

Charismatic megafauna of Antarctica - the toothfish hunters of the Ross Sea

Antarctic seals, whales, and seabirds hold a particular fascination for human visitors to the Deep South. The ‘charismatic megafauna’ of Antarctica inspire a range of emotions from curiosity to awe. But, most importantly, these iconic species may hold the key to protecting the last great wilderness.

One thing all the charismatic megafauna of Antarctica have in common is that their true home is the ocean. The Antarctic continent itself is too cold and barren to support anything bigger than tiny invertebrates and slow-growing, miniscule plant life. The vast numbers of seabirds and seals that congregate each summer along the Antarctic coastline all make their living at sea. Some whale species such as humpback whales and blue whales travel thousands of kilometres to the Southern Ocean to take advantage of its extravagant productivity during the summer months. Others, such as killer whales and minke whales, follow the receding sea ice to access rich stocks of fish and other prey. Some, such as Weddell seals, live inside the ice year-round.

New Zealand’s sector of the Antarctic is home to the world’s largest Marine Protected Area (MPA), the Ross Sea region MPA. Established in 2017 by CCAMLR, the Commission for the Conservation of Antarctic Marine Living Resources, the MPA was designed to protect the Ross Sea region from the impacts of fishing for Antarctic toothfish. Toothfish are large and valuable fish prized by chefs and gourmets worldwide. Humans are of course not the only ones that appreciate the creamy, rich flesh of the toothfish: Toothfish is hunted by Weddell seals, sperm whales, and a particular kind of killer whale known as ‘Type C’ that is especially common in the Ross Sea.

“As toothfish predators, Weddell seals and Type-C killer whales are among the species that might be most directly affected by the removal of toothfish from the ecosystem through fishing.”

It was this concern that was one of the major drivers for the Ross Sea region MPA, and prompted the designation of Weddell seals and Type-C killer whales as focal species for the MPA. The scientific study of these toothfish hunters – their abundance, foraging habits, distribution, reproductive success, and migratory habits – allows us to assess whether the MPA is achieving its aims. By virtue of their position in the food web, top predators such as seals, whales, and penguins integrate the cumulative effects of everything that happens at lower levels. Changes in the ecosystem, such as annual variation in marine productivity or long-term changes in the availability of prey, are transmitted via the food web and appear as measurable parameters, such as the number of breeding penguins or how many seal pups and whale calves are born each year. We just need a way of decoding the signal.

While long-term data sets exist for selected areas and subpopulations (such as the Weddell seals of Erebus Bay or the Adélie penguins of the Southern Ross Sea), our understanding of charismatic megafauna at the scale of the Ross Sea region is still rudimentary. We do not know how many Type C killer whales live in the Ross Sea region, or where they go to have their calves. For that matter, we do not know with any

certainty how many Weddell seals there are, due to their inconvenient habit of spending part of each day beneath the surface of the ice.

To advance our understanding, we need to study species not where it is most convenient or apparent to us, but in a manner that reflects their life cycle priorities and on scales, in both time and space, that are truly representative. For seals, whales, and penguins, this means developing technological solutions for studying them in their true home, the Southern Ocean. Two promising solutions are the development of high-performance remotely operated vehicles (ROV), such as the Boxfish ROV we used on our 2018-19 expedition to McMurdo Sound; and utilisation of recent technological advances in remote sensing from stationary cameras, unpiloted aerial vehicles (UAVs), and satellites.

Another consideration is that killer whales, who are properly considered the largest member of the dolphin family and have the enormous brains to prove it, perceive the world primarily through sound, not vision, as we do. Just as a dog's reality is different from ours and shaped by its phenomenal sense of smell, toothed whales including dolphins, killer whales, and sperm whales use echolocation to 'see' the world around them. One theory for why toothed whales have such large brains is to provide the extra processing power required to analyse exceedingly complex acoustic signals. The Top Predator Antarctic Research Programme (TPA) has established passive acoustic monitoring of Type-C killer whales in the Ross Sea to gain a better understanding of their ecology and social structure.

The iconic inhabitants of the Great White South have fascinated multiple generations of scientists, explorers, and enthusiastic citizens, many of whom caught the 'Antarctic bug' from an inspiring teacher or public speaker. The value of flagship species such as whales, seals, and penguins is immense, not just for scientific research, but also for raising awareness for marine conservation and for promoting the responsible stewardship of one of the last wild places on Earth.

By Regina Eisert, *University of Canterbury* / @TPAonIce

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Killer whale among the sea ice, McMurdo Sound; photo: R. Eisert, *University of Canterbury* / @TPAonIce.



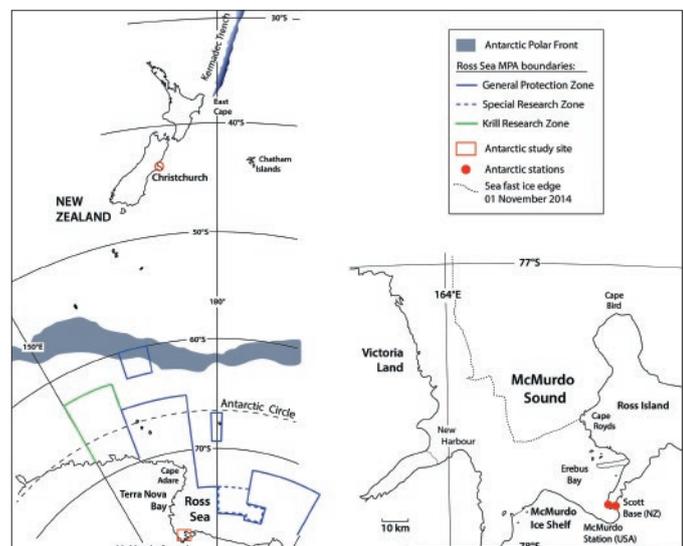
Weddell seals beneath a hole in the sea ice; photo: B. King, *Boxfish Research*



Adelle penguins swimming; photo: B. King, *Boxfish Research*



Killer whales underwater; photo: R. Eisert, *University of Canterbury* / @TPAonIce



Map showing the Ross Sea region Marine Protected Area in relation to NZ and Antarctica; credit: R. Eisert, *University of Canterbury* / @TPAonIce.



A curious young Weddell seal swimming in a tidal crack in the sea ice of McMurdo Sound;
photo: R. Eisert, University of Canterbury/TPAonIce