

# Cultivation of Blue King Crab Larvae, *Paralithodes platypus*: Effects of Diet, Temperature, and Density

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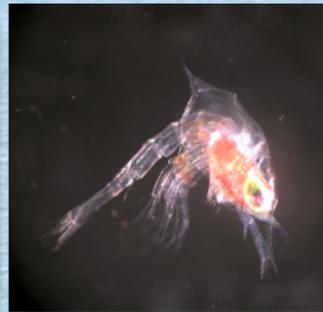
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## Introduction

The blue king crab (*Paralithodes platypus*) was a valuable commercial fishery species around the Pribilof Islands in the Bering Sea until the late 1990s. At that time populations declined to levels considered too low to support commercial fishing, stimulating interest in the early life history of the crabs. In order to study young crab in the laboratory we investigated the best conditions for cultivating the larvae from hatching to the first juvenile crab stage (C1). We tested the effects of diet, temperature, and rearing density on larval survival.



Adult female blue king crab



Stage 1 blue king crab zoea



Glaucothoe larval stage



First juvenile crab stage

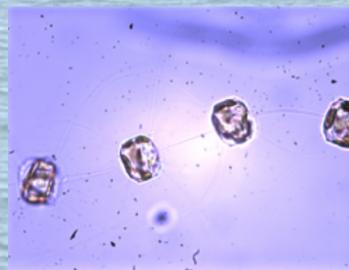
After hatching, blue king crabs pass through five larval stages, Zoea I-IV and the transitional glaucothoe stage, before metamorphosing into the first juvenile crab stage.

## Methods

### Culture Conditions for Blue King Crab Larvae

| Treatment Name | Larval Food   | Temperature °C | Density (zoeae·l <sup>-1</sup> ) | Number of Larvae |
|----------------|---|----------------|----------------------------------|------------------|
| UNFED          | None  | 6              | 10                               | 60               |
| THAL           | <i>Artemia</i> enriched with <i>T. nordenskiöldii</i> | 6              | 10                               | 60               |
| A+THAL         | <i>Artemia</i> and live <i>T. nordenskiöldii</i>      | 6              | 10                               | 60               |
| ISO6           | <i>Artemia</i> enriched with <i>Isochrysis</i> paste  | 6              | 10                               | 60               |
| ISO3           | <i>Artemia</i> enriched with <i>Isochrysis</i> paste  | 3              | 10                               | 60               |
| ISO9           | <i>Artemia</i> enriched with <i>Isochrysis</i> paste  | 9              | 10                               | 60               |
| DENS20         | <i>Artemia</i> enriched with <i>Isochrysis</i> paste  | 6              | 20                               | 120              |
| DENS40         | <i>Artemia</i> enriched with <i>Isochrysis</i> paste  | 6              | 40                               | 240              |

The experiment consisted of 8 treatments grouped by diet, temperature, and density. Four different diets were tested: 1) larvae receiving no food in order to determine if they were lecithotrophic (UNFED); 2) larvae receiving *Artemia* nauplii enriched with the diatom *Thalassiosira nordenskiöldii* (THAL); 3) larvae receiving newly-hatched unenriched *Artemia* nauplii plus culture water supplemented with *T. nordenskiöldii* (A+THAL); and 4) larvae receiving *Artemia* nauplii enriched with *Isochrysis* Instant Algae® paste (ISO6), considered the "standard" diet. All diets were tested at 6°C and at a larval density of 10 zoeae·l<sup>-1</sup> with 6 replicates per treatment. The *Isochrysis* diet was also tested at 3°C (ISO3) and 9°C (ISO9), and at densities of 20 (DENS20) and 40 (DENS40) zoeae·l<sup>-1</sup>.



Diatom *Thalassiosira nordenskiöldii*



Diatom culture room



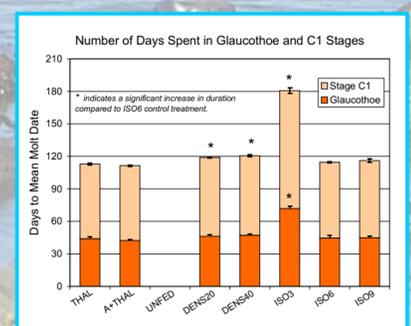
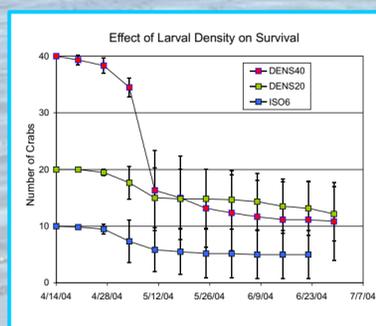
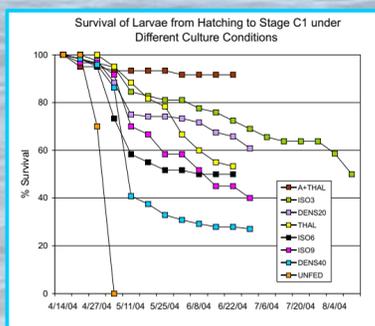
Beakers and tubes for larval crab culture

Crab zoeae were cultivated in PVC tubes with 625 µm mesh glued to the bottom. Each tube was placed in a 1 liter glass beaker filled with filtered and UV-sterilized seawater. Tubes and their larvae were transferred to

beakers with fresh seawater daily, prior to feeding. Molts and dead larvae were removed daily, and larval counts were made weekly until all larvae molted to C1.

## Results

Survival on the A+THAL diet (91.7%) was significantly higher than all others, whereas all UNFED larvae died within 21 days. Survival in all other treatments was not significantly different. Survival decreased slightly with increasing temperature, but not significantly. Density had no significant effect on survival, but final mean density (16 zoeae·l<sup>-1</sup>) was similar in the DENS20 and DENS40 treatments suggesting that a maximum carrying capacity for these conditions had been reached. Development time from hatching to stage C1 was identical (74 d) at 6°C and 9°C, but was lengthened considerably (105 d) at 3°C.



## Conclusions

### Diet:

- High survival (91.7%) using a diet of unenriched *Artemia* nauplii combined with *Thalassiosira nordenskiöldii*
- Zoeae are not lecithotrophic

### Temperature:

- 6°C is adequate, no increase in survival at higher temperature (9°C)
- Colder temperature (3°C) prolongs development

### Density:

- Highest survival achieved at up to 16 zoeae per liter
- Delayed molting to C1 at higher densities

These conditions can be adapted to produce larger numbers of juvenile crab for laboratory research or for enhancement of wild crab stocks.

## Acknowledgements

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