

## **CPT Top 10 Research Priorities**

### **148 (#1)**

**Title:** Spatial distribution, habitat requirements, and movement of crabs relative to life history events and fishing

**Description:** There is a need to characterize the spatial distribution and movement of crab stocks. For example, information is needed to understand the distribution of male/female snow crab at time of mating, a better understanding of spatial stock dynamics and population connectivity for Tanner Crab east and west of 166, and to understand the distribution and movement of golden king crab in the Aleutian Islands in areas historically fished and not fished. There is a need to characterize the spatial distribution of male snow crab at time of mating relative to reproductive output of females in the middle domain of the EBS shelf. Additionally there is a need to investigate spatial stock dynamics and population connectivity for Tanner Crab (2 stocks).

### **167**

**Title:** Alternative approaches to acquire fishery-independent abundance data for unsurveyed crab stocks.

**Description:** Explore alternative approaches to acquire fishery-independent abundance data on stock distribution and recruitment of unsurveyed crab stocks (e.g., Aleutian Islands golden king crab, cooperative research efforts with Industry).

### **223**

**Title:** Develop and evaluate global climate change models (GCM) or down-scaled climate variability scenarios to assess impacts to recruitment, growth, spatial distributions, and benthic productivity.

**Description:** Quantify the effects of historical climate variability and climate change on recruitment, growth, spatial distribution, and benthic productivity. Develop standard environmental scenarios (e.g., from GCMs) for present and future variability based on observed patterns. This is important for fisheries that target benthic species such as crab for which management may be structured on an assumption of stable stock distribution.

### **225**

**Title:** Develop projection models to evaluate management strategies under different climate, ecological, and economic conditions and evaluate impacts to managed resources and coastal communities.

**Description:** There is a need to develop projection models that evaluate the robustness and resilience of different management strategies under varying climate, ecological, and economic conditions. Projection models should forecast seasonal and climate related shifts in the spatial distribution and abundance of commercial fish and shellfish, and impacts to communities.

### **CPT006: Proposed combination of 223 & 225**

**Title:** Develop and evaluate global climate models (GCMs) or other projection models to assess climate change impacts on biology (recruitment, growth, spatial distributions, and benthic

productivity), and to evaluate management strategies under different climate, ecological, and economic conditions.

**Description:** Quantify the effects of historical climate variability and climate change on recruitment, growth, spatial distribution, and benthic productivity. Develop standard environmental scenarios (e.g., from GCMs) for present and future variability based on observed patterns. Develop projection models that evaluate the robustness and resilience of different management strategies under varying climate, ecological, and economic conditions. Projection models should forecast seasonal and climate related shifts in the spatial distribution and abundance of commercial fish and shellfish, and impacts to communities.

### 532

**Title:** Natural mortality estimation for crab stocks

**Description:** Tagging studies or the development of methods to accurately age crab are necessary to improve M estimators based on maximum age. Additional studies to explore variation in M by size, sex, and time and in response to environmental variables and predation are also warranted.

### 715 (#4)

**Title:** Physiological responses of crab to climate stressors

**Description:** Field and laboratory research examining the effects of climate change on crab stocks is critical given recent warming and acidification in Alaskan marine ecosystems. Studies focused on characterizing the physiological responses of crab to combined environmental stressors (temperature, OA, etc.) will inform estimates of critical physiological thresholds and thermal tolerances, and will build mechanistic understanding of climate effects.

### 731

**Title:** Norton Sound Red King Crab case study

**Description:** Needed to help understand and address urgent stock assessment and management challenges in the NSRKC fishery, including the efficacy of previously instituted community protection management measures through the collaborative involvement of the LKTKS taskforce and the Climate Change taskforce.

### CPT001 (#5)

**Title:** Crab early life history population bottlenecks

**Description:** Bristol Bay red king crab has experienced population declines due to low recruitment in recent decades, recent strong juvenile Tanner crab cohorts are not propagating to legal size classes, and Bering Sea snow crab are at the lowest levels on record with only a small cohort of juveniles and the older portion of the population senescing. Targeted research focused on identifying early life history bottlenecks (larval advection/delivery, nursery habitat disturbance by fishing gear, predation, etc.) is needed to understand factors limiting population growth, to advise new management actions, and to evaluate stock enhancement potential.

### CPT003 (#3)

**Title:** Improved maturity estimation and reproductive potential characterization for crab

**Description:** Seasonal or episodic changes in size at maturity and reproductive potential related to acute or systematic changes require urgent research to inform management.

Additionally, the inclusion of quantitative reproductive potential indices (e.g., mature female biomass or egg production indices) as components of management currencies must be further considered. (Combines previous priorities CPT 002 and N008, 592)

#### **CPT004 (#2)**

**Title:** Evaluate fishing gear impacts on crab, benthic communities, and essential fish habitat

**Description:** Research is needed to quantify unobserved fishing mortality and assess the impacts of fishing gear on crab during vulnerable life history periods. Relevant studies include 1) assessing the efficacy of existing habitat closure areas, 2) assessing the effects of potential habitat disturbance on the distribution and abundance of crab stocks, 3) quantifying gear interactions during vulnerable life history periods (e.g., molting/mating), and 4) quantifying unobserved fishing mortality (e.g., pelagic trawl gear that contacts bottom but doesn't retain crab as observed bycatch). This research priority combines #164 "Effects of trawling on crab and benthic communities" and #N018 "Quantification of unobserved fishing mortality on crab across all gear types and evaluate fishing gear impacts on crab and crab habitat."

#### **CPT005**

**Title:** Annual monitoring survey in the NBS

**Description:** Climate is changing rapidly and biennial surveys are insufficient for tracking changes in crab populations (e.g., EBS snow crab in 2020). Characterizing annual stock abundance in the NBS is critical for snow crab and Norton Sound red king crab. The NBS may also be the future for other fisheries and consistent baseline data is needed to develop models that incorporate NBS data into assessments. Cooperative surveys with industry could be a feasible means to support annual NBS monitoring, but continuity in standard survey methods is critical for comparison across the existing NBS time series.