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SCIENTISTS SAY LET DATA TELL THE STORY

Alarming claims that global fisheries are heading for collapse have aroused a lot of media interest and public concern. But within the scientific community the 'doom scenario' is being contested as sustainability measures improve across some national fisheries

When the *New York Times* reported on its front page that fisheries worldwide could completely collapse by 2048 due to overfishing, Ray Hilborn was deeply perplexed.

Based at the University of Washington's School of Aquatic and Fishery Sciences, he specialises in natural resource management and conservation, while serving as an adviser to several international fisheries commissions. As he was familiar with the science reported in the newspaper he was asked to comment on the study when it originally appeared in the journal *Science*.

But he experienced a yawning divide between the data on sustainability as he knew it, the nature of the data in the scientific paper, and the doom scenarios portrayed by the media.

Ray Hilborn says the scientific paper analysed an important issue but one unrelated to the *New York Times* story: whether more diverse marine ecosystems have higher productivity. The newspaper, instead, honed in on one figure showing the historic rate of species collapse as estimated from catch trends. Projected into the future by the scientists, the graph predicts a global fisheries collapse by 2048 – a view reinforced by the lead scientist who is quoted, suggesting ways to prevent this calamity. However, the journalist also quoted the chief scientist of the US National Marine Fisheries Service, who said the prediction of a major collapse did not "gibe" with current trends.

With the mixed signals and the discrepancies grating, Ray Hilborn decided to do something about it and contacted the study's lead scientist, Boris Worm.

Starting in 2007, they got together with a group of 21 scientists to understand why such different views on the sustainability of marine capture fisheries exist. The meetings resulted in the release of a joint paper in July 2009.

"We had no trouble at all coming to joint conclusions – we are all natural scientists, trained to let the data do the talking," Ray Hilborn told *FISH* during a recent visit to Australia. "And while we both probably still put slightly different spins on it, we went to Washington DC together to brief congressional staff on our findings and we were telling the same story."

They found that a range of exploitation rates exist that achieve high yields and yet maintain most species. These are called 'MMSYs' (multispecies maximum sustainable yields). They also assembled data from developed countries to look at long-term trends in fish stocks and catch rates within their 200-mile fishing zones.

Before the 1990s, the data indeed speaks of a sustainability crisis. They found that six of the 10 ecosystems analysed had exploitation rates "substantially" higher than those predicted to produce maximum sustainable yields.

Since then, however, pressure on stocks has been declining and many developed nations are fishing at, or even below, the modelled MMSYs. These include the Southeast Australian Shelf and the Northeast US Shelf. And two sites – New Zealand and the California Current – are actually on track to achieve the conservation target of less than 10 per cent of stocks collapsed. Certainly no marine species to date have been made biologically extinct due to overfishing; the problem has tended to relate to 'commercial extinction'.

"We did find that 10 to 20 years ago – in most places – fishing rates were too high and stocks were

overfished," Ray Hilborn says. "And today, still, about 65 per cent of the stocks we examined are below levels that maximise long-term yield. But most stocks we looked at are in the process of rebuilding. Certainly catch rates are coming down and when that happens most fish populations – but not all – start to recover."

So the trend is towards greater – not less – sustainability.

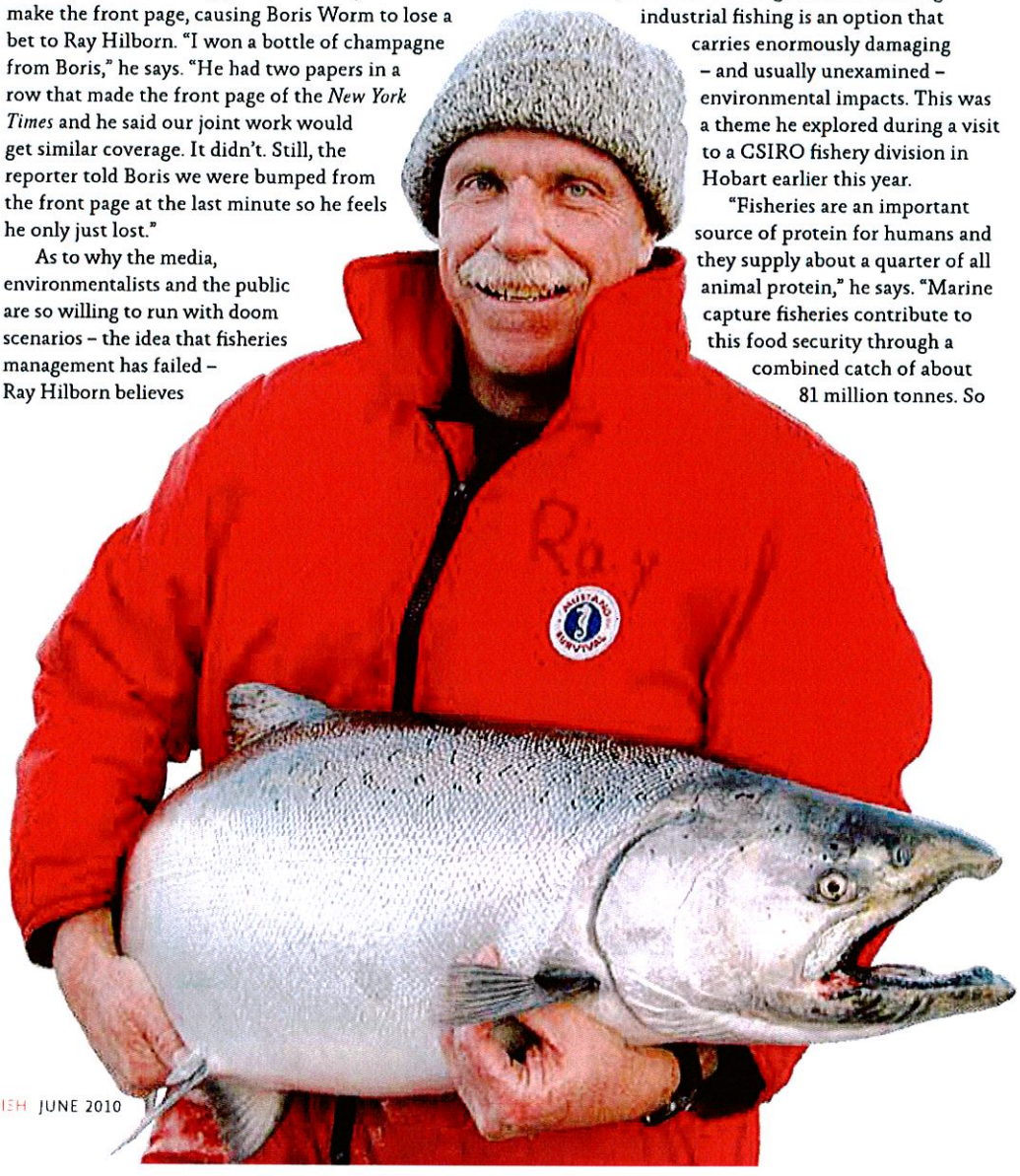
While the *New York Times* did run a story on these more optimistic findings, the joint study failed to make the front page, causing Boris Worm to lose a bet to Ray Hilborn. "I won a bottle of champagne from Boris," he says. "He had two papers in a row that made the front page of the *New York Times* and he said our joint work would get similar coverage. It didn't. Still, the reporter told Boris we were bumped from the front page at the last minute so he feels he only just lost."

As to why the media, environmentalists and the public are so willing to run with doom scenarios – the idea that fisheries management has failed – Ray Hilborn believes there are a number of explanations. In part he blames what he calls a "near-religious belief" in banning industrial fishing to solve sustainability problems.

"What the 'doom-and-gloomer' will say is that you cannot successfully manage fisheries without marine protected areas," he says, "and that is clearly wrong. There are many successfully managed fisheries – including areas that have never been overfished – and they do not use marine protected areas."

In fact, he makes a strong case that banning industrial fishing is an option that carries enormously damaging – and usually unexamined – environmental impacts. This was a theme he explored during a visit to a CSIRO fishery division in Hobart earlier this year.

"Fisheries are an important source of protein for humans and they supply about a quarter of all animal protein," he says. "Marine capture fisheries contribute to this food security through a combined catch of about 81 million tonnes. So



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– RAY HILBORN

replacing it with terrestrial meat production stands to incur all the impacts associated with intensifying livestock production."

On any metric he examined – impacts on biodiversity, greenhouse gas emissions, water use, pesticides, fertiliser, soil erosion – he found fisheries are far less environmentally damaging. He is particularly struck by impacts to biodiversity: "If the world's marine capture fisheries were replaced with terrestrial livestock production, then the extra grazing area required is equivalent to cutting down all the world's rainforest 22 times over. People just aren't connecting the dots, they are thinking too narrowly and don't see that as soon as you put the plough in the ground, the biodiversity of natural ecosystems is 100 per cent gone." (See box.)

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In contrast, fished marine areas may not exactly resemble a natural ecosystem, but studies find that they are similar. Generally, an area may not have all the original species due to displacement and catch, but they tend to have about 70 per cent of the same species and about a third the number of fish.

As long as the fishery is sustainably managed, Ray Hilborn thinks that fishing less would actually be associated with major environmental costs. So given a choice of sustainably produced protein, his message is "eat fish".

"In the past 20 years, especially in countries like Australia and New Zealand, all the people involved in commercial fisheries – the managers, scientists and fishers – have worked hard to move away from this 'tragedy of the commons' (whereby acting in their own interest, individuals will ultimately deplete a shared resource) and institute regulations," he says.

"It has been a difficult, painful process that has been hard on everyone. Yet these doom scenarios are saying that we are wasting our time, that it has failed. In fact, it is actually working." F

SUSTAINABILITY BEYOND MARINE CAPTURE FISHERIES

At the time Ray Hilborn and Boris Worm jointly studied national fisheries data, the survey included data from 150 fisheries. It has since grown to 320, covering about half the world's marine catch. But the database is also being expanded to international fisheries and there is growing interest in impacts associated with aquaculture.

"Most people won't believe it, but basically the world's high seas fisheries are not overfished," Ray Hilborn says. "In the biggest fishery in the Pacific there is almost nothing overfished and the Atlantic is just barely overfished. So these fisheries are not in terrible shape."

However, this is not due to good management, he says, and governance structures can be a problem when they involve 30 countries that cannot agree on the science. Rather, the cost of fishing on the high seas is so high that it often does not pay to overfish these stocks.

But there are exceptions, primarily the "super luxury" species of tuna.

"If you want to drag out a fishery that has problems, then in many ways bluefin tuna is the premier example in the world," he says. "In the past 10 years, the catches and the exploitation rates have probably been three times too high. Even when you set quotas, some countries over-catch anyway."

That was the case with the Japanese overfishing Southern Bluefin Tuna quotas. But stocks are now so low that in the absence of Korean and Japanese subsidies, Ray Hilborn thinks it is no longer profitable for fleets based in faraway ports to catch Southern Bluefin Tuna. At that juncture, if aquaculture can step in and fill the supply gap, there is a real opportunity to relieve pressure on wild stocks.

"Some forms of aquaculture have very little environmental impacts, some have more," Ray Hilborn says. "These production systems have been beat up very badly for their environmental cost, particularly the salmon and prawn industries. But again, you need to compare the alternatives. And with aquaculture there are definite positives."

Ray Hilborn is just starting to integrate aquaculture into the bigger sustainability picture. So far he has found that while some intensive aquaculture can transform land as much as farming, it can also produce about 100 times as much protein per hectare as conventional livestock production and 1000 times as much as grazing.

"The amount of land you need to produce by aquaculture is relatively small," he says. "And some forms of aquaculture, particularly freshwater species, are way ahead of any form of animal production. They are just stunningly efficient, better than livestock and capture fisheries."

In 1995, aquaculture produced about 30 million metric tonnes worldwide and production is growing at seven per cent annually.

"Aquaculture is going to continue to grow and one impact is that farmed fish can dramatically lower price. Competition with aquaculture, for example, saw the price for salmon halve in the past 10 years. But there is no way around it; we are catching pretty much everything that's out there and marine capture fisheries are not going to grow."

In parts of the developing world, the need to maintain yields in extremely hard-pressed fisheries has created a third option: a shift in species caught and consumed by humans.

In Asia for instance, more benthic invertebrates are finding their way to market. Since these substitute species include worms, Ray Hilborn suspects that as a yield-maintaining strategy, it is one that could see the West come to appreciate having "turned the corner" in the quest for sustainability.