

Report of NPFMC SSC Sub-Committee Meeting with AFSC on Trawl Survey Options and Priorities August 28, 2020

Overview:

This report summarizes the Scientific and Statistical Committee (SSC) response to a request from the Alaska Fisheries Science Center for input on a series of questions regarding trawl survey options and priorities. The report was originally developed by a sub-committee of the SSC. The following SSC members served on the sub-group: Anne Hollowed (chair), Sherri Dressel, Chris Anderson, Dana Hanselman, George Hunt, Dayv Lowry, Franz Mueter, Andrew Munro, and Alison Whitman. The report was presented to the full SSC during the October 2020 NPFMC meeting. Suggestions for improvement from the full SSC were incorporated into this report. This updated version of the report reflects the SSC's response to AFSC's request for clarification of survey priorities.

The sub-committee meeting was attended by many members of the public. Dr. Ian Stewart attended as a participant. Diana Evans (NPFMC Deputy Director) provided logistical assistance. Drs. Stan Kotwicki (AFSC) and Robert Foy (AFSC) gave oral presentations. The following Plan Team co-chairs also attended: Steve Barbeaux, Martin Dorn, James Ianelli, Chris Lunsford, Katie Palof, and Grant Thompson.

The sub-group received public testimony from Gerry Merrigan (NPFMC), John Gauvin (Alaska Seafood Cooperative), Stephanie Madsen (At-sea Processors Association) and Julie Bonney (Alaska Groundfish Databank). Gerry Merrigan provided written testimony.

Background:

During the June 2020 virtual Council meeting, Robert Foy, Science and Research Director for the Alaska Fisheries Science Center (AFSC), provided the AFSC report. For the past several years, the SSC has expressed concerns about funding needed to maintain stock assessment surveys in the Alaska Region given budget cuts, loss of one-time funding sources, and the need for new routine assessments in the northern Bering Sea (NBS) and Arctic. The COVID-19 created a worst-case scenario for 2020, as five of six large-scale assessment surveys in federal waters off Alaska were cancelled owing to uncertainties surrounding the pandemic, lack of vessel availability, logistical constraints, and a need to minimize health risks to staff, crew, and communities. Cancelled surveys included trawl surveys in the eastern Bering Sea (EBS), the NBS, and the Aleutian Islands (AI), as well as the Bering Sea pollock acoustic survey, and the fall ecosystem survey. The annual Alaska longline survey in the Gulf of Alaska (GOA) and AI (primarily targeting sablefish), and the Southeast Alaska Coastal Monitoring survey (primarily targeting salmon and providing valuable environmental data), proceeded as planned. During his comments in June, Dr. Foy raised questions that needed to be answered to develop future survey plans and priorities.

Dr. Foy sought SSC advice once again on survey prioritization. The SSC welcomed this opportunity. Following the protocol used in 2018, the SSC formed a 2020 survey prioritization sub-committee with the following members: Chris Anderson, Sherri Dressel, Dana Hanselman, Anne Hollowed, George Hunt, Dayv Lowry, Franz Mueter, Andrew Munro, and Alison Whitman. This meeting was coordinated with the NPFMC and was open to the public.

On August 28, 2020 the SSC sub-committee met virtually with NMFS staff. As was the case in 2018, Dr. Foy provided some key motivating questions (and scenarios) about survey prioritization. Dr. Stan Kotwicki (AFSC), summarized the key findings of the ICES Workshop on Unavoidable Survey Effort Reduction (WKUSER) report.

Dr. Foy provided a useful figure depicting bottom trawl survey cancellations in the North Pacific for the period 2010-present (Figure 1).

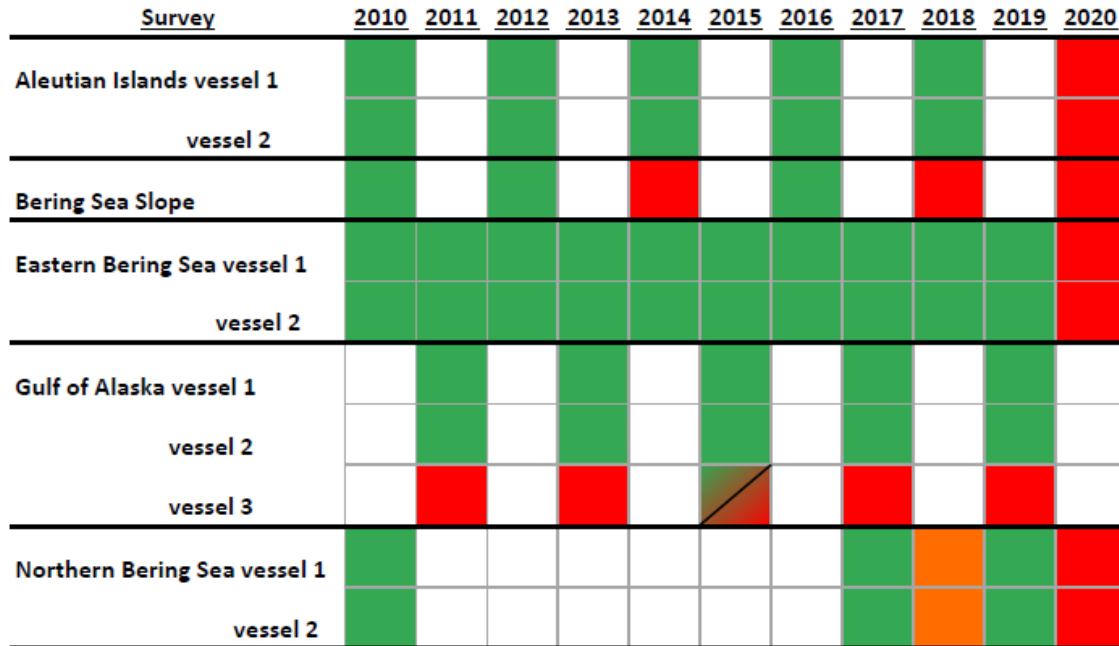


Figure 1. Summary of completed, partial and cancelled Alaska Fishery Science Center bottom trawl surveys 2010-2020.

AFSC Request:

The AFSC request outlined the following key assumptions for fish and crab biomass index monitoring surveys.

- The full complement of survey locations (**core** areas within Alaska's 5 Large Marine Ecosystems) for fishery independent stock assessment surveys includes the Gulf of Alaska, Aleutian Islands, eastern Bering Sea shelf, Bering Sea slope, and the northern Bering Sea. This represents an extension in effort to cover the northern Bering Sea.
- Secondary priorities will include point estimate and process studies in the Chukchi Sea and Beaufort Sea.

Given these key assumptions, the AFSC requested SSC input regarding the following scenarios regarding bottom trawl survey prioritization.

1. In odd years, if staffing or funding limit a full complement of core bottom trawl surveys, would the priority be to conduct the northern Bering Sea or increase GOA station density and deep station coverage?
2. How would an annual GOA survey rank among other core bottom trawl surveys if staffing/funding limit a full complement? That is, in an odd year would adding a GOA survey to our research portfolio be prioritized over another core area?
3. If the northern Bering Sea becomes a standard survey:
 - a. Would biennial surveys be adequate?
 - b. Should the Norton Sound region be included?
 - c. Should station spacing be consistent with the eastern Bering Sea?
4. If surveys become severely limited would it be better to focus on a full survey in one core area or partial surveys in multiple core regions?
5. What is the value in considering any surveys in the Chukchi Sea to assess the northern edge of gadid distributions? Should such a survey come at the expense of a core survey area (e.g. EBS slope)?

Note, consideration of survey alternatives was in the context of long-term prioritization and planning, rather than specifically in the context of tactical 2021 survey planning in response to Covid-19.

WKUSER workshop:

In January 2020, AFSC hosted an international workshop sponsored by the International Council for Exploration of the Sea (ICES) focused on Unavoidable Survey Effort Reduction ([WKUSER](#)). Dr. Kotwicky provided an overview of the key outcomes of this workshop. The workshop addressed several of the issues regarding reductions in sample size, dropping depth strata, and modifications to survey frequency. While this document provides a useful starting point for discussions of survey modifications, additional studies will be needed including comparisons of status-quo and alternative scenarios. These scenarios should assess the costs and benefits of alternative survey designs. A paper by Spencer et al. included in the WKUSER report demonstrated a relationship between survey variability (CV) and biological reference points used for management. This study suggested that a target range for survey biomass CV for key species should be at or below 0.2-0.3, and it is species dependent. The WKUSER report notes that the survey CVs for most, but not all, GOA groundfish fall within this desirable range. The SSC welcomes continued work on these relationships.

2018 SSC conclusions:

In 2018, the SSC concluded that:

“NPFMC enjoys an excellent track record with regard to stock assessment throughput and sustainable management of the valuable fisheries off the coast of Alaska. A high priority should be placed on maintaining current funding to ensure continuation of surveys to continue this high level of performance. A thorough evaluation should also be performed to determine the impacts of reducing sample size during surveys, including dropping depth strata (as has been frequently done in the Gulf of Alaska), before modifications to the standing survey schedule are implemented.”

The SSC sub-committee continues to place a high priority on maintaining funding to ensure continuation of all surveys. Comments from the CPT noted that we are living in a historic time as the impacts of climate change emerge in our high latitude system. The CPT emphasized the importance of continued data collections during this period of change to fully understand, and appropriately respond to, non-stationary production of living marine resources in the Alaska region. In 2018, the SSC sub-committee provided the following survey priority: 1) eastern Bering Sea shelf; 2) Gulf of Alaska; 3) Aleutian Islands; 4) northern Bering Sea; and 5) Bering Sea slope. **The 2020 SSC sub-committee modified its 2018 prioritization by recommending that the northern Bering Sea survey is combined with the eastern Bering Sea Shelf survey for the near future until sufficient measurements are available to assess whether a switch to biennial NBS surveys is recommended. The 2020 SSC survey sub-committee continues to prioritize these 5 surveys over expansion into the Chukchi Sea.**

Sub-committee responses to AFSC scenarios and questions:

1. “In odd years, if staffing or funding limit a full complement of core bottom trawl surveys, would the priority be to conduct the northern Bering Sea or increase GOA station density and deep station coverage?”

As noted above, the SSC places a high priority on both the GOA surveys and the inclusion of the NBS survey as part of the EBS annual survey (at least for the near future). If the undesirable outcome of a reduction in the number of vessels available occurs, the SSC provides the following guidance with respect to question 1.

- a. When referring to ‘deep station coverage’ in the Gulf of Alaska, the SSC sub-committee clarified that this refers to a scenario based on a two boat vs three boat survey in the GOA, where a two boat survey would not sample the deeper stations (>700m). This scenario was used because sampling deep stations in the GOA requires a separate contract for a vessel with enough trawling cable to sample deep stations (720m). This type of contract is more difficult to secure. In addition, it takes a lot longer to sample deep stations than shallow stations. In this scenario, the two-boat survey would cover stations less than or equal to 700m representing 550 stations. The three boat survey would allow the full survey of 820 stations including stations from 700 to 1000m.
- a. The SSC sub-committee reviewed the figure depicting the relationship between one boat, two boat and three boat surveys under current and optimized survey designs in the GOA (See Burnett et al. in WKUSER report).

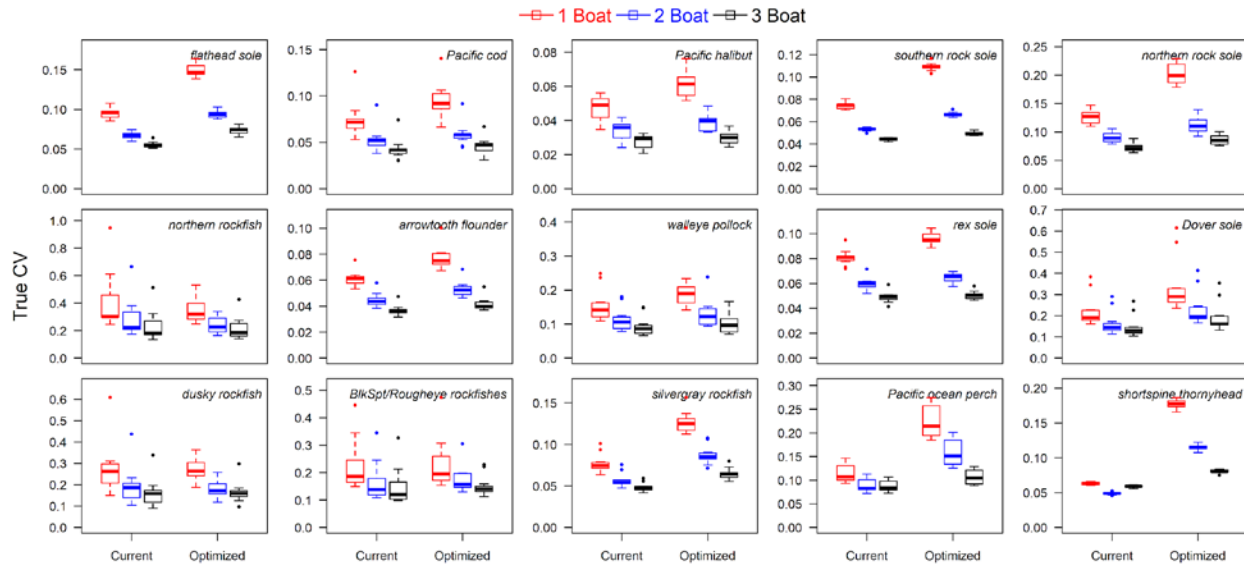


Figure 2. Comparison of the true coefficient of variation (CV) of design-based biomass estimates from simulated surveys between the current and optimized Gulf of Alaska Bottom Trawl Survey design for each of 15 species modeled. The True CV is defined here as the standard deviation of simulated mean density estimates divided by the true mean density computed from a multivariate spatiotemporal operating model fitted to the Gulf of Alaska Bottom Trawl Survey historical data from 1996 to 2019. Color indicates the sampling effort in terms of number of samples or hauls expected given three sampling effort scenarios related to the number of vessels operating simultaneously during a survey: 1 boat (n=280), 2 boat (n=550), 3 boat (n=820).

The sub-committee noted that there are clear advantages to a two boat design over a one boat design. This analysis also revealed that for the majority of species, the two or three boat design resulted in CVs well below 0.2 and the differences between the two and three boat designs were not large. As noted above, this was because the three boat design focused on deep water stations. However, the two vs three boat design made a difference for some valuable rockfish and flatfish stocks. It was noted that only a few commercially important species are found in waters deeper than 700m (e.g., Dover sole and thornyhead) and these species are not heavily exploited. It was also noted that the sablefish longline survey samples deeper stations allowing monitoring of potential shifts to deeper waters by Pacific cod and sablefish under a changing climate.

Therefore, if it becomes necessary (an undesirable outcome), the SSC sub-committee recommends that the GOA deep stations should be dropped from the bottom trawl survey to allow a survey in the NBS.

- b. The SSC sub-committee noted that if reductions beyond dropping the deep stations in the GOA were required, the SSC sub-group did not support surveying the NBS at the expense of the GOA core survey (stations <700m).
- c. **The SSC sub-committee recognized that dropping the EBS slope survey and dropping deep stations in the GOA is not a desirable scenario.** If it became clear that these two deepwater surveys would not occur, then alternative ways of monitoring the deep stations would be required.

2. How would an annual GOA survey rank among other core bottom trawl surveys if staffing/funding limit a full complement? That is, in an even year would adding a GOA survey to our research portfolio be prioritized over another core area?

The SSC sub-committee noted that the 2014-2016 marine heatwave in the GOA impacted Pacific cod and detection of these impacts were delayed and limited by the biennial survey schedule in the region. Gadid stocks in the GOA represent valuable resources and therefore, the SSC sub-committee understands why this question was posed to the group. The sub-committee noted that there are several surveys that occur in the GOA that contribute to our understanding of stock status of gadids. These include: the spring acoustic surveys for spawning walleye pollock, the biennial summer acoustic surveys for walleye pollock, the summer ADF&G bottom trawl surveys, the AFSC longline surveys and the IPHC longline surveys. Assessment authors already utilize information from several of these surveys in their assessments or are exploring ways to incorporate this information into their assessments.

The SSC sub-committee noted that the GOA bottom trawl surveys also provide valuable information on the status and trends for several rockfish species. Rockfish populations are long-lived and therefore abrupt swings in abundance are less likely. Biennial survey time steps for these species has proven to be adequate for many years.

Given the considerations above, the SSC sub-committee did not recommend prioritizing the GOA survey in even years over another core area to achieve annual GOA surveys. It was noted that some consideration might be given to the possibility of sampling stations in the western GOA as part of the Aleutian Islands bottom trawl survey if this could provide useful information on the westernmost portion of the GOA gadid stocks.

3. If the northern Bering Sea becomes a standard survey:

a. Would biennial surveys of the NBS be adequate?

As noted in the response to question 1 above, the sub-committee recommends that the northern Bering Sea survey is combined with the eastern Bering Sea Shelf survey for the near future until sufficient measurements are available to assess whether a switch to biennial NBS surveys is feasible. This region is experiencing considerable change that is influential for several valuable commercial species including: snow crab, Pacific cod, walleye pollock, yellowfin sole, and Alaska plaice.

b. Should the Norton Sound region be included? The SSC sub-committee agreed that the Norton Sound region should be included in the NBS survey and that the survey extent should be consistent from year to year, to the extent practicable. It was noted that funding for the ADF&G survey for Norton Sound Red King Crab was uncertain and the bottom trawl survey results are used in the NSRKC assessment. In addition, given the warm water observed in the inner domain of the NBS in 2019, there is continued interest in monitoring this region.

c. Should station spacing be consistent with the eastern Bering Sea? The SSC-subgroup recognized that research on sampling intensity and survey design is continuing at the AFSC. In particular, we note that the papers by Bryan and Hulson and Conner et al. in the WKUSER report are directly relevant to this question. Conner et al. concluded that the bias in systematic sampling is species specific and random sampling is desirable. Systematic sampling, on the other hand, can be more precise than random sampling in a relatively homogenous habitat like the eastern Bering Sea shelf and has distinct logistical advantages. The SSC sub-committee supports continuation of research on sampling intensity and survey design as it may inform future improvements to trawl surveys. The SSC sub-committee noted that, given that the NBS survey is relatively new, a shift to a random or random stratified sampling design could occur now. However, the SSC sub-committee recognized that changing the sampling design of the systematic eastern Bering Sea

trawl survey should be done cautiously and only after a well-designed alternative has been brought forward. Furthermore, studies to provide a statistical bridge between the EBS alternative and the EBS systematic survey would be needed.

In light of these issues, the sub-committee considered two scenarios: 1) NBS random or random stratified and EBS systematic or 2) NBS and EBS remain systematic until an alternative design for the EBS is brought forward. In support of scenario 1, it was recognized that VAST models would accommodate different survey designs in the two regions, but the model could behave differently in each area because the resolution will be different and annually changing under a stratified random design. The EBS Pacific cod assessment model currently uses VAST model estimates. It was also noted that if the NBS annual survey used a random design that it might be easier to reduce the number of stations under conditions of unavoidable survey effort reductions without losing the overall information gained by the survey. VAST model estimate can mitigate some issues with missing data. In support of scenario 2, it was recognized that maintaining consistency in the survey design was desirable as it would not create an edge effect between the two surveys. Given that the southern boundary of the NBS coincides with the spatial shifts in some species such as snow crab, avoiding an edge effect was important (see Fedewa et al. In Press, <https://doi.org/10.1016/j.dsr2.2020.104878>). In addition, a consistent survey design offered some logistical benefits for survey planning. **The SSC sub-committee concluded that scenario 2 was recommended as long as survey effort could remain consistent.**

4. If surveys become severely limited would it be better to focus on a full survey in one core area or partial surveys in multiple core regions?

The sub-committee discussed this undesirable scenario and concluded that if this situation occurred, that adoption of a biennial schedule where the EBS and NBS were surveyed in one year and the GOA and AI were surveyed in another should be considered. It was noted that the limits of reducing station density to accommodate a GOA and AI survey should be carefully examined to ensure that the surveys continue to provide the reliable biological information necessary for estimating population trends of managed species.

5. What is the value in considering any surveys in the Chukchi Sea to assess the northern edge of gadid distributions? Should such a survey come at the expense of a core survey area (e.g. EBS slope)?

The SSC sub-committee recognizes that the Chukchi Sea is a transition zone and that considerable changes are already occurring in the region under changing climate conditions. Monitoring these changes is important to the NPFMC, as they will inform future decisions regarding if, when, and how commercial fisheries could occur in the region. It was noted that the Chukchi Sea region is currently closed to commercial fishing and will remain closed until sufficient information is available to sustainably manage fisheries in the region. Therefore, failing to collect information in the region will delay the future fishing opportunities in the region.

When weighing the issues noted above, the SSC sub-committee concluded that the highest priority currently is to collect relevant information needed to sustainably manage existing fisheries. Thus, the sub-committee agreed that the Chukchi Sea region is of secondary importance to the core surveys discussed above. In light of this conclusion, and in recognition of the importance of monitoring living marine resource responses to changes in ocean conditions, the SSC sub-committee provided the following

advice: a) explore options for research partnerships with outside entities, including both local and regional entities and cooperative research with industry, or AFSC ecosystem surveys to sample groundfish in the Chukchi Sea; b) attempt to align these surveys temporally with existing trawl surveys and, to the extent possible, use similar gear and survey sampling protocols. Partnerships might include not only US researchers, but also those from other countries, notably Japan, Korea and Russia.

It was noted that if this type of research partnership was achieved, that outreach to coastal communities would be needed to solicit input on preferences and priorities for research, and to gauge interest in and opportunities for potential research partnerships with local and regional entities to enhance understanding of the region's ecosystems and fish resources.

Additional General Comments

The SSC sub-committee noted that efforts to assess the implications of alternative survey frequencies or survey designs should be carried through to include the implications for catches. What actually gives value to the information gathered through each survey is how it impacts management and resource allocation, because that is what will lead to changes in attainment of optimum yield (NS 1) or sustained participation in harvesting or processing (NS 8). There is a need to continue ongoing analyses, including local analysis of these fisheries and international coordination. However, there is still a critical knowledge gap in how changes in the survey lead to changes in economic or societal benefits. It was noted that some papers have already been published demonstrating the value of this type of analysis (e.g., Hutniczak et al. (2019) <https://www.nrcresearchpress.com/doi/abs/10.1139/cjfas-2018-0130>). The sub-committee was informed that a first step, incorporating changes in survey frequency and station density into stock assessments within a management strategy evaluation framework to assess the implications of alternative survey operations on biological reference points (ABC and OFL), has been funded (leads Meaghan Bryan, Lewis Barnett and Stephen Kasperski, AFSC). The sub-committee looks forward to reviewing the results of this study. The sub-committee recommends that this work be extended to connect survey CV to changes in TACs (considering that many species have headroom to expand buffers without changing TACs) and changes to fleet allocations, given what each fleet is able to harvest (considering limitations on TAC utilization or TAC flexibility). This information will be critical to making long term plans, and will also help build a case for maintaining and possibly scaling the resources available for these surveys.

The SSC sub-committee also noted that decisions relative to survey prioritization should include the full suite of surveys conducted by the AFSC. Consideration of the trade-offs between research surveys and standard stock assessment surveys should be clearly articulated. In addition, efforts to explore opportunities to collect relevant ecosystem information during stock assessment surveys is recommended.

The SSC appreciated the opportunity to provide input on priorities for strategic survey planning and looks forward to continued opportunities as new information is obtained, new environmental conditions occur, or advice on a different combination of surveys and research is desired.