AKCRRAB Project Progress Report January 1–March 31, 2008

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Project Introduction

Stock enhancement has the potential to be an effective tool for rehabilitation of depleted stocks and for fishery management and is currently in progress for crab and lobster species in the United States and worldwide. However, before implementation, research is needed to assess the feasibility, effectiveness, and possible consequences of a stock enhancement program. The Alaska King Crab Research and Rehabilitation and Biology (AKCRRAB) Program was created in 2006 as a partnership among the University of Alaska Fairbanks, Alaska Sea Grant, the Alutiiq Pride Shellfish Hatchery (APSH), NOAA Fisheries, and several community-based groups to begin the necessary research to assess the feasibility of stock enhancement for king crabs in Alaska. Commercial harvest of Alaska king crab was for decades active and lucrative. However, many stocks declined drastically more than 20 years ago and have not rebounded, even in the absence of fishing. Work is being done to study the early life history of red and blue king crab species to develop methods and determine feasibility of hatchery rearing. This project addresses methods for culture of larvae and juveniles in the Alutiiq Pride Shellfish Hatchery in Seward, Alaska.

Project Outline

The AKCRRAB project currently has two primary phases. The first phase focuses on hatchery scale cultivation of red and blue king crab larvae and evaluates effects of stocking density, diet, and other water parameters on growth and survival. The second phase focuses on hatchery scale cultivation of juvenile red and blue king crab and evaluates effects of stocking density, diet, substrate type, and other culturing parameters. Juvenile experiments also aim to investigate tagging techniques in order to track hatchery crabs in the wild and perform simulated releases in large tanks.

The long-term vision on the AKCRRAB project is to conduct field studies to address questions regarding habitat preference, predator/prey interaction, and tagging. Planned genetic work may determine a genetic baseline of wild stocks and assess potential genetic risks of releasing hatchery crabs. There are also long-term plans to look at disease history of wild stocks and the pathology of individuals to be out-planted.

Work Completed during 1-1-08 to 3-31-08

January

- Broodstock care and developing husbandry techniques.
- Coldwater algae culture.
- Fine-tuning logistics for the next year of larval rearing experiments.
- Broodstock embryo monitoring to develop hatch model.
- Hatchery improvements.
- *Artemia* flushing experiments.

February

- Broodstock care and developing husbandry techniques.
- Coldwater algae culture.
- Fine-tuning logistics for the next year of larval rearing experiments.

- Broodstock embryo monitoring to develop hatch model.
- Presented at AKCRRAB project at Cook Inlet Aquaculture meeting.

March

- Broodstock care and developing husbandry techniques.
- Coldwater algae culture.
- Fine-tuning logistics for the next year of larval rearing experiments.
- Broodstock embryo monitoring to develop hatch model.
- Red king crab hatch is first seen on March 12.

Summary of Hatch model

Based on embryo eyespot (length, width) and yolk length measurements, we were able to predict hatch date within ~1 week. Simple methods to predict larval release of red king crab may be useful as a managing tool for researchers and hatchery managers. Predicting hatch timing would allow for cost effective preparations for larval rearing research and production as larval food production and infrastructure can be costly to maintain. Based on the literature and anecdotal observations from 2007, larvae were expected to release when eyespots reached ~390 µm.

Embryo measurements

Examination of embryos began in early December 2007. All eggs were examined live using a compound microscope (Nikon AlphaPhot YS) at 40x and 100x magnification with a back light. Embryo samples were taken at the edge of the clutch and placed in a spot plate with ambient seawater. Embryo measurements included egg color, maximum eyespot diameter (length), and minimum eyespot diameter (width). When viewing the eggs we selected eggs horizontally oriented to make eyespot measurements. Measurements of the largest eyespot were recorded in an attempt to predict the soonest possible release under the assumption that the largest eyespot would release first.

Using the dorsal view of the eggs, we also estimated the percent height of the yolk mass (% yolk height = (yolk height / egg height) x 100). The most-developed embryos were taken to predict when the first sign of hatch would appear (Fig. 1). In this case crab #84 was had the largest eyespots and was predicted to hatch on ~March 11, 2008 based on the model. Hatch was first seen on March 12. This model has the potential to be extremely useful in predicting the hatch data of red king crab embryos for aquaculture purposes.

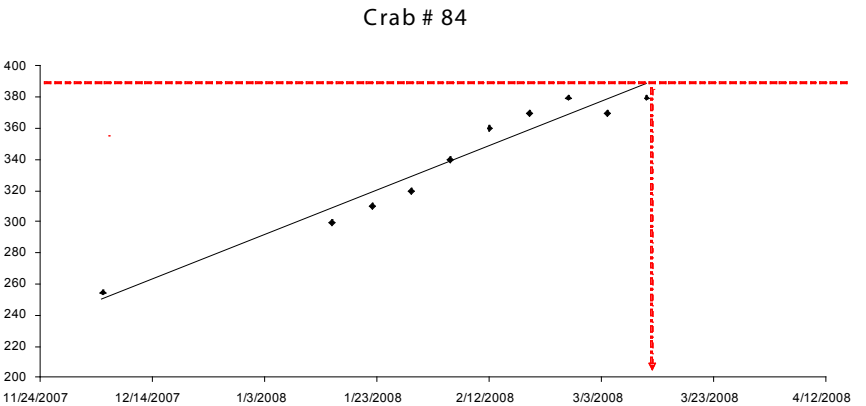

Figure 1. Eyespot development of crab #84. Hatch was predicted to occur when eyespot length reached 390 µ.

Work Forecast

In 2008, we plan to investigate effects of stocking density on small and large scales with modifications to water flow, water filtration, and tank aeration to improve larval survival. Red king crab broodstock first released larvae on March 12, 2008. With a successful larval run, we plan to conduct juvenile rearing production trials to investigate effects of diet and stocking density on survival. As juvenile crabs grow, we also plan to investigate growth rates and try various physical and genetic tagging methods.

Twelve blue king crab broodstock are to be obtained during March 21-28, 2008 near Little Diomede Island, Alaska, via crab pot. Crabs will be shipped to Seward from Little Diomede after all twelve crabs are obtained. Larvae will be used for further experimentation of effects of various diet regimes, stock densities, and tank parameters to further fine-tune hatchery scale production of king crab.

The following is work planned for 2008, organized by report periods.

4-1-08 to 6-31-08

Duties will include:

- Broodstock care.
- Broodstock pathology sampling.
- *Artemia* culture.
- Algae culture.
- Large-scale king crab larval rearing experiments.
- Small-scale king crab larval rearing experiments.
- Hatchery maintenance.
- Broodstock permitting.
- Data recording.
- Data analysis.

7-1-08 to 9-31-08

Duties will include:

- Broodstock care.
- Broodstock pathology sampling
- *Artemia* culture (if needed).
- Algae culture (if needed).
- Large-scale king crab larval rearing experiments (depending on timing of larval release).
- Small-scale king crab larval rearing experiments (depending on timing of larval release).
- Hatchery maintenance.
- Broodstock permitting.
- Data recording.
- Data analysis.
- Juvenile production experiments (depending on timing of larval release).
- Potential fieldwork in Kodiak.

10-1-08 to 12-31-08

Duties will include:

- Broodstock care (if needed).
- Broodstock pathology sampling (if needed).
- Hatchery maintenance, improvement.
- Broodstock permitting.
- Data recording.
- Data analysis.
- Juvenile production experiments (depending on timing of larval release).
- Report writing.
- Potential fieldwork in Kodiak.

Personnel

Name: Benjamin Daly
Title: Research Biologist
Number of hours: 448