

Project Title: Research on Bering Sea Crab Species with Commercial Industry Research Foundations and Resource Agencies

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TOTAL PROPOSED: \$182,000

The Alaska Fisheries Science Center (AFSC) crab scientists have worked cooperatively with the University of Alaska, Alaska Department of Fish and Game (ADF&G), and other agencies to assess and manage crab stocks in the Bering Sea and Aleutian Islands and the Arctic Fishery Management Plan regions. The 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. The AFSC and the newly formed Aleutian King Crab Research Foundation began working cooperatively in 2013. These cooperative projects have focused on the evaluation of alternative survey methodology for Bristol Bay red king crab (*Paralithodes camtschaticus*), 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 snow crab, Tanner crab (*Chionoecetes bairdi*) and golden king crab (*Lithodes aequispinus*) handling mortality, and the determination of snow crab (*Chionoecetes opilio*) 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 FMP for Bering Sea and Aleutian Islands King and Tanner Crabs and with consideration for the goals of the Arctic FMP. 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 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. The 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, allowable biological catch, and total allowable catch.

Based on meetings with industry foundations and resource agencies to define cooperative research priorities, we propose the following research projects in FY15. The total requested funds for all crab projects are \$182,000.

Red king crab catchability (Total = \$61,000)

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 an important 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 cooperative research on snow crab suggests that the selectivity of crab species by the standard survey gear is less than one and is size and sex specific. In June, 2013 and 2014, 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. The survey was successful in 2013 but due to the limited number of stations with red king crab an additional year of data was necessary to have the sample size needed to statistically assess selectivity across size and sex classes. Confounding results due to the addition of two new vessels and to above normal bottom temperatures in 2014 suggest that additional surveys are required to assess the effects of vessel and environmental conditions on selectivity. We propose to collaborate with industry by providing scientific staffing for data collection and analysis aboard industry funded vessels during the AFSC bottom trawl survey in FY15.

- Send AFSC representatives to participate in the side by side survey of Bristol Bay Red King Crab
 - Travel costs: **\$5,000**
- Camera mounted on BSFRF trawl w/lights
 - Supplies: **\$6,000**
- Charter fuel: **\$50,000**

Tanner crab growth (Total = \$81,000)

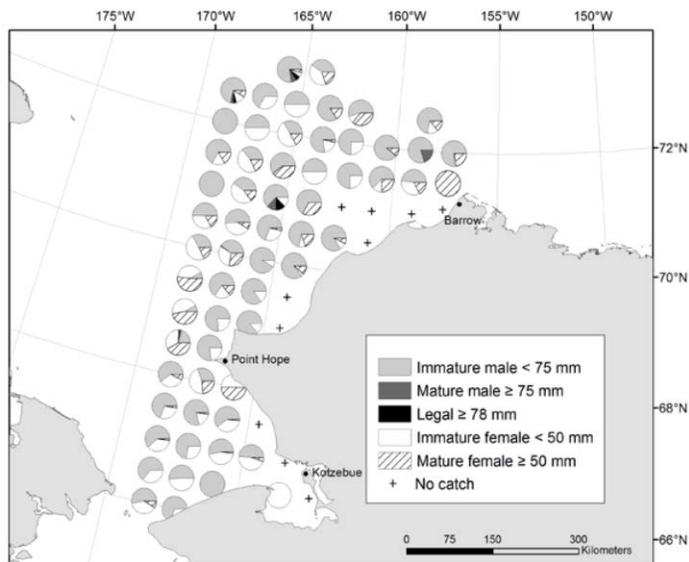
The stock assessment for Tanner crab depends upon the values of various parameters and functional relationships in the length based population assessment model used to manage crab stocks. One of the most influential of these parameters is the growth per molt (increase in size) as a function of carapace width. This study is intended to collect the growth per molt data needed to estimate this functional relationship. A similar study was conducted on snow crab in 2011 with the empirical data incorporated into the stock assessment process in 2013. In 2012, studies were initiated by AFSC and BSFRF scientists to assess Tanner crab growth. Unfortunately, the data collection was limited by sea ice and only a small portion of the size distribution was covered. In 2014, funds were not able to be used for this study due to the timing of the availability of the funds. This year an MOU between industry and AFSC will allow industry funds to be spent earlier in the year so that this study can be completed in 2015. We propose to work with industry to collect Tanner crab, hold them in Dutch Harbor, and assess growth per molt throughout their size range.

- Staff overtime at sea: **\$10,000**
- Contract to send person to DH to go to sea and run experiment: **\$25,000**
- Charter Fuel: **\$30,000**
- Travel to DH: **\$6,000**
- Supplies to hold crab at sea and in DH: **\$10,000**

Snow crab larval distribution in the Chukchi Sea (Total = \$40,000)

As part of an interagency agreement between the Bureau of Ocean Energy Management and AFSC, a bottom trawl survey of the Chukchi Sea was conducted to assess the distribution of fish and invertebrate resources in 2012. The objective of the survey was to gather baseline data for future assessment of economic development activities in the Arctic region and for long-term monitoring of climate change effects to the Arctic marine ecosystem. The 2012 Arctic EIS Chukchi Sea bottom trawl survey region extended north of the Bering Strait to Barrow Canyon, bounded to the west by the U.S.-Russia Maritime Boundary and east to the 10 meter bathymetry limit along the Alaska coastline. Sampling design was based on a 55.6 km (30 nmi) square grid pattern with the planned trawl stations located at the approximate center of each grid cell,

resulting in a total of 73 sampling locations. Snow crab at multiple life stages were found at a number of stations throughout the survey (see Figure below). In addition to bottom trawls, pelagic zooplankton tows were incidentally conducted to assess zooplankton distribution however because plankton was not the focus of the survey, the samples were not analyzed to determine the species composition of the crab. We propose to complete the analysis of the zooplankton samples (n=90) to assess the distribution and abundance of the snow crab larvae. These data, coupled with the distribution information on adults will better inform industry and AFSC about potential commercial resources in the arctic. It is unclear if the snow crab found in the Chukchi Sea are independent stocks from those found in the Beaufort Sea and in the northern Bering Sea. We propose to establish baseline data on larval timing and distribution to support future studies on this potential commercial resource.



- Contract for technician to process samples: **\$35,000**
- Supplies: **\$5,000**