ALLIANCE™
(https://debug.globalseafood.org)

Responsible Seafood ADVOCATE

Health & Welfare

Proactive health management using probiotics in marine fish hatcheries

1 October 2001

By Daniel D. Benetti, Ph.D. , Federico J. Rotman and Erik DeMicco

University of Miami attempts to determine the benefits of probiotics with tropical marine fish species

Probiotic trials with larval spotted sea trout have shown faster growth and greater survival rates in the treated fish.

Recent hatchery progress with tropical marine fish has raised interest in the feasibility of establishing commercial grow-out operations to supply a strong market demand. However, the availability of sufficient hatchery-produced fingerlings remains the main problem hampering commercial aquaculture development of many high-value tropical marine fish species in the Americas and the Caribbean. The main reason is difficulties in culturing the early life stages, especially for species exhibiting high metabolism and fast rates of development and growth. Research addressing hatchery technology is the first and most crucial stage for industry development. Innovation and technology are needed to meet this challenge.

Diseases still a problem

Efforts to produce mass quantities of high-value tropical marine fish fingerlings in hatcheries are still undermined by disease outbreaks during early developmental stages of larvae. In temperate regions (e.g. Asia, Europe, Australia), where marine fish aquaculture is a well-developed and profitable industry, hatchery diseases are mainly controlled using vaccines and anti-microbial compounds (antibiotics).

Chemotherapeutants

Although chemotherapeutants are an effective means of decreasing larval fish mortality, their use is not encouraged because of the risk of developing antibiotic-resistant bacteria strains, the chemical impact on the environment, and the potential of drug residuals in fish muscle tissues. Besides, very few of these substances have been approved for use in aquaculture in most countries, even though they have been widely used as growth promoters and as both prophylactic and curative treatments in the poultry and cattle industries.

Vibrio

In tropical aquaculture, prevention and control of outbreaks of pathogenic bacteria, mainly *Vibrio spp.*, will require innovative and aggressive techniques. A recent study showed that Gram-negative heterotrophic bacteria, primarily *Vibrio alginolyticus*, which is highly pathogenic for marine fish larvae, constituted 100 percent of the bacterial community isolated on TCBS medium in a commercial hatchery without sterile conditions. There are numerous reports showing that epizootics of *Vibrio alginolyticus* have repeatedly occurred during the early developmental stages in marine fish hatcheries. The challenge is to suppress these outbreaks, allowing the sustainable mass production of several species of high-value marine finfish fingerlings in the Americas.

Probiotics

The use of probiotics in agriculture and aquaculture, particularly in the form of Gram-positive bacteria such as *Bacillus spp.*, as an alternative to antibiotics for disease control is not a new concept. Probiotics have been widely used by the hatcheries throughout the world. Indeed, there is strong evidence that probiotics improve results in crustacean, mollusk and fish hatcheries. However, evidence that the use of probiotics is beneficial to survival of high-value tropical species of marine fish remains largely anecdotal.

Current research

Attempts to determine the benefits of using probiotics in the larval rearing of tropical marine fish species are currently being conducted at the Aquaculture Program, University of Miami (Miami, Florida, USA). Our hypothesis is that probiotics containing Gram-positive bacteria such as *Lactobacilluss spp.*

and *Bacillus spp.* can be used to control pathogenic *Vibrio spp.* in larval fish rearing tanks.

Preliminary trials

Preliminary larval rearing trials with spotted sea trout (*Cynoscion nebulosus*), a marine sciaenid, showed that post-metamorphic larvae stocked in tanks inoculated with Epicin, a commercialy available probiotic, had faster rates of growth and development. The larvae had survival rates through metamorphosis twice as high as the controls. (Results are in preparation for publication. References are available from the authors).

Conclusion

Scientific and anecdotal evidence suggests a proactive probiotic regiment that prevents disease outbreaks from occurring can be more effective than a reactive regime using anti-microbial substances, aimed to cure and control disease outbreaks after they occur. Continuing comparative studies using both methods will determine the protocols to be implemented by commercial hatcheries in the future.

(Editor's Note: This article was originally published in the October 2001 print edition of the Global Aquaculture Advocate*.)*

Authors

DANIEL D. BENETTI, PH.D.

Assistant Professor
University of Miami
MAF Division, RSMAS
4600 Rickenbacker Causeway
Miami, Florida 33149 USA

dbenetti@rsmas.miami.edu (mailto:dbenetti@rsmas.miami.edu)

FEDERICO J. ROTMAN

Assistant Professor
University of Miami
MAF Division, RSMAS
4600 Rickenbacker Causeway
Miami, Florida 33149 USA

ERIK DEMICCO

Assistant Professor
University of Miami
MAF Division, RSMAS
4600 Rickenbacker Causeway
Miami, Florida 33149 USA