Editorial: integrating emerging technologies into marine megafauna conservation m...

Health & Medicine

Editorial on the Research Topic

Integrating Emerging Technologies into Marine Megafauna Conservation Management

Many recent and emerging technological innovations hold great potential to transform the “ best-available science” for marine megafauna conservation management, such as remote sensing, telemetry, molecular technologies, unmanned aerial vehicles, bio-acoustics, and animal-borne imaging (O'Brien, 2015 ; Nowacek et al., 2016 ; Hays and Hawkes, 2018 ; Harcourt et al., 2019). This includes both the use of these technologies to address key knowledge gaps in species' biology required for management decisions (e. g., critical habitat use, demographic vital rates, and population connectivity), as well as their application to identify and mitigate human impacts (e. g., distinguishing impact hotspots and forecasting interactions). These technologies are being increasingly employed across a broad diversity of wildlife research contexts; however, there has been highly variable efficacy integrating these new tools into conservation science and translating results into successful management practices and policies (Berger-Tal and Lahoz-Monfort, 2018).

In this special Research Topic, researchers submitted articles addressing how recent and emerging technological innovations are being used to answer the key outstanding biological questions for marine megafauna. The resulting 17 articles illustrate how novel information from different technological applications is informing marine megafauna conservation and discuss challenges, future directions and remaining technological gaps.

Bio-acoustics

The collection of passive acoustic data is a rapidly evolving field that is helping to enhance the ability to accurately estimate abundance and determine distribution of marine mammals, particularly for rare or elusive species (Marques et al., 2013). The case study presented by Hildebrand et al. illustrates how passive acoustic monitoring can be applied to detect and analyze signals from two different species of sperm whales (*Kogia* spp.) to obtain estimates of population density in the Gulf of Mexico (GOM).

Genetic and Other Molecular Analyses

Collecting non-invasive samples for genetic analysis to identify species, subspecies, or stocks of marine megafauna at sea remains challenging. Baker et al. demonstrate how eDNA methods can be used to detect specific communities of killer whales, and validate a method that will be useful for collecting DNA from the wake of whales.

Harcourt, R., Sequeira, A. M. M., Zhang, X., Roquet, F., Komatsu, K., Heupel, M., et al. (2019). Animal-borne telemetry: an integral component of the ocean observing toolkit. *Front. Mar. Sci.* 6: 326. doi: 10. 3389/fmars. 2019. 00326

Hays, G. C., and Hawkes, L. A. (2018). Satellite tracking sea turtles: opportunities and challenges to address key questions. *Front. Mar. Sci* . 5: 432. doi: 10. 3389/fmars. 2018. 00432

Marques, T. A., Thomas, L., Martin, S. W., Mellinger, D. K., Ward, J. A., Moretti, D. J., et al. (2013). Estimating animal population density using passive acoustics, *Biol. Rev.* 88, 287–309. doi: 10. 1111/brv. 12001

Nowacek, D. P., Christiansen, F., Bejder, L., Goldbogen, J. A., and Friedlaender, A. (2016). Studying cetacean behavior: new technological approaches and conservation implications. *Anim. Behav* . 120, 235–244. doi: 10. 1016/j. anbehav. 2016. 07. 019

O'Brien, J. (2015). Perspective: technologies for conserving biodiversity in the Anthropocene. *Issues Sci. Technol.* 32, 91–97.