The production of brown shrimp (*Crangon crangon*) in aquaculture: results from the project CranGo

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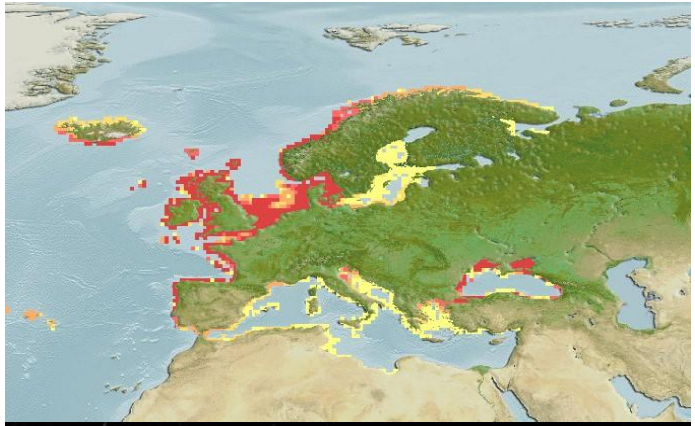
The brown shrimp *Crangon crangon*

- Is a small, bottom-dwelling crustacean
- It plays a vital role in marine ecosystems
- Is a commercially valuable species in European fisheries
- Distribution
  - Northeastern Atlantic
  - North Sea
  - Baltic Sea
  - Mediterranean



The brown shrimp *Crangon crangon*

Size	Adults 30 – 50 mm
	Can reach up to 90 mm
Habitat	Shallow coastal waters, estuaries, and brackish lagoons.
	Prefers sandy or muddy seabeds
Behavior	Nocturnal feeder, burrows into sediment during the day
	Exhibits camouflage by changing color to match surroundings
Diet	Carnivorous
	feeds on small benthic organisms, ann discards
Reproduction	Females mature at 22 – 43 mm, males
	Eggs hatch into planktonic larvae, whi

Commercial Importance & Statistics

- Main Fishing Areas
  - Southern North Sea, especially the Wadden Sea.
  - Major producers: Germany, Netherlands, Denmark
- Processing
  - Most brown shrimp caught in the North Sea are cooked onboard and then peeled by hand in Morocco, which adds cost and delays
- Prices
  - Per kg, unpeeled
    - In March/2025 – 10 to 13 euros
    - Current – 5 euros
  - Retail, per kg, peeled
    - Up to 100 euros

Prices are higher...


Bild STARTSEITE NEWS POLITIK REGIO UNTERHALTUNG KAUFBERATER SPORT FUSSBALL RATGEBER GESUNDHEIT SEX & LIEBE AUTO SPIELE

Nur noch 1057 Tonnen gefangen

Krabben-Krise an der Nordsee verschärft sich

Was bedeutet das für die Krabbenbrötchen-Preise?

Only 1,057 tons caught

Brown shrimp crisis in the North Sea worsens

Fishermen in crisis: Why brown shrimp prices are high


NDR

ig-Holstein Mecklenburg-Vorpommern Hamburg Sport Ratgeber Kultur Geschichte

Fischer in der Krise: Deshalb sind die Krabben-Preise hoch

Stand: 14.04.2025 16:13 Uhr

...and stocks are decreasing

ZAHLEN FÜR WESER-EMS

Krabbenfischer fahren historisch niedrige Fangmenge ein

Svenja Fleig 07.03.2025, 12:00 Uhr

Shrimp fishermen land historically low catches
44% less compared to 2023

Why the fishing season for brown shrimp in the North Sea is already over

In 2024, the season ended a month earlier than usual.

NORDDEUTSCHE FISCHEREIKONFERENZ IN CUXHAVEN

Warum die Fangsaison für die Krabbenfischer in der Nordsee jetzt schon gelaufen ist

Holger Bloem 20.11.2024, 15:58 Uhr

Main fishing methods for brown shrimp

Beam Trawling

- Most common method in the North Sea and coastal European waters.
- Involves dragging a horizontal beam with nets across the seabed.
- Equipped with tickler chains that stir up shrimp from the sediment.

- ⚠ Environmental Considerations
  - Beam trawling can disturb benthic habitats and lead to bycatch.
  - Efforts are underway to develop more sustainable gear, including:
    - Pulse trawling (using electrical pulses to stimulate shrimp).
    - Selective sorting grids to reduce bycatch.

A new species for aquaculture?

Crangon crangon is a popular, high-priced regional product, but fishing along the German coast is under threat because the EU wants to restrict bottom trawling and ban it completely in protected areas in order to protect the seas.

In this way, the project CranGo aimed to investigate the production potential of the species in closed facilities, and to evaluate if *Crangon crangon* is suitable for aquaculture.

CranGo catching

- Cuxhaven/Germany
  - Duhnen
- April 2024
  - Early cycle
  - ~200 shrimp
- Trawling net

CranGo catching

- Cuxhaven/Germany
  - Sahlenburg
  - Wadden Sea National Park
- June/August 2024
  - More successful
  - ~3000 shrimp

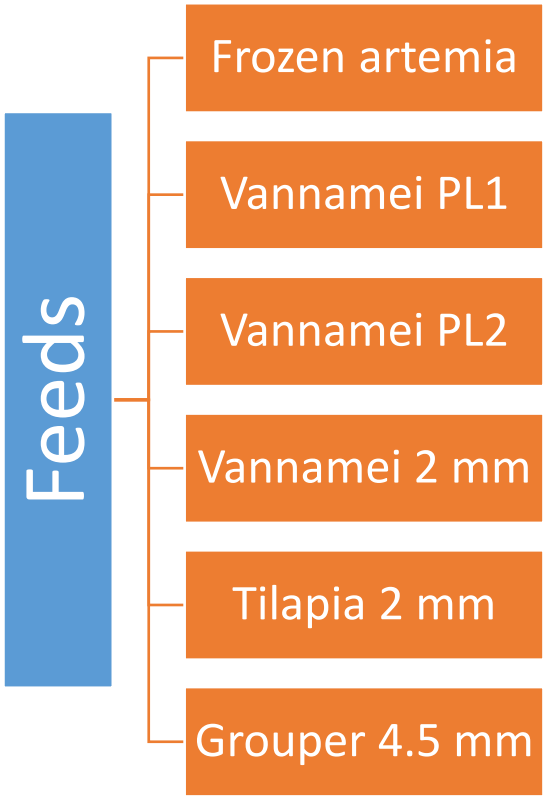
RAS setup for CranGo

- 12 Tanks
  - 20 L
  - Water temperature 13 °C
  - Salinity 33 ppt (water from the North Sea + artificial salt)
  - Shading net (50%) to cover the tanks
- Water treatment
  - Biofilter, protein skimmer, drum filter, UV light, sump, chiller
- Substrate
  - Aquarium sand for ornamental shrimp
    - 0.7 – 1.2 mm
- Room temperature 13 °C




CranGo experiments

- Feeding pre-trial
- 30 days
- Average survival rate = 70%
  - Stocking density = 15 shrimp/box (750 shrimp/m^3)



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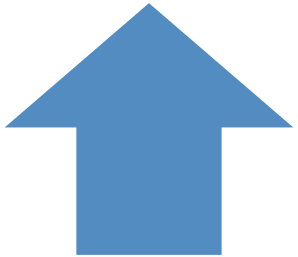
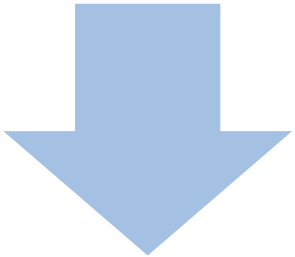


Good acceptance

- Frozen artemia
- Shrimp PL2

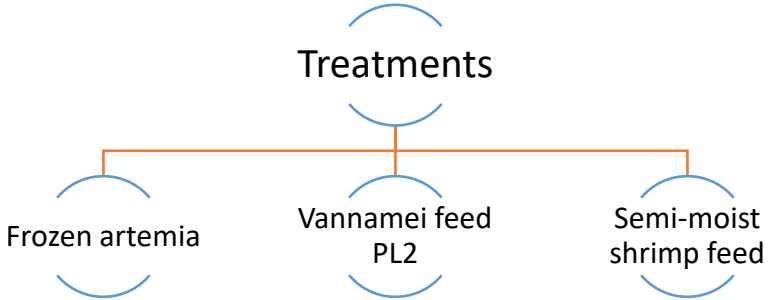


Poor acceptance

- Grouper 4.5 mm

CranGo experiments

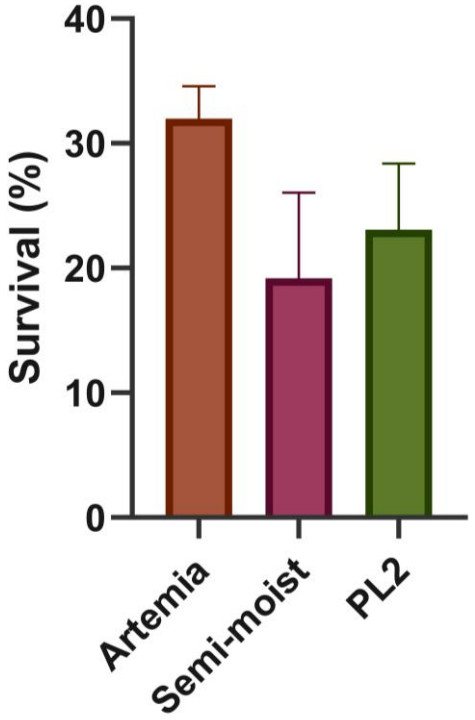
- **Feeding trial**
- 4 replicates
- Stocking density: 70 shrimp/box – 3500 shrimp/m^3
- Experimental period: 34 days
- Initial weight: 0.07 g



CranGo experiments

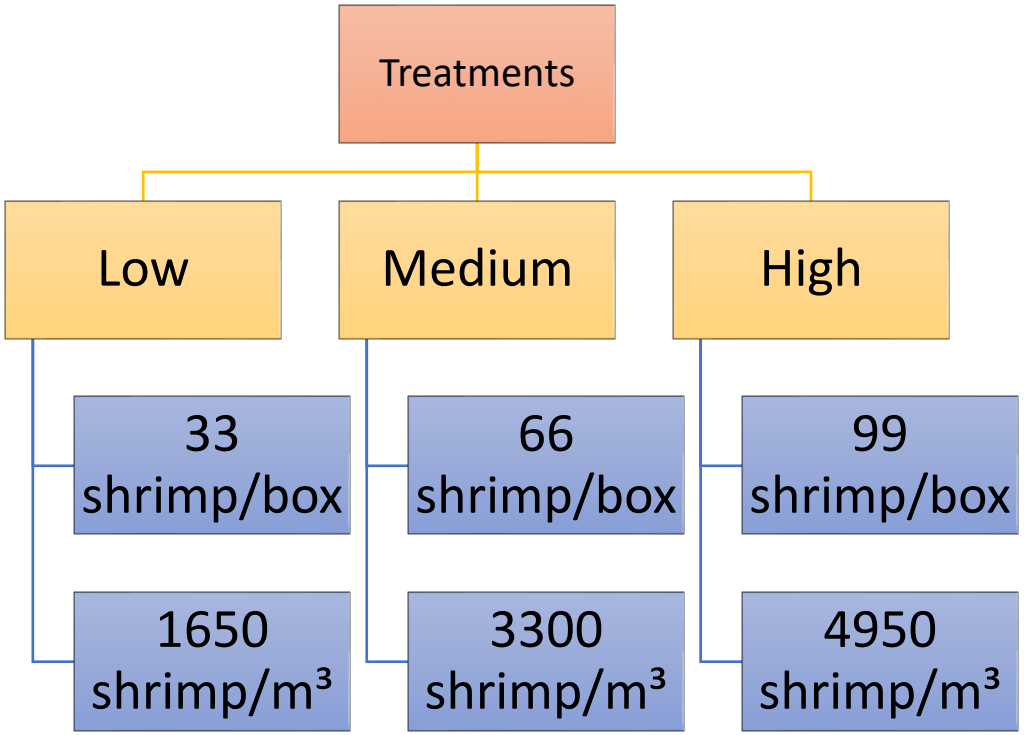
- Production indexes of *Crangon crangon* cultivated with different feed types for 34 days

	Artemia	Semi-moist	PL2	*p-value*
Mean weight (g)	0.13	0.12	0.09	0.2260
Survival (%)	31.43^{a}	19.05^{b}	22.86^{a}	0.0433
Productivity (g/m²)	29.46^{a}	15.78^{b}	14.86^{b}	0.0041



CranGo experiments

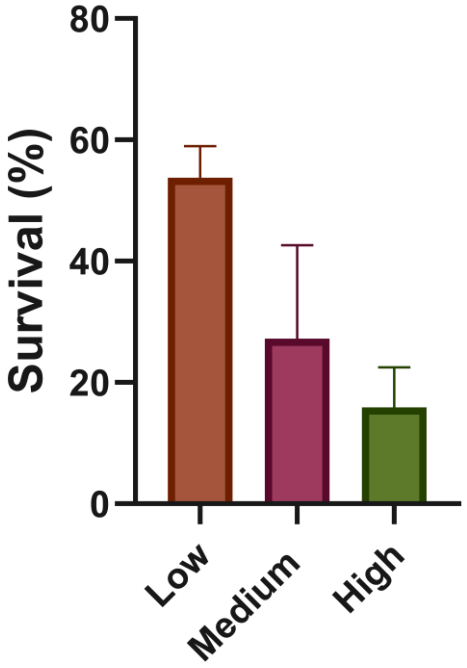
- **Stocking density trial**
- 4 replicates
- Experimental period: 52 days
- Initial weight: 0.08 g
- Frozen artemia



CranGo experiments

- Production indexes of *Crangon crangon* cultivated in different densities for 52 days

	Low	Medium	High	*p-value*
Biomass final (g)	4.1 ± 1.4	3.6 ± 1.1	3.9 ± 0.4	0.8328
Final Weight (g)	0.23 ± 0.09	0.39 ± 0.40	0.32 ± 0.21	0.9131
Survival (%)	53.8 ± 4.5^{b}	27.3 ± 13.3^{ab}	15.9 ± 5.7^{a}	0.0048



Is *Crangon crangon* suitable for aquaculture?

Parameter	***Penaeus vannamei*** (Pacific White Shrimp)	***Crangon crangon*** (Brown Shrimp)
Growth Rate	Fast: ~0.25–0.35 g/day under optimal conditions	Moderate: ~0.05–0.1 g/day; temperature-dependent
Survival Rate	High: 73–90% depending on stocking density and water quality	Variable: 20–70%; sensitive to salinity and pH
Feeding	Commercial formulated feed; 4x/day; FCR ~1.4	Omnivorous; feeds on benthic invertebrates; cannibalism observed
Stocking Density	Intensive: 40–80 shrimp/m^2 in semi-intensive systems	Low: ~10–20 shrimp/m^2 in experimental aquaculture; high density leads to stress
Reproduction	Controlled breeding; multiple spawns/year; hatchery-reared larvae	Seasonal spawning; females spawn 3–5 times/year; difficult to close life cycle in captivity
Aquaculture Challenges	- Disease outbreaks (e.g., WSSV, EMS) - Water quality management - Market saturation in some regions	- Sensitive to salinity & temperature - Larval rearing is difficult - No established commercial hatchery system

Key future research areas

- 1. Reproduction and Hatchery Development
  - **Controlled breeding protocols:** Understanding mating behavior and spawning triggers.
  - **Larval rearing techniques:** Improving survival rates and reducing cannibalism.
  - **Closing the life cycle:** Achieving full-cycle aquaculture (from broodstock to market size).

- 2. Growth and Nutrition
  - **Optimal diet formulation:** Identifying feed types and feeding schedules.
  - **Feed conversion efficiency:** Measuring FCR under different conditions.
  - **Growth rate optimization:** Studying temperature, salinity, and photoperiod effects.

Key future research areas

- 3. Health and Survival
  - **Disease resistance**: Identifying pathogens and developing prevention strategies.
  - **Stress tolerance**: Evaluating responses to crowding, handling, and water quality.
  - **Mortality reduction**: Addressing larval and juvenile vulnerabilities.

- 4. System Design and Stocking
  - **Stocking density studies**: Balancing growth, survival, and space.
  - **Tank and pond design**: Optimizing for burrowing behavior and sediment needs.

- 5. Economic Viability
  - **Cost-benefit analysis**: Comparing production costs to market value.
  - **Market development**: Assessing consumer demand and pricing.
  - **Supply chain logistics**: Processing, packaging, and distribution.

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