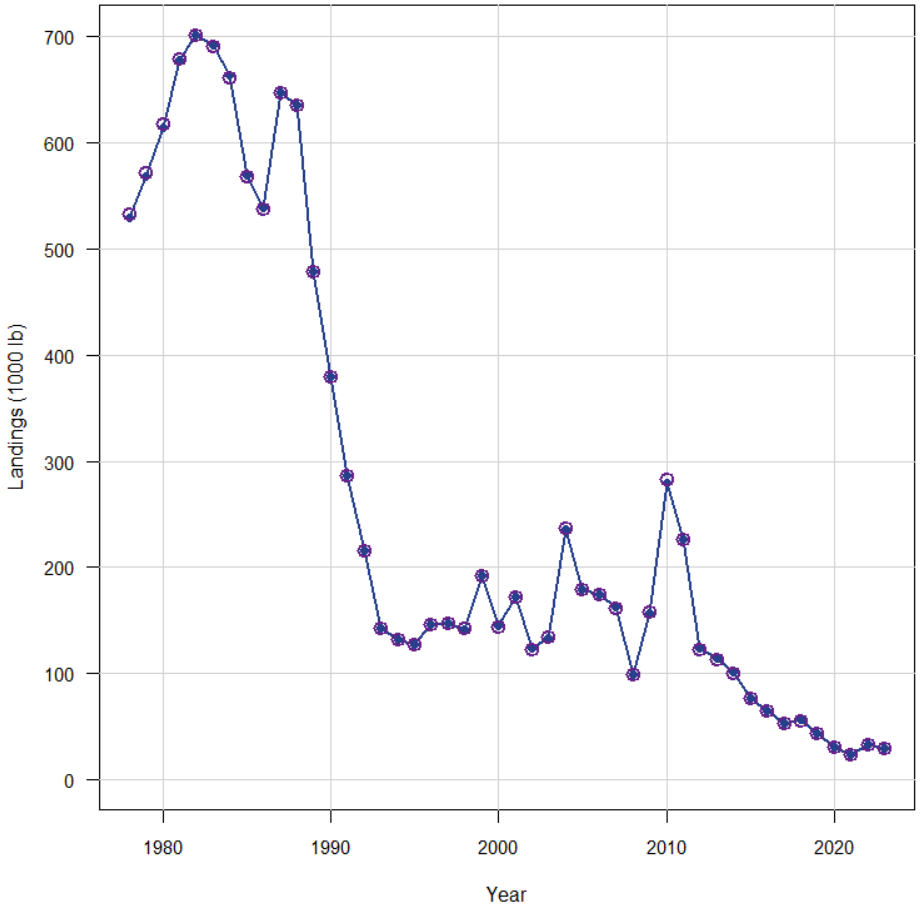


Commercial pots

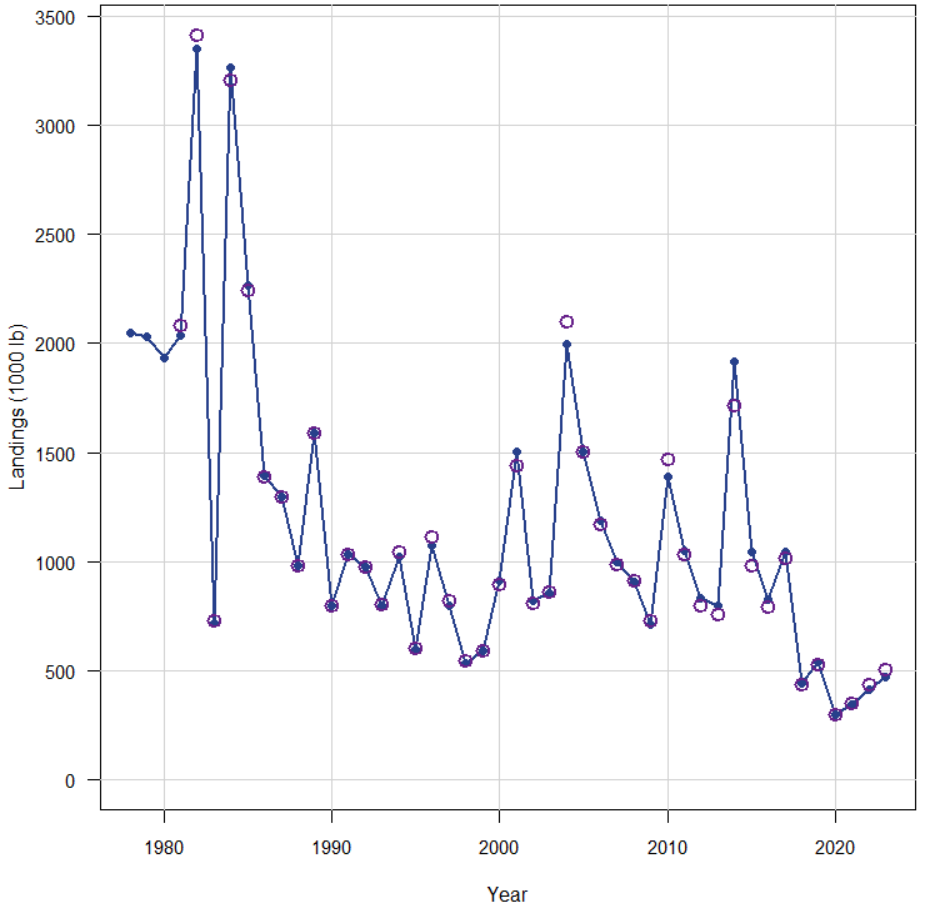


BAM base model – fits to rec landings

Headboat

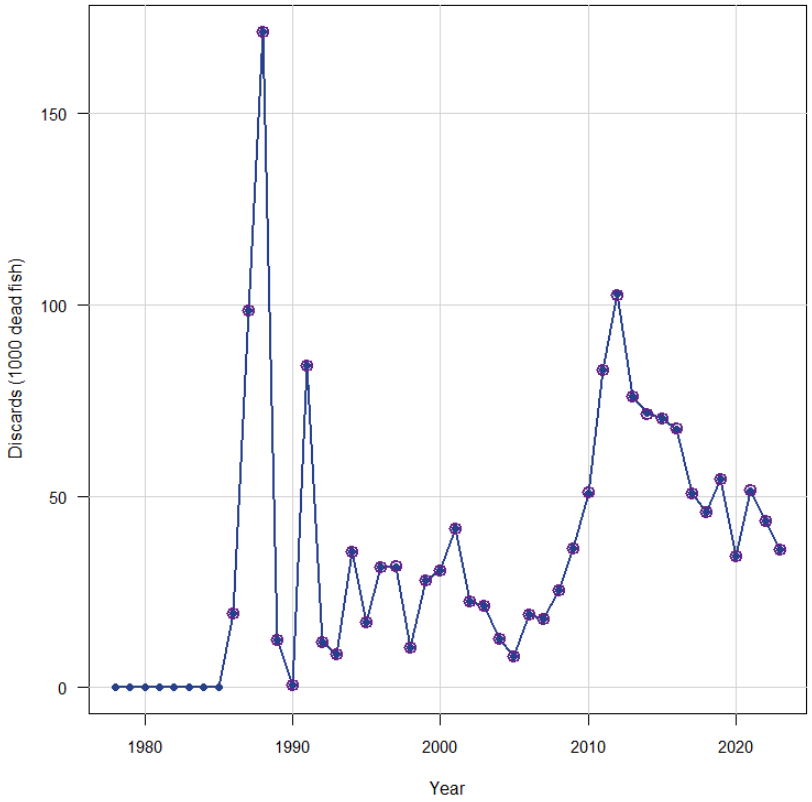


General recreational

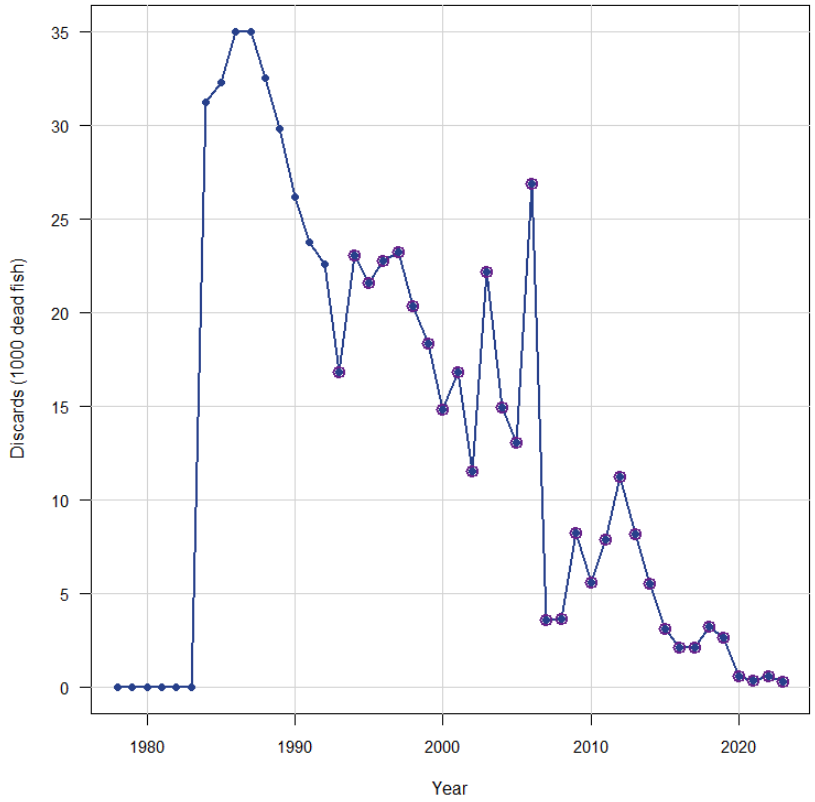


BAM base model – fits to discards

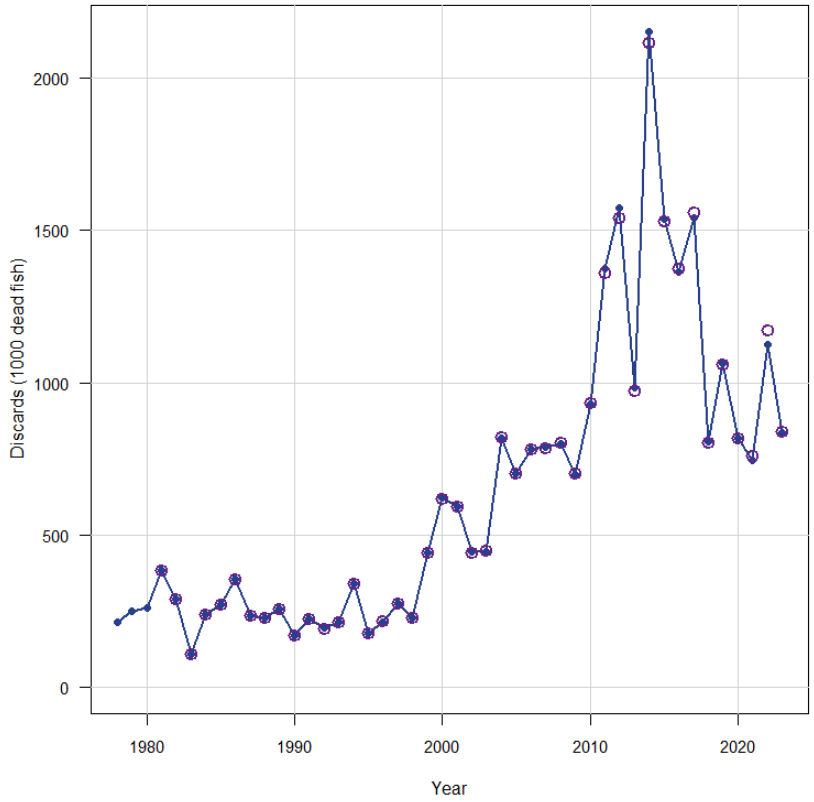
Headboat



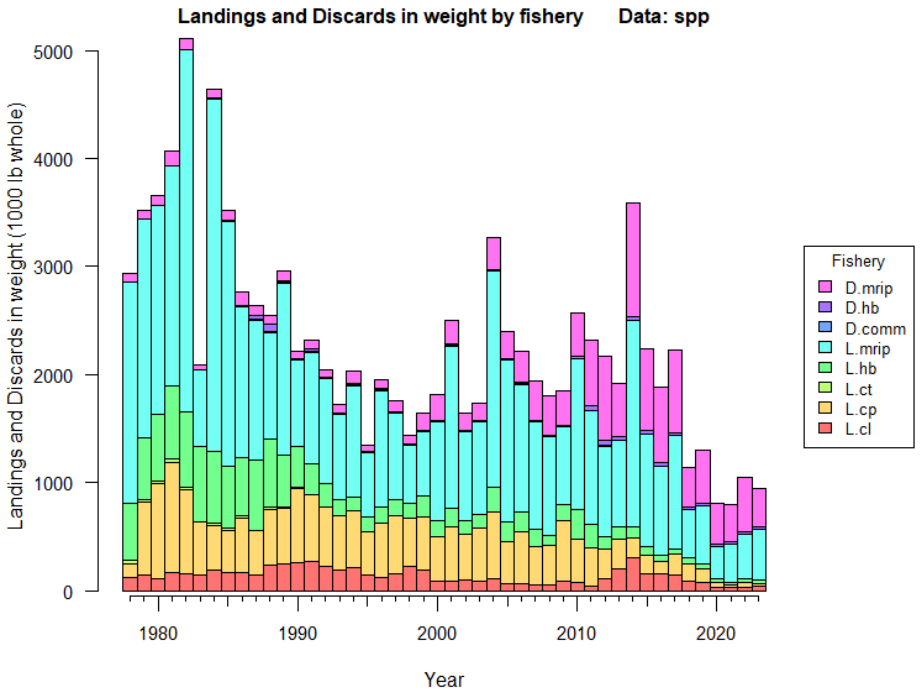
Commercial

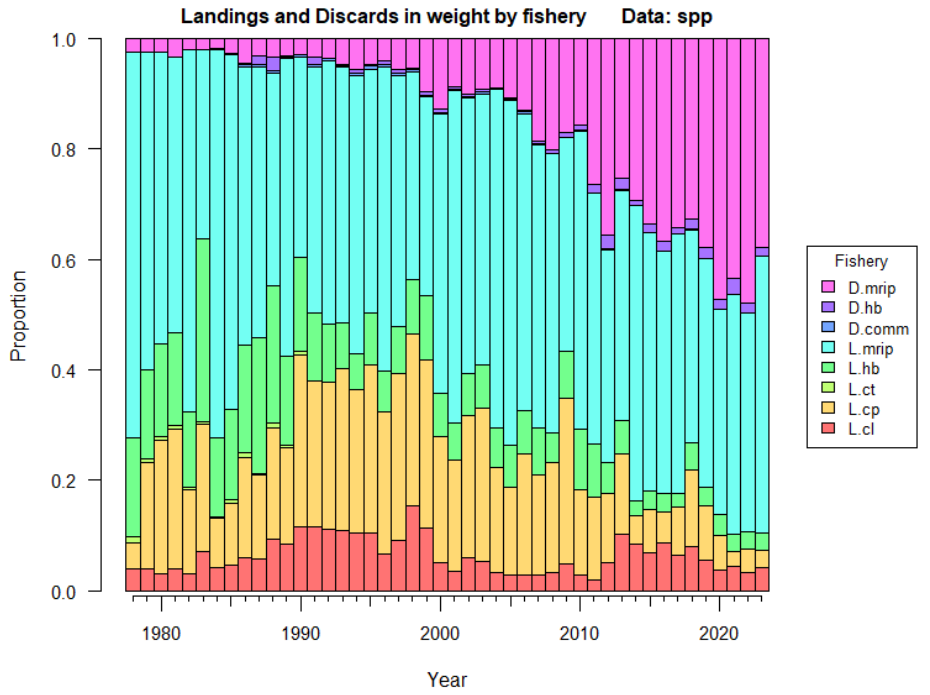


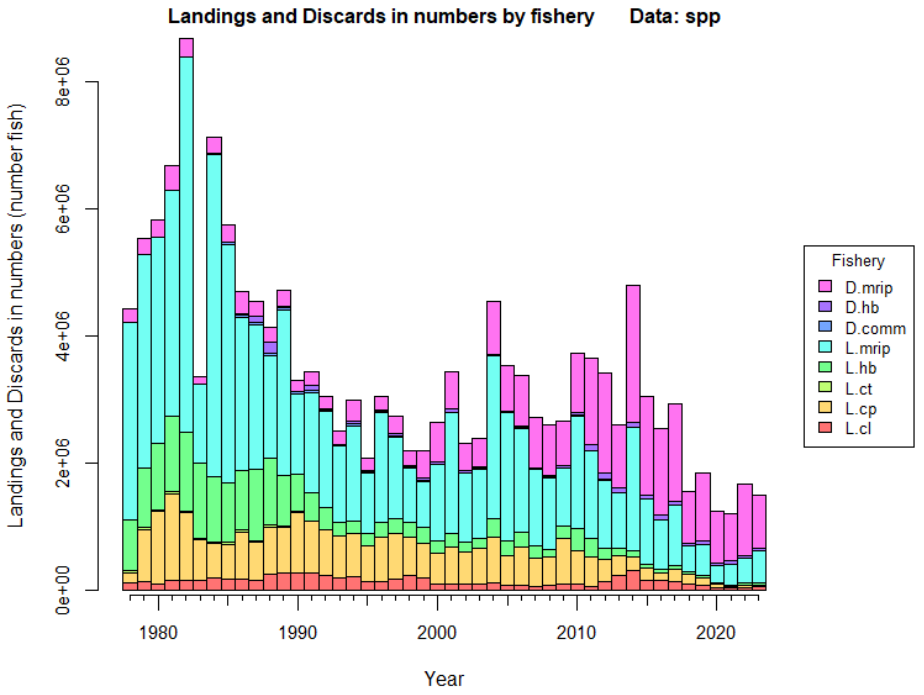
General recreational

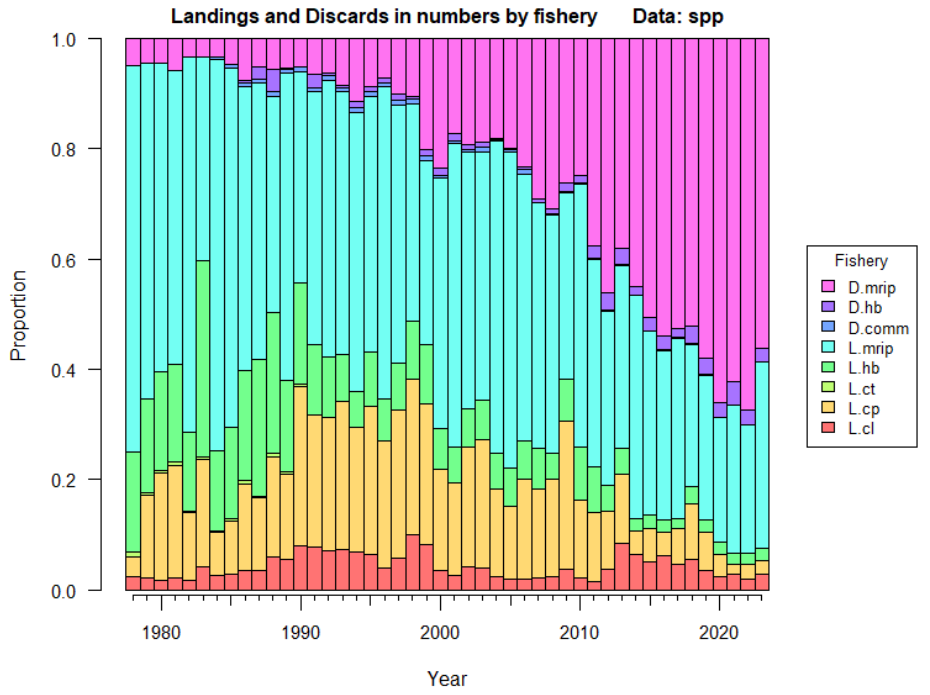


BAM base model – Estimated Landings and Discard



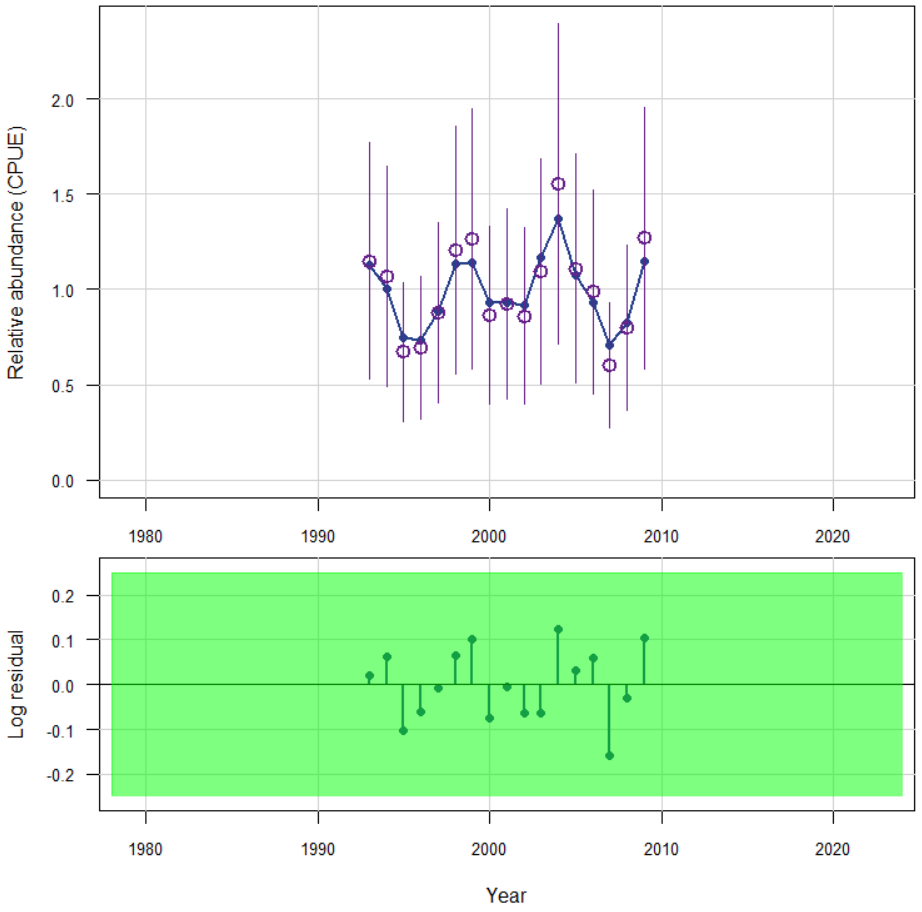




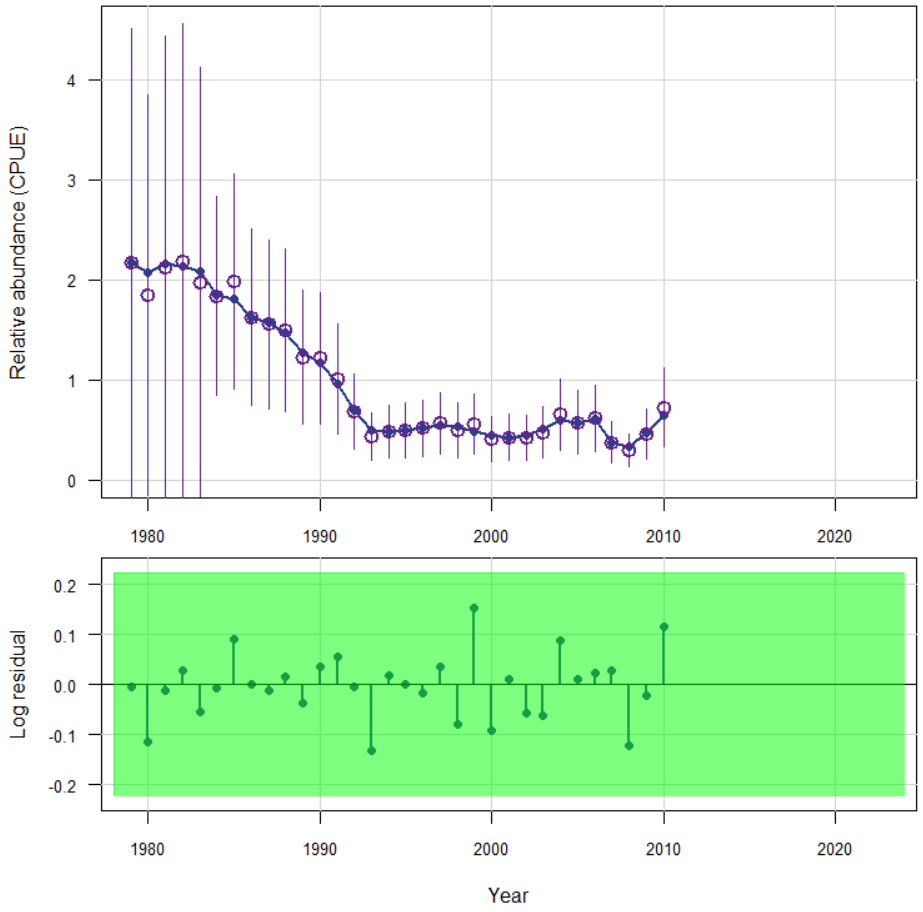


BAM base model – fits to fishery index

Commercial handline

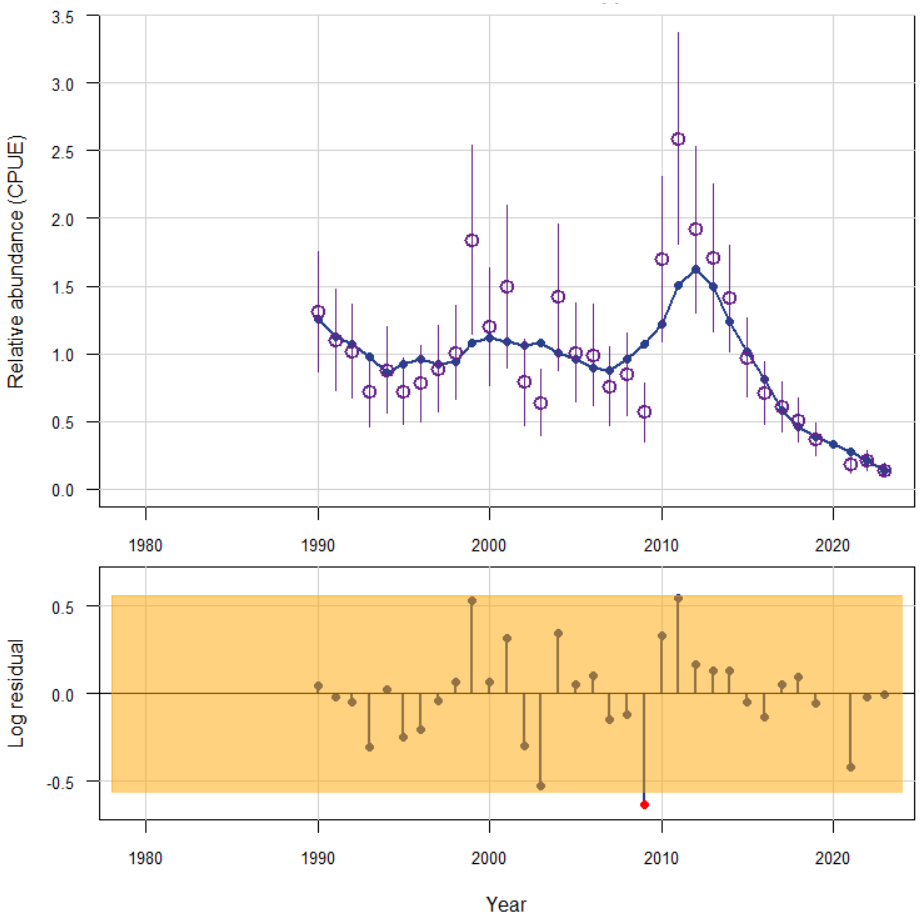


Headboat

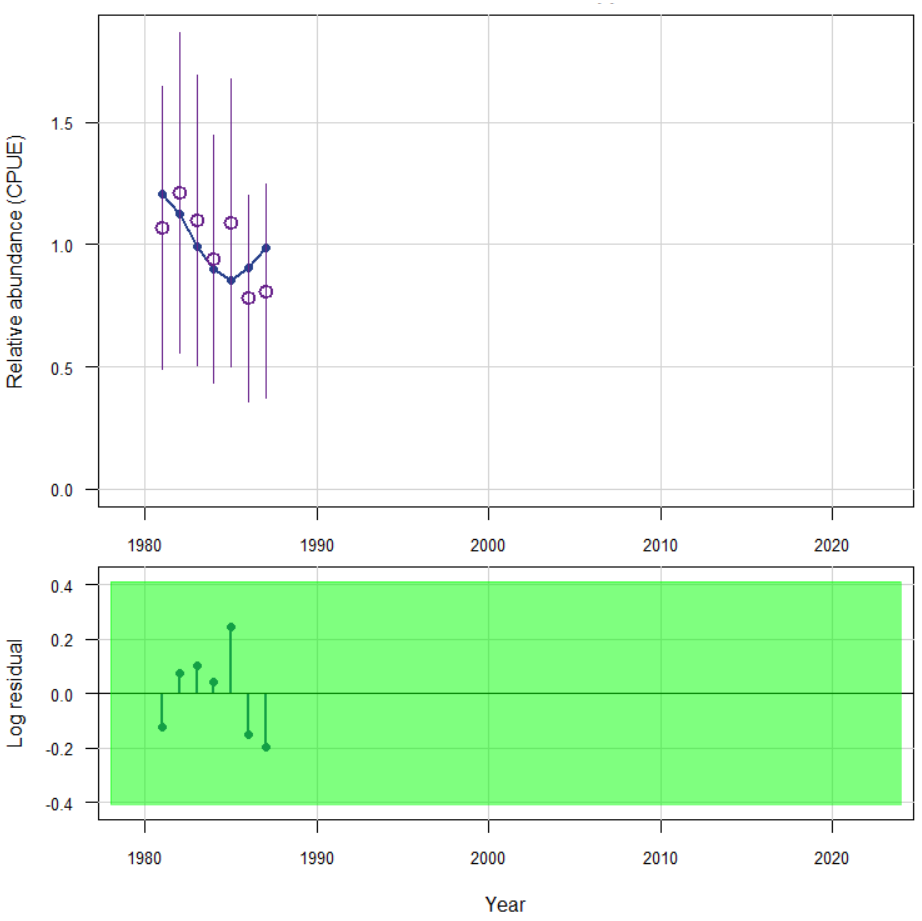


BAM base model – fits to survey index

SERFS

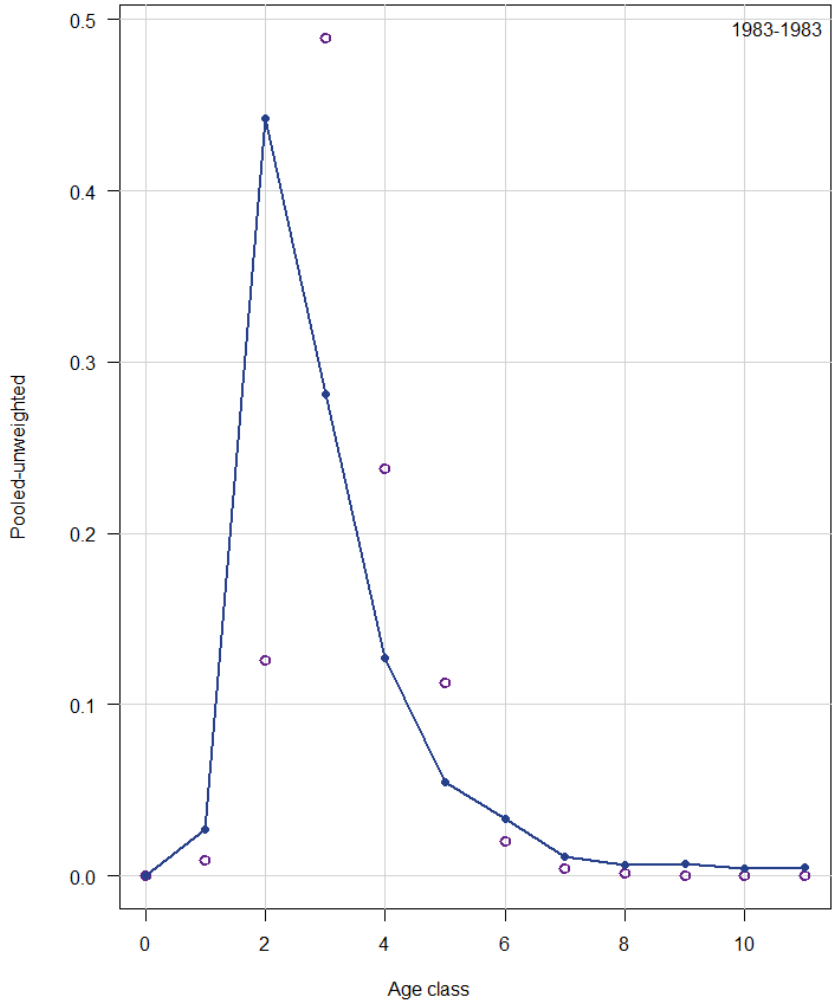


MARMAP blackfish

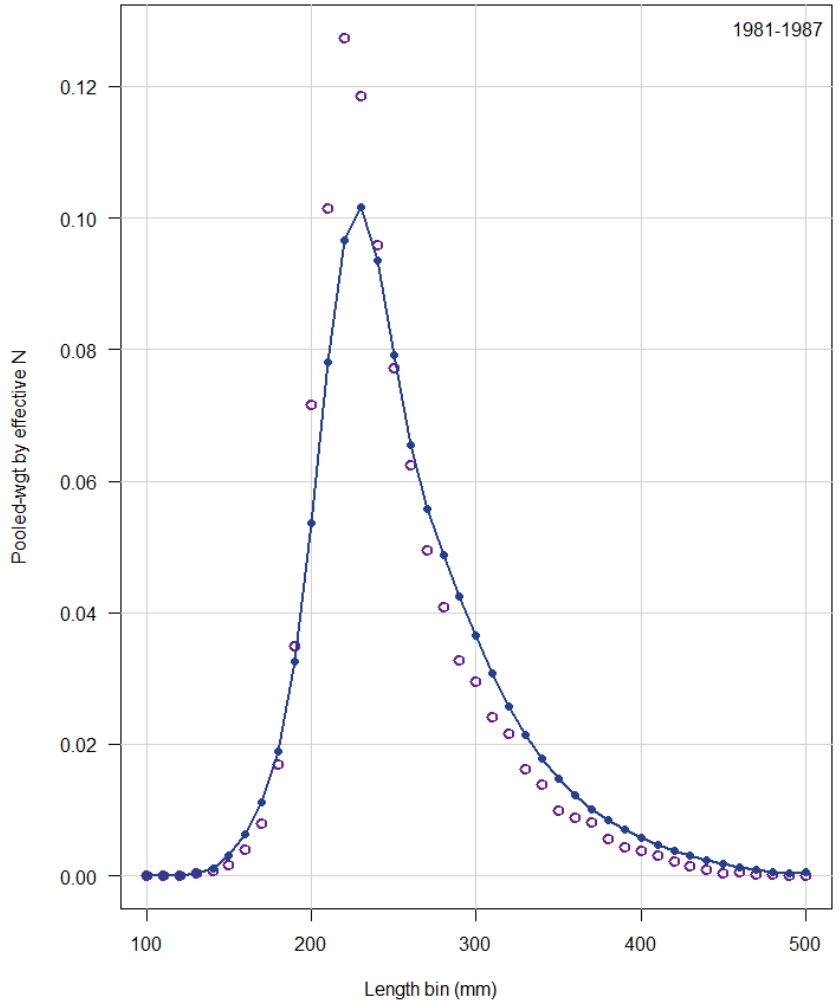


BAM base model – fits to MARMAP blackfish length and age composition

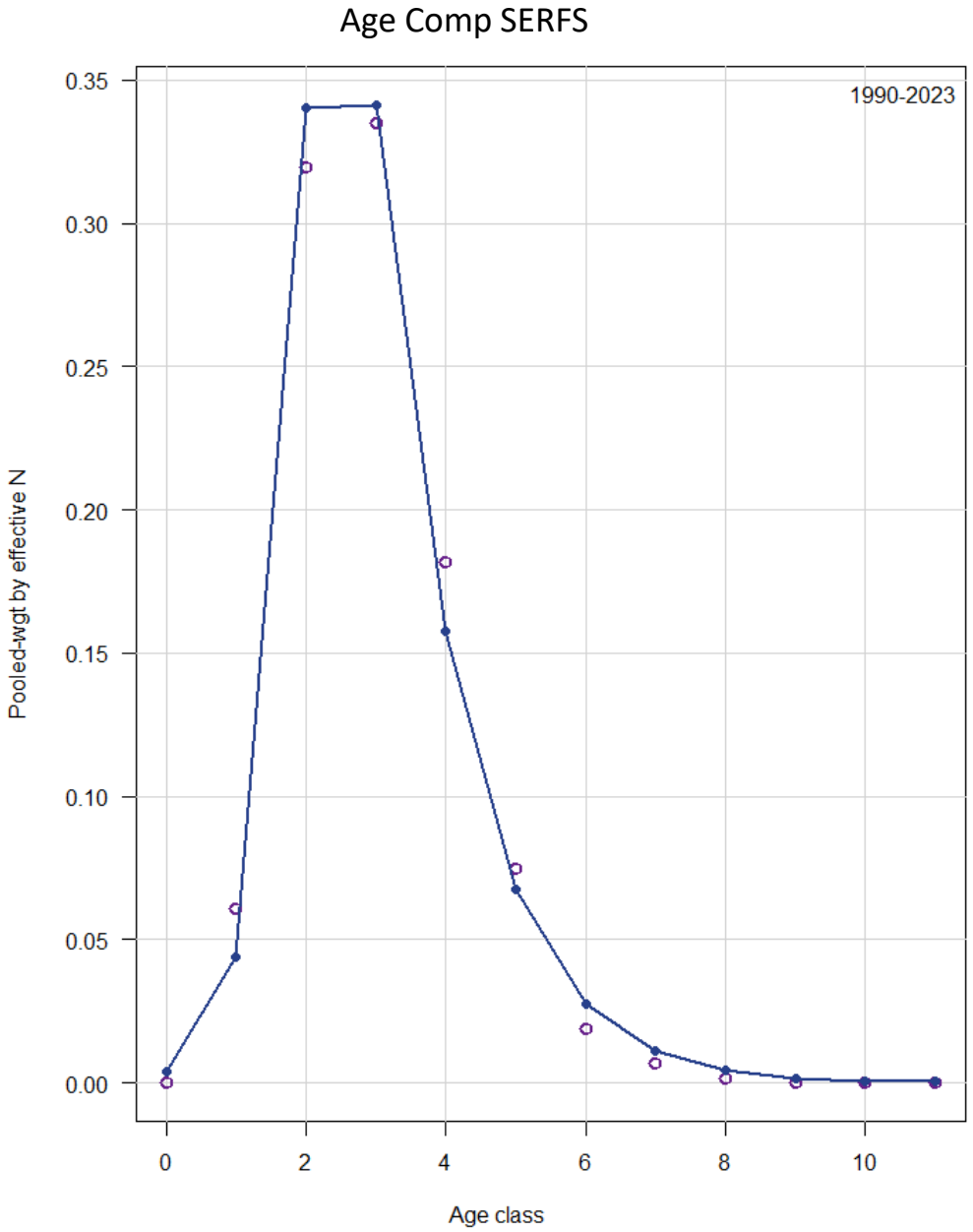
Age Comp MARMAP blackfish



Length Comp MARMAP blackfish

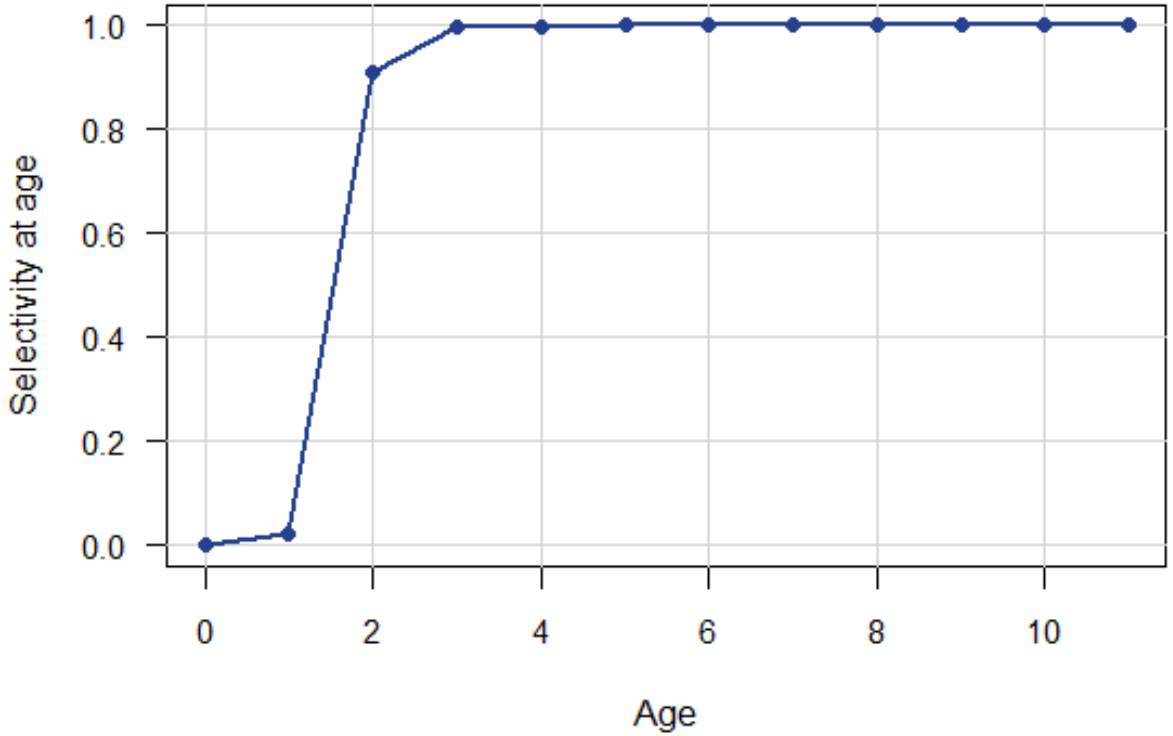


BAM base model – fits to SERFS age composition

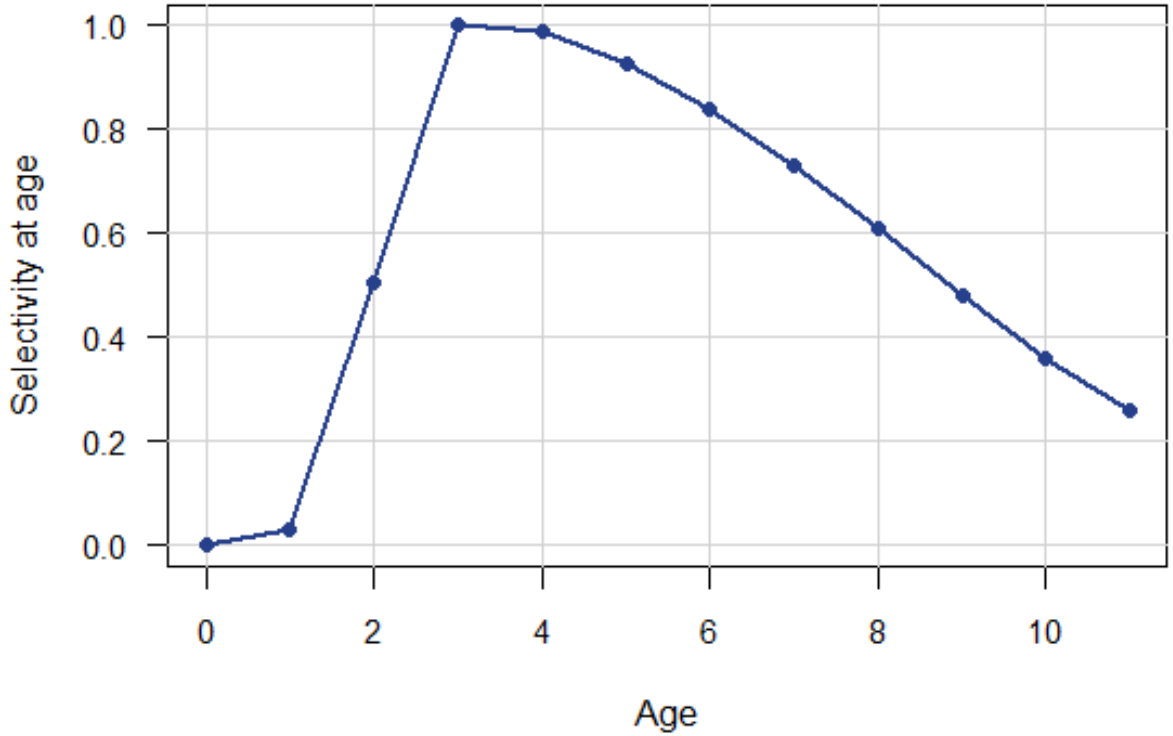


BAM base model – Survey selectivity

MARMAP Blackfish Survey Selectivity

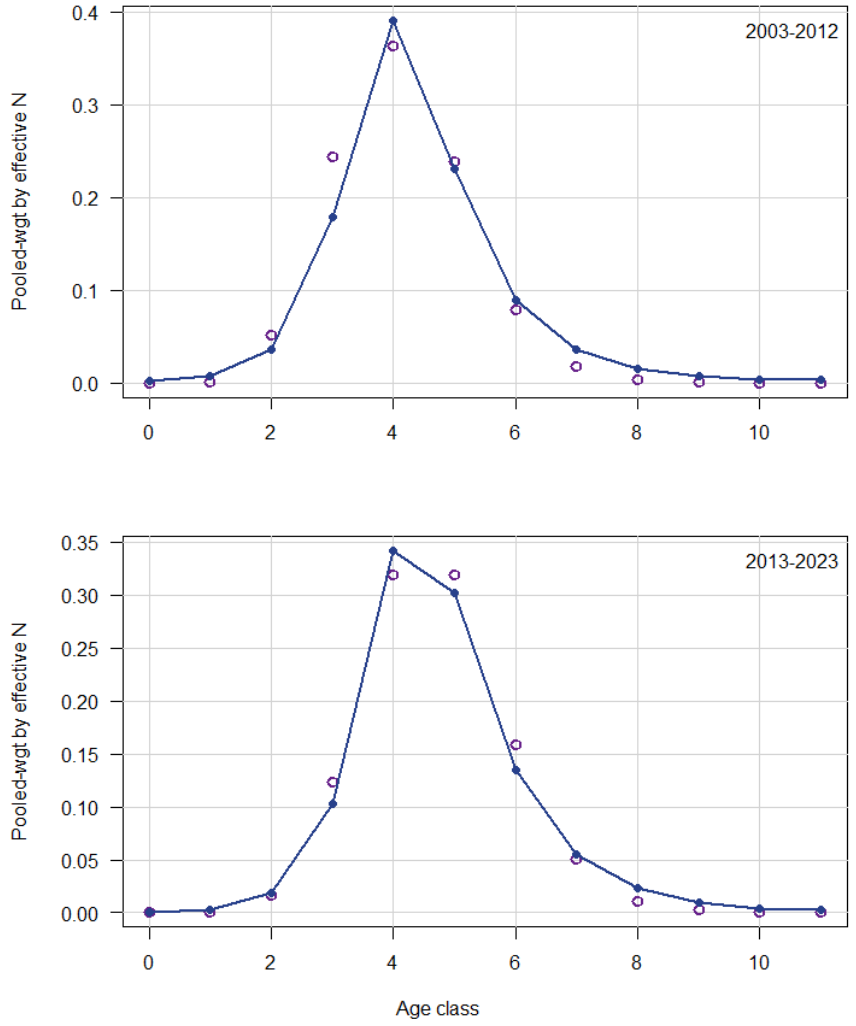


SERFS Survey Selectivity

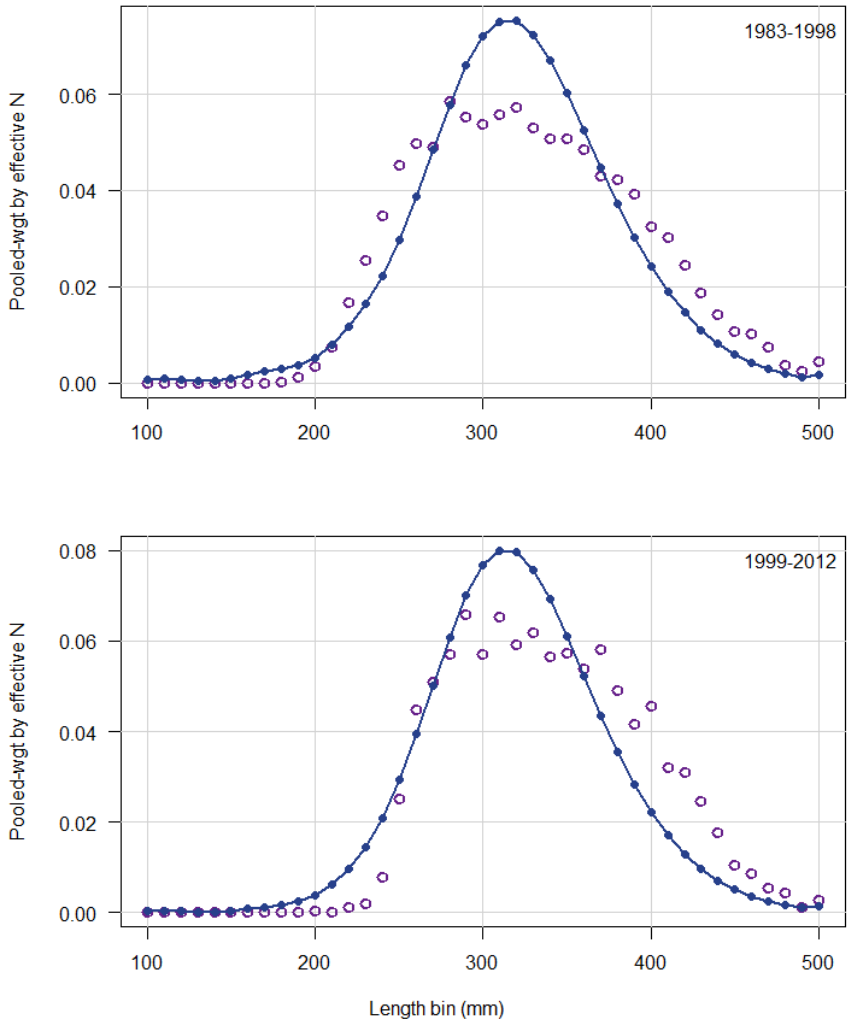


BAM base model – fits to commercial handline length and age composition

Age Comp commercial handline

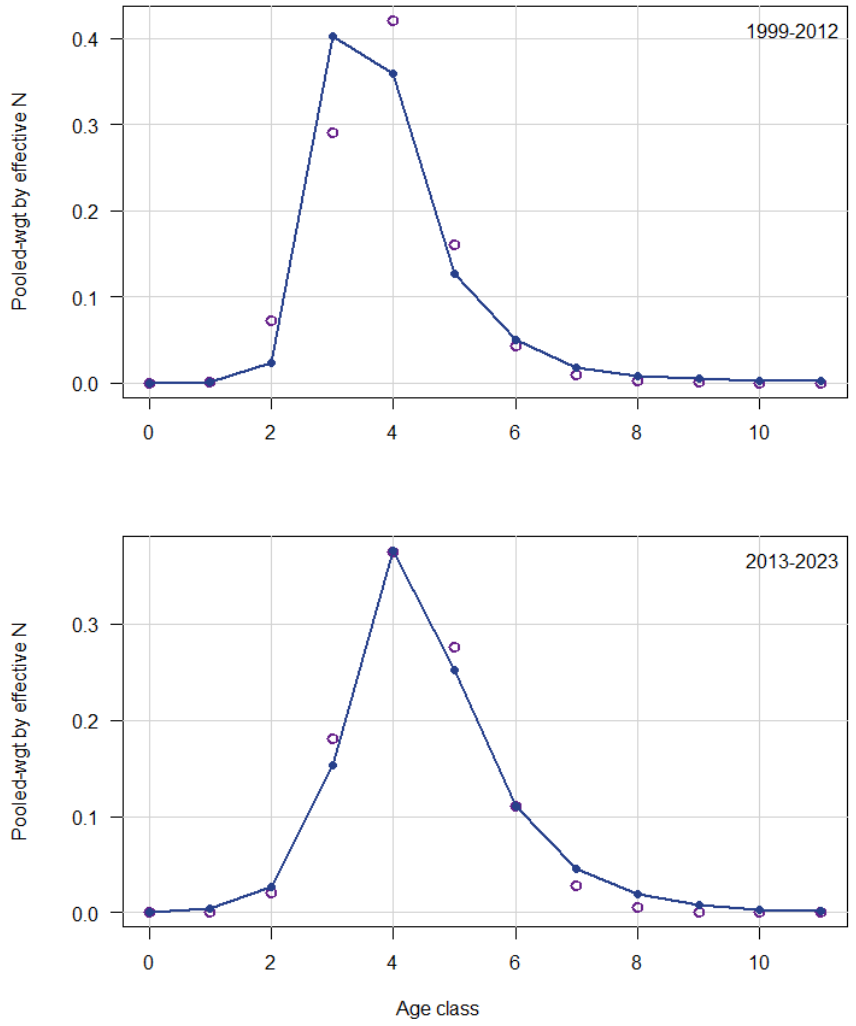


Length Comp commercial handline

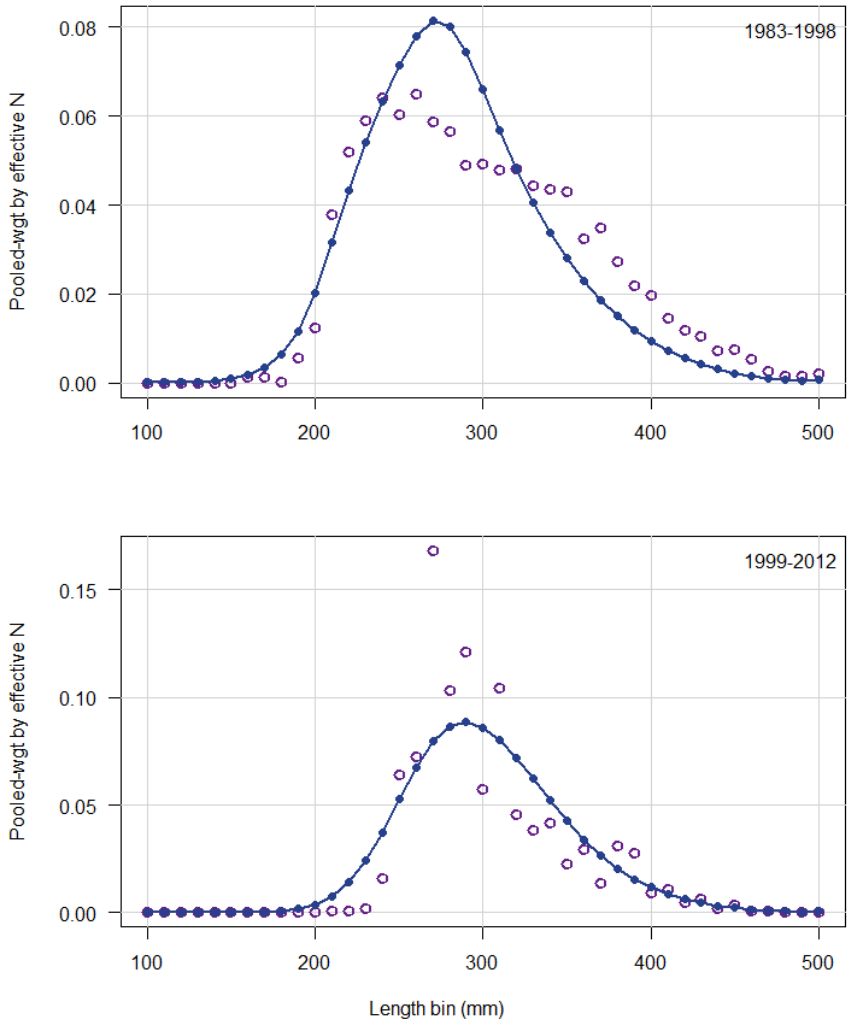


BAM base model – fits to commercial pots length and age composition

Age Comp commercial pots

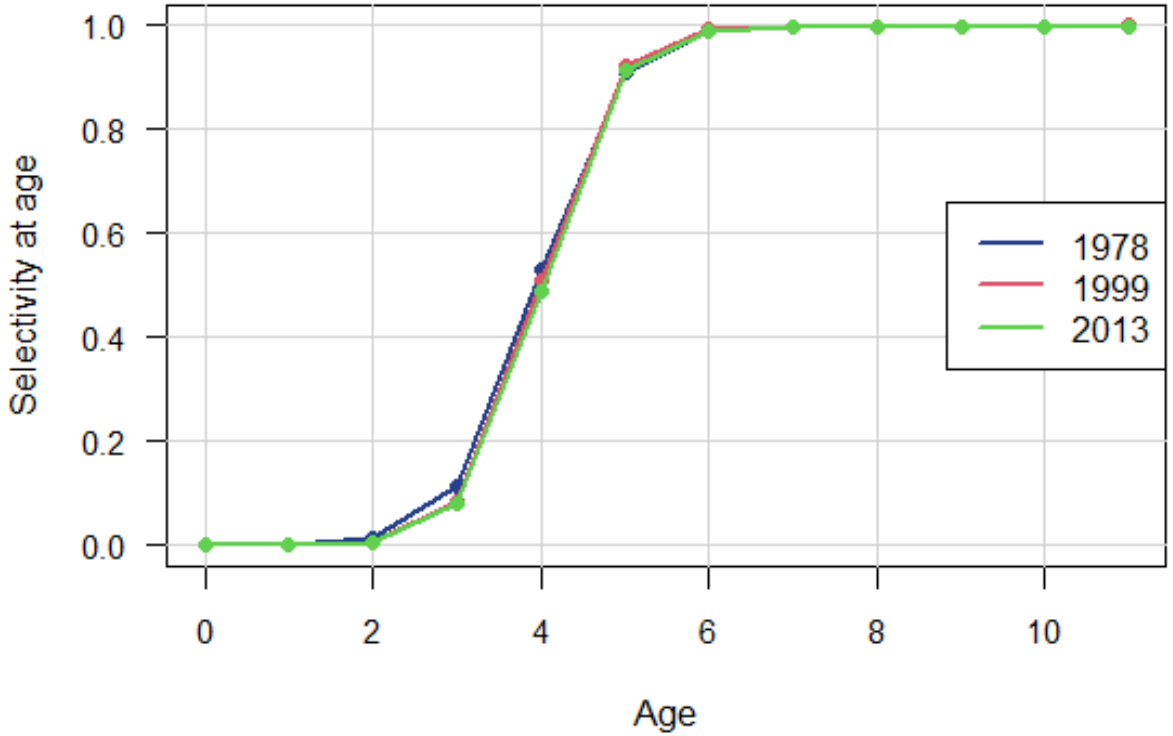


Length Comp commercial pots

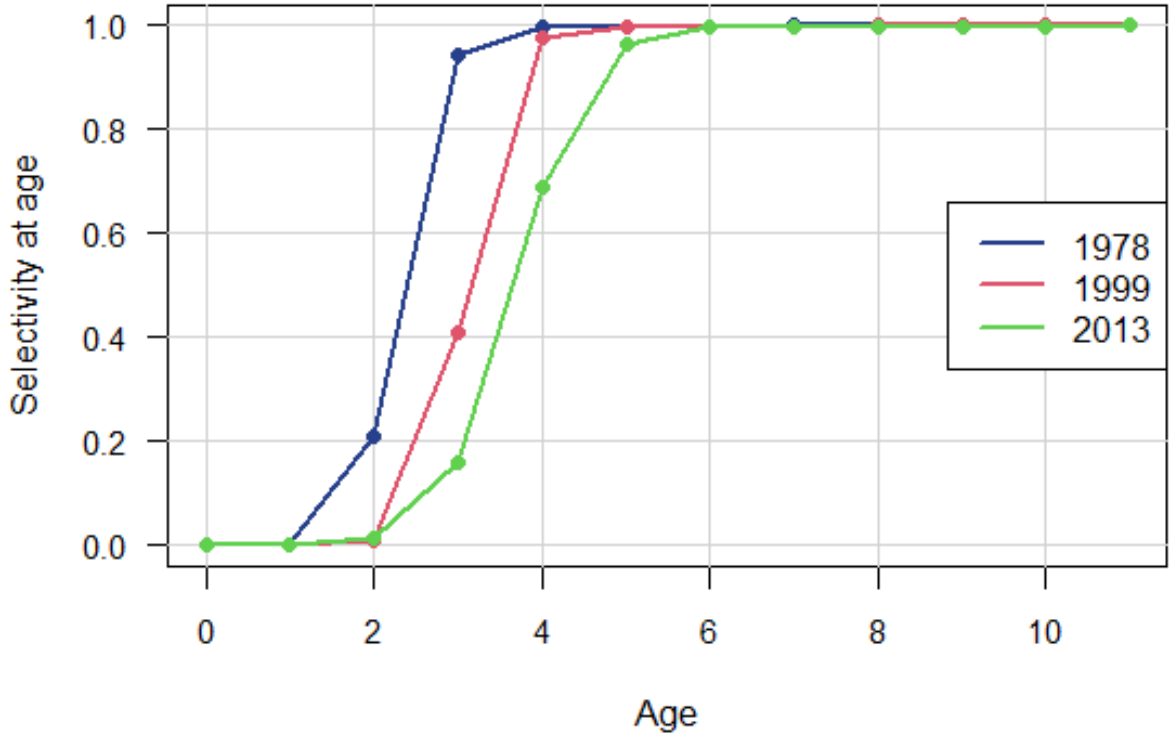


BAM base model – Commercial selectivity

Commercial Lines Selectivity

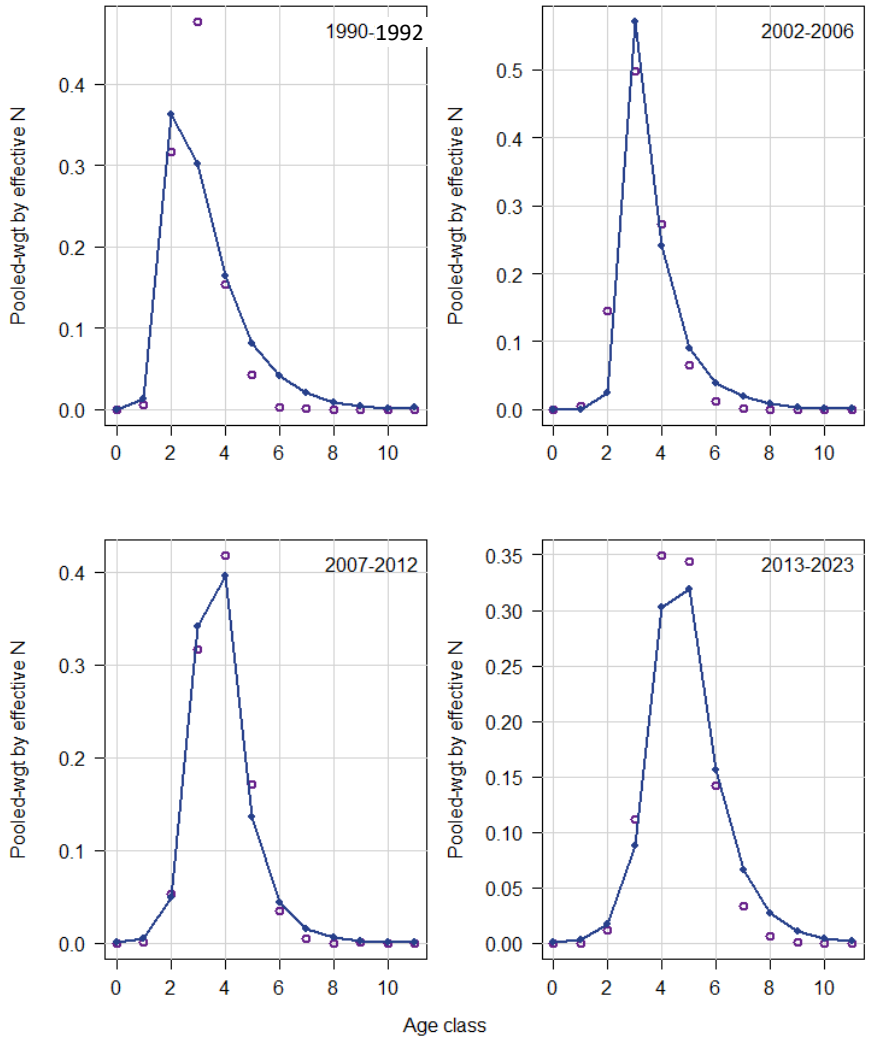


Commercial pots Selectivity

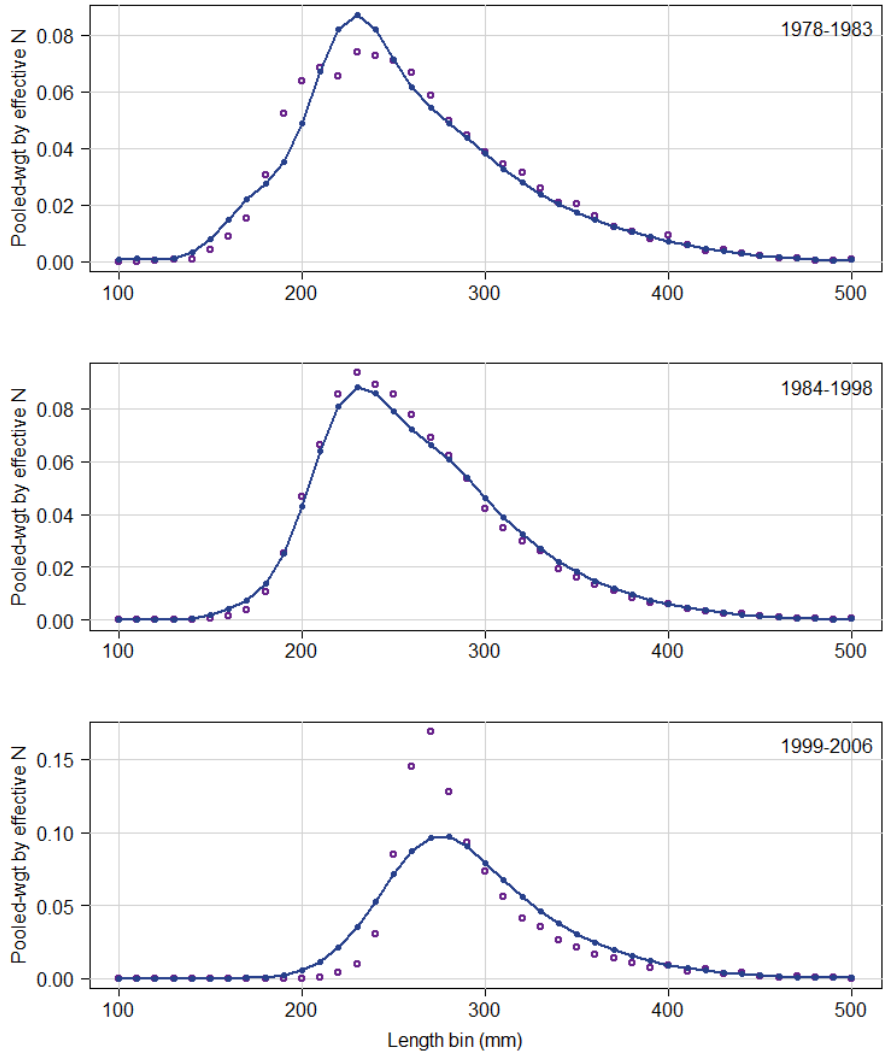


BAM base model – fits to Headboat length and age composition

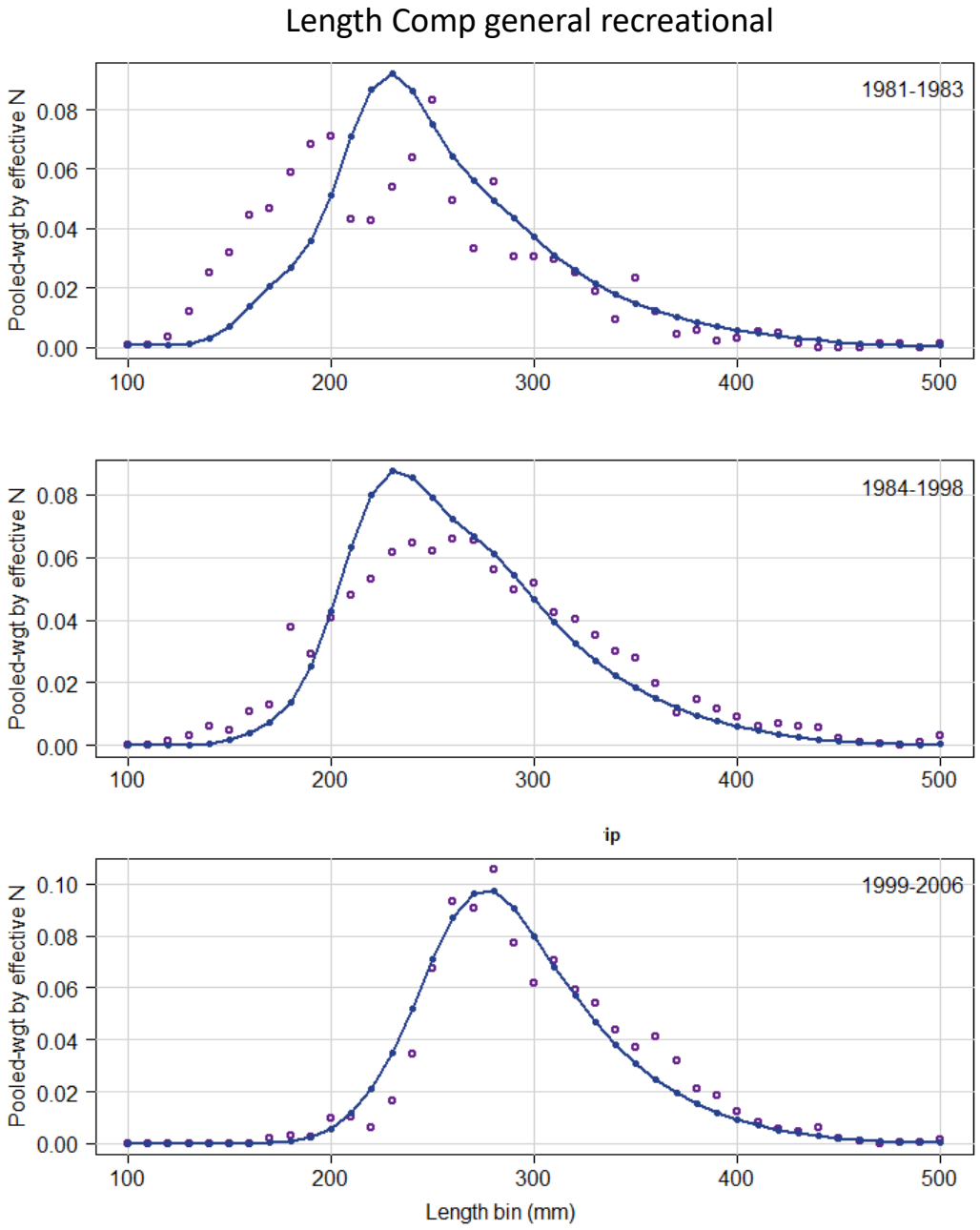
Age Comp headboat



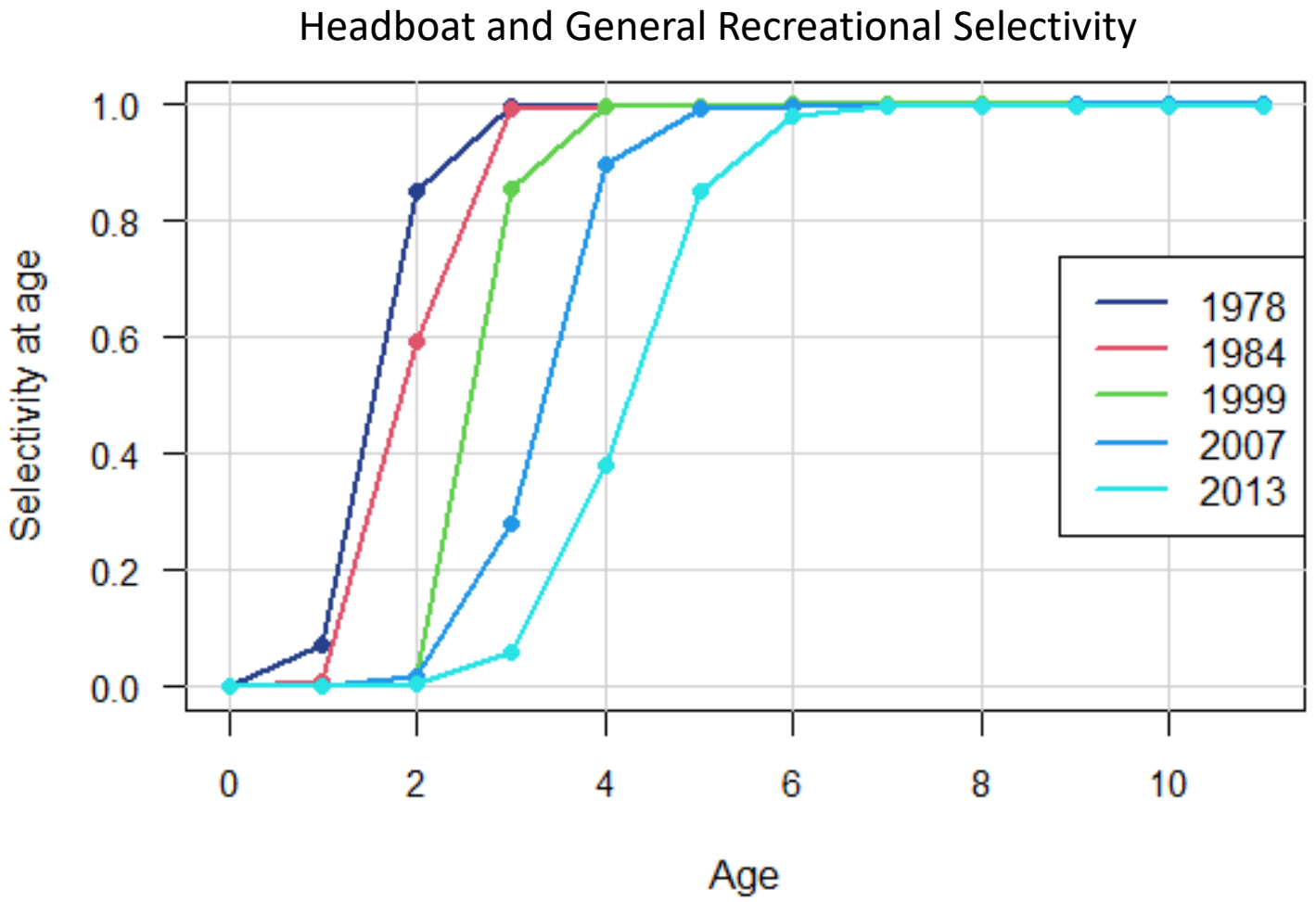
Length Comp headboat



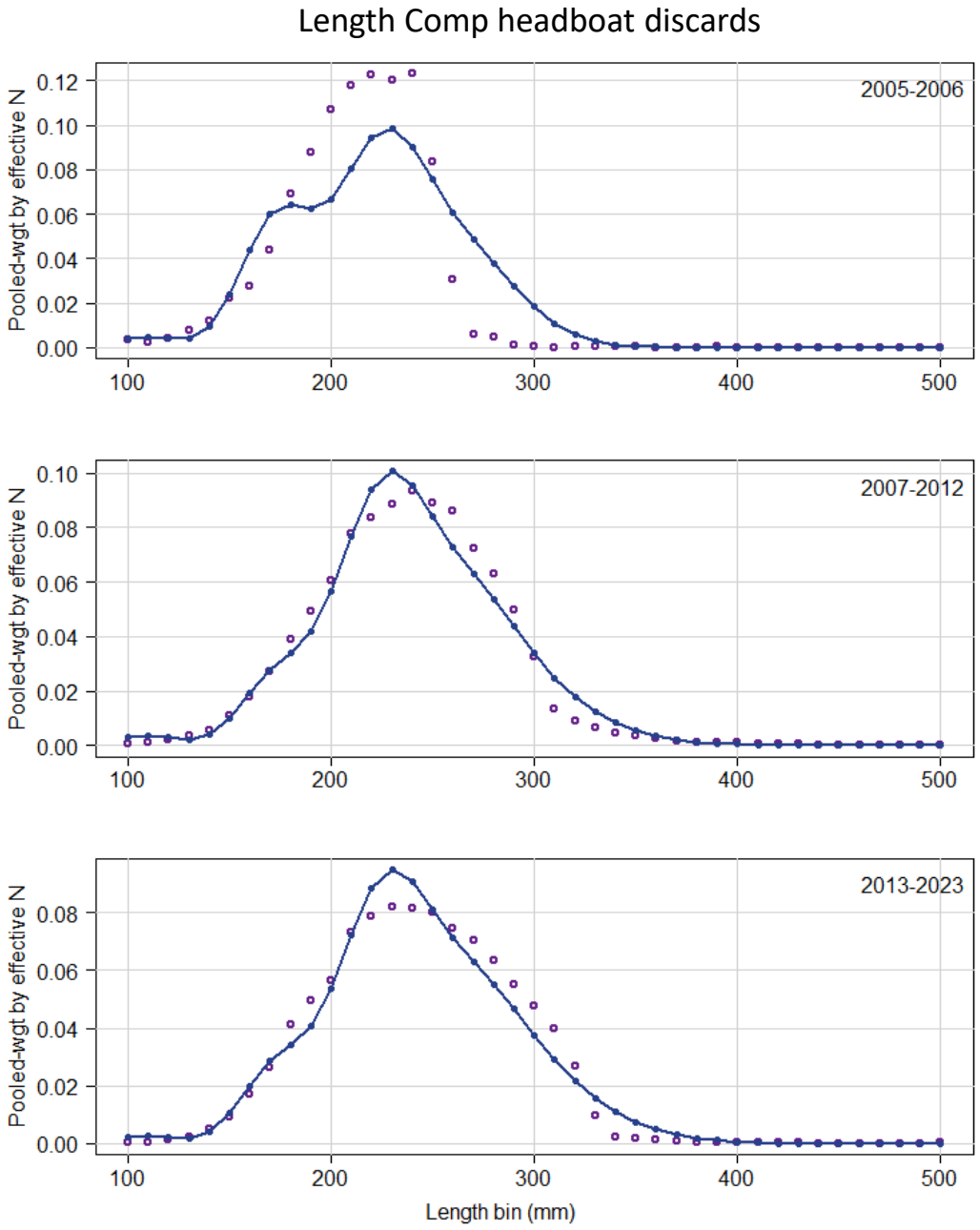
BAM base model – fits to general recreational length composition



BAM base model – Recreational selectivity

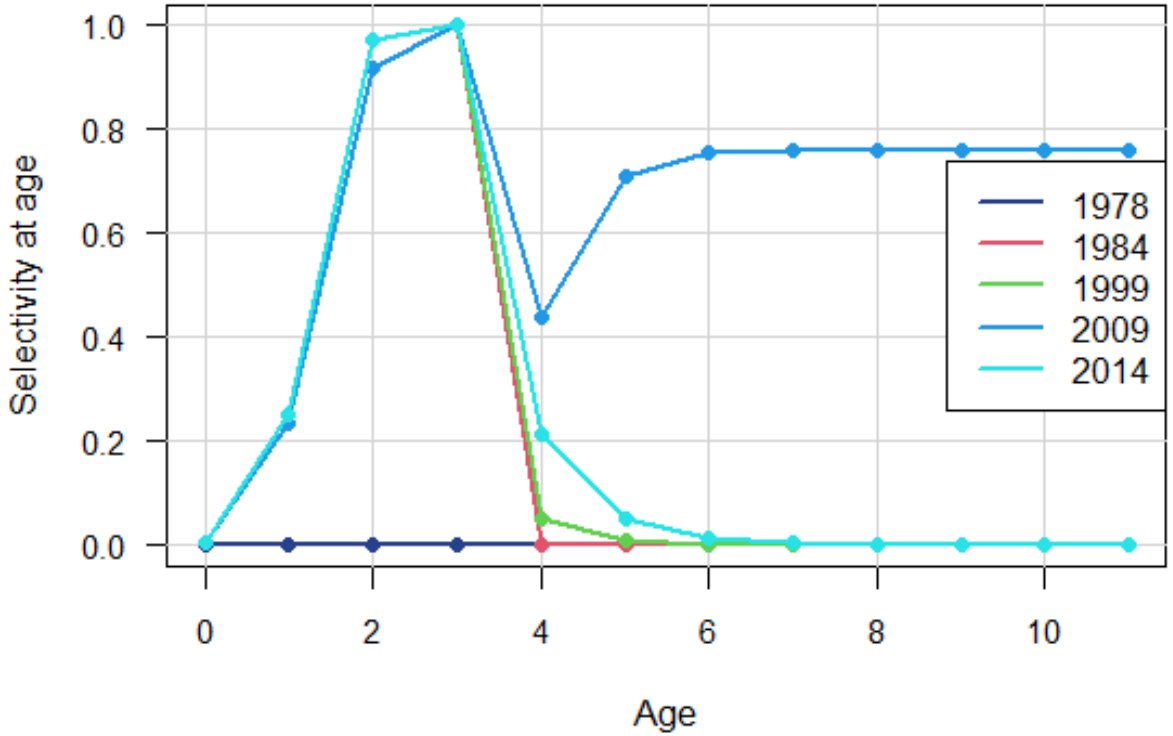


BAM base model – fits to Headboat discards length composition

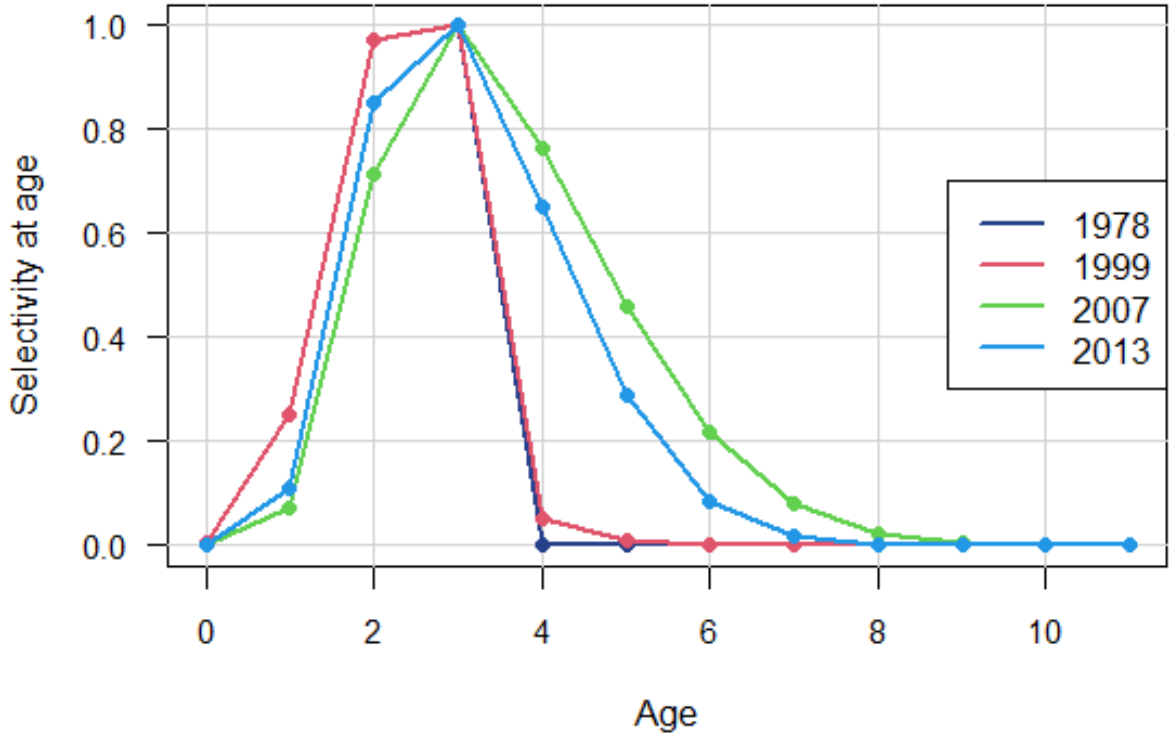


BAM base model – Discard selectivity

Commercial Discard Selectivity

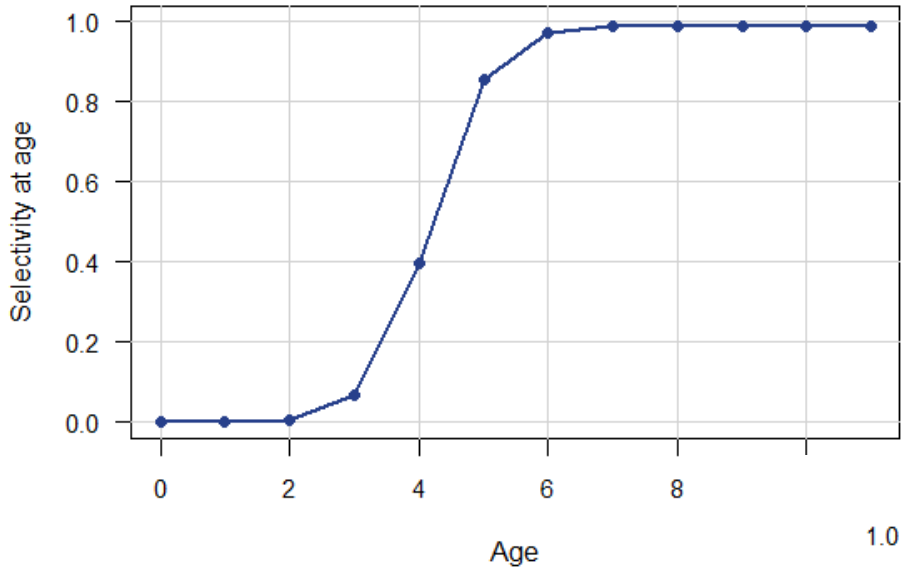


General Recreational and Headboat discard Selectivity

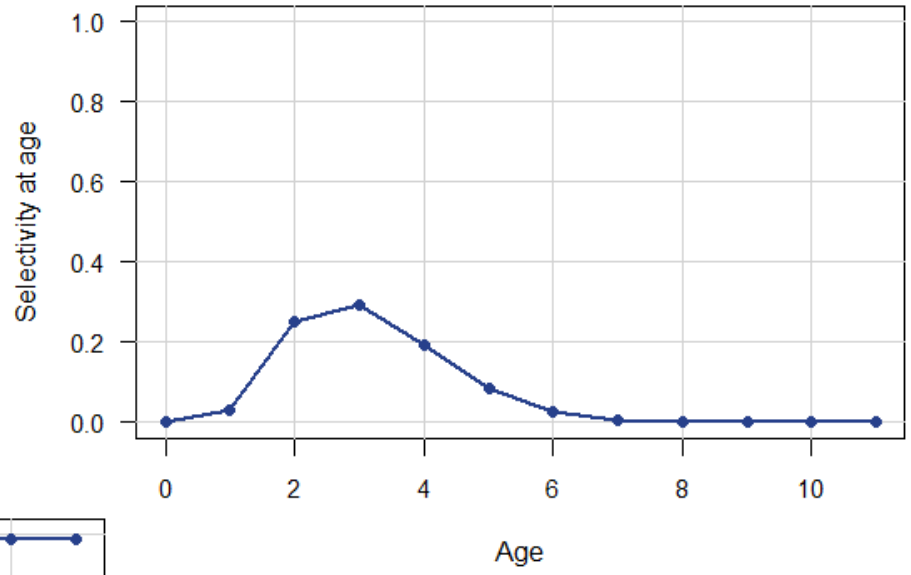


BAM base model – Weighted selectivity

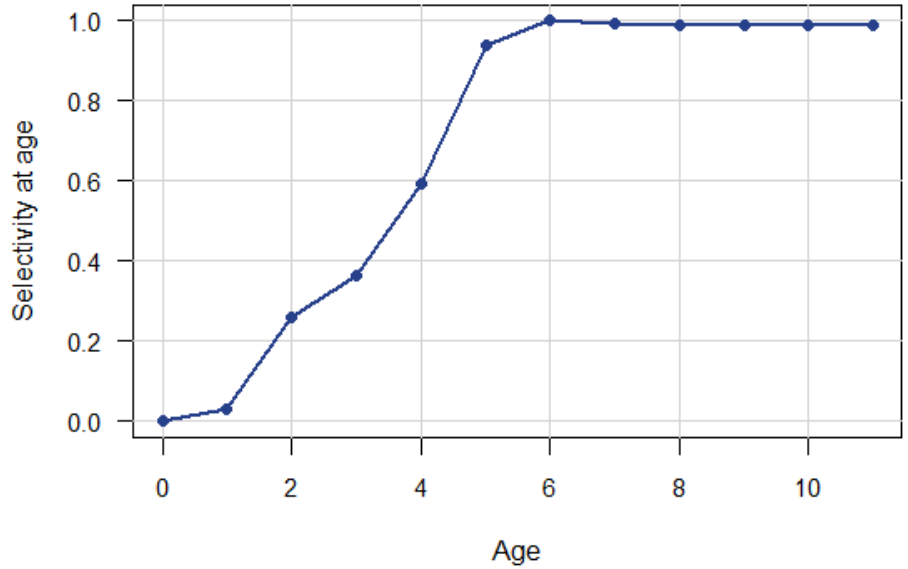
Landings weighted Selectivity



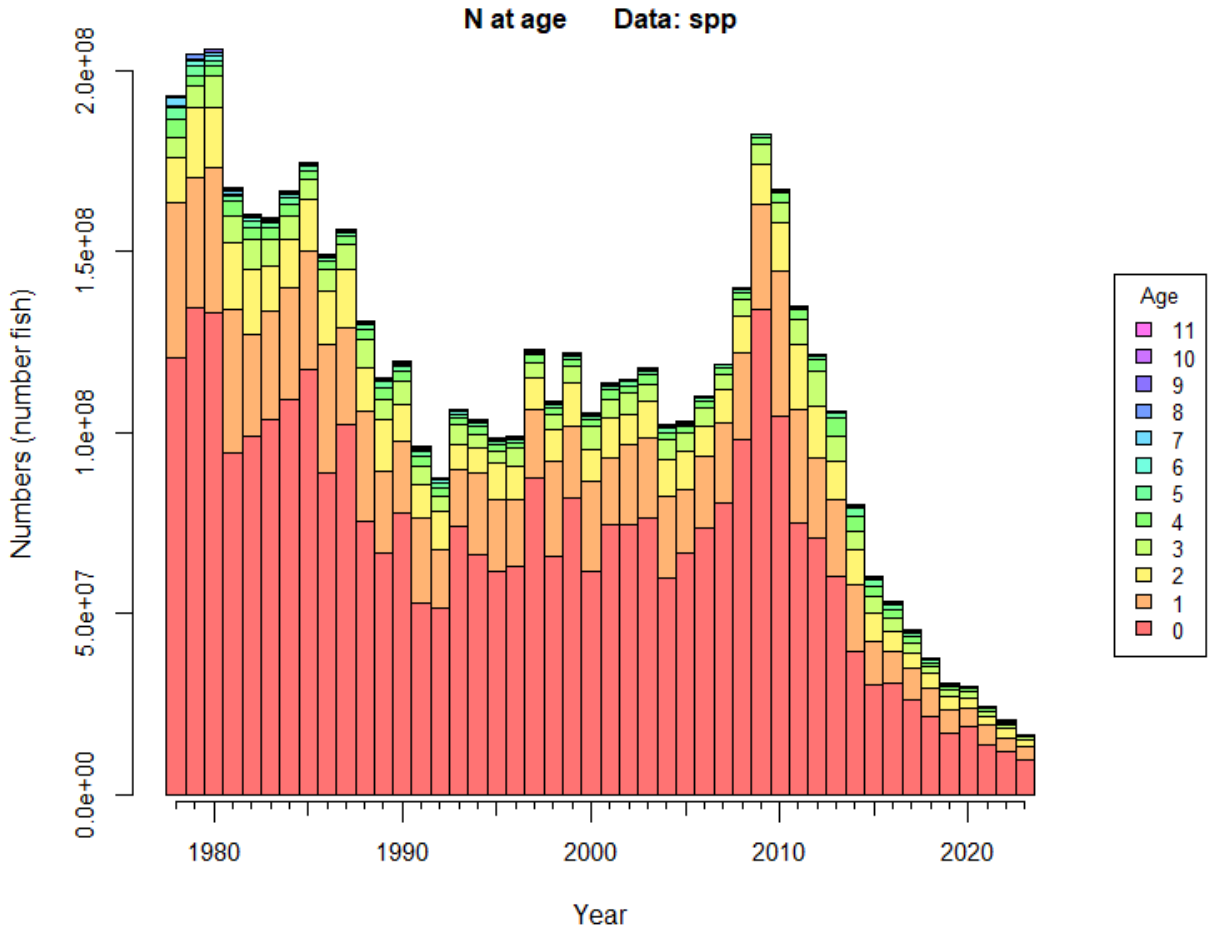
Discards weighted Selectivity

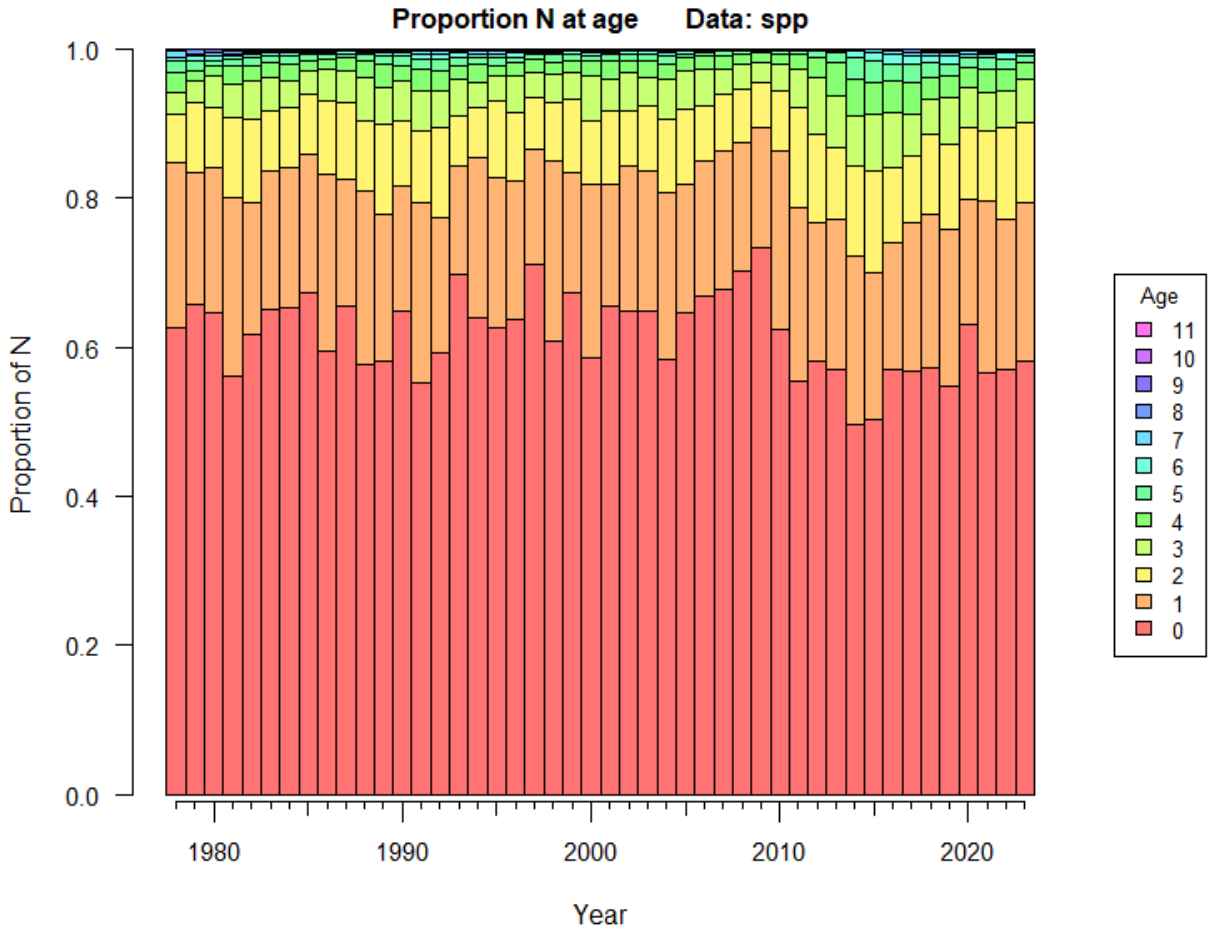


Total weighted Selectivity

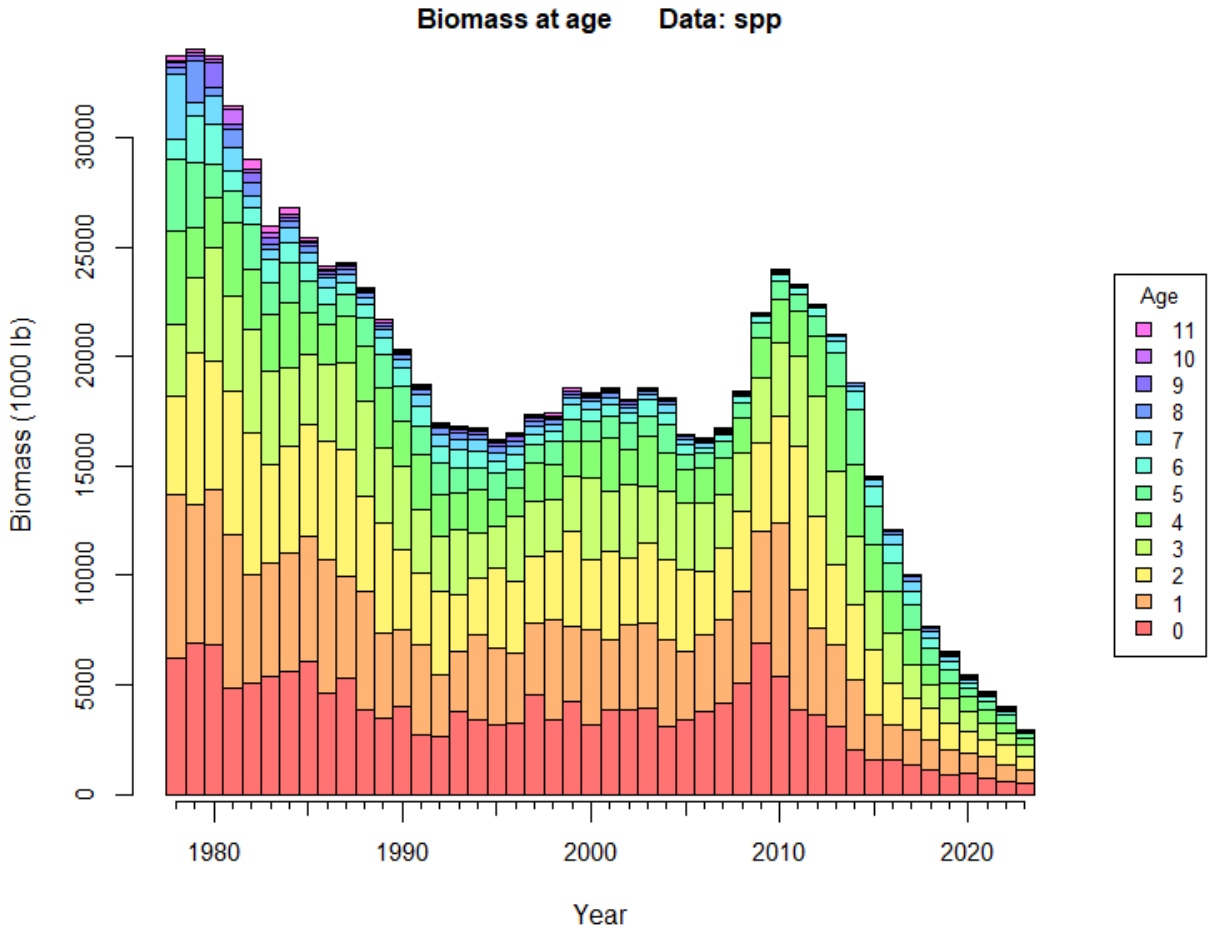


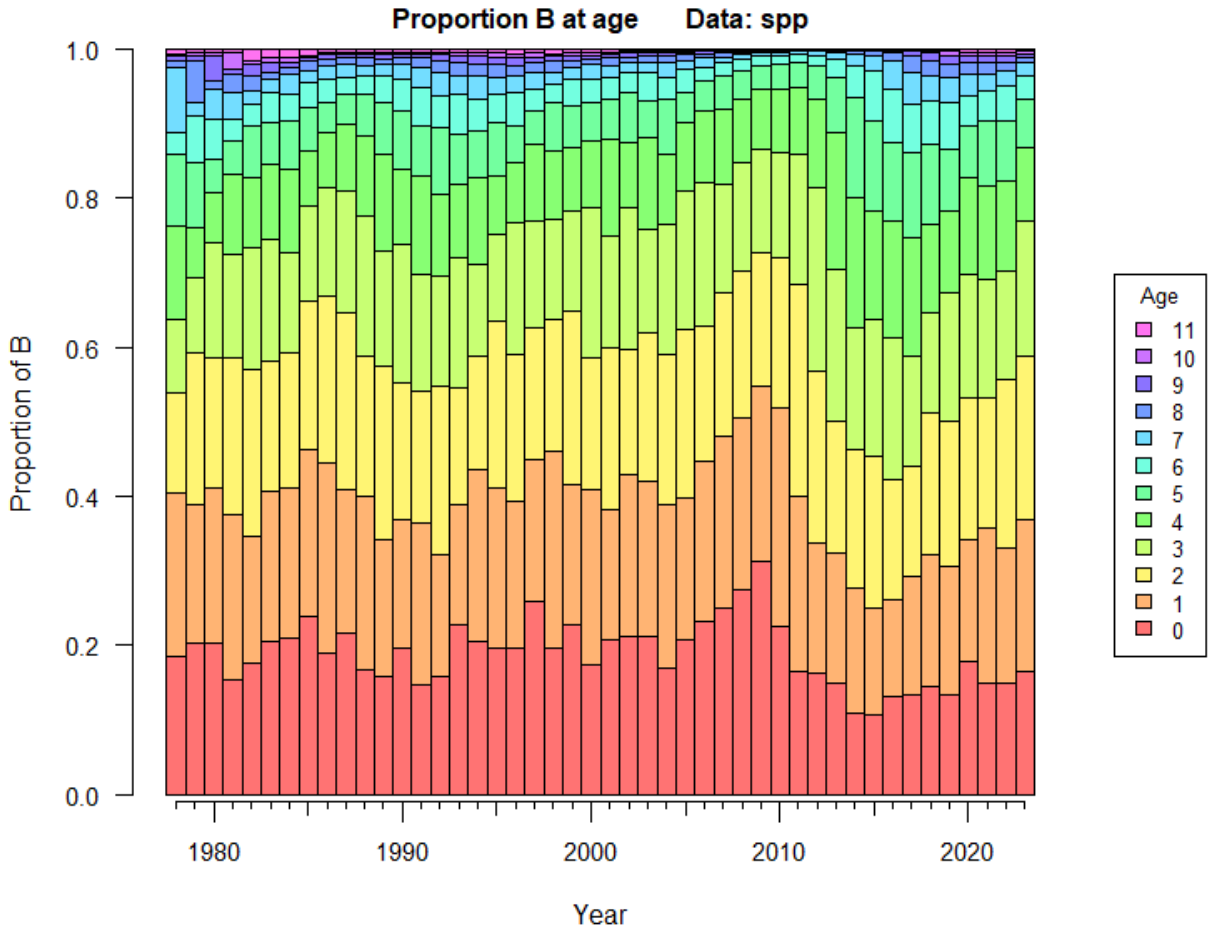
BAM base model – Abundance at age



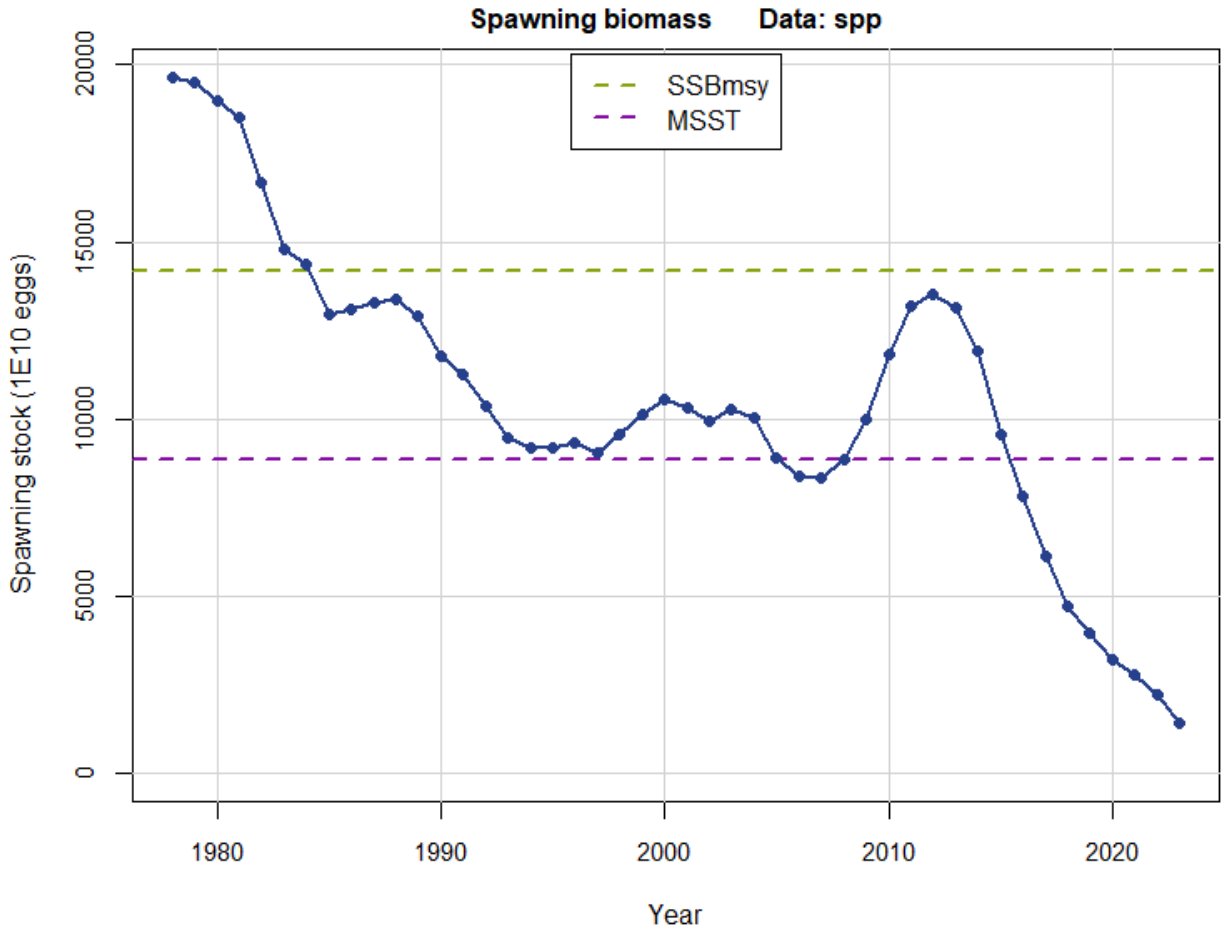


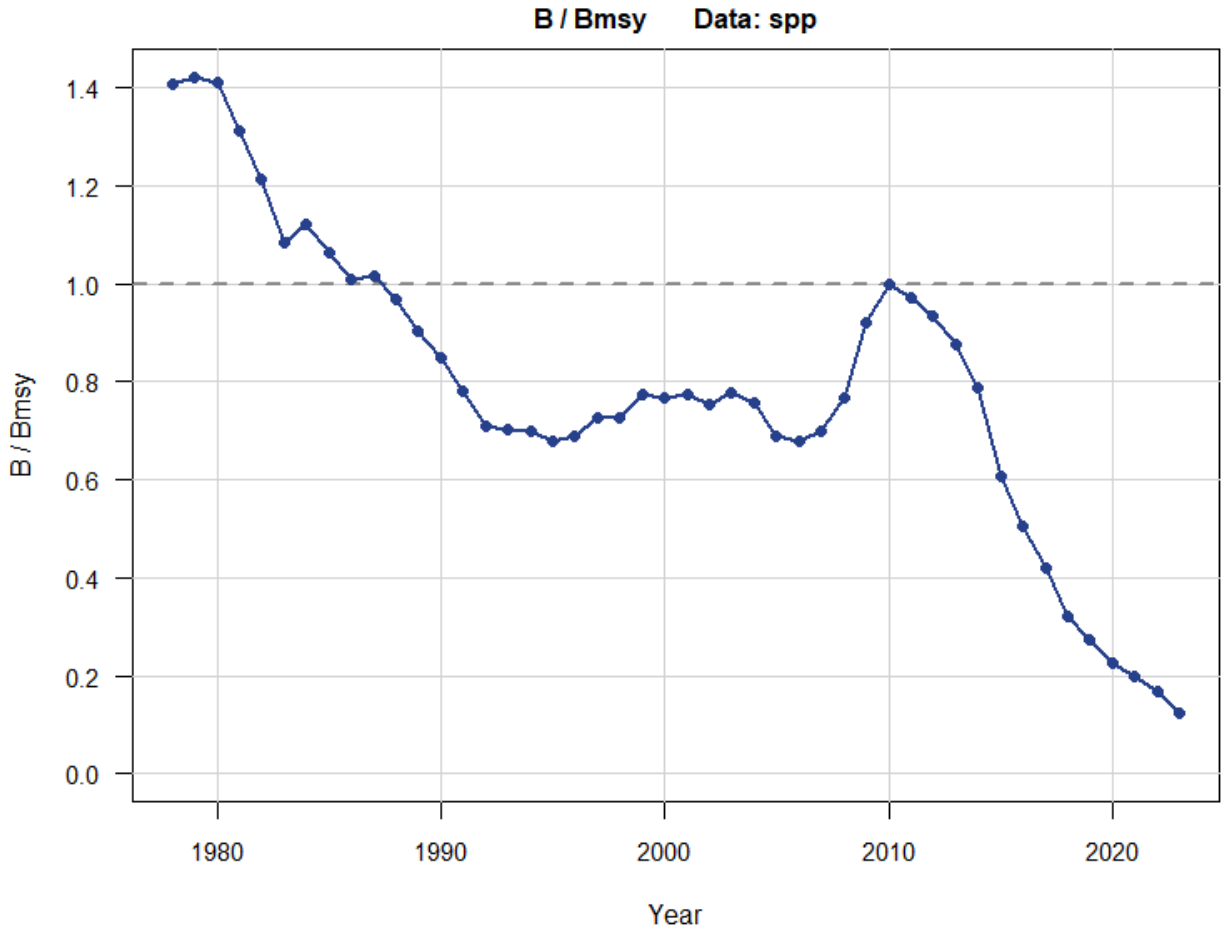
BAM base model – Biomass at age



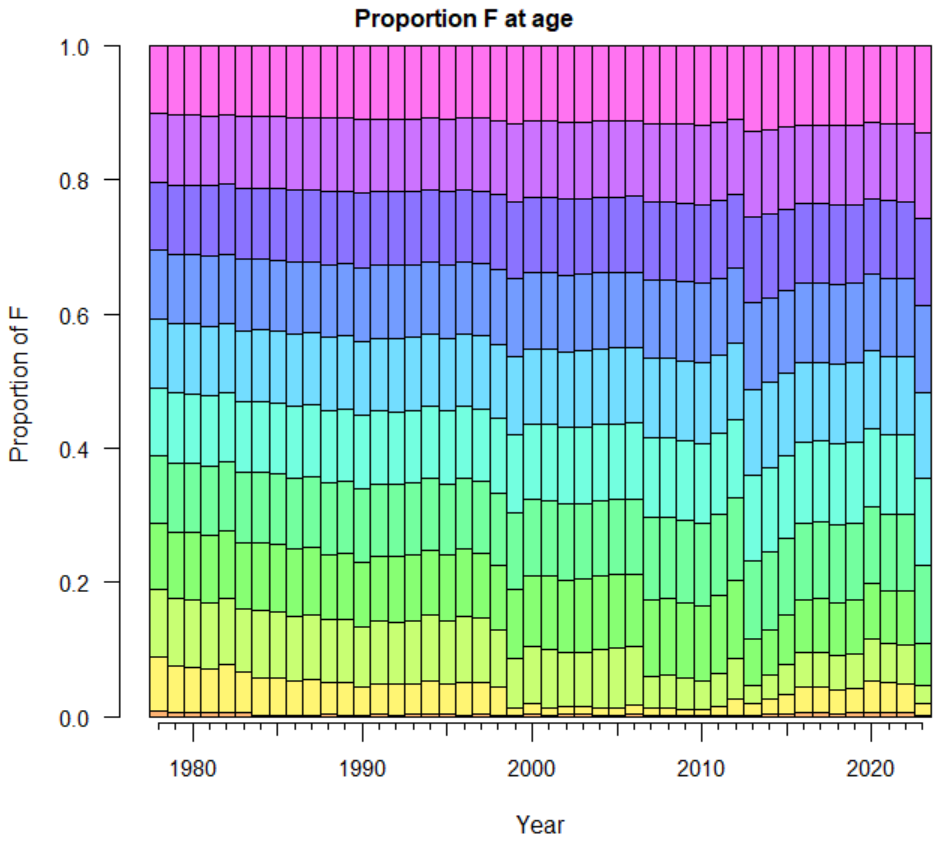


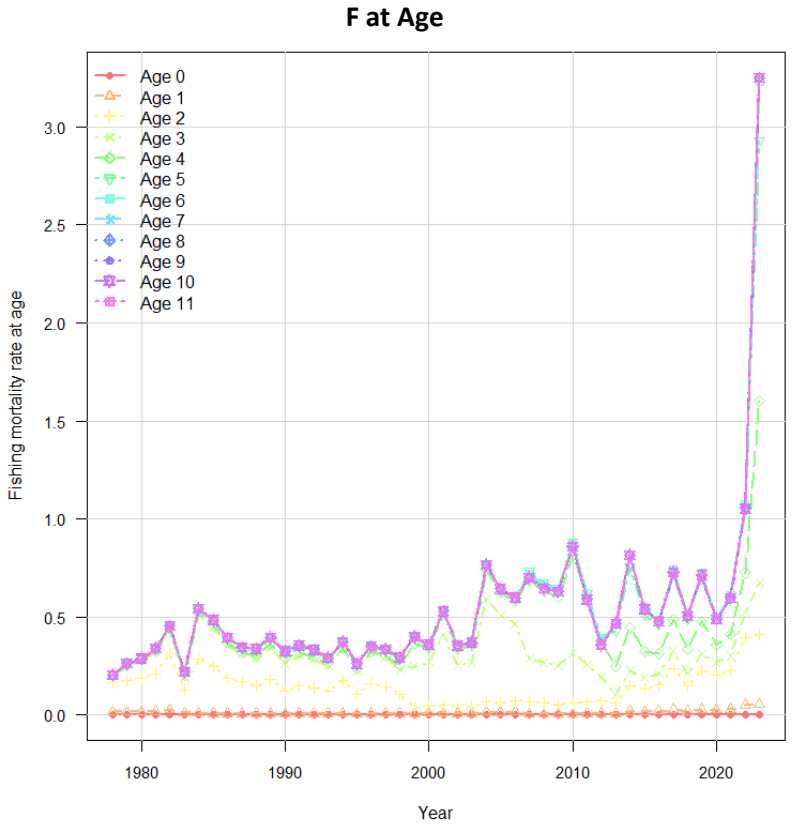
BAM base model – Spawning stock

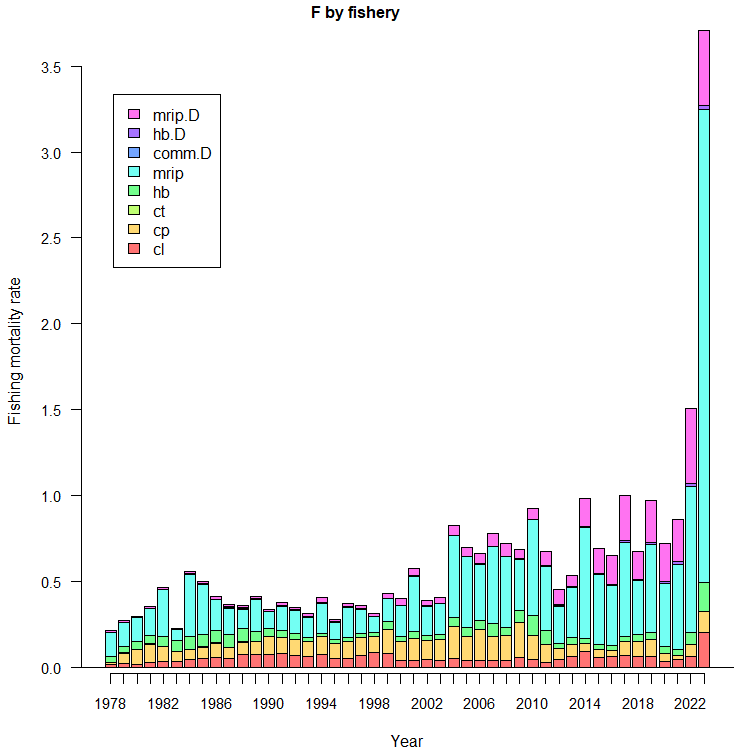




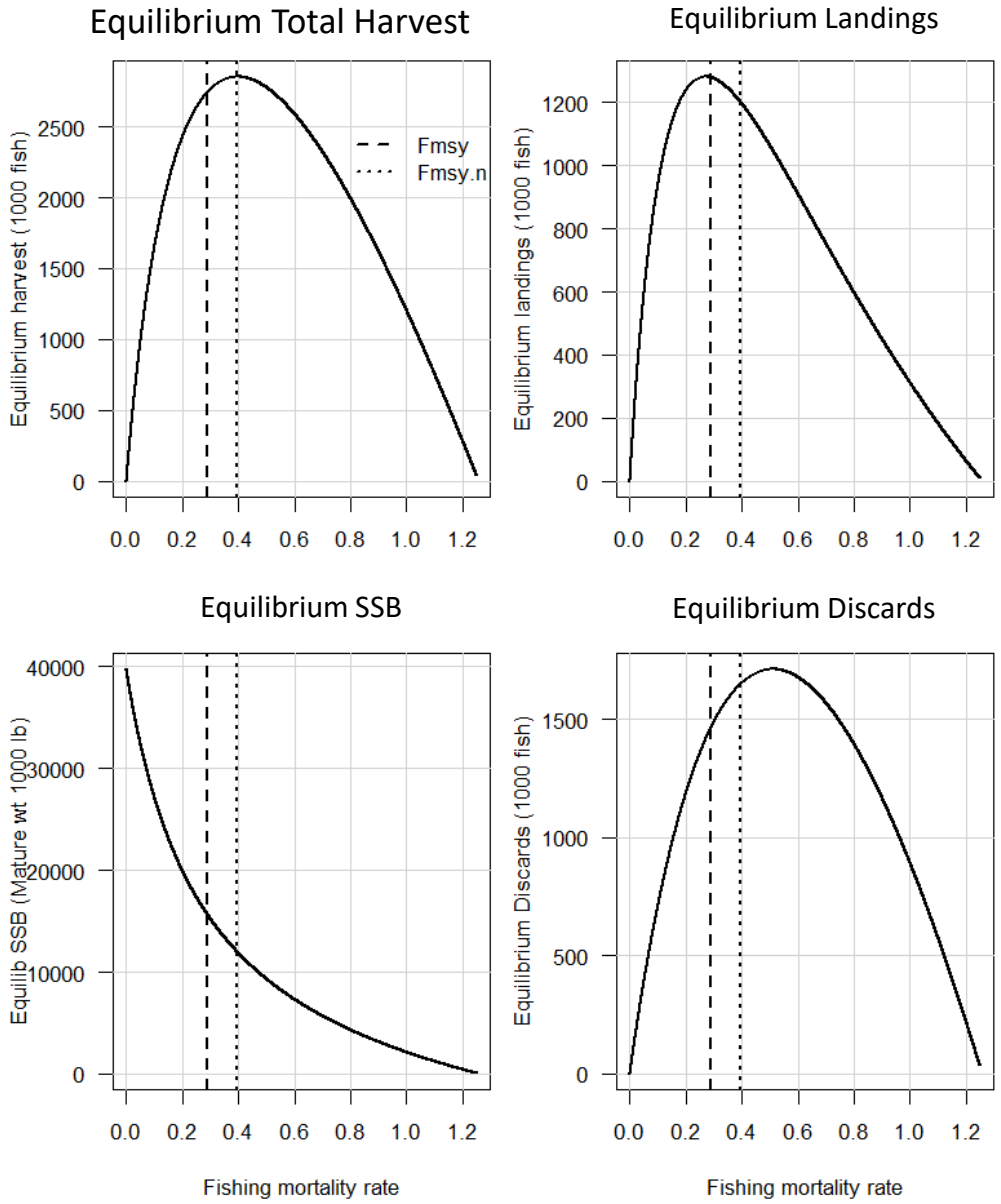
BAM base model – Fishing mortality





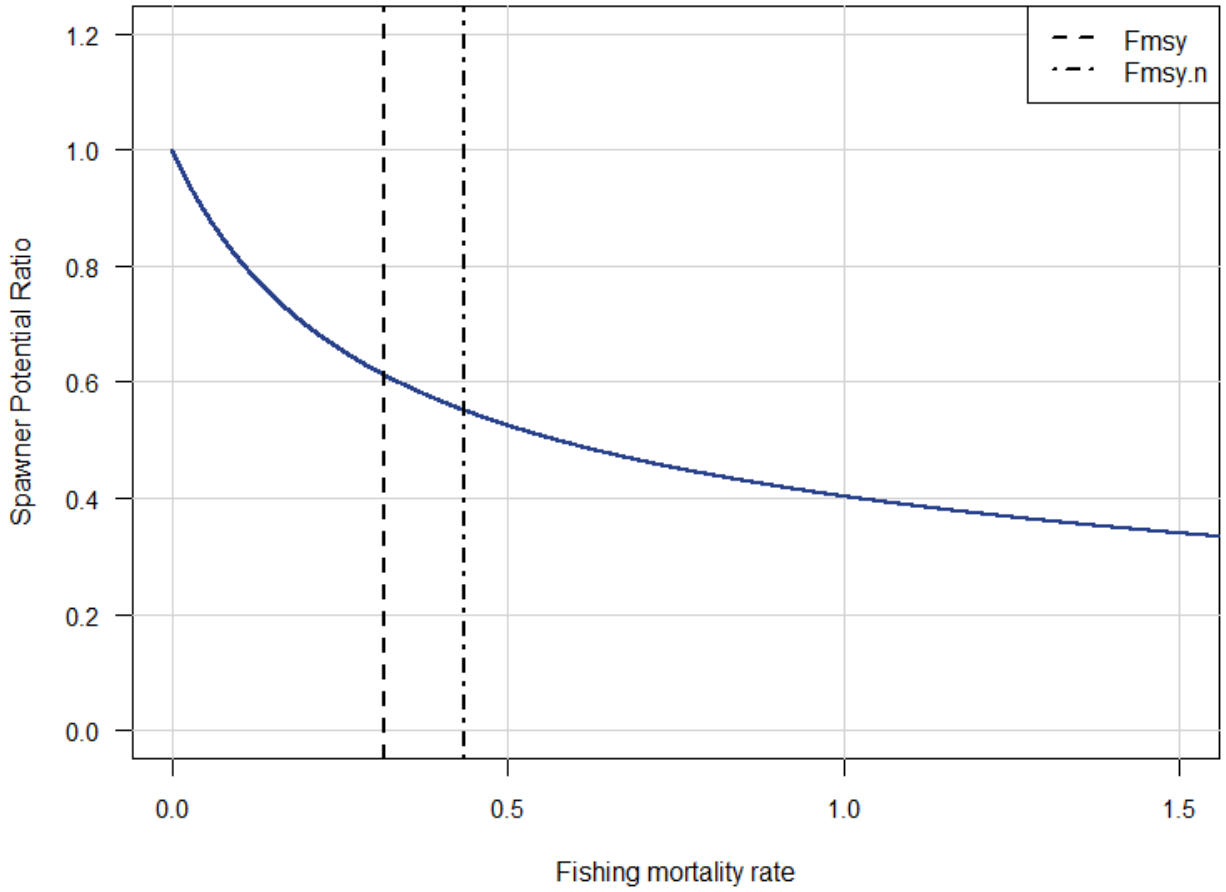


BAM base model – Equilibrium Landings and Discard

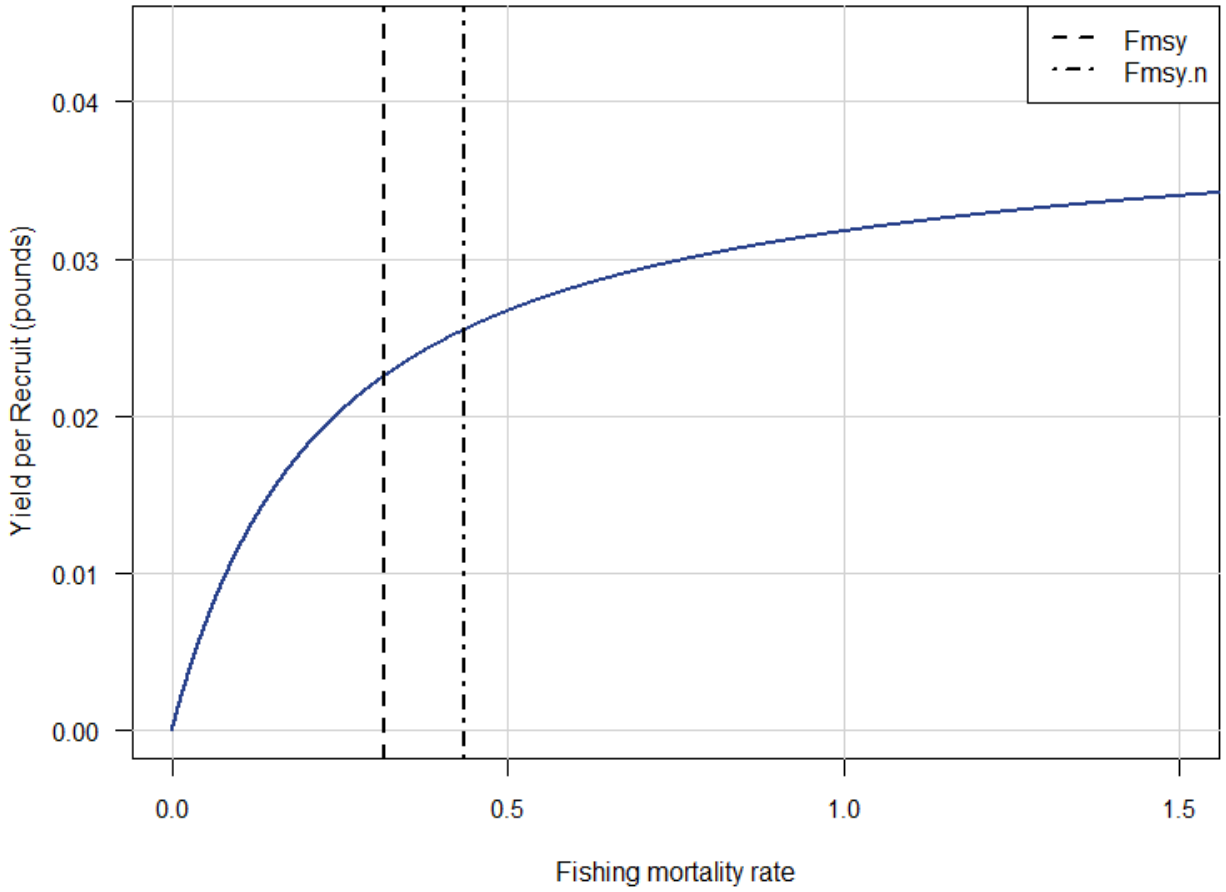


BAM base model – Per recruit

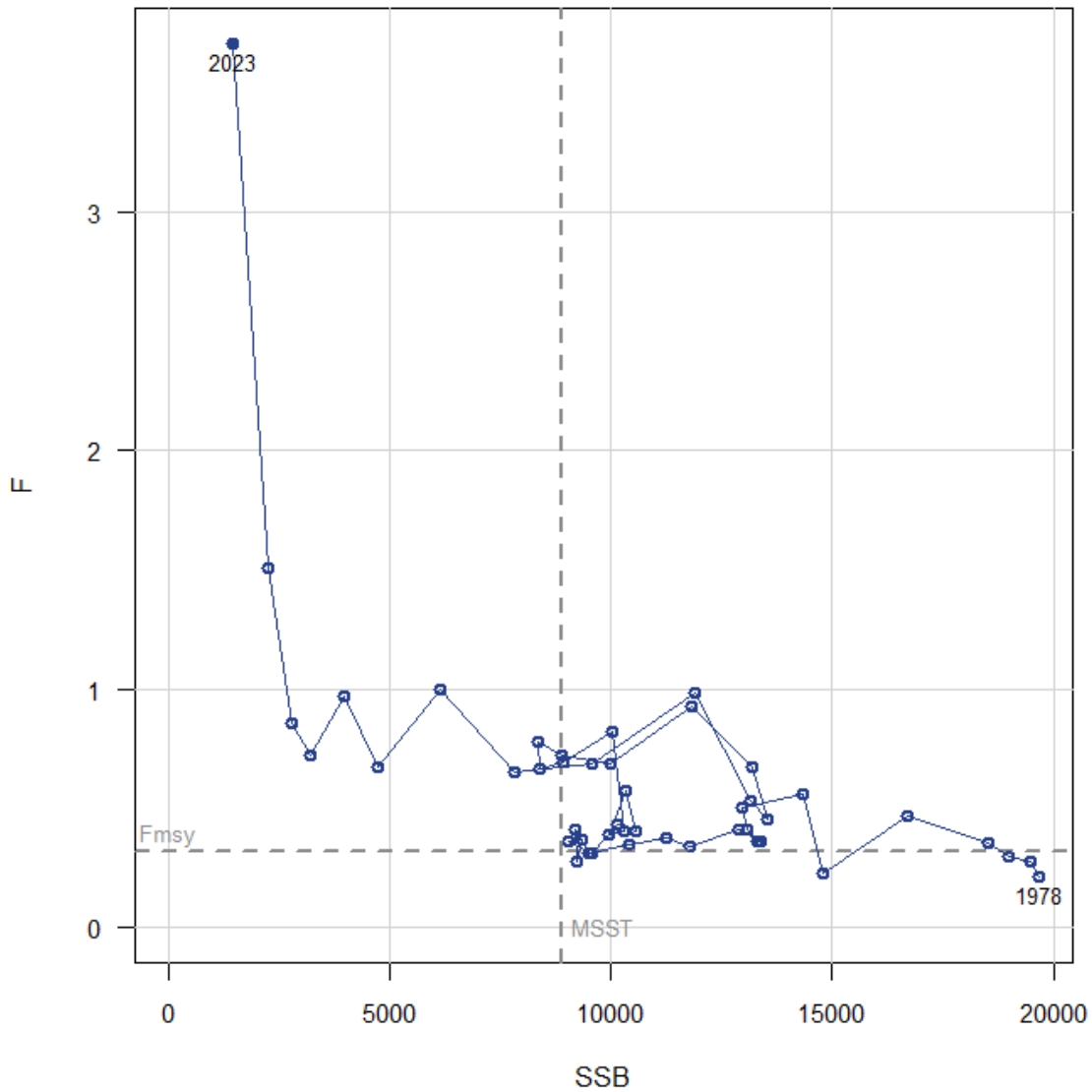
Spawning Potential Ratio

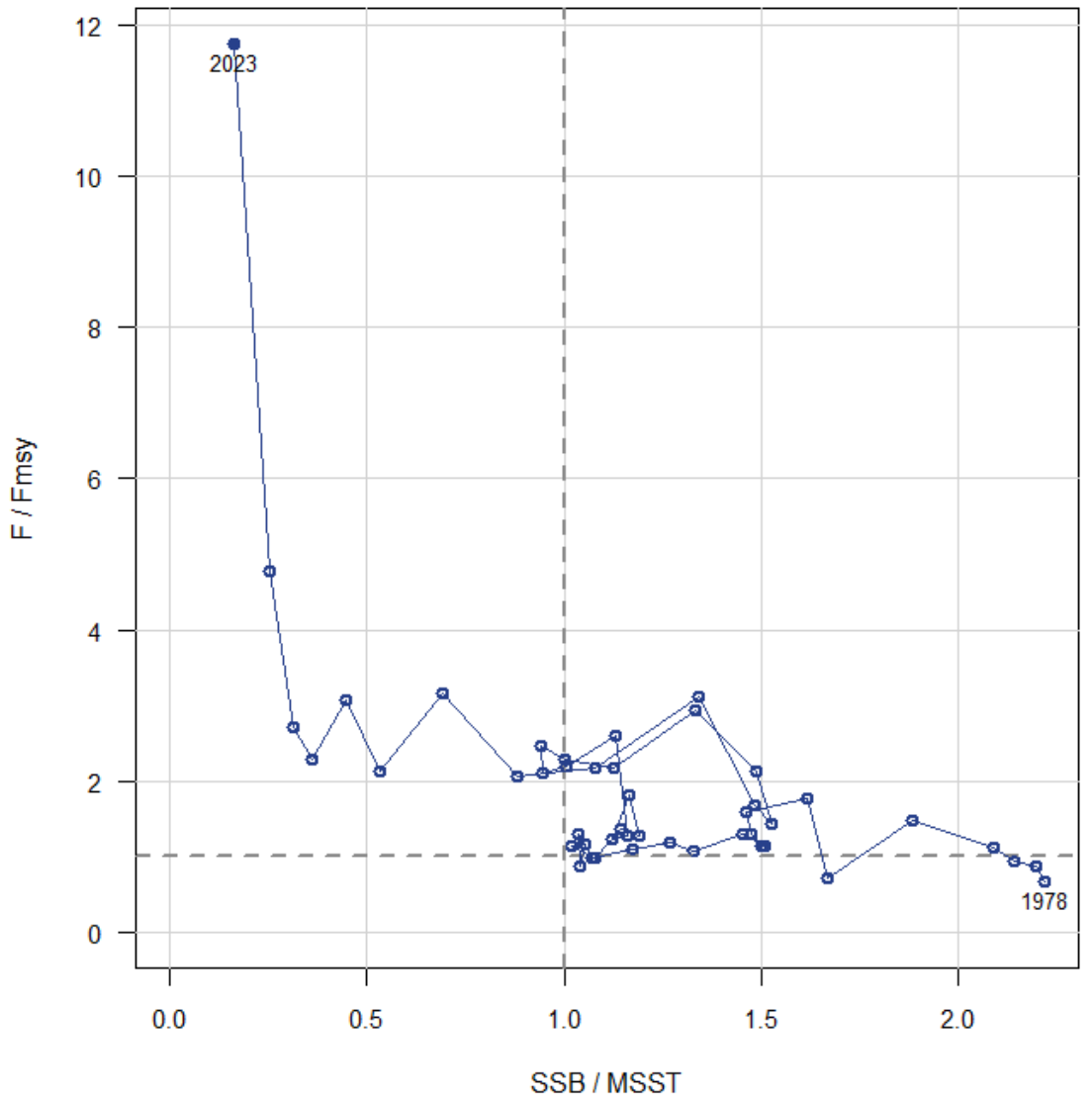


Yield Per Recruit

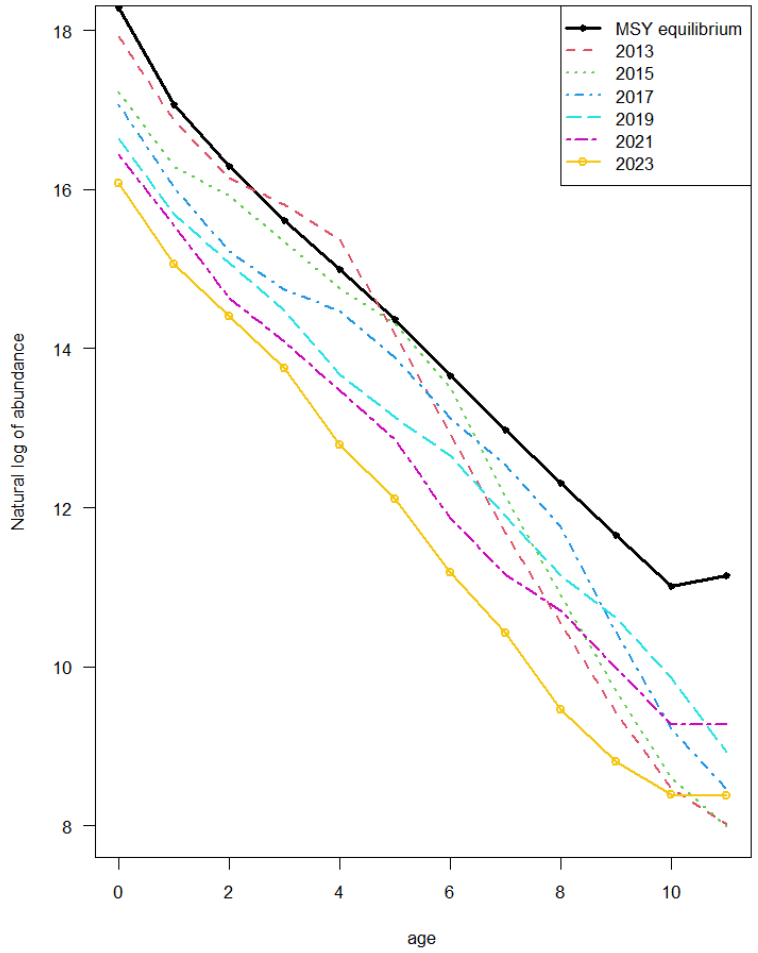


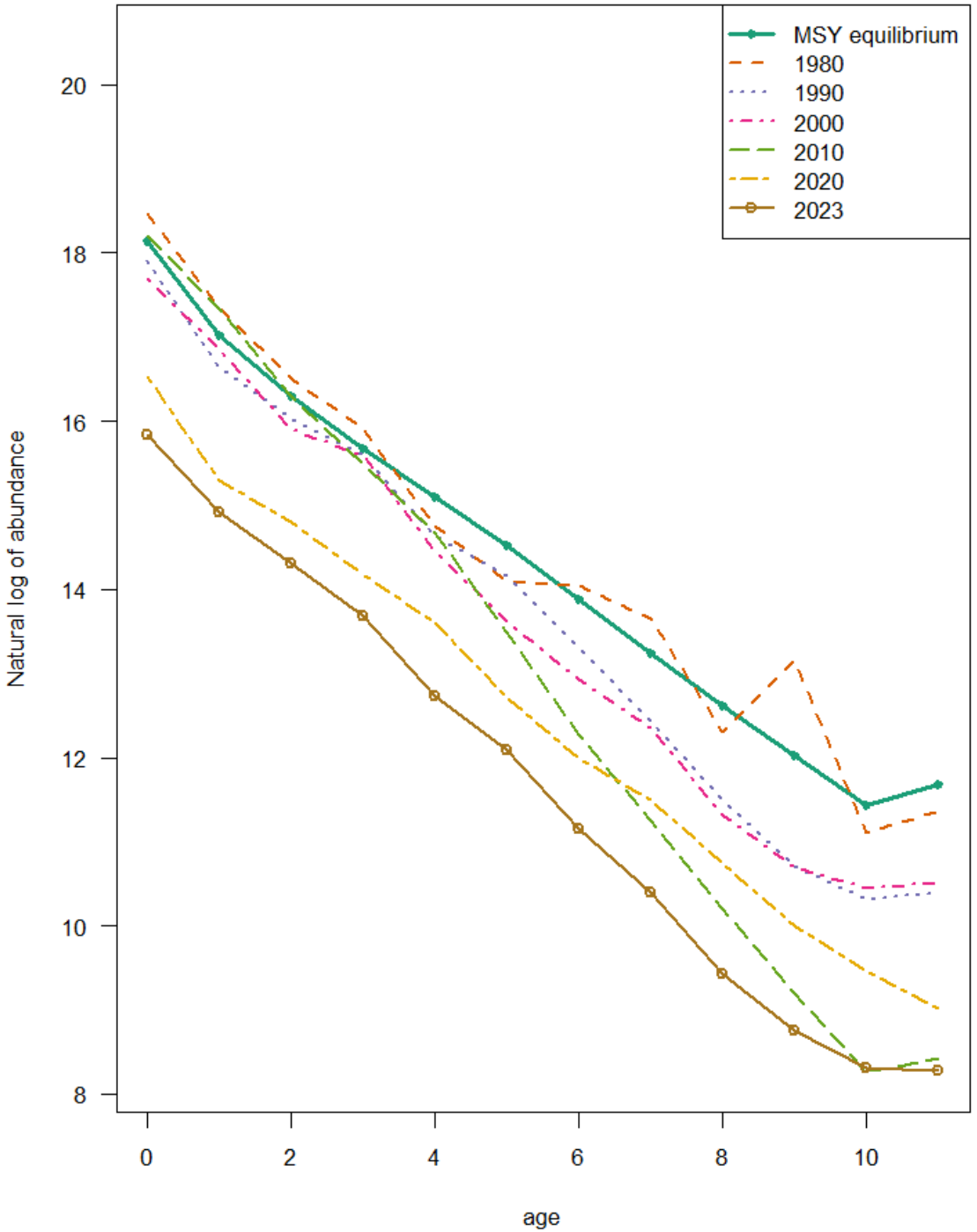
BAM base model – Phase plot



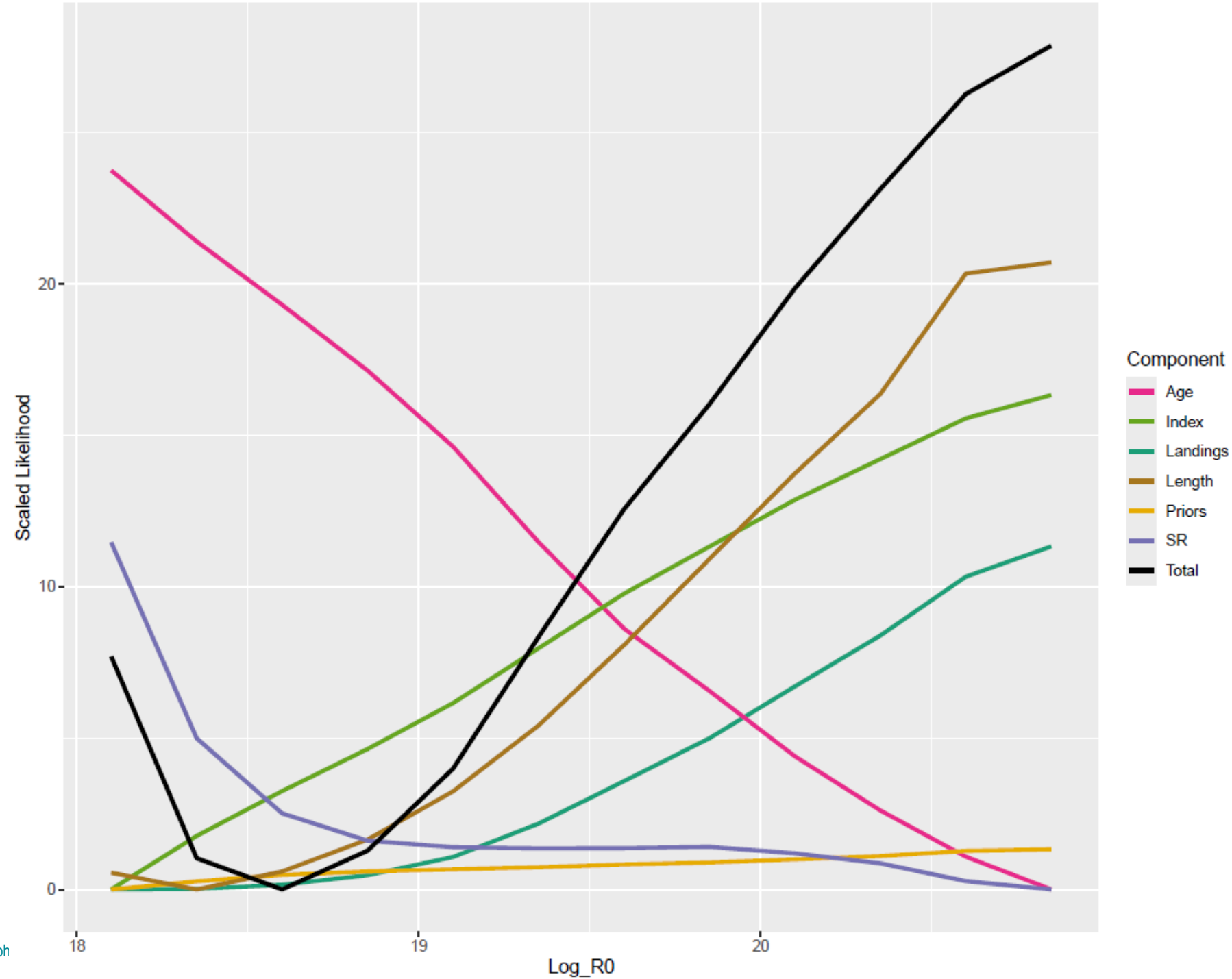


Age Structure Compared to Equilibrium

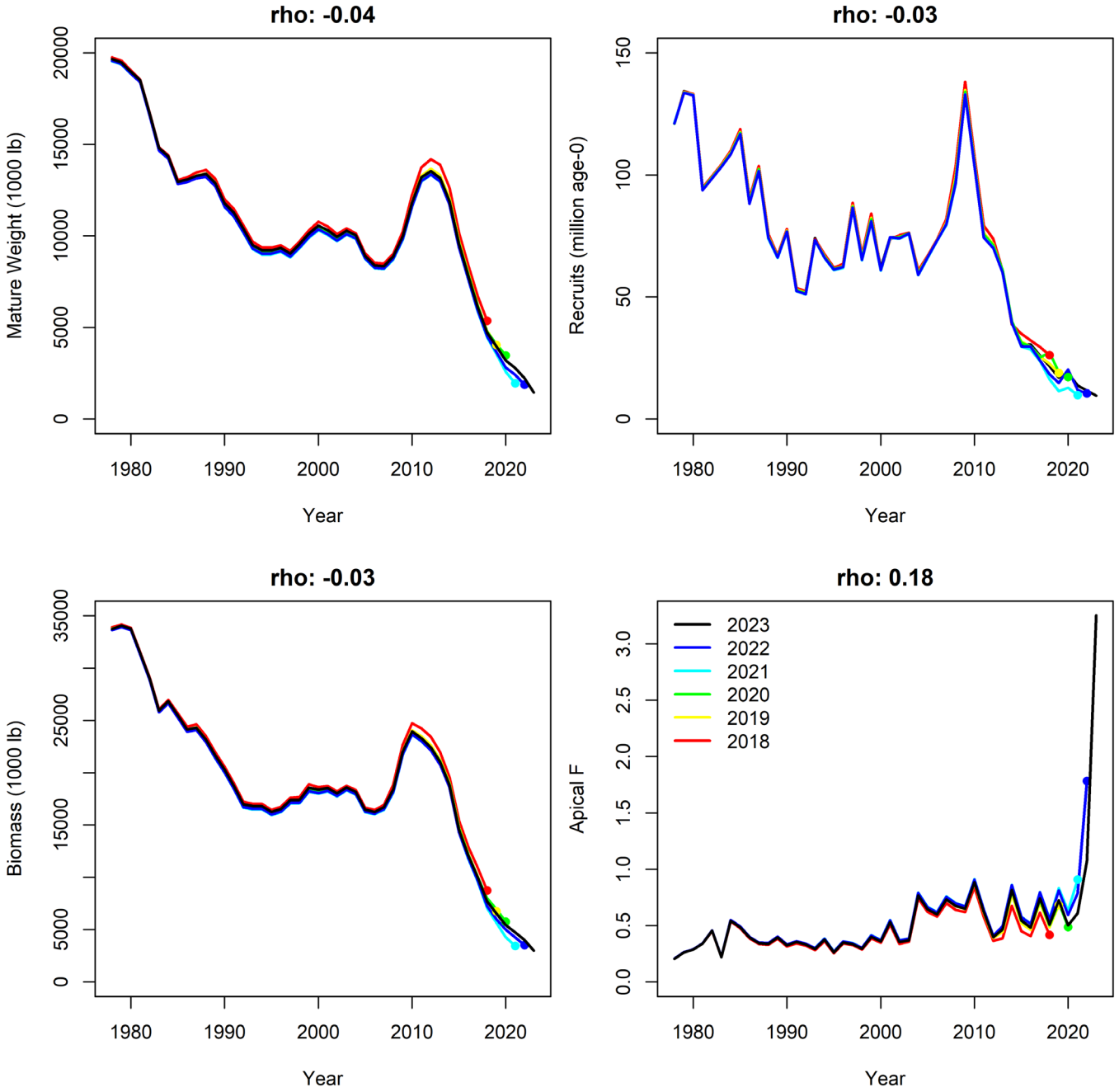




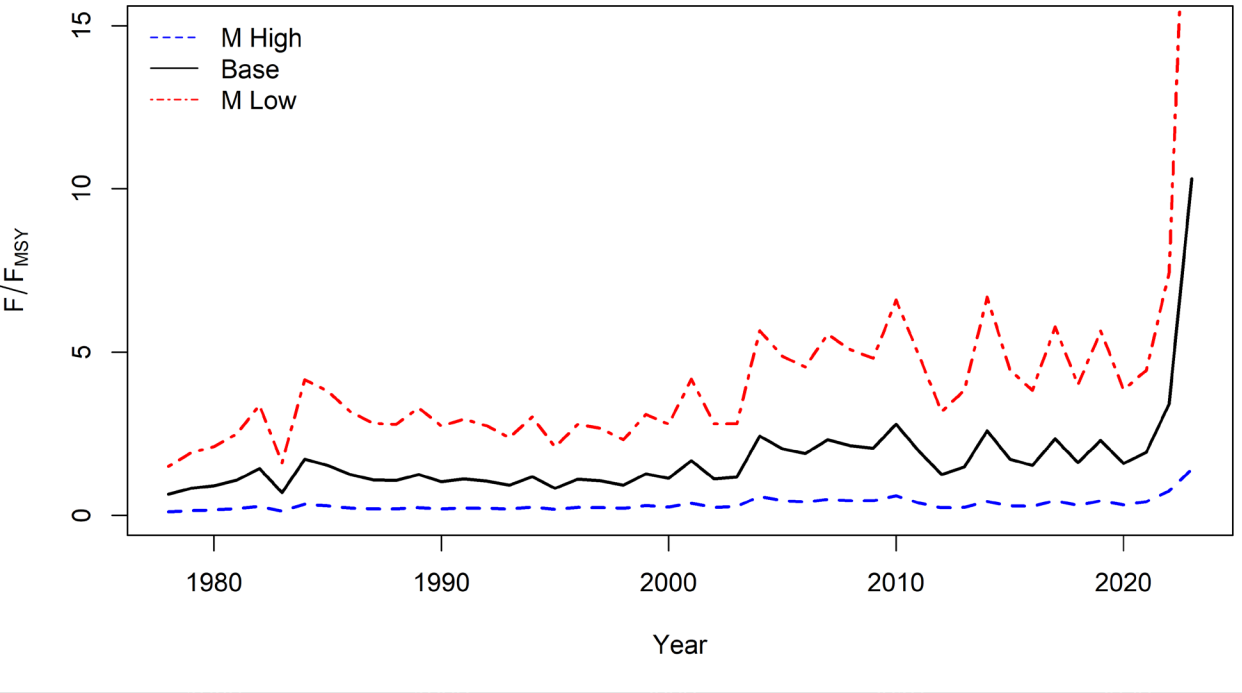
BAM base model – Log R0 Profile

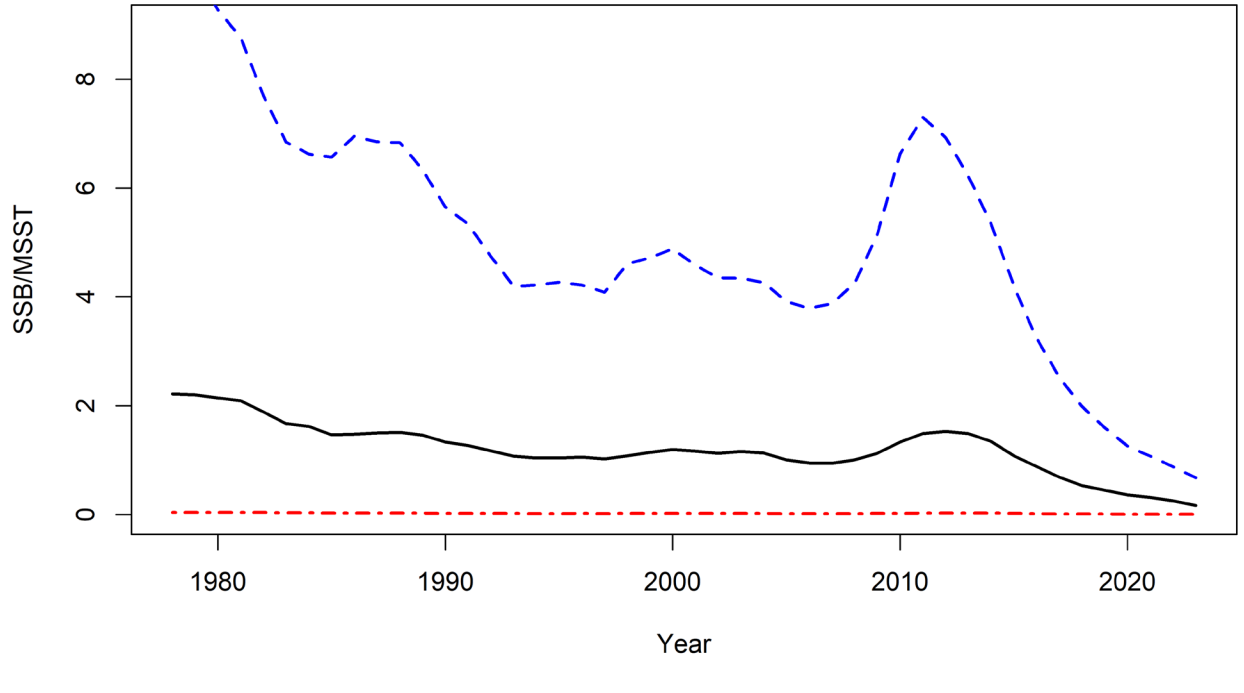


BAM base model – Retrospective analysis

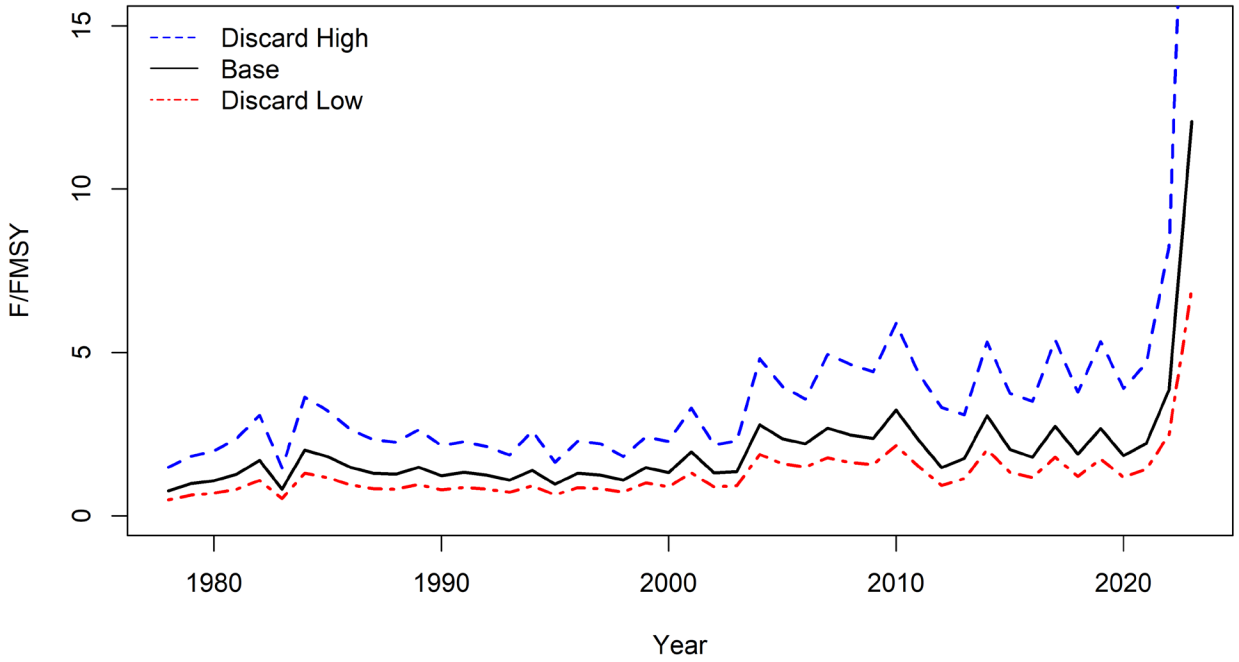


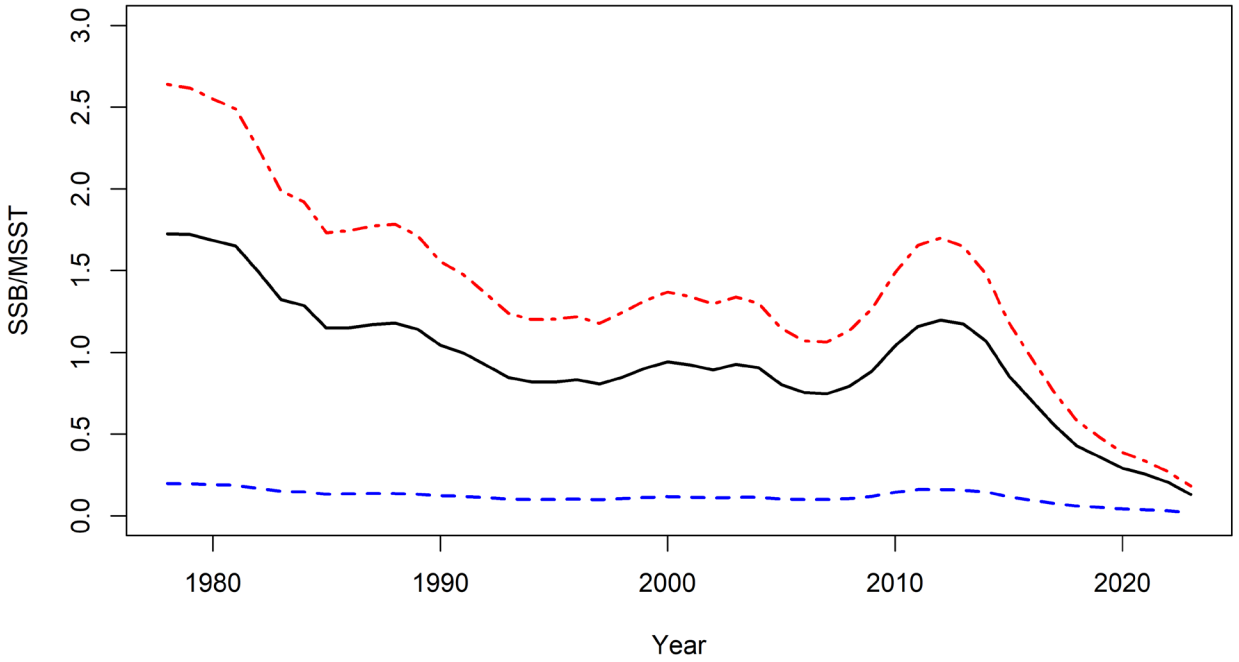
BAM base model – Natural mortality sensitivity



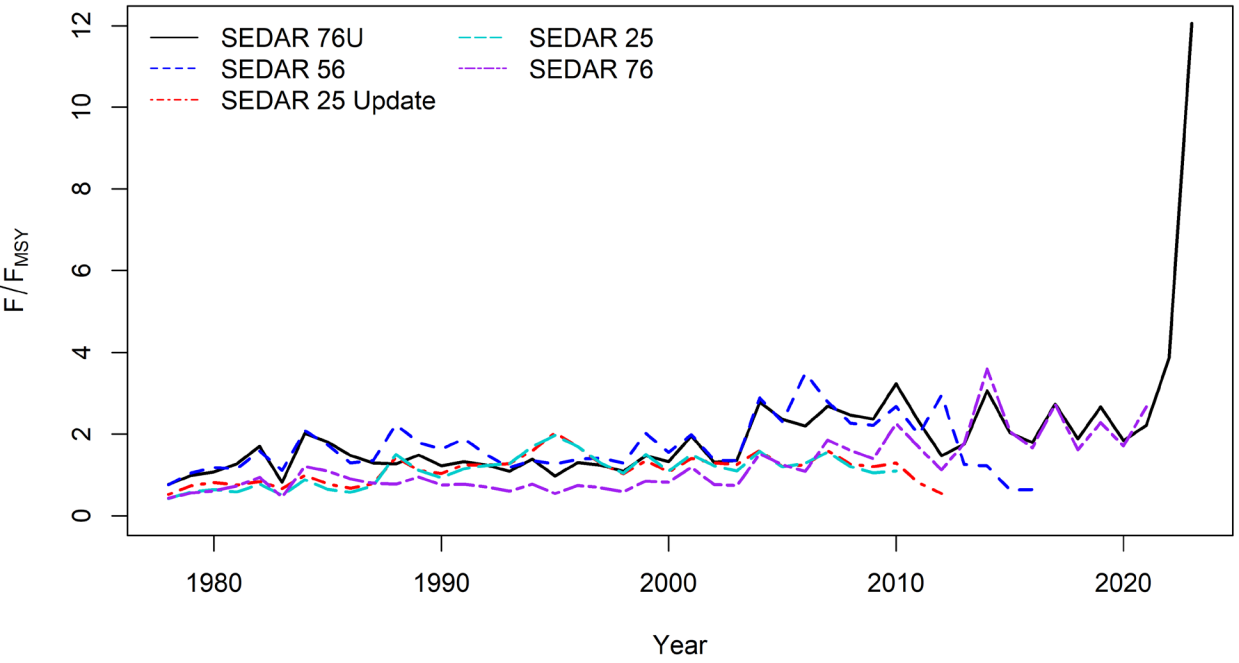


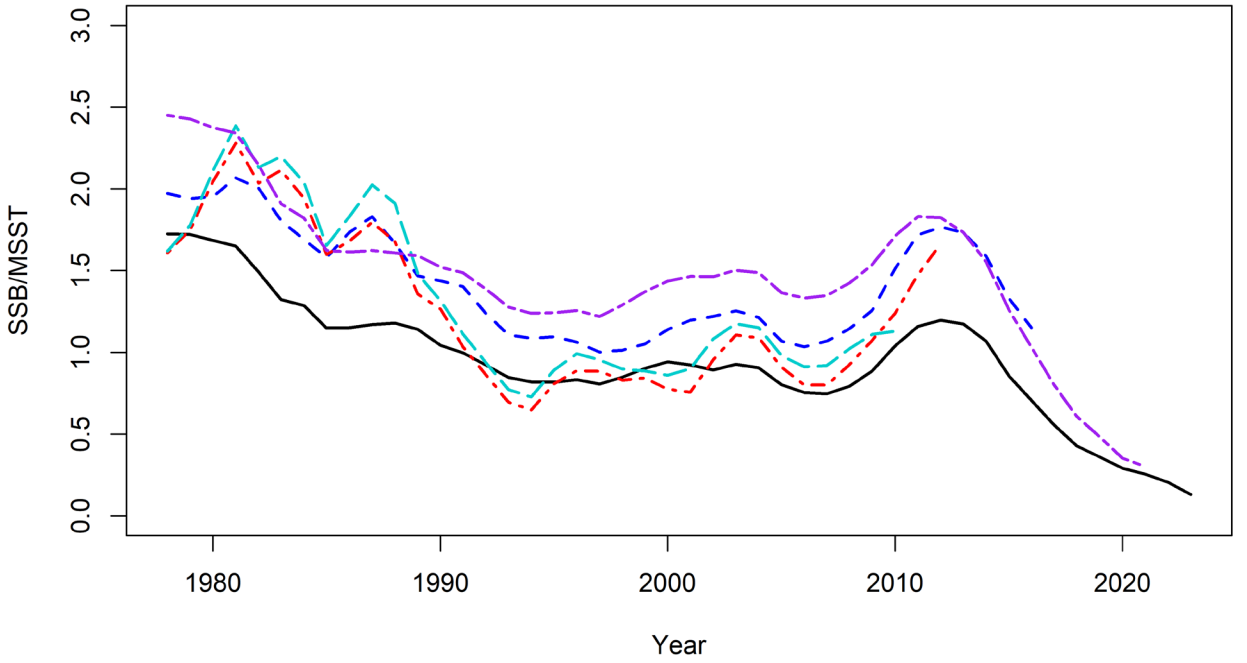
BAM base model – Discard mortality sensitivity





BAM base model – Previous assessments

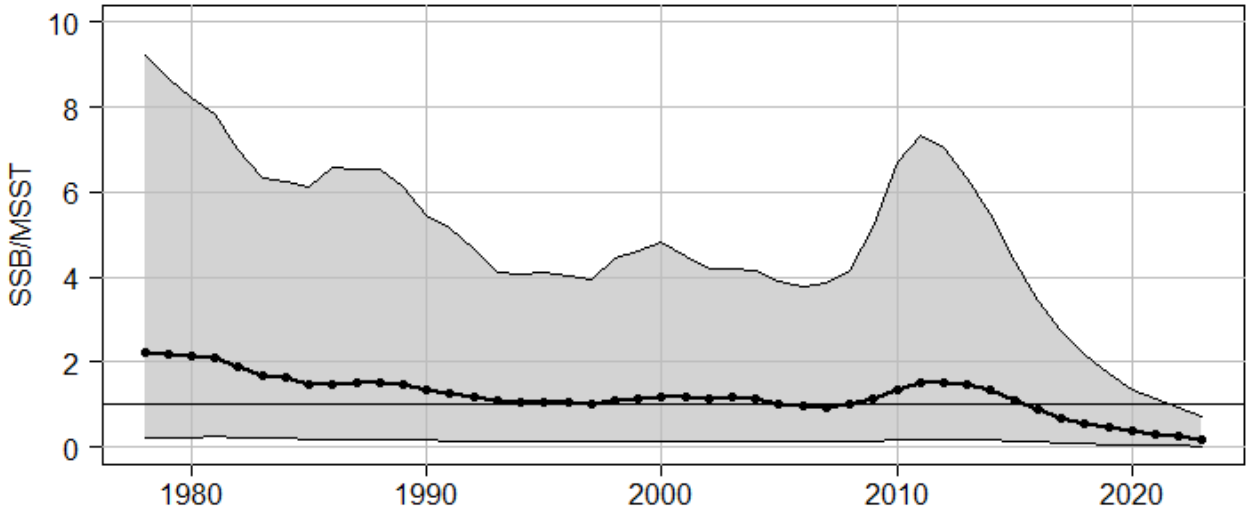


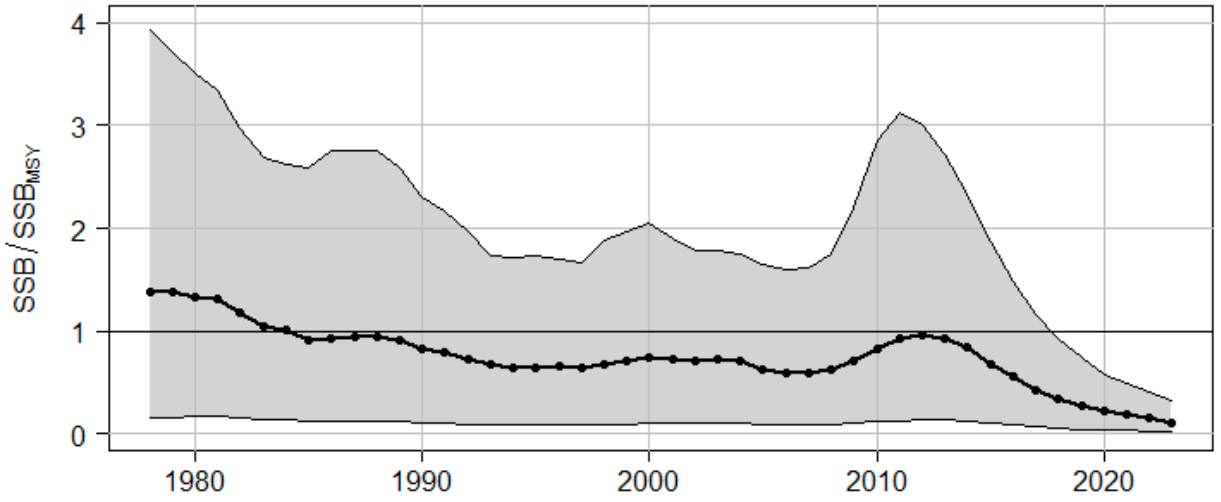


Characterizing uncertainty: Monte Carlo/Bootstrap Ensemble (MCBE)

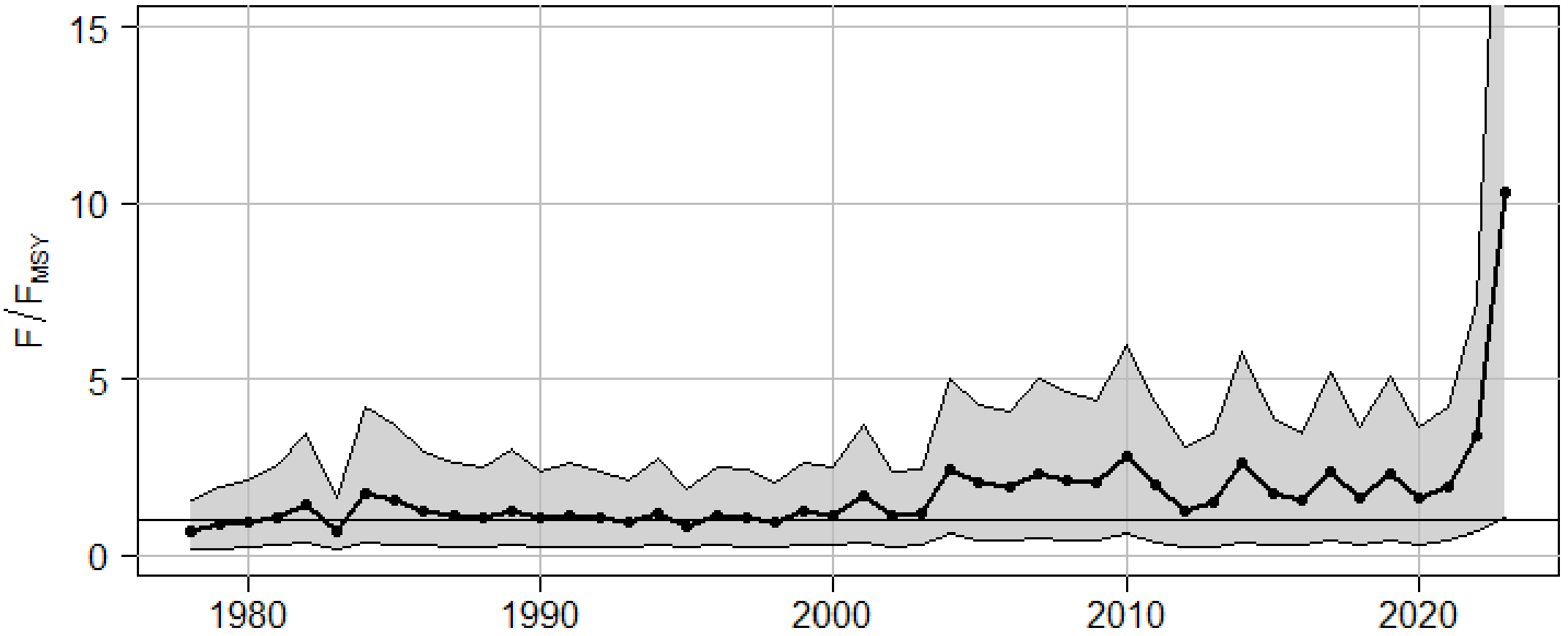
- Bootstrap the data
  - Multinomial resampling of age and length compositions
  - Multiplicative lognormal error on indices and removals
- Monte Carlo draws
  - Natural mortality: Drawn from U(0.22, 0.6)
  - Discard Mortality: Drawn from fleet specific truncated gamma distribution
  - Index weights : Drawn from U(1.875, 3.125) as in SEDAR 56
- 4000 model fits
  - 3343 (83.6%) trials converged with parameters away from bounds

MCBE – Relative spawning stock

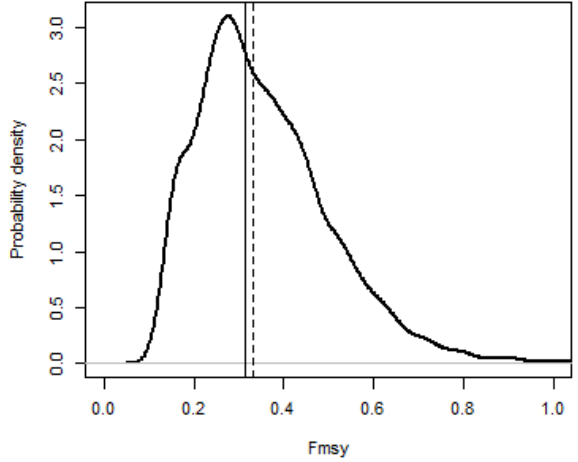


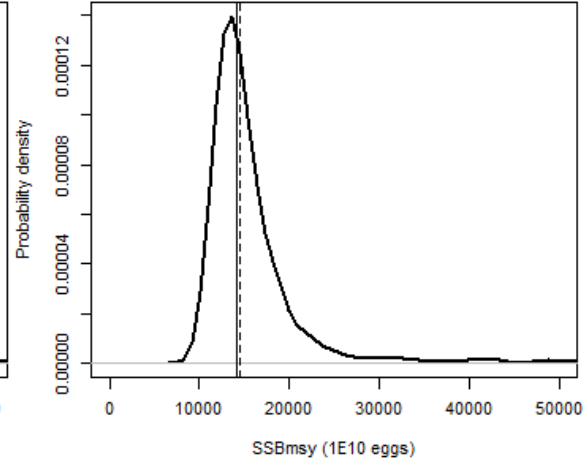


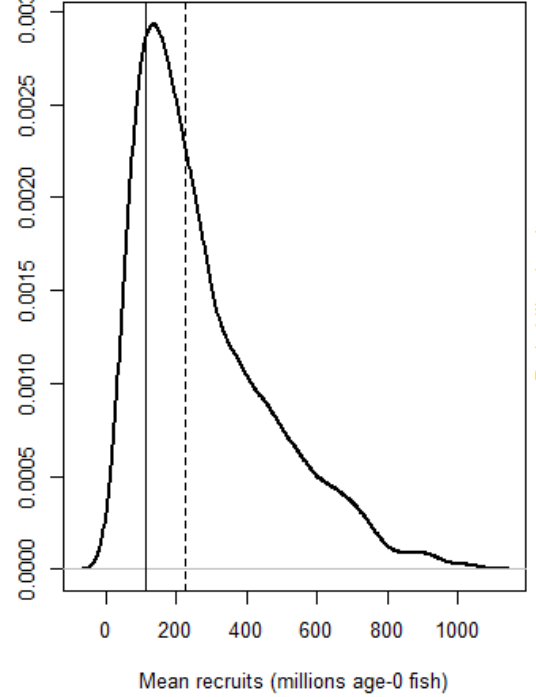
MCBE – Fishing mortality

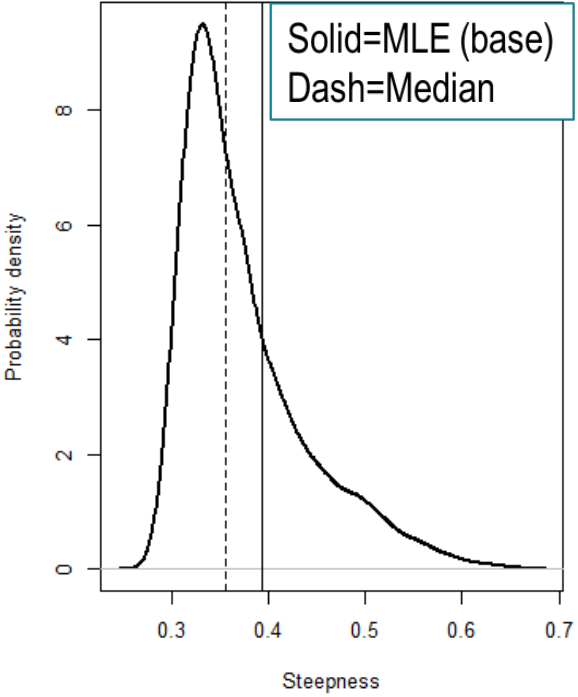


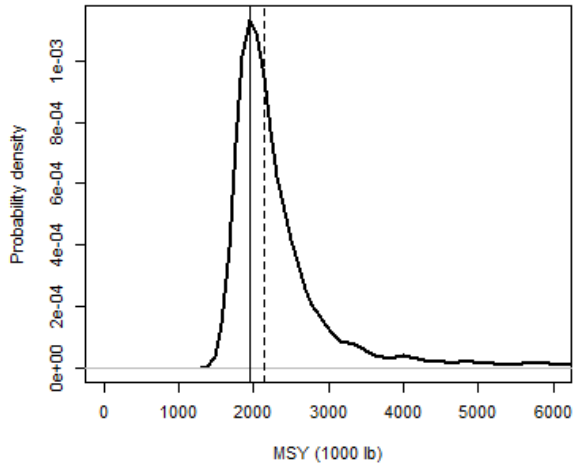
MCBE – Benchmarks

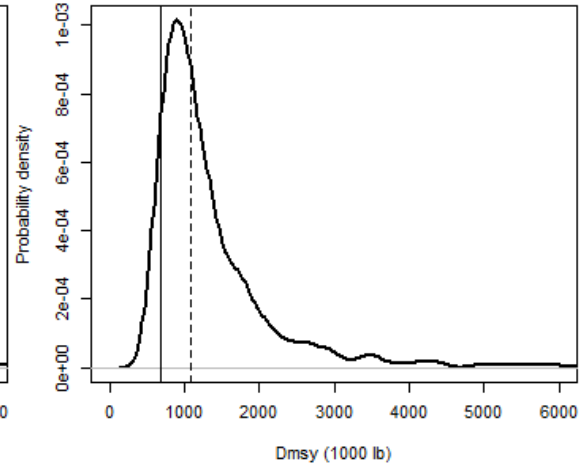


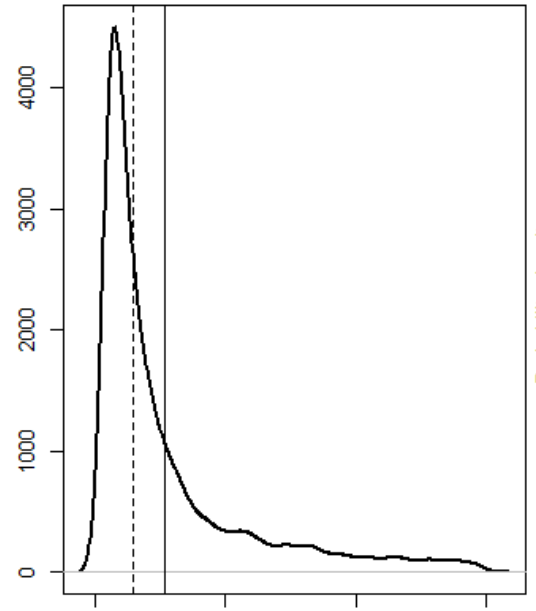


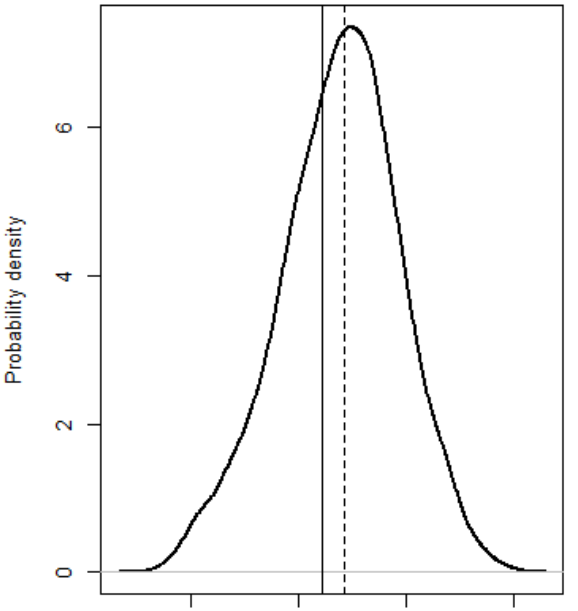


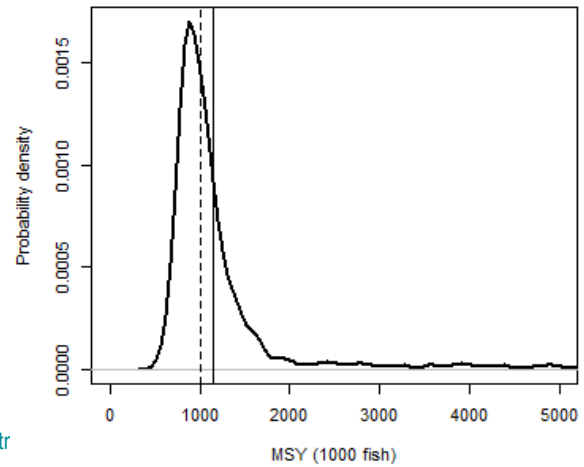


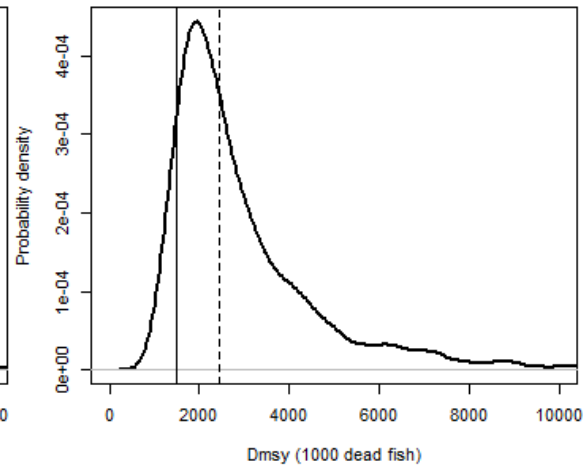




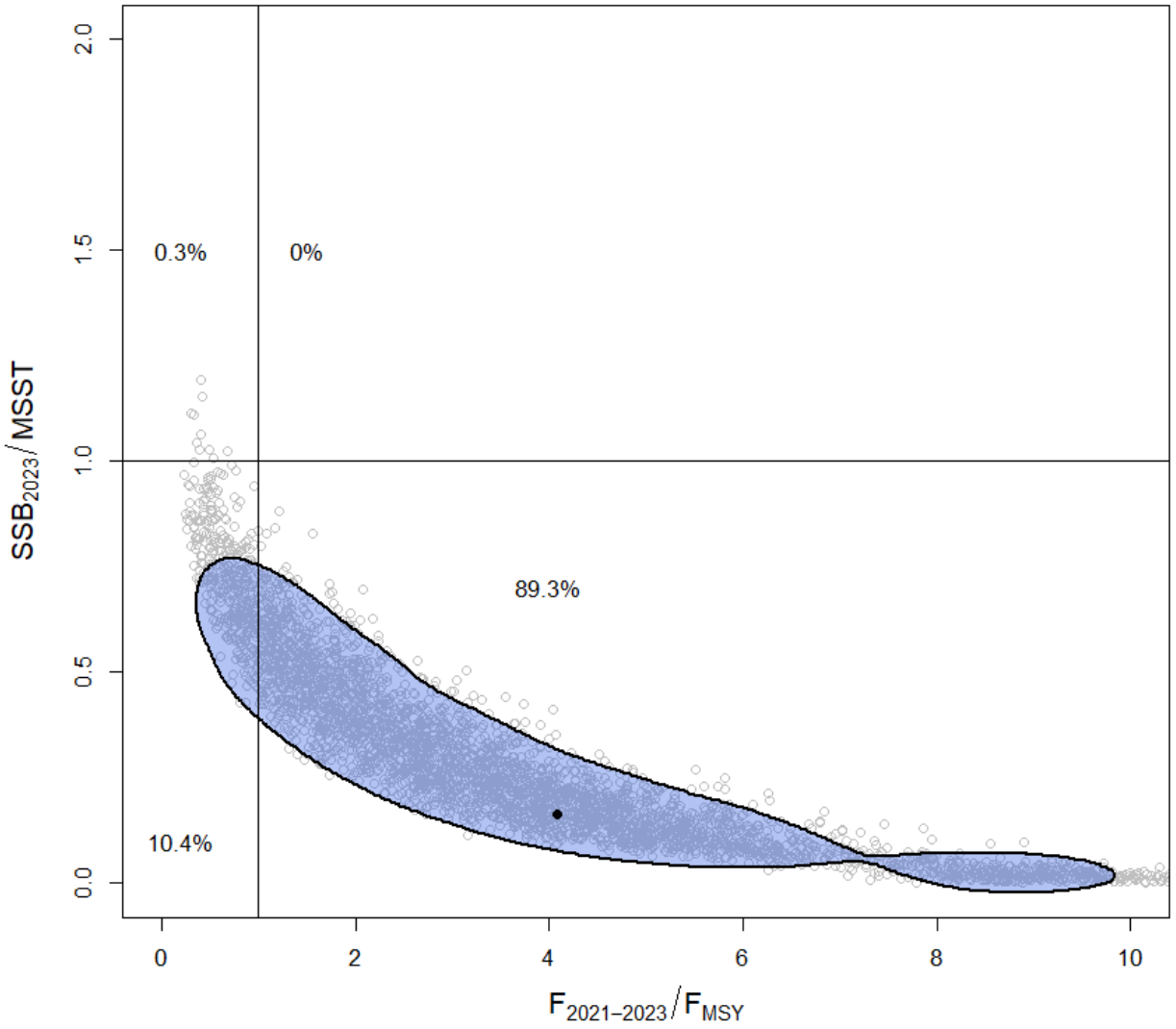


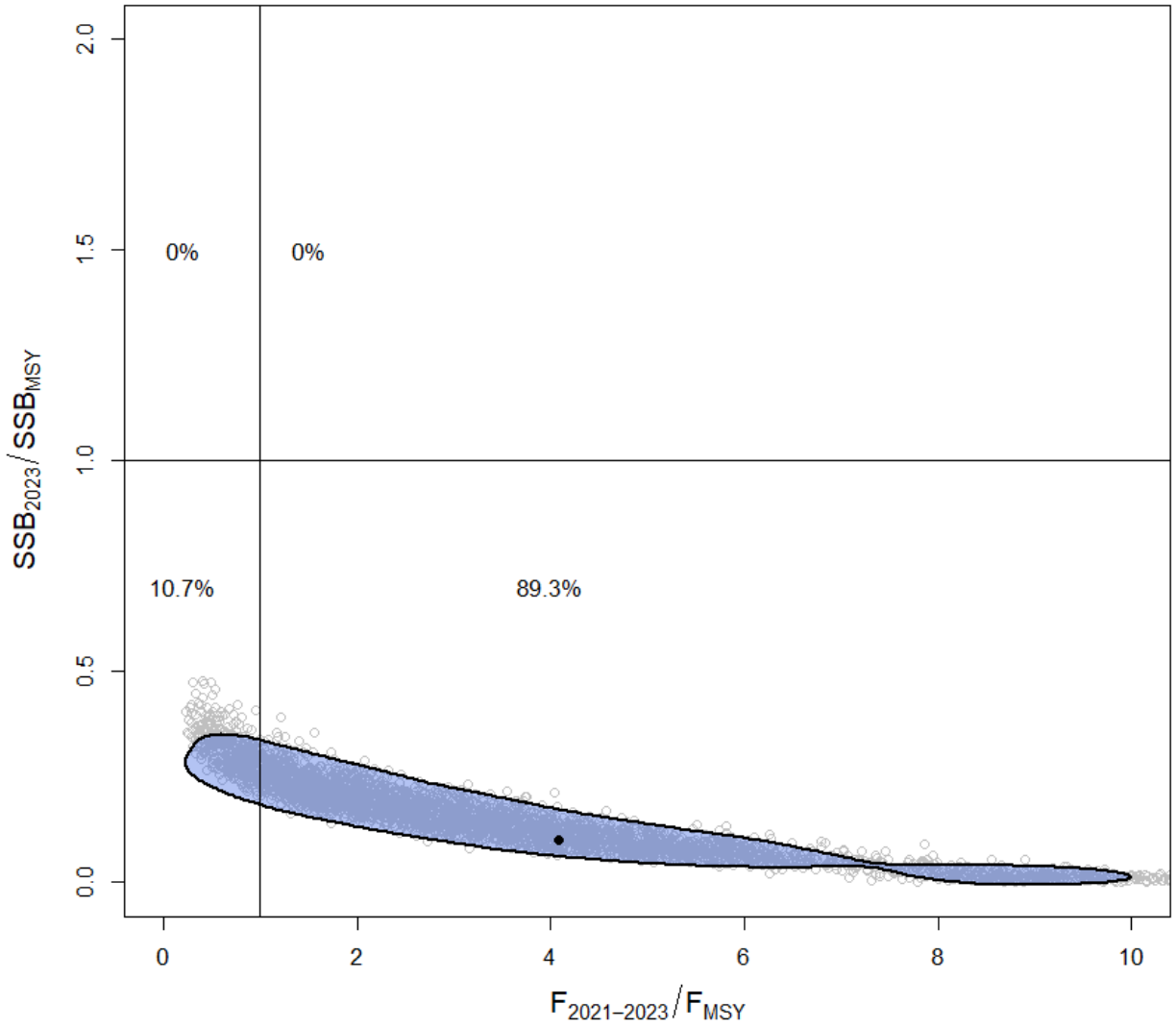






MCBE – Management quantities

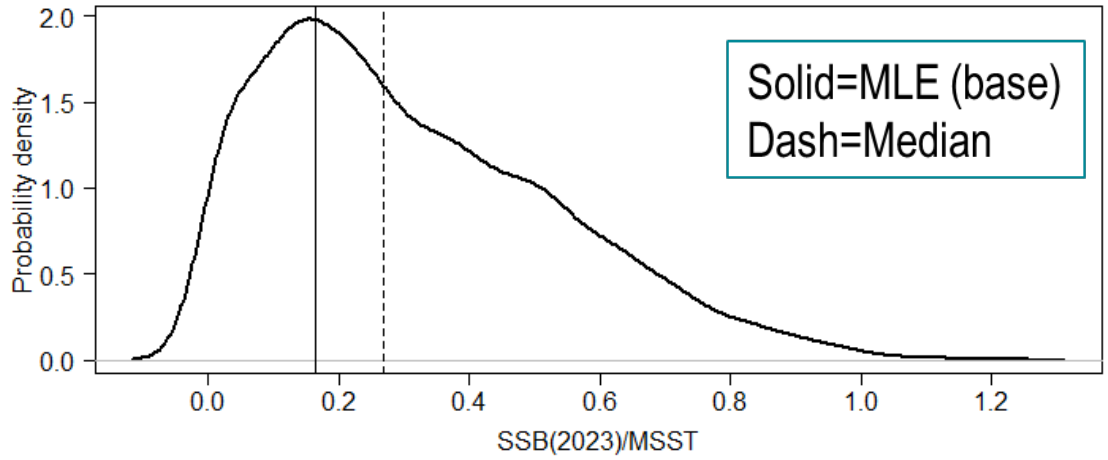


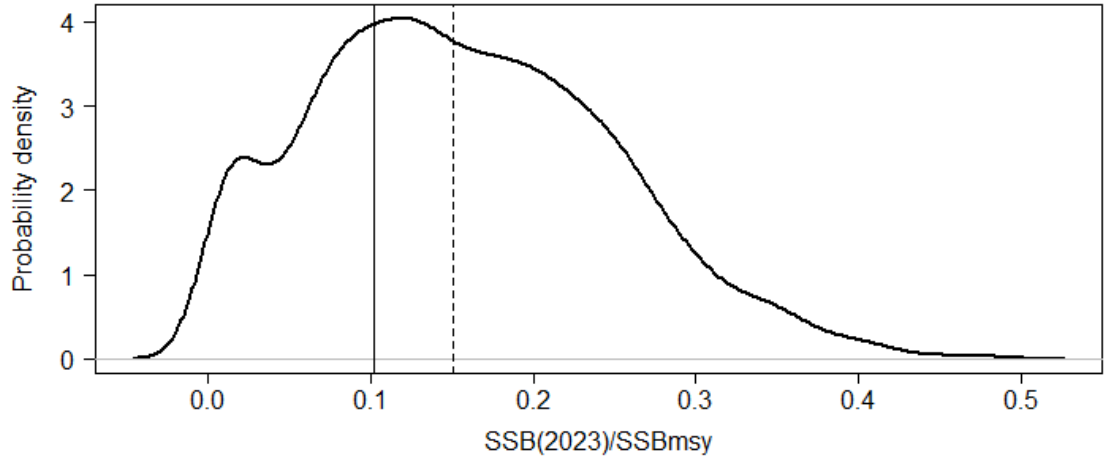


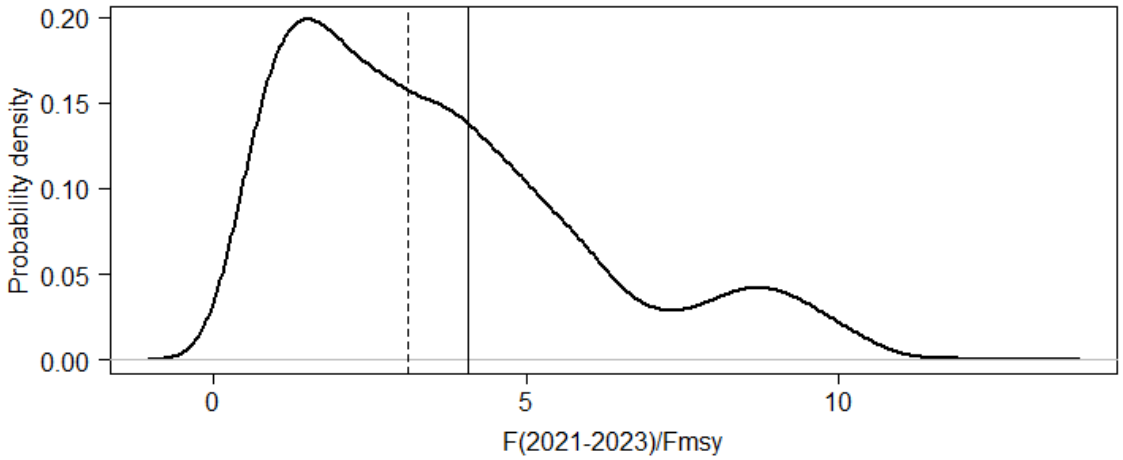
MCBE – Status indicators

99.7% of distribution below 1.0 (i.e., overfished)

89.3% of distribution above 1.0 (i.e., overfishing)







MCBE –Status Indicators

Quantity	Units	Estimate	Median	SE
F_{MSY}	y^{-1}	0.32	0.33	0.15
$75\%F_{MSY}$	y^{-1}	0.24	0.25	0.11
B_{MSY}	1000 lb	23946.38	31774.95	47522.56
SSB_{MSY}	1E10 eggs	14182.85	14546.38	37762.97
MSST	1E10 eggs	8864.28	7574.79	28417.79
MSY	1000 lb	1956.49	2148.97	3685.48
MSY	1000 dead fish	1154.26	1008.55	2130.65
$L_{75\%MSY}$	1000 lb	1308.81	1047.19	2875.41
$L_{current}$	1000 lb	508.00	509.39	67.39
D_{MSY}	1000 lb	685.83	1093.68	966.57
D_{MSY}	1000 dead fish	1485.11	2426.36	2078.38
T_{MSY}	1000 lb	2642.32	3249.55	4547.01
T_{MSY}	1000 dead fish	2639.36	3420.59	3896.09
$D_{75\%MSY}$	1000 dead fish	594.71	2127.04	1819.98
$D_{current}$	1000 dead fish	947.46	1255.76	540.76
R_{MSY}	millions fish	8.67	16.61	14.38
$F_{2021-2023}/F_{MSY}$	—	4.08	3.11	2.45
$SSB_{2023}/MSST$	—	0.16	0.27	0.22
SSB_{2023}/SSB_{MSY}	—	0.10	0.15	0.09

Summary of assessment results

- SA black seabass is overfished/depleted (99.7%)
- Overfishing is occurring in terminal years (89.3% of MCBE runs)
- Natural mortality and discard mortality are important sources of uncertainty in this assessment
  - Though stock status is robust to range used in this assessment
- Pattern of low recruitment since 2014
  - Appears to be an increase in mortality across all ages

Projections Changes

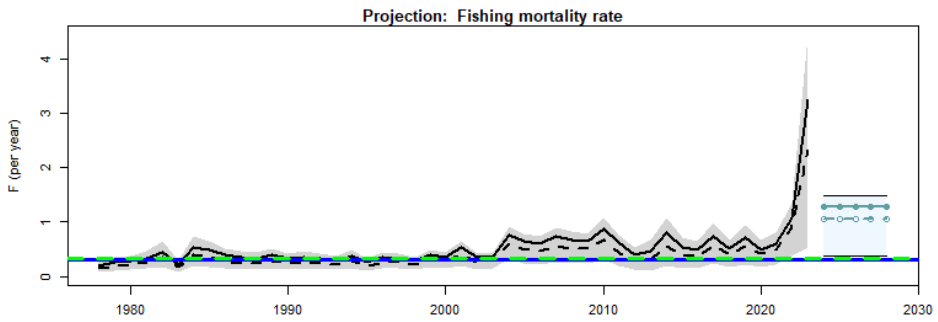
- Use BH SRR for recruitment forecasting
- Recruitment for 2024-2028 assumes recent mean recruitment deviate with stochasticity from Beverton-Holt relationship
  - 2029 and after assume BH with stochasticity
- F_{MSY} and $P^*_{30\%}$ scenarios assume discards reduced proportionally with landings
  - $P^*_{30\%}$ scenarios assumes a 93.4% reduction in discards compared to 2023

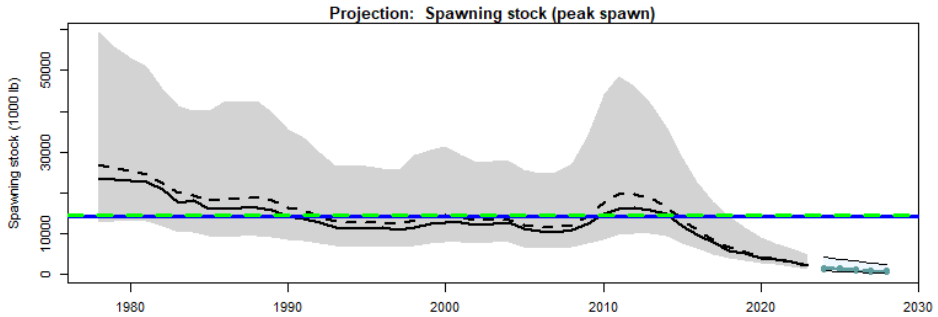
Projection Scenarios

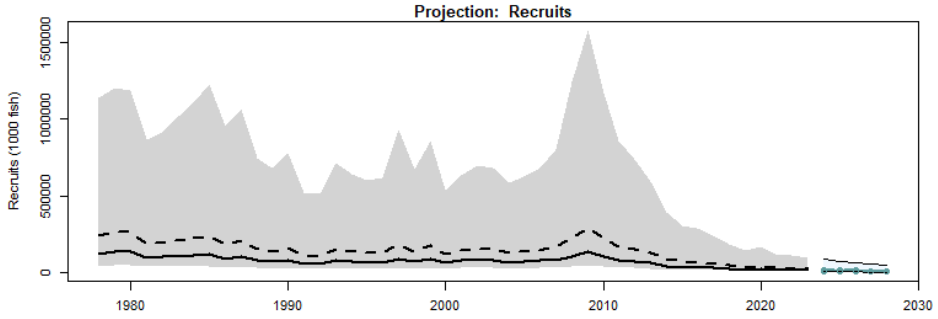
1. $F_{current}$
2. F_{MSY}
3. $P^{*}_{30\%}\ F_{MSY}$
4. $F_{40\%}$
5. $P^{*}_{30\%}\ F_{40\%}$
6. $F_{30\%}$
7. $P^{*}_{30\%}\ F_{30\%}$
8. $F = 0$
9. $F_{Landings}=0$ & $F_{discards}=F_{current}$

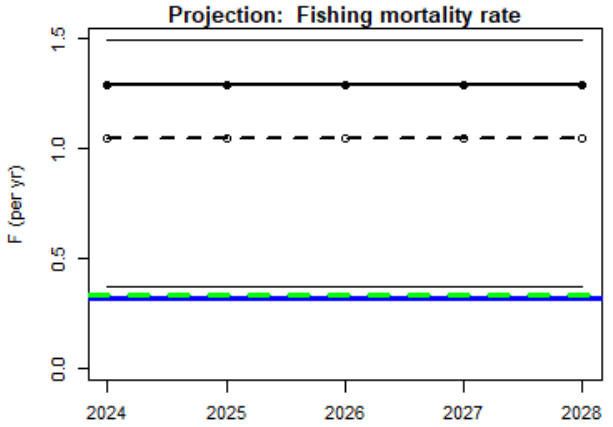
$F_{current}$

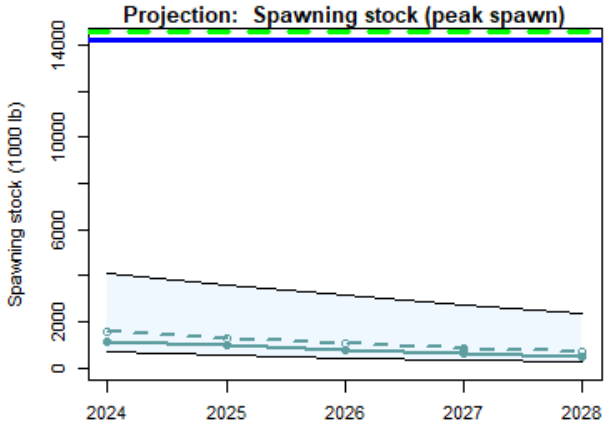
Solid dot & lines = Base model
Circles & Dashed lines = Median MCBE

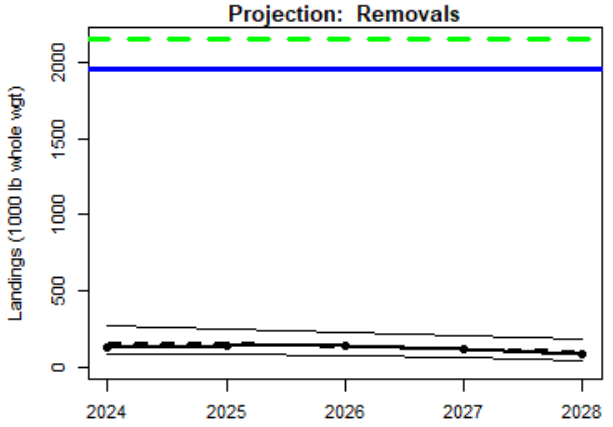


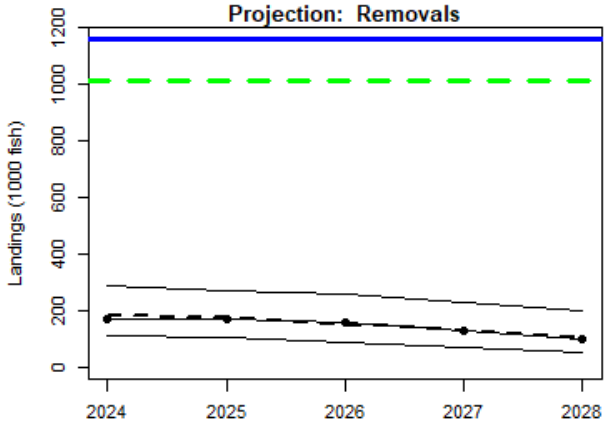


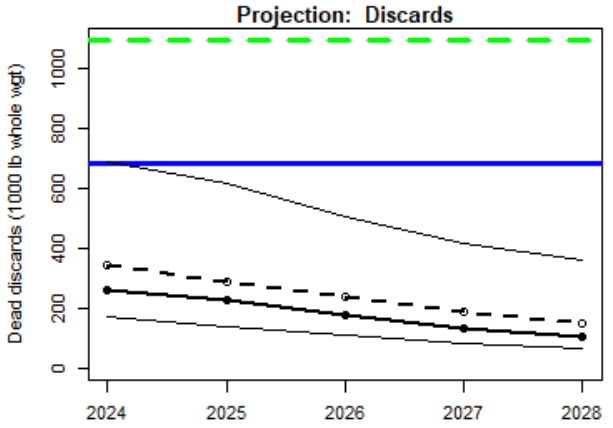


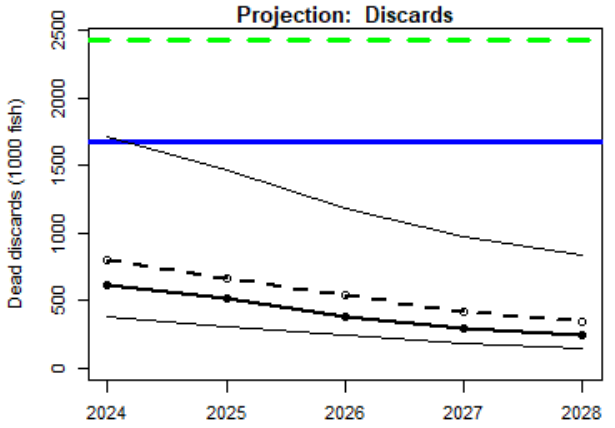






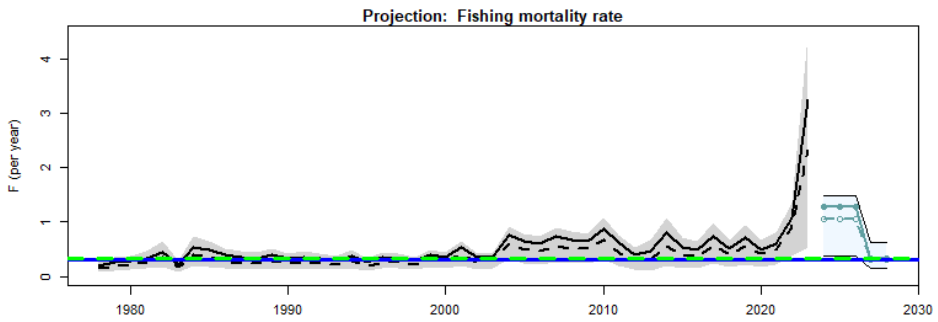


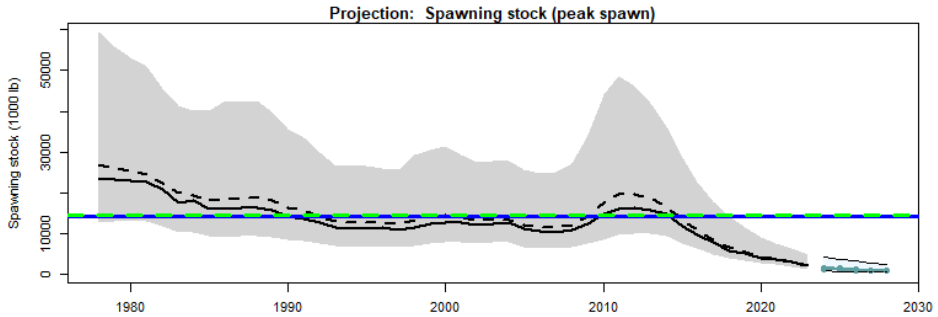


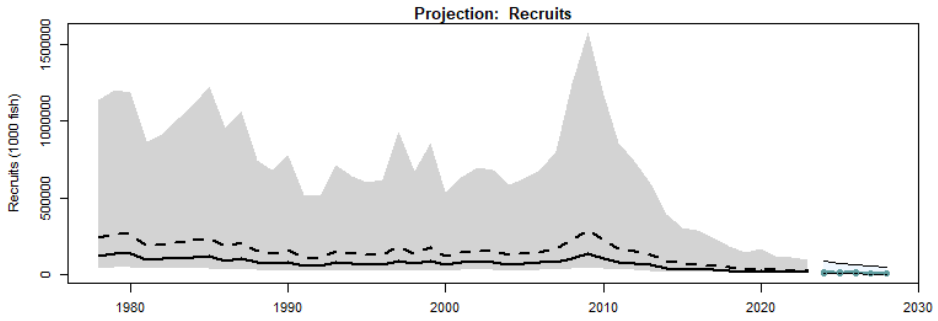


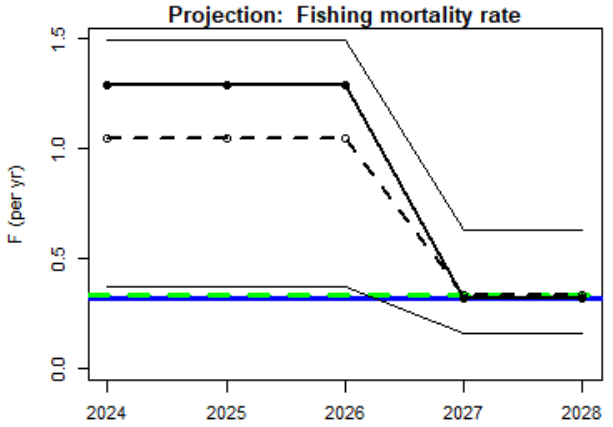
F_{MSY}

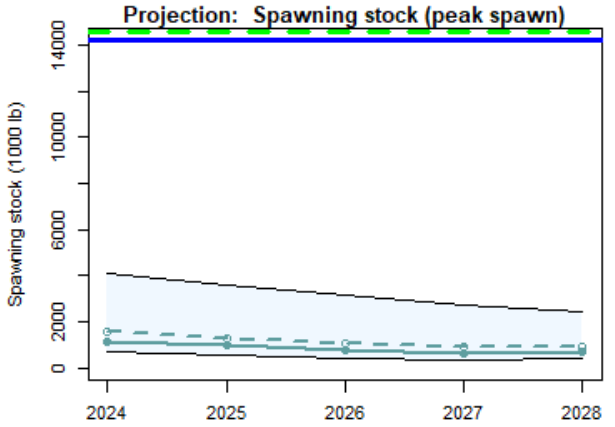
Solid dot & lines = Base model
Circles & Dashed lines = Median MCBE

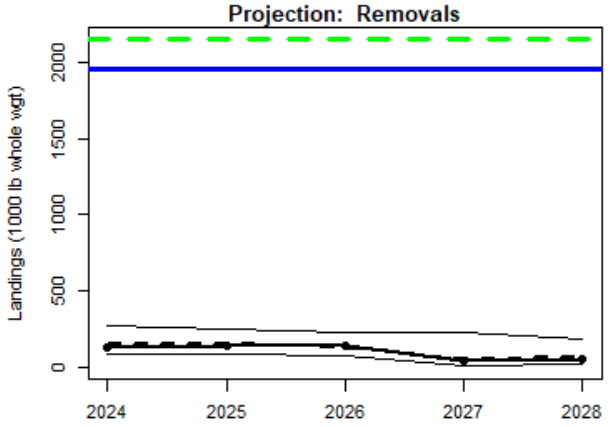


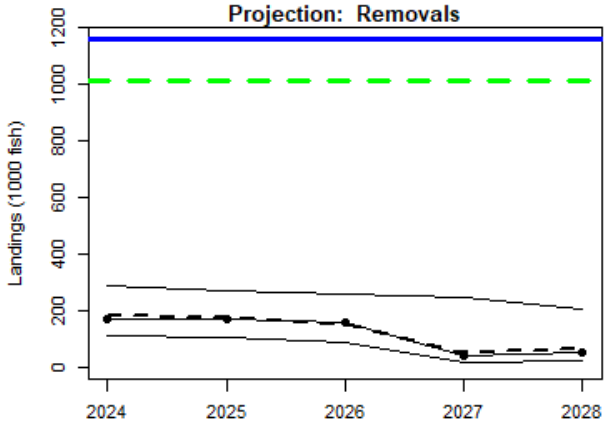


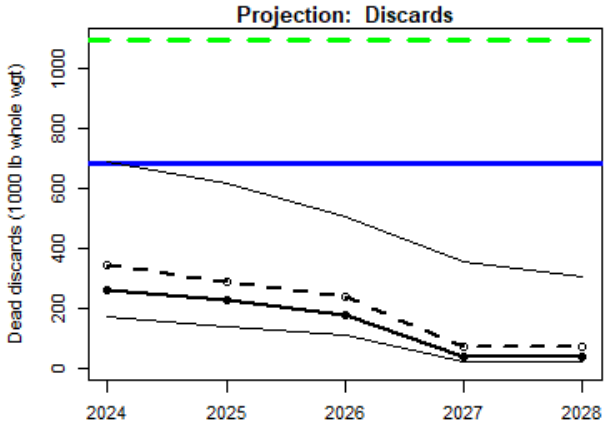


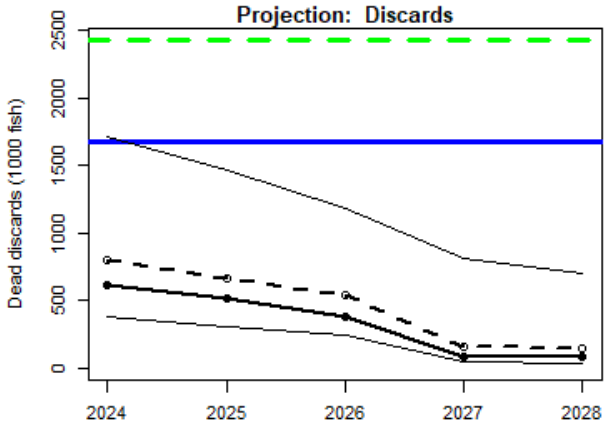












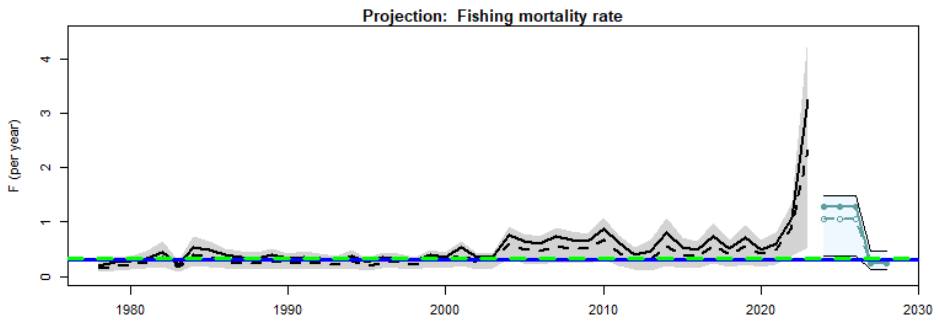
F_{MSY} Values

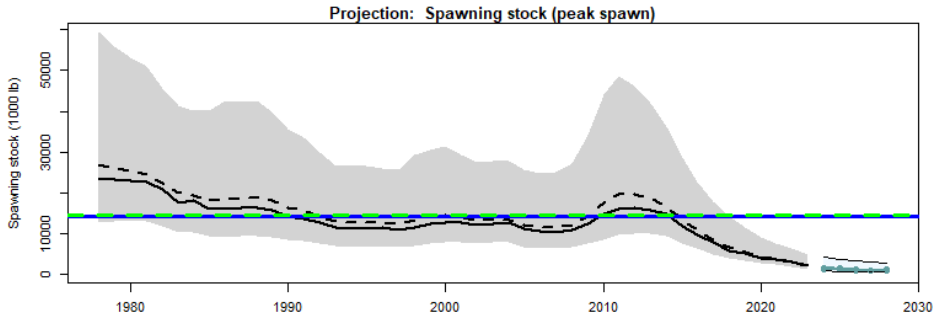
Table 21. Projection results with fishing mortality rate fixed at $F = F_{MSY}$ starting in 2027 and a recent average recruitment deviate until 2028. R = number of age-0 recruits (in millions), F = fishing mortality rate (per year), S = spawning stock (1000 lb), L = landings and D = discards expressed in numbers (n, in 1000s) or whole weight (w, in 1000 lb), pr.reb = proportion of stochastic projection replicates with $SSB \geq SSB_{MSY}$. The extension b indicates expected values (deterministic) from the base run; the extension med indicates median values from the stochastic projections.

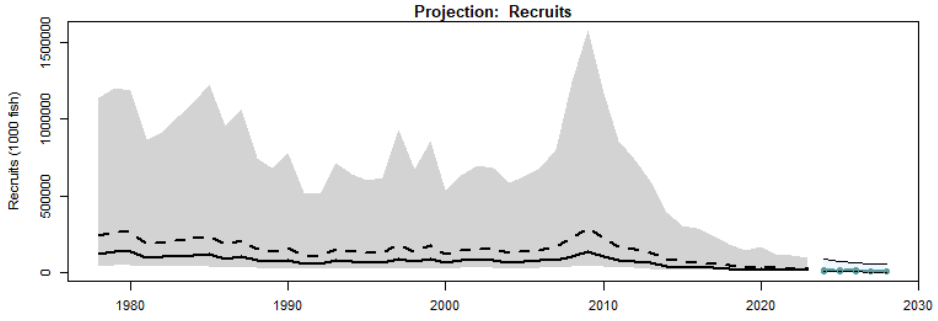
Year	R.b	R.med	F.b	F.med	S.b	S.med	L.b(n)	L.med(n)	L.b(w)	L.med(w)	D.b(n)	D.med(n)	D.b(w)	D.med(w)	pr.reb
2024	6	14	1.287	1.047	1114	1531	166	182	132	151	610	796	260	341	0
2025	5	11	1.287	1.047	959	1307	171	174	144	149	512	668	226	290	0
2026	4	9	1.287	1.047	763	1062	155	150	134	132	384	534	175	236	0
2027	4	7	0.316	0.334	659	928	42	52	38	46	82	159	38	71	0
2028	3	7	0.316	0.334	674	914	53	62	52	59	76	149	36	70	0

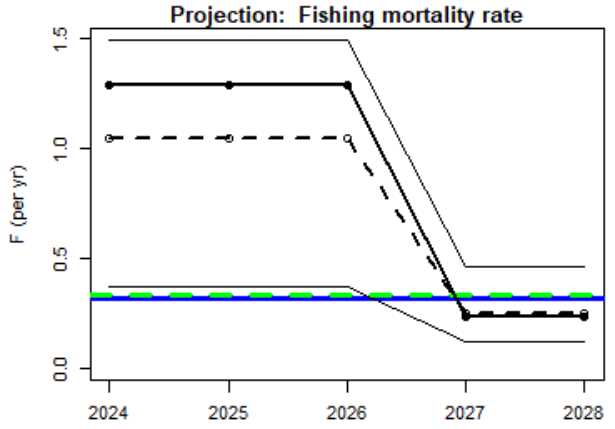
$P^*_{30\%}$ F_{MSY}

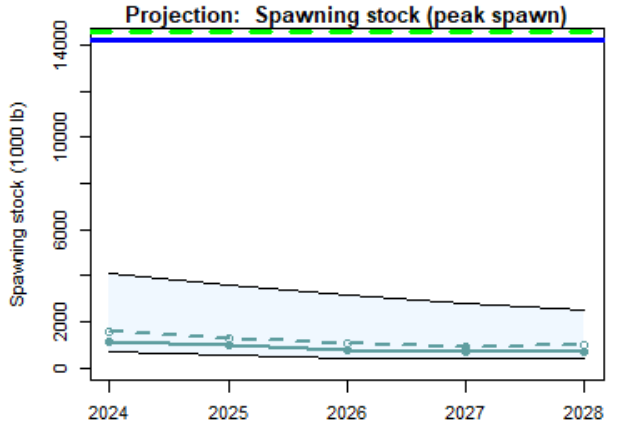
Solid dot & lines = Base model
Circles & Dashed lines = Median MCBE

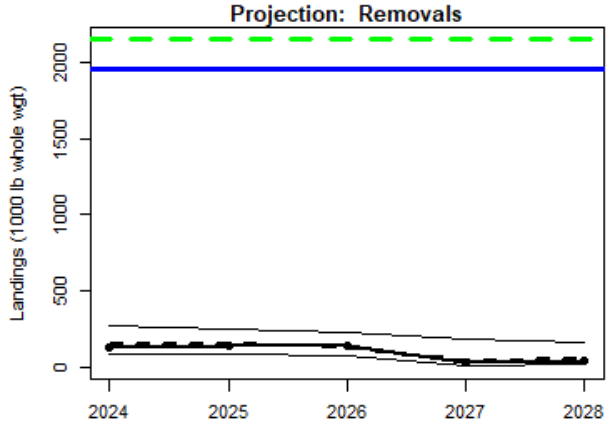


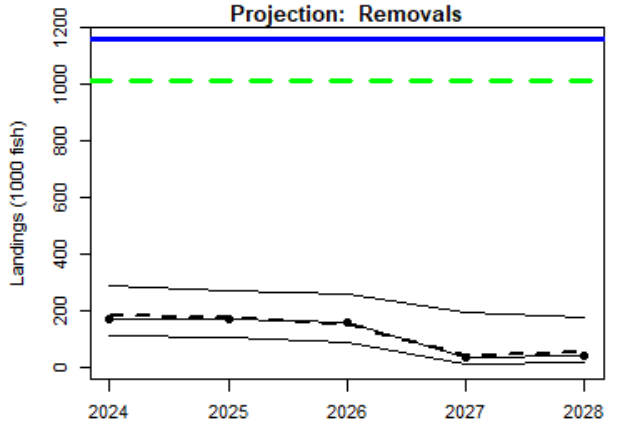


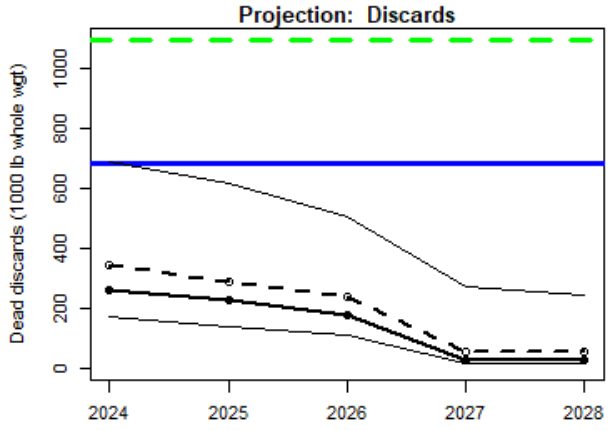


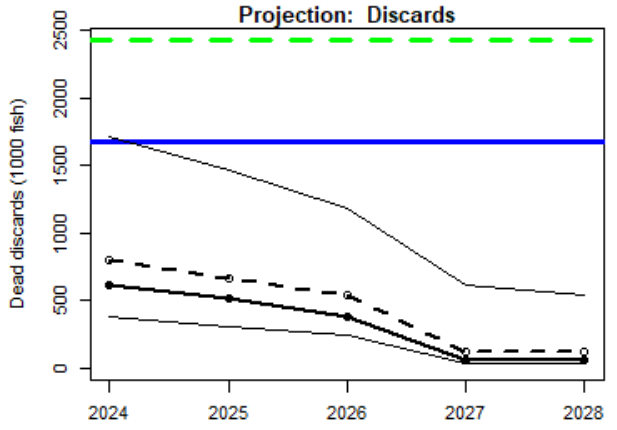












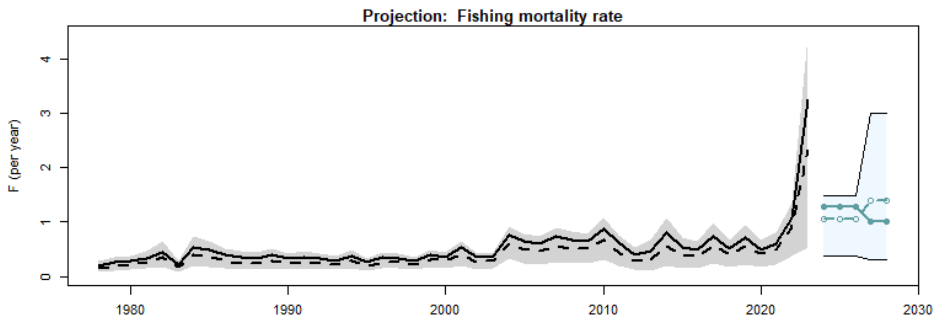
$P^*_{30\%}$ F_{MSY} Values

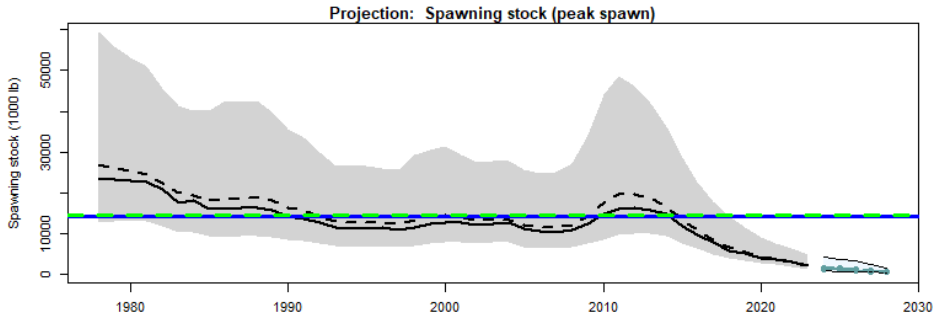
Table 22. Projection results with fishing mortality rate fixed at $F = P^*_{30\%} F_{MSY}$ starting in 2027 and a recent average recruitment deviate until 2028. R = number of age-0 recruits (in millions), F = fishing mortality rate (per year), S = spawning stock (1000 lb), L = landings and D = discards expressed in numbers (n, in 1000s) or whole weight (w, in 1000 lb), pr.reb = proportion of stochastic projection replicates with $SSB \geq SSB_{MSY}$. The extension b indicates expected values (deterministic) from the base run; the extension med indicates median values from the stochastic projections.

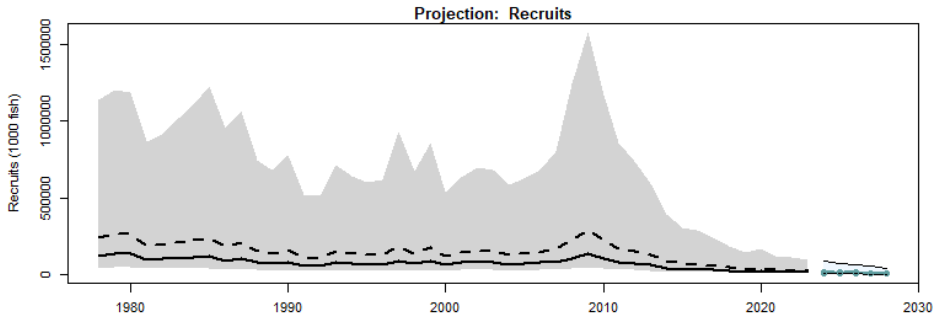
Year	R.b	R.med	F.b	F.med	S.b	S.med	L.b(n)	L.med(n)	L.b(w)	L.med(w)	D.b(n)	D.med(n)	D.b(w)	D.med(w)	pr.reb
2024	6	14	1.287	1.047	1114	1531	166	182	132	151	610	796	260	341	0
2025	5	11	1.287	1.047	959	1307	171	174	144	149	512	668	226	290	0
2026	4	9	1.287	1.047	763	1062	155	150	134	132	384	534	175	236	0
2027	4	7	0.232	0.246	665	938	32	39	29	35	61	119	28	53	0
2028	3	7	0.232	0.246	698	951	42	50	41	48	58	113	28	54	0

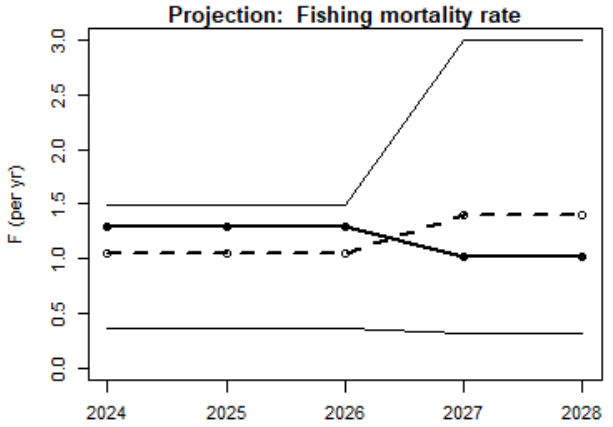
$F_{40\%}$

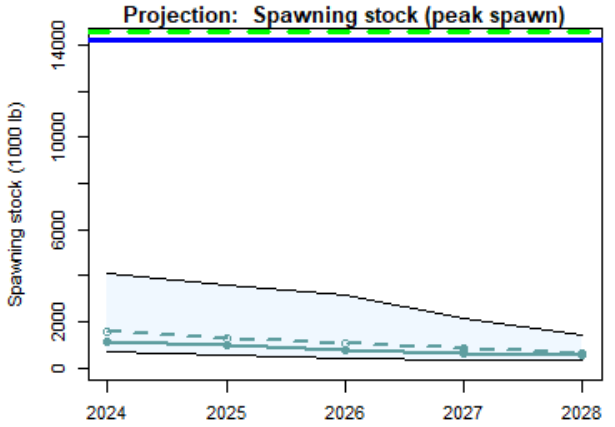
Solid dot & lines = Base model
Circles & Dashed lines = Median MCBE

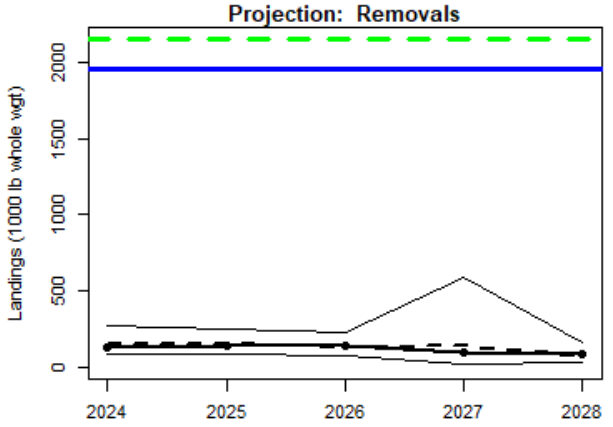


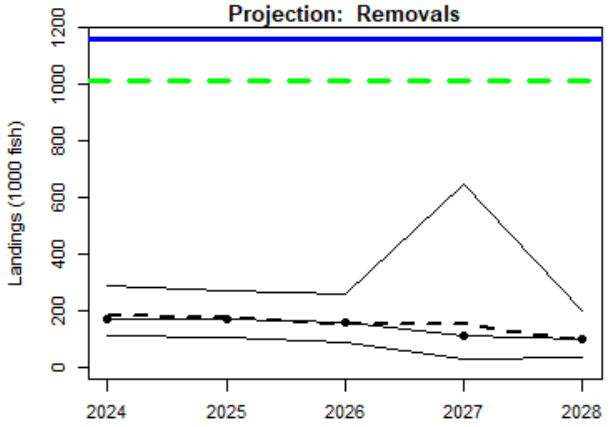


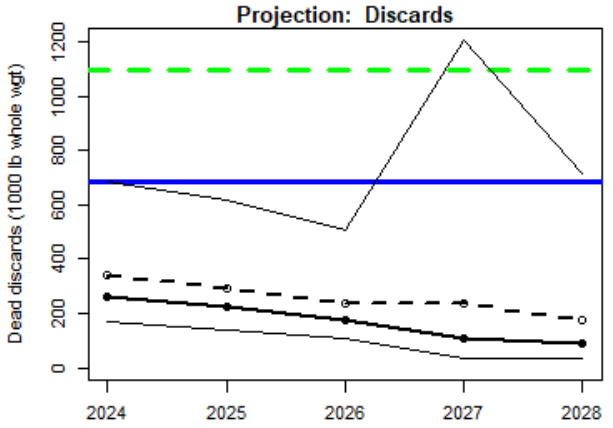


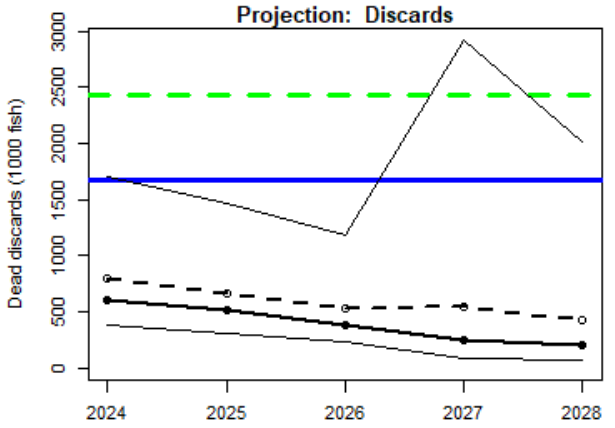






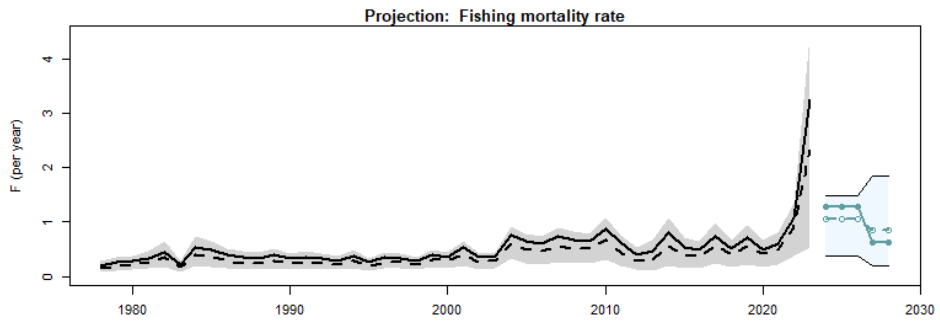


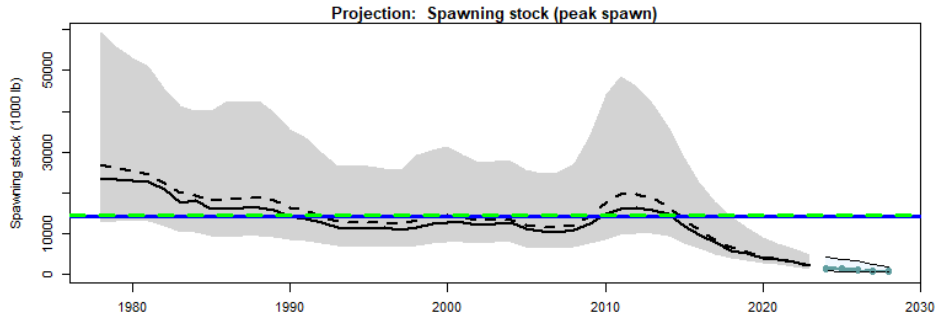


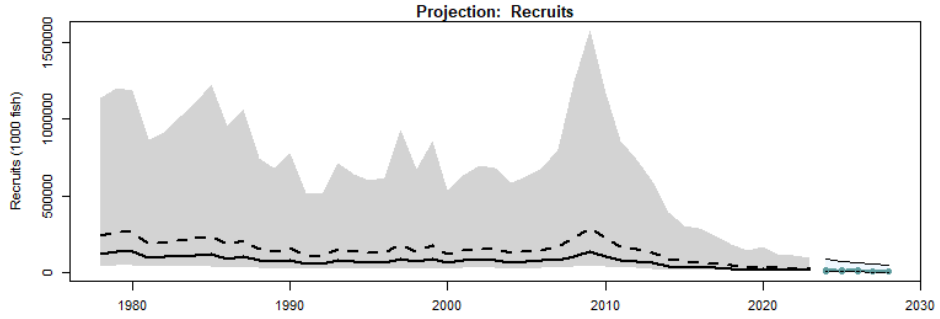


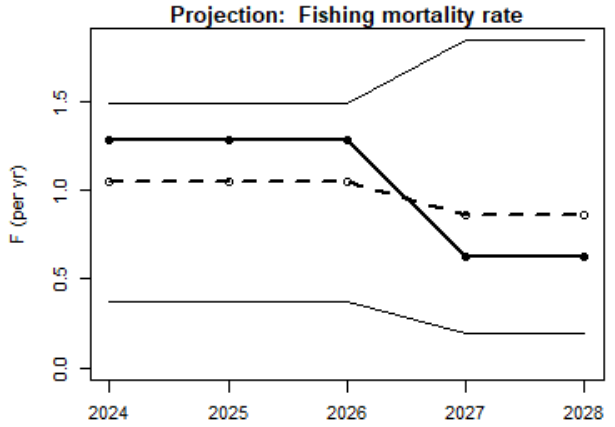
$P^*_{30\%}$ $F_{40\%}$

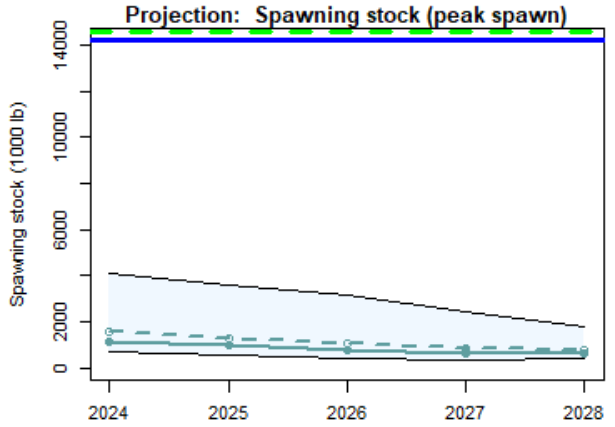
Solid dot & lines = Base model
Circles & Dashed lines = Median MCBE

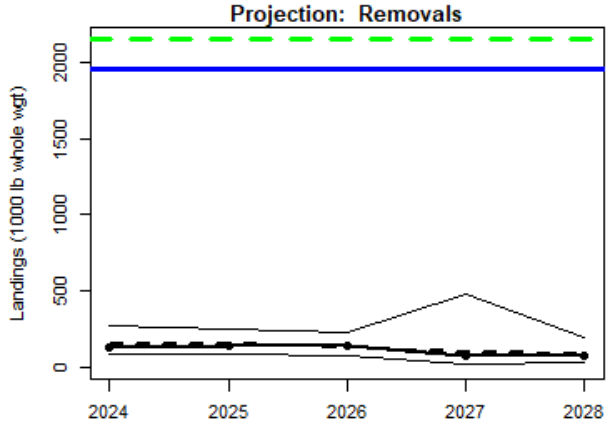


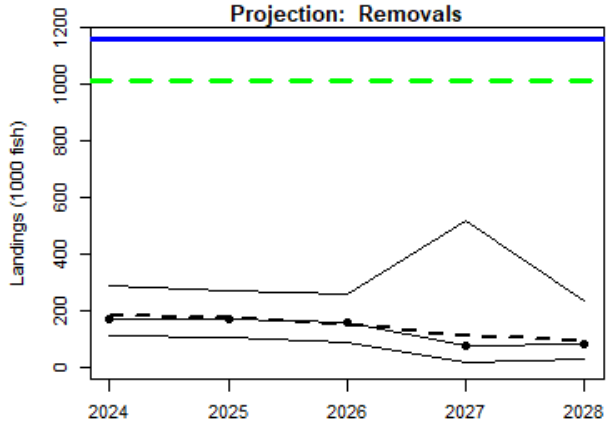


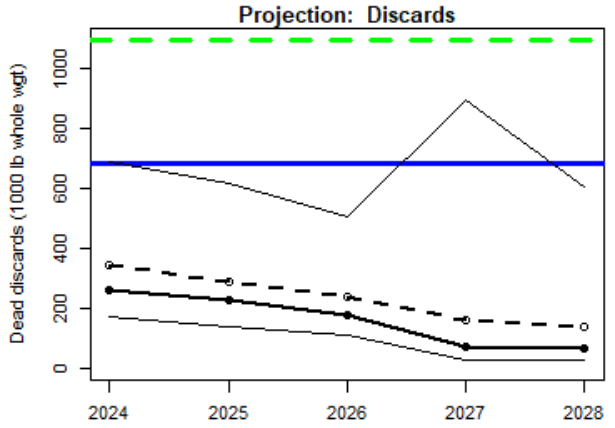


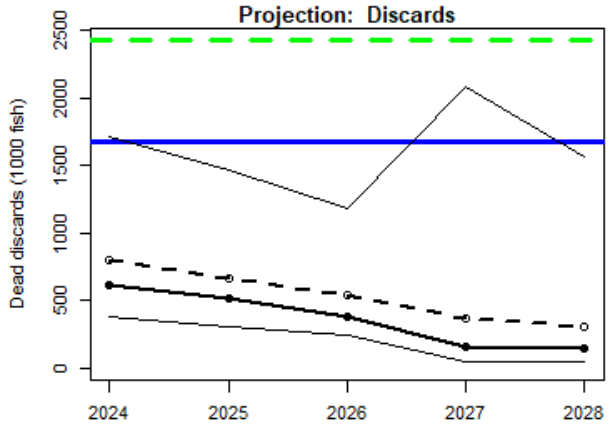






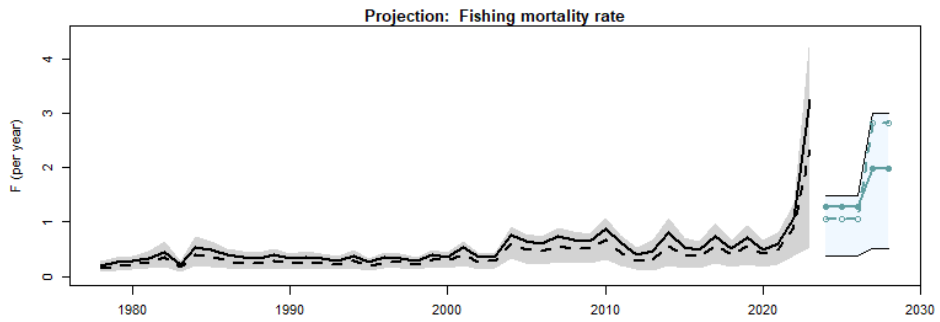


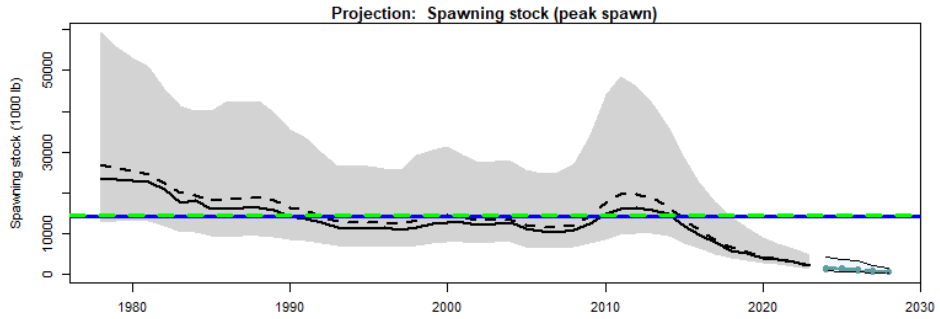


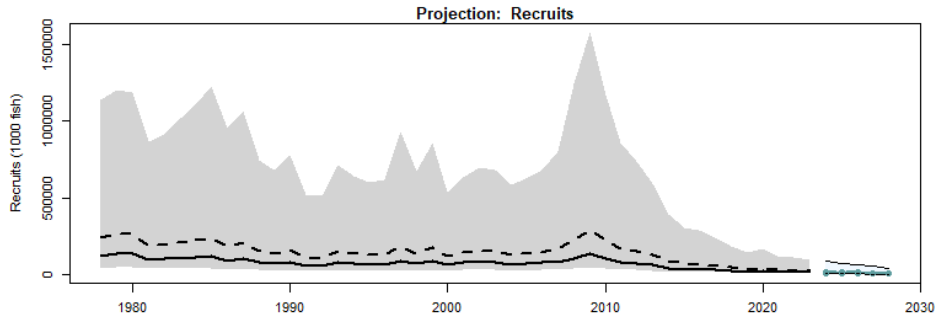


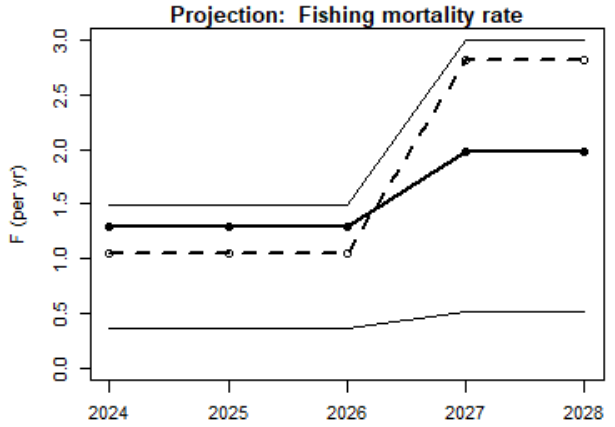
$F_{30\%}$

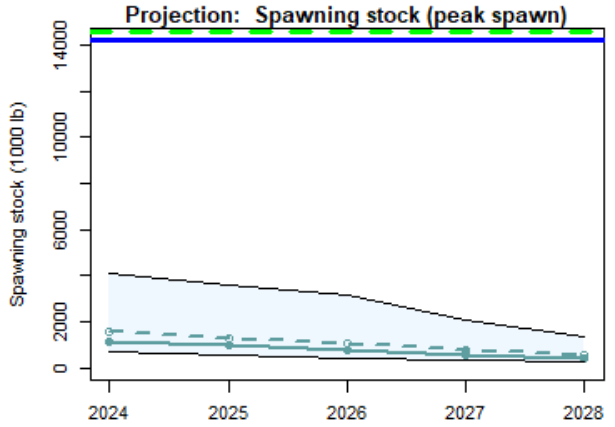
Solid dot & lines = Base model
Circles & Dashed lines = Median MCBE

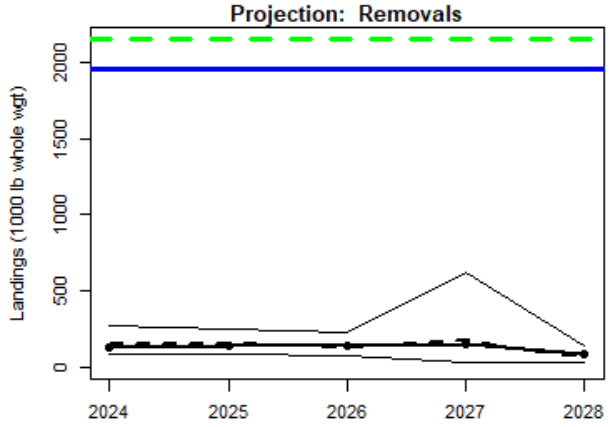


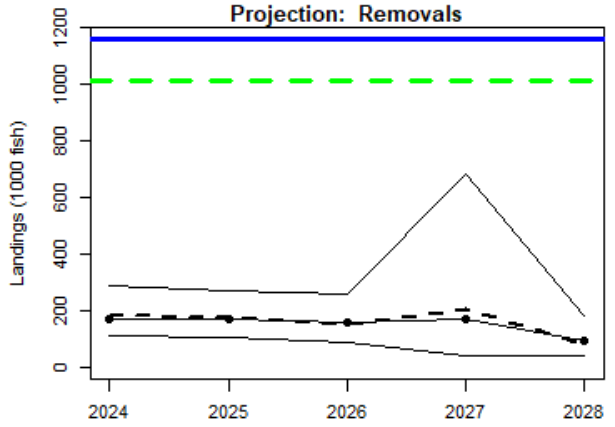


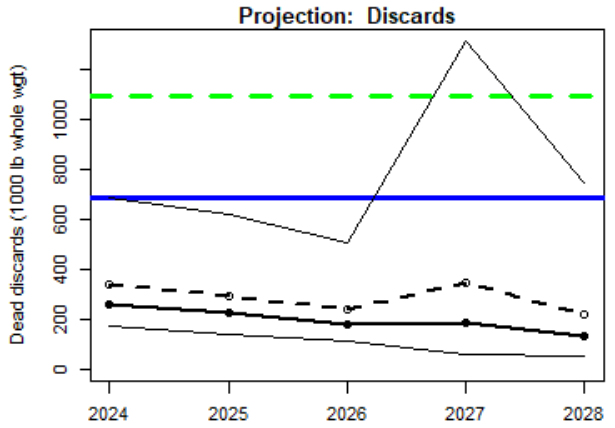


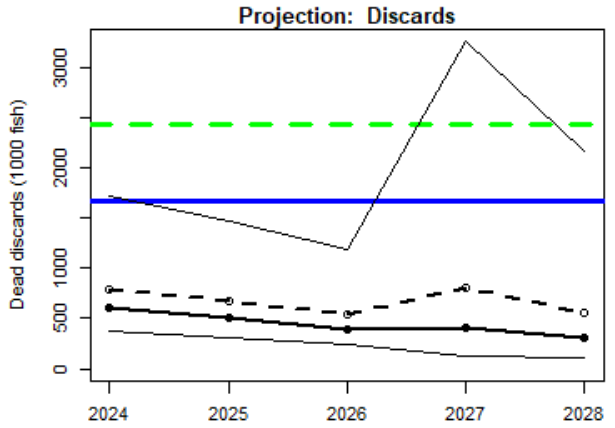






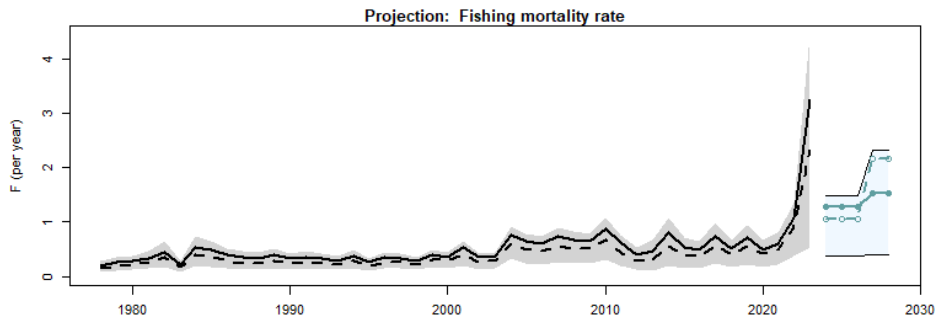


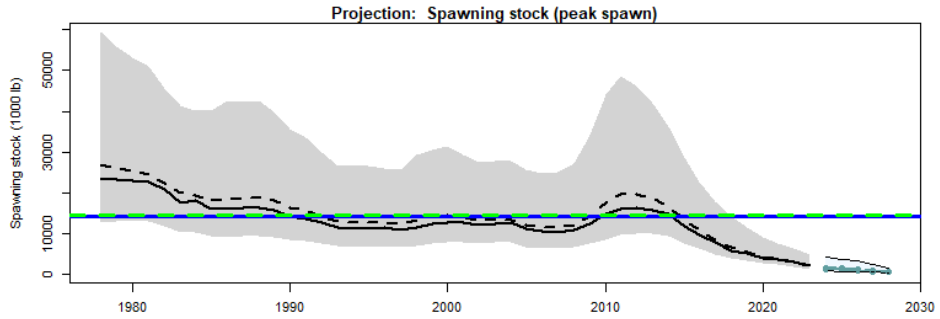


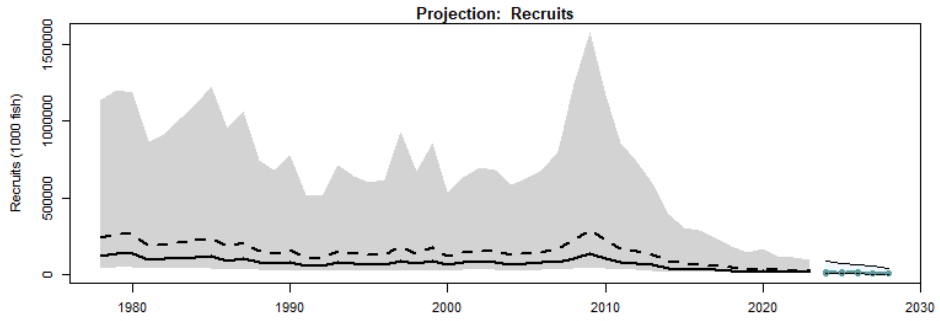


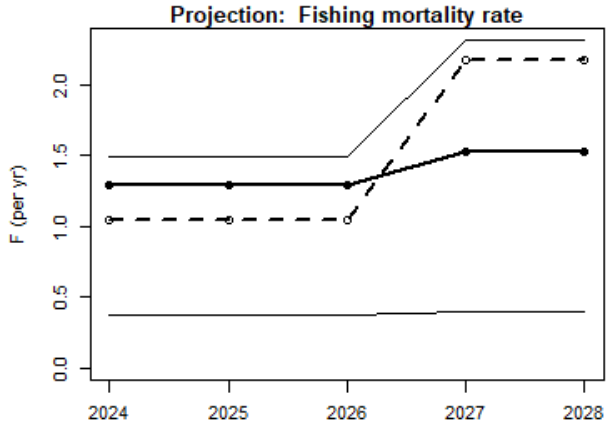
$P^*_{30\%}$ $F_{30\%}$

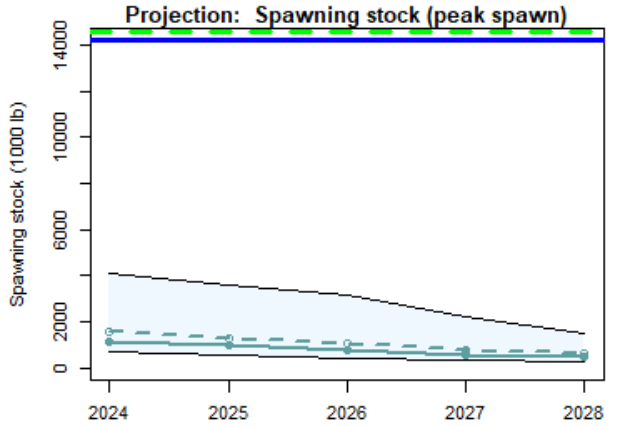
Solid dot & lines = Base model
Circles & Dashed lines = Median MCBE

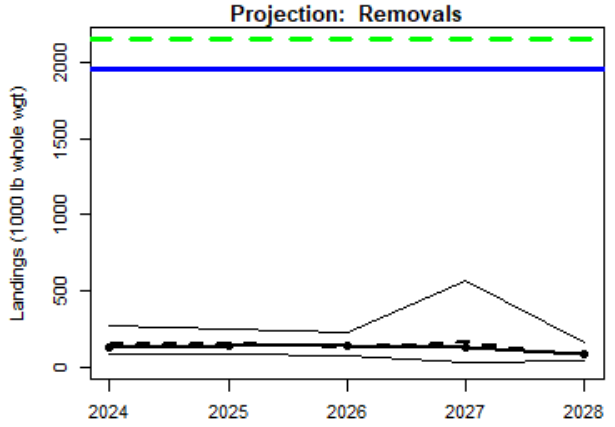


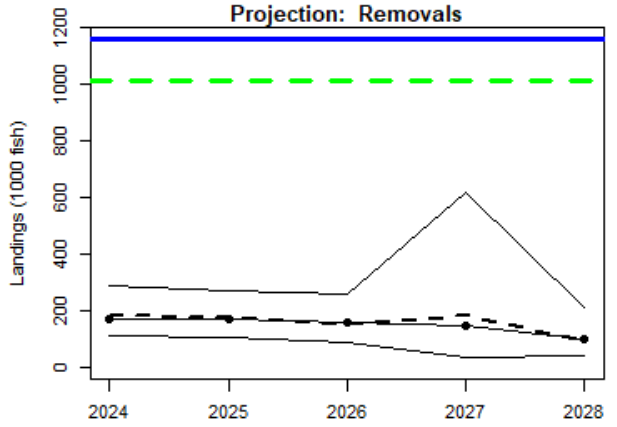


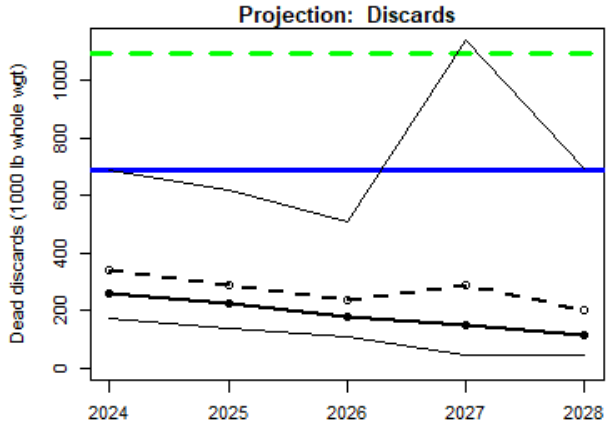


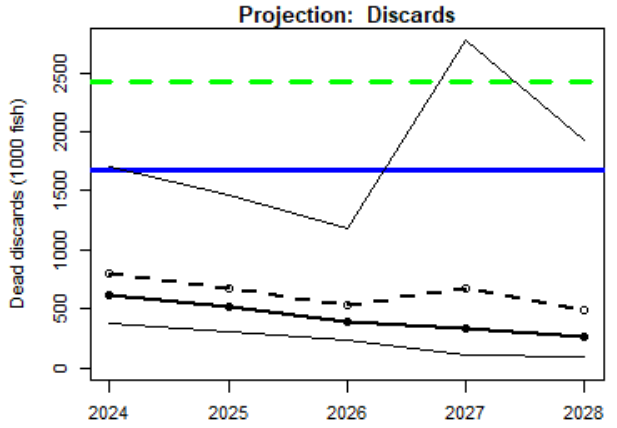






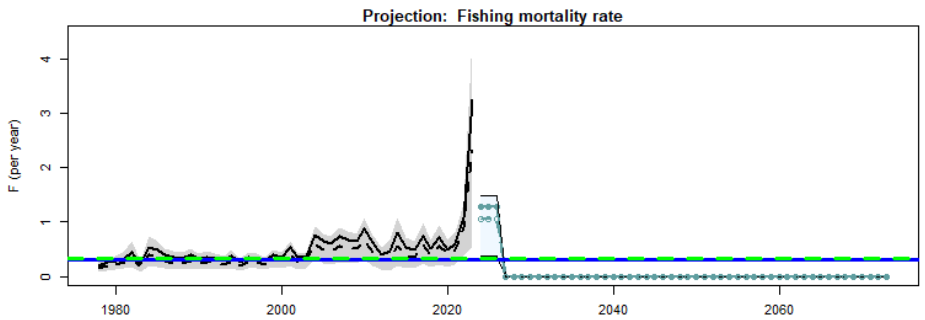


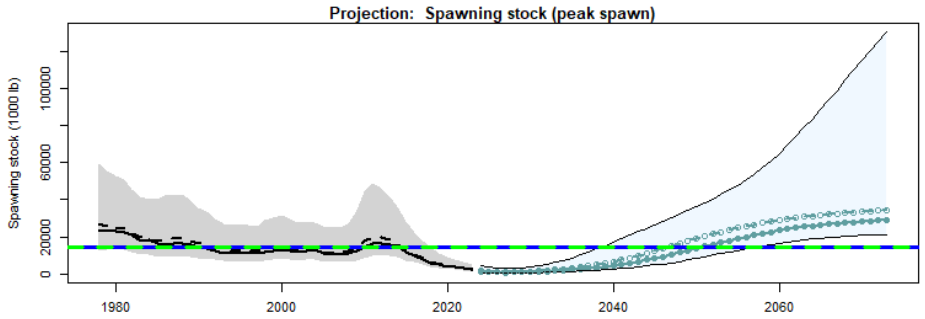


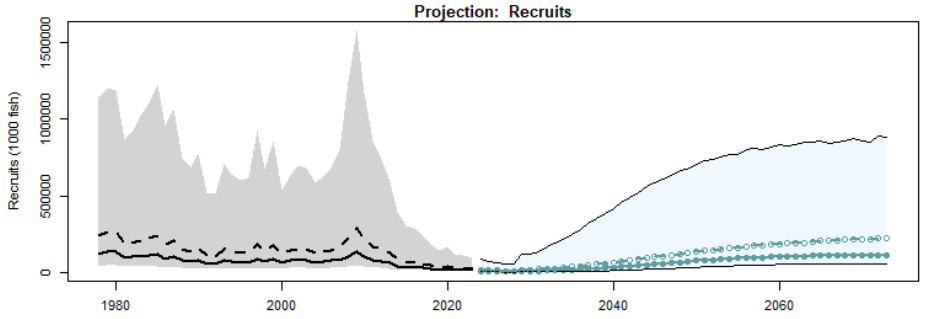


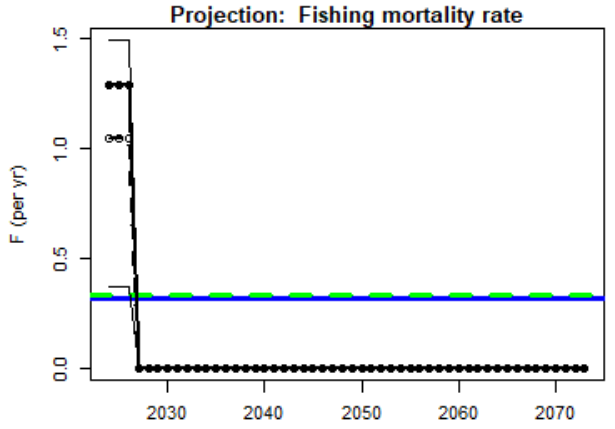
F = 0

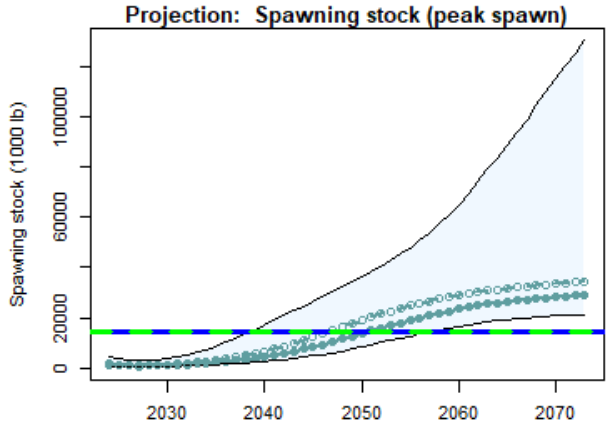
Solid dot & lines = Base model
Circles & Dashed lines = Median MCBE

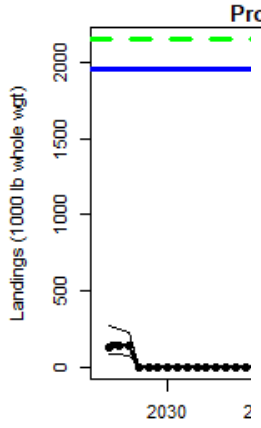


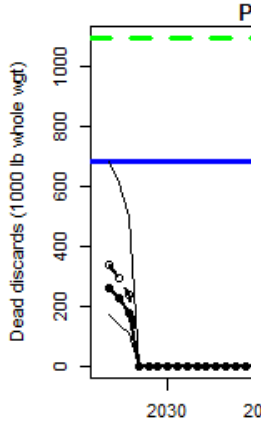


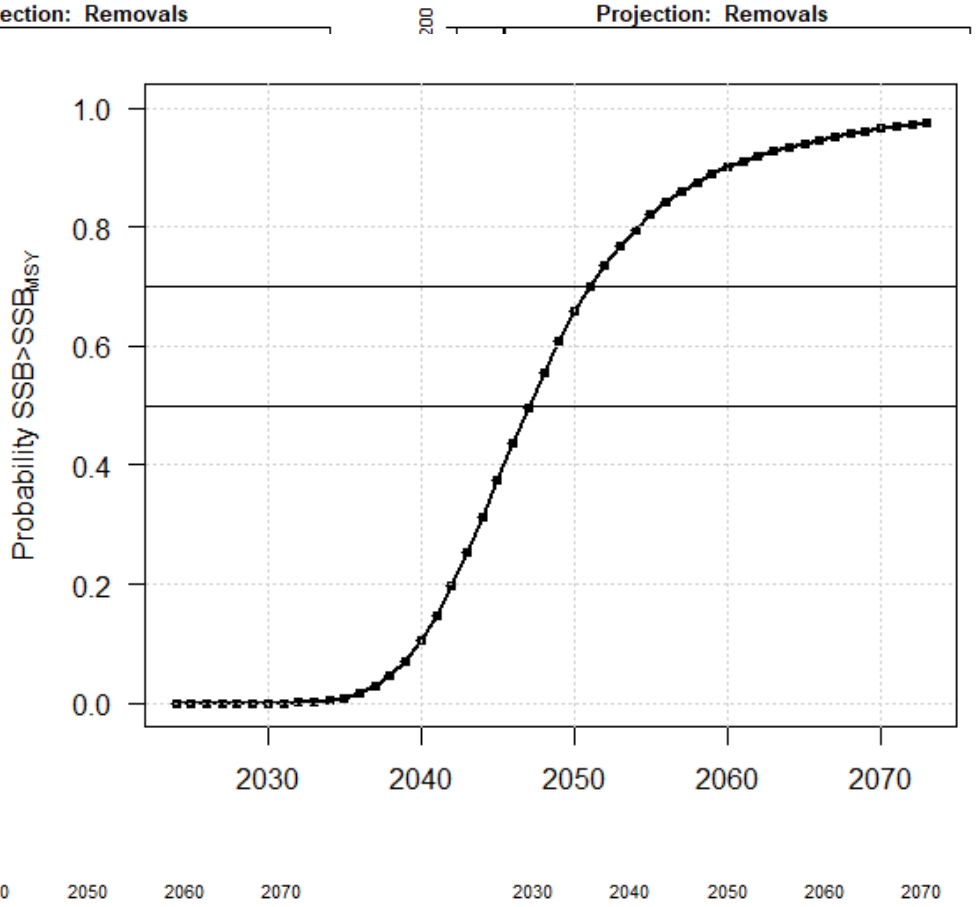




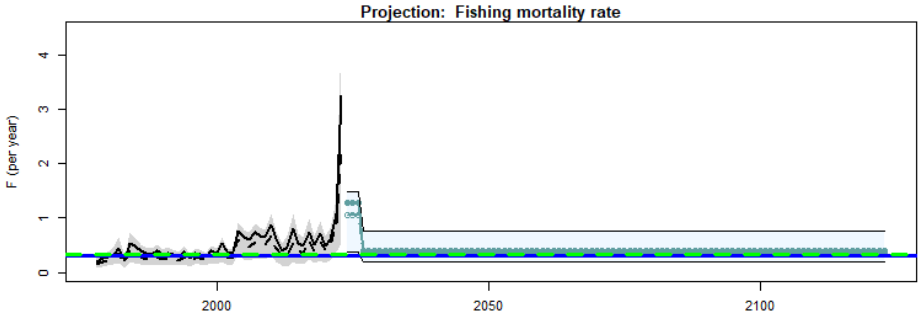


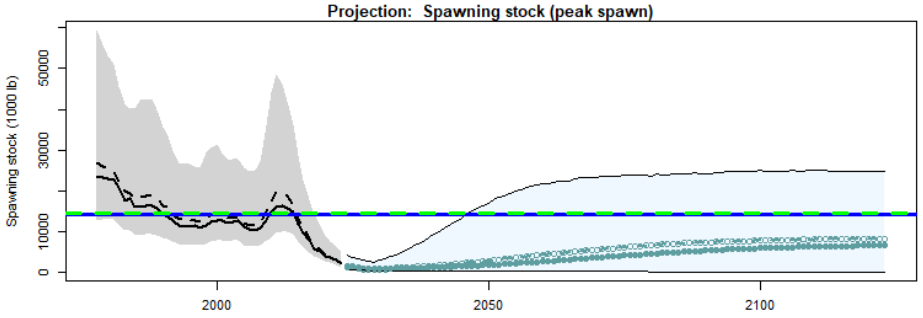


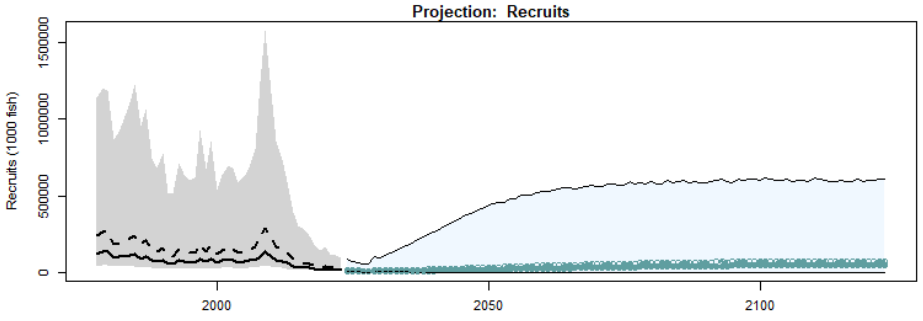




$F_{Landings} = 0$ $F_{Discards} = F_{current}$

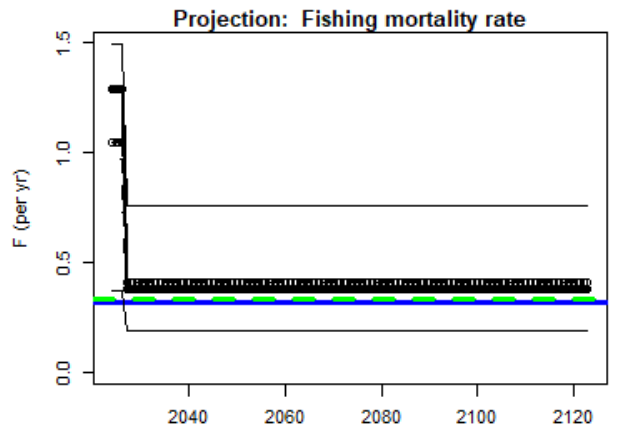


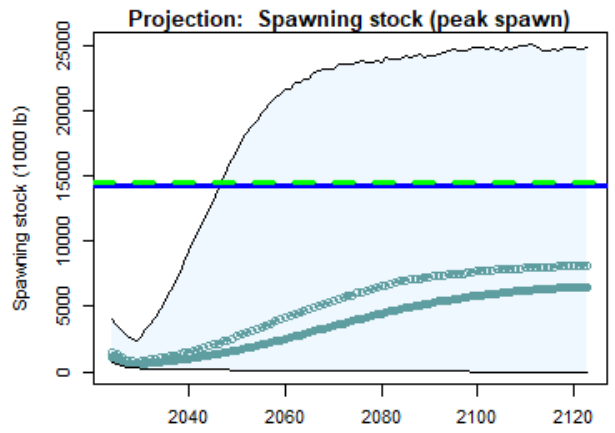


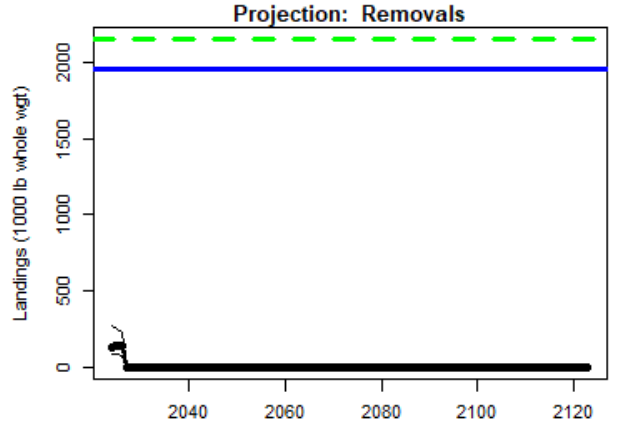


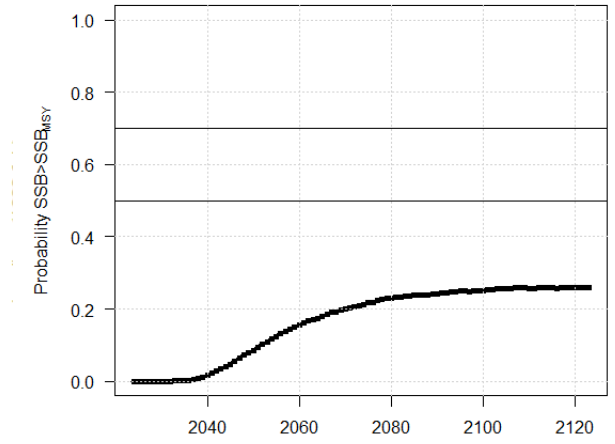
Solid dot & lines = Base model

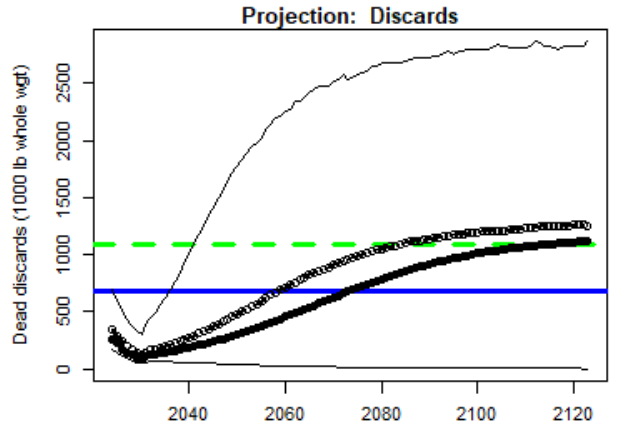
Circles & Dashed lines = Median MCBE

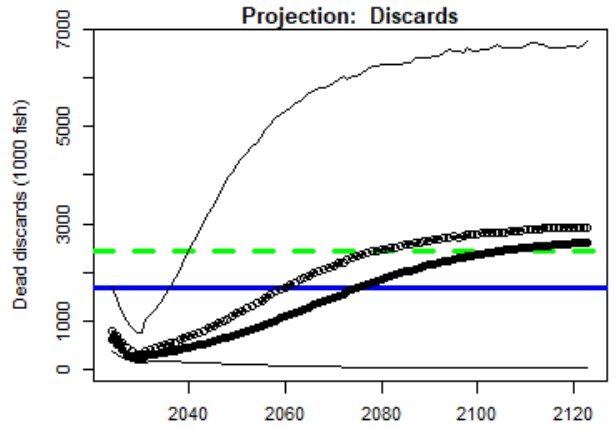












Overall Conclusions

- Stock is very overfished and undergoing extreme overfishing
- Addition of more years of data and continued decline of stock allowed for estimation of steepness
- F_{MSY} estimated by the model corresponds to an SPR $F_{61\%}$
- Immediate and drastic action must be taken to stop the overfishing and prevent the continued decline of the stock
- Projections suggest that stopping all landings and continuing with current discards would not allow for rebuilding of the population