

# Ripple effect seen in collapse of cod

■ The fish's loss from Nova Scotia may have altered the ecosystem.

## THE ASSOCIATED PRESS

PORTLAND, Maine - The collapse of cod stocks off Nova Scotia changed the marine ecosystem so dramatically that it may be impossible for cod to recover, according to a study by Canadian scientists that could have ramifications for cod stocks at Georges Bank.

Once the top predator, cod is now a bit player in waters off Nova Scotia. Its population on the Scotian Shelf has plunged 96 percent since the 1850s, according to archaeological evidence and old fishing records. In its absence, the entire marine ecosystem has been transformed, said Ken Frank, who co-authored the report published recently in *Science* magazine.

"It was always thought that the effects of overfishing were reversible," Frank said. "It's pretty shocking when you stop fishing, the fish don't return."

The research of Frank, Brian Petrie, Jae Choi and William Leggett could have ramifications for Georges Bank cod, which also has been decimated by overfishing.

Frank, who works for Canada's Department of Fisheries and Oceans at the Bedford Institute of Oceanography, said the disappearance of cod and other large species such as haddock, flounder and hake led to what is called a "cascade effect."

As the population of large predators declined, the fish they prey on - herring, shrimp, crab and lobster - have undergone a population explosion. That means cod, which used to sit on the top of the food chain, has now been replaced by smaller fish, Frank says.

Cod's departure is felt at the bottom of the food chain, where zooplankton and algae are now being depleted at a faster rate because more and more fish are feeding on them, he said. Eventually, the lack of food could bring about a crash in the numbers of fish, he said.