



Institute of Marine Research, Norway

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# A magnetic compass guides Atlantic Haddock larvae at sea

Haddock (*Melanogrammus aeglefinus*) is a fish of great ecological and economic importance that has supported a fishery in the North Sea for more than a hundred years. Together with the closely related gadoid Atlantic cod, haddock stocks show large natural variation in abundance over multiannual time scales. Scientists have been trying to solve the enigma behind the fluctuations of fish stocks for over a century, in the shadow of Hjort's visionary hypotheses (1914), which associated variability in population size with food availability and the dispersal patterns of eggs and larvae. Specifically, larvae need to be transported to areas where conditions for survival are favorable: lots of food and low predation.

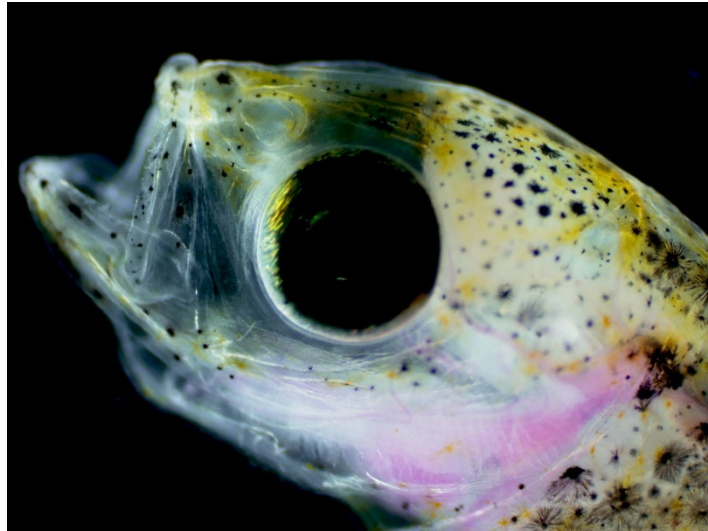


Figure 1 Larva of Atlantic haddock. photo: A.Cresci

How do haddock larvae accomplish this? To date, whether the few-millimeters-long haddock larvae let themselves be carried around by ocean currents or whether they actively migrate is unknown. Studying the behavior of tiny temperate larvae *in situ* remains challenging as even with today's most advanced tag technology tracking larvae in their natural habitat is not possible.

To shed new light on the movement ecology of larval haddock, a [team](#) of scientists at the [Norwegian Institute of Marine Research's Austevoll Research Station](#), in collaboration with the [Physical-Biological Interactions Laboratory](#) at the University of Miami's [Rosenstiel School of Marine and Atmospheric Science](#), explored the possibility that haddock larvae could use the magnetic field of the Earth to find their way at sea. The study, "Atlantic haddock (*Melanogrammus aeglefinus*) larvae have a magnetic compass that guides their orientation", published in the Cell Press journal *iScience*, reports that haddock larvae use a magnetic compass to maintain their orientation direction at sea. Specifically, the study shows that haddock larvae can orient towards the magnetic northwest using the earth magnetic field. This discovery



represents a major step forward in our understanding of the dispersal ecology of the early-life stages of this species.

The research team used a unique combination of experiments conducted in a magnetoreception test facility (the "[MagLab](#)"), and directly at sea, in a [Norwegian fjord](#), a natural environment of Atlantic haddock larvae. In the study, haddock larvae were observed in a transparent behavioral chamber ([Drifting \*in situ\* Chamber](#), DISC) developed by Professor Claire Paris, so that they could orient while drifting with the current under the environmental conditions that they would encounter during their dispersal at sea. The larvae were also tested in the [MagLab](#), where the magnetic field to which they were exposed was artificially rotated such that the N-S and E-W axes were shifted by 90 degrees for each of the larvae.

Haddock larvae oriented to the magnetic northwest *in situ*, and, although deprived of all other environmental cues, they oriented towards the exact same magnetic direction in the MagLab.

“These results tell us that Atlantic haddock possess incredible orientation abilities from the earliest phase of their life, and that they have a sensitive magnetic compass.” says Alessandro Cresci, first author of the article. “The dispersal of haddock larvae could be much less passive than we have assumed in the past and we need to incorporate this finding into biophysical coupled models in order to assess its ecological importance” adds Cresci.



## Notes to editor

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