

POPULATION BIOLOGY

New Study Provides Some Good News for Fisheries

In the nineteenth century, biologists and fishermen alike believed that the ocean's fish were a boundless resource that could never be depleted. But the population crashes that have struck many fish stocks during this century have dispelled that notion. Indeed, some fish populations have plummeted so precipitously that fisheries biologists in recent years have wondered whether something besides fishing was accelerating that decline: Perhaps at low numbers the fish were unable to reproduce efficiently or were succumbing disproportionately to predators. Such a phenomenon, known as depensation, has been documented in some dwindling insect and marine mammal populations, including whales; if it were to occur in depleted fish stocks, they would be unlikely to recover, even if fishing were stopped.

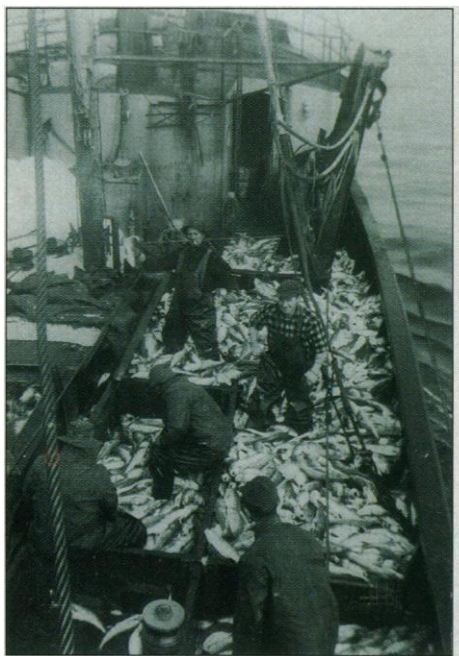
Now, a study of data on 128 heavily exploited fish stocks, reported on page 1106 of this issue, concludes that depensation doesn't appear to be at work in most fishery declines. "Fish stocks don't collapse because of depensation," says Ransom Myers of the Northwest Atlantic Fisheries Centre in St. John's, Newfoundland, the lead author on the study. "Fish stocks collapse because of plain simple overfishing."

"This can be thought of as good news," says John Beddington, a population biologist at Imperial College, London. "An implication of their work is that there is little evidence to indicate that fish stocks won't recover once you stop fishing them." Adds Alec MacCall, director of the Tiburon, California, laboratory of the National Marine Fisheries Service (NMFS): "It really places the burden right back on the fisheries manager. It says it's really up to you folks to get [the fish] back."

Myers and his colleagues arrived at their conclusion from a meta-analysis of statistics gathered over at least 15 years on a wide range of major commercially fished stocks. They analyzed the numbers of spawning fish in individual stocks as well as the numbers of "recruits," young fish that survive to adulthood. The ratio of recruits to the total number of fish reflects a population's success at reproduction and survival. A drop in that ratio at low population numbers would mean depensation had occurred. In a handful of fish populations, including herring on the Georges Bank off New England, and Pacific sardines, depensation could not be ruled out. But in the vast majority of the fish stocks, including the greatly reduced Georges Bank

cod and flounder stocks and Pacific sockeye salmon, the researchers found no evidence of depensation.

News like that will provide support for fishery managers in their efforts to regulate fishing, says Andrew Rosenberg, Northeast regional director for the NMFS and an author on the paper. The reason: They can now assure the fishing industry that cutbacks in fishing should lead to recovery of overexploited stocks. "You are continually trying to tell people there is a real benefit from reducing fishing, not just on stocks that have collapsed, but on stocks that have been



Before the crash. A bumper haddock catch, common in the 1950s. Even severely overfished stocks should recover.

reduced to arguably low levels," says Rosenberg. With the current results in hand, he says, "I can stand up in the council meetings and argue that you're going to have to cut back the catch very severely this year, but if you maintain that low harvest rate for several years, you are going to start to see an increase in catch."

If the study had instead shown depensation to be widespread, the outlook for fisheries would be bleak. Overfished stocks would be less likely to recover, and managers would have to be "even more cautious in regulating fisheries to prevent overharvesting in the first place," says Rosenberg. In contrast, says Gunnar Stefansson of the Ma-

rine Research Institute in Reykjavik, Iceland, the new finding suggests that "if you just reduce the fishing effort to a moderate level, then you should be able to allow the stock to regain ... a healthy stock size, yet also maintain some harvest."

The NMFS is putting that kind of policy into practice on the ailing cod and flounder fisheries of the Georges Bank, based in part on the Myers team's findings. The fisheries were taking 66% of the fish stock every year, says Rosenberg, and the goal is to reduce that to about 20% without closing the fishery. "As the stock begins to recover and move up that stock recruitment curve," he adds, "you would expect 20% of whatever is out there will start to become a substantial number in a couple of years' time."

At the same time, Rosenberg cautions that these findings should not be used to justify fishing until stocks are almost completely gone. "It is really a false argument to say because it will come back, we don't have to worry about it," says Rosenberg. For any depleted stock to recover its health, Rosenberg and his co-authors say, fishing must be reduced.

The earlier that reduction is begun, the better. A badly damaged fish stock may recover eventually, but not without wreaking severe economic hardship on the industry it supports, says Myers. He cites as an example Canada's lack of action when Newfoundland's cod stock got dangerously low in the late 1980s. By 1992, the population had dropped to 1/100th of its original size, and the fishery was shut down, causing the loss of 35,000 fishery jobs. There is no sign of recovery yet.

Indeed, the Myers team's lack of evidence for depensation has not calmed all fears that it is occurring in Newfoundland or elsewhere where fish stocks have crashed. "My feeling about this is even if one can't see depensation in stock recruitment data, there is something going on out there," says Jeremy Collie of the Graduate School of Oceanography at the University of Rhode Island in Narragansett. Reflecting on the Newfoundland cod fishery, Alaska's herring fishery, and others that have been slow to bounce back after fishing was stopped, he says, "the nagging fear is that maybe it is more complicated," and that depensation is occurring that can't be detected by the model used by Myers and his colleagues.

But even if the potential for depensation does lurk undetected in some declining fish stocks, Collie says, "the prescription [would be] basically the same ... reduce fishing mortality drastically." The difference, then, is not so much in the treatment as in the prognosis for the ailing patient, and that is where Myers and his colleagues have provided cause for optimism.

—Marcia Barinaga