Staff from the National Parks Board on a survey of nocturnal wildlife at the Bukit Timah Nature Reserve. Red light is less disturbing to nocturnal animals than white light as their eyes are less sensitive to red light which has a longer wavelength. Singapore's efforts to use technology in wildlife conservation, coupled with easy access to the country's forested areas, have made the Republic the ideal venue for the semi-finals of the XPrize Rainforest international competition in 2023. ST PHOTOS: MARK CHEONG

Wildlife spotted with the help of night vision equipment include the elusive pangolin (above) and the Malayan colugo (left). PHOTOS: NATIONAL PARKS BOARD

How NParks is using tech to help S'pore's biodiversity

It taps tools from night vision equipment to app that may identify birds via their calls

In more than 30 years of exploring Singapore's forests, Dr Adrian Loo, group director of the National Parks Board's (NParks) wildlife management division, has come across the critically endangered Sunda pangolin just twice.

The nocturnal mammal, which is native to Singapore, is reclusive.

If estimates about its population were to be made solely based on human observation, Singapore's pangolin count would be much lower.

"But NParks is now harnessing more tools that will help provide a better understanding of Singapore's wildlife," said Dr Loo.

In 2019, for instance, NParks started using drones to explore tree canopies – allowing researchers to capture records of flowering specimens or other plants, such as rare mistletoe, that grow only at the very tops of trees.

It also recently embarked on a research project that involves collecting environmental samples – such as from seawater, air or soil – and analysing them for traces of genetic material from animal species, and to detect dangerous pathogens.

NParks is also working with researchers from the National University of Singapore's (NUS) Tropical Marine Science Institute (TMSI) to develop a monitoring system that can identify birds solely based on their calls.

"Nowadays, we are losing ecosystems and species faster than we can fully understand them," he said.

Singapore's efforts to use technology in wildlife conservation, coupled with easy access to the country's forested areas, have made the Republic the ideal venue for the semi-finals of an international competition in 2023.

XPrize Rainforest was launched in 2019 with a US$10 million (S$14 million) prize sponsored by Alana Foundation, an independent philanthropic organisation founded in the United States.

The competition aims to identify technologies that can be used for real-time monitoring of rainforests and their treasure troves of biodiversity.

XPrize's executive vice-president for biodiversity and conservation Peter Houlihan told The Straits Times that in the past, wildlife survey methods had been time- and labour-intensive, and that it could take decades to document or survey species through human observation.

"This urgency has driven that change and demand for more rapid tools to aid and assist humans, not to replace them, in making more effective management decisions with improved data."

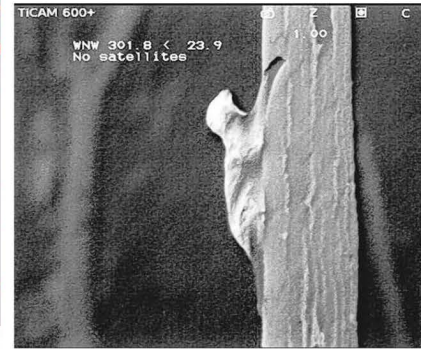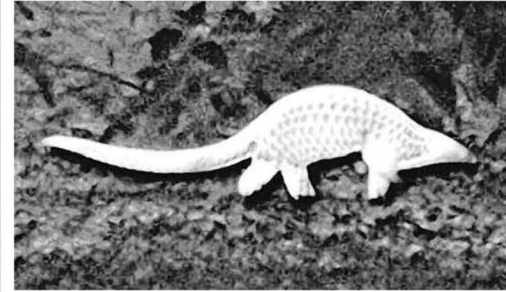**UNSEEN BEHAVIOUR**

It was past 9pm on a Thursday evening in early September, and photojournalist Mark Cheong and I were crouched on a trail in the Bukit Timah Nature Reserve, staring into the thicket with NParks staff on a survey of wild animals that prefer the night.

We kept our red torches trained on the lesser mousedeer – red light does not disturb wildlife as much as white light – and watched it graze from some distance away.

That sighting was made possible with the help of night vision equipment.

NParks started using these tools for nocturnal surveys in 2018, said Ms Li Tianjiao, a senior manager at the NParks' National Biodiversity Centre.

Dr Loo and I had earlier gone ahead of the rest of the team, hoping to catch sight of a pangolin. About 10 minutes later, he stopped in his tracks, and shone his torch into the vegetation.

He had noticed an animal in the vicinity. We saw the red light of our torches reflected in the animal's eyes but could not identify the creature.

That is, until Ms Li, who was holding on to a set of binoculars and the night vision equipment, caught up with us.

"Such equipment detects heat signatures from the animal, and allows us to see them even if they are masked by vegetation," said Ms Li. "Since it works in low-light conditions, the equipment also allows us to observe natural animal behaviour in a non-intrusive manner."

She recalled a particularly important sighting in 2019, when the night vision camera enabled her to catch sight of a slow loris feeding on the nectar of a flower from a durian tree. It was the first time this creature was seen feeding on a durian tree flower.

The slow loris is known to consume mainly fruit and small insects.

Information like this can be useful for conservation efforts, as it could help NParks determine what trees to plant in the known habitats of these animals, said Dr Loo.

"Nectar doesn't show up in animal poop – only seeds or remnants of insects do," he added. "So if not for the sighting, we would not know that durian trees could be a food source for the slow loris."

AURAL DETECTION

Strolling through a forest, it is easier to hear the birds than see them.

This is the challenge that researchers from NParks and TMSI are trying to overcome in developing a monitoring system that can identify birds through their calls – similar to how mobile app Shazam can identify songs based on a snippet of music play ed over the radio.

NParks started discussions with TMSI on the project in 2019, said Mr Low Bing Wen, a senior manager at NParks' National Biodiversity Centre.

The pilot phase of the study was done at the Singapore Botanic Gardens, and to date, the software is able to reliably identify the calls of 38 birds including the banded woodpecker and greater racket-tailed drongo.

Dr Mandar Chitre, head of TMSI's Acoustic Research Laboratory, said the software is "trained" to associate certain bird calls with specific species with audio recordings from multiple sources, including those on Xenocanto, a database where bird watchers from all over the world upload snippets of birdsong.

For the pilot phase, the researchers used only recordings from Singapore to train the software. They then applied it to the thousands of hours of audio recordings collected from two sites at the Singapore Botanic Gardens.

"We are still refining the algorithm to identify more bird species and with higher accuracy," said Dr Chitre.

Said NParks' Mr Low: "The greater racket-tailed drongo, for example, tends to mimic other birds, so the team needs to manually go through the recordings to ensure that it identifies the right birds."

The lack of recordings for certain species, especially those often poached for the songbird trade, is another challenge.

The calls of the straw-headed bulbul and the hill my nah, popular in the caged bird trade, are redacted from Xenocanto, to prevent poachers from using these calls to lure wild birds into traps.

But when ready for deployment around 2025, this tool could help NParks better detect the presence of rare birds that, like the pangolin, would prefer to stay out of sight of humans.

Said Mr Low: "It is an unobtrusive way of monitoring our bird life even in remote areas with minimal disturbance."

NUS conservation scientist Koh Lian Pin, who is one of the judges of XPrize Rainforest, said conservation technologies help scientists collect data from remote locations in the field 24/7, without the need for human intervention.

He added: "This allows scientists to focus efforts on analysing the data, monitoring the condition of nature and wildlife, and developing solutions to help in their conservation."

Audrey Tan

Microphones installed at the Singapore Botanic Gardens to record bird calls. Researchers from NParks and NUS Tropical Institute are developing a monitoring system that can identify birds through their calls.