

CORRESPONDENCE

Empowering fishers for Great White Shark stewardship: Reply to Madigan et al. 2021

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Madigan et al. (2021) recently reported a supposedly illegal fishery targeting white sharks in the Gulf of California (GC), Mexico. While we are strongly against illegal fishing and recognize the need to enhance enforcement to pro-

tect white sharks, the evidence presented does not support the authors' argument and likely failed to abide by ethical and professional guidelines. Claiming the existence of a targeted fishery is weakly supported and irresponsible,

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and could jeopardize white shark research and conservation in Mexico. Additionally, the paper does not reference mandatory permits required under Mexican regulations for working with protected wildlife – regardless of whether handling of samples or derivatives was direct or indirect, especially when local scientists are not involved (LGVS arts. 97 & 98: http://www.diputados.gob.mx/LeyesBiblio/pdf/146_190118.pdf, accessed April 13, 2021).

Madigan et al. (2021) compiled white shark captures from online media outlets and interviewed an unknown number of local fishers allegedly partaking in this activity. Despite acknowledging that the activity is rare and opportunistic, the authors incorrectly refer to it as a targeted fishery. Labeling these infrequent captures as a targeted fishery is incorrect because it lacks essential structural elements such as: 1) sufficient spatio-temporal biological availability, 2) a fishing fleet purposely designed to catch white sharks, 3) processing and marketing infrastructure for their catch, integrated into a fishing system with a clear social, economic and cultural impact (Charles, 2000). Most fisheries in the region are multispecific, and incidental white shark catches are considered rare (Galván-Magaña et al., 2010). The authors do not report following generally accepted guidelines for conducting interviews and obtaining informed consent. This non-technically supported collecting of anecdotal information would disqualify its interpretation given its lack of technical rigor (see Vanclay et al., 2013) which is inferred from the lack of evidence of informed consent. This is particularly concerning given the potential consequences of criminalizing a marginalized sector of society based on unsubstantiated information.

The authors present a population model that forecasts a high and negative population-level impact. However, the author's interpretation is based on several assumptions without enough evidence and an uncertain sample size, even assuming that the teeth analyzed were obtained from 14 individuals all captured in a single year. However, independent verification to eliminate the possibility that some samples belong to the same individual - a fact that even the authors acknowledge - or were caught in a different area or year is not presented. Therefore, their uncertain sample size would lead to larger error in their size estimates based on jaw tooth position, thus skewing reported size distribution to the left or to the right (younger or adult sizes, respectively), with drastically different interpretation and management implications. While local ecological knowledge should not be disregarded, it should be verified and contrasted against additional evidence. However, the authors only contrast their findings with online media outlets that are prone to overemphasize facts or be unreliable (see West & Bergstrom, 2021). For these reasons, the model, although

mathematically sound, is likely not valid for estimating the infrequent catch of white sharks in the GC.

We regret that this paper failed to incorporate the expertise and perspective of local researchers and fishery managers, which could have increased their sample size reducing model uncertainty and error, as well as improved the context of the findings and their implications based on the current understanding of the white shark's population and its interactions with local fisheries. Local collaborators would have also prevented wrongly presenting Mexican state names, which has management implications and suggests lack of knowledge of the study area. Mexican science has been critical for informing co-management enhancing conservation efforts of white sharks and their habitat, and for implementing legislation that forbids targeted fishing (e.g. https://www.dof.gob.mx/nota_detalle.php?codigo=5330831&fecha=27/01/2014, accessed April 20, 2021). Collaborating with local experts would avoid the pitfalls of scientific colonialism (see Trisos et al., 2021).

Alleging the existence of an illegal targeted fishery without solid evidence will likely lead to mistrust between fishers and researchers, and reprisals from local authorities against fishers, thus thwarting the assessment of white shark bycatch in the GC. Fisheries management is about managing natural populations while actively engaging users. Therefore, the solution to illicit fishing practices of white sharks and other species requires working collaboratively with fishers and empowering them to replace unsustainable fishing practices with a true commitment to conservation and marine stewardship (e.g. Karr et al., 2017).

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AUTHOR CONTRIBUTIONS

L. Malpica-Cruz coordinated coauthors' input and wrote the first draft. All authors revised the manuscript for critical intellectual contributions; edited the manuscript; support its content; approve of the final manuscript form; and agree to be accountable for its content.

ETHICS STATEMENT

This article does not contain any studies involving animals or human participants performed by any of the authors.

DATA ACCESSIBILITY STATEMENT

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CONFLICT OF INTEREST

All authors declare that they have no conflicts of interest.

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REFERENCES

- Charles, A.T. (2000). *Sustainable fishery systems*. Blackwell Science Ltd, Oxford, UK
- Galván-Magaña, F., Hoyos-Padilla, E.M., Navarro-Serment, C.J., Márquez-Farías, F. (2010). Records of white shark, *Carcharodon*

carcharias, in the Gulf of California, Mexico. *Marine Biodiversity Records* 3: <https://doi.org/10.1017/s1755267210000977>

Karr, K.A., Fujita, R., Carcamo, R., et al (2017). Integrating science-based co-management, partnerships, participatory processes and stewardship incentives to improve the performance of small-scale fisheries. *Frontiers in Marine Science* 4:345. <https://doi.org/10.3389/fmars.2017.00345>

Madigan, D.J., Arnoldi, N.S., Hussey, N.E., Carlisle, A.B. (2021). An illicit artisanal fishery for North Pacific white sharks indicates frequent occurrence and high mortality in the Gulf of California. *Conservation Letters* e12796. <https://doi.org/10.1111/conl.12796>

Trisos, C.H., Auerbach, J., Katti, M. (2021). Decoloniality and anti-oppressive practices for a more ethical ecology. *Nature Ecology & Evolution* 1–8. <https://doi.org/10.1038/s41559-021-01460-w>

Vanclay, F., Baines, J.T., Taylor, C.N. (2013). Principles for ethical research involving humans: Ethical professional practice in impact assessment Part I. *Impact Assessment and Project Appraisal* 31:243–253. <https://doi.org/10.1080/14615517.2013.850307>

West, J.D., Bergstrom, C.T. (2021). Misinformation in and about science. *Proceedings of the National Academy of Sciences* 118:e1912444117. <https://doi.org/10.1073/pnas.1912444117>

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