Report of the September 2018 BSAI Groundfish Plan Team meeting

NOAA FISHERIES
Alaska Fisheries Science Center

Grant Thompson

October 2, 2018

Meeting overview

- Dates: September 20-21
- Place: AFSC Seattle lab
- Leaders: Grant Thompson (chair), Diana Stram (coordinator)
- Participation: 11 Team members present, plus numerous AFSC and AKRO staff and members of the public
- File containing minutes includes Joint, BSAI, GOA
  - Bookmarked, and with “clickable” Table of Contents
- Documents and presentation files available on the Team agenda site
  - Link provided on Council agenda site (under item C2)

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Agenda (action items in red)

- Policy for off-cycle assessments
- EBS pollock
- Flatfish CIE review
- BSAI Atka mackerel
- BSAI BS/RE spatial issues
- Arrowtooth flounder CIE review
- Northern Bering Sea Pacific cod genetics
- EBS Pacific cod
- Greenland turbot
- Flathead sole
- Alaska skate catch estimation
- Stock structure evaluation requests
- Approve proposed 2019 and 2020 harvest specifications

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Policy for off-cycle assessments

- The Team discussed its previous policy not to take up any assessments brought forward in an off-year for reasons other than “an immediate conservation concern”
- The Team chose to rescind its policy for off-cycle assessments in light of the Joint Team discussion on this topic and instead refer to the new Joint Team policy (see Joint Plan Team Report)

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EBS pollock (1 of 3)

- Jim Ianelli presented a report this year's EBS pollock fishery to date, and briefly discussed plans for this year's assessment
- The A-season catch has accumulated faster (measured against A-season time fishing) in 2018 than in previous years, and the geographic pattern of A-season fishing seems to be different (more concentrated in the southeast) than in the previous 3 years
- The B-season catch is accumulating at an intermediate rate relative to previous years; and the geographic pattern of B-season fishing is quite different than in 2017, with catch more evenly spread out along the shelf edge (higher concentration in the northwest than 2017)

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EBS pollock (2 of 3)

- New data for the 2018 assessment includes the following:
  - 2018 EBS bottom trawl
    - Plus NBS?
  - 2 years of AVO
  - 2018 acoustic trawl
    - Note that this year's data are somewhat compromised due to a lag in the middle part of survey, and missing an important subarea; options for addressing this include:
      - Re-district index to identical coverage
      - Calibrate on the basis of the relative proportion of biomass from the missing area in other survey years
      - Ignore missing area and inflate variance for 2018
  - 2017 fishery age and weight compositions

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EBS pollock (3 of 3)

- Assessment plans for this year focus on configuring the model to deal with the NBS component of the stock
- The NBS component is implicitly included in the model now as a random effect on EBS survey Q, without linking to the NBS data themselves, but Jim plans to explore a model with explicit movement between areas, which would require inclusion of the NBS data
- The Team recommends that the information content of the movement data from all available studies be evaluated, and that, if the information content is found to be significant, methods be developed that would allow them to be integrated
- The Team recommends that the author consider including a model in which the data from the EBS and NBS surveys are added together, with appropriate weighting of the variances

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Flatfish CIE review (1 of 9)

- This agenda item consisted of three parts:
  1. The CIE review itself
  2. Proposed alternative model for yellowfin sole
  3. Ensemble modeling of northern rock sole
- Part 1: The CIE review itself
  - Tom Wilderbuer presented an overview of the spring 2018 CIE review of BSAI yellowfin sole, northern rock sole, and Alaska plaice
  - Reviewers were Joseph Powers, Yan Jiao, and Matthew Cieri
  - Terms of reference were listed, followed by a summary of the recommendations for each assessment
  - Several requests for alternative model runs were addressed during the review itself

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Flatfish CIE review (2 of 9)

- The CIE review itself, continued
  - Disposition of most other recommendations yet to be determined
  - Exceptions: see Parts 2 and 3
- Part 2: Proposed alternative model for YFS
  - Tom reported on his planned response to the following CIE recommendation:
    - "Use new formulation of Q that includes start date and interaction"
  - This stems from a manuscript by D. Nichol (in final review at *Fisheries Research*), showing that the performance of the temperature-dependent survey Q in the current YFS model can be improved significantly by including survey start date and a temperature-and-date interaction term

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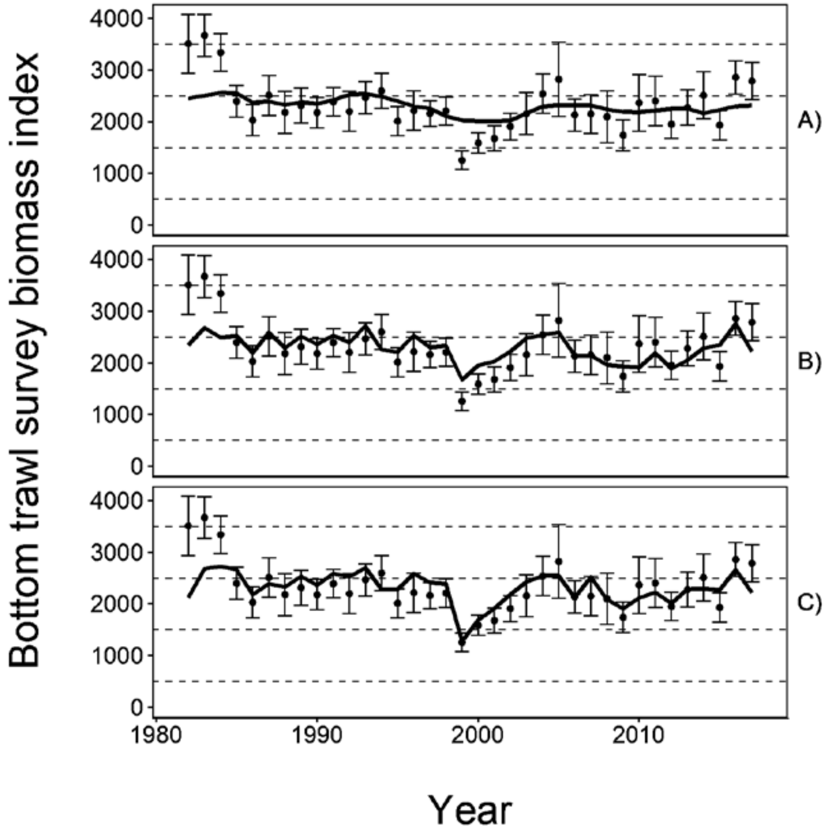
Flatfish CIE review (3 of 9)

- Proposed alternative model for YFS, continued
- A: Q = f(T), B: Q = f(T,D), C: Q = f(T,D,T&D)



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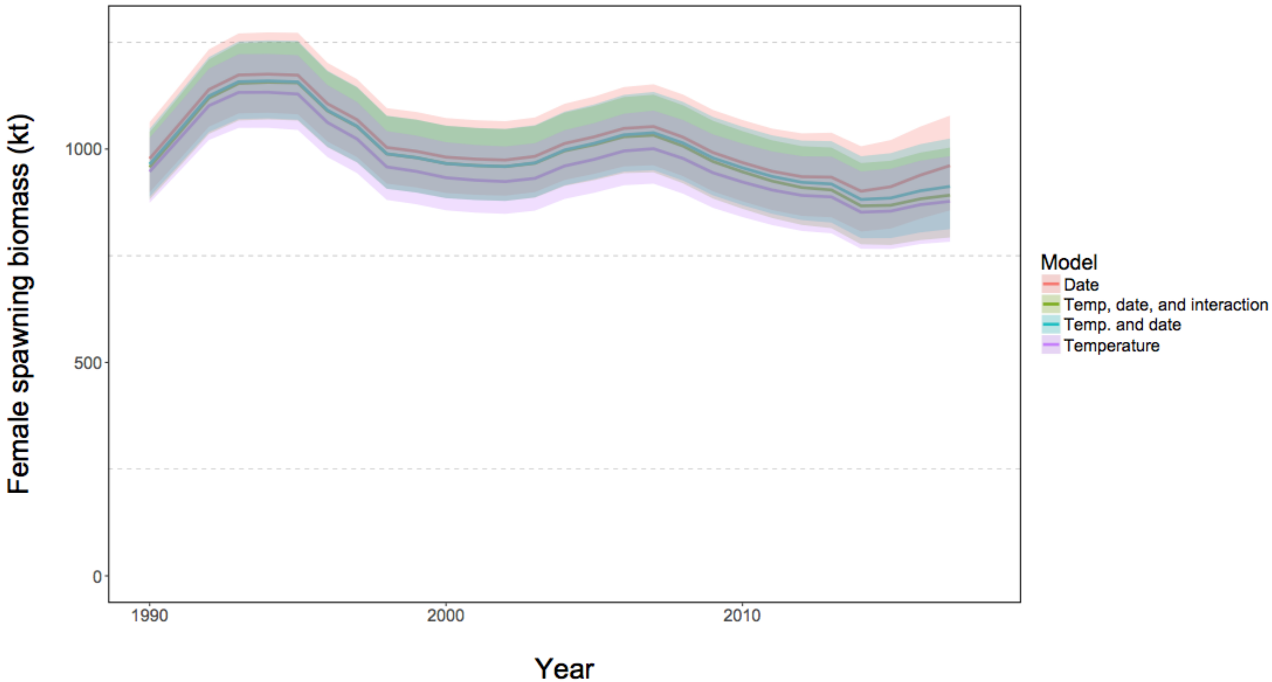
Flatfish CIE review (4 of 9)

- Proposed alternative model for YFS, continued



- The Team recommended that the new yellowfin sole model with the start date and interaction term be presented in November, and also suggested including information on the proposed mechanism that underlies the inclusion of the start date and the interaction term in the model

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Flatfish CIE review (5 of 9)

- Part 3: Ensemble modeling of NRS
  - CIE recommendations:
    - "Recommend using model run with M estimated for both sexes ... instead of fixed values for both sexes as in base model"
    - "Fixing M at 0.15 is appropriate"
    - "Explore free floating Q (unconstrained)"
  - During the June BSAI Team workshop, authors volunteered to try ensemble modeling of NRS
  - The CIE recommendations gave rise to an ensemble of 3 models (others examined, but not included in final ensemble):
    1. Base model: Q prior (mean=1.5, CV=5%), M=0.15 both sexes
    2. Same as Model 1, but male M estimated
    3. Same as Model 2, but Q prior CV=20%

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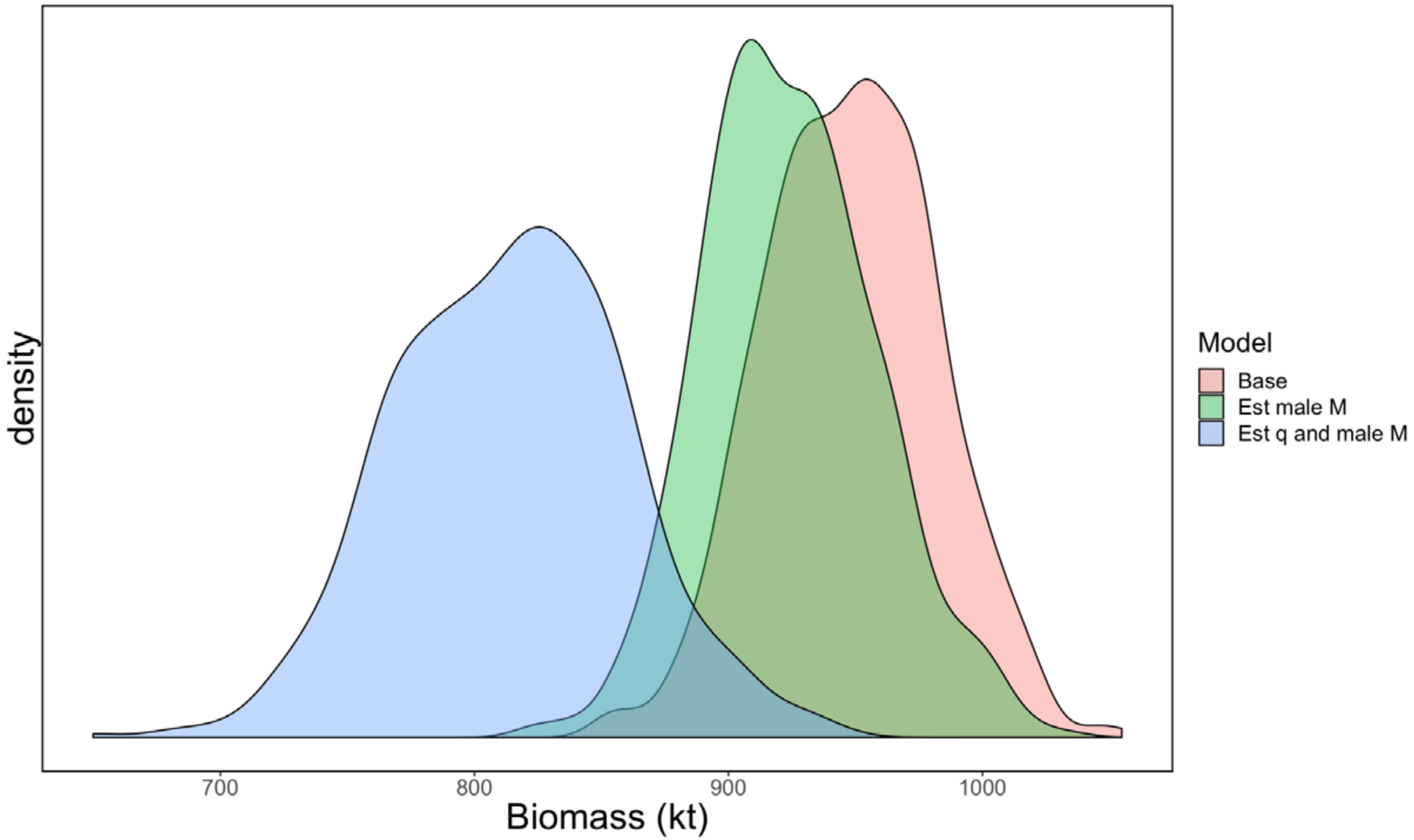
Flatfish CIE review (6 of 9)

- Ensemble modeling of NRS, continued: age 7+ biomass



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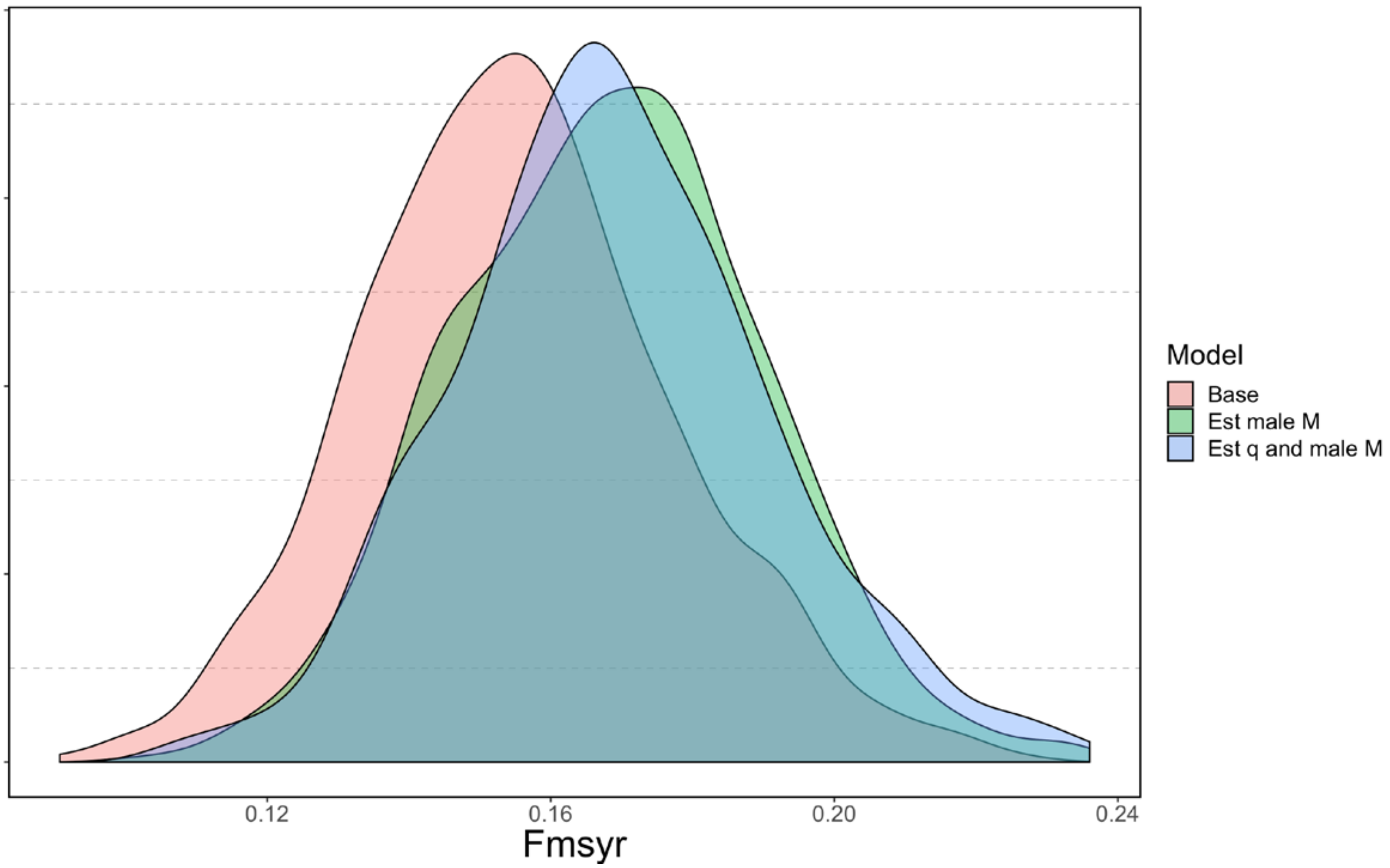
Flatfish CIE review (7 of 9)

- Ensemble modeling of NRS, continued: F_{MSY} harvest rate



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Flatfish CIE review (8 of 9)

- Ensemble modeling of NRS, continued: reference point comparison

	FOFL	FABC	Biomass	ABC	OFL	Buffer
Base	0.156	0.152	948	144	147	2.1%
Estimate Male M	0.169	0.166	924	153	156	1.7%
Estimate Male M, q	0.169	0.166	812	135	137	1.9%
“Stacked” ensemble	0.164	0.161	893	143	147	2.3%
Mean point estimates	0.165	0.161	895	144	147	1.8%

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Flatfish CIE review (9 of 9)

- Ensemble modeling of NRS, continued:
  - Overall, Models 2 and 3 fit the data better than the base model
  - However, the base model fit the survey age composition data better
    - The authors feel that this may be due to the fact that the initial age composition varies by sex
    - Considering a sex-specific “offset” for selectivity may be appropriate (female and male selectivity both reach an asymptote of 1.0 in all three models)
  - The selected ensemble seemed to consist mainly of nested models, and a broader set of alternatives might be preferred
  - The Team recommended that the NRS ensemble be presented in November and also asked that the authors consider an additional model alternative involving an offset on selectivity to account for the unequal sex ratio

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BSAI Atka mackerel (1 of 10)

- Sandra Lowe presented her response to 6 of 8 items the Plan Team and the SSC had previously recommended that she evaluate regarding the BSAI Atka assessment

1. Investigate which parameters (including derived quantities) are changing in the retrospective peels that might contribute to the relationship between historical scale and number of peels:
    - This investigation seems to indicate that the model is prevented from fitting the 2012 and 2016 large drops in survey biomass
    - The author feels that the retrospective bias is due to the data rather than any problems with the model
    - The model is trying to rectify these points
    - There was discussion within the Team regarding the validity of this; no recommendations were made

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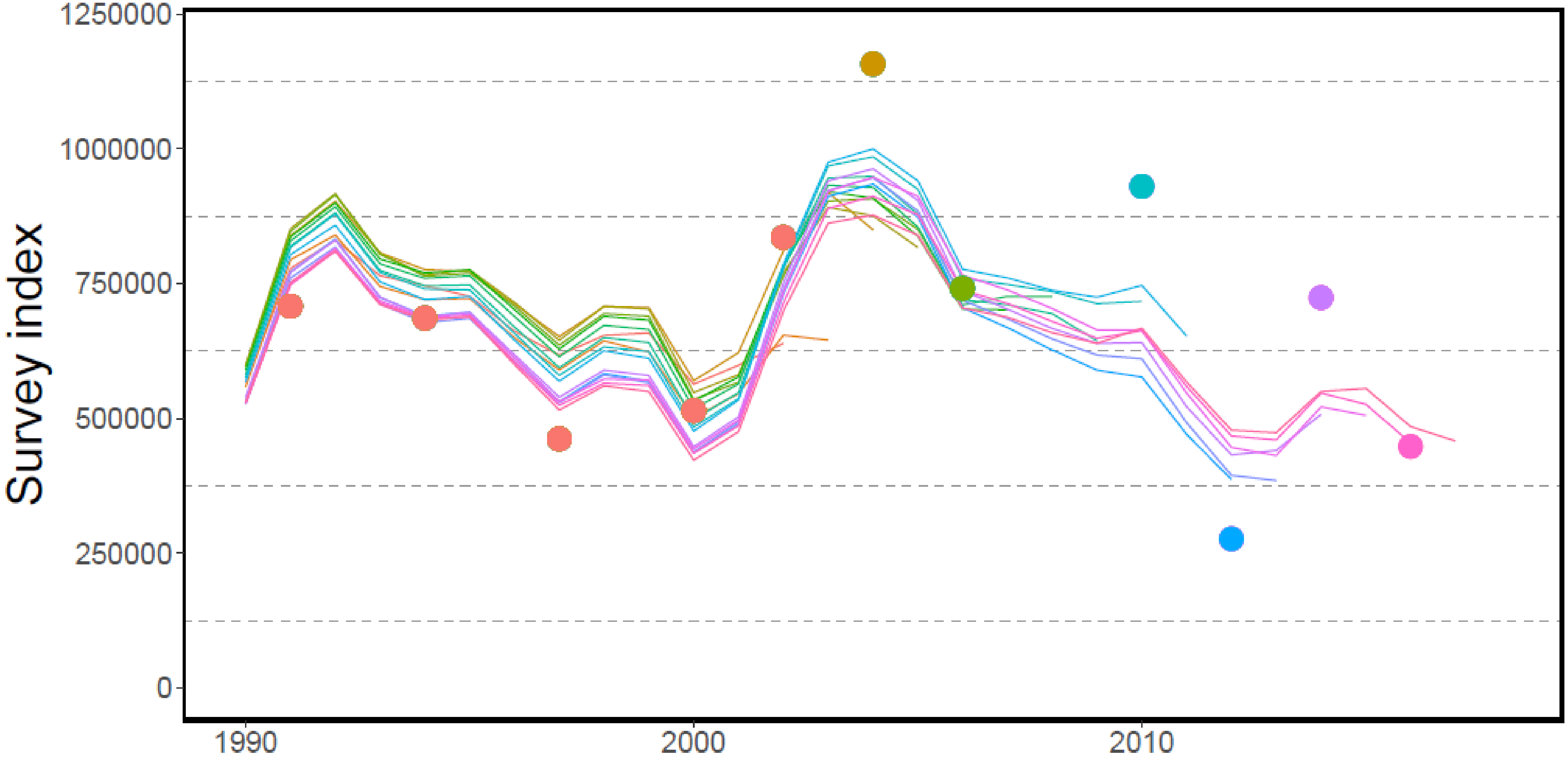
BSAI Atka mackerel (2 of 10)

- Retrospective fits to survey data (Figure 3)



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BSAI Atka mackerel (3 of 10)

2. Consider dropping the 1986 age composition from the analysis, to be consistent with the policy of not using pre-1991 survey data:
    - The author performed runs with and without the 1986 age data
    - This showed no real benefit to including 1986 age data
    - There is also an inconsistency, because the assessment excludes the 1986 survey index, while it includes the 1986 age data
    - The author proposed to exclude the 1986 survey age data from future assessments
    - The Team endorsed the author's proposal to exclude the 1986 survey age data from future assessments

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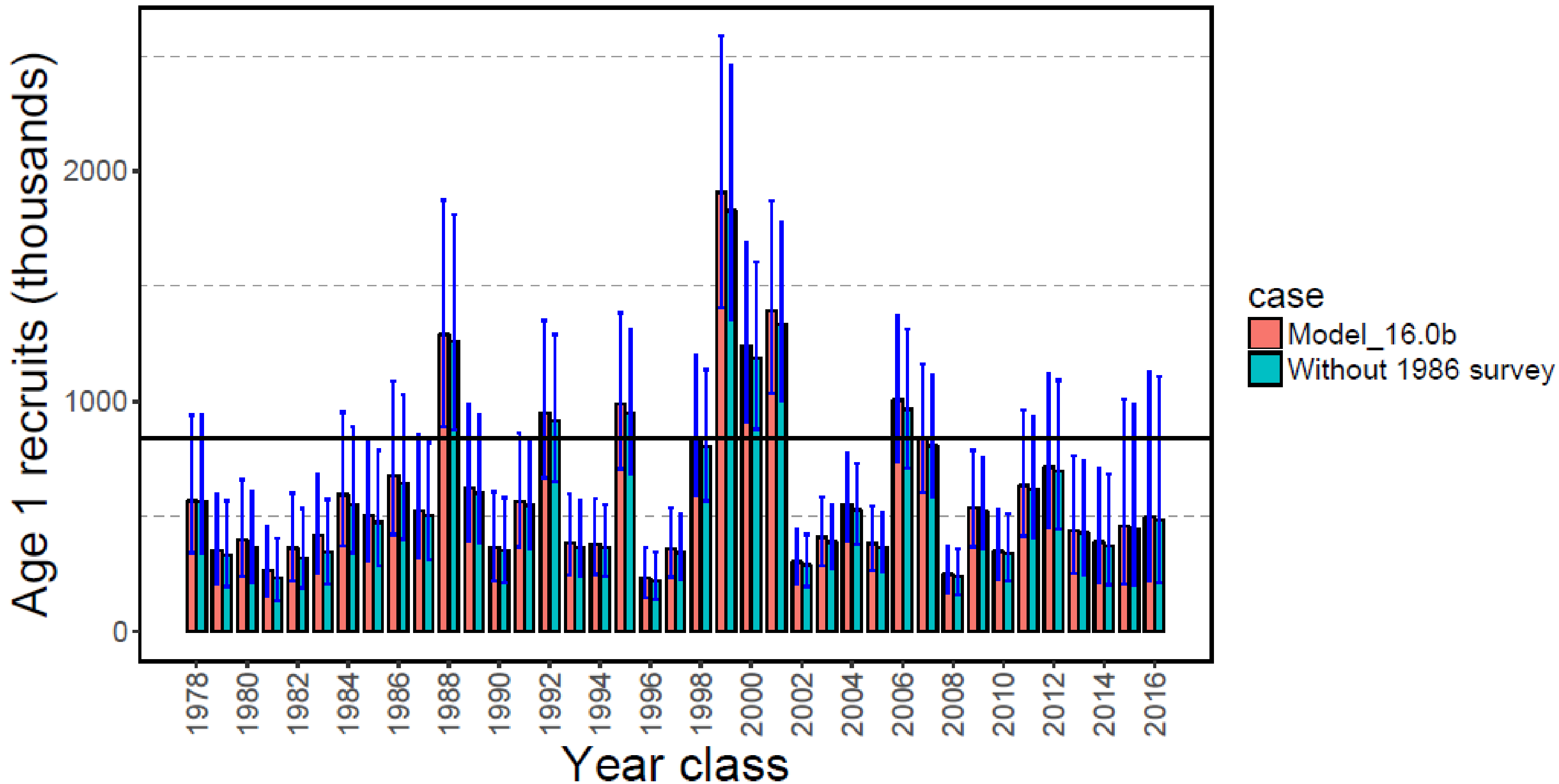
BSAI Atka mackerel (4 of 10)

- Effect of using 1986 survey agecomp (Figure 5)



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BSAI Atka mackerel (5 of 10)

3. Improve documentation for the process of using Francis weights to tune the constraint on time variability in fishery selectivity
   - See document
4. Continue to investigate fishery selectivity time blocks, with blocks linked to identifiable changes in the fishery:
   - Additional time blocks were added to the model
   - Addition of the 1999-2010 Steller sea lion regulation time block resulted in degradation of fit to the fishery age comps and tended to obscure significant recruitment events, and may also miss age-specific targeting
   - The author concluded that she will not pursue time blocks, unless the Team or SSC requests that they be implemented to replace annually varying selectivity with constraints as in Model 16.0b

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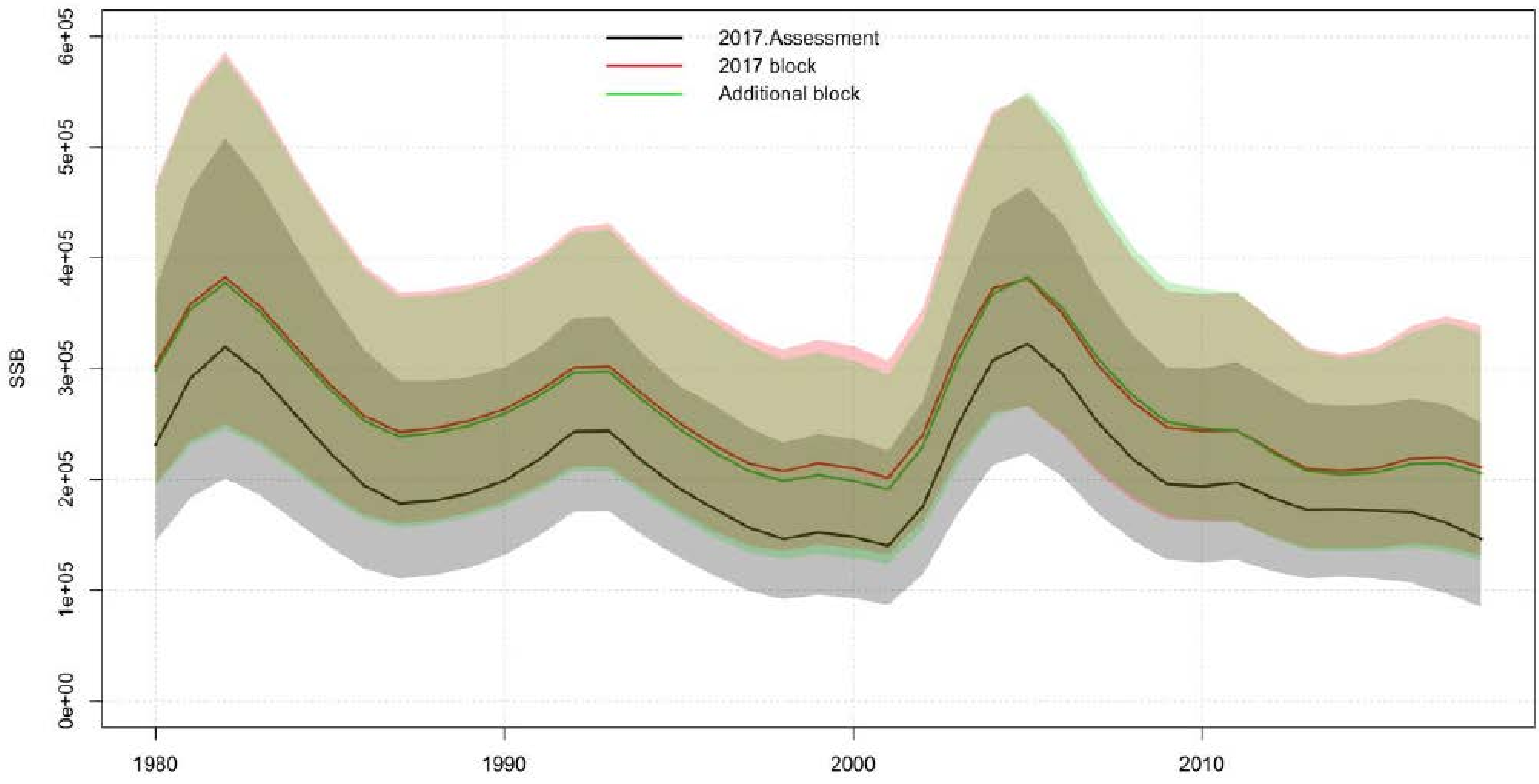
BSAI Atka mackerel (6 of 10)

- Effects of time-block versus annually varying selectivity (Figure 8)



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BSAI Atka mackerel (7 of 10)

5. Evaluate the sensitivity of model results to an assumed average sample size of 100 for the fishery age composition data, or better yet (if possible), find a way to tune the sample size and the constraint governing the amount of time variability in fishery selectivity simultaneously:
   - The authors made runs with average sample size (N_{ave}) changed to 50 (half) and 200 (double), with results as expected in terms of degree of fishery selectivity variability
   - Discussion focused on the issue of how to choose N_{ave}
     - Try 3 values, then pick the middle one; estimate statistically?
   - Author's responses;
     - The assumption of N_{ave}=100 is consistent with the historical number of tows sampled, and will be retained for this year
     - This is a research priority and will continue to be explored

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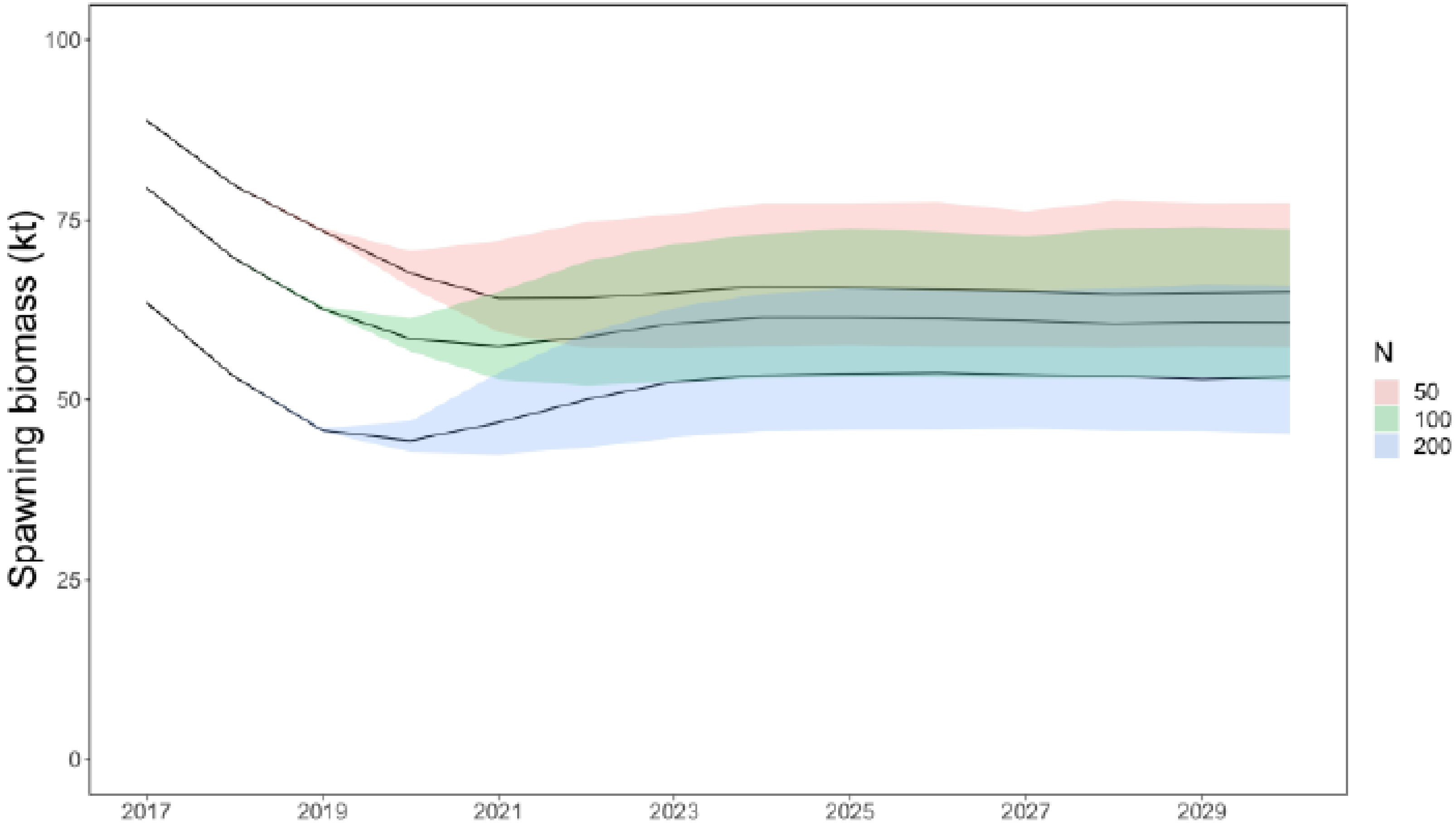
BSAI Atka mackerel (8 of 10)

- Effects of alternative average fishery sample sizes (Figure 14)



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BSAI Atka mackerel (9 of 10)

6. Continue the investigation of age-dependent natural mortality:
   - Three established methods were used to evaluate this
   - Largest impact is on ages 1-2
   - Minor increases in 1-year ABC and OFL resulted
   - Results did not indicate clearly that age-specific natural mortality is an improvement as ages 1-2 are not selected and have very little impact on stock dynamics
   - The author suggests continuing with the current accepted model (Model 16.0b), including the assumption of fixed constant M=0.3

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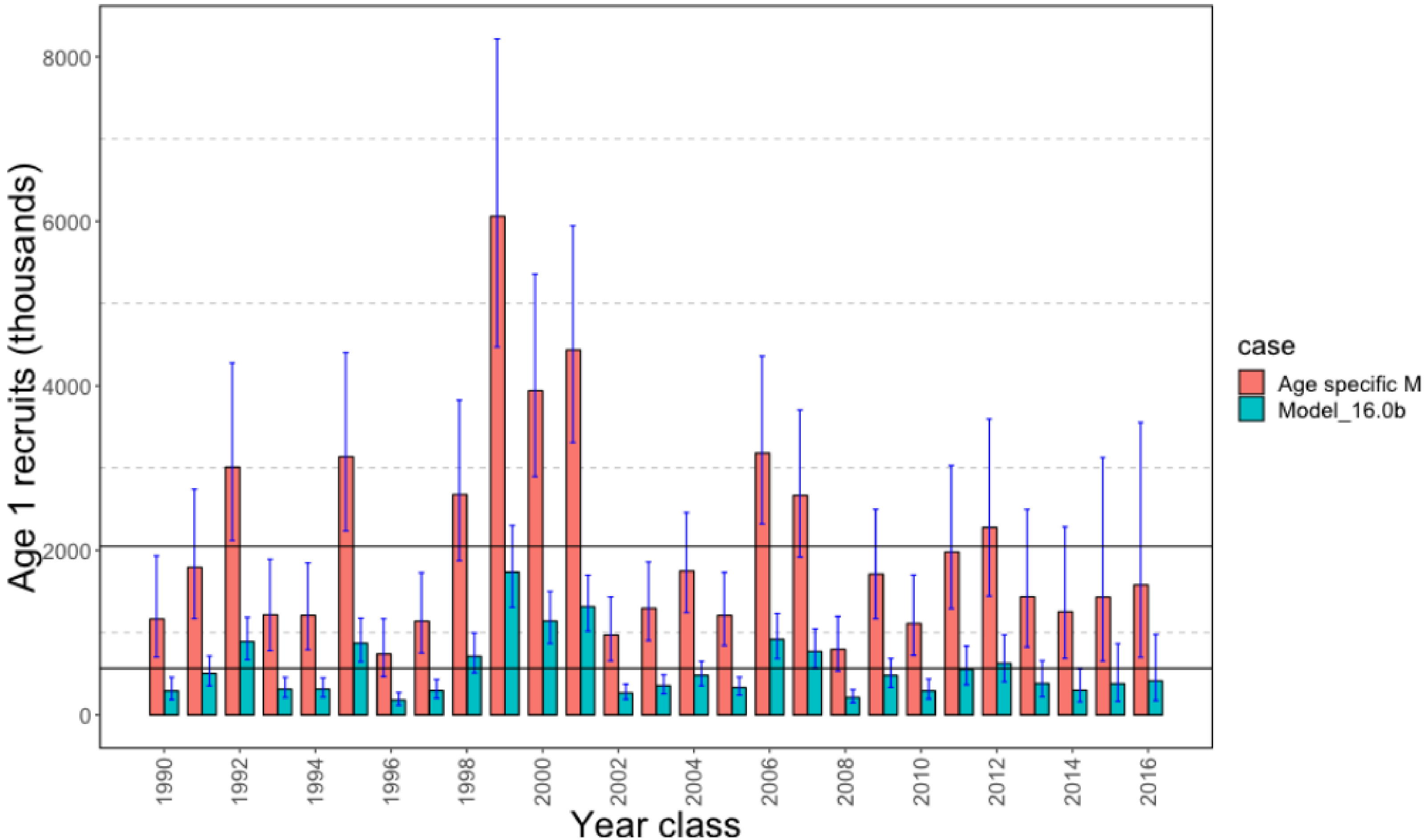
BSAI Atka mackerel (10 of 10)

- Age-dependent M (Figure 17)



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BSAI BS/RE spatial issues (1 of 9)

- Paul Spencer provided an overview of options for modeling the BSAI blackspotted/rougheye (BS/RE) stock complex
- The options were provided in response to an SSC request to reevaluate the spatial area for the modeled stock
  - Currently, the model is applied to a BSAI-wide stock with a single fishery and two survey indices (AI survey and EBS slope survey)
- Paul noted issues with the 2016 model, including:
  - Inconsistencies in year class strength between the EBS slope survey and AI trawl survey age compositions
  - Uncertainty in the availability of the BSAI population to each survey
  - Age and length composition data not consistent with the time series of AI survey biomass estimates
  - Projected population trends are based on relatively uncertain estimates of recent year classes

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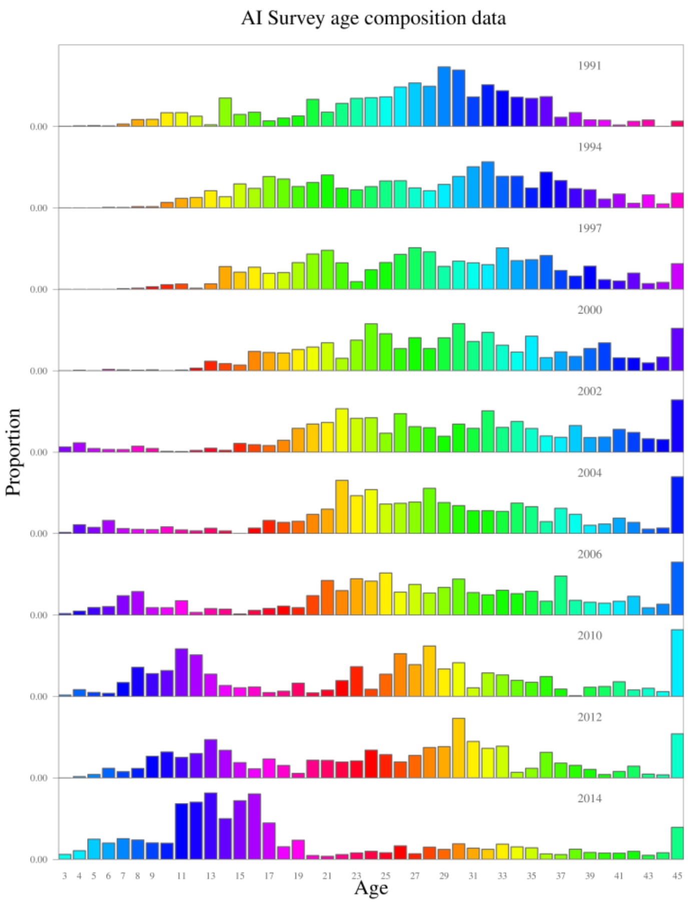
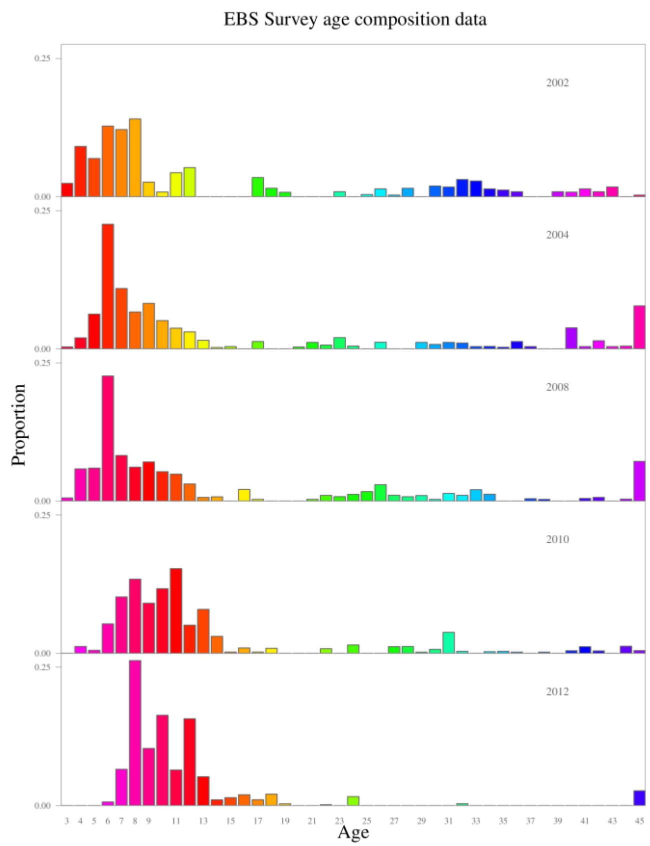
BSAI BS/RE spatial issues (2 of 9)

- Comparing survey agecomps between areas (author's slide 6)





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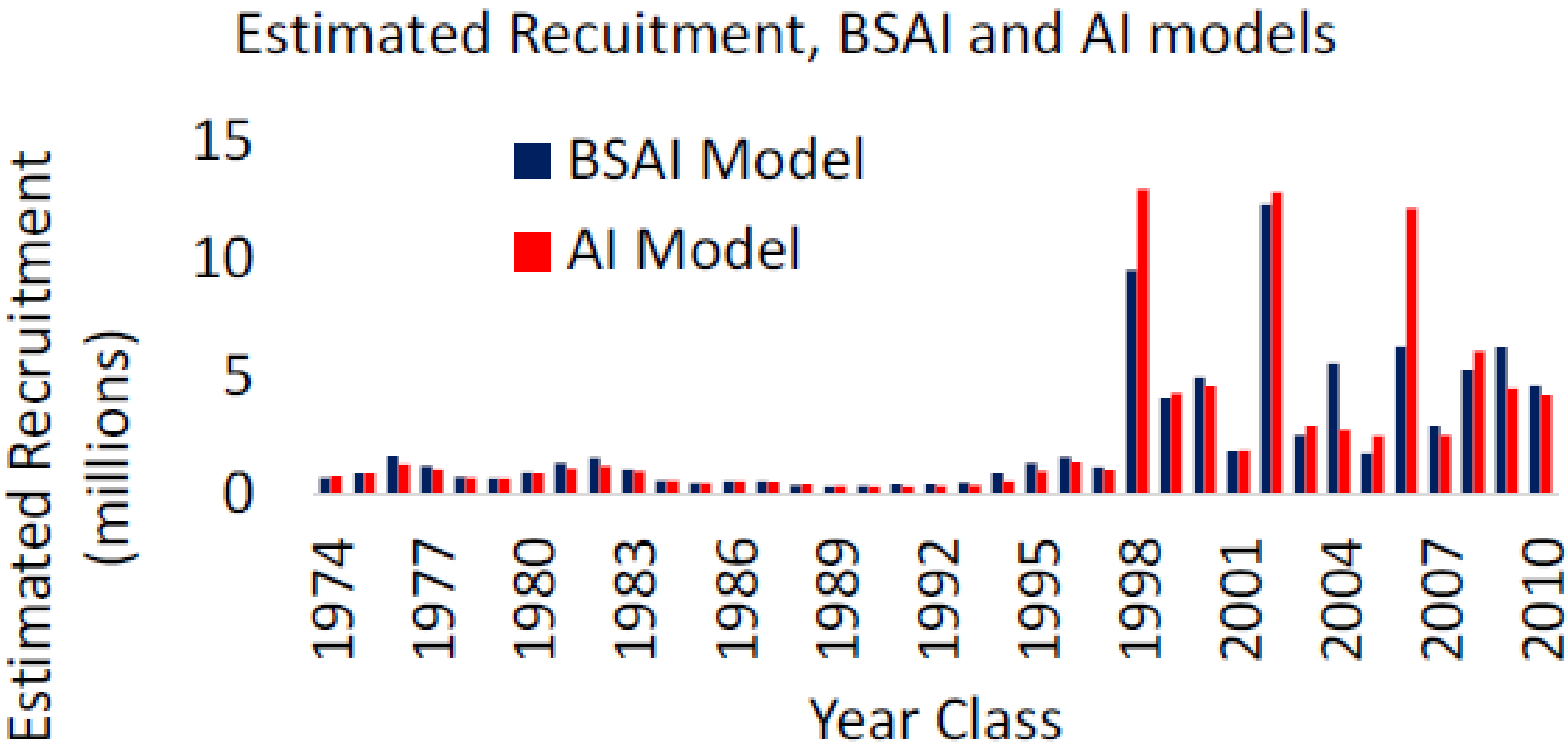
BSAI BS/RE spatial issues (3 of 9)

- Author's slide 8



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BSAI BS/RE spatial issues (4 of 9)

- Other age-structured assessments with both AI and EBS components generally use the proportions of the combined survey biomass across areas, either as fixed values or as informing prior distributions for Q
- The need to specify a prior distribution for Q would not be necessary if it could be reasonably estimated
- However, the estimates of Q obtained without prior distributions in this assessment seemed implausible
- Age and length composition data degrade the fit to survey biomass in the AI while improving the fit to the EBS slope data
- There was discussion of combining these into a single index in order to address conflicting trends, but this is complicated by the fact that surveys are done in different years, with different designs and gear, and applied in different bottom habitats

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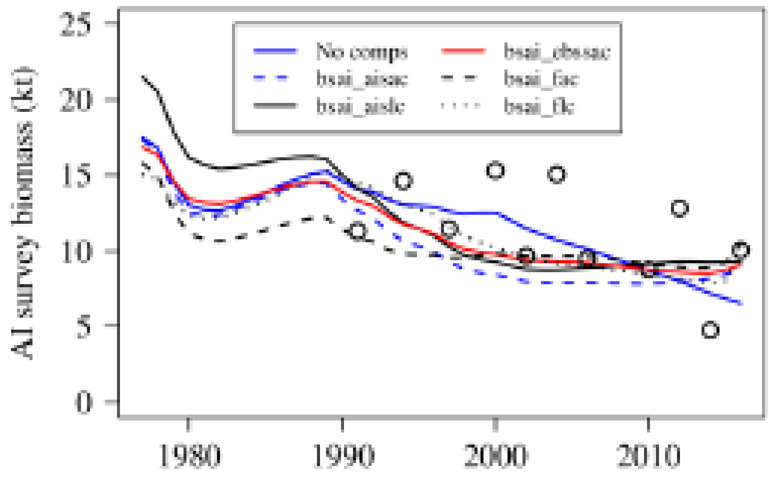
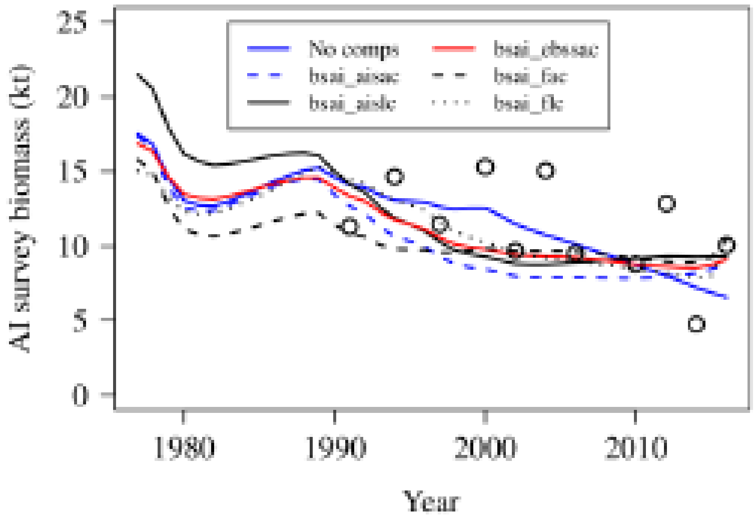
BSAI BS/RE spatial issues (5 of 9)

- Adding any composition data degrades fit to AI survey biomass series
- Adding any composition data improves fit to EBS survey biomass series
- Author's slide 15





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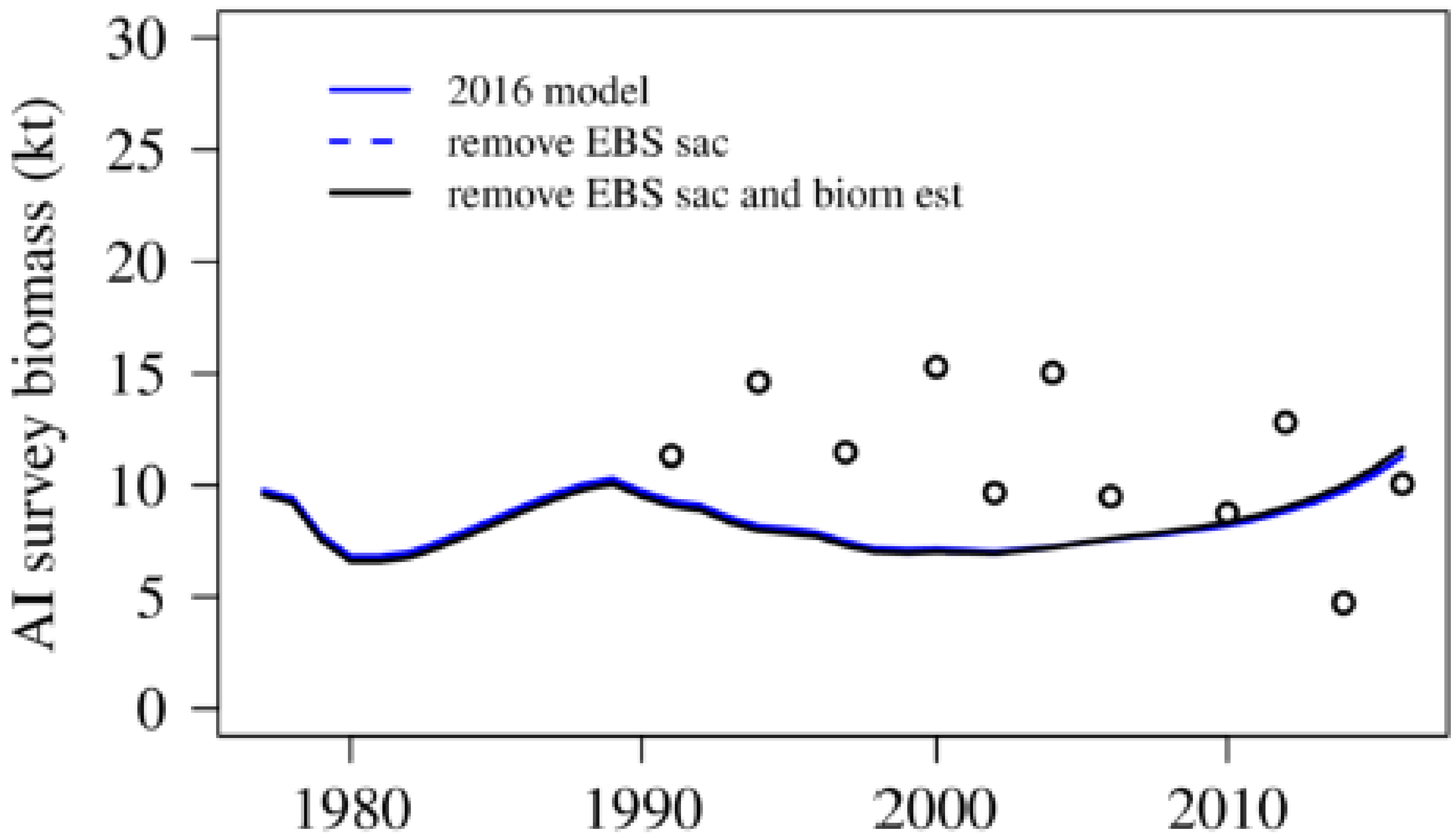
BSAI BS/RE spatial issues (6 of 9)

- Effect of removing EBS data from the 2016 model (author’s slide 18)



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BSAI BS/RE spatial issues (7 of 9)

- The Team discussed the potential to explore a two-area model
  - One suggestion was to use time-varying recruitment proportions with no movement as an alternative to a full migration model
  - However, spatial subdivision of the data is complicated by the sparsity of the data in the EBS once the areas are split
  - The fact that two species are involved is also a complicating factor
    - Rougheye rockfish are rare in the AI, but both species are present along the EBS slope
    - This may account for some of the differences in the composition data between the EBS and AI

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BSAI BS/RE spatial issues (8 of 9)

- Paul proposed evaluation of the following alternatives for November:
  1. Current BSAI model (employed since 2016)
  2. Combination of an age-structured model for the AI with a Tier 5 approach for the BS
  3. Tier 5 considerations for both areas
- The Team recommends the author move forward with these suggested approaches for the November assessment
- The Team also recommends consideration of a two-area approach as outlined above in the future (i.e., beyond 2018)

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BSAI BS/RE spatial issues (9 of 9)

- Finally, the Team notes that other assessments exist in which multiple species are combined within an age-structured assessment model (e.g., flathead sole and Bering flounder), and identifying best assessment practices for these situations was the focus of a recent (unfunded) research proposal
- The Team recommends that AFSC assessment scientists continue to pursue research on mixed-stock assessment techniques

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Arrowtooth flounder CIE review (1 of 7)

- Ingrid Spies developed new models that addressed comments from the Team and the SSC in November and December of 2016, and the CIE review in the spring of 2017
  - This was done in response to the Joint Teams' request from September of 2017 for a document outlining the author's plans for addressing the CIE reviewers' comments
- Overview of the base model (15.1b):
  - Male and female M is fixed at 0.35 and 0.20, respectively
  - The model estimates male and female parameters separately
  - For years in which there are no age data, length data are converted to age via a length-age conversion matrix
  - Uses data from the AI, EBS shelf, and EBS slope surveys
  - Age-based fishery selectivity is estimated non-parametrically and constrained to be monotonically increasing, separately by sex

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Arrowtooth flounder CIE review (2 of 7)

- Alternative models:
  - Model 15.1c: same as base model, except length-age conversion matrix was smoothed, as requested by Team/SSC
  - Model 18.0: same as 15.1c, except with length-based rather than age-based selectivity for all three surveys
  - Model 18.1: same as 18.0, except with logistic selectivity by age for the fishery rather than non-parametric
  - Model 18.2: same as 18.0, except with logistic selectivity by length for the fishery rather than non-parametric
  - Model 18.3: same as 15.1b, except with an ageing error matrix
  - Model 18.4: same as 18.0, except with Lorenzen M
  - Model 18.5: same as 18.0, except with Gislason M
  - Model 18.6: same as 18.0, except with an ageing error matrix

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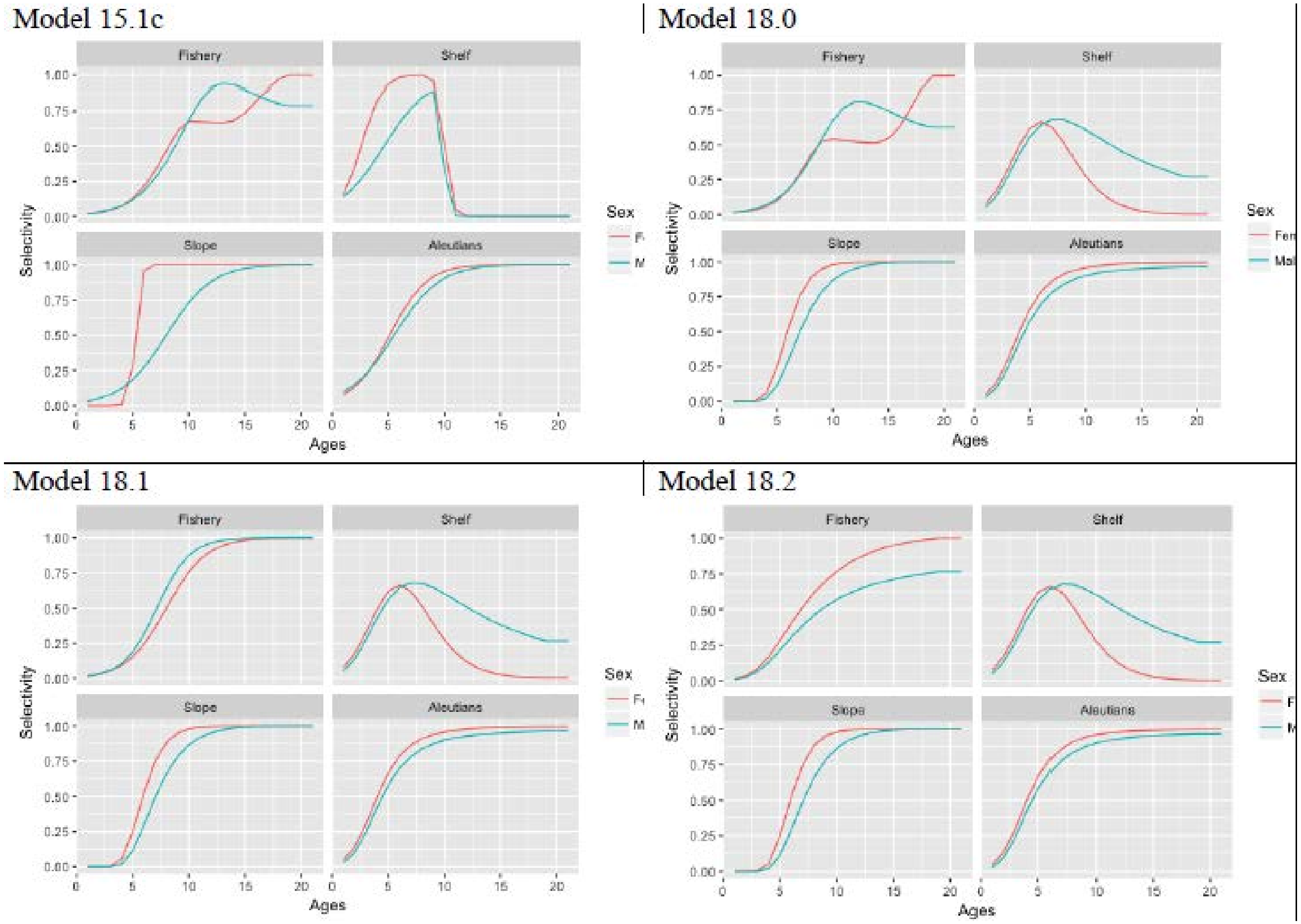
Arrowtooth flounder CIE review (3 of 7)

- Selectivity comparison, Models 15.1c and 18.0-18.2 (Figure 1a)



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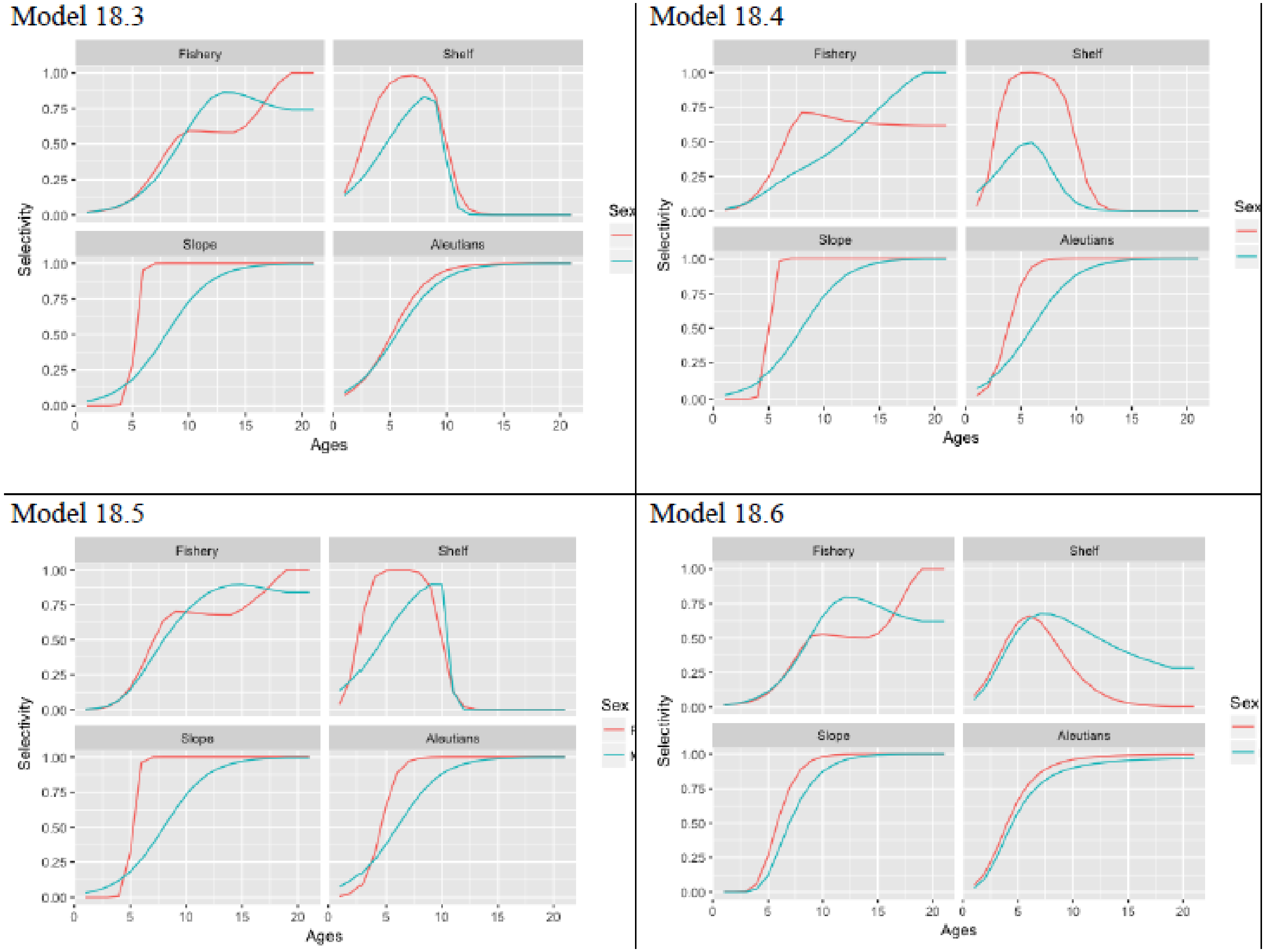
Arrowtooth flounder CIE review (4 of 7)

- Selectivity comparison, Models 18.3-18.6 (Figure 1b)



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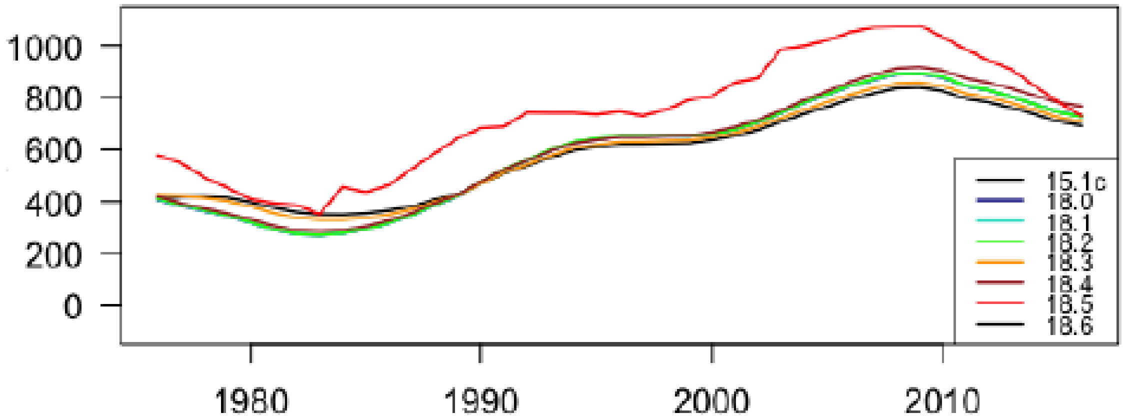
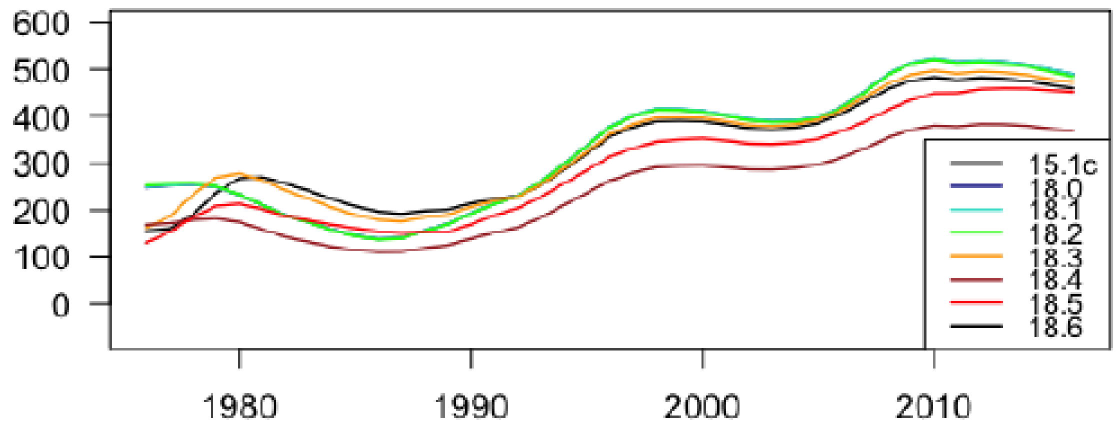
Arrowtooth flounder CIE review (5 of 7)

- Total biomass comparison (Figure 3)



- Female spawning biomass comparison (Figure 4)



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Arrowtooth flounder CIE review (6 of 7)

- Model evaluation:
  - Models 18.0-18.2 did not improve the survey biomass likelihoods, but they did improve the survey age and length likelihoods, as well as the recruitment likelihood (relative to Model 15.1c)
  - Model 18.3 had the lowest AIC of all models
  - Models 18.4 and 18.5 did not converge and resulted in poor fits to the age data for the EBS shelf survey
  - Model 18.6 had the lowest –lnL of all models
  - Models 18.3 and 18.6 (the two models incorporating an ageing error matrix) are preferred by the author, who plans to bring these forward, together with the base model, in November

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Arrowtooth flounder CIE review (7 of 7)

- The CIE review requested investigation of other ways to integrate the three surveys
  - Ingrid described two area-specific models (not included in the assessment document) that addressed this:
    - Model 18.7 applied to the EBS shelf and slope only, and Model 18.8 applied to the AI only
  - These models indicated changes in biomass proportions among the areas, with a large increase in the AI and lowered proportions in the EBS shelf and slope compared to the base model
- The Plan Team recommends more investigation of Models 18.7 and 18.8, but not for November 2018
- An ageing error matrix should be included

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EBS Pacific cod (1 of 17)

- 15 Team and SSC comments addressed (see document)
- Data:
  - Fishery sizecomp data same as in last year's assessment
  - Fishery agecomp data augmented by newly aged 2010 and 2011 samples in the 2 models that use fishery agecomp data
  - EBS survey data (index, sizecomp, agecomp) same as in last year's assessment, except for 2 models that examine inclusion of the 2 NW EBS strata (82 and 90)
  - NBS survey data (index and sizecomp) used in 4 models
  - Environmental indices used as parameter covariates in 8 models and also used in addressing SSC request for "impending severe decline" analysis

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EBS Pacific cod (2 of 17)

- Model 16.6 was adopted by the SSC in 2016 as the new base model
- In contrast to the previous base model (Model 11.5, which had been in use since 2011), Model 16.6 is a very simple model
- Its main structural features are as follow:
  - One fishery, one gear type, one season per year
  - Logistic age-based selectivity for both the fishery and survey
  - External estimation of time-varying weight-at-length parameters and the standard deviations of ageing error at ages 1 and 20
  - All parameters constant over time except for recruitment and fishing mortality
  - Internal estimation of all natural mortality, fishing mortality, length-at-age (including ageing bias), recruitment (conditional on Beverton-Holt recruitment steepness fixed at 1.0), catchability, and selectivity parameters

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EBS Pacific cod (3 of 17)

- Model structural differences, relative to Model 16.6 (Table 2.1.6)

	EBS survey area	EBS survey area	Growth covariates	Growth covariates	Time-vary *Q*, w/o NBS	Time-vary *Q*, w/o NBS	Time-vary *Q*, with NBS	Time-vary *Q*, with NBS	Previous models	Previous models	Migration	Migration	*M* covariates	*M* covariates	Omnibus
Feature	16.6a	16.6b	16.6c	16.6d	16.6e	16.6f	16.6g	16.6h	17.2	17.6	18.1	18.2	18.3	18.4	18.5
Separate *Q* for EBS survey 1982-1986		x													
K linked to environmental covariate			x												
Lmin linked to environmental covariate				x											
Randomly time-varying EBS *Q*					x		x			x					
EBS *Q* linked to environmental covariate						x		x							x
NBS *Q* and selectivity estimated							x	x							x
Randomly time-varying NBS *Q*							x	x							
Adjust timing of fishery and survey									x	x					
Prior distribution for *M*									x	x					
Flat-topped double normal selectivity									x	x					
Randomly time-varying fishery selex									x	x					
Harmonic mean composition weighting									x	x					
Randomly time-varying survey selex										x					
Randomly time-varying *Lmin*										x					
EBS-NBS migration											x	x			x
Randomly time-varying migration											x				x
Migration linked to environ. covariate												x			
M linked to environmental covariate													x	x	x
Age-varying *M*														x	x
Block-specific steepness estimated															x

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EBS Pacific cod (4 of 17)

- Model data sets (Table 2.1.7)

Category	Model	Comp. N	EBS survey 1982-1986	EBS survey 1987-2017	Fishery ages	NBS	Areas	Env. var. 4	Env. var. 5	Env. var. 6
Base model	16.6	mean=300	yes	standard	no	no	1	n/a	n/a	n/a
EBS survey area	16.6a	mean=300	no	expanded	no	no	1	n/a	n/a	n/a
EBS survey area	16.6b	mean=300	yes	expanded	no	no	1	n/a	n/a	n/a
K covariates	16.6c	mean=300	yes	standard	no	no	1	fsh_cndtn	n/a	n/a
K covariates	16.6d	mean=300	yes	standard	no	no	1	bttm_tmp	n/a	n/a
Time-vary Q, w/o NBS	16.6e	mean=300	yes	standard	no	no	1	n/a	n/a	n/a
Time-vary Q, w/o NBS	16.6f	mean=300	yes	standard	no	no	1	NPI	n/a	n/a
Time-vary Q, with NBS	16.6g	mean=300	yes	standard	no	yes	1	n/a	n/a	n/a
Time-vary Q, with NBS	16.6h	mean=300	yes	standard	no	yes	1	NPI	n/a	n/a
Previous models	17.2	no. hauls	yes	standard	yes	no	1	n/a	n/a	n/a
Previous models	17.6	no. hauls	yes	standard	yes	no	1	n/a	n/a	n/a
Migration	18.1	mean=300	yes	standard	no	yes	2	n/a	n/a	n/a
Migration	18.2	mean=300	yes	standard	no	yes	2	NPI	bnthc_frgr	brd_brdng
M covariates	18.3	mean=300	yes	standard	no	no	1	fsh_cndtn	n/a	n/a
M covariates	18.4	mean=300	yes	standard	no	no	1	ntrtn_dfct	n/a	n/a
Omnibus	18.5	mean=300	yes	standard	no	yes	2	NPI	ntrtn_dfct	n/a

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EBS Pacific cod (5 of 17)

- Why so many models?
  - Model 16.6 is required
  - Models 16.6a, 16.6b, 17.2, and 17.6 requested by Team or SSC
  - Models 16.6e, 16.6f, 16.6g, 16.6h, 18.1 and 18.2 address the need to use the NBS survey data in an acceptable way
    - Is a model with time-varying *Q* acceptable?
      - If yes, does time-varying *Q* require a covariate?
      - If no, is a migration model an acceptable alternative?
        - If yes, does migration require a covariate?
  - Models 16.6c, 16.6d, 18.3, 18.4, and 18.5 requested by AFSC

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EBS Pacific cod (6 of 17)

- Summary of model dimensions and results (Table 2.1.10)

Dimensions	16.6	16.6a	16.6b	16.6c	16.6d	16.6e	16.6f	16.6g	16.6h	17.2	17.6	18.1	18.2	18.3	18.4	18.5
EBS exp. area data used?	no	yes	yes	no	no	no	no	no	no	no	no	no	no	no	no	no
NBS data used?	no	no	no	no	no	no	no	yes	yes	no	no	yes	yes	no	no	yes
Separate area for NBS?	no	no	no	no	no	no	no	no	no	no	no	yes	yes	no	no	yes
Diagnostics	16.6	16.6a	16.6b	16.6c	16.6d	16.6e	16.6f	16.6g	16.6h	17.2	17.6	18.1	18.2	18.3	18.4	18.5
ADSB	n/a	0.102	0.098	0.070	0.043	0.034	0.065	0.031	0.054	0.117	0.174	1.076	0.595	0.185	0.145	1.106
Mohn's ρ	0.243	0.202	0.217	0.304	0.222	0.323	0.291	0.359	0.319	0.309	0.069	0.452	0.370	0.118	0.451	0.724
Base values	16.6	16.6a	16.6b	16.6c	16.6d	16.6e	16.6f	16.6g	16.6h	17.2	17.6	18.1	18.2	18.3	18.4	18.5
Natural mortality rate	0.359	0.348	0.347	0.354	0.363	0.361	0.354	0.353	0.348	0.374	0.312	0.305	0.331	0.349	0.381	0.294
EBS std. area catchability	0.929		0.995	0.943	0.913	0.917	0.952	0.954	0.980	1.043	1.200	1.240	1.074	1.008	0.816	1.286
EBS exp. area catchability		0.994	0.990													
NBS catchability								0.058	0.060			0.457	1.030			0.526
Unfished equil. sp. biom.	629	645	645	637	627	631	638	640	645	604	703	753	684	626	619	484
2019 quantities	16.6	16.6a	16.6b	16.6c	16.6d	16.6e	16.6f	16.6g	16.6h	17.2	17.6	18.1	18.2	18.3	18.4	18.5
Depletion	0.424	0.392	0.401	0.418	0.431	0.443	0.424	0.448	0.428	0.356	0.208	0.529	0.481	0.327	0.461	0.741
EBS spawning biomass												199	239			188
NBS spawning biomass												199	90			170
Spawning biomass	267	253	259	266	270	279	270	287	276	215	147	399	329	205	285	358
EBS age 0+ biomass												589	690			541
NBS age 0+ biomass												483	220			409
Age 0+ biomass	775	731	746	774	797	810	781	813	782	657	488	1,072	910	614	835	950
OFL	209	186	196	206	214	220	209	220	208	155	53	197	212	133	237	179
maxABC	175	156	165	173	180	185	175	185	175	130	45	170	180	111	199	154

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EBS Pacific cod (7 of 17)

- Model averaging: distributions of ABC and OFL (Table 2.1.26)

	2019 OFL			2019 maxABC			Pr(ABC>OFL)	
Model	Mean	SDev	CV	Mean	SDev	CV	Sam.	Pop.
16.6	208,725	25,907	0.124	175,394	21,705	0.124	0.287	0.381
16.6a	186,345	44,764	0.240	156,497	38,104	0.243	0.189	0.245
16.6b	195,995	24,755	0.126	164,711	20,736	0.126	0.225	0.300
16.6c	206,168	26,255	0.127	173,237	21,998	0.127	0.273	0.364
16.6d	214,405	26,410	0.123	180,120	22,121	0.123	0.321	0.419
16.6e	220,429	32,303	0.147	185,156	27,067	0.146	0.363	0.460
16.6f	208,647	26,222	0.126	175,316	21,967	0.125	0.286	0.380
16.6g	219,645	31,185	0.142	184,787	26,172	0.142	0.359	0.457
16.6h	208,201	25,457	0.122	175,189	21,357	0.122	0.286	0.379
17.2	154,825	42,277	0.273	129,953	35,909	0.276	0.120	0.114
17.6	53,480	17,399	0.325	44,529	14,564	0.327	0.019	0.004
18.1	197,498	24,185	0.122	169,944	20,693	0.122	0.253	0.339
18.2	211,915	24,892	0.117	180,412	21,137	0.117	0.323	0.421
18.3	133,196	34,616	0.260	111,286	29,251	0.263	0.092	0.061
18.4	237,280	39,559	0.167	199,107	33,130	0.166	0.499	0.576
18.5	178,873	30,100	0.168	153,757	25,702	0.167	0.179	0.228
Average	189,727	52,872	0.279	159,962	44,672	0.279	0.203	0.267

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EBS Pacific cod (8 of 17)

- Model averaging: effective sample size summary (Table 2.1.27)

Type	Fleet	16.6	16.6a	16.6b	16.6c	16.6d	16.6e	16.6f	16.6g
Size	Fish.	23,850	23,439	23,779	24,015	23,389	23,606	23,835	23,899
Size	Std.	11,086	n/a	2,264	11,171	11,546	11,088	11,078	11,056
Size	Exp.	n/a	9,427	9,373	n/a	n/a	n/a	n/a	n/a
Size	NBS	n/a	n/a	n/a	n/a	n/a	n/a	n/a	105
Age	Fish.	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Age	Std.	1,395	n/a	n/a	1,392	1,384	1,408	1,399	1,392
Age	Exp.	n/a	1,452	1,443	n/a	n/a	n/a	n/a	n/a
Index	Std.	3,978	n/a	2,161	3,895	3,966	11,782	4,119	12,332
Index	Exp.	n/a	3,177	3,166	n/a	n/a	n/a	n/a	n/a
Index	NBS	n/a	n/a	n/a	n/a	n/a	n/a	n/a	177
	Sum:	40,309	37,496	42,185	40,473	40,285	47,885	40,431	48,960

Type	Fleet	16.6h	17.2	17.6	18.1	18.2	18.3	18.4	18.5
Size	Fish.	24,110	45,671	27,866	22,152	22,741	25,802	23,640	22,373
Size	Std.	11,045	10,471	20,062	11,334	11,239	11,155	11,118	11,326
Size	Exp.	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Size	NBS	106	n/a	n/a	206	269	n/a	n/a	208
Age	Fish.	n/a	1,339	1,293	n/a	n/a	n/a	n/a	n/a
Age	Std.	1,383	1,068	2,506	1,511	1,454	1,496	1,367	1,490
Age	Exp.	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Index	Std.	4,201	3,215	12,246	4,487	3,814	3,580	4,021	4,552
Index	Exp.	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Index	NBS	175	n/a	n/a	176	2,216	n/a	n/a	176
	Sum:	41,020	61,763	63,973	39,866	41,732	42,033	40,146	40,124

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EBS Pacific cod (9 of 17)

- Model averaging: SSC model weight adjustments (Table 2.1.28)

Model:	16.6	16.6a	16.6b	16.6c	16.6d	16.6e	16.6f	16.6g	16.6h	17.2	17.6	18.1	18.2	18.3	18.4	18.5
abs(ρ):	0.243	0.202	0.217	0.304	0.222	0.323	0.291	0.359	0.319	0.309	0.069	0.452	0.370	0.118	0.451	0.724
Adjust (α=1.0):	0.841	0.875	0.863	0.791	0.858	0.776	0.801	0.748	0.779	0.787	1.000	0.682	0.740	0.952	0.683	0.520
Adjust (α=0.8):	0.870	0.899	0.888	0.829	0.885	0.817	0.838	0.793	0.819	0.826	1.000	0.736	0.786	0.961	0.737	0.593
Adjust (α=0.6):	0.901	0.923	0.915	0.869	0.912	0.859	0.876	0.840	0.861	0.866	1.000	0.795	0.835	0.971	0.795	0.675
Adjust (α=0.4):	0.933	0.948	0.943	0.911	0.941	0.904	0.915	0.890	0.905	0.909	1.000	0.858	0.887	0.981	0.858	0.770
Adjust (α=0.2):	0.966	0.974	0.971	0.954	0.970	0.951	0.957	0.944	0.951	0.953	1.000	0.926	0.942	0.990	0.927	0.877

Model:	16.6	16.6a	16.6b	16.6c	16.6d	16.6e	16.6f	16.6g	16.6h	17.2	17.6	18.1	18.2	18.3	18.4	18.5
Jitter score:	0.000	0.000	0.000	0.000	2.110	0.000	0.000	0.000	0.004	0.001	0.125	0.000	0.000	0.000	0.000	0.000
Adjust (α=1.0):	1.000	1.000	1.000	1.000	0.121	1.000	1.000	1.000	0.996	0.999	0.883	1.000	1.000	1.000	1.000	1.000
Adjust (α=0.8):	1.000	1.000	1.000	1.000	0.185	1.000	1.000	1.000	0.997	1.000	0.905	1.000	1.000	1.000	1.000	1.000
Adjust (α=0.6):	1.000	1.000	1.000	1.000	0.282	1.000	1.000	1.000	0.998	1.000	0.928	1.000	1.000	1.000	1.000	1.000
Adjust (α=0.4):	1.000	1.000	1.000	1.000	0.430	1.000	1.000	1.000	0.998	1.000	0.951	1.000	1.000	1.000	1.000	1.000
Adjust (α=0.2):	1.000	1.000	1.000	1.000	0.656	1.000	1.000	1.000	0.999	1.000	0.975	1.000	1.000	1.000	1.000	1.000

Model:	16.6	16.6a	16.6b	16.6c	16.6d	16.6e	16.6f	16.6g	16.6h	17.2	17.6	18.1	18.2	18.3	18.4	18.5
Finit - M:	-0.179	-0.186	-0.161	-0.174	-0.189	-0.192	-0.172	-0.180	-0.165	0.094	1.379	-0.176	-0.182	-0.036	-0.237	-0.116
Adjust (α=1.0):	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.910	0.252	1.000	1.000	1.000	1.000	1.000
Adjust (α=0.8):	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.927	0.332	1.000	1.000	1.000	1.000	1.000
Adjust (α=0.6):	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.945	0.437	1.000	1.000	1.000	1.000	1.000
Adjust (α=0.4):	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.963	0.576	1.000	1.000	1.000	1.000	1.000
Adjust (α=0.2):	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.981	0.759	1.000	1.000	1.000	1.000	1.000

Model:	16.6	16.6a	16.6b	16.6c	16.6d	16.6e	16.6f	16.6g	16.6h	17.2	17.6	18.1	18.2	18.3	18.4	18.5
ln(EBS *Q*):	-0.074	-0.006	-0.005	-0.058	-0.091	-0.086	-0.050	-0.047	-0.021	0.042	0.182	0.215	0.072	0.008	-0.204	0.251
Adjust (α=1.0):	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.959	0.833	0.807	0.931	0.992	1.000	0.778
Adjust (α=0.8):	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.967	0.864	0.842	0.944	0.994	1.000	0.818
Adjust (α=0.6):	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.975	0.896	0.879	0.958	0.995	1.000	0.860
Adjust (α=0.4):	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.983	0.930	0.918	0.972	0.997	1.000	0.904
Adjust (α=0.2):	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.992	0.964	0.958	0.986	0.998	1.000	0.951

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EBS Pacific cod (10 of 17)

- Model averaging: cross-validation model weights (Table 2.1.30)

Sorted in order of model number					Sorted in order of negative log likelihood				
Model	-lnL	Δ(-lnL)	Exp(-Δ)	Weight	Model	-lnL	Δ(-lnL)	Exp(-Δ)	Weight
16.6	-0.1254	10.4446	0.0000	0.0000	17.6	-10.5700	0.0000	1.0000	0.9868
16.6a	9.7917	20.3617	0.0000	0.0000	16.6g	-3.3902	7.1798	0.0008	0.0008
16.6b	2.4149	12.9849	0.0000	0.0000	16.6f	-1.8964	8.6736	0.0002	0.0002
16.6c	0.6439	11.2139	0.0000	0.0000	16.6e	-0.5542	10.0158	0.0000	0.0000
16.6d	-5.6623	4.9077	0.0074	0.0073	16.6	-0.1254	10.4446	0.0000	0.0000
16.6e	-0.5542	10.0158	0.0000	0.0000	16.6c	0.6439	11.2139	0.0000	0.0000
16.6f	-1.8964	8.6736	0.0002	0.0002	18.1	0.9316	11.5016	0.0000	0.0000
16.6g	-3.3902	7.1798	0.0008	0.0008	18.5	1.5202	12.0902	0.0000	0.0000
16.6h	-5.2589	5.3111	0.0049	0.0049	16.6b	2.4149	12.9849	0.0000	0.0000
17.2	13.4868	24.0568	0.0000	0.0000	16.6d	-5.6623	4.9077	0.0074	0.0073
17.6	-10.5700	0.0000	1.0000	0.9868	16.6h	-5.2589	5.3111	0.0049	0.0049
18.1	0.9316	11.5016	0.0000	0.0000	18.2	3.4571	14.0271	0.0000	0.0000
18.2	3.4571	14.0271	0.0000	0.0000	18.3	6.1074	16.6774	0.0000	0.0000
18.3	6.1074	16.6774	0.0000	0.0000	18.4	7.4747	18.0447	0.0000	0.0000
18.4	7.4747	18.0447	0.0000	0.0000	16.6a	9.7917	20.3617	0.0000	0.0000
18.5	1.5202	12.0902	0.0000	0.0000	17.2	13.4868	24.0568	0.0000	0.0000

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EBS Pacific cod (11 of 17)

- ESR variables as predictors of change in spawning biomass:
  - Change in spawning biomass was regressed against each of the environmental variables in T2.1.5 in a set of cross-validation analyses
  - Each model with a positive cross-validation R^2 was retained
  - The cross-validation R2 values were used to weight the model-specific means and standard deviations as follows:

Variable	nlags	R^2	weight	2018 μ	2018 σ
Benthic forager biomass	6	0.193	0.134	0.039	0.096
Pelagic forager biomass	4	0.062	0.043	0.002	0.102
Euphausiid biomass	3	0.342	0.237	-0.078	0.185
Apex predator biomass	1	0.033	0.023	0.080	0.127
Motile epifauna biomass	6	0.531	0.368	0.122	0.075
Multivariate seabird breeding	2	0.139	0.096	0.119	0.098
Mean bottom temperature	3	0.141	0.098	0.039	0.101
R^2-weighted mean	n/a	n/a	n/a	0.049	0.119

  - Results imply a 25.8% chance that the 2018 spawning biomass will decline, but only a 0.2% chance that it will decline by more than 20%

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EBS Pacific cod (12 of 17)

- The Plan Team recommends to not consider models with linkages to environmental covariates for further review in 2018 but encourages continued investigations in the future of the relationships between environmental covariates and various stock assessment parameters as well as the mechanisms behind those relationships
  - Given the recently realized importance of the NBS for Pacific cod, the Team was pragmatic and focused on investigating models that included northern areas
  - The intention was not to downweight the importance of investigating environmental linkages, and the Team recognizes the importance of understanding parameter linkages to environmental covariates
  - If range expansion is occurring, linking various parameters to environmental covariates and understanding those relationships and the potential effects on the stock may be very important

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EBS Pacific cod (13 of 17)

- Therefore, the Plan Team recommends suspending the investigation of two-area models for Bering Sea Pacific cod in 2017 but encourages further development of the models in the future if data suggest that they are warranted
- The Plan Team recommends not including Model 17.6 for 2018 runs for a number of reasons
  - First, even though many diagnostics showed that Model 17.6 fit the data well, some data were fit very well and other data not very well
    - Concern that 17.6 may be overparameterized; chasing noise
  - Second, the predictions of the model were outliers that were not congruent with any other models and did not agree with anecdotal trends in fishery performance
  - Lastly, plausibility of parameter estimates were suspect given current knowledge of the Pacific cod stock

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EBS Pacific cod (14 of 17)

- Given recent and projected warm conditions and recent distributional trends, the Plan Team recommends that the NBS survey extension is conducted again in 2019 (and future years as needed) in order to support assessment estimates of fish biomass, to continue to monitor potential range expansion of Pacific cod, and to understand the dynamics and behavior of the Pacific cod stock in relation to environmental conditions
  - The ten-fold increase in the Pacific cod biomass in the NBS and distributional shifts between 2010 and 2017 is an important event to understand and monitor
  - Also, these observations led the Team to recommend models that included data from northwestern EBS and NBS areas

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EBS Pacific cod (15 of 17)

- The Plan Team requests that five models (described below) be brought back in November, with 2018 data included, for further evaluation
  - Model 16.6: the base model
  - Model 16.6b, which includes the two northwestern strata in the EBS survey index and is modeled with a change in Q from the early period without those northwestern strata
  - A combination of Models 16.6b and 16.6g which includes the northwestern strata in the EBS survey index and modeled with time-varying Q, and the NBS survey observations with estimated selectivity and time-varying Q
  - Model 17.2 as it was structured and parameterized in 2017, but with 2018 data included
  - Same as Model 17.2 but including the northwestern strata in the EBS survey index and modeled with time-varying Q, and the NBS survey observations with estimated selectivity and time-varying Q

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EBS Pacific cod (16 of 17)

- Additionally, if time allows, the Plan Team recommends that the author consider the following two models:
  - Same as Model 16.6 but including the northwestern strata in the EBS survey index modeled with time-varying Q
  - Same as Model 16.6 but adding the NBS survey estimates to the EBS survey estimates (with the northwestern strata) and model Q as time-varying; size compositions should be combined by weighting by the abundance estimates from each area (if available)
- The final model in the above list may not be statistically satisfactory
- Therefore, the Plan Team encourages continued research on statistical methods (e.g., geospatial analysis) to combine the Bering Sea surveys into a single comprehensive biomass index, noting that it may be possible to include environmental covariates in this analysis, such as the cold pool and ice cover

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EBS Pacific cod (17 of 17)

- Relatedly, the Plan Team recommends investigating model-based approaches to estimate a consistent time-series for the NBS survey given that the survey design changed in 2018
- Finally, the Plan Team asks that the author provide a clear rationale for a reduction in the ABC from maxABC if one is proposed
  - For example, some concerns may be the possibility of an uncertain but potentially dramatic increase in mortality in the northern areas if ice cover returns quickly
  - An ensemble of models may not capture factors that are of concern, as the magnitude of this potential mortality is unknown

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Greenland turbot (1 of 9)

- Meaghan Bryan gave a two-part presentation on Greenland turbot:
  1. Completion of the stock structure template
  2. Stock assessment
- Part 1: stock structure
  - The data do not suggest differentiation between the EBS and the AI; genetic studies would be needed to confirm this
  - Length frequency data reflect the ontogeny of the species
    - Smaller fish are found on shelf; larger fish on slope and in AI
    - The EBS slope and the AI length distributions are similar
  - The share of catch in the AI has increased in recent years, while the share of biomass has declined
  - AI catch is generally highest in the east; higher on the EBS slope than the shelf

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Greenland turbot (2 of 9)

- Stock structure, continued:
  - Exploitation rates are generally below FOFL and FABC
  - Maximum sampling depth of the AI survey is 500m, which may underestimate abundance
    - This may help to explain the large exploitation estimates in the AI
  - Age at length is similar between the shelf and slope
  - Most fish caught in the fishery are above maturity A50%
  - Genetic studies in the BSAI are lacking, so conclusions about isolation by distance cannot be made
    - There is some differentiation in the North Atlantic between the Faroe Islands and Greenland
  - With respect to issues of stock structure and spatial management, the Team recommends a rating of “little or no concern” for Greenland turbot

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Greenland turbot (3 of 9)

- Part 2: stock assessment
  - The author transitioned the 2016 assessment from SS V3.24 to V3.30 and obtained similar results
  - Overview of base model (16.1):
    - 2 sexes, 2 fleets, 3 surveys
    - Shelf and slope Qs fixed; ABL longline Q analytically determined
    - M fixed at 0.112 for males and females; growth estimated
    - Stock-recruitment relationship:
      - steepness fixed at 0.79; σ_R fixed at 0.6
      - R_0, the autocorrelation between recruitment deviations, and the recruitment deviations themselves all estimated internally
  - Many selectivity parameters in Model 16.1 are poorly estimated

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Greenland turbot (4 of 9)

- Stock assessment, continued
  - For this analysis, the author ran two additional models:
    - Model 16.1a: remove the ABL longline survey index
    - Model 16.1b: estimate the ABL longline survey Q
  - For selectivity, the ABL longline survey was logistic with externally estimated parameters (not fit to the sizecomp data because they are not sex-specific), while all other selectivity curves were of the double-normal form with time blocks
  - A noticeable change in the longline fishery sizecomps occurred around 2008, which the author will investigate further
  - In a jitter analysis of Model 16.1, only 6 of 100 iterations resulted in a solution
  - Jitter analysis of Model 16.1b showed improvement in model stability and generally gave results similar to 16.1

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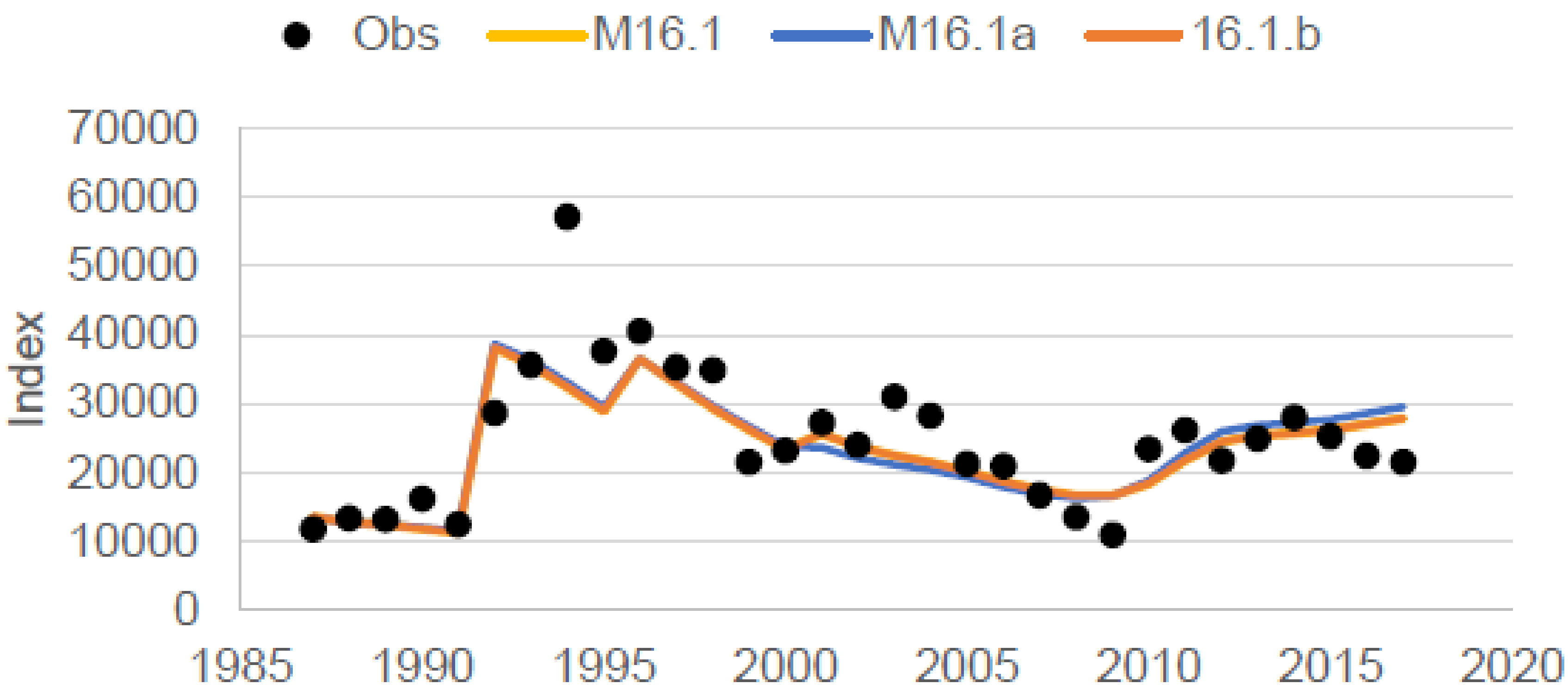
Greenland turbot (5 of 9)

- Fit to EBS shelf survey index (Figure 19)



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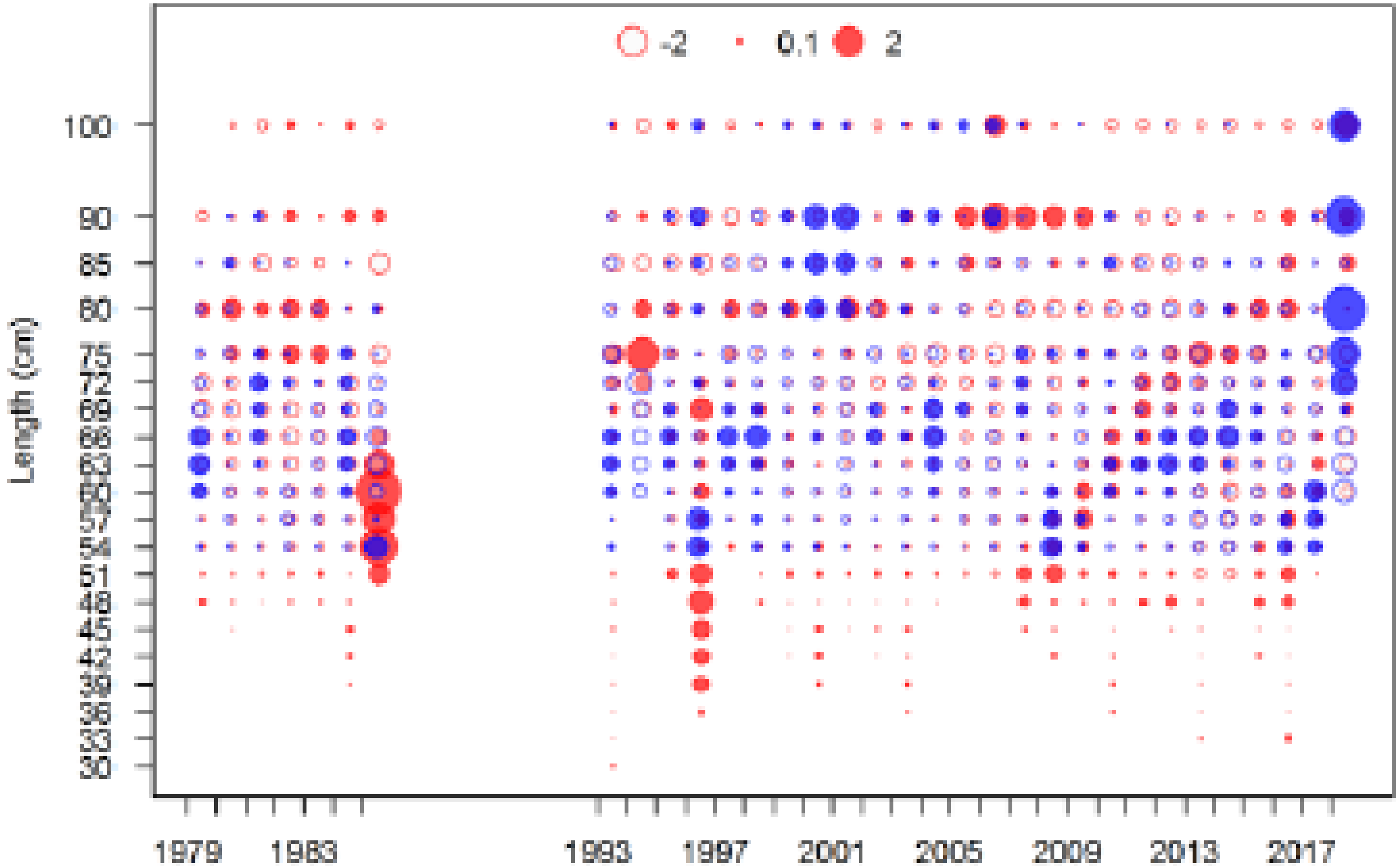
Greenland turbot (6 of 9)

- Fit to longline fishery sizecomps, Model 16.1b (Figure 26)



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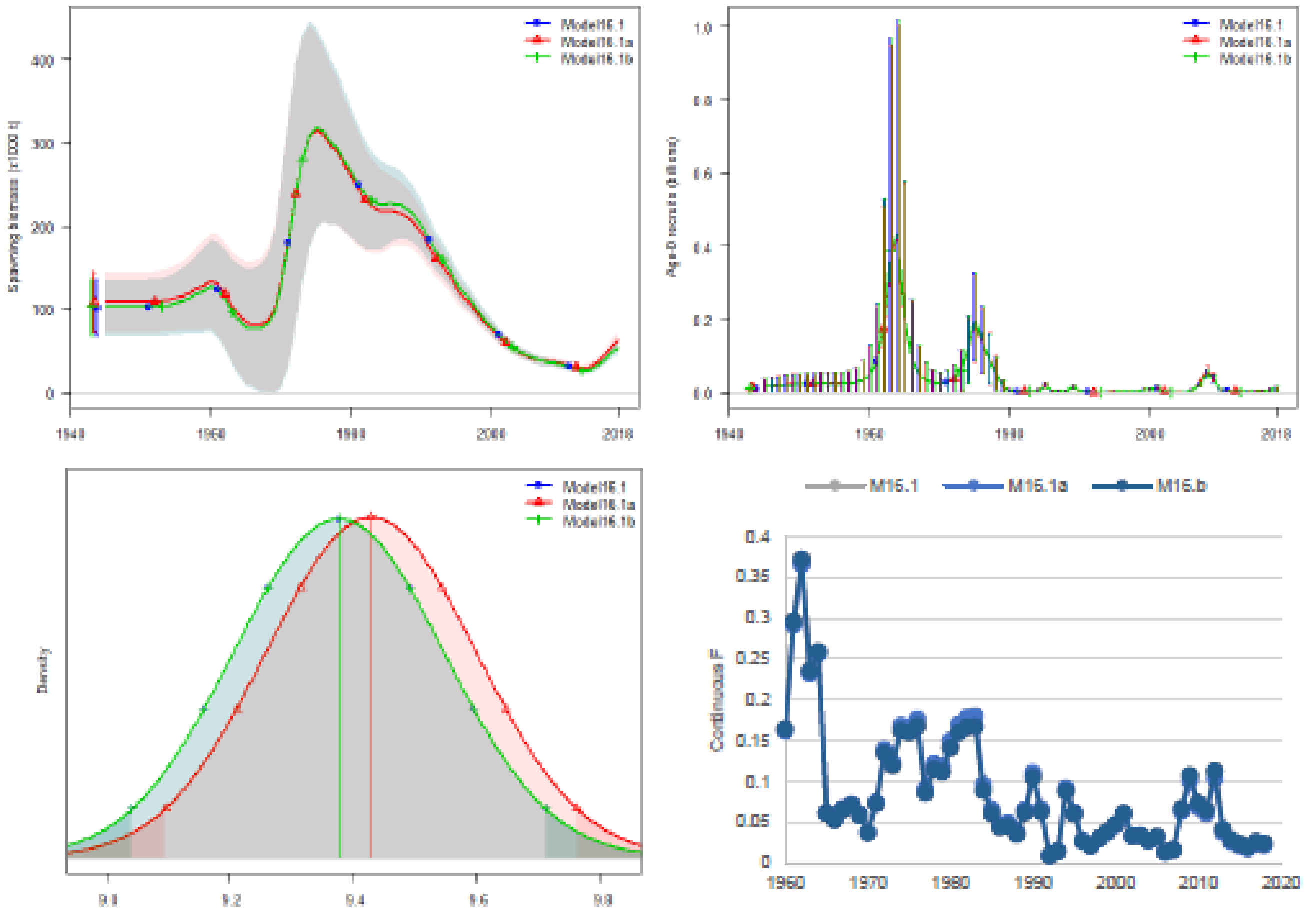
Greenland turbot (7 of 9)

- Sample of results from Models 16.1, 16.1a, and 16.1b (Figure 29)



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Greenland turbot (8 of 9)

- Stock assessment, continued
  - Sizecomp data from the ABL longline survey are not currently used, partly because they are not sex-specific
  - This may be worth further examination; perhaps the longline survey methods could be changed in order to collect length by sex
  - The author noted that there is a CIE review planned and she hopes to explore this more at that time
  - For November, the Team recommends that the author bring forward the following models:
    - 16.1
    - 16.1b with selectivity estimated
    - 16.1b with environmental covariates included to help explain selectivities

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Greenland turbot (9 of 9)

- Stock assessment, continued:
  - The author plans to evaluate whether simplifying the time-blocks improves estimation of some of the selectivity parameters
    - She will reduce time blocks and bring forward additional models as appropriate
  - The Team also requests that dynamic B0 output be displayed
  - Sometime after the current assessment cycle, the Team recommends that the author consider excluding pre-1977 data

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Flathead sole (1 of 8)

- Carey McGilliard presented results of transitioning the flathead sole-Bering Flounder stock assessment into the SS framework, along with new model options for the 2018 assessment
- The transition from the 2016 model to SS will allow for additional assumptions, include more data, and provide more options
- The author listed eight primary differences between the two model frameworks along with a suggestion as to whether each item was a positive attribute of the framework
  - Full details are in table on page 4 of the document
- Briefly, despite enormous effort (which included coding new options into the 2016 model), it was impossible to achieve an exact match, due to minor but fundamental differences between the two frameworks
  - 2016 model versus "SS 2016"

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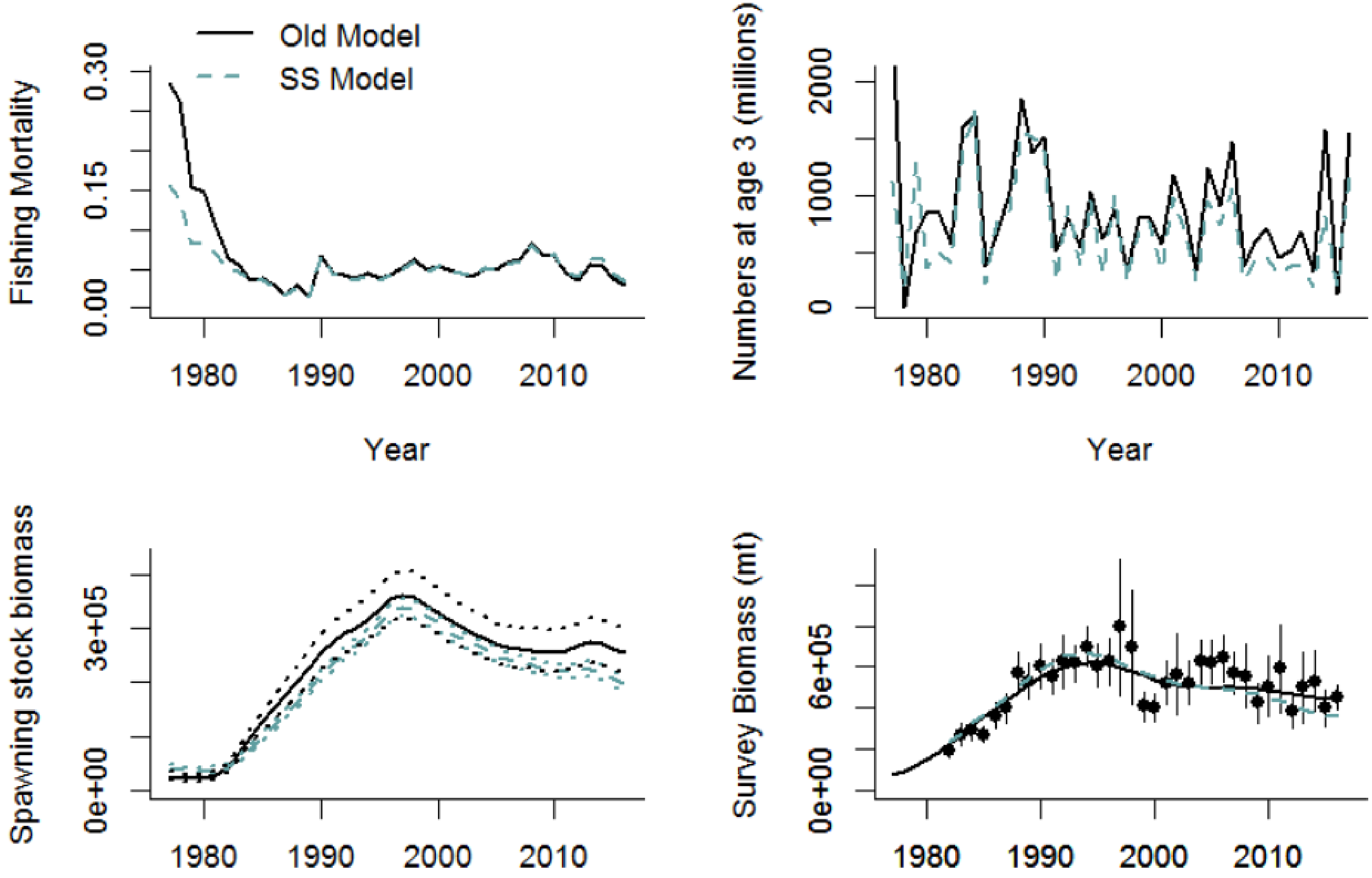
Flathead sole (2 of 8)

- Figure 11



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Flathead sole (3 of 8)

- Two new models were also presented:
  - Model 18.0 differs from the base model in the following ways:
    - Foreign catches in the years 1964-1987
    - Recruitment likelihood function used a sum-to-zero constraint
    - Recruitment was fixed to the mean value for the last 4 years due to lack of non-zero observations of young fish
    - Recruitment deviations were estimated dating back to 1961
    - Survey selectivity was changed to be age-based and sex-specific, using a double-normal selectivity curve
    - Francis (2011) data weighting was used
  - Model 18.0b is the same as Model 18.0, but estimates selectivity in time blocks: 1964-1987, 1988-2007, and 2008-2016
    - Blocks chosen to correspond with key management changes

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Flathead sole (4 of 8)

- Models 18.0 and 18.0b estimated similar spawning biomass trends to SS 2016, but both time series were lower than SS 2016
- Estimated F was different for all three models in the first and last time block, but 18.0 and 18.0b were similar during the middle time block
- The new models fit age and length composition data better
- The new models also indicate that males are selected at smaller lengths than females
  - Is this real, or a result of model mis-specification?
- For November, the author plans to incorporate newly aged historical otoliths into the model and estimate growth internally using conditional age at length

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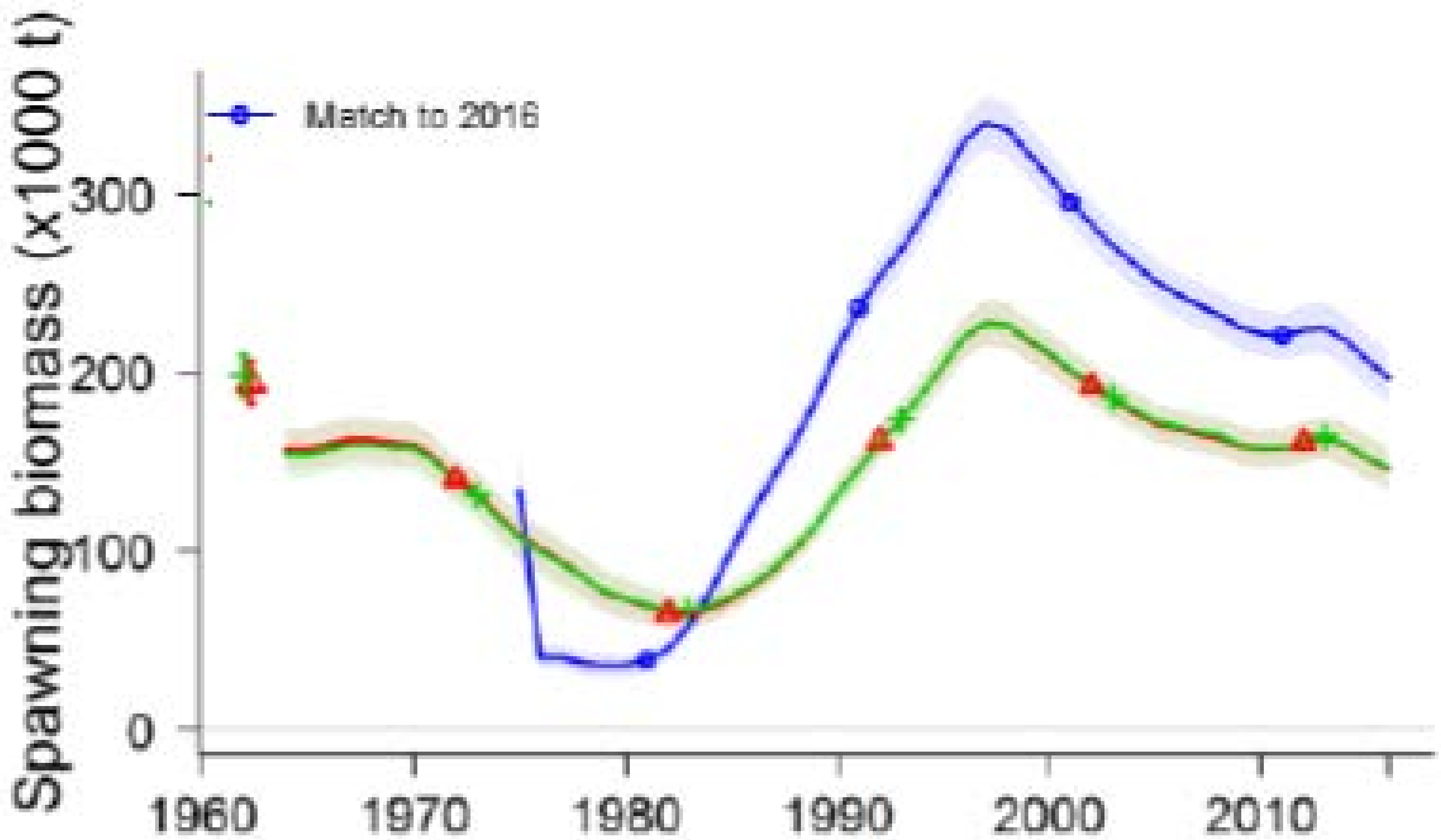
Flathead sole (5 of 8)

- Comparison of spawning biomass (Figure 21a)



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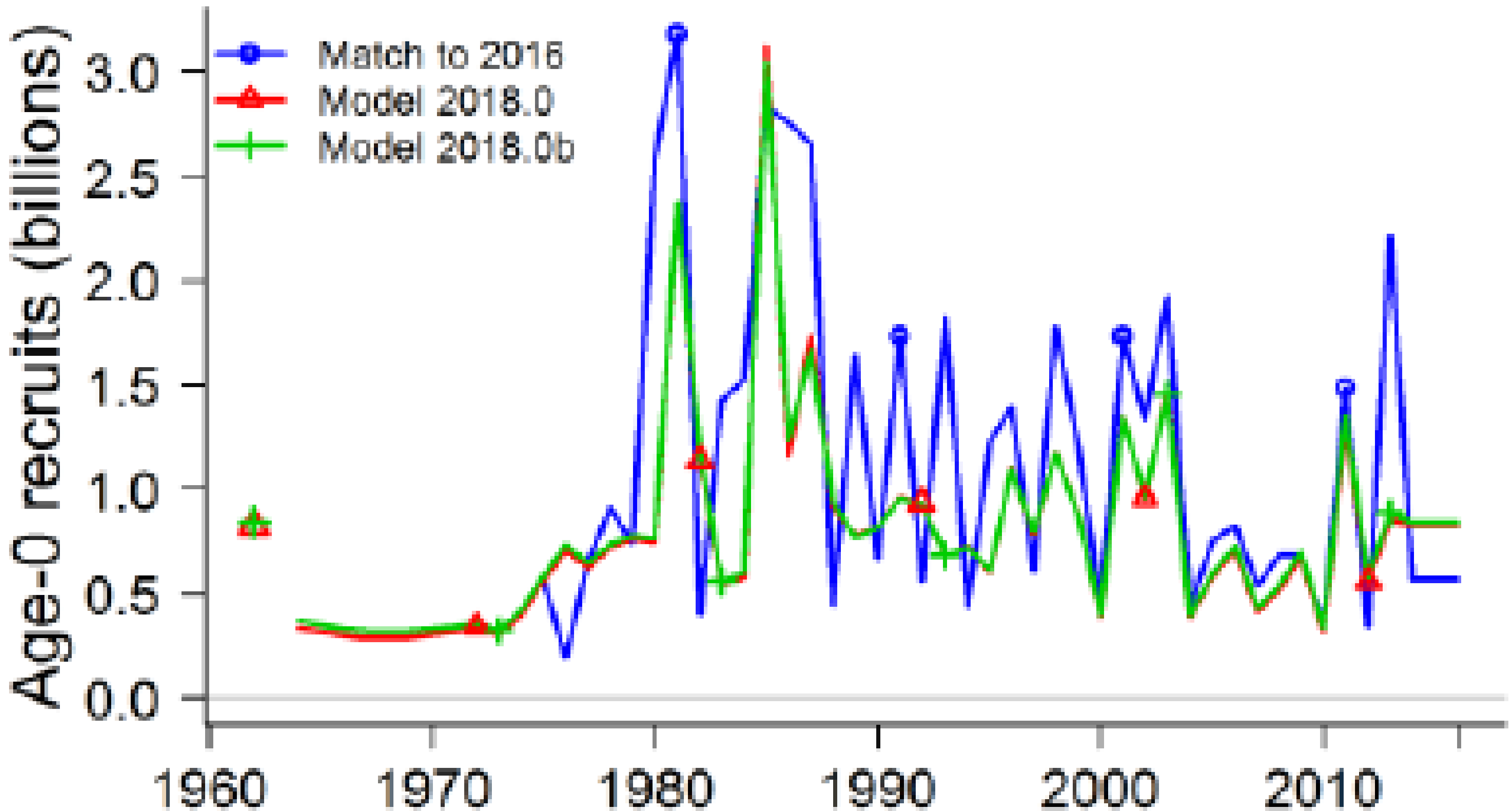
Flathead sole (6 of 8)

- Comparison of recruitment (Figure 21b)



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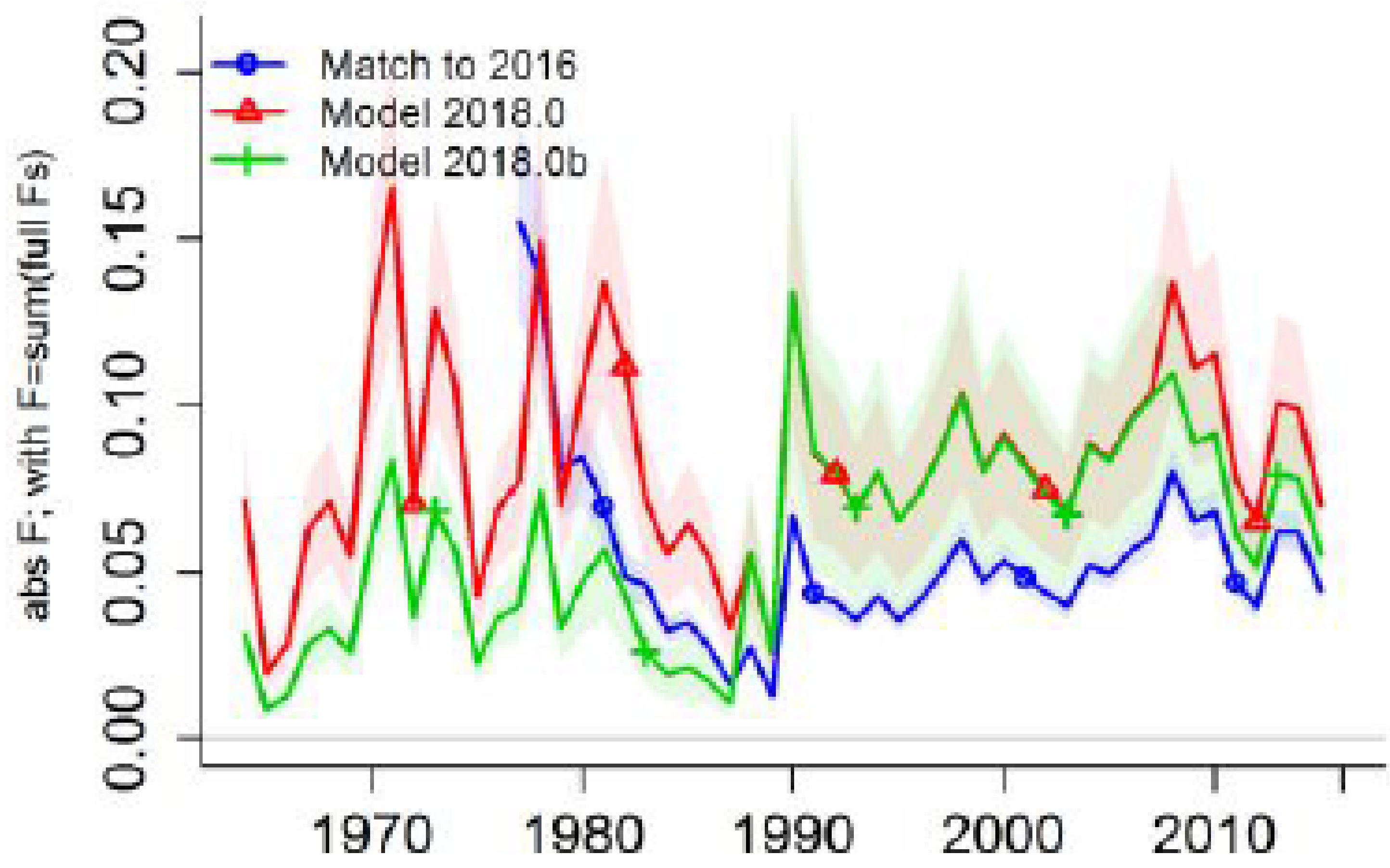
Flathead sole (7 of 8)

- Comparison of fishing mortality (Figure 21c)



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Flathead sole (8 of 8)

- Author's longer-term plans:
  - Conduct more data exploration
  - Deal with the lack of model uncertainty in M and Q
  - Investigate incorporating slope survey data and other gears
  - Explore alternative methods for extrapolating AI survey data in non-survey years (currently a linear regression between years is used)
  - Look into growth morphs or area-specific model options
- Team members expressed support for Model 18.0b over Model 18.0 because 18.0b incorporates important information on the fishery and the fits to length composition data were better than in Model 18.0
- The Team requests that the author bring forward Model 18.0b and the original 2016 model for the November assessment

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Alaska skate catch estimation (1 of 5)

- Olav Ormseth presented his investigation into improving catch estimations for individual species in the BSAI skate complex
- The issue comes from uncertainty in skate ID by observers on longline vessels, primarily in the Pacific cod fishery
- This is because observers do not ID soft-snout skates (*Bathyraja* spp) to species when they are not in-hand, since they are difficult to correctly ID without closely examining small anatomical characteristics
- Thus, up to 80% of skates are recorded as soft-snout skate, whereas most stiff-snout skate species do get ID'd to species by observers
- In the CAS, most skates get lumped into the "other skate" category
- This becomes a problem in the AK skate model, where there is obviously a need to know the AK skate catch

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Alaska skate catch estimation (2 of 5)

- Method currently used in the assessment:
  - Assume that proportions of unidentified skates in the fishery are equal to the proportions in the bottom trawl survey
  - Note that most fishery catches of skates are taken by longliners
- Author's proposed new method:
  - Assume that skates in-hand are representative of all skates in the observer's tally period
  - Species rates of those in-hand are applied to all tallied individuals
  - Stratifies by CP versus CV and also by gear type
    - For CP, stratify further by NMFS 3-digit statistical area
    - The author feels that this additional level of stratification means that fishing depth is considered implicitly

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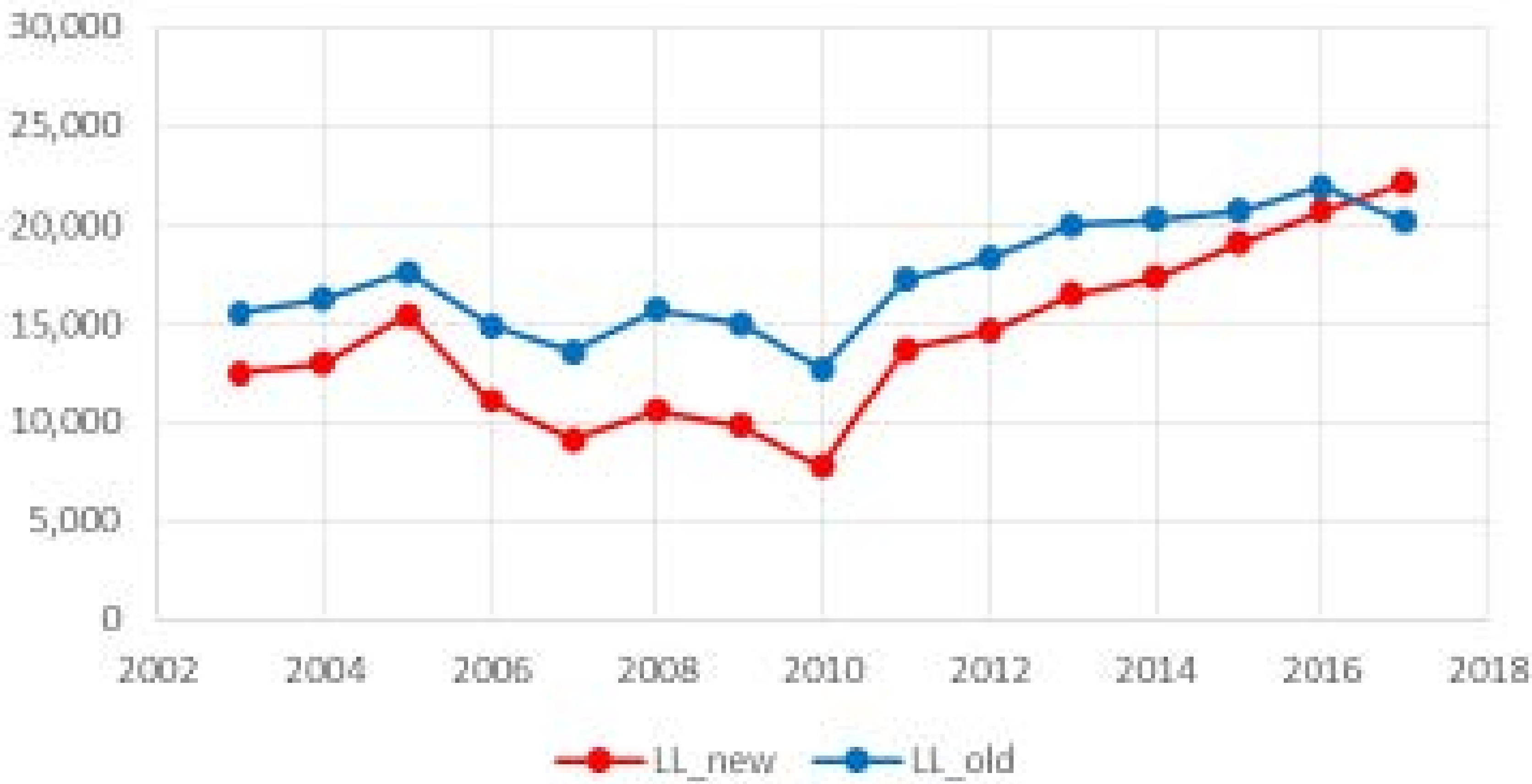
Alaska skate catch estimation (3 of 5)

- Comparison of longline catch time series estimates (Figure 5b)



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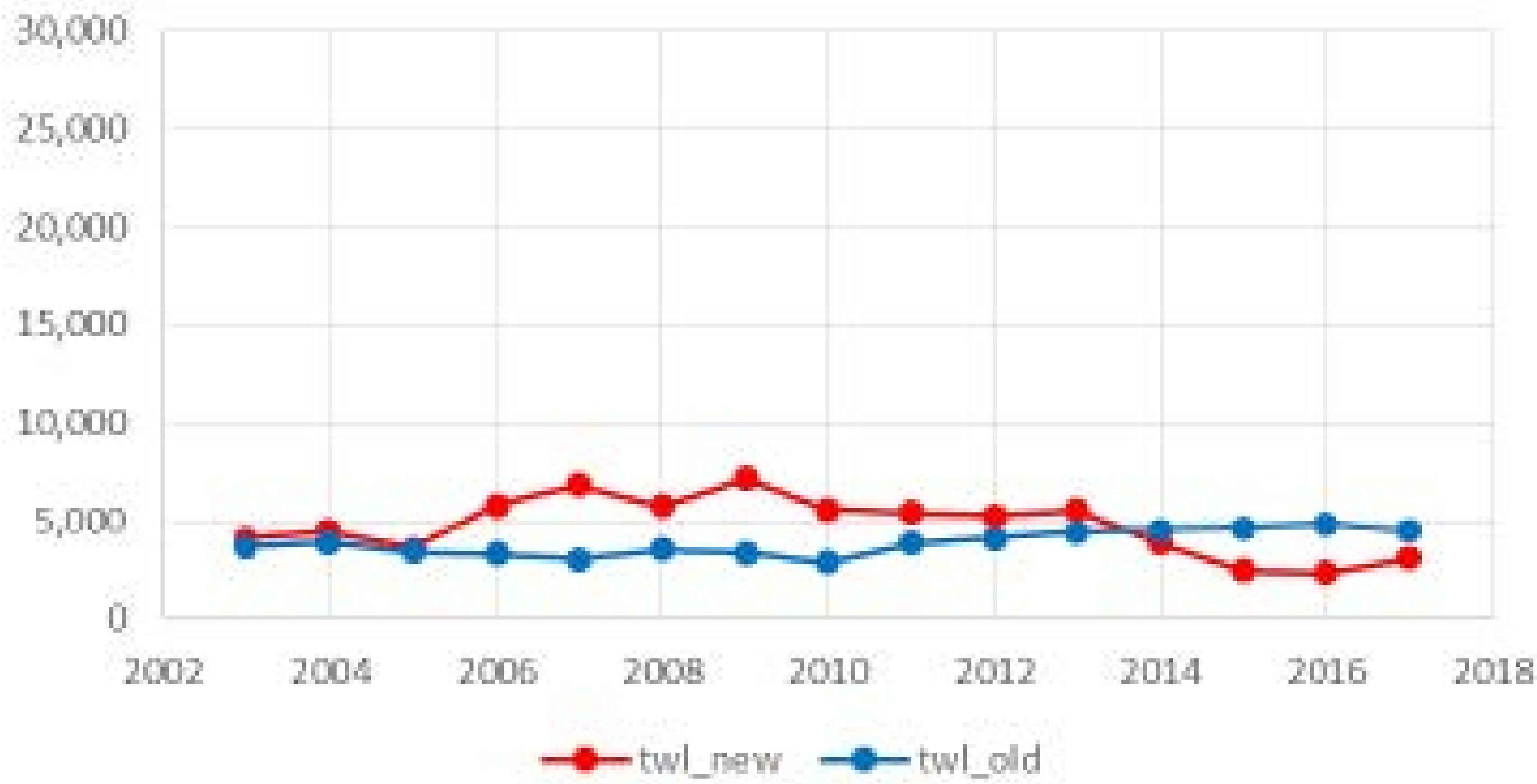
Alaska skate catch estimation (4 of 5)

- Comparison of trawl catch time series estimates (Figure 5c)



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Alaska skate catch estimation (5 of 5)

- The Team recommends that, although this method appears to be a major improvement, the issue of how species composition may be affected by depth should be examined before the method is adopted
  - This could be addressed by a simple look at the observer data to see if depth-related differences in species composition exist
  - The November assessment should therefore include an examination of skate stratification by depth in the observer data

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Stock structure evaluation requests

- The Team requests that stock structure templates be completed for the following BSAI assessments: in 2019 – octopus (Ormseth); in 2020 – forage fish (Ormseth), Bogoslof pollock (Ianelli), and flathead sole (McGilliard)

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Approve proposed 2019/2020 specs (1 of 2)

Species	Area	2017 OFL	2017 ABC	2017 TAC	Catch as of 12/31/2017	2018 OFL	2018 ABC	2018 TAC	Catch as of 9/8/2018	2019 and 2020 OFL	2019 and 2020 ABC	2019 and 2020 TAC
Pollock	EBS	3,640,000	2,800,000	1,345,000	1,359,274	4,797,000	2,592,000	1,364,341	1,294,454	4,592,000	2,467,000	
	AI	43,650	36,061	19,000	1,507	49,289	40,788	19,000	1,748	37,431	30,803	
	Bogoslof	130,428	60,800	500	186	130,428	60,800	450	9	130,428	60,800	
Pacific cod	BS	284,000	239,000	223,704	222,814	238,000	201,000	188,136	142,502	201,000	170,000	
	AI	28,700	21,500	15,695	12,258	28,700	21,500	15,695	10,906	28,700	21,500	
Sablefish	BS	1,499	1,274	1,274	1,159	2,887	1,464	1,464	1,422	4,576	2,061	
	AI	2,044	1,735	1,735	590	3,917	1,988	1,988	457	6,209	2,798	
Yellowfin sole	BSAI	287,000	260,800	154,000	132,266	306,700	277,500	154,000	97,101	295,600	267,500	
Greenland turbot	BSAI	11,615	6,644	4,500	2,834	13,148	11,132	5,294	1,765	13,540	11,473	
	BS	n/a	5,800	4,375	2,712	n/a	9,718	5,125	1,614	n/a	10,016	
	AI	n/a	844	125	122	n/a	1,414	169	151	n/a	1,457	
Arrowtooth flounder	BSAI	76,100	65,371	14,000	6,518	76,757	65,932	13,621	4,528	75,084	64,494	
Kamchatka flounder	BSAI	10,360	8,880	5,000	4,503	11,347	9,737	5,000	2,814	12,022	10,317	
Northern rock sole	BSAI	159,700	155,100	47,100	35,214	147,300	143,100	47,100	27,513	136,000	132,000	
Flathead sole	BSAI	81,654	68,278	14,500	9,149	79,862	66,773	14,500	8,262	78,036	65,227	
Alaska plaice	BSAI	42,800	36,000	13,000	16,492	41,170	34,590	16,100	21,453	38,800	32,700	
Other flatfish	BSAI	17,591	13,193	2,500	4,133	17,591	13,193	4,000	5,871	17,591	13,193	
Pacific Ocean perch	BSAI	53,152	43,723	34,900	32,544	51,675	42,509	37,361	25,524	50,098	41,212	
	BS	n/a	12,199	11,000	8,987	n/a	11,861	11,861	4,024	n/a	11,499	
	EAI	n/a	10,307	7,900	7,803	n/a	10,021	9,000	6,370	n/a	9,715	
	CAI	n/a	8,009	7,000	6,868	n/a	7,787	7,500	6,767	n/a	7,549	
	WAI	n/a	13,208	9,000	8,886	n/a	12,840	9,000	8,363	n/a	12,449	
Northern rockfish	BSAI	16,242	13,264	5,000	4,699	15,888	12,975	6,100	5,286	15,563	12,710	
Blackspotted/Rougheye Rockfish	BSAI	612	501	225	205	749	613	225	190	829	678	
	EBS/EAI	n/a	306	100	71	n/a	374	75	45	n/a	414	
	CAI/WAI	n/a	195	125	134	n/a	239	150	145	n/a	264	
Shortraker rockfish	BSAI	666	499	125	161	666	499	150	147	666	499	
Other rockfish	BSAI	1,816	1,362	875	831	1,816	1,362	845	763	1,816	1,362	
	BS	n/a	791	325	261	n/a	791	275	145	n/a	791	
	AI	n/a	571	550	570	n/a	571	570	618	n/a	571	
Atka mackerel	BSAI	102,700	87,200	65,000	64,449	108,600	92,000	71,000	54,474	97,200	84,400	
	EAI/BS	n/a	34,890	34,500	34,267	n/a	36,820	36,500	21,435	n/a	33,780	
	CAI	n/a	30,330	18,000	17,749	n/a	32,000	21,000	20,077	n/a	29,350	
	WAI	n/a	21,980	12,500	12,433	n/a	23,180	13,500	12,962	n/a	21,270	
Skates	BSAI	49,063	41,144	26,000	31,892	46,668	39,082	27,000	13,517	44,202	36,957	
Sculpins	BSAI	56,582	42,387	4,500	5,342	53,201	39,995	5,000	4,173	53,201	39,995	
Sharks	BSAI	689	517	125	142	689	517	180	85	689	517	
Squids	BSAI	6,912	5,184	1,342	1,996	6,912	5,184	1,200	1,456			
Octopuses	BSAI	4,769	3,576	400	281	4,769	3,576	250	160	4,769	3,576	
Total	BSAI	5,110,344	4,013,993	2,000,000	1,951,439	6,235,729	3,779,809	2,000,000	1,726,580	5,936,050	3,573,772	

Sources: 2017 OFLs, ABCs, and TACs and 2018 OFLs and ABCs are from harvest specifications adopted by the Council in December 2016 and December 2017, respectively; 2017 catches through December 31, 2018 catches through September 8, 2018 from AKR Catch Accounting.

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Approve proposed 2019/2020 specs (2 of 2)

- The Team recommends adoption of the 2019 BSAI final harvest specifications (published in the FR in February 2018) for the proposed 2019/2020 BSAI OFLs and ABCs for the purpose of notifying the public of potential final harvest specifications, with the exception of squid, for which harvest specifications are no longer set as a result of the complex being moved to the Ecosystem Component of the FMP
- Per request of the SSC, all of the assessment authors were asked to examine the 2017 Ecosystem Status Report over the course of the summer, to see if it contained indications of impending severe declines in their respective stocks, and none found any
- The primary new data that pertain to possible stock declines, and that have become available since those examinations were completed, are the results from this year's surveys, which were addressed previously

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