# Independent Peer Review of Fisheries Stock Assessments for Bering Sea and Aleutian Islands Yellowfin Sole, Northern Rock Sole, and Alaska Plaice

By

Joseph E. Powers

Conducted for

Center for Independent Experts (CIE)

June 2018

## Executive Summary

Yellowfin Sole, Northern Rock Sole and Alaska Plaice were assessed, and that assessment was reviewed. The review concurs that none of these three stocks are overfished, nor are they undergoing overfishing.

Exploratory analyses using age-specific M's and free-floating survey catchability are suggested.

Research on fecundity and temperature/habitat effects on catchability are encouraged.

As the survey expands to northern areas and as more is learned about the spatio-temporal distribution of the fish, there may have to be some further evaluation about catchability and the shape of the age-selectivity relationship.

## Background Section

The National Marine Fisheries Service is mandated by the Magnuson-Stevens Fishery Conservation and Management Act, Endangered Species Act, and Marine Mammal Protection Act to conserve, protect, and manage our nation's marine living resources based upon the best scientific information available. In order to fulfill this obligation, the Alaska Fisheries Science Center's (AFSC) Resource Ecology and Fisheries Management Division (REFM) requested an independent review of the integrated stock assessments that have been developed for three Bering Sea and Aleutian Islands (BSAI) flatfish species: BSAI Yellowfin Sole, Northern Rock Sole and Alaska Plaice. The fishery for these species is managed by the North Pacific Fisheries Management Council (NPFMC). The sum of the ABCs for these three species is 455,200 metric tons (t) in 2018, with catch levels annually set lower than the ABC due to a 2.0 million t harvest cap for all species and constraints due to Pacific halibut bycatch limits and markets. The catch limits are established using automatic differentiation (AD) Model software that uses survey abundance data, and survey and fishery age and length composition data with a harvest control rule to model the status and productivity of these stocks and set quotas.

The independent review was conducted through the Center for Independent Experts (CIE) through review of background materials and participation in the review meeting April 16-18, 2018 at the AFSC in Seattle. I (J. Powers) was one of three CIE reviewers. This report constitutes my independent conclusions about the review.

## Description of the Individual Reviewers' Roles in the Review Activities

My role in this CIE Review was to provide my expert opinion on the results of the analyses with regards to the terms of reference for three stocks of BSAI flatfish fishery resources, with regards to strengths and weaknesses of the assessment. Key aspects of these analyses included model structure (selectivity, catchability, life-history, natural mortality, stock-recruitment s, survey and catch data), status criteria based on the FMP "Tier" designation and recommendations on how the

assessment data and/or models might be improved. The two other CIE reviewers served the same roles in the process.

## Summary of Findings for each Term of Reference (TOR)

The terms of reference require:

For the three assessments (Bering Sea and Aleutian Islands yellowfin sole, northern rock sole, and Alaska plaice) consider the following:

1. Evaluate the strengths and weaknesses of the assumptions made in applying the stock assessment model including how survey indices are scaled to the populations. Specifics might include:
   a. How natural mortality estimates are estimated/applied
   b. Assumptions about survey "catchability"
   c. Application of fishery and survey age-specific schedules (maturity, body mass, selectivity)
   d. The application (or lack thereof) of a stock-recruitment relationship (and associated parameter estimates)
2. Evaluate the stock assessment approach used focusing specifically on how fisheries and survey data are compiled and used to assess the stock status relative to stated management objectives under the Bering Sea and Aleutian Islands Fishery Management Plan (FMP) and the Magnuson-Stevens Act requirements. Elements should consider:
   a. The FMP "Tier" designation
   b. Fishing rate estimation relative to overfishing definitions
   c. Stock status determinations relative to $B_{MSY}$
3. Recommend how assessment data and/or models could be improved.

### *Bering Sea and Aleutian Islands (BSAI) Yellowfin Sole*

The basis of the yellowfin sole (YF) assessment is the southern area where the fishery has predominately occurred. It is noted that the northern area has not been traditionally surveyed and catches in that area have been small or non-existent. Therefore, the assessment appropriately assumes that the "stock" is limited to the southern area, and that the analyses and the scientific advice that ensues relates to the southern YF resources that are not affected by interaction with the north. As research advances, this may be revised in the future, but it does not materially affect the current assessment results and management advice.

An important aspect of this assessment is the history of fishing where very large catches were removed in the 1970s by foreign fleets followed by low catches after the departure of those fleets and then a building of domestic capacity. Additionally, the recent history of fishing has been governed by externally motivated management issues, which have resulted in TACs which are well below the scientific recommendations as to sustainable levels and catches which are well below the TACs. Therefore, it is not surprising that despite whatever criticisms might arise about assessment methods, the assessment is robust to the status determination. ***I agree that the biomass***

***is determined to be greater than that at Maximum Sustainable Yield (MSY), and that the stock is not overfished and it is not undergoing overfishing. The assessment constitutes the best available science.*** Thus, issues raised in this review about methods and alternative approaches are inconsequential in terms of the status determination.

The entire essence of the assessment results is captured in Figure 1: the female spawning biomass trajectory coupled with recruitment with replacement lines imposed under varying F regimes. Note that female spawning biomass (FSB) at F=0 was 1.204 and at MSY was 0.424. So, currently, the stock is operating well above FSBmsy with the fishery at Fs smaller than F40%SPR.

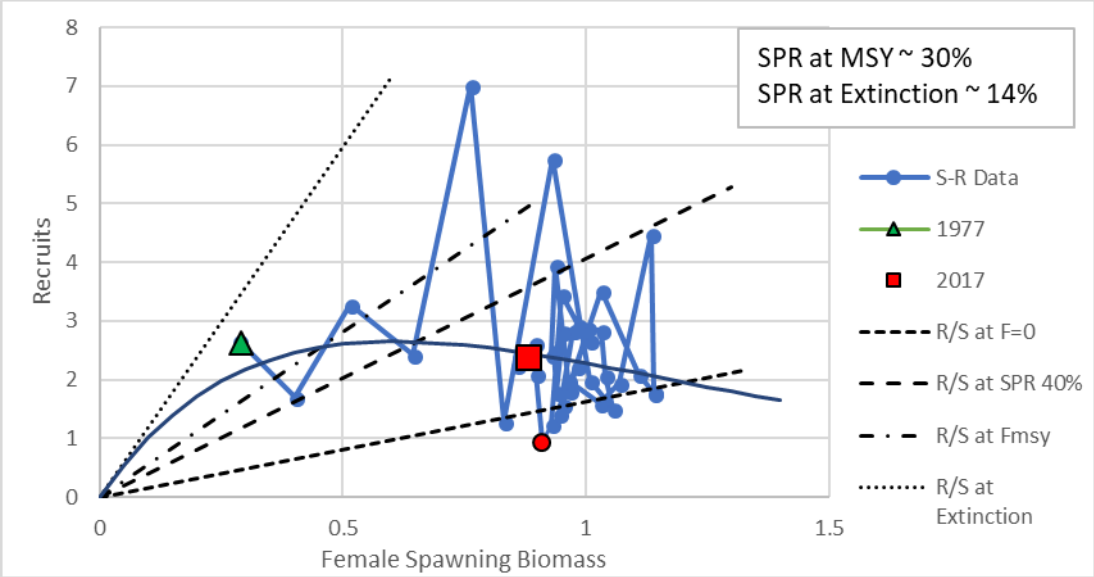


**Figure 1: Stock-Recruit Yellowfin Sole**

The data used in the assessment are the catches, a swept-area survey estimate of biomass, proportional size and age from the catches and the survey, and associated life history information. The key questions in this assessment (as in all assessments) is the specification/estimation of natural mortality rate M, the degree to which surveys depict biomass or its trends, catchability in surveys, the selectivity pattern and the choice of the stock recruitment relationship.

***The natural mortality*** was fixed at 0.12 for all ages and sexes. There is some historical scientific evidence for this based on older Japanese studies, likelihood profiles from this assessment, alternative assessment structures in which M was estimated and basic life history (e.g. M/K ratios). Exploratory analyses were done with sex-specific Ms, but the results are confounded with how representative the sex data from surveys were. Therefore, the fixed rate was chosen.

There was some discussion of whether an age-dependent M might be used. In other assessments around the world using an age-dependent M function such as the Lorenzen are being used more frequently with higher Ms at younger ages. These are not based on data from the specific stock, but rather on life history allometric relationships. It was argued here that since catch and reproduction occurs at ages where a Lorenzen curve asymptotes out, that effectively the Ms under such an assumption would be constant over ages anyway.

I do not entirely buy that argument for the following reasons. In a typical stock assessment there is no estimate of absolute abundance. Thus, using higher Ms at younger ages rescales the overall biomass without changing the overall dynamics. Then the status rates (FMSY, etc.) are scaled accordingly, and in a relative sense the methods are robust. However, in this case there is an estimate of absolute abundance: that is what allows the assessment to have some small chance of actually estimating M in the first place. Therefore, in the present assessment, increasing Ms at younger ages will interact in the estimation process with the absolute biomass estimates in some unknown (to me) ways. Recruitment is modeled as abundance at age 1 with Ms at age being imposed for several years before catches and reproduction starts. It would be interesting to examine age-specific Ms in the future through simple exploration or the addition of two Lorenzen-type parameters. But to reiterate, I fully expect that the effects will be minor in the overall status determinations.

***"Catchability"*** for the surveys should be viewed in several contexts. First, the survey knowingly is not addressing abundance in the northern area, so catchability only refers to the southern area. Secondly, the survey makes an estimate of absolute abundance using swept area methods. There is a long history of this method with the AFSC and many issues have been explored over the years, improving the methods as time went on. Thus, the catchability in that sense is equal to 1.

But there is flexibility in how the survey is actually implemented into the assessment. To my understanding, catchability "q" can be estimated overall for the survey within constraints imposed by the likelihoods of annual variance estimates in the survey. So, in that sense, estimating or specifying q is more or less an estimate in the bias in the q=1 assumption. But inherently there is a presumption, because of the history of the swept area methods that q will be close to 1.

Then, finally, catchability can be viewed in the context of explaining annual variations on the survey-biomass relationship, i.e. explaining annual deviations in q from the overall value. The AFSCs recent research on this in relationship to temperature and other oceanographic factors looks promising and should be continued, including implementation in subsequent assessments.

I come from an assessment world in which there is no hope of ever getting an absolute abundance estimate for almost all resources. Therefore, surveys and other indices are viewed as relative only, with no preconceived notions as to the scale of the catchability. I realize that the YF resource surveys cover a rather confined area of the ocean (especially related to tuna); and that much effort has gone into defining absolute q. But, I am curious if the survey has ever been implemented into the assessment as a purely relative index of abundance to see if there is some space in the response surface where there is an alternative solution.

***The application of fishery and survey age-specific schedules (maturity, body mass, selectivity)*** is typical with the data sets more extensive than in stocks in other regions. Growth, weight at age/length and maturity are monitored periodically or in some cases annually. Research is ongoing to improve estimates and the efficiency of obtaining those estimates.

The assessment implicitly assumes that female spawning biomass at age is proportional to fecundity at age. This is a standard procedure with many assessments. In my understanding, this

assumption is mostly the case. However, I am aware of stocks in which fecundity at length and age has been investigated and this proportionality does not hold. For example, in Gulf of Mexico red snapper, older females produce proportionally more eggs than would be inferred by their weight. Additionally, recent research suggests that this phenomenon may be more ubiquitous than originally thought. Therefore, there might be a long term need to begin to explore fecundity relationships.

An important assumption in any assessment is the choice of the selectivity relationship, flat-topped versus domed. In this assessment flat-topped was chosen for both surveys and the fishery. Given the gear-mensuration research and confined area of the survey and fishery, this seems a reasonable assumption, especially for the survey. However, selectivity at age as implemented into the model can be affected by things other than the gear. In particular, the spatial distribution of size/age/sex in relation to the survey or fishery can affect the overall selectivity pattern. As recent research has indicated the distribution is not uniform. Therefore, research which allows selectivity effects to be evaluated should be encouraged and continued.

***The stock-recruitment relationship*** for this assessment was chosen to be a Ricker function (see Figure 1 of this report). This is complicated by the history of the fishery where there were very large foreign catches in the 1970s. The implications of this to the assessment was that there appeared to be very high productivity rates in the early years, and that rates over the last few decades were much lower. This is exemplified in the stock-recruitment plots including data prior to 1977 and also in the FSB trajectory prior to 1977, whereby the FSB was near zero for a decade or so and then rapidly increased. I am not convinced that the data in the early years are adequate for this conclusion. But the assessment uses post-1977 data for fitting the S-R curve which seems appropriate.

However, I am not particularly enamored with the use of a Ricker curve without some hypothesis as to why depensation occurs as opposed to a Beverton-Holt (BH) curve. I suppose to some extent this is driven by the eternal debate of fisheries scientists that treat everything as a salmon versus those that treat everything as a cod. However, perusing the S-R data in Figure 1, it indicates that there is nothing magical about the Ricker curve. I suspect that if a BH curve were used instead of Ricker, then the "fit" would converge to a steepness of 1, which is equivalent to simply estimating recruitment deviations from a mean. By the fact that a Ricker can be fit isn't compelling to me that Ricker is most appropriate. I am confident that the status determination would not be much different using a Ricker or BH/mean R approach with surrogate Fmsy.

The problem lies in the structure of the models versus typical S-R data. With a BH, one essentially estimates a mean asymptote of R until S has decreased enough for R to measurably decrease, so that one can estimate steepness (which is often not the case). With a Ricker, $R=aSexp(-S/Smax)$ where *Smax* is the S that produces maximum recruitment. So, with just about any data-set, one can estimate a peak *Smax.* Then the value of *a* follows along. But *a* is important as it defines the SPR at extinction: SPR at extinction with the Ricker is about 14% (my back of the envelope calculation from Figure 1) which seems high to me (with limited knowledge of flatfish life history). If one accepted this, then threshold management criteria Fs would have to be lower than SPR 14%. At the review meeting, an assessment was conducted in which only the post 1977 data were used. The resulting biomass trajectories were quite similar, the Ricker SPR at

extinction was very, very low. This demonstrates the ability for the Ricker to fit a set of data but not be realistic. However, as mentioned above, I am confident on the status determination using Ricker or BH/mean with a surrogate Fmsy. All the FSB data is to the right of the range regardless of the S-R relationship.

However, even though the status determination is robust, the reason I bring this up is that in the TORs there is a requirement for ***the FMP "Tier" designation. If the defining criteria for determining Tier 1 is the availability of a fitted S-R curve and a resultant Bmsy estimate, then, in my opinion, in the case of YF a Tier with a surrogate, Fmsy would be more appropriate***. Specifying YF as Tier 1 implies that we know more about the S-R relationship than we really do. But in terms of current YF status at the present time, it makes no practical difference.

***And A final Comment about Yellowfin Sole:*** in the spirit of Management Strategy Evaluations and Management Procedures (MPs), it occurs to the curmudgeon in me that a simple rule to replace the assessment (and a CIE review) by an MP would be to simply specify the ABC as 10% of the survey biomass estimate, which is not too different from the scientific advice!

***Northern Rock Sole***

Many of my review issues with northern rock (NR) sole are similar to these elucidated above for yellowfin sole. In those cases, the explanation is truncated and reference is made to the YF section above. In many cases, I use the exact same wording.

Rock sole catches increased from an average of 7,000 t annually from 1963-69 to 30,000 t from 1970-1975. Catch data for 1980-88 separated into catches by non-U.S. fisheries, joint venture operations and Domestic Annual Processing catches are available but prior to 1987, the classification of rock sole in the "other flatfish" management category prevented reliable estimates. Catches from 1989-2016 (domestic only) have averaged 49,900 t annually, well below ABC values. The recent history of fishing has been governed by externally motivated management issues which have resulted in TACs which are well below the scientific recommendations as to sustainable levels and catches which are well below the TACs. Therefore, it is not surprising that despite whatever criticisms might arise about assessment methods, the assessment is robust to the status determination. ***It is my opinion that the biomass is determined to be greater than that at Maximum Sustainable Yield (MSY), and the stock is not overfished, and it is not undergoing overfishing. The assessment constitutes the best available science.*** Thus, issues raised in this review about methods and alternative approaches are inconsequential in terms of the status determination.

The entire essence of the assessment results is captured in Figure 2: the female spawning biomass trajectory coupled with recruitment with replacement lines imposed under varying F regimes. Note that female spawning biomass (FSB) at F=0 was 683 and at MSY was 257. So, currently, the stock is operating well above FSBmsy with the fishery at Fs at about F40%SPR.

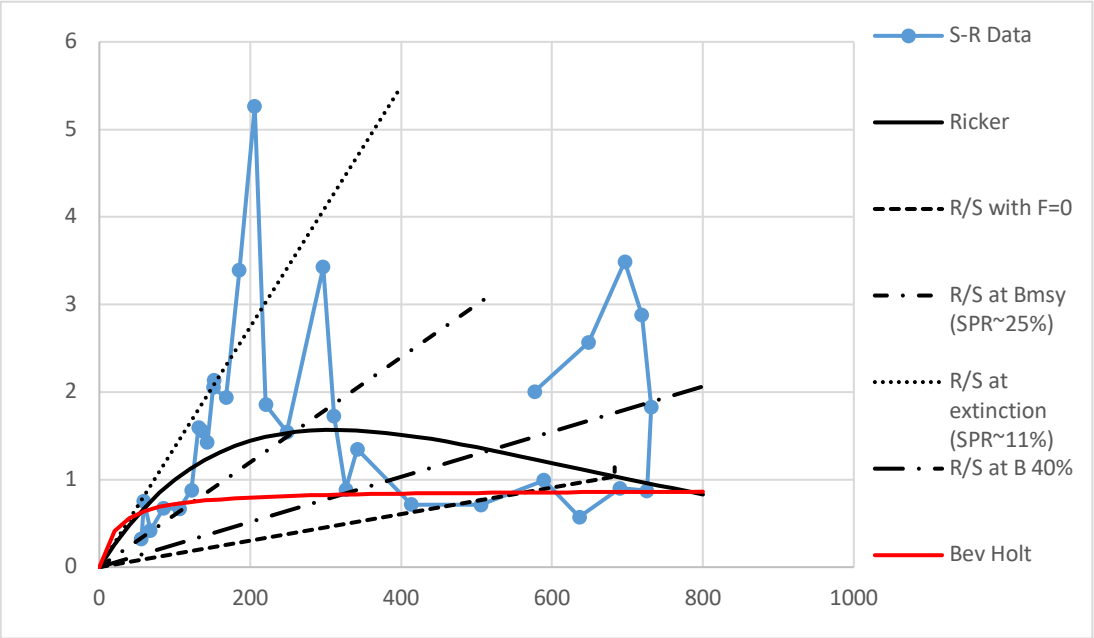


**Figure 2. Stock Recruit Northern Rock Sole (note that the Bev Holt curve was estimated by me as an example by fitting to the observed S-R points from the assessment. It was NOT integrated into the assessment as would need to be done to properly estimate.**

As with YF, the data used in the assessment are the catches, a swept-area survey estimate of biomass, proportional size and age from the catches and the survey and associated life history information. The key questions in this assessment (as in all assessments) is the specification/estimation of natural mortality rate M, the degree to which surveys depict biomass or its trends, catchability in surveys, the selectivity pattern and the choice of the stock recruitment relationship.

***The natural mortality*** was first estimated for both sexes as free parameters with values of 0.159 and 0.19, for males and females respectively, when survey catchability was fixed at 1.5. The base assessment model fixed M at 0.15 for both sexes and catchability at 1.5. Other assessments for rock sole in other areas assume M = 0.20 based on life history. In a past BSAI assessment, a range of natural mortality values provided a best fit at M = 0.18 with the survey catchability coefficient (q) set equal to 1.0. Fixing M at 0.15 for both sexes is appropriate.

As with yellowfin sole, it would be interesting to examine age-specific Ms in the future through simple exploration or the addition of two Lorenzen-type parameters. But again, I fully expect that the effects will be minor in the overall status determinations.

***"Catchability"*** for Northern Rock Sole surveys is determined from swept-area methods as with YF. My comments in regards to catchability of YF apply here as well. It seems that because of the confined area for which the stock ID is defined and the history of trawl mensuration relative to the swept area methods, it is a reasonable assumption that the survey biomass estimates are sufficiently accurate. However, if it has not been done already, an exploratory analysis where q is allowed to float freely might be useful.

I also encourage the analysis of temperature/habitat dependent effects on annual catchability, although it will probably be less immediately useful than that research on this subject conducted for YF.

***The application of fishery and survey age-specific schedules (maturity, body mass, selectivity)*** is typical with the data sets more extensive than in stocks in other regions. Growth, weight at age/length and maturity are monitored periodically or in some cases annually. Research is ongoing to improve estimates and the efficiency of obtaining those estimates.

As with YF a long-term research goal might be to explore fecundity relationships. Also, as more is learned about spatial size/sex/age distributions and how they change, then the assumption of flat-topped selectivity might have to be revisited.

***The stock-recruitment relationship*** for this assessment was chosen to be a Ricker function (see Figure 2 of this report). The time series of available data shows a general increase of biomass over time where the early biomass is rather low. For this reason, there are observations of stock-recruit pairs at which biomass and recruitment were fairly low.

The Ricker curve was used (without some hypothesis expressed as to why depensation occurs as opposed to a Beverton-Holt (BH) curve). As opposed to YF, I suspect that if a Beverton-Holt curve were used, you would still get a fit. But the slope at the origin might be very different (Figure 2).

As with YF, I question the determination of Tier 1 based on the fact that a S-R curve can be fit. In this case, I expect that alternative S-R curves can be fit. I am confident that the current status would be the same with whatever reasonable S-R curve was used. So, in regards to ***the FMP "Tier" designation, if the defining criteria for determining Tier 1 is the availability of a fitted S-R curve and a resultant Bmsy estimate, then, in my opinion, in this case of NR sole, Tier 1 would be appropriate***. But in terms of current NR status at the present time, it makes no practical difference which Tier is used. My criticism of this criteria is not with the assessment itself, but rather with how Tier 1 is defined.

***Alaska Plaice***

Alaska plaice have been lightly harvested in most years as no major commercial target fishery exists for them. Catches of Alaska plaice increased from approximately 1,000 t in 1971 to a peak of 62,000 t in 1988. Part of this apparent increase was due to increased species identification and reporting of catches in the 1970s. With the cessation of joint venture fishing operations in 1991, Alaska plaice are now harvested exclusively by domestic vessels. In 2016, 59% and 30% of the Alaska plaice catch occurred in the yellowfin sole and northern rock sole fisheries, respectively.

Catches have averaged less than 20,000t annually, well below ABC values. The recent history of fishing has been governed by externally motivated management issues, which have resulted in TACs well below the scientific recommendations as to sustainable levels, and catches which are well below the TACs. Therefore, it is not surprising that despite whatever criticisms might arise

about assessment methods, the assessment is robust to the status determination. ***It is my opinion that the biomass is determined to be greater than that at Maximum Sustainable Yield (MSY), the stock is not overfished and it is not undergoing overfishing. The assessment constitutes the best available science.*** Thus, issues raised in this review about methods and alternative approaches are inconsequential in terms of the status determination.

The basic assessment results are given in Figure 3: the female spawning biomass trajectory coupled with recruitment with replacement lines imposed under varying F regimes. Note that current female spawning biomass (FSB) at F=0 was 317, FSB at F40%SPR is 127 and at F35% it is 111. Note also from Figure 3 that the fishery is operated at SPRs greater than 20% over the entire history**.**

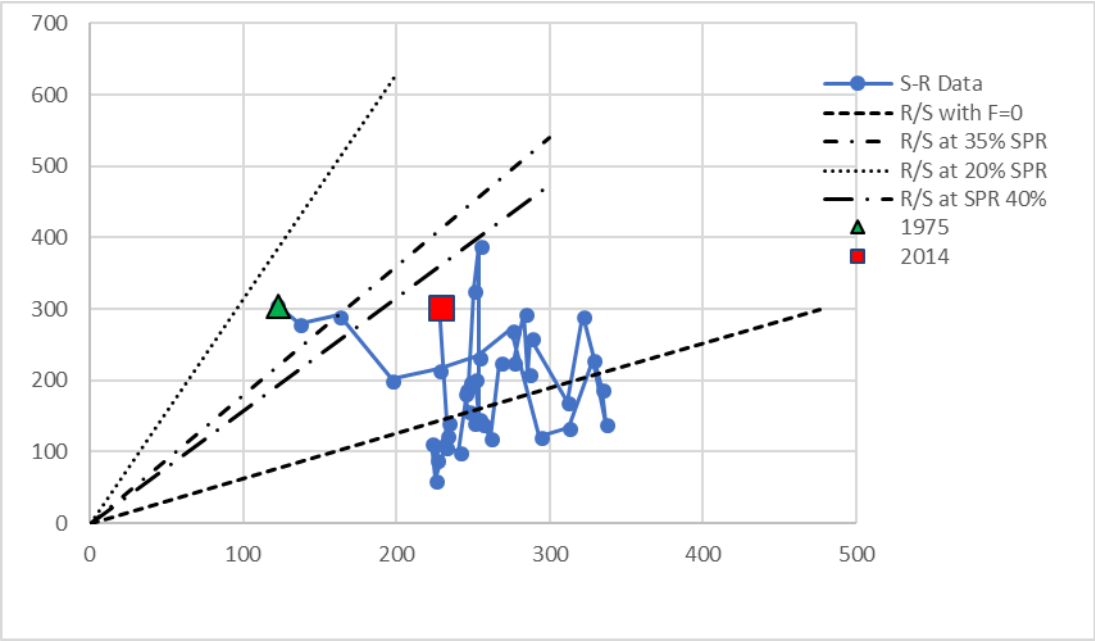


**Figure 3. Stock Recruit Alaska Plaice**

My comments relative to ***natural mortality and age-specific schedules*** is the same as for YF and NR sole.

***"Catchability"*** for the AP survey was specified as 1.2 based on research on herding effects. This was close to the mean value from the combined flatfish species in the herding experiment. As with the other stocks, the assessment imposes a great deal of reliance on the survey biomass estimates. However, if it has not been done already, an exploratory analysis where q is allowed to float freely might be useful.

I also encourage the analysis of temperature/habitat dependent effects on annual catchability.

***A stock-recruitment relationship*** for this assessment was not chosen (see Figure 3 of this report). Clearly, the data do not support an estimation of curvature from whatever stock-recruitment model might be chosen. So, in regards to ***the FMP "Tier" designation, Tier 3 is appropriate***.

# Appendix 1: Bibliography of materials provided for review


Wilderbuer, T.K., D.G. Nichol, and J. Ianelli, 2017. Assessment of the yellowfin sole stock in the Bering Sea and Aleutian Islands. *In* Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Bering Sea/Aleutian Islands Regions.
https://www.afsc.noaa.gov/REFM/stocks/assessments.htm

Wilderbuer, T.K. and D. G. Nichol. 2017. Assessment of the northern rock sole stock in the Bering Sea and Aleutian Islands. *In* Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Bering Sea/Aleutian Islands Regions.
https://www.afsc.noaa.gov/REFM/stocks/assessments.htm

Wilderbuer, T.K. and D. Nichol. 2017. Assessment of the Alaska plaice stock in the Bering Sea and Aleutian Islands. *In* Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Bering Sea/Aleutian Islands Regions. North Pacific Fisheries Management Council, Anchorage, AK.
https://www.afsc.noaa.gov/REFM/stocks/assessments.htm

Introduction to Bering Sea/Aleutian Islands SAFE
https://www.afsc.noaa.gov/REFM/stocks/assessments.htm

Somerton, D., K. Weinberg, P. Munro, L. Rugolo and T. Wilderbuer. 2017. The effects of wave-induced vessel motion on the geometry of a bottom survey trawl and the herding of yellowfin sole. Fish. Bull. 116:21–33 (2018). doi: 10.7755/FB.116.1.3
https://www.st.nmfs.noaa.gov/spo/FishBull/1161/somerton.pdf

# Appendix 2: Statement of Work

National Oceanic and Atmospheric Administration (NOAA)
National Marine Fisheries Service (NMFS)
Center for Independent Experts (CIE) Program

## External Independent Peer Review of Fisheries stock assessments for yellowfin sole, northern rock sole and Alaska plaice

### Background

The National Marine Fisheries Service (NMFS) is mandated by the Magnuson-Stevens Fishery Conservation and Management Act, Endangered Species Act, and Marine Mammal Protection Act to conserve, protect, and manage our nation's marine living resources based upon the best scientific information available (BSIA). NMFS science products, including scientific advice, are often controversial and may require timely scientific peer reviews that are strictly independent of all outside influences. A formal external process for independent expert reviews of the agency's scientific products and programs ensures their credibility. Therefore, external scientific peer reviews have been and continue to be essential to strengthening scientific quality assurance for fishery conservation and management actions.

Scientific peer review is defined as the organized review process where one or more qualified experts review scientific information to ensure quality and credibility. These expert(s) must conduct their peer review impartially, objectively, and without conflicts of interest. Each reviewer must also be independent from the development of the science, without influence from any position that the agency or constituent groups may have. Furthermore, the Office of Management and Budget (OMB), authorized by the Information Quality Act, requires all federal agencies to conduct peer reviews of highly influential and controversial science before dissemination, and that peer reviewers must be deemed qualified based on the OMB Peer Review Bulletin standards[1]. Further information on the CIE program may be obtained from www.ciereviews.org.

### Scope

The Alaska Fisheries Science Center's (AFSC) Resource Ecology and Fisheries Management Division (REFM) requests an independent review of the integrated stock assessments that have been developed for three Bering Sea flatfish species; yellowfin sole, northern rock sole and Alaska plaice. The fishery for these species is managed by the North Pacific Fisheries Management Council. The sum of the ABCs for these three species is 455,200 metric tons (t) in 2018, with catch levels annually set lower than the ABC due to a 2.0 million t harvest cap for all species and constraints due to Pacific halibut bycatch limits and markets. The catch limits are established using automatic differentiation (AD) Model software that uses survey abundance data and survey and fishery age and length composition data with a harvest control rule to model the status and productivity of these stocks and set quotas. Having these assessments vetted by an independent expert review panel is a valuable part of the AFSC's review process. The Terms of Reference (TORs) of the peer review and the tentative agenda of the meeting are below.

[1] http://www.cio.noaa.gov/services_programs/pdfs/OMB_Peer_Review_Bulletin_m05-03.pdf

## Requirements

NMFS requires three reviewers to conduct an impartial and independent peer review in accordance with the SOW, OMB Guidelines, and the TORs below. The reviewers shall have working knowledge and recent experience in the application of fisheries stock assessment processes and results, including population dynamics, separable age-structured models, harvest strategies, survey methodology, and the AD Model Builder programming language. They should also have experience conducting stock assessments for fisheries management.

## Tasks for reviewers

1. Review the following background materials and reports prior to the review meeting:

Wilderbuer, T.K., D.G. Nichol, and J. Ianelli, 2017. Assessment of the yellowfin sole stock in the Bering Sea and Aleutian Islands. *In* Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Bering Sea/Aleutian Islands Regions.
https://www.afsc.noaa.gov/REFM/stocks/assessments.htm

Wilderbuer, T.K. and D. G. Nichol. 2017. Assessment of the northern rock sole stock in the Bering Sea and Aleutian Islands. *In* Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Bering Sea/Aleutian Islands Regions.
https://www.afsc.noaa.gov/REFM/stocks/assessments.htm

Wilderbuer, T.K. and D. Nichol. 2017. Assessment of the Alaska plaice stock in the Bering Sea and Aleutian Islands. *In* Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Bering Sea/Aleutian Islands Regions. North Pacific Fisheries Management Council, Anchorage, AK.
https://www.afsc.noaa.gov/REFM/stocks/assessments.htm

Introduction to Bering Sea/Aleutian Islands SAFE
https://www.afsc.noaa.gov/REFM/stocks/assessments.htm

Somerton, D., K. Weinberg, P. Munro, L. Rugolo and T. Wilderbuer. 2017. The effects of wave-induced vessel motion on the geometry of a bottom survey trawl and the herding of yellowfin sole. Fish. Bull. 116:21–33 (2018). doi: 10.7755/FB.116.1.3
https://www.st.nmfs.noaa.gov/spo/FishBull/1161/somerton.pdf

2. Attend and participate in the panel review meeting
    - The meeting will consist of presentations by NOAA and other scientists, stock assessment authors and others to facilitate the review, to provide any additional information required by the reviewers, and to answer any questions from reviewers
3. After the review meeting, reviewers shall conduct an independent peer review in accordance with the requirements specified in this SOW, OMB guidelines, and TORs, in adherence with the required formatting and content guidelines; reviewers are not required to reach a consensus
4. Each reviewer may assist the Chair of the meeting with contributions to the summary report, if required by the TORs
5. Deliver their reports to the Government according to the specified milestone dates

## Foreign National Security Clearance

When reviewers participate during a panel review meeting at a government facility, the NMFS Project Contact is responsible for obtaining the Foreign National Security Clearance approval for reviewers who are non-US citizens. For this reason, the reviewers shall provide requested information (e.g., first and last name, contact information, gender, birth date, passport number, country of passport, travel dates, country of citizenship, country of current residence, and home country) to the NMFS Project Contact for

the purpose of their security clearance, and this information shall be submitted at least 40 days before the peer review in accordance with the NOAA Deemed Export Technology Control Program NAO 207-12 regulations available at the Deemed Exports NAO website: http://deemedexports.noaa.gov/ and http://deemedexports.noaa.gov/compliance_access_control_procedures/noaa-foreign-national-registration-system.html. The contractor is required to use all appropriate methods to safeguard Personally Identifiable Information (PII).

## Place and Period of Performance

The place of performance shall be at the contractor's facilities, and at the Alaska Fisheries Science Center, Seattle, Washington, USA. The period of performance shall be from the time of the award through June 1, 2018. Each reviewer's duties shall not exceed 14 days to complete all required tasks.

## Schedule of Milestones and Deliverables

The contractor shall complete the tasks and deliverables in accordance with the following schedule:

| | |
|---|---|
| Within two weeks of award | Contractor selects and confirms reviewers |
| No later than April 12, 2018 | Contractor provides the pre-review documents to the reviewers |
| **April 16-18, 2018** | Panel review meeting |
| May 11, 2018 | Contractor receives draft reports |
| May 25, 2018 | Contractor submits final reports to the Government |

## Applicable Performance Standards

The acceptance of the contract deliverables shall be based on three performance standards:

1. The reports shall be completed in accordance with the required formatting and content
2. The reports shall address each TOR as specified
3. The reports shall be delivered as specified in the schedule of milestones and deliverables.

## Travel

All travel expenses shall be reimbursable in accordance with Federal Travel Regulations (http://www.gsa.gov/portal/content/104790). International travel is authorized for this contract. Travel is not to exceed $11,000.

## Restricted or Limited Use of Data

The contractors may be required to sign and adhere to a non-disclosure agreement.

## NMFS Project Contact

Thomas K Wilderbuer
7600 Sand Point Way NE, Bldg. 4
Seattle, WA 98115-6349
tom.wilderbuer@noaa.gov

## Peer Review Report Requirements

1. The report must be prefaced with an Executive Summary providing a concise summary of the findings and recommendations, and specify whether or not the science reviewed is the best scientific information available.
2. The report must contain a background section, description of the individual reviewers' roles in the review activities, summary of findings for each TOR in which the weaknesses and strengths are described, and conclusions and recommendations in accordance with the TORs.
    a. Reviewers must describe in their own words the review activities completed during the panel review meeting, including a brief summary of findings, of the science, conclusions, and recommendations.
    b. Reviewers should discuss their independent views on each TOR even if these were consistent with those of other panelists, but especially where there were divergent views.
    c. Reviewers should elaborate on any points raised in the summary report that they believe might require further clarification.
    d. Reviewers shall provide a critique of the NMFS review process, including suggestions for improvements of both process and products.
    e. The report shall be a stand-alone document for others to understand the weaknesses and strengths of the science reviewed, regardless of whether or not they read the summary report. The report shall represent the peer review of each TOR, and shall not simply repeat the contents of the summary report.
3. The report shall include the following appendices:
    Appendix 1: Bibliography of materials provided for review
    Appendix 2: A copy of this Statement of Work
    Appendix 3: Panel membership or other pertinent information from the panel review meeting.

# Terms of Reference for the Peer Review

For the three assessments (Bering Sea and Aleutian Islands yellowfin sole, northern rock sole, and Alaska plaice) consider the following:

4. Evaluate the strengths and weaknesses of the assumptions made in applying the stock assessment model including how survey indices are scaled to the populations. Specifics might include:
    e. How natural mortality estimates are estimated/applied
    f. Assumptions about survey "catchability"
    g. Application of fishery and survey age-specific schedules (maturity, body mass, selectivity)
    h. The application (or lack thereof) of a stock-recruitment relationship (and associated parameter estimates)
5. Evaluate the stock assessment approach used focusing specifically on how fisheries and survey data are compiled and used to assess the stock status relative to stated management objectives under the Bering Sea and Aleutian Islands Fishery Management Plan (FMP) and the Magnuson-Stevens Act requirements. Elements should consider:
    d. The FMP "Tier" designation
    e. Fishing rate estimation relative to overfishing definitions
    f. Stock status determinations relative to $B_{MSY}$
6. Recommend how assessment data and/or models could be improved.

# CIE Flatfish Assessment Review Agenda

NMFS Alaska Fisheries Science Center April 16-18, 2018, room 2079

7600 Sand Point Way NE, Building 4 Seattle, Washington

## Monday April 16th

| | | |
|---|---|---|
| 9:00 | Welcome and Introductions, adopt agenda,TORs | |
| 9:15 | Overview | **Tom** |
| 10:00 | Bering Sea shelf trawl survey | **Dan Nichol** |
| | Observer Program | **Marlon Conception** |
| 11:00 | Coffee break | |
| 11:20 | Fisheries Management and Council process | **Diana Stram** |
| 12:30 | Lunch | |
| 1:30 | Age Determination | **Delsa Anderl** |
| | BSAI Yellowfin sole | **Tom and Jim** |

## Tuesday April 17th

| | | |
|---|---|---|
| 9:00 | Effect of rationalization on flatfish fisheries | **Alan Haynie** |
| 10:00 | BSAI Northern rock sole | **Tom and Jim** |
| 11:00 | Coffee break | |
| 11:20 | BSAI Northern rock sole (continued) | **Tom and Jim** |
| 12:30 | Lunch | |
| 1:30 | BSAI Alaska plaice | **Tom and Jim** |

## Wednesday April 18th

| | | |
|---|---|---|
| 9:00 | CIE panel discussion (assessment authors will be available) | |
| 12:30 | Lunch | |
| | Continue as needed | |

## Appendix 3: Panel membership or other pertinent information from the panel review meeting

***CIE Reviewers***

Matthew Cieri
Yan Jiao
Joseph Powers

***NMFS-Alaska Regional Office***

Diana Stram

***NMFS-Alaska Fisheries Science Center***

*Assessment Scientists*

Tom Wilderbuer
Jim Ianelli
Dan Nichol

*Observer Program*

Marlon Conception

*Aging and Growth*

Delsa Anderl
Beth Matta

*Economics and Rationalization*

Alan Haynie

***Industry Observer***

Susan Robinson