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Divers check an acoustic receiver
by Ryan Daly

Sound in the sea

During COVID-19 lockdowns around the world, stories of wildlife venturing closer to human habitation or apparently thriving thanks to the reduction of human activity, traffic and noise have circulated in both the mainstream media and social media. The effect extends to the oceans too, and this has provided the perfect opportunity to conduct a project that was first conceptualised a decade ago. Called the International Quiet Ocean Experiment (IQOE), it aims to improve understanding of background sound in the sea – the 'soundscape' – and the effects of noise on marine life. By early February 2021, IQOE project leaders had coordinated a network of more than 230 hydrophones operated by various groups in different parts of the world. Software has been developed to standardise data analysis, allowing the project participants to contribute to a global database that can be used to investigate changes in ocean sound during the pandemic.

Sound in the sea was first intensively monitored during the 1950s, when the US Navy set up SOSUS – the Sound Surveillance System – to track Soviet submarines. A network of hydrophones was installed along the edge of the continental shelf on the east and west coasts of the United States and around Hawaii. These hydrophones listened in on sound transmitted via the 'deep sound channel', also known as the SOFAR (Sound Fixing And Ranging) channel. This is simply a layer in the world's oceans where low-frequency sound travels great distances because it is effectively trapped between warm water near the surface and the increased pressure of deep waters. It exists because the speed of sound decreases with temperature and pressure, so at the depth of the water column where both are relatively low, the speed of sound is at a minimum. Since sound waves are refracted towards the area of slower speed, those in the SOFAR channel bend back when they encounter the warm waters above or the higher-pressure waters below. By bouncing between these layers, sound waves can travel long distances with little loss of energy, or attenuation. The SOFAR channel varies in depth according to the local salinity, temperature and water depth, but its axis lies about 600–1200 m below the sea surface in low and mid latitudes.

By the end of the Cold War in 1991, the US Navy had started to allow some government and civilian research groups to use SOSUS to monitor undersea volcanic and seismic activity, whale migration and vocalisation, and later oceanographic conditions for climate change studies. Scientists were already using hydrophones moored in coastal waters or deployed from boats – Roger Payne famously discovered the songs of the humpback whales in 1967 – and underwater acoustics were also being widely used to map the seafloor and survey fish stocks.

The year 2021 marks the start of the Decade of Ocean Science for Sustainable Development (2021–2030) proclaimed by the United Nations. The 'Ocean Decade' provides a framework to ensure that ocean science can support countries in their efforts to reverse the decline in ocean health and achieve the 2030 Agenda for Sustainable Development. In celebration of this global event, this issue of *Quest* focuses on 'Sound in the sea', and features relevant research carried out by South African scientists.

Sue Matthews
Quest Editor

Lesisiqephu se *Quest* sibhekene nomsindo wasolwandle. Isivinini sinyuka kanye nezinga lokushisa Kanye nencindezi. Okusho ukuthi umsindo ushesha kakhulu emanzini angaphezulu afudumele ezindaweni ezishonayo bese uhamba ngesivinini esiphansi ezindaweni eziphakathi nolwandle.

Translated by Zamantimande Kunene