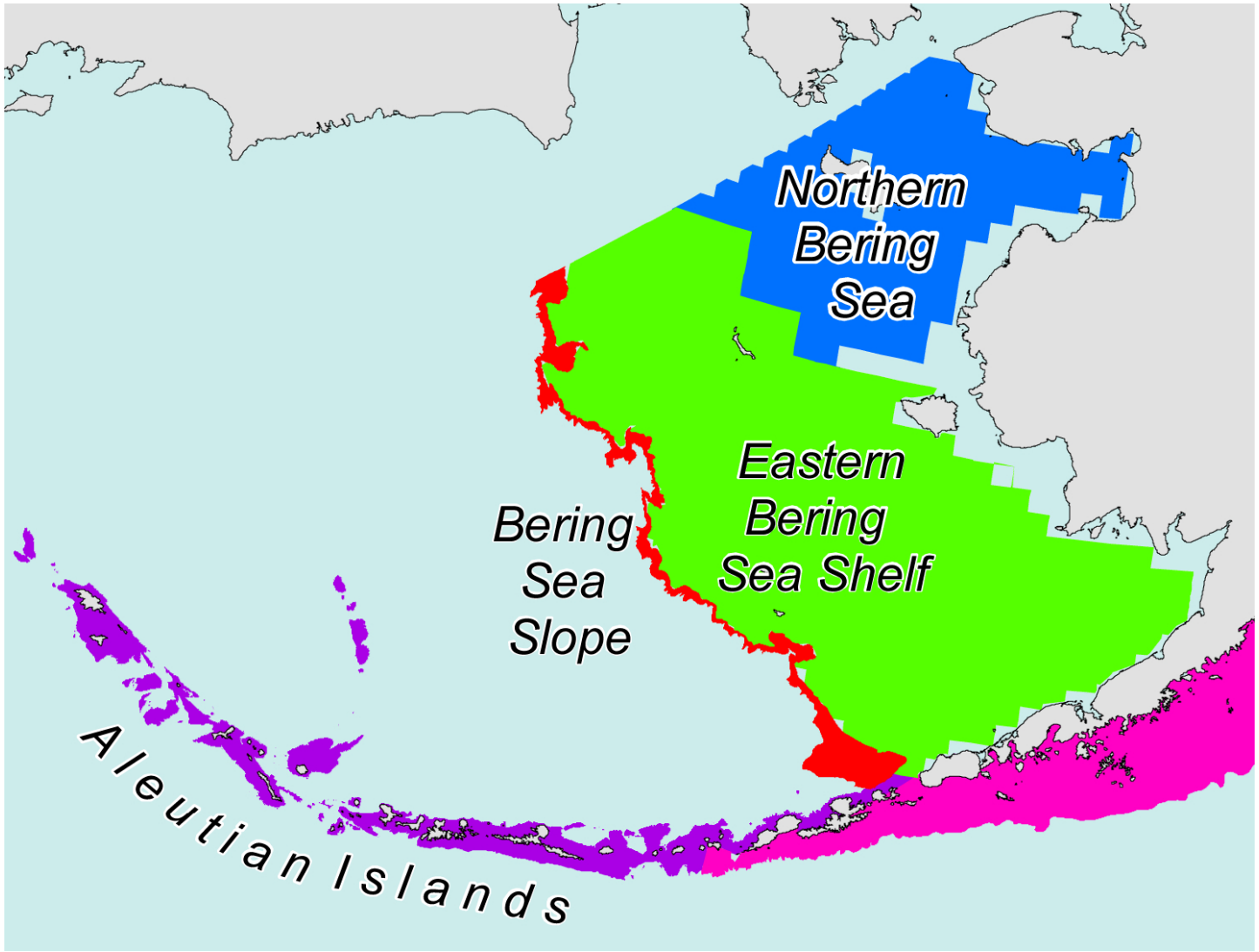
SCIENTIFIC AND STATISTICAL COMMITTEE DRAFT REPORT for the NORTH PACIFIC FISHERIES MANAGEMENT COUNCIL

C-4 BSAI Specifications



Ecosystem Chapters to BSAI and GOA

This year, as in the past, Ecosystem Considerations chapters are thoughtful, well done, and most helpful in providing a context within which to assess the stocks of commercially harvested fish in Federal waters off Alaska.

Ecosystem Chapters to BSAI and GOA

NOAA provided additional staff resources to sustain the improvement of these documents, and that these additional resources allowed more for in-depth analyses of recent environmental changes, such as the examination of the sudden decline in Pacific cod in the Gulf of Alaska.

Ecosystem Chapters to BSAI and GOA

Additions Include:

- Rapid zooplankton assessments included for both EBS and GOA Ecosystem reports.
- Expanded analyses of abundance and distribution shifts of groundfish and jellyfish from AFSC bottom trawl surveys
- "Groundfish Recruitment Predictions" section, which includes a new indicator for Pacific cod and five new indicators for walleye pollock.

Ecosystem Chapters to BSAI and GOA

- The SSC supports the development of these predictions based on ecosystem indicators that are firmly grounded in mechanistic relationships.
- Effort should be directed toward the eventual incorporation of these recruitment indicators in the assessment models.
- The **SSC recommends** that these species specific predictions are transitioned to the ESPs (Ecosystem Socio-economic Profile) to ensure that they are considered by the Stock Assessment author.

Ecosystem Chapters to BSAI and GOA

- The SSC commends the ongoing efforts to expand the treatment of the Human Dimensions portion of the Ecosystem Considerations chapters. In particular, new indicators have been incorporated.
- **The SSC recommends** the inclusion of maps demonstrating finer scale shifts in population trends as well as school enrollment trends, both of which are strong indicators of community stability or vulnerability.

Ecosystem Chapters to BSAI and GOA

- Specific to the Northern Bering Sea, the **SSC endorses** the Plan Team recommendation for continued evaluation of approaches to incorporating local ecological knowledge into the Ecosystems Consideration Chapters.
- In addition, the SSC encourages exploration of other more active approaches to gathering and engaging citizen science from communities.

Ecosystem Chapters to BSAI

- “Hot Topics” section included an excellent discussion of relatively large biomasses of Pacific cod and walleye pollock in the Northern Bering Sea.
- The presence of these fish in large numbers that far north raises important questions about their persistence there and their relationship to the stocks in the southeastern Bering Sea.
- Our best information is that both walleye pollock and Pacific cod lack the anti-freeze proteins needed to prevent tissues from freezing at the sub-zero water column temperatures almost certain to occur over the shelf in the coming winter.

Ecosystem Chapters to BSAI

- With regard to Pacific cod in particular, results from the 2017 Northern Bering Sea survey, in concert with the observed decline in biomass from the EBS bottom trawl survey, suggest that we might need to be adaptive not only in our management, but also in our surveying of commercial fish stocks. The **SSC strongly supports** conducting additional surveys in the Northern Bering Sea.

Ecosystem Chapters to BSAI

Notable Trends

- Groundfish condition declined from 2016 – 2017 for all species, except for age-1 pollock and Alaska plaice, e.g., length-weight residuals for adult walleye pollock and Pacific cod were both negative. Poor condition may compromise overwinter survival.
- Based on the CEATTLE model, estimated mortality for age-1 pollock, Pacific cod and arrowtooth flounder remained elevated in 2017,
- Predictions based on the relationship between the North Pacific Index and Pacific cod recruitment deviations suggest that poor cod recruitment is likely.

Ecosystem Chapters to BSAI

Notable Trends

- The results from these three indicators in concert (poor condition, increased mortality and negative recruitment deviations) may signal an upcoming period of poor Pacific cod recruitment.
- On a more positive note, cooler temperatures are forecast for 2018, which should lead to increased large zooplankton, and better survival of juvenile pollock and cod.

Ecosystem Chapters to BSAI

Notable Trends

Springtime drift patterns were consistent with below average flatfish recruitment for winter spawners. There have been very few years with drift patterns that indicate strong recruitment for flatfish over last decade, and, this relationship may be weakening for certain species. The extended period of poor flatfish recruitment should be monitored.

Ecosystem Chapters to BSAI

Notable Trends

Commercial crab biomass decreased in 2017 again, whereas brittle stars and sand dollars continue to increase. The SSC raised the possibility that a restructuring of this part of the ecosystem is occurring, or has already occurred, and recognizes the continued depression of commercial crab stocks.

Ecosystem Chapters to BSAI

Notable Trends

Canadian-origin juvenile chinook abundance in the northern Bering Sea was below the long term average, and there is the potential for reduced bycatch caps three to four years from now. It could be useful to summarize data on the availability of zooplankton and forage fish to salmon as they enter the ocean.

Ecosystem Chapters to GOA

Ecosystem Chapters to GOA

The Ecosystem Considerations Chapter for the **Gulf of Alaska is still expanding and developing,** and the SSC wishes to recognize hard work of the editors and the Contributors in developing this valuable management product.

Ecosystem Chapters to GOA

An exceptionally valuable addition this year is a examination of the impact that the warm “blob” that arrived in 2014 had on the dynamics of Pacific cod in the Gulf of Alaska. This provides not only a way to understand what happened and why, but also provides the tools for rethinking how we might have detected the decline of cod two to three years before it happened.

Ecosystem Chapters to GOA

The SSC welcomes new contributions including: multiple oceanographic indicators, forage fish from Middleton Island auklet and kittiwake diets, ADFG herring biomass in EGOA, spring larval pollock from the EcoFOCI survey in western GOA, humpback whales in Glacier Bay, and the new suite of socio-economic indicators. The disease ecology indicators may prove particularly important.

Ecosystem Chapters to GOA

- The **SSC suggests** that results from the AFSC GOA bottom trawl survey be further investigated as a strong data source.
- Biomass estimates for the apex predator and the motile epifauna guilds are included in the report cards for the subregions, but more detail on these results included in the executive summaries and the current state sections would be useful.
- It would also be useful to have data on acidification (pH) as an additional indicator to complement temperature and salinity.
- The SSC noted that Qiong Yang (PMEL/JISAO, NPRB 1509) has developed a new index of fish distribution by size which should be considered for the 2018 report.

Ecosystem Chapters to GOA

Notable Trends

- The shift in the size of zooplankton from large (*Calanus*, *Neocalanus*) to smaller species, and the scarcity of the larger species is an important observation. This shift may reflect changes in the advection of large species from the south and/or onto the shelf or an ecosystem response to the recent warming events.

Ecosystem Chapters to GOA

Notable Trends

- The arrowtooth flounder stock has declined recently, potentially indicating a similar response to the marine heat wave as Pacific cod, but this would have also decreased predation pressure on pollock as well.
- Larval walleye pollock at-sea rough counts were above average in the WGOA EcoFOCI survey throughout grid, in contrast to 2015, when the survey encountered lots of zero stations and low rough counts. Larval pollock abundances were also high in late summer from the Oscar Dyson survey. The **SSC requests** that this survey be further investigated to evaluate its utility for other groundfish species.

Ecosystem Chapters to GOA

Notable Trends

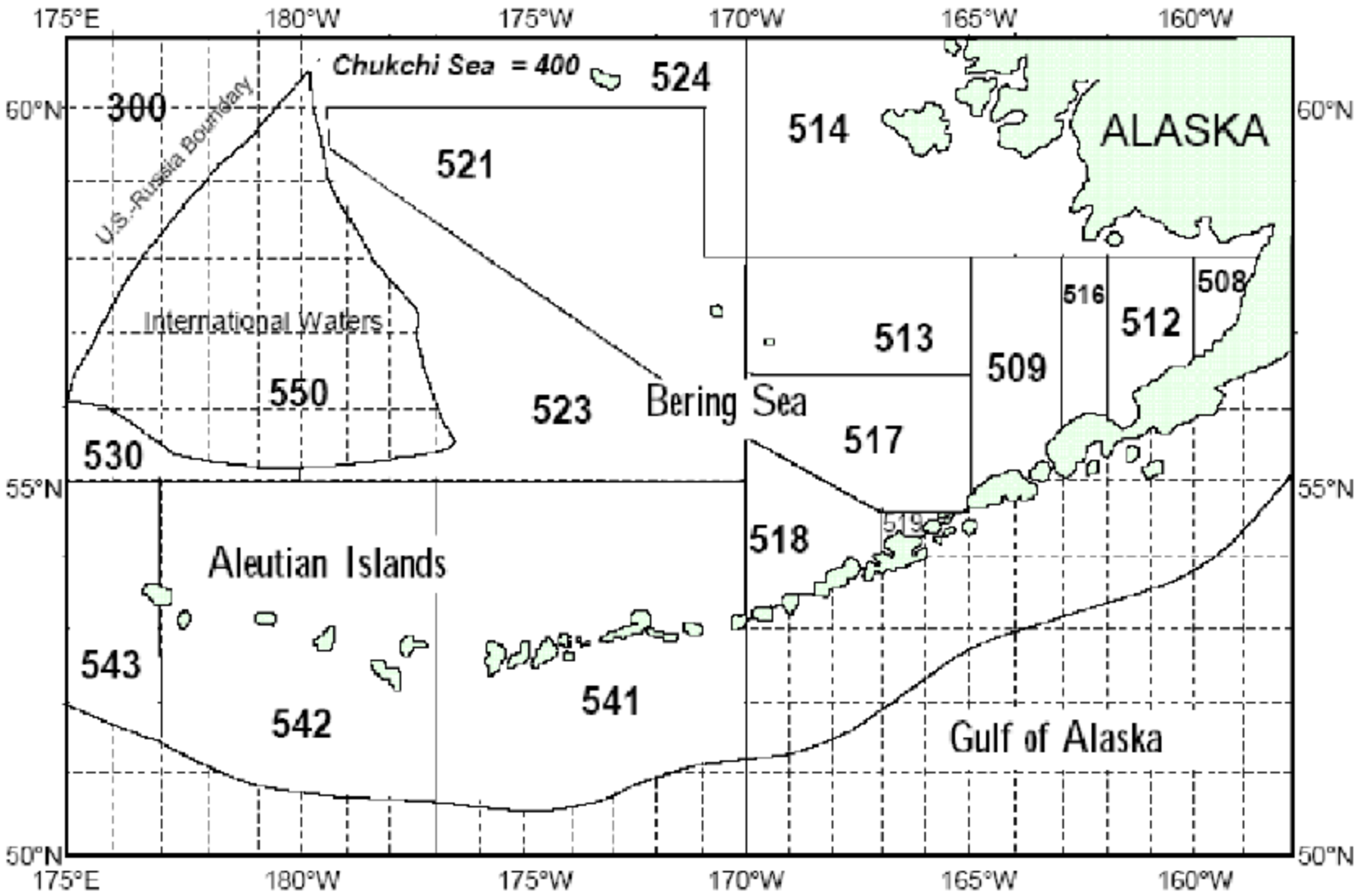
- Most groundfish species had below average condition. The lack of a consistent temporal and spatial trend might be indicative of highly dynamic productivity with local hotspots that influence condition. The **SSC requests** these data be split out into juvenile and adult samples, as suggested by the contributors to evaluate further spatial and temporal patterns.
- Based on 2016 environmental data, model-based predictions are for an above average abundance of age-2 sablefish (68 million) in 2018 (2016 year-class). However, based on 2017 environmental data, there may be below average abundance of age-2 sablefish in 2017 (2015 year-class). These data are from the Southeast Coastal Monitoring survey – are there other data that could be available from this survey?

Ecosystem Chapters to GOA

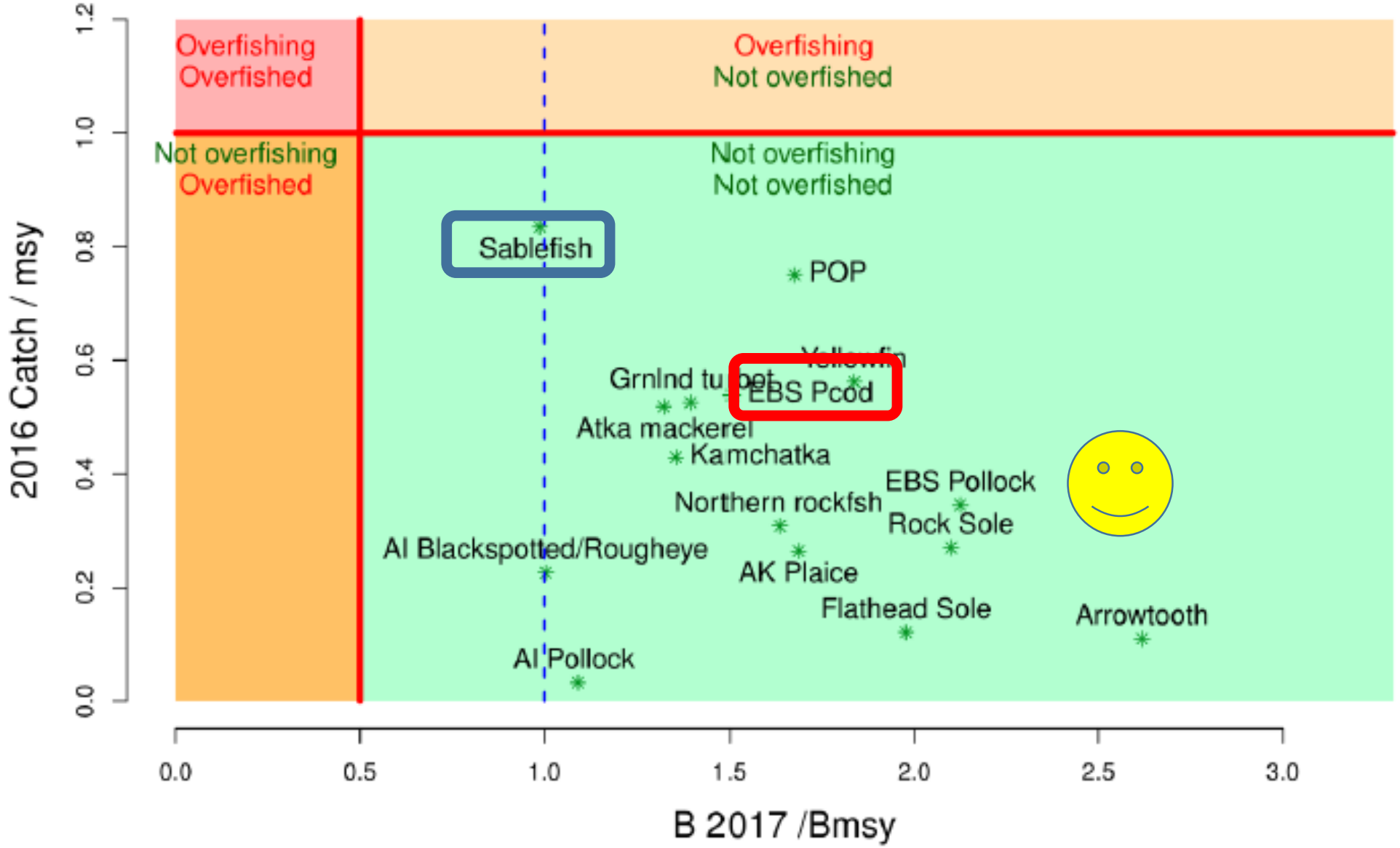
Given the marked changes observed in the Gulf of Alaska in response to the marine heat wave, the **SSC encourages** the ecosystem considerations authors to examine methods to estimate the carrying capacity of the Gulf of Alaska.

We recognize that some consideration of ecoregions (perhaps nearshore, banks and troughs) and zoogeography (perhaps an eastern and western/central spilt) may be needed.

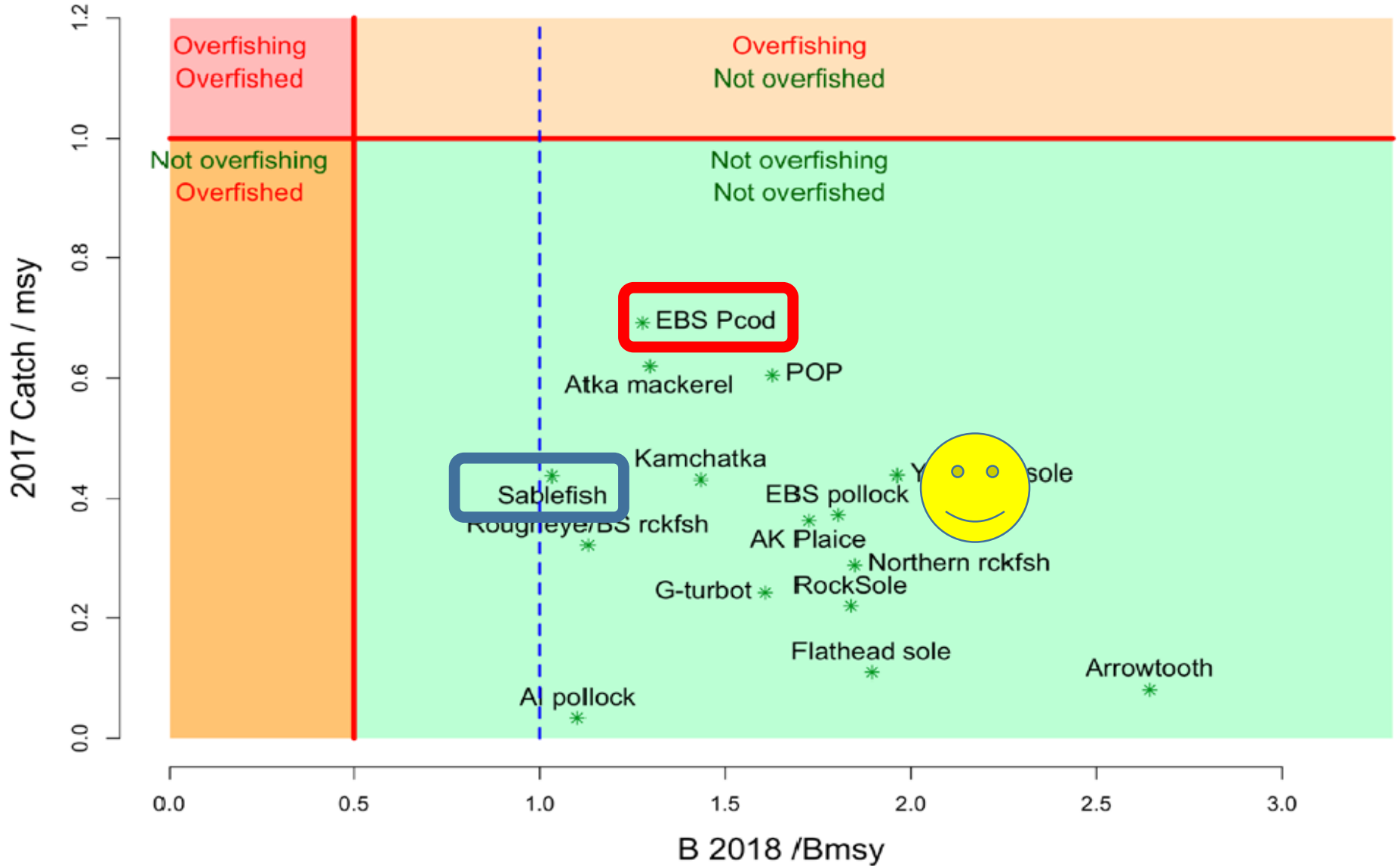
C-4 BSAI Specifications



C-6 BSAI Specifications



C-6 BSAI Specifications



C-6 BSAI Specifications

Many of the assessments were updates since there was not a EBSAI Survey

SSC Recommendations that differed from Plan Team

- BSAI Pacific cod

C-6 BSAI Specifications

EBS Pollock

- The stock assessment using Model 16.1 estimates strong 2012 and 2013 year-classes and the female spawning biomass estimates (3.87 million t in 2017, 3.68 million t in 2018) are well above B_{msy} (2.04 million t). There were no retrospective patterns of concern in estimated biomass.
- **However, subject to the concerns, the SSC concurs with the authors and Plan Team to follow recent practice of using BRPs from Tier 3 for additional precaution, which results in a 2018 ABC of 2.59 million t and OFL of 4.80 million t.**

C-6 BSAI Specifications

EBS Pollock (Concerns)

- There may be lower larval and juvenile survival due to the warm conditions during 2014-2016.
- There were few age-1 pollock in 2016 and 2017.
- The abundance of older pollock (ages 10 and above) is relatively low (although this has been expected due to small year-classes before 2012).
- Warm temperatures may have provided a corridor to allow some EBS pollock to move north into the Northern Bering Sea, where they will not be routinely assessed and cannot be harvested presently. Whether these fish will return to their normal range is a concern.
- The multi-species CEATTLE model produces a much different estimate of B_{msy} than the single-species assessment model (3.6 million t versus 2.0 million t).
- As pollock is a key prey species for many predator species, a northward movement of pollock may have detrimental effects on these species.
- Projections suggest declines in abundance in the future, except at low catch levels. In addition, greater amounts of fishing effort would be required.

C-6 BSAI Specifications

EBS Pacific Cod

- The SSC commends the author on his extremely thorough response to the numerous and varied Plan Team and SSC comments from previous meetings. The breadth of analyses and options provided to both the Plan Teams and the SSC fostered evaluation of many aspects of the data and models.

C-6 BSAI Specifications

EBS Pacific Cod

- **The SSC agrees with the Plan Team to use model 16.6 as the basis for this year's status determination and setting management quantities.** After considerable discussion, the SSC concluded that there were not compelling reasons to set the 2018 ABC below the maximum permissible value.
- Ecosystem and population information provided a mixed signal: recent low recruitment estimates are concerning, there was high age-1 mortality estimated from the multi-species model, there was contradictory information on Pacific cod body condition in recent years.
- An expected return to cooler conditions in the near future may alleviate some of these concerns.

C-6 BSAI Specifications

EBS Pacific Cod

- The results of the NBS survey from 2017 indicated a substantial amount of cod north of the area included in the stock assessment, associated with warmer bottom temperatures over much of the shelf.
- The size composition of fish in the NBS is similar to that in the standard survey area, consistent with the hypothesis that they are part of the same population.
- **The SSC does not support a reduction from the maximum ABC for 2018 of 201,000 t. The SSC does endorse the Plan Team recommended 2019 ABC of 170,000 t, which is equal to the maximum from model 16.6.** The SSC notes that biomass is expected to decline in the near term due to the recent low recruitments.

C-6 BSAI Specifications

EBS Pacific Cod

- The SSC strongly supports the proposal for renewed genetics work to investigate the degree to which the cod observed in the NBS represent a separate genetic pool from those observed in the EBS.

C-6 BSAI Specifications

EBS Pacific Cod

- The SSC has encouraged the additional work on model averaging conducted during 2017, and the author and Plan Teams have made good progress on the topic, even if neither are ready to move forward with it.
- Remaining concerns include clearly identifying criteria for including models in an ensemble, specifically delineating between alternative plausible hypotheses and sensitivity analyses (which should not be included), as well as continued exploration of specific methods for calculating averaged results. **The SSC supports the Plan Team's recommendation to conduct a spring workshop to address these and other issues which would not be limited to just Pacific cod.**

C-6 BSAI/GOA Specifications

Sablefish

- The new longline survey data provided evidence of a large 2014 year-class. The model estimate of this year-class was 10 times the long-term average.
- The author noted that the presence of 2 year-olds in the age compositions was positively related with eventual year-class strength, however the magnitude of the year-class has been uncertain. In addition, there was a strong lack of fit to the recent trawl survey indices related to the magnitude of this year class.
- Given this uncertainty, the author recommended replacing the magnitude of this year-class with the next largest year-class on record (1977) in the projections.

C-6 BSAI Specifications

Sablefish

- The SSC approved the authors and Joint Plan Team's recommendations for Tier, ABC and OFL. These adjustments include adjustments for the magnitude of the 2014 year-class and whale depredation.

C-6 BSAI Specifications

Sablefish

- The SSC welcomed seeing a fully developed Environmental Socio-economic Profile (ESP) for sablefish. This document holds great promise as an “on-ramp” for the introduction and testing of environmentally or socio-economically linked assessments.
- In the case of sablefish, the ESP type process has already succeeded. The whale depredation methods appeared as an appendix to the SAFE chapter for several years and it has now transitioned to be formally used in the estimation of biological reference points.
- This type of testing and formal transition, serves as a test case for the ESP. Another case study is the incorporation of the CEATTLE model as an appendix to the EBS pollock chapter.