

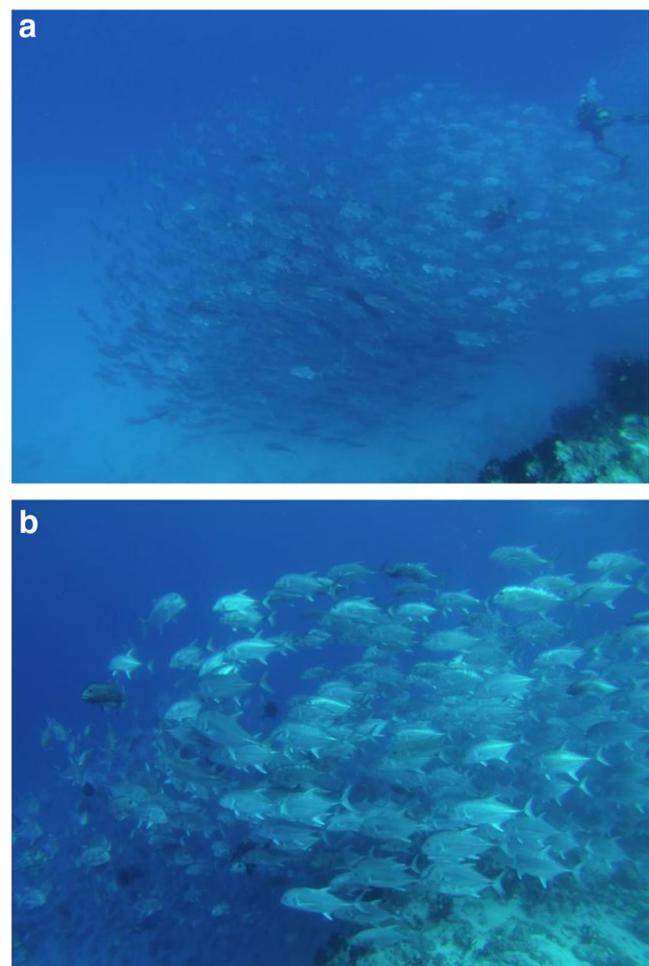
# Giant trevally spawning aggregation highlights importance of community fisheries management no-take zone

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Location and timing of spawning aggregations for large teleost predators either remain elusive or constitute core-fishing sites in developing countries, limiting or confounding management actions for sustainable harvesting. In the Quirimbas Archipelago in northern Mozambique, limited artisanal fisheries catch data are available, and only emerging management plans are in place in scattered isolated locations. Artisanal fisheries, however, are the dominant fisheries sector in the region, employing a large proportion of the local population and contributing the main food source for consumption. Giant trevally (*Caranx ignobilis*) is a highly valued fish and consumed locally but data on giant trevally spawning locations is limited (Westernhagen 1974). This is a concern, given spawning aggregations are extremely susceptible to over-fishing, but their functional role is imperative for maintaining ecosystem resilience. Within a community declared no-take zone on the eastern point of Vamizi island, a large aggregation of giant trevally were observed by scuba divers on December 15, 2013, two days prior to the full moon. The fish entered the shelf edge at ~15–20 m depth from the adjacent deep-water reef channel during daylight hours (15:00) and two hours after high tide. The aggregation numbered >1,000 fish that were estimated to be approximately 80–100 cm total length and larger (Fig. 1a). Individuals were observed pair chasing and displaying color changes (silver to black; Fig. 1b). The fish remained in aggregation formation on the shelf for 1–2 min surrounding the divers before returning to the deep-water

channel. Although the physical release of gametes was not observed, indirect evidence commonly used to infer spawning activity, indicate these fish were in the process of spawning



**Fig. 1** a Spawning aggregation of >1,000 *Caranx ignobilis* at the eastern point of Vamizi Island; diver of 180 cm height on right hand side provides scale. b Individual fish coloration changes occurring within the school

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(Domeier and Colin 1997). Primarily, these lines of evidence are (i) the occurrence of a large number of giant trevally in aggregation formation at this one site, (ii) the occurrence of the aggregation by a deep-water channel around the full moon and (iii) observed courtship behaviors including fish chasing and coloration changes (Westernhagen 1974; Meyer et al. 2007). This represents the first identified spawning location for giant trevally in the Western Indian Ocean. Establishing the occurrence of a vital process such as the spawning location of a large valuable teleost predator reinforce the no take designation at this site (Meyer et al. 2007) and highlights the importance of developing community co-fisheries management programs for protecting such processes (Hamilton et al. 2011). This is particularly important for giant trevally because spawning locations are considered to be highly predictable due to their stable occurrence over space and time (Meyer et al. 2007). Effective management of marine resources in remote and fragmented areas such as the Quirimbas archipelago are dependent on community buy in and support through co-fisheries management schemes. This finding underscores the utility of community-based programs to protect critical ecosystem functions but highlights the need

for investment in both community and national marine protected area and fisheries management networks off the east coast of Africa to ensure an ecosystem based management approach.

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## References

- Domeier ML, Colin P (1997) Tropical reef fish spawning aggregations defined and reviewed. *Bull Mar Sci* 60:698–726
- Hamilton RJ, Potuku T, Montambault JR (2011) Community-based conservation results in the recovery of reef fish spawning aggregations in the Coral Triangle. *Biol Cons* 144:1850–1858
- Meyer CG, Holland KN, Papastamatiou YP (2007) Seasonal and diel movements of giant trevally *Caranx ignobilis* at remote Hawaiian atolls: implications for the design of marine protected areas. *Mar Ecol Prog Ser* 333:13–25
- Von Westernhagen H (1974) Observations on the natural spawning of *Alectis indicus* (Rüppell) and *Caranx ignobilis* (Forsk.) (Carangidae). *J Fish Biol* 6:513–516