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Using animal-borne acoustic tags to explore the vulnerability of the endangered Maugean skate to habitat degradation

Climate change and spatial movements

Australia

Using animal-borne acoustic tags to explore the vulnerability of the endangered Maugean skate to habitat degradation

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Maugean Skate (*Zearaja maugeana*) have perhaps the most restricted distribution of any elasmobranch, as they are now thought to be confined to a single remote estuary (Macquarie Harbour) in Tasmania, Australia. Conditions in the system have changed markedly since Euro- pean settlement, influenced by anthropogenic activities in and around the estuary (e.g., mining, hydro-electricity generation, and marine farming operations). Of recent concern, has been a sig- nificant and ongoing decline in dissolved oxygen (DO) levels in the water column. It is critical for the conservation of the species to understand the current and future effects of these changes in their last known habitat. 25 adult Maugean Skate were externally tagged with novel multi-sensor acoustic tags continuously transmitting information on depth, temperature and dissolved oxygen concentrations experienced over a 12-month period. Results show an intricate link between movement of the Maugean Skate and environmental conditions in Macquarie Harbour. The species appear to behaviourally modulate the impacts of environmental stressors through movement, balancing optimal habitat requirements against the energetic cost of chronic hypoxia in deeper waters and increased thermal and osmoregulatory stress at shallow sites. Two multi-stressor events (3 and 6 months into the tracking period) resulted in several mortalities (50 %) and elicited a behavioural response from all remaining individuals. This suggests that recent changes in the environmental health of the system (especially dissolved oxygen levels), coupled with the consequences of climate change (including occurrence of extreme weather events), may already be challenging the skate's capacity to cope with the environmental conditions in Macquarie Harbour. This study represents the first use of animal-borne acoustic sensors to monitor long-term dissolved oxygen conditions experienced by a coastal elasmobranch and how these relate to behaviour and physiology. Results from this work coupled with recent documented declines in the population highlight the significant extinction risk for this micro-endemic species and the need for urgent conservation action.

Keywords: hypoxia, microendemic, extinction risk

Information for Delegates