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[Finding Fish](#)

Catalyst by Maywa Montenegro / July 16, 2009

Six experts discuss the **global fisheries crisis**; the economic, political, and social pressures that contributed to it; and what it will take to **make fish stocks bounce back**.

The Catalyst: Driving Reactions to Issues in the News

What will it take to make the ocean's fisheries bounce back?

Our Panel Responds:

- [Daniel Pauly](#), fisheries scientist
- [Boris Worm](#), marine ecologist
- [Jennifer Jacquet](#), marine scientist
- [Christopher Costello](#), environmental resource economist
- [Ray Hilborn](#), fisheries scientist
- [Suzannah Evans](#), environmental writer

The new documentary film *The End of the Line* paints a sobering picture: Humans have perfected the art and science of the catch, using computers to help pinpoint migratory schools and nets large enough to cinch around several ocean cruise liners. The length of hook-bearing fishing line dropped into the ocean each year could be wrapped around the globe 550 times. However, those nets and lines are culling fewer and fewer fish each year.

So few, in fact, that Boris Worm—the marine biologist around whose work the film's narrative revolves—and Ransom Myers concluded in a 2003 [Nature paper](#) that industrial fishing had reduced global populations of sharks, tuna, and other large open-water predators by 90 percent. Three years later, Worm and his colleagues went a step further: Extrapolating from current populations in collapse, they predicted that by 2048, the oceans would be empty of fish.

Almost immediately, the 2048 doomsdate came under attack by other members of the scientific community. A particularly prominent critic was fisheries scientist Ray Hilborn of the University of Washington, Seattle. Hilborn, who is also featured in the film, told the media that Worm's analyses were "sloppy" and called the projection "mind-boggling[ly] stupid."

The film skips over the scientific dispute rather quickly and proceeds to lay thick blame on the powerful: First, there are the faceless multinationals systematically disregarding catch quotas. Then there are corrupt leaders in developing nations who broker deals with these multinationals for fishing rights—we're shown fishermen off the coast of Senegal, who in their dinghies must compete with some of world's largest and most advanced fishing fleets. And there are the oddly shortsighted policymakers who, against all scientific evidence, imagine that legislation can somehow best biology. In one particularly memorable scene, European ministers gather in Luxembourg at the 2007 meeting of the International Commission for the Conservation of Atlantic Tunas to determine quotas for bluefin tuna from the Mediterranean. Scientists recommend an annual catch of 15,000 tons a year, with a preference for 10,000 tons in order to let populations rebound. The ministers digest that information and agree on a quota of 29,500 tons.

But there is a bright edge to this gloomy portrait. Unlike the climate crisis, the global fisheries crisis appears to have a relatively simple fix. When ocean habitats are left undisturbed, they show surprising resilience—species and entire ecosystems can, and do, come back. A global network of un-fished ocean preserves, the film suggests, could be key to

fending off imminent collapse. If paired with scientifically informed fishing legislation and simple labeling practices so that consumers can more easily distinguish between “sustainable” and “unsustainable” at the market, there may be hope yet for edible sea life.

Even Worm and Hilborn appear to broker a truce. They may not agree on the precise date fisheries will collapse, but neither seems to doubt that it will happen. A point not included in the film: At the National Center for Ecological Analysis and Synthesis in Santa Barbara, California, the once-rivals have recently begun collaborating on a new project to figure out why their different data or methods yield such divergent impressions of ocean ecosystems.

Volumes have been written about this imminent crisis, and *The End of the Line* is but the latest attempt to bring more attention to it. If, as the film suggests, the problem has a relatively simple solution, why hasn't the world acted on it already? Is it a lack of consumer awareness? Is it the age-old “out of sight, out of mind” predicament that bedevils ocean issues in general? How can innovative science, policy, and management strategies help us balance fishing and conservation—or should we stop eating fish altogether?



A Brief History of Collapse

[Daniel Pauly](#) is a professor of fisheries at the University of British Columbia. He also leads the [Sea Around Us Project](#), devoted to documenting the impact of fisheries on marine ecosystems worldwide and proposing policies for their mitigation.

This worldwide decline of fishery catches had to happen at some time: All major countries in the north overfished their coastal water long ago—some of them at the very onset of industrialized fishing—and maintained their catch only through a feverish expansion into more southern waters. First they expanded into tropical developing countries, then into the southern hemisphere, the fate of the targeted fish thus mimicking that of the great whales.

But their distant-water fleets never achieved anything resembling sustainability and they continued to deplete one population after the other. The only new element now is that fisheries worldwide have run out of new stock to exploit—hence the global decline.

All along, though, it was clear that fisheries *could* be sustainable, if two goals could be achieved: the radical reduction of fishing capacity, notably by abolishing the \$30 to \$35 billion in annual subsidies that governments spend to keep otherwise unprofitable fleets afloat, and the strict enforcement of various gear restrictions, especially against bottom trawlers, one of the most destructive fishing method conceivable. Such measures may allow us to sustain the population we have and that which we are in the process of losing—a loss that will intensify the food security issues that shrinking per capita fish supply in developing countries has begun to create.

These traditional measures may succeed in stabilizing fish supply but will likely not be sufficient to prevent the loss of large, and hence more vulnerable, fish species. To do this, we must restore the refugia earlier fish populations enjoyed—the sort that made it possible for some pre-industrial fisheries to last for centuries even though they were not regulated. Some of these refugia, now called “marine reserves,” or “no-take zones,” should be inshore to protect coastal species. Some will have to be large and offshore to protect oceanic fishes. The alternative is that we lose many of the species upon which our fisheries have so far depended.

At present, less than 1 percent of the world ocean is protected from fishing. To change this statistic into one that gives fish a fighting chance, no-take marine reserves will have to be perceived not as scattered, small concessions to

conservationist pressure, but as a legitimate and obvious management tool. Indeed, avoiding the commercial, then biological, extinction of species that were once inaccessible to our high-tech fishing gear should become a major goal for future management regimes. This would not only enable fisheries, for the first time in their history, to become truly sustainable, but would also address the issue of uncertainty, which was so eloquently stated in a posthumous edition of some of Rachel Carson's rediscovered writings:

To convert some of the remaining wild areas into state and national parks, however, is only part of the answer. Even public parks are not what nature created over the eons of time, working with wind and wave and sand. Somewhere we should know what was nature's way; we should know that the Earth would have been had not man interfered. And so, besides public parks for recreation, we should set aside some wilderness area of seashore where the relations of sea and wind and shore—of living things and their physical world—remain as they have been over the long vistas of time in which man did not exist. For there remains, in this space-age universe, the possibility that man's way is not always best."



Let's Make Mackerel Sushi

[Boris Worm](#) is a professor of marine conservation biology at Dalhousie University in Halifax, Canada.

In a way, the fisheries situation is similar to climate change—scientists have known about it for decades, but the reality sank in with the wider public only two or three years ago. But this is changing, and with greater awareness comes the political will to change the status quo.

What will be required to solve the fisheries crisis is a range of measures that each reinforce the other. These include lower catch limits for overfished species; more selective fishing gear; economic incentives for conservation; and the zoning of the ocean into fished, lightly fished, and unfished areas. A fundamental problem is the global fishing fleet overcapacity—a fancy term for “too many boats chasing too few fish.” Many experts believe that the fishing fleet capacity should be reduced dramatically to better match the ocean's capacity to provide fish. A second problem is that we are still catching a lot of species that are too depleted, or too slow-growing in the first place, to sustain any fishing. Large sharks such as hammerhead, mako, dusky, and bull sharks are an example. Bluefin tuna is another. In Canada, where I live, there is still a substantial bluefin tuna fishery, and the same is true in the Mediterranean. These species need time to rebuild their populations.

I believe that this must become the universal focus of fishery management: the careful rebuilding of depleted species, while concentrating our fisheries on those species that can sustain the fishing pressure. Maybe we need to try mackerel on our sushi for a while rather than bluefin tuna. Would that be the end of the world?

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Overfishing Is Also About Overeating

Jennifer Jacquet is completing her PhD on seafood markets with the Sea Around Us Project at the University of British Columbia Fisheries Centre. She maintains the blog [Guilty Planet](#).

When we talk about overfishing, we are really talking about overeating.

Most fishing exists to feed humans or to feed other things that we eat, such as farmed fish. So it stands to reason that some tools to assuage overfishing would try to reform the human appetite.

Many campaigns attempt to change eating habits by pointing out which seafood we should consume or avoid with wallet cards or eco-labels. But these “choice campaigns” can be confusing, premature, and still require consumers to relate to fish as commodities rather than as wildlife. Plus, changing consumers is *slow*.

With the rise of industrial fishing, we have seen big changes in the ocean in a very small amount of time—a fishing trawler can extract 60 tons of fish in a single haul! Which means that when it comes to reform, we also require big changes very rapidly. Working to change one consumer at a time is not the speedy recovery we need. In terms of making big changes in seafood consumption, we should:

- **Deal with pigs and chickens.** We currently turn one-third of seafood into fishmeal to feed farmed fish, chickens, and pigs. Pigs and chickens alone eat six times the amount of seafood as US consumers. We must work to reform the absurd fishmeal industry.
- **Eat local and leave seafood for survival.** In the name of globalization, we are importing seafood from poor, developing countries to feed the rich. European shrimp trawlers off the coast of Tanzania, for instance, are in direct competition with local fishermen trying to feed their families. Many of the agreements that provide developed countries with access to foreign fishing grounds should be revised.
- **Consider a seafood boycott.** A major conservation group should call for a total boycott of seafood. While anti-consumption campaigns are never likely to be widely adopted, such a campaign would widen the spectrum of voices in ocean conservation and serve to help de-commodify marine life.
- **Agitate vertically, rather than laterally.** The public should engage in conservation primarily through the democratic process and activism rather than simply through personal consumption. But if one has the gumption to also engage as a consumer, convictions about personal consumption and disapproval should be expressed vertically up the supply chain (to chefs, store managers, and seafood suppliers) rather than simply laterally (consumer-to-consumer reproach).





A Smorgasbord of Innovative Approaches

[Christopher Costello](#) is a professor of environmental and resource economics at the Bren School of Environmental Science & Management at the University of California, Santa Barbara. His research focuses on natural resource management for profitability and sustainability.

[Ray Hilborn](#) is a professor in the School of Aquatic and Fishery Sciences at the University of Washington, Seattle specializing in natural resource management and conservation.

The solutions to the fisheries crisis proposed in *The End of the Line* may protect marine ecosystems but will not solve the whole problem. Fisheries fail when institutions are weak and fishermen have the individual incentive to overfish. Closed areas can be an effective way to restore ecosystems but often do little to protect fishing-dependent communities or the more than 1 billion people who derive much of their protein from fish. While also important, consumer awareness has done little to change the manner in which fish are exploited because it does not include a mechanism for the delicate adjustments of catch levels as stock abundance changes—a tuning instrument required for successful fisheries management.

Yet innovative approaches to protect marine ecosystems and the food derived from these ecosystems *do* exist. These involve a broad set of tools, including catch limitation, effort limitation, gear restriction, closed areas, catch shares, consumer action, and community-based management. Key to all of these measures is resetting incentives so that individual fishermen will benefit by conserving rather than by catching as many fish as fast as possible.

A few notable examples where such tools are being implemented are in Alaska, New Zealand, Chile, and Iceland. Here, the majority of fisheries are regulated by programs in which individual fishermen, companies, cooperatives, or communities are allocated “catch shares”—essentially guaranteed shares of the total catch or of the area being fished. As a consequence, the track record of ecosystem health is much better there, overfishing occurs much less frequently, fisheries are profitable, and fishermen prosper.

A recent global analysis showed that fisheries that employ these catch-share incentive systems are dramatically less prone to collapse. Yet fewer than 2 percent of the world’s fish stocks are managed with these innovative approaches. If one looks globally at fisheries, the norm is depleted stocks and impoverished fishermen impelled to further deplete the stocks. Breaking this cycle is a near universal objective of governments and management agencies, and we know *how* to do it—we have an example of success in our own backyard.

The Pacific halibut fishery in the US and Canada was overfished in the 1920s, so an international commission between the two countries was established to set catch limits. This commission did an excellent job of biological conservation, and the halibut resource has been healthy and sustainably managed for more than 60 years by setting well-enforced catch limits. However, in both countries pressure mounted to join the race to fish: Fishermen steadily increased capacity of their operations to harvest as much as possible during the allowed fishing season, resulting in an ever-shrinking season to stay within biologically acceptable catch. By the late 1980s, the fishery season in Alaska lasted only two days. Thousands of boats raced to catch the fish as fast as possible, lives were lost if those were stormy days, and almost all the product was sold frozen. Finally, individual catch shares were assigned. Fishing now takes place over 6 months, almost all fish is sold fresh, and the much smaller fishing fleet makes a very good living.

Collapses in many high-profile fisheries worldwide will require stark changes to reverse. But we are optimistic about the future of the world’s fisheries. A mixture of catch limits, catch shares, and area allocations and closures customized to different locations will allow fish stocks to rebuild; the larger stock will spin off a larger harvest of fish.

While this will cause short-term costs to fishermen, the long-term benefits—to fishermen, communities, consumers, and the ecosystem—will be worth it.



The Business of Extinction

[Suzannah Evans](#) is the senior editor at Oceana, the world's largest international organization dedicated solely to ocean conservation.

For millions of years, cod fish thrived along the North American coast. The fish, in its cured, salted form, was such a treasured commodity that Basque sailors crossed the north Atlantic in search of it, eventually discovering vast populations along the rocky shoals that skirted the island John Cabot would name Newfoundland. An early report described Cabot's men picking up the cod from the sea in great overflowing baskets. The story may be apocryphal, but it speaks to the cod's near-mythic abundance.

By the early 1990s, 500 years later, cod populations along the North American coast would be utterly depleted with little chance of recovery. (The time in between is described in terrific detail in Mark Kurlansky's *Cod*.)

Since then, we've learned to decimate fish populations in a fraction of the time it took to kill off the cod. Patagonian toothfish, a scowling fish from frigid near-Antarctic waters, was hauled up, renamed Chilean sea bass and made a staple of upscale North American menus in the 1990s. By the end of the decade, the fish was in steady decline, but even now you can still find it on some menus at a greater price.

Meanwhile, the imperiled bluefin tuna, already teetering on the edge of commercial extinction in the Atlantic, commands higher and higher prices. Earlier this year, one bluefin sold for \$104,800 in a Tokyo market and was parceled out as sushi for \$22 a slice.

So why do we keep fishing seafood to the brink of oblivion? Because the business of extinction pays—and not just when it's on a diner's plate.

The global fishing industry receives an estimated \$30 to \$34 billion a year in government subsidies. These subsidies have helped build a world fleet that's up to two and a half times the size needed to fish the seas sustainably. They push boats that are no longer economically viable to find fish that are no longer abundant. Subsidies have also been linked to a shadow industry of illegal fishing estimated to be worth \$9 billion each year.

As Charles Clover notes in *The End of the Line*, fish populations are resilient. They can rebound, but only if they get a breather from subsidy-fueled, intensive fishing. That didn't happen for cod, which looks like it has been driven past the point of no return. And it isn't happening for bluefin tuna and many other seafood species.

Economics, which drove merchants to pursue cod across the vast ocean hundreds of years ago, has a chance to help save the oceans in the modern age. Removing the billions of dollars that artificially prop up the fishing industry would result in an enormous release of the pressure on many fish stocks. It would only be one step, of course, in the larger process of restoring global fish populations, but it would be a major one and swift one to implement.