

From Wetlands to Wastelands:

Impacts of Shrimp Farming

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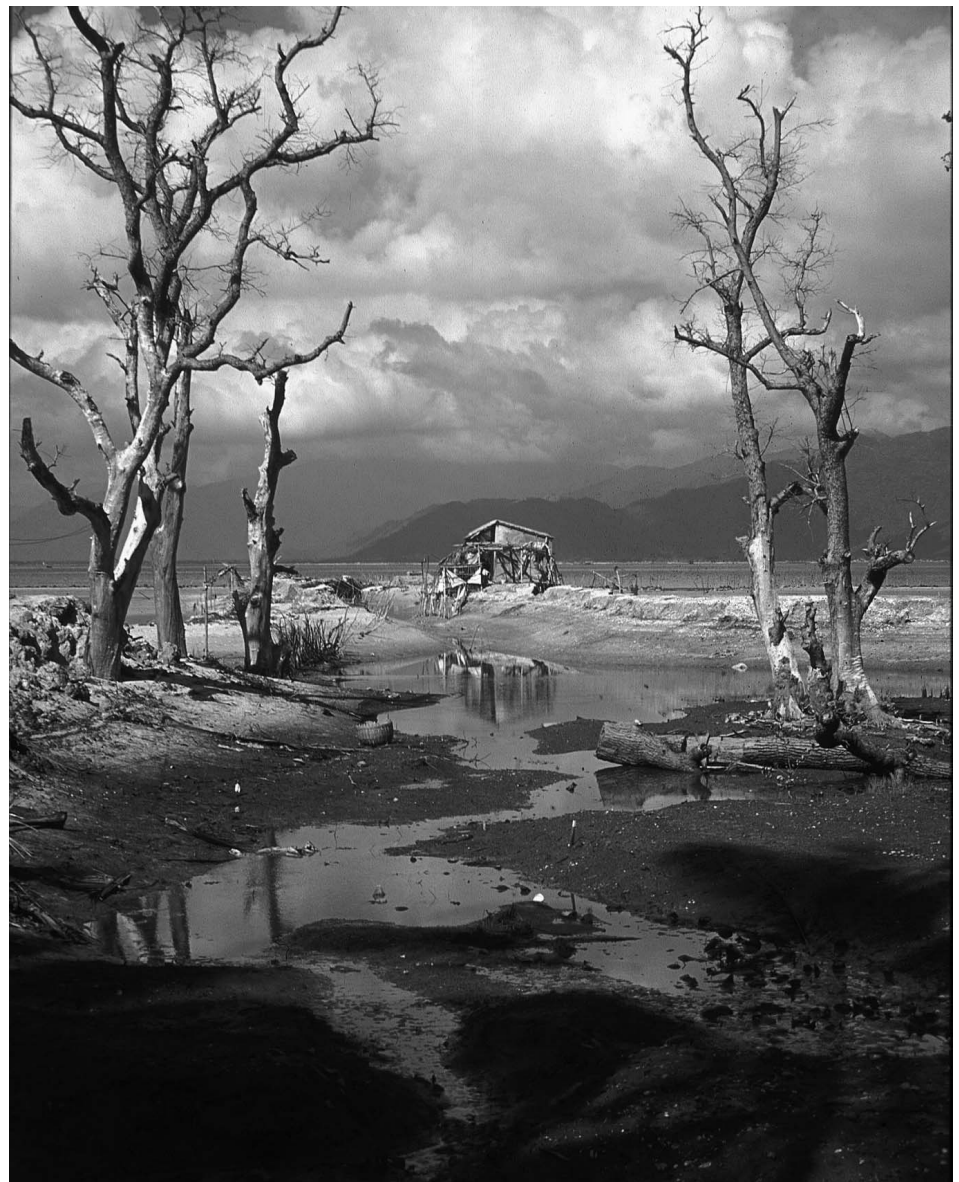
Introduction

Wetlands worldwide face a range of anthropogenic threats, among the most widespread and alarming of which are those posed by commercial shrimp farming. Shrimp farming (or aquaculture), concentrated largely in tropical developing countries for export to the West, has experienced spectacular growth over recent decades. Initially hailed as part of a 'Blue Revolution' capable of producing food whilst relieving pressure on wild fish stocks, the industry has been widely promoted by aid agencies, international financial institutions and governments as a means of speeding development and alleviating poverty in producing countries. Today, 28% of shrimp consumed are farmed (World Bank, NACA, WWF and FAO 2002), compared to about 5% in the early 1980s (Goss 2000); annual production in 2000 was 1,083,641 metric tonnes, valued at over US\$6.8 billion (World Bank, NACA, WWF and FAO 2002).

Most shrimp produced by commercial farms are tiger shrimp (*Penaeus monodon*), a warm, brackish water species. Such farms require substantial quantities of water, and are primarily located alongside rivers, estuaries and coastal areas. Consequently, the industry's rapid expansion is exacting a serious toll on wetland habitats found in these areas; mangrove forests, which lie in the intertidal zone, have been particularly impacted. The conversion of large

tracts of wetlands in recent decades has been compounded by the long-standing trend for substantial undervaluation of wetlands, and the fact

that such areas often lack formalised or well-defined land rights (Söderqvist et al. 2000, Barbier et al. 2002, Barbier and Cox 2002, EJF 2003a).



Mangroves degraded by shrimp farm construction - Vietnam. Photo by Coralie Thornton - Environmental Justice Foundation

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Mangrove loss

From historical records, it is estimated that over half of the world's original mangrove cover has been destroyed (Kelleher et al. 1995). National rates of mangrove decline differ markedly, but a dominant pattern exists of reduced mangrove area for nearly every country, particularly those with large mangrove forests (Valiela et al. 2001). Much of this destruction has taken place in recent decades (Spalding et al. 1997; World Resources Institute 2000-2001). For example, much of the estimated 83.7% loss of original mangroves in Thailand has happened since 1975 (MacKinnon 1997, Spalding et al. 1997, World Resources Institute 2000-2001), and it has been estimated that 35% of the total area of mangrove forests has been lost in the last 20 years (Valiela et al. 2001).

Mangroves have traditionally been used for shrimp farming for decades, but with the expansion of commercial shrimp farming and the complete forest clearance demanded by these systems, mangrove ecosystems are rapidly being lost. The exact extent to which shrimp aquaculture has been responsible for mangrove loss is unclear, and conflicting data reported by governments, the shrimp industry and environmental organisations has precluded accurate assessments of the situation. However, evidence suggests that the shrimp industry's often unregulated expansion has been a major contributor to global mangrove loss; in some local watersheds and even in some countries it is considered to be the greatest threat to mangrove ecosystems (Professor Phan Nguyen Hong, Vietnam National University, Centre for Natural Resource and Environmental Studies, Hanoi, Vietnam. Personal communi-

cation) (Primavera 1995, Boyd and Clay 1998, Primavera 1998, Barbier 2000, Rönnbäck 2000, Kairo et al. 2001, Sathirathai and Barbier 2001, Spalding et al. 2001; Valiela et al. 2001; Lacerda 2002)

Valiela et al. (2001) report that conversion to shrimp aquaculture is responsible for 38% of total mangrove loss and that shrimp culture is, by a considerable margin, the greatest single cause of mangrove loss.

- Mangrove cover in Bangladesh's Chokoria Sundarban forest fell from 7,500 ha in 1976 to just 973 ha in 1988, largely due to shrimp farm development (Hossain et al. 2001, Gain 2002, Vannucci (in Lacerda) 2002). This deforestation has reportedly had socio-economic impacts on over 90% of the local community (Hossain et al. 2001).
- Aquaculture is believed to have been a major cause of recent mangrove loss in Thailand (Spalding et al. 1997, Hinrichsen 1998, Barbier 2000, Barbier et al. 2002). Estimates vary, but some place up to 50% - 65% of Thai mangrove losses due to shrimp farm conversion since 1975 (Barbier and Cox 2002). The rate of mangrove loss in Thailand has been estimated to be as high as 6037 ha per year (Sathirathai and Barbier 2001).
- Around half of 279,000 ha of Philippine mangroves lost from 1951-1988 were developed into aquaculture ponds, with 95% of Philippine brackish water ponds in 1952-1987 being derived from mangroves (Primavera 1995).
- 269,000 ha of mangroves were reportedly converted to shrimp ponds in Indonesia between 1960 and 1990 (Harrison and Pearce 2000). Shrimp farming remains a major threat to Indonesia's man-

groves (Spalding et al. 1997, Hussain et al. 1999, The Jakarta Post 2001) and 50% of *Nypa* stands in Borneo's Mahakam River have been lost to aquaculture in the last 10 years (Blasco et al. 2001).

- Vietnam has reportedly lost more than 80% of its mangrove forests over the last 50 years (World Bank 2002). Today, shrimp aquaculture is thought to be the single greatest threat to the mangroves that remain (Professor Phan Nguyen Hong, personal communication; EJF 2003a).
- Nearly 50% of Ecuador's mangroves have been lost during the last 20 years; most of this loss has been attributed to shrimp farm development (Lacerda et al. 2002).
- Shrimp farms are reported to have been responsible for the direct destruction of about one third of dense mangroves in the Gulf of Fonseca, Honduras (DeWalt et al. 1996). The current rate of mangrove deforestation in Honduras has been estimated to be as high as 2,000 - 4,000 ha per year, a rate that could be expected to lead to the total loss of all mangroves by 2020 (Lal 2002).

Legislation to protect mangroves has improved in recent years, and there have been efforts to promote better practice within the industry, but in many countries laws are poorly enforced and the destruction of mangroves for shrimp aquaculture continues.

Impacts on other wetlands

Shrimp farm development has also led to degradation of other important wetland habitats, such as salt marshes, and even freshwater wetlands. For example, in Sri Lanka, salt marshes

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in the Puttalam / Mundal estuarine system, and in particular those on the Mi Oya flood plains, have been severely threatened since the advent of shrimp farming. Over 200 ha of salt marshes around Puttalam lagoon, and over 50% of the Mi Oya basin's salt marshes have been lost to shrimp aquaculture (Dayaratne *et al.* 1997, Siriwardena 2001).

Vietnam's Ha Tien-Kien Luong wetlands harbour the Mekong Delta's last extensive seasonally inundated grasslands, and patches of *Melaleuca* forest. These are rapidly being destroyed to make way for brackish water shrimp farms; as many of these grasslands are true freshwater habitats, their loss to shrimp farm development is likely to be irreversible (EJF 2003a, Tran Triet 2001). In Bangladesh, farm-

ing of the freshwater prawn *Macrobrachium rosenbergii* is impacting large areas of freshwater wetland habitats, and has been linked to population declines of the 'farmer's friend', the Indian bullfrog (*Rana tigrina*), and the ecologically-important freshwater snail *Pila globosa*, a preferred source of prawn feed (Ahmed 2001).

Wider impacts

Beyond shrimp farming's contribution to wetland habitat loss, secondary environmental impacts include: reduced water flow, salinization of soil, salinization and depletion of ground and surface water supplies, depletion of wild fish and shrimp populations, and biological pollution of native shrimp stocks. Organic and inorganic pollution, par-

ticularly that due to the unregulated use of pesticides, bleaches, and antibiotics known to have deleterious effects on human health and the environment, are of special concern (Shanahan and Trent 2003).

In areas like the Bangladeshi Sundarbans, loss of traditional fuel sources due to shrimp farming in surrounding areas has led to increased exploitation of forest products by local communities, leading to further loss of the Sundarban mangrove forest. Furthermore, the process of wild shrimp fry collection can negatively affect mangrove growth and regeneration (Citizen's Forum for Conservation of Biodiversity of the Sundarbans (Khulna, Bangladesh) personal communication)(The Daily Star 2002, Gulf News 2002).



Shrimp farms (dead mangroves visible) - Bahia de Caraquez, Ecuador. Photo by Trent - Environmental Justice Foundation.

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Pollution of coastal waters and increased terrestrial runoff following loss of the filtering actions of mangroves and other wetlands can affect adjacent coastal and marine ecosystems such as seagrasses and coral reefs. Effluent from shrimp farms has led to serious seagrass losses in the Gulf of Thailand, and is of concern for vulnerable dugong (*Dugong dugon*) populations dependent on these habitats (Marsh *et al.* 2002).

Protected on paper, plundered in practice

In Honduras, CODDEFFAGOLF, a non-governmental organisation, recently claimed that Honduran laws and international treaties were broken by, amongst others, Natural Resources and Environment Ministers in the granting of licenses allowing shrimp farms to operate in protected areas. In November 2002, Honduras' sole official representative at the Ramsar Convention meeting in Valencia was an employee of the country's largest shrimp farm – one accused of repeatedly breaching the Ramsar Agreement on wetland protection (EJF 2003b). Contraventions of laws protecting mangroves and other wetlands have also been repeatedly reported from, amongst others, Bangladesh, Ecuador and India (EJF 2003b).

Farming the sea, costing the earth

Wetland destruction has left coastal areas exposed to erosion, flooding and storm damage, altered natural drainage patterns, increased salt intrusion and removed critical habitats for aquatic and terrestrial species. Destruction of mangroves and shrimp fry collection have been linked to declines in capture fisheries, while use of fishmeal feeds can lead to a net loss of protein (EJF

2003b, Naylor *et al.* 2000).

Lives and livelihoods of many poor rural communities in developing nations are intrinsically linked to the health of wetland ecosystems, mangrove forests in particular. Worldwide, shrimp farming has impacted such communities by reducing access to, and availability of, resources, and by pollution and salinization of water and agricultural land. Increased food insecurity, poverty, landlessness, and impacts on the health and livelihoods of rural communities associated with the development of shrimp aquaculture are of serious concern; social conflict has frequently resulted and lives have been lost as a consequence in at least 11 countries (EJF 2003b).

There is a clear conflict between the need for a healthy ecological support system and the environmental effects of shrimp farming (Larsson *et al.* 1994); although a shrimp farm's ecological footprint will depend on the intensity of farming, it has been estimated to be as high as 35-190 times the size of the farm surface for a semi-intensive system (Larsson *et al.* 1994; Kautsky *et al.* 1998). In Sri Lanka, the mangrove area in Chilaw is now insufficient to support the current area of shrimp farms and, by direct association and a knowledge of farming methods and mangrove coverage, the country's total mangrove area is also estimated to be insufficient (Nikola Cattermoul, Centre for the Economics and Management of Aquatic Resources (CEMARE), University of Portsmouth, UK personal communication).

As understanding of natural resources' economic value is improving, it is also becoming increasingly clear that conversion of land for shrimp aquaculture is often not economically sound. Recent analysis

revealed that the total economic value of an intact mangrove in Thailand exceeded that of shrimp farming by 70% (Balmford *et al.* 2002).

Given the range of externalities generated by shrimp farming, there are serious concerns over its sustainability, and evidence indicates that many of the more intensive systems suffer from productivity declines and disease outbreaks after just a few years in operation (EJF 2003a, EJF 2003b). However, as shrimp are produced for an export market, the impacts associated with their production remain a local externality whose costs fail to be incorporated into consumer markets.

Conclusion

While it is clear that there is growing awareness of the need for improved legislation and practice within the industry, impacts of shrimp aquaculture are still a serious cause for concern. Shrimp farming is projected to continue its expansion with new territories being targeted as old ones are exhausted. Unless action is taken, threats to wetlands, due to Western demand for shrimp, seem likely to increase before they decline.

The Environmental Justice Foundation (EJF) is an international non-governmental organisation. EJF continues to investigate the social and environmental impacts of shrimp production, and is campaigning for fundamental change in the way shrimp are produced. More information about EJF's work and pdf versions of their reports can be found at www.ejffoundation.org.

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