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

September 10, 2018
AFSC, Building 4

SSC: Gordon Kruse (chair), George Hunt, Dana Hanselman (phone), Anne Hollowed, Dayv Lowry, Alison Whitman (phone)
NPFMC staff: Diana Evans (phone)
AFSC: Stan Kotwicki, Jeremy Rusin, Stephani Zador, Michael Martin, Maggie Mooney-Seus
Public: Craig Cross, Ron Feeney, Susan Robinson, Mark Fina

At the June 2018 Council meeting in Kodiak, Mr. Jeremy Rusin, Acting Science and Research Director for the AFSC, briefed the SSC regarding the FY19 budget. At that time, it appeared that sufficient funding would not be available to fully support the typical five vessels for trawl surveys in the Alaska region, which inform stock assessments for many groundfish and BSAI crab stocks. Funding was projected to be available for only four vessels: two on the Bering Sea shelf, and two in the Gulf of Alaska. There was also a substantial chance that only three vessels would be supported. Contracting issues, the increasing cost of rent for AFSC facilities in Sand Point, and uncertainty with regard to the final FY19 budget were identified as root causes for this potential reduction in survey effort. Mr. Rusin requested that a sub-committee of the SSC be established to meet with AFSC staff and develop recommendations for actions in FY19, and beyond, to minimize the impact of survey reductions on long-term abundance time series and the collection of biological samples used for stock assessment.

On September 10th an SSC sub-committee made up of Gordon Kruse, Anne Hollowed, George Hunt, Alison Whitman, Dayv Lowry, and Dana Hanselman met with NMFS staff at the AFSC in Seattle. Center staff in attendance included Jeremy Rusin, Stan Kotwicki, Michael Martin, Stephani Zador, and Maggie Mooney-Seus. AFSC staff provided a background document for the meeting (Appendix 1), and gave a presentation (Appendix 2). The meeting opened with a general discussion of the value of trawl surveys and their importance to management. It was noted that these surveys have been identified in the Council's research priorities as Critical Ongoing Monitoring, and, as such, are considered to be the highest priority level for the NPFMC. These priorities create and maintain indispensable data that substantially contribute to our understanding and management of fish populations, fisheries, and the communities dependent upon those fisheries. Discontinuation or diminishment of the research that provides these datasets would leave a significant gap in the science needed to support sustainable and successful fisheries management in the North Pacific. Recent rapid changes in environmental conditions and fish abundance and distribution in response to the marine heat wave accentuate the need to maintain current effort levels, if not *increase* them. Evidence of spatial shifts to the northern Bering Sea in warm conditions raises the question of whether this is a new phenomenon or has occurred in the past, without being previously observed due to limited survey coverage north and west of the standard EBS shelf trawl survey. In addition, a time series is needed to understand the importance of transboundary regions to harvested stocks, and international cooperation with Russian and Canadian managers will be critical for ensuring adequate sample coverage for the entire distributions of stocks.

Next, Mr. Rusin provided an update on the funding outlook for FY19, which has improved since June. The slope survey did not occur in FY18 due to contracting difficulties, and these funds will be carried over to support survey work in FY19. Projected facility costs for the AFSC are also estimated to stay stable in FY19, rather than increasing as originally anticipated. Vacant job positions and other minor cost savings have also been realized, further shoring up FY19 funding. Finally, $700K of temporary funding from the Office of Science and Technology was provided to the Center to support at-sea sampling efforts. All of these factors combined to mean that in FY19 the AFSC will almost certainly be able to afford four survey vessels. However, under a one-year ahead funding strategy, funding a fifth vessel in FY19 could compromise the ability to fund a fourth vessel in FY20. Members of the SSC sub-committee indicated that a minimum of four vessels is critical, and that dramatically impacting FY20 to maximize vessels in FY19 is not advisable.

Sub-committee members noted that fully funding five vessels in each fiscal year is the status quo, and that current research needs indicate *more* sampling is needed rather than less. While members were relieved to hear that the budget picture had improved, they found it troubling that obtaining even this reduced level of support required a series of events that are unlikely to be repeated in future years. A reliable and stable funding source is needed to fully fund these Critical Ongoing Monitoring activities. The SSC sub-committee notes that reducing these funds could compromise long-term data series and introduce additional uncertainty into stock assessments. At current cost levels, the funding required to annually cover surveys in three regions of the Bering Sea (shelf, slope, and northern), the Aleutian Islands, and the Gulf of Alaska is $5.3-6.1M – though different regions are sampled in odd and even years. Given the value of Alaskan fisheries to the economy and food security of the nation, and the relatively small cost of surveys relative to the value of these fisheries, securing a stable source of funding should be a national priority.

The 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 noted that changes in the frequency or station density of AFSC trawl surveys could impact several NPFMC management decisions. The NPFMC's recent adoption of stock assessment priorities was based on an analysis that aligned stock assessment frequency to the current survey frequency. If this frequency is changed, decisions regarding stock assessment priorities would have to be revisited. In addition, it is possible that a reduction in survey frequency or station density could lead to tier changes for some stocks in Tiers 1-5 (for groundfish). Stocks managed in these Tiers require a "reliable biomass estimate," and biomass estimates derived from stock assessments that utilize infrequent, and/or uncertain, survey biomass estimates may be deemed insufficient to meet this standard. It should also be noted that, the NPFMC is considering alternatives under consideration for abundance-based management of Pacific halibut bycatch caps that would rely on annual EBS trawl surveys.

Stan Kotwicki noted that four research projects were recently started that could provide helpful information for deciding which surveys impart the greatest benefit. Specifically, these studies will: 1) derive model-

based estimates of abundance for key species using subsets of existing data, essentially mimicking reductions in survey frequency; 2) statistically evaluate thinning of samples on a systematic basis; and 3) develop spatial temporal models (e.g., VAST) for the Gulf of Alaska, Bering Sea, and Aleutian Islands. Longevity, recruitment variability, patchiness, growth rates, and other life history characteristics will need to be considered when looking at individual stocks. **Until results from such studies are available, the SSC sub-committee lacks the ability to objectively defend why a specific level of survey frequency and sampling density is needed. The SSC sub-committee strongly recommends maintaining current levels of survey effort until the analyses are completed.**

Recent monitoring of oceanographic and biological parameters indicate that unprecedented ecological conditions are currently being observed, especially on the Bering Sea shelf and in the northern Bering Sea. If survey frequency were to be reduced, it is possible that rapid changes in fish abundance in response to these conditions could be missed. If the underlying ecosystem state is rapidly changing, it is important to document how the system is changing to assess whether the underlying assumptions of the models are still reliable. A national climate assessment is just being released, which will contain information on the rate of climate change in Alaska and the Arctic. **The SSC sub-committee recommends that the findings of this climate assessment are considered as an additional rationale for maintaining the current status quo of at least five ships annually.**

Responses to Questions:

A series of questions were provided to focus discussion and prioritize input from the sub-committee. The sub-committee noted that these surveys are explicitly multispecies, and there are important stocks to be considered beyond pollock and Pacific cod. These include rockfish, flatfish and crabs, among others. The surveys obtain not only data on abundance and distribution of fished stocks, but also the specimens needed for age composition, weight–at-age, and other metrics used in assessment models. The surveys also provide important information on the ecosystem, including environmental conditions, and provide a platform for investigations of food habits and other additional research on target species.

In attempting to answer the questions below, the sub-committee questioned whether the goal of a limited set of surveys would be to maximize accuracy, or to minimize the likelihood of missing a significant change in a stock. Skipping years may allow for funding of better coverage within a year, but leaves the Council vulnerable to missing a major change in a stock, such as the sudden decrease in the Gulf of Alaska Pacific cod stock, or the apparent sudden shift of Pacific cod and pollock into the northern Bering Sea. With climate change and warming occurring much faster than initially expected, recent experience supports the notion that frequent surveys may be the only way to monitor the impacts of these events on fish stocks. **The sub-committee did not have an answer to the question of maximizing accuracy or minimizing risk of disaster, but felt that it should be addressed in the justification of whatever survey schedule evolves.**

Question 1. What are the ranked order of priorities for our present suite of bottom trawl surveys: the eastern Bering Sea shelf, eastern Bering Sea slope, northern Bering Sea shelf, Gulf of Alaska, and Aleutian Islands?

Response:
The sub-committee suggested the following priority list: 1) eastern Bering Sea shelf; 2) Gulf of Alaska; 3) Aleutian Islands; 4) northern Bering Sea; and 5) Bering Sea slope.

All of these surveys are of critical importance to the management of fish stocks in the federal waters off Alaska. That said, it may be possible to reduce the frequency of some surveys, though at the potential cost of increased uncertainty. Recent experience in the Gulf of Alaska and the Bering Sea has shown that very large changes in the biomass or distribution of large, highly-valued stocks can take place in a short time. Failure to detect and respond to large, rapid changes could lead to overfishing or foregone yield.

Rationale:
Based on the monetary importance of the fisheries, the eastern Bering Sea shelf was seen as a top priority, followed by the Gulf of Alaska, and then the Aleutian Islands. While the dollar value of the fisheries in the GOA and AI are not as high as the EBS fisheries, many communities are dependent on the fisheries in those regions. These two surveys support a number of commercially and ecologically important stock assessments (e.g., GOA and AI POP, GOA pollock, and BSAI Atka mackerel). The northern Bering Sea shelf survey was seen as more important than the slope survey because of the issues pertaining to the connection between the biomass of pollock and Pacific cod in the northern and southern portions of the Bering Sea shelf. However, the SSC sub-committee recognizes that data from the northern Bering Sea surveys were only recently considered within assessments for these stocks. The EBS slope survey is used in several assessments and there was concern that some stocks, such as Greenland turbot that are below target reference points, rely on the EBS slope survey. Stocks in poor condition need to be regularly monitored so that fishing effort can be appropriately adjusted.

If large portions of the eastern Bering Sea pollock and Pacific cod stocks continue to occupy the northern Bering Sea, the survey of that area will rise in priority. If the northern segments of Pacific cod and pollock populations are contributing to the overall production of eastern Bering Sea pollock and Pacific cod, then it will be essential to determine the environmental factors governing movement into the northern Bering Sea. Time series of reliable biomass estimates and assessments of fish condition will be needed to estimate environmentally linked movement and growth parameters. Therefore, the SSC sub-committee concludes that it is critical to develop time series (10 – 12 years) of trawl surveys for these northern components. In addition, it is possible that the northern components of these stocks may be impacted by: 1) interannually varying exposure to fishing mortality due to fish captured in Russian waters; 2) interannually varying emigration into the Chukchi Sea; and 3) higher over-winter mortality from freezing in cold winters if northern stocks don't migrate south in the fall. Thus, if planned surveys in the next few years find that the northern components of Pacific cod and pollock stocks remain large, it will be critical to conduct surveys in the north if optimal exploitation of their overall eastern Bering Sea populations are to be maintained.

Question 2. If the Center has four, rather than five charter vessels on contract in FY19, we propose to put two vessels on the eastern Bering Sea shelf and two in the Gulf of Alaska. If additional funds are available, then these will be used to support a northern Bering Sea survey. Do you agree?

Response:
For all of the reasons noted in Question 1, the SSC sub-committee agrees with the plan put forward by the AFSC. If sufficient resources are available, the sub-committee recommends conducting as complete a survey as possible in the northern Bering Sea.

The sub-committee was relieved that the Center has a reasonable prospect to have four vessels available for surveys in FY19, although dependence on the present sources of funds for these surveys is not sustainable in the long run.

Rationale:
Although the Bering Sea slope survey scheduled for 2018 had to be canceled, given the other priorities for surveys in 2019 and the relatively stable stocks on the slope, it was agreed that a slope survey could be postponed until 2020, when the next slope survey was scheduled. The sub-committee was clear that further postponement of the slope survey beyond 2020 would not be wise given the somewhat diminished state of the Greenland turbot stock there.

The possibilities of using only one vessel in the Gulf of Alaska was discussed. There were safety concerns about a single vessel operating in isolation. Moreover, it was agreed that the station density or areal coverage under a one-boat scenario would be so thin that the results would be unreliable for stock assessment. A Gulf survey with only two vessels is already a reduction from the standard three-vessel-surveys and will result in less precise estimates and perhaps some deeper depth strata going unsampled. Thus, the expected reduction of survey effort from five vessels to four vessels, as planned, still has serious implications for the required stock assessments.

The use of only a single vessel was considered for the Aleutians, but, again, safety concerns about having a single vessel operating in isolation caused that possibility to be rejected. Safety concerns are heightened in the Aleutians.

Question 3. Given the answer to Question #2, which surveys should we prioritize for FY20 under a four-boat scenario?

Response:
The SSC sub-committee was reluctant to answer this question until more information on the consequences of changing survey frequency or decreasing sample density in time or space became available. The sub-committee also additionally noted the fluidity of the funding situation between now and 2020.

Rationale:
As noted above, the SSC sub-committee was informed of a number of analytical projects that are funded and underway to examine how changing the frequency of surveys or the density of stations within surveys would affect the variance of stock estimates. These studies should provide information necessary to make more informed decisions about how altering the present design of surveys might affect stock assessments, and thus waiting for their results seems prudent.

That said, the eastern Bering Sea shelf survey (two boats) would remain the top priority for FY20, and the Bering Sea slope survey (one boat) would need to be on the schedule. The Gulf of Alaska would not be a priority, given what we know now, as it would normally be off-schedule in an "even" year. It was noted that Aleutian Islands' survey, due in FY20, needs two boats because of safety reasons. Together, this set of surveys will need five boats. Depending on what we learn in 2018 and 2019, there may also be a need for a northern Bering Sea survey (one boat).

Question 4. If the Center is only able to fund 3 charter vessels in FY19, which survey(s) should we attempt?

Response:
The sub-committee was glad to hear that four vessels are likely to be available in FY19 so that an answer to this question may not be necessary. With only three vessels, the least bad option seem to be to pick either the EBS or the GOA and do a very thorough survey in one region only. Another alternative would be to change the survey frequency to triennial, although this time step proved to be problematic in the past in the GOA and AI. If the focus was the eastern Bering Sea, it might be possible to conduct a survey of the northern Bering Sea as well with the third vessel. If the Gulf is the focus, it might be useful to conduct a full 3-boat survey there or an eastern Bering Sea slope survey might be possible. There is no good choice between the eastern Bering Sea shelf and the Gulf of Alaska surveys. The sub-committee very reluctantly supported the option of surveying the Gulf of Alaska with two boats and the Bering Sea slope with one boat under this hypothetical scenario.

Rationale:
The Gulf of Alaska and the eastern Bering Sea have major fish stocks that are experiencing unusual mortality (GOA Pacific cod) and/or major movements that have not been observed before (Pacific cod and pollock in the eastern Bering Sea). Additionally, in the eastern Bering Sea, there are three crab stocks all of which need annual assessments to avoid overfishing. If the Gulf of Alaska or the eastern Bering Sea were not both surveyed in 2019, it would dramatically impact assessment quality and index reliability in these critically important regions.

If the Gulf of Alaska was not surveyed in 2019 but conducted two years later, it would mean a break of four years in the time series. With Pacific cod down severely in the Gulf and getting close to B20 and the closure of the fishery to protect sea lions, a strongly precautionary approach would be required. Likewise, with both pollock and Pacific cod missing from the southeastern Bering Sea, and the failure to have a strong pollock recruitment since the 2014 year-class, there needs to be concern about running into the B20 limit on pollock fishing in the Bering Sea and Aleutian Islands because of sea lion protective measures. However, in view of the recent survey of the eastern Bering Sea in 2018, the survey of the Gulf of Alaska may be the greater priority.

Question 5. Given the answer to Question #4, which surveys should we attempt in FY20 under a three boat scenario?

Response:
Similar to Question 3, the sub-committee felt that it was unable to answer this question with the available information.

Rationale

The sub-committee understood the need to give the best advice possible for FY19, as finalizing planning and contract negotiations cannot be put off. The sub-committee looks forward to the provision of the results of the ongoing efforts to assess the implications of decreasing the present level of spatial and temporal resolution in the survey program.

Additional items:

Given the importance of these ongoing research projects, the sub-committee requests a presentation at the North Pacific FMC meeting in February 2019 on progress/results of the three research projects outlined by Stan Kotwicki. The sub-committee also encourages the AFSC to investigate the implications of survey reduction using an MSE-based approach. In any of the discussions of reducing the spatial density of survey effort, it should be remembered that the areas to be covered are extremely large (the area of the EBS shelf is about the same as the areas of the states of California and Oregon, combined), and increasing the distance between stations may not result in significant cost savings because of the added transit times between stations.

If NOAA is unable to provide sufficient funds for at least four boats annually, it may be necessary to examine ALL field and laboratory activities to assess their contributions to the basic requirement of providing assessments of fish stocks to the North Pacific Fishery Management Council. The sub-committee recognizes that the basic science will promote more robust management in the long run, but if the survey program falters, high quality assessments may not be possible. The sub-committee felt it was not in its remit to go into the ranking of projects and surveys specifically, but the sub-committee feels that the AFSC may need to have a broader programmatic view of where cuts happen.

Appendix 1: AFSC background document and terms of reference for AFSC-SSC Working Group, provided in advance of September 10, 2018 meeting

FY19 & FY20 Survey Priorities: Three & Four Boat Scenarios

Basic Assumptions:

- Bottom trawl surveys are multi-species surveys and should continue to be so.
- Continuation of standard survey coverage requires five boats.
- In the absence of information on survey impact, it is critical to complete the entire eastern Bering sea shelf survey without eliminating stations or increasing the distance between stations.
- Present multi-species assessments require the entire geographic extent of the Bering Sea slope, Gulf of Alaska and the Aleutian Islands survey area. The only options available to cut these surveys involve removing depth strata and/or occupying fewer stations in each stratum.
- Current assessments assume that either our present surveys encompass entire spatial extent of the fish populations (Tier 5 assessments), or that the fraction of the fish population remains constant within the survey area. Neither of these assumptions are met for some important commercial species. To meet these assumptions in the Bering Sea, it is necessary to conduct the NBS survey. However, without knowledge of the movement of fish across the international border with Russia, our survey may still not meet the basic assumption. Initiating cooperation with Russia (for the Bering Sea) and Canada (for the Gulf of Alaska) to address the movement question is advised.
- The FY19 three boat scenario discussed with the Council does not include the summer and winter GoA acoustic-trawl surveys for pollock/rockfish. We assume these surveys will proceed as planned, although the Shumagin survey may be delayed due to dry dock maintenance and repairs scheduled for winter 2018/2019.

"Terms of Reference"

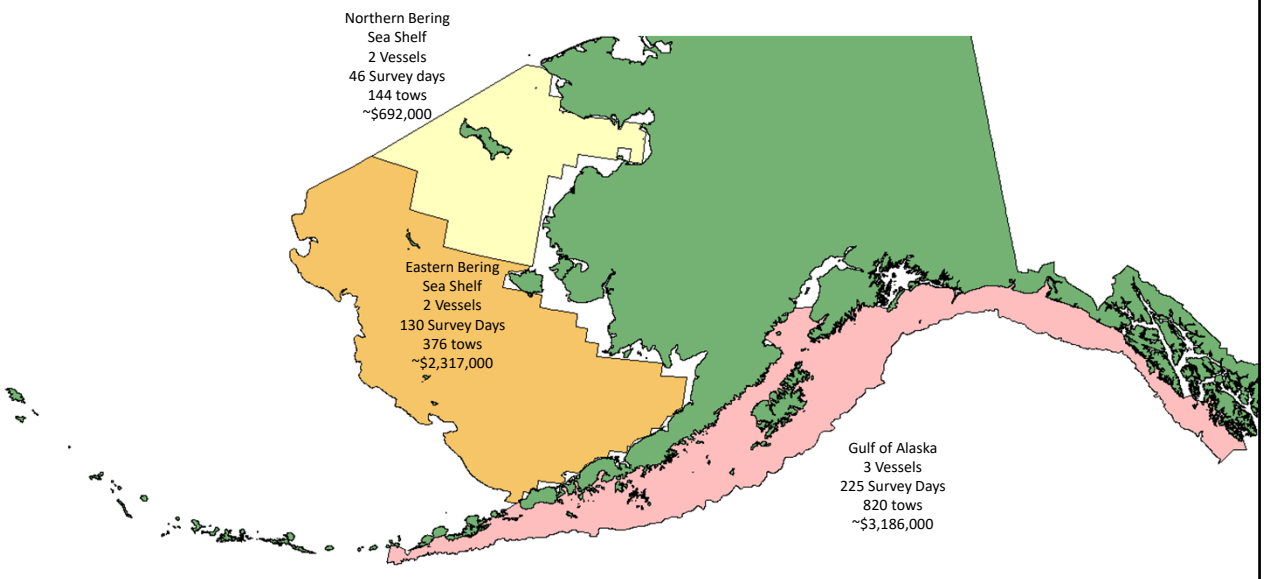
The questions we would ask you to address are:

1. What are the ranked order of priorities for our present suite of bottom trawl surveys: the eastern Bering Sea shelf, eastern Bering Sea slope, northern Bering Sea shelf, Gulf of Alaska, and Aleutian Islands?
2. If the Center has four, rather than five charter vessels on contract in FY19, we propose to put two vessels on the eastern Bering Sea shelf and two in the Gulf of Alaska. If additional funds are available, then these will be used to support a northern Bering Sea survey. Do you agree?
3. Given the answer to Question #2, which surveys should we prioritize for FY20 under a four-boat scenario?
4. If the Center is only able to fund 3 charter vessels in FY19, which survey(s) should we attempt?
    a. Eastern Bering Sea shelf (2 boats) + slope (1 boat)
    b. Gulf of Alaska (all three boats)
    c. Gulf of Alaska (2 boats) + eastern Bering Sea slope (1 boat)
5. Given the answer to Question #4, which surveys should we attempt for FY20 under a three boat scenario?

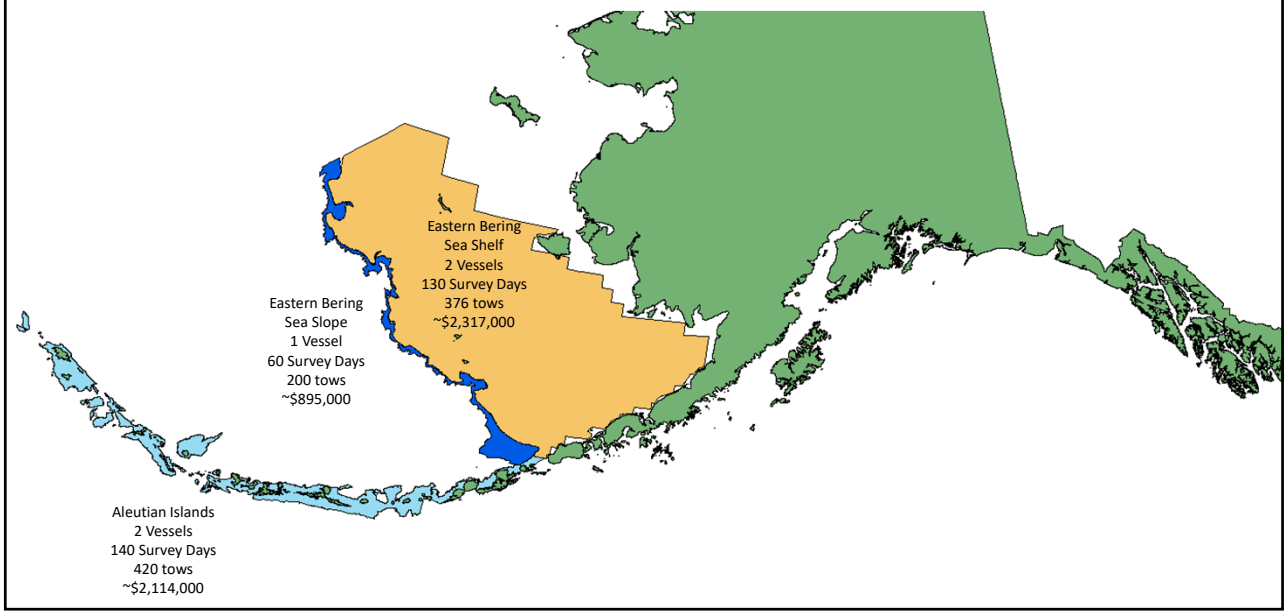
Questions

1. What are the ranked order of priorities for our present suite of bottom trawl surveys: the eastern Bering Sea shelf, eastern Bering Sea slope, northern Bering Sea shelf, Gulf of Alaska, and Aleutian Islands?
2. If the Center has four, rather than five charter vessels on contract in FY19, we propose to put two vessels on the eastern Bering Sea shelf and two in the Gulf of Alaska. If additional funds are available, then these will be used to support a northern Bering Sea survey. Do you agree?
3. Given the answer to Question #2, which surveys should we prioritize for FY20 under a four-boat scenario?
4. If the Center is only able to fund 3 charter vessels in FY19, which survey(s) should we attempt?
5. Given the answer to Question #4, which surveys should we attempt in FY20 under a three boat scenario?

Standard Survey Pattern – Odd Years (2019, 2021…)



Standard Survey Pattern – Even Years (2020, 2022…)



Survey Costs by Year

Odd year Costs (2019, 2021…)	
Eastern Bering Sea Shelf	~$2,317,000
Northern Bering Sea Shelf	~$692,000
Gulf of Alaska	~$3,186,000
TOTAL	~$6,195,000
Even Year Costs (2020, 2022…)	
Eastern Bering Sea Shelf	~$2,317,000
Eastern Bering Sea Slope	~$895,000
Aleutian Islands	~$2,114,000
TOTAL	~$5,326,000

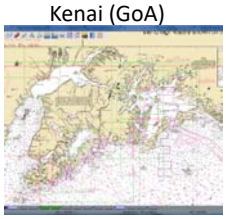
Most Abundant Commercial Species by Survey Area

Survey	Year	Most Abundant Commercial Species	Biomass (mt)
Eastern Bering Sea Shelf	2018	walleye pollock	3,143,381
		yellowfin sole	1,964,687
		northern rock sole	1,064,719
		Pacific cod	521,182
		flathead sole	503,575
Eastern Bering Sea Slope	2016	POP	357,000
		walleye pollock	116,000
		shortspine thornyhead	35,900
		Greenland turbot	23,600
		flathead sole	19,300
Northern Bering Sea Shelf	2017	walleye pollock	1,315,374
		yellowfin sole	426,117
		Alaska plaice	324,264
		Pacific cod	283,479
		snow crab	230,785
Gulf of Alaska	2017	POP	1,570,359
		walleye pollock	315,116
		Pacific halibut	298,407
		flathead sole	236,588
		northern rockfish	150,326
Aleutian Islands	2016	POP	982,503
		Atka mackerel	448,166
		northern rockfish	253,217
		Pacific cod	95,734
		walleye pollock	93,117

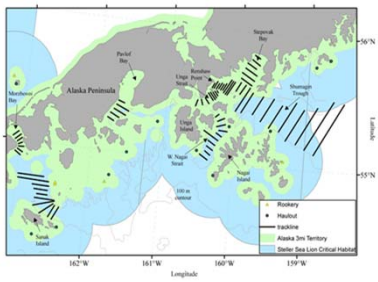
Acoustic – Trawl Surveys (Odd Years)

Winter Surveys

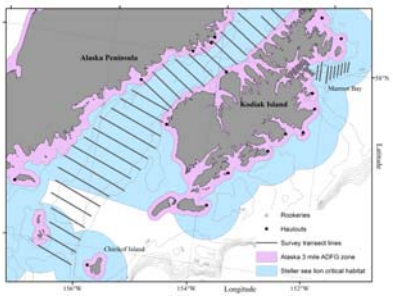
Kenai (GoA)



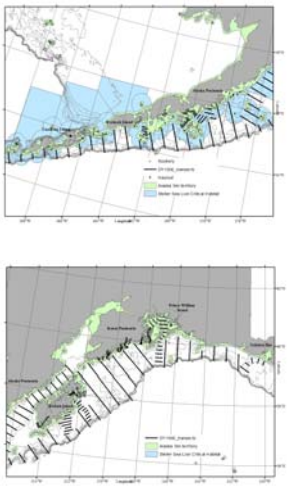
Shumagin (GoA)



Shelikof Strait (GoA)



Summer Gulf of Alaska Survey



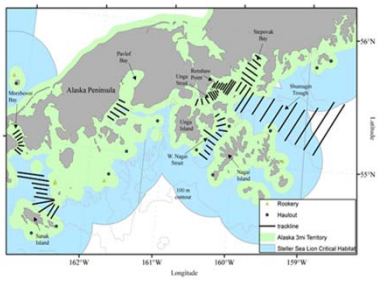
Acoustic – Trawl Surveys

(Even Years)

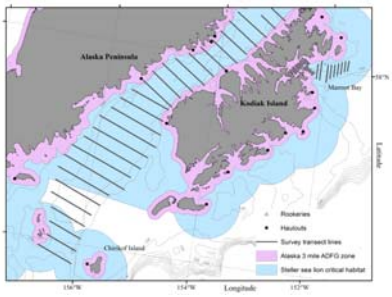
Winter Surveys

Bogoslof (EBS)

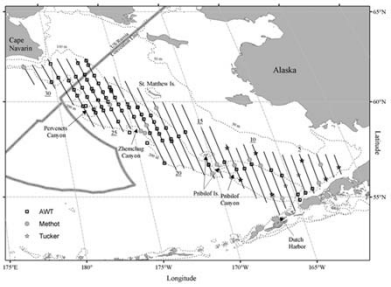
Shumagin (GoA)



Shelikof Strait (GoA)



Summer Eastern Bering Sea Survey



Questions

1. What are the ranked order of priorities for our present suite of bottom trawl surveys: the eastern Bering Sea shelf, eastern Bering Sea slope, northern Bering Sea shelf, Gulf of Alaska, and Aleutian Islands?
2. If the Center has four, rather than five charter vessels on contract in FY19, we propose to put two vessels on the eastern Bering Sea shelf and two in the Gulf of Alaska. If additional funds are available, then these will be used to support a northern Bering Sea survey. Do you agree?
3. Given the answer to Question #2, which surveys should we prioritize for FY20 under a four-boat scenario?
4. If the Center is only able to fund 3 charter vessels in FY19, which survey(s) should we attempt?
5. Given the answer to Question #4, which surveys should we attempt in FY20 under a three boat scenario?