

1. PROJECT INFORMATION

NPRB Project Number:	711
Title:	Quantification of unobserved injury and mortality of Bering Sea crabs due to encounters with trawls on the seafloor
Subaward period	June 1 2007 – March 30, 2010
Amount of funding	\$ 221,848
Report period	January 1 to June 30, 2008
Report submission date	July 14, 2009
Lead Author of Report*	Craig S. Rose

Principal Investigator(s), Co-Principal Investigators and Recipient Organization(s):

Craig S. Rose, Al Stoner, Eric Munk – Alaska Fisheries Science Center, NMFS, John Gauvin, J.Gauvin and Associates

2. PROJECT OVERVIEW

a. Briefly (4-5 sentences) describe both the research purpose and the underlying need for this research.

The potential for unobserved mortality of crabs encountering bottom trawls, but not brought aboard the fishing vessel, has long influenced the management of Bering Sea groundfish fisheries. Our research addressed the lack of data on the mortality rates of such crabs for two principal commercial crab species of the Bering Sea, Tanner crab and snow crab. We applied and improved existing methods for collecting crabs immediately after trawl encounters (Rose 1999). Assessments of reflex impairment were used to more efficiently estimate delayed mortality rates with reduced requirements for long-term holding (Davis 2006). This proposal leverages pilot funding from the NMFS cooperative research program. Pilot fieldwork in early Summer 2007 established recapture net designs and handling, as well as procedures for holding crabs onboard. Reflex and reflex impairment observations of captive animals at the Kodiak NMFS laboratory provided information needed for field assessments of crab condition. The principal fieldwork in Summer 2008 combined these developments to assess the mortality probabilities of crabs that have passed the sweeps, wings and central footrope of a commercial groundfish trawl as well as control animals collected identically without trawl encounters. Mortality estimates will be derived by combining condition assessments based on reflex impairments with the delayed mortality rates of retained animals.

b. State your hypotheses.

- 1) The loss of reflex behaviors after stress or injury can predict the probability of subsequent mortalities for Bering Sea crab species
- 2) That some crabs encountering bottom trawls die due to that interaction. (We use hypothesis 1 to estimate the rate at which such mortalities occur).

c. List the objective(s) of the research project, exactly as described in your approved Statement of Work.

- Objective A: Evaluate reflex behaviors in Alaska crabs that hold potential as predictors of stress
- Objective B: Assess the sensitivity of behavioral indices to stress
- Objective C: Evaluate relationships between behavioral indices (vs physical injury) and mortality
- Objective D: Develop methods for capturing and crabs affected by trawls and appropriate control animals and making them available for evaluation and holding aboard the study vessel
- Objective E: Estimate mortality rates for Alaska crabs encountering different components of bottom trawls
- Objective F: Communicate Results and Follow-up

d. Provide a table showing the timeline and milestones for the entire project.

<u>DATE</u>	<u>Milestone</u>	
June 1, 2007	NPRB funding notification	complete
June - August 2007	Pilot fieldwork (supported by matching funding)	complete
January 2008	Presentation at Marine Science Symposium 2008	complete
May 2008	Lab tests complete	complete
April 2008	Charter of vessel for principal fieldwork	complete
May - August 2008	Principal fieldwork	complete
December 2008	Mortality assessments and analysis complete	complete
January 2009	Presentation at Marine Science Symposium 2009	complete
May 2009	Submission of results for peer-reviewed publication	
August 2009	Follow-up fieldwork on red king crab RAMP	
October-December 2009	Fishing industry outreach	
March 2010	Final report	

3. PROGRESS SUMMARY

a. Describe report period progress.

- Objective A: Evaluate reflex behaviors in Alaska crabs that hold potential as predictors of stress
 - Objective B: Assess the sensitivity of behavioral indices to stress
 - Objective C: Evaluate relationships between behavioral indices (vs physical injury) and mortality
 - Objective D: Develop methods for capturing and crabs affected by trawls and appropriate control animals and making them available for evaluation and holding aboard the study vessel
- Objectives A to D were completed in 2007 and have been published.*

- Objective E: Estimate mortality rates for Alaska crabs encountering different components of bottom trawls
- Objective E was completed in 2008*

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Objective F: Communicate Results and Follow-up

Nearly all of our work in this period has been directed at communicating the results from the 2008 field work, specifically the estimates of mortality for *Chionoecetes opilio* and *C. bairdi* following trawl encounters. These have included presentations to scientific, management and industry meetings and initial work on manuscripts.

b. Describe preliminary results.

No additional preliminary results were generated during this period. Our principal results were reported in the previous progress report.

c. Describe any concerns you may have about your project's progress.

The manuscript of our results with *C. opilio* and *bairdi* is still being developed, partially due to time requirement of the Council presentations and preparation for the additional fieldwork. While this misses our planned May milestone, we expect to submit the first paper during the next performance period.

d. Poster and oral presentations at scientific conferences or seminars

This period saw the principal results of this research made available to the full range of potential users. These results included both the first direct estimates of unobserved mortality rates for both *Chionoecetes opilio* and *bairdi* encountering bottom trawls, as well as demonstrated reductions in mortality achievable with modified gear. Scientific audiences received these results at the Alaska Marine Science Symposium (two oral presentations) in January and the Lowell Wakefield Symposium (poster) in March.

3. Education and outreach

Our outreach during this period included a presentation to the fishing industry on January 9. This occurred at a joint meeting of the Best Use Cooperative and the Groundfish Forum, groups representing Bering Sea Groundfish factory trawlers. The North Pacific Fisheries Management Council (and its Advisory Panel and Scientific and Statistical Committee) received oral reports in February and a written research summary for its June meeting. The reductions in crab mortalities were very relevant to their deliberations on requiring sweep modifications to protect Bering Sea seafloor habitats. In addition, we plan to make additional presentations this Fall, including initial results of the red king crab studies, to the NPFMC and to fishing industry groups. A very timely gathering of Bering Sea and Gulf of Alaska bottom trawlers had been expected to occur in November at the fishing gear research facility in Hirtals, Denmark. Unfortunately, we have just learned that event has been cancelled, due to many fewer participants committing to attend than in past years. We will be working with industry groups to find an alternative setting to discuss our results and follow-up.

4. PROGRESS STATUS

This project remains on schedule and we anticipate meeting the remaining milestones, with the one delay mentioned above. We are very pleased at the opportunity to extend the research to red king crabs and look forward to providing additional useful results in the coming year.

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