

Potential bycatch impact on distinct sea turtle populations is dependent on fishing ground rather than gear type in the Mediterranean Sea: editorial comment on the feature article by Clusa et al. (2016)

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Mitigating the impacts of human activities on marine megafauna remains a major challenge. Of long-standing concern is the wholesale removal of such species as fisheries bycatch, which has intensified through the industrialisation of fishing fleets and the increased accessibility of the open ocean (Zeeberga et al. 2006). Beyond the complication of quantifying incidental mortality rates lies the challenge of assessing the overall consequences of removal at a population and species level given the broad spatial scale over which vertebrate species can range (Lewison et al. 2004). Such movements may arise through reproductive migrations, foraging excursions or, more cryptically, through shifts in habitat association during an individual's life history. Amongst the marine vertebrates, these issues are highlighted clearly by the hard-shelled sea turtles which can both migrate and mature over oceanic scales. In their seminal study, Bowen et al. (1995) illustrated this point in its extreme by using mtDNA to reveal that juvenile loggerhead turtles (*Caretta caretta*) found off Baja California, Mexico (where the species does not breed) had in fact originated from nesting sites in Japan and Australia.

Within this broader context, the study by Clusa et al. draws together a range of techniques to consider the consequences of bycatch on the Atlantic and Mediterranean

loggerhead populations sharing the same foraging grounds in the western Mediterranean Sea. Broadly speaking, they tested the hypothesis that juvenile turtles of Atlantic origin settle on the continental shelf later and at a larger size than their Mediterranean counterparts and hence may be more vulnerable to pelagic fishing gears. By using a combination of morphometric, stable isotopic and molecular data, the authors were able to evaluate the make-up of sea turtle bycatch from drifting longlines and bottom trawl/trammel nets around eastern mainland Spain, southern Balearic Islands, and southern Italy. Intriguingly, the population make-up of loggerhead bycatch reflected the area where the fishing operations were conducted but not the fishing gear used, against the original hypothesis of differential capture in demersal and pelagic fishing gears. Within a regional conservation framework, the take-home message was that the impact of loggerhead bycatch throughout the Mediterranean Sea will depend not only on the total number of individuals removed from the system, but also on the geographic distribution of the fishing effort. Consequently, this study was not merely a rerun of what had gone before but in a different area, but a well thought out amalgamation of techniques that highlighted the complexity of the sea turtle bycatch in near-shore environments where individuals from different age groups and natal sites may reside.

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