

## INTRODUCTION

The Aquaculture & Fisheries Collaborative Research Support Program (AquaFish CRSP), based at Oregon State University, creates and nurtures strong global partnerships that develop sustainable solutions in aquaculture and fisheries for improving health, building wealth, and conserving natural environments through advanced science, research, education, and outreach. Under the subject of biodiversity, a number of topics are addressed within the AquaFish CRSP research portfolio, investigating both the threats and the positive impacts of rural aquaculture. As aquaculture expands globally, its success is contingent upon minimizing environmental impacts, effects on wild populations, and its suitability as a sustainable food source for human use.

Each AquaFish CRSP investigation is categorized under one of ten topic areas covering research in aquaculture production systems, ecosystem interrelationships, and socioeconomic implications of small scale aquaculture and fisheries. Three of these topic area— 1) Indigenous Species Development, 2) Mitigating Negative Environmental Impacts, and 3) Sustainable Feeds Technology— provide a complete snapshot of the work being done within AquaFish that investigates the relationships between rural aquaculture development and biodiversity. This work in Africa, Asia, and Latin America incorporates a comprehensive look at the impacts on biodiversity and provides a perspective on how aquaculture and fisheries can minimize their deleterious effects while still balancing the quest for economic progress and poverty alleviation.

## MITIGATING NEGATIVE ENVIRONMENTAL IMPACTS

Negative environmental impacts associated with aquaculture are of increasing concern due to the rapid growth and often unregulated nature 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
- Introduction of alien species.

Mitigation of these adverse effects is key to developing sustainable, end-user level aquaculture systems. Several investigations within the AquaFish CRSP portfolio focus on sustainable solutions for mitigating or eliminating environmental impacts in Mexico, Cambodia, China, Indonesia, The Philippines, and Vietnam. Each investigation assesses a variety of ecological



*Alien fish species in Vietnam with no food value was accidentally introduced into freshwater reservoirs.*

effects with the long-term goal of reducing the “ecological footprint” of aquaculture through best management practices, innovative sustainable technologies, and targeted trainings and workshops.



*Over 59 species of wild small sized fish caught in Cambodia, relied upon both human consumption and aquaculture feeds. Researchers are working to decrease reliance on these fish for fishmeal to protect the fishery and to promote more sustainable feeding practices of small-scale fish farmers.*

## SUSTAINABLE FEED TECHNOLOGIES

Fish feeds are a major expense for small-scale aquaculture farmers. Ingredients can be costly and can create a reliance on wild caught fish as the primary protein source in fishmeal. Other costs are attributed to feed wastage due to uneaten diets or poor feed conversion efficiency. As a result, researchers are interested in developing nutritionally efficient diets and optimal feeding strategies that not only reduce operating costs but also minimize environmental impacts.

AquaFish CRSP investigators in Vietnam, the Philippines, Guyana, and Tanzania are exploring different sustainable feed technologies, including:

- Replacing fishmeal and other costly protein sources in fish diets with protein from sustainable local sources.
- Optimizing feeding schedules to lower feed input.
- Adopting least-cost formulation and feed manufacturing technologies to develop less expensive and more efficient feeds.



*In order to decrease the reliance on fishmeal, researchers in Tanzania are experimenting with the leaves from local trees, *M. oleifera* (left) and *L. leucocephala* (right), as ingredients in tilapia feed.*

## INDIGENOUS SPECIES DEVELOPMENT



*Eating native black cockles in Nicaragua*

Domestication of indigenous species may contribute positively to the development of local communities as well as for ecosystem protection. The development of indigenous species aquaculture can be a means to:

- enhance and restock small-scale capture fisheries
- alleviate pressure on wild fisheries resources for fishmeal and seed
- prevent the spread of invasive species and disease

At the same time, the development of new native species for aquaculture must be approached in a responsible manner that diminishes the chance for negative environmental, technical, and social impacts. Under this topic area, AquaFish CRSP researchers work with several indigenous species in Mexico, Cambodia, Vietnam, Nepal, Nicaragua, and Ghana using best management practices to both support and protect natural stocks. Researchers in each of the countries are currently engaged in various stages of indigenous species production development, ranging from initial species evaluations and breeding experiments to on-farm production trials.



*Ponds in Mexico used for the development of a snook breeding program*