1-25-2001

UNH Study Increased UVB Radiation from Thinning Ozone Could Be Killing Atlantic Cod Larvae

Sharon Keeler

UNH Research Associate Professor Michael Lesser

Centre for Environment Fisheries and Aquaculture Science

UNH Study: Increased UVB Radiation from Thinning Ozone Could Be Killing Atlantic Cod Larvae

By Sharon Keeler
UNH News Bureau

January 25, 2001

DURHAM, N.H. -- Stricter quotas on catches of Atlantic cod and other fish may not be enough to curb population depletion, because the quotas are based on models that don't take into consideration potentially harmful environmental changes.

Zoologist Michael Lesser and his colleagues at the University of New Hampshire report in a recent issue of "The Journal of Experimental Biology," that in some areas increased ultraviolet-B radiation resulting from the thinning of atmospheric ozone could be helping to kill cod larvae. Unless this stock loss is built into models, "mortality estimates of cod larvae could be a lot higher than fisheries biologists have estimated in the past," says Lesser.

Atlantic cod spawn in deep water, but the embryos float upward to finish their development. At these shallower depths, they can be exposed to increased levels of UV radiation.

In laboratory experiments, Lesser split the cod larvae into three experimental groups. One was exposed to only visible radiation. Another was exposed to visible radiation, and UVA radiation, which is prevalent but not affected by ozone depletion. The third group was exposed to visible, UVA and UVB radiation.

In these experiments Lesser found that 90 percent of Atlantic cod larvae died within 12 days of exposure to UVA and UVB radiation, whereas exposure to UVA radiation alone resulted in 61 percent mortality. This was against a background mortality of 41 percent during the experiment.

"Exposure to UVB radiation increased mortality from 61 to 90 percent," says Lesser. "These levels of UVB radiation occur at seven to 12 meters in the Gulf of Maine waters, where cod embryos and larvae are known to develop."

The most critical time for any living organism to be exposed to harmful agents is during the embryonic and larval developmental stages, when cell division and DNA replication are highest, says Lesser.

Those larvae that were able to survive the exposure to UV radiation in Lesser's experiment were severely stressed, showing higher levels of DNA damage.

"They were also smaller when they hatched to yolk-sac larvae. This is possibly due to the energetic costs of repairing DNA damage," Lesser adds. "Stressed and smaller larvae are at higher risk for being eaten because they spend more time in the plankton."

Around 99 percent of juvenile cod are thought to be eaten by predators before they can reproduce, and Lesser argues that the survival rate could be lower if rising UV radiation levels are included in the calculation.

He is quick to point out, however, that more field measurements are needed to find out whether UV radiation is making a difference to cod and other species in their natural environment.

"The ocean is not static, like a laboratory," Lesser explains. "The water mixes vertically, which adds great variability in the time larvae are close enough to the surface to be exposed to harmful UV radiation. Water clarity also varies, so more turbid water could also help mitigate the harmful effects of UV radiation."

Other environmental facts altered by human activity may also be important. Earlier this year, researchers at Britain's Centre for Environment, Fisheries and Aquaculture Science found a link between rising surface temperatures in the North Sea and reduced survival rates of young cod. The number of young cod dying in the waters off the coast of Nova Scotia has also doubled in the last 10 years, with no definitive explanation.

Back to UNH News Bureau