Mitigating the Negative Environmental Impacts of Aquaculture Practices

Ford Evans*, Stephanie Ichien, Laura Morrison and Hillary S. Egna

AquaFish Collaborative Research Support Program

Introduction

Negative environmental impacts associated with aquaculture are of increasing concern due to the rapid growth and often unregulated of the aquaculture industry. Aquaculture has been associated with a range of issues including habitat degradation, contaminated water systems, increases in the spread of fish diseases, and the introduction of alien species. Mitigation of these adverse effects is key to developing sustainable, end-user level aquaculture systems.

The Aquaculture & Fisheries Collaborative Research Support Program (AquaFish CRSP) strives to enrich livelihoods and promote health through international multidisciplinary partnerships. Headquartered at Oregon State University, AquaFish CRSP funded 43 core research investigations from 2007-2009 to increase the efficiency of aquaculture and improve fisheries management in three global regions: Latin America, Africa, and Asia. Of these investigations, seven focused on sustainable solutions for mitigating or eliminating environmental impacts caused by aquaculture. These investigations were conducted in Mexico, Cambodia, China, Indonesia, The Philippines, and Vietnam. Each investigation assessed a variety of ecological effects relating to waste management, crop diversification, habitat recovery, and native species diversity. The long-term goal of this work is ultimately to reduce the "ecological footprint" of aquaculture through best management practices, innovative sustainable technologies, and targeted trainings and workshops. Here, we showcase these investigations, which were conducted through a collaborative effort between US and Host Country researchers.

Alien fish species in Vietnam

Polyculture in Banda Aceh

Women fish traders in Cambodia

Workshop on Aquaculture, Human Health, & the Environment: China

The Dai fishery in Cambodia

Vietnam & Cambodia

Assessment of Diversity and Bioecological Characteristics of Low Value/Trash Fish Species

Collaborating Institutions

- University of Connecticut-Avery Point (USA)
- Inland Fisheries Research & Development Institute (Cambodia)
- Can Tho University (Vietnam)

Research and Outreach:

- Investigated the environmental impacts of aquaculture in the lower Mekong Basin.
- Involved local fisheries stakeholders in understanding the status of low value fish stocks and the importance of sustainable management.

Indonesia & The Philippines

Training in Sustainable Coastal Aquaculture Technologies in Indonesia and The Philippines

Collaborating Institutions

- North Carolina State University (USA)
- University of Arizona (USA)
- Unjung Batee Aquaculture Center (Indonesia)
- Southeat Fisheries Development Center Aquaculture Department (SEAFDEC AQD) (The Philippines)
- Department of Agriculture (The Philippines)

Research and Outreach:

- Provided training and short courses on alternatives to shrimp monoculture: 1) incorporating seaweed in tilapia-shrimp polyculture and 2) soft shell crab farming.
- Determined if new techniques were adopted and if crop diversification and farming sustainability have improved.

China

Assessing Effectivenss of Current Waste Management Practices for Intensive Freshwater and Marine Pond Aquaculture in China

Collaborating Institutions

- University of Michigan (USA)
- Shanghai Ocean University (China)
- Huazhong Agricultural University (China)
- Hainan University (China)

Research and Outreach:

- Estimated the degree and extent of environmental damage from intensive pond aquaculture and evaluate different waste management strategies.
- Informed small-scale pond farmers about best waste management practices through trainings to build consensus and develop improved governing policies.

Determining the Ecological Footprint of Shrimp Aquaculture Through Life Cycle Analysis of Outdoor Pond Systems

Collaborating Institutions

- University of Michigan (USA)
- Hainan University (China)
- Shanghai Ocean University (China)

Research and Outreach:

- Life cycle assessment (LCA) and life cycle cost analysis between different shrimp aquaculture systems revealed that the main disparities are related to energy use, global warming, and eutrophication potential.
- Provided information on the relative energy intensity, environmental impact, and cost-benefit of different aquaculture systems to increase the understanding and extension of more sustainable aquaculture.

Workshop on Aquaculture, Human Health, and Environment

Collaborating Institutions

- University of Michigan (USA)
- Shanghai Ocean University (China)
- World Wildlife Fund (WWF)

Research and Outreach:

- Shared results and experiences from AquaFish CRSP research related to aquaculture, human health, and environment to develop links between research findings and management.
- Established collaborations with institutions in the region, Asian CRSP colleagues, and WWF.

China & Vietnam

Impact of Introduction of Alien Species on the Fisheries and Biodiversity of Indigenous Species in the Zhanghe Reservoir of China and Tri An Reservoir of Vietnam

Collaborating Institutions

- University of Michigan (USA)
- Huazhong Agricultural University (China)
- Shanghai Ocean University (China)
- Nong Lam University (Vietnam)

Research and Outreach:

- Investigated the impacts of alien species in reservoirs, involving farmers, reservoir management, and government officials in understanding the implications for the development of appropriate managment strategies.
- Developed recommendations to eliminate further stocking of the alien species.

Mexico

Elimination of methyltestosterone from Aquaculture Masculinization Systems: Use of Catalysis with Titanium Dioxide and Bacterial Degradation

Collaborating Institutions

- University of Arizona (USA)
- Universidad Juarez Autonoma de Tabasco (Mexico)

Research and Outreach:

- Investigated clean technology solutions for masculinizing tilapia fry to boost productivity among small-scale fish farmers.
- Technical and public workshops for hatchery managers, extension agents, university students, fish farmers, farm workers, and selected community leaders to introduce reliable and efficient masculinization techniques.

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