

# Developing sustainable shellfish and algal production systems to increase food security in Latin America and Asia.

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## Introduction

According to the FAO, total world aquaculture production in 2009 reached 73.0 million tonnes. Although most of this production was achieved through the culture of freshwater finfish species such as carp, tilapia, and catfish (30.6 million tonnes), a large fraction was attributable to the culture of molluscan shellfish (13.5 million tonnes) and algae (17.3 million tonnes). With over 90% of the total world aquaculture production occurring in least-developed and developing countries, shellfish and algae play an important role in food security and income generation for the neediest smallholder farmers in impoverished coastal communities.

With funding from the **Aquaculture & Fisheries Collaborative Research Support Program (AquaFish CRSP)**, investigators from the United States and partnering host countries are working together in Latin America and Asia to develop and improve shellfish and algal production systems and to develop best management practices. This poster showcases these efforts and highlights the global role of AquaFish CRSP research in developing sustainable end-user level aquaculture systems to alleviate poverty and increase food security in coastal communities of least-developed and developing countries.



## Benefits to Smallholder Farmers/Fishers



- Food security and employment in coastal communities
- Nutritional source of protein, omega-3 fatty acids, and micronutrients
- Minimal input requirements given that these species are either low trophic level species (shellfish) or primary producers (algae)
- Simple and low-tech culture systems



## Ecosystem Services of Shellfish and Algae



- Turbidity reduction by filtration
- Biodeposition of organics and denitrification
- Sequestration of carbon
- Provision of structural habitat ("ecosystem engineers")
- Habitat and shoreline stabilization
- Nutrient uptake (e.g. N and P)



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## Species Under Investigation

Bivalve and algal species studied through AquaFish CRSP include:



**Black Cockle**  
(*Anadara* spp.)



**Pacific Oyster**  
(*Crassostrea gigas*)



**Mangrove Oyster**  
(*Crassostrea corteziensis*)



**Sea Cucumber\***  
(*Holothuria scabra*)



**Red Algae**  
(*Gracilaria heteroclada*)



**Red Algae**  
(*Kappaphycus alvarezii*)



**Red Algae**  
(*Euchemo* spp.)

\*Although not a bivalve, *H. scabra* is included here because it is being paired with algae in AquaFish CRSP-sponsored research.

## Related AquaFish CRSP Investigations

### RESEARCH INVESTIGATIONS

- Ration Reduction, Integrated Multitrophic Aquaculture (milkfish-seaweed-sea cucumber) and Value-Added Products to Improve Incomes and Reduce the Ecological Footprint of Milkfish Culture in the Philippines. *North Carolina State University (USA), Southeast Asian Fisheries Development Center (Philippines)*
- Demonstration of Sustainable Seaweed Culture and Processing in Aceh, Indonesia and the Philippines - Opportunities for Women to Improve Household Welfare. *North Carolina State University (USA), Ujung Batee Aquaculture Center (Indonesia)*
- Spat Collection, Growth Rates and Survival of the Native Oyster Species, *Crassostrea corteziensis* at Santa Maria Bay, Mexico. *University of Hawaii-Hilo (USA), Universidad Autonoma de Sinaloa (Mexico)*
- Oyster-relaying and Depuration in Open-water Locations. *University of Hawaii-Hilo (USA), Universidad Autonoma de Sinaloa (Mexico)*
- Determination of Carrying Capacity of the Boca Camichin Estuary in Reference to Oyster Culture. *University of Hawaii-Hilo (USA), Universidad Autonoma de Sinaloa (Mexico)*
- Developing hatchery methods for the mangrove oyster, *Crassostrea corteziensis* for the Pacific Coast of Mexico. *University of Hawaii-Hilo (USA), Universidad Autonoma de Sinaloa (Mexico)*
- Microbiological Quality of Shellfish Growing Waters and Tissues. *University of Hawaii-Hilo (USA), Universidad Centroamericana (Nicaragua)*
- Co-management and bivalve sanitation for black cockles (*Anadara* spp.) in Nicaragua. *University of Hawaii-Hilo (USA), Universidad Centroamericana (Nicaragua)*



### WORKSHOPS & TRAININGS

- Training in Sustainable Coastal Aquaculture Technologies in Indonesia and the Philippines. *North Carolina State University (USA), Central Luzon State University (Philippines)* (Total number of trainees: 255)
- Training in Best Management Practices for the Production of Molluscs in the States of Nayarit and Sinaloa. *University of Hawaii-Hilo (USA), Universidad Autonoma de Sinaloa (Mexico)* (Total number of trainees: 28)
- Co-sponsorship of "Second International Workshop on the Cultivation and Biotechnology of Marine Algae: An Alternative for Sustainable Development in Latin America and the Caribbean". *University of Arizona (USA), Universidad Autonoma de Tamaulipas (Mexico)* (Total number of trainees: 75)
- International Workshop for Aquaculture Sanitation. *University of Hawaii-Hilo (USA), Universidad Autonoma de Sinaloa (Mexico)* (Total number of trainees: 136)
- Regional Workshop on Shellfish Culture and Sanitation. *University of Hawaii-Hilo (USA), Universidad Autonoma de Sinaloa (Mexico)* (Total number of trainees: 43)
- Intensive Training and Internship in Bivalve Culture and Shellfish Sanitation. *University of Hawaii-Hilo (USA), Universidad Centroamericana (Nicaragua)* (Total number of trainees: 8)

