Evidence found for climate-driven ecological shifts in North Atlantic, says Cornell study

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While Earth has experienced numerous changes in climate over the past 65 million years, recent decades have experienced the most significant climate change since the beginning of human civilized societies about 5,000 years ago, says a new Cornell University study.

The paleo-climate record shows very rapid periods of cooling in the past, when temperatures have dropped by as much as 18 degrees Fahrenheit (10 degrees Celsius) in a matter of years to decades, "the rate of warming we are seeing [now] is unprecedented in human history," said Cornell oceanographer Charles Greene, the lead author of the paper appearing in the latest issue (November 2008) of the journal Ecology, which is published by the Ecological Society of America.

During the past 50 years, melting Arctic ice sheets and glaciers have periodically released cold, low-salinity slugs of water from the Arctic Ocean into the North Atlantic. This has led to dramatic ecosystem shifts as far south as North Carolina and extensive geographic range shifts of many plant and animal species. One microscopic algal species from the Pacific Ocean, not seen in the North Atlantic for over 800,000 years, has successfully crossed over the Arctic Ocean and reinvaded the North Atlantic during the past decade.

By reviewing climate changes in the past, the researchers were able to more clearly observe how this influx of fresher water has led to changes in ecosystems as well as the geographic distributions of species, said Greene.

Interestingly, the study reports findings counter to the expectations of most ecologists: that the distributions of southern species will move northward and those of northern species will retreat as the climate warms. Instead, as colder, fresher Arctic waters flow south along the Northwest Atlantic shelf, from the Labrador Sea south of Greenland all the way to North Carolina, the distributions of many northern species have actually moved southward, said Greene.

In addition, the periodic freshening of shelf waters can extend the growing seasons of phytoplankton and tiny drifting animals, like copepods, which together make up the base of the marine food chain. Such climate-driven changes can alter the structure of shelf ecosystems from the bottom of the food chain upwards, said Greene.

"While it is true that cod stocks never rebounded from 20th-century overfishing, part of their failure to recover can be attributed to the climate bringing colder waters to Newfoundland since the 1990s," said Greene. Cod don't grow and reproduce as rapidly in the colder water. The decline in cod, combined with the ocean's colder temperatures, enabled populations of cold-water crustacean species, like snow crab and shrimp, to increase.

"As climate changes, there are going to be winners and losers, both in terms of biological species and different groups of people," said Greene. "The cod fishermen are out of luck, but the fishermen that have decided to go after snow crab and shrimp are very successful now." He added that adapting to climate change is partly being able to predict what we can expect.

Source: Cornell University