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Editorial: Assessment Approaches to Support Bycatch Management for Marine Mammals

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Editorial on the Research Topic

Assessment Approaches to Support Bycatch Management for Marine Mammals

Bycatch in marine fisheries is, and long has been, one of the leading sources of human-caused mortality of marine mammals (Lewison et al., 2004; Read et al., 2005). It has contributed to declines of many populations and species, and at least one species extinction. A well-established approach for managing the impacts of fishing on marine mammal populations involves identifying the fishery or fisheries of concern, identifying the affected marine mammal populations, collecting data on marine mammal abundance and bycatch, estimating levels of mortality that populations can likely sustain, and implementing regulations or taking other mitigation approaches to reduce marine mammal bycatch as needed to achieve management goals. The Potential Biological Removal (PBR) framework established under the USA's Marine Mammal Protection Act (MMPA) identifies a level of human-caused mortality that, with high probability, will allow a given marine mammal population to remain at, or recover to, its level of maximal production (Wade, 1998), and prescribes a process for achieving this.

Interest in developing similarly robust assessment frameworks for use across a broad range of contexts is expected to increase worldwide owing to the recently-implemented seafood import provisions of the MMPA[12], which require exporting countries to implement reliable, standardized methods for collecting and analyzing data to estimate marine mammal abundance and bycatch rates. The absence of either the data to evaluate bycatch impacts or a plan to collect such data for fisheries that export to the USA can lead to the products from those fisheries being prohibited from entering the USA, with severe implications for associated fishing communities, some of which are in poor and developing countries. At the same time, the import provisions provide incentives and opportunities to reduce marine mammal bycatch.

This Research Topic was inspired by a need to increase the number of marine mammal populations around the world for which abundance and bycatch can be estimated and to help identify which fisheries are most urgently in need of mitigation. The 12 resulting contributions consist of nine original articles, one policy and practice article, and two review articles that collectively provide guidance and novel methods or examples for addressing these issues.

Wade et al. provide a comprehensive overview of the steps involved with assessment and management of marine mammal bycatch. These include collecting data on the abundance and bycatch of marine mammals and on fisheries that are known or suspected to cause bycatch, assessing the impact of bycatch in relation to reference points, and using the results of the assessments to guide

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bycatch mitigation and reduction. Most of the other papers in the Research Topic expand on the steps outlined by Wade et al.

Two publications provide best-practice guidance for data collection and estimation of marine mammal abundance and bycatch, applicable across species and in a variety of programmatic and data contexts. Hammond et al. review the steps for estimating abundance of marine mammal populations. Guidance is provided for the use of transect sampling from ships and aircraft, land- or ice-based counts, and mark-recapture methods. The paper summarizes data collection and practical considerations related to estimating abundance for pinnipeds, cetaceans, and sirenians. Moore et al. review methods for estimating bycatch mortality of marine mammals using data on bycatch-per-unit-effort, total fishing effort, and rate of mortality of bycaught animals. They summarize sources of error when estimating bycatch, including non-representative sampling, observer effects, and cryptic mortality.

The Research Topic also features articles exploring bycatch estimation using sub-optimal data. Basran and Már Sigurðsson quantify the under-reporting bias in estimates of bycatch when estimation methods rely on data from logbooks rather than observer programs, using data from New Zealand, the United States, and Iceland. They conclude that if reliance on logbook data is to continue, clearer regulations and simplified reporting using modern technology, in combination with electronic monitoring cameras to verify compliance, would improve accuracy. Authier et al. outline a model-based approach for estimating bycatch when the data are non-representative. This can arise when levels of observer coverage are low or certain fishing sectors or vessel types are not monitored due to logistics, costs, or security issues. Rouby et al. address the difficulties that arise from non-representative data on bycatch of common dolphins (*Delphinus delphis*) in the Bay of Biscay by proposing a regularized multilevel regression method with post-stratification implemented using Bayesian methods.

Several papers explore the implications of unobserved mortality or injury. Jannot et al. describe a model-based approach for estimating bycatch of humpback whales (*Megaptera novaeangliae*) in the fishery for sablefish (*Anoplopoma fimbria*) off the US west coast. The method is based on the Bayesian paradigm to estimate probability distributions for unobserved bycatch. Tackaberry et al. use photo-identification data to explore post-release survival of humpback whales entangled in fisheries off the US west coast, and find that entangled whales are seen (and photo-identified) less frequently than control animals, and that this is particularly true of younger individuals. Constanza et al. use a low-cost, public-participation mapping approach called Bycatch Risk Assessment (Hines et al., 2020) to generate a spatial and temporal assessment of entanglement (bycatch) risk to humpback whales off northern Peru.

Genu et al. describe an R software package to carry out management strategy evaluation of control rules for setting marine mammal removal limits, and provide an example application for harbor porpoises (*Phocoena phocoena*) in the North Sea.

Mogensen et al. use multiple analytical approaches to investigate spatial relationships between live and dead Yangtze finless porpoises (*Neophocaena asiaeorientalis asiaeorientalis*) and different threats, trends in reproduction over time, and sustainable offtake levels, finding that mortality is spatially associated with cargo traffic, that observed mortality levels are unsustainable, and that population recruitment is declining. Goldsworthy et al. describe an assessment of bycatch of Australian sea lions (*Neophoca cinerea*) off South Australia and evaluate the effectiveness of mitigation methods including closures, bycatch mortality limits, and incentives to switch to gears with lower bycatch rates.

The contributions to this Research Topic provide guidance for managers and researchers who are expected to understand, quantify, and mitigate the impacts of marine mammal–fishery interactions, including situations where few or no data are available and no system is in place to collect needed data.

AUTHOR'S NOTE

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REFERENCES

Hines, E., Ponnampalam, L. S., Junchompoo, C., and Peter, C. (2020). Getting to the Bottom of Bycatch: A GIS-Based Toolbox to Assess the Risk of Marine Mammal Bycatch. Endanger. *Species Res*. 42, 37—57. doi: 10.3354/esr0103

Lewison, R. L., Crowder, L. B., Read, A. J., and Freeman, S. A. (2004). Understanding Impacts of Fisheries Bycatch on Marine Megafauna. *Trends Ecol. Evol.*19 (11), 598—604.

Read, A.J., Reynolds, J. E., Perrin, W. F., Reeves, R. R., Montgomery, S., and Ragen, T. J. (2005). Bycatch and Depredation," in: Marine Mammal Research: *Conservation Beyond Crisis*. p. 5—17.

Wade, P. R. (1998). Calculating Limits to the Allowable Human-Caused Mortality of Cetaceans and Pinnipeds. *Mar. Mammal Sci.* 14, 1—37.

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