Background

Calculating total catch for a crab stock must include mortality of sublegal and female crab which are not retained, but suffer mortality due to exposure and trauma before being returned to the sea.

Commercial crab vessels vary widely in their handling practices which directly affects discard mortality rates.

Best available information estimates the crab discard mortality to be 50% in pots but it is widely acknowledged that work is needed to refine that estimate.

The Reflex Action Mortality Predictor (RAMP) method will be used during the January 2010 commercial snow crab fishery to determine the range of mortality rates which might be expected during the fishery.

The results will be a first step in improving the bycatch mortality estimate needed to set crab harvest levels in the Bering Sea.

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The Predictor Reflexes

- **Leg Flare**
  - Positive: all legs spread high & wide
  - Negative: legs hang down loosely

- **Eye Retraction**
  - Positive: eye retracts strongly
  - Negative: eye does not move back into carapace hood

- **Leg Retraction**
  - Positive: leg with strong retraction up in posterior direction
  - Negative: leg does not retract

- **Mouth Closure**
  - Positive: 3rd maxilliped retracts quickly
  - Negative: maxilliped does not return to closed position

- **Chela Closure**
  - Positive: chela open & close rapidly
  - Negative: no movement observed in chela

- **Kick**
  - Positive: immediate strong kicking when abdominal flap is lifted
  - Negative: no reaction to lifting of flap

RAMP: Reflex Action Mortality Predictor

The response to a suite of reflexes can be used to predict mortality caused by stress and trauma.

The method has been applied to a variety of fish (e.g. Humborstad et al. 2009) and invertebrates including Tanner crab *Chionoecetes bairdi* and snow crab *C. opilio* (Stoner et al. 2008, Stoner 2009).

This model correctly predicted 91% of snow crab mortalities in an at-sea experiment conducted in 2007.

![Graph showing percent mortality by reflex impairment score](image)

**Fig. 1.** Percent mortality by reflex impairment score. Reflex impairment score for each crab is simply the sum of negative reflex responses (score = 0 or 1). Adapted from Stoner et al., 2008.

![Surface plot from logistic regression showing probability of mortality for *C. opilio*](image)

**Fig. 1.** Surface plot, resulting from logistic regression, showing probability of mortality for *Chionoecetes opilio* with varied levels of reflex impairment and injury. Mortality was independent of injury score. (from Stoner et al., 2008).

Industry Participation

The following Bering Sea crab vessels have generously offered to take a Research Biologist with them during commercial fishing operations to collect bycatch mortality data using the RAMP Method.

- F/V Southern Wind
- F/V Arctic Sea
- F/V Arctic Hunter

**Literature Cited**

