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A series of articles and multimedia examining the human toll, global impact and political challenge of China's epic pollution crisis.

In China, Farming Fish in Toxic Waters



Chang W. Lee/The New York Times

A fish farmer brought oysters to buyers in Yuxi, a town in Fuqing County, Fujian.

By DAVID BARBOZA
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FUQING, China — Here in southern China, beneath the looming mountains of Fujian Province, lie dozens of enormous ponds filled with murky brown water and teeming with eels, shrimp and tilapia, much of it destined for markets in Japan and the West.

Fuqing is one of the centers of a booming industry that over two decades has transformed this country into the biggest producer and exporter of seafood in the world, and the fastest-growing supplier to the United States.

But that growth is threatened by the two most glaring environmental weaknesses in China: acute water shortages and water supplies contaminated by sewage, industrial waste and agricultural runoff that includes pesticides. The fish farms, in turn, are discharging wastewater that further pollutes the water supply.



This is the eighth in a series of articles and multimedia examining the human toll, global impact and political challenge of China's epic pollution crisis.

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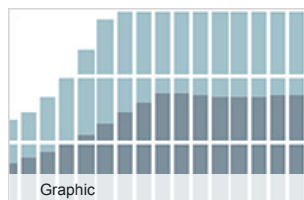
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[Contamination Threatens Seafood Industry](#)



The New York Times
Fuqing is No. 1 on a list for refused seafood shipments from China.

“Our waters here are filthy,” said Ye Chao, an eel and shrimp farmer who has 20 giant ponds in western Fuqing. “There are simply too many aquaculture farms in this area. They’re all discharging water here, fouling up other farms.”

Farmers have coped with the toxic waters by mixing illegal veterinary drugs and pesticides into fish feed, which helps keep their stocks alive yet leaves poisonous and carcinogenic residues in seafood, posing health threats to consumers.

Environmental degradation, in other words, has become a food safety problem, and scientists say the long-term risks of consuming contaminated seafood could lead to higher rates of cancer and liver disease and other afflictions.

No one is more vulnerable to these health risks than the Chinese, because most of the seafood in China stays at home. But foreign importers are also worried. In recent years, the [European Union](#) and Japan have imposed temporary bans on Chinese seafood because of illegal drug residues. The United States blocked imports of several types of fish this year after inspectors detected traces of illegal drugs linked to cancer.

This week, officials from the United States and China signed an agreement in Beijing to improve oversight of Chinese fish farms as part of a larger deal on food and drug safety.

Yet regulators in both countries are struggling to keep contaminated seafood out of the market. China has shut down seafood companies accused of violating the law and blacklisted others, while United States regulators are concentrating on Chinese seafood for special inspections.

Fuqing (pronounced foo-CHING) is at the top of the list this year for refused shipments of seafood from China, with 43 rejections through November, according to records kept by the United States [Food and Drug Administration](#). All of those rejections involved the use of illegal veterinary drugs.

By comparison, Thailand, also a major exporter of seafood to the United States, had only two refusals related to illegal veterinary drugs. China as a whole had 210 refusals for illegal drugs.

“For 50 years,” said Wang Wu, a professor at Shanghai Fisheries University, “we’ve blindly emphasized economic growth. The only pursuit has been G.D.P., and now we can see that the water turns dirty and the seafood gets dangerous. Every year, there are food safety and environmental pollution accidents.”

Environmental problems plaguing seafood would appear to be a bad omen for the industry. But with fish stocks in the oceans steadily declining and global demand for seafood soaring, farmed seafood, or aquaculture, is the future. And no country does more



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of it than China, which produced about 115 billion pounds of seafood last year.

China produces about 70 percent of the farmed fish in the world, harvested at thousands of giant factory-style farms that extend along the entire eastern seaboard of the country. Farmers mass-produce seafood just offshore, but mostly on land, and in lakes, ponds, rivers and reservoirs, or in huge rectangular fish ponds dug into the earth.

“They’ll be a major supplier not just to the U.S., but to the world,” said Richard Stavis, the chairman of Stavis Seafoods, an American company that imports Chinese catfish, tilapia and frog legs.

China began emerging as a seafood power in the 1990s as rapid economic growth became the top priority in the country. But environmental experts say that headlong pursuit of higher gross domestic product has devastated Chinese water quality and endangered the country’s food supply. In Guangdong Province in southern China, fish contaminated with toxic chemicals like DDT are already creating health problems.

“There are heavy metals, mercury and flame retardants in fish samples we’ve tested,” said Ming Hung Wong, a professor of biology at Hong Kong Baptist University. “We’ve got to stop the pollutants entering the food system.”

More than half of the rivers in China are too polluted to serve as a source of drinking water. The biggest lakes in the country regularly succumb to harmful algal blooms. Seafood producers are part of the problem, environmental experts say. Enormous aquaculture farms concentrate fish waste, pesticides and veterinary drugs in their ponds and discharge the contaminated water into rivers, streams and coastal areas, often with no treatment.

“Water is the biggest problem in China,” said Peter Leedham, the business manager at Sino Analytica, an independent food safety testing firm that works with companies that buy from China. “But my feeling is China will deal with it, because it has to. It just won’t be a quick process.”

Fishing for Prosperity

Fuqing is called *qiaoxiang*, or home, for those who go overseas, because for decades this port city on the East China Sea is where thousands of people fled as stowaways.

In the 1980s, some emigrants began sending home money and ideas at just about the time that investors were arriving from Japan and Taiwan, promising to help the country build fish farms.

“Aquaculture was popular in Japan, so I saw the future,” said Wang Weifu, a longtime eel producer.

Thousands of peasants who had struggled to earn a living harvesting rice and potatoes began carving up huge plots, digging rectangular pits and filling them with water to create fish ponds. Other parts of the country followed, creating fish farms alongside roads, near rivers and streams and in big lakes, ponds and reservoirs.

Today, the mighty Yangtze River is lined with fish farms. Historic Lake Tai is stocked with crab pens. Near Ningde, 90 miles north of here, thousands of people live in a huge bay area, where they float on large wooden rafts, feeding and harvesting caged fish, like the yellow croaker.

The government hoped the building boom would lift millions out of poverty. And it did. There are now more than 4.5 million fish farmers in China, according to the Fishery

Bureau.

Lin Bingui, 50, is one of them, a former bricklayer with an easy smile who now manages 20 enormous shrimp and eel ponds in western Fuqing, on reclaimed land with access to a narrow strait of seawater.

“This doesn’t take a lot of technology,” he said while walking into an indoor pond, where he raises baby eels. “You just learn it as you go along.”

The boom did more than create jobs. It made China the only country that produced more seafood from fish farms than from the sea. It also helped feed an increasingly prosperous population, a longstanding challenge in China.

Many growers here struck it rich as well, people like Lin Sunbao, whose 25-year-old son is now studying at [Cambridge University](#) in England. “My best years were 1992, ’93, ’94,” he said. “I only had one aqua farm, and I earned over \$500,000 a year.”

As early as the mid-1990s, though, serious environmental problems began to emerge after electronics and textile manufacturing plants moved into central Fuqing. Water shortages appeared in the southeastern part of the city, and some fish farmers say their water turned black.

Government records document the environmental ills in the region. The nearby Dongzhang Reservoir, a water source for agriculture and more than 700,000 people, was recently rated level 5, near the bottom of the government scale, unfit for fish farming, swimming or even contact with the human body.

The Long River, the major waterway in Fuqing, has been degraded by waste dumped by paper factories and slaughterhouses. The government this year rated large sections of the river below level 5, or so highly polluted that it is unfit for any use. And nearby coastal waters which are also heavily fish farmed are polluted with oil, lead, mercury and copper, according to the State Environmental Protection Administration in China.

As water quality in Fuqing declined, farmers who often filled their ponds with too much seafood tried to fight off disease and calm stressed fish with an array of powerful, and often illegal, antibiotics and pesticides.

Eel producers, for example, often used nitrofurans to kill bacteria. But that antibiotic has been banned for use in animal husbandry in the United States, Europe, Japan, and even China, because it has caused cancer in laboratory rats.

Importers of Chinese seafood quickly caught on. In recent years, eel shipments to Europe, Japan and the United States have been turned back or destroyed because of residues of banned veterinary drugs. Eel shipments to Japan have dropped 50 percent through August of this year, dealing a heavy blow in Fuqing.

Chinese farmers say they have stopped using the banned medicines, and have suffered a 30 percent decline in survival rates of their fish and other seafood.

“Before 2005, we did use drugs blindly. They were very effective in fighting disease,” said Wang Weifu, chairman of a local eel association, noting that drug residues might still be in the water. “But now we don’t dare because of the regulations.”

Some growers have lashed out at Japan, arguing that it keeps raising the drug residue standard simply to protect its own eel farms against competition. But growers here say buyers from Japan will eventually be forced to purchase eels from China.

“Our market will expand in Russia and Southeast Asia, and the E.U.,” Mr. Wang said. “Also, we see big prospects in the Chinese market. In five or six years, as we transfer our export destinations, Japan will be begging us.”

Retreating From the Coast

The drive about 175 miles west of Fuqing leads into the lush subtropical mountains of Fujian Province, where some of China’s richest bamboo and timber reserves can be found. There, near the city of Sanming, Fuqing eel producers have built a collection of aquaculture farms, huge cement tubs wedged into the mountainside, covered by black tarps and stocked with millions of eels.

“This costs a lot more up here, but we had to do it,” said Zheng Qiuzhen, a longtime Fuqing eel producer who now operates near Sanming. “We had to do something about the water problems.”

In much of the country, seafood growers are leaving crowded coastal areas for less developed regions, where the land is cheaper and there is cleaner water. But they say the overall cost of doing business so far from the coast is higher, given the expense of shipping the fish in oxygenated trucks to the processing plant in Fuqing and their forswearing illegal drugs, which lowers survival rates and increases the growth period of most fish to five years from three years.

“You can’t find many places as beautiful as this, covered by trees and bamboo,” said Lin Sunbao, who moved from Fuqing to Sanming. “We use water from mountain streams. And because our water is better, it’s harder to get disease.”

This is one of the solutions to the water crisis in China: to seek out virgin territory and essentially start the cycle all over again. And that worries scientists, who say aquaculture in China is not just a victim of water pollution but a culprit with a severe environmental legacy.

Industrial fish farming has destroyed mangrove forests in Thailand, Vietnam and China, heavily polluted waterways and radically altered the ecological balance of coastal areas, mostly through the discharge of wastewater. Aquaculture waste contains fish feces, rotting fish feed and residues of pesticides and veterinary drugs as well as other pollutants that were already mixed into the poor quality water supplied to farmers.

Besides algal blooms, some of the biggest lakes in China, like Lake Tai, are suffering from eutrophication nutrient bombs, brought on partly by aquaculture, that can kill fish by depleting the water’s oxygen. The government is forcing aquaculture out of these lakes, and also away from the Long River in Fuqing.

Places like Sanming may not be pristine for long. Heavy industry is moving in, lured by mineral riches and incentives from local governments, which are pushing for development.

And Sanming already has 72 giant eel farms, producing 5,000 tons of seafood a year. Those farms together use about 280 million gallons of water a day and then discharge the wastewater the following day, back into the Sanming environs.

There are efforts to operate aquaculture in a sustainable way. In Norway, for instance, salmon producers use sophisticated technology, including underwater cameras, to monitor water quality and how much fish feed is actually consumed. But nothing like this is being done in China, and specialists like Li Sifa of Shanghai Fisheries University insist that Chinese regulations are too lax and that enforcement efforts are often feeble or

nonexistent.

The government has stepped up its inspections of fish farms and seafood processing plants here, alerting workers of the dangers and consequences of using illegal drugs. But the drugs have remained a problem, partly because of poor water quality.

A possible solution to the water woes is to move aquaculture well out to sea, specialists say, with new technology that allows for deepwater fish cages served by automatic feeding machines.

The United States is already considering such a plan, partly as a way to make it less dependent on imports, which now fill 80 percent of its seafood needs. China is also considering adopting what is now being called “open ocean” aquaculture.

Currently, China’s coastal fish farms face many of the same challenges as those on land. Waters there are heavily polluted by oil, lead, mercury, copper and other harsh substances. Veterinary drugs dropped in shoreline waters may easily spread to neighboring aquaculture farms and affect species outside the cages, and while coastal waters are less polluted than those on land, aquaculture farms, with their intensive production cycles, are prone to be polluters.

Still, said An Taicheng of the Chinese Academy of Sciences: “China has to go to the sea because it’s getting harder and harder to find clean water. Every year there are seafood safety problems. One day, no one will dare to eat fish from dirty water, and what will farmers do?”

Chen Yang contributed research from Shanghai and Fuqing.

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