Ecologists battle deafening insects while assessing biodiversity via acoustic surveys in sub-tropical Japan

November 16 2020

Animals like this bird, spotted in Okinawa, can be identified by their characteristic calls. Credit: Trinity College Dublin

A collaborative team of ecologists, led by those from Trinity, has been

using recordings of animal noises to assess biodiversity in sub-tropical Japan.

The team assessed how effective these acoustic surveys were for pinpointing Okinawa's wild and wonderful fauna in different sonic conditions—and discovered that the incessant choruses of the local cicadas disguise the true diversity of the region.

The work, just published in the journal Ecological Indicators, underlines the great potential that acoustic surveys have for characterising the biodiversity of habitats while also highlighting some major potential pitfalls.

Many scientists believe we are now living through the sixth mass extinction in Earth's history, which has largely been driven by human actions and our exploitation of the environment, but there is general consensus that it is not too late to halt declines in biodiversity if we act now. However, we need to know which species (and how many) are present in any given habitat before designing conservation programmes.

Acoustic surveys

Acoustic surveys—simple audio recordings of the animal sounds in a habitat—offer the potential to record large volumes of data. They can do this relatively cheaply and easily, given that recording devices can be left unattended once set up.

This technique also means researchers need not spend lengthy periods in unhospitable or dangerous habitats, species are more likely to be accounted for as they won't be scared away by human presence, and the data can be very sensitive as each species makes unique sounds.

However, the new research shows that consideration must be given to

ambient conditions, with the time of day, season, and proximity to urban areas and human activity all likely to interfere to varying extents with the recordings, such that some species cannot be heard.

Interestingly, on the sub-tropical island of Okinawa off the coast of Japan, it is the incessant noise of the cicada insects that have the biggest impact in masking the hoots, clicks and chirps of hundreds of native animals.

Lead author of the study, Samuel Ross, is a Ph.D. Candidate in Trinity's School of Natural Sciences. He said:

"In total, we used about 230 hours of sound recordings from a wide range of habitats across Okinawa to gain insights into the biodiversity of the region, to characterise how it changes near urban areas, and most importantly, to assess how effective the various audio recording and assessment techniques are in extracting reliable information."

"As you'd expect the weather is important, with heavy winds and rain affecting the information we can get from recordings, and human noise pollution is also problematic. However, it's cicadas that really impact the quality of such assessments during Okinawa's summer months."

Cicadas, like the one pictured here, dominate the animal airwaves in the summers of Okinawa. Credit: Trinity College Dublin

To date, most bio-acoustic surveys have been conducted in the Tropics but the field is developing quickly and these monitoring techniques will prove useful in Ireland, which provides homes to a number of iconic, endangered animals.

Many of Ireland's creatures have a cultural significance and the ability to soothe and inspire, while other research is opening our eyes to the power of the acoustic environment in influencing mental health.

Samuel Ross added:

"These methods are still relatively new and the prospect that we can monitor biodiversity using only audio recording equipment is really exciting. I see this as the next frontier in assessing the state of the world's ecosystems."

The study was led by Samuel Ross and Ian Donohue, Associate Professor in Zoology, at Trinity, working closely with colleagues at the Okinawa Institute of Science and Technology (OIST), including Professor Evan Economo and Dr. Nick Friedman, who run an island-wide project to monitor Okinawa's ecosystems using sound.

Dr. Friedman added:

"The forests in Okinawa are really noisy when the cicadas are out. The sound they make is so loud, it's at least annoying if not painful. It conceals a lot of different species that are in the forest because they don't really bother calling to each other while the cicadas are going. Knowing this helps us strategise how to use soundscape recordings to measure biodiversity or track the health of an ecosystem."

More information: Samuel R.P-J. Ross et al. Utility of acoustic indices for ecological monitoring in complex sonic environments, *Ecological Indicators* (2020). DOI: 10.1016/j.ecolind.2020.107114

Provided by Trinity College Dublin