

RESEARCH SUMMARY



SMALL-SCALE FISHERIES AND BYCATCH MITIGATION

MARK HAMANN

James Cook University, Townsville, Qld, Australia

mark.hamann@jcu.edu.au

The influence of commercial fisheries on marine turtle populations is well known and many mitigation options to reduce bycatch, such as technological changes, spatial and temporal closures, reductions in effort or types of fishing allowed (Lewison *et al.*, 2004; Wallace *et al.*, 2010), are widely used. However, less is known about the possible and actual impact of bycatch from smaller scale or artisanal fisheries, especially those in the Indian Ocean region using gill nets or trawls (Komoroske & Lewison, 2015).

Small scale gill-net fisheries are a recognised issue for marine turtles in many regions of the world, either through direct evidence, or implied from stranded turtles found close to fishing areas (Peckham *et al.*, 2007; Wallace *et al.*, 2010; Alfaro-Shigueto *et al.*, 2011). However, importantly, small scale gill net fisheries are not only affecting marine turtles; other taxa, such as small cetaceans (Read, 2008; Mangel *et al.*, 2010), sirenians (e.g. Northridge *et al.*, 2017; Temple *et al.*, 2018), and elasmobranchs (e.g. Alfaro-Cordova *et al.*, 2017), are also impacted. Often these species groups are impacted within a single fishery or jurisdiction, and often the individual species affected are conservation dependent as evidenced by their listing on the IUCN Red List or national threatened species lists.

Indeed, several recent publications have focused on impacts on more than one taxon (e.g. Alfaro-Shigueto *et al.*, 2018; Temple *et al.*, 2018), or from more than one type of fishery (e.g. Riskas *et al.*, 2016). Collectively, these recent papers all highlight the need for increased cooperation among managers and fishers involved in different fisheries types and expansion of efforts to collect robust bycatch data to examine the extent of the impact of small-scale fisheries on threatened marine species. One option which shows considerable promise to improve data collection from small-scale fisheries involves the use of remote electronic monitoring cameras (Bartholomew *et al.*, 2018). The authors found the cameras were effective at quantifying elasmobranch bycatch, especially rays, and with modification could be used to detect and quantify marine turtles or mammals. One of the key benefits of the technique, or similar automated

tools, would be to improve species identification and reduce the cost and deficiencies of on-board observer programs or fisheries logbooks. Hence, they warrant further investigation in a wide array of fisheries types.

Most fisheries are managed independently from each other, and bycatch mitigation tends to be focused on single species. Thus, with small-scale fisheries often impacting more than one conservation dependent species, and an increase in the concern for many of them, there is a need to understand the multi-taxa impacts arising from existing mitigation. A recent paper by Gilman *et al.* (2019) has neatly summarised several areas across several commercial fisheries, including gill net fisheries, where mitigation of bycatch for one species/taxon can either benefit or have unintended negative impacts for other species. For gill net fisheries some of the bycatch mitigation techniques used to minimise impacts on sea turtles also work to varying degrees across species such as net mesh sizes, net tightness and illumination (Mangel *et al.*, 2018) and these warrant testing in other small-scale gill net fisheries.

It is also vital to consider the relationship between small-scale fisheries and the livelihoods of coastal communities, in particular the role of fisheries, and the influence of fisheries management, on poverty alleviation, food security and wellbeing (Béné, 2006). While these themes are being increasingly examined, recent papers continue to highlight the need for further research on, and inclusion of, human dimensions as they relate to small-scale fisheries, bycatch management, and threatened species conservation (e.g. Campbell *et al.*, 2016; Panagopoulou *et al.*, 2017; Aswani *et al.*, 2018). By combining an improved understanding of the relationship between small-scale fisheries and livelihoods of fishing-based communities coupled with knowledge and development of bycatch mitigation, we can be in a better place to implement locally relevant methods to minimise inadvertent negative impacts on people and the environment.

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