

Ecology of marine turtles across the eastern Mediterranean and the Middle East

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Abstract

Marine turtles are wide-ranging, long-lived, iteroparous species of conservation concern. From indirect threats, such as development at their breeding grounds and negative fisheries interactions, to direct take of eggs meat and shells, they are impacted at all stages of their life-cycle by the activities of Man. A better understanding of their reproductive and spatial ecology together with knowledge of population status can inform conservation and management actions for their protection. This thesis presents a collection of chapters covering three species of marine turtle, from four countries in two regions where major knowledge gaps existed on marine turtle biology and ecology.

In Oman we identify plasticity in adult loggerhead turtle (*Caretta caretta*) internesting behaviour combined with globally-atypical, predominantly oceanic habitat use and we raise concerns over potential bias derived from temporally-restricted tracking studies. Conversely, we show that adult female individuals of the principally oceanic olive ridley turtle (*Lepidochelys olivacea*) remain in neritic waters outside of the breeding season, with some local turtles unusually utilising the same location both during and after the breeding period. We also show that green turtles (*Chelonia mydas*) nesting on Masirah Island are long distance migrators, travelling 2000 km or more into the Red Sea. Together with our tracking data for the other species in Oman we highlight the threat that fisheries interaction, in a region with poor fisheries regulation, is likely to have on these populations.

We describe the recent status of green turtle populations in Kuwait and Syria. In Kuwait nesting habitats have recently been halved through development of one of the two critical nesting areas and with the remaining nesting population estimated at no more than 5 females per year. For Syria, we describe the discovery of a regionally important nesting aggregation located south of Latakia city, with 30 individuals estimated nesting in 2004. Using satellite telemetry we identify potentially important foraging locations for individuals from both locations. Results from Syria further highlight the importance of neritic habitats off north Africa for adult turtles in the Mediterranean and results from Kuwait revealed the potential threat from the use of the unselective coastal fish traps locally known as a 'hadra'.

Lastly, in Greece we investigate the status of turtles in a neritic coastal habitat through a boat-based mark-recapture study. Combining flipper tagging, satellite telemetry and genetic research we verify that Amvrakikos Gulf hosts regionally important numbers of

loggerhead turtles (300 individuals identified from 67 days fieldwork) that establish distinct home ranges and maintain long-term associations to the area. A male-biased sex ratio was revealed in the area. These turtles are predominantly derived from local breeding stocks, especially from Zakynthos Island, and we hypothesise that a combination of environmental and biological factors specific to Zakynthos Island are the cause of this bias.

The results presented here, generated from a range of techniques including field surveys, satellite telemetry and genetic analysis, contribute to our knowledge of the status of several under-reported or previously unknown sea turtle populations, including evidence of their spatial footprint, and demonstrate the utility in adopting a variety of methods to corroborate results on migrations and linkages at individual and population levels.

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