

Shrimp Farming's 'Ecological Footprint'

The extent and nature of the negative environmental impacts of shrimp aqua culture arise primarily from two aspects: pond construction and operation. The severity of environmental threats increases as the number of farms increase in an area, and intensity of cultivation per farm rises.

In general, modern shrimp farming is clearly unsustainable ecologically because its operational requirements vastly exceed the carrying capacity of surrounding ecosystems. Extensive, low-input shrimp ponds are typically stocked at rates between 5,000 - 20,000 post larvae (PL) per hectare (1 hectare = 2.5 acres), and can provide harvest levels ranging from 75kg/ha to 1000 kg/ha in a year. By contrast, intensive shrimp farmers stock ponds at 250,000 to 600,000 PL per hectare, and yield from 10 to 16 tons of shrimp annually. At low density, shrimp do not require additional inputs for feeding, generally being able to forage on available nutrients. Because the density of shrimp is relatively low, water quality is better and shrimp are less prone to disease and, hence, loss. The environmental impacts associated with the operation of these extensive systems are, thus, minimized. On the other hand, intensive, industrialized shrimp farms, while yielding higher output, are also far more costly to operate and risk prone due to high stock densities, heavy feeding rates, and the difficulty of maintaining adequate water quality and disease control. Environmental impacts are also vastly greater and more pervasive in comparison to low density operations.

The environmental pressures from industrialized shrimp farms have impacts well beyond the boundaries of the immediate site itself. The additional ecological or biophysical "costs" have become known as the "ecological footprint". This "ecological footprint" is the minimum area of productive ecosystem required to sustain resource inputs to and assimilate waste outputs from an aqua culture operation.

For instance studies have shown that a one hectare (2.5 acres) semi-intensive shrimp culture system in Columbia (producing about 4000 kg of shrimp annually) requires the productive and assimilative capacity of between 38 and 189 hectares of natural ecosystem per year. Higher intensity farming operations require even greater levels of support from the surrounding environment. Such systems are extremely inefficient from an ecological energy standpoint, using approximately 295 Joules of ecological work in order to produce just one Joule of edible shrimp protein (that includes inputs such as fish meal, agricultural products in feed and pond productivity plus industrial energy such as labor, energy to catch and produce feed, fuel, fertilizer, maintenance and harvest costs, etc.).

A related aspect of the ecological footprint is the threat to the world's fisheries linked to the fact that many of the prime commercial aqua culture species, like shrimp and salmon, are carnivorous. Intensive modes of shrimp farming rely heavily on compound aqua feeds made largely from fish meal, because they mimic the composition of the natural food of carnivorous fish and crustaceans and are the simplest means of providing the nutritional requirements needed by these species on a daily basis. Assuming that intensively cultured, carnivorous fish and crustaceans will depend largely on fish meal in the future, this will lead to even greater fishing pressure globally as demand for fish meal increases.

Currently about 35 million tons of fish caught from the world's oceans are being ground into fish meal, oil and other non-food products annually. That is more than 40 percent of all fish caught from the world's oceans and seas. Aqua culture used 10 percent of the global fish meal supply in 1988, but by 1995 it had risen to around 15 percent. By the year 2000, however, aqua culture's share of global fish meal production is expected to be 20-25 percent, creating what has been called a "fish meal trap."

Already a disturbing trend to 'biomass fishing' is occurring, particularly in Asia, because of the rise in shrimp farming. Biomass fishing uses boats that pull large nets with extremely small mesh so that nothing escapes for the sole purpose of catching as many marine organisms as possible; after the higher valued commercial

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component of the catch is removed for sale, the remaining catch is converted to fish meal to feed farmed shrimp and other farmed fish species. This contributes to the already unsustainable fishing pressure that is pushing many fisheries in the developing coastal countries into quite serious declines. This in turn threatens the food security of hundreds of millions of coastal people who rely on fish as the main source of protein and other vital nutrients in their diets. The increasing use of aqua feeds made from fish meal will mean increasing competition for fish that might otherwise be used to provide food for direct human consumption.