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**Bird Predation:** Migrating flocks of birds can land on a shrimp farm and quickly consume most of the shrimp. Almost everywhere birds are protected by law and efforts to scare them away are usually futile. Noise cannons, rockets and scarecrows work for awhile, but the birds soon learn to ignore them.

**Pollution and the Environment:** Whenever large numbers of semi-intensive and intensive shrimp farms concentrate on the same river, estuary or bay, their rich effluents, primarily shrimp waste products, uneaten feed and dead algae and bacteria, lower the quality of the surrounding water, overwhelm the environment and create conditions which favor shrimp pathogens.

Moderate amounts of effluents from shrimp farms have a beneficial effect on the environment, enriching it without overwhelming it. In some cases shrimp farm effluent has improved the local fishery. The mangroves and mangrove species that surround many shrimp farms thrive on moderate amounts of nutrients from shrimp farms. In turn, the mangroves prevent erosion and reduce turbidity by trapping sediments and binding nutrients. Ecuador's extensive shrimp farms operate in a comfortable balance with the mangroves. In some parts of Thailand, Indonesia and the Philippines, where pollution has put shrimp farms out of business, mangroves have reclaimed shrimp ponds. In Thailand, Venezuela and Ecuador, shrimp farmers restore and protect mangrove areas.

**The weather**

The weather plays a major role in the shrimp farmer's life. He never knows what to expect, but must be ready to alter labor, feeding, pumping, aeration and harvesting schedules and then be prepared to operate his business from a boat or plane, while waiting for the restoration of roads, bridges, electricity and communications. Scheduling hatchery and farm operations at these times creates major headaches for the industry.

In a very general sense, heavy rainfall and high temperatures benefit shrimp farming.

**The El Niño:**

**The Monsoon:** The southwest monsoon affects the lives of 60% of the world's population and has a major controlling effect on world food production. India gets 80% of its annual precipitation from the monsoon, which begins in late May, when southern trade winds in the Indian Ocean push moist ocean air northward toward southwest India. When they hit the coast in June, they warm, rise and shed their moisture. The rising air draws in more cool, moist air, causing heavy rainfall over most of the country.

The monsoon arrives in Trivandrum, Indian, in June and reaches Bangladesh, Thailand, China and the Philippines by the end of summer. In September, when the orbital position of the tilted Earth changes, the wind system reverses, pulling cool, dry air across Asia and carrying rain to Vietnam, Malaysia, Thailand, Southeast India, Sri Lanka, Indonesia and Australia, all of which farm shrimp.

Like El Niño in the western hemisphere, the monsoon flushes out rivers and estuaries and has a positive effect on shrimp farming and broodstock supplies. If the rains flood the ponds, however, which frequently happens in West Bengal, India and Bangladesh—and elsewhere—its effects can be decidedly negative.

On October 4, 2001, The Indian Meteorological Department (IMD) said that the country had a normal monsoon in 2001. IMD said cumulative rainfall was 92% of the long period average, making 2001 the 13th successive normal monsoon year. IMD said 30 of 35 meteorological subdivisions received normal to excess rainfall.

Every now and then, however, the monsoon fails, and Indian and Southeast Asia suffer through endless droughts and baking heat. Agricultural crops fail, economies slump and governments change. When the monsoon fails during an El Niño year, someone always speculates that El Niño did it. Events in the 1990s say they are wrong. El Niño was very active throughout the 1990s, but there was not one missed monsoon. Furthermore, the 1997/98 El Niño (April 1997 to April 1998), the biggest in a century, had no detectable effect on the 1997, 1998 and 1999 monsoons.

**Cyclones, Typhoons, Hurricanes and Tropical Storms:** Of the major shrimp farming nations, only Peru, Brazil and Ecuador in the western hemisphere and

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Thailand, Malaysia and Indonesia in the eastern hemisphere escape powerful cyclical storms. These storms are called cyclones in India and Bangladesh, typhoons in China and the Philippines and hurricanes in the western hemisphere. It's the huge amounts of rain and the surge of water that precedes these storms that do the most damage, easily flooding out an entire shrimp farming region overnight. The wind also tears buildings and hatcheries apart. These storms hit with enough regularity that shrimp farmers beyond the safe countries should be prepared to deal with at least one every ten years, or so. In addition to the physical punishment, they drop enough water to change the pond chemistry, shocking the shrimp into weakness and often death. Tropical storms lack the punch of the cyclical storms, but they have a similar effect on water quality. For a detailed report on Hurricane Mitch's (1998) effects on shrimp farming in Nicaragua and Honduras, visit the Shrimp News webpage at <http://www.shrimpnews.com>