

**Letter of Expert Concern to the WA Environmental Protection Authority on the State Government
Proposal for a 3 -Year Lethal Drum Line Program as Part of its Shark Hazard Mitigation Strategy**

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As professional marine scientists and experts, we strongly encourage the Environmental Protection Authority (EPA) of Western Australia (WA) to **reject** the Government of Western Australia's proposalⁱ for a 3-year, lethal drum line program as part of its broader shark hazard mitigation policy. We congratulate the WA State Government on its wider program that involves education, increased surveillance and research. However, there is insufficient scientific evidence to justify a lethal drum line program, either in terms of improvements to ocean safety or with respect to the potential detrimental impacts on shark populations. The WA EPA should reject the proposal on the following grounds:

- (1) The proposal presents no evidence to suggest that the lethal drum line program, as implemented, will improve ocean safety. The proposal relies on reported outcomes from netting or mixed netting / drum line programs despite netting having been rejected by the WA Government on the grounds of excessive impacts on ocean wildlife. The proposal ignores the more relevant examples from Hawaii that showed no improved safety outcomes despite a lethal long-line program lasting 16 years that captured nearly 300 tiger sharks a yearⁱⁱ (comparable to the expected take of tiger sharks in WA's program), and Queensland, where beaches protected only by drum lines are largely in locations with no history of fatalities.ⁱⁱⁱ
- (2) The drum lines are indiscriminate, as shown by the outcomes of the program from January to April 2014. Approximately 78% of the animals caught were non-target animals (wrong species; undersized) with tiger sharks comprising 95% of the catch^{iv} despite this species not being implicated in a regional fatality since 1925.^v It is very likely that all captured animals had a high risk of mortality before and after release due to overnight setting of baits and poor configuration of the drum lines. The proposal provides no estimates of post-release mortality from the trial nor does it suggest how by-catch will be mitigated and survivorship outcomes improved. These issues add to the unacceptability of the program.
- (3) The proposal does not adequately assess scientifically-supported, non-lethal alternatives such as the South African "Shark Spotter" program^{vi} and Brazil's "tag and remove" program^{vii} as viable options for Western Australia. These are programs that could be implemented immediately as representative of best practice. Importantly, such non-lethal programs not only achieve demonstrable safety outcomes, but also generate the information we need to improve understanding of the distribution and movement of sharks, data that underpin ocean safety.
- (4) The proposal does not adequately support its estimates of "negligible" (white shark) or "low" (tiger shark) population impacts as it is predicated on either uncertain or no estimates of regional population sizes. For white sharks, the best peer-reviewed estimate now suggests approximately 700 breeding individuals in southwestern Australia^{viii} yet the proposal's un-reviewed estimate is for a total population of 3,400-5,400 animals^{ix}, implying very high levels of natural mortality in juvenile stages of these sharks. No compelling evidence for this assumption is presented. Moreover, experience from South Africa confirms that calculating the regional population size of white sharks is a challenging task, with recent research showing that numbers may have been over-estimated by an order of magnitude in the waters off the Cape of Good Hope^x.

The argument that 300 tiger sharks (40 tonnes) can be removed annually with low impact from a population of unknown size is of concern. This assertion is largely based on estimated catches by drum lines being 50% of peak historical landings by commercial fisheries (but comparable to mean annual landings) and thus ecologically acceptable. However, the proponents fail to demonstrate that historical landings were sustainable and also ignore potential cumulative effects of ongoing mortality from illegal, unreported and unregulated (IUU) fisheries for the species.

- (5) The proposal does not acknowledge the importance of demography. By targeting mature or nearly mature animals, the proposal has the potential to have a disproportionate effect on near-term reproductive output and recovery of populations. Similarly, sex ratios of catches are likely to be highly skewed given that to date, 4 females have been destroyed in the drum line trial for every single male tiger shark caught in the >3 m size class. Such biases in catches are likely to have disproportionate effects on population recovery and maintenance.
- (6) In assessing broad-scale ecological impacts, the proponents suggest that as there was no evidence of ecosystem impacts associated with shark removal during the height of the shark fishery in the region, the impacts from the drum line program are likely to be negligible. However, no historical research from the fishery is presented to support this assertion and the proposal ignores the mounting evidence of the effects of the removal of apex predators such as tiger sharks on marine ecosystems that has appeared in the recent literature^{xi}. Thus, the posited absence of such impacts in the past merely reflects a lack of research on this topic and is not grounds for dismissing the issue in the present day.
- (7) The proponents suggest that ecological impacts on the two regional World Heritage Areas (Shark Bay and Ningaloo) will be minimal as few (if any) drum line deployments would occur in these areas. This assertion ignores the fact that white and tiger sharks are wide-ranging, with individuals capable of moving over much of the coastline of WA^{xii}. The connectivity of the population at this scale means that the proponents cannot dismiss potential impacts of the annual removal of upwards of 40 tonnes of largely female tiger sharks on these World Heritage Areas merely on the basis of deployment strategies.

The Western Australian Government's proposal to attempt to mitigate shark hazards through, in part, the implementation of a lethal drum line program, is not scientifically supported. The impacts on targeted wildlife and regional ecosystems are unquantified and have the potential to be significant. Given the range of non-lethal, demonstrably effective strategies available to mitigate risk and improve our understanding of shark distributions and behaviour, we need to move beyond lethal options.

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