Proposal for Methodology Review of Commercial Fishery-Dependent Index Standardization

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Background and purpose

The main source of fishery-independent indices for groundfish is the West Coast Groundfish Bottom Trawl Survey (WCGBTS). However, the survey struggles to provide informative indices for species that inhabit high relief untrawlable habitat and those that are semi-pelagic. In addition, it samples only during summer and early fall, limiting our understanding of intra-annual variation in fish density. The midwater trawl fishery operates year-round and the gear used in that fishery is better able to sample many of these species, making it a tempting alternative. However, the fishery does not randomly sample the population. Due to non-random sampling, fishery-dependent indices worldwide have a long history of hyperstability and displaying spurious dynamics (e.g., Rose and Kulka 1999; Walters 2003). A reexamination of the appropriateness and best practices for commercial fishery-dependent indices for west coast groundfish is valuable at this point in time for two reasons. First, developments in spatiotemporal modeling and efficient estimation of random effects has led to the ability to better account for the non-random sampling of the fishery within model-based index standardization methods. Second, the catch share sector has had 100% observer and electronic monitoring (EM) coverage for over a decade now, providing a current time series of fishery-dependent data that, were effective standardization possible, is becoming long enough to truly inform trends in population abundance.

Methods: This methodology review will focus on practices for data filtering, index standardization model structure, and variables to consider in standardization. Currently, the analysis develops separate indices for each species and sector based on tow-level EM or observer data. Data is from the ITQ fishery, with three sectors: 1) midwater rockfish, 2) shoreside hake, and 3) bottom trawl. Initially, we have been exploring development of indices for canary rockfish, widow rockfish, yellowtail rockfish, Pacific ocean perch, and petrale sole. Petrale sole was included so that a fishery-dependent index could be compared to a reliable and informative fishery-independent index. The proposed model includes a standard spatiotemporal delta-model for catch rates and positive encounters, but also includes a third layer to estimate preferential sampling behavior of fishing vessels (sensu Conn et al. 2017). This approach allows us to estimate the magnitude of preferential sampling behavior (aggregate, or by vessels) and compare indices to models that do not account for non-random sampling. We will also incorporate indices into the most recent stock assessment for each species, and explore estimation (and estimability)

of a power function for catchability. This is one potential way to explore hyperstability of the fishery-dependent indices.

Literature cited:

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