

The "Overfishing" Metaphor

A conversation with fishery scientist Prof. Brian Rothschild of the School for Marine Science and Technology, University of Massachusetts, Dartmouth. This article was originally published in the 2012 Working Waterfront Festival Program Guide

Q: Prof. Rothschild, is there a common-sense definition of overfishing? I'm imagining a container with fish in it. Through reproduction, fish are added at some variable rate that you can't directly measure or control. If there's a population decline, you're taking out too many. What's wrong with that conception?

Rothschild: When a stock declines, people say it's from overfishing, but that's not necessarily true. The decline may have nothing to do with fishing, but rather with an unfavorable ocean environment.

Secondly, overfishing has several definitions. You and I might look at the same stock, but if we use different definitions, I could say the stock was overfished, and you could say it wasn't. That's not very scientific. That's why I say the term is a metaphor.

It's like saying someone is overweight. You don't look to be overweight, but I could come up with a definition by which you are overweight. I'm overweight, but I could come up with a definition by which I'm not: for example, if someone has skinny hands, and our sampling method is to weigh the hands.

Q: What is the dilemma of the fisheries manager?

Rothschild: The manager must make choices, but needs to take account of different definitions and come up with an optimum fish take. He, or she, must be informed of the different definitions.

Some definitions are important from a conservation point of view, and others are not. Those important from a conservation point of view relate to whether fishing has reduced the capacity of the stock to reproduce.

"Recruitment" overfishing says you overfish when it affects population regeneration. Another theory is concerned with optimum harvest: if you catch a fish before it reaches maximum size, your take will be smaller.

We're left with a fuzzy and complicated structure. That's why it's metaphorical.

Q: You wrote that "current marine fisheries management in North America has been built on biological rather than on economic criteria." Does that diminish the role of economics in management decisions?

Rothschild: Magnuson-Stevens [the Fishery Conservation and Management Act] says that any fishery management plan needs to take into account the economic/sociological needs of the community. But how can it do so, when the relevant data is generally not collected?

Q: Returning to your comment about an unfavorable ocean environment, are there instances where fish population declines were traced to the environment rather than overfishing?

Rothschild: In 1972, I was in Peru with a group of distinguished fishery scientists, the best and the brightest (except for me), trying to figure out what had happened to the anchovy fishery on the west coast of South America. What had once been the most productive fishery in the world had suddenly collapsed, and everyone was blaming overfishing. But what we found was a sudden shift in the plankton population. Anchovies feed on the fraction of plankton of about 300 micrometers or larger; sardines feed on the fraction below 300 micrometers. The data indicated a sudden drop-off of 300+ micrometer plankton, accompanied by a similar drop in the anchovy population and a concomitant increase in sardine numbers.

Q: How about the Northwest Atlantic cod crash of a few years ago? You said there was evidence that overfishing may not have been the main cause?

Rothschild: The growth rates of individual cod declined. For example, a four-year-old cod might weigh 10 pounds before the crash, and a fish of the same age 5 pounds after the crash. Those aren't the actual figures, just an illustration. The weight-to-length ratio went down, so that instead of looking like a fish, a cod looked more like a snake. Natural mortality increased substantially during the population decline. The populations of species associated with cod also declined. So the crash was not obviously related to fishing, as declines in growth, length-weight and increases in natural mortality are unrelated to fishing.

Q: Are there any new advances that you would call "breakthroughs" in distinguishing the impact of fishing from other forces?

Rothschild: Reliably separating the effects of fishing and the environment has been the holy grail of fishery science. It has never been achieved.