PROBIOTICS AND IMMUNOSTIMULANTS AS NUTRITIONAL SUPPLEMENTS FOR FISH LARVAE IN AQUACULTURE

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Aquaculture – Importance and Bottlenecks

Currently, most exploited fish stocks are overfished (Froese et al., 2011). Stagnating profits in the fishing industry and the increasing demands of a growing world population have resulted in a gap of supply. An alternative to fishery overharvesting wild fish stocks is aquaculture. The term aquaculture describes the production of aquatic organisms under controlled conditions; it accounts for nearly 50 percent of the world's food fish (FAO, 2012). Major problems in aquaculture are a high mortality in the early life stages of fish and epidemics caused by pathogens. As a consequence, successful breeding and the availability of high-value marine fish larvae are still main bottlenecks in aquaculture production.

A promising solution

Early life stages are extremely sensitive, therefore, explicit knowledge is necessary to reach efficient growth and maximal survival rates of fish larvae in aquaculture. Since the adaptive immune system of fish larvae is not yet fully developed (Janeway, 2001), the stimulation of the larval immune system by using probiotics and immunostimulants is a promising tool to increase survival rates. The survival of probiotics in the gastrointestinal tract is considered a prerequisite for the competitive exclusion of pathogens and for the stimulation of the immune system (Denev et al., 2009). Furthermore, immunostimulants have been shown to activate both specific and non-specific immune responses (Sakai, 1999), but have rarely been used for larval rearing.
Therefore, the aim of our study is to investigate the suitability of probiotics and immunostimulants as nutritional supplements for fish larvae of important marine aquaculture species.

Planned studies

Developing efficient methods to apply probiotics and immunostimulants to the larval fish, e.g.:

- directly through the rearing water
- via *Artemia*
- via *Brachionus*

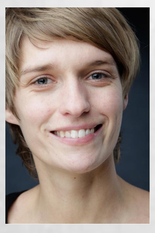
Measuring the response in fish larvae by determining:

- survival rate
- growth rate
- condition (RNA/DNA ratio)
- immune gene expression





Model species: *Scophthalmus maximus*
(Photos: S. Porter and larvalbase.org)



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