SEDAR 64 Interim Analysis:
Southeastern U.S. Yellowtail Snapper

SAFMC Meeting

Sep 13, 2022

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https://www.saltwatersportsman.com/howto/fishing-for-snappers-in-the-bahamas/

Outline

- Assessment and quota history
- Model results
- Stock status overview
- Projection scenarios

S64 Interim Analysis: Yellowtail Snapper

Assessment & Quota History

Assessment History

SEDAR 3 (2003)

- Integrated and Statistical Catch-at-Age model (ICA)
- Data from 1981 – 2001
- F_{2001}/F_{msy} = 0.57 (**not overfishing**); SSB_{2001}/SSB_{msy} = 1.43 (**not overfished**)

SEDAR 27A (2012)

- Statistical catch-at-age model (ASAP2)
- Data from 1981 – 2010
- $F_{msy} \rightarrow F_{30\%SPR}$; MSST = (1-M)*$SSB_{30\%SPR}$
- $F_{2001}/F_{30\%SPR}$ = 0.15 (**not overfishing**); SSB_{2001}/MSST= 3.36 (**not overfished**)

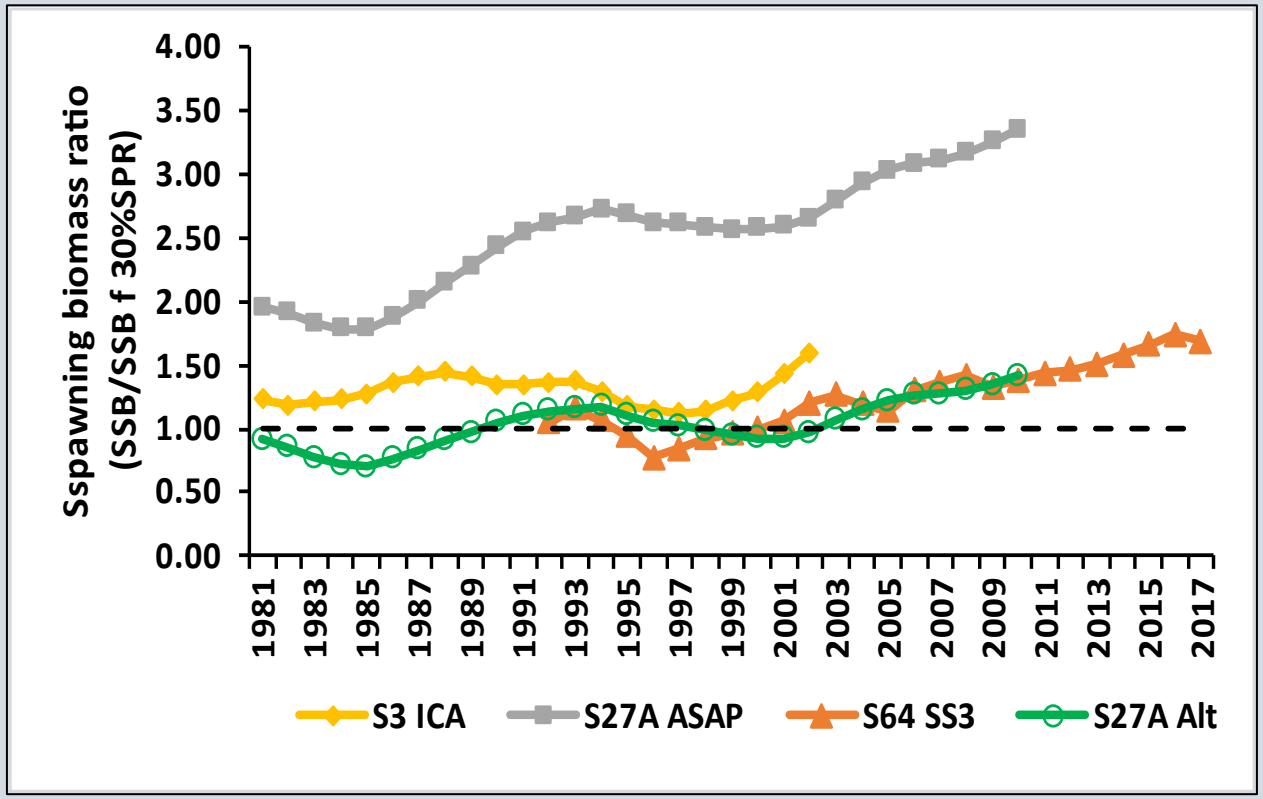
SEDAR 64 (2020)

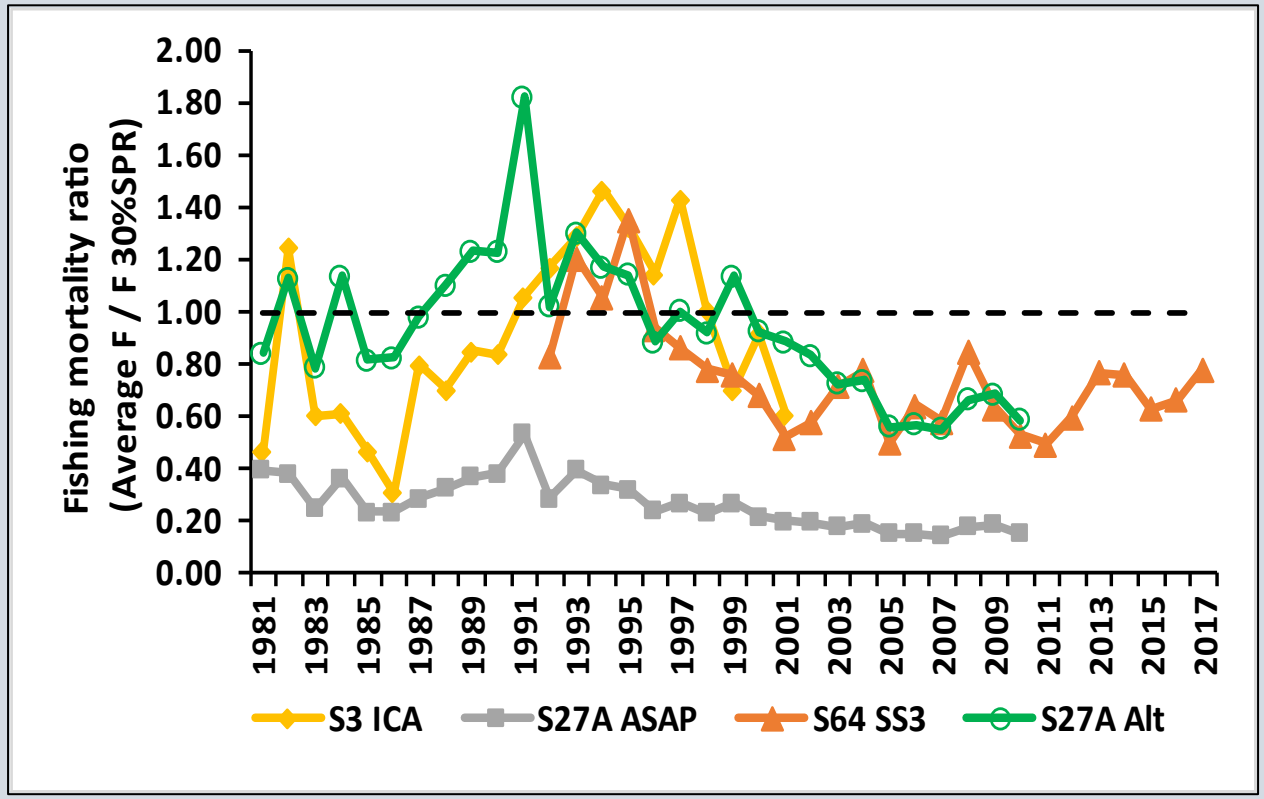
- Age- and size-structured assessment model in the integrated analysis class of models (SS 3.30.14)
- Data from **1992** – **2017**
- $F_{30\%SPR}$; MSST = 0.75*$SSB_{30\%SPR}$
- $F_{current}/F_{30\%SPR}$ = 0.68 (**not overfishing**); $SSB_{current}$/MSST= 2.26 (**not overfished**)

Term of Reference #1

- *"Update the SEDAR 64 Southeastern U.S. Yellowtail Snapper base model in SS v.3.30.13 with landings and discard data for commercial, headboat, and other recreational fishing modes from 2018 to 2020."*
  - As was determined for the S64 benchmark assessment, only landings and discards data from Florida waters were considered as input.
  - No indices nor any length and age composition data were updated.

S64 Model Bridging





Model		Description
S3 ICA		SEDAR 3 Final Model
S27A ASAP		SEDAR 27A Final Model
S27A Alt		Alternative SEDAR 27A Model with additional weight at age matrices
S64 SS3		SEDAR 64 Final Model

Quota History

Date	Total ACL
1/30/2012 – 11/2012	2,898,875 lbs. (1,315 mt)
9/3/2013 – present	**3,938,625 lbs. (1,787 mt)**

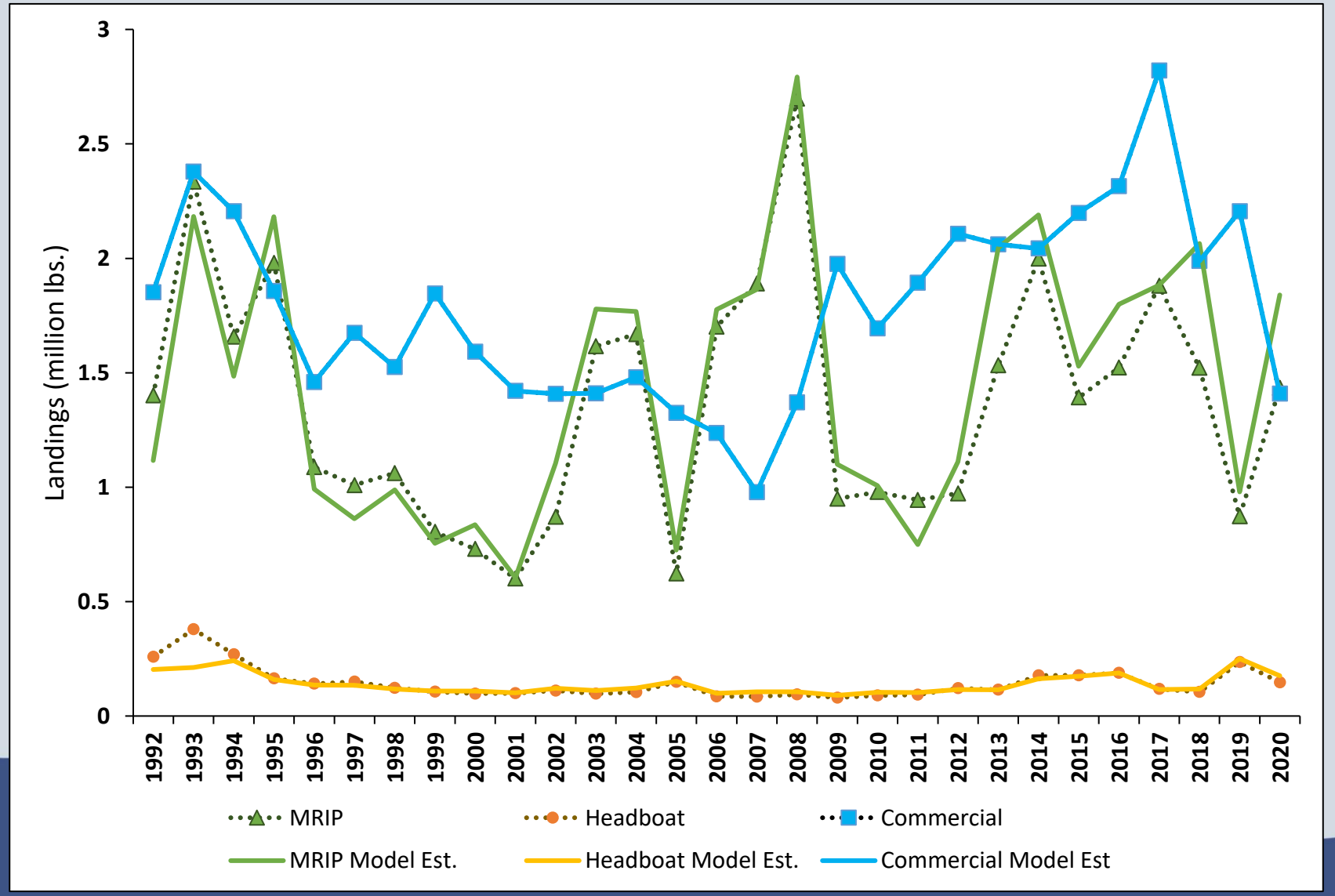
South Atlantic (77%)	**Date**	**ACL**
Commercial	Apr 2012 – Nov 2012	1,142,589 lbs.
	Nov 2012 – Current	**1,596,510 lbs.**
Commercial Closures	10/31/2015 – 12/31/2015 6/3/2017 – 7/31/2017 6/5/2018 – 7/31/2018 6/7/2019 – 7/31/2019	
Recreational (CHTS)	Apr 2012 – Sept 2013	1,031,286 lbs.
	Sept 2013 – Current	**1,440,990 lbs.**

Gulf of Mexico (23%)	**Date**	**ACL**
Commercial and Recreational (CHTS)	Jan 2012 – Sept 2013	725,000 lbs.
	Sept 2013 – Current	**901,125 lbs.**

S64 Interim Analysis: Yellowtail Snapper

Interim Base Model Results

Reported vs Model Estimated Landings (lbs)



Discards

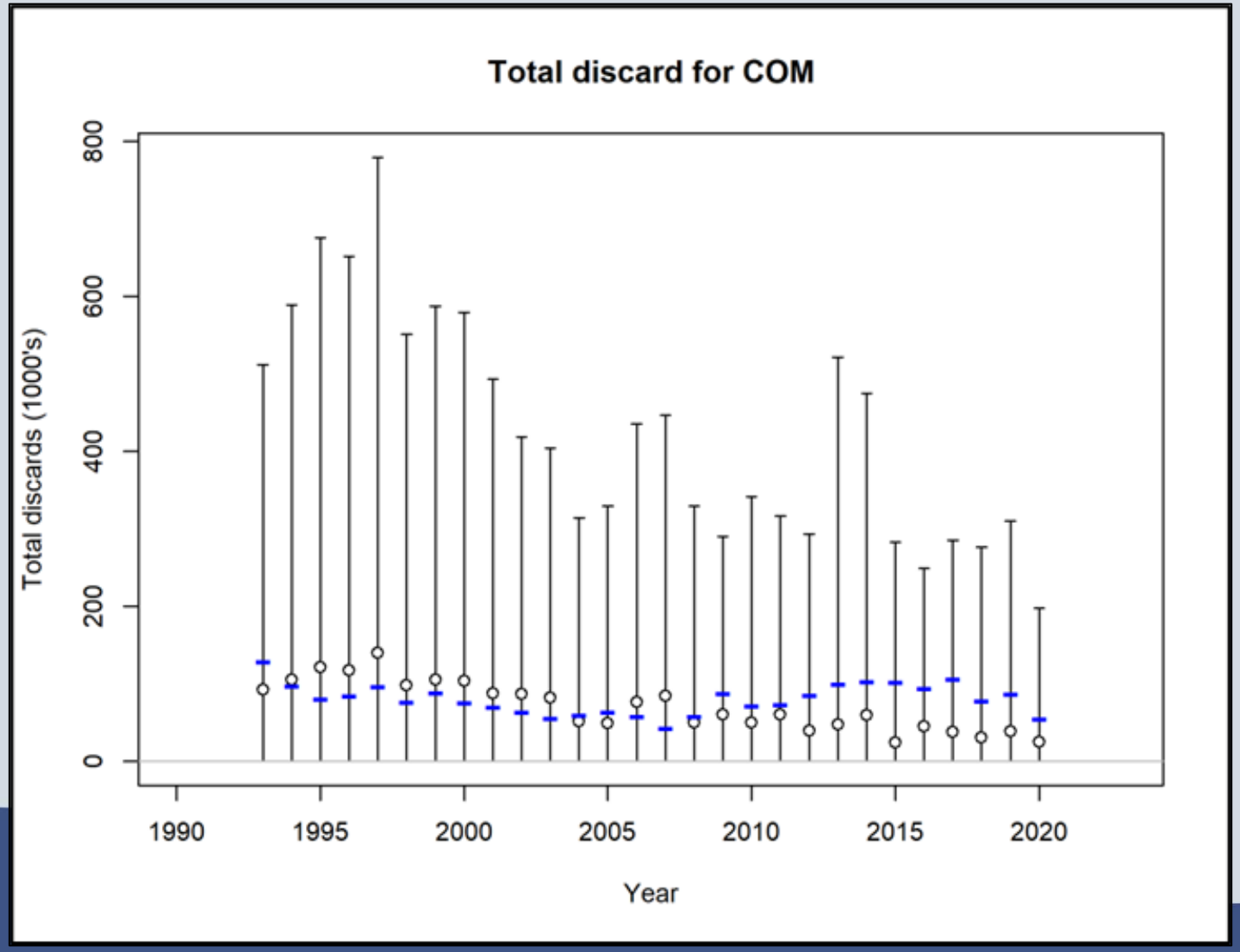


Figure 4

Discards

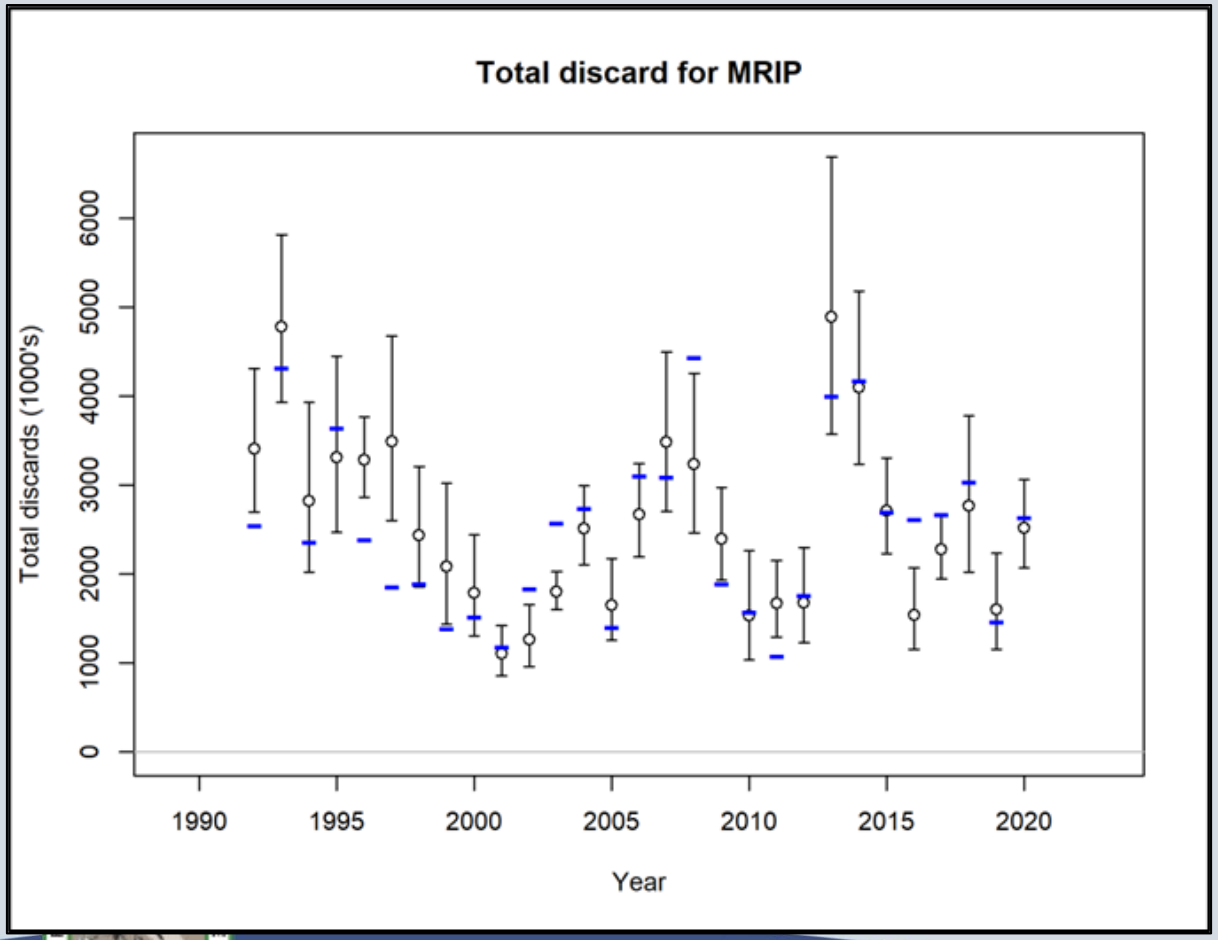


Figure 5

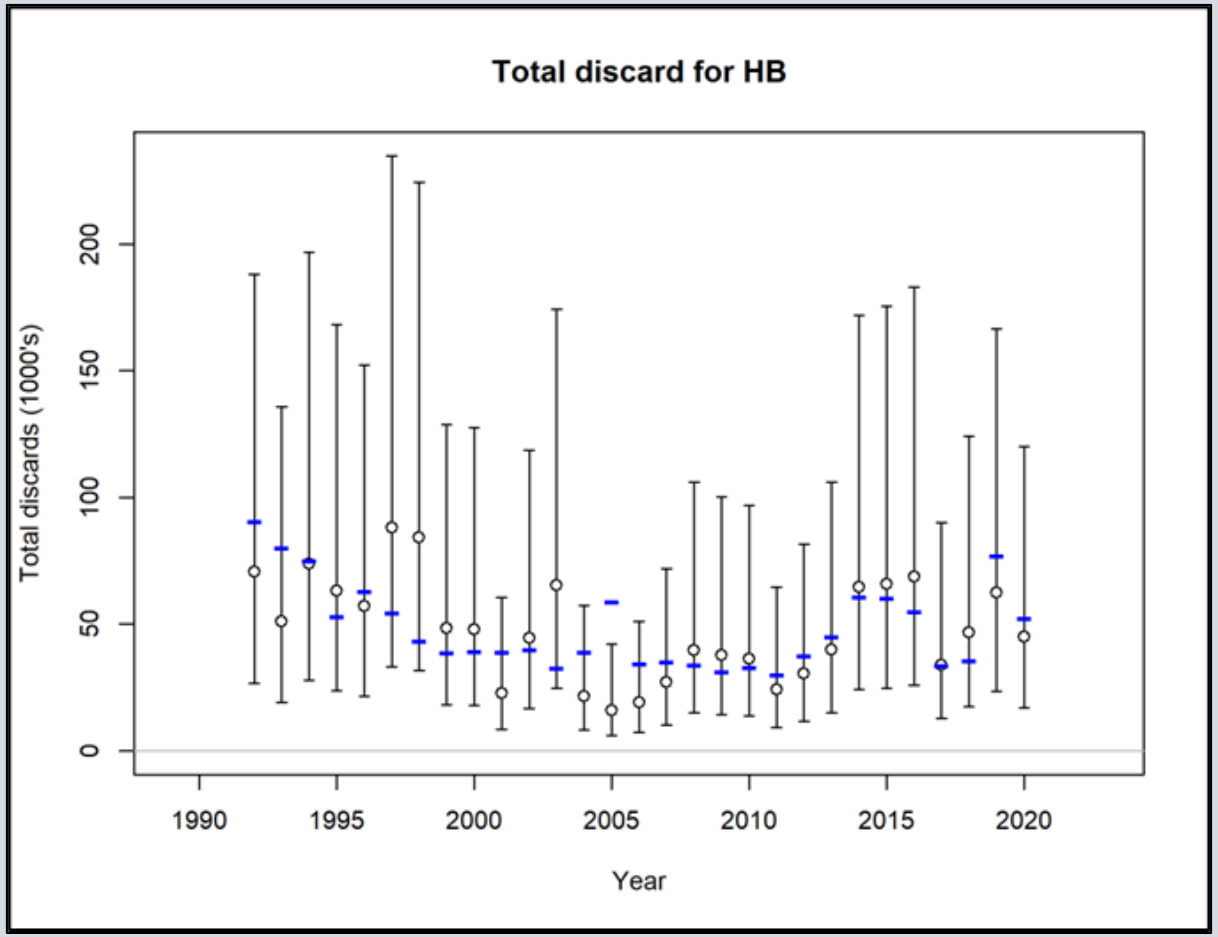
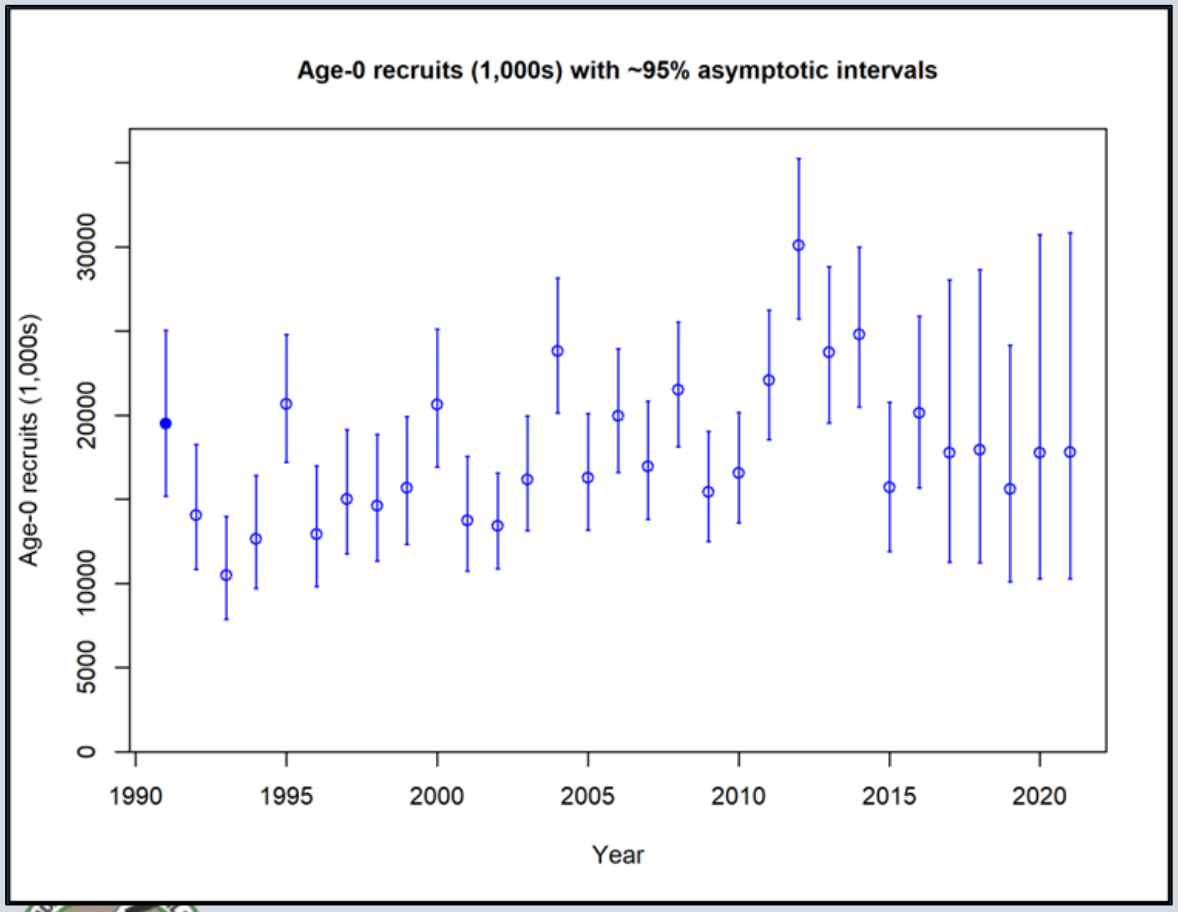


Figure 6

Estimated Recruitment



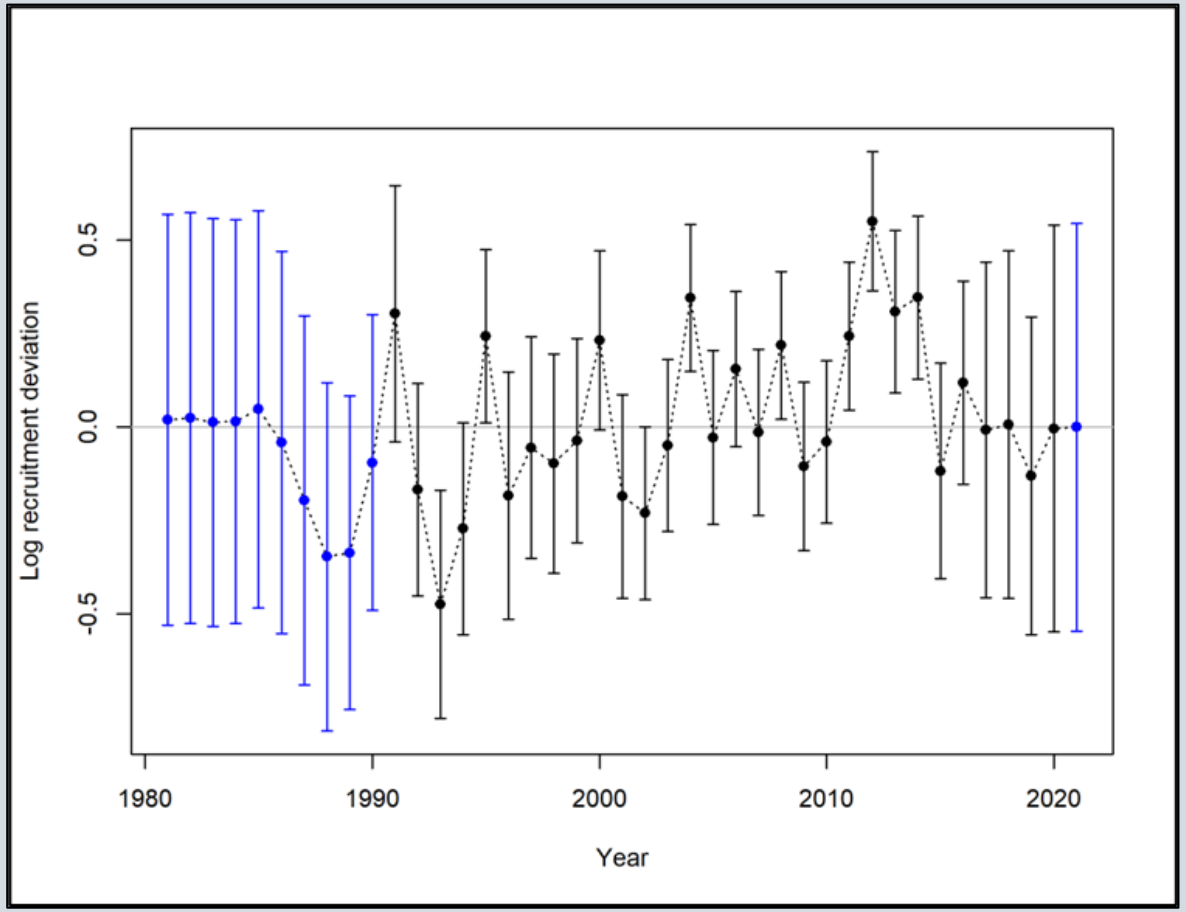
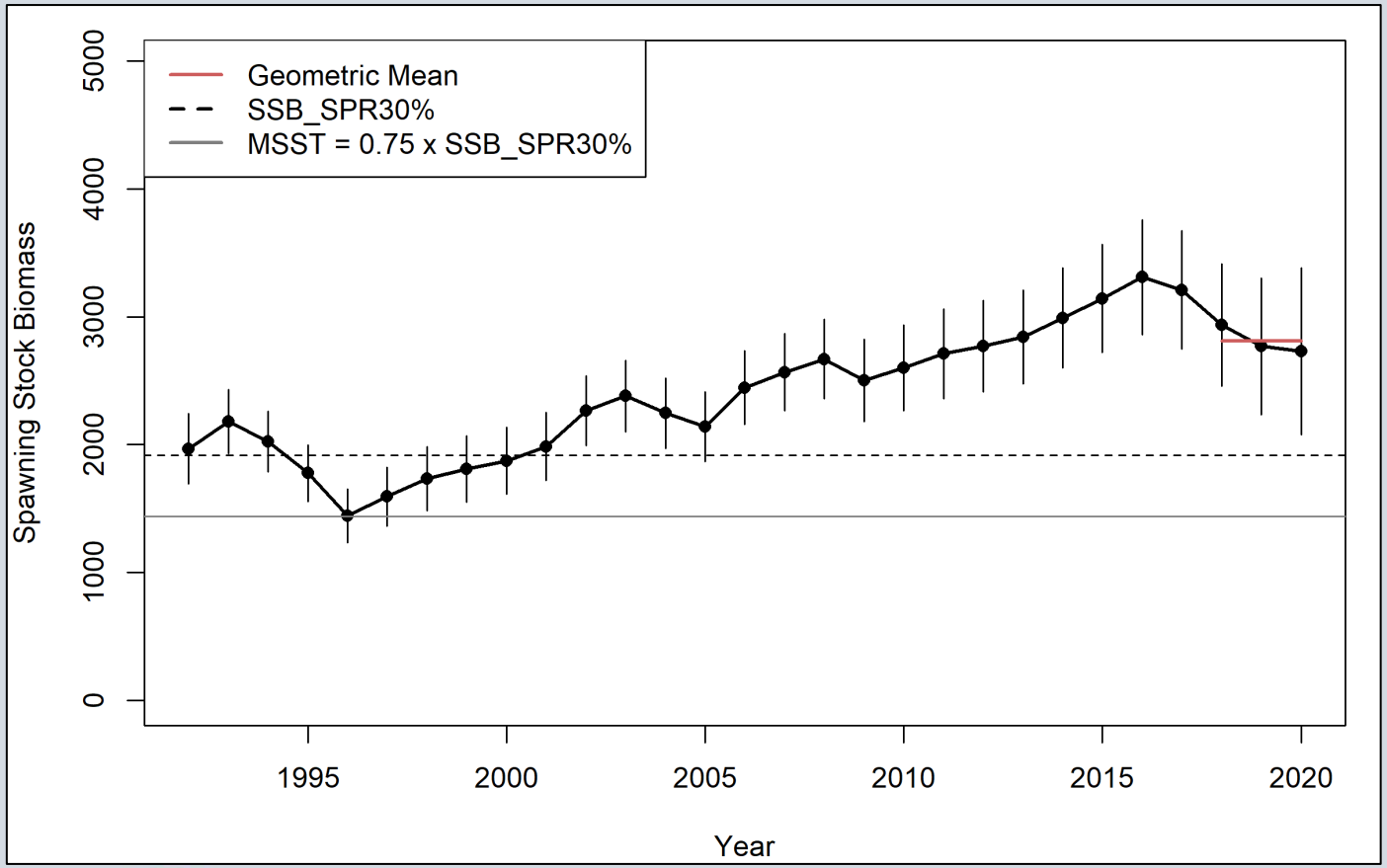
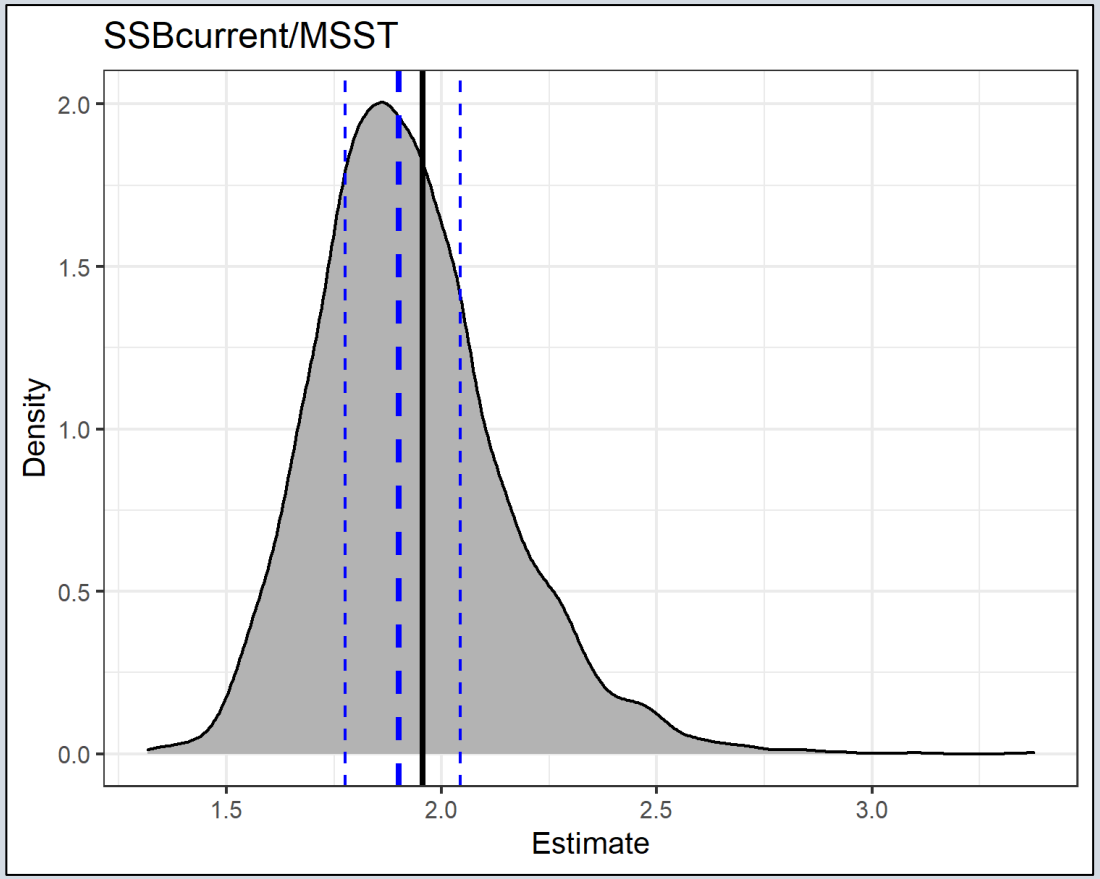
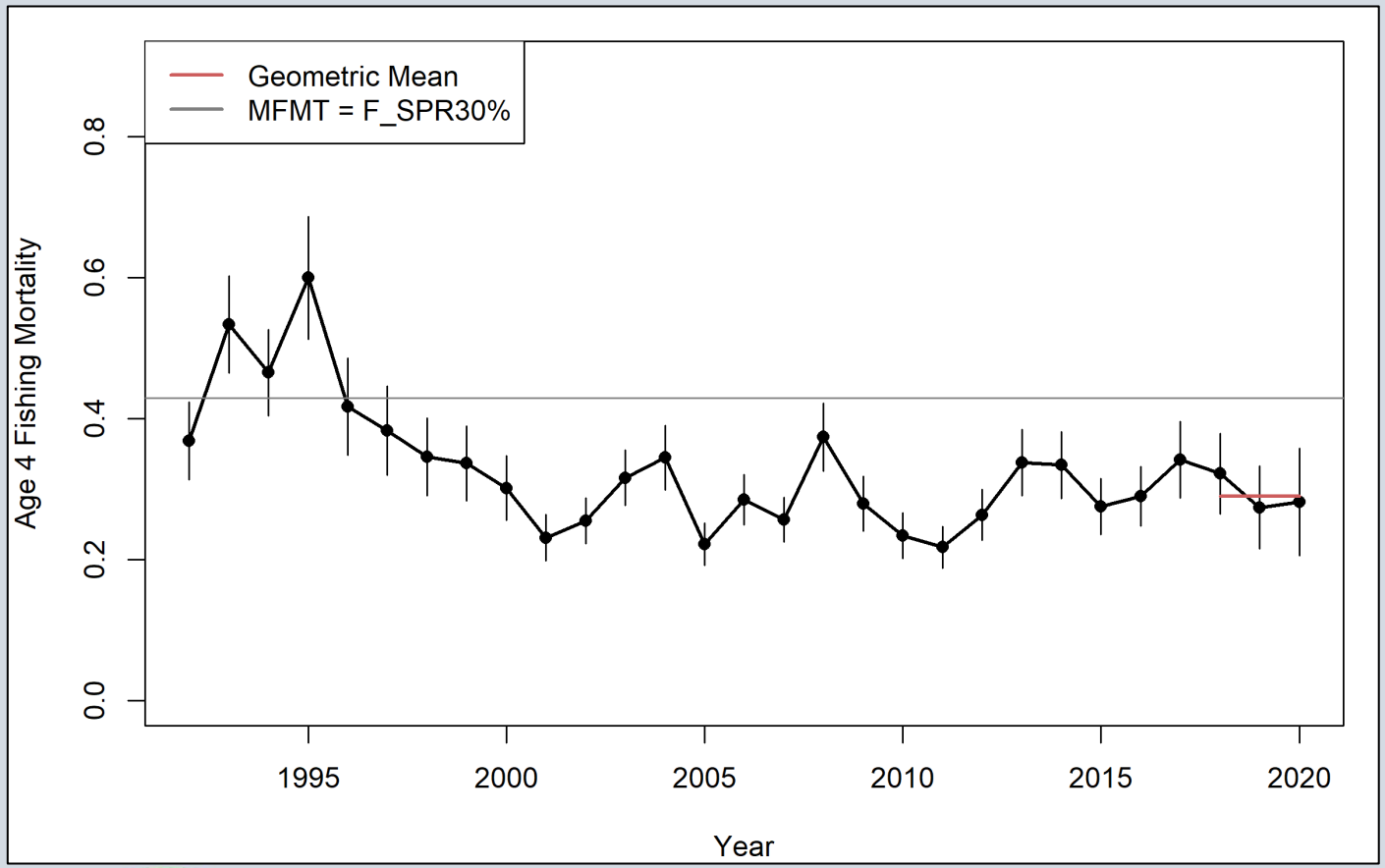
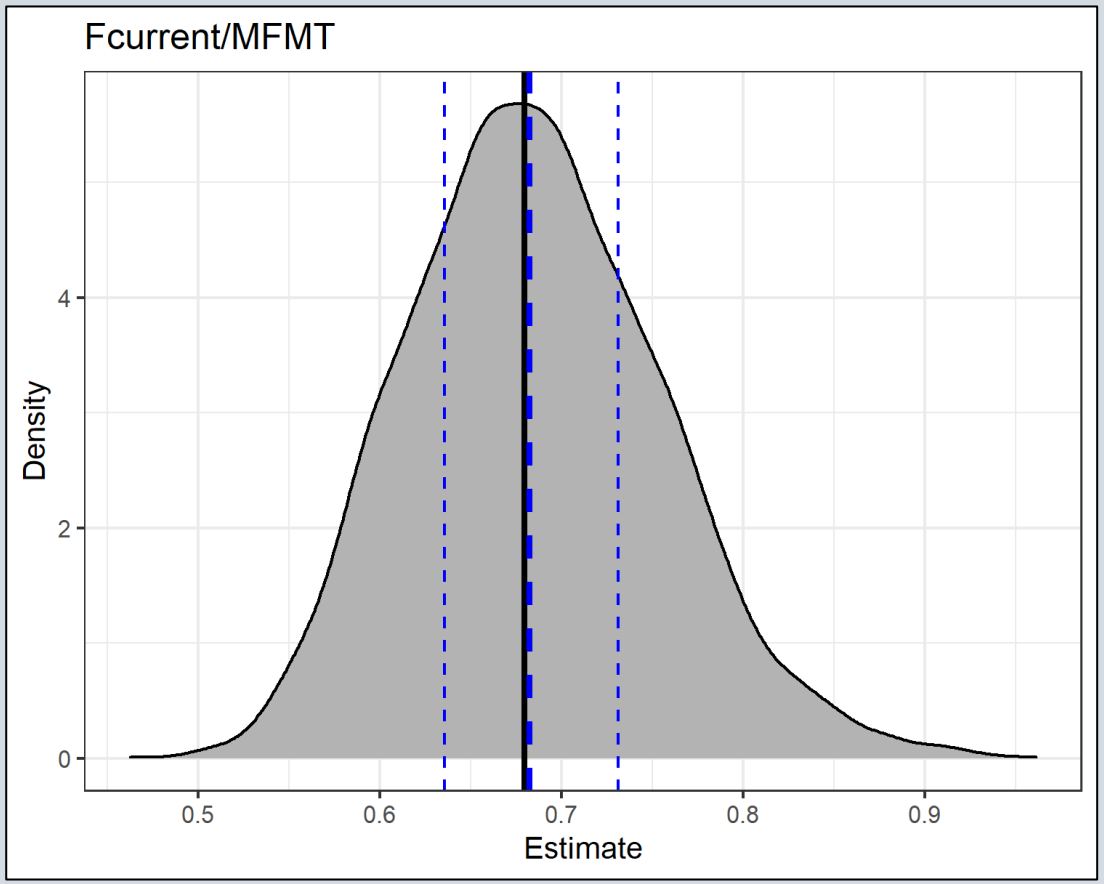


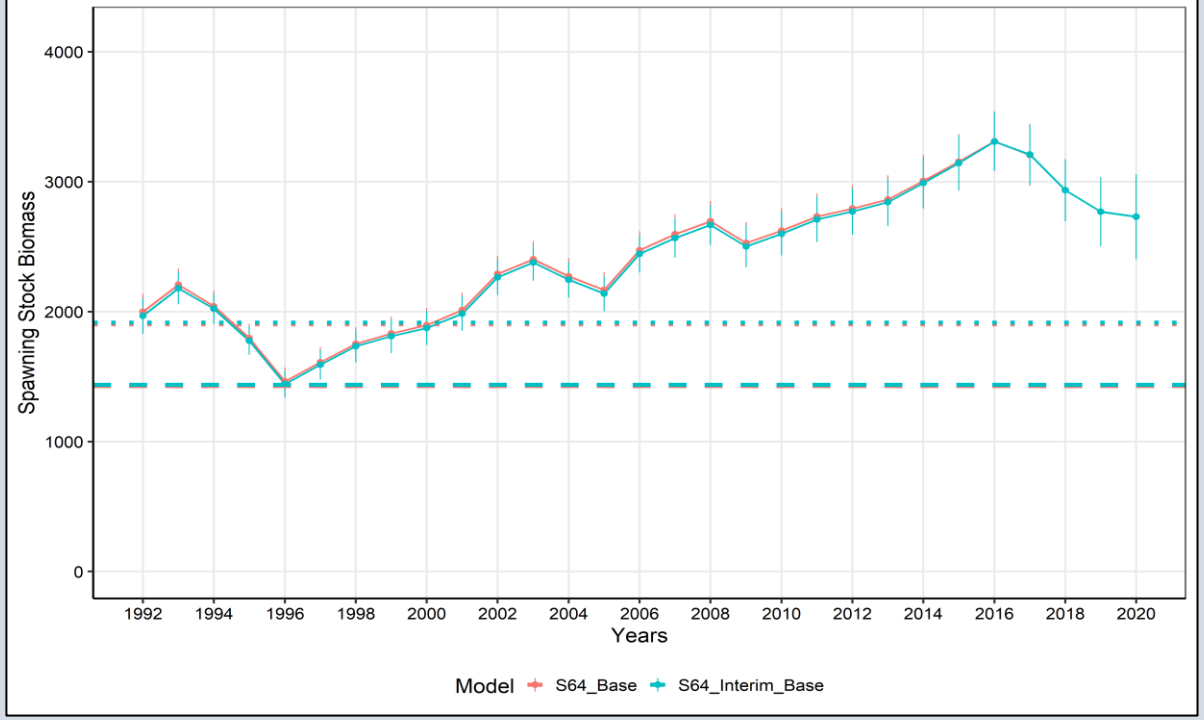
Figure 7

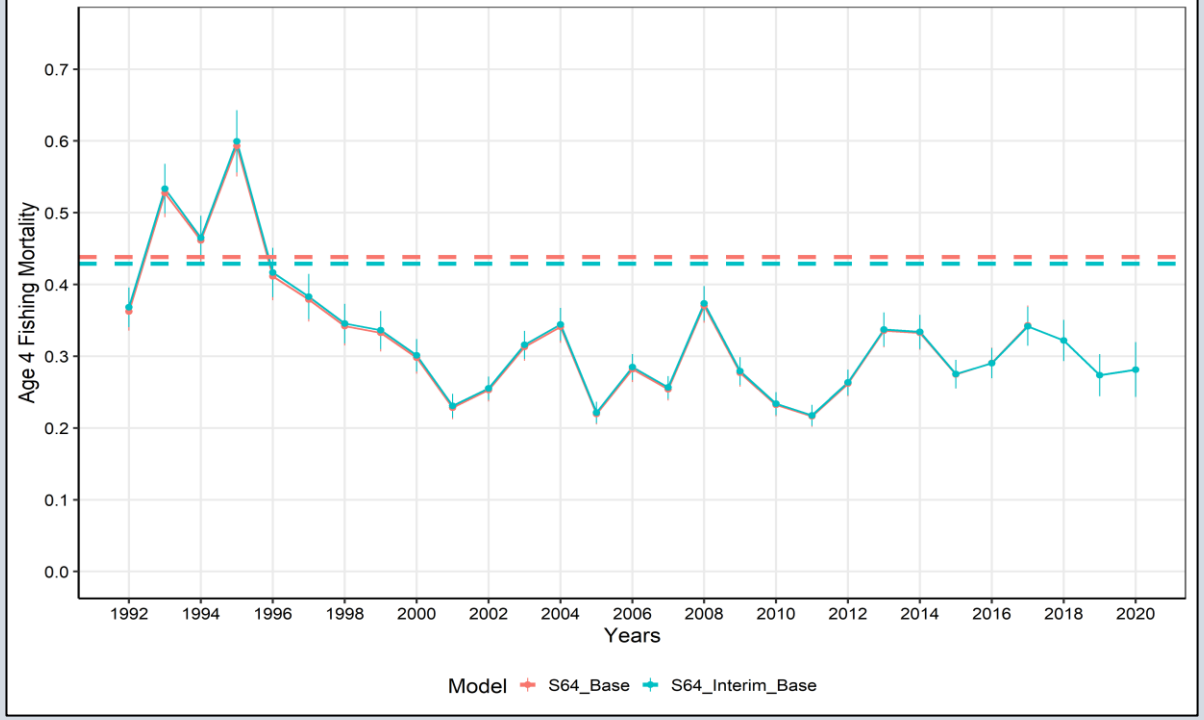

Geometric Mean
SSB_SPR30%
MSST = 0.75 x SSB_SPR30%
Spawning Stock Biomass
0
1000
2000
3000
4000
5000
1995
2000
2005
2010
2015
2020
Year

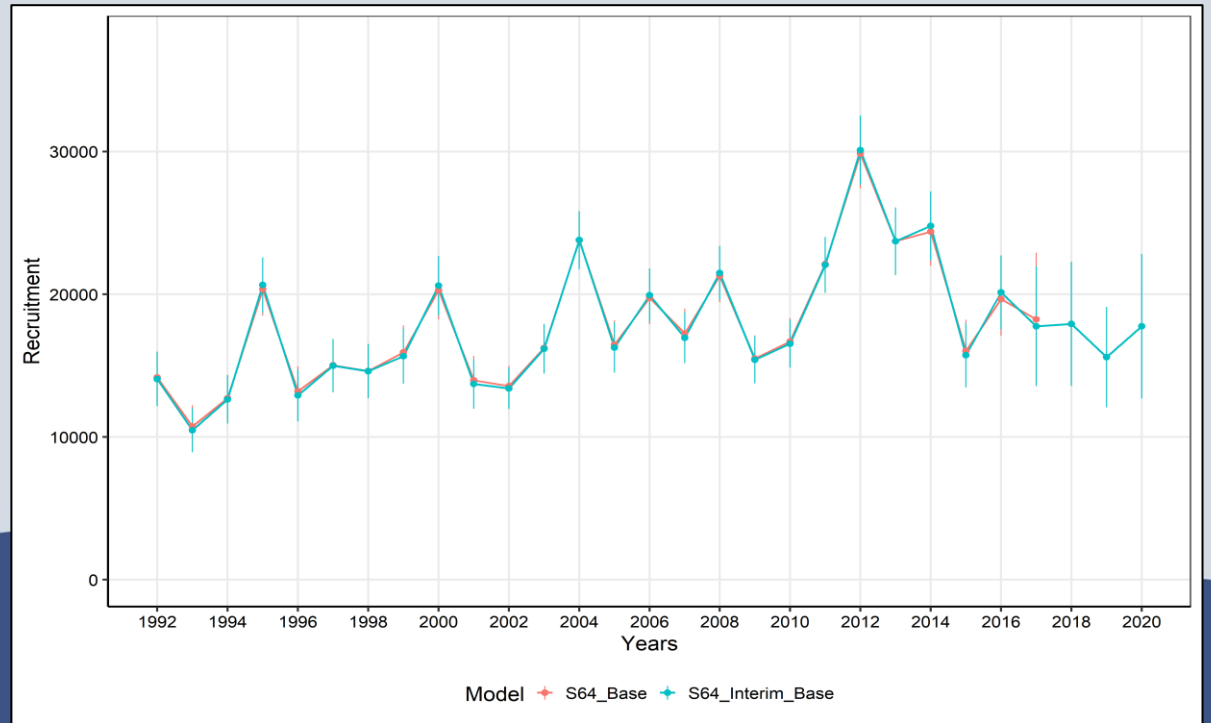

SSBcurrent/MSST
Density
0.0
0.5
1.0
1.5
2.0
1.5
2.0
2.5
3.0
Estimate

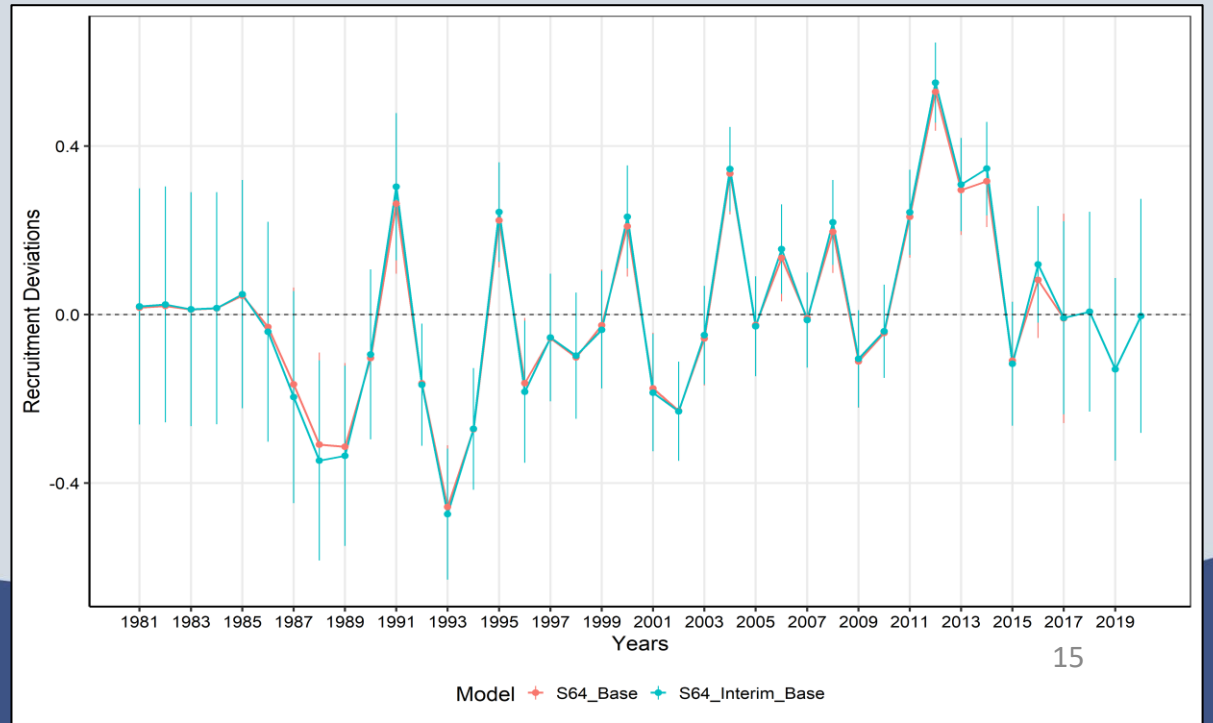

Geometric Mean
MFMT = F_SPR30%
Age 4 Fishing Mortality
0.0
0.2
0.4
0.6
0.8
1995
2000
2005
2010
2015
2020
Year


Fcurrent/MFMT
Density
0
2
4
0.5
0.6
0.7
0.8
0.9
Estimate


Spawning Stock Biomass
4000
3000
2000
1000
0
1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Years
Model S64_Base S64_Interim_Base


Age 4 Fishing Mortality
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Years
Model S64_Base S64_Interim_Base


Recruitment
30000
20000
10000
0
1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Years
Model S64_Base S64_Interim_Base


Recruitment Deviations
0.4
0.0
-0.4
1981 1983 1985 1987 1989 1991 1993 1995 1997 1999 2001 2003 2005 2007 2009 2011 2013 2015 2017 2019
Years
Model S64_Base S64_Interim_Base

Stock Status Determination Criteria (Table 15)

Criteria	Definition	Value
MFMT ($F_{30\%SPR}$) Maximum Fishing Mortality Threshold	The fishing mortality rate associated with 30% SPR and the proxy used for F_{MSY}	0.429 yr^{-1}
P* = 0.375	The fishing mortality rate associated with the 37.5th quantile of $F_{30\% SPR}$	0.418 yr^{-1}
$F_{current}$	The geometric mean of F on age-4 fish for 2018 - 2020	0.292 yr^{-1}
MSST (Minimum Stock Size Threshold)	$0.75*SSB_{F30\%SPR}$	3,167,807 lbs.
$SSB_{F30\%SPR}$	The estimated spawning stock biomass associated with F at 30% SPR	4,223,743 lbs.
$SSB_{current}$	The geometric mean of SSB for 2018 - 2020	6,195,718 lbs.
Equilibrium OFL (Overfishing Limit)	Equilibrium Retained Yield at MFMT	3,498,908 lbs.
Equilibrium ABC (Acceptable Biological Catch)	Equilibrium Retained Yield at P* = 0.375	3,407,637 lbs.

S64 Interim Analysis: Yellowtail Snapper

Projections

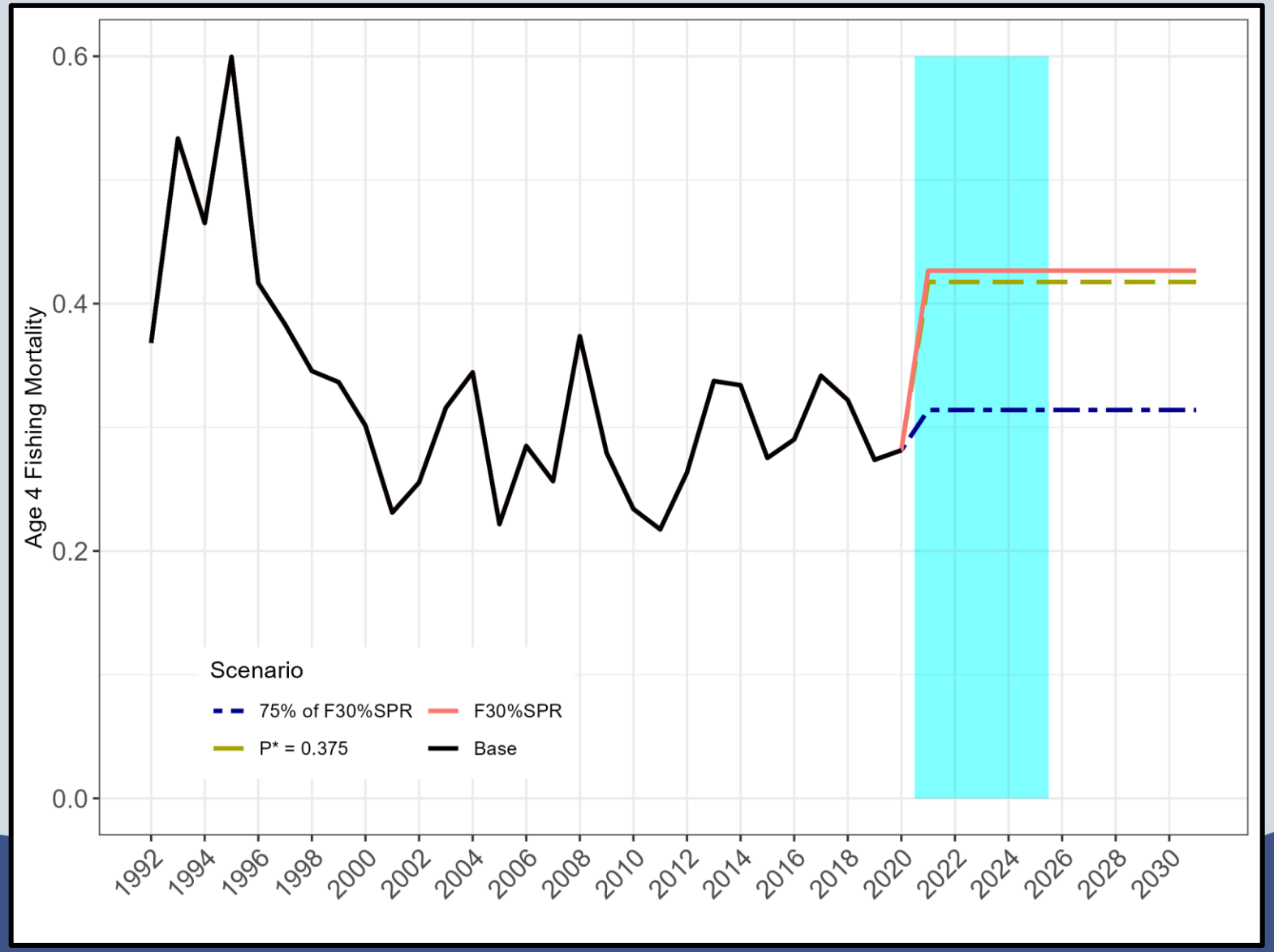
Projections

Deterministic projections were run to estimate SSB and yield under multiple constant F and constant catch scenarios (TOR #2 sub-point).

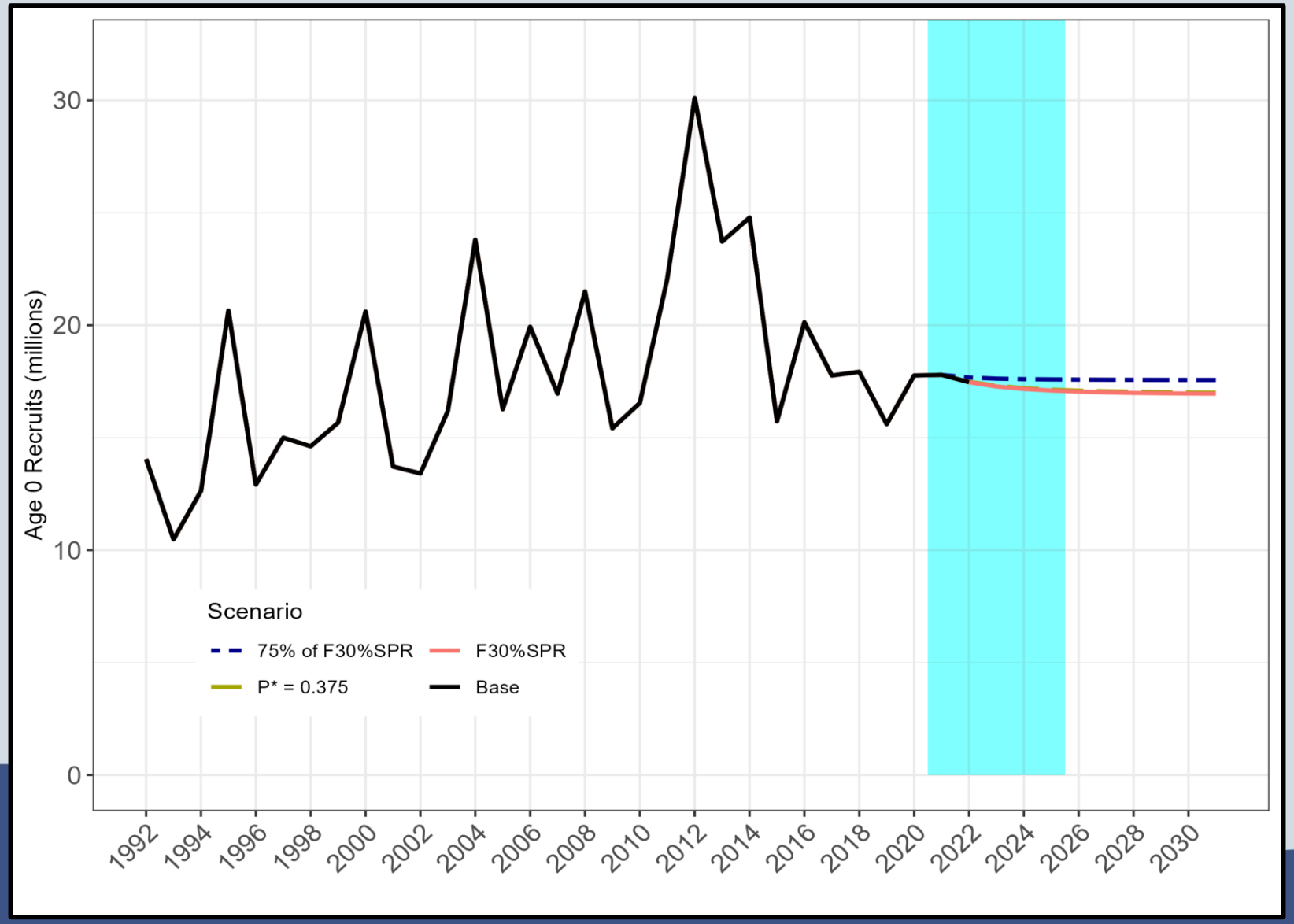
- Structure and parameters of the projection model same as assessment model.
- Recruitment for first year of projection based on S-R relationship as estimated by the IBM (17.792 million fish)
- An iterative method (provided by the SEFSC) specifies fishing mortality rates for each fleet per year (2021 – 2121). Fleet allocations are kept constant each year according to those in the SA (52.56% commercial and 47.44% recreational).

Constant F Projection Scenarios

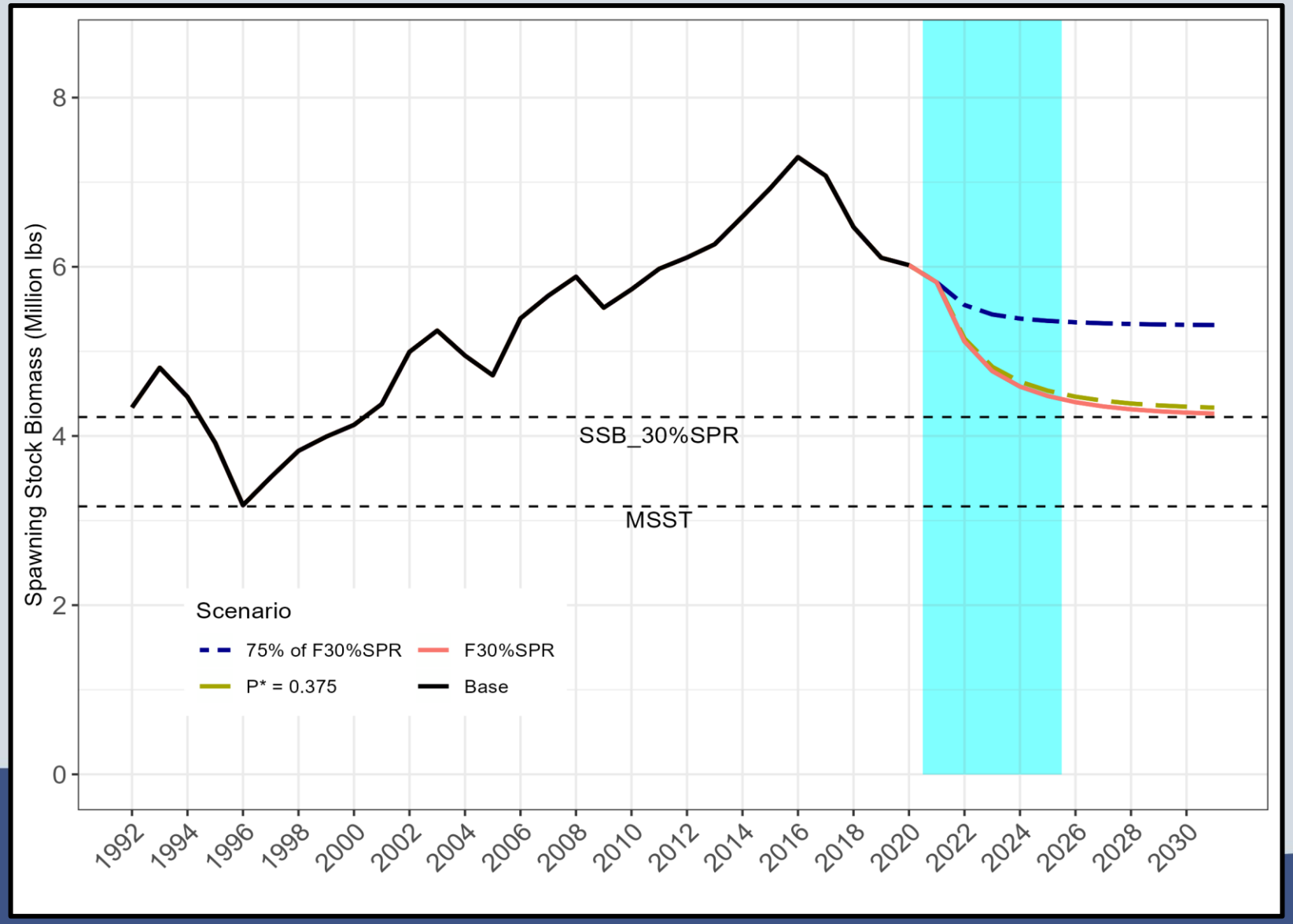
1. $F_{30\%SPR} = 0.429$
2. $F_{P^* =0.375} = 0.418$
3. $75\%F_{30\%SPR} = 0.314$



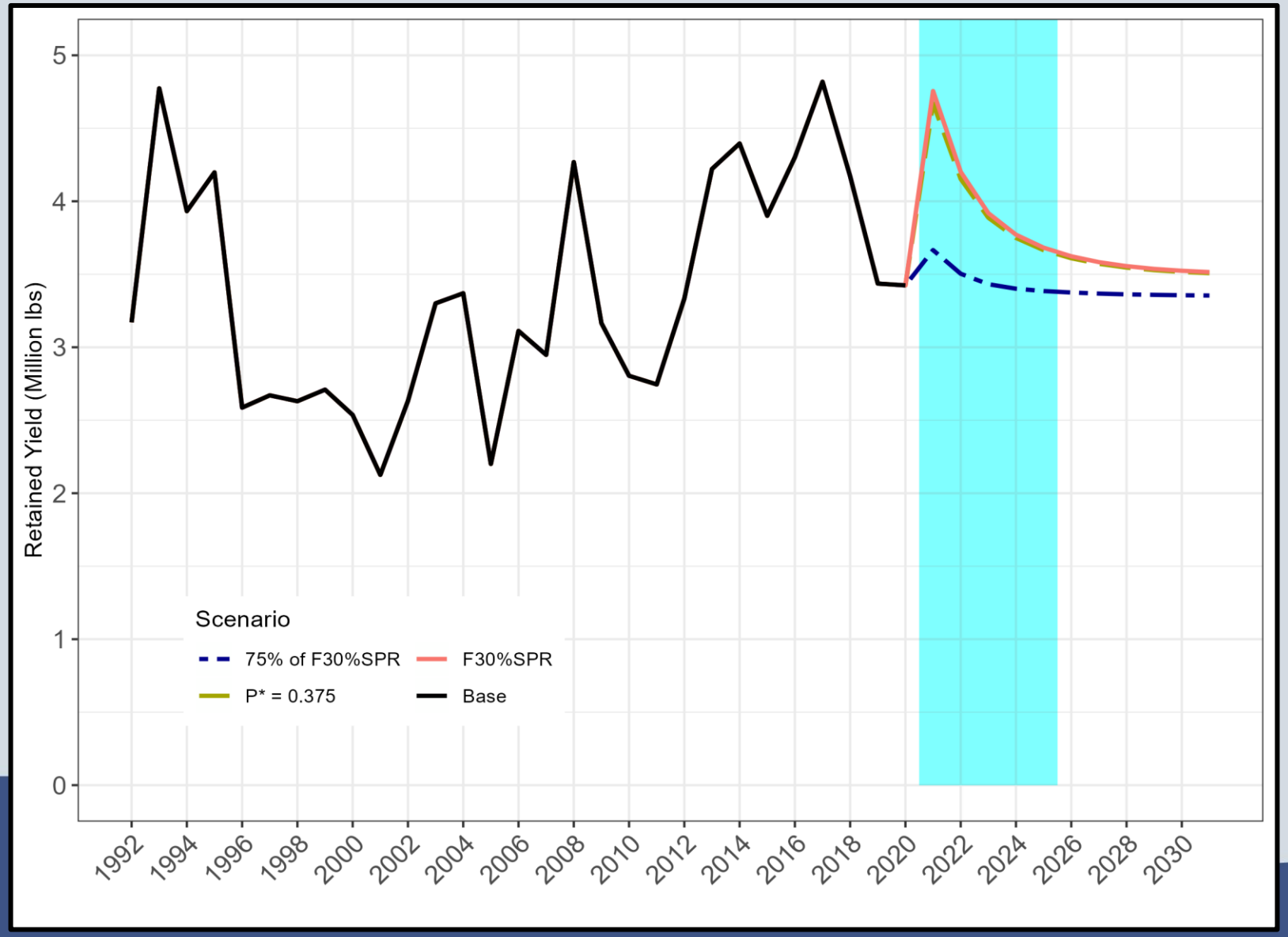
Constant F Projections: Recruitment (millions)



Constant F Projections: SSB (million lbs)



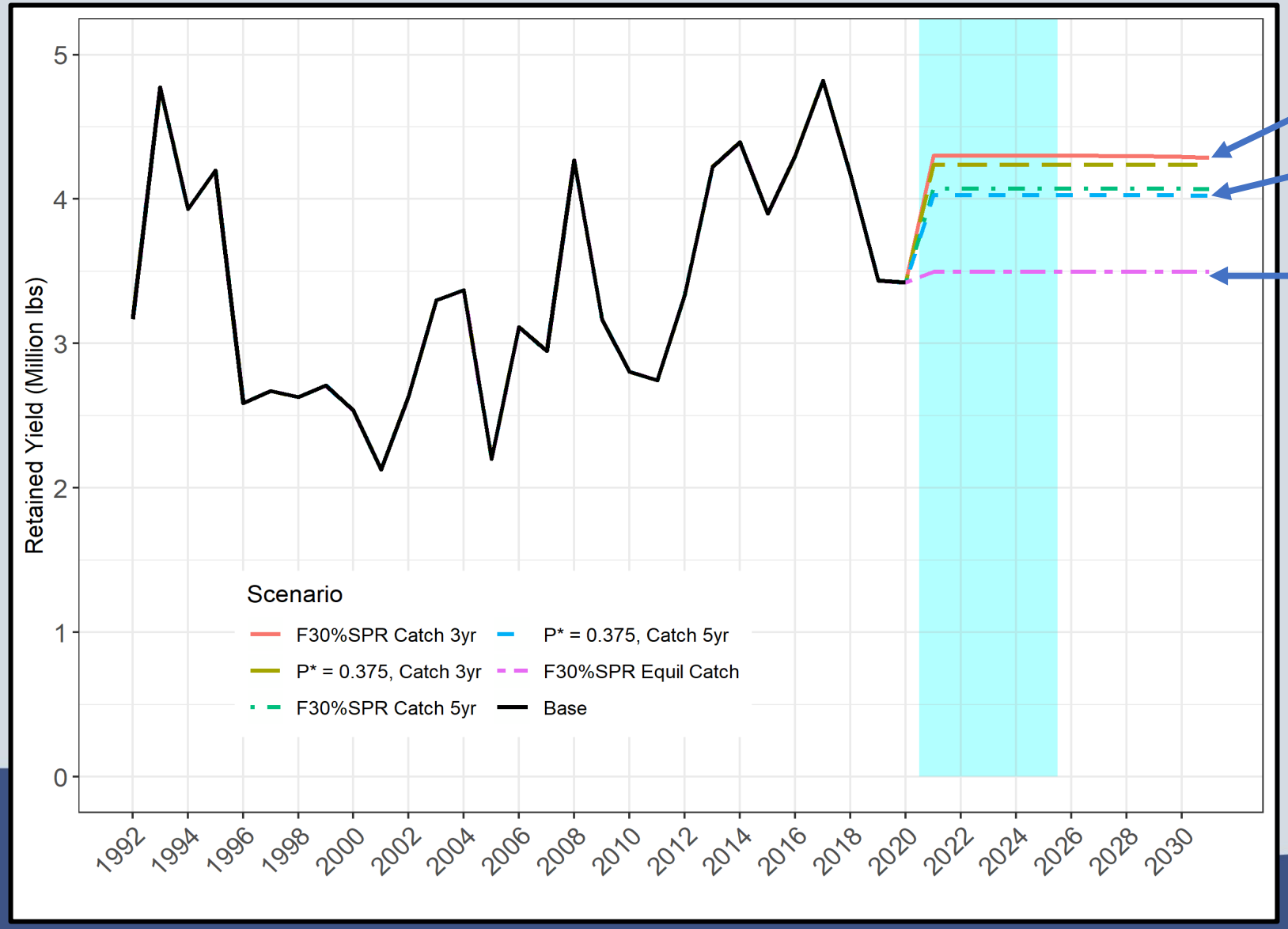
Constant F Scenarios: Retained Yield (million lbs)



Constant F Scenarios: Projected Retained Yield (lbs)

Year	$F_{30\%SPR}$ (OFL)	P* = 0.375 (ABC)	$75\%F_{30\%SPR}$	**ABC/OFL**	**ABC=ACL** Com ACL (52.56%)	**ABC=ACL** Rec ACL (47.44%)
2021	4,765,705	4,670,681	3,665,668	98.01%	2,454,911	2,215,771
2022	4,207,390	4,152,787	3,503,435	98.70%	2,182,708	1,970,079
2023	3,922,267	3,887,251	3,431,880	99.11%	2,043,149	1,844,102
2024	3,773,583	3,748,639	3,400,873	99.34%	1,970,295	1,778,343
2025	3,684,061	3,664,980	3,384,921	99.48%	1,926,322	1,738,658
2026	3,624,751	3,609,528	3,374,999	99.58%	1,897,173	1,712,355
2027	3,584,330	3,571,596	3,367,497	99.64%	1,877,241	1,694,355
2028	3,556,683	3,545,663	3,362,246	99.69%	1,863,607	1,682,056
2029	3,537,757	3,527,977	3,358,933	99.72%	1,854,312	1,673,665
2030	3,524,780	3,515,691	3,356,297	99.74%	1,847,857	1,667,834
2031	3,515,862	3,507,371	3,354,276	99.76%	1,843,483	1,663,888
3 yr Avg	4,298,454	4,236,906			2,226,923	2,009,984
5 yr Avg	4,070,601	4,024,868			2,115,477	1,909,391
Equil Catch	3,468,661				1,823,128	1,645,533

Constant Catch Scenarios: Retained Yield (million lbs)

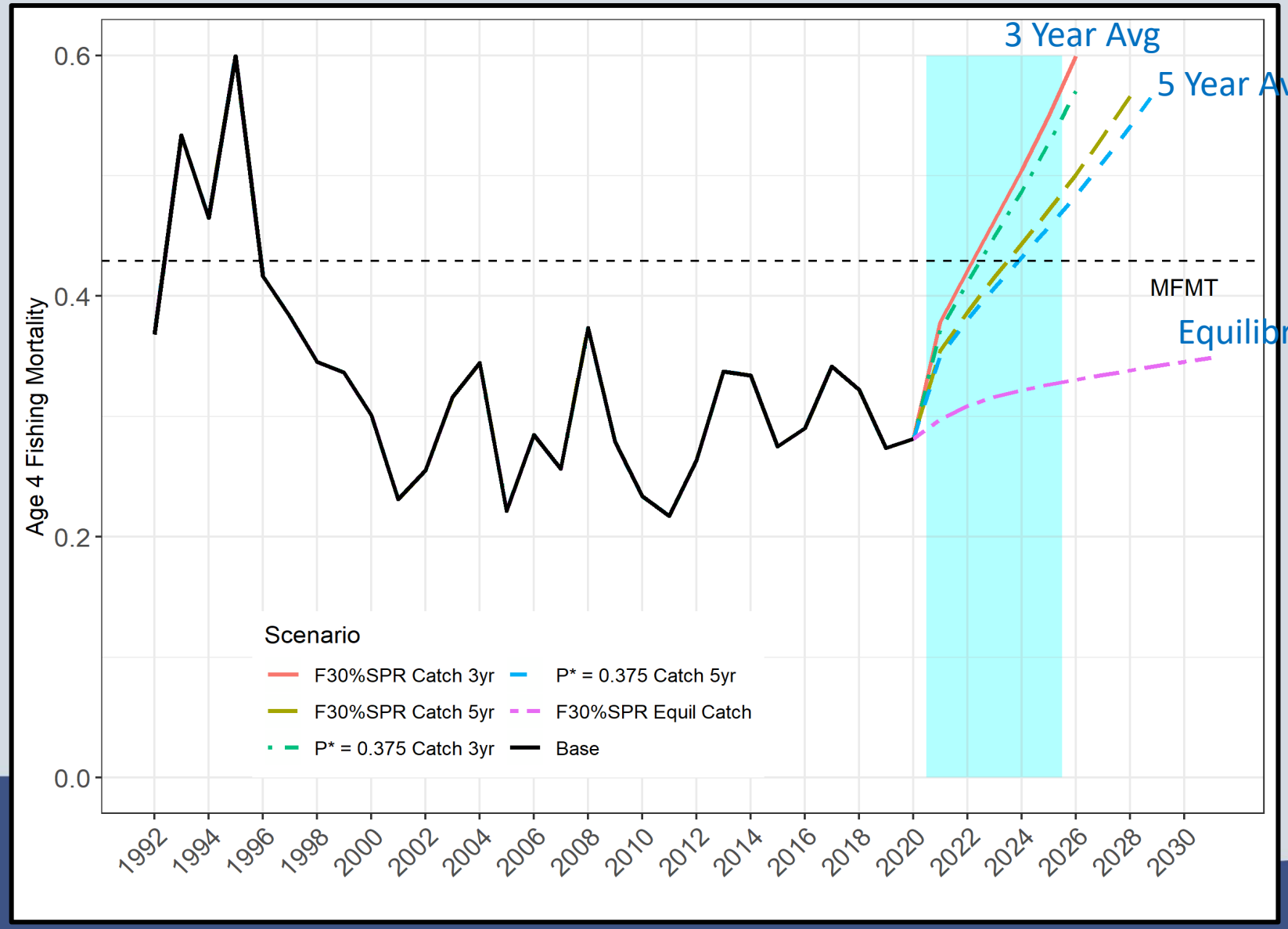


3 Year Avg

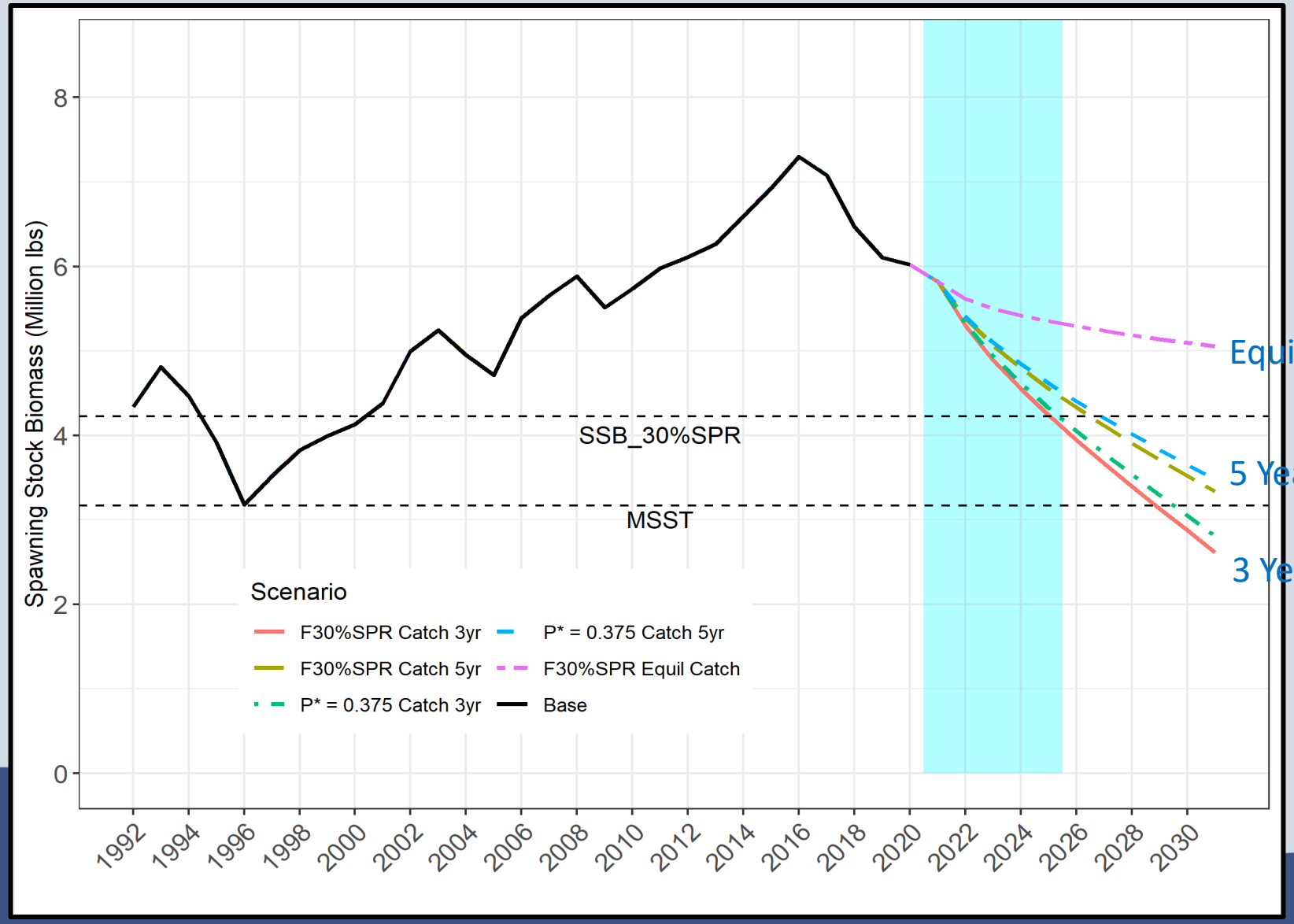
5 Year Avg

Equilibrium

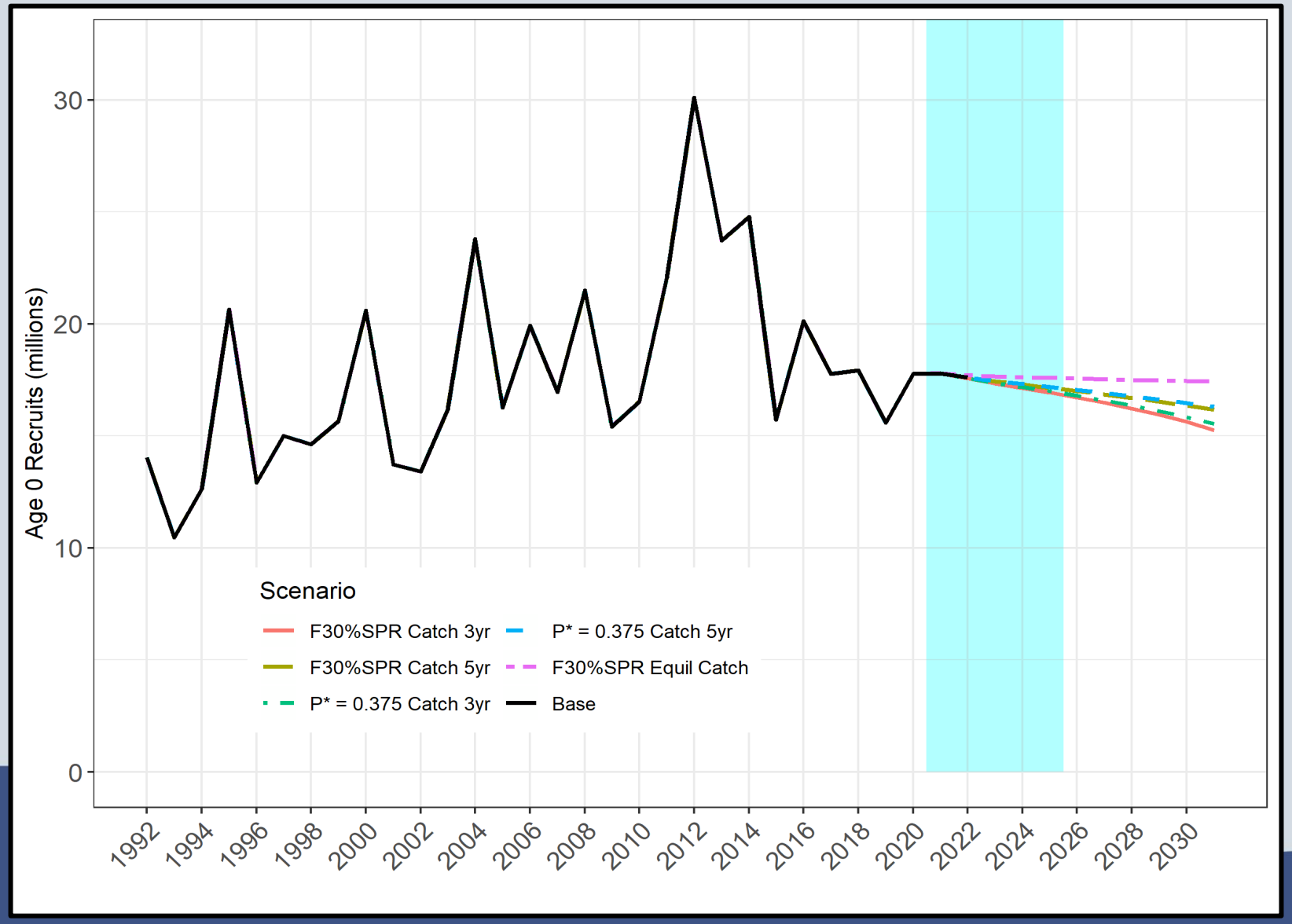
Constant Catch Scenarios: Fishing Mortality Rates



Constant Catch Scenarios: SSB (million lbs)



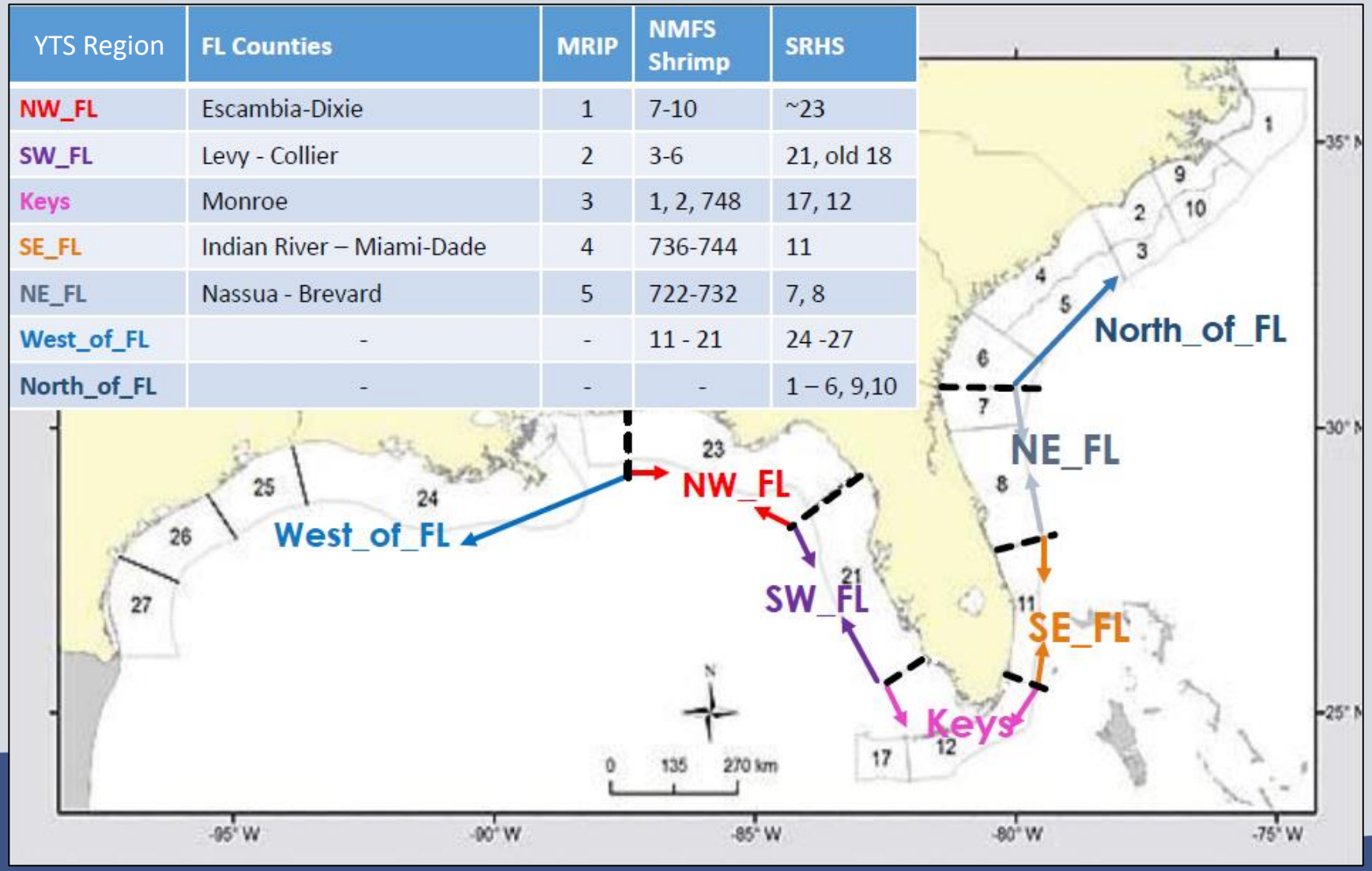
Constant Catch Scenarios: Recruitment (millions)




Questions?

Regions of Florida

YTS Region	FL Counties	MRIP	NMFS Shrimp	SRHS
NW_FL	Escambia-Dixie	1	7-10	~23
SW_FL	Levy - Collier	2	3-6	21, old 18
Keys	Monroe	3	1, 2, 748	17, 12
SE_FL	Indian River – Miami-Dade	4	736-744	11
NE_FL	Nassua - Brevard	5	722-732	7, 8
West_of_FL	-	-	11 - 21	24 -27
North_of_FL	-	-	-	1 – 6, 9,10



Management History: SAFMC

- Snapper-Grouper FMP (8/31/1983)
  - 12” (305 mm) TL minimum size limit for commercial and recreational fisheries
    - Florida state waters regulation enacted 7/1/1985
- Amendment 4 (1/1/1992)
  - Aggregate daily bag limit of 10 snappers for recreational fishery
    - Florida state waters regulation enacted 12/1/1986
- Amendment 11B (12/2/1999)
  - MSY-proxy set as 30% static SPR; OY-proxy is 40% static SPR
- Regulatory Amendment 15 (9/12/13)
  - OY = ACL = ABC
- Regulatory Amendment 21 (11/6/2014)
  - Modified MSST to be 75% of the SSB_{MSY}

Management History: GMFMC

- Reef Fish FMP (11/8/1984)
- Reef Fish Amendment 1 (2/21/1990)
  - 12” (305 mm) TL minimum size limit for commercial and recreational fisheries
  - Aggregate daily bag limit of 10 snappers for recreational fishery
- Reef Fish Amendment 48 (6/8/2022)
  - MFMT: $F_{30\%SPR}$
  - MSST: GMFMC currently defers to SAFMC
  - OY: 90% of the MSY or MSY proxy

Landings by Fleet in Pounds

Year	Commercial	Headboat	MRIP	Total
2010	1,693,953	89,739	978,430	2,762,122
2011	1,893,544	92,552	943,810	2,929,906
2012	2,107,291	121,417	972,774	3,201,482
2013	2,061,143	114,676	1,532,100	3,707,919
2014	2,043,260	177,331	1,998,309	4,218,900
2015	2,197,954	177,597	1,391,931	3,767,482
2016	2,314,905	188,058	1,522,151	4,025,114
2017	2,820,426	117,929	1,880,002	4,818,357
2018	1,988,139	104,935	1,521,940 *	3,615,014
2019	2,205,944	235,374	872,478 *	3,313,796
2020	1,408,072	147,282	1,433,681 *	2,989,035

*MRIP Public Query

Table 1. Commercial landings (pounds, metric tons) in Florida by region for years 2018 – 2020.

Landings (whole lbs.)

Year	Northwest	Southwest	**Keys**	Southeast	Northeast	**Total**
2018	29	20,996	**1,908,453**	58,538	123	**1,988,139**
2019	41	21,669	**2,098,050**	85,988	196	**2,205,944**
2020	25	12,443	**1,339,926**	55,507	171	**1,408,072**

Landings (mt)

Year	Northwest	Southwest	**Keys**	Southeast	Northeast	**Total**
2018	0.013	9.524	**865.659**	26.552	0.056	**901.804**
2019	0.019	9.829	**951.659**	39.004	0.089	**1,000.598**
2020	0.011	5.644	**607.780**	25.178	0.078	**638.690**

Table 4. MRIP landings (thousands of fish) and releases (thousands of fish) in Florida by region for years 2017 – 2020.

Landings (000s)

Year	Northwest	Southwest	**Keys**	**Southeast**	Northeast	**Total**
2017	0.000	304.551	**839.815**	**400.493**	5.437	**1,550.296**
2018	0.000	74.051	**658.794**	**960.244**	3.462	**1,696.551**
2019	0.000	76.392	**478.745**	**250.499**	0.000	**805.637**
2020	0.000	41.747	**737.861**	**730.010**	0.249	**1,509.868**

Live Releases (000s)

Year	Northwest	Southwest	**Keys**	**Southeast**	Northeast	**Total**
2017	0.000	114.382	**1,669.138**	**487.509**	1.968	**2,272.998**
2018	0.456	50.630	**1,513.459**	**1,151.028**	45.240	**2,760.814**
2019	0.000	47.969	**1,081.940**	**471.446**	0.000	**1,601.356**
2020	0.000	96.067	**1,982.903**	**433.940**	1.921	**2,514.831**

Model Estimated MRIP Landings in Pounds

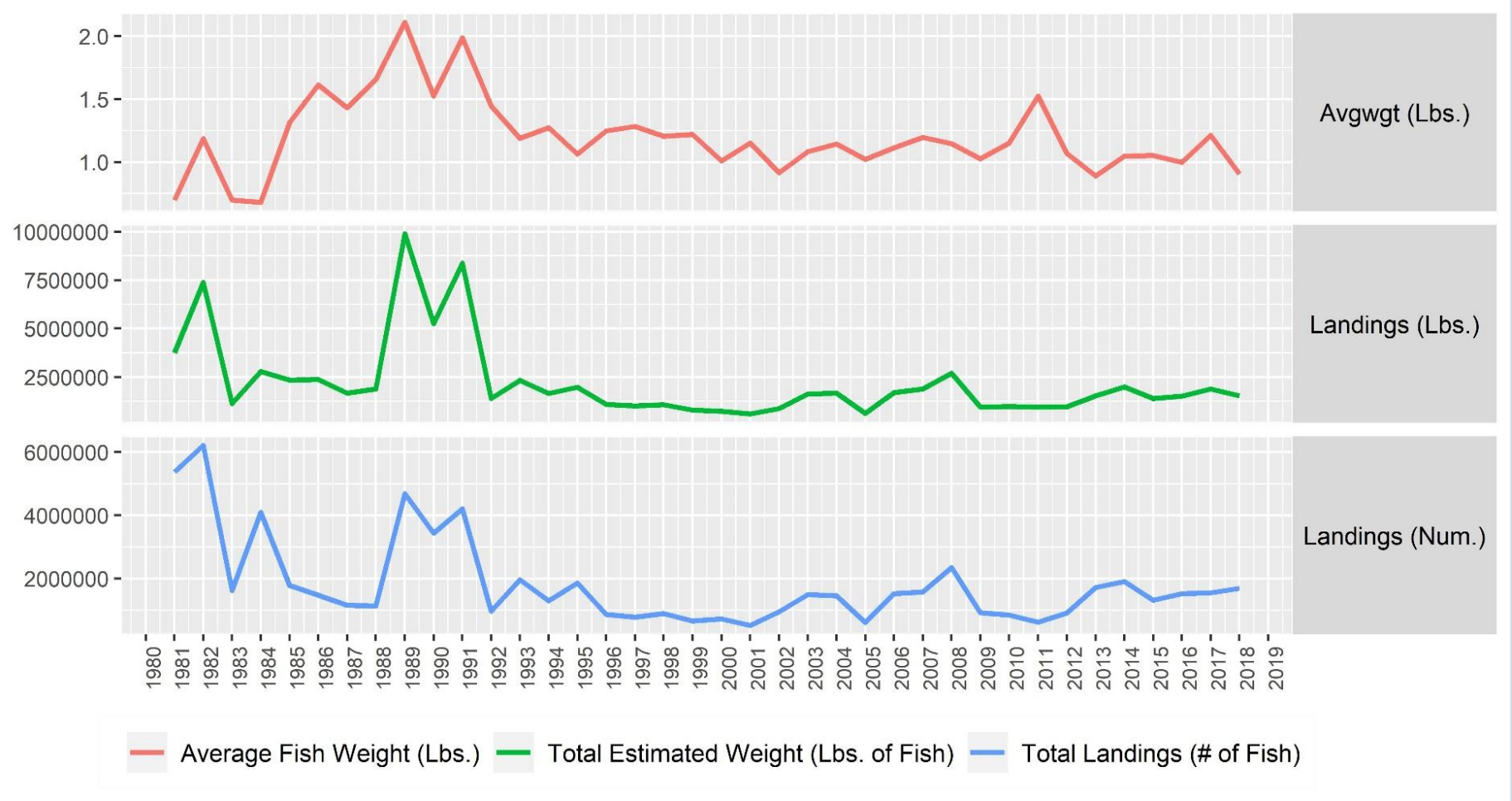
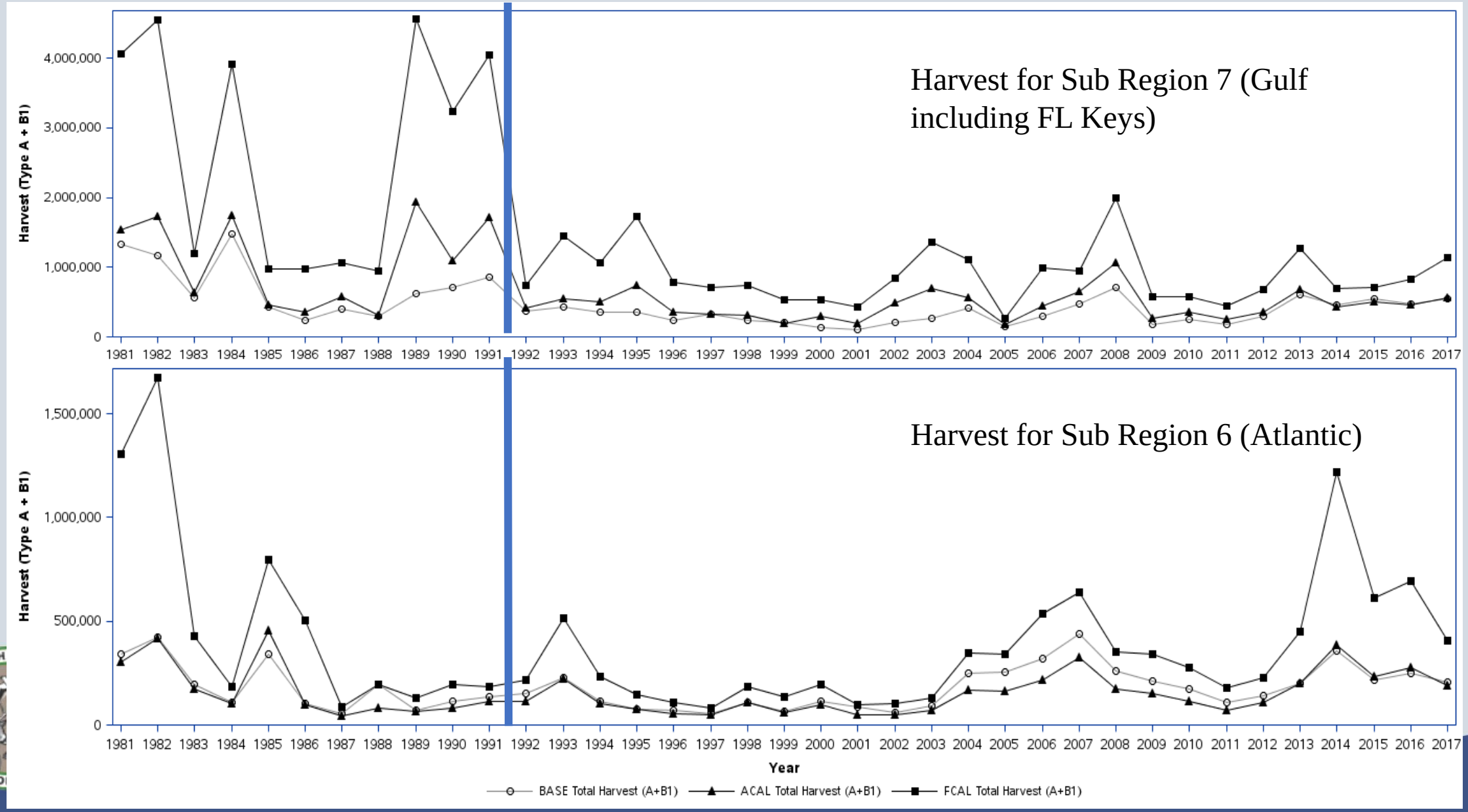
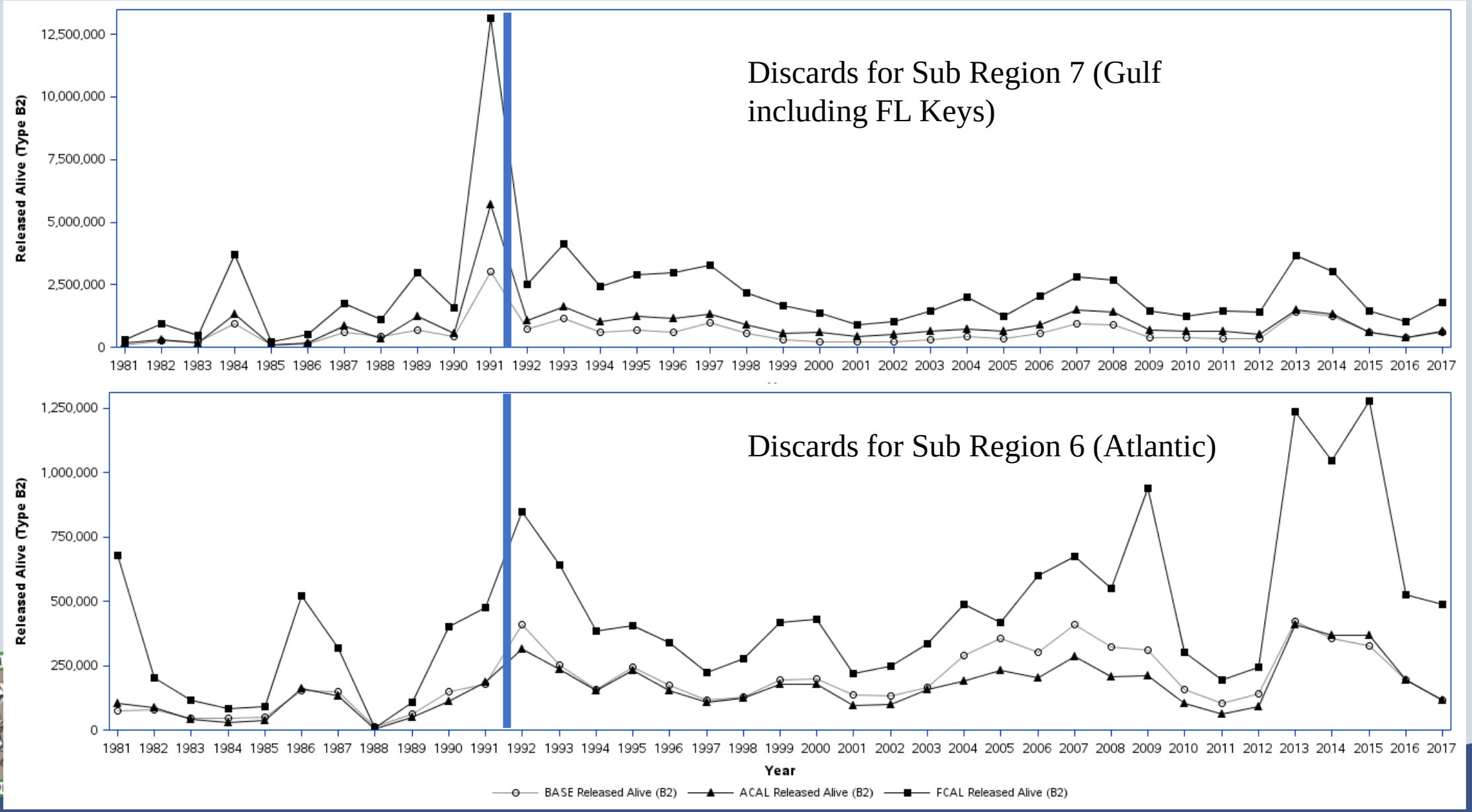


Figure 7. Landings estimates of Yellowtail Snapper by year: a) yearly average weight (lbs./#) of estimated landed Yellowtail Snapper (in pounds); b) estimated landings in weight (pounds) by year; c) estimated landings in number (whole fish) by year.

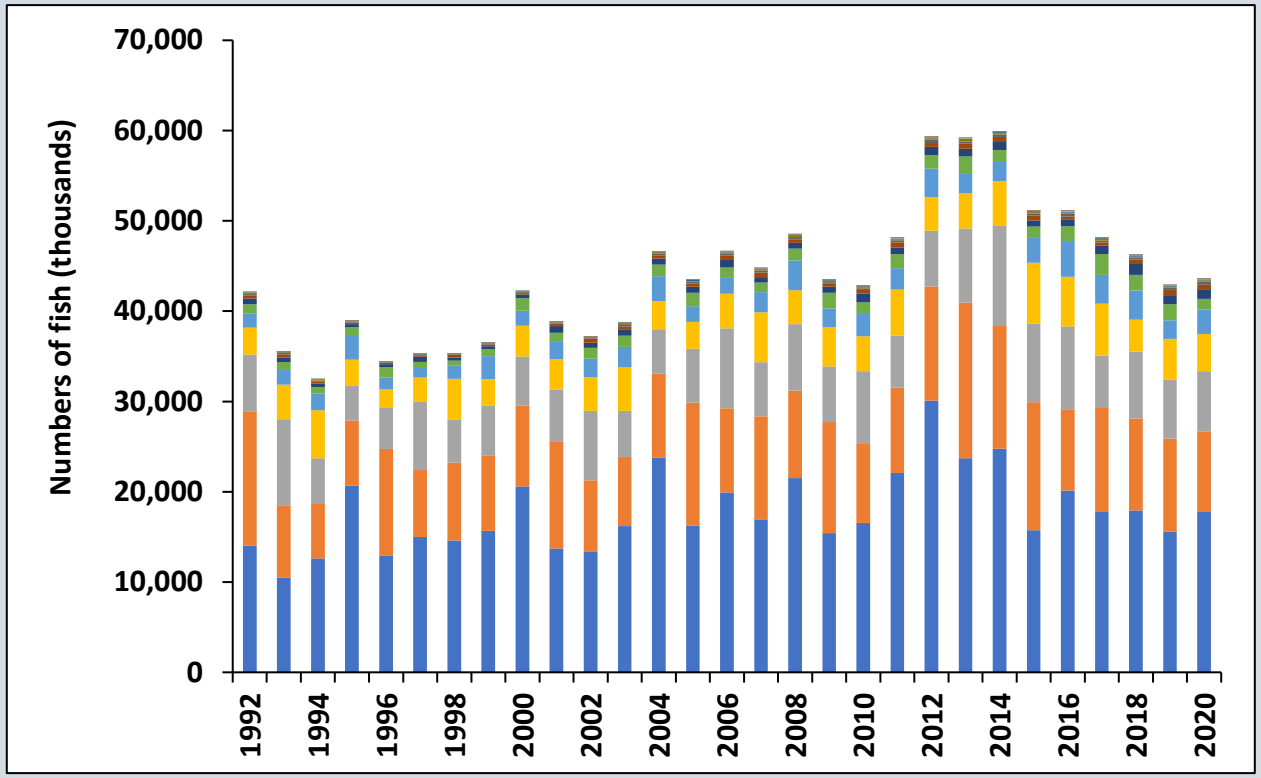
Comparison of non-calibrated vs calibrated MRIP Landings

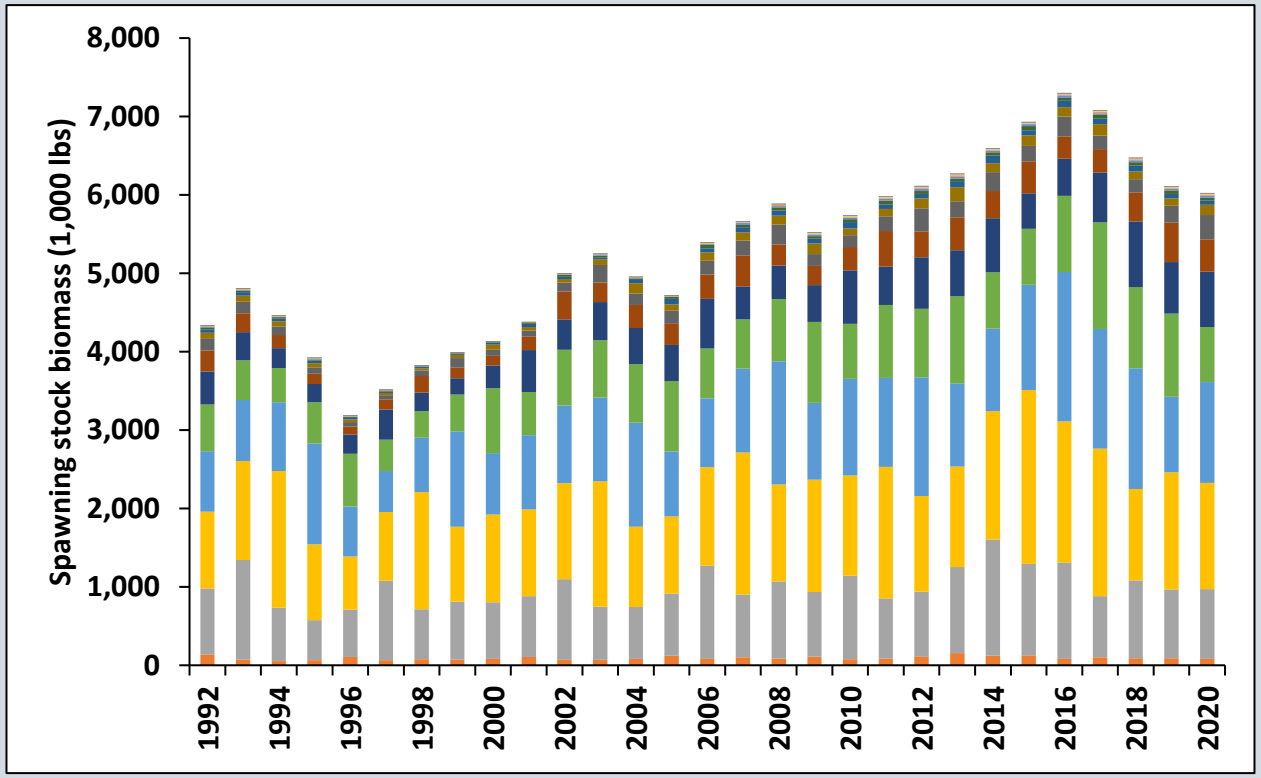


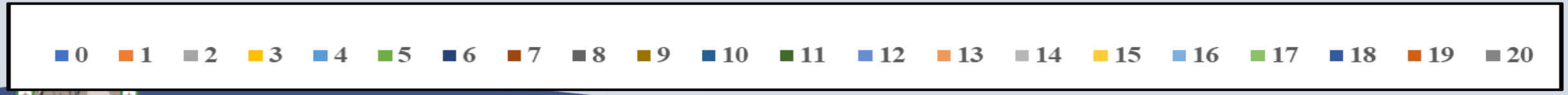
Comparison of non-calibrated vs calibrated MRIP Discards



Numbers and spawning stock biomass at age







Fishing Mortality

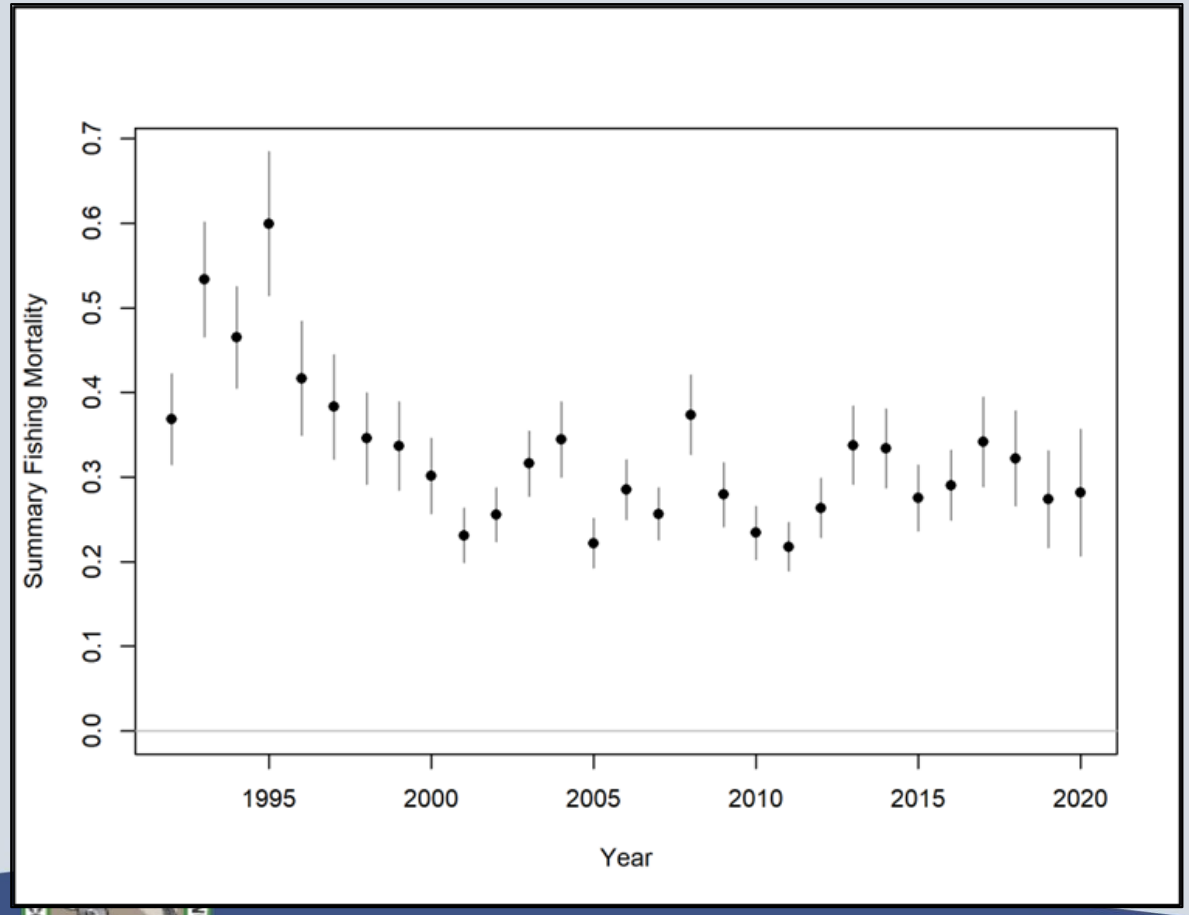


Figure 10

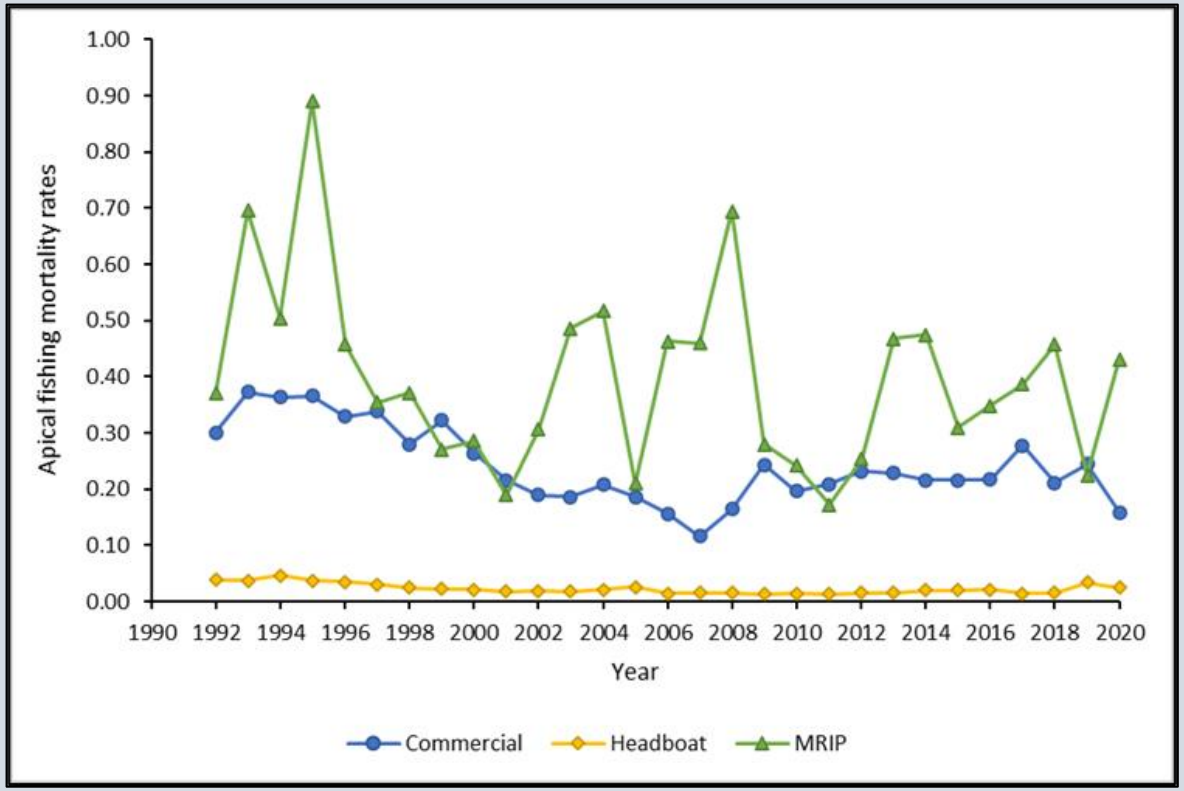


Figure 11

S64 Interim Analysis: Yellowtail Snapper

Sensitivity Runs

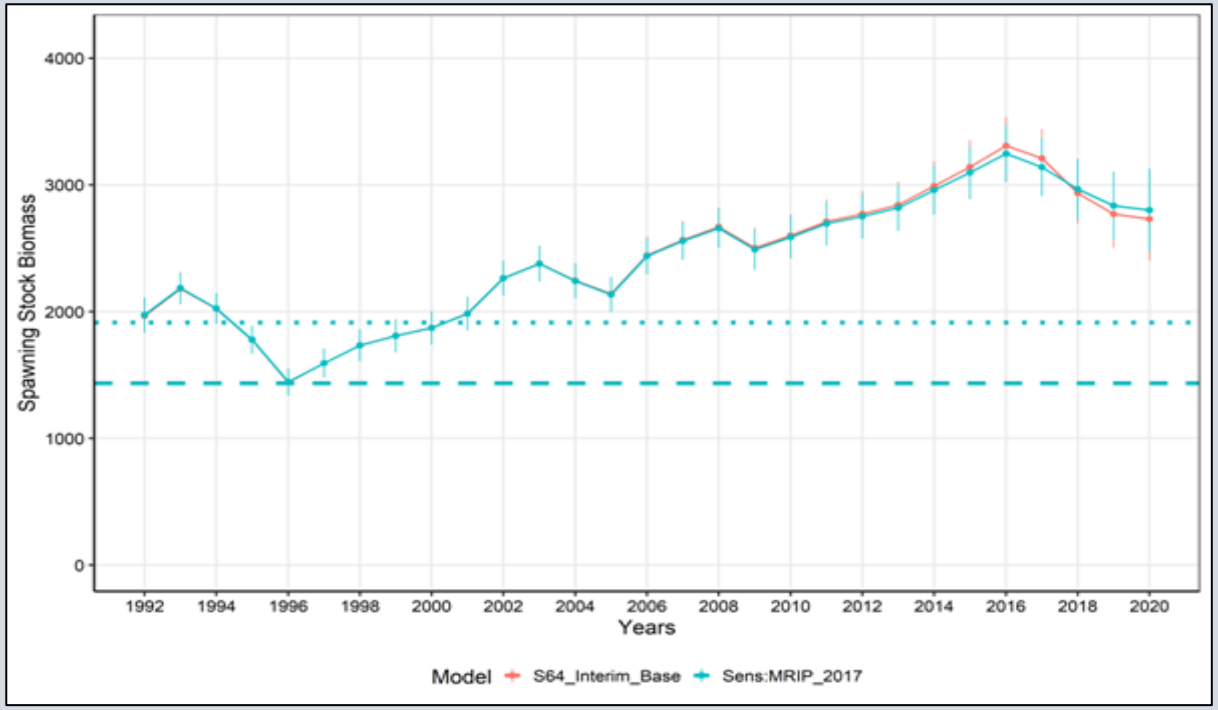
https://www.saltwatersportsman.com/howto/fishing-for-snappers-in-the-bahamas/

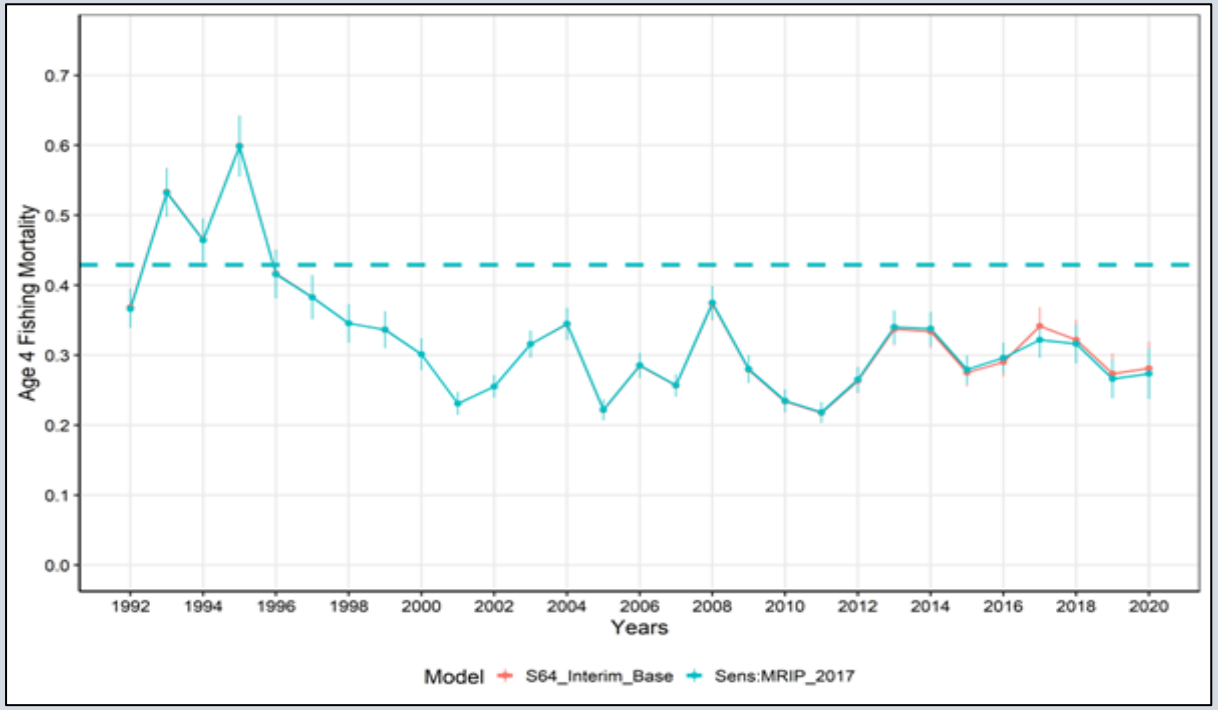
2017 Southwest FL Region MRIP Data

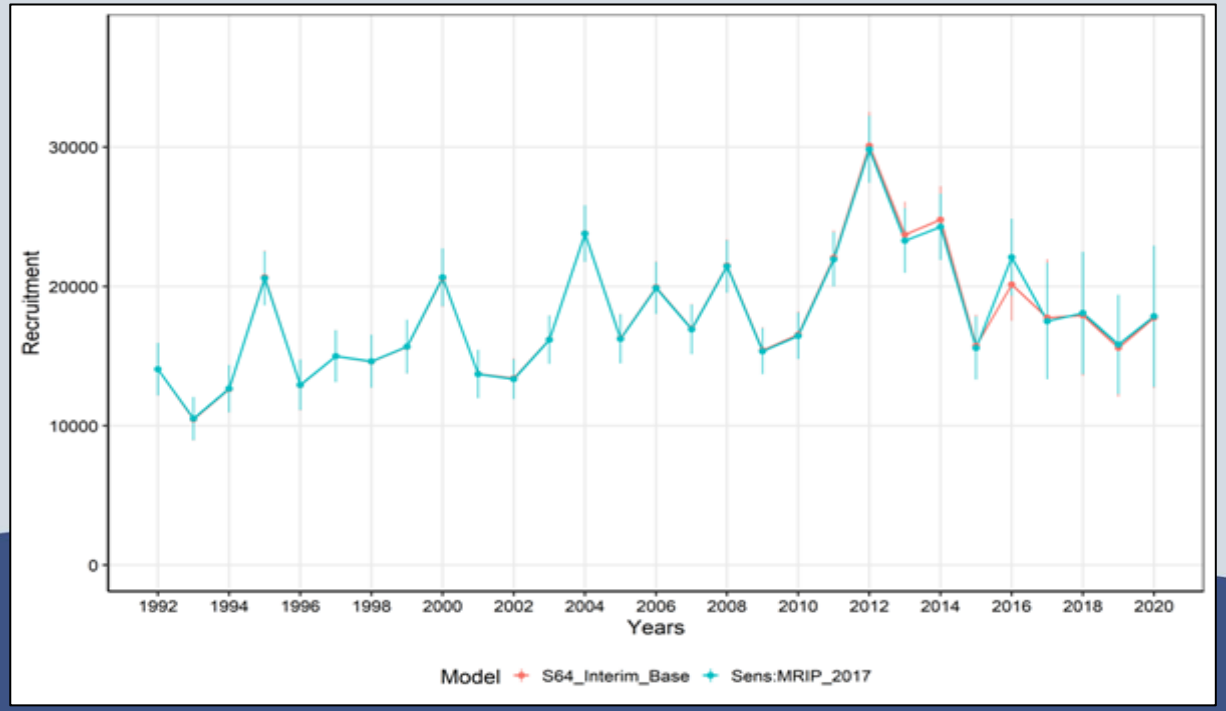
Evaluate the impact of the elevated MRIP landings and discard data in 2017 for the SW region of Florida (TOR #1 sub-point)

2017	SW FL	Total
Landings	304,551	1,550,296
Discards	114,382	2,274,882

2017	SW FL	Total
Landings	44,750	1,290,495
Discards	33,064	2,191,679


Spawning Stock Biomass
Years
Model S64_Interim_Base Sens:MRIP_2017


Age 4 Fishing Mortality
Years
Model S64_Interim_Base Sens:MRIP_2017


Recruitment
Years
Model S64_Interim_Base Sens:MRIP_2017

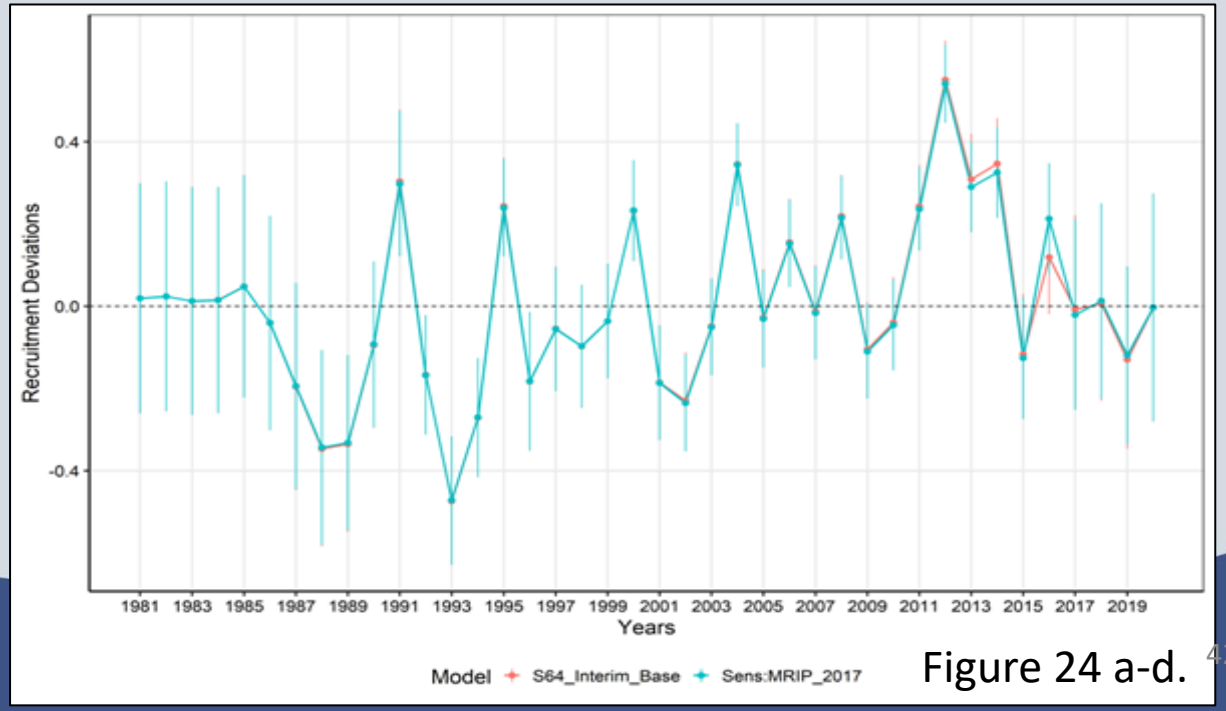

Recruitment Deviations
Years
Model S64_Interim_Base Sens:MRIP_2017

Figure 24 a-d.

2017 SW FL Region MRIP Data

- Impacts to the model were negligible
- The observed variability in the data is reflective of catch estimates in a large region of mostly unfavorable YTS habitat
- Approved for use during S64 DW
- The 2017 MRIP data were not altered in the IBM

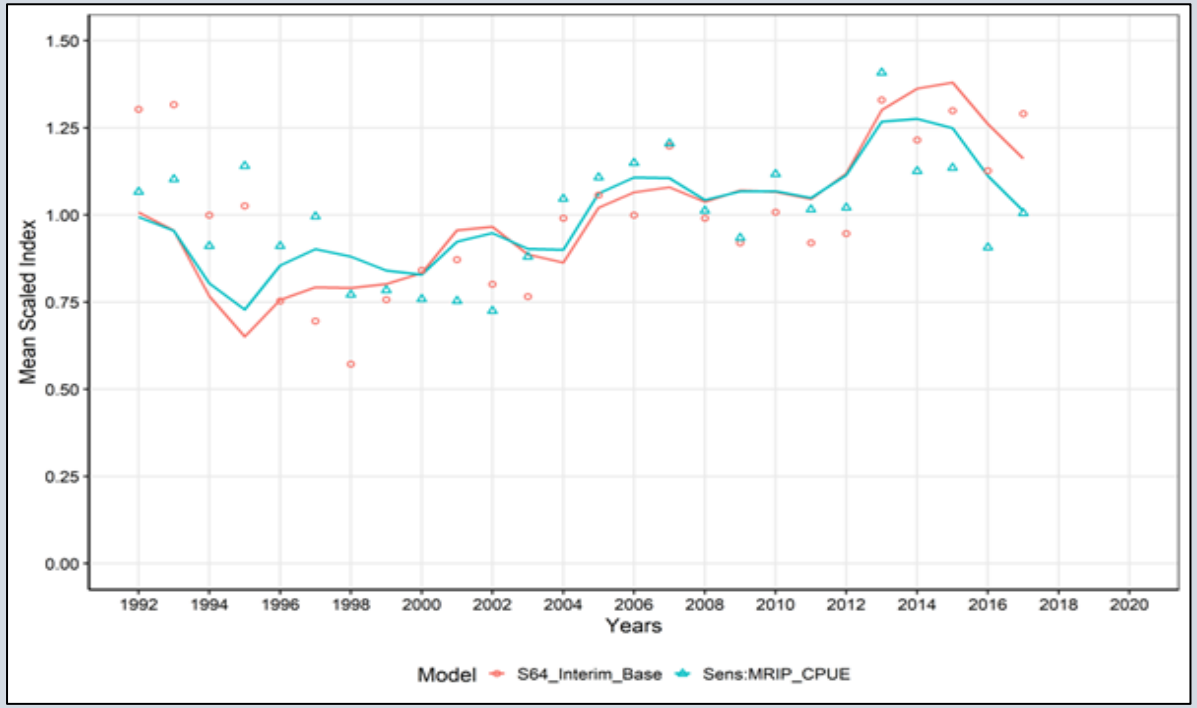
https://www.sosuabeachdr.com/yellow-tail-snapper/

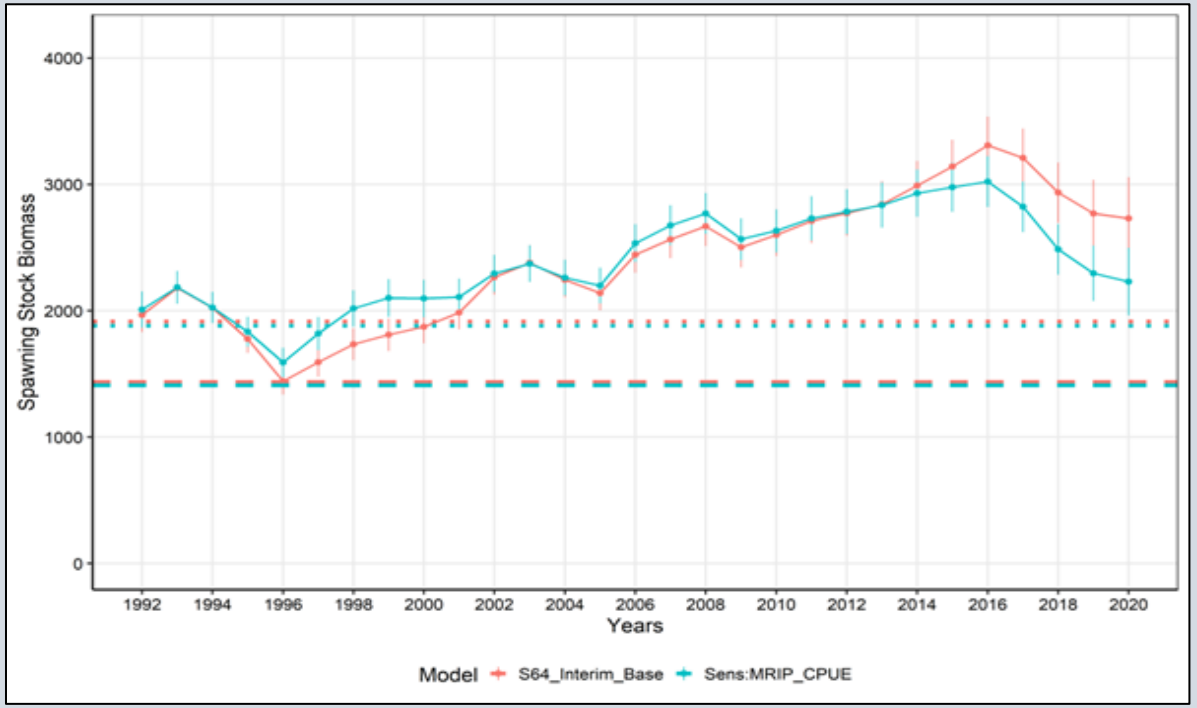
MRIP CPUE Index of Abundance

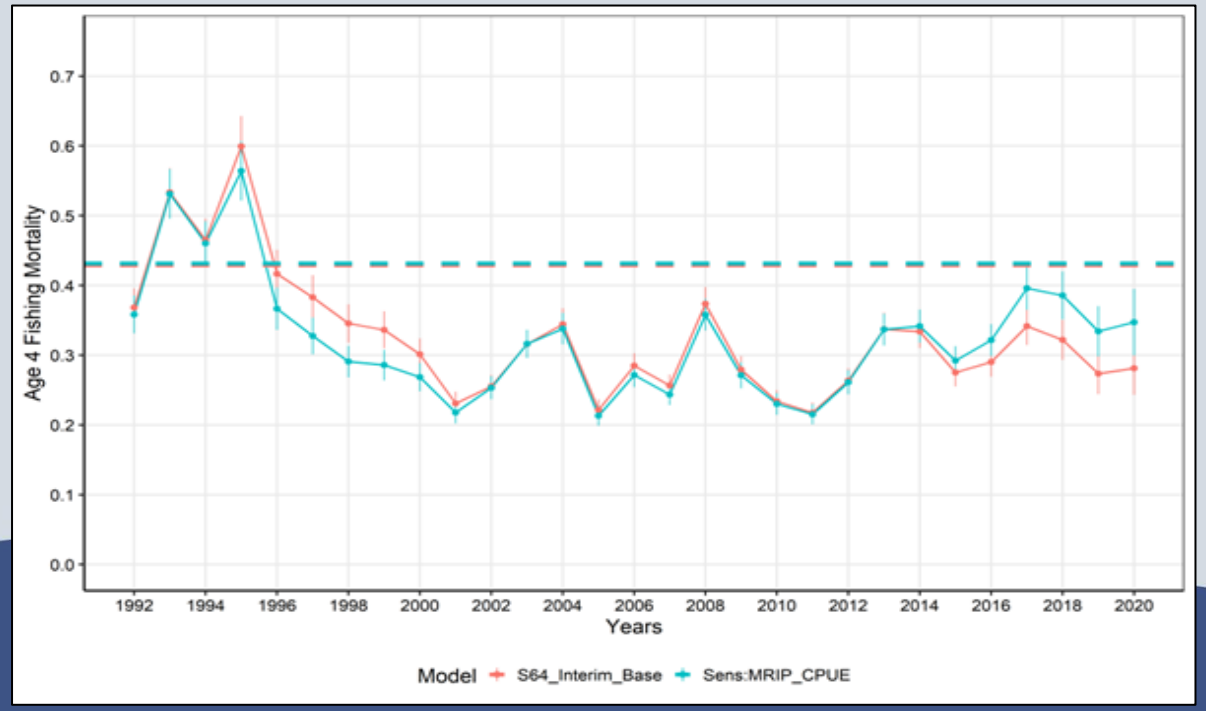
Catch Per Angler → Catch Per Trip

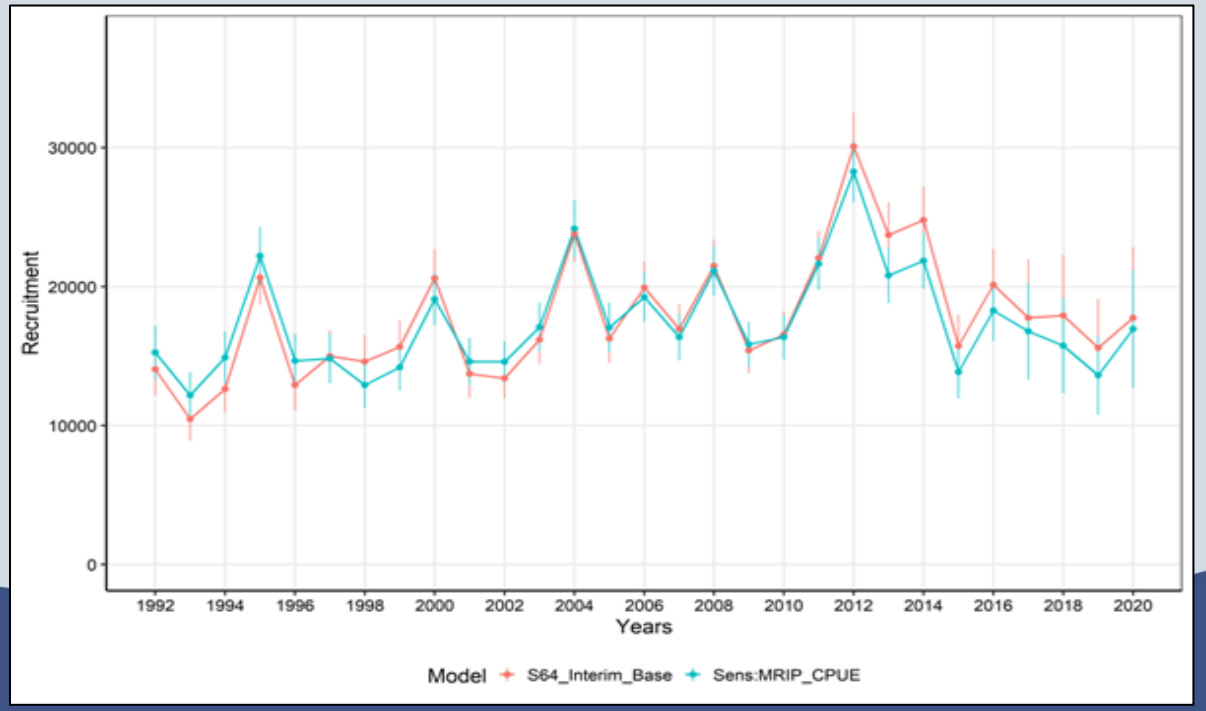
- Catch per angler was consistent with SEDAR 27A (2012) but the intent was to use ‘catch per trip’ (see SEDAR64-DW-09)
- A sensitivity run with the MRIP CPUE index configured as total catch per trip was performed to evaluate any potential changes in model results and to help inform discussions during future assessments.

https://www.sosuabeachdr.com/yellow-tail-snapper/


Mean Scaled Index
1.50
1.25
1.00
0.75
0.50
0.25
0.00
1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Years
Model S64_Interim_Base Sens:MRIP_CPUE


Spawning Stock Biomass
4000
3000
2000
1000
0
1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Years
Model S64_Interim_Base Sens:MRIP_CPUE


Age 4 Fishing Mortality
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Years
Model S64_Interim_Base Sens:MRIP_CPUE


Recruitment
30000
20000
10000
0
1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Years
Model S64_Interim_Base Sens:MRIP_CPUE

https://safmc.net/species/snapper-yellowtail/

MRIP CPUE Index of Abundance

- Reference points remained unchanged, and results were mostly within uncertainty bounds.
- Resulted in a reduction in estimated scale from 2014 – 2020 and indicated that the stock may be approaching the target SSB and the MFMT

Constant F Scenarios: Projected SSB (lbs)

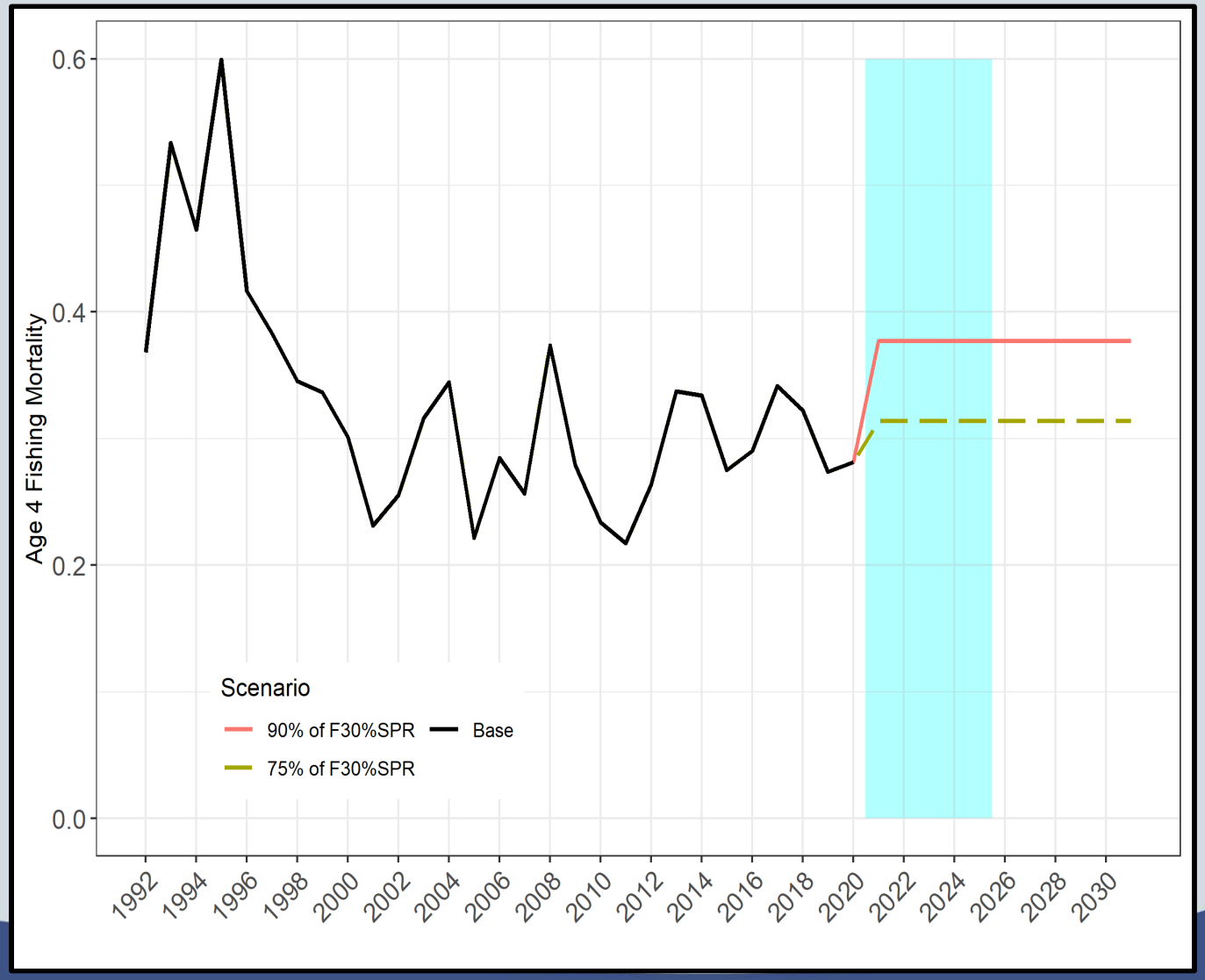
Year	$F_{30\%SPR}$ (OFL)	P* = 0.375 (ABC)
2021	5,815,920	5,815,920
2022	5,114,123	5,151,469
2023	4,761,781	4,817,359
2024	4,577,056	4,641,695
2025	4,465,149	4,535,036
2026	4,391,294	4,464,554
2027	4,341,183	4,416,625
2028	4,307,012	4,383,909
2029	4,283,621	4,361,466
2030	4,267,593	4,345,989
2031	4,256,592	4,335,363

Constant F Scenarios: Projected Recruitment (numbers)

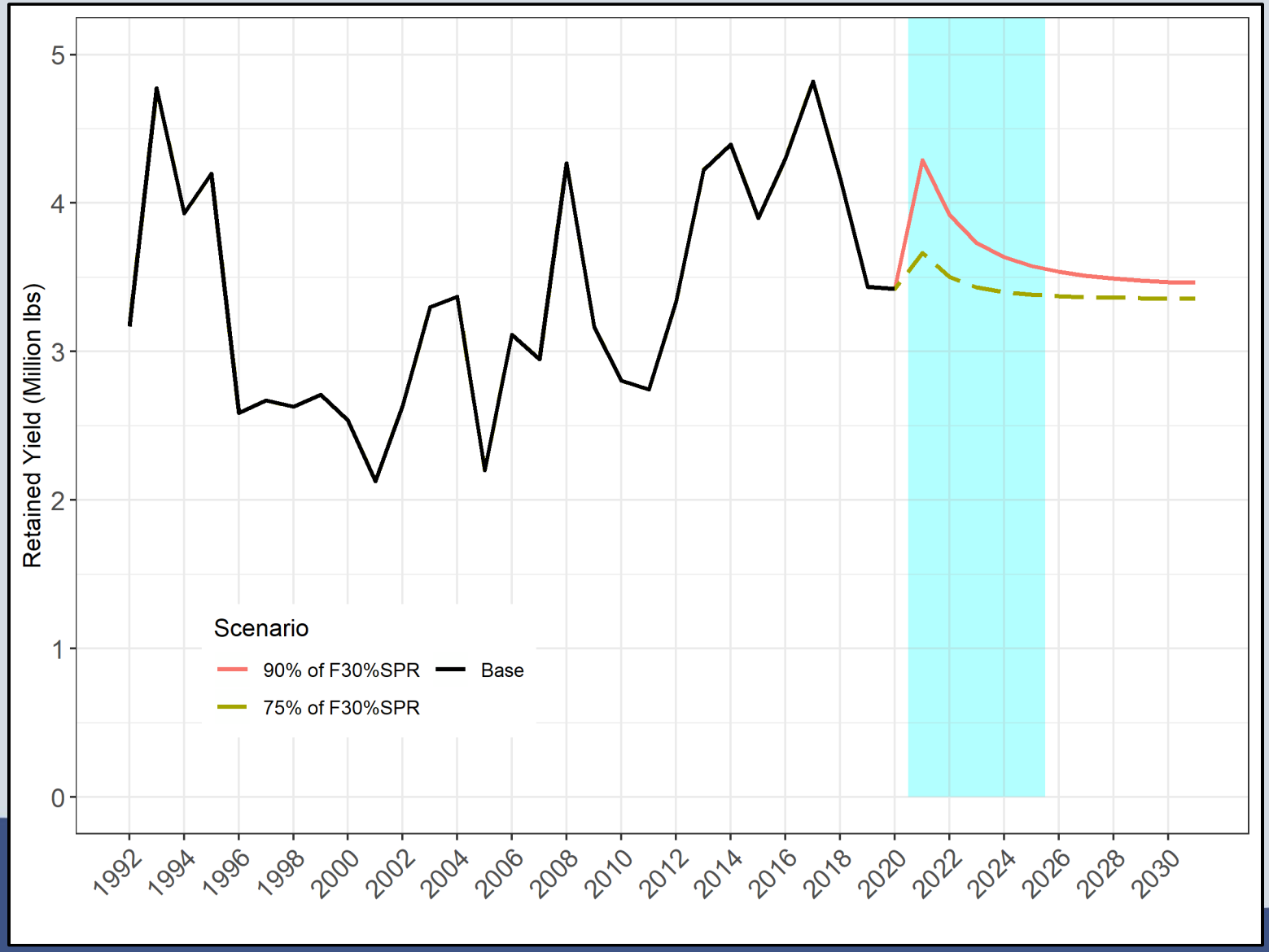
Year	$F_{30\%SPR}$ (OFL)	P* = 0.375 (ABC)
2021	17,792,000	17,792,000
2022	17,467,400	17,486,600
2023	17,274,100	17,306,200
2024	17,162,900	17,202,700
2025	17,091,800	17,136,600
2026	17,043,200	17,091,400
2027	17,009,500	17,060,100
2028	16,986,100	17,038,300
2029	16,970,000	17,023,200
2030	16,958,800	17,012,800
2031	16,951,100	17,005,600

Additional Constant F Projection Scenarios

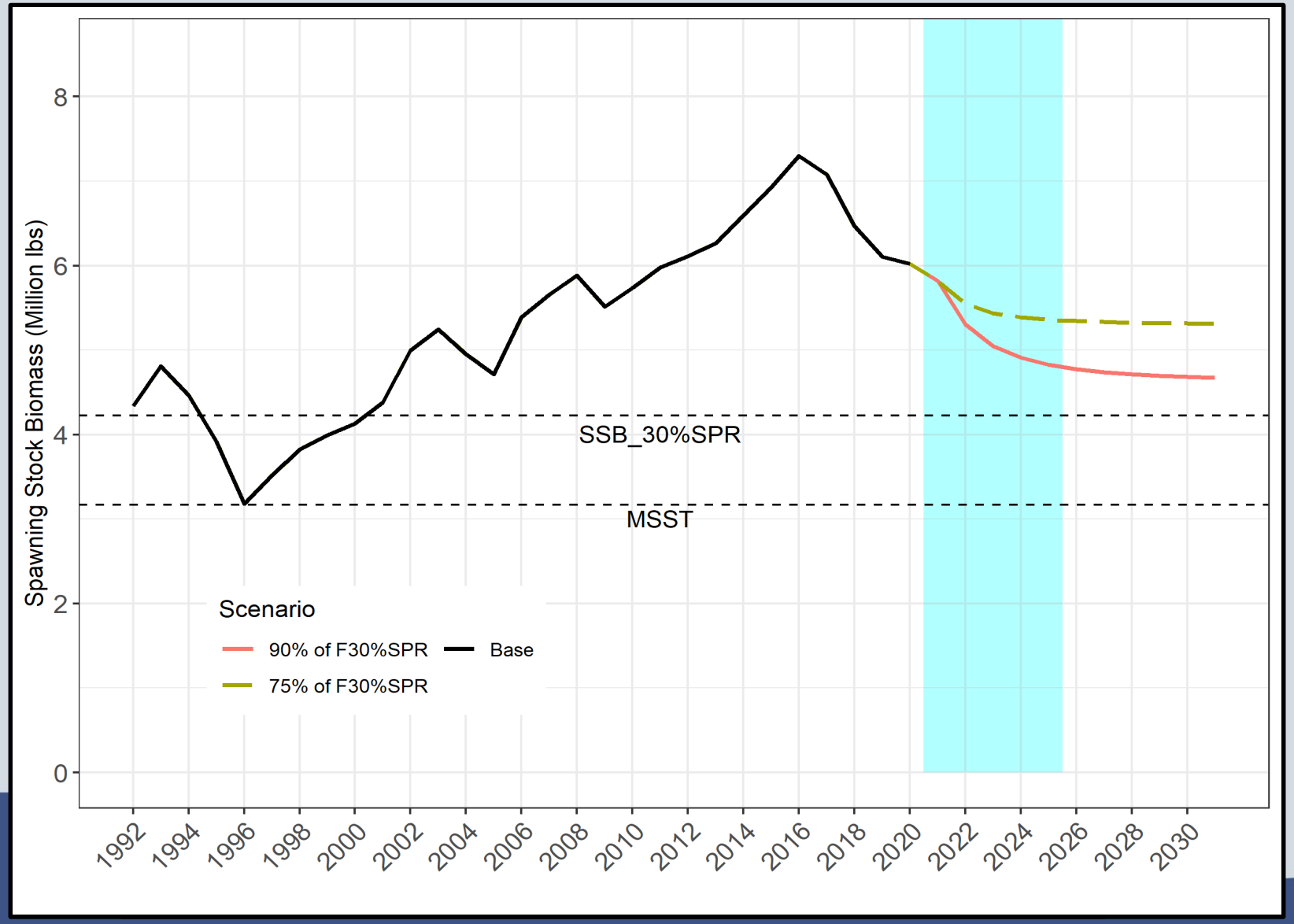
1. 90% of $F_{30\%SPR}$ = 0.377
2. 75% of $F_{30\%SPR}$ = 0.314



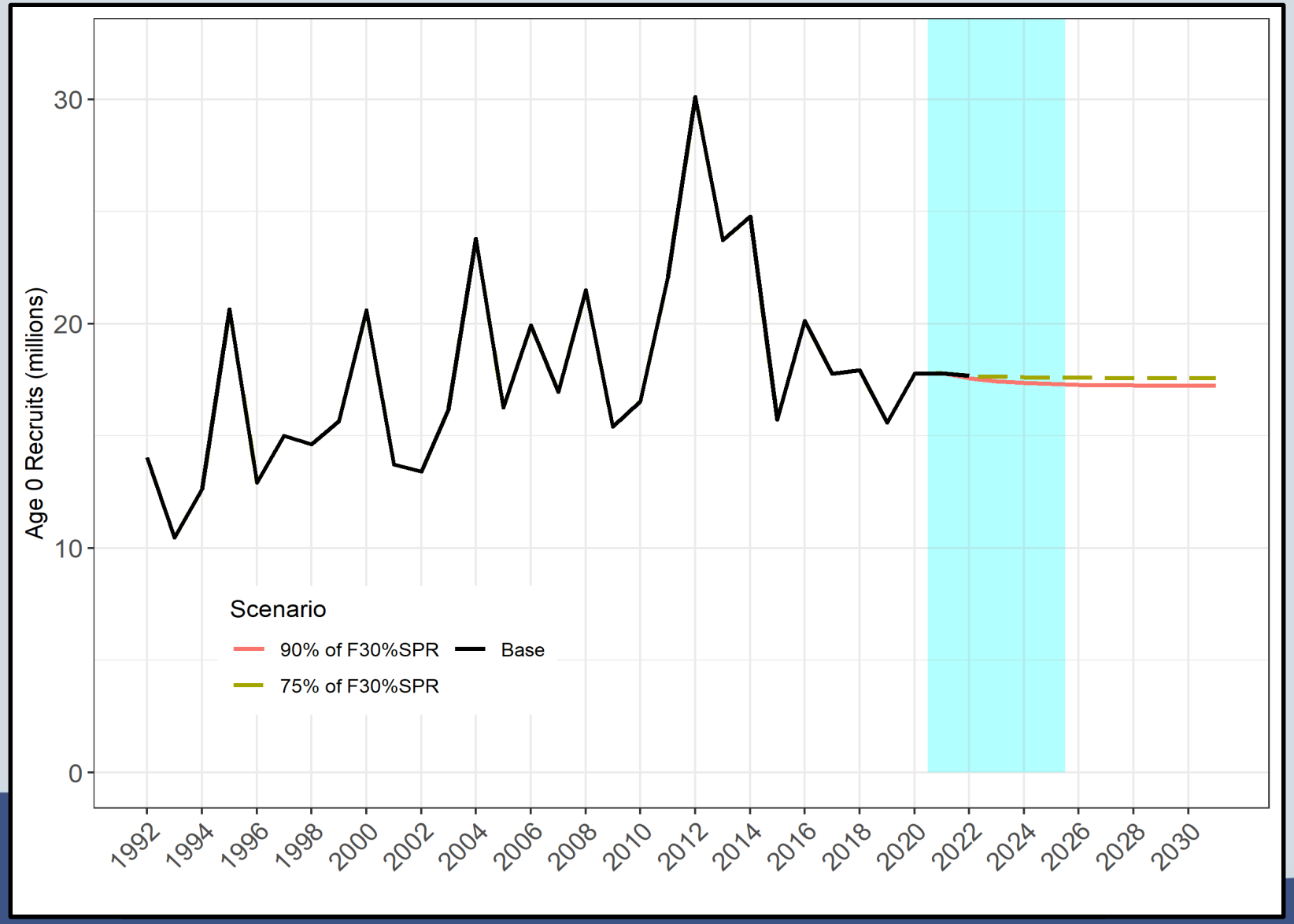
Additional Constant F Scenarios: Retained Yield (mill lbs)



Additional Constant F Projections: SSB (million lbs)



Additional Constant F Projections: Recruitment (millions)



Additional Constant F Scenarios: Retained Yield (lbs)

Year	90% $F_{30\%SPR}$	75% $F_{30\%SPR}$
2021	4,287,982	3,665,668
2022	3,920,629	3,503,435
2023	3,732,763	3,431,880
2024	3,635,227	3,400,873
2025	3,576,373	3,384,921
2026	3,537,220	3,374,999
2027	3,510,131	3,367,497
2028	3,491,446	3,362,246
2029	3,478,436	3,358,933
2030	3,469,424	3,356,297
2031	3,463,220	3,354,276
3 yr Avg	3,980,458	3,533,661
5 yr Avg	3,830,595	3,477,355