SUPPLEMENTAL OREGON DEPARTMENT OF FISH AND WILDLIFE REPORT ON STOCK ASSESSMENT METHODOLOGY REVIEW

The Oregon Department of Fish and Wildlife (ODFW) proposes review of a fishery-independent visual survey methodology for nearshore groundfish species by the Pacific Fishery Management Council's Scientific and Statistical Committee (SSC). The purpose of the review would be to determine whether results produced using this method can be used in future stock assessment models to better inform management.

The Research and Data Needs sections of many recent stock assessments[1] for nearshore and other stocks have included recommendations for a fishery-independent survey in untrawlable habitats. Comments in the related reports by Stock Assessment Review Panels and the Center for Independent Experts have echoed these recommendations, noting the need to avoid reliance on fishery-dependent Catch Per Unit Effort (CPUE) indices, as well as to adequately survey populations (or portions thereof) that are not available to the current survey sampling gear in order to understand scale and trends in abundance.

ODFW's Marine Resources Program has invested over the past 17 years in conducting Remotely Operated Vehicle (ROV) based video transect surveys of nearshore rocky reefs to assess demersal fish, benthic habitat structures, and invertebrates in untrawlable habitats, and has steadily moved toward the ability to conduct fishery-independent abundance estimates in these habitats. ODFW requests that the SSC review methods and data developed in ODFW's ROV program to determine if results of surveys using these methods are suitable for incorporation into groundfish stock assessments, and to provide advice for improving methods and expanding surveys to best support future nearshore groundfish stock assessments.

Over the past 17 years, ODFW's methods have evolved to quantify field of view and surveyed area to create more accurate fish density estimates and recent methods use stereo-video to generate fish length data and validate surveyed area estimates. Survey transects were established by a number of methods to create either random sampling or stratified-random sampling within each regional survey.

To date, these survey data have been used primarily to identify priority habitats, and to provide ecological baselines associated with the establishment and evaluation of a new network of marine reserves. Currently, ODFW is extending the analysis of fish-habitat associations, with the dual goals of 1) developing regional population estimates for nearshore benthic fish (e.g. yelloweye, yellowtail, quillback, China, and canary rockfishes; lingcod, kelp greenling, etc.) from existing data, and 2) guiding the development of new fishery-independent surveys intended to supplement

[1] 2015 Black Rockfish, 2015 China Rockfish, 2015 Oregon Kelp Greenling, 2015 Canary Rockfish, 2017 Blue and Deacon Rockfishes, 2017 Yelloweye Rockfish, 2017 Lingcod

existing data through expansion to previously un-surveyed areas, temporal repetition of previous surveys, or both.

We are finding that, as expected, nearshore benthic species exhibit a range of associations with habitat types and landscape structures that can be quantitatively described using high-resolution multibeam bathymetric data. Therefore, the proposed methods for generating population estimates vary by species. At the most simplistic level, minimum population estimates are generated from simple extrapolation of densities (with confidence intervals) from surveyed areas to the total area of comparable reef, as determined by analysis of existing substrate and multibeam bathymetry data. For species with strong specific habitat affinities, more complex statistical modeling approaches may be selected to incorporate habitat variables derived from raster analysis of the available high-resolution multibeam data, such as depth, slope, or bathymetric position index (BPI).

All methods apply densities throughout a region to mapped areas of specific substrates using GIS. For some regions, these maps have coarser resolution and may drive the selection of a relatively simplistic density extrapolation. Our final population estimates may follow a hybrid approach that combines multivariate statistical models for reefs with high resolution bathymetry data, with simple density extrapolations for regions with lower resolution habitat mapping. We are continuing to expand the area mapped with high-resolution multibeam bathymetry surveys, especially along the south coast. All existing ROV surveys are in areas with multibeam data, and new surveys planned for the south coast would benefit from this expanded mapping.

ODFW is prepared to describe these methods and data in detail for SSC review. We expect the review would include addressing questions related to transect sampling design, data post-processing (i.e., filtering), species-habitat association models, and total abundance extrapolations, as well as any other appropriate questions. For example:

- Is the method of allocating transects within reef regions appropriate/efficient for this new purpose of coast-wide abundance estimation?
- Does the filtering of data to exclude ROV-off-bottom times sufficiently address any habitat-specific bias that could be due to increased off-bottom time in high-relief habitats?
- Are the existing/anticipated multibeam data adequate for OR-coastwide extrapolation?

ODFW is prepared to work with the SSC in any way necessary to facilitate the review, and appreciates consideration of this proposal by the SSC and the Council. We are hopeful that results of this visual survey approach will contribute to reducing some of the uncertainty associated with stock abundance estimates and trends in future nearshore stock assessments.