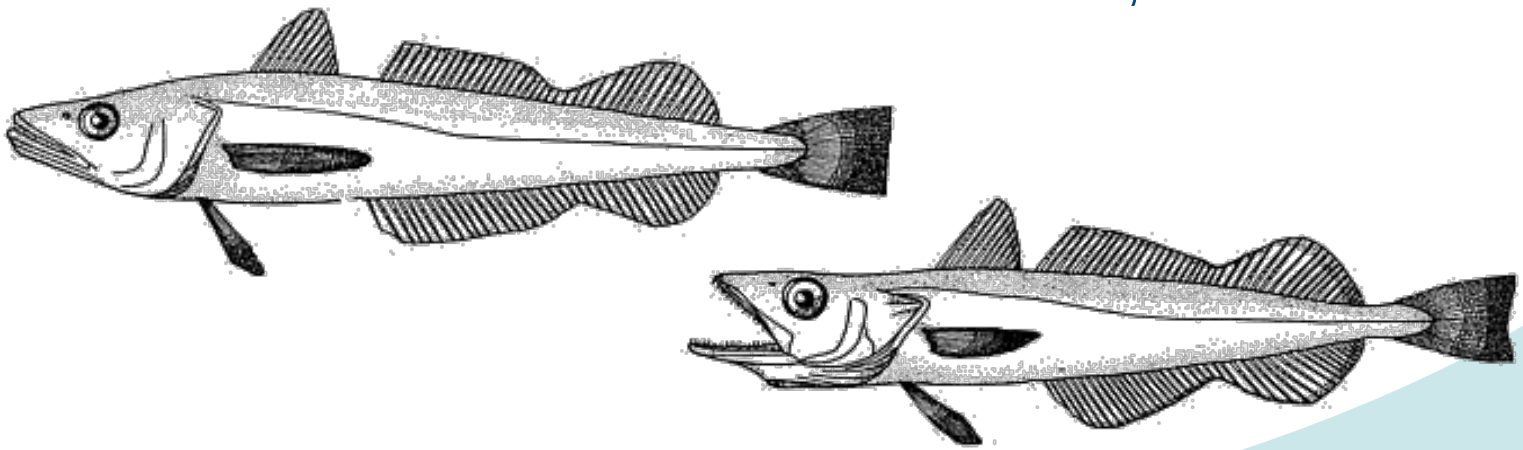
Summary of Southern Whiting Complex Assessment Update through 2019

NOAA FISHERIES

NEFSC

NEFMC's Science and Statistical Committee Webinar

Thurs. November 12, 2020



Reviewed at the September Management Track Assessment Review
14th – 18th 2020

Level 2 Review

Background: Southern silver hake/Offshore hake

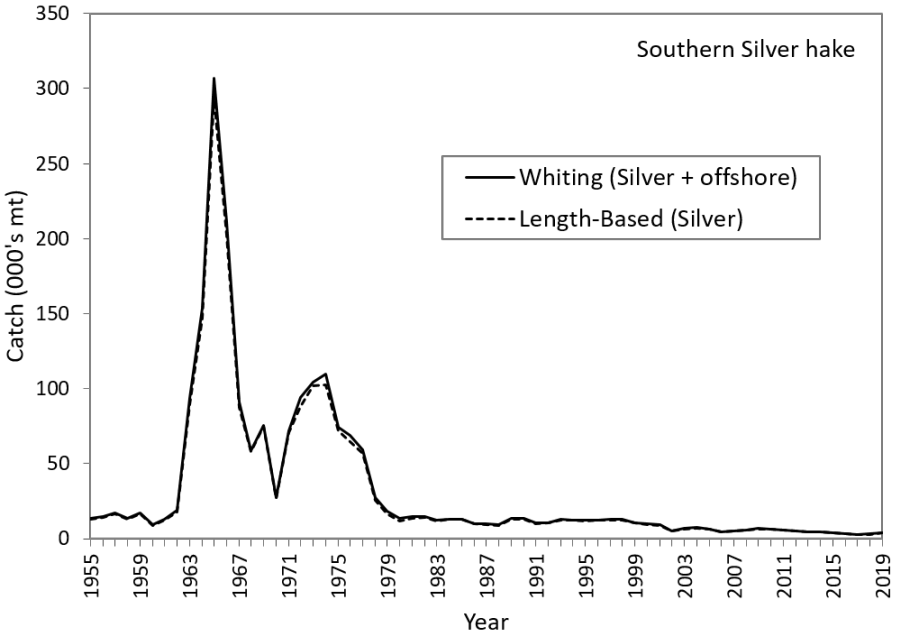
- Silver and offshore hake are commonly referred to as whiting
  - Sympatric species and co-exist over a considerable range of the continental slope.

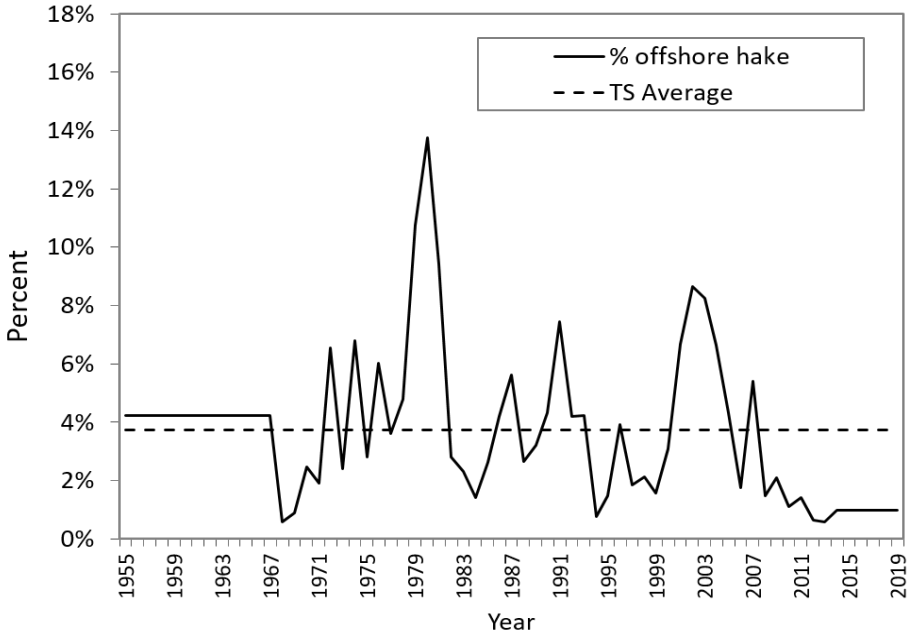
- Last benchmarked SARC 51: 2010
  - Silver hake: Proposed ASAP Model rejected
  - Adopted Empirical Approach
  - Offshore hake: Panel concluded that “Sufficient information was not available to determine offshore hake stock status with confidence, because fishery data are insufficient and one cannot assume that the survey trends reflect stock trends (NEFSC 2011)

Southern Silver hake

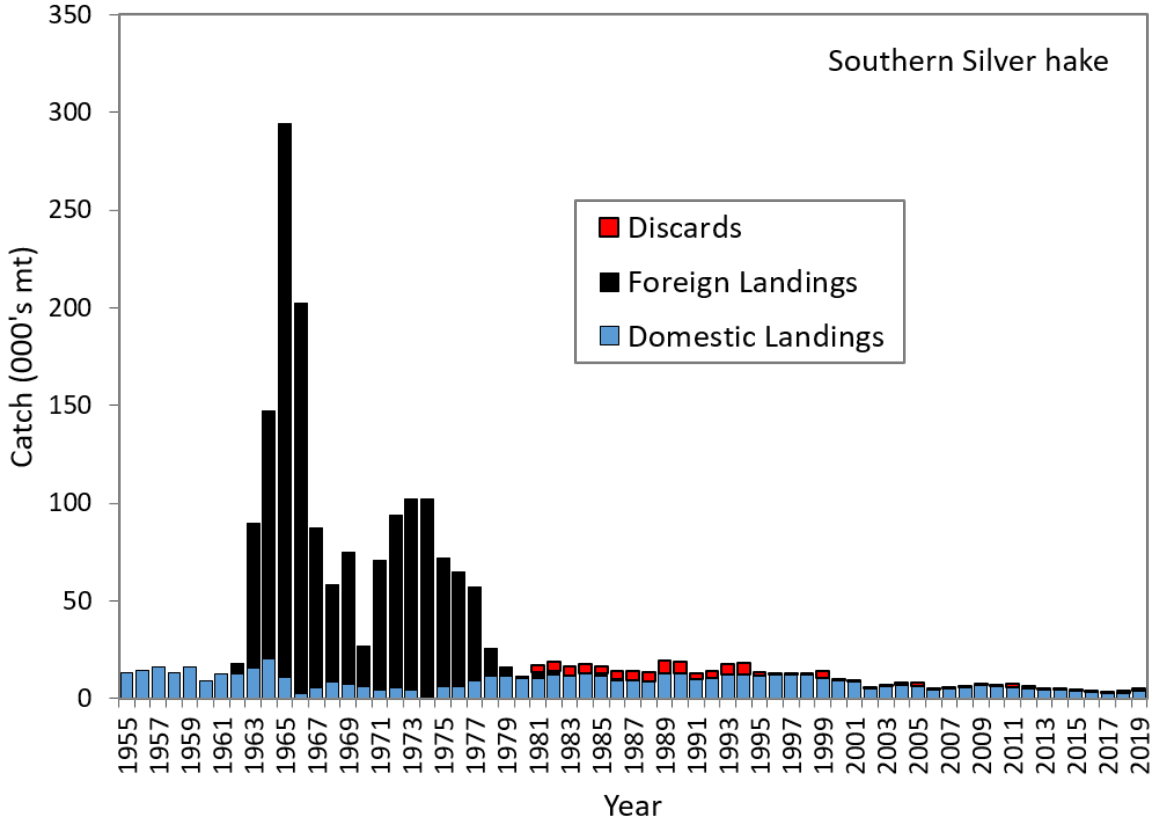
- Last assessment update: 2017 (Peer reviewed through the NEFMC SSC)
- Index-based approach; years 1955-2016
- Reference points
  - F_{MSY} Proxy = 34.18 kt/kg
  - ½ B_{MSY} Proxy = 0.83 kg/tow
- Stock Status:
  - Overfished = No (B_{2016} 1.05 kg/tow)
  - Overfishing = No (Rel. F_{2016} = 5.85 kt/kg)

Percent offshore hake in Southern whiting derived from the length-based split for years 1955-2019



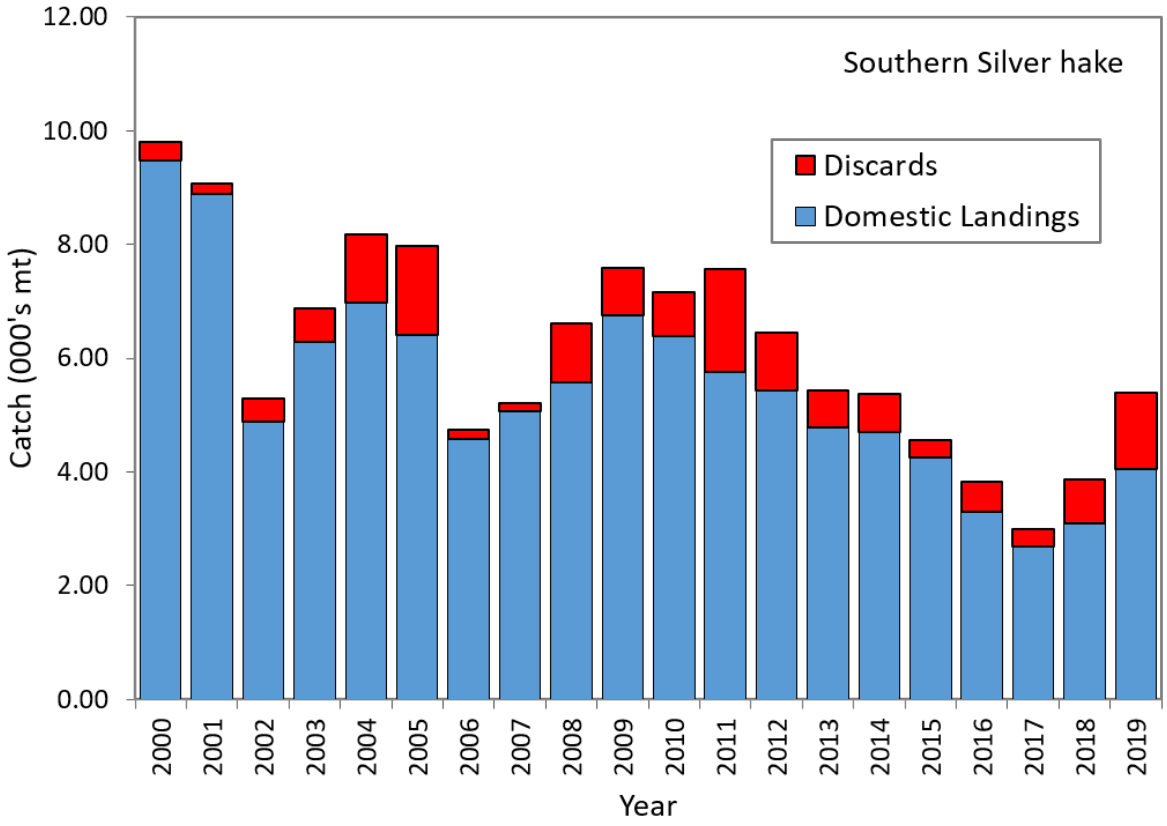


Southern Silver hake Commercial Catch 1955-2019



- Early 1960's to late 1970's = Period of extreme high catches peaking ~ 300,000mt in 1965
- Post industrial and distant water fleet, catches averaged ~ 12,000 mt/yr thru the late 1990's

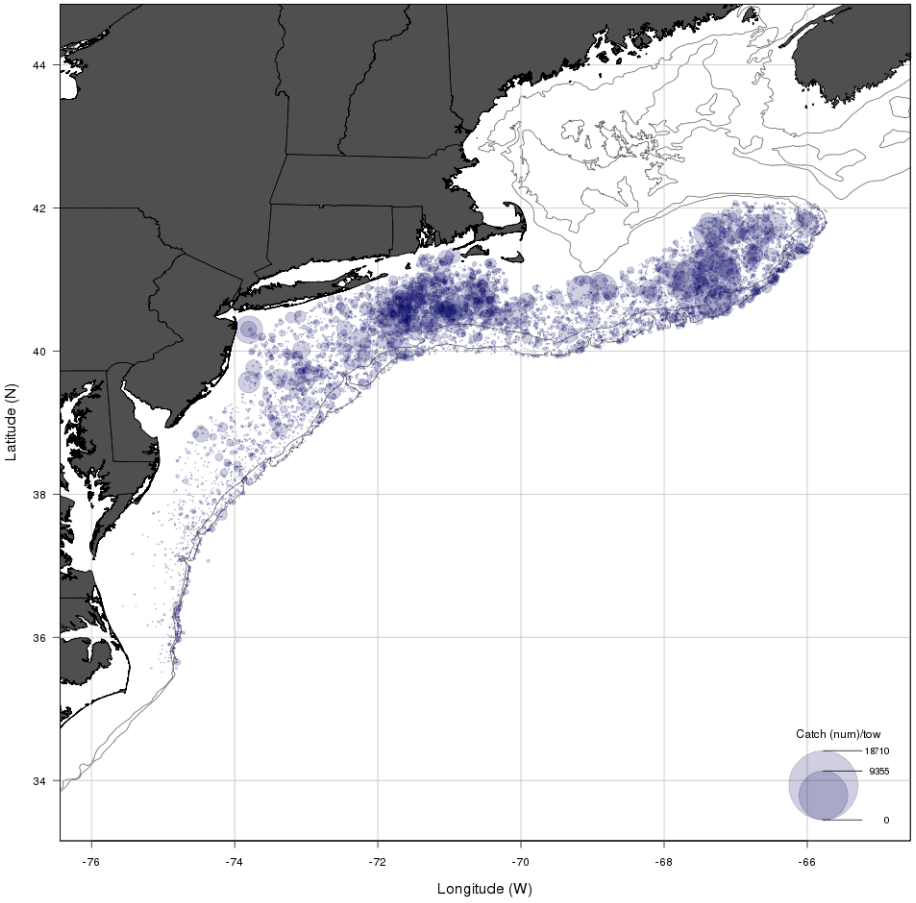
Southern Silver hake Commercial Catch



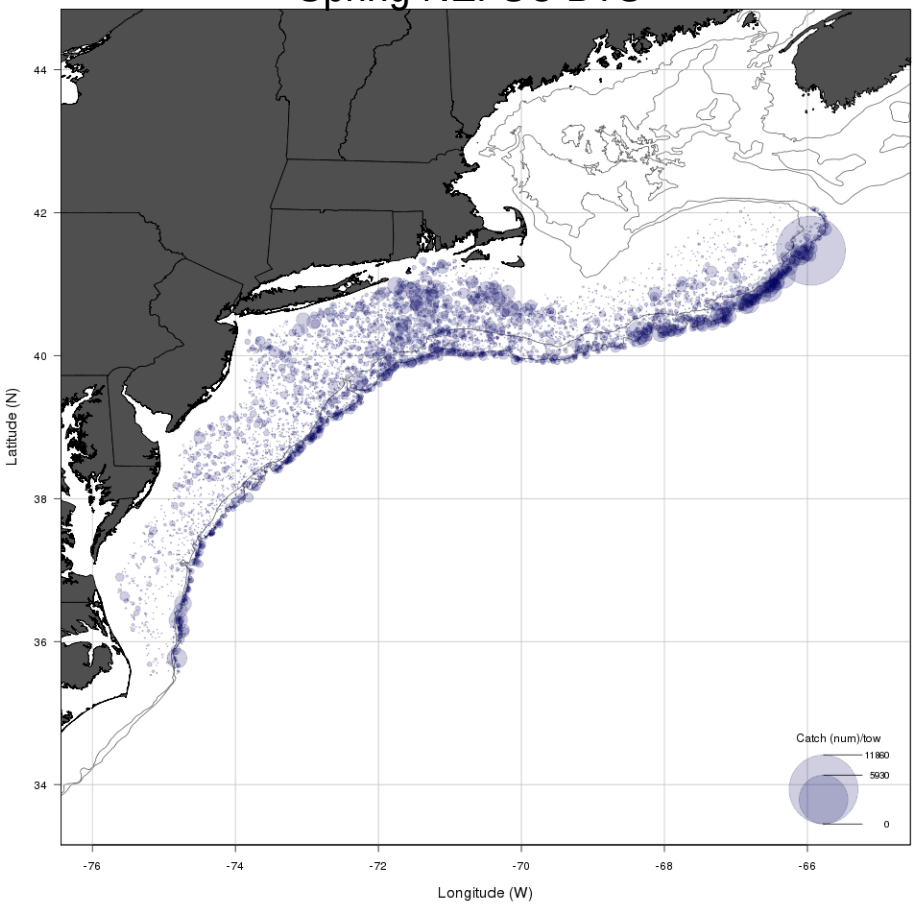
- Since last assessment, catches have increased by ~41%
- Catches in 2019 = 5,400 MT (below the ACL = 19,163 MT)
- Discards steadily increasing (2017-2019) from 10% (2017) to 25% (2019) of catch

southern silver hake NEFSC survey distribution

Fall NEFSC BTS

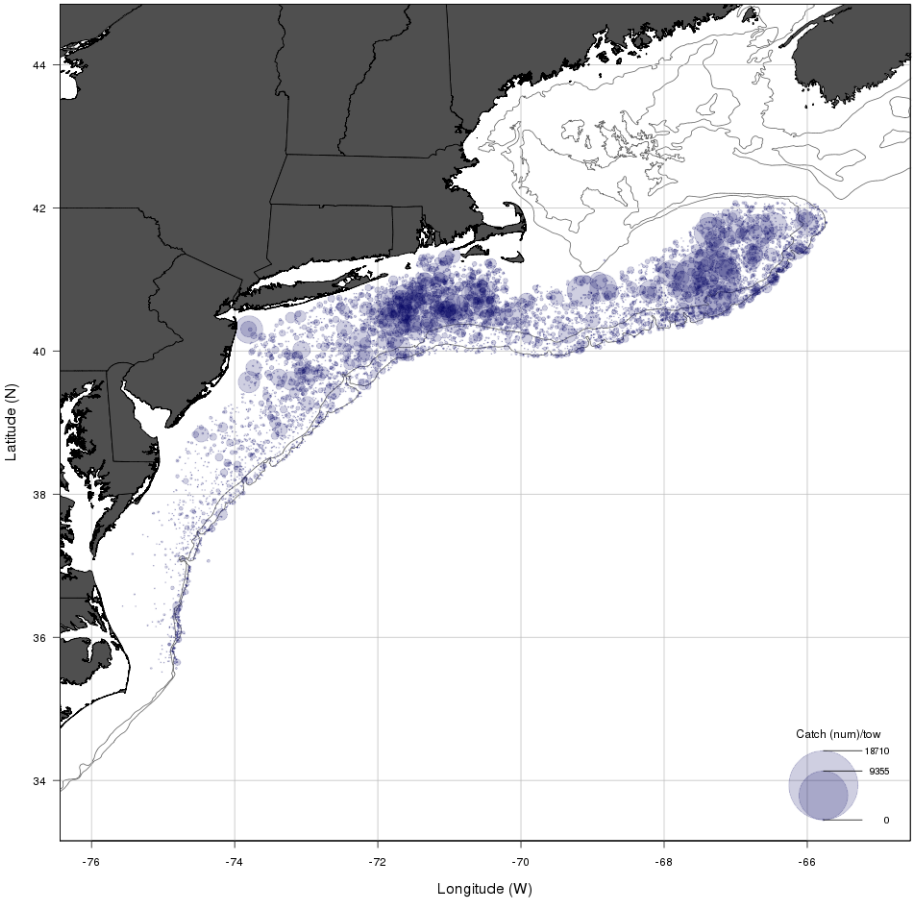


Spring NEFSC BTS

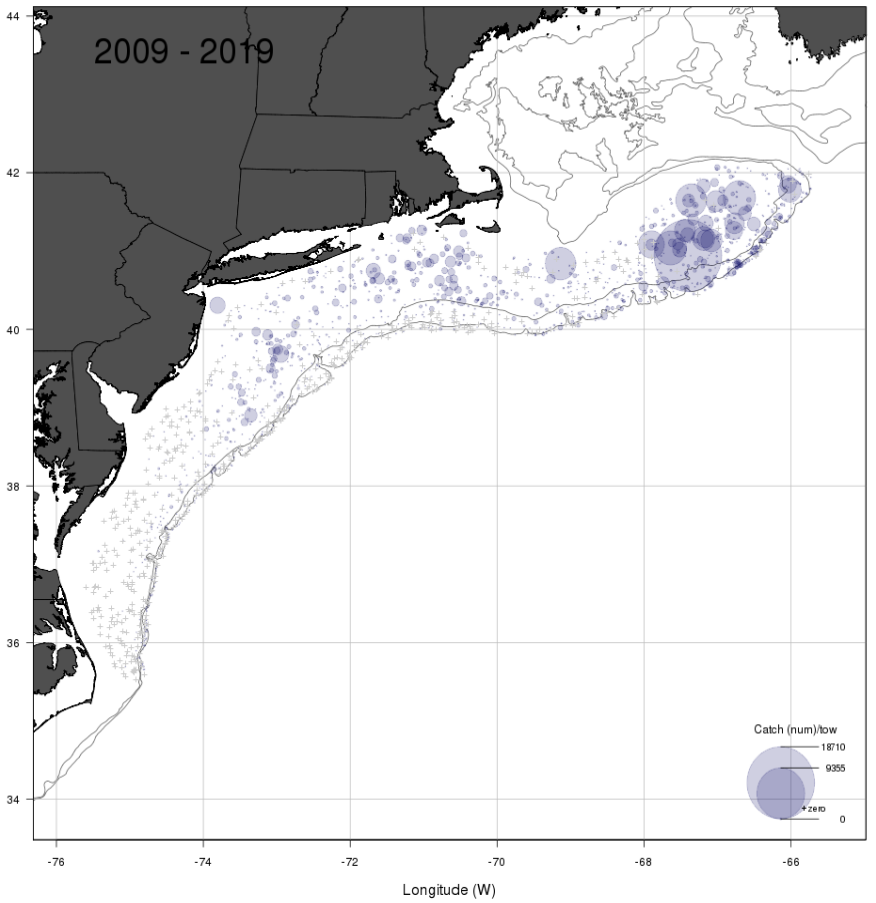


southern silver hake NEFSC fall survey distribution

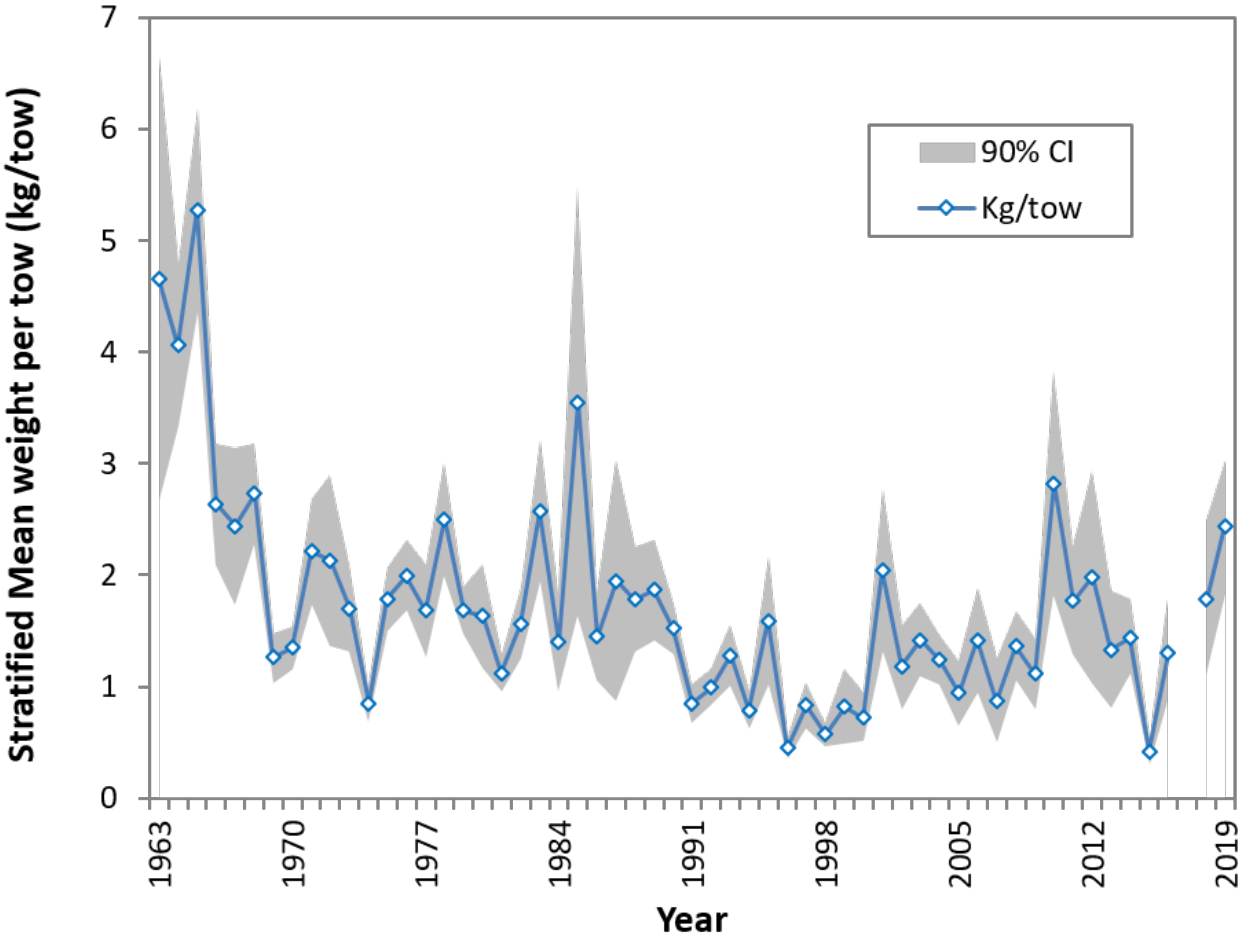
1963-2019



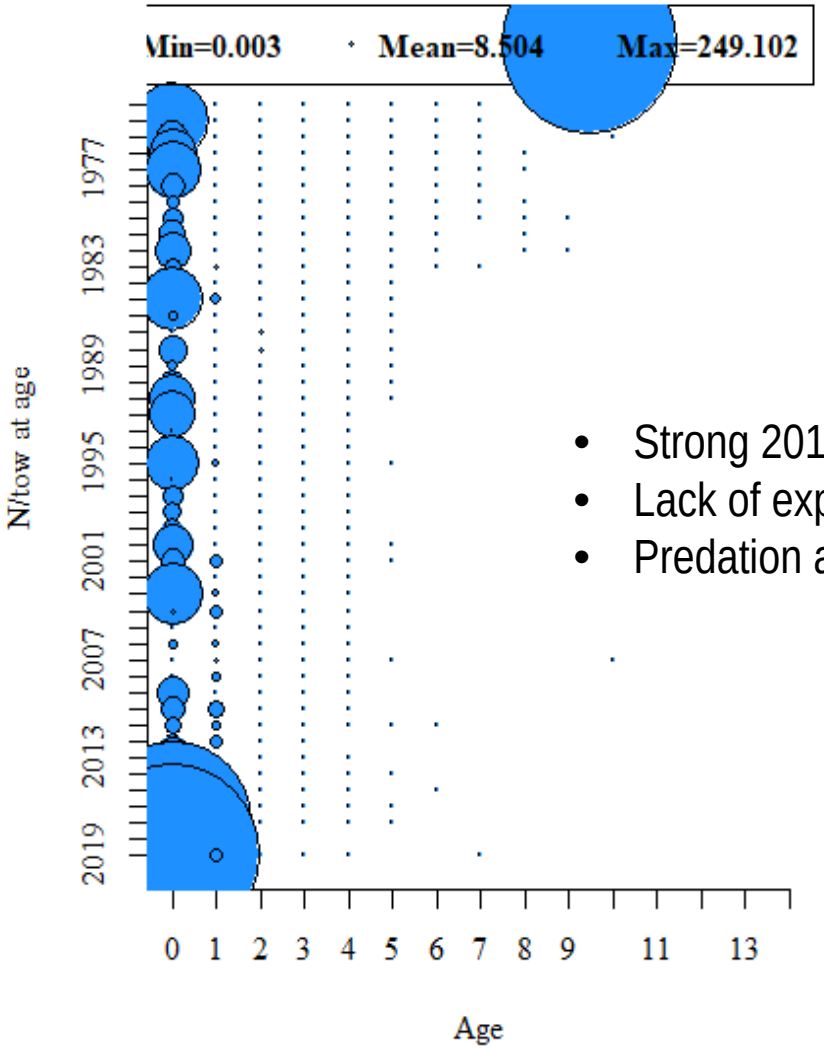
2009-2019



Southern silver hake NEFSC fall survey trends



Southern silver hake NEFSC fall survey Age Comp.

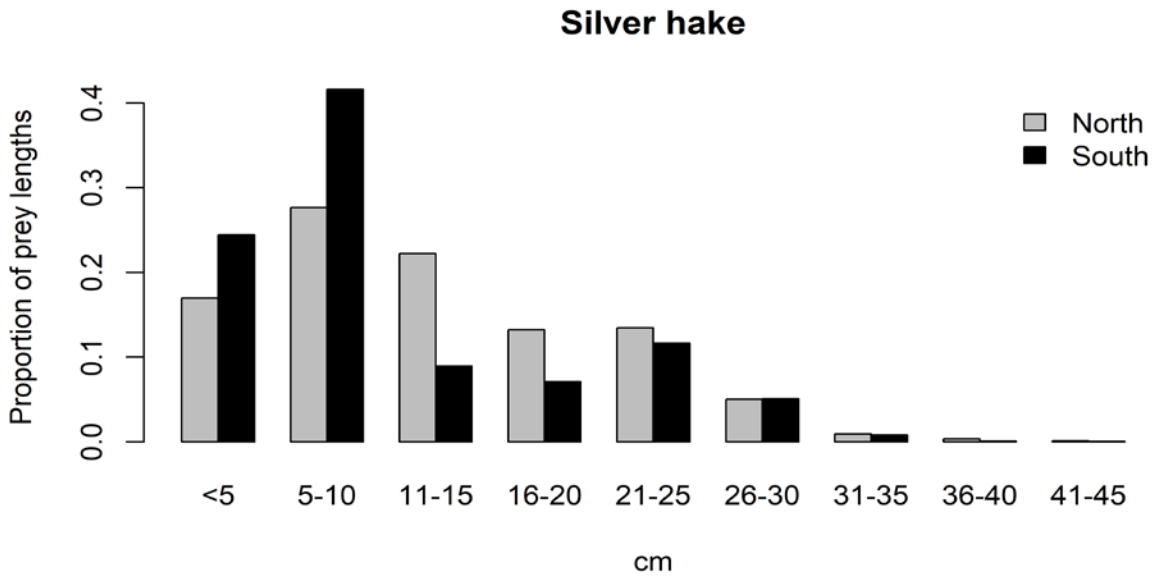


- Strong 2018 and 2019 YC
- Lack of expansion in age structure
- Predation and Cannibalism

Age1 15-30cm Age3 38-45cm Age5-6 >45 cm
Age2 31-37cm Age4 27-49cm

Predation or Cannibalism?

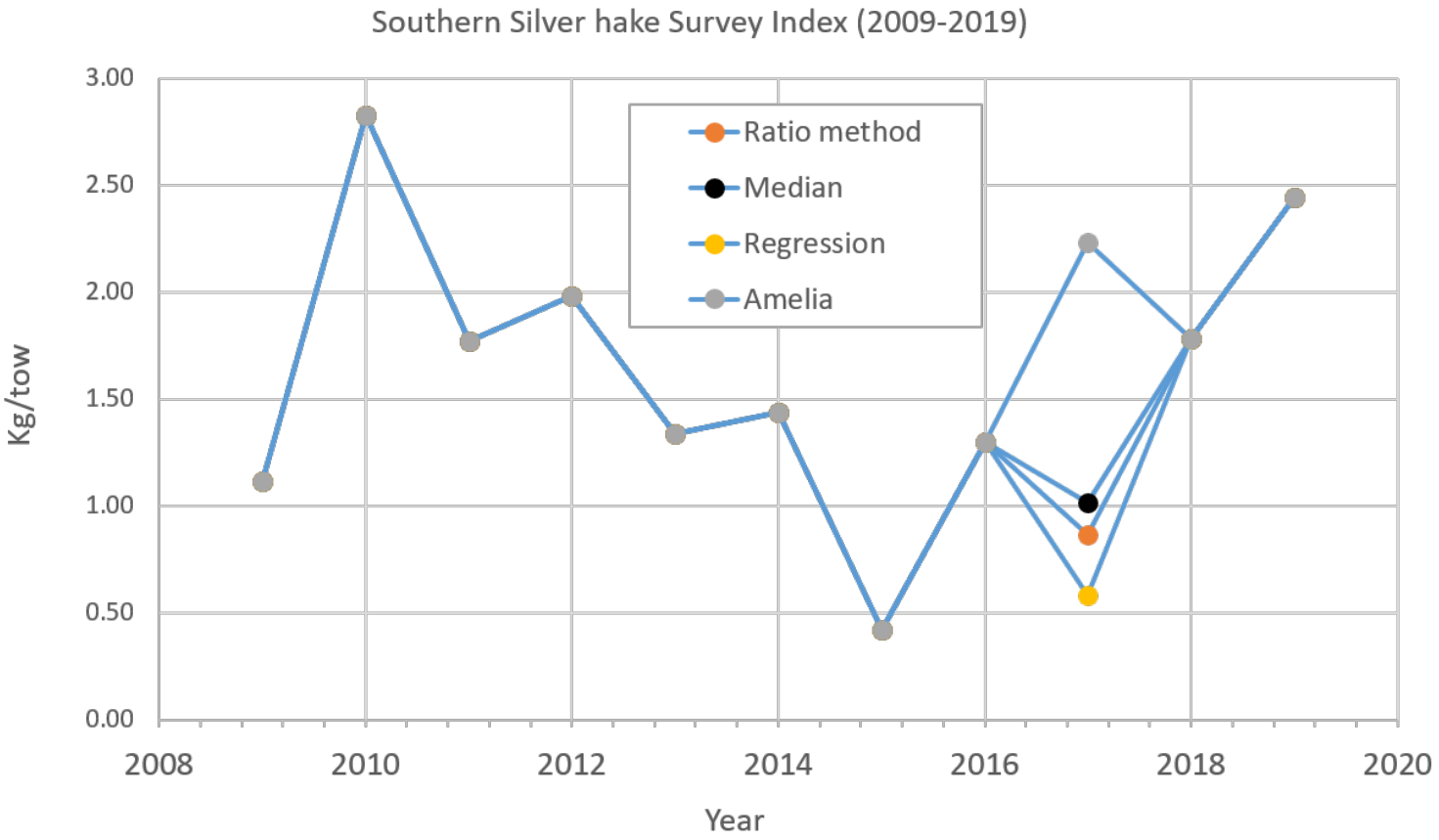
- Lack of expansion in age structure
- Consumption analyses (1973-2019) and 14 predators (Smith, 2020)
- Largest proportion of silver hake consumed in the south < 10cm



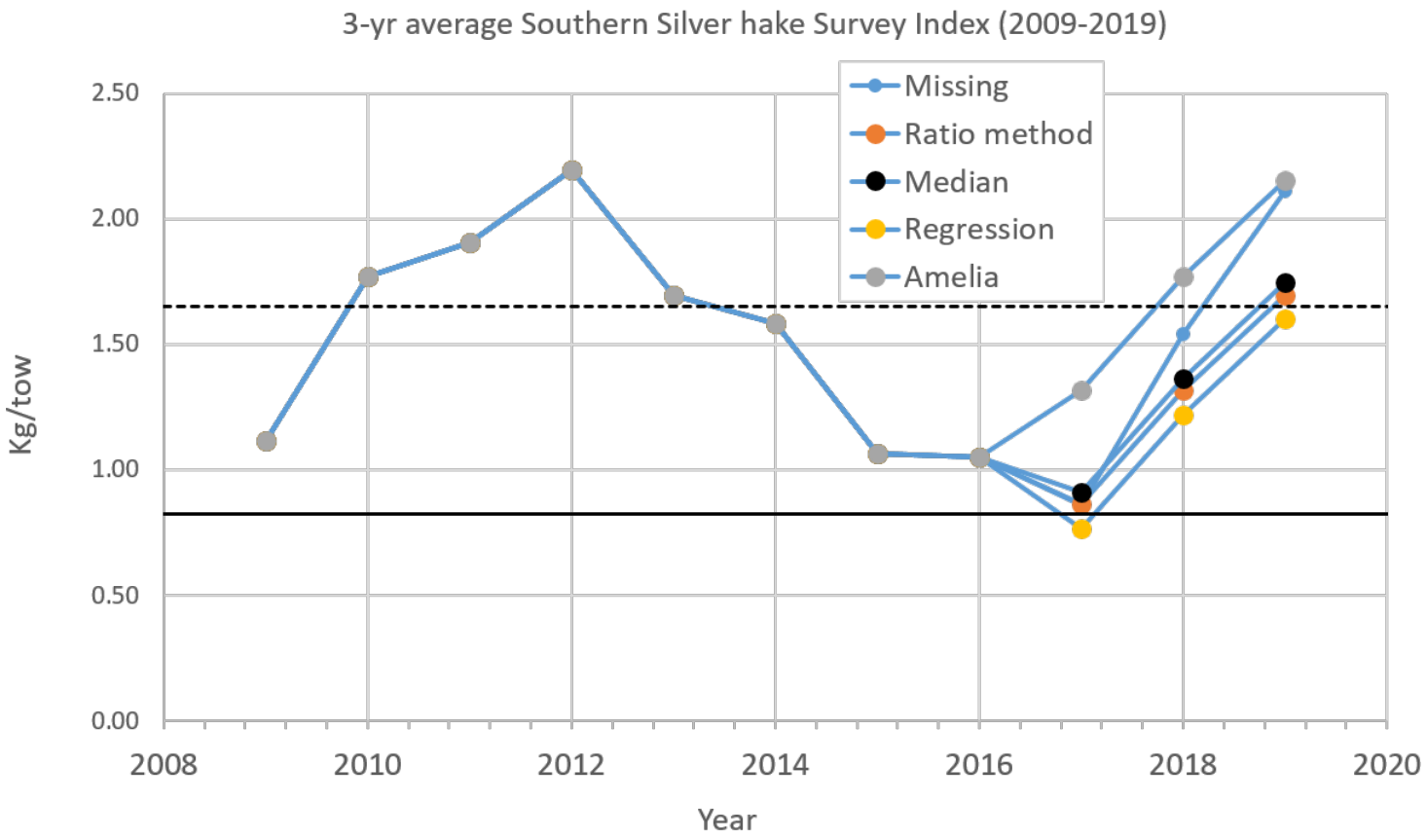
2017 NEFSC Fall Survey Coverage

- In 2017, only 20% of total stock area was surveyed due to mechanical challenges that led to delay in the survey
- Average contribution of missing strata (2009-2016) by weight ~ 63%
- Several imputation approaches were explored and potential implications on the 3-yr moving average of the fall survey

2017 NEFSC Fall survey Imputations



Comparison of imputations on the 3-yr mean

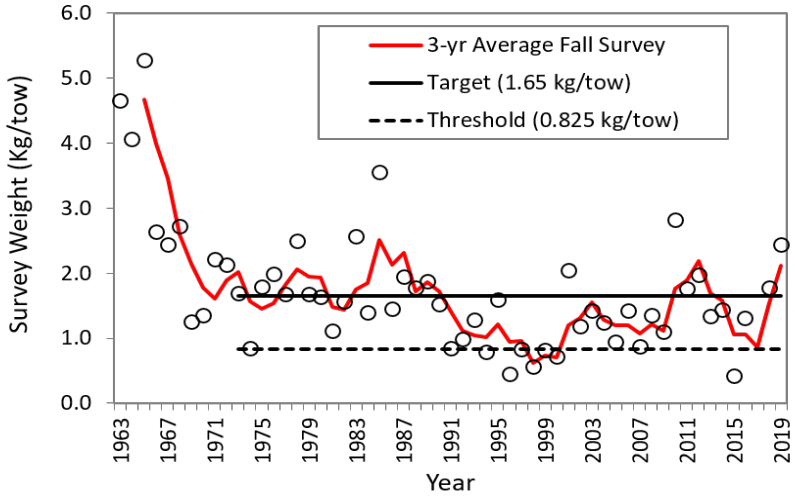


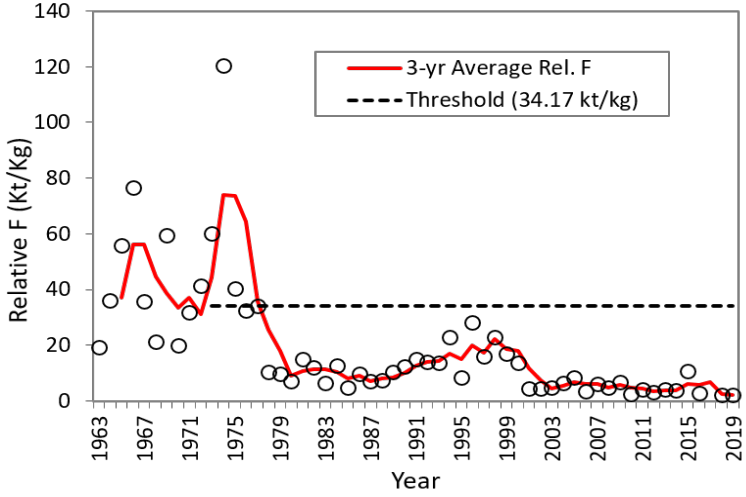
SARC 51 Silver hake Biological Reference Points

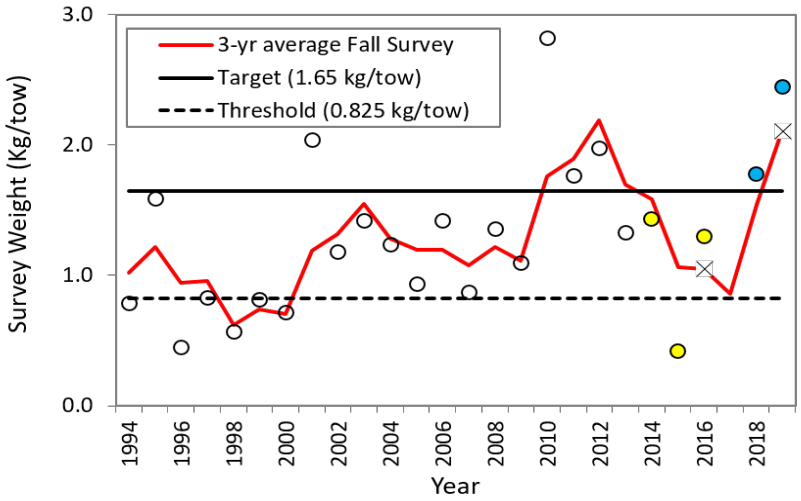
- Lack of ASAP model, the panel recommended the fallback method (Survey Index approach)
- Biomass reference points based on the arithmetic average of fall Survey (1973-1982)
- Exploitation Index is based on ratio b/w total catch and arithmetic fall survey index averaged from 1973-1982

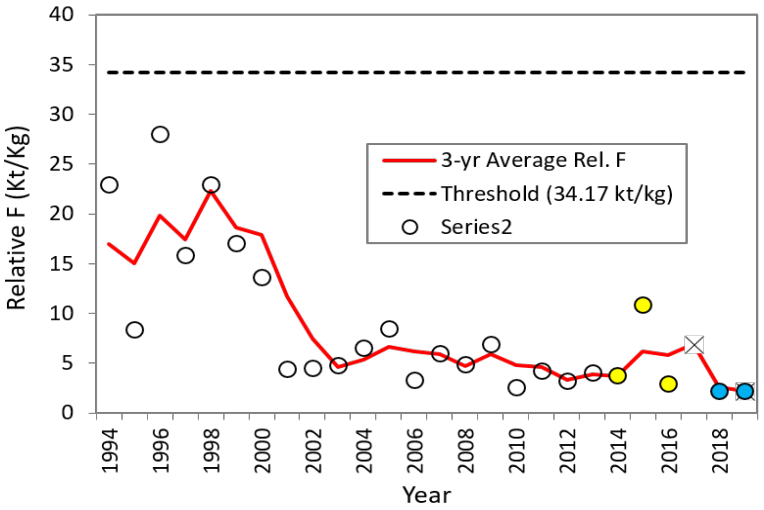
STOCK	THRESHOLDS (SARC 51)	TARGETS(SARC 51)
Northern Silver Hake	1/2 B_{MSY} Proxy (3.21) F_{MSY} Proxy (2.78)	B_{MSY} Proxy (6.42) F_{MSY} Proxy (NA)
Southern Silver Hake	1/2 $_{BMSY}$ Proxy (0.83) F_{MSY} Proxy (34.17)	B_{MSY} Proxy (1.65) F_{MSY} Proxy (NA)

Southern silver hake survey biomass(kg/tow) and Relative Exploitation (kt/kg)

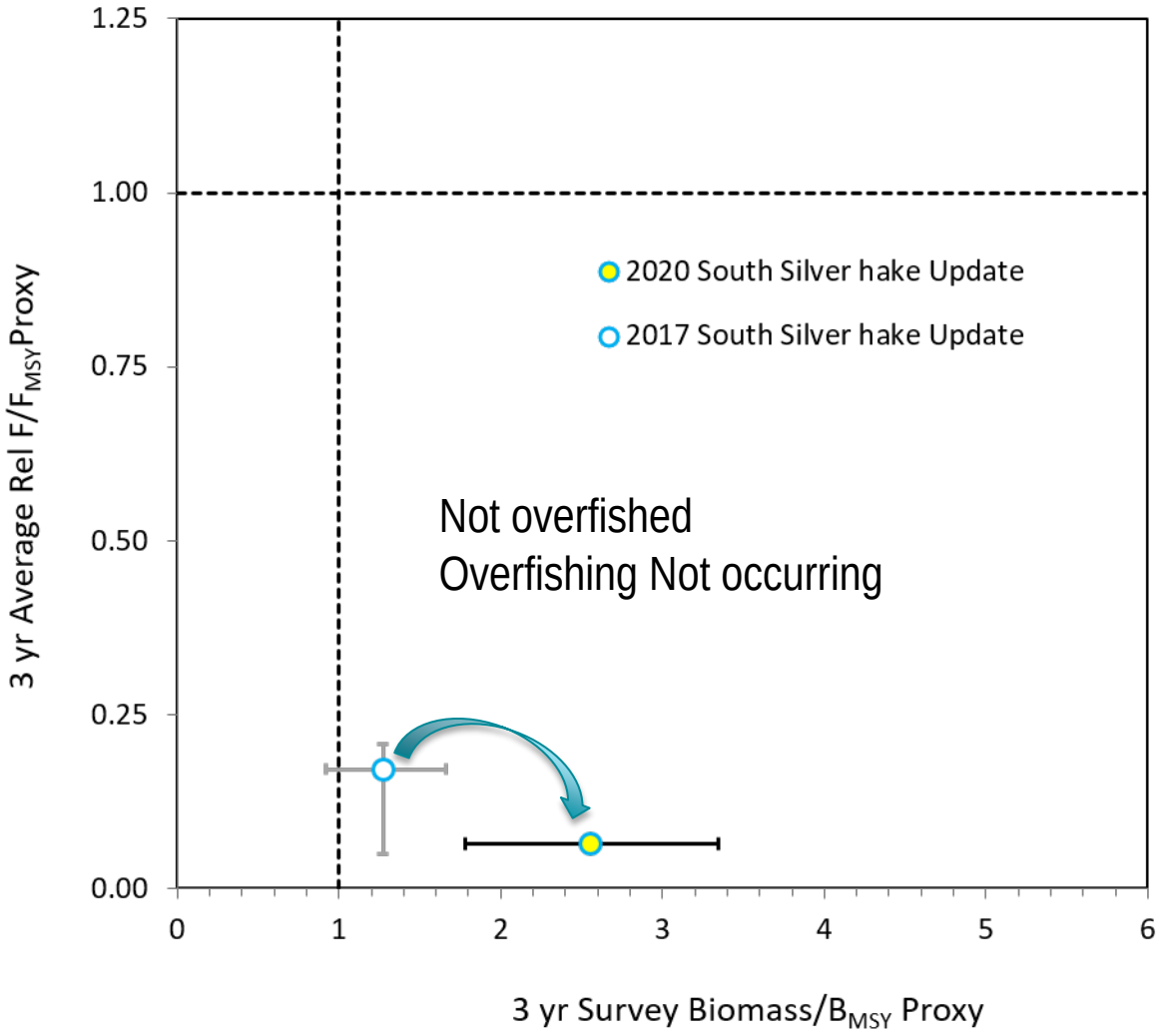








Southern silver hake recommended stock status



Overfishing Limit (OFL)

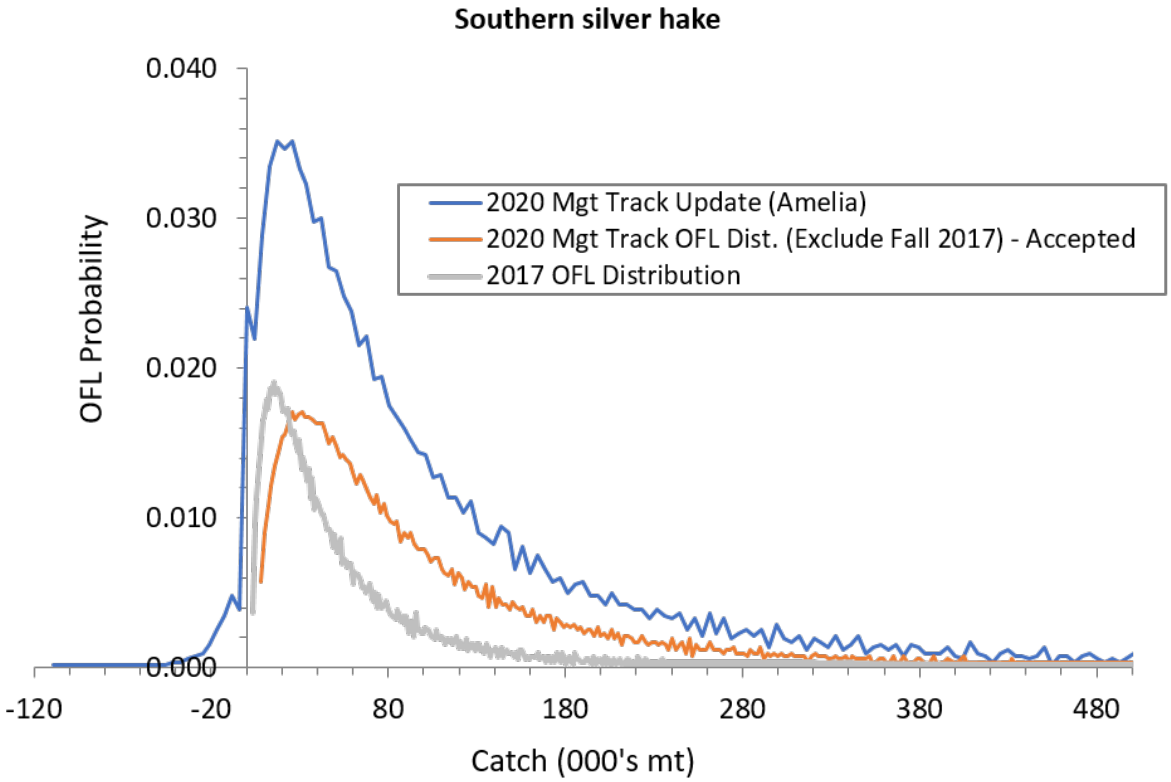
$$OFL \sim I_{2017-2019} \times F_{MSY}Proxy \left(\frac{kt}{kg}\right)$$

$$F_{MSY}Proxy = 1973 - 1982$$

- Uncertainty in OFL
  Estimated as a cross product between the uncertainty (i.e. probability distribution) in **F_{MSY} proxy** and the most recent **3-year survey Index**

- Uncertainty in F_{MSY}
  Mean and variance of the exploitation ratios from 1973-1982 and assumed lognormal error structure

Southern silver hake OFL distribution



Proposed OFL 2020: 72,160 MT (15,860 – 421,068 MT)

Highly uncertain due to statistical properties of FMSY proxy (lognormal)

Proposed ABC 2020: 39,411 MT (25th percentile of the OFL distribution)

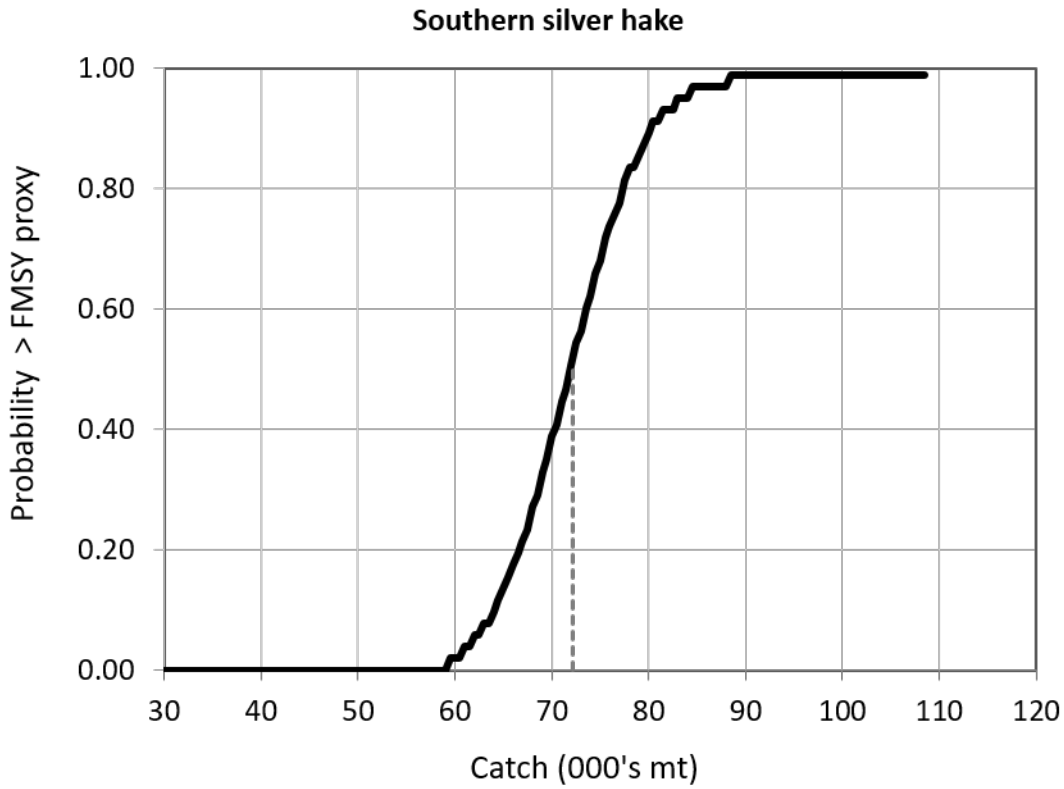
Risk Analyses

- Defined as the probability of exceeding of F_{MSY} proxy given the current population Index (Two step process):

- Calculated corresponding Rel. F for each survey realization from the survey cum. distribution.
  - Corresponding Rel F= (OFLcurrent/Index_distr)

- The Probability of Rel. F for a given catch exceeding F_{MSY} proxy is a function of two probabilities:
  - Probability of each survey realizations
  - Probability of each corresponding Rel F of exceeding FMSY proxy computed over a range of catch

Southern Silver hake Risk Analyses



Southern Silver hake Summary Table	2017 Update	2020 Update	% Difference
3-year Average Fall Index (kg/tow)	1.05	2.11	101%
BMSY Proxy Threshold (kg/tow)	0.83	0.83	NA
BMSY Proxy Target (Kg/tow)	1.65	1.65	NA
Ratio of 3-year average Fall index to BMSY Proxy Threshold	1.27	2.54	100%
Ratio of 3-year average Fall index to BMSY Proxy Target	0.64	1.28	101%
3-Year Average Relative Exploitation Index (kt/kg)	5.85	2.19	-63%
FMSY Proxy Threshold 1973-1982 (kt/kg)	34.18	34.18	NA
Ratio of 3-year average Exploitation index (2014-2016) to FMSY Proxy	0.17	0.06	-63%
OFL (000's mt) based on median of probability value from the OFL distribution	35.88	72.16	101%
ABC (000's mt) = 25th Percentile of OFL distribution (account for 4% offshore hake)	20.17	40.99	103%
ACL (000's mt) = 95% of ABC	19.16	38.94	103%
ACL/OFL	0.53	0.54	
Pr (F > FMSY) @ ACL	< 1%	< 1%	NA

Southern silver hake summary

- This assessment indicates improvement in stock status of southern silver hake
- Catches in the south increased in the recent three years and likely due to evidence of increase in the survey index.
- Proposed OFL suggest that the stock can withstand higher level of exploitation with negligible risk of exceeding FMSY proxy

Sources of Uncertainty/Research Needs

- Lack analytical framework. Important population quantities such as growth, natural mortality, recruitment etc cannot be explicitly considered in the current empirical framework
- The basis for the existing BRP (1973-1982) assumes conditions have remained relatively static. Alternative BRPs need to be investigated
- Catch is a source of uncertainty – Mixed whiting
- Offshore hake lacks sufficient information content to fully disaggregate catch to species level. Impact is probably minor
- Missing 2017 fall survey value. The empirical approach is highly dependent on consistent time series.