GOA Groundfish Plan Team Minutes on Survey Optimization (2020-2021)

September 2021 GOA Plan Team minutes

GOA Bottom Trawl Survey Design

Lewis Barnett (Groundfish Assessment Program, RACE Division) provided an update on multispecies survey design optimization simulation analyses for the Gulf of Alaska bottom trawl survey. Goals of this effort are to increase flexibility and efficiency of the survey design and provide a better understanding of how to maximize survey efficiency in the case of survey effort reductions. The simulation approach used a multivariate spatial temporal model and optimization routine to compare the current design to alternative design elements. The estimation model was used to calculate expected uncertainty and bias in the abundance index for a number of species and to examine how bias and uncertainty changed as a function of sampling effort, the number of strata, and the location of strata boundaries.
Biomass trends are consistent between the design-based and the model-based indices lending confidence to the operating model's performance. The proposed optimized survey design has from 5-20 strata versus the current 59 strata. Optimized strata characteristics were based on depth and longitude and sample allocation criteria were based on a Bethel rather than Neyman allocation scheme. In addition, optimization would be based on 15 species groups rather than 52-57 individual species used in the design-based method. Under the optimized approach, the optimal sampling density places the highest density of survey hauls in the western GOA, where the biomass of many species is highest. Under the optimized scheme there is virtually no bias in abundance estimates except for deep dwelling species, which corresponds to the areas or strata where effort has been removed in reduced survey years. In general, the accuracy of uncertainty estimates are similar or improved compared to the design-based estimates. Overall, the optimized design offers several advantages over the current design. Abundance estimation is improved by reducing bias in estimates and the accuracy of biomass uncertainty estimates can be increased. This tool also allows analysts to utilize user-specified precision constraints to design a survey, thus allowing improved flexibility in responding to survey effort reductions.

The Team noted that the presentation was mainly informational, but the analysts sought feedback. Consequently the Team:

- Agreed that this general approach is acceptable.
- Supported the authors recommendation to focus on area level solutions as they provide unbiased estimates for each management area, whereas the gulf-wide design results in some bias for certain management areas.
- Suggested that the authors explore area-specific species prioritizations.
- Indicated that it would be a potential concern if changes to survey design would affect interpretation and consistency of the survey time series.
- Supports the author's conclusion that the two vessels, 550 stations, and survey design likely provide adequate abundance estimates (outlined in a Technical Memorandum currently in revision).

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GOA Survey Optimization Scheme

Lewis Barnett (Groundfish Assessment Program, RACE Division) provided an update on multispecies survey design optimization simulation analyses for the Gulf of Alaska bottom trawl survey. Goals of this effort are to increase flexibility and efficiency of the survey design and provide a better understanding of how to maximize survey efficiency in the case of survey effort reductions. The simulation approach used a multivariate spatial temporal model and optimization routine to compare the current design to alternative design elements. The estimation model was used to calculate expected uncertainty and bias in the abundance index for a number of species and to examine how bias and uncertainty changed as a function of sampling effort, the number of strata, and the location of strata boundaries.

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The Team had several comments relevant to this work. One potential avenue of research is to examine survey design in relation to species specific questions of interest, such as species value or implications of choke species such as harlequin rockfish. It was also suggested to look closer at the value of a species or species groupings and how value is defined. Alternatively, this tool may be useful for providing insight into species movements in response to changing environment such as shifting to deeper habitats during warming trends. Finally, the Team noted the optimized strata are defined by longitude but are not aligned with management areas, which are also typically defined by longitude in the GOA. The author responded this is possible and can be done pre- or post-stratification.

The Team recommends further research to incorporate the management boundaries in the stratification scheme as biomass estimation and apportionment by management area are fundamental management priorities.

In closing, the Team expressed concern in response to the survey prioritization exercise presented to the joint Teams, specifically in response to an alternative to only sample depths <500 meters in the GOA.

The Team continues to recommend a full survey of all depths be conducted in the GOA on a biennial basis.