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### Healthy Parents Provide Clues to Survival of Young Haddock on Georges Bank

*Large fall phytoplankton bloom could control reproduction, future stock size*

In 2003, haddock on Georges Bank experienced the largest baby boom ever documented for the stock, with an estimated 800 million new young fish entering the population. With typical annual averages of 50 to 100 million new fish in the last few decades, fisheries biologists have been puzzled by the huge increase and its ramifications for stock management. They have been looking for answers and may have found one - healthy adults.

In a study to be published in the June issue of the *Canadian Journal of Fisheries and Aquatic Sciences*, Dr. Kevin Friedland and colleagues from NOAA's National Marine Fisheries Service and the University of Massachusetts suggest that the successful 2003 recruitment year is related to the fall phytoplankton bloom the year before spawning, and to the condition of the adult haddock. Phytoplankton, microscopic marine plants, form the basis of the ocean food web, and are the main source of food for many fish and other animals in the ocean. The fall 2002 bloom was significant, providing a larger than usual source of food for the ecosystem.

"Simply put, having more food to eat gives adult haddock a chance to get into better physical shape to reproduce healthy offspring with a higher chance of survival," says Friedland, a research scientist at NOAA Fisheries' Northeast Fisheries Science Center. "We reviewed the commonly applied factors that control recruitment, and found that the fall phytoplankton bloom the year before seems to link parental condition with a good recruitment. We call this new approach the parental condition hypothesis."

The researchers analyzed various factors that control recruitment, from egg and larval retention, feeding conditions for larvae, size of juveniles in the fall and their estimated hatch dates, prey and time of spawning to circulation patterns and the timing and size of spring and fall phytoplankton blooms. They found that the fall phytoplankton bloom the year prior to spawning and its affect on the condition of adults to be the best supported hypothesis.

Their study suggests that the condition of the adult haddock not only leads to an improved chance to reproduce, but that the adults will produce more eggs of higher quality with higher fertilization rates. Those factors in turn will produce more abundant, larger and potentially better-conditioned offspring with a higher probability of survival to adulthood, which can significantly affect haddock stocks.

Georges Bank haddock have been heavily fished by domestic and foreign fleets over the past 50 years, with shifting patterns of fishery yields that are largely dependent on

successful recruitment events. The paradigm that processes affecting mortality during the early life stages determine recruitment has guided research on Georges Bank for decades, with many recent studies suggesting that the formation of each incoming year class of new fish is driven by differing sets of external environmental factors ranging from climate change patterns like the North Atlantic Oscillation to timing of spawning and the feeding environment.

Friedland and colleagues suggest a new paradigm, that the condition of parents affects egg size and fertilization success through the most difficult growth-mortality period early in the haddock life cycle. The bottom line: the number and quality of offspring is more important than the external environmental factors that occur after spawning.

“We need to be able to explain extreme recruitment events for species like haddock, where recruitment is typified by highly unusual circumstances like that in 2003,” Friedland says. “Factors that may be responsible for these large recruitments will help dictate how the haddock resource on Georges Bank is utilized and conserved. This new hypothesis needs to be tested, but it seems to be the only one that explains the 2003 record year class. If it proves true, the implications could be significant.”

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NOAA Fisheries Service is dedicated to protecting and preserving our nation's living marine resources and their habitat through scientific research, management and enforcement. NOAA's Fisheries Service provides effective stewardship of these resources for the benefit of the nation, supporting coastal communities that depend upon them, and helping to provide safe and healthy seafood to consumers and recreational opportunities. To learn more, please visit <http://www.nmfs.noaa.gov>.

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Related links:

Status of the Haddock Stock: <http://www.nefsc.noaa.gov/sos/spsyn/pg/haddock/>

2003 Haddock Baby Boom News Release:  
[http://www.nefsc.noaa.gov/press\\_release/2004/news04.02.html](http://www.nefsc.noaa.gov/press_release/2004/news04.02.html)

Canadian Journal of Fisheries and Aquatic Sciences (Volume 65, Number 6, June 2008):  
<http://pubs.nrc-cnrc.gc.ca/rp-ps/issueDetail.jsp?jcode=cifas&vol=65&is=6&lang=eng>