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Editorial: Conservation implications of pathogens, parasites, and pollutants for sea turtles

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Editorial on the Research Topic
Conservation implications of pathogens, parasites, and pollutants for sea turtles

Because of their complex life history, sea turtles face a myriad of threats in both terrestrial and marine habitats, including interactions with fisheries, coastal development, direct take, climate change, and pollution and pathogens. These threats have been identified among the priority areas for sea turtle research and conservation (Hamann et al., 2010; Rees et al., 2016), with studies on pollutants, pathogens, and parasites at the intersection of environmental health, climate change, and population viability.

This special Research Topic highlights research that moves beyond baseline data and addresses the conservation implications of these threats for sea turtles. The five articles examined the impact of novel and emerging pathogens and different pollutants, and described a non-invasive technique that can be used for assessing and monitoring sea turtle health status.

Pathogens

Fungal diseases in wildlife are an increasing problem worldwide (Fisher et al., 2012; Casadevall, 2018; Fisher et al., 2020; Thornton, 2020). Sea turtle egg fusariosis is an emerging disease in sea turtles caused by fungi in the *Fusarium solani* species complex lineage (Gleason et al., 2020). Kuschke et al. assessed necropsy reports from dead hatchlings and tissue samples and cultures from live hatchlings and found that *Fusarium* spp. had long-term effects on leatherback (*Dermochelys coriacea*) sea turtle hatchlings after emergence from affected nests in Florida, USA. Exposure to the pathogen(s) likely occurred in the nest environment at the study site. The authors identified the potential impact of the fungus on the success of hatchlings in successfully emerging from the nest, their long-term health, and viability of the leatherback turtle population to be important areas of future research.

Goldberg et al. presented the first documented case of systemic mycobacteriosis in wild sea turtles. A stranded green (*Chelonia mydas*) sea turtle, observed on the coast of Rio de Janeiro, Southeastern Brazil, tested positive for *Mycobacterium gordonae* and died despite medical treatment. Nontuberculous mycobacteria have previously been found in a number of reptile species and are endemic worldwide (e.g., Soldati et al., 2004; Mitchell, 2012). Coinfections and a compromised immune system may have increased this turtle's vulnerability to the opportunistic mycobacterium. The source of the bacteria in this case remains uncertain but may be linked to human activities, such as the release of untreated domestic and industrial effluents, improper waste disposal, and potential landfill leakage, that contribute to the degradation of water quality in marine habitats.

Pollutants

Anthropogenic contaminants in the nest environment have the potential to alter embryo survival, hatchling sex ratios, and hatchling physiological performance (e.g., Fuentes et al., 2011; Santidrián Tomillo et al., 2015; Patrício et al., 2019; Patrício et al., 2021). Fuentes et al. examined the effect of microplastics (fragments of plastic that are smaller than 5mm; Arthur et al., 2009) of different colours and concentrations on the thermal profile of beach sediments. Containers of sand were seeded with microplastics at different concentrations (0-30% v/v) and of different colors (black or white). Microplastic concentration in the sediment had a greater influence on temperature than color. The greatest increase in sand temperature – 0.58°C – could significantly affect hatchling sex ratios, as well embryo survival and hatchling physiological performance. The impact of microplastics on beach sand thermal profiles, in combination with climate changes and increases in ambient temperatures (Fuentes et al., 2011; Santidrián Tomillo et al., 2015; Patrício et al., 2019; Patrício et al., 2021), could limit the recovery of already threatened sea turtle populations.

Other contaminants with the potential to change hatchling sex ratios are those accumulated by female sea turtles foraging near contaminated areas and then transferred to their eggs (Barraza et al., 2021). Barraza et al. found that loads of trace elements including antimony, barium, cadmium, chromium and lead, known endocrine disruptors, in hatchling tissues had significant effects on clutch sex ratio and sex ratio deviation. Maternal transfer of, and interactions among contaminants, combined with nest temperature are likely to have affected determination of hatchling sex in this study.

Monitoring

Monitoring sea turtle health and recovery is challenging in wild animals. Hancock et al. investigated the potential for photo identification (photo-ID) to identify and monitor the progression and recovery of turtles with fibropapillomatosis (FP). FP is an epizootic disease that presents as lesions and tumours that can interfere with a turtle's ability to swim, see, and feed (Page-Karjian et al., 2014). In the study, photos of turtles were collected from researchers and citizen scientists and individual turtles identified by their unique patterns of facial scales. Health status, especially the presence of FP tumors, was appraised at the time of photography and through examination of photos. Photo-ID was found to be a useful, non-invasive method to document and monitor the FP in foraging populations of sea turtles.

The studies in this special Research Topic advance our understanding of the implications of novel and emerging pathogens and different pollutants for sea turtle conservation.

Author contributions

AP: Writing – original draft. FY: Writing – review & editing.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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