**Problem Definition**

**Introduction**

The production of sufficient live food for the larviculture stage is a bottleneck for aquaculture expansion and diversification. As a substitute for the natural food, the larvae (“nauplii”) of the brine shrimp *Artemia* are used as a universal live food source.

To tackle the increasing demand of *Artemia* from natural salt lakes, *Artemia* production in salt ponds are maintained through a labour intensive and economically costly stimulation of microalgae blooms and supplementation with inert feeds.

Recent field studies are trying to optimize such salt pond based *Artemia* production by stimulating the naturally occurring halophilic bacterial flora as additional food source for the *Artemia* nauplii. However, in these xenic and open culture systems there is no way to assess the nutritional contribution of bacterial biomass among a variety of available feeds.

**Objectives**

- To investigate for the first time *Artemia* nauplii’s ability to survive and grow on diets consisting exclusively of halophilic bacteria biomass, typical for the hypersaline environment where *Artemia* occurs.

- To understand the relative importance of different halophilic bacterial genera and species for the *Artemia* life cycle as part of the hypersaline food web, and to shed light on the potential of this microorganisms to maximize *Artemia* production in salt ponds.

**Experimental Design**

*Gnotobioc* (animals cultured in axenic conditions or with a known microflora) *Artemia* culture systems were used.

### Principle of Gnotobioc Studies

![Principle of Gnotobioc Studies](image)

**Tested diets**

- A halophilic bacterial strain belonging to a genus described as associated with *Artemia* in natural ecosystems was evaluated as mono-diet for *Artemia* culture when offered as live or dead biomass.

- Two controls were used:
  - Negative Control (NC) → Starvation
  - Positive Control (PC) → Marine bacterial strain LVS3 (*Halomonas* hydophilica)

**Tested culture salinities**

- Tests were conducted with culture water at 35 g/L and at 100 g/L salinity

**Results**

### Experiment 1: 5 days culture experiment to assess survival and growth of *Artemia* nauplii when fed a mono-diet of halophilic bacteria biomass

<table>
<thead>
<tr>
<th>Salinity (g/L)</th>
<th>Artemia Survival</th>
<th>Artemia Growth (Day 5)</th>
<th>Artemia Swimming Speed (Day 5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>-</td>
<td>b a b b</td>
<td>6.7</td>
</tr>
<tr>
<td>100</td>
<td>-</td>
<td>b a b b</td>
<td>7.0</td>
</tr>
</tbody>
</table>

**Main Findings**

- *Artemia* nauplii have the ability to **survive and grow** on diets consisting of pure biomass of halophilic bacteria strains.

- The positive effects on **development and swimming speed** of the tested halophilic mono-diets compared to both controls in both salinities, clearly denotes their value as food item for *Artemia* culture.

- *Artemia* shows **better performance** when fed with its naturally associated halophilic microbiota than when fed with marine bacteria.

**Conclusion**

The acquired knowledge is a crucial contribution to understand the role of these bacteria in the hypersaline food webs, illustrating that they can be an integral part of the *Artemia* diet. Furthermore our results indicate that the strategy to stimulate the formation of halophilic biofloc and bacterial aggregates in ponds should indeed provide a valuable extra source of nutrients for *Artemia*.  

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