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## Fishing down the food chain

APR 22, 2009

For most of his life, Daniel Pauly has been ahead of the curve, and it's not a pretty one: it's the curve showing the myriad ways in which our oceans are dying.

Until 2001, the statistics compiled by the United Nations Food and Agriculture Organization (FAO) suggested that the total amount of fish taken out of the oceans had stabilized at about 100 million tons a year. While certain species like cod and bluefin tuna were undeniably in serious trouble, the agency indicated that the world's highly-trained fisheries scientists wielding complex mathematical models were well equipped to regulate fishing in coastal waters, from which most fishes are taken, and on the high seas.

But in a series of scientific studies pioneering a global approach carried out since 1995, Pauly has shown the just how broad the devastating effects of fishing on marine ecosystems have become. He also demonstrated that in fact, the world catch has been declining since the late eighties, despite a huge catch—on the order of 50 million tons—never making it into the FAO statistics. Pauly believes that by the time a child born today reaches old age, wild fresh fish will be as rare and expensive as caviar is now.

In recognition for his work as perhaps the world's most influential fisheries scientist, the 62-year-old Frenchman was invited earlier this month to deliver a pair of lectures at the Albert L. Tester Memorial Symposium at the University of Hawai'i—Mānoa.

In the lectures and in several conversations over his four-day visit to Honolulu, Pauly—a cheerful bear of a man with piercing green eyes and a self-deprecating, impish sense of humor—painted an appalling picture of our future and the declining health and dwindling numbers of fish in the world's oceans, based on the detailed examination of global catch trends dating back to the 1950s.

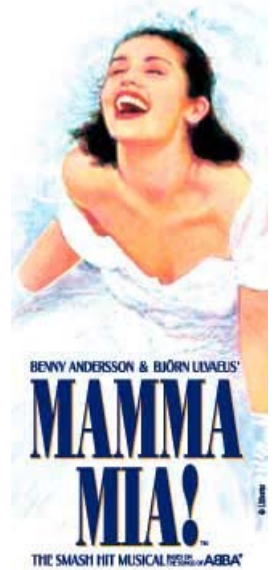
### The horrific reality

The increasing global catches published annually by the FAO didn't jibe with evidence of decline in catches of individual species pretty much everywhere, Pauly thought. Based at the University of British Columbia in Vancouver, his researchers closely examined Chinese statistics and discovered that corrupt junior officials over-reported fisheries catches from each district, while senior officials topped the catch estimates at provincial level. The result of this accumulation of little lies was that China was reporting to FAO a catch that was nearly twice as high as reality—a total so large that it made the global catch appear to be increasing.

When the global catch was corrected for Chinese over-reporting, Pauly showed, it became evident that it had in fact peaked at 80 million tons in the late '80s and declined ever since at a rate between 1 and 2 percent a year, reaching about 70 million tons today. As a result of his findings, published in 2001, the FAO now reports world statistics with and without China, which Pauly says is unable to compile accurate statistics even for its own consumption because its officials continue to fabricate the data that they think their superiors want to see.

Meanwhile, Pauly's Sea Around Us Project team has been examining historic files and old reports from more than 50 countries and found that a huge amount of coastal fishing goes simply unreported to governments and the FAO, even in places like Hawai'i (see sidebar). Most of it is perfectly legal and involves recreational and subsistence fishers, along with small-scale commercial ones. Many are all three: they fish for fun, keep some of the catch for their family and friends and if there's a surplus, they sell it or barter it.

"We've discovered that this fishery is much bigger than anyone had estimated," Pauly says. "So far we've examined fisheries in about 50 countries, and based on these partial results we're guessing that the total will be something close to 50 million tons a year.



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And in most places it's also dropping."

So now we're talking about a world fishery of 120 million tons a year, declining at a rate probably below 2 percent a year, which may appear to be pretty manageable.

But the slowness of the incline masks much more depressing changes in *what* is being fished: 50 years ago, we were commonly fishing 1,500-pound bluefin, 5,000-pound beluga sturgeon and 200-pound New England cod. Now we are fishing much smaller fish: the average bluefin is 100 pounds, the average beluga is 150 pounds, and there are no cod of any size to be had in most of the markets that traditionally sold this staple fish.

As the fish we like to eat shrink and become fewer, they become too dispersed and too expensive to capture, so our fishing fleets move on and target less desirable but more numerous species—until they too become depleted and the fleets move on to a new species, and so on.

Pauly's team examined this and in 1998 published a paper that coined a phrase that has become so common it's no longer attributed to him: fishing down the food chain, from the top predator like the tuna, the snapper or the swordfish to the sardine and the anchovy. The phenomenon's latest form: several new fisheries for edible jellyfish have opened up in the North Atlantic to supply markets in Asia.

In addition, Pauly and his associates showed that over time, the fishing fleets had moved slowly from north to south and have gone deeper and deeper in search of catch. "We are now fishing much deeper than previously, and bottom trawling at more than a thousand feet has become common," he says. "Today, only the deepest part of the ocean is not fished at all, and that's only because the amount of fish down there is minuscule."

And it's not a fair catch either: heavily subsidized European fleets have plundered the African coasts, taking fish that employed fishermen and fed coastal villages and sending it to European tables. For the right to do so, the Europeans pay the politicians, not the fishermen whose livelihood they take, says Pauly. "A lot of those Somali pirates are fishermen who are out of work because foreigners took all their fish."

"If things like fuel prices stay the same," he adds, "in a few decades the only cheap seafood will be plankton, because the few fish left in the sea will cost too much to catch."

#### The false solutions

Now that Pauly and other concerned scientists have shown us how bad things are, surely it's a simple matter to fix it. After all, fishing a bit less should allow the fish to reproduce enough so that we can catch the same amount while the total population stays the same. Right?

Unfortunately, virtually all of the world's fishing activity has been restricted by the effectiveness of the gear, not because people understood that if you take too much fish today, you won't have any tomorrow. There are some exceptions, such as some Pacific islands like Hawai'i and Palau prior to European contact, but not many.

"We have basically never fished sustainably and there's no evidence the industry is about to start," Pauly explains. "The world's fishing fleet is twice the size it needs to be to catch the current amount of fish and a lot of countries are still spending their taxpayers' money to *increase* their fleets."

How about fish farming? Much of the seafood farmed outside of China is carnivorous, like salmon and shrimp, and it consumes half of the 30 million tons a year of small fish that is turned into fish meal instead of being eaten by people (that's nearly half the current reported, mostly industrial total catch of 70 million tons). The rest of the fish meal goes to everything from cats to cattle.

"It takes four pounds of anchovies to produce a pound of salmon," says Pauly. "It would be much smarter to just eat the anchovies, which are actually very tasty." But anchovy consumption remains negligible.

Well what about the rest of the aquaculture sector? "It's mostly carp from China," says Pauly. "Most people in the West don't like carp. And don't even try to feed soy to salmon: either they taste like tofu or they die."

#### The real solutions

Pauly sees two reasons to believe that our grandchildren will still be eating fish, though not as an everyday thing (like today's average Japanese citizen, who eats 173 pounds a year of it) but for ceremonial occasions, like Hawaiians eat 'opihi at lū'au. "We're talking about 20 pounds a year per capita, if the world population stabilizes at 8 billion," says Pauly.

Inevitably, the price of fuel will rise for good. Boats that must tow big nets behind them for long distances, like trawlers and shrimpers, consume huge amounts of fuel and

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operated deep in the red last year because of the spike in fuel prices. When the prices go back up, even massive subsidies will not save trawlers that are exploiting depleted fish stocks.

“The fishing industry lobby is very powerful, but at some point the taxpayers are going to say ‘enough,’” says Pauly. “What will remain are small coastal fishers employing traps, lines and set nets, which are much more energy-efficient.”

While there’s no motivation to conserve a fish that someone else will catch, especially in the high seas, where 15 percent of the world catch originates, countries can regulate their commercial waters, which extend 200 nautical miles out to sea and constitute Exclusive Economic Zones of coastal states from which the remainder is taken.

Today, European fleets are plundering the coastal zones of African countries because they have emptied their own. Once they have nowhere else to go, most will be sold for scrap and reconverted, says Pauly. Eventually, these coastal states are going to take ownership of their fish stocks. “The question is how much will be left at that point,” Pauly says. “The North Sea has been fished for so long that its bottom is mud, not covered by oyster reefs and kelp like it used to be. If you stopped fishing there today, it would probably take half a century to grow back. But once it does, it would have 10 times more fish than it does now, so if you took just 10 percent a year, it could last forever.”

Around the world, coastal communities, often assisted by Western non-governmental organizations, are taking timid steps to restrict foreign fleets and regulate their own commercial fishers. Watching their fish stocks dwindle is a powerful motivator but so is, for the fishers, the ever-rising price of fish, lifted by a deadly combination of decreasing supply and increasingly affluent Asian demand.

### **Unreported catch figures**

Over the past half-century, four times as much fish has been taken from the coastal waters off the Main Hawaiian Islands than officially reported, according to Dirk Zeller, a senior researcher in a program called The Sea Around Us that Daniel Pauly founded in 1999 at the University of British Columbia in Vancouver.

Zeller compared the official commercial catch figures—for instance, 748 tons in 2002, the last year in his study—with the number of local fish reaching the markets and other indirect data. For that year, he concluded that commercial fishers were fishing 396 tons that they were not reporting and that recreational fishers were taking another 1,695 tons, for a total of 2,840 tons.

These figures include both shallow reef fish and bottom fish like ‘ōpaka and onaga snappers but excludes blue-water fish like tuna and marlin.

The same four-to-one ratio emerged when Zeller added up the reported take and the unreported catches for the period from 1950 to 2002.

Zeller was not surprised to discover that those catches have been steadily diminishing. In 2002, local fishers caught 54 percent of what they caught in 1989, the peak year, he says. “All the indicators we had were suggesting that the fish were being taken out of the ocean faster than they could reproduce,” Zeller says. “Our study indicated how much, and that came as a surprise to a lot of people.”

As a result of this knowledge gap, scientists and officials who are charged with ensuring that future generations will also have access to fresh fish have introduced some seasonal closures and some catch limits for recreational fishermen (who are neither licensed nor monitored). But they have brushed aside calls from marine scientists to set up permanent no-fishing zones where the stocks can grow again and to reduce fishing. In fact this year, the quota for bottom fish has been raised 35 percent.

Steve Martell, a colleague of Zeller who studies the Hawaiian bottom fish populations, estimates that it’s down to half or less of what it used to be. Bottom fish, which are caught between 150 and 600 feet, are particularly vulnerable because they grow and reproduce slowly.

To date, Pauly’s researchers have not examined how much of the catch of blue-water fish like tuna, swordfish and marlin has gone unreported in Hawai‘i.

But Rick Gaffney, a former member of Wespac who owns several sportsfishing businesses, said the Hawai‘i-based long-line fishery has visibly depleted those stocks. “Twenty years ago, you could easily catch several 250-pound yellowfin or bigeye tuna (both known here as ahi) in a weekend,” he said. “Today you’re lucky if you can land a single 150-pounder.”

The decline coincides with the expansion of the state’s long-line fishing fleet from a dozen to over 100 in the 1980s, says Gaffney.

But because the 1,000-pound blue marlins, the pride of the Kona sportsfishing fleet, fetches only 30 cents a pound as food, they are only targeted by true recreational fishers, so far fewer are taken out and many are released and survive. As a result, says Gaffney, the number of big marlins appears to be holding up.

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