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## i REPORT

SEPTEMBER - DECEMBER 2007

### Power and poisons

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#### What's swimming in your soup?

by Prime Sarmiento

TUESDAY, NOVEMBER 27TH, 2007

**SO WE** may not be as avid seafood-eaters as the Okinawans. But we live in an archipelago bordered by the South China and Celebes seas and the Pacific Ocean, after all, so seafood is part and parcel of our daily lives. The Philippines is among the world's biggest fish producers, netting over four million tons in 2006. It is also a major fish exporter, hauling in over \$500 million annual export revenue. The fishery industry employs nearly two million people and is among the main drivers of the country's steady agricultural growth.

Fish is our number one source of protein and, next only to rice, fish and other marine-based products like clams, seaweed, and prawns are the food we eat most often. Actually, we love seafood so much, we can no longer count the ways we enjoy eating what we harvest from the sea. We have fried *tinapa* paired with fresh tomatoes and garlicky *sinangag* (fried rice) for breakfast, *sinigang na hipon* or *bangus* (shrimps or milkfish in sour broth) for lunch, and steamed crabs for dinner. There are the reliable fish balls and prawn crackers for snacks, and perhaps even a sardine or tuna

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FISH is the number one source of protein of Filipinos. [photo by Jaileen Jimeno]

sandwich for those who have to have something heavier in between meals. When we drink with our friends, among the *pulutan* (bar chow) could be baked *tahong* (clams) and grilled *tilapia*.

Many of us, however, may lose their appetite for seafood if they knew what is also in the waters from which those good eats come. Says the Environmental Management Bureau (EMB) in its National Water Quality Report for 2001 to 2005: “(Most) surface and coastal waters are under severe environmental stress from point sources of pollution. Human settlements, farming, and industry all contribute to pollution of water bodies.”

Still, it’s domestic wastewater discharges that account for a larger number of bacteria and viruses that pollute our water bodies, according to the Bureau, and independent environmental consultant Joel Adriano agrees.

“We are one of the worst countries (in the world) when it comes to drainage systems,” he says. “Most of our untreated household wastes go to our rivers and seas. These wastes have nutrients that cause harmful algal bloom.” Which is to say, whatever we are flushing down the toilet will soon be swimming with fish and other water creatures, and can eventually lead to red tide, among other things.

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The Philippine Environment Monitor for 2006 issued by the World Bank says only seven cities (including Manila) in the Philippines have pipe sewer systems. This means 95 percent of the wastewater flowing from households directly or via septic tanks is transported into groundwater or into public canals and drainage systems. This untreated wastewater eventually flows into (and pollutes) the country's rivers, coasts, and other water bodies.

**OCEANS ARE** home to numerous species of single celled organisms such as algae and dinoflagellates. The presence of high nutrients and light levels in the water usually spur these organisms to reproduce rapidly, creating a "bloom." We have come to know the bloom as "red tide" because some algae grow very fast and form dense, visible patches near the surface of the water, which at times appear reddish orange.

Not all algal blooms are harmful, but there are organisms that produce neurotoxins, which can hurt and even kill higher forms of life such as zooplankton, shellfish, and fish. It can also be fatal to humans who consume what have become essentially toxic fish and shellfish, and they fall victim to paralytic shellfish poisoning. The symptoms include tingling, numbness, and burning of the perioral region, giddiness, drowsiness, fever, rash, and staggering. The most severe cases result in respiratory arrest within 24 hours of consumption of the toxic shellfish.

Bureau of Fisheries and Aquatic Resources (BFAR) Director Malcolm Sarmiento clarifies that fish harvested from red tide areas can be safe to eat if it is cleaned and cooked properly, with all the internal organs — especially the intestine — taken out. But it's another story with bivalves such as oysters, clams, scallops, and mussels. Shellfish are filter-feeders and ingest the toxin (called saxitoxin) in red tide organism and accumulate the toxin in their internal organs. Cooking and cleaning the shellfish won't help as the heat won't destroy the toxin.

In the Philippines, the first — and one of the country's worst — recorded case of harmful algal bloom or red tide occurred in 1983 at the Maqueda and Villareal Bays in Western Samar. The incident resulted in 157 cases of paralytic shellfish poisoning, of which there were nine deaths. Then the red tide quickly spread to other coastal areas including Carigara, Leyte, Capiz, Sorsogon, and Mati, Davao Oriental.

The final tally of paralytic shellfish poisoning cases for 1983 was 279, with 23 deaths. For the next two decades, red tide would continue to occur in various coastal areas in the Philippines — from Manila to Zambales, to Zamboanga del Sur to Palawan — leading to several outbreaks of paralytic shellfish poisoning. The annual tally of people falling ill because of red tide poisoning ranged from 200 to 300. In 1988 alone, as much as 307 cases were recorded.

Since the late 1990s, however, incidences of paralytic shellfish poisoning have declined significantly, thanks to increased consumer awareness on the dangers of eating shellfish gathered in waters poisoned by red tide, as well as constant monitoring by BFAR in cooperation with local governments. BFAR regularly monitors and tests water samples from different coastal and marine areas nationwide to detect the presence of red tide toxins. Since 2000, there were reported cases of paralytic shellfish poisoning only in 2002, 2003, and 2005.

That said, harmful algal bloom still occurred in various parts of the Philippines, this time resulting to massive fish kills. The worse case of fish kill took place in Pangasinan in 2002, as the rapid expansion of mariculture activities — otherwise known as fishponds — hurt water quality. The high amount of ammonia, nitrite, and phosphate (mostly due to unconsumed fish feeds) caused a bloom that killed the fish. Miguel Fortes, professor at the University of the Philippines Marine Science Institute (UP-MSI), says fishpond owners greedy for a bigger harvest tend to overfeed their fish. But the uneaten feed ends up in the water, and so the fishpond owner has even less fish — live ones, that is.

Red tide can cause fish kills through several ways. One is through oxygen depletion. Algae give off more oxygen during the day (through photosynthesis). Lack of nutrients or unfavorable conditions of light, salinity, or temperature usually produced in stagnant waters can cause red-tide organisms to die, resulting in a mass of decaying cells. Bacteria in the water grow rapidly on these decaying cells, resulting in removal of all the oxygen from the affected waters, thus suffocating other marine animals. Or,

the blooms become dense enough that they block sunlight and therefore destroy eelgrass beds, an important habitat for shellfish and other marine organisms. The blooms release toxins as well, thereby poisoning the waters and snuffing the life out of other organisms.

**SARMIENTO SAYS** that red tide still occurs in some places, and his agency issues a bulletin every month to announce where the problem areas are located to warn both the consumers and the fisherfolk about the dangers of harvesting and eating shellfish from these sources. BFAR's records show that red tide usually occurs after a long dry spell or during the summer months of March and April.



[photo by Jaileen Jimeno]

Sarmiento and other experts say there is no one big hot spot in the country for harmful algal bloom. Our water systems are interconnected and as past red tide occurrences have told us, the bloom can spread rapidly from one area to another. Algae move around, and actively swim toward the light. Water currents also transport algae from one body of water to the next.

Adriano, meanwhile, isn't optimistic that red tide will cease to appear anytime soon, given the deteriorating or already bad water quality of many of our lakes, rivers, and coastal waters. Aside from untreated domestic waste and mariculture activities, bodies of water across the country have been polluted by farms that raise hogs, chicken, and cattle and generate high organic wastewater (but with no appropriate wastewater treatment facilities).

Industries also get away with discharging heavy metals and hazardous wastes into the waterways.

Adriano mentions surface runoffs as well as among the water pollutants. He says these happen when "you deforest a mountain or engage in mining, disturbing the topsoil." Or, he continues, "you convert agricultural land into a (residential) subdivision — that's bound to have surface runoff. It rains, the topsoil goes with the surface water flow, and ends up in (a water body). The topsoil has nutrients that help propagate organisms, which in turn lead to (red tide) that kills the fish."

Red tide or no red tide, though, it may be wise to find out first where that fish you're about to buy came from. In its five-year study of the country's 196 inland surface waters (192 rivers and four lakes), the EMB found 13 percent as having poor quality, based on the amount of dissolved oxygen (DO). Fish and other aquatic organisms need at least five milligrams per liter (mg/L) of oxygen to live. DO that is below this level cannot sustain aquatic life. Although the surface waters deemed to have poor quality still have some life, whatever are able to survive there are bound to be loaded with toxins and bacteria.

During the EMB study, these registered poor water quality owing to their low DO levels: San Juan River, Parañaque River, Navotas-Malabon-Tullahan-Tinejeros River, and Pasig River in Metro Manila; Guadalupe River in Cebu; Meycauayan and Bocaue Rivers in Bulacan, and Calapan River in Oriental Mindoro.

Recently, Marilao River in Bulacan landed in the news for having water quality that is so bad it actually ranks among the world's worst. In the EMB study, the river was found to have a high annual total dissolved solids (TDS) levels that ranged from 1,785 to 3,265 mg/L. TDS is an indicator of the presence of a broad array of chemical contaminants; experts say that the level should not be more than 500 mg/L for good quality water. The primary sources of TDS in receiving waters are agricultural runoff, leaching of soil contamination, and industrial or domestic sewage.

The EMB also singled out Pampanga River in Region 3 for having high levels of Total Suspended Solids (TSS), which measures the amount of undissolved solid particles in water such as silt, decaying plant and animal matter, and domestic and industrial wastes. Ideally, the TSS level should not be above 25 mg/L; the EMB, however, did not specify what the Pampanga River's TSS levels were.

**BUT DON'T** swear off seafood just yet. The inland surface waters that EMB considers to have good water quality (47 percent) still outnumber those with poor quality, based on DO levels. And of the 26 coastal and marine water bodies the EMB surveyed, about 54 percent had managed to maintain good water quality during the time of the study. So long as the fish and other marine

products that you are serving come from these (and there was no recent environmental disaster there), then any trip to the hospital afterward may be more likely to be caused by gluttony or the cook's severe lack of culinary skills.

The EMB actually classifies water bodies into three groups. Aside from inland surface waters and coastal and marine waters, there is also groundwater, which the Bureau evaluates according to how safe it is for drinking.

As for being habitats for creatures that end up on the dinner table, the EMB determines that an inland surface water body has good water quality when it has low amounts of TDS and TSS, as well as low levels of biochemical oxygen demand or BOD. The latter determines the amount of oxygen required for the decomposition of organic matter from a pollution source. Higher BOD levels means more pollution. If the BOD is less than 30 mg/L, then that may be good quality water.

Both inland surface waters and coastal and marine waters must also have zero or very low heavy metal content to be described by the EMB as having good water quality. The Bureau failed to mention a benchmark level for this for inland surface waters, but for coastal areas, it says that as far as mercury content is concerned, it should not be more than .002 mg/L. The EMB also monitors water bodies for lead, copper, and cadmium content.

The EMB singled out these rivers for having particularly low TSS levels and good water quality: Nagan (upstream and downstream), Akutan, and Tanudan Rivers in the Cordillera Autonomous Region; Laoag River in Region 1; Mabayan River in Region 3; Saaz and Patalon Rivers in Region 9; Sibulan and Manurigao Rivers in Region 11; and Cabadbaran River in Caraga. The lowest BOD levels in the study were recorded at four rivers in Caraga — Taganito, Magallanes, Taguibo, and Bislig Rivers — which all registered figures that were below one mg/L, implying low organic pollution sources from surrounding areas.

For coastal waters, the EMB considered Sarangani Bay — an important fishing ground for tuna — in Region 12 as having good water quality.

**EXPERTS AND** activists agree that keeping our water resources from being polluted is not a matter of having more laws. They point out that there are already significant pieces of legislation that could help keep our waters clean, such as the Clean Water Act, the Marine Pollution Control Decree, and the Pollution Control Law. But as with other laws, they say the problem lies in the implementation. There is also a need to invest in proper infrastructure like an improved sewage treatment system that can treat bigger volumes of household wastewater discharges.

The EMB itself cited cheaper alternatives to conventional sewage treatment, such as wetlands that can serve as simple and low-cost wastewater treatment plants, which use natural processes for filtration and cleaning. Partially treated sewage can also be used for fish propagation.

UP-MSI's Fortes also suggests implementing an integrated coastal management system, instead of focusing all our resources into saving the coral reefs alone or mangroves alone.

“We must look at seagrass, mangroves, or coral reefs as one integrated ecosystem interacting with one another, and helping with one another,” he says. “Some people mistakenly think that the sea is all about coral reefs.”

Fortes points out that seagrass is usually left out of efforts to protect coastal waters, even though these provide food and habitat to marine animals and help keep water bodies clean by absorbing nutrients from coastal run-off.

In a project that he coordinated recently up north in Pangasinan, Fortes has made seagrass the star. The Bolinao Seagrass Demonstration Site (BSDS), funded by the UN Environmental Program (UNEP), aims to protect, conserve, and maintain the seagrass beds in Bolinao in an effort to keep the Lingayen Gulf as clean as possible.



FISHERMEN going out to sea. [photo by Jaileen Jimeno]

Fortes says that one of the successful ventures that has been implemented through BSDS is the marketing of salted and dried rabbit fish, locally known as padas, which live in seagrass meadows. If the project is maintained, however, Pangasinan may have a bounty of other fresh and pollution-free offerings from the sea for your dining pleasure.

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