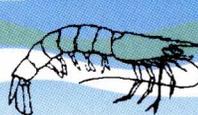


# SEAFDEC Asian Aquaculture



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**Dr. Barry Hill,** Secretary-General of the Paris-based Office International des Epizooties (OIE) lauded the efforts of countries around the world in reporting and dealing with diseases of marine animals that can threaten world trade

## SEAFDEC and OIE hold disease workshop

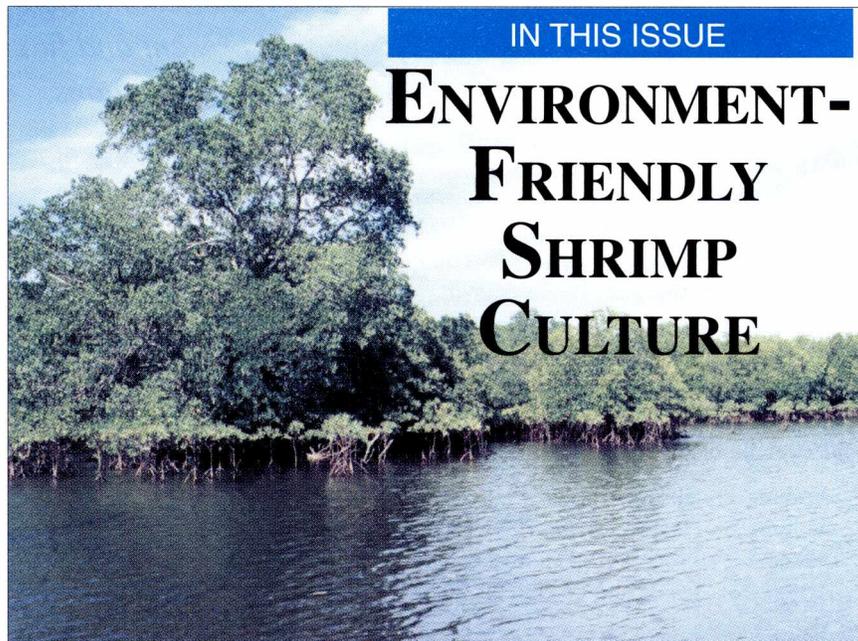
Recognizing that the aquaculture industry is continuously threatened by diseases, SEAFDEC/AQD and the Paris-based Office International des Epizooties (OIE) organized a 2 and 1/2 day seminar-workshop on *Disease Control in Fish and Shrimp Aquaculture in Southeast Asia: Diagnosis and Husbandry Techniques*. This was conducted December 4-6, 2001 in Iloilo City. As AQD Chief Dr. Rolando Platon noted in his welcome address, Asia is a major aquaculture site, and better regional cooperation can help the aquaculture industry attain its goal of sustainability. OIE Secretary General Dr. Barry Hill, on the other hand, said that there is a global monitor for aquatic animals and aquatic animal products. Further, the OIE disease control policy is based on regulations focused on certain diseases (what are called notifiable diseases) and

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**Dr. Yasuo Inui,** fish health expert at SEAFDEC/AQD, noted that Southeast Asia needs more skilled fish health workers who can diagnose and report diseases quickly and efficiently

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on page 7, you'll  
find more  
SEAFDEC/AQD news



IN THIS ISSUE

## ENVIRONMENT-FRIENDLY SHRIMP CULTURE

### THAILAND: OPERATING GUIDELINES FOR MARINE SHRIMP FARMS

By

*Siri Tookwinas, Surasak Dirakkait, Waraporn Prompoj, Claude Boyd, Randy Shaw*

The marine shrimp industry in Thailand has developed a code of conduct for its operations. This code is a set of principles and processes that provides a framework to meet the industry's goal for environmental, social, and economic responsibility. The foundation of the code of conduct is the following mission statement:

*The marine shrimp farming industry in Thailand is committed to producing high quality, hygienic products in a sustainable manner that provides for environmental, social, and economic benefits to present and future generations.*

Policy statements have been formulated to outline actions that the industry will undertake to meet its commitments under the statement. These policy statements cover a broad range of topics, including:

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- Environmental protection
- Public consultation
- Regulatory compliance
- Location
- Quality and safety
- Continual improvement
- Efficiency
- Research and development
- Social responsibility
- Monitoring and auditing
- Education and training
- International trade

The code of conduct is voluntary, but it has been signed by a wide variety of industry stakeholders. The code commits the signatories to specific actions, including the development of a series of operating guidelines and procedural manuals. These actions will aid the industry in carrying out its operations in a manner consistent with the intent of the code of conduct.

The code of conduct for shrimp farms is the first in a series of operating guidelines and procedural manuals that will be developed for the marine shrimp culture industry of Thailand. Succeeding volumes would cover the other sectors of the industry.

Volume 1 – Shrimp Farms

Volume 2 – Hatcheries and Broodstock Capture

Volume 3 – Processing Facilities

Volume 4 – Feeds and Chemical Suppliers

The overall objective is to establish a consistent approach to industry operations through establishment of good management practices or GMPs. It is anticipated that implementation of these GMPs will enable the industry to operate in a sustainable manner.

### Good management practices

Good management practices are defined here as practices that are thought to be effective, yet practical, in eliminating or reducing environmental and social impacts. GMPs may include structural (e.g., a settling basin to remove suspended solids), biological (e.g., wetland plants to remove nutrients in effluent) or management (e.g., minimize use of chemicals) practices to solve a particular problem.

A single GMP seldom solves a problem; rather a system of GMPs is normally required to prevent a particular type of farming or other activity from causing negative impacts. Therefore, for an activity such as shrimp farming, a system based on GMPs requires identification of

“*The marine shrimp farming industry in Thailand is committed to producing high quality, hygienic products in a sustainable manner that provides for environmental, social, and economic benefits to present and future generations.*”

potential impacts (environmental or social) and the installation of GMPs to prevent or mitigate possible impacts.

Shrimp farming in Thailand is conducted over a wide range of coastal environments within which, physical, chemical, and biological conditions and resource use patterns differ. A flexible system of GMPs has therefore been formulated, and selected combinations of GMPs can then be used to optimize the operating systems

for site-specific conditions in a given area and on individual farms.

### Potential impacts of shrimp farms

As noted above, the first step in developing GMPs is to identify the key impacts that need to be stressed. Shrimp farming is a comparatively new activity, but possible impacts associated with operating shrimp farms are well known and include:

- Conversion of mangrove and other coastal wetlands to ponds
- Nutrient enrichment and eutrophication of coastal waters by pond effluents
- Discharge of potentially toxic and bioaccumulative chemicals into natural ecosystems
- Sedimentation in coastal waters because of erosion from ponds and other earthen infrastructure
- Salinization of freshwater sources by ponds effluents or seepage
- Reduction in biodiversity of coastal ecosystem caused by water pollution, sedimentation and toxicity of effluents
- Introduction of non-native species or new shrimp diseases into coastal waters
- Competition with other activities for natural resources
- Land use disputes

### Operating guidelines and procedures for shrimp farms

This manual was developed with the input from international and national experts on shrimp farming operations and was reviewed by shrimp farmers at a series of workshops held in Thailand in February 1999.

GMPs are provided to eliminate or minimize the negative environmental impacts listed above. The following sections of the

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MANGROVE-FRIENDLY SHRIMP CULTURE PROJECT

**THAILAND'S GUIDELINES FROM PAGE 2**

manual discuss general guidelines for shrimp farm operations, specific procedures for implementing these guidelines, and a series of checklists and record keeping forms for farm management.

**Site selection for new shrimp farms**

Proper location of a shrimp farm is important to minimize adverse environmental and social impacts and in maximizing production rates.

GMPs for site selection include:

- The shrimp farm owner should have clear title or right to their property or other, legal or concession agreements
- All stakeholders should be involved in area zoning for shrimp farming
- The carrying capacity of an area should be determined in order to prevent too many shrimp farms in one place
- The water and soil quality should be suitable for shrimp farming and farms should be located far away from pollution sources
- Farmers should register with the appropriate government agencies

**General pond management**

Good pond management helps prevent water pollution, loss of biodiversity, and other negative environmental impacts, and it will improve the efficiency of shrimp production.

GMPs for pond management include:

- Good water quality should be maintained by using stocking and feeding rates that do not exceed the assimilative capacity of the culture system and by using high quality feeds and good feeding practices
- Water exchange should be reduced as much as possible
- Fertilizers, liming materials, and all chemicals should be used in a responsible manner and only as needed
- Good shrimp health management should be used
- Aerators should be positioned and operated to minimize erosion and creation of sediment mounds in pond bottoms
- Water inlets and outlet to ponds should be screened to prevent entrance of competitors and release of culture species
- Predator control methods that do not require destruction of ecologically important species in receiving water should be used

**Stocking density**

Stocking density is an important consideration in shrimp farming because the amount of feed needed to culture shrimp to market size increases in direct proportion to the stocking density. As feeding rates increase, water and soil quality in ponds tends to deteriorate. Ponds with high stocking rates tend to have poorer water quality than ponds stocked at moderate density. Impaired water quality stresses shrimp and reduces the efficiency with which they convert feed to shrimp flesh. Effluents from ponds with excessive stocking and feeding rates are of lower quality and have a greater potential to cause water pollution than effluents from ponds stocked at more reasonable rates.

GMPs for optimizing stocking density include:

- Stocking densities should be based on anticipated survival, desired size at harvest, and carrying capacity of ponds
- The size and age of shrimp fry should be considered

**Feed management**

Feed is the basis for high levels of shrimp production in intensive shrimp culture ponds. However, shrimp do not eat all of the feed provided to them, and only a portion of the feed consumed is converted to shrimp flesh. Uneaten feed, feces, and metabolic wastes enter ponds and serve as nutrients for phytoplankton. Ammonia excreted into pond water by shrimp can reach toxic concentrations. As feeding rates increase, water and soil quality in ponds usually deteriorate.

Good feed quality and careful feed management are essential ingredients for efficient shrimp culture. By using high quality feeds in reasonable quantities, water and soil quality in ponds is protected. This reduces stress in shrimp; there is less likelihood of disease; and shrimp convert feed more efficiently to improve the feed conversion ratio and minimize feed costs. Better water quality effluent reduces the possibility of negative environmental impact in receiving water bodies.

GMPs for feed management include:

- Feed should be purchased fresh and not stored for more than a few months
- Feed should be stored in cool and dry areas
- Feed management practices should be implemented to make sure that shrimp consume the feed as completely as possible
- Medicated feed should be used only if necessary for the control of a specific diagnosis of disease
- Cut fish (= trash fish) should not be used as shrimp feed, but if it is, care should be taken to prevent overfeeding
- Pond managers should keep careful records of daily feed application rates so that feed conversion ratio (FCR) can be assessed

**Shrimp health management**

Authorities on shrimp health management recognize that stress reduction through better handling, reasonable stocking densities, good nutrition, and optimal environmental conditions in ponds can prevent most infectious and non-infectious diseases. Treatment should be undertaken only when a specific disease has been diagnosed and it is known that this disease is treatable. Also, effective measures must be taken to minimize the spread of disease between farm stocks and natural stocks.

GMPs for shrimp health management include:

- Water quality evaluation and management should be implemented to avoid stressing shrimp, but when stressful conditions are observed, shrimp should be checked for disease
- For non-infectious diseases related to pond conditions, carry out the best option for disease treatment or for correcting pond conditions

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- For infectious diseases that may spread widely, isolate the pond, net harvest remaining shrimp, and disinfect the pond before discharging water

#### Therapeutic agents and other chemicals

There is considerable use of therapeutic agents and other chemicals in shrimp culture in Thailand. Some of the chemicals can be toxic to shrimp or accumulate in the flesh of shrimp and represent a potential hazard to the consumer. Also, some chemicals may exist in effluents as residues and be harmful to natural aquatic ecosystems. Reducing the use of these agents and chemicals will improve environment performance but also reduce cost of operating shrimp farms. Shrimp health management should focus on disease prevention through good nutrition, sound pond management, and overall stress reduction rather than disease treatment.

GMPs for safe use of therapeutic agents and other chemicals include:

- Shrimp farmers should follow reliable information regarding dosage, withdrawal period, proper use, storage, disposal, and other constraints on the use of a chemical including environmental and human safety precautions
- When potentially toxic or bioaccumulative chemicals are used in ponds, water should not be discharged until compounds have naturally decomposed to nontoxic form
- Careful records should be maintained regarding use of chemicals in ponds
- Store therapeutants in a cool place and in a secure manner where they will be inaccessible to unauthorized personnel, children, and animals. Dispose of unused compounds by methods that prevent environmental contamination
- Drug, antibiotic, and other chemical treatments should be done in accordance with recommended practices and comply with all national and international regulations

#### Effluent and solid wastes management

Pond effluent often contains elevated concentrations of nutrients, suspended solids, and possibly other potential pollutants. Pond management GMPs outlined previously can help improve effluent quality and reduce effluent volume. Effluent quality can be further improved by alterations of the discharge infrastructure and by the timing and manner of final discharge. Shrimp farms also generate solid wastes that should be disposed of in a manner that does not damage the aquatic or terrestrial ecosystem.

GMPs for effluent and solid wastes management include:

- Canals and embankments should be maintained in a manner to reduce erosion of above water portions
- Minimize water exchange to the extent feasible
- Use efficient fertilization and feeding practices to promote natural primary productivity while minimizing nutrient inputs
- Store and use fuels, feeds and other products in a responsible manner to avoid accidental spills that could contaminate water.

An emergency plan should be made for containing accidental spills

- The effluent should be treated before discharging if it does not comply with existing standards
- Ponds should be drained in a manner to minimize resuspension of sediment and prevent excessive water velocities in canals and at effluent outfalls
- Design outfalls so that no significant impacts of effluents on natural waters occur beyond the mixing zone
- Shrimp pond effluents should not be discharged into freshwater areas or onto agricultural land
- Sediment from ponds, canals or settling basins should be put back into areas from which it was eroded, used as earthfill, or disposed in some other environmentally-responsible way
- Sanitary facilities for disposal of human wastes and other health facilities should be provided
- Garbage and other farm wastes should be managed by acceptable methods
- Shrimp farms should comply with existing governmental regulations related to effluents and other wastes
- Managers should routinely evaluate wastes management procedures and continually attempt to improve them

#### Social responsibility

Sometimes, conflicts arise between shrimp farmers and others who either live in the coastal zone or depend upon coastal zone resources for their livelihood. Shrimp farmers also employ people, and conflicts may arise over employee-employer relationships. Public relations and employee welfare are complex issues, but general guidelines presented in the GMPs will be useful in enhancing the prospects of harmonious interactions among large shrimp farming companies, worker, and the local community. In Thailand there are many small shrimp farmers in addition to large company-operated farms, and many of the issues related to community relations will be addressed through other sectors of the industry, such as government regulations and shrimp farming associations.

GMPs for improving community relations include:

- Shrimp farmers or associations should communicate with community leaders
- This is particularly important in the planning stages for new farms or expansions
- Shrimp farmers or associations should attempt to accommodate traditional uses of coastal resources and encourage mangrove replantation activities through a cooperative attitude towards established local interests and environmental stewardship
- Shrimp farmers or associations should contribute to community efforts to improve local environmental conditions, public health and safety, and education
- Local workers should be employed as possible, and they should be fairly compensated with respect to local wage scales



- Healthy and safe living and working conditions should be provided
- Shrimp farm management should have clearly defined and posted security policies
- Employees should have a clear understanding of their duties and of company expectations regarding their performance

#### Farmer associations and education

Shrimp farmers should form cooperatives or associations by region in order to exchange technology and to achieve cooperation in water use and waste management. Shrimp culture techniques are also constantly improving, and it is important that shrimp operators continue to increase their knowledge of sustainable farming techniques.

GMPs for farmer association and education include:

- Farmer associations should be encouraged. Meeting among members should be routinely held for exchanging information on shrimp culture
- The farmers would participate in training in the aspects of shrimp farm management, in the manner of friendly environment practices, and for law and regulation for shrimp culture industry
- The association should promote “environmentally-friendly” practices

#### Data collection

Data collection on the above topics and farm accounts should be done. Shrimp farming associations should cooperate with the department of Fisheries to collect, organize, and evaluate data to demonstrate the adoption of GMPs and document the benefits of their use.

### SEAWATER IRRIGATION FROM PAGE 5

#### What is SIS

Several Seawater Irrigation Systems have been built and it is likely that more will be constructed in the near future. The systems differ because of the variety of pond layout, different ecological systems and limitation of land utilization in different areas. They are normally designed using three types of water management.

- *Open Sea System (SIS type I)*. In private shrimp farms most of which have their own water intake facilities, the DOF will provide a drainage pumping system to collect shrimp farm effluent which is then given appropriate treatment in a common reservoir. The water is pumped out to a safe distance offshore
- *Bay System (SIS type II)*. High quality water supply will be provided by pumping through an underground pipeline. The length

of the pipe depends on the distance of the best all-season water quality found offshore. The effluent will be treated in shrimp farms before release into a common treatment facility and then discharged into the water resource nearshore

- *Shrimp Farm Consolidated System (SIS type III)*. The system is the combination of the first two management systems. The water will be provided via a pumping system and stored in a common treatment facility. The drainage pumping system is also provided. This type of water management is ideal for the shrimp industry; it must be operated in a large area by the same management team and shrimp pond layout must be completely redesigned. Therefore, a land reclamation program is required

#### Criteria for site selection

Thailand has large areas for shrimp culture. It has developed site selection criteria for future construction plans as follows:

- *A Shrimp Farming Association* is required in order to keep farmers working closely together. The association committee selected from the members provides linkage between farmers and the government. They will transfer the new technologies and government regulations to the farmers while informing the government about the problems during the rearing period (e.g. shrimp disease) and the difficulties of doing shrimp culture under the new environmental protection law
- *The construction site must be on the coastal area outside a mangrove forest*, preserving land for environmental protection or other purposes, and protecting the area for tourism
- The site must be located away from a productive agricultural area. If necessary, the construction sites near agricultural areas must have additional studies on environmental impact
- *All construction sites must have undergone an EIA* which is included in the feasibility study prior to the engineering design work
- *The construction sites should be located on the area listed in the Country's Coastal Zone Management Plan (CZMP)*

#### Implementation

Several SIS projects have been completed – in Ranot, Songkhla province; Ban Nakot, Nakorn Sri Thammarat province; and Kung Krabaen Bay, Chanthaburi province. Others are in varying stages of completion, and 28 more locations are on the list for feasibility study and engineering design. The ongoing project will cover a shrimp culture area of 44,000 ha. The government has invested US\$ 77.28 million. Farmers are expected to pay for the operation and maintenance cost through the farmers cooperatives management system.

#### Project details

There are a few sites that have been completed on the southern coast of Thailand, in Ranot, Songkhla province and Nakot, Nakorn