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# Shrimp culture and the environment

Aquaculture Department, Southeast Asian Fisheries Development Center

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# Shrimp Culture and the Environment

Shrimp culture have caused serious economic losses to shrimp farmers. Aquaculture production of shrimps in 1993 was only 609,000 t, 16% less than in 1992. The decline was due to major collapse in China (from 140,000 t in 1992 to 50,000 t in 1993), a decrease in Indonesian production from 130,000 to 80,000 t, and a further slight decline in Taiwan from 30,000 to 25,000 t.

Problems of shrimp farming industries widely attributed to disease outbreaks linked to environmental deterioration, have raised major questions about the sustainability of shrimp farming. Shrimp culture may bring large profit but if badly planned and managed, may cause irreversible environmental damage, lost opportunities, and rehabilitation costs that can easily lead to net economic loss. The principal natural resources required for shrimp culture are land, water, and biological resources, including seed and feed. The available resources and the manner in which they are used determine in large part the economic and sustainability of shrimp farming.

## Land requirements

Shrimps are cultured almost entirely in land-based ponds. The area of land required depends on the culture system. Traditional exten-

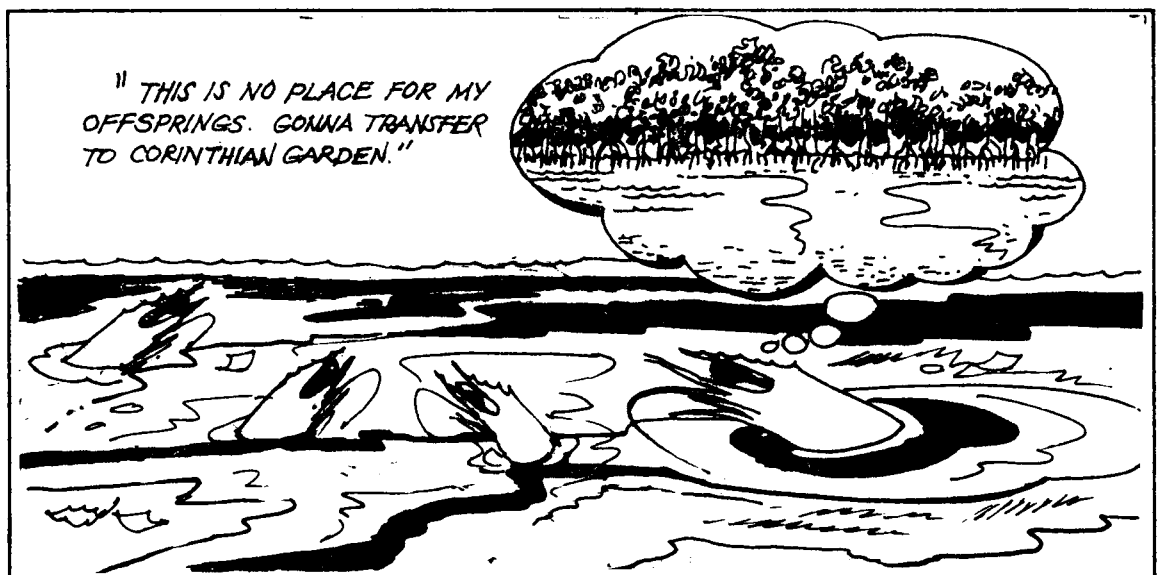
sive culture system occupies large land areas, with ponds often 2-20 ha, sometimes, even 200 ha. Semi-intensive and intensive culture systems tend to be in smaller ponds.

The price of coastal land depends on its availability. Limited coastal land and higher land prices, as in Taiwan, stimulate development of more intensive shrimp culture systems to get greater economic returns per unit area. In countries such as Indonesia and Vietnam, with cheaper and more abundant coastal land, semi-intensive and extensive systems predominate.

The type of land used for shrimp farming affects the success of shrimp farming itself and the kinds of environmental impacts and conflicts with other coastal resource users. The traditional preference for low-lying coastal wetlands has changed to an industry preference for supra-tidal land where ponds are cheaper to construct and drain, and the soil are normally better.

Salination of soils as a result of shrimp farming devaluates the agricultural land. In Thailand 3,344 ha of shrimp ponds had led to salination of 1,168 ha of agricultural land.

The decline of the shrimp industry in Thailand since 1989 was due to over-production, water pollution, and inadequate water supply.



## **Mangroves and shrimp culture.**

The impact of shrimp culture on mangroves has received considerable attention being one of the coastal activities leading to the loss of the region's mangroves. However, the recent semi-intensive shrimp culture has occurred in non-mangrove areas, or in mangrove areas earlier cleared for extensive shrimp or fish culture, or other purposes. In China (the major shrimp producer in 1991), shrimp ponds are mostly in non-mangrove areas.

In Malaysia, shrimp farms have encroached into mangrove reserves while in Indonesia, most of the estimated 200,000 ha of shrimp ponds have been converted from mangrove forests. The total pond area is just 5% of the massive Indonesia mangrove resource of 4,251,011 ha, but construction of ponds for shrimp and milkfish culture has contributed to very significant local denudation in Java, Sulawesi and Sumatra. In the Philippines, a combination of shrimp and milkfish culture is responsible for the 60% loss of the mangrove areas.

In Thailand, 38.3% of mangrove areas lost between 1979 and 1986 were used for aquaculture. Shrimp ponds in some parts of the country have certainly encroached in mangrove areas, but other major shrimp farms are in areas with limited mangroves, such as Songkhla in the south. Some of the problems that emerge where there is large-scale conversion of mangroves to shrimp ponds can be seen in the Mekong Delta of Vietnam. Loss of the mangroves has serious implications for the sustainability of various coastal activities. The productivity of some coastal fisheries appears to be positively correlated to the abundance of mangrove forests adjacent to the fishing grounds. In Thailand, fishermen reported declines in catches due to restricted

access to previously accessible mangrove areas.

In Bangladesh, expansion of shrimp farming into mangrove areas has reduced fish catches and the socioeconomic condition of traditional coastal fishermen. The loss of life and structural damage caused by the 1991 cyclone in southeastern Bangladesh may have been made worse by the earlier loss of mangroves; and coastal shrimp ponds themselves suffered severe damage. The economic impacts of mangrove destruction ultimately can be very significant and may far outweigh the short-term benefits from conversion to shrimp ponds.

There is a growing realization that mangroves themselves can contribute to the sustainability of aquaculture. Certainly, pond construction should not proceed indiscriminately in mangrove areas. The traditional extensive culture method uses up large areas of mangrove but has very low productivity in return. One hectare of mangroves can yield 767 kg of wild fish and crustaceans, more than the yields in extensive system (usually less than 500 kg/ha/yr).

The shrimp ponds on mangrove land often support profitable shrimp culture for only a short period. Mangrove areas are often not the places to build sustainable aquaculture farms. In extensive culture systems, loss of mangrove nursery areas can affect the supply of postlarvae for the ponds, a trend that has appeared in Bangladesh and may be threatening the sustainability of traditional shrimp culture in the Mekong Delta of Vietnam. In semi-intensive or intensive shrimp culture, acid sulfate soils common in mangrove areas may affect farm sustainability.

*"Environmental deterioration was linked to the intensification of shrimp culture and the overloading of coastal waters with pond effluents and domestic and industrial discharge."*

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# Aquaculture clinic

**Q:** *Our mangroves are in a very sorry state yet the rich continue to destroy them in favor of fishponds. Why is our government not keen about protecting our mangroves? Is there any law protecting them?*

**A:** The Department of Environment and Natural Resources (DENR) has finally banned the conversion of mangroves into fishponds through Administrative Order No. 15. The Order prohibits the conversion of mangrove forests and regulates the use, development and management of the country's remaining mangroves. Under the policy, the government stops issuing permits and immediately convert abandoned and unused mangrove swamps back to their original forest-land classification.

In addition, it has also stipulated provisions giving the government the prerogative to pull out existing and unproductive fishponds from these areas. The Department said operators will be compensated, but the areas will be declared off-limit to further use for aquaculture development.

The DENR has limited fishpond development to denuded areas zoned as suited for such activities. Even estuarine mangroves that are predominately vegetated by shrubs will not be disposed for fishponds. The shrub coastal areas will instead be subject to intensive rehabilitation.

The Order also allows the establishment of mangrove plantation forest lands and alienable and disposable areas. This provision allows an initial maximum area for plantation development of 50 ha for corporation, cooperatives and associations and 10 ha for individuals for plantation development. Additional areas may be granted to existing developers provided that their accumulated area will not exceed 200 ha and 50 ha respectively.

The DENR Order will supersede existing restrictions and instead impose the conversion ban, but government will still use certification of Stewardship Contracts for community-based activities aside from mangrove plantations. The Department said these contracts will not cover fishpond and paddy development.

*Source: The Manila Times, March 3, 1990*

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Mangroves protect the ponds built behind them and influence considerably the water quality in shrimp farming areas. Mangroves may remove nutrients, heavy metals, suspended solids, and toxic hydrocarbons. Thus, coastal water quality may deteriorate through loss of the mangroves' filtering capacity. Conversely, mangroves can "clean-up" shrimp pond effluent.

There are mutually supportive functions of aquaculture and mangroves and there is now growing interest in integrating mangrove and shrimp farming in the coastal zone. If the benefits of mangroves to sustainable shrimp culture are

more clearly recognized, shrimp farming may provide an additional economic justification to preserve mangroves. In Indonesia, Thailand, and the Philippines, a mangrove buffer zone between the sea and the shrimp ponds has been advocated. Such zones can potentially serve the interests of both the conservationists and the shrimp farmers. In Thailand, large private farms retain a protective mangrove buffer.

*Source: Bagarinao, TU and EC Flores. Eds. Towards Sustainable Aquaculture in Southeast Asia and Japan. Proc. of the Seminar-Workshop on Aquaculture Development in Southeast Asia. 26-28 July 1994. p. 38.*