ARROWTOOTH FLOUNDER
GROUNDFISH PLAN TEAM, NOV 2020

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FULL ASSESSMENT IN EVEN YEARS

TIER 3

- New catch, survey, age/length comps, no model changes
- Correction to EBS shelf survey index
- Projection model
- Recommendations for 2021:
  - OFL 90,873 t
  - ABC 77,349 t (10% increase from 2020)

SSC/PT COMMENTS

- The SSC requests that authors of full assessments fill out the risk table, include the table ranking descriptions, and remove the overall score

    - We completed the risk table as per SSC request

- CIE review, Plan Team, and SSC requested investigation of alternative ways to integrate the three surveys

    - We plan to investigate model-based survey time series (e.g., VAST) as a way to integrate the three surveys available for BSAI arrowtooth flounder when these methods become available.

- SSC recommended investigation regarding speciation of the survey and catch data used in the assessment model

    - We investigated species ID confidence in the survey and composition in the catch and made a correction to the shelf survey index and 2008-2010 catch proportions

SSC/PT COMMENTS

- Species identification confidence on bottom trawl survey

  - Recommended by RACE to use data when species ID at least moderate

  - Moderate confidence attained in 1980 on AI survey and 1992 on EBS shelf/slope

  - Correct EBS shelf survey index to reflect the higher confidence species ID

- Species compositions in Observer Program

  - Sparse amounts of arrowtooth identified since early 1990s

  - Subsampling protocol increased in 2008 and observers encouraged to ID arrowtooth in their subsamples, which showed steadily increasing proportion of Kamchatka

  - Speciation routines began in the catch accounting system (CAS) in 2011

  - Used proportions of arrowtooth reported in Observer database from 2008 to 2010

Thanks Meaghan!!

DATA CORRECTION IS MINOR

Female Spawning Biomass
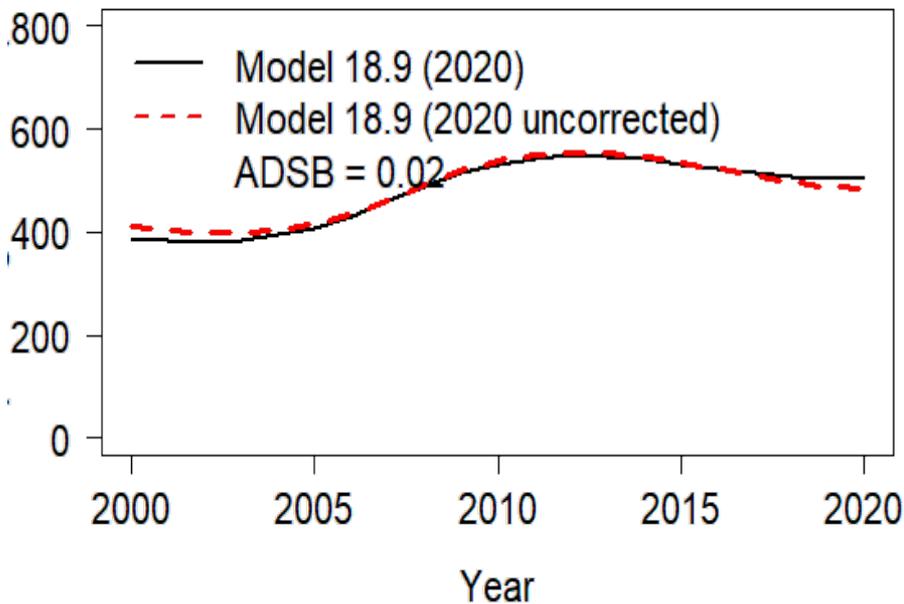
Total Biomass
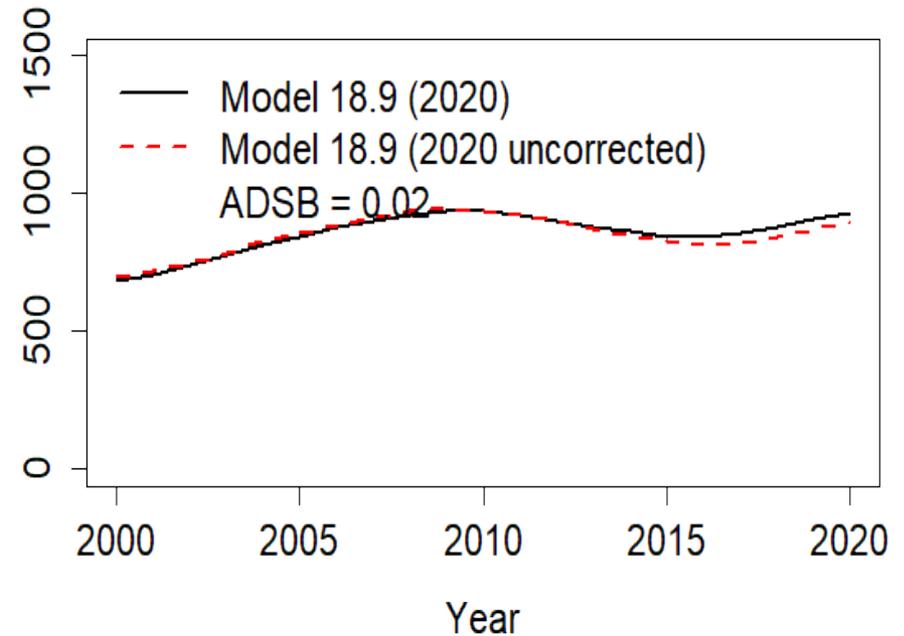
* ADSB = Average difference spawning biomass

TIER 3A ASSESSMENT FOR ARROWTOOTH (AGE-STRUCTURED ASSESSMENT & PROJECTION MODEL)

Quantity	As estimate or specified last year for:		As estimated or recommended this year for:	
	2020	2021	2021	2022
M (natural mortality – Male, Female)	0.35, 0.2	0.35, 0.2	0.35, 0.2	0.35, 0.2
Specified/recommended Tier	3a	3a	3a	3a
Projected total (age 1+) biomass (t)	891,959	934,008	923,646	921,074
Female spawning biomass (t) Projected	481,845	478,260	497,556	509,208
$B_{100\%}$	606,237	606,237	558,826	558,826
$B_{40\%}$	242,495	242,495	223,530	223,530
$B_{35\%}$	212,183	212,183	195,589	195,589
F_{OFL}	0.161	0.161	0.160	0.160
$maxF_{ABC}$ (maximum allowable = $F_{40\%}$)	0.136	0.136	0.135	0.135
Specified/recommended F_{ABC}	0.136	0.136	0.135	0.135
Specified/recommended OFL (t)	82,860	84,057	90,873	94,368
maxABC (t)	70,606	71,618	77,349	80,323
Specified/recommended ABC (t)	70,606	71,618	77,349	80,323
Status	As determined *last* year for:		As determined *this* year for:	
	2018	2019	2019	2020
Overfishing	No	n/a	No	n/a
Overfished	n/a	No	n/a	No
Approaching overfished	n/a	No	n/a	No

TIER 3A ASSESSMENT METHODS FOR ARROWTOOTH (AGE-STRUCTURED ASSESSMENT & PROJECTION MODEL)

Source	Data	Years
NMFS Bering Sea shelf survey	Survey biomass	1992-2018, **2019**
	Age Composition	1993, 1994, 1996, 1998, 2004, 2010, 2012, 2014, 2015, 2016, 2017, **2018**, **2019**
	Length composition	1992-2019
NMFS Bering Sea slope survey	Survey biomass	2002, 2004, 2008, 2010, 2012, 2016
	Age Composition	2012
	Length composition	2002, 2004, 2008, 2010, 2016
NMFS Aleutian Islands survey	Survey biomass	1980, 1983, 1986, 1991, 1994, 1997, 2000, 2002, 2004, 2006, 2010, 2012, 2014, 2016, 2018
	Age composition	2010, 2012, 2014, 2016, **2018**
	Length composition	1980, 1983, 1986, 1991, 1994, 1997, 2000, 2002, 2004, 2006, 2010, 2012, 2016, 2018
Fishery	Catch Biomass	1970-**2019**, **2020**
	Length composition	1978 – 1988, 1990-2017, **2018**, **2019**

CATCH BY SPECIES AND AREA
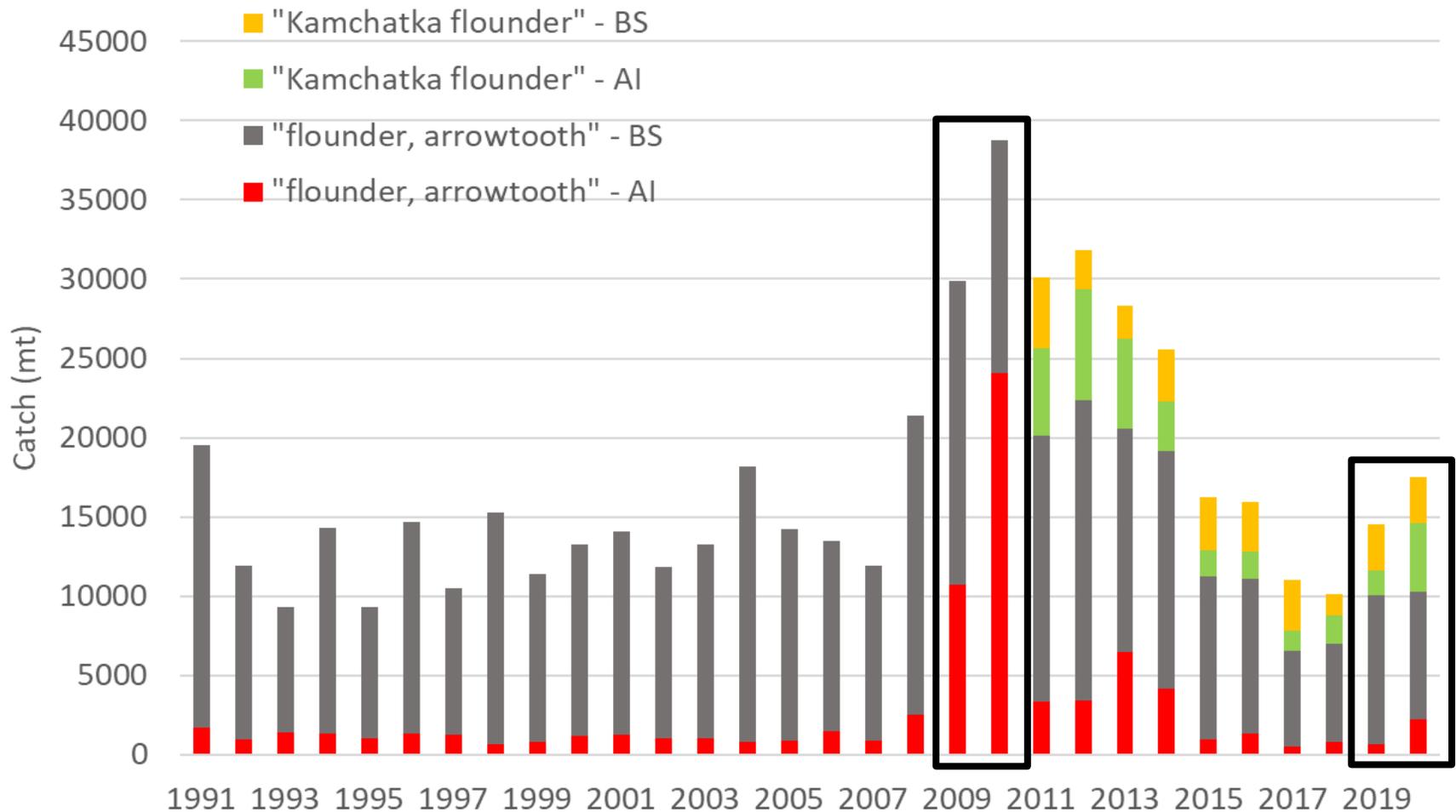
SURVEY BIOMASS

Bering Sea Shelf
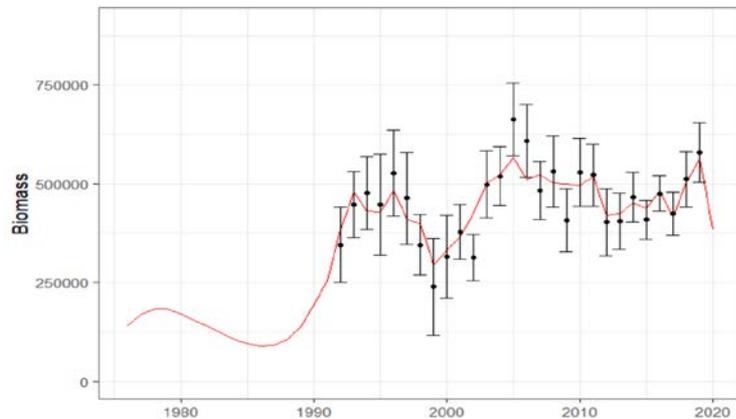
Aleutian Islands
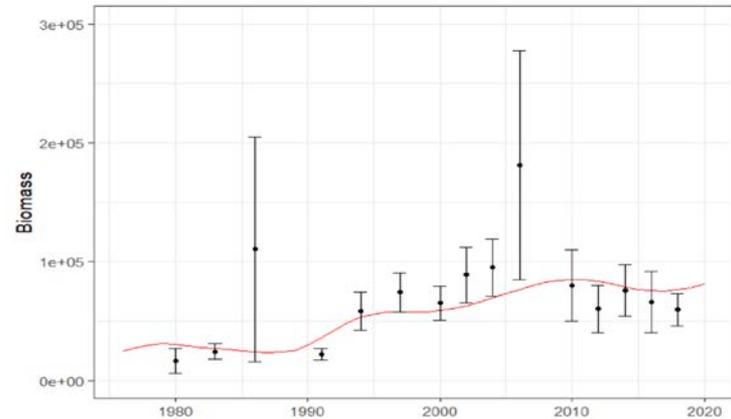
Bering Sea Slope
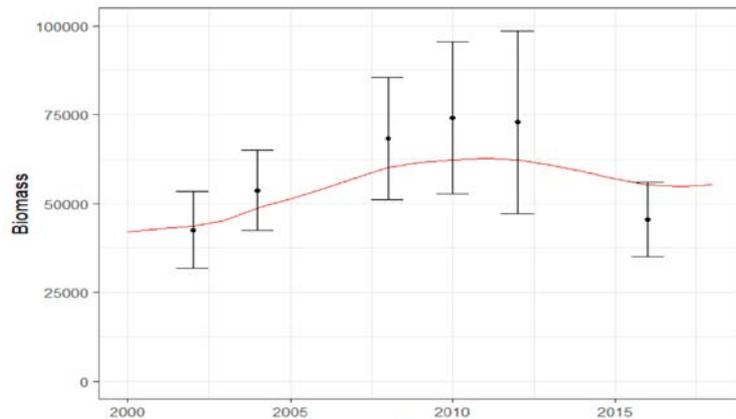
BSAI Biomass
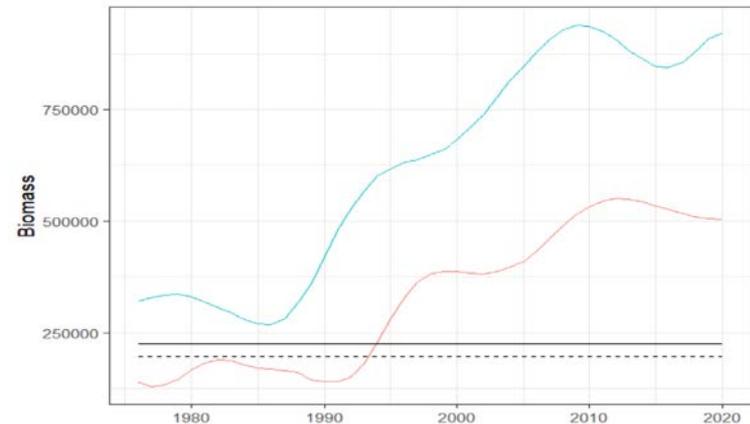
EBS SHELF SURVEY AGE COMPOSITIONS
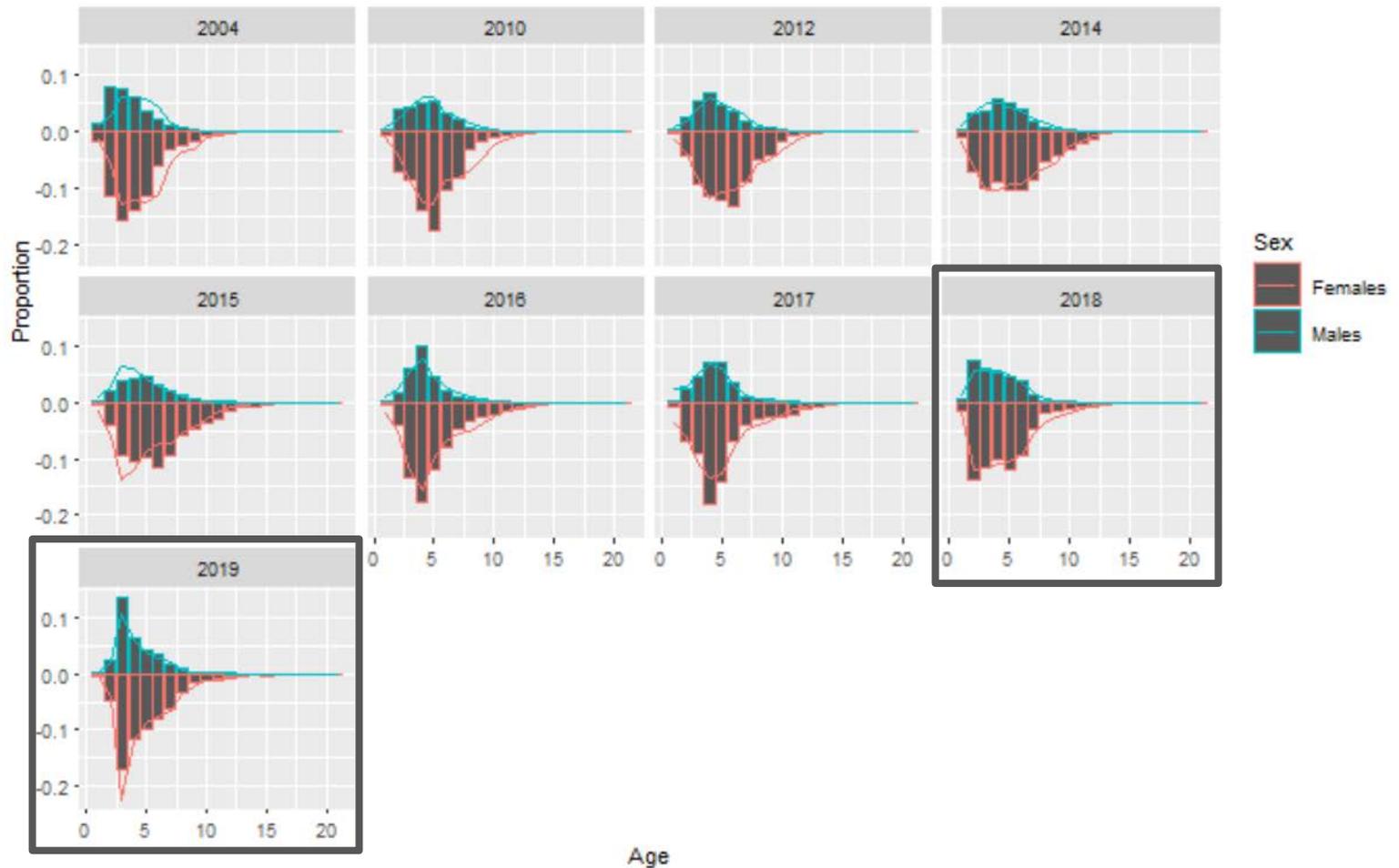
AI SURVEY AGE COMPOSITIONS
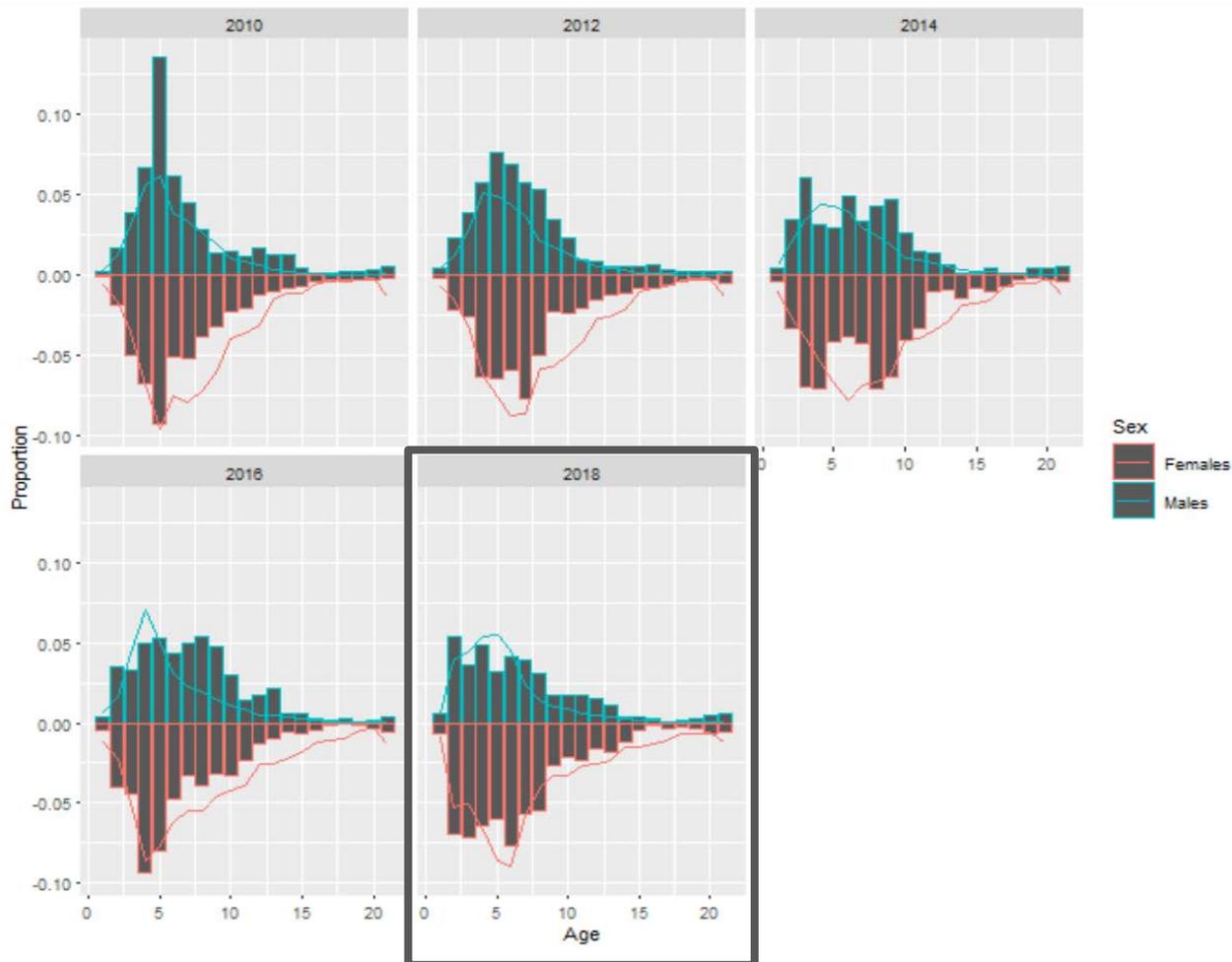
FISHERY LENGTH COMPOSITIONS

Length
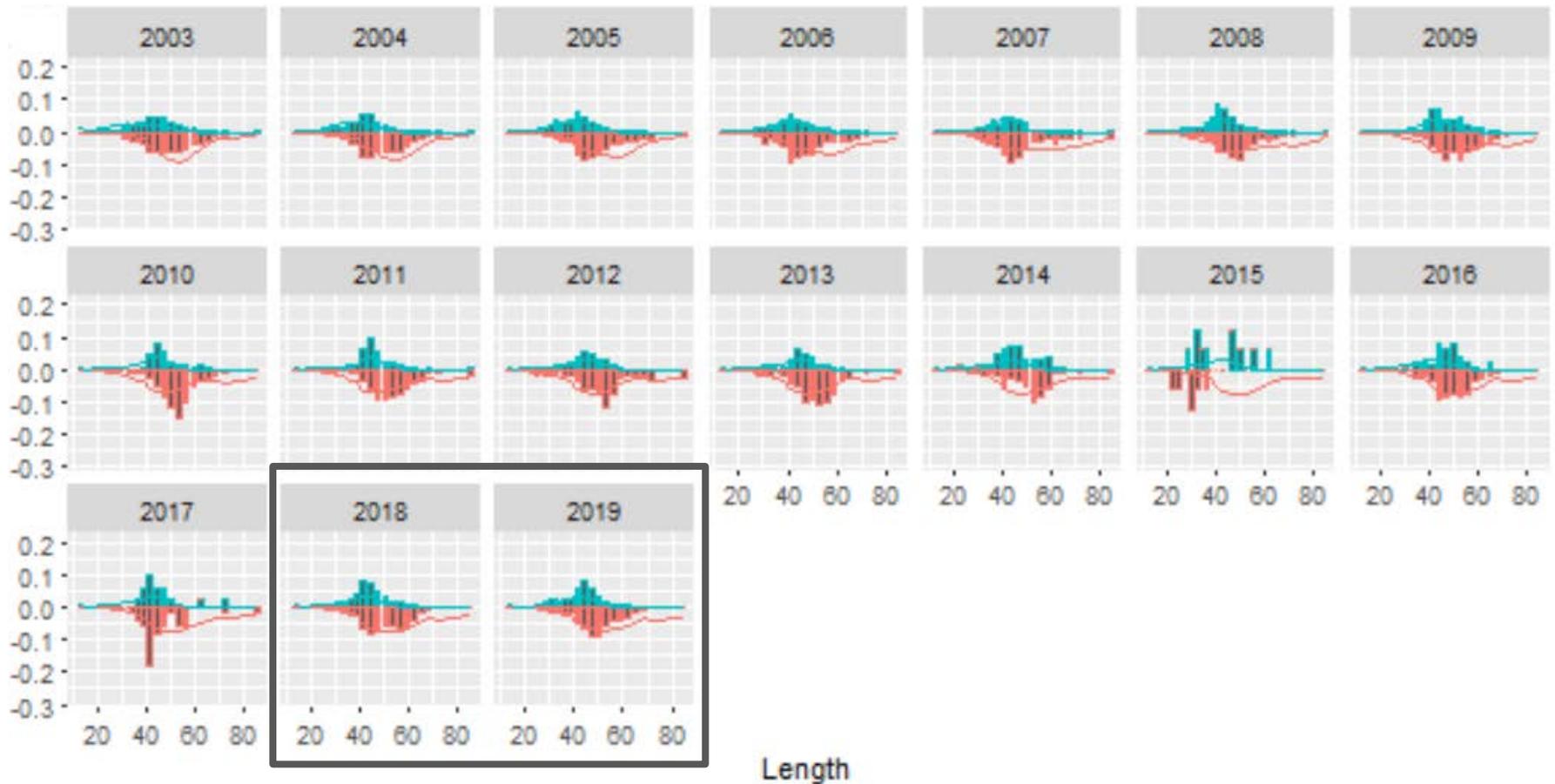
RETROSPECTIVE
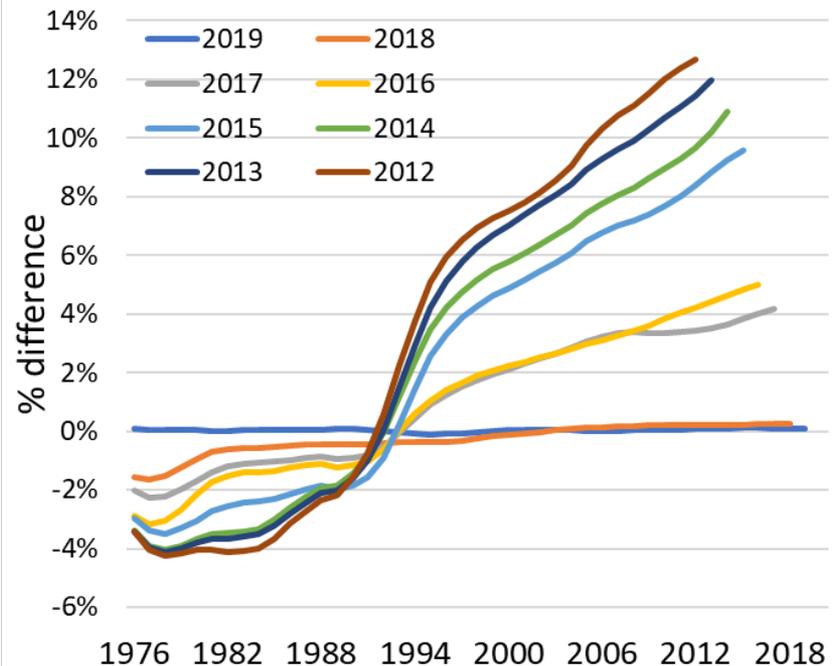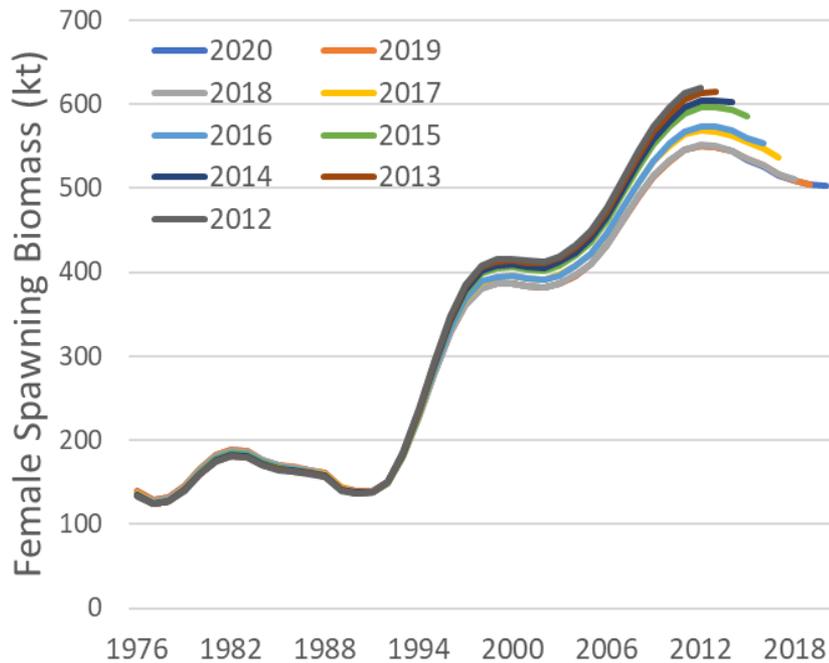
Mohn's Rho = 0.068

RECRUITMENT

Estimated age 1 recruitment
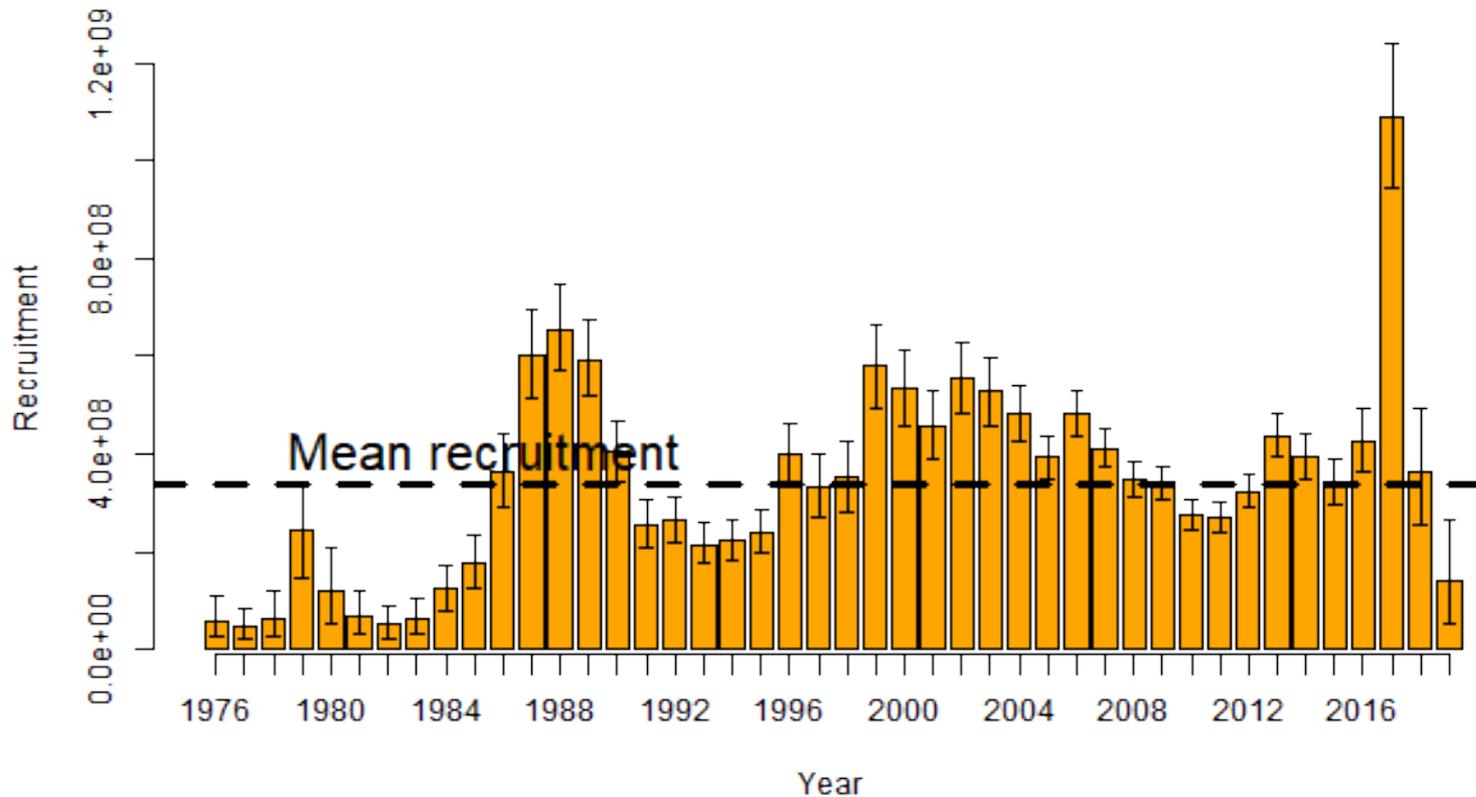
PHASE PLANE
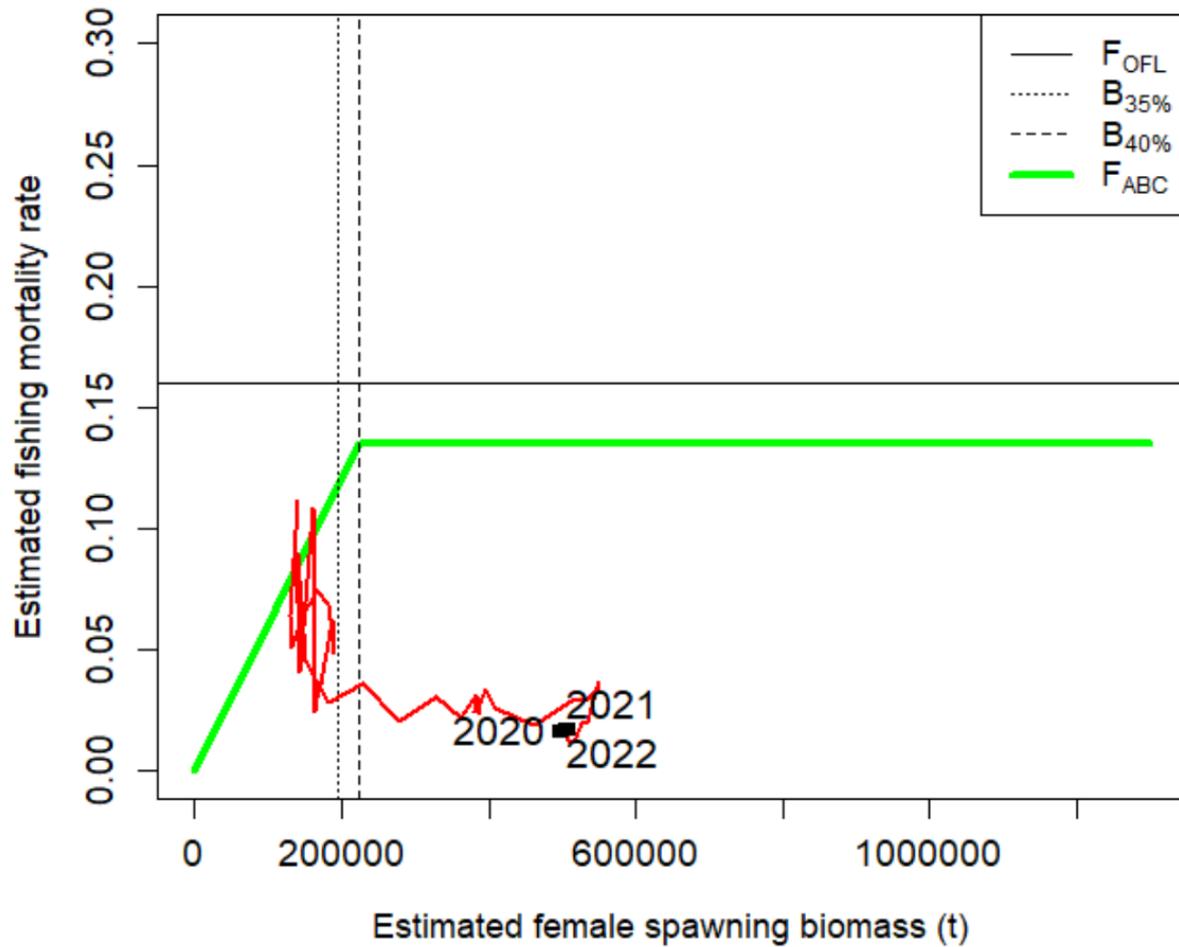
PROJECTIONS
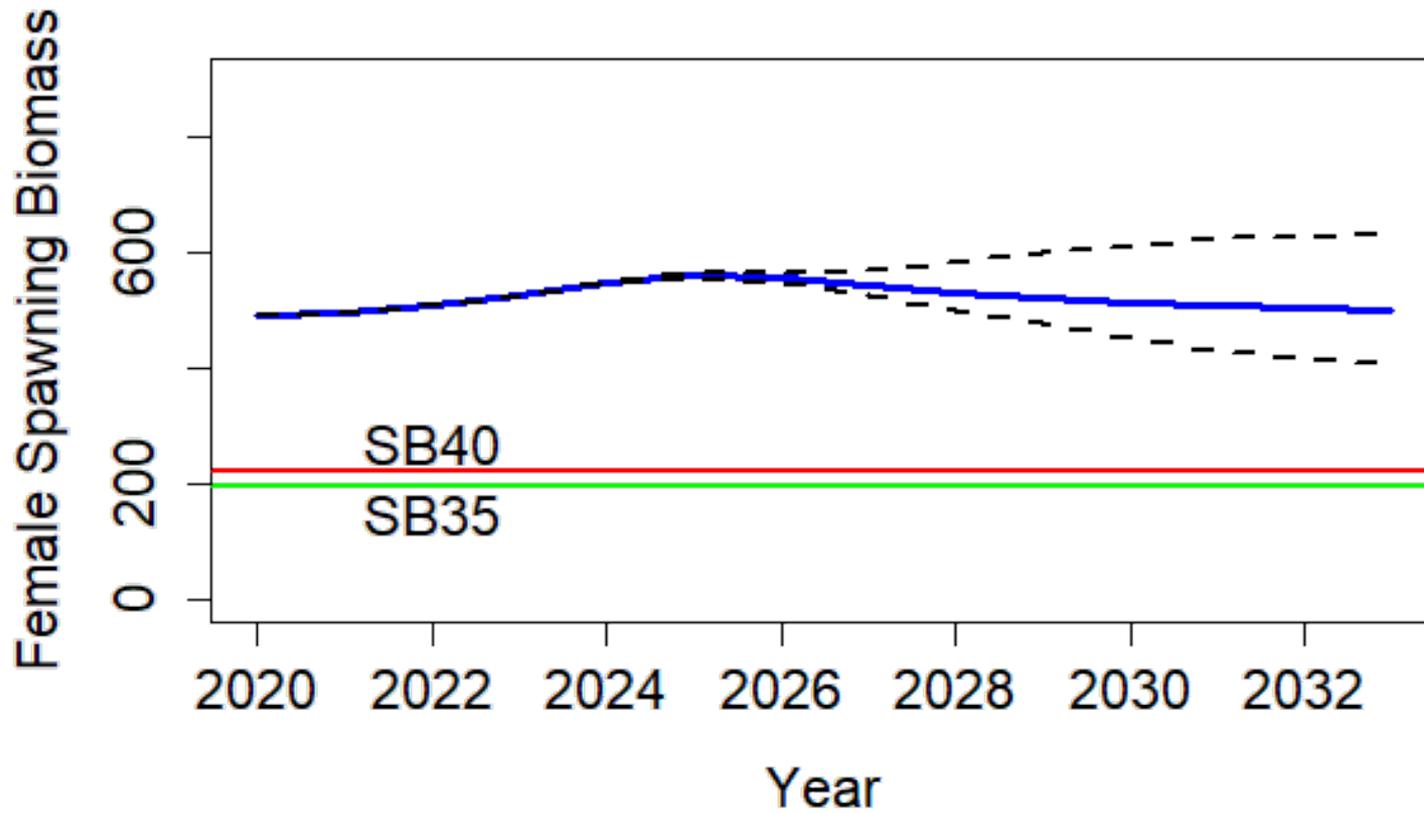
RISK TABLE – NEW THIS YEAR

Assessment-related considerations	Population dynamics considerations	Environmental/ ecosystem considerations	Fishery Performance considerations
Level 1: No apparent concern	Level 1: No apparent concern	Level 1: No apparent concern	Level 1: No apparent concern

All Level 1 so we do not recommend a reduction from max ABC

Assessment – age structured model, mohn's rho =0.068, catch well below ABC (14%) and generally below TAC (~20% of ABC), low concern for one missing survey year as have alt surveys in GOA and that has not been listed as a cause for extra concern in the past

Pop dy and Fishery – SSB and total biomass have steadily increased since 1990s, SSB well above reference points and recent strong recruitment in 2016, suggesting stock doing well

Environment (Zador) – Arrowtooth avoid the cold pool, which was average in 2020, condition was strongly positive suggesting good feeding (generalists), < competitor/predator

QUESTIONS

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