

SEMIANNUAL REPORT ON KING AND TANNER CRAB RESEARCH:

UNDER AMENDMENT #3 TO COOPERATIVE AGREEMENT

NA37FL0333 DURING OCTOBER 1, 1996 THROUGH MARCH 31, 1997

Submitted Under Cooperative Agreement NA37FL0333 To

National Oceanic and Atmospheric Administration
National Marine Fisheries Service
P.O. Box 21668
Juneau, Alaska 99802



Edited By

Gordon H. Kruse
ADF&G Project Coordinator

Regional Information Report No. 5J97-06
Alaska Department of Fish & Game
Commercial Fisheries Management and Development Division
P.O. Box 25526
Juneau, Alaska 99802-5526

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FORWARD

Dr. Gordon H. Kruse, ADF&G Project Coordinator

*Alaska Department of Fish & Game, Commercial Fisheries Management and Development Division
P.O. Box 25526, Juneau, Alaska 99802-5526*

This report summarizes semiannual (October 1, 1996 through March 31, 1997) progress on a project titled, "Breeding Success of Legal Size Male Red King Crabs *Paralithodes camtschaticus* (Decapoda, Lithodidae)." Project progress during the first quarter (July 1, 1996 through September 30, 1996) was reported previously (Kruse 1996). An annual report will document the completion of this project on June 30, 1997.

This research project was funded during state fiscal year (FY) 96 under the auspices of NOAA Cooperative Agreement NA37FL0333. Due to logistical problems in collecting specimens for study, an Alaska Department of Fish and Game (ADF&G) request to carry-over unspent FY 96 funds to FY 97 was approved by NOAA on August 26, 1996. The only substantive change in the project description is that deliverables are now due by June 30, 1997 rather than by June 30, 1996.

BREEDING SUCCESS OF LEGAL SIZE MALE RED KING CRABS *PARALITHODES CAMTSCHATICUS* (DECAPODA, LITHODIDAE)

Dr. A.J. Paul, Principal Investigator

*Institute of Marine Sciences, University of Alaska Fairbanks, Seward Marine Center
P.O. Box 730, Seward, Alaska 99664*

Background and Need

Male red king crabs, *Paralithodes camtschaticus*, previously supported an important commercial fishery in Alaska. Currently several fishing areas have very restricted harvest quotas because of low crab abundance. The reasons for the large scale population decreases are poorly understood, but their occurrence has increased the desire to understand the reproductive biology of the species. The fishery is restricted to males larger than 145 mm carapace length (CL), and a decrease in the number of large males in the population due to fishing mortality is to be expected. In nature males in grasping pairs are typically larger than 120 mm. Thus it appears that the larger males are those that mate. The removal of large males by the fishery may affect the reproductive potential of the species. Experiments are proposed in which legal size males will have access to several ovulating females. The experiments will determine how many females legal size males can fertilize. This information will be useful in

reviewing regulations concerning the number of males that can be harvested and still maintain full reproductive potential of the population.

In a previous study of sublegal male reproductive potential, red king crab males 80-89 mm CL were successful in inducing ovulation with 75, 38, 12 and 12% of their 1st, 2nd, 3rd and 4th potential mates respectively. An average of 68% of the eggs initiated division in clutches of their first mate. Corresponding values for their 2nd, 3rd and 4th consecutive mates were 18, 12 and 12% respectively. As male size increased so did the ability to mate with successive females. Males in the 130-139 mm group induced an average of 88, 78, 100 and 44% of their four successive potential mates to ovulate. Clutches of the first through fourth females bred by 130-139 mm males had 87, 76, 95, and 38% of the eggs initiate division on the average. Thus these sublegal males often fertilize only part of an egg clutch.

Several older observations exist for multiple matings with king crabs. In an early report (Paul and Paul 1990) 11 new shell males, 120-144 mm, bred 51 females that all extruded full clutches. Males near legal size have been reported to mate as many as 13 successive times, but their mating ability decreased after the sixth or seventh mating (Powell et al. 1974). None of those reports quantified egg viability and it is possible that the reproductive capacity of those red king crab males was overestimated. During this study mating experiments with legal size males will be redone with egg viability monitored to verify or discount existing observations.

Project Description

The reproductive potential of red king crab males 140-200 mm CL will be examined. Individual legal-sized males will have access to four to ten females and breeding behavior, ovulation and percentage of dividing eggs in clutches will be recorded. The number of females a male has access to will be determined by the number of crabs collected by the Alaska Department of Fish and Game (ADF&G). A mating will be considered successful if a male induces a female to ovulate and eggs initiate division. The results will provide information on the reproductive potential of large males that will be useful to evaluate the size limit, annual harvest levels, and fishery thresholds.

Goals For FY 97

The overall objective of this project is to provide information on the reproductive biology of legal size red king crab to assist ADF&G in the management of stocks of this species. Specifically the following aspects of the reproductive biology of red king crab will be investigated:

- (1) Ability of 140 mm CL and larger males to breed and successfully fertilize successive females.

- (2) The percentage of developing eggs in clutches of females mated to males of different sizes and to males that bred several females.

Progress During 1st Quarter

On August 26, 1996, NOAA approved the extension of FY 96 funds and deliverables into FY 97. No experiments were planned to take place during the first quarter because king crab reproduction takes place in late winter and spring. Collections of specimens were planned for late winter.

Progress During 2nd and 3rd Quarters

ADF&G initiated specimen collection efforts in early February 1997 in conjunction with another crab research project off Kodiak Island. Commercial-style crab pots were fished in areas expected to yield red king crabs. It was originally expected that sampling goals could be achieved in 2-3 days of fishing. However, catch rates were much lower than anticipated. As a result, ADF&G acquired additional pots to increase sampling efforts. Pots were fished for a total of approximately 4 weeks. Poor catch rates are attributed to locally depressed king crab abundance.

By mid-March, the period for egg hatching and female molting was rapidly approaching and ADF&G had to terminate collection efforts so that specimens could be shipped to the Seward Marine Center to initiate the breeding study. A total of 16 mature female and 20 legal male red king crabs were collected by ADF&G. Although short of the ideal target sampling goal of 80 females and 20 males, it is anticipated that sample size will be adequate to meet project objectives.

After receipt of red king crabs at the Seward Marine Center in mid-March 1997, the crabs have been kept in captivity in a running seawater facility awaiting the mating season which usually occurs in April and May. Therefore, no laboratory experiments were carried out during the 2nd and 3rd quarters.

Plans for the Remainder of the Year

Once the mating season begins, breeding experiments will be carried out following the methods outlined in the proposal. The study design requires 4 females to be allocated for each male to determine whether males can breed with more than one female. Thus, the 16 females will be enough to test the reproductive capacity of 4 males.

Breeding should be completed by mid-June 1997. Results from this experiment will be combined with unpublished data from 6 other legal males mated during previous years in experiments conducted by the principal investigator. Aggregate results on legal-sized males will be compared to results from a similar study on sublegal-sized males (Paul

and Paul 1990) A manuscript will be prepared for publication. The first draft of this paper is anticipated to be completed by the end of June 1997.

Benefits of Project

This study will measure male reproductive capacity that is useful to resource managers who rely on such information to determine legal size limits, harvest levels, and fishery thresholds that prevent recruitment overfishing. Results of our experiments will be published in a peer-reviewed journal and appropriate management reports.

ACKNOWLEDGMENTS

Special thanks are extended to Al Spalinger and his staff and Ron Kutchick and the crew of the *RV Resolution* for their extra efforts to collect red king crabs for this experiment, and to Peggy Murphy for reviewing a draft of this report.

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