Eavesdropping on NATURE

NEW TECHNOLOGY HAS MADE IT POSSIBLE FOR SCIENTISTS TO LISTEN TO ALL THE SOUNDS THAT NATURE OFFERS, WRITES REESE HALTER.

Currawongs calling, creeks trickling, corals clacking, whales serenading, wind surfing along treetops – nature is rich with soundscapes that make us feel good. Scientists are now actively collecting and interpreting those sounds that also tell captivating natural history stories.

Technological advances, such as the ability to store large amounts of data, are now making acoustic research easier and more accessible. For example, land-based investigators can now use non-invasive, cost-effective, continuous audio recorders to collect data, which is stored on high-capacity memory cards. Those cards are read by computer programs that sift through the data and identify individual sounds, such as weather events, species and their communications, helping to assess biodiversity and track environmental changes. Essentially, the louder the concert, the healthier the natural world.

Every vibrational note has a meaning – most are yet undeciphered communications while others are vital phenological cues. For example, the onset of the wet season's reverberating thunder, awakens dormant frogs and it signals the mating season with its ample ephemeral pools for tadpole development.

With the world all ears, the first continental-scale eavesdropping project began in 2019. The Australian Acoustic Observatory is a multi-university partnership led by the Queensland University of Technology (QUT) in collaboration with Birdlife Australia. The project has over 300 listening stations installed at 86 sites around Australia, including wetlands, deserts, grasslands, shrublands, and temperate, subtropical and tropical rainforests.

According to an investigation published in July 2023 in *Austral Ecology*, listening to nature at all of the 86 sites could "potentially harbour vocal threatened species, and thus could potentially aid in the conservation of up to 171 species".

At one of the wetland sites along the Murray River, Lin Schwarzkopf of James Cook University, is focusing on reed beds, seeking a series of low frequency blips and whooping calls of the endangered Australasian bittern, or bunyip birds. It's a challenging task because there's a huge dawn chorus burst after a quiet night. Since there are only 1300 of these large secretive birds left on the continent, this information is essential to help create robust wetlands with water levels sufficient for bunyips to fledge and flourish.

Soundscape ecology

The QUT Ecoacoustics Research Group has developed software that analyses soundscapes to fingerprint the environment, an acoustic DNA. Spectrograms, a visual map of different sounds, are being entered into a digital library, which will be freely available for researchers, citizen scientists and the general public.

"We are expecting these soundscapes will be used and re-used in many creative ways," says one of the principal investigators, QUT's Paul Roe.

Wiretapping oceans is a more costly proposition but can provide useful insights. For instance, healthy coral reef communities chirp, grunt and snap, the most communicative of marine ecosystems.

Researchers at the University of Adelaide are applying their acoustic knowledge to create a highway of sound for oyster larvae to resuscitate Western Australian and Queensland heat-shocked, bottom-trawled sea floors. To lure packs of immature oysters to dive onto the seabeds, marine ecologist Dominic McAfee, is using the attractive sound of snapping shrimp, a marker of lively oyster beds.

It's working like a charm. Oyster larvae have begun recolonising and bringing oyster bars back from the dead. Oyster beds create reefs, imperative habitat for hundreds of marine species, such as fish and crabs, that use crevices to hide from predators.

Across the Pacific, my colleagues at the University of California, Berkeley, are using sonobuoys to detect the codas, or the clicking language of sperm whales. AI is decrypting sperm whale Morse Code-like transmissions, which are staggeringly similar to human vowels and diphthongs, when one vowel sound changes into another e.g., pie. Unique coda vowels, 'a' and 'i', are actively exchanged in complex conversations of the world's largest-brained animals. Alas, the incessant cacophony of the fossil fuel industry, 4.5 million fishery propellers, military exercises and subsea mining are obstructing the whale's ability to hear, communicate and forage for food.

Eavesdropping

Beneath northwest Greenland's Bowdoin Glacier, Hokkaido University geoscientist Evgeny Podolskiy is stethoscoping the deep ocean. A seismometer, the size of a bus, is anchored to the sea floor where the glacier meets rock. It's recording tremors at the base of the glacier, friction levels, water pressure and the rate of movement; the noises of manmade global heating in real-time.

From a creaky icy abyss to buzzing honeybees, the hum of the hive is a healthful indicator. A queen bee lays about 2000 eggs daily. Her colony vibrates with activity. Seventy years ago, British beekeeper Edward Farrington Woods first noted the different hive sounds indicating: swarming, nectar, pollen, water and tree resins harvesting, or when invaders intrude. Today, a growing number of beekeepers depend upon wee digital hive microphones to eavesdrop, receive alerts and quickly rescue colonies when strife or thieves strike.

Animals, too, eavesdrop on other species and share new information: social learning! Nature's concertos are all meaningful. That's why in 1977, Voyager 1 and 2 were launched carrying a variety of salubrious earthly sounds and images on two Golden Records – a digital time capsule with a peaceful and happy message for future spacefarers. OG

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