Press release
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Institute of Marine Research, Norway
University of Miami, Rosenstiel School of Marine And Atmospheric Science, USA

The Odyssean migration of the European eel: how a magnetic compass linked to an internal biological clock prevents glass eels from being lost at sea

The odyssey of the European eel begins when they hatch in the Sargasso Sea. As little leptocephalus larvae, they travel thousands of kilometers across the Atlantic Ocean, hopefully making it to the European continental shelf. When eel leptocephali arrive at the continental shelf, they metamorphose into transparent glass eels, changing shape, physiology and behavior. At some point during this journey - anywhere from the Canary Islands to northern Norway - they "hop off" the Gulf Stream and actively migrate towards the coast, heading for estuaries. Some eels remain in the coastal area, while others move inland into lakes, remaining there, slowly growing, for up to 30 years. How glass eels "hop off" the Gulf Stream towards the coast and find estuaries is a long-standing mystery.

To understand how these small fish manage to find the coast, a research team 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, assessed whether glass eels use the Earth's magnetic field to guide them towards the coast. The study, "Glass eel (*Anguilla anguilla*) have a magnetic compass linked to the tidal cycle", published today in the AAAS journal *Science Advances*, reports that glass eels use a magnetic compass, modulated by an internal tidal clock, to orient towards the coast. In other

words, young eels can sense the Earth's magnetic field, use it as a frame of reference for orientation, and change direction according to the tidal cycle.

University of Miami Doctoral student Alessandro Cresci has been investigating the orientation behavior of glass eels using a unique combination of experiments conducted in a magnetoreception test facility (the "MagLab"), and in a Norwegian fjord, the natural environment of the glass eel just before it arrives at the coast. In the study, glass eels were observed in a neutrally buoyant aquarium (Drifting *in situ* Chamber, DISC) designed so that they could orient while drifting with the current under the environmental conditions that they would encounter during their migration towards the coast. The same eels were also tested in the MagLab, where the magnetic field to which they were exposed was artificially manipulated such that the N-S and E-W axes were shifted by 90 degrees. Although deprived of all other environmental cues, glass eels in the laboratory oriented to the South, the same direction that they swam *in situ* during the ebb tide.

"It is incredible that these small transparent glass eels can detect the Earth's magnetic field. The use of a magnetic compass could be a key component underlying the amazing migration of these animals," says Cresci.

This study is an important addition to our understanding of the mechanisms of eel migration and also to that of other species if it turns out that their magnetic orientation is similarly modulated by a biological clock.

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Notes to editor

Research article: A. Cresci, C. B. Paris, C. M. F. Durif, S. Shema, R. M. Bjelland, A. B. Skiftesvik, H. I. Browman, Glass eels (*Anguilla anguilla*) have a magnetic compass linked to the tidal cycle. Sci. Adv. 3, e1602007 (2017).

Embargoed: Not for Release Until 2:00 pm U.S. Eastern Time Friday, 09 June.

After the embargo lifts, the article will be available at the journal website here:

http://advances.sciencemag.org/content/3/6/e1602007

Institutional Media Contacts

Torny Aarbakke
Communications Director
Institute of Marine Research
Bergen, Norway
E-mail: torny.aarbakke@imr.no
Tel: +4790854462
Institutional Twitter account: @Havforskningen

Diana Udel
Director of Communications
University of Miami
Rosenstiel School of Marine and Atmospheric Science
Miami, FL, USA
Tel: +17862564446
Email: dudel@rsmas.miami.edu
Institutional Twitter account: @UMiamiRSMAS

Author Contacts and Biographies

Alessandro Cresci (Main contact - English and Italian)
Department of Ocean Sciences
Rosenstiel School of Marine & Atmospheric Science
4600 Rickenbacker Causeway, Miami, FL 33149-1098, USA
E-mail: axc597@miami.edu; alessandrocresci90@gmail.com
Tel. 17866022992
Twitter: @AlessandroCre90
Biography online

Howard I. Browman (Institute of Marine Research contact - English and French)
Institute of Marine Research
Marine Ecosystem Acoustics Research Group
Austevoll Research Station, Sauganeset 16, 5392 Storebø, Norway
E-mail: howard.browman@imr.no
Tel. +4798860778
Twitter: @HBrowman
Biography online

Claire B. Paris (University of Miami contact - English and French)
Department of Ocean Sciences
Rosenstiel School of Marine & Atmospheric Science
4600 Rickenbacker Causeway, Miami, FL 33149-1098, USA
E-mail: cparis@rsmas.miami.edu
Tel. +17863516482
Twitter: @beatrixparis
Biography online

Caroline M.F. Durif (Institute of Marine Research contact - Norwegian, French and English)
Institute of Marine Research
Marine Ecosystem Acoustics Research Group
Austevoll Research Station, Sauganeset 16, 5392 Storebø, Norway
E-mail: caroline.durif@imr.no
Tel. +4797627269
Twitter: @durifcaroline
Biography online

Steven Shema
Grótti ehf
Grundarstíg 4, 101 Reykjavík, Iceland
E-mail: stephen.shema@gmail.com
Tel. +3548448109
Biography online

Reidun M. Bjelland
Institute of Marine Research
Marine Ecosystem Acoustics Research Group
Austevoll Research Station, Sauganeset 16, 5392 Storebø, Norway
E-mail: reidun.bjelland@imr.no
Tel. +4790071309
Biography online

Anne Berit Skiftesvik (Institute of Marine Research contact - English and Norwegian)
Institute of Marine Research
Marine Ecosystem Acoustics Research Group
Austevoll Research Station, Sauganeset 16, 5392 Storebø, Norway
E-mail: anne.berit.skiftesvik@imr.no
Tel. +4791866526
Biography online