

How do marine turtles return to the same beach to lay their eggs?

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Marine turtles almost always return to the same beach to lay their eggs. The egg-laying sites are often far from the feeding areas and the females cross several hundred kilometers of ocean with no visual landmarks. How do they manage to return to the same spot?

A study by Simon Benhamou of the Center for Functional and Evolutionary Ecology at Montpellier¹, France, together with other groups (CNRS, IRD, IFREMER, CEDTM², University of Pisa), shows that the marine turtles use a relatively simple navigation system involving the earth's magnetic field, and this allows them to return to the same egg-laying site without having the ability to correct for the deflection of ocean currents. This work, published in *Current Biology and Marine Ecology Progress Series*, should allow better conservation strategies for this endangered species.

Every 4 years, on average, Indian Ocean green turtles (*Chelonia mydas*) travel hundreds of kilometers to specific egg-laying areas, where they will lay 4 to 6 successive clutches. To better understand the navigation process and the sensory channels involved in this long-distance oceanic travel, the researchers have conducted a multidisciplinary study, involving biology and physical oceanography, in two series of experiments. In the Mozambique Channel, between the east coast of Africa and Madagascar, on the beaches of the French Islands of Europa and Mayotte, they caught turtles at the beginning of their egg-laying cycle, so that the animals were strongly impelled to return to this area to complete their cycle. After having Argos transmitters fitted to their

shells in order to satellite track their return journey to the beach, the animals were released in open sea, several hundred kilometers from the egg-laying site.

The first experiment was to study the navigation system of the marine turtles and discover how they detect the ocean currents: are the turtles' movements controlled by the currents or can they use them to their benefit? The study has shown that the marine turtles' navigation system allows them to maintain their course towards the egg-laying site wherever they find themselves. It is almost as if they were equipped with a compass pointing towards the beach in question. So they can correct any deflection they are subject to: transport by boat, ocean currents... But, unlike human navigators, they are not able to correct for ocean drift in plotting their course. So the movements recorded by the satellite are a combination of deliberate action by the turtles and the effect of currents. So it appears that the turtles' navigation system is relatively simple and may cause them to be wander at sea for long periods during adverse ocean conditions. One turtle released 250 km from its egg-laying site on Europa traveled more than 3 500 km in two months before returning there!

In the second experiment, the researchers have studied the effect of the earth's magnetic field on the turtles' navigation system. They have shown, for the first time in natura, that marine turtles use the magnetic field of the earth to orientate themselves. When this field is disturbed by placing a powerful magnet on their heads, turtle navigation is not as good. But the fact that they can still return to their original egg-laying site shows that the geomagnetic field is not the only information source that they use. Researchers think the turtles may also use their sense of smell like certain sea birds or homing pigeons. This hypothesis remains to be proven...

This work should improve conservation strategies for marine turtles, an

endangered, officially protected species, by providing a better understanding of how they manage these long migrations between egg-laying and feeding areas.

Source: CNRS

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