



Editorial

## Sea Turtle Migration: What Kind of Cue they Use for Navigation?

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Sea turtle is a long-lived marine reptile. The long evolution history of this animal results in great interests to understand its population traits. However, the endangered status of sea turtle prevents us from conducting extensive studies. In spite of great efforts have devoted to the researches on the biology of sea turtle, little progress was achieved for decades. Only in recent years, the advancement of technologies allows us to solve these miseries gradually. Current major topics involves in population genetic, biologging (e.g. satellite telemetries, diving behavior), nesting ecology (include nesting environment and embryogenesis), diet, pollution, plasma biochemistries, parasites, fisheries interactions and global climate changes. Still, with the limit sample size, the understanding of the sea turtle biology is mostly in infant stage. Controversies, however, occurred in the interaction between sea turtle behavior and other disciplines. The most obvious one is the importance of migratory cues for sea turtles.

In the controversy issues, some believed that geomagnetic field is the major cue for migration of sea turtle and large marine organisms [1]. However, Papi et al. [2] found that, the migration routes of sea turtles that installed the magnetic bars around their heads were indifferent from the turtles without magnetic bars. He concluded that the influence of geomagnetic field was not as strong as previous described. Thus, current and other mesoscale oceanographic features might be the major factors that influence the migration of sea turtle. Several other researchers, e.g. Hays et al. [3], suggested that the physical and chemistry information derived from air and in the current might be the important cues. In the coastal regions, turtles may use the coastal morphology or currents to reach their nesting sites [4]. Later on, even Lohmann admitted that, in addition to the secular variation in the geomagnetic field [5], several other natural factors, such as celestial, wave, may also act as the migration cues [5]. He believed that the hatchlings have the born-in ability to determine the geomagnetic field. Subadults and adults, on the other hand, learned to discriminate the fine variation in geomagnetic field and other migration cues [6].

Similar to most scientific arguments, there is a trend of merging between two hypotheses. For example, in a review article Freake et al. [7] suggested that the animal use different migration cues during its lifetime, depends on the age, location and migration distance. In the other paper, Luschi et al. [8] by satellite tracked the relocated female green turtles during the nesting season found that; the migration behavior did influenced by the current and local geomagnetic field. In a recent paper Akesson and Hedenstrom [9] stressed that sea turtle use different cue in different life stage, and the mechanism is very complicate. Lohmann et al. [10] also pointed out that sea turtle use one group of cues in the open ocean, while shift to different cues when approaches its destination. Southwood and Avens [11] also mentioned that the open ocean migrants will use various cues to adjust their migration routes.

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