C5 JOINT GROUNDFISH SEPTEMBER PLAN TEAM REPORT

JIM IANELLI, CHRIS LUNSFORD, STEVE BARBEAUX, KALEI SHOTWELL, CINDY TRIBUZIO

October 4, 2022

GF Plan Team Meetings, September 19-23, 2022

- Hybrid: Traynor Room, Seattle, WA, see e-agenda for details
- Joint Teams, then GOA and BSAI

BSAI Team		GOA Team	
Steve Barbeaux	AFSC REFM (co-chair)	Jim Ianelli	AFSC REFM (co-chair)
Kalei Shotwell	AFSC REFM (co-chair)	Chris Lunsford	AFSC ABL (co-chair)
Cindy Tribuzio	AFSC ABL (vice-chair)	Sara Cleaver	NPFMC (coordinator)
Diana Stram	NPFMC (coordinator)	Kristan Blackhart	NMFS OS&T
Caitlin Allen Akselrud	AFSC RACE	Obren Davis	NMFS AKRO
Mary Furuness	NMFS AKRO	Craig Faunce	AFSC FMA
Allan Hicks	IPHC	Lisa Hillier	WDFW
Lisa Hillier	WDFW	Pete Hulson	AFSC ABL
Kirstin Holsman	AFSC REFM	Sandra Lowe	AFSC REFM
Phil Joy	ADF&G	Nat Nichols	ADF&G
Andy Kingham	AFSC FMA	Andrew Olson	ADF&G
Beth Matta	AFSC REFM	Jan Rumble	ADF&G
Andrew Seitz	UAF	Paul Spencer	AFSC REFM
Michael Smith	AFSC REFM	Marysia Szymkowiak	AFSC REFM
Jane Sullivan	AFSC ABL		

Joint BSAI and GOA Plan Team (JPT)

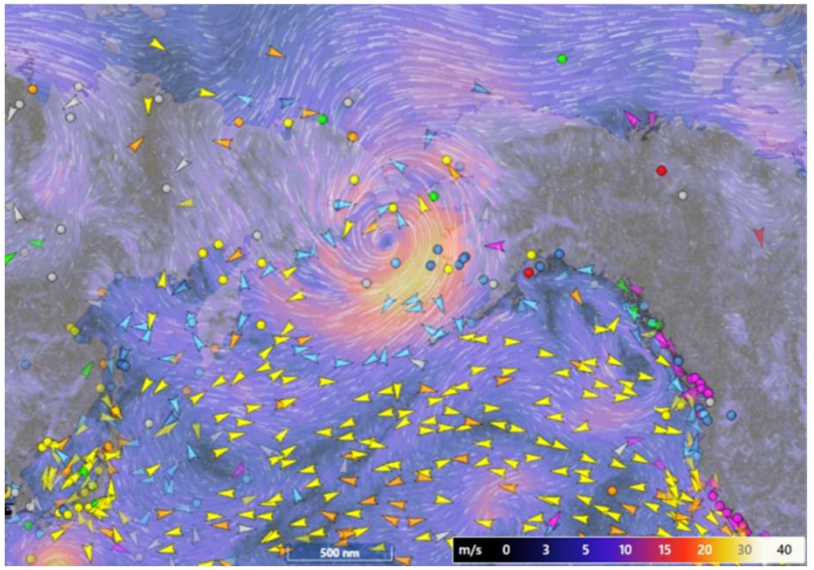
JPT Agenda Summarized

Topic	Type	Action	Model Change
Administrative & Council Updates	Information Only	No	NA
ESP Update	Information Only	No	NA
ESR Climate Overview	Information Only	No	NA
Forage Fish Congress	Information Only	Yes	NA
RPA Update	Information Only	No	NA
AFSC Longline Survey	Information Only	No	NA
Whale Depredation	Information Only	No	NA
Sablefish CPUE Standardization	Information Only	No	NA
Shark Stock Structure, Models	Model Update	Yes	Minor
State-Space Models	Information Only	Yes	NA
Tiers 4/5 Random Effects	Model Update	Yes	Moderate
Economic SAFE	Information Only	No	NA
Genomic Update Pollock/Cod	Information Only	No	NA

Note: Links to presentations underlined...

ESP Update and ESR Climate Overview

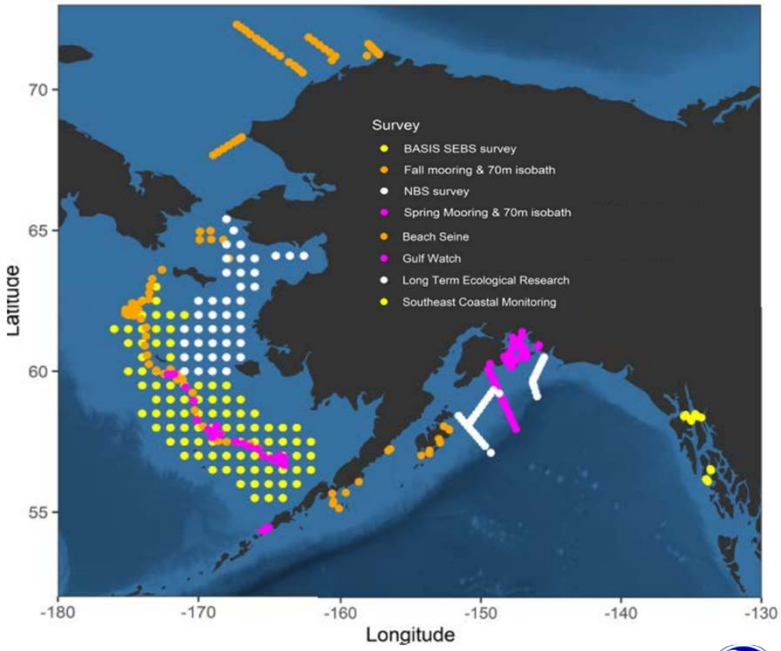
- ESP: 1 full and 6 report cards 2022
  - Request for indicators in winter 2023
  - National ESP programs are developing
- ESR: climate overview by region
  - EBS - average SST, cold pool, low pH
  - AI - warming, increased transport
  - GOA - average SST, heatwave recovery
  - Sea surface temp forecasts provided



Thanks to Kalei Shotwell and Ivonne Ortiz

Recruitment Processes Alliance Update (RPA)

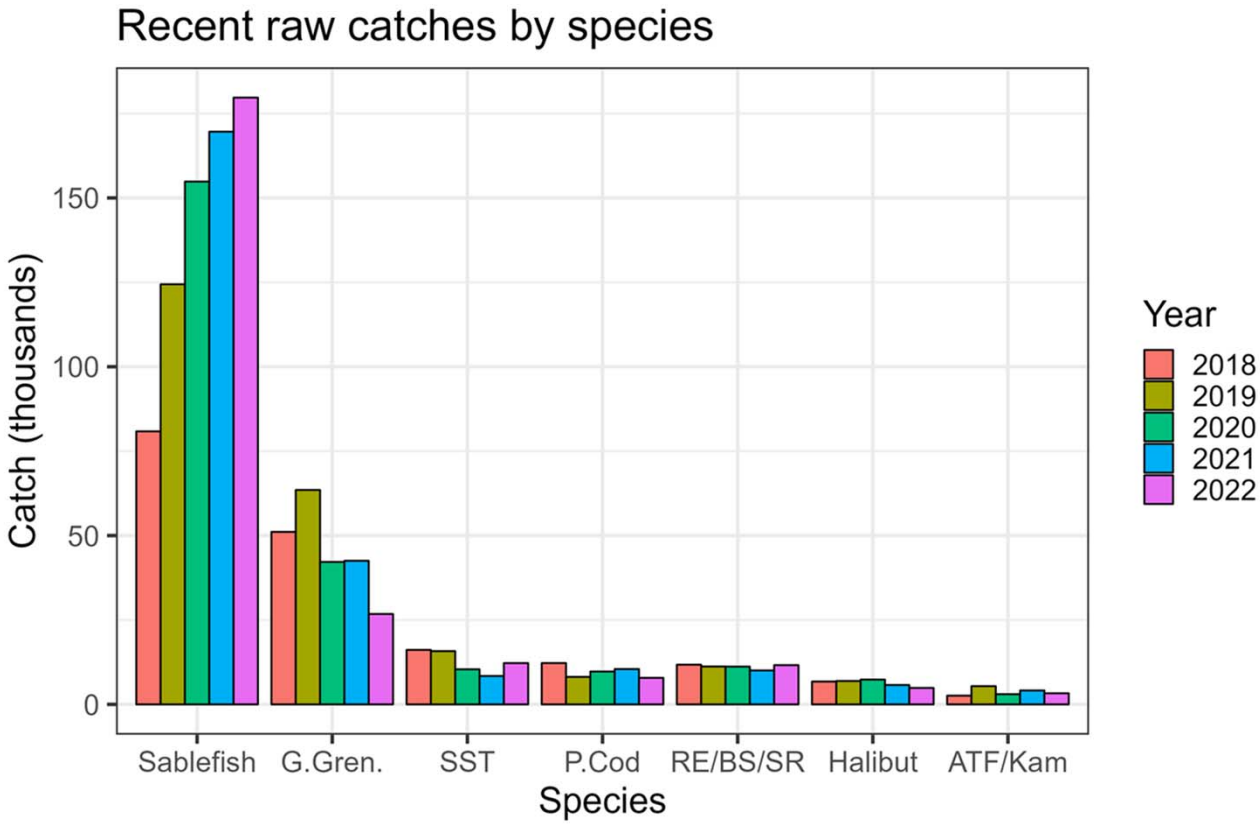
- Overview of ecosystem surveys
- EBS: 4 surveys, 1 cancelled
  - Warm year conditions, smaller copepods, increased euphausiids, large catch age-0 pollock, juv sockeye, forage
- GOA: 4 surveys
  - Cooler conditions, large copepods, more age-0 pcod and pollock, 2022 sablefish more prevalent in seabird diets



Thanks to Rob Suryan

AFSC Longline Survey Update

- Aleutians and GOA year
- AK-wide sablefish RPNs up 17%
- Sperm & killer whale depredation relatively low
- GOA Pacific cod RPNs down 24%



Thanks to Kevin Siwicke

JPT Presentation summary

Topic	Author	Topic/Stock
Forage Fish Congress	David McGowan	Forage fish
Recruitment Processes Update	Rob Suryan	ESRs
AFSC Longline Survey	Kevin Siwicke	Sablefish, others
Whale Depredation	Megan Williams	Sablefish
Sablefish CPUE Standardization	Matt Chen	Sablefish
Shark Stock Structure, Models	Cindy Tribuzio	Sharks
Adding length data in state-space assessment models	Giancarlo Moron	Assessment modeling
Tiers 4/5 Random Effects	Jane Sullivan	Cross-cutting
Economic SAFE	Ben Fissel	Cross-cutting
Genomic Update Pollock/Cod	Sara Schaal	Pacific cod (and pollock)

Note: Links to presentations underlined...red text indicates PT had a recommendation

JPT Responses

Forage fish

- **Joint Team recommended:**

  …that the forage fish workshop requested by the Council occur after the BSAI forage fish assessment in 2023 to better coincide with the assessment cycle.

Thanks to Dave McGowan

Sharks

- **Joint Team recommended:**
  1. **Retaining observer at-sea length measurements and expand list of shark species codes,**
  2. **Separating the Pacific spiny dogfish ABC from the other shark species in the GOA,**
  3. **Developing fishery -dependent and -independent indices for use in stock assessment**
  4. **Continuing to expand biological studies of Pacific sleeper sharks to inform catch models**
  5. **Creating a more efficient combined (BSAI and GOA) stock assessment document for Alaska sharks.**
  6. **Bringing forward an alternative model that uses the 90th percentile of catch for other/unidentified sharks (BSAI/GOA) and spiny dogfish(BSAI) to deal with extreme catch events**

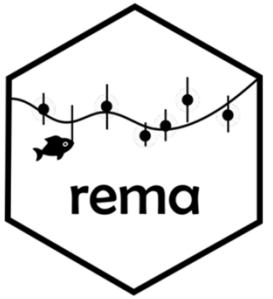
Also: show status quo assessment approach and the ORCS catch model as alternatives for sleeper sharks in November

Thanks to Cindy Tribuzio

Tier 4/5 Random Effects Modeling

- Overhaul of survey trend model
  - Created new easy-to-use R package (*rema*)
  - Unified code among scientists
  - Flexible treatment of strata and additional CPUE index
  - Examples and usage here
- **Joint Team recommended:**

  Analysts use updated software



Thanks to Jane Sullivan

QUESTIONS?

GROUNDFISH PLAN TEAM CONTACTS:

JIM.IANELLI@NOAA.GOV

CHRIS.LUNSFORD@NOAA.GOV

STEVE.BARBEAUX@NOAA.GOV

KALEI.SHOTWELL@NOAA.GOV

CINDY.TRIBUZIO@NOAA.GOV

DIANA.STRAM@NOAA.GOV

SARA.CLEAVER@NOAA.GOV

C5 BSAI GROUNDFISH SEPTEMBER PLAN TEAM REPORT

STEVE BARBEAUX, KALEI SHOTWELL, CINDY TRIBUZIO

BSAI PT Agenda Summarized

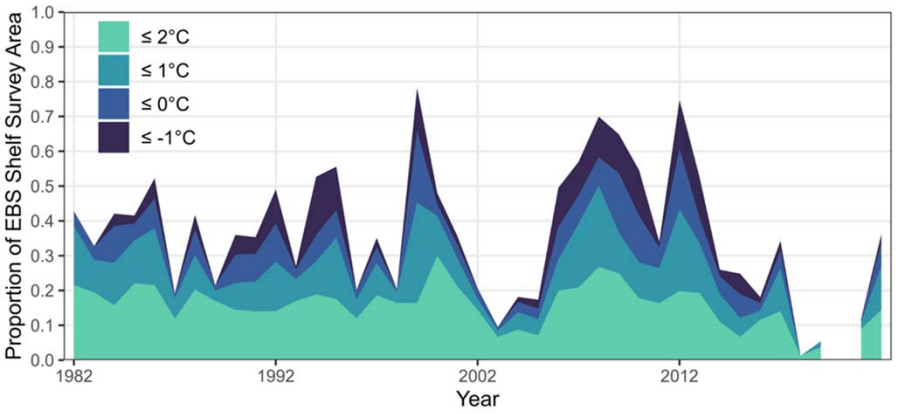
Topic	Type	Action	Model Change
Bottom Trawl Surveys: EBS, AI	Information Only	Yes	NA
EBS Pacific Cod	Model Update	Yes	Minor
AI Pacific Cod	Model Update	Yes	Moderate
Pacific Ocean Perch	Model Update	Yes	Minor
Blackspotted/Rougheye Rockfish	Model Update	No	No
Other Rockfish	Model Update	Yes	Moderate
Shortraker Rockfish	Model Update	Yes	Moderate
Greenland Turbot	Model Update	Yes	Moderate
Yellowfin Sole	Model Update	Yes	Moderate
EBS Acoustic Trawl Survey	Information Only	No	NA
EBS Pollock	Model Update	Yes	Minor
Proposed Harvest Specifications	Review	Yes	NA
Halibut Discard Mortality Rates	Review	Yes	NA

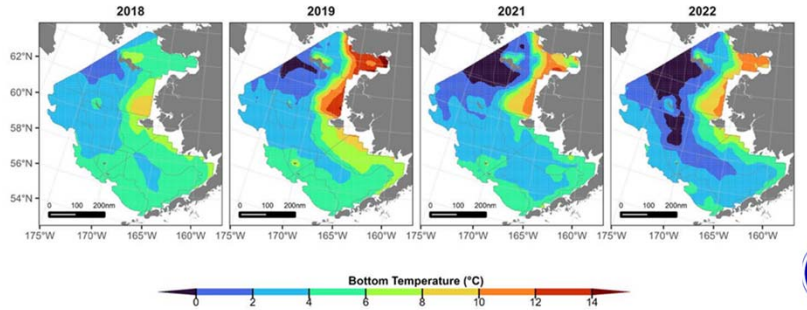
Note: Underlined text has a link to presentation

EBS Bottom Trawl Survey

- Highlights:
  - Survey temps show larger cold pool than recent years
  - Some fewer lengths sampled than last year's survey
  - Fish biomass generally up in EBS and down in NBS
  - Data available now for authors
  - Public data: FOSS, DisMAP

Thanks to Duane Stevenson

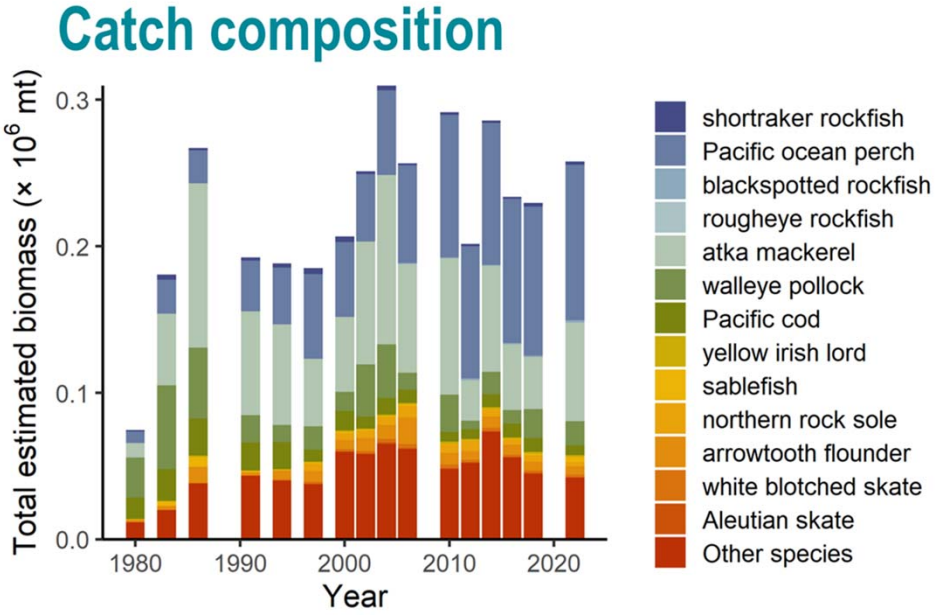




AI Bottom Trawl Survey

- Highlights:
  - Water temps remain above long term average
  - Biomass of 6 of 10 highlighted species increased
  - Data available now for authors
  - Lots of personnel changes, and growing collaboration with stock assessment authors

Thanks to Ned Laman



Bottom Trawl Survey - Summary

- **Team Recommended:**
  - **Document detailing the change in gear and survey configurations as well as species identification be available for authors to reference in the future**
  - **Noted and appreciated extra efforts by survey teams to streamline products, collaborate and respond to request by authors and conduct special collections**

EBS Pacific Cod

- Data and model explorations for 2022:
  - Removing seasonally corrected annual W@L relationship
    - New script developed since previous in unsupported software
  - New algorithm for fishery length comp data in R function
  - No ageing bias for ages after 2007 based on AGP discussions
  - Alternative input sample sizes for fishery length comps
  - Additional standard error term on VAST estimates

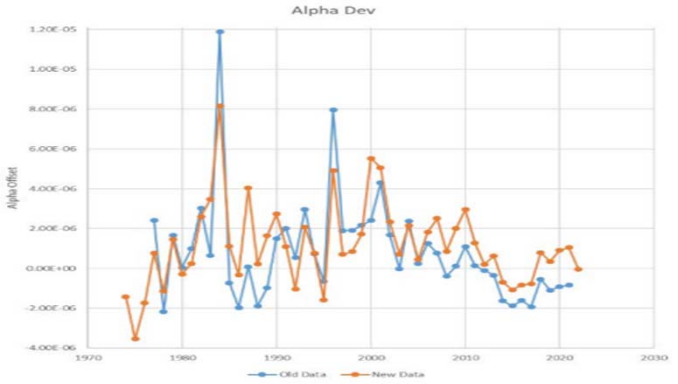
Thanks to Steve Barbeaux

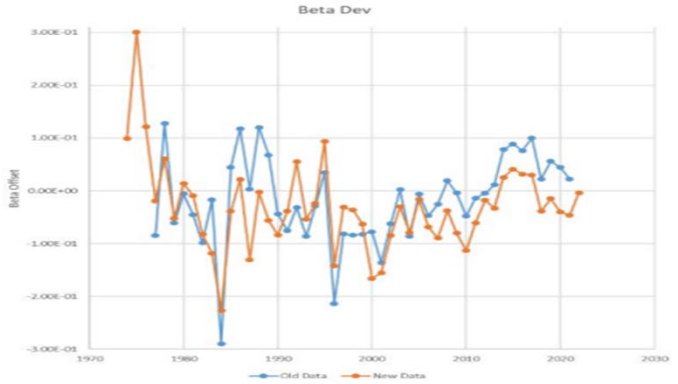
EBS Pacific Cod - New W@L Method

- Issue: W@L model conducted using complicated algorithm developed in unsupported MATHCAD program

- Method:
  - Previous: Complicated linear model with seasonal trend in W@L for annual variability (34 pages of script)
  - New: GAM in R (4 lines)

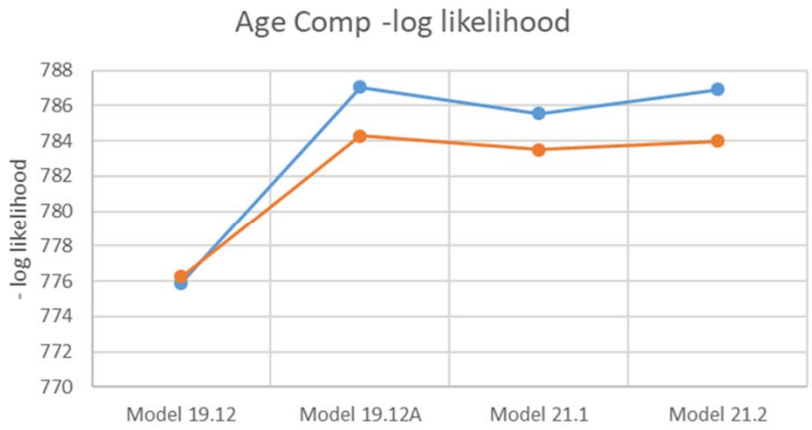
- Results: New method similar to previous, however author recommended the annual W@L parameters not be used..

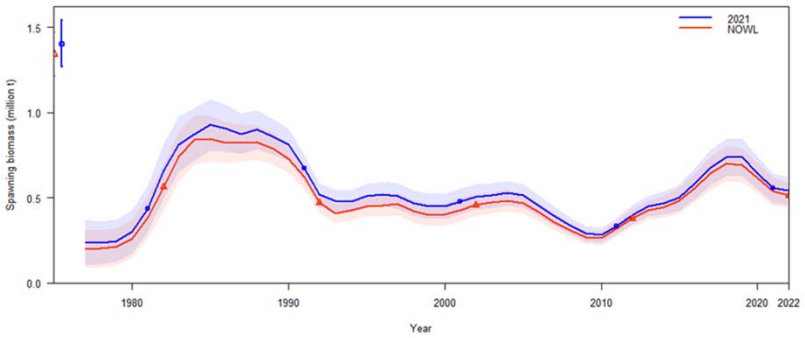




EBS Pacific Cod - NOWL Alternative

- Issue: Annual W@L relationship degrades fits of models
- Method:
  - Author suggested removing annual W@L with NOWL (No annual W@L) alternative
- Results:
  - Removal improves overall fit to age comp for most models.
  - Slightly lower M and higher q lead to minor decrease in SSB and recruitment in all models



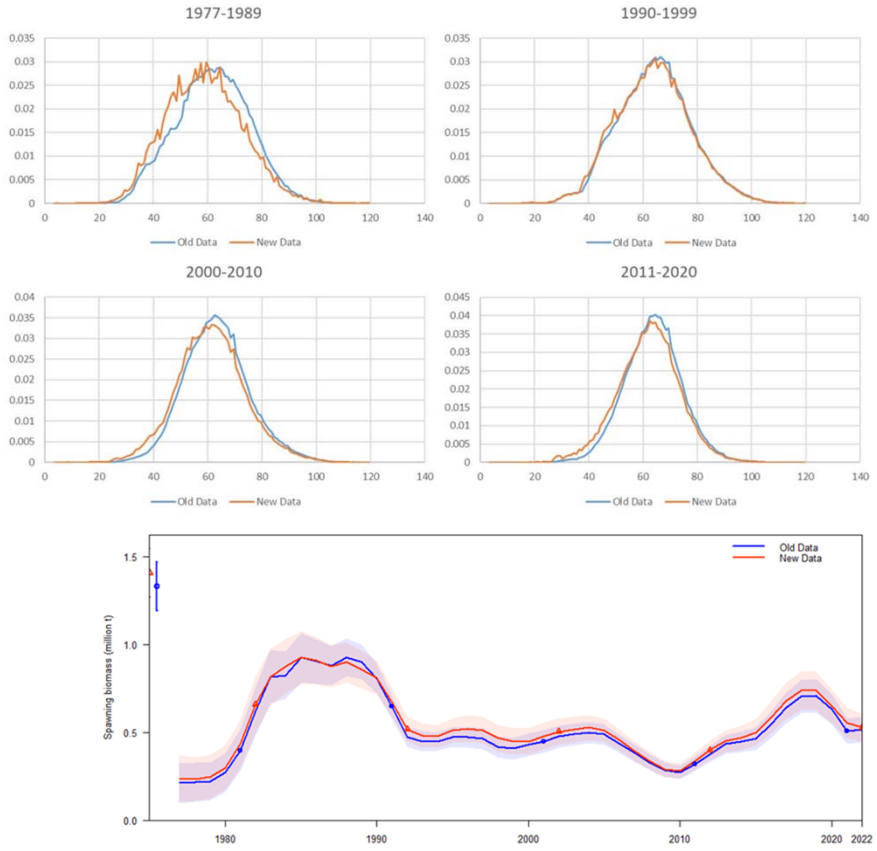


EBS Pacific Cod - New Fishery Length Data

- Issue: Complicated manual pulling and processing of data

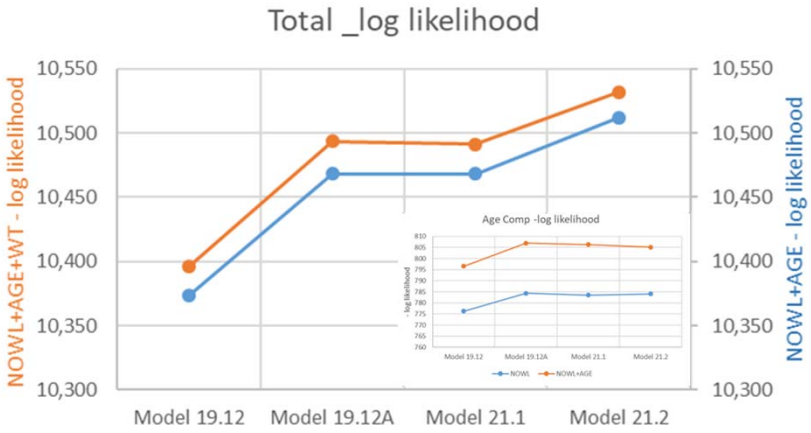
- Method:
  - Data pulling and processing developed into R-script
  - Change in catch weighting of fishery length composition data

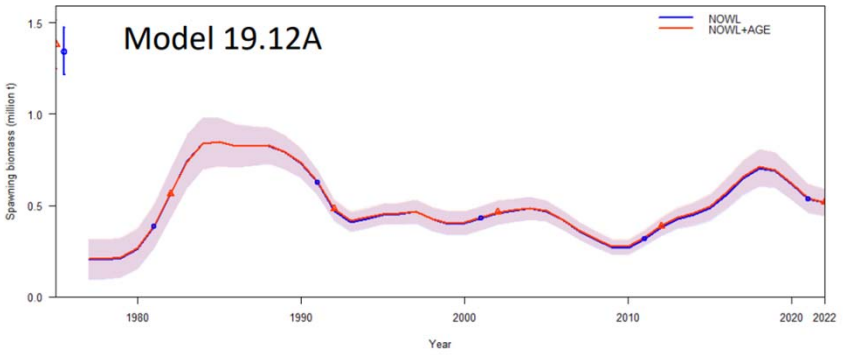
- Results:
  - Easier to use and appropriate weighting of older data
  - Minor changes in model results due to shift to smaller fish in early data



EBS Pacific Cod - AGE Alternative

- Issue: Bias modeling not consistent with Age and growth program (AGP) advice
- Method:
  - Previous: Two blocks for ageing bias; 92-07 and 08-21
  - New: Single early time block 92-07
- Results:
  - Removal degrades overall fit
  - However, consistent with AGP advice
  - Minor changes in model result



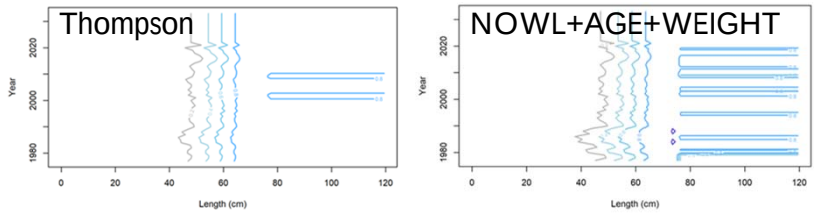


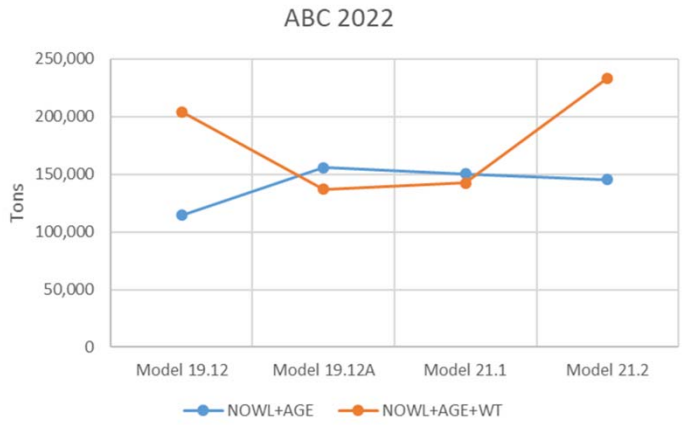
EBS Pacific Cod - Input Sample Size Explorations

- Issue: Dirichlet multinomial log theta parameter at upper bound for length comps with current input samples sizes

- Method:
  - Explored alternative fishery and survey length comp input sample sizes (Number of hauls for fishery and inflated number of hauls for survey)
- Results:
  - Improved fit to length comps, poorer fit to abundance indices, see increase in annual variability in selectivity, mixed changes in model results
- **Not recommended at this time by Team, rather to bring topic of input sample size calculations to JPT in Nov for discussion for consistency across assessments and investigating alternative methods**

Fishery selectivity





EBS Pacific Cod - Summary

- **Team and Author Recommended**
  - **Removing seasonally corrected annual W@L relationship**
  - **Explore alternative methods for seasonal growth in future**
  - **Use new algorithm for fishery length comp data in R function**
  - **Remove ageing bias for recent time period (post-2007)**
  - **Explore more options for capturing variability in growth**
  - **Input sample size calculation issues be brought to JPT, possible subject for new working group**

AI Pacific Cod

- Model Explorations:
  - Simple model (2022_2) explored in SS3, no longline survey, one fishery, starts in 1991
  - Complex model in SS3 (2022_1), trawl and longline survey, three fisheries, starts in 1978

Thanks to Ingrid Spies

AI Pacific Cod - Results

- Comparison of SS Models and ADMB Model
  - Many parameters similar between all three models
  - Exceptions were growth (estimated inside model with SS3), weighting of fishery catch data, high fixed sigma r in SS3 models
- Other Discussions
  - Start date for the models differ (1978, 1991), support consistency between SS models
  - Dome-shaped selectivity of longline survey

AI Pacific Cod - Summary

- **Team and Author Recommendations**
  - **Bring forward Tier 5, last year's ADMB, and 2 SS models**
  - **Consider parameterizations for sigma R, standardize tuning**
  - **Support using AI observer data to estimate maturity at age**
  - **Support weighting fishery catch similar to previous versions**
  - **Recommend exploring data weighting methods similar to EBS Pacific cod assessment in the future**
  - **Recommend exploring evidence for dome-shape in LL survey in future assessments**

BSAI Pacific Ocean Perch

- Overview of Center of Independent Experts (CIE) review
  - Discussed lack of fit to AI survey and retrospective pattern
  - Evaluated *M*, including loosening prior, and time blocks
  - Considered different weighting options
- Overall Conclusions
  - Determined stock assessment appropriate for management use
  - Retrospective vexing but no obvious solution, assessment robust, insufficient evidence to change data weighting procedure
  - Prioritized list of recommendations by reviewer

Thanks to Paul Spencer

BSAI Pacific Ocean Perch

- **Team and Author Recommendations**
  - **Fit model to survey abundance instead of biomass**
  - **Explore stochastic initial age compositions**
  - **For equilibrium initial age compositions, explore mortality rates other than currently used**

Discussed potential for new maturity study and case study for WHAM model to explore age-length conversion matrix

Blackspotted / Rougheye Rockfish

- Responses to previous Team and SSC comments on input data
  - Distribution of survey samples to evaluate trends by depth
  - Spatial footprint of AI survey and incidental catch fisheries
  - Exploration of other survey data (AFSC/IPHC longline, ADF&G)
  - Natural mortality estimates (value of *M* is "very high")
  - Changes in depth of fishery effort, effect on age/size comps
- Reviewed each topic, provided recommendations for Nov

Thanks to Paul Spencer

Blackspotted / Rougheye Rockfish - Results and Summary

- Author Recommendations:
  - Do not recommend including either IPHC or AFSC longline surveys in the model
  - Length compositions similar in fishery and survey, indicating increase in proportion of small fish not primarily function of fishing effort
- Team had no recommendations for model changes but discussed examining much-lower value of *M* used in GOA REBS

Other Rockfish

- Concerns in previous assessment due to no EBS slope survey since 2016, SST on EBS slope comprise ~65% of all BSAI other rockfish
- Spatial mismatch in the AI between bottom trawl and longline surveys
- Model Explorations:
  - Bridging from ADMB to TMB using new *rema* R package
  - Add AFSC longline survey RPWs for SST on EBS slope

Thanks to Jane Sullivan

Other Rockfish - Summary

- Bridging exercise adequately documented the benefits of moving to the *rema* R package, consistent with previous model
- Addition of AFSC longline survey in the EBS an improvement over previous model
- **Team Recommendations for November:**
  - **Bring forward last year's model with updated LL survey model**
  - **Communicate with the Groundfish Assessment Program regarding starting year for this species and document in SAFE**

Shortraker Rockfish

- SSC requested to develop methods to be robust to survey reductions efforts, explored IPHC and AFSC longline surveys
- Spatial mismatch in the AI between bottom trawl and longline survey
- IPHC sampling coverage changing from 2020 forward
- Model Explorations:
  - Bridging from ADMB to TMB and univariate version (re) to multivariate version (rem) using new *rema* R package
  - Add AFSC longline survey RPWs for shortraker on EBS slope

Thanks to Kalei Shotwell

Shortraker Rockfish - Summary

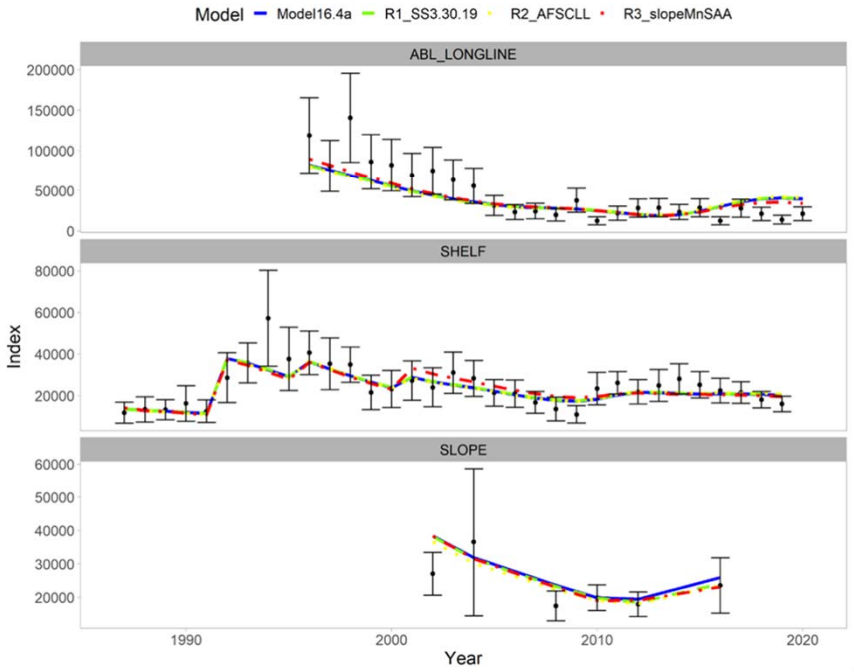
- Bridging exercise adequately documented the benefits of moving to the *rema* R package, consistent with previous model
- Addition of AFSC longline survey in the EBS an improvement over previous model (-0.4% change from previous model)
- **Team Recommendations for November:**
  - **Bring forward last year's model with updated LL survey model**
  - **Communicate with the Groundfish Assessment Program regarding starting year for this species and document in SAFE**

Greenland Turbot

- Model Explorations:
  - R1: Software updates to SS3, use newest version, improvement on double normal parameterization
  - R2: Use AFSC longline survey length data and estimate selectivity, previously fixed selectivity and length data was ghost data
  - R3: Use EBS slope bottom trawl survey mean size-at-age data that would provide more information about growth at older ages

Thanks to Meaghan Bryan

- Many aspects of all models similar (e.g., growth, selectivity), with improvement of no stair step in fixed gear and EBS slope
- Fit to survey biomass similar
- Time series all similar in recent years, some historical differences



Greenland Turbot - Summary

- Author Recommendations for November:
  - Three runs: 1) use newest version of SS3, 2) use AFSC longline survey length data, estimate selectivity, 3) use EBS bottom trawl survey mean size@age data
- **Team recommended Runs 1 and 3 in November, document Run 2**
- Team discussed platform updates, requested guidance from SSC on how to present model changes for obsolete version
- Team also strongly supports resuming EBS slope survey, major source of data for deep water stocks, better represents older ages

Yellowfin Sole

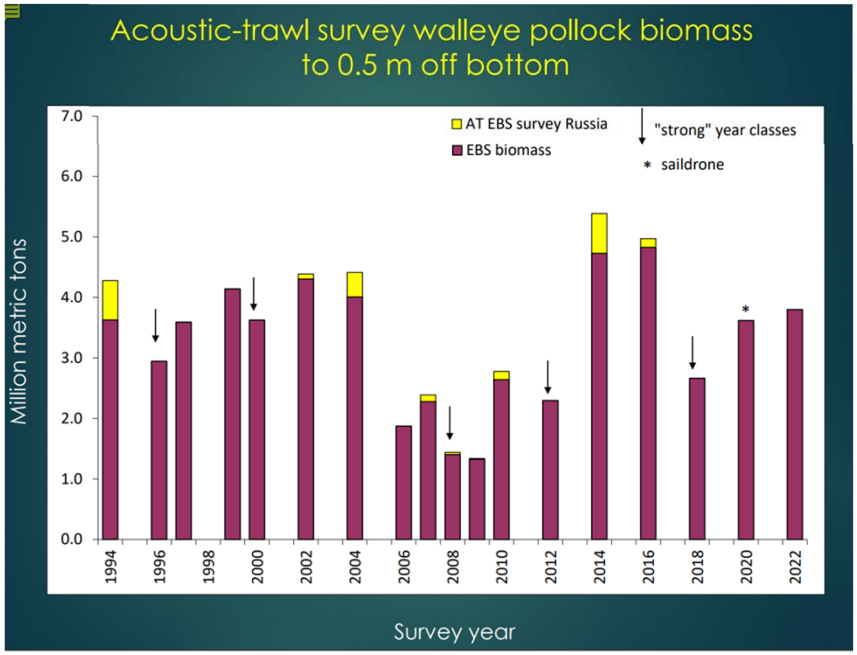
- Model Explorations:
  - Model 18.2: base model with designed based abundance index and age compositions, sex-specific survey selectivity
  - Model 22.1: design-based abundance index and age compositions, single survey selectivity
  - Model 22.2: model-based (i.e., VAST) abundance index and age compositions, single survey selectivity

Thanks to Ingrid Spies

Yellowfin Sole - Summary

- **Plan Team Recommendations for November:**
  - **Bring forward all three proposed models for consideration**
- Plan Team also discussed:
  - Input sample sizes to use for model-based composition data, agreed to continue with Francis weighting, noted plans to develop standardized data weighting methods, encouraged author to revisit in the future
  - Team supports efforts to reduce run timing for VAST age comps using cloud based resources

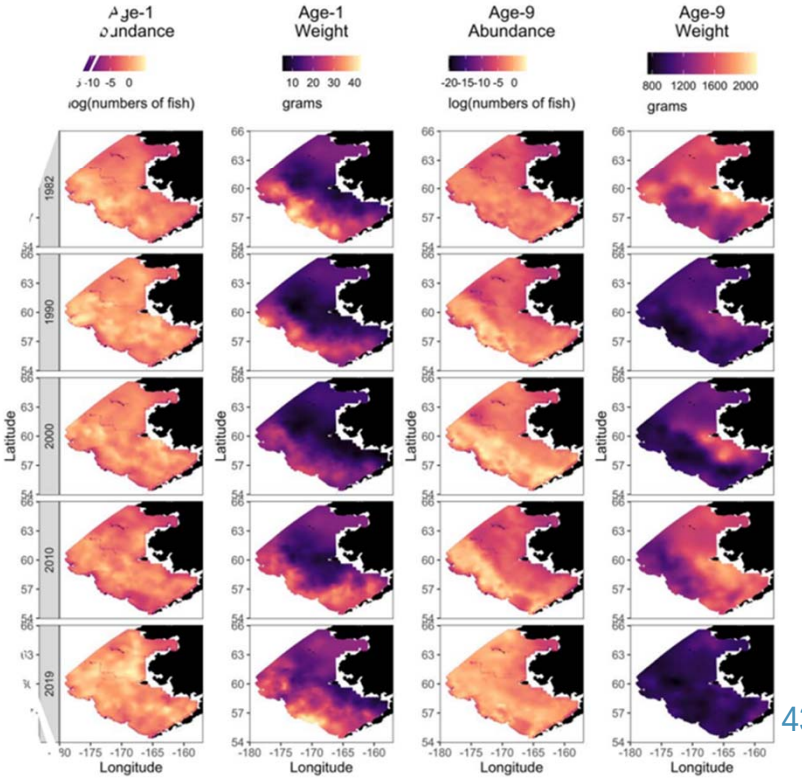
- Highlights:
  - 2022 haul transect, locations
  - Pollock biomass estimates, length/weight, distribution
  - Backscatter low in northern extension west 170°W
  - Annual AVO index for midwater pollock



Thanks to Sarah Stienessen

EBS Pollock

- Model and data exploration:
  - Alternative methods for calculating survey weight-at-age as previous method assumed fixed parameters
    - Non-spatial simple annual mean weight-at-age
    - Spatio-temporal model for weight-at-age similar to VAST approach

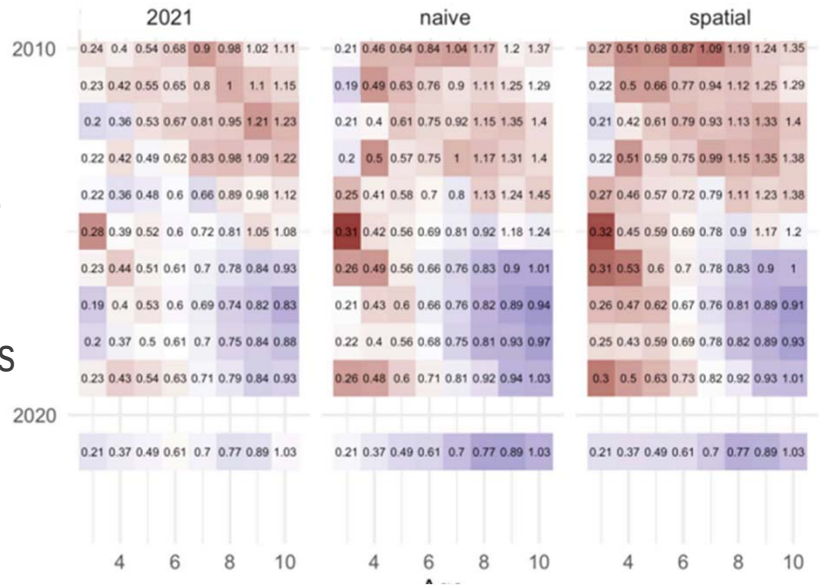


Thanks to Jim Ianelli

EBS Pollock - Results and Summary

- Results:
  - Both the non-spatial and spatio-temporal methods resulted in similar annual weight-at-age matrices
  - Improvement over previous approach
    - Mean-weights-at-age used as empirical estimates applied to model numbers-at-age for predicted survey biomass.
    - Supplementary to fishery weight-at-age estimates

- **Team Recommended:**
  - **The author use non-spatial approach for the 2022 assessment**



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SARA.CLEAVER@NOAA.GOV

C5 GOA Groundfish Plan Team

JIM IANELLI, CHRIS LUNSFORD

October 4, 2022

NOAA FISHERIES

GOA PT Summary topics

Topic	Type	Action	Model Change
Shelikof Survey	Information Only	No	NA
GOA Pollock	Model Update	Yes	Minor
GOA Other Rockfish	Model Update	Yes	Moderate
SEO Demersal Shelf Rockfish	Model Update	Yes	Many
Spatial Management Policy	Information only	Yes	NA
GOA CLIM: OY, Atlantis, CEATTLE	Information Only	No	No
Vulnerability Assessment	Information Only	Yes	No
Northern Rockfish	Model Update	Yes	Moderate
Dusky Rockfish	Model Update	Yes	Moderate
Thornyhead Rockfish	Model Update	Yes	Moderate
Proposed Harvest Specifications	Review	Yes	NA
Halibut Discard Mortality Rates	Review	Yes	NA

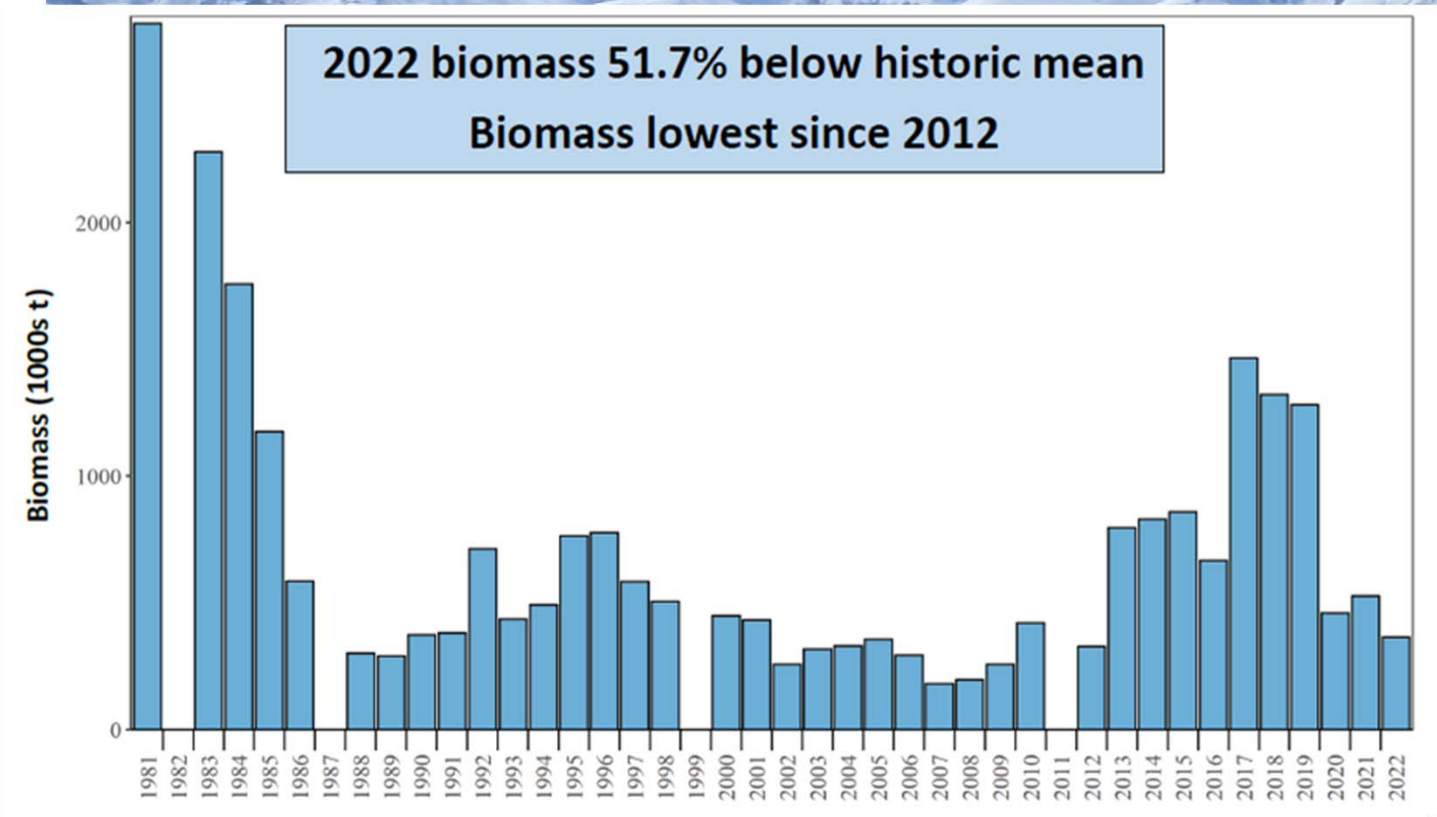
Note: Links to presentations underlined...

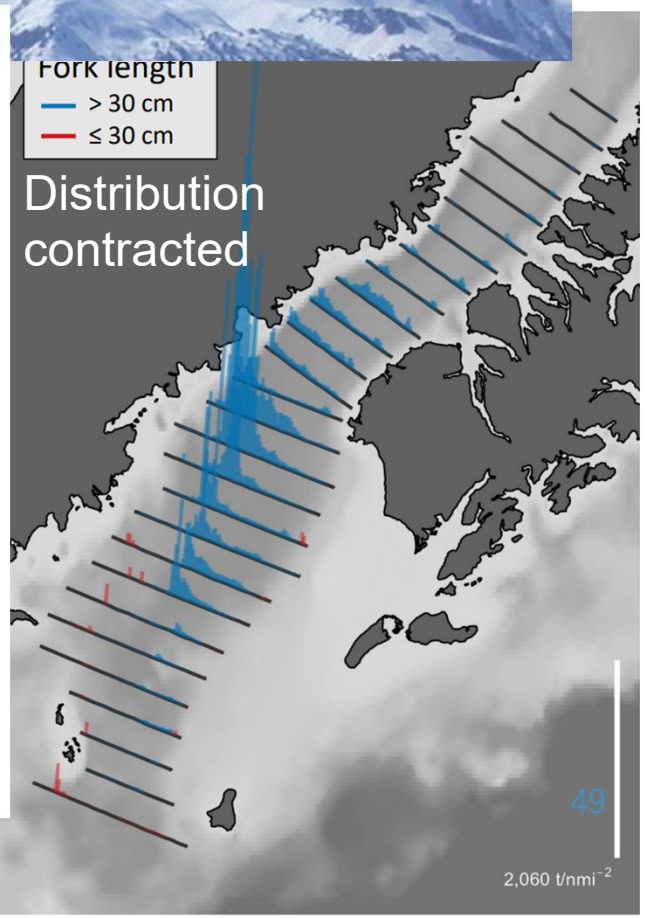
GOA PT presenters

Topic	Presenter(s)/author(s)	Stock
Shelikof Survey	David McGowan	GOA Pollock
GOA Pollock	Cole Monnahan	GOA Pollock
GOA Other Rockfish	Cindy Tribuzio	GOA Other rockfish
SEO Demersal Shelf Rockfish	ADFG	Demersal shelf rockfish
Spatial Management Policy	Sara Cleaver	Other Rockfish/DSR
GOA CLIM: OY, Atlantis, CEATTLE	A. Rovellini, M. Dorn, G. Adams	Cross-cutting
Vulnerability Assessment	Paul Spencer	Cross-cutting
Northern Rockfish	Ben Williams	Northern rockfish
Dusky Rockfish	Ben Williams	Dusky rockfish
Thornyhead Rockfish	Jane Sullivan	Thornyhead
Proposed Harvest Specifications	AKRO	all
Halibut Discard Mortality Rates	Review	cross-cutting

Note: Links to presentations underlined...

Shelikof survey for GOA pollock





Thanks to Dave McGowan

GOA Pollock

Link to analyst's presentation

Analysis of σ_R

- Shows that value ~1.3 in random effects model

Team recommended using the value of 1.3 for Sigma R for November (or best estimate selected by author)

Thanks to Cole Monnahan

GOA Other Rockfish

Link to analyst's presentation

Analysts proposed 3 options for determining *M*

- Weighted mean value with uncertainty

The Team recommended this methodology and approach for estimating values of *M* be brought forward in the next full assessment for documentation purposes and that decision points in determining species specific values and rationale be included

Thanks to Cindy Tribuzio

GOA SEO Demersal Shelf Rockfish

Linnk to analyst's presentation

The Team recommended that:

- The REMA model be used for producing biomass estimates going forward.
  - The Team appreciated the work that went into developing the surplus production model but considers it a “research” model at this time.
- The November 2022 assessment document includes the three versions of the results table for comparison purposes
  - current model [status quo], REMA model with IPHC survey data, and REMA model without IPHC survey data).
  - The surplus production model results should be presented as an appendix.
  - The Team expressed concerns about using the IPHC survey data for a patchily distributed species such as yelloweye rockfish, and how appropriate the IPHC survey is for tracking yelloweye population trends.
- The author use the biomass point estimate instead of the lower 90% CI that is being used in the current model.
  - If the author recommends an ABC/OFL reduction, it should be justified in the risk table.
- The author determine the origins of the F40% value (0.026) being used
  - noted that if a Tier 4 designation is determined to be inappropriate, that the author should consider dropping to Tier 5 to more appropriately reflect the data limitations of DSR.
- The author consult the catch accounting group at the Alaska Regional Office for the best way to estimate historical yelloweye rockfish discards in the halibut fishery and resulting catch estimates.
- The author, after consultation with the SSC, pursue a CIE-type review of this assessment in the next 2 years.

Thanks to Phil Joy

Other Rockfish/DSR Spatial Management

- The Team recommended that:
  - The 2022 DSR assessment incorporate an example of how the DSR Gulf-wide OFL and the ABCs would be calculated under this revised categorization, including corresponding changes to the Other Rockfish OFLs and ABCs

Thanks to Sara Cleaver

GOA Vulnerability Assessment

- The Team recommended that:
  - other subject matter experts beside Team members and assessment authors be considered as potential resources to assist with ranking and scoring the potential effects and extent of how species may be vulnerable to climate change.

Thanks to Paul Spencer

GOA Northern Rockfish

Link to analyst's presentation

- The Team recommended that the following model changes be brought forward in November:
  - Remove the bottom trawl data from the 1980s
  - Extension of the length plus group
  - A model that uses the Francis method to reweight the composition data
  - A model that sets the VAST index weight at 1 rather than 0.25

The Team recommended that the issue of skip-spawning be brought forward in the risk table for this year's assessment

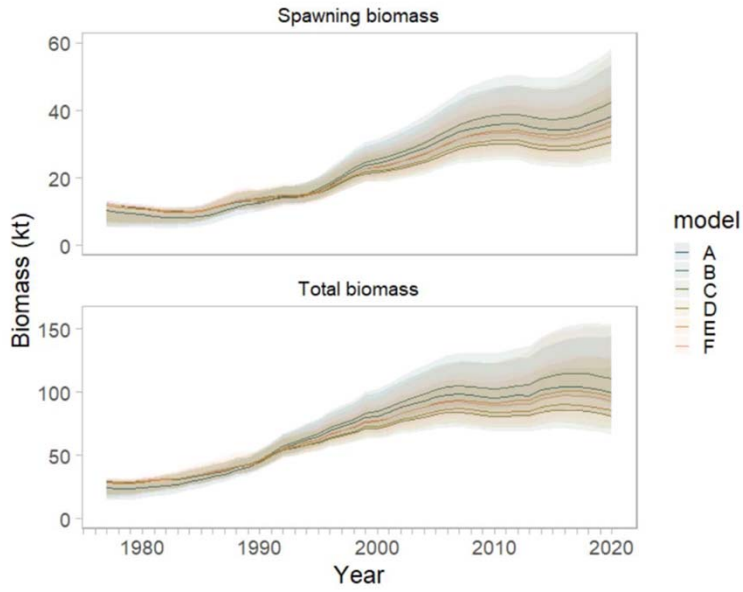
Thanks to Ben Williams

GOA Dusky Rockfish

Link to analyst's presentation

The Team recommended that the following model changes be brought forward in November:

1. Remove the bottom trawl survey data from the 1980s
2. Extension of the age and length plus groups
3. A VAST index using the lognormal distribution and 750 knots



Thanks to Ben Williams

GOA Thornyheads

Link to analyst's presentation

- The Team recommended excluding BTS data from 1984 and 1987 due to different survey methodology and to continue utilizing a two-survey model.

- The Team recommended simplifying the model naming convention where Model 18 represents the status quo model, Model 18* is the corrected model in TMB with new data, and Model 22 is the model with additional observation error on BTS and LLS.

- The Team recommended discontinuing the misspecified status quo model (Model 18) and bringing forward both the corrected model (Model 18*) and the model with observation error on both the BTS and LLS (Model 22) for the November assessment.

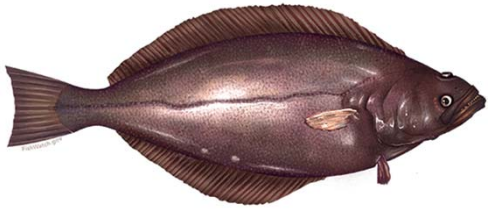
Thanks to Jane Sullivan

QUESTIONS?

GROUNDFISH PLAN TEAM CONTACTS:

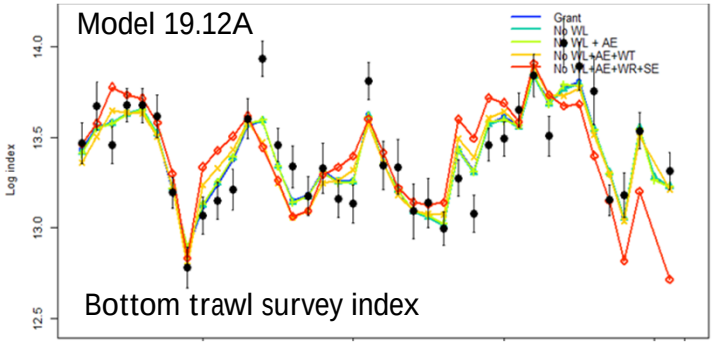
JIM.IANELLI@NOAA.GOV
CHRIS.LUNSFORD@NOAA.GOV
STEVE.BARBEAUX@NOAA.GOV
KALEI.SHOTWELL@NOAA.GOV
CINDY.TRIBUZIO@NOAA.GOV
DIANA.STRAM@NOAA.GOV
SARA.CLEAVER@NOAA.GOV

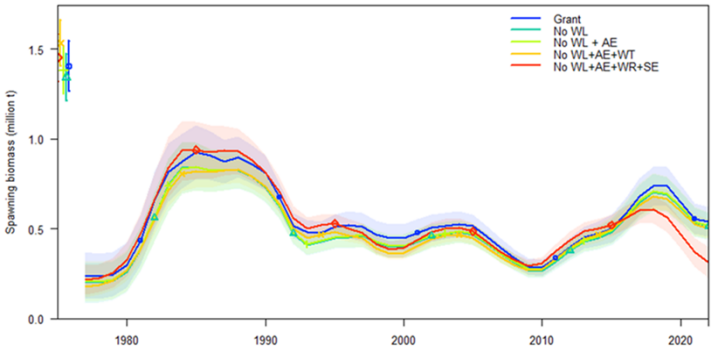
Supplemental Slides for BSAI Plan Team



EBS Pacific Cod - Additional variance for indices

- Issue: VAST estimated variance is much lower than design-based resulting in potentially overweighting in model
- Method:
  - Explored fitting additional standard error of the indices with the model
- Results:
  - Substantially increased index variance resulting in much poorer fit to the index with slight improvement of fit to composition data. Severe degradation in retrospective. Mixed changes in model results.
- Team agreed with author and not recommended for change at this time.

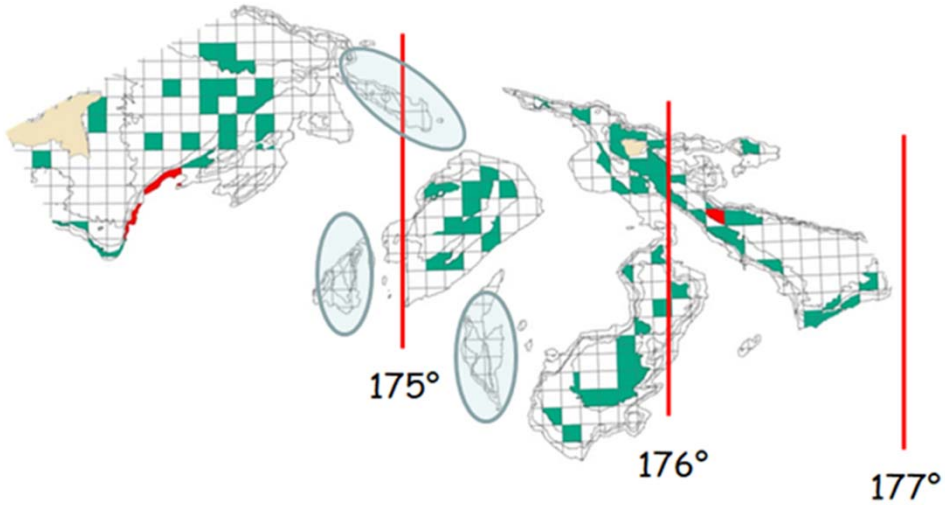




Supplemental Slide

Blackspotted / Rougheye Rockfish - Survey Sampling

- Sampling effort relatively evenly distributed by area, less in SBS
- 100-200 has most sampling effort, 300-500 most biomass
- Not expect spatial distribution of survey/fishery effort to match, recent study shows consistency in fish/survey comp data

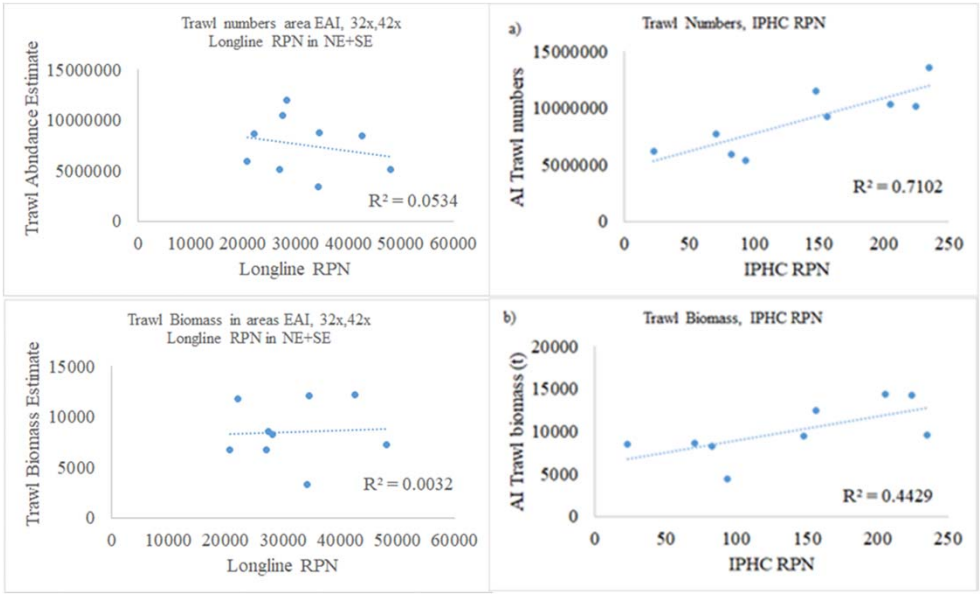


- Green = successfully trawled stations, red = untrawlable stations
- The three ellipses are areas with fishing effort but no survey sampling

Supplemental Slide

Blackspotted / Rougheye Rockfish - "Other" Surveys

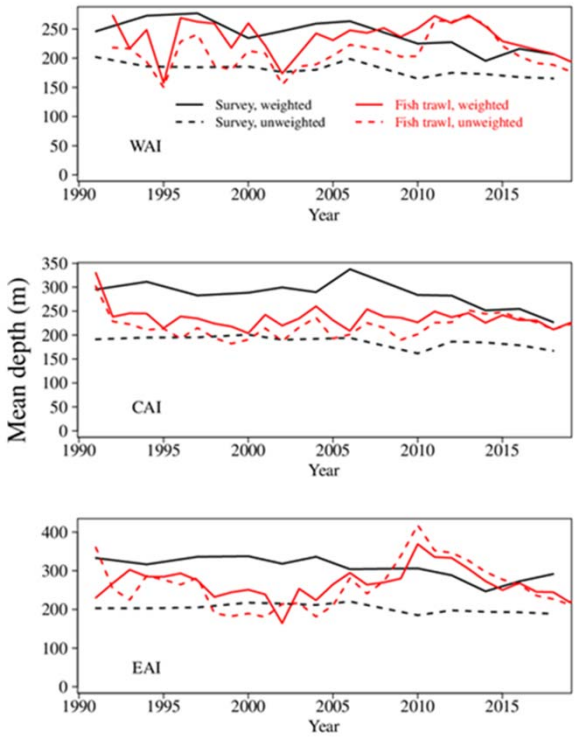
- Mismatch in spatial coverage relative to stock area and AI BTS
- Spatial complexity of AI complicates interpretation of partial area surveys
- Conclusion consistent with that of AI shortspine thornyhead



Supplemental Slide

Blackspotted / Rougheye Rockfish - Spatial Shifts

- Mean depth fishery effort changed in west and east, less in central
- Depth of capture changed in both fishery and survey
- Size comps from trawl fishery similar to trawl survey, showing a decrease in size over time



Supplemental Slide

Other Rockfish - SST Results

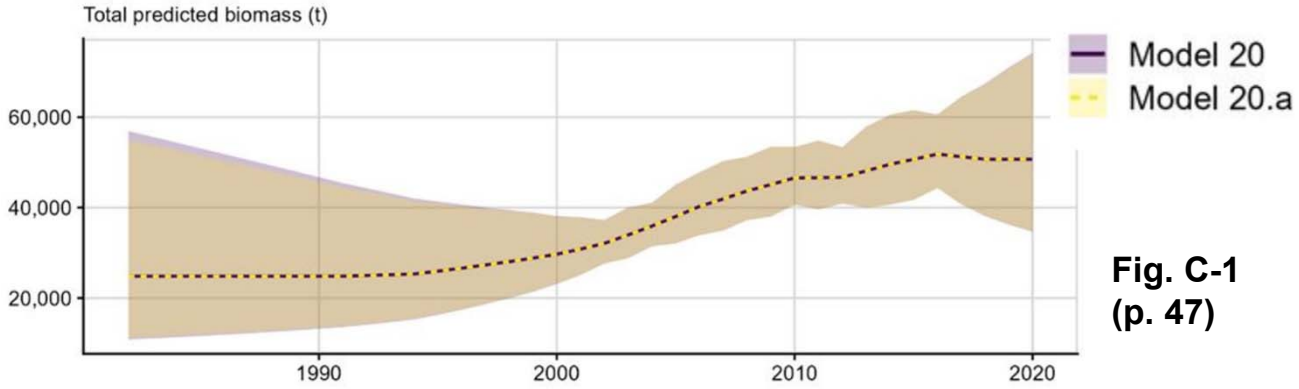


Fig. C-1 (p. 47)

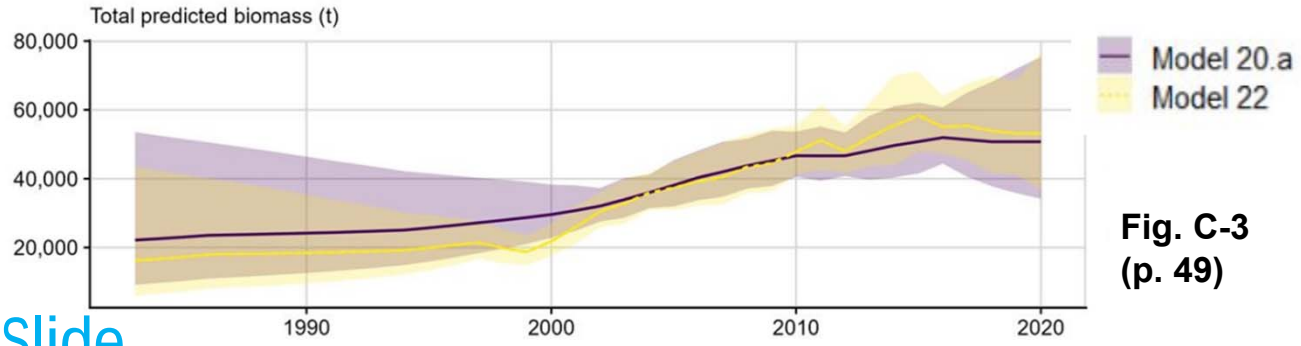


Fig. C-3 (p. 49)

Supplemental Slide

Shortraker Rockfish - Results

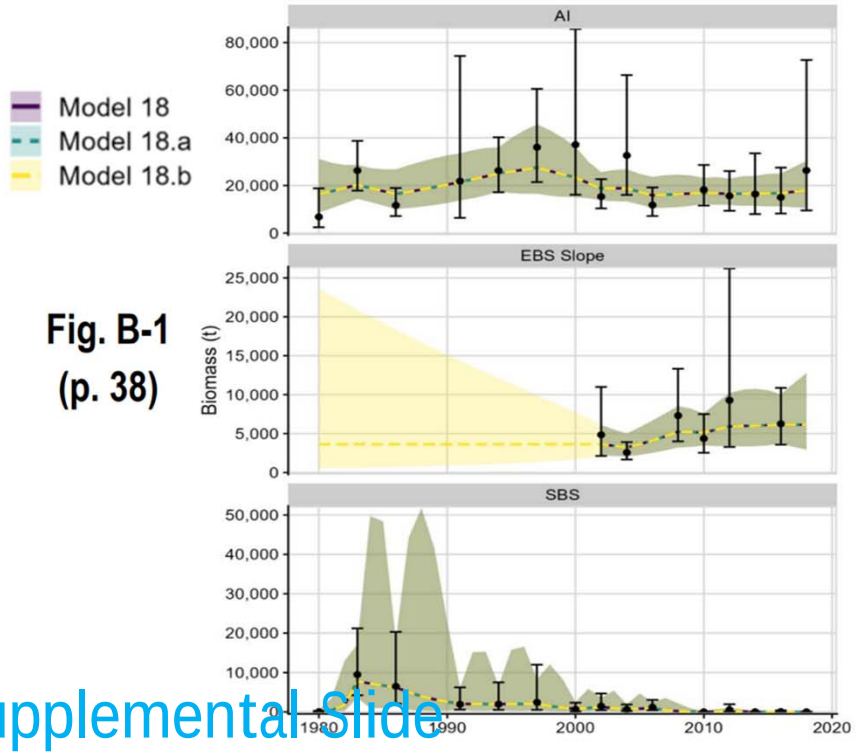


Fig. B-1 (p. 38)

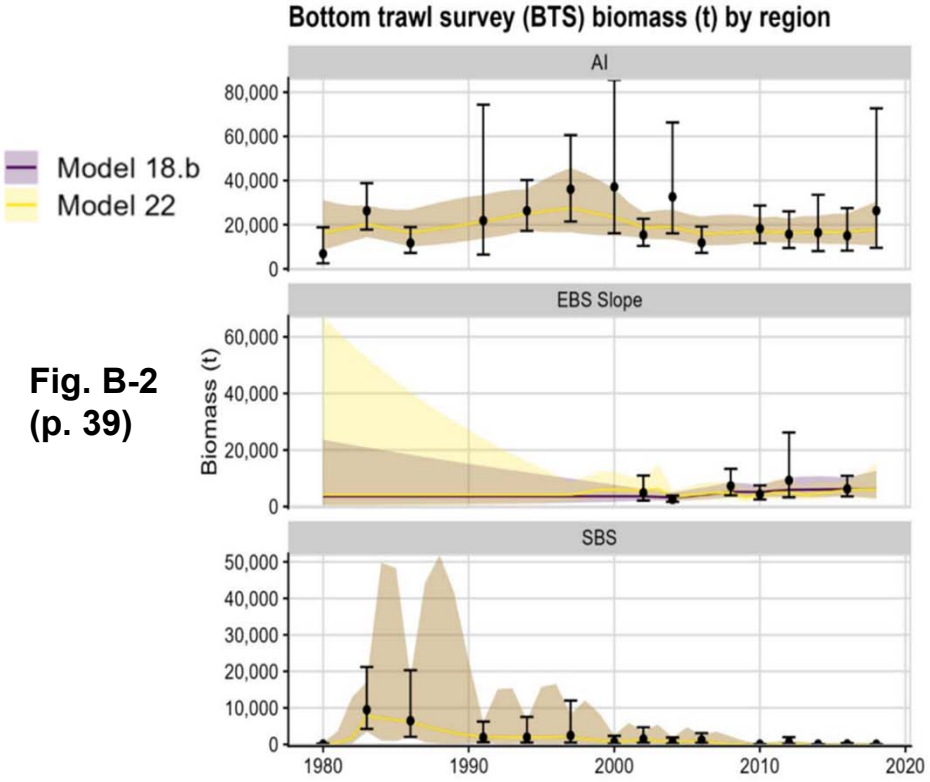
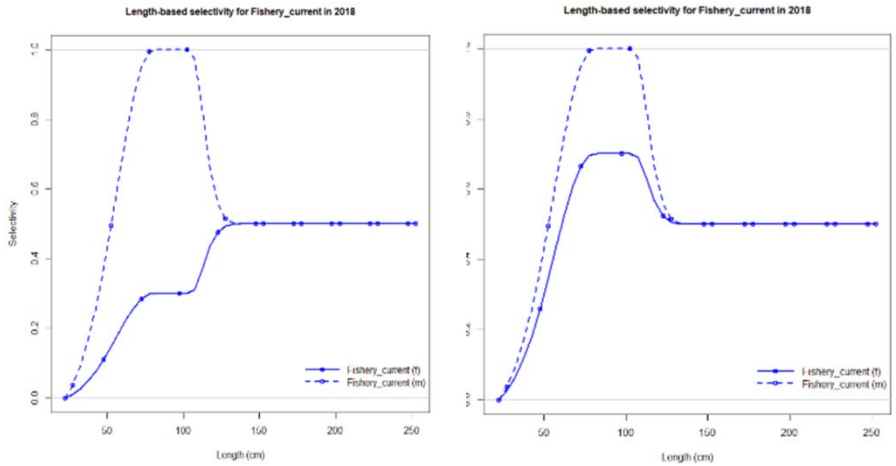


Fig. B-2 (p. 39)

Supplemental Slide

Greenland Turbot - SS3 Update

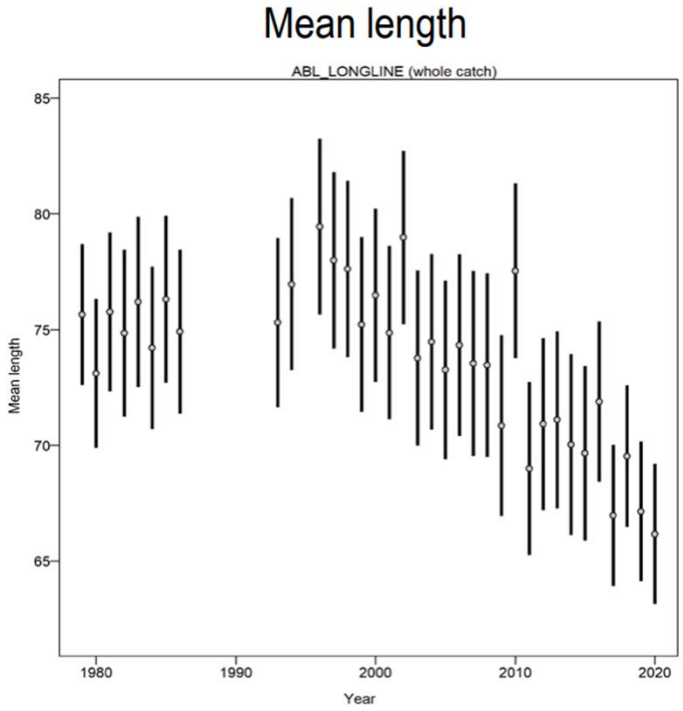
- Last assessment at version 30.12, now at version 30.19
- Parameterization of double normal selectivity pattern offset has changed
- Now constrains final selectivity to be at or lower than the apical selectivity, avoided stair step



Supplemental Slide

Greenland Turbot - AFSC Longline Survey

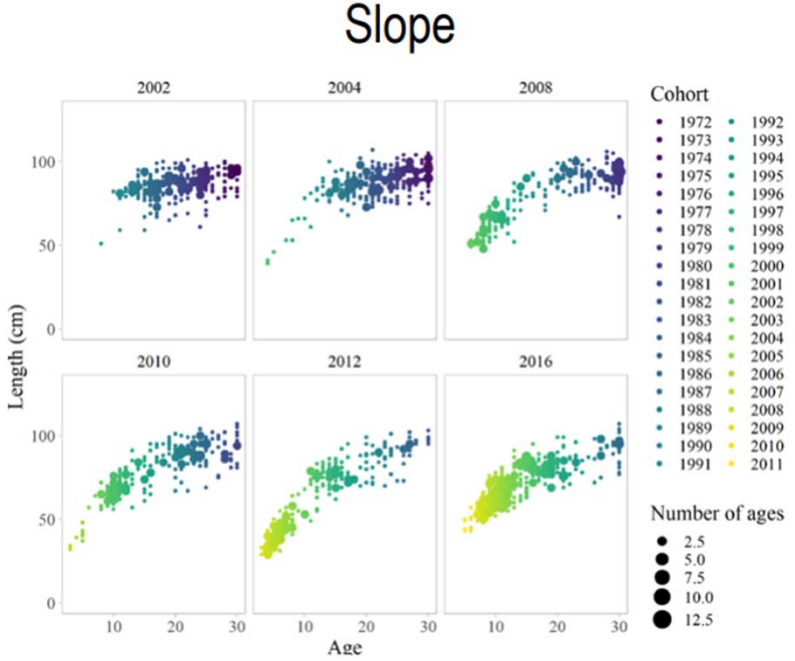
- Used as ghost data previously and selectivity was fixed
- Was not sex-specific, but started to sex this fish in 2021
- Mean length decline over time
- Now using longline survey length data and estimating logistic selectivity (2 parameters)



Supplemental Slide

Greenland Turbot - EBS Slope Survey Mean Size@Age

- Previously used mean size@age of shelf trawl survey, but not slope
- Six years of data on slope by females and males, more information about growth at older ages
- Now fit mean size@age of slope trawl survey



Females

Supplemental Slide

Yellowfin Sole - Growth Model

- Author did many explorations with growth model
  - Used bottom temperature as index of interest
  - Model run from 1982-2021, consists of 32,590 age/length/weight
  - Shows similar trend in biomass as Model 18.2
  - Has similar AIC as Model 18.2_1 single selectivity
- Author not putting forward growth model for consideration this year, and team supported author's continued research on this model

Supplemental Slide