

FY13 Cooperative Research on Bering Sea Crab Species with Commercial Industry Research Foundation

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The Alaska Fisheries Science Center (AFSC) and the Bering Sea Fisheries Research Foundation (BSFRF) have been working cooperatively on research relative to Bering Sea king, snow, and Tanner crab surveys, biology, and assessment since 2004. These cooperative projects have focused on the evaluation of alternative survey methodology for Bristol Bay red king crab, the experimental determination of the trawl efficiency of the AFSC's Bering Sea survey trawl, the tagging of both snow crab and red king crab to determine movements of these stocks within the survey area, the assessment of red king crab in the nearshore waters of Bristol Bay, the estimate of handling mortality aboard commercial snow crab vessels, and the determination of snow and Tanner crab growth increments in the field and in the laboratory. Research projects were prioritized based on level of importance for the survey and assessment of crab stocks in the eastern Bering Sea consistent with the Fisheries Management Plan (FMP) for Bering Sea and Aleutian Islands King and Tanner Crabs. This research is a cooperative effort not only with the commercial industry but also with other agencies cooperatively managing these crab stocks. As outlined in the FMP, the Alaska Board of Fisheries and the North Pacific Fishery Management Council jointly manage ten crab stocks in the Eastern Bering Sea with research and assessment conducted by the Alaska Department of Fish and Game (ADF&G) and the NOAA Fisheries Service. In this partnership, the AFSC is responsible for providing biomass estimates from the annual eastern Bering Sea bottom trawl survey for these stocks. AFSC and ADF&G stock assessment scientists then utilize these biomass estimates along with catch data and other biological information to determine the status of the stock and to estimate the overfishing limit (OFL), allowable biological catch (ABC), and total allowable catch (TAC).

In FY13, research was focused on planning for Tanner crab growth studies, estimating red king crab larval release locations, estimating handling mortality of snow and Tanner crab, and on the catchability of red king crab during the AFSC annual bottom trawl survey.

Snow and Tanner crab growth

In 2012, studies were jointly conducted with AFSC and BSFRF scientists to assess snow crab (*Chionoecetes opilio*) growth. The success of that project and the incorporation of new growth schedules into the stock assessment modeling process was complete during the 2013 stock assessment cycle and resulted in a new stock assessment model, numerous presentations to industry, and a publication (Somerton, D., Goodman, S., Foy, R., Rugolo, L., Slater, L. 2013. Growth per molt of snow crab in the Eastern Bering Sea. North American Journal of Fisheries Management. 33:1, 140-147). This was a cooperative effort using industry vessels. Planning is underway to conduct a similar experiment for Tanner crab (*Chionoecetes bairdi*).

Red king crab larval release locations

To assess the location of larval release areas for adequate settlement and recruitment and to determine the vulnerability of the aggregated females to disturbance from benthic trawl gear, AFSC scientists working with a tagging technology company developed pop-up satellite tags in 2013. In cooperation with the fishing industry, the tags will be affixed to crab during the spring of 2014 and data will be subsequently retrieved from satellite receivers after crabs molt. Diel patterns of movement and behavior in addition to location of molting (and therefore larval release) will be determined. These data will be used to define essential habitat for crab stocks and help manage the bycatch of crab in other commercial fisheries in Bristol Bay.

Handling mortality

Crab fisheries in Alaska use baited pots to capture crab and bring them to the surface. Only males of a minimum size can be retained while females, smaller males, and crab from non-targeted species must be

returned to the sea. The process of sorting and discarding non-retained crab results in discard mortality of unknown magnitude, under some conditions estimated to be up to 100%. Management regulations, recognizing the importance of considering all sources of fishing mortality, mandate that discard mortality must be considered when setting catch limits. Until recently, a rate of 50% mortality was applied to the crab discarded from pot fisheries in Alaska. In 2011 and 2012, working collaboratively with the Alaska crab industry, mortality data and environmental condition data were collected on commercial fishing vessels during the winter opilio fishery. In 2013, the final analysis of this research was presented to the North Pacific Fisheries Management Council. In short, the results of the research led to a decrease in the handling mortality used for snow crab bycatch from an arbitrarily chosen 50% to an empirically based estimate of 30%. The results of this analysis are currently in review for a peer-reviewed publication. Based on the positive response from the North Pacific Fisheries Management Council, efforts are underway to continue the research for Tanner crab.

Red king crab catchability

To assess and manage the stock biomass of red king crab in Bristol Bay, scientists currently use a length based stock assessment model to approximate survey biomass trends and to establish biological reference points. Catchability is a parameter in the assessment model describing the relative ability of a survey to estimate the population abundance. The catchability of crab in the survey is a function of both availability and selectivity of the crab to the bottom trawl gear. Currently the selectivity of red king crab to the survey gear is unknown. However, recent research on snow crab suggests that the selectivity of other crab species is not 1 and is size and sex specific. In June, 2013, AFSC and BSFRF scientists collaborated on a side-by-side survey with two industry vessels “shadowing” two AFSC vessels during the standard bottom trawl assessment of crab (Fig. 1 and 2). Approximately 55 stations were towed with two gear types to establish an index of selectivity between the catches. Data from this survey are currently being analyzed and will be jointly presented to the NPFMC by industry and AFSC scientists. A second year of this project will be required to obtain a large enough sample size for statistical analysis. At this time, the stock assessment model will be informed with more appropriate catchability indices.

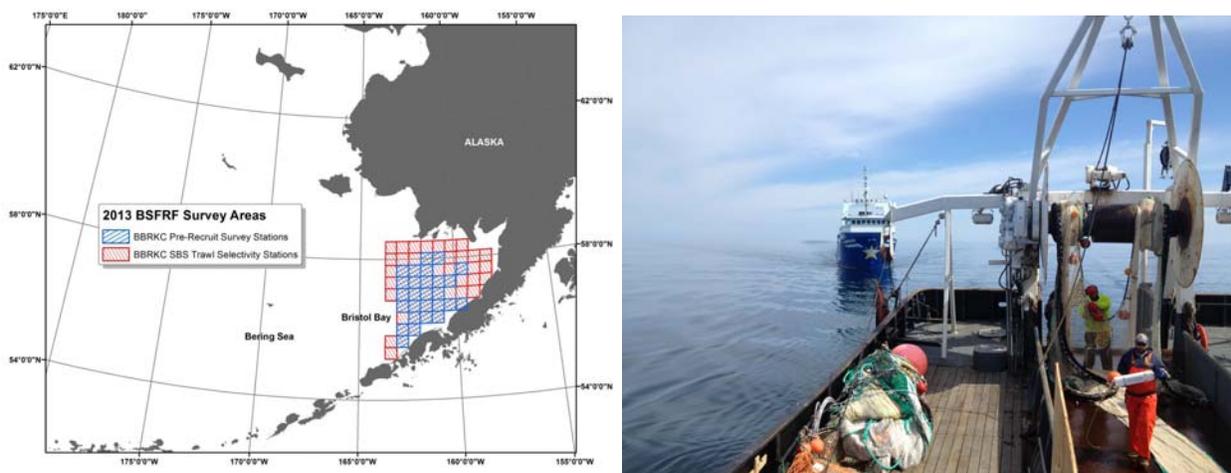


Figure 1. 2013 stations occupied by both NOAA-AFSC and Industry vessels for collaborative research to establish selectivity patterns for NOAA research trawls on red king crab.



Figure 2. Industry, ADF&G, and NOAA-AFSC scientists working up catches aboard the industry vessel during survey in 2013.