Density Effects in Larval Rearing of Red and Blue King Crab

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Larval Food Production

Microalgae

Utilized standard commercial hatchery methods

Scaling up microalgae from small volume stock cultures in test tubes and flasks into 100 L production cylinders

Species Produced:

- 3H (Thalassiosira pseudonana)
- T-Iso (Isochrysis galbana)
- PV (Pavlova lutheri)
Larval Food Production

**Artemia**
(Brine Shrimp nauplii)

Production utilizing standard commercial hatchery techniques

Series of steps leading from cysts to nauplii

- Prehydration/Disinfection
- Incubation
- Hatching
- Harvest of Instar I nauplii
Observations on RKC Larvae Reared in the 1200 L Hatchery Tanks

Primary Goals

• Monitor the effect of different hatchery stocking densities on larval survival

• Conduct a preliminary study testing the effect of a preserved diet vs the standard live diet on larval survival

• Maximize production of juvenile red king crab for subsequent tagging and nursery rearing studies

Note: Observational Study Only! – No Replicated Treatments
Methods: RKC

Tank Setup
Standard Live Diet:
Moderate density – Yellow
High density – Orange
Ultra High Density – Red

Preserved Diet:
High Density – Green

1200 Liter

1.12 m

1.3 m

40/L
67/L
96/L
100/L
194/L
77/L
25/L
42/L
Methods: RKC

Two Diets Tested

Live Diet:
Artemia fed at 2-3/ml once daily
Cultured algae fed at 10,000 to 20,000 cells/ml once daily
Algae species included *Isochrysis galbana*, *Thalassiosira pseudonana*, and *Pavlova lutheri*.

Preserved Diet:
Frozen Artemia fed at 2/ml once daily
Preserved *Isochrysis galbana* concentrate fed at 20,000 cells/ml once daily
Red King Crab Larval Survival
Live Feed Only

Percent survival vs larval stage for different treatment levels:
- Moderate (N=3)
- High (N=2)
- Ultra High (N=1)

Note: The graph shows the survival rates for each larval stage from Z1 to Z4.
Red King Crab Larval Survival: Live vs Preserved Diet

![Graph showing larval survival rates for Standard Live and Preserved diets across larval stages Z1, Z2, and Z3. The graph indicates a decreasing survival rate from Z1 to Z3 for both diets, with Standard Live consistently showing higher survival rates than Preserved.](#)
Blue King Crab

Goals:

Build on knowledge obtained during RKC culture

- Scientifically sound experiment
  - replicates
- Eliminate handling stress
  - Initial and final counts
Methods: BKC

• 3 Treatments
  – 10 larvae/L (12,000 total larvae)
  – 30 larvae/L (36,000 total larvae)
  – 100 larvae/L (120,000 total larvae)
Methods: BKC

Tank Setup

• 3 treatments
  – 3 replicates

1200 Liter

1.3 m

1.12 m

10/L

30/L

100/L

30/L

10/L

30/L

100/L

30/L

100/L

100/L
Methods

Feeding regime: pulse feeding

*Artemia* (Brine shrimp nauplii)
- 2 *Artemia*/ml
  - 10/L, 30/L
- 4 *Artemia*/ml
  - 100/L

*Algae: Isochrysis galbana*
- 25,000 cells/ml

(Epelbaum and Kovatcheva 2005)
Water Temperature

date
degree C

Z2
Z3
Z4
G

9 days
9 days
8 days
10 days

Z1 → Z2 → Z3 → Z4 → G
Blue King Crab Larval Survival

Total Organisms

initial Z1 density       Glaucothoe

10/L
30/L
100/L
Blue King Crab Larval Survival

![Graph showing the relationship between Z1-G percent survival and stocking density (larvae/L).]
Discussion

• Good survival in early larval stages (RKC + BKC)

• High mortality started around mid to late Z3 (RKC) mid to late Z4 (BKC)
  • All densities

• Continued throughout Glaucothoe/C1
  – Less than 1% survival to C1
Discussion: Possible Causes

Nutritional deficiency?

– Feeding efficiency (turbulent aeration)
  • Influences ability to capture and consume food items

– Food density
  • Diluted with continuous flushing
Discussion: Possible Causes

Water Quality?

• Bacteria
  – *Vibrio* spp.
  – *Leucothrix* spp. (filamentous)

• Contaminants
  – hydrocarbons
Discussion

Learned much about hatchery scale larval rearing

• Experimental and anecdotal observations

Similar trend in both species

Refine methodology

– tease apart and address potential causes of mortality