Guitarfish fishing in southwest Madagascar: An assessment of the status of grayspotted guitarfish (*Acroteriobatus leucospilus*)

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**Background**

Guitarfishes include some of the most threatened species of elasmobranchs. Their high value meat and fins and their preference for shallow coastal waters expose them to intense fishing pressure. This, along with their low resilience and often small distribution, has led to global population declines and localised extinctions. Over 70% of species are either in threatened categories or Data Deficient (DD) of the IUCN Red List of Threatened Species. While guitarfishes have many characteristics in common with sawfishes and may undergo the same decline, they are often overlooked and remain poorly known.

The grayspotted guitarfish, *Acroteriobatus leucospilus*, is restricted to the southwestern Indian Ocean between Mozambique, Madagascar and South Africa and it is classified as DD. Fisheries surveys have shown that this species is caught at several sites along the coast of Madagascar. In particular, it is commonly observed in the artisanal fishery of the Bay of Ranobe, in southwest Madagascar. However, the lack of quantitative data does not allow to evaluate the health of its population and makes this species vulnerable to overexploitation.

Here we present a multiyear assessment of the small-scale fishery of *A. leucospilus* in the Bay of Ranobe to: 1) provide baseline information for this area; and 2) propose strategies for the conservation and management of the species.

**Methods**

Trained observers recorded catches from 5 villages within the Bay of Ranobe from January 2015 to August 2018. Catches for July 2014, the only data available for that year, where also included in this study. Observers collected data for 3 to 5 days per month at each site, surveying up to 30 pirogues per sampling day. The total catch, species composition, weight, standard length (SL), gears used, site, duration of trip and the number of fishers who participated in the fishing were recorded for each sample. For the purposes of this study, only records of *A. leucospilus* were used.

Annual and monthly weighted mean catch per unit effort (CPUE) was calculated, as the number of individuals caught per 100 pirogues surveyed per day, by gear type for each village. Conservative estimates of total catch per fishing gear within each village were then created by multiplying the weighted mean CPUE by the total effort, calculated considering that two-thirds of the pirogues in each village go fishing every day. One-way ANOVA was used to test for differences in SL among years and gear types. Pairwise comparisons were calculated using Tukey HSD test to examine where differences lay. A length–weight relationship (LWR) was estimated for males and females combined as sex was not recorded.
Results

A total of 226 individuals were recorded in this study, 62% were caught in Ambolimailaka and 27% of the total were below the maturity size, including 8 newborns. An estimated mean of 5,599 individuals per year were caught during the study period. Mean annual CPUE peaked in 2016 (3.04 ind./100 pirogues/day) followed by a sharp decline in 2017 and a partial recovery in 2018. Mean monthly CPUE was greater between July and October, with the highest value in September (7.36 ind./100 pirogues/day) mainly driven by catches in Ambolimailaka. A surprisingly high number of catches (n = 52) was observed in September 2016 in this village, with 51 of them made by spearfishermen (150 ind./100 pirogues/day). Speargun had the highest catch rate among gears, more than 6 times greater than any other gear type. The mean CPUE of each village reflects the main fishing techniques used. Fish size was smaller in 2017 (SL = 52.29 ± 3.85 cm, mean ± SE) than in the other years (mean SL = 62.10 - 65.98 cm). Largest catches were made using speargun (SL = 72.13 ± 1.07 cm, mean ± SE), while the other types of gear caught fish of similar size, just below the maturity size. *Acroteriobatus leucospilus* exhibits negative allometric growth (b = 2.47 - 2.75).

Conclusion

*Acroteriobatus leucospilus* appears to be abundant in the Bay of Ranobe, however, catches are decreasing despite the increasing fishing effort. This species is mostly caught by spearfishermen in Ambolimailaka. Instead, fishermen who use nets, harpoons or hook and line catch less fish and of smaller size. There is a general increase in the use of nets, conversely harpoons and spearguns are decreasing, except in Ambolimailaka where spearguns continue to be widely used. This may slightly reduce the number of catches, but it may also decrease their mean size.

The period in which the CPUE was greater, between July and October, was also the one in which 7 of the 8 newborns have been caught. This may suggest that *A. leucospilus* gives birth during winter months. Sex ratio of catches, which could not be assessed in this study, could improve our understanding of the reproduction of this species. An improvement in the management of *A. leucospilus* could be achieved with a temporary closure or by imposing a minimum catch size, after having discussed with the local association of fishermen and village councils.