# Report of the September 2020 Joint Groundfish Plan Team meeting

Alaska Fisheries Science Center

Grant Thompson

September 29, 2020

# Meeting overview

- Date: September 8-9
- Place: Cyberspace
- Leaders: Jim Ianelli, Chris Lunsford (GOA GPT co-chairs); Sara Cleaver (GOA GPT coordinator); Grant Thompson, Steve Barbeaux (BSAI GPT co-chairs); Steve MacLean (BSAI GPT coordinator)
- Participation: 140+ total participants, including 24 Team members and numerous AFSC and AKRO staff and members of the public
- Documents and presentation files available on the Team agenda site
  - Link provided on SSC agenda (under item C2)

# Agenda (action items in red)

- Administrative/Intro/Council
- Observer Program Updates (COVID-related commendation)
- Ecosystem Status Report (ESR)
- Longline Survey (COVID-related commendation)
- Essential Fish Habitat
- Ecosystem and Socioeconomic Profiles (ESP)
- Economic SAFE
- Ecosystem Surveys: 2020 Recruitment Process Alliance (RPA) surveys
- VAST Applications in Survey Group
- Survey Prioritization Update
- Survey Loss Uncertainty
- Halibut Discard Mortality

# Ecosystem & Socioeconomic Profiles (1 of 12)

- Kalei Shotwell provided an update on the Ecosystem Socioeconomic Profiles (ESPs), including an overview of ESP developments, SSC and Team comments, and the workshops completed to date
- With the end goal of transitioning to ecosystem-linked assessments, ESPs are specifically designed to prevent inclusion of process linkage in the decision making process before it has been tested and vetted through the scientific review process
- ESPs are a standardized framework for presenting and communicating the emerging evidence linking ecosystem processes to stock assessments
- Completing the loop between the disciplines allows for building a proactive strategy to be prepared for extraordinary change

# Ecosystem & Socioeconomic Profiles (2 of 12)

- ESP inventory:
  - ESPs currently available:
    - Sablefish
    - GOA walleye pollock
    - St. Matthew blue king crab
    - Bristol Bay red king crab (new this month!)
  - ESPs anticipated to be available this November:
    - EBS Pacific cod
    - GOA Pacific cod
- Remainder of this section describes post-June activity and Team responses to questions from the presenter

# Ecosystem & Socioeconomic Profiles (3 of 12)

- SSC (6/20): *"The SSC supports plans for further ESP development and evaluation. These efforts should enhance the future utility of indicators in stock assessments, including evaluations of uncertainty. ESPs are a commitment to a process, not a static product. As such, consideration should be given to the regularity (and timing) of reviews and revisions. Moreover, this effort should not stop with ecosystem indicators, but continue until ecosystem information is formally incorporated into SAFEs to achieve the goal of ecosystem-based fisheries management (EBFM)."*
- Response:
  - ESP workshop (9/25) included review/feedback on the annual cycle
  - Intent is to streamline the review process and reporting templates to help with increasing efficiency in producing the annual ESPs
  - ESP facilitators / ESR editors are coordinating indicator contributions between the ESPs, ESRs, and Economic SAFE to avoid redundancy

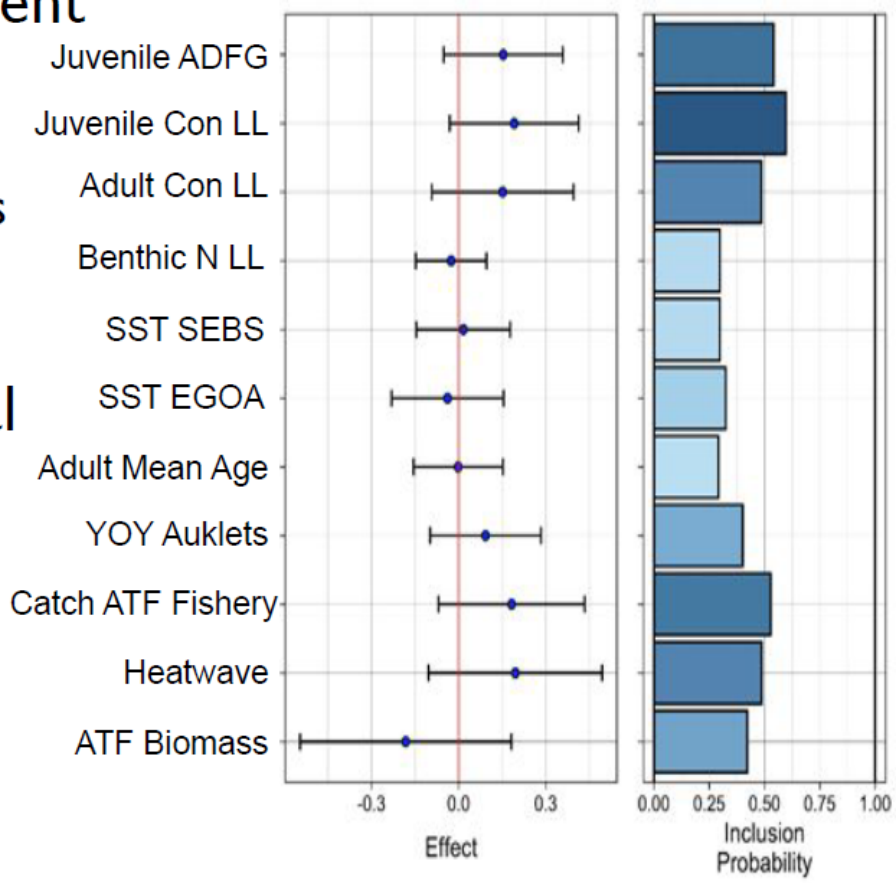
# Ecosystem & Socioeconomic Profiles (4 of 12)

- Stage 1 of proposed 3-stage indicator analysis (sablefish example):
  - Traffic Light Score
    - Evaluate for the current year
    - Use +1, -1, 0 to count G/P/S then / by total indicators
    - Evaluate for all categories and provide total ecosystem and socioeconomic score
  - Potential Use of Score
    - Evaluate ESP considerations section, risk table, SSC

| Category | Good | Poor | Stable | Score |
|---|---|---|---|---|
| Physical | 3 | | 1 | 0.75 |
| Zooplankton | | | 1 | 0 |
| Larval & YOY | 1 | | | 1 |
| Juvenile | 1 | 1 | 1 | 0 |
| Adult | 2 | 1 | 3 | 0.17 |
| Total (8 NA) | 7 | 2 | 6 | 0.33 |

# Ecosystem & Socioeconomic Profiles (5 of 12)

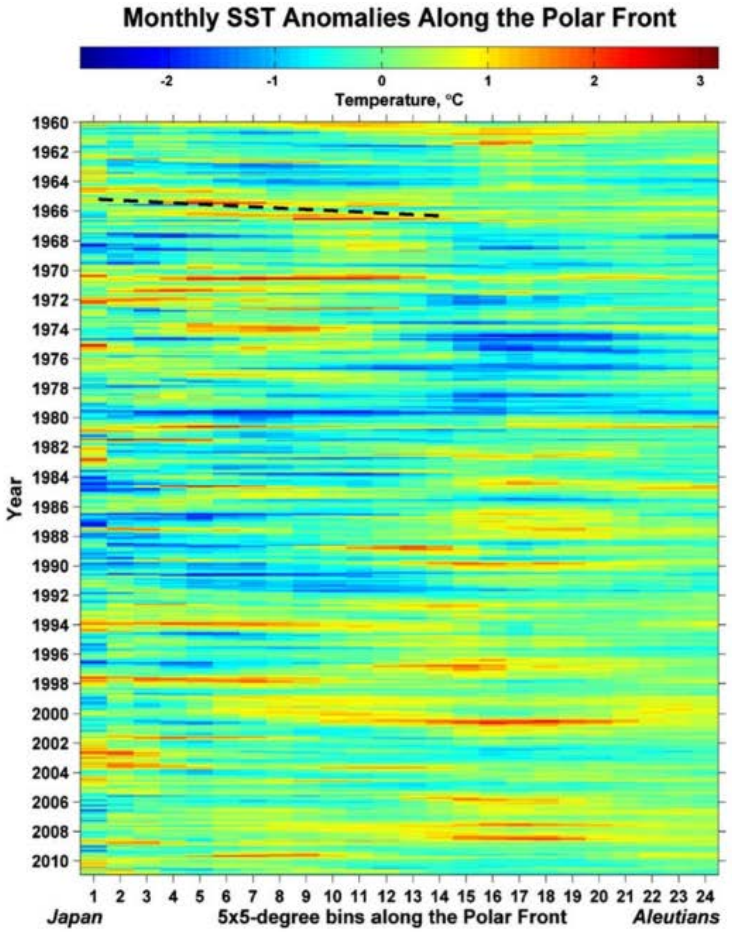
- Stage 2 of proposed 3-stage indicator analysis (sablefish example):
  - Modeling outside assessment
    - Inclusion probabilities
    - Weighting in stage 1 scores
    - Priorities for assessment
  - 5 indicators have potential
    - Juvenile index stand alone
    - Use together to inform recruitment deviations and lower uncertainty




# Ecosystem & Socioeconomic Profiles (6 of 12)

- Stage 3 of proposed 3-stage indicator analysis (sablefish example):

  - Modeling within assessment
    - Improve model parameters
    - Improve forecasting
    - Provide decision tables
  - Polar Front example
    - Wintertime conditions in central NP important
    - Improvement in medium-term
    - Compare with current model




# Ecosystem & Socioeconomic Profiles (7 of 12)

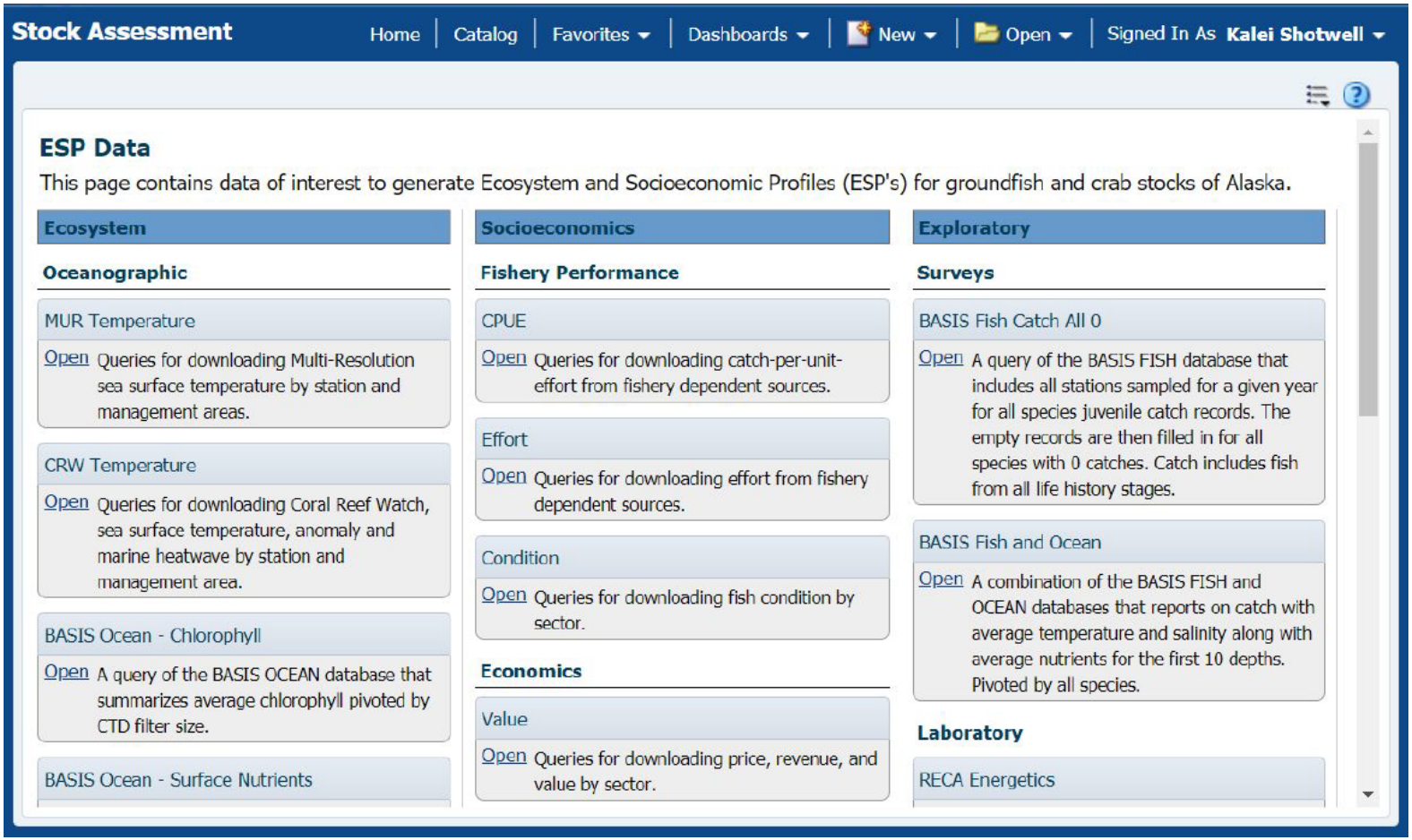
- *Question 1*: "Do the Teams support the 3-stage indicator analysis concept and scoring methods?"
- The Teams discussed concerns of over-emphasizing the 1:1 weighting on the first stage
- In the absence of information to indicate an appropriate weighting strategy, it is recommended to not rely too heavily on the uninformed 1:1 weighting to select appropriate indicators
- The Teams also requested that the ESP team/authors consider appropriately caveating the indicators to ensure they are interpreted species-specific and not over generalized
- The Teams support continuing with the current 3-stage indicator analyses for now, and re-evaluate as the ESP process develops, recognizing that the actual value of the integrated index is yet to be clearly demonstrated although it is one high-level summary statistic that may be valuable to examine

# Ecosystem & Socioeconomic Profiles (8 of 12)

- Agenda for the September 25 “Discussion” workshop:
  1. Review March workshop
  2. Metric and indicator scoping, testing and validation method
  3. Indicator analyses and transfer to/from SAFE report
  4. Socioeconomics in the ESPs: what to use and how
  5. Coordinating between ESP, ESR, Econ. SAFE, and SAFE chapters
- *Question 2*: “Are the one-day discussion topics sufficient?”
- The Teams support the proposed one-day ESP discussion agenda, and requests that linkages to the EFH be included in the last two discussion topics planned: Coordinating data and Indicator Analyses
  - Note that the list of topics was rearranged after the Team meeting, so “the last two” now correspond to items #3 and #5

# Ecosystem & Socioeconomic Profiles (9 of 12)

- ESP “dashboard” on AKFIN




# Ecosystem & Socioeconomic Profiles (10 of 12)

- *Question 3*: "Do the Teams support the ESP dashboard on AKFIN?"
- The Teams fully support the development of the ESP dashboard hosted on AKFIN with the following considerations:
  - Include metadata for each data source as well as the queries or traceability to those data
  - While a one-stop-shop for finding and downloading indicator data is useful and will help authors, the Teams suggest a staged approach for including data sources on AKFIN
  - The indicator data sets that are publicly available, thoroughly vetted and published can be included/linked on AKFIN, many are currently linked on the ESR websites
  - (Continued on next slide)

# Ecosystem & Socioeconomic Profiles (11 of 12)

- The Teams fully support the development of the ESP dashboard hosted on AKFIN with the following considerations (continued):
  - The ESP dashboard can either mirror or link to the data source, as per the preferences of the data provider
  - Indicators that are still in development, those that are “for use with permission only” indices are important for authors to be able to access and providing those indices on AKFIN would be helpful
  - However, until ready for public distribution, the ESP and assessment authors should work with the index developers
  - Thus, for those indices, AKFIN may need to only list and describe the index with contact information

# Ecosystem & Socioeconomic Profiles (12 of 12)

- ESP formats
  - Standard template: full (ESP appears as appendix to SAFE chapter)
    - Introduction: justification, data
    - Metrics assessment: baseline, processes
    - Indicators assessment: time series, analysis
    - Recommendations: data gaps, future priorities
  - Standard template: partial
    - Based on SAFE chapter "partial update" template
- *Question 4*: "Do the Teams support the existing standard template formats for both full and partial ESP; is the timing of reports reasonable?"
- The Teams support the current formats and timelines for now
  - This question may need to be revisited as the ESP process develops

# Ecosystem (RPA) Surveys (1 of 6)

- RPA: Ecosystems and Fisheries-Oceanography Coordinated Investigations (EcoFOCI), Ecosystem Monitoring and Assessment (EMA), Recruitment, Energetics & Coastal Assessment (RECA), Fisheries Behavioral Ecology (FBE)
- Presenters: Rob Suryan, Ellen Yasumiishi, Lauren Rogers
- Goal: To provide recent information on ecosystem conditions affecting recruitment processes
- Objectives:
  1. Provide updates on RPA-related surveys that occurred in 2020
  2. Encourage discussions of data/indicators most useful for stock assessments, ESRs, and ESPs
  3. Update on efforts to integrate recruitment models and indicators into stock assessments

# Ecosystem (RPA) Surveys (2 of 6)

- Results of the following 2020 surveys were presented:
  - Moorings and “Distributed Biological Observatory” (NBS, EBS, GOA)
  - NOAA GOA Beach Seine and Southeast Coastal Monitoring
  - Gulf Watch Alaska and NGOA Long Term Ecological Research
- Summary of the above (GOA only):
  - No return of the “blob”
  - *Inshore* = warm; *Shelf (upper)* = spring and summer near long-term mean, warm in fall; *Shelf (bottom)* warm summer and fall
  - Prey abundance appears improved from recent years
  - Strong GOA Pacific cod age-0 year class
  - Average- to below-average juvenile salmon catches
  - Still potential recruitment carry-over effects of 2019 heatwave
  - Overall, near-average conditions for feeding and growth

# Ecosystem (RPA) Surveys (3 of 6)

- Research on integration of indicators into assessments:
  - Artificial intelligence / machine learning and stock assessment (contact: J. Watson)
    - Initial model development focusing on pink salmon forecasts
    - Next steps: AK pollock, some west coast groundfish stocks
  - Large copepod index from 70 m isobath survey (contact: E. Yasumiishi, L. Eisner, D. Kimmel)
    - Large copepod densities predict recruitment of pollock at age 3
  - Satellite index of chlorophyll *a* as a proxy for phytoplankton biomass (contact: J. Nielsen, L. Eisner)
    - Balance of phytoplankton growth and loss (zooplankton grazing)
  - Continued on next slide

# Ecosystem (RPA) Surveys (4 of 6)

- Research on integration of indicators into assessments (continued):
  - Pop-up floats and Pacific cod spawning habitat (contact: L. Rogers, P. Stabeno)
    - Data will be used to refine ROMS, model spatio-temporal changes in Pacific cod spawning habitat
    - Eventually to be included in ESPs, risk table, and climate-informed reference points (via CEATTLE)
  - GOA pollock spawn timing and availability to winter acoustic survey (contact: L. Rogers, M. Dorn, K. Williams, D. Jones)
    - Spawn timing may affect availability of pollock to the survey
    - Currently developing indicators of spawn/survey timing mismatch to test as catchability covariates in assessment model

# Ecosystem (RPA) Surveys (5 of 6)

- The authors want to know:
  1. What is most useful for the Teams to see/hear from the RPA at September meetings?
  2. Are survey updates useful?
  3. Are science updates useful?
- Team discussion touched upon the following:
  - What indicators could be used in the different assessments?
  - What would be required in order to develop a conceptual model that would track changes through time?
  - Indices would need to be specific to the assessment
  - What is important to each of the life stages?
  - How should information of this type inform the risk table?

# Ecosystem (RPA) Surveys (6 of 6)

- Other Team discussion:
  - There will likely be a larger number of surveys next year, and the current format of the presentation may preclude showing results of them all in the time available
  - Options include defining a set of “core” surveys that should be reported every year, and identifying “hot topics” that might vary
  - The Teams also discussed the possibility of providing a set of predictive performance measures to determine whether an indicator is a candidate for inclusion in the ESP, but no specific alternatives were suggested and the Teams took no action on this
- The Teams recommended that the Ecosystem Status Report (ESR) and Ecosystem and Socioeconomic Profile (ESP) committees provide a prioritized list of ecosystem information to be reported to the Teams for the September meeting

# VAST Applications in Survey Group (1 of 14)

- Jason Conner presented an overview of the Groundfish Assessment Program's (GAP) work in producing model-based abundance indices using the Vector Autoregressive Spatio-Temporal (VAST) model
- GAP staff prepared hindcast models, through 2019, for 16 different species in the GOA, EBS, and EBS/NBS
- Methods for these model runs were described, including standard settings (terms of reference) and exceptions (non-standard settings)
- In general, the VAST point estimates track the design-based indices well and have less standard error
- However, some exceptions were noted where 2020 VAST indices either:
  - Cross or diverge from earlier VAST models or design-based indices
    - e.g., GOA Dusky Rockfish, GOA Pacific Ocean Perch
  - Had higher standard error than design-based indices
    - e.g., EBS Greenland Turbot

# VAST Applications in Survey Group (2 of 14)

- Papers testing spatio-temporal model performance (esp. VAST)

Shelton et al. 2014 CJFAS
- Case study demonstration of improved precision relative to design-based

Thorson et al. 2015 ICES JMS
- Simulation testing for estimating indices of abundance

Thorson et al. 2017 CJFAS
- Simulation testing for fishery-dependent standardization

Cao et al. 2017 CJFAS
- Case study comparison of design and spatio-temporal index in Gulf of Maine northern shrimp assessment

Thorson and Haltuch 2018 CJFAS
- Simulation testing for estimating age/length composition data

Grüss et al. 2019 Fish. Res.
- Blinded experiment with independently made operating model

Johnson et al. 2019 Fish. Res.
- Simulation experiment comparing model performance for VAST when missing covariates

Brodie et al. 2020 Ecography
- Biologically motivated operating model, comparing VAST, random forest, and GAMs

Maunder et al. 2020 Fish. Res.
- Discussion of importance for spatio-temporal standardization of fishery-dependent CPUE

O'Leary et al. In press Fisheries Oceanography
- Case-study comparison of design-based and spatio-temporal standardization for EBS pollock

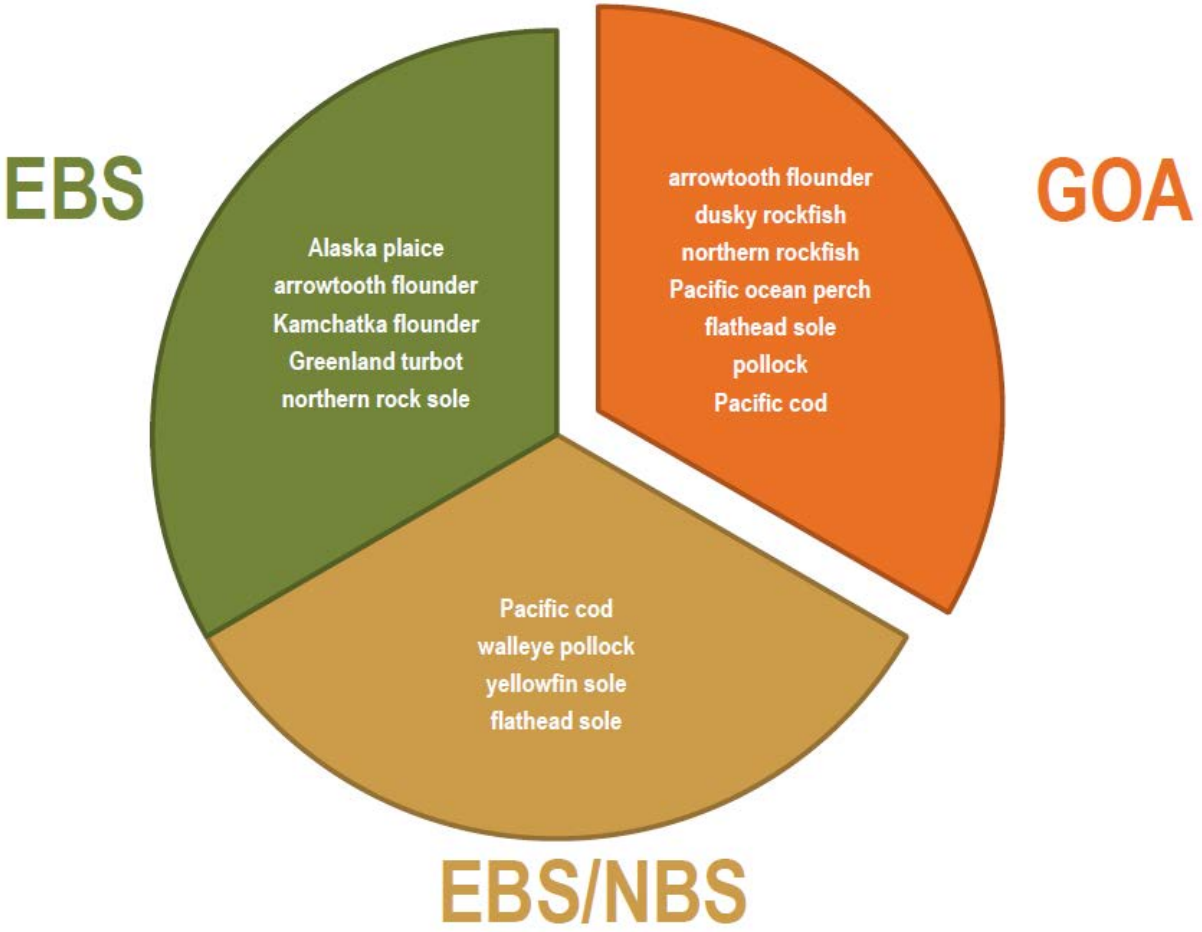
Thorson et al. In press Fish. Res.
- Simulation and case study showing that gamma distribution (and Tweedie model) match scale of design-based estimator on average

WKUSER ICES Workshop Report (http://www.ices.dk/sites/pub/Publication%20Reports/Forms/DispForm.aspx?ID=36905)
- Several participants are working on papers comparing design-based and VAST estimates in a simulation framework for GOA and EBS



# VAST Applications in Survey Group (3 of 14)

- Stocks for which VAST survey time series are currently available



# VAST Applications in Survey Group (4 of 14)

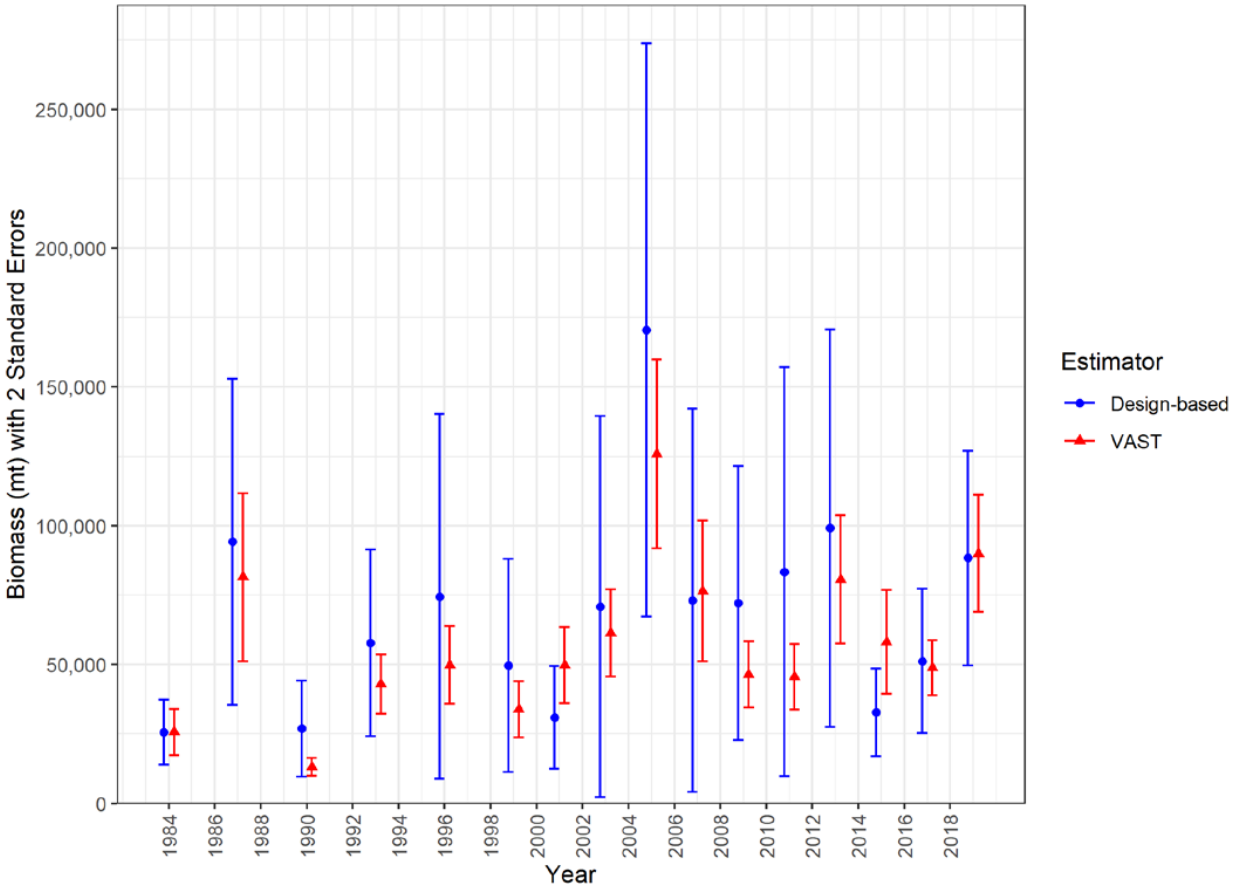
- Standard VAST settings:
  - Two linear predictors in a Poisson-link delta model with gamma distributed positive catch rates
  - Catch density extrapolated over a 4 $nmi^2$ grid (3.7 km × 3.7 km)
  - 500 knots distributed in proportion to the extrapolation grid, using fine-scale bilinear interpolation
  - No temporal smoothing
  - Each linear predictor included spatial and spatio-temporal terms
  - Retransformation bias was corrected using epsilon bias-correction
  - GOA extrapolation grid was limited to <700m, however all data were used in the model

# VAST Applications in Survey Group (5 of 14)

- Exceptions to standard VAST settings:
  - GOA dusky and northern rockfish: additional run using a lognormal distribution for positive catches
  - GOA pollock: additional run using data west of 140°W only
  - Bering Sea pollock, Pacific cod, flathead sole, and yellowfin sole:
    - Combined data from NBS and EBS used
    - Number of “knots” reduced to 250
    - Temporal autocorrelation enabled
    - Spatially varying response to cold pool extent included
  - Bering Sea pollock and Pacific cod: age composition estimated
  - Bering Sea Pacific cod:
    - Encounter probability for 100% encounters fixed
    - Survey index expressed as numbers of fish rather than biomass

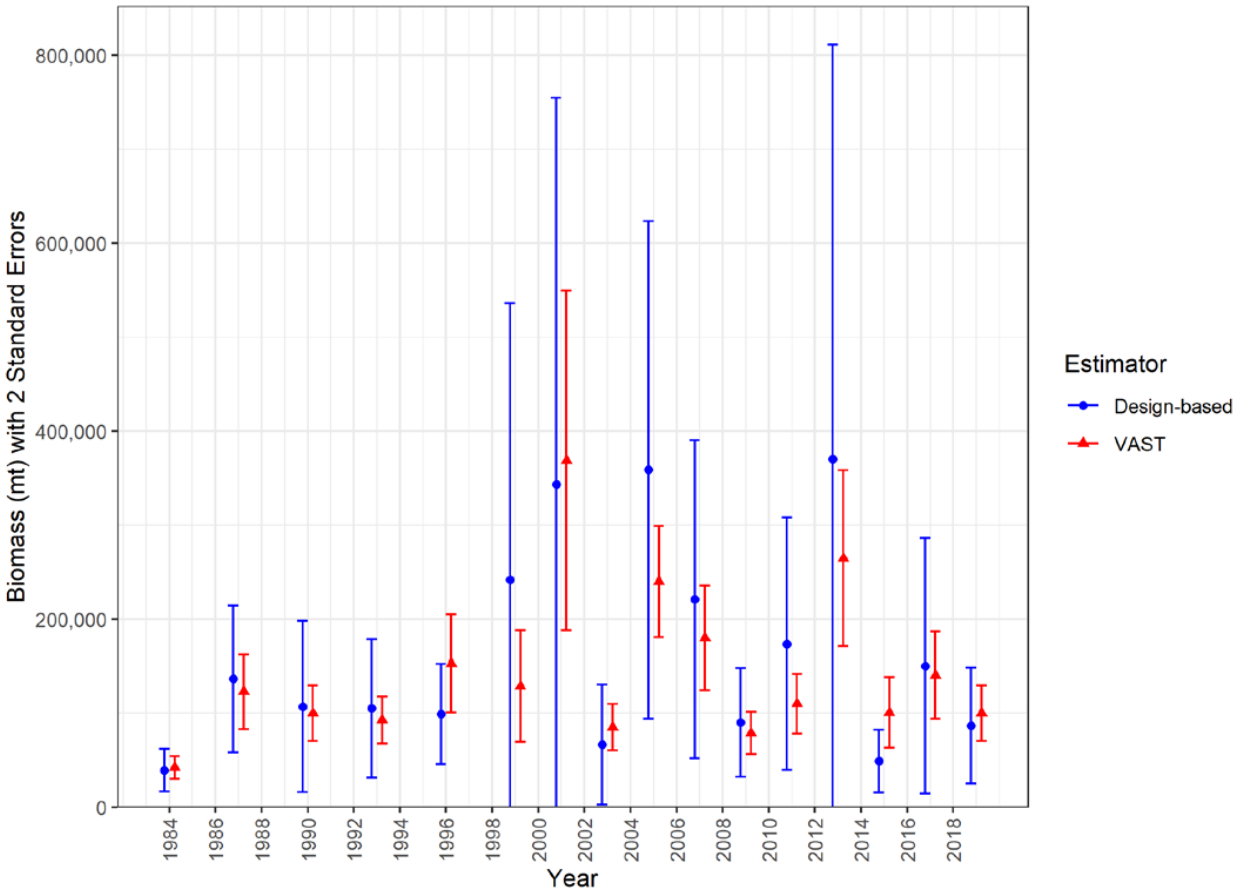
# VAST Applications in Survey Group (6 of 14)

- Example: GOA dusky rockfish (combined with dark prior to 1993)



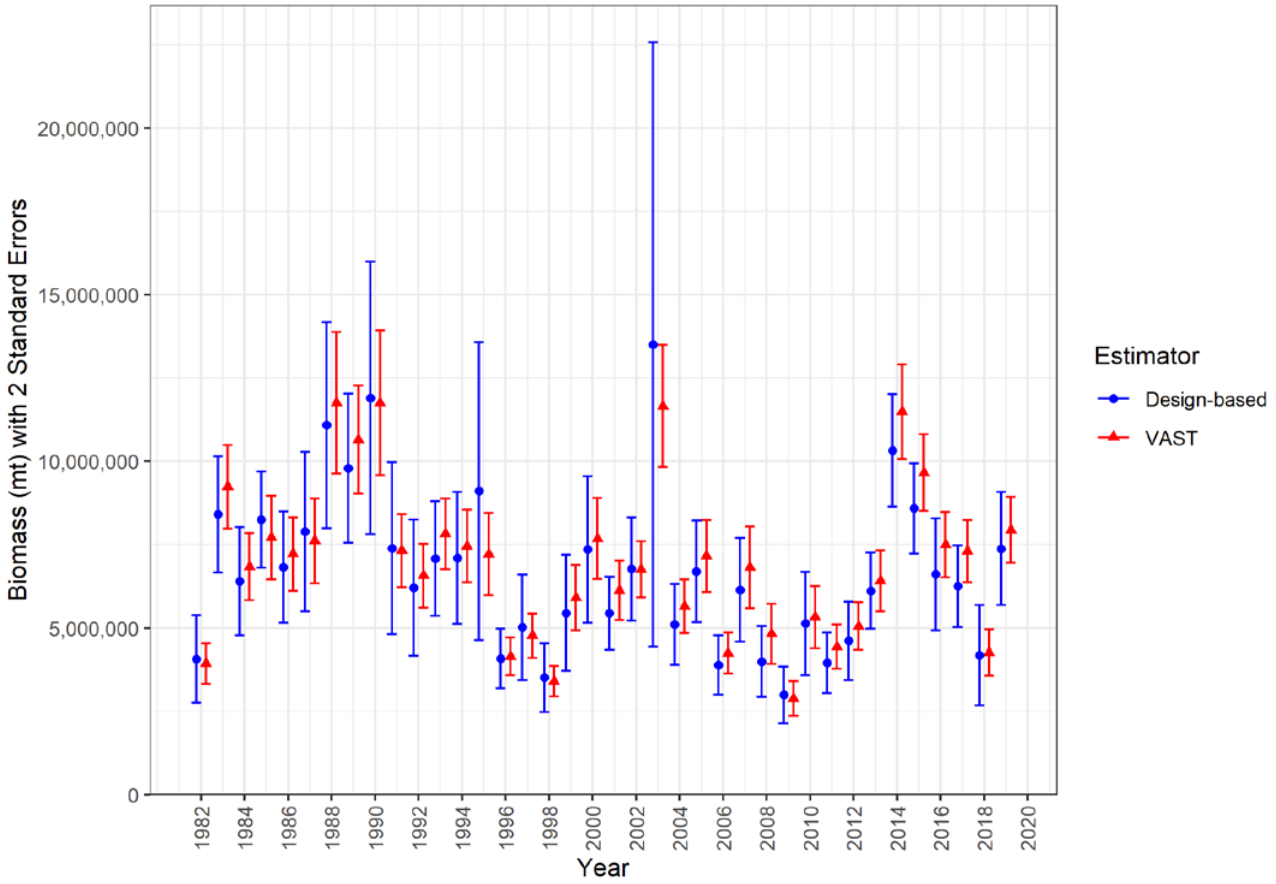

# VAST Applications in Survey Group (7 of 14)

- Example: GOA northern rockfish



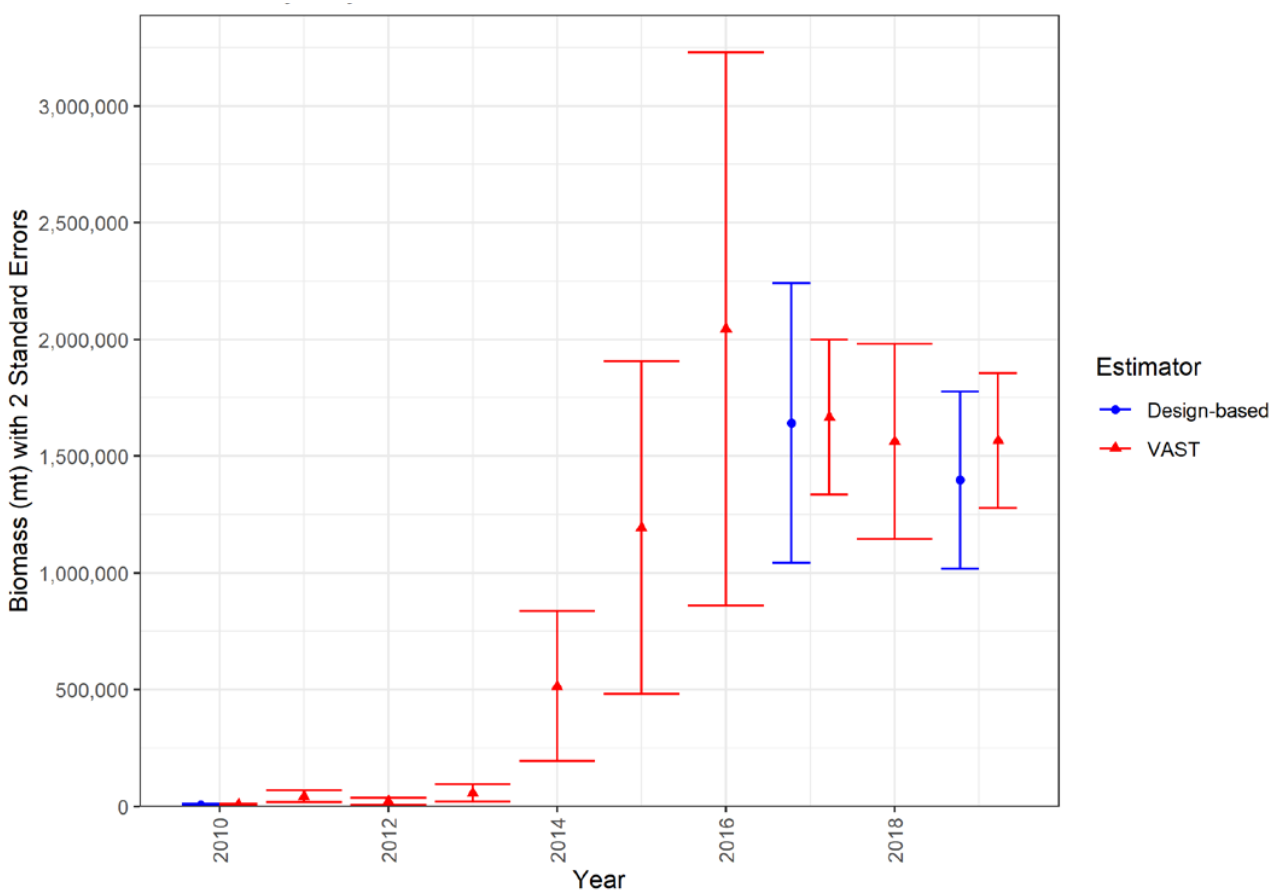

# VAST Applications in Survey Group (8 of 14)

- Example: EBS pollock



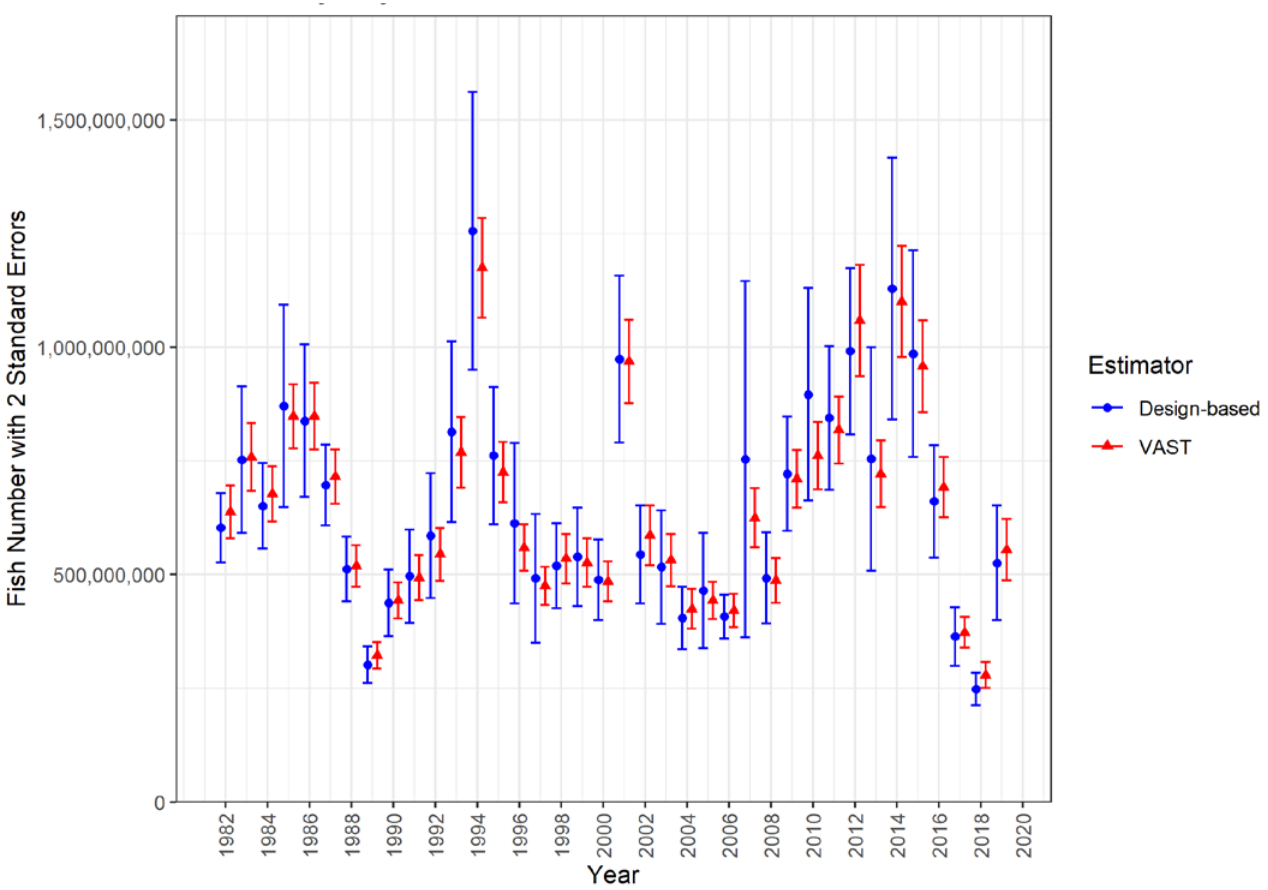
# VAST Applications in Survey Group (9 of 14)

- Example: NBS pollock



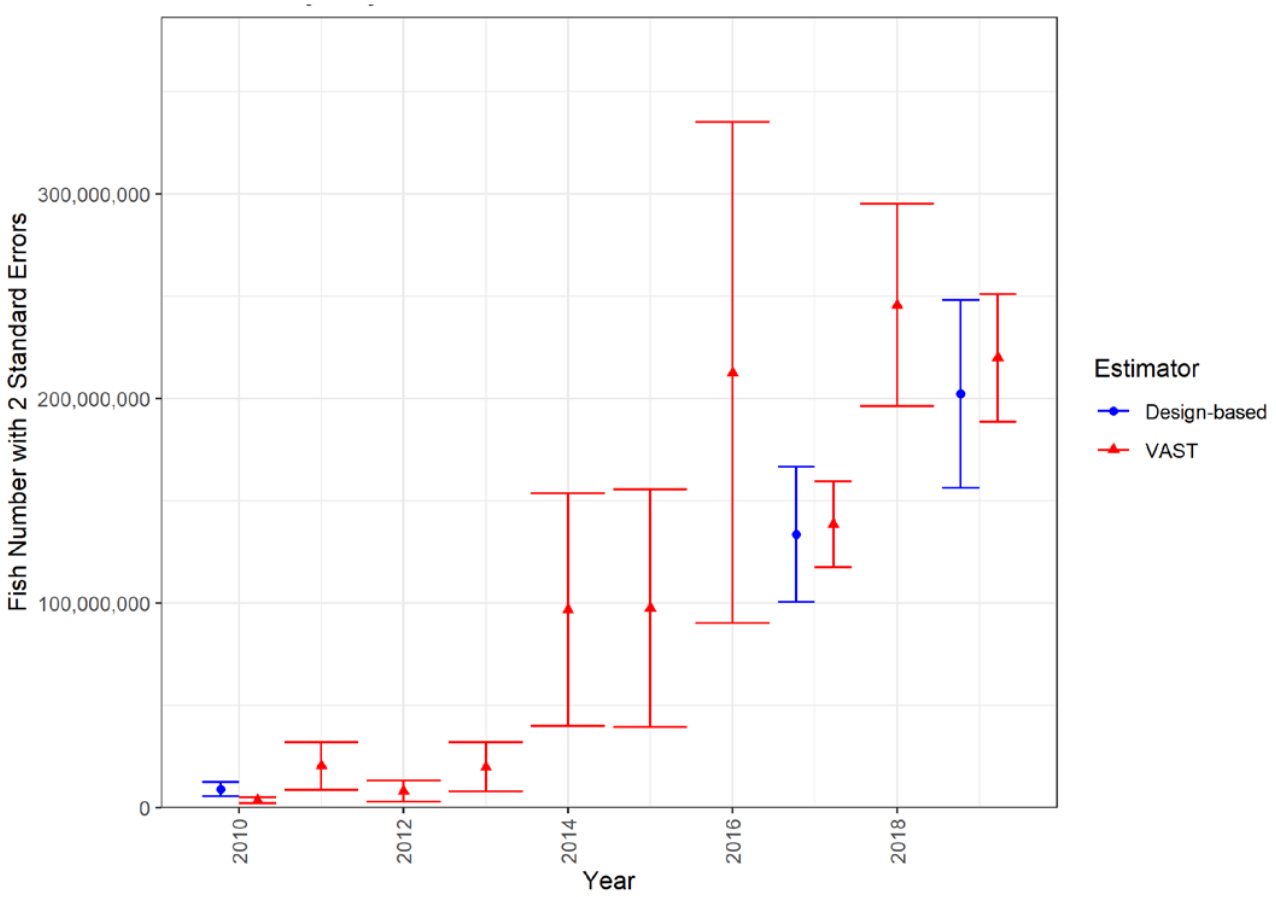
# VAST Applications in Survey Group (10 of 14)

- Example: EBS Pacific cod



# VAST Applications in Survey Group (11 of 14)

- Example: NBS Pacific cod



# VAST Applications in Survey Group (12 of 14)

- Do the Teams want indices extrapolated to deep stations in the GOA?
  - The Teams support extrapolating indices to deep strata (>700m) in the GOA and recommend exploring the sensitivity of using depth as a covariate
  - However, the Teams also recommend that authors use discretion when extrapolating to deep strata as life history characteristics of some species may not support this (e.g., northern rockfish)
- What other products should be developed based on these fits?
  - The Teams support development of a suite of standardized outputs (e.g., center of area, effective area occupied) for use in ESPs and recommend that auxiliary products selected for inclusion be discussed in more detail at the 2021 Hindcast Meeting (Feb 2021)
  - The Teams also recommend that developing a more streamlined process for uploading results into AKFIN be discussed at the 2021 Hindcast Meeting

# VAST Applications in Survey Group (13 of 14)

- Do the Teams recommend including a spatially varying response to cold-pool extent for those indices using Northern Bering Sea (NBS) and Eastern Bering Sea (EBS)?
  - The Teams discussed the utility of including a cold-pool covariate for indices using NBS and EBS data but made no formal recommendations, but agreed that this was a topic for the BSAI Team to address, not the Joint Teams
- How should untrawlable habitat in the GOA be addressed in VAST?
  - The Teams briefly discussed this but made no recommendations
  - Lewis Barnett noted that GAP staff are aware of this issue and that it is a good candidate for future VAST work in survey optimization
  - The general thought is that it is best not to predict densities for untrawlable habitat

# VAST Applications in Survey Group (14 of 14)

- Are there specific research questions the Teams would prioritize to support stock assessments?
  - The Teams support the progress of GAP staff in developing new facilities in VAST to better evaluate model fit for a given data set (i.e., proxies for cross validation)
    - There is a plan in process to have this ready prior to the 2021 Hindcast Meeting (Feb 2021)
- General Joint Team recommendation:
  - The Teams are encouraged by the standardizations in VAST indices that have occurred across species and support the continuation of that effort

# Survey Loss Uncertainty (1 of 10)

- Meaghan Bryan conducted an evaluation of the impacts of a lack of recent survey data in AFSC groundfish and crab stock assessments
- Objectives:
  - Better understand the expected uncertainty with the loss of the most recent survey data for a number of groundfish and crab species
  - Identify species that would be more sensitive to the loss of data
- Tools:
  - Standard retrospective analysis
  - Alternative retrospective analysis, with survey data in the terminal year heavily down-weighted
- Statistics calculated to assess uncertainty were: model estimated CV, Mohn's $\rho$, the "Ralston sigma," and an "additional variance" term

# Survey Loss Uncertainty (2 of 10)

- Let $X_y^{fish\_yr,surv\_yr}$ represent the estimated biomass $X$ in year $y$ when fishery data through year $fish\_yr$ only and survey data through year $surv\_yr$ only are used in the model
- Then, if the year of the most recent data used in the current assessment is designated $Y$ and $p$ is a positive integer, the current assessment's estimate of biomass in year $y=Y-p$ is denoted $X_{Y-p}^{Y,Y}$
- A standard retrospective run when the most recent $p$ years of data are stripped from both the fishery data set and the survey data set (i.e., the $p$th "peel") is denoted $X_{Y-p}^{Y-p,Y-p}$
- For time series with annual surveys, the notation $X_{Y-p}^{Y-p,Y-p-1}$ indicates an alternative type of retrospective run for the $p$th peel, in which 1 additional year of survey data (only) is dropped from the model

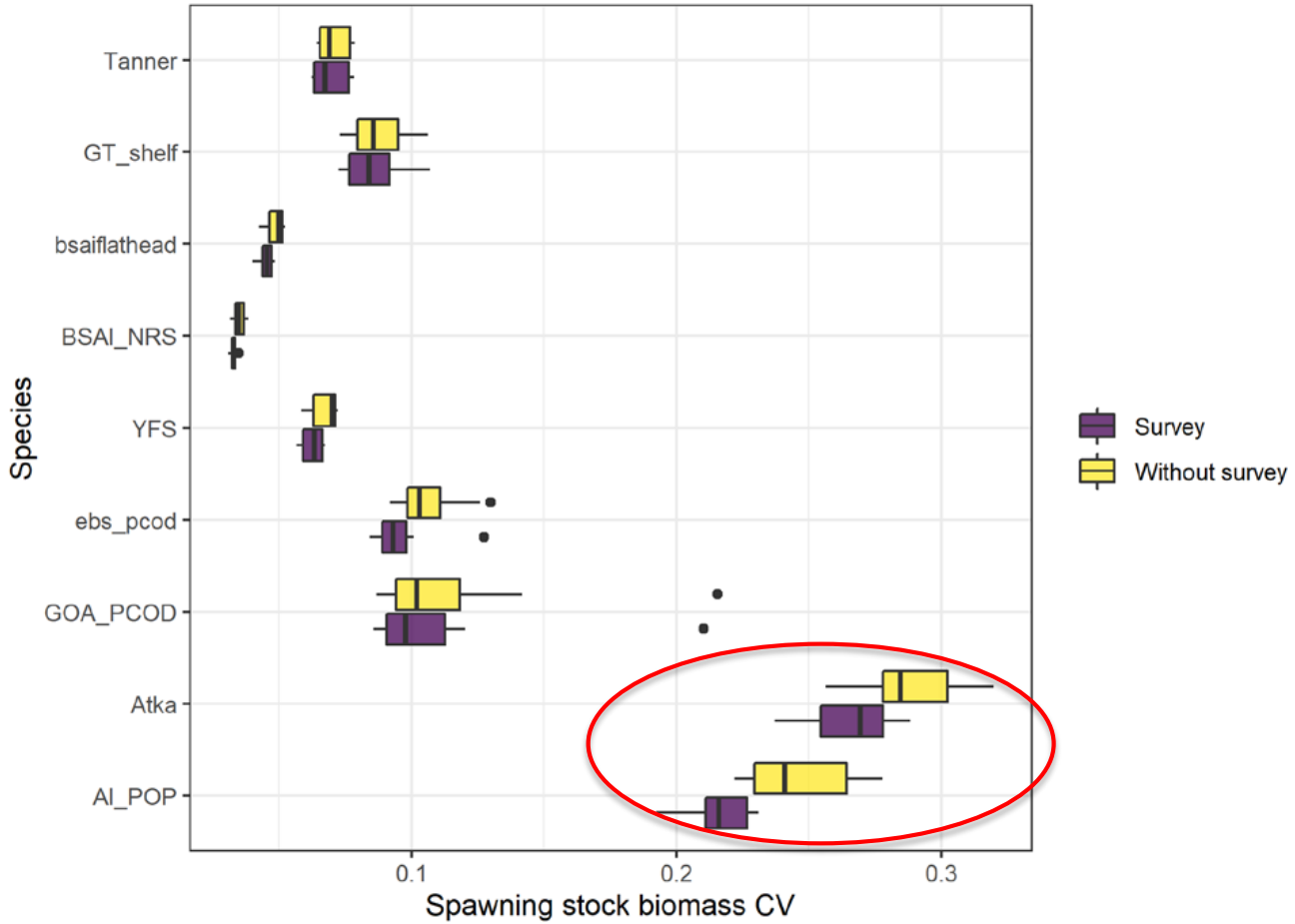
# Survey Loss Uncertainty (3 of 10)

- Table 1: Stock/complexes included in the analysis

| Species | Year of last full stock assessment | Bottom trawl survey | Time period | Number of peels |
|---|---|---|---|---|
| EBS Pacific cod | 2019 Thompson and Thorson (2019) | Bering Sea shelf | 2009-2019 | 10 |
| EBS Yellowfin sole | 2019 Spies et al. (2019) | Bering Sea shelf | 2009-2019 | 10 |
| BSAI Northern rock sole | 2018 Wilderbuer et al. (2019) | Bering Sea shelf | 2008-2018 | 10 |
| BSAI Flathead sole | 2018 McGilliard et al. (2018) | Bering Sea shelf | 2008-2018 | 10 |
| BSAI Greenland turbot | 2018 Bryan et al. (2018) | Bering Sea shelf | 2008-2018 | 10 |
| BSAI Pacific Ocean perch | 2018 Spencer and Ianelli (2018) | Aleutian Islands | 2010-2018 | 8 |
| BSAI Atka mackerel | 2019 Lowe et al. (2019) | Aleutian Islands | 2008-2018 | 10 |
| GOA Pacific cod | 2019 Barbeaux et al. (2019) | Gulf of Alaska | 2009-2019 | 10 |
| EBS Tanner crab | 2019 Stockhausen et al. (2019) | Bering Sea shelf | 2010-2019 | 9 |
| EBS snow crab | 2019 Szuwalski et al. (2019) | Bering Sea shelf | 2012-2019 | 7 |

# Survey Loss Uncertainty (4 of 10)

- Figure 1: distribution of CVs across peels (snow crab not available)



# Survey Loss Uncertainty (5 of 10)

- For a total number of peels $P$, Mohn's $\rho$ for retrospective types $i$=0 (standard) and $i$=1 (alternative) is then given by
  - $\rho_i = \frac{1}{P}\sum_{p=1}^{P}\left(\frac{X_{Y-p}^{Y-p,Y-p-i}}{X_{Y-p}^{Y,Y}} - 1\right)$
- The "Ralston sigma" for retrospective types $i$=0 =and $i$=1 =is given by
  - $\sigma_{Ralson_i} = \sqrt{\frac{1}{P-1}\sum_{p=1}^{P}\left(ln\left(X_{Y-p}^{Y-p,Y-p-i}\right) - ln\left(X_{Y-p}^{Y,Y}\right)\right)^2}$
- An "additional variance" can be defined as
  - $\sigma_{add}^2 = \frac{1}{P-1}\sum_{p=1}^{P}\left(\frac{X_{Y-p}^{Y-p,Y-p-1}}{X_{Y-p}^{Y-p,Y-p}} - 1\right)^2$

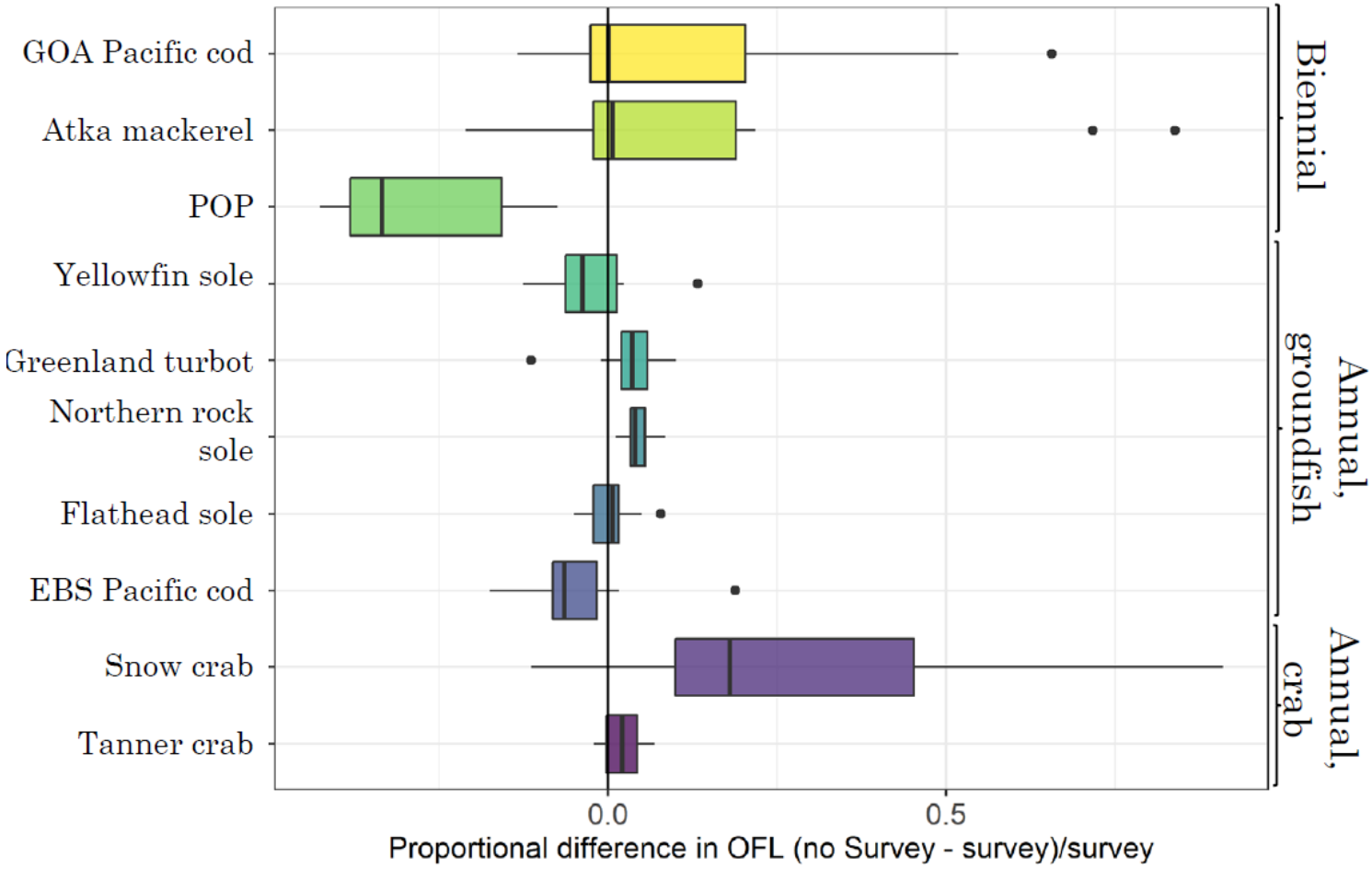
# Survey Loss Uncertainty (6 of 10)

- Table 2: summary statistics (column color scales: red=low, green=high)

| Stock/complex | Mohn's rho | | | Ralston sigma | | | Added variance |
|---|---|---|---|---|---|---|---|
| | Survey | No surv. | Change | Survey | No surv. | Change | |
| BSAI POP | -0.391 | -0.551 | -0.160 | 0.487 | 0.789 | 0.302 | 0.101 |
| BSAI Atka mackerel | 0.114 | 0.188 | 0.074 | 0.242 | 0.264 | 0.022 | 0.085 |
| GOA Pacific cod | 0.118 | 0.178 | 0.060 | 0.246 | 0.265 | 0.019 | 0.013 |
| EBS Pacific cod | -0.037 | -0.121 | -0.084 | 0.062 | 0.238 | 0.176 | 0.021 |
| BSAI yellowfin sole | -0.209 | -0.237 | -0.028 | 0.332 | 0.359 | 0.027 | 0.003 |
| BSAI northern rock sole | 0.107 | 0.134 | 0.027 | 0.113 | 0.137 | 0.024 | 0.001 |
| BSAI flathead sole | -0.046 | -0.045 | 0.001 | 0.069 | 0.055 | -0.014 | 0.001 |
| BSAI Greenland turbot | 0.098 | 0.110 | 0.012 | 0.107 | 0.112 | 0.005 | 0.002 |
| EBS Tanner crab | -0.098 | -0.082 | 0.016 | 0.139 | 0.129 | -0.010 | 0.001 |
| EBS Snow crab | 0.635 | 0.985 | 0.350 | 0.459 | 0.629 | 0.170 | 0.094 |
| Average | 0.029 | 0.056 | 0.027 | 0.226 | 0.298 | 0.072 | 0.032 |

# Survey Loss Uncertainty (7 of 10)

- Figure 13: distribution of proportional OFL differences across peels



# Survey Loss Uncertainty (8 of 10)

- Grant Thompson also presented an analysis: super-simple, no new runs
  - Time series of model biomass CV estimates, together with on/off flags for the respective surveys, were obtained for 22 assessments
  - "Model biomass" = spawning for Tiers 1-3, RE survey for Tier 5
- Main results:
  - Tiers 1-3 (n=13): CVs tended to increase in "off" years only slightly, *unless* the terminal year was an "off" year (n=3); then:
    - *CVpooled* increased in terminal year by an average of 35%
    - *CVratio* increased in terminal year by an average of 7%
  - Tier 5 (n=9):
    - *CVpooled* increased in "off" years by an average of 56%
    - *CVratio* increased in "off" years by an average of 42%

# Survey Loss Uncertainty (9 of 10)

- Discussion comments with respect to the risk table:
  - Lots of stocks are on a biennial cycle; we do not put that in risk table
  - Loss of survey data is an assessment-related issue
    - There are options for including these issues in the risk table
    - Preliminary indications are that they do not pose major concerns
  - From the perspective of the model's performance in terms of bias and precision of estimates, whether a survey's absence was anticipated or unanticipated makes no difference
  - What about interactions between columns of the risk table?
    - That is, if other columns in the risk table are of concern, the assessment concern might be increased if a survey is missed
    - There are interactions with ecosystem conditions in particular
  - (Continued on next slide)



# Survey Loss Uncertainty (10 of 10)

- Discussion comments with respect to the risk table, continued:
  - A public comment letter referred to SSC guidance stating that the risk tables are intended to capture uncertainty outside of the assessment (i.e., what is not quantitatively accounted for)
  - Both the magnitude and direction of changes in $\rho$ are important
  - Should the authors of the included assessments be asked to re-do Meaghan's analysis with updated data, or all authors be asked to conduct similar analyses?
- The Teams recommend that, to the extent practicable, authors consider these analyses, or analyses like them, for incorporation in the risk table
- The Teams also discussed the possibility of prescribing a formulaic reduction from maxABC based on analyses such as this, but no specific alternatives were suggested and the discussion ended without any further action by the Teams

# Halibut Discard Mortality

- The Teams approved the Halibut Discard Mortality Rate (DMR) Working Group recommendations for in-season management of BSAI and GOA Groundfish fisheries for 2021-2022