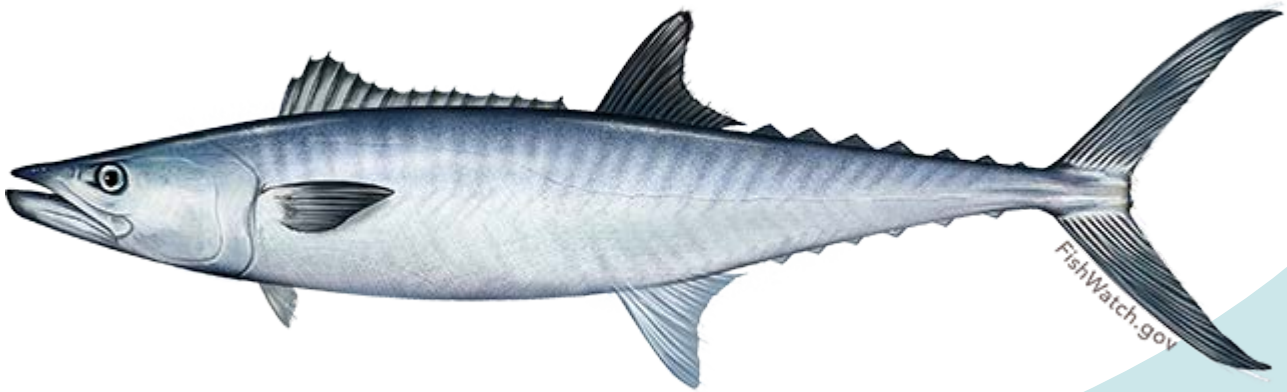
South Atlantic King Mackerel Stock Assessment

SEDAR 38 Update

June 2020
SEFSC staff
Webinar



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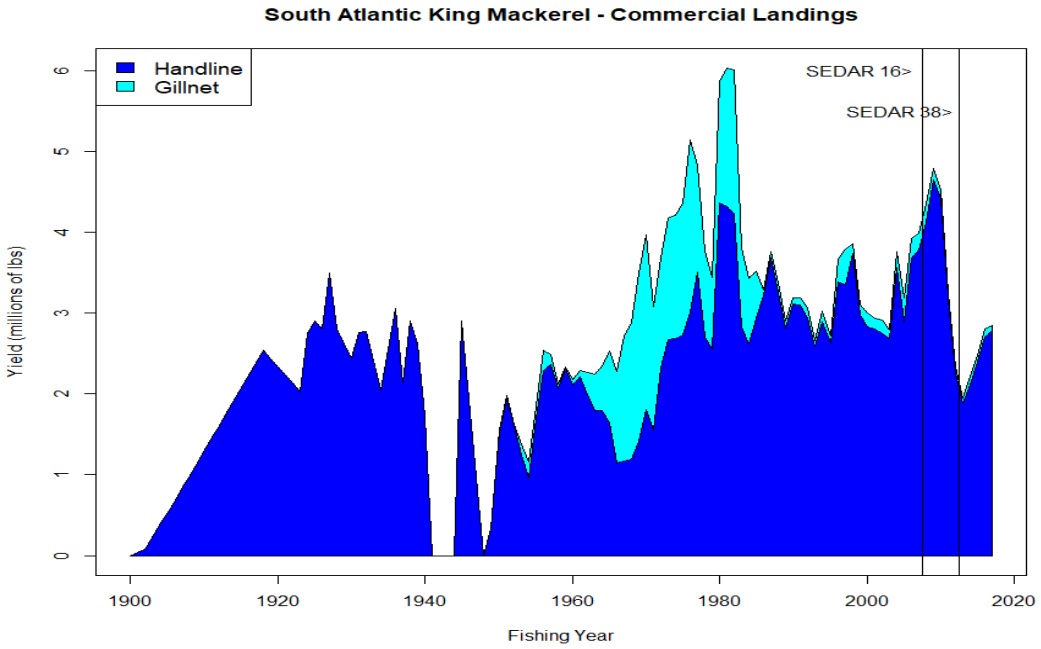
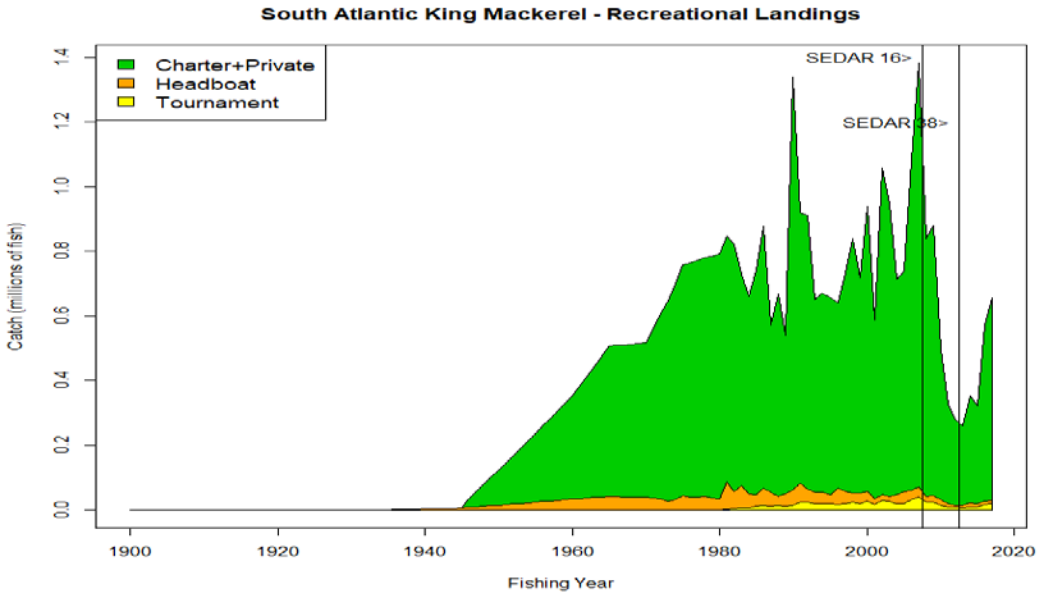
Executive Summary – South Atlantic King Mackerel

- SEDAR 38 Update Terms of Reference called for a strict update of the approved SS3 model
- Five years of data added to Stock Synthesis (Mar 2013 to Feb 2018), model peer-reviewed during SEDAR 38
- Current Stock Status: NOT OVERFISHED
- Current Fishery Status: NOT OVERFISHING
- All fishery indicators (landings, fleet CPUEs and scientific survey) showed increasing trends since SEDAR 38
- Estimated biomass trending up beginning in 2013
- Exploitation rate steady since 2010 (0.04 and 0.05/year)
- Average recruitment estimate = 9.8 million age-0 fish/year
- Equilibrium landings at target exploitation (F_{SPR30} = 0.14/year) = 18.3 million pounds
- Period of high recruitments in 2013 to 2016, following the 2008 to 2012 low recruitments detected during SEDAR 38
- Overfishing limits of 34 million pounds in 2021 decreasing to 20 million pounds by 2025, tracking recent high recruitment

Fisheries Landings

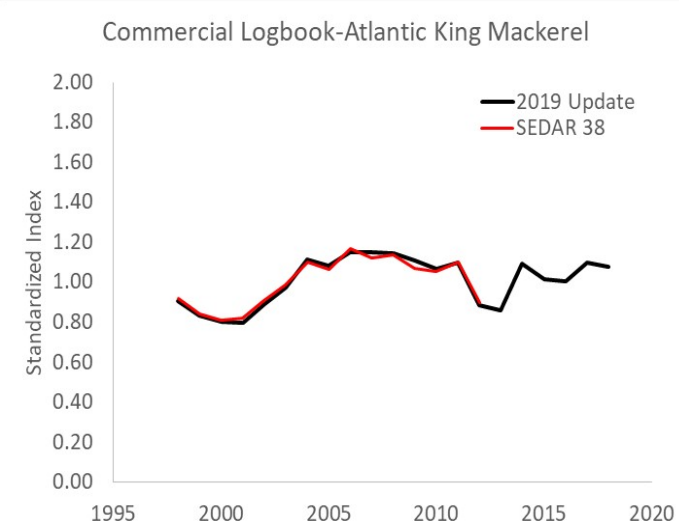
- SEDAR 38 observed steep decline in landings
- Lowest catches since fishery development period (1950s)
- Both commercial and recreational landings have increased since 2013

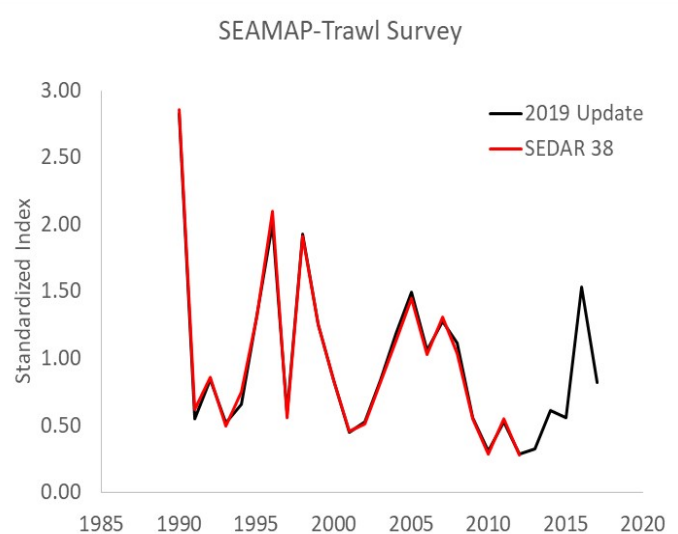


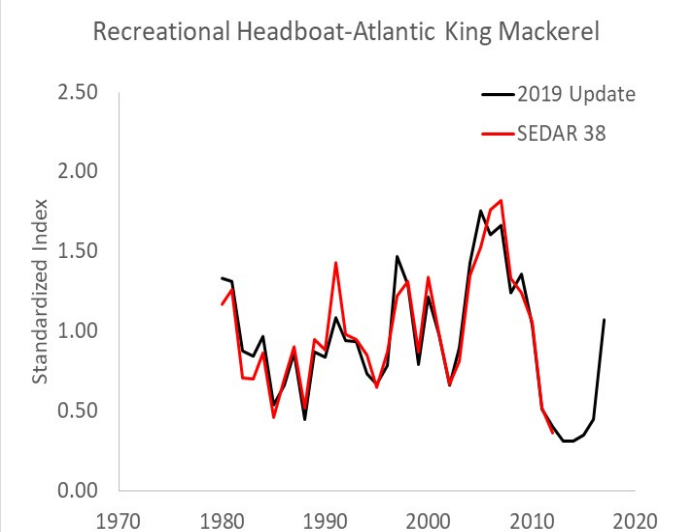


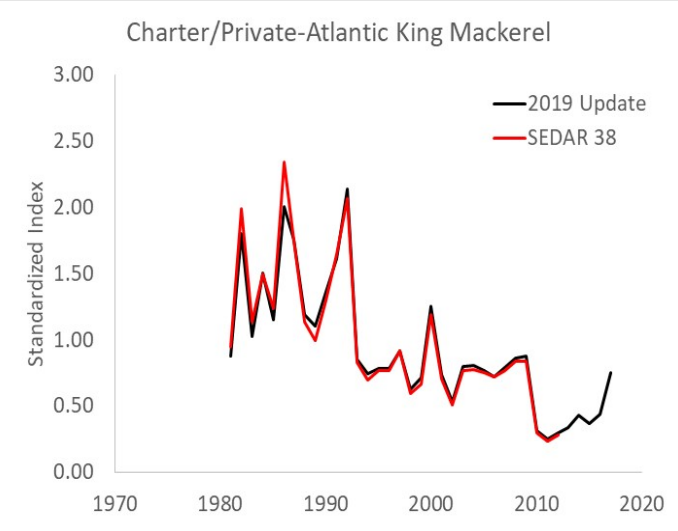
Fishery Indicators

- All indices showed positive trend since SEDAR 38
- Observed recent peak in the recruitment index in 2016 (SEAMAP survey)
- Sharp positive turn in headboat CPUE
- Charter/Private shown for comparison (not modeled in SS3)



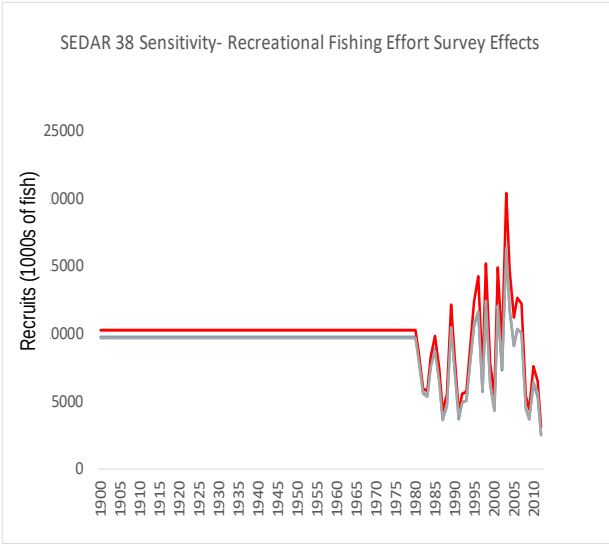


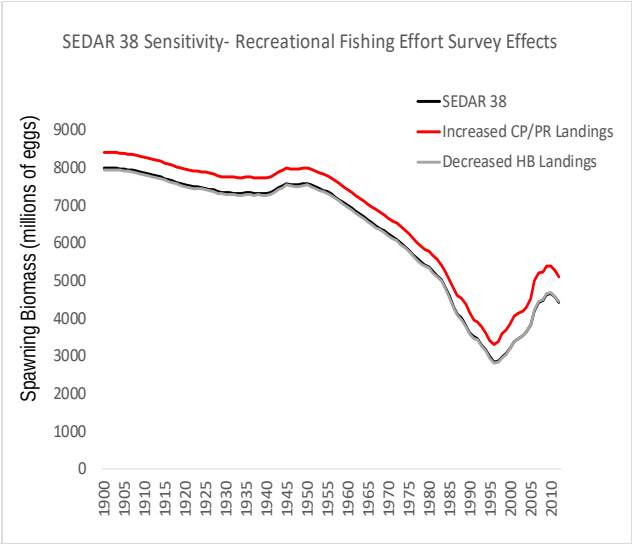




Effects of the FES on the Stock Assessment

- Higher recreational landings estimates (38% increase)
- Increased recruitment and scaled up spawning biomass series accordingly
- Mean unfished recruitment 5% higher, 0.5% lower with new HB discards
- SSB benchmark scaled by the same percentages
- Target F_{SPR30} did not change substantially



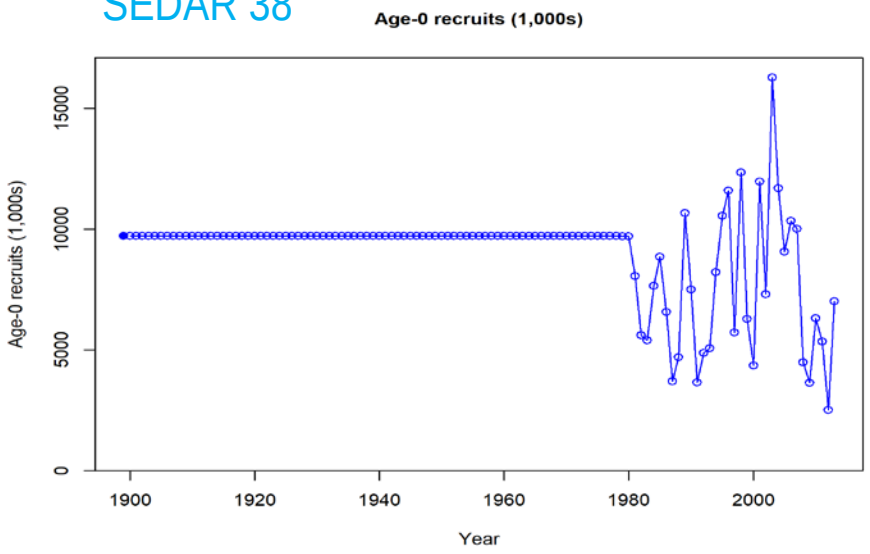


	SEDAR 38	Increased CP/PR Landings	Decreased HB Landings
Spawning Biomass Unfished (billions of eggs)	8.0 bil eggs	8.4 bil eggs	7.9 bil eggs
Total Biomass Unfished (millions of pounds)	295.9 mil lbs	311.2 mil lbs	294.3 mil lbs
Recruitment Unfished (millions of age-0 fish)	9.72 mil fish	10.24 mil fish	9.67 mil fish
SPR target	30% SPR	30% SPR	30% SPR
Spawning Biomass at SPR30 (billions of eggs)	2.4 bil eggs	2.5 bil eggs	2.4 bil eggs
F at SPR30	0.15	0.15	0.15
Total Yield at SPR30%	17.7 mil lbs	18.9 mil lbs	17.6 mil lbs

Estimated Recruitments

- Consistent recruitment scale and time series trends between SEDAR 38 and the update
- Two recent (2015 and 2016) estimated recruitments some of the highest on record
- Stakeholder feedback during SEDAR 38 indicated high juvenile abundance compared to previous years
- SS3 showed a similar signal to the observations on the water

SEDAR 38



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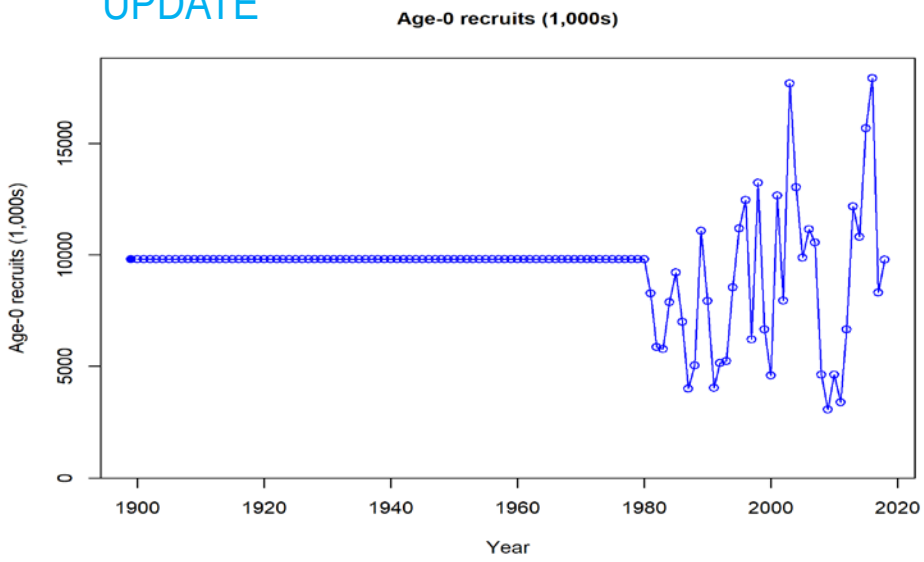
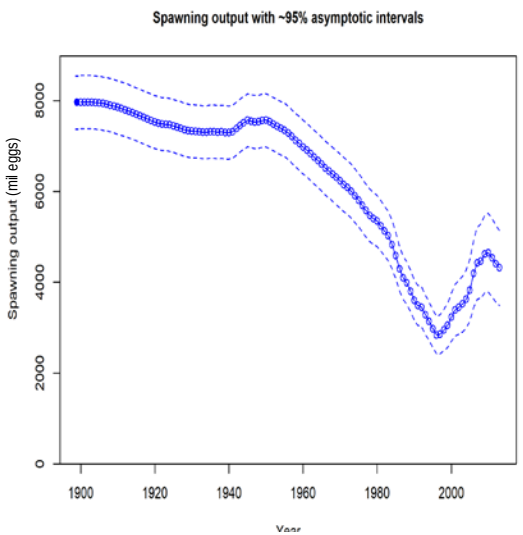
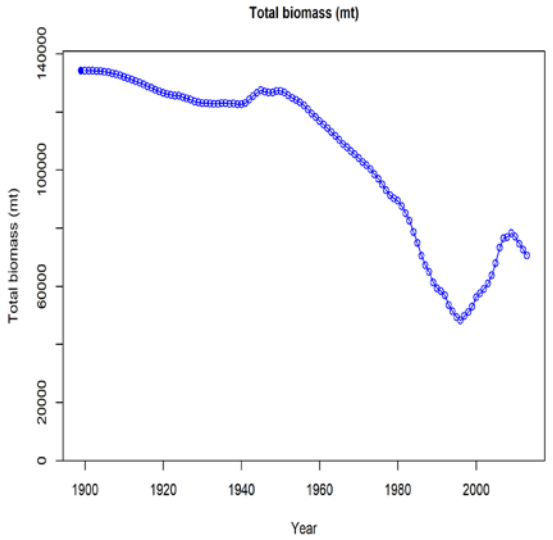


Stock Biomass

- Consistent biomass scale and time series trends between SEDAR 38 and the update
- Stock determined to be not overfished during SEDAR 38
- Total and spawning biomass increased steadily since 2013
- Spawning biomass is 1.7 times the SPR30% target
- The stock is NOT OVERFISHED

SEDAR 38





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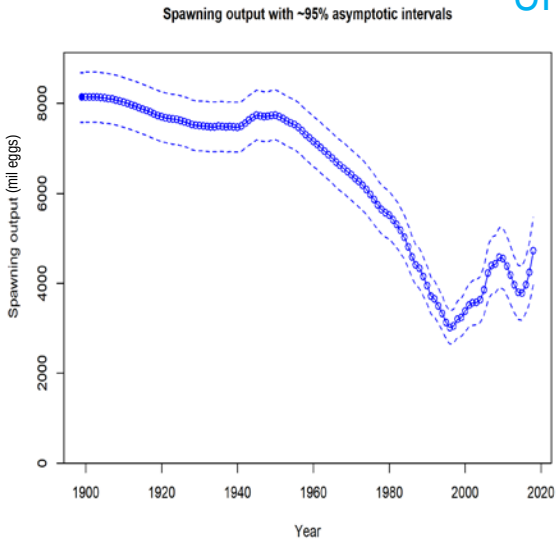
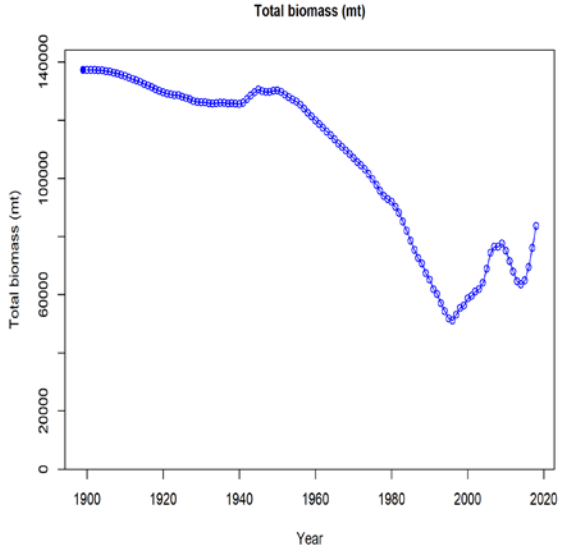
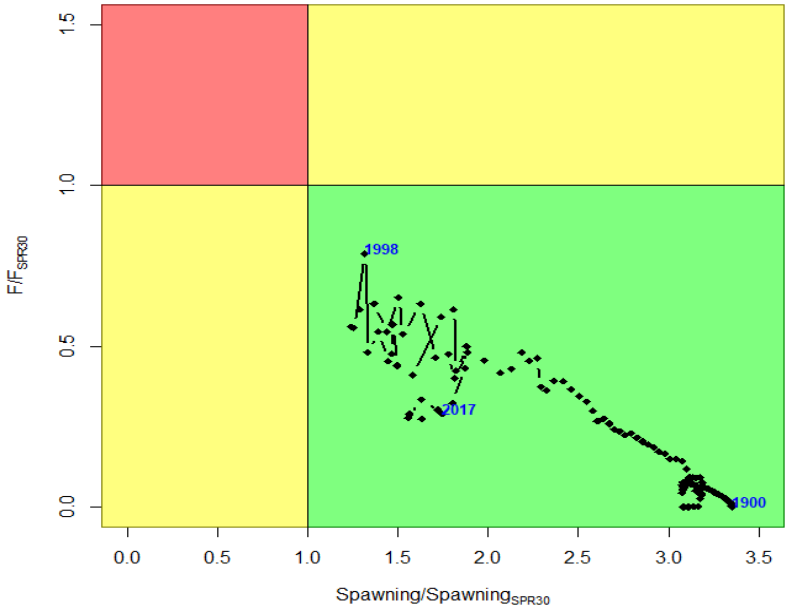
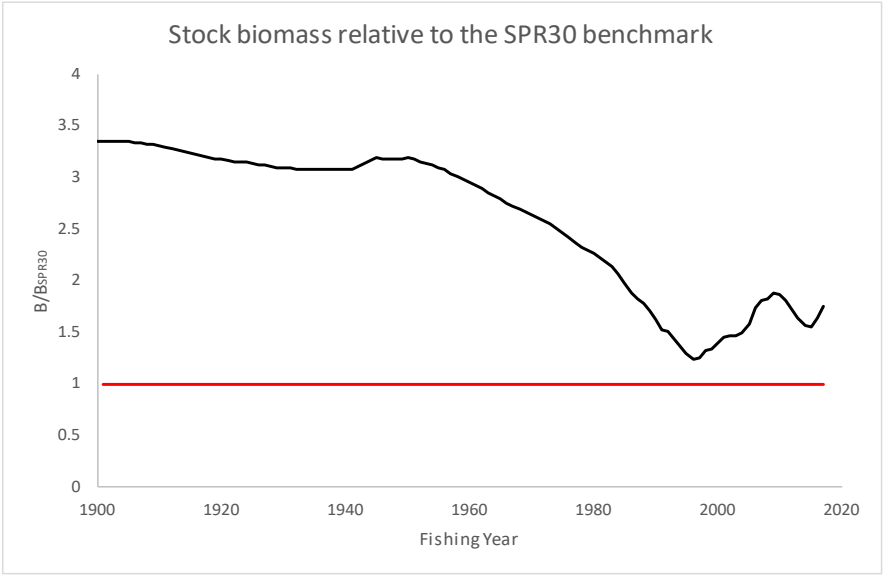


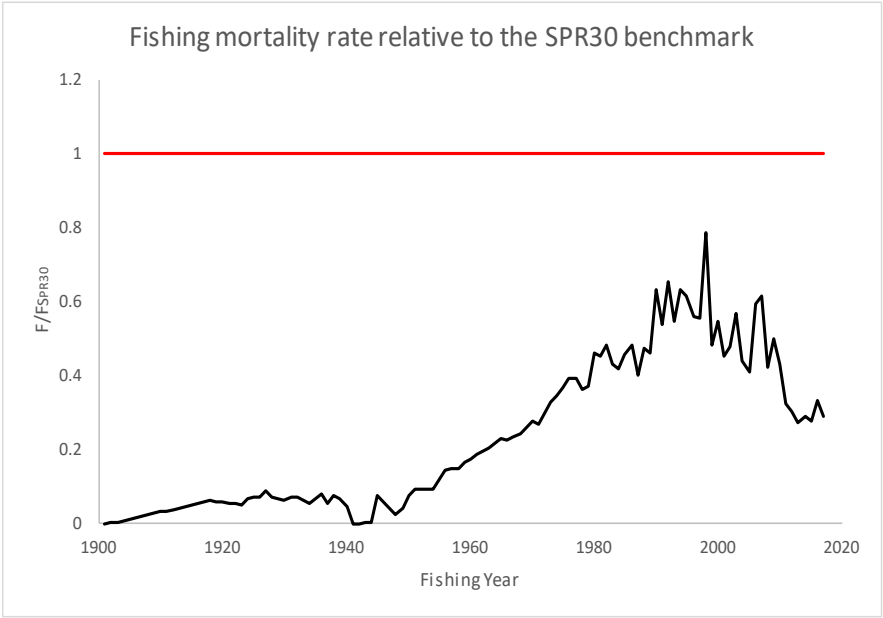


Stock Status Estimates

- SS3 indicates the stock was never fished to SPR30 target
- The highest exploitation occurred during 1998, the stock remained above SPR30
- Are these results consistent with the historic state of the fisheries?







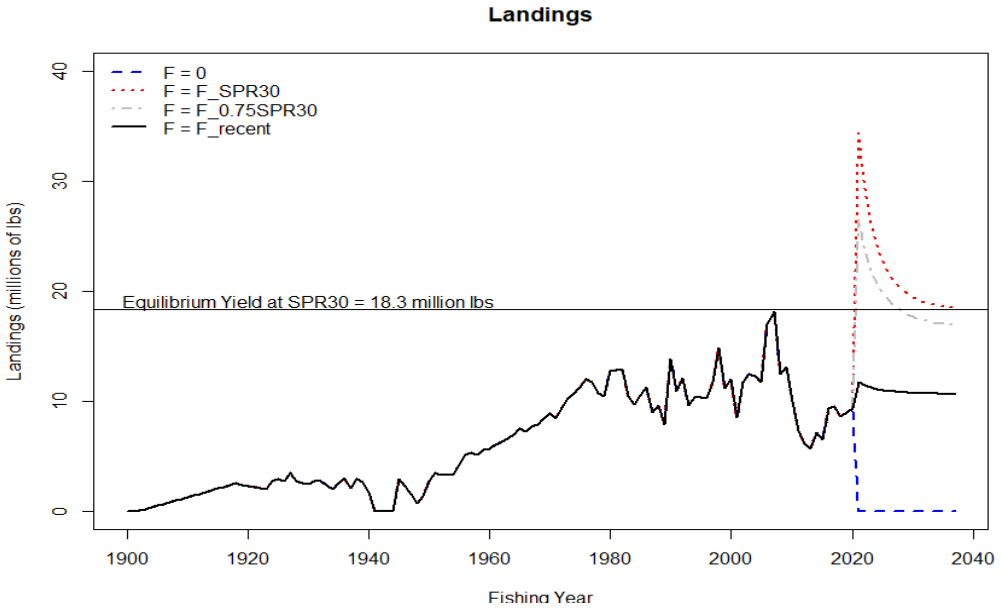
Stock Status Overview

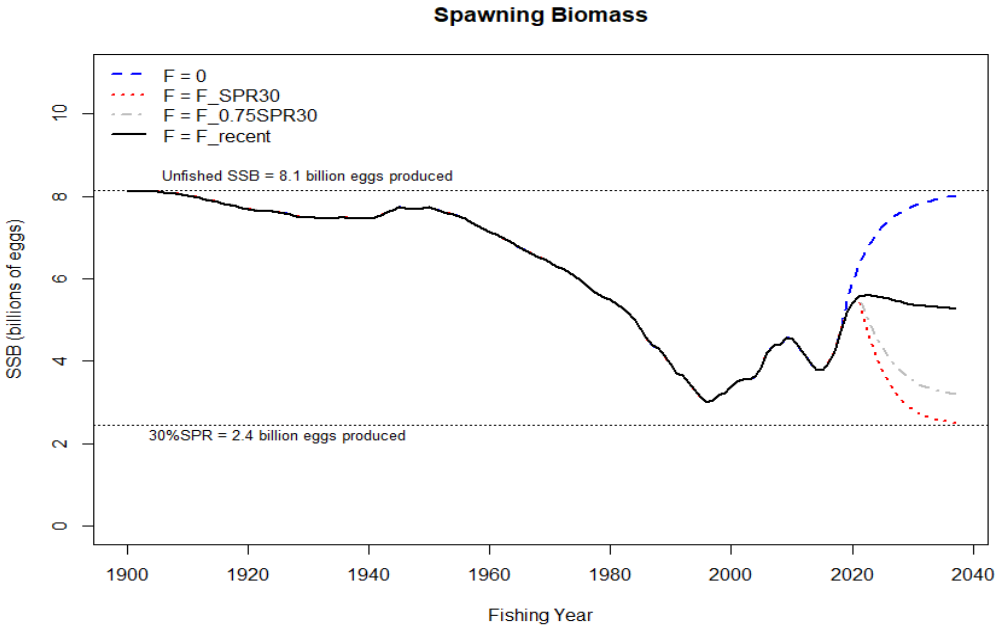
Metric	Value/Determination
Fishing mortality$_{2017}$	0.04
Fishing mortality$_{SPR30}$	0.14
F_{2017}/F_{SPR30}	0.29 (0.19-0.39)
Recruitment$_{Unfished}$	9,815,000 age-0 fish
Spawning Stock Biomass$_{Unfished}$	8,130 million eggs
Spawning Stock Biomass$_{SPR\ target}$	2,439 million eggs
Spawning Stock Biomass$_{2017}$	4,232 million eggs
SSB_{2017}/SSB_{SPR30}	1.7 (1.6-1.8)
Yield $_{2017}$	9.5 million lbs
Yield $_{SPR\ target}$	18.3 million lbs
Optimum Yield$_{SPR\ target}$	16.7 million lbs
Stock Status	Not Overfished
Fishery Status	Not Overfishing

*Fishing mortality is exploitation rate by numeric abundance

Constant F Projections

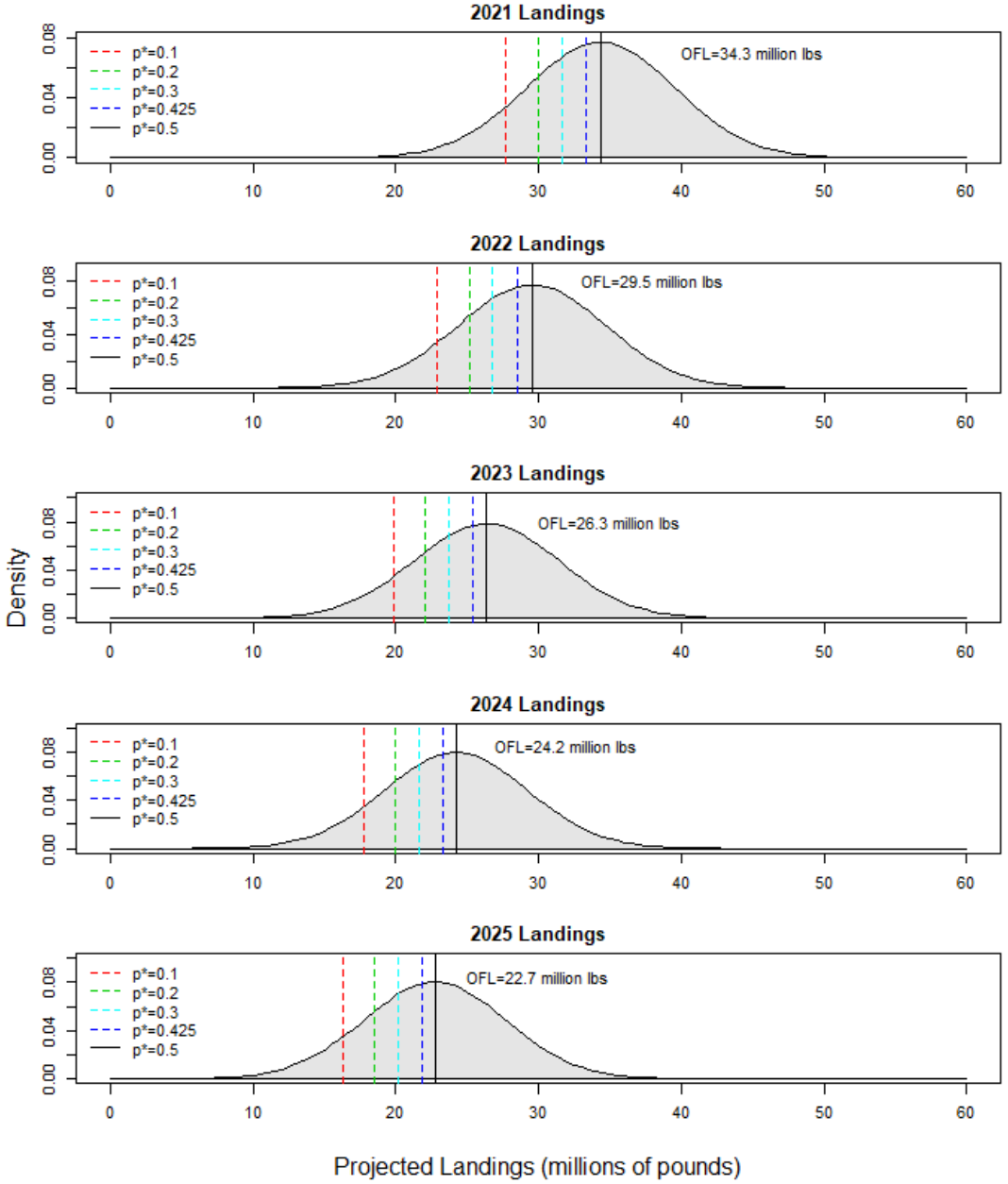
- Fishing at F_{SPR30} results in a sharp increase in projected landings, followed by gradual decline toward the equilibrium yield
- Fishing at $F_{current}$ results in relatively constant yield and biomass near current levels
- Fishing at 75%Flimit also significantly increases landings, lower equilibrium yield, higher long-term SSB





Projections at F_{SPR30}

- Forecasted yields for the next five years much higher than current yields
- The large increase is a result of a high recruitment period up to 2016, plus low current F compared to the fishing limit
- Catches decline each year as the strong cohorts move through the fisheries



Projected Yields (in millions of pounds)

Fishing Year	p*=0.1	p*=0.2	p*=0.3	p*=0.425	OFL
2021	27.7	30.0	31.6	33.3	34.3
2022	22.9	25.2	26.8	28.5	29.5
2023	19.8	22.1	23.7	25.4	26.3
2024	17.8	20.0	21.6	23.3	24.2
2025	16.3	18.5	20.1	21.8	22.7

Summary and Conclusions

- South Atlantic King Mackerel are NOT OVERFISHED and the fisheries are NOT OVERFISHING
- Current exploitation rate much lower than the target F_{SPR30}
- SS3 (as configured) proved stable in long-term trend estimates, yet responsive to current data
- Recruitment cycled from 5-year low up to SEDAR 38 to 4-year high recently (2013-2016)
- The high-recent recruitment leads to a large increase in near-term catch projections
  - If fully exploited at the target F, landings in 2021 increase sharply followed by steady reduction toward 18.3 mil pounds

Acknowledgements

Many people at various state and federal agencies assisted with assembling the data sources included in this stock assessment. The FISHSMART project PIs (Tom Idhe, Tom Miller, David Secor and Mike Wilberg) provided substantial assistance and data for how to model the tournament fishery. Harvey Walsh, Jon Hare, Katrin Marancik and Dave Richardson provided NEFSC larval data. Chris Bonzek at VIMS provided NEAMAP trawl survey data. Ian Taylor has greatly improved the R code for plotting and diagnostics of Stock Synthesis models with which many of the figures in this document were created.