Abstract

Long-Distance Migrations: Orientation and Navigation of Anguillid Eels †

Caroline Durif ‡

Institute of Marine Research, Austevoll Research Station, 5392 Storebø, Norway; caroline.durif@hi.no
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Abstract: Anguillid eels grow in freshwater but spawn in the open ocean. Almost all of them undertake long migrations, consisting of several thousands of kilometers, between their feeding and their distant oceanic spawning areas. The cues that guide eels over long distances to the spawning area are unknown. The Earth’s magnetic field is one, if not the only, reliable cue that can guide them between these areas. To test whether the use of magnetic cues is compatible with what we know about the life-history and migration of eels, the patterns of magnetic inclination and intensity along the migratory routes of five anguillid species were investigated. Regardless of the species and the differing routes between life stages, larvae of those species always drift along paths of increasing magnetic inclination and intensity, while adults follow reverse gradients. This is consistent with an imprinting/retracing hypothesis. The proposed navigation mechanism suggests that larvae imprint the target magnetic intensity or inclination isoline value upon hatching, and then years later retrace the magnetic gradient until they reach the target isoline value which they can follow to find their conspecifics. Such a mechanism does not require a high level of precision to find a specific area but does require imprinting of the magnetic gradient experienced during the early life of the eel. There is already evidence for the imprinting of a magnetic compass direction in glass eels as well as yellow and silver eels. Knowledge about the orientation cues and biological mechanisms used by marine organisms to navigate and orient are important for taking appropriate management steps that are likely to help the conservation of vulnerable or endangered species.

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