Status Of Shark And Ray Landings In Tanzania And Implications For Management

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Submission:

Background

The United Republic of Tanzania (URT, which includes the semi-autonomous Zanzibar Archipelago) has a considerable fisheries sector, largely dominated by artisanal and small-scale fishers, which operate predominantly for subsistence. However, there are also commercial and industrial fisheries and trade, including international trade. All of these fisheries catch multiple shark and/or batoid (rays, skates, wedgefishes, sawfishes, guitarfishes) species.
Of the ten Western Indian Ocean (WIO) states, the URT reported the second-largest catch of sharks between 2003 and 2012 (for fisheries that report catches to FAO), accounting for 26.5% of the total shark catch made by these states. The URT has a considerable fisheries impact on sharks and batoids in the country's waters and in the WIO, yet has limited data on shark and batoid species and their catches for their effective management. To bridge this knowledge gap, the Wildlife Conservation Society's (WCS) Tanzania Marine Program, in collaboration with the WCS WIO Shark Conservation Program and Government partners, has been monitoring the sharks and batoids landed in the artisanal fishery across landing sites in Zanzibar and mainland Tanzania.

We present here the results from the past three years of data collection, describing details of our monitoring approach, main findings and lessons learned.

Method

A total of 12 sites were sampled over the three-year period at target locations in Zanzibar (Unguja and Pemba Islands) and mainland Tanzania. Mobile devices purchased by the project facilitated data recording, using the Atlan Collect application and more recently the Kobotoolbox application.

Data recorded for every individual (where possible) included biological data (species, sex, weight, length (total (TL), fork (FL) and precaudal (PCL) lengths for shark and shark-like ray species, and disc width (DW) and length (DL) for batoids) and fishery data (fishing gear type and whether targeted or bycatch). Numerous photographs were taken of each individual, recording different parts of the body, to facilitate species identification/confirmation during data analysis. Small tissue samples were also collected from most individuals, to contribute to regional population genetics studies.

The protocol was updated over the years to include more detailed information while maintaining compatibility with previously collected data. All data was stored on the cloud in real-time and monitoring dashboards have been produced to rapidly visualize data collection efforts and trends in catch.

Landing site visits and training for data collectors were conducted at periodic intervals. Support was also provided to data collectors through a WhatsApp group to allow for real-time training and information sharing.

Results

Artisanal catch surveys from 2019–2021 across mainland Tanzania and Pemba and Unguja islands revealed at least 61 chondrichthyan species being caught, representing 62% of chondrichthyan species confirmed in the URT. In Zanzibar, 58 species were caught, with more than double and nearly four times more species than previously reported, in 1997 and 2004, respectively.

At mainland Tanzania landing sites, 44% of the individuals caught were classified as threatened (including several Critically Endangered species), compared to 47% at Unguja and 53% at Pemba sites. There were also numerous shark and ray species recorded that are listed on the appendices of the Convention on the Conservation of Migratory Species of Wild Animals (CMS) and the Convention in the International Trade in Endangered Species of Wild Fauna and Flora (CITES), as well as species with retention bans as implemented by the Indian Ocean Tuna Commission (IOTC).

Results show a considerably larger presence of sharks in Pemba and a lower presence of batoids, in comparison to Unguja and Mainland, which is likely the result of the different bathymetric profiles and associated habitats at the Pemba, Unguja, and Mainland sites.

Seasonal variations were notable in the catches of several species. There appear to be seasonal changes in catch rates for these shark species, with higher catch rates of Carcharhinus falciformis and Sphyrna lewini associated with the two rainy seasons and absence of Alopias pelagicus and Carcharhinus longimanus in the main Autumn rainy season. Seasonal variations appeared stronger for the shark species than many of the batoid species which could be due to these shark species being highly mobile pelagic and migratory species, and thus affected by changes in the seasonal monsoon conditions and the environmental characteristics around Pemba.

Lastly, the data show a notable effect of fishing gear type on the catch demography, with sharks caught primarily with hook-and-line (36%) and longlines (28%) followed by gill nets (several types for a total of 27%) and ring nets (6% of the total catches). This was considerably different from the catches of batoids where the main gear was gill nets (35%) followed by ring nets (32%), spears (13%) and hook-and-line (12%).

Significant proportions of both sharks and batoids (39% and 32%, respectively) were targeted as declared by the anglers during the landing site surveys, leaving opportunities for future management interventions.

Conclusion

These findings demonstrate the importance of species-level, long-term catch monitoring as well as the opportunity and need for improved fishery management and conservation in order to limit or avoid catches of threatened species. The findings indicate the possibility of several management opportunities.

Seasonal trends can be attributed to several biological factors but also to seasonal changes in fishing patterns of local fishers, based on wind and rain conditions. This offers opportunities for targeted seasonal management measures. Geographical variability in the distributions of catches presents an opportunity for management zonation, which in combination with studies on the presence of juveniles and seasonality could further refine appropriate management measures. Lastly, fishing gears had a significant impact on catch demography, and are used differently when targeting species, providing an opportunity to inform gear-based management measures.

We hope with this work to present a model for ecological monitoring of shark and ray landings and to contribute to advancing knowledge in the URT and the WIO, thus supporting the future development of improved management measures and more sustainable fisheries for sharks and rays.