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# Another Side of Tilapia, the Perfect Factory Fish

By **ELISABETH ROSENTHAL**

AGUA AZUL, Honduras — A common Bible story says Jesus fed 5,000 people with five loaves and two fish, which scholars surmise were tilapia.

But at the Aquafinca fish farm here, a modern miracle takes place daily: Tens of thousands of beefy, flapping tilapia are hauled out of teeming cages on Lake Yojoa, converted to fillets in a cold slaughterhouse and rushed onto planes bound for the United States, where some will appear on plates within 12 hours.

Americans ate **475 million pounds of tilapia** last year, four times the amount a decade ago, making this once obscure African native the most popular farmed fish in the United States. Although wild fish predominate in most species, a vast majority of the tilapia consumed in the United States is “harvested” from pens or cages in Latin America and Asia.

Known in the food business as “aquatic chicken” because it breeds easily and tastes bland, tilapia is the perfect factory fish; it happily eats pellets made largely of corn and soy and gains weight rapidly, easily converting a **diet** that resembles cheap chicken feed into low-cost seafood.

“Ten years ago no one had heard of it; now everyone wants it because it doesn’t have a fishy taste, especially **hospitals** and schools,” said Orlando Delgado, general manager of Aquafinca.

Farmed tilapia is promoted as good for your health and for the environment at a time when many marine stocks have been seriously depleted. “Did you know the **American Heart Association** recommends eating fish twice a week?” asks the industry Web site, [abouttilapia.com](http://abouttilapia.com). But tilapia has both nutritional and environmental drawbacks.

Compared with other fish, farmed tilapia contains relatively small amounts of beneficial omega-3 fatty acids, the fish oils that are the main reasons doctors recommend eating fish frequently; salmon has more than 10 times the amount of tilapia. Also, farmed tilapia contains a less healthful mix of fatty acids because the fish are fed corn and soy instead of lake plants and algae, the diet of wild tilapia.

“It may look like fish and taste like fish but does not have the benefits — it may be detrimental,” said [Dr. Floyd Chilton](#), a professor of physiology and pharmacology at Wake Forest Baptist Medical Center who specializes in fish [lipids](#).

Environmentalists argue that intensive and unregulated tilapia farming is damaging ecosystems in poor countries with practices generally prohibited in the United States — like breeding huge numbers of fish in cages in natural lakes, where fish waste pollutes the water. “We wouldn’t allow tilapia to be farmed in the United States the way they are farmed here, so why are we willing to eat them?” said Dr. Jeffrey McCrary, an American fish biologist who works in Nicaragua. “We are exporting the environmental damage caused by our appetites.”

Defenders of tilapia aquaculture point out that this young and rapidly growing industry has begun improving standards and toughening regulation. The two-year-old [Aquaculture Stewardship Council](#), the brainchild of the conservation organization WWF and [I.D.H.](#), a Dutch sustainable trade program, is rolling out an inspection program for tilapia farms independent of the industry. Those that choose to participate — and pass — will receive labels identifying their product as “responsibly farmed.”

In a nod to its growing popularity, this year tilapia’s will be the [first of 10 fish certification programs](#) to be initiated. Aquafinca, which began adopting more environmentally friendly cultivation in 2006 to better appeal to large corporate customers like Costco, this year became the first farm to pass an initial inspection.

Proponents say tilapia aquaculture will only grow in importance because it provides food and jobs in a world of declining fish stocks and rising population. “There are going to be more farmed fish each year,” said [Kevin Fitzsimmons](#), a biologist at the [University of Arizona](#). “Think about it: if we tried to get beef from hunting, there would be a lot of hungry people.”

### **From Africa to the World**

Native to lakes in Africa, this versatile warm-water fish was deployed by many governments in poor tropical countries around the world in the second half of the 20th century to control weeds and mosquitoes in lakes and rivers. In a cistern or pond, a few fish yielded [dietary protein](#).

In retrospect, that global dispersal “maybe was not the best idea,” said [Aaron McNevin](#), a WWF biologist who is coordinating the development of standards for tilapia farms, because tilapia “is one of the most [invasive species](#) known and very hard to get rid of once they are established.” Today, wild tilapia has squeezed out native species in lakes throughout the world with its aggressive breeding and feeding.

By the 1990s, businesses saw opportunity in farming this hearty species, which tolerates

crowding and does not need expensive meat-based feed. Using selective breeding, scientists created today's industrial strains: big, fleshy fish with tiny heads and tails, and intestines that allow them to absorb food faster. Farmed tilapia reaches its sales weight of about two pounds in roughly nine months of intensive feeding.

"Nature is for maintaining species; what we do is make fillets," said Danilo Sosa, a technician at the tilapia breeding pens of Nicanor Fish Farms, outside Managua, Nicaragua, plopping a tilapia used for breeding on a wooden table and scanning the chip in its gut that identifies its breeding line.

Last year, more than 52 million pounds of fresh tilapia were exported to the United States, mostly from Latin America, as well as 422 million more pounds of frozen tilapia, both whole and fillet, nearly all from [China](#), according to the [United States Department of Agriculture](#).

The growth has been abetted by the creation and marketing of new products like fleshy "tilapia loins" — even though fish do not possess that anatomical feature.

For United States shoppers picking up tilapia from China or [Honduras](#) or Ecuador, there is little guidance. "It's such a complicated job for consumers to decide what to eat, with aquaculture production expanding so rapidly," said Peter Bridson, aquaculture research manager of the Monterey Bay Aquarium, which produces the popular [Seafood Watch](#), an independent consumer guide to buying sustainable fish.

The new sustainability standards [being developed for aquaculture](#) will be tailored by species to address their diverse environmental risks. [For tilapia](#), that means fish cages can be placed only in lakes where tilapia already live, and must be designed to prevent escapes. To limit overtaking of lakes, the new guidelines establish water quality rules for oxygen and phosphorus, a product of fish waste.

Fish farms may not use prophylactic [antibiotics](#). But even the new rules allow for some practices considered unacceptable in the United States, where cage farming in lakes is generally forbidden. In many states, tilapia must be housed in specially designed pens with roofs to prevent birds from carrying the fish elsewhere; their waste is often collected to use as fertilizer rather than released. Also, the new standards allow for baby fish to be fed [testosterone](#) even though markets like [Whole Foods will not buy](#) hormone-treated seafood.

For the moment, Seafood Watch lists tilapia raised in the United States as a "best choice," tilapia from Latin America as a "good alternative" and tilapia from China as "to be avoided." Less than 5 percent of the tilapia consumed in the United States is farmed within its borders, and that is mostly whole fish. Dr. Bridson said these rough ratings were largely based on the

presence of effective monitoring in those places and how farms disposed of their waste.

## **The Pollution Problem**

But many biologists worry that the big business of tilapia farming will outweigh caution, leaving dead lakes and extinct species.

Dr. McCrary has spent the past decade studying how a small, short-lived [tilapia farm degraded Lake Apoyo](#) in Nicaragua. “One small cage screwed up the entire lake — the entire lake!” he said of the farm, which existed from 1995 to 2000.

Waste from the cages polluted the pristine ecosystem, and some tilapia escaped. An aquatic plant called charra, an important food for fish, disappeared, leaving the lake a wasteland. Today, some species of plants and fish are slowly recovering, but others are probably gone forever, said Dr. McCrary, who works for the Nicaraguan foundation [FUNDECI](#).

That experience explains why Dr. Salvador Montenegro, director of Nicaragua’s Center for Aquatic Resource Investigation, has spent a decade fighting to close the much larger Nicanor tilapia farm in a remote corner of Lake Nicaragua. “This kind of intensive fish farming jeopardizes a lake that is a national treasure, already under stress from pollution,” he said, once comparing its effect to allowing 3.7 million chickens to defecate in the water. Weaker fish, like the rainbow bass, have been disappearing from Lake Nicaragua as the number of tilapia has increased, said Ben Slow, a local fisherman.

But David Senna, the manager of Nicanor, said the company’s cages occupied only a tiny fraction of the lake, in an area with deep water and strong currents sufficient to carry away fish waste; it has taken monthly water samples to prove it. While he acknowledged that early on there were some escapes — one involving 10,000 tilapia — he noted that tilapia were introduced to Lake Nicaragua in the 1980s, “so if they’re going to take over, it was already doomed.”

## **Nutritional Concerns**

For doctors, the debate has centered more on tilapia’s nutritional benefits, or lack thereof. Like all fish, tilapia is a good source of protein, with few of the unhealthy saturated fats in red meats. But unlike most other fish, tilapia contains relatively little of the fish oils that medical research has shown assist brain development and protect against heart disease, stroke and [abnormal heart rhythms](#): a pair of omega-3 fatty acids.

“When people talk about the need to eat more fish, they are using that as a metaphor for fish oil, DHA and EPA,” said [Edgar R. Miller III](#), associate professor of medicine and epidemiology at

the [Johns Hopkins University](#) School of Medicine. “So what do we do about the fact that tilapia and catfish, which are farm raised, have very low levels of these compounds?”

While a portion of tilapia has 135 milligrams of omega-3 fatty acids, a portion of salmon has over 2,000 milligrams. And farmed tilapia may have even less than wild tilapia because fish acquire omega-3s by eating aquatic plants and other fish. “They are what they eat,” Dr. Bridson said.

In farmed tilapia, raised largely on corn and soy, omega-3 levels depend on how much fish meal or fish oil the farm’s breeders mix in. While most fish species need a good helping of these fatty acids to grow, herbivorous tilapia grow decently with little or none. And there are compelling reasons to skimp on fish meal or oil additives: they are costly and create more pollution.

“The content can vary dramatically and the consumer won’t know it,” said [Bruce Holub](#), a professor of nutritional science at the University of Guelph in Ontario, who said that omega-3 levels should appear on every fish label.

He and other experts echo [the industry’s message](#) that tilapia is nonetheless beneficial to eat as a lean source of protein and one that still contains some omega-3, where protein alternatives like red meat and chicken have none. But others are concerned about research showing that another type of fatty acids, the so-called omega-6 acids, outnumber the beneficial omega-3s in farmed tilapia by a factor of 2 to 1. Some research suggests that ratio increases the risk of heart disease; in salmon and trout the ratio is reversed.

With this in mind, the [Mayo Clinic advises patients](#) that some typically farmed fish, like tilapia and catfish, “don’t appear to be as heart-healthy.” More research will be needed to see whether improving fish feeds enhances tilapia’s health benefits, and whether the omega-6 levels in tilapia are significant relative to its already high prevalence in the American diet.

## **The Choice**

Although environmentalists long battled to shut down Nicanor, the Nicaraguan fish farm is failing for another reason: cheap frozen tilapia fillets from China.

Imports of frozen tilapia to the United States rose 30 percent in 2010, as fresh fillet imports dropped 2 percent, reducing demand from smaller producers like Nicanor. Much of the fish that China exports is what producers call “refreshed,” which means it is frozen and packed in [carbon monoxide](#) to preserve color so it can be thawed and sold in fish displays, where it will appear to have been recently caught. Even in Managua, the capital of Nicaragua, the tilapia on supermarket shelves is from China.

“People wanted to pay \$3.99 a pound for this frozen stuff rather than \$5.99 for fresh, especially

during the **recession**,” said Mr. Senna, the Nicanor manager. Chinese fish farms are regarded as poorly regulated, Dr. Bridson said, which is why the world needs clearer standards for sustainable fish farming and consumer labeling. Until then, the biggest producer offering the cheapest product is poised to win.

“If I have 100 tilapia in a pond, I may have happy tilapia because they have room to swim, but I won’t be able to sell them since I won’t get access to the global market,” Dr. McCrary said, adding that, for now, “there’s no tilapia equivalent of free-range chicken.”

*Blake Schmidt contributed reporting from Managua, Nicaragua.*