

Whale-Watching Impacts: Science, Human Dimensions and Management (Editorial)

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Published

2021

Journal Title

Frontiers in Marine Science

Version

Version of Record (VoR)

DOI

[10.3389/fmars.2021.737352](https://doi.org/10.3389/fmars.2021.737352)

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Editorial: Whale-Watching Impacts: Science, Human Dimensions and Management

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Keywords: cetaceans, tourism, impacts, management, economy

Editorial on the Research Topic

Whale-Watching Impacts: Science, Human Dimensions and Management

Whale watching, the activity of sighting cetaceans in their natural habitat, and the basis of tourism industries worldwide, has been growing in the last decades. Although the growth of the industry has been beneficial in economic terms for the communities in countries where the activity takes place (Guidino et al., 2020), there is a great concern about how whale watching may negatively impact the behavior and physiology of the species being observed (Senigaglia et al., 2016) or even compromise their survival (Barragán-Barrera et al., 2017). There is a significant history of research on the impacts of whale watching due to the need to provide a scientific basis for regulations that seek to ensure the welfare of the species targeted by the industry (Corkeron, 1995; Parsons and Brown, 2018; Gleason and Parsons, 2019). Optimal management allowing sustainable whale watching remains a challenge for most countries. Lack of regulations, or guidelines not being followed by tour operators, are commonly reported (Higham et al., 2009). Failure to follow regulations is related to poor governmental monitoring, competition between operators for ensuring profit and, in some instances, lack of self-organization among operators. Currently, understanding site-specific idiosyncrasies of governance is crucial to minimize the negative impacts of whale and dolphin watching, including in countries with well-established regulations.

This Research Topic addressed ecological, management and economic issues surrounding whale watching in 14 contributions: 12 original research, one review and one perspective. Studies involved 13 species of cetaceans including, humpback (*Megaptera novaeangliae*), gray (*Eschrichtius robustus*), blue (*Balaenoptera musculus*), fin (*B. physalus*), Bryde's (*B. brydei*), sperm (*Physeter macrocephalus*) whales, Hector's (*Cephalorhynchus hectori hectori*), common (*Delphinus delphis*), dusky (*Lagenorhynchus obscurus*), common bottlenose (*Tursiops truncatus*), spotted (*Stenella attenuata*), spinner (*S. longirostris*) dolphins, and killer whales (*Orcinus orca*). Papers covered marine regions of Colombia, Chile, Italy, Mexico, New Zealand, Panama, Peru, and the United States reflecting the widespread and global importance of whale-watching research.

Most contributions have addressed the impacts of whale watching on several aspects of the cetacean's species behavior and ecology. Holt et al. demonstrated that female southern resident killer whales are more likely to assume a non-foraging state with vessels in proximity than males, compromising their energy available for reproduction. Given the precarious state of this population of killer whales, this is a significant conservation concern. Amrein et al. highlight the changes of

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Specialty section:

This article was submitted to
Marine Megafauna,
a section of the journal
Frontiers in Marine Science

Received: 06 July 2021

Accepted: 22 July 2021

Published: 13 August 2021

Citation:

Pacheco AS, Sepúlveda M and
Corkeron P (2021) Editorial:
Whale-Watching Impacts: Science,
Human Dimensions and Management.
Front. Mar. Sci. 8:737352.
doi: 10.3389/fmars.2021.737352

movement direction in humpback whales in presence of three or four whale-watching boats. Also, Currie et al. show that the presence of vessels causes changes in swim speed, respiration rate, and path directness, as well as decreases in dive times in humpback whales. Similar results on changes of movement direction and resting behavior were observed in fin whales by Santos-Carvalho et al. off the central coast of Chile. Toro et al. studied group size and surface behavior of bottlenose dolphins comparing two data sets, one 18 years prior to and another after the onset of dolphin watching tourism. The results suggests both a substantial reduction in group size and surface activities in presence of dolphin-watching boats.

In a physiological study, Villagra et al. used a before-during-after design with non-vessel-presence controls to show that the simultaneous presence of several whale watching boats can affect the energy budget of humpback whales. Acoustic impacts were addressed by Perez-Ortega et al., using a paired-comparison study design. They demonstrated that bottlenose dolphins exposed to substantial dolphin-watching traffic increased their whistle frequency modulation, an indicator of stress. Rey-Baquero et al., used acoustic propagation models to show that humpback whales song communication can be masked up to 63% by a single whale-watching boat, even in an area with little other anthropogenic noise.

Soto-Cortés et al. examined the management of whale watching in a marine protected area in Colombia. They showed that the sustainability of the activity may be affected by socioeconomic problems among tour operators, inconsistency in the enforcement of regulations and a lack of communication among stakeholders including the authorities. Tepsich et al. studied the satisfaction levels of tourists participating in the whale watching industry in the Pelagos Sanctuary, a marine protected area in the northwest of the Mediterranean Sea. They reported high levels of satisfaction by tourists, but almost half of the tour operators were unaware that their activities were conducted in a marine protected area that could be used to enhance conservation actions. On the Pacific coast of Panama, Cárdenas et al. demonstrated that compliance by tour operators to regulations and the provision of information about the ecology of humpback whales produced higher levels of satisfaction for tourists participating in whale watching compared to those operators who did not comply with regulations.

Fumagalli et al. presented a historical review (ca. 30 years) of whale and dolphin-watching involving several species at

different locations in New Zealand. They concluded that despite an early establishment in precautionary regulations, successful management depends in the socio-cultural factors as well as socio-economic dynamics. Not all places have succeeded in management of cetacean-based tourism and site-specific adaptation and governance is crucial. Urbán and Vilorio-Gómora reviewed the situation of whale watching throughout the Mexican Pacific coast, highlighting successful cases of whale watching in marine protected areas, but in locations not under protection, whale watching does not follow rules currently imposed by Mexican authorities. Also, the authors pinpointed the need for a regulatory framework for tourism based on swimming with dolphins. Finally, Wiener et al. provided the first estimates of revenue generated by the tourism industry involved with swimming with spinner dolphins at two sites in the Hawaiian Islands. These researchers demonstrated that the industry provides significant funding into the local economy, with each individual dolphin worth between \$1.6 and \$3.3 million over its lifetime. The authors also call for further assessment of the impacts of the activity and the economic role in the tourism industry.

The contributions in this Research Topic show that research on whale-watching has developed into a well-organized scientific enterprise. The work collected here highlights the value of monitoring of biological impacts, the need for this work to continue internationally and the importance of the enforcement of regulations surrounding the whale watching industry.

AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

ACKNOWLEDGMENTS

We would like to thank all the authors that made this Research Topic possible. We thank the support of the members of the Frontiers editorial office who assisted the authors and us promptly. We also acknowledge Rebeca Dunlop, Rob Harcourt, and Lars Bejder for their additional help editing manuscripts. We are indebted with all the reviewers whose thoughtful support ensured the quality of the science presented in all contributions. Also, thanks to Mark Meekan for editing this manuscript.

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