BSAI Skates Assessment History and SSC/PT minutes

2023 - Operational Update

No Sept PT presentation, nor PT/SSC comments
November PT eAgenda with presentation and minutes

SSC Dec

An operational update for the BSAI skate complex was presented this year. The last full assessment was conducted in 2020. There was no public testimony.

Harvest recommendations for the BSAI skate complex includes two components, a Tier 3 age-structured model for Alaska skate (*Bathyraja parmifera*) and a Tier 5 random effects model for all other skates. These components are combined to produce the harvest specifications for the BSAI skate complex. Updated data for this assessment included: catch through October 1, 2023, EBS shelf bottom trawl survey biomass estimates updated through 2023, 2022 Aleutian Islands survey data, and survey length compositions from the 2021–2023 EBS shelf bottom trawl surveys.

The Tier 3 Alaska skate model, Model 14.2, was migrated to a newer version of Stock Synthesis (SS3 v3.30.21) and some changes to historical data were incorporated, but assessment methodology did not change. A series of bridging steps were evaluated, and it was determined that the updated model, Model 14.2d, was consistent with the previously accepted structure in Model 14.2. In Model 14.2d, the longline fishery selectivity changed to dome-shaped from asymptotic, but it was suggested that this change was related to the newer Stock Synthesis version. It was also noted that biomass is overestimated during the colder years and underestimated during the warmer years. The SSC concurs with the recommendation to explore using a catchability tuned to temperature. The model also tends to underestimate lengths of the oldest skates in early years, but there has been no new age data since 2015. The BSAI GPT discussed whether there would be collections of age structures (vertebrae) and new age estimates in the future because lack of more recent samples will result in increased uncertainty in this Tier 3 assessment in the future. While collection and aging of vertebrae are time-intensive, the SSC encourages considerations of collecting and aging Alaska skate vertebrae when prioritizing fishery and survey sampling and determining age-reading priorities at the AFSC Age and Growth Lab. Overall, the model fit the data reasonably well and performed similarly to the 2020 model. The model, however, has substantial retrospective bias with indication that the model is overestimating SSB.

The assessment model indicates that spawning biomass of Alaska skate peaked in 2020 and has since shown a decreasing trend since 2021; however, estimates are still well above the long-term average. Lower recruitment in recent years suggests that spawning biomass is expected to decrease in the future, but there is indication that a new cohort may be beginning to recruit into the population. The 2023 estimate of female spawning biomass is above B40% and, therefore, harvest specifications for Alaska skate are set in Tier 3a.

The Other Skate complex consists of many species over multiple BSAI regions. Species composition varies by region. This assessment uses the EBS shelf, the EBS slope and the AI survey. The total biomass estimate for the Tier 5 Other Skate species in the complex was updated from the previous random effects model framework to the REMA framework (Model 23.0).

Since the last full assessment in 2020, there have been three EBS shelf surveys and one survey in the AI. Biomass estimates in the EBS shelf have been trending upward since 2013 and the 2023 estimate was the highest in the time series and is mostly driven by big skate. The assessment model, however, underestimated the high 2023 value. The combined Tier 5 AI biomass is slightly down from the 2020 assessment, which continues the downward trend starting around 2010. The leopard skate biomass in the AI continues to decline and the SSC reiterates its concern over the decline of this rare endemic species. The SSC is encouraged that the authors have initiated discussions with RACE GAP staff about this and will prioritize further evaluations in collaboration with RACE staff regarding the reliability of the AI trawl survey for assessing leopard skates, and skate species in general because of habitat rugosity and the survey gear used. There has not been an EBS slope survey since 2016; therefore, the estimated biomass from that region is unchanged, but with increased uncertainty.

The SSC appreciates the implementation of the risk table. Assessment-related concerns were rated at a level 2 (major concern) for Alaska skates because of the strong retrospective bias, but level 1 for other skates. All other categories were rated as level 1 (no concern). The SSC accepts the authors' and BSAI GPT's recommended OFL and ABC for the skate complex in 2024 and 2025 with no reduction from maxABC.

The SSC concurs with assessment authors' plans for future assessments including exploring updated natural mortality rates (M) for each of the Tier 5 Other Skate species. The SSC also reiterates the suggestion from the previous two full assessments (2018 and 2020) to update the stock structure template with a focus on Alaska skate during the next full assessment and appreciate the authors' agreement that this is something to revisit. Finally, The SSC would like to commend the authors for their work on this assessment. The SSC appreciates the thoughtful approach the authors took with this operational update and agree with the BSAI GPT that this assessment is a good template for transitioning authorship of a SAFE in the future.

BSAI PT Nov

Cindy Tribuzio presented the operational assessment of the BSAI skate complex, which includes the Alaska skate component, assessed as a Tier 3 stock, and the "other skates" component, assessed as a Tier 5 stock. This assessment underwent a change in authorship for this assessment cycle, and the authors' approach was to change nothing of note in the methodology and run the previously accepted model on an upgraded modeling software version, with new or updated data. In the recommended Tier 3 Alaska skate model (14.2d), the longline fishery selectivity changed to dome-shaped from asymptotic. Since the only changes to the assessment were a) changes to the input data, including adding new data and slight corrections from past data; and b) a switch to a new modeling software version, the Team noted that this change in selectivity was most likely related to the Stock Synthesis version change, recalling that a different stock assessment author had noted this same behavior last year for a different stock assessment.

The Team noted that BSAI Alaska skates are the only age-structured assessment for groundfish in Alaska that do not include marginal age composition data. The primary aging structures for skates are vertebrae, and there are several years of survey age data available (2003, 2007, 2008, 2009, and 2015). The Team wondered if this collection would happen again, since the absence of the samples moving forward will increase uncertainty in this Tier 3 assessment in the future. The cessation of sample collection may continue in the near term since it is time-intensive for AFSC Age and Growth Lab staff to age skate vertebrae, and also for survey biologists and fishery observers to collect the vertebrae at-sea. It was noted by AFSC Age and Growth Lab staff that whether this collection and ageing continues depends on age reading prioritization and staffing availability.

For the "other skates" component of the stock, assessed as Tier 5, the Team asked the author how they thought about using a combined fixed natural mortality value of 0.10 for all the species in that group. The author responded that the combined value is likely incorrect, and that it is one of the first things they will tackle for the next assessment cycle.

A Team member noted that the biomass estimates for the Tier 3 Alaska skate component of the stock appears to be overestimated during the colder years and underestimated during the warmer years. Survey catchability is fixed at 1.0 in the model. The Team recommends the authors examine using a catchability that is tuned to temperature. In terms of other next steps for improving the assessment, the lead author expressed a desire to generally "clean things up". This includes but is not limited to the following:

- Make the assessment code clear, documented, and reproducible.
- Focus on tuning the data and model inputs.
- Examine deriving a different value of M for each of the Tier 5 "other skate" species.
- Determine whether to include the northern Bering Sea (NBS) survey in the assessment. NBS survey data indicate that Alaska Skate is abundant in the region.

The Team applauded the authors' approach to not change the methodology for this first assessment cycle after the change in authorship and gave the authors leeway to explore the data and assessment methodology in more detail to come up with the improvements that should be incorporated into the model for the next assessment cycle. The Team commended this careful and considered approach and would like to see it be used for how authorship transfers be conducted going forward.

The author recommended Model 14.2d with no reductions from maximum permissible ABC. The Team agreed with the author's recommendation and had no additional recommendations.

2022 - Partial Assessment

No Sept PT presentation, nor PT/SSC comments
November PT eAgenda, skates presented with other Partial Assessment stocks

SSC Dec

Typically, full assessments for this complex occur in even years. Staffing limitations precluded the completion of a full assessment, so a partial was presented this year. The last full assessment was presented in 2020 and the next is currently scheduled for 2023, pending any revisions to stock prioritization. Skates in the BSAI are managed at the complex-level, which represents the sum of harvest specifications from two separate assessments. Alaska skate is more abundant and assessed with an age-structured model under Tier 3. The remaining skate species are assessed together under Tier 5. There was no public testimony.

No changes were made to the assessment. For Alaska skate, the Tier 3 model was updated with catch data through October and estimated catch for the remainder of 2022. Catch was estimated through 2023 for the updated projection model. The Tier 5 specifications for the remaining skate species remained unchanged since no new biomass estimates were produced. Survey biomass estimates were provided as supplementary information and demonstrated little change from those projected in 2021. Harvest recommendations for 2023 are very similar to those projected last year.

The SSC accepts the authors' and BSAI GPT's recommended OFL and ABC for the skate complex for 2023 with no reduction from maxABC.

There SSC continues to support prior SSC and GPT recommendations for the next full assessment, including transitioning the model from ADMB to the rema framework and considering whether updating the stock structure template for Alaska skate is warranted.

BSAI PT Nov

A skate partial assessment was presented for the BSAI skate stock complex. The Team accepted the updated projection model estimates for the Tier 3 Alaska skate component of the complex and rolled over Tier 5 estimates for the remaining portion of the stock complex.

2021 - Partial Assessment

No Sept PT presentation, nor PT/SSC comments
November PT eAgenda, with link to presentation

SSC Dec

The BSAI skate complex is assessed biennially. The last full assessment was in 2020 and a partial assessment was presented this year. There was no public testimony.

The complex is separated into two components to generate harvest recommendations: Alaska skate (Bathyraja parmifera), which is the most abundant skate species in the BSAI, and the remaining species (i.e. "Other Skates"). Alaska skate harvest recommendations are based on an age-structured model and managed under Tier 3a, while Other Skates are managed under Tier 5. The Tier 3 and Tier 5 recommendations are combined to generate recommendations for the whole complex.

No changes were made to the assessment methods. New data for the Alaska skate projection model included updated 2020 catch data, preliminary 2021 catch estimates, estimated total catch for 2022 and 2023. The EBS shelf bottom trawl survey biomass estimate time-series, including 2021, was provided. The Tier 5 random effects model for the Other Skates component was not re-run.

While not included in the partial assessment calculations, the estimated survey biomass for the aggregate skate complex on the EBS shelf was shown to decrease slightly relative to 2019 (511,965 t vs. 528,826 t). There was no survey in 2020 due to COVID-19. Catches remain well below the ABC.

The SSC concurs with the author's and BSAI GPT's recommended OFL and ABC for the BSAI skate complex, with no reduction from maxABC. The SSC requests that the methods used for catch projections be detailed in future assessments.

BSAI PT Nov

Olav Ormseth presented a partial update of the BSAI skate stock complex assessment. This assessment is conducted biennially in even years so a full assessment will be presented in 2022. For the partial update, only the Tier 3 projection model for Alaska skate is re-run with updated catch. The Tier 5 portions of the complex harvest recommendations are rolled over from the previous assessment. The Team accepts the author's recommended ABC and other reference points. The Team noted that this is Olav's final skate assessment before he leaves the AFSC and thanked him for his extensive efforts over the years.

2020 - Full Assessment

No Sept PT presentation, nor PT/SSC comments
November PT eAgenda, with link to presentation

SSC Dec

Harvest recommendations for the BSAI skate complex includes two components, a Tier 3 age-structured model for Alaska skate in the EBS and a Tier 5 random effects model for all other skates. These components are combined to produce the harvest specifications for the BSAI skate complex. A full assessment was presented. BSAI skates are assessed on a biennial schedule, with the next full assessment to occur in 2022. There was no public testimony. Updated data for this assessment includes:

- Updated catch estimates for 2019 and 2020
- New biomass estimates from the 2019 EBS shelf survey
- The Tier 3 model also includes 2019 length compositions from the EBS shelf survey and the fishery, and estimated catch through 2020

With regards to the Tier 3 model for Alaska skate, only a single model was presented, Model 14.2, which remains unchanged except for updated data. Overall, the model performed similarly to the 2018 model. There is some moderate retrospective bias. Results from this model estimate that 2020 total biomass is down slightly in recent years but spawning biomass continues to increase. There is also a limited indication of a few stronger year classes from 2016 – 2018 entering the population. The SSC accepts the BSAI GPT and author recommended model. The 2021 estimate of female spawning biomass is above B40% and harvest specifications for Alaska skate are provided under Tier 3a. Further, the SSC concurs with the BSAI GPT and the authors recommended OFL. The SSC appreciates the implementation of the risk table and concurs that no reduction from the maximum ABC appears to be necessary.

The other skates complex consists of many species over multiple BSAI regions. Species composition varies by region. Three surveys are utilized for this assessment, including the EBS shelf, the EBS slope and the AI survey. In contrast to previous assessments, where biomass estimates are aggregated into a single random effects model for each survey, this assessment created separate RE models for each survey/species combination. Species that appeared inconsistently in survey data or exhibited extreme variability were aggregated into a “minor skate” group. The SSC notes that this approach represents a considerable improvement in the ability to delineate stock-specific trends within the complex.

Results from the individual RE models suggest that most species have fairly stable spatial distributions. An exception is the big skate, which increased in the southeastern Bering Sea, likely reflecting an extension of the GOA big skate population. Biomass trends differed by area. In general, results from the RE models suggest that EBS shelf species declined, whereas EBS slope and AI species’ biomass trends were flat or slightly increasing relative to last year. Shelf species are generally increasing. However, the declining trend of leopard skate is notable, from a high of 11,825 t in 2010 to 2,634 t in 2018. The SSC registers some concern with the decline of this endemic species, and asks if there are any additional data that could be brought forward to attempt to discern if there is a conservation issue associated with this decline. The SSC further notes that the text for this section was confusing as to whether it referenced the biomass estimates provided by the surveys or the RE model estimates. This should be clarified for the future.

An exploitation rate analysis was provided. In general, exploitation rates were much less than 0.1. Bering skate and big skate both had several years in which the exploitation rates were greater than 0.1, and these are discussed in more detail in the assessment. A value of M = 0.1 was used for harvest specifications of this Tier 5 stock complex. The SSC concurs with the recommended OFL and ABC, based on the combined RE model results from the 2019 shelf survey and the 2018 estimates from the EBS slope and AI.

There is an extensive section on ecosystem considerations presented for all species included in the BSAI skate complex. This information is much appreciated. The SSC suggests that it may be appropriate to update the stock structure template during the next full assessment, with a focus on Alaska skate, as was requested by the SSC in 2018. Also, the SSC further emphasizes the importance of the slope survey to this complex; despite the complex being dominated by a shelf species, the slope contains the highest diversity of skate species in the North Pacific. This is noted within the context of the survey prioritization process outlined by the SSC in previous minutes (October 2018, October 2020).

BSAI PT Nov

Olav Ormseth presented the assessment for the BSAI skate complex. This stock complex is comprised of Tier 3 (Alaska skate) and Tier 5 (all other skates) species and is assessed biennially in even years. There were no changes to the author’s recommended model for Alaska skate (Model 14.2), nor changes to the Tier 5 method. The Alaska skate projected biomass for 2021 increased, as did the spawning biomass. The Team noted that skate catch is generally correlated with Pacific cod TAC, which has been declining.

The Team discussed whether there have been any observed changes in distribution of catch or of critical habitat (i.e., nursery sites) given the warmer conditions. It does not appear that skates have shifted northward, nor do data exist to determine if nursery site locations have shifted. However, there is extensive research on temperature-induced changes to incubation timing. Warmer temperatures lead to shorter incubations, and it is possible that skate eggs could be hatching earlier, or incubation cohorts could overlap.

The author presented a risk table with considerations for the different tiers discussed separately. The author noted concerns over the lack of a slope survey for this assessment. While the stock complex is dominated by Alaska skate, a shelf species, the EBS slope region contains a greater diversity of species. Without the EBS slope survey, there is no indicator for those species in the EBS and no further data to inform the Tier 5 model. For population considerations, the author noted that Alaska skate trends are stable, and that Aleutian and Bering skates are declining but still above the long term average and therefore not a concern. The Team noted that the leopard skate, which is endemic to the Aleutian Islands, is also declining, but because this species may be at the geographic limit of its range in the U.S. portion of the Aleutian Islands and catch of skates in the AI is small, this may not be a concern.

The Team accepts the author's recommended Tier 3 and Tier 5 models for this stock complex and agrees with the risk table scores.

2019 - Partial Assessment

No Sept PT presentation, nor PT/SSC comments
November PT eAgenda, with link to presentation

SSC Dec

The BSAI skate complex is managed as an aggregate with a single set of harvest specifications. The stock is separated into two units to generate harvest recommendations: Alaska skate (Bathyraja parmifera), which is the most abundant skate species in the BSAI, and the remaining species (i.e. "Other Skates"). Alaska skate harvest recommendations are based on an age-structured model and managed under Tier 3a, while Other Skates are managed under Tier 5. The Tier 3 and Tier 5 recommendations are combined to generate recommendations for the whole complex.

The last full assessment was done in 2016 and only a partial assessment was done this year. No changes were made to the assessment methods. New data for the Alaska skate projection model included updated 2018 catch data, preliminary 2019 catch estimates, estimated total catch for 2019 and 2020, and 2019 EBS shelf bottom trawl survey biomass estimates. The Tier 5 random effects model for the Other Skates component was not re-run. The estimated survey biomass for the aggregate skate complex on the EBS shelf decreased slightly relative to 2018 (528,826 t vs. 610,666). The 2019 catch is on track to be substantially lower than in recent years, which had been increasing. The harvest specification recommendations for 2020 have changed slightly from last year's assessment.

Several recommendations provided by the GPT and SSC last year are planned to be addressed in the next full assessment in 2020, which include:

- Explore the implications of using a random effects models for aggregates of species with different life histories and vital parameters.
- Conduct sensitivity runs to examine potential biases in ageing.
- Consider whether separating Alaska skate from the skate complex is advisable to avoid potential undue exploitation on the other skate species.
- Fill out/or update a stock-structure template for the skate complex.
- Work to integrate IPHC longline data into the assessment.

The SSC concurs with the author's and GPT's recommended OFLs and ABCs for BSAI skates for 2020 and 2021.

BSAI PT Nov

Olav Ormseth presented the partial assessment update for the BSAI skate complex. This is a complex of Tier 3 (Alaska skate) and Tier 5 (other skates) assessments. The Tier 5 component of the complex was not updated for this partial assessment. The estimated catches were updated and the projection model was rerun for Alaska skate. This year's estimated 2019 catch is substantially lower than that used in last year's full assessment, and the estimated biomass for 2020 and 2021 changed accordingly. The projected biomass for Alaska skate in 2020 is 491,974 t, an increase of approximately 2% over last year's projected 2020 biomass. The 2021 biomass is projected to decrease to 478,477 t. The exploitation rate continues to be below 5%. The Team accepted the authors' recommendations for the 2020 and 2021 skate complex ABCs and OFLs.

2018 - Full Assessment

September PT eAgenda with link to presentation. See Appendix 2 of the Full Assessment or Improved BSAI skate catch estimation2.docx for what is likely the September document. November PT eAgenda with link to presentation

SSC Dec

A full assessment based on a model used since 2014 was provided for the BSAI skates complex, which consists of 15 species but is dominated by Alaska skate. Alaska skate are assessed using an age-structured model (Tier 3) and all other skates are assessed using Tier 5 methods. The aggregate specifications for the complex are then calculated by summing OFL and ABC values across assessments. In addition to updating catch and survey data through 2018, new model inputs included new times series of species-specific catch and exploitation rates, and inclusion of abundance estimates from the AFSC longline survey.

A single model (14.2) was presented for Alaska skate. While the structure of the model was the same as that used since 2014, a new approach was used to generate catch estimates and exploitation rates based on species composition data for the subset of skates positively identified by observers. Aggregate skate catch was then partitioned according to this species composition to approximate historic catch, for which composition data is largely absent. Additionally, the authors added an abundance estimate data series from the AFSC longline survey. For other skate species the authors used the same catch composition partitioning method to obtain species-specific harvest trends and then used a random effects (RE) model to estimate biomass. Though past practice was to run the RE model for all "other skates" combined, this year the model was run for each species independently and then biomass estimates were summed. For rare species, combination was still required prior to running the RE model.

Alaska skate generally make up over 90% of skate catch in the BSAI and results from their assessment similarly dominate OFL and ABC for the complex. Despite the new method for estimating catch and exploitation rate, as well the use of updated data, harvest recommendations for the skate complex changed very little from 2018. The SSC supports use of the authors' recommended models for the skate complex and accepts the resulting OFL and ABC for 2019 (Table 2).

The SSC commends the authors for their work to incorporate new data and improve inputs to the model. The SSC also concurs with the authors that while exploitation rates for many skate species are low relative to natural mortality, there is continued concern about the lack of reliable species composition data from fisheries, which may contribute to local depletion of species that concentrate at localized hotspots.

The SSC recommended that:

- The authors continue to explore the implications of using an RE model for collections of species with very different vital parameters
- Authors fill out/or update a stock-structure template for the skate complex
- Consideration be given to whether splitting Alaska skate out of the complex is warranted to avoid undue exploitation potential for other skate species
- Authors work to integrate IPHC longline data into future assessments
- The Bering Slope survey continue to be recognized as Critical Ongoing Monitoring and performed as scheduled, as both skate biomass and diversity are highest in this area and any assessment of the complex without adequate data from this region is flawed.

BSAI PT Nov

Olav Ormseth presented a full assessment for the BSAI skate complex. The last full assessment was in 2016. This assessment consists of 15 species, managed as two groups: Alaska skate (Tier 3) and "other skates" (Tier 5). There are no changes to the assessment model used for Alaska skates, which is the same model in use since 2014. The approach used for the Tier 5 species was changed in this assessment such that the random effects model was run individually for each species with sufficient data, then summed for the total other skate biomass (in the last assessment, the random effects model was run on the summed "other skate" survey biomasses). There were substantial changes to the input data for this assessment. Most notably, the species compositions were updated with a new estimation procedure as approved during the September Plan Team meeting (Appendix 2). The Team commends the author for the improvements to the species specific catch. Other data changes include finalizing the 2016 catch, including the 2017 and 2018 preliminary catch, and updating the EBS shelf and AI surveys through 2018.

For the Tier 3 Alaska skate assessment, this year's model run resulted in a slightly worse fit than the previous assessment. The survey biomass fit is poor after 2005, the model underfits length-at-age for older age classes, and Mohn's rho and the RMSE are both worse for this assessment. The 2019 SSB estimate of 115,957 t is greater than B40% (71,105 t). The Team accepted the author's recommended Model (14.2) which resulted in the 2019 ABC and OFL of 33,730 t and 39,173 t, respectively.

Most of the Tier 5 stocks' biomass trends, as estimated by the random effects model, were increasing or flat. The exceptions were whiteblotched and leopard skates in the Aleutian Islands surveys. The majority of the whiteblotched biomass occurs in the Aleutian Islands and the leopard skate is endemic to the region.

The Team accepted the author's recommended Tier 5 model, resulting in contributions to the overall ABC and OFL for the complex of 8,984 t and 11,979 t, respectively. The Team accepts the author's recommendations for the full complex ABC of 42,714 t and OFL of 51,152 t. The ABC is not apportioned.

The Team had requested an examination of the exploitation rates by species for the complex, in particular the endemic species in the Aleutian Islands. This was presented in the assessment; however, leopard skates were not included. As a result of this analysis, the author identified that the Bering skate exploitation rate exceeds the FOFL for the species and may be a concern. The leopard skate exploitation rate is still of concern given the declining biomass.

The Team requested that the discussion of Bmsy proxies be moved to September 2019.

The Team suggested that the author review how other Tier 5 complexes deal with species with differing life histories when running the random effects models.

The Team reiterated the request from the November 2016 minutes to "examine the utility of including IPHC and AFSC longline survey indices in both Model 14.2 and the random effects model for the Tier 5 species." (The author examined the AFSC longline survey data and determined that it would not provide useful information to the assessment, but has not yet examined the IPHC survey data.)

The Team requested that the author conduct sensitivity runs to examine potential biases in ageing.

SSC Oct

A brief description of the uncertainty in skate identification by observers on longline vessels, primarily in the Pacific cod fishery was presented. Most skates are categorized as "other skate" because few skates are physically identified by observers. A new method was proposed for estimating skate catches using the skates examined to create a species composition for application to the entire observed catch. The method uses stratification by vessel type (CP vs CV) and gear type in an effort to account for depths where the skates are caught. The SSC agrees with the Team and recommends that, although this method appears to be an improvement, further investigation of how species composition is affected by depth should be examined before the method is adopted.

BSAI PT Sept

Olav Ormseth presented his investigation into improving catch estimations for individual species in the BSAI skate complex. A brief description of the issue in both words and pictures was presented. The issue comes from uncertainty in skate ID by observers on longline vessels, primarily in the P cod fishery. This is because observers do not ID soft-snout skates to species when they are not in-hand, since they are difficult to correctly ID without closely examining small anatomical characteristics. Thus, up to 80% of skates are recorded as soft-snout skate (Bathyraja spp). Most stiff-snout skate species do get ID'd to species by observers.

A brief description of the current method for estimating AK skate catches followed. In the Catch Accounting system, most skates get lumped into the "other skate" category (due to the majority of skates on longline vessels not being ID'd to species when not in-hand, as mentioned previously). The author noted that the 2018 data presented are not complete (thru August only). For Catch Accounting, this system works because skates are managed as one complex. However, it becomes a problem in the AK skate model, where there is a need to understand total AK skate catch. Also, if looking at other species individually, it would be useful to estimate catch by species.

The author also noted that skate ID has historically been problematic in the survey (not just the fishery). A brief presentation of the current method for estimating AK skate catches followed, with the note that estimates of selectivity from the model are very different by gear type.

The author presented his proposed new method for estimating skate catches. In short, this method assumes skates in-hand are representative of all skates in the observer's tally period and creates a species comp for the observed catch (the species rates of those in-hand are applied to all tallied individuals). Then the method stratifies by CP vs CV, and gear type. These are the same stratifications for observer data as those in Catch Accounting. For CP's, further stratify by statistical area (this was clarified as NMFS federal reporting area, not state statistical area). However, for CVs, there are not always comp data from stat areas where there is reported catch. So the author ignored stat area for CV's. The author noted also that the small amount of skate catch in the pot fishery was lumped into the trawl fishery for simplicity.

Some questions were raised regarding this new estimation method. The author clarified the following:

- The method is useful for the GOA as well as the BSAI
- While target species may have an impact on the stratification, the author was hesitant to do this because of the difficulty in matching target species from CA to the observer data, since target species is not recorded in observer data.
- Fishing depth is considered implicitly as stratification because the spatial component (stat area) in the BS has depth associated

Next the author presented a comparison of skate catch estimates in time series with the old method vs the new method. For unidentified skates, the vast majority of catch is AK skate. The skate unID ratio has gone way down over time, so this is good. For the new method, the stratified species comps were applied to the same catch, and apportioned based on that year's ID'd species comp. For the small percentage that is still unID, the author asked if it is valuable to apportion to species. It is a minor issue because the level is now so small.

Overall, skate catches have been increasing since 2010. In the BSAI, the majority is still AK skate. However, there has been a recent increase in proportion of white-blotched and big skates in the trawl fishery. The author noted that there has been no change in the biomass of white-blotched, so this change in catch may indicate a change in fishing behavior. Big skate biomass has been increasing in the SEBS during this time period, which could explain that change.

Continuing with the comparison of the new method vs. the old method: the new method produces a lower catch estimate of AK skate longline catch every year except 2017. For trawl gear, the new estimate is higher until recently, due to more white-blotched and big skates in the catch (as noted previously).

A Team member commented that they thought the new method is better and asked if it could be used for other skate species. The author noted that poor skate ID prior to 2003 means we should use caution (observers were not required to ID skates at all prior to 2003, although some did).

The Team recommends that, although this method appears to be a major improvement, the issue of how species composition may be affected by depth should be examined before the method is adopted. This could be addressed by a simple look at the observer data to see if depth-related differences in species composition exist. The November assessment should therefore include an examination of skate stratification by depth in the observer data.

The author again noted that spatial differences may account for depth, particularly in the BS.

Finally, the author raised the question of how to deal with the issue of skate unID in pre-2003 data. 60- 70% of skates were not ID'd at all, in-hand, or tallied only. Should we assume that those that were ID'd to species are representative? There may be biases in terms of areas, fisheries, etc. due to uneven rollout of enhanced skate ID or other non-random species ID effects. The author has no doubt that, for recent data, the new method is better, so it is really just a question of how to handle the old data when poor ID existed. The Team was unsure how to answer this and elected to leave it to the author's discretion.

2017 - Partial Assessment

No Sept PT presentation, nor PT/SSC comments
November PT eAgenda, with link to presentation

SSC Dec

No comments

BSAI PT Nov

Olav Ormseth presented a partial assessment for the skate complex. The next full assessment for skates will be in 2018. Alaska skate is the primary species in the BSAI skate complex and is a Tier 3 species. The remaining species are Tier 5. The projection model for Alaska skate from the last full assessment was run forward through 2019 with the following changes to the input data:

- 2015 and 2016 catch data were updated
- 2017 total catch was estimated by multiplying the partial 2017 catch (as of October 31) by a correction factor based on the proportion of additional late-season catch in the previous 5 years.

The 2017 EBS shelf trawl survey biomass estimates were also included in this partial assessment. However, the stock assessment model was not re-run (standard procedure for a partial assessment of a Tier 3 stock) and the random effects model for the Tier 5 component of the complex was also not re-run. The random effects model was not re-run because the species included in that model are primarily caught in the EBS slope and Aleutian Islands surveys, which did not occur in 2017.

On average, 88% of the skate biomass occurs on the shelf and >90% of that is Alaska skate. The Alaska skate biomass was down slightly in the 2017 EBS shelf survey. The biomass estimates of the remaining skates in the EBS shelf survey has been increasing since 2012, with a large increase in 2017 in the biomass estimates of Aleutian, Bering and big skates. Olav presented additional information beyond what is in the assessment document regarding the increasing biomass of big skates in the eastern Bering Sea. Big skates have been appearing in hauls near Unimak Pass and the southern Bering Sea. In the GOA, there appears to be an ontogenetic shift towards the west as the animal grows, and the hypothesis is that some of the GOA big skate population is spilling into the Bering Sea through Unimak Pass. The size distribution of big skates captured during the EBS shelf survey is similar to that in the WGOA and no small big skates appear in the EBS, lending support to the hypothesis. .

The exploitation rates of Alaska and other skates have been increasing since 2010, but remain below 6% for Alaska skate and below 3% for other skates. These exploitation rates are FMP-wide and there may be some variability between areas.

Olav pointed out that he is working on incorporating improved species identification into the assessment for the Bathyraja species. However, there has been some confusion about what at-sea observers record compared to what is used in estimating catch. The Team recommends that the author work with FMA and AKRO staff to investigate species composition.

The Team requests that the author examine exploitation rates by species for the complex, in particular the endemic species in the Aleutian Islands (leopard and butterfly skates). The Team notes that all three surveys in the Bering Sea (EBS shelf and slope, and Aleutian Islands) are critical for this assessment, as some species occur only in the Aleutian Islands and others are more abundant on the slope, meaning that the shelf survey does not adequately sample those species. Further, this is a large complex and, without the full suite of surveys, critical changes in biomass of the less dominant species may go unnoticed.

2016 - Full Assessment

September PT eAgenda with link to presentation
November PT eAgenda with link to presentation

SSC Dec

A full assessment was presented for BSAI skates in 2016. The skate complex is managed as a single unit for the BSAI and consists of two models, one for Alaska skate and one for all other skates (14 species). Within the complex, Alaska skate are assessed as a Tier 3 stock and the remaining skate species ('other skates') are managed as Tier 5 due to a lack of reliable age-specific information.

Total skate survey biomass has increased for the EBS shelf and EBS slope, and declined for the Aleutian Islands. The EBS shelf survey accounts for approximately 80% of the overall skate biomass among the areas, and is almost entirely composed of Alaska skates. Biomass trends for the predominant species were stable or increasing. However, the SSC noted the declining trend in leopard skate biomass in the AI survey, which has declined 67% from its 2010 survey biomass estimate (12,958 t to 4,220 t in 2016). This decline highlights the need for species-specific catch estimation of skates, and for life history information for this species and the other endemic AI skate, the butterfly skate. Overall, catch is stable and historically high the last few years, with most catch occurring in the longline fisheries.

Alaska skate

Three models were presented for Alaska skate: the previously accepted model (14.2); a model with asymptotic selectivity for the trawl and longline fisheries (14.3); and a version of model 14.2 started in 1977 rather than 1977. Results among models were similar and the SSC recommends the author's and Plan Team recommended model 14.2. The species remains in Tier 3a.

In addition to supporting the Plan Team's recommendations, the SSC has the following recommendations:

- Re-evaluate the the use of trawl survey data to apportion longline. The assessment uses trawl survey species composition to apportion Alaska skate from other skates caught in the longline fishery. Trawl species composition from a survey maybe quite different from species composition in the longline fishery. Speciation in the observer data has improved since the Ormseth and Matta (2007] paper referenced in the assessment. The author should compare the observer data from the longline fishery to the trawl survey catch to evaluate this assumption.

- The assessment should incorporate relevant information pertaining to the relationship between water temperature and recruitment. Development time for some skate species is influenced by water temperature (i.e., warmer water results in shorter development periods). This may functionally affect recruitment trends and variability.
- The stock structure section for Alaska skates has conflicting and inaccurate information regarding national standard guidelines. This section needs to be updated.

Other Skates

A random effects model is used for the harvest specifications for the remaining skate species in the complex, which are primarily whiteblotched skates. The SSC recommends the Plan Team's and authors' recommended model.

As possible, future assessments should include information on the distribution and abundance of endemic skate species (such as the leopard skate), spatial information on fishery catch, and available biological information. Fishery impacts to rare species managed as part of a complex can be extreme in the face of limited population-level information.

BSAI PT Nov

Olav Ormseth presented the skate complex stock assessment. The skate complex consists of the Alaska skate (Tier 3a) and all other skates (Tier 5, 14 species), with ABCs and OFLs set for the complex as a whole. For Alaska skates he presented the previously accepted model, 14.2, as well as two new alternative models as a result of discussions during the September Team meeting. The random effects model was used for the Tier 5 species, where each of the survey areas is run separately.

This year's assessment updated catch data through October of 2016, included the 2015 and 2016 eastern Bering Sea (EBS) shelf survey biomass and the 2016 EBS and Aleutian Islands (AI) trawl survey biomasses. The Alaska skate model was also updated with EBS shelf survey size compositions, fishery length compositions through 2015 and an additional length-at-age dataset from vertebrae collected during the 2015 EBS shelf trawl survey. There were no changes to the assessment methodology.

The EBS shelf survey, which is generally at least 80% of the total BSAI skate biomass, has been increasing since 2012 and is dominated by Alaska skate. The EBS slope has the greatest species diversity, but is predominantly Aleutian skate, has also shown increasing biomass, which is mostly Aleutian skates. The AI survey biomass increased until 2010 and has been decreasing since. This complex is composed mostly of whiteblotched skate. The leopard skate, which is endemic to the AI has been showing a steep decline, since 2010.

Catch of skates had been increasing since 2010, however it has been relatively stable the last few years. Skate catch generally occurs in NMFS area 521 and mostly from the Pacific cod fishery. Catch has been below the TAC and well below the ABC.

Olav presented the previously accepted Model 14.2, a new Model 14.3 (14.2 with asymptotic selectivity) and Model 14.4 (starting the model in 1977). The author continued to recommend Model 14.2, as neither of the new alternatives improved the overall model output. One concern was how changing the length of the time series would impact the retrospective pattern, however, the older catch data does change the model results, probably due to limited information input into the model prior to 2009.

In discussions of the Alaska skate model (Model 14.2) it was pointed out that the model fit to the survey biomass doesn't match recent trends in biomass, which could be because the model doesn't capture the peak in the larger fish (large plus group). The numbers at age suggest that there could be recruitment events working through the population, but the model may not be picking up these events. The retrospective analysis is complicated in this model because of limited data prior to 2009.

The random effects model was used for the remaining species in the complex, which consists primarily of Aleutian and whiteblotched skates. The model is run with the combined biomass of the non-Alaska skates and separately for each survey area, and then summed for the total FMP biomass. The only change in the models was that the EBS shelf survey model fit improved dramatically with the addition of the 2015 and 2016 survey data, owing to the increased contrast in the data.

The Team accepts the author's recommendations for continuing with Model 14.2 for Alaska skates and the random effects model for the Tier 5 species, and accepts the recommended ABC and OFL.

Following up on a concern from its November 2014 meeting, in September the Team requested that the author provide an appendix detailing how the model and data changes (between the 2013 and 2014 assessments, where the 2013 assessment was just a partial update based on the 2012 model) which resulted in a decreased 2015 spawning biomass (down 35%) and a decreased FOFL (down 20%) could also result in an increased 2015 OFL (up 32%). Specifically, the Team requested a demonstration of exploitation at age using FOFL, selectivity, and biomass at age. The Team commends the author for including the requested appendix, but individual Team members expressed concern that it did not fully resolve the paradox.

The Team recommends that the author:

1. Investigate appropriate Bmsy proxies for skates and relate the values to current harvest recommendations, for example, most elasmobranchs have Bmsy >= B50%, less productive species have been documented to have Bmsy=B79%. The BSAI skate species are likely between these two extremes. See Simpfendorfer et al. 2008 (http://www.iccat.int/Documents/Meetings/Docs/SCRS/SCRS-08-140_Simpfendorfer_et_al_REV.pdf) and Cortes et al. 2007 (http://www.publish.csiro.au/MF/pdf/MF06191) for starting places.

2. Examine the utility of including IPHC and AFSC longline survey indices in both Model 14.2 and the random effects model for the Tier 5 species.

3. Expand on appendix 2 of the SAFE document by reconciling more explicitly the differences between the results of the 2013 and 2014 assessments with respect to the substantial decreases in FOFL and 2015 spawning biomass and the substantial increase in 2015 OFL.

SSC Oct

A follow-up analysis of the Alaska skate age-structure model as last presented in 2014 resulted in an increased estimate of ABC/OFL, while both estimated spawning biomass and F35% decreased. The Plan Team and the SSC asked that this result be investigated and two changes in the assessment (SS) and the projection model were explored: 1) Adjusting the dome-shaped selectivity, and 2) correcting the age-length parameters reduced it even further. Correcting the age-length parameters reduced biomass estimates in the SS model, and with the projection model. The weight misspecification skewed the proportion of older skates, which aren't available to the fishery. Substituting the alternative selectivity resulted in a higher OFL, but did not dramatically affect biomass estimates. The mismatch between spawning biomass and ABC/OFL was resolved when the old model was run with the corrected age-length parameters. It was also apparent that the higher OFL was due to higher productivity, and the SSB was skewed by older skates unavailable to the fishery. The PT recommended that model 14.2 be brought forward in November with the analysis included as an appendix. The SSC supports these recommendations and also recommends revisiting recommendations from the PT and SSC in past years to see if anything was missed.

BSAI PT Sept

Olav Ormseth presented a follow-up analysis of the Alaska skate age-structured models he presented in 2014 (the last year for a full assessment). The Alaska skate is the primary species in the BSAI skate complex, and is managed under Tier 3. All other skates are considered Tier 5 and there is a single aggregate OFL for the BSAI skate complex. In 2014 Olav presented a new model (14.2) that was substantially improved relative to the existing model (13.1) and was accepted by the Plan Team and SSC for use in harvest recommendations. However, the Plan Team raised questions regarding the fact that in Model 14.2 OFL increased while both spawning biomass and F35% decreased, and Olav was asked to explore the reasons for these changes. No document was provided.

There were 5 models presented for this preliminary assessment to address concerns about dramatic changes between Model 13.1 and Model 14.2. There are two major changes examined between the different models: adjusting the dome-shaped selectivity; and fixing weight-at-age/length parameters that were misspecified in Model 13.1. The new alternatives are in essence a sensitivity analysis to examine how fixing the errors in Model 13.1 impacted the results.

- Model 13.1.p: projection model using data from SS Model 13.1
- Model 14.2.p: projection model using data from 14.2, the new SS model accepted in 2014
- Model 13.1.sw: projection model using data from a new SS run of 13.1 but with the updated weight parameters used in 14.2 Model 13.1pw: Re-ran projection model only for Model 13.1 but with weight at age from Model 14.2, i.e., identical to 13.1.p except for the weight-at-age data
- Model 14.2.ps: Re-ran projection model only for Model 14.2, but with selectivity from Model 13.1, i.e., identical to 14.2.p except using the selectivity from 13.1

There were no changes to the input data for these models.

Model 14.2 resulted in lower FOFL and biomass than Model 13.1, but a higher OFL, which prompted the requests by the Plan Team and SSC to examine the model in more detail. Within the SS model, the changes resulted in a maturity ogive that is more consistent with empirical data and the spawning stock is younger and faster-growing. Of note is that the maturity ogive is shifted younger in that the new model never reaches 100% maturity at age. Maturity is modelled based on length, which gets converted to age, so the conversion may force the asymptote less than 100%, however, it was also pointed out that the standard error around length at age impacts the maturity curve. The purpose of Models 13.1.sw, 13.1.pw, and 14.2.ps was to examine which changes influenced the model results. Correcting the misspecification in the length-weight relationship inside SS (i.e., Model 13.1.sw) reduced the biomass estimates relative to 13.1, and correcting the same misspecification inside the projection model (i.e., Model 13.1.pw) reduced the biomass estimates even more, while substituting the selectivity from 13.1 into 14.2 (i.e., Model 14.2ps) resulted in higher FOFLbut little change in biomass relative to 14.2.

The Plan Team discussed the model results and requested that the author bring forward Model 14.2 for the November assessment, and include the work presented here as an appendix. Within the appendix the Plan Team suggested showing exploitation at age using FOFL, selectivity, and biomass at age to show changes, just as a simple spreadsheet, to make it easier to discern the changes between models.

The Team recommends that the author bring forward Model 14.2 for the November assessment, and include the work presented here as an appendix. Within the appendix the Team recommends showing exploitation rate (at age and overall) using FOFL, selectivity, and biomass at age, just as a simple spreadsheet, to make it easier to understand why OFL went up while spawning biomass and FOFL both went down.

The Team also recommends that the author revisit the list of recommendations made by the Team and the SSC in 2014/2015 to ensure that all recommendations are addressed in the November assessment. The author can bring forward new models in November at his discretion, as a result of any previous recommendations not addressed during this presentation.

2015 - Executive Summary

No Sept PT presentation, nor PT/SSC comments
November PT eAgenda, no presentations linked

SSC Dec

This chapter was presented in executive summary format as a scheduled off-year assessment. The model was updated with 2014 catch data and preliminary 2015 catch data. The SSC concurs with the author and the PT that the Alaska skate stock should be managed as a Tier 3a stock and the other skates complex as a Tier 5 stock. The SSC accepts PT recommendations for ABC and OFL of the skate complex as a whole (see table).

BSAI Nov PT

Olav Ormseth presented an update of the skate complex stock assessment. This was a scheduled “offyear” assessment. New data in the 2015 assessment included updated 2014 catch (27,511 t) and 2015 catch (22,864 t, as of October 18, 2015). BSAI skates are in Tier 3a (Alaska skate) and Tier 5 (all other skates). There were no changes to the assessment methodology. The projection model for Alaska skate was re-run with the most recent catch data and estimated 2016 catch. Results from the 2015 EBS shelf survey were presented and the random effects biomass estimates for the other skates were updated. The 2016 recommended OFL and ABC have slightly increased from last year’s projected values. The Team accepts the authors’ recommendations for the 2016 fishery of OFL = 50,215 t and ABC = 42,134 t. There is no apportionment of the ABC.

2014 - Full Assessment

No link yet to Sept PT eAgenda
November PT eAgenda with link to presentation

SSC Dec

A full assessment was presented for BSAI skates in 2014. This stock complex is divided into two units to generate separate recommendations that are aggregated for the entire complex. Alaska skate is managed under Tier 3 criteria and the remaining skate species ("other skates") are managed under Tier 5. New data in this year's assessment include updated catch, 2014 EBS shelf and AI survey data, 1982-1991 EBS shelf survey biomass estimates, reconstructed catch data beginning in 1954, and additional length- and weight-at-age data. As part of an ongoing effort to improve skate assessments, and in response to a 2013 CIE review, the BSAI Alaska skate model has undergone substantial modifications.

Four model alternatives were presented in 2014 for Alaska skate, including, as requested by the SSC, last year's model. Model 1 is last year's assessment model with updated data. Model 2 is the author's preferred model, with a start in 1950 instead of 1977, growth estimated within the model, removal of the embryonic stage, a return to the original Beverton-Holt spawner-recruit model, a maximum age of 25 instead of 30, and removal of age selectivity (but retention of length selectivity). Models 3 and 4 were specifically requested by the SSC at the October meeting. Model 3 is the same as Model 2 but with asymptotic selectivity curves for both the survey and the fishery, and finally, Model 4 is the same as Model 2 but with a starting year of 1977, as opposed to 1954.

The Plan Team accepted the author's preferred Model 2, though they noted some model concerns and modified the accompanying harvest recommendations. The primary Plan Team concern with Model 2 appeared to be the decrease in spawning biomass due to model change with a contrasting increase in the OFL and ABC. As a result of this concern, the Plan Team recommended rolling over the 2014 harvest specifications from Model 1, last year's model, with updated data. In contrast to the Plan Team, the SSC recommends the acceptance of Model 2 for stock biomass and dynamics and use of Model 2 for 2015 harvest specifications.

Acceptance of Model 2 is contingent upon having accurate historical catches between 1950 and 1977. It is unclear if the author addressed a primary concern of the SSC regarding the evaluation of historical catch data in regard to the assumptions on the proportion of gear-specific effort and species compositions. Further evaluation of selectivity as a function of age and/or length is also warranted.

Additionally, a new random effects model is also presented for other skates, which was recommended by the author to replace the 3-survey average biomass, as is consistent with other Tier 5 stocks. The SSC concurs with this recommendation. The summary table below gives the total skate ABCs and OFLs, obtained as the sum of Alaska skate and other skates (in mt).

BSAI PT Nov

Olav Ormseth presented the skates stock assessment. This was a scheduled “on-year” assessment because all three surveys were scheduled, but since the slope survey was cancelled, he used the 2012 data for biomass distribution. For Alaska skate, he presented four models. For “other skates” he presented a random effects model.

Additions to the Alaska skates model:

- The entire time series (1982-present) of EBS shelf bottom trawl biomass estimates.
- Reconstructed historical catch data beginning in 1954.
- Four length-at-age (LAA) datasets from the EBS shelf survey (2003, 2007-2009); a LAA dataset from the 2005 longline fishery was determined to be inadequate and was not included.

- Weight-at-length data from a dataset on Alaska skate tagging activities on the 2008-2010 EBS shelf survey.

Highlights from this year's model explorations:

- Model 1: Existing model with updated data (i.e., the model used in the 2012 assessment).

- Model 2: Author's preferred model, with features described in the chapter text. Model 3: Same as Model 2, except with selectivity parameter 6 fixed for both fisheries and the survey, creating asymptotic selectivity curves. This model offered a contrast to the dome-shaped selectivity curves generated in Model 2.

- Model 4: Same as Model 2, except starting in 1977 rather than 1950.

Model 2 provided the best overall fits when the data are considered as a whole and produced results that are consistent with the author's conceptual approach.

For Alaska skates, the Team concurred with the author and recommended Model 2. However, concern about the change in estimated spawning biomass between the two assessments led the Team to recommend rolling over the lower 2014 ABC for 2015 and 2016. The Team also recommends, for September 2015, an evaluation of the optimum starting year, age composition data, and recruitment variability. Recruitment variability may help explain the change in the estimates of spawning biomass.

The Team reminds the author to include a retrospective analysis and harvest scenarios next year. For "other skates", the random effects model is the Team's preferred model for estimates of biomass and recommends use of it to set ABC and OFL for this Tier 5 assessment.

SSC Oct

Revised population models were presented for Alaska skate in the Bering Sea and Aleutian Islands management area (BSAI). This revision was motivated in part by CIE review comments. The most important of the CIE recommendations was to include the full eastern Bering Sea (EBS) shelf bottom trawl survey time series, which shows a dramatic increase in skate biomass during the 1980s. The reviewers felt that inclusion of the entire time series was necessary for proper modeling of skate population dynamics and might resolve some of the long-standing problems with the model (e.g., fits to unusual patterns in the length compositions). In response to the CIE comments, the EBS shelf survey data from 1982 to present are included in all models considered. In addition, the author lengthened the model time period to start in 1950, and a reconstruction of historical catches extends the catch time series back to 1954.

The author presented four alternative models. All of the models considered for the 2014 revision used catch data from 1954 through 2013. All data regarding skate catches rely to some degree on assumptions regarding the proportion of Alaska skates in the total skate catch. Additionally, the earlier data also rely on assumptions regarding removals by gear type. Ultimately, the author preferred Model 1 for setting harvest specifications in 2014/15, as it had the best overall fit and produced results consistent with suspected determinate growth in skates, the large recruitment event in the 1980s, and a greatly simplified model.

The reconstructed catch data used in the models were heavily influenced by the assumptions regarding the proportion of skates in the “Other Species” catch. To explore this assumption and how different catch histories influenced the model, two catch datasets were created. One dataset (“high catch”) used the assumption described above, that the proportion of Alaska skates during the entire catch history was equal to the average proportion from 2003 through 2013. An alternative dataset (“low catch”) modified the proportion of skates, using the ratio of estimated skate biomass in 1982, to the estimated skate biomass during 2003 through 2013. The author’s preferred model, Model 1, was run using both of these datasets. Results were similar between the runs, and the “high catch” model provided slightly better fits to the data. Therefore, only the “high catch” dataset was used in developing and evaluating the alternative models. The SSC expressed concern about using the model to select data that would subsequently be used for model runs, and asked that the author instead find a rationale outside the model to determine what datasets would be used for model runs.

By examining the spatial distribution by age, the author found that skates move shoreward from ages 0-9 and once mature, spread out and most return to the outer shelf. Of the four models presented, three models used dome-shaped selectivity curves and one model used selectivity that was forced to be asymptotic. The dome-shaped selectivities for the trawl and longline fisheries are consistent with Alaska skates being taken as bycatch, and with the fact that the shelf trawl survey does not sample the slope where bigger skates might be found (although it was noted that few Alaska skates are caught in the slope survey). The SSC expressed some concern about using selectivity and catchability to account for conducting an assessment with data from only part of the species range, although the SSC recognizes this has been done for other assessments. The SSC encourages the author to use any data available to explore size composition and biomass information for skates that extend outside the trawl survey area, and to continue to provide justification for the values of catchability and form of selectivity chosen (e.g., are small skates expected to be outside the survey area, as well as large skates).

The SSC supports the Plan Team recommendation that the last accepted version of the model (2012) be included in November as a base model for comparison with the author’s preferred model from among the new four alternative models. The SSC requested that the author also include two other models in November: (1) Model 3 (the model with logistic selectivity); and (2) a model with a more recent start date, but prior to 1989 (e.g., one possibility is starting around the regime shift in 1977). The SSC noted that AIC cannot be used to compare models with different data or different weighting in the objective function.

BSAI PT Sept

Olav Ormseth presented a revision of the Alaska skate model. This revision was motivated, in part, by CIE review comments, as well as Olav’s desire to improve the model. One big change was to lengthen the time series used in the model. The revision also addressed the pattern of growth implied by the length frequencies (determinant growth with a distinct maximum size). A

Team member suggested that Olav investigate whether determinant growth has been found for other skate species. One challenge has been explaining why biomass doubled from about 1985 to 1995 (e.g., was it immigration or recruitment?). Olav concluded that the pattern of average weight through time is more consistent with a recruitment event, rather than movement. Olav made some simplifications in the model, including removal of the embryonic period, removal of age selection, and modeling recruitment as deviations from a constant mean (simplified from the 3-parameter “survivorship” stock-recruitment relationship used previously). Olav examined the spatial distribution by age and found that skates move shoreward from ages 0-9 and, once mature, they spread out and for the most part return to the outer shelf.

The revised model starts at the beginning of the catch time series (1950s). The longline catch data are problematic because reliable identification of Alaska skate requires an in-hand examination. For all catches, the species composition is inferred from survey data on an area-specific basis. In addition, for the pre-1990 trawl fishery data, the skate catch is inferred from the reported Other Species catch and the proportion of skates in Other Species catches from 1997-2013. In addition, skate catch is partitioned into longline and trawl catches based on the ratio of Pacific cod catch to yellowfin sole catch. One Team member suggested that Olav evaluate how the initial numbers-at-age vector is specified in SS; if individual age groups are estimated, it may not be necessary to extend the catch series so far back in time.

Olav presented four alternative models. The models tested how variability in annual recruitment and selectivity, and increased emphasis on length-at-age data, affected the model results. Models 1-3 fit the length compositions well, in particular the final peak in the length compositions, which has not occurred in previous model versions. Model 4 did not, which is a reason for disregarding this model. Models 1 and 2 have similar selectivity curves (dome-shaped) whereas Model 3 is forced to be asymptotic and Model 4 dramatically drops to zero at lengths greater than about 100 cm. The dome-shape patterns of Models 1 and 2 for the trawl and longline fisheries are consistent with Alaska skates being taken as bycatch, and with the fact that the shelf trawl survey does not sample the slope where bigger skates might be found (although it was noted that few Alaska skates are caught in the slope survey). All four models produced a large recruitment(s) in the early 1980s. One Team member suggested that Olav explore further how the early recruitment deviations (before the years with survey data) are set up in SS, as SS has options fortreating those years differently from the main part of the time series. The models generally represent the lengthened time series of survey biomasses included in this revision. Compared to the previous model version (2012), the reference spawning biomass is somewhat lower (about 30%). Olav reported that the two parameters governing variability in length at age ended up being constrained by the bounds, and that moving the bounds tended to result in unbelievable estimates of those parameters. One Team member suggested that there may not be enough data to estimate those parameters internally, so perhaps specifying them a priori would be a preferable alternative to letting the parameters hit the bounds.

The Team recommends that the last accepted version of the model (2012) be included in November as a base model for comparison with the author’s preferred model.

2013 - Executive Summary

No Sept PT presentation, nor PT/SSC comments
No link yet to Nov PT eAgenda

SSC Dec

This chapter was presented in executive summary format as a scheduled “off-year” assessment. The model was updated with 2012 catch data and partial 2013 catch data. The SSC concurs with the author and the Plan Team that the Alaska skate stock should be managed as a Tier 3a stock and the other skates complex as a Tier 5 stock. The SSC accepts Plan Team recommendations for ABC and OFL of the skate complex as a whole (in metric tons):

BSAI PT Nov

Olav Ormseth presented the squid assessment. This was a scheduled “off-year” assessment. He provided an overview of the executive summary for BSAI skates. No changes were made to the assessment model for Alaska skate. The projection model was re-run with the most recent catch data. Results from the 2013 EBS shelf survey were presented but not used for making harvest recommendations. The 2014 and 2015 recommended OFLs and ABCs are slightly reduced from 2013, consistent with last year’s projections. The author is planning to examine and respond to recommendations from the May 2013 CIE review in next year’s full assessment.

2012 - Full Assessment

No link yet to Sept PT eAgenda
No link yet to Nov PT eAgenda
No link to Sept PT minutes yet
No link to Nov PT minutes yet

SSC Dec 2012

The SSC concurs with the author and the Plan Team that the Alaska skate stock should be managed as a Tier 3a stock and the other skates complex as a Tier 5 stock. The stock assessment model has been substantially modified with updated data and changes to the growth function, selectivity functions, spawner-recruit function, maximum age, and length bins. Four candidate models were evaluated following Plan Team and SSC suggestions at the September/October meetings. The SSC agrees with the author and Plan Team that Model 3 is the best model for Alaska skates. This model uses only the most recent length-at-age data and estimates growth parameters within the model. The SSC accepts Plan Team recommendations for ABC and OFL (in metric tons):

As a research possibility, it might be fruitful to explore other measurement variables for size, e.g., IOW (inter-orbital width), in field data collection. It may be easier to measure and have smaller measurement error, particularly for large skates.

SSC Oct

There were major changes made to this assessment, so it is being vetted to the Plan Team and SSC per standard operating procedure. The author used the updated version 3 of Stock Synthesis, and a Schnute growth curve rather than a von Bertalanffy. Fishery and survey selectivities are allowed to be domeshaped, and a new density-dependent survivorship function developed by Mark Maunder is used. The oldest age is increased from 25 to 30, and only the most recent year of length-at-age data is used.

These changes result in modest increases in biomass, fishing mortality, ABC, and OFL. The Plan Team approved of the changes to the assessment and recommended that three models be developed for November/ December: the model with last year's configuration, the revised model, and an extension of the new model, in which growth parameters are estimated internally in the model. The Plan Team also recommended that the author try lowering the starting size of the plus group to 110 cm. The SSC concurs with these recommendations but also recommends an additional model with all three length-at-age datasets be considered for November/ December.

2011 - Full Assessment

No link yet to Sept PT eAgenda
No link yet to Nov PT eAgenda
No link to Sept PT minutes yet
No link to Nov PT minutes yet

SSC Dec

With passage of Amendment 96 to the BSAI Fishery Management Plan this year, which separated the "other species" complex into constituent groups, the Plan Team presented recommendations to the SSC for OFLs and ABCs specific to BSAI skates. The SSC agrees with the BSAI Plan Team that biomass estimates are reliable for skates in the BSAI, and notes that the biomass trend for BSAI skates has been stable. The SSC agrees with the estimate of OFLs and ABCs, shown below in metric tons, for Alaska skates under Tier 3a combined with all other skates under Tier 5, based on a natural mortality rate of 0.10 and biomass estimated as the average of the three most recent surveys.

2010 - Full Assessment

No link yet to Sept PT eAgenda
No link yet to Nov PT eAgenda
No link to Sept PT minutes yet
No link to Nov PT minutes yet

SSC Dec

With passage of Amendment 96 to the BSAI Fishery Management Plan this year, which separated the “other species” complex into constituent groups, the plan team presented recommendations to the SSC for OFLs and ABCs specific to BSAI skates. The SSC agrees with the BSAI plan team that biomass estimates are reliable for skates in the BSAI, and notes that the biomass trends for BSAI skates has been fairly stable. The SSC agrees with the combined estimate of OFLs and ABCs for Alaska skates under Tier 3a combined with all other skates under Tier 5 for combined skate specifications as shown in the table below. The SSC supports the change of using the last 3 survey years to determine average biomass for the “other skates” group, as opposed to using the prior 9 surveys.

SSC Oct

For the BSAI skate complex, the plan team recommended not changing the current method of assessment (combining Tier 3 and Tier 5 methods). The SSC agrees, and notes that we will entertain separate Tier 3 management for Alaska skates if additional information is provided. GOA skates are already separated out of the current “other species” complex in the Gulf, and no changes are recommended.

2009 - Full Assessment

No link yet to Sept PT eAgenda
No link yet to Nov PT eAgenda
No link to Sept PT minutes yet
No link to Nov PT minutes yet

SSC Dec

The stock assessment for BSAI skates is partitioned into a Tier 3 assessment for Alaska skates and Tier 5 assessment for all other skates. No changes were made to the assessment for Alaska skates in 2009, which used the same SS2 model as in 2008.

The SSC provided extensive comments regarding the lack of fit to survey size-at-age data for the Alaska skate, and requested presentation of a revised model with more realistic representation of growth. Due to time constraints, this was not possible, but the authors expect to be able to provide this next year.

Recognizing that there have been no substantive changes in the assessment, the SSC accepts the Plan team and authors' recommendation for Tier 3a analysis of Alaska skates based on the estimate of spawning biomass as 48% greater than B40% with FOFL = 0.08 and FABC = 0.069, and Tier 5 analysis of other skates combined with M = 0.10. The SSC accepts the determination of total OFL = 27,800 t and ABC = 24,000 for Alaska skates and an OFL = 8,220 t and ABC = 6,170 t for all other skates for both 2010 and 2011. These combine to total OFLs for all skates equal to 36,000 t and 35,900 t for 2010 and 2011, respectively,

2008 - Full Assessment

No link yet to Sept PT eAgenda
No link yet to Nov PT eAgenda
No link to Sept PT minutes yet
No link to Nov PT minutes yet

SSC Dec

The stock assessment for BSAI skates has undergone a series of improvements in the past two years. An age-structured model was first presented to the SSC in October 2007 for estimating biomass of the most abundant skate species caught incidentally in the BSAI fisheries (the Alaska Skate). This model was revised in October, 2008 and November, 2008. The assessment authors have been very responsive to SSC comments for changes and improvements to the models as they seek to move BSAI skates from Tier 5 to Tier 3 control rules. Four concerns were raised this past October: (1) lack of fit to size-at-age data, (2) rationale for the level at which recruitment variation was fixed, (3) documentation for egg case development time, and (4) selectivity parameter bounds. Each of these concerns were addressed in the current assessment.

The lack of fit to survey size-at-age data remains an issue of concern. However, the presentation of information in the SAFE provides a sufficiently convincing argument for accepting the current model as an adequate representation, and sufficient to provide for Tier 3 management. Specifically, the lack of fit shown in Figures 24 and 26 indicate that the length of skates older than 13 years is underestimated by the model. There are at least two plausible explanations for this lack of fit (see page 1240 of the SAFE report). The first is that the present model framework (Stock Synthesis 2 and 3) does not allow growth to be modeled realistically for skates. A second is that larger skates (larger at age) are preferentially selected, and thus may be over-represented in the sample of larger skates. In either case, the errors, if real, are in a precautionary direction, resulting in a reduced estimate of biomass because the number of large skates is underestimated. More important, the application of the model takes into account the late maturation of Alaska Skates, and this feature does not factor into Tier 5 estimates of allowable catch.

Based on the foregoing, the SSC agrees with the stock assessment authors to apply Tier 3a control rules to estimate reference points for Alaska Skates in the BSAI, with M = 0.13, and with the estimate of spawning biomass far exceeding B40% in both 2009 and 2010. The author and the Plan Team recommended that the skate portion of the Other Species complex ABC and OFL for 2009 and 2010 should be calculated as the sum of the Tier 3 estimates of Alaska skate and the Tier 5 estimates for Other Skates. The SSC agrees with this procedure and the OFL is 30,077 t for Alaska Skates in 2009 and 30,009 t in 2010, and the ABC is 25,854 t in 2009 and 25,796 t in 2010. Applying the Tier 5 calculations for the Other Skates in the complex results in an OFL of 8,221 t and ABC = 6,165 t in both 2009 and 2010. In total, the contribution of skates to the other species category is as follows (values are rounded): OFL = 38,300 t and 38,200 t in 2009 and 2010, respectively, and ABC = 32,000 t in both 2009 and 2010. The SSC approves these estimates.

SSC Comments to the BSAI skate stock assessment authors: The SSC asks to see a revised model with more realistic representation of growth, as was attempted this year but thwarted by software limitations.

SSC Oct

Grant Thompson (NMFS-AFSC) presented an update of the age-structured model for Alaska skate in the BSAI management area. The SSC reviewed the first iteration of this model in October 2007 and determined at the time that the model was not yet adequate for the purpose of ABC specifications. Most of the concerns expressed by the SSC have been addressed in the current version. The model provides a reasonable estimate of current biomass. In particular, concerns about historical catch data prior to the 1990s are no longer relevant as the authors chose to limit the analysis to the post-1991 period. Another concern relating to the lack of a spawner-recruitment relationship was addressed by fixing the steepness of the Beverton-Holt model at 1, which effectively assumes constant recruitment over the range of observed spawner abundances.

The SSC commends the authors for their creativity in dealing with the life history specifics of skates and their responsiveness to SSC concerns. We look forward to seeing an updated model incorporating 2008 survey data in December. The SSC has some remaining concerns and specific recommendations:

1. The fit to the size-at-age data has improved but remains biased: the LVB model tends to consistently overestimate length-at-age of younger fish and underestimate length-at-age of older fish (Fig. 35), probably due to limitations of the assumed growth model. This bias appears to result in an overestimation of the number of skates in intermediate size classes and an underestimation of the number of skates in larger size classes (Fig. A13). Because skates mature at relatively large sizes (Fig. A10), underestimating the abundance of large skates may greatly underestimate spawning biomass. It is our understanding that the new version of SS2 can accommodate more flexible growth models and we encourage the authors to fit one of these more flexible models to improve the fit to size-at-age data. For some elasmobranchs, growth rate shifts at or near size of maturity, and models (e.g., two-stage von Bertalanffy) have been developed

to handle such situations. In addition, we encourage the author to explore and document the sensitivity of the model to the assumption that L1 is fixed at 22 cm, given the large uncertainty (CV) of this parameter (Table A6).

2. The authors present output from a single model that was based on a number of assumptions that are difficult to evaluate. In particular, the authors make a strong assumption about the limited level of recruitment variability (fixed at $\sigma R = 0.3$). The authors argue that skate recruitment should display low variability because skates are equilibrium strategists. However, recruitment is effectively estimated at age-4 by the model and variability in egg deposition and in the survival between egg deposition and emergence could easily lead to considerable variability in age-4 recruitment. The authors chose $\sigma R = 0.3$ "…on the basis of improved model fits", but differences in model fits were not presented (last year's model assumed $\sigma R = 0.1$). Therefore, the SSC recommends that the authors document the sensitivity of the model to the specification of σR or provide a stronger rationale for their choice. For example, alternative models with different levels of σR or a likelihood profile for σR could be presented.
3. The authors assume that egg case development takes 3.6 years based on a study by Hoff (2006). The SSC requests that the authors include a brief description of the available evidence for this determination, including some discussion of the reliability of skate aging data and of the methods used to determine development times and age determinations.
4. There should be some discussion on the sensitivity of model results to the assumptions that were made regarding selectivity parameters. The SSC notes that many of these parameters were arbitrarily bounded and parameter estimates were often near their specified bounds (e.g., p1 for longline length selectivity; and, p3, p4 and p6 for trawl length selectivities, Table A6).

Other, minor points:

1. Fig. A20: It would be useful to display biomass and spawning biomass on the same scale.
2. Table 6: Clarify which of the listed values are on the log-scale (e.g. CV of L2 is negative and appears to be on log-scale).
3. The authors should be careful in using statistical nomenclature. For example,
    a. p. 5: "The level of recruitment … results from…". It should be clarified that recruitment is not deterministic but there is some variability around the predicted recruitment from the Beverton-Holt model.
    b. p.5: "Weighting of individual likelihood components was not performed…". More likely, weights were assumed to be 1 for each component.
    c. It was stated that no priors were used for any parameters. However, SS2 requires the specification of bounds and assumes uniform priors within those bounds if no other prior is specified

2007 - Full Assessment

No link yet to Sept PT eAgenda
No link yet to Nov PT eAgenda
No link to Sept PT minutes yet
No link to Nov PT minutes yet

SSC Dec

The SSC disagrees with the Plan Team and authors' recommendation to move Alaska skate under Tier 3 due to ongoing skate assessment concerns SSC discussed during the October, 2006 meeting. In particular, the lack of fit of the model to survey biomass trends and growth are the main concerns. The SSC recommends using the tier 5 criteria to specify skate harvest levels. Thus, the ABC and OFL contributions of skates to the "other species" ABC and OFL for 2008/09 are 37,600 t and 50,100 t, respectively.

SSC Oct

Olav Ormseth (NMFS AFSC) presented a new age-structured Stock Synthesis 2 model for Alaska skates. The SSC commends the author for clear presentation on a new stock assessment and for considerable effort to develop an age-structured model for skates. There was no public testimony on this agenda item.

The base model started in 1992, used length-based selectivity, and incorporated the EBS shelf survey biomass and a level of equilibrium catch equal to the 1992 catch. The Authors also explored an alternative model that was started in 1958 incorporating the entire historical catch record. The early catch estimates were based on the 1997-2006 species composition, which raises questions about how consistent these proportions are over time, particularly when extrapolating back in time, e.g., could the fairly dramatic increase in biomass in the 1980s be attributed to changes in species composition, changes in spatial distribution, or both? The SSC encourages further development of the age-structure

The SSC encourages further development of the age-structured model and recommends that the authors consider the following issues in future updates to the model:

1. Run several alternative models that look at plausible lower and upper bounds of historical catch.
2. Examine any historical evidence for changes in species composition that may have occurred during the time of rapid increase, as well as the evidence for movement of skates onto the shelf over time, which may imply that a larger proportion of the population was unavailable to the survey in the early 1980s.
3. Examine and show the observed level of variability in species composition in both the catch and the survey over time for the years where data are broken down by species.
4. If possible, incorporate an alternative growth model into SS2 that may improve the model fit to the available length-at-age data.

5. Examine potential problems with aging of older fish (i.e. do they all accumulate in a large size class without further growth and without depositing growth rings in vertebrae).
6. Include a discussion of trophic relationships and other ecosystem relationships for Alaska skate (ecosystem considerations, similar to other assessments), with attention to the main prey and predators (based on available diet data) and including evidence for predation on adult skate.
7. The base model is not responsive to the recent increase in the trawl survey biomass apparent since 2001 and further evaluation of possible misspecification should be made.
8. Consider using an average recruitment level, rather than trying to fit a Beverton-Holt model that appears to fit poorly and has issues with strong autocorrelation in the residuals.
9. Fix Fig A5 to clarify the ages represented on the x-axis.