

Project Title: Investigating the selectivity of the eastern Bering Sea survey bottom trawl for Pacific cod, *Gadus macrocephalus*: Do larger, stronger fish avoid capture?

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Overview: Pacific cod represent a significant proportion of the total U.S. domestic finfish catch, ranking 4th overall in both poundage and value in 2010. Due to this species commercial importance, the AFSC, which conducts annual multispecies bottom trawl surveys in the eastern Bering Sea (EBS) and provides fishery-independent estimates of abundance and size and age compositions, along with the support from two external reviews of the 2011 Pacific cod stock assessment (Dr. Mark Maunder on behalf of the fishing industry's Freezer Longline Coalition and the Center for Independent Experts (CIE)) has identified a critical need for further information on the catchability of its survey trawl. The current Pacific cod management model requires not only survey and commercial catch data, but also information on a variety of parameters, including one that determines the maximum value of the survey selectivity (q) function, which directly scales population size, and another that determines the rate of decline in selectivity with the largest fish, which also directly scales the Allowable Biological Catch (ABC) in addition to influencing the need for size varying natural mortality functions. Current estimates of q are based on depth data collected from data storage tags to determine the fraction of biomass that is below the trawl headrope height at the moment of sampling. Last year a NCRP funded experiment was conducted on the EBS survey to determine if cod dive into the trawl just before capture, which, if true, would invalidate the current estimate of q . As a companion study, pending 2013 NCRP funding, we propose a field study to estimate the model's drop in apparent selectivity with increasing fish size. In this study we plan to make longer faster tows which the large cod cannot avoid. If there is no indication of the AFSC bottom trawl survey having lower catchability for larger fish, then the alternate scenario, that larger fish have a higher mortality rate should be pursued in the model. Previous model explorations at doing this indicate that such a change to the model will increase the ABC.

Research Description: We propose to carry out an experiment to test the null hypothesis that larger, stronger Pacific cod do not out-swim, thus avoid, the standardized survey trawl when fished following standardized protocols and that the trawl selectivity is representative of the available population. To accomplish this project we will utilize both EBS chartered vessels in a side-by-side comparison during the 2013 EBS survey. For each pair of tows, one vessel will follow standardized towing procedures, including towing at a 3 knot, GPS-determined towing speed. The second vessel will be towing faster for varying durations. The study will be carried out over 2 days (4 vessel days) in areas of known cod abundance based on 2013 survey sampling.

Deliverables:

- 1) Completion of research aboard the chartered vessels used to conduct the 2013 eastern Bering Sea groundfish survey.
- 2) A report of cooperative research activities with results provided to industry and management by December 2013.
- 3) Presentation of the experiment results at scientific meetings, to the Pacific cod stock assessment authors, and if warranted, to the NPFMC Groundfish Plan Team.
- 4) A draft report of the study to be completed by the end of 2014 for publication in a peer-reviewed science journal.

Budget:

Vessel charter (2 boats for 2 days = 4 days)	30.8K
Fuel for charter	13.6K
Additional salary for fieldwork	4.8K
Total funds requested	49.2K