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In the case of shrimp, a wildly popular food in the US, Europe, and parts of Asia, the answers to all these questions, except the last one, are all negative. The trade in shrimp is already global and free, virtually unregulated. Characterized not by trade barriers and distorting subsidies, it is a vast free-market failure allowing environmental and social costs to be dumped on local communities and coastal environments. This report attaches the consumption of shrimp here in the US to the impacts of such a global and free trade.

Mangrove destruction, loss of fisheries, the pollution of land and water, loss of employment, and even human rights violations, mark the intensive shrimp aquaculture industry world wide. Social and environmental abuses often reduce price in the short term, thus shrimp is traded at a fraction of the true costs.

The World Trade Organization (WTO) is the global institution chartered to regulate global trade, but it, despite its own rhetoric, is currently incapable of (and largely unwilling to) distinguishing between unsustainable and sustainable production, trade and consumption. Although there is currently no specific WTO protocol that covers aquaculture shrimp, discussions for such an accord are underway.

We believe that organization’s current course — removal of tariffs and quotas and non-tariff barriers in the absence of trade policies which promote sustainability — would further enhance the gaping market failures, environmental destruction, social costs, and economic inefficiency inherent to the intensive shrimp aquaculture industry. This should not happen.

This report describes the problem in greater depth and outlines what individuals can do to help. We are trying to influence the WTO to institute specific reforms to address this crisis. This will not be an easy or a quick task. In the meantime, we call on consumers, particularly in the largest market for aquaculture shrimp, the United States, to shift their consumption away from destructive to sustainable shrimp production, toward more sustainable ones.
Seafood is one of the most widely traded products in the world. In 1996, 195 countries exported 22 metric tons of fisheries products valued at $52.5 billion. According to the United Nations Food and Agriculture Organization, in live weight, this trade accounted for a full 40% of total world fisheries production (FAO, 1998).

For developing nations, the trade in seafood products is greater than that of coffee, tea, rubber, and banana combined. Shrimp ranked as one of the leading commodities. The US imports 10% of the total world trade of fisheries products by value. Together, Japan, US, and the European Community import about 75% of the total fisheries exports by value (FAO, 1998).

The demand for fish is rising. By year 2010, the demand for fish for human consumption is expected to be 10 to 40 million tons higher than the supply. Since most wild fisheries are currently either fully or overexploited, the FAO expects a full 30% of total fish production in 2010 to be derived from aquaculture. Shrimp is by far the highest value aquaculture product traded today (FAO, 1998).

World Shrimp Production

Good marketing and a rapid rise in eating out (most US consumers eat their shrimp in restaurants) pushed up the demand for shrimp. As supply expanded, prices declined even in the face of growing demand. The development of shrimp aquaculture — in effect, the conversion of vast tracts of tropical mangrove forests and coastal lands into aquaculture ponds — in the 1980s drove the rise in shrimp supply and the decline in prices.

Over 50 countries currently export farmed shrimp. The number is growing. In 1998, the total number of hectares (2.47 acres per hectares) in worldwide shrimp production was 864,350. The world’s largest producer is Thailand: over 70,000 hectares in Thai shrimp aquaculture ponds produced over 210,000 metric tons of shrimp in 1998 (Rosenberry, 1998).

From the perspective of promoting export-led growth with a short term, high rate of return on investment, shrimp aquaculture can hardly be beaten. In the 1970s and 1980s, the World Bank, the Asian Development Bank, and foreign aid programs from the US, Japan and Europe provide massive loans and grants for the development of shrimp aquaculture throughout the tropics in the 1970s and 1980s. Studies funded by these entities amply demonstrate the high short-term returns of shrimp aquaculture as well as its success in earning producers a great deal of foreign currency. Unfortunately, this is all they show. Remaining overlooked are the environmental, social and long-term economic impacts of shrimp aquaculture.

Table 1 shows world aquaculture shrimp production in 1998. Producing countries vary greatly in the number of farms and productivity. Highly intensive ones produce on average up to 4,000 kilograms per hectare (some individual farms achieve 20,000 kilogram per hectare!). Less intensive producers yield a few hundred kilograms per hectare.

Unfortunately, these trade statistics do not tell us how long this production can be sustained or anything about its impact on people or the environment. Although some small tariffs and “non-tariff barriers” on aquaculture shrimp remain (the US has removed all tariffs on the most important shrimp imports), the fact is that there is a vast, free, unregulated and expanding trade in aquaculture shrimp. This dramatic development has pushed shrimp prices down and social and environmental costs through the roof.
US Shrimp Consumption: All you can stomach

Shrimp is America’s favorite seafood. Once a pricey delicacy at over $14/lb (1986), shrimp is now so inexpensive and available that many US restaurants offer an all-shrimp menu in their seafood section and all-you-can-eat shrimp bars. Despite a decline in overall seafood consumption, Americans consumed nearly 1 billion pounds of shrimp in 1998, far more than any other fresh or frozen seafood and way beyond the consumption of shrimp in any other country (NMFS, 1999).

Furthermore, Americans are not just increasing their overall consumption of shrimp. To a growing extent, US consumers prefer imported over domestic shrimp. In 1988, US consumers bought 2.5 pounds of imported shrimp for every pound of domestic shrimp. The US consumed 986 million pounds of shrimp in 1998. Of this, the US imported a record 695.4 million pounds of shrimp valued at $3.1 billion and accounting for 38% of the total value of edible fisheries products brought into the country (NMFS, 1999). Tuna hailed a distant second at only $845 million or just over 10% of total imports (Aquaculture Magazine, 1998). According to the National Marine Fisheries Service (1999) the US imported $37 billion in shrimp in the last 25 years. This means at the retail level, consumers spent between $50 and 100 billion on imported shrimp since 1974. US shrimp exports, on the other hand, amounted to a paltry 32,432 pounds valued at $0.1 million (NMFS, July 1999). This left a gaping $3 billion US trade deficit in shrimp products.

Table 1. World Shrimp Aquaculture Production 1998

<table>
<thead>
<tr>
<th>Country</th>
<th>Production Metric Tons (thousands)</th>
<th>Percent of World Trade</th>
<th>Hectares of Shrimp Farms (thousands)</th>
<th>Average Production (Kg/Ha)</th>
<th>Estimated No. of Farms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thailand</td>
<td>210</td>
<td>28.1</td>
<td>70</td>
<td>3,000</td>
<td>25,000</td>
</tr>
<tr>
<td>Ecuador</td>
<td>130</td>
<td>17.3</td>
<td>160</td>
<td>813</td>
<td>1,600</td>
</tr>
<tr>
<td>India</td>
<td>70</td>
<td>9.4</td>
<td>140</td>
<td>500</td>
<td>100,000</td>
</tr>
<tr>
<td>Indonesia</td>
<td>50</td>
<td>6.7</td>
<td>200</td>
<td>250</td>
<td>30,000</td>
</tr>
<tr>
<td>Philippines</td>
<td>35</td>
<td>4.7</td>
<td>20</td>
<td>1,750</td>
<td>2,000</td>
</tr>
<tr>
<td>Mexico</td>
<td>17</td>
<td>2.3</td>
<td>24</td>
<td>708</td>
<td>319</td>
</tr>
<tr>
<td>Colombia</td>
<td>12</td>
<td>1.6</td>
<td>3.2</td>
<td>3,750</td>
<td>14</td>
</tr>
<tr>
<td>Honduras</td>
<td>12</td>
<td>1.6</td>
<td>14</td>
<td>857</td>
<td>90</td>
</tr>
<tr>
<td>Malaysia</td>
<td>8</td>
<td>1.1</td>
<td>4</td>
<td>2,000</td>
<td>8,000</td>
</tr>
<tr>
<td>Panama</td>
<td>8</td>
<td>1.1</td>
<td>8.5</td>
<td>941</td>
<td>40</td>
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<tr>
<td>Brazil</td>
<td>7.3</td>
<td>1.0</td>
<td>4.3</td>
<td>1,681</td>
<td>113</td>
</tr>
<tr>
<td>Venezuela</td>
<td>7</td>
<td>0.9</td>
<td>2</td>
<td>3,500</td>
<td>13</td>
</tr>
<tr>
<td>Peru</td>
<td>5</td>
<td>0.7</td>
<td>3.2</td>
<td>1,563</td>
<td>35</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>5</td>
<td>0.7</td>
<td>3</td>
<td>1,667</td>
<td>1,000</td>
</tr>
<tr>
<td>Belize</td>
<td>4</td>
<td>0.5</td>
<td>1.2</td>
<td>3,333</td>
<td>8</td>
</tr>
<tr>
<td>Nicaragua</td>
<td>4</td>
<td>0.5</td>
<td>5.5</td>
<td>727</td>
<td>160</td>
</tr>
<tr>
<td>Australia</td>
<td>2.2</td>
<td>0.3</td>
<td>0.6</td>
<td>4,000</td>
<td>33</td>
</tr>
<tr>
<td>US</td>
<td>2</td>
<td>0.3</td>
<td>1</td>
<td>2,000</td>
<td>25</td>
</tr>
<tr>
<td>Other</td>
<td>160</td>
<td>20.2</td>
<td>205</td>
<td>780</td>
<td>10,200</td>
</tr>
<tr>
<td>Total</td>
<td>748</td>
<td>100</td>
<td>869</td>
<td>861</td>
<td>171,450</td>
</tr>
</tbody>
</table>

Adapted from Aquaculture Magazine (1998) and Rosenberry 1998
Where Your Shrimp Comes From

Like much of our food, we just eat shrimp and do not think about where they come from. Most commercial shrimp are either caught in the wild or produced by factory farm ponds in what is known as aquaculture: the farming of fresh, brackish or marine animals in ponds or pens.

The Wild Shrimp

Throughout the world, fish catches are declining. Of the world’s 17 most important fisheries, according to the United Nations Food and Agriculture Organization (FAO), nine have suffered serious decreases and four are commercially fished out. The FAO estimates that 69% of the world’s fisheries are either overfished, fully fished, depleted, or recovering from past over exploitation.

Shrimp trawlers are among the most wasteful fishing boats in the world — they produce less than 2% of the world’s seafood, but are responsible for a third of the wasted fish bycatch. Up to 14 pounds of fish and other marine life are destroyed and discarded for each pound of shrimp harvested in some shrimp fisheries. Globally, shrimp trawling has a severe impact on sea turtle populations. The National Academy of Sciences has concluded that shrimp trawling kills more sea turtles than all other human means combined in US waters. An estimated 150,000 sea turtles worldwide are captured in shrimp nets every year.

Shrimp trawlers use nets that are dragged through the ocean floor and sweep up everything in their path. Since sea turtles breath air, they drown when the nets drag them under water for up to six hours. These deaths are needless. In the US, sea turtle drowning can be avoided through the proper installation and use of Turtle Excluder Devices (TEDs) which allow sea turtles to escape the nets.

Trawling is also the most important source of human-caused physical disturbance on the ocean’s floor. Trawling churns sediments on the seabed, crushes or buries marine life, and reduces the structural complexity of the seabed.

The Farmed Shrimp

Modern shrimp aquaculture grew out of the intensification of traditional and “extensive” shrimp farming practiced in Southeast Asia for generations.

Shrimp aquaculture ponds are located in estuaries and coastal wetlands, the most biologically productive and undervalued areas on earth. Shrimp naturally grow in the brackish water of coastal estuaries, mangrove forests and wetlands then migrate further off the coast as they grow. For this reason, mangrove areas are chosen as sites for construction of shrimp ponds. Pond construction begins by cutting down the mangrove forests and digging diked ponds.
How Your Shrimp is Farmed

Shrimp farming methods are categorized according to stocking densities, that is, how many young shrimp or post larvae are packed into each hectare (2.47 acres) of shrimp pond, as well as the extent of chemicals, feeds pumps and management involved. There are basically three systems of shrimp aquaculture.

1. Extensive shrimp aquaculture
   This system of aquaculture often relies on natural tidal action to bring wild shrimp larva and other species into the ponds. Sometimes, fertilizer or manure is added to promote algae growth to provide food for the shrimp. Stocking densities are low and disease outbreaks are rare. This method requires minimal management and low capital input (Clay, 1996). However, it provides the lowest yield among the other shrimp farming methods, an average of 1/2 ton per hectare per crop. Extensive shrimp aquaculture has been practiced in Asia for hundreds of years.

2. Semi-intensive shrimp aquaculture
   Ponds are stocked with hatchery-reared or wild-caught post larvae and the farmer relies on the natural productivity of the pond along with supplementary artificial feeds. This method of farming uses chemical inputs, antibiotics, feeds, and diesel water pumping. Pumps exchange 10 to 30% of the water daily to remove wastes. Stocking densities of young shrimp range from 25,000 to 200,000 per hectare, and the natural food in the pond are augmented with shrimp feed, antibiotics and chemicals. Yields range from 1/2 to 5 tons per hectare per crop.

   While semi-intensive shrimp farming is considered by some shrimp farming advocates to have less impact on the environment intensive aquaculture systems of shrimp production, its long-term sustainability has not been demonstrated. Failures are common. It requires large amounts of clean water, fish and cereal for feed, and wild shrimp fry and/or broodstock from healthy mangroves (Naamin, 1991; Paw and Chua, 1991 cited in Folke and Kautsky, 1994). A majority of shrimp farms pump in clean water and pump out polluted water, resulting in accumulation of wastes in the surrounding ecosystems which can lead to severe or irreversible problems. Thus, they directly or indirectly degrade the ecosystems upon whose resources they depend (Folke and Kautsky, 1994).

3. Intensive aquaculture
   Ponds are stocked with post larvae, mostly from hatcheries and nurseries, at high stocking densities of more than 200,000 per hectare. Feed is usually formulated protein pellets. Other pond additives include antibiotics, pesticides, detergents and other chemicals. This type of farming entails high stocking densities, full-time management, heavy feeding, and pumping oxygen into the water to accommodate the high stocking and feeding levels. Water is exchanged at the daily rate of 30% or higher. Fresh water is either brought in from rivers or, more often, pumped from cleaner groundwater sources. The ponds are lit all night to force the shrimp to feed continually. Average production ranges from 5 to 10 tons per hectare per crop.

   This type of system is primarily used in countries with high land value because shrimp are raised in smaller and densely packed ponds. The producer incurs higher investment costs but the potential for profit is also higher. However, intensive aquaculture is very hard on the environment. It is also the system most vulnerable to diseases and collapse.
The Impacts of Shrimp Farming

One might suspect more intensive farms to be easier on the environment because, yielding more shrimp per hectare, they require less land to produce the same amount of shrimp. In reality, however, without government regulations and proper enforcement in place, intensive farms are much less sustainable and more polluting. After a few years, many intensive shrimp farms are shut down and moved to more pristine and productive areas. The abandoned operations leave behind a wasteland.

Shrimp Farming Is Environmentally Destructive

These are some of the environmental effects of shrimp aquaculture:

- **Destruction of Mangrove Forests.** Completely ignored by the economic analysis which promotes the shrimp aquaculture industry is the importance of mangroves to coastal ecosystems and communities. Mangroves link tropical forests and coral reefs providing a critical transition between terrestrial ecosystems and marine ecosystems, they are crucial to healthy coastal ecosystems in the tropics. Mangroves protect shorelines from erosion, capture sediments protecting coral reefs, and are the spawning grounds for the majority of tropical commercial fish, including the highest value species. In addition to the mangrove forest itself, waterways (estuaries, creeks, canals, lagoons and backwaters), mudflats, salt pans and islands contribute to the physical dimension of these ecosystems (Kjerfve, 1990). About half of the world’s mangroves have been lost, and about half of that have been lost in the last twenty years. Shrimp farming has been one of the major causes of such loss.

In addition to their key role in coral reef health and fisheries production, mangrove trees and shrubs form conspicuous wetland ecosystems fringing extensive areas of coastline in tropical and subtropical latitudes. They protect coastal lowland rainforests from tropical storms. They are critical to local biodiversity, harboring plants and animals totally unique to mangrove ecosystems. Increasingly, they are used for recreation and eco-tourism, and are already protected for this reason (and for their role in coral reef health) in parts of the Caribbean, Asia and Latin America. Finally, because they are so biologically productive, mangrove forests are used in many parts of the world for fuel wood, charcoal, construction, furniture materials, drugs, fodder, glue, and other functions.

- **Introduction of Exotic and Native Species.** Shrimp species that may be more productive or popular to consumers than native species compete with the latter. This may result in the loss of genetic diversity or weakening of the genetic stock. Also, pathogens and parasites that are carried by introduced individuals are transferred to areas where they did not previously exist.

- **Bycatch in Harvesting Wild Post Larvae.** Workers, mainly women and children, drag fine-meshed nets around shallow waters in order to catch juvenile and larvae shrimp. The other fish larvae are discarded on the beach as bycatch. Estimates show that 100 other fish or shrimp are killed for every shrimp grown in a pond. The bycatch of wild post larvae is higher than even the shrimp trawler industry, which is considered to have the highest bycatch rate of all fisheries in the world (Clay, 1997).
• **Waste, Suffocation, Toxification and Salinization.** The intensive stocking of shrimp is one reason why ponds are so financially lucrative. However, the vast volume of waste production from packing massive quantities of shrimp into the ponds is also one of the primary reasons for the ecological and financial collapse of shrimp farms.

Feed eaten by shrimp but not retained in their body weight ends up as waste. As the waste piles up, bacteria flourish and consume the available oxygen. This can suffocate the shrimp or reduce their growth. Intermediate waste products of both shrimp and microbes, such as ammonia and nitrite, are toxic to shrimp, fish and other animals. Shrimp weakened by waste and lack of oxygen are more susceptible to disease.

To avoid a die-off due to lack of oxygen or the toxic build-up of wastes, wastewater is frequently pumped out of the ponds and fresh water is pumped in. This practice pollutes the surface waters, including coastal marine waters that receive the wastes. In order to avoid polluting their own farms, aquaculture farmers prefer eschew surface water in favor of cleaner ground-water for their fresh water sources. This creates a host of other problems like the salinization of coastal aquifers.

• **Salinization of Coastal Aquifers and Agricultural Lands.** Coastal areas maintain a delicate balance between underground fresh water and underground saltwater. The availability of fresh groundwater is critical for people living right on the coast. If fresh water pumped from ground exceeds the renewal-rate of fresh water flowing through the aquifer, the resulting salinization can destroy drinking water and irrigation wells for towns and farms. Shrimp aquaculture has caused this to occur in India, Taiwan, Thailand, Malaysia, Ecuador and the Philippines.

When vast quantities of ground water are pumped out, the land can actually subside. This occurred in Taiwan and India. Furthermore, wastewater discharged from ponds into rivers and waterways is salty. If drawn into irrigation canals for rice or other crops, these brackish waters can kill crops and destroy the viability of agricultural lands. Thailand passed a law in 1998 banning inland shrimp farms due to the destruction of rice lands from salinization.

When shrimp ponds are abandoned due to disease or other causes, the area is often left as a wasteland. The soils are left with high salinity and high levels of acidity and toxic chemicals, so agricultural uses are usually not viable. In Ecuador, 15% of the shrimp aquaculture lands have now been abandoned and are considered unusable (Greenpeace, 1997).

• **Antibiotics, Fungicides, Parasitcides, Algicides and Pesticides.** With high-density shrimp agriculture, disease is a constant threat. It can wipe out not only a single crop but become a reoccurring nightmare that can force pond closures throughout an entire region. To guard against diseases, farmers engage in the intensive use of antibiotics during production and poisons between harvests to sterilize the ponds.

The treatment of bacterial infections in shrimp ponds with doses of various antibiotics added to shrimp feed could lead to the occurrence of high levels of antibiotics in marketed shrimp. This could increase antibiotic resistance in human consumers. A related environmental issue with potential implications for humans is that since shrimp ponds are downstream from agricultural lands, pesticides may accumulate in shrimp tissue as well.

Most consumers have no idea what goes into growing shrimp. Table 2 shows some of the antibiotics, pesticides, detergents, and other chemicals used in Tiger prawn aquaculture in the Philippines.
## Table 2: Chemical and Biological Inputs Used In Philippine Tiger Prawn Aquaculture

<table>
<thead>
<tr>
<th>Product</th>
<th>Use</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Antibiotics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chloramphenicol</td>
<td>Antibacterial</td>
<td>Used in hatcheries and feeds</td>
</tr>
<tr>
<td>Doxycycline</td>
<td>Antibacterial</td>
<td></td>
</tr>
<tr>
<td>Erythromycin</td>
<td>Antibacterial</td>
<td>Used in hatchery bath</td>
</tr>
<tr>
<td>Formalin</td>
<td>Fungicide/parasiticide</td>
<td>Spawning shrimp disinfectant</td>
</tr>
<tr>
<td>and gill disease</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malachite green</td>
<td>Parasiticide/antifungal</td>
<td>Shell and gill diseases</td>
</tr>
<tr>
<td>Nitrofurans</td>
<td>Antibacterial/fungicides</td>
<td>Disinfection of spawning shrimp, may cause deformities in larvae</td>
</tr>
<tr>
<td>Oxolinic acid</td>
<td>Antibacterial</td>
<td>Added to feed</td>
</tr>
<tr>
<td>Oxytetracycline</td>
<td>Antibacterial</td>
<td>Added to feed and pond directly</td>
</tr>
<tr>
<td>Rifampicin</td>
<td>Antibacterial</td>
<td>Used in hatcheries, prescribed for human tuberculosis</td>
</tr>
<tr>
<td>Sulfur drugs</td>
<td>Antibacterial</td>
<td>Added to feed</td>
</tr>
<tr>
<td>Trifluralin</td>
<td>Antifungal</td>
<td>Agricultural herbicide used in shrimp hatcheries</td>
</tr>
<tr>
<td>2. Pesticides</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ammonium sulfate</td>
<td>Piscicide (fish killer)</td>
<td>Used with burnt lime</td>
</tr>
<tr>
<td>Chelated copper</td>
<td>Algicide</td>
<td>Also used to induce molting</td>
</tr>
<tr>
<td>Copper sulfate</td>
<td>Antibacterial</td>
<td></td>
</tr>
<tr>
<td>Teased powder</td>
<td>Piscicide (fish killer)</td>
<td>Widely used in ponds</td>
</tr>
<tr>
<td>3. Disinfectants</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calcium sulfide</td>
<td>Disinfectant</td>
<td></td>
</tr>
<tr>
<td>Calcium hypochlorite or commercial bleach</td>
<td>Disinfectant</td>
<td>Widely used in hatcheries</td>
</tr>
<tr>
<td>EDTA</td>
<td>Binds with heavy metals</td>
<td>Hatchery use</td>
</tr>
<tr>
<td>Lodophore comp.</td>
<td></td>
<td>For equipment and shell diseases</td>
</tr>
<tr>
<td>Laundry detergent</td>
<td>Egg disinfectant</td>
<td></td>
</tr>
<tr>
<td>Alkyldimethyl dimethyl ammonium chloride</td>
<td>Antibacterial; antifungal</td>
<td>Also used for soil and water treatment</td>
</tr>
<tr>
<td>Benzalkonium chloride</td>
<td>Antibacterial</td>
<td>Also used to induce molting</td>
</tr>
<tr>
<td>Diodecyl dimethyl ammonium bromide</td>
<td>Antibacterial; antifungal</td>
<td></td>
</tr>
<tr>
<td>4. Soil and water treatment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bacteria-enzyme preparations</td>
<td>Decomposition of organic matter</td>
<td>Used in wastewater treatment</td>
</tr>
<tr>
<td>Hydrated lime</td>
<td>Increases pH; pond disinfectant</td>
<td>'Traditional pond input; also used to induce molting</td>
</tr>
<tr>
<td>Agricultural lime</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Burnt lime</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potassium permanganate</td>
<td>Oxidizer and detoxifier</td>
<td></td>
</tr>
<tr>
<td>Zeolite</td>
<td>Absorbs toxic gases</td>
<td>For water quality maintenance in ponds</td>
</tr>
<tr>
<td>5. Plankton growth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemical fertilizers</td>
<td>Fertilizers</td>
<td>‘Traditional pond inputs, urea and monoammonium phosphate</td>
</tr>
<tr>
<td>Organic fertilizers</td>
<td></td>
<td>Dried chicken and cow manure</td>
</tr>
<tr>
<td>Mineral/nutrient mixes</td>
<td></td>
<td>May be mixed with chemical fertilizers</td>
</tr>
<tr>
<td>6. Feed additives</td>
<td>Two or more may be combined in one product</td>
<td></td>
</tr>
<tr>
<td>Hormones</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enzymes</td>
<td></td>
<td></td>
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<tr>
<td>Vitamins and minerals</td>
<td></td>
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</tr>
<tr>
<td>Fatty acids</td>
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<tr>
<td>Protein extracts</td>
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</tr>
<tr>
<td>Bacteria</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chicken eggs (binder)</td>
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*Adapted from Primavera, 1993.*
loss of groundwater, coastal subsidence and other problems. Taiwanese shrimp exports to the US fell from 37,037,000 lbs. in 1987 to 3,505,000 lbs. in 1990, and fell in 1998 to less than 785,400 lbs. of total shrimp imports.

This pattern of boom and bust has followed the industry. Philippine shrimp production dropped from over 76,000 metric tons in 1996 to 35,000 in 1998 due to diseases and El Nino (Rosenberry, 1998). In Thailand, Indonesia, India, Honduras, Ecuador and other countries shrimp farms have been abandoned because they were unsustainable. Diseases, pollution, toxic sediments in the ponds, loss of water availability are caused by the shrimp industry and ensure that it has a short life.

Once a shrimp investor abandons the land it is often too salty and toxic for agriculture, or other uses. Rehabilitation is expensive and slow. One study in the Indian states of Andhra Pradesh and Tamil Nadu estimated that the “time required to rehabilitate land salinated by prawn culture [is] 30 years.” (Ahmed, 1997) It is clear that the eventual invasion by disease cannot be prevented and the ponds, no longer economically viable, are abandoned as wastelands or converted to fishponds. The production life of many shrimp ponds is 3-9 years, hardly sustainable.

### Shrimp Farming is Not Socially Responsible

Even though it is the coastal communities in tropical countries that suffer from the worst excesses of aquaculture development, few of the profits directly benefit them (Primavera, 1989, 1994).

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**Food Security.**

Aquaculture is promoted as a viable response to the problem of dwindling food resources especially in poor countries. This is not the case for shrimp aquaculture. As shown in this report, the bulk of the shrimp farmed in poor countries is exported to the rich countries where it is sold not as a basic food item but a luxury that can be done away with.

Advocates of shrimp aquaculture push for it as a source of much-needed foreign exchange, enabling shrimp-producing countries to import lower-cost protein and alleviate food security. There is some merit to this argument, but it presents two significant problems. First, there is no evidence that the foreign exchange earned by shrimp farmers is used to purchase cheap imported protein. The foreign exchange is earned not by the poor but by the rich shrimp pond owners who decide how to spend it. Second, dependence on imported food reduces food security in times of currency instability. As in the case of the Southeast Asian crisis, when the Indonesian rupiah dropped in value by half, imported food prices doubled.

Furthermore, fish such as anchovies are ground up for fishmeal and fed to shrimp rather than consumed directly by fishers or within the ecosystem by other larger fish that would be caught by the fishers. Overfishing for fishmeal production contributes to the reduction of fisheries in some tropical nations and reduces the catch of local fisherfolks, many of whom depend on fish as their primary source of protein.
Employment. Shrimp aquaculture is extremely capital and resource-intensive. Due to its industrial nature, shrimp aquaculture employs fewer people directly than agriculture or other fishing operations. Rice farming employs ten times the laborers per hectare as shrimp aquaculture (Hempel and Winther, 1997). Most of the jobs opportunities in shrimp aquaculture are for a small number of technical experts or unskilled and low-wage workers who maintain the pond dikes, harvest the shrimp, and guard the ponds.

An increase in shrimp aquaculture results in a net reduction in employment for the poorest fisherfolks who also have few other job or subsistence opportunities. With job loss, the ability to purchase food is also lost. Income from coastal ecosystems is redistributed away from small-scale municipal fisherfolks to a few staff and the owners of large, capital intensive shrimp aquaculture ponds, exacerbating food insecurity.

Human Rights Issues. In some cases, shrimp farming has been undertaken through considerable violation of human rights. Incidents have included murders, physical injuries, summary expulsion of villagers, detention of workers in shrimp farms, forced resignations on the part of shrimp farm workers who are deemed to be vigilant of their rights, lodging of harassment court cases, and confiscation of land and water resources. These violations have been committed by employees of shrimp companies in Indonesia, Thailand, Bangladesh, India, Ecuador, and Honduras (Ahmed 1997; Clay 1996, personal communications, 1999). Below are the more recent examples of human rights violations.

- **Killings in Bangladesh:** over 100 Bangladeshi villagers were killed in conflicts over land acquisition efforts by the shrimp culture industry by 1997 (Ahmed, 1997).

- **Death and Injury of protesters in India.** Four fisherfolk were killed and 13 others injured seriously in Orissa, India, by policemen on June 11, 1999, after the villagers of Sorana protested the non-implementation of the Supreme Court ruling to ban shrimp farms within 1,000 meters of the Chilika Lake, the biggest brackish water lagoon in India (Kocherry, 1999).

- **Trumped up criminal charges in Indonesia.** Endang Suparmono and 15 other contract farmers were falsely accused of stealing shrimp or engaging in violence in South Sumatra. Endang was influential in Badan Musyawarah Plasma Sementara, or Provisional Consultative Body of Contract Farmers, the organization set up by the contract farmers to negotiate with the company. The incident which was the basis of the charges against Endang was actually started by man who turned out to be a shrimp farm employee (Human Rights Watch, 1999).

Displacement of Local Communities. In many shrimp-exporting countries, it is relatively easy for politically connected developers to turn highly productive, complex ecosystems into a single-use private domains (Primavera, 1989). Even those few jobs that are available are often filled by a work force brought in by the developer. Thus, many poor people who depend on mangrove forests and coastal fisheries for their livelihood are eventually dislocated. Through reduction of coastal fisheries production, increase in storm damage, saltwater intrusion eliminating mangrove forest products, and displacement of coastal peoples, shrimp aquaculture has highly impoverishing effects on coastal people.
**Conflict over Resource Rights.** Land tenure, ownership or use of land and water resources have been in the center of conflicts in shrimp farming areas around the world. Rice farmers in Thailand have consistently opposed the inland expansion of shrimp farming operations due to that industry’s detrimental effect on the production of rice. This year in Ecuador the shrimp aquaculture industry sponsored a bill which would have legalized farms built illegally in mangrove reserves and other public lands and attempted to grant the industry 99 year leases for $1.50/year/hectare. Local community organizations, with the help of ISA Net, successfully stopped legislative efforts that would have allowed shrimp farming to be given virtually free access to the use of coastal resources.

**Inequitable Income Distribution.** Shrimp aquaculture as promoted by national governments and international development agencies is geared to benefit large-scale enterprises rather than small-scale producers. The local elite, having better access to education, capital, and institutional resources like credit subsidies and permits than the disenfranchised coastal residents, tend to benefit more from shrimp farming. The enjoyment of these benefits then increase economic disparities in these countries (Bailey, 1988).

**Shrimp Farming is Economically Inefficient**

Free trade argues in favor of economic efficiency and growth in production and income. Trade allows countries to specialize, produce goods more efficiently, exchange products and increase total income and wealth. Trade links consumers in one nation with producers in another expanding market and global economic integration. Trade assumes that pervasive “external” costs (environmental and social) do not exist.

Liberalized trade assumes efficient markets where all the costs are included in the production costs of the product, that is, there should not be extensive “external” costs in the form of environmental destruction or social costs paid by people not engaged in the production or trade of the product. Economists call this a “market failure.” Fixing market failures requires intervention and regulation to either “internalize” these costs into the price of the product or mandate a change in behavior.

For example, a company dumping toxic waste on the neighbors, can sell its’ product at a price cheaper than if it were regulated to adopt a clean technology or dispose of the waste properly. The neighbors receive no benefit from the production, trade, or consumption of the company’s product but pay in terms of health and other costs. This is a market failure. Market efficiency requires that those receiving the benefits of the product should pay for all the costs. In addition, purchasers should have full information about the costs of the products they purchase.

Shrimp aquaculture has pervasive “externalities.” Mangroves, coral reefs, coastal forests are degraded or destroyed with all the services they provide. Local fisherfolks lose their livelihoods and food security as marine fisheries decline, drinking and irrigation water is polluted and they are displaced by aquaculture expansion. These costs are vast, though unmeasured in the market price of shrimp.

Shrimp aquaculture is also unsustainable, leaving degraded toxic land for the next generation. This is an intergenerational market failure. Production for current consumption should not rob future generations of opportunities.

Though the trade in shrimp is vast, and some people are making great profits, tremendous costs are borne by affected people, some costs are passed to the future. This means that promoting trade in shrimp aquaculture is promoting a market failure, not increased efficiency, which is the goal of trade. What is needed is effective regulation of the international production, trade and consumption of shrimp to ensure that it is efficient and all the costs are included in the price.
To Trade or Not to Trade, That is NOT the Question

There is more to trade than the commerce of goods between nations. Without sufficient regulation and safeguards, trade can unravel the ecosystems, social fabric, and local economies that support natural and human communities around the world. Fundamentally, trade cannot be sustainable without sustainable production.

How shrimp is produced is important. The incentive driving aquaculture shrimp production is international trade that links consumers in the US, Europe and Japan with producers in tropical countries. The evidence is overwhelming that modern aquaculture shrimp production is environmentally and socially harmful, unsustainable and economically inefficient.

These issues are unimportant if it is assumed that trade is neutral with respect to the environment, society, sustainable management and economic efficiency. This is the basic position of the World Trade Organization (WTO). But trade is not environmentally neutral. It can have positive or negative effects. Two examples of these are the trade in pollution control equipment which has resulted in cleaner air in many countries, and the trade in tigers and their parts, if permitted, would drive these endangered species closer to extinction.

Fundamentally, for the trade in shrimp and other fisheries products to be sustainable, fisheries must be sustainably managed. Trade is not neutral toward the sustainability of fisheries. Trade rules emphasizing only the removal of tariffs, quotas and non-tariff trade barriers provide a short-term competitive advantage to countries or companies willing to liquidate and overexploit wild fisheries or use highly productive but clearly unsustainable aquaculture methods.

Pairing an incomplete view of free trade with the tremendous purchasing power in the US, Japan and Europe and weak regulatory and enforcement institutions in most nations worldwide could spell a sustainability disaster for fisheries and coastal areas. In fact promoting fishing without promoting sustainable fishing has an abundant history of collapse.

Increased economic efficiency and benefits to all that engage in trade is the very foundation for promoting free trade. Yet a market failure exists if various real costs are shunted aside, delayed, or hidden. The fact is that some markets are not efficient and may in fact contain astronomical hidden costs. They require regulation and adjustment so that producers and consumers pay the true costs of production.

What is really needed is sustainable, environmentally sound, socially beneficial, and economically efficient trade. This is in the interest of consumers, producers, traders and future generations. It is also consistent with the view expressed in the preamble of the WTO Charter:

“...The parties to this Agreement... with a view to raising standards of living, ensuring full employment and a large and steadily growing volume of real income...while allowing for the optimal use of the world’s resources in accordance with the objective of sustainable development, seeking both to protect and preserve the environment and to enhance the means for doing so...."
There is a critical need for international regulation of the trade in shrimp. The international institution charged with setting trade rules, resolving disputes and generally governing world trade is the World Trade Organization (WTO). It is currently moving in the direction of liberalizing world trade, that is, of reducing tariffs, quotas and non-tariff trade barriers. However, in the case of shrimp aquaculture “free trade” already exists. The real trade issues concern sustainability, environmental damage, social harms and economic inefficiencies.

Currently the scope of the WTO does not include a specific agreement on fisheries products, and fisheries are not included in the Agreement on Agriculture. However, other agreements within the WTO do apply to fisheries. These include:

**The Agreement on Subsidies and Countervailing Measures** would allow action to reduce subsidies to the fishing industry. An agreement on this issue is currently being discussed and promoted by the US. Whereas the elimination of subsidies that promote fisheries degradation is critical, the agreement would not encompass the most significant subsidies.

**WTO’s Failure to Promote Sustainable Trade in Shrimp**

The World Trade Organization is primarily concerned with removing barriers to trade. Current barriers did not stop 40% of total world fisheries production from being traded internationally. In fact, tariffs on aquaculture products have been falling. According to the FAO, “Average tariffs on imports from developing countries are now estimated at 4.8%, a cut of 27% from the previous level of 6.6% (FAO, 1995). The long-term trend, with growing membership in the World Trade Organization, will be for further reductions in tariffs.” (Lem, A and Z. H. Shehadehm, 9/24/99)

In terms of promoting the sustainable trade in shrimp the WTO is failing in the following areas.

1. **Scale.** This refers to absolute size of shrimp aquaculture relative to the ecological systems that support it. It is different from “economies of scale.” This is a question that must be considered in terms of world trade in shrimp. Shrimp Aquaculture has been tagged as one of the major causes of mangrove loss. What is an ecologically balanced and economically efficient limiting size of the industry globally? Though the trade in shrimp drives the expansion in shrimp production and mangrove loss, there is no market mechanism for establishing a global scale for shrimp aquaculture.
2. **Sustainability.** Despite their own preamble (see above), the WTO is committed to promoting trade whether or not it is sustainable. Shrimp and fisheries production must be sustainable to have sustainable trade. To promote sustainable trade, unsustainable methods of production must be phased out and sustainable methods promoted. The WTO is not only unable to do this, but restricts countries from discriminating against unsustainably produced products.

3. **Ecolabeling.** To promote sustainability and economic efficiency, consumers must have full information about the products they purchase. Ecolabeling of shrimp is critical to enabling consumers willing to pay for sustainability produced shrimp to do so. Ecolabeling of shrimp products would discriminate against countries that produce predominantly unsustainable shrimp. This would be illegal under current WTO rules. Thus the WTO is currently standing in the way of more sustainable and economically efficient trade.

4. **The Precautionary Principle** is intended to prevent great costs under conditions of uncertainty. “Rather than await certainty, regulators should act in anticipation of any potential environmental [and economic] harm in order to prevent it.” (Costanza et. al., 1997). For example, it is ecologically and economically sound to prevent toxic waste rather than clean it up, or to prevent invasive species from invading rather than try to kill them off once they are established even if certainty as to the costs they might inflict does not exist. Using the precautionary principle in fisheries management is the most scientifically rigorous and economically effective way to prevent collapse and promote sustainability. It is critical to promoting sustainable shrimp production as well as food safety for shrimp products and the prevention of introduced species and diseases into producing or importing countries. For the past twenty years, environmental regulators in the US and in many other countries have increasingly adopted the precautionary principle. However, the WTO takes the position that damage must be demonstrated. Precaution is not allowed. Where damage is demonstrated, the use of ameliorative trade restrictions must be minimized.

5. **Economic Efficiency.** For trade to be economically efficient, all the social and environmental costs must be internalized into the cost of the product. Shrimp aquaculture results in the loss of mangrove, coral reef, and fisheries. Other costs inflicted on local communities include increased pollution, salinization of fresh water supplies, and loss of employment. These costs must be internalized if the trade in shrimp is to be considered economically efficient.

6. **Food Security.** There is ample evidence that the trade in shrimp reduces food security, particularly for coastal people directly affected by shrimp aquaculture. The WTO assumes that increases in foreign exchange earned from exported shrimp supports food security by funding low-cost protein imports. They present no evidence for this claim. The actual implications for food security of shrimp aquaculture must be examined before a new fisheries agreement is considered.

7. **Subsidies.** The WTO readily admits that aspects of the shrimp aquaculture industry are subsidized. However, it does not appear to discriminate between subsidies that enhance economic efficiency, such as education programs for fisherfolks, and clearly destructive subsidies for large-capacity fishing trawlers.

8. **Democracy.** It is critical that local, state, and national governments be allowed to pass laws that promote sustainability, environmental enhancement, social benefits and economic efficiency even if they infringe slightly on trade. Most international law has been an extension of local and national law. WTO powers over local, state and national governments should be more fully discussed and curbed.

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*Local fisherfolk, protesting the decline of their catch and the cutting of mangroves in Northern Ecuador, cut a shrimp dike that was blocking the flow of water to their mangrove reforestation area.*
9. **Conservation Laws.** Countries are passing laws which protect mangroves and place controls, including bans on the shrimp aquaculture industry. These laws could be challenged as barriers to trade if proposed new agreements at the WTO on fisheries and investment proceed. Thailand has banned inland aquaculture ponds, India has banned shrimp aquaculture expansion. The Philippines has banned the cutting of mangroves for aquaculture ponds. Each of these laws could be challenged under the WTO proposed agreement on investment as barriers to investment in aquaculture and barriers to trade in aquaculture products.

10. **Government Procurement.** Local, state and national governments should be allowed to procure sustainably produced products. This would promote the shift to sustainable production, trade and consumption. However, current WTO rules do not allow this.

Instead of examining the effects of trade carefully to ensure that trade is sustainable, environmentally sound, socially beneficial and economically efficient, the WTO has promoted trade liberalization with little or no analysis of the social, ecological and development impacts. The WTO simply assumes that trade automatically results in rising standards of living, increasing employment, growing incomes, optimal resource use, sustainable development and environmental protection. This is not the case in the trade in shrimp aquaculture. Further, the specific structure, policies and decision-making process at the WTO discriminate against policies that promote trade (in shrimp) that is sustainable, environmentally, socially and economically sound.

In the end, the greatest threats to the production, trade and consumption of fisheries products are unsustainable production methods. Overfishing, resource mismanagement, intensive aquaculture, pollution, habitat destruction, these are threats to food security, fisheries productivity and trade.

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**The Need to Review and Repair the WTO**

To what extent are WTO policies and unregulated trade promoting unsustainable production, environmental destruction, social costs and economic inefficiency? No one knows. There has never been a thorough review of WTO policies and performance. Therefore, before the WTO can be effective in promoting sustainable trade which is economically efficient and clearly beneficial to the environment and society it should adopt and allow these policies and actions.

- Conduct global analysis of the scale aspects of production and environmental degradation
- Use sustainability criteria
- Allow ecolabeling
- Adopt the precautionary principal
- Enforce internalization of external costs in trade
- Protect food security
- Eliminate subsidies destructive to sustainability, and permit the use of subsidies that support sustainability and increase positive environmental and social benefits
- Implement an open, transparent process and respect local, state and national initiatives for environmental and social enhancement.
- Do not remove environmental laws under WTO rulings until alternative protections are in place.
- Accept government procurement of sustainable products though this will discriminate against some producers to prod the market into greater long-run efficiency

The community of nations should review the significant shortcomings of the WTO and repair those problems before expanding WTO powers into new areas. Since the WTO is currently incapable of regulating international trade to promote sustainability in shrimp production it is up to consumers to change their purchasing.
You're powerful as a consumer! You can exercise this power by choosing to eat only spot prawns or shrimp that are certified as turtle-safe. There are at least four ways to exercise your power.

1. **Go Wild, Eat Local.** Eat only spot prawns and shrimps that are certified as turtle safe. Both farmed and wild-caught shrimp—in other words, most shrimp on the market today—are generally unsustainable. In the US Pacific Northwest area, you will have to ask specifically for spot prawn that are caught through traps with mesh sides or buy a product that has the turtle-safe shrimp mark.

   Spot prawn (*Pandalus platyceros*) can be found off the coasts of Alaska, Western Canada, Washington state, Oregon, and Japan (Butler as cited in Schilining). It is caught by prawn trapping vessels through traps or pots that are fished in lines that are set at 200 to 400 meters (Schilining, 1999). Traps with mesh sides allows for the escapement of smaller prawns. This, by far, is the most sustainable manner of catching shrimp in the US Pacific coast. Coastal peoples from the tropics who have been adversely impacted by shrimp farming have, during interviews with the authors, repeatedly urged US consumers to eat only shrimp that have been caught or grown in the US where environmental regulations are stricter and better enforced compared to other countries.

   Give yourself a treat. Order live shrimp in restaurants. In the Pacific Northwest, live shrimp are caught through arguably the most ecologically sound fishing practices and you are guaranteed that you are eating fresh seafood! Most of the live shrimp in restaurants around especially the Seattle area are spot prawns.

2. **Make the turtles happy.** You can also look for this Turtle-Safe shrimp mark when you dine and shop. If you don’t see it, let grocers and chefs know you’ll accept nothing less. The more people demand sustainably caught or produced shrimp, the sooner we can stop the slaughter of sea turtles, save mangrove forests and threatened species that depend on them, and reduce poverty of people living in tropical coastal communities.

3. **Spread the word among your friends, and the businesses you patronize.** Friends do not let friends eat ecologically and economically unsound shrimp. Let them know more about the environmental and social impacts of eating farmed shrimp.

4. **Know more, be more involved! Contact us!**
   - Give us a call: (253) 846-7455
   - Send us a fax: (253) 547-5977
   - Write us an e-mail: isatorre@seanet.com
   - Write or visit us: 25415 70th Ave. East, Graham, WA, USA 98338
   - Visit our website: [www.shrimpaction.com](http://www.shrimpaction.com) or [www.shrimpaction.net](http://www.shrimpaction.net).

   You can also get in touch with our colleagues at the Sea Turtle Restoration Project at (415) 488-0370 or visit their website at [www.seaturtles.org](http://www.seaturtles.org).
References


_________. Interview with Dave Batker. Manilla, 6/21/99.


There is hope.  
These children understand 
more about mangroves than 
our parents ever did.