SEDAR 50: Atlantic Blueline Tilefish Stock Assessment SAFMC December 2017 Meeting

NOAA FISHERIES

Southeast Fisheries Science Center

Revised 12-05-2017

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Summary of Assessment Process

Stock Identification

- **2016 June 28-30 Stock ID Workshop**. Stock ID Workgroup concludes that available data "not support the existence of separate biological populations at either the MAFMC/SAFMC or SAFMC/GMFMC jurisdictional boundaries" (SEDAR50-DW12[1]).
- **2016 October 28, Webinar**. Joint SSC Sub-Panel effectively accepted the results of the Stock ID Work Group (SEDAR50-DW16)
- **2016 November 14, Conference call**. Members of the Council, Science Center, and Regional Office leadership recommended "using the boundary between the Gulf of Mexico and South Atlantic Council as the Southwestern boundary for the SEDAR 50 stock assessment of Blueline Tilefish" (SEDAR50-DW17)
- **2017 May 23-26, SEDAR 50 Assessment Workshop**. AW Panel Recommends using Cape Hatteras as northern boundary due to data limitations north of Hatteras. (AW Report)

[1] Blue san serif text hyperlinks to document

Summary of Assessment Process

Age Data

- **2016 August 29-31, Blueline Tilefish Age Workshop II**. "The consensus of the participants of the workshop is that Blueline Tilefish could not be precisely aged at this time" (SEDAR50-DW18)

Summary of Assessment Process

Data, Assessment, and Review

- 2017 January 23-27, SEDAR 50 Data Workshop (DW Report)
  - Preceded by 3 webinars and calls with DW Panel
  - Followed by 1 webinar with DW Panel
  - Followed by 1 webinar with DW and AW Panels
  - Resulted in data sets to use in assessment and report
- 2017 May 23-26, SEDAR 50 Assessment Workshop (AW Report)
  - Preceded by 1 webinar with DW and AW Panels
  - Preceded by 2 webinars with AW Panel
  - Followed by 3 webinars with AW Panel
  - Recommended ASPIC surplus production model as base model
- 2017 Aug 29-31, SEDAR 50 Review Workshop (RW Report)
  - Preferred age-structured surplus production model which had been presented as an additional analysis
- 2017 Oct 24-26, SAFMC SSC Meeting
  - Recommended ASPIC base model recommended by AW Panel

Methods

- At their October 2017 meeting, the SSC recommended using the Assessment Workshop Base model (AW Base) for management of Blueline Tilefish in the Atlantic south of Cape Hatteras
- The AW Base model is described in detail in the AW Report:

SECTION III: Assessment Workshop Report

4 Stock Assessment Models and Results

4.1 South Atlantic: Age-aggregated Production Model (ASPIC)

- Projections are described in a document recently submitted to the SAFMC (Nov. 13, 2017)
- This presentation provides a summary of AW Base model and relevant projections
- The content of this presentation reflects the efforts of many experts, especially the SEDAR 50 Data and Assessment Workshop panels and the analytical team

Methods

Model description

- Models run with ASPIC Suite Version 7
- Age-aggregated annual biomass, no age-structure
- Assumes recruitment + growth - nat. mortality = ‘surplus’ production
- Fit to CPUE indices of abundance (ASPIC, Prager 1994)
- Model estimates B_1/K, F_{MSY}, MSY, and q_i parameters

Methods

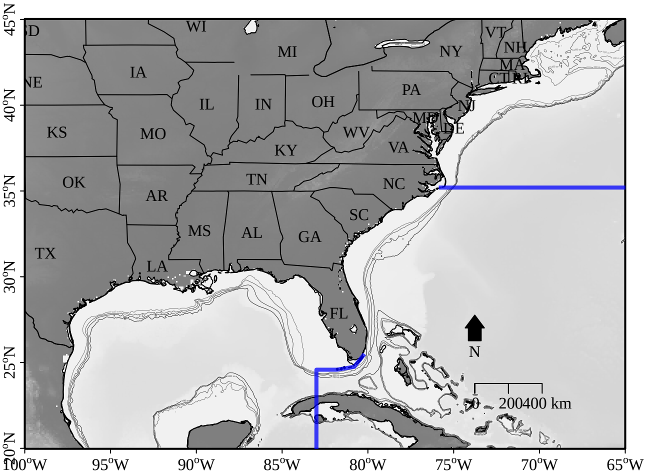
Model description

- Inputs
  - Single series of removals
  - Abundance indices and annual CVs
  - Item values of B_1/K, F_{MSY}, MSY, and q_i parameters
  - Range limits or prior distributions on parameters
  - Settings (e.g. fitting method, rules, tolerance)
- Outputs
  - Single estimated biomass series
  - Estimates of B_1/K, F_{MSY}, MSY, and q_i parameters
  - Estimated CPUE series (scaling B by q_i)
  - Status series (F/F_{MSY}, B/B_{MSY})

Methods

Data

Data series restricted to area between GMFMC/SAFMC boundary at Key West north in the Atlantic to Cape Hatteras

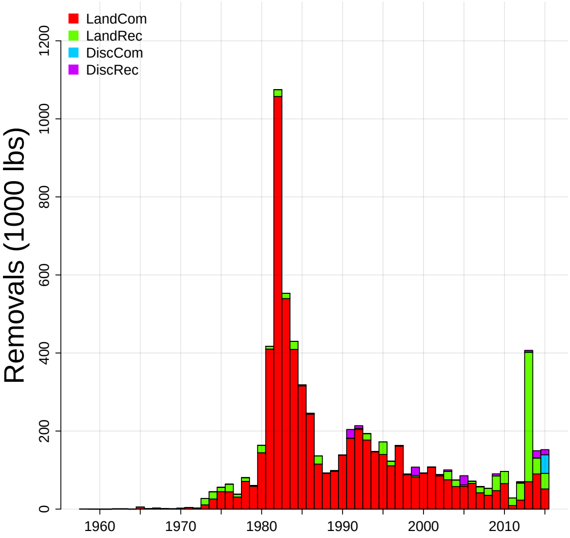


Methods

Data

Removals south of Cape Hatteras, by fleet

- Commercial landings
- Recreational landings
- Commercial dead discards
- Recreational dead discards

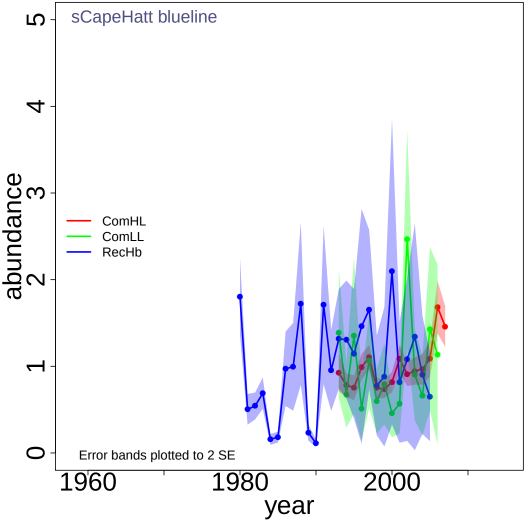


Methods

Data

Indices of abundance

- Commercial handline (ComHL)
- Commercial longline (ComLL)
- Recreational headboat (RecHb)



Methods

AW Base Model Specifications

- Headboat index excluded from base models
  - Fishery only covers margins of Blueline Tilefish distribution
  - Concern that wide swings in CPUE may be more representative of fleet behavior rather than true abundance
  - Negatively correlated with commercial indices
- Handline and longline indices considered equal quality
- Assessment Panel chose to average the results of the handline and longline models
- Combining indices or running both in one model weights indices based on CVs, placing undue weight on the handline index

Methods

AW Base Model Specifications

- Models run from 1958-2015
- Removals 1958-2015
- Indices of abundance
  - Commercial handline (1993-2007)
  - Commercial longline (1993-2008)
  - Recreational headboat (1993-2006)
- Status determination
  - F status: $F_{2013-2015}/F_{\text{MSY}}$
  - Overfishing if $F_{2013-2015}/F_{\text{MSY}} > 1$
  - Minimum Stock Size Threshold = MSST = $0.75B_{\text{MSY}}$
  - B status: B_{2015}/MSST
  - Overfished if $B_{2015}/\text{MSST} < 1$

Methods

Uncertainty

- ASPIC Bootstrap procedures were run to estimate uncertainty in the models
    1. ASPIC fits to observed data and saves predicted population data and residuals
    2. Normalized inflated residuals are randomly drawn with replacement and incorporated into predicted values to generate a trial resampled dataset
    3. Resampled data are fit, results saved, and the next trial begins
- Results of bootstrapping were combined (i.e. merged) to characterize the uncertainty in the average of the handline and longline models

Methods

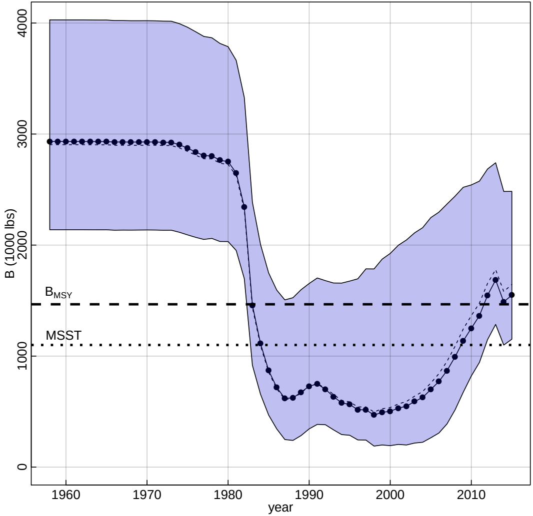
Projections

- The most recent projections requested by the Council, are presented
- Two sets of projections:
  1. $F_{2016} = F_{\text{current}}$, $F_{2017-2020} = F_{\text{P}^*_{30\%}}$
  2. $F_{2016-2017} = F_{\text{current}}$, $F_{2018-2020} = F_{\text{P}^*_{30\%}}$
- The value $F_{\text{P}^*_{30\%}}$ is the F associated with $P^* = 0.30$, where P^* is the allowable probability of overfishing in any single year
- Projections were made from the combined bootstrap results from the handline and longline models
- Uncertainty in projections based on bootstrap runs

Results

AW Base Model Results and Uncertainty

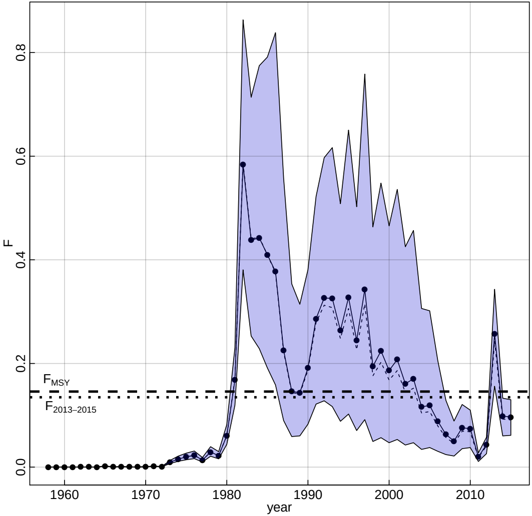
Estimated biomass series (B)



Results

AW Base Model Results and Uncertainty

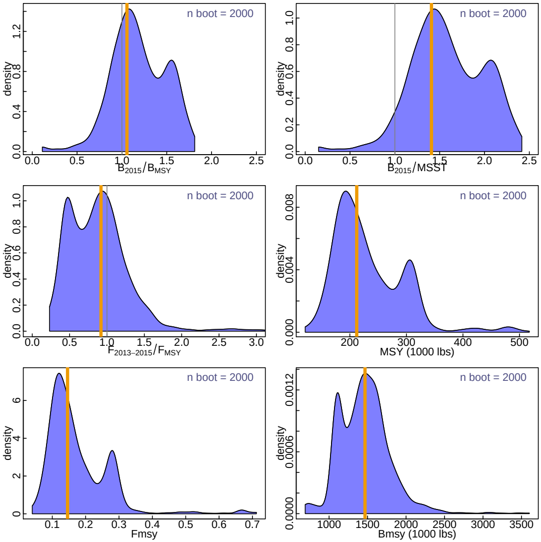
Estimated fishing mortality series (F)



Results

AW Base Model Results and Uncertainty

ASPIC bootstrap parameter distributions

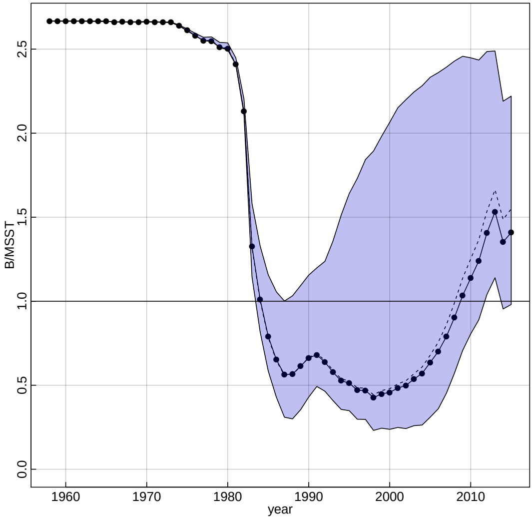


Results

AW Base Model Results and Uncertainty

Estimated biomass series (B) relative to MSST combining Runs 55 and 56 from ASPIC

- Solid line indicates B/MSST
- Dashed line represents median B/MSST
- Blue error bands indicate 5^{th} and 95^{th} percentiles of the bootstrap trials

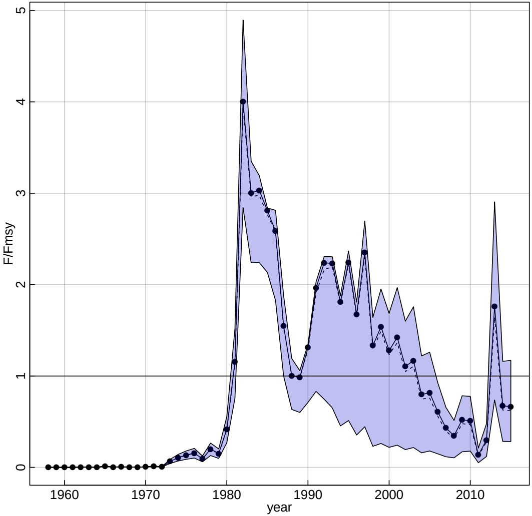


Results

AW Base Model Results and Uncertainty

Estimated F/F_{MSY}

- Solid line indicates F/F_{MSY}
- Dashed line represents median F/F_{MSY}
- Blue error bands indicate 5^{th} and 95^{th} percentiles of the bootstrap trials

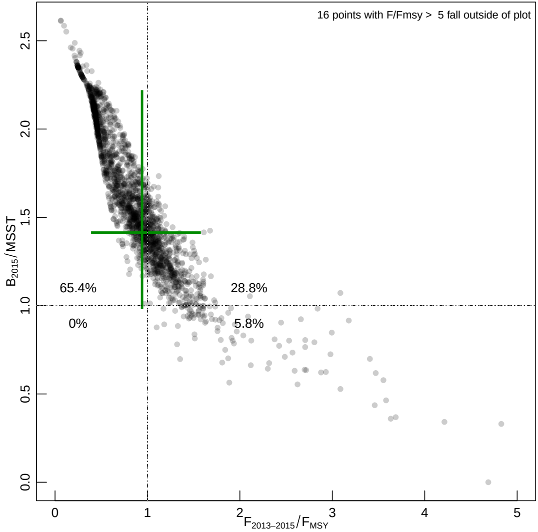


Results

AW Base Model Results and Uncertainty

Bootstrap status phase plots

- Bootstrapping was conducted for each model separately, results were combined
- The intersection of crosshairs indicates average estimate from the base runs
- Lengths of crosshairs defined by 5^{th} and 95^{th} percentiles
- Percent of runs falling into each quadrant indicated



Results

AW Base Model Results and Uncertainty

Base run estimates

Table: Estimated status indicators, benchmarks, and related quantities from ASPIC, averaged between the handline and longline models for the Atlantic south of Cape Hatteras. Also presented are median values and measures of precision (standard errors, SE) from the bootstrap analysis. Rate estimates (F) are in units of y^{-1}; status indicators are dimensionless; and biomass estimates are in units of 1000 pounds, as indicated.

Quantity	Units	Estimate	Median	SE
F_{MSY}	y^{-1}	0.146	0.148	0.106
$85\%F_{\mathrm{MSY}}$	y^{-1}	0.124	0.126	0.090
$75\%F_{\mathrm{MSY}}$	y^{-1}	0.109	0.111	0.080
$65\%F_{\mathrm{MSY}}$	y^{-1}	0.095	0.096	0.069
B_{MSY}	1000 lb	1467	1452	1225
MSST	1000 lb	1100	1089	918
MSY	1000 lb	212	216	85
$F_{2013-2015}/F_{\mathrm{MSY}}$	—	0.92	0.86	0.96
B_{2015}/MSST	—	1.41	1.55	0.41
$B_{2015}/B_{\mathrm{MSY}}$	—	1.06	1.16	0.31

Results

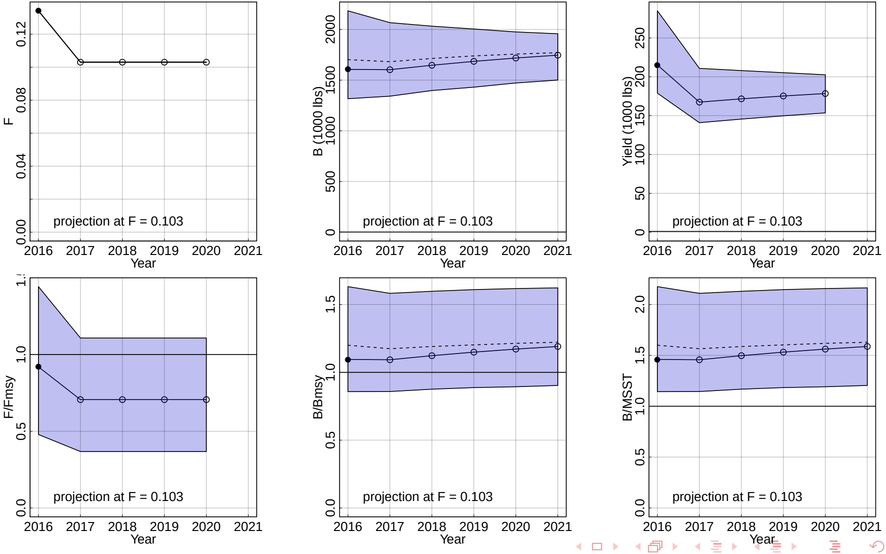
Projections: $\mathrm{P}^* = 0.3$

- Two sets of projections:
  1. $F_{2016} = F_{\text{current}},\ F_{2017-2020} = F_{\mathrm{P}^*_{30\%}}$
  2. $F_{2016-2017} = F_{\text{current}},\ F_{2018-2020} = F_{\mathrm{P}^*_{30\%}}$
- Solid circles (2016) represent values projected by the assessment model
- Open circles (2017-2021) represent values produced by the projection code
- Solid lines are deterministic estimates
- Dashed lines are medians of the bootstrap projections, respectively
- Blue error bands indicate 10^{th} and 90^{th} percentiles of the bootstrap trials

Results

Projections: $P^* = 0.3$

Projections at: $F_{2016} = F_{\text{current}},\ F_{2017-2020} = F_{P^*_{30\%}}$



Results

Projections: $P^* = 0.3$

Projections at: $F_{2016} = F_{\text{current}}$, $F_{2017-2020} = F_{P^*_{30\%}}$

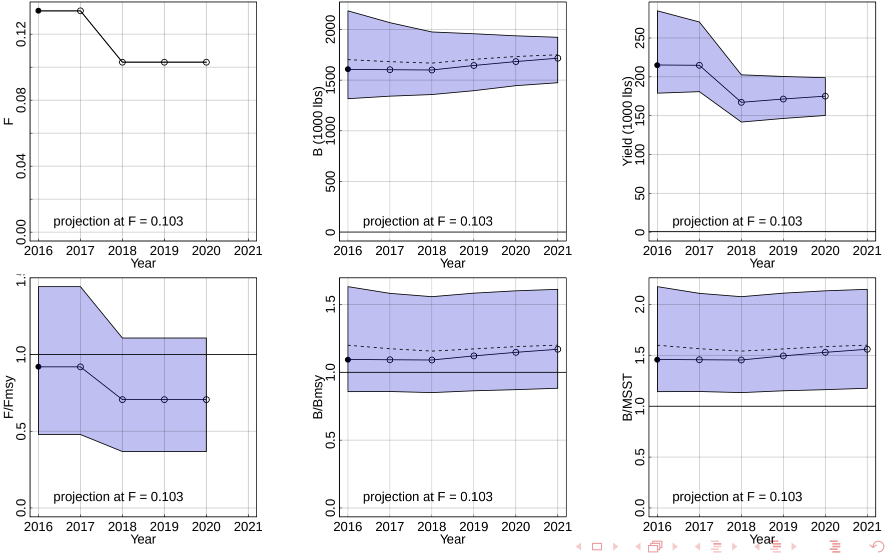
Table: Projection results with fishing mortality fixed at $F = F_{\text{target}} = 0.71 F_{\text{MSY}}$ starting in 2017 . For 2016 , $F = F_{\text{current}}$. F = fishing mortality rate (per year), $P(B > B_{\text{MSY}})$ = proportion of stochastic projection replicates exceeding B_{MSY}, $P(B > \text{MSST})$ = proportion of stochastic projection replicates exceeding MSST, B_{median} = median biomass (1000 lbs) estimate among projections, B = deterministic biomass (1000 lbs) estimate, Y = deterministic yield (1000 lbs) estimate, Sum Y = cumulative sum of deterministic yield (1000 lbs). Yield includes landings and dead discards. Note that observed dead discards were 1, 13 and 40% of total removals from 2013 to 2015 respectively.

Year	F(per yr)	$P(B > B_{\text{MSY}})$	$P(B > \text{MSST})$	B_{median}	B	Y	Sum Y
2016	0.134	0.77	0.95	1702	1606	215	215
2017	0.103	0.76	0.95	1682	1603	167	383
2018	0.103	0.78	0.96	1714	1647	172	554
2019	0.103	0.80	0.96	1739	1685	175	730
2020	0.103	0.81	0.96	1757	1718	178	908
2021		0.82	0.96	1771	1746		

Results

Projections: $P^* = 0.3$

Projections at: $F_{2016-2017} = F_{\text{current}},\ F_{2018-2020} = F_{P^*_{30\%}}$



Results

Projections: $P^* = 0.3$

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Year	F(per yr)	$P(B > B_{\text{MSY}})$	$P(B > \text{MSST})$	B_{median}	B	Y	Sum Y
2016	0.134	0.77	0.95	1702	1606	215	215
2017	0.134	0.76	0.95	1682	1603	215	430
2018	0.103	0.74	0.95	1668	1600	167	597
2019	0.103	0.76	0.96	1705	1644	171	769
2020	0.103	0.78	0.96	1733	1683	175	944
2021		0.80	0.96	1750	1716		

Conclusions

- Blueline Tilefish south of Cape Hatteras are not overfished (B_{2015}/MSST=1.41) and overfishing is not occurring ($F_{2013-2015}/F_{\mathrm{MSY}}$=0.92)
- Bootstrap analysis suggests that stock status (B/MSST) is fairly certain, as only 5.8% of runs found the stock to be overfished
- Bootstrap analysis suggests that fishery status (F/F_{MSY}) is much less certain, as 28.8% of runs found the stock to be undergoing overfishing
- Projections at $F_{\mathrm{P}^*_{30\%}}$ show yield increasing and low risk of B falling below MSST up to 2021