NORTHWEST FISHERIES SCIENCE CENTER STATEMENT ON
OFF-YEAR SCIENCE AND STOCK ASSESSMENT METHODOLOGY REVIEW

The Northwest Fisheries Science Center's (NWFSC) Population Ecology Program (which conducts groundfish assessments and research) has an important suite of research projects and related activities identified for the coming year that are intended to improve future scientific guidance for managing groundfish off the west coast. At the end of this document, we list topics that are of highest priority to make substantive progress in the next twelve months. These priorities include considerations for NOAA Fisheries and NWFSC priorities (such as making progress on MSEs, climate-relevant research and EBFM), Pacific Whiting Treaty process concerns, key areas of research noted through the assessment approval process, and Council priorities (noted in brackets in our list).

We agree that the issues identified in the Council's September motions on these items are important and that work should be done on all of them over the next year. Item 7 on our list includes developing new materials that will help those involved in the development and review of assessments to better understand the process through which the VAST software package estimates indices of abundance. Additionally, we anticipate developing VAST indices using recreational CPUE that will be compared to those that have been developed using an alternative method and used in recent nearshore assessments,

Subject to available resources, we are willing to participate in a workshop addressing aspects of catch construction. As identified in item 9, however, we envision most of our focus being on working with state agencies to reach agreement on time series for catch of skates. Item 13 includes continued work on describing how the uncertainty of stock assessment projections increases with the age of an assessment, and how that source of uncertainty can best be translated in the specification of the 'sigma' parameter (that is part of the P*-sigma calculations of the uncertainty buffer between the Overfishing level and the Allowable Biological Catch..

We support pursuing the Council-family's interest in transboundary assessments. Item 15 note our continuing involvement in a large transboundary sablefish assessment. Item 19 reflects our interest in conducting additional analysis of the impacts of including available Canadian data in a number of base models from 2017 assessments. Given that these results have not yet been produced, and in turn discussed with Department of Fisheries and Oceans staff, we believe that committing to hold a workshop on transboundary assessments is premature at this time. The time and energy involved in developing materials for and conducting a workshop on this topic, without knowing the extent of Canadian involvement, could better be used in addressing the large number of other high-priority research we have identified.

Item 16 reflects our interest in revisiting the suite of available assessment options, in order to make better use of available data and provide the Council with improved science to support groundfish management. While the addition of the currently-approved data-moderate methods

were a step forward, the current Terms of Reference (TORs) require the exclusion of all compositional data, which we feel is no longer is an acceptable limitation. Similarly, our TORs place greater restrictions on the conduct of assessment updates than is the case in most, if not all, other regions. The Benchmark assessment process has served the Council well and has helped to improve assessments and stakeholder confidence in results. However, this process is an extremely resource intensive one, arguably the most intensive in the world, in terms of both the development and review of a single assessment. We believe that the Council can be better served by our ability to employ an expanded array of approaches, and that the STAR process can be used to help relieve the SSC of much of the additional review burden that would be associated with conducting more, and more varied, less-then-Benchmark assessments.

Finally, we agree with the need for additional research and review of the representativeness of age data. however, this was an issue raised in the 2017 assessment reviews not only in the context of conditional age-at-length, but also with respect to the direct inclusion of ("marginal") age data in a model. Identifying the extent of potential concerns, across assessed species, and reaching agreement on the recommended methods for recognizing and addressed situations regarded as problematic should be a high priority before the next round of assessment development begins.

We look forward to the opportunity to discuss these priorities with the Council and its advisory bodies.

NWFSC Population Ecology Program's Research Priorities for Fiscal Year 2018

Top Tier
1. Hake assessment and Management Strategy Evaluation (MSE) development: conduct the 2018 assessment, initiate development of a new, multi-area MSE model, and continue related research on environmental and life-history influences on hake distribution and movement.
2. Update stock-assessment prioritization analysis for 2018 selection of species to be assessed in 2019.
3. Continue service on Council advisory bodies.
4. Complete Climate Vulnerability Analysis.
5. Continue analysis of the impacts on stock assessment results of reduced data availability from NWFSC groundfish surveys, in the event that changes are made necessary by available funding.

2ⁿᵈ Tier
6. Assist in organizing and executing workshops and methods reviews related to improving the assessment enterprise, as needed.
7. Develop additional analysis, documentation and training/education for using the VAST software package to develop indices from both fishery-dependent and -independent sources, including comparison with the current approach for estimating recreational CPUE indices. **[Council]**
8. Continue research into oceanographic drivers of petrale sole recruitment strength.
9. Work with state agencies to create/improve catch histories, particularly for individual skate species in anticipation of 2019 assessments of longnose and big skates. **[Council]**
10. Participate in research with AFSC and DFO on the variability in growth and maturity of skates over large marine ecosystems.
11. Identify ageing priorities and targets for 2019 assessments.
12. Develop an MSE for west coast sablefish to examine the potential impacts of climate change scenarios.
13. Continue research into changes in the uncertainty ("sigma") of assessment projections associated with the age of the assessment. **[SSC]**
14. Test and document new versions of the Stock Synthesis (SS) software, and incorporate improvements into the R4SS programming.
15. Contribute to a transboundary sablefish stock assessment (including the west coast, Canada, Alaska). **[Council]**
16. Enhance, and contribute to review of, data-limited and update assessment alternatives, for potential use in 2019. **[SSC]**

3ʳᵈ Tier
17. Attempt to identify quantifiable environment metrics that are linked to one of more aspects of the populations dynamics (recruitment, growth, mortality) of some important groundfish species.
18. Archive models and files from all assessments in order to insure future reproducibility of results, and support agency assessment databases.

19. Document the impacts of including Canadian survey and fishery data into base models from 2017 assessments, where possible. **[Council]**
20. Conduct bomb radiocarbon studies to validate the accuracy of existing protocols for ageing canary (CA) and black rockfishes.
21. Comparison of groundfish maturity curves estimated from existing data, derived from macroscopic inspection by commercial port samplers, with curves based on recent histology-based research. (*Histological inspection of ovary tissue is regarded as being a more accurate means of determining maturity, but is also far more costly and time-consuming.*)
22. Contribute to research into and review of best practices for determining representativeness of age data and treatment in cases where they non-representativeness is indicated. **[Council]**

Other research and activities funded from outside the NWFSC
23. Participate in four research projects exploring the development and testing of spatially-explicit stock assessment models, which may allow the complexity of real populations to be better modeled.
24. Explore opportunities for combining index and/or compositional information across surveys and fisheries in a spatio-temporal modeling framework, in order to extract more useful information from available data.
25. Contribute to training stock assessment scientists in the US and other countries.