

O C E A N S

Bringing Fisheries Back from the Brink

Marine biologist Daniel Pauly did a turnabout from helping fishing trawlers to fighting them. Can struggling fisheries now turn around?

By Richard Schiffman on September 23, 2021



French oceanographer Daniel Pauly poses at the Oceanographic Institute in Paris on June 7, 2019. Credit: Geoffroy Van der Hasselt *Getty Images*

Overfishing is wiping out commercial fisheries, and climate change is making certain fish species smaller. But Daniel Pauly says the world can still save endangered fisheries. Pauly is called “the ocean’s whistleblower” in a new biography, for good reason. The French-born marine biologist, who teaches at the University of British Columbia, spent much of the past quarter-century documenting the swift decline of fish within the seas. Now he says that warming waters are depleting the oceans of oxygen that fish need to grow to their full stature.

In an interview with *Scientific American*, Pauly addresses whether fisheries are doomed or if there is still hope for sustaining them. He speaks about how his early experiences

working in Southeast Asia convinced him that fisheries science had become a captive of the fishing industry, promoting industrial methods such as bottom trawling that devastated underwater ecosystems and threatened the livelihoods of small-scale artisanal fishers.

Pauly is credited with helping to develop a new kind of science, one that pays more attention to the ocean's ecology and what fish need to thrive. He coined the term "shifting baseline syndrome" to describe how scientists and others forget the biological abundance of earlier times—thinking that today's meager fisheries are somehow the norm. This "collective amnesia," as he describes it, has led researchers and regulators to routinely misjudge the magnitude of the ecological disaster taking place in the seas.

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In his most influential research project, Pauly assembled hundreds of scientists to create a global database to document the impact of fisheries on marine ecosystems. The team found that governments had routinely underestimated their catch and that fisheries everywhere are close to collapse. If current trends continue, Pauly warns, the world's oceans will end up as marine junkyards dominated by jellyfish and plankton.

Nevertheless, the outspoken fisheries scientist says that solutions are readily available. If nations close the high seas to fishing and end wasteful government subsidies, fish populations would rebound, he claims. And of course, the world also ultimately needs to get climate change under control. Pauly is currently researching how global warming drives fish stocks toward the poles and makes fish smaller. The new biography of him is

The Ocean's Whistleblower: The Remarkable Life and Work of Daniel Pauly, by David Grémillet (Greystone Books). It was released on September 21.

[An edited transcript of the interview follows.]

You were born in Paris, the son of a Black American GI and a white Frenchwoman, and grew up in Switzerland, far from the ocean. Through some twists and turns, you became an employee of the German government in Indonesia in the 1970s, where you worked on a research trawler as part of a project to introduce industrial fishing to the country.

Yes, I regret that now. Trawlers in Southeast Asia devastated reefy habitat—giant sponges and soft coral that structured the habitat. [Trawling] transformed a productive, diverse ecosystem into a muddy mess. We simply didn't know what we were doing. We didn't even have the words to describe this kind of ecological destruction at the time. Trawlers [also] encouraged an immense waste of fish for export. There was little left over for local fishers. In Indonesia, I encountered such poverty among the fishers. They were going out with three or four men and coming back with one kilogram of fish. Introducing industrial trawling into such an environment was madness.

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Trawling allowed the fishing industry to exploit places that had earlier been unreachable.

That's right. This expansion of fisheries has eliminated all the protection that fish had naturally from us. Depth was a protection, cold was a protection, ice was a protection, rocky grounds were a protection. With successive technological developments, we can now go everywhere where the fish were protected before.

After working in Southeast Asia, you moved on to West Africa and Peru. Offshore fleets were putting small-scale fishers out of business. You've written that this is not just an economic problem, it is a health problem.



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Up to 50 percent or more of the protein consumed in many poor regions comes from fish. In these countries, most of the calories come from carbs, from corn, cassava and rice. The only way these carbs are nutritionally efficient is by adding a little fish. Also, the micronutrients, the vitamins, the various minerals and metals such as zinc—all of this comes from fish.

Your work with a team of researchers in a group that you founded, the Sea Around Us, was critical in establishing the fact that industrial fishing was rapidly wiping out local fish stocks all over the globe. You basically created a massive data set that proved that we were fishing unsustainably. How did you pull that off?

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Reconstructing the catch of every country from 1950 to 2018 was an immense job that involved about 300 researchers. We came up with a much higher catch than was being reported officially. Many countries had a completely distorted view of their own fisheries: recreational fisheries were not included in the catch totals; illegal fisheries, local artisanal fisheries were not included. We found that catches have been sharply declining globally since 1996.

Some scientists initially argued that fishing was not to blame but rather natural fluctuations in fish populations. It reminds me of the argument that climate change is a natural phenomenon, so we don't need to worry about it.

I was about to say that!

Nations also denied that they were engaged in overfishing.

I remember talking to the minister of fisheries in Australia. She said fish in Australia are being exploited sustainably. But you look at the statistics, and the catch there is going down, down, down. So what can she possibly mean? In Canada, the fishery of cod has collapsed to 1 percent or 2 percent of its value in the 1950s. If a country can somehow maintain such a meager catch, they call it “sustainable exploitation,” but the bar is set so low that it is meaningless.

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You’ve said that if human destruction of the seas continues unchecked, they will end up as marine junkyards dominated by jellyfish and plankton.

It’s already happening. Dead zones without oxygen are spreading; fish are getting smaller and smaller both because of being caught and also because of global warming.

Not only is this an ecological disaster, but in the long run, it is not in the interest of the fishing industry either.

I have described the form of fishing where you devastate one area, then move on to another, as a Ponzi scheme. As long as you find new suckers, you can go on. Bernie Madoff [a New York City–based financier who was convicted of running the largest Ponzi scheme in history] got money from investors and then paid them back with the money he got from new investors. That works so long as you find new investors, right? But ultimately you run out of investors—you run out of new areas to fish—and the whole thing collapses.

Your latest research has focused on the impact of climate change on fish size. Can you talk about that?

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Our big problem for us mammals is getting enough food to maintain our temperature. Fish don't need to maintain their own temperature, so basically they eat much less. Their problem is getting enough oxygen rather than eating enough food. Fish breathe through gills. As the fish grows, its volume grows faster than the surface of the gills. Also, as waters grow warmer, they contain less oxygen, and the fish themselves get warmer. And as fish get warmer, they need more oxygen. So you have a perfect storm—the fish are squeezed. The result is that they are getting smaller and smaller.

Fish are also moving to cooler waters.

Fish have to stay at the same temperature that they are adapted to because their enzyme system functions at a certain temperature. So as the seas warm, it means that South Carolina and North Carolina will be in conflict because the South Carolina stocks have moved to North Carolina. These migrations are occurring on a grand scale. In the tropics, the fish that leave are not replaced by anything else.

You say that we should stop fishing on the high seas to help fish stocks recover.

Fishing in the so-called high seas generates only about 5 percent or 6 percent of global catches, mostly tuna. The central part of the oceans are actually a desert. The tuna are like camels in the Sahara. They swim from one oasis to another. Tuna is not a fish that poor people in the developing world eat anyway, so limiting their catch would have no impact on food security.

If the high seas account for such a small percentage of the catch, how will closing them to fishing save fish populations?

Fisheries existed intact for hundreds of years because we couldn't go after the last fish. But now we can. And you not only catch the fish you want but kill everything else in the process—there is a huge bycatch. If you close the high seas to fishing, you give fish a sanctuary where they can replenish themselves. Research shows that no-fishing sanctuaries help to rebuild stock, some of which then moves into coastal waters where it can be caught.

International negotiations are currently underway at the World Trade Organization about getting rid of subsidies given by most rich countries to their industrial fishing fleets. Are you hopeful?

I'm somewhat hopeful. I have researched subsidies myself. Many fishers nowadays don't fish for fish. They fish for subsidies. They couldn't operate without massive subsidies. So, yes, eliminating them would greatly reduce overfishing. Actually, fisheries issues are not difficult or intractable problems. We need to fish less and to create sanctuaries where fish populations can revive.

Throughout your career, you've done science that aims to help people. What is your advice to young scientists?

My advice is to choose problems that are global and not local. We need to attack problems that feed into policy. And we need solutions that can work throughout the world.

You have a reputation as a workaholic, as someone who has tackled ambitious scientific problems. Was there extra pressure on you to prove yourself in a way that a white scientist would not have to?

Yes. But the way that I experienced that is somewhat different. What motivated me is that I was living a privileged life and was working with colleagues in the developing world who were as smart and well educated as I was but were paid one tenth of what I was getting. I felt a responsibility to the people I was working with and the countries I was working in.

Some universities are trying to increase participation in the sciences among students from minority groups. Are they doing enough?

The problem is these kids don't trust themselves to be scientists. The vision for minority students from poor backgrounds is to become a doctor or lawyer but not a scientist, because frankly, scientists don't make money. What you understand when you are actually in science is that most people in the profession love what they do. They can't

believe that they are being paid to do it. Science, in its own way, is as creative as the arts. Impoverished young people don't know that. They don't know that science is fun and that you don't have to be a robot or a nerd to do it.

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