

Underwater forensics reveal new shark and ray species in S'pore waters

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Singapore's murky waters hide an abundance of marine life – including a group of creatures that are globally threatened from overfishing.

A new study by National University of Singapore (NUS) scientists has found that there could be more species of sharks and rays here than expected – including two species never before recorded in local waters: the Bengal whip ray and cowtail stingray.

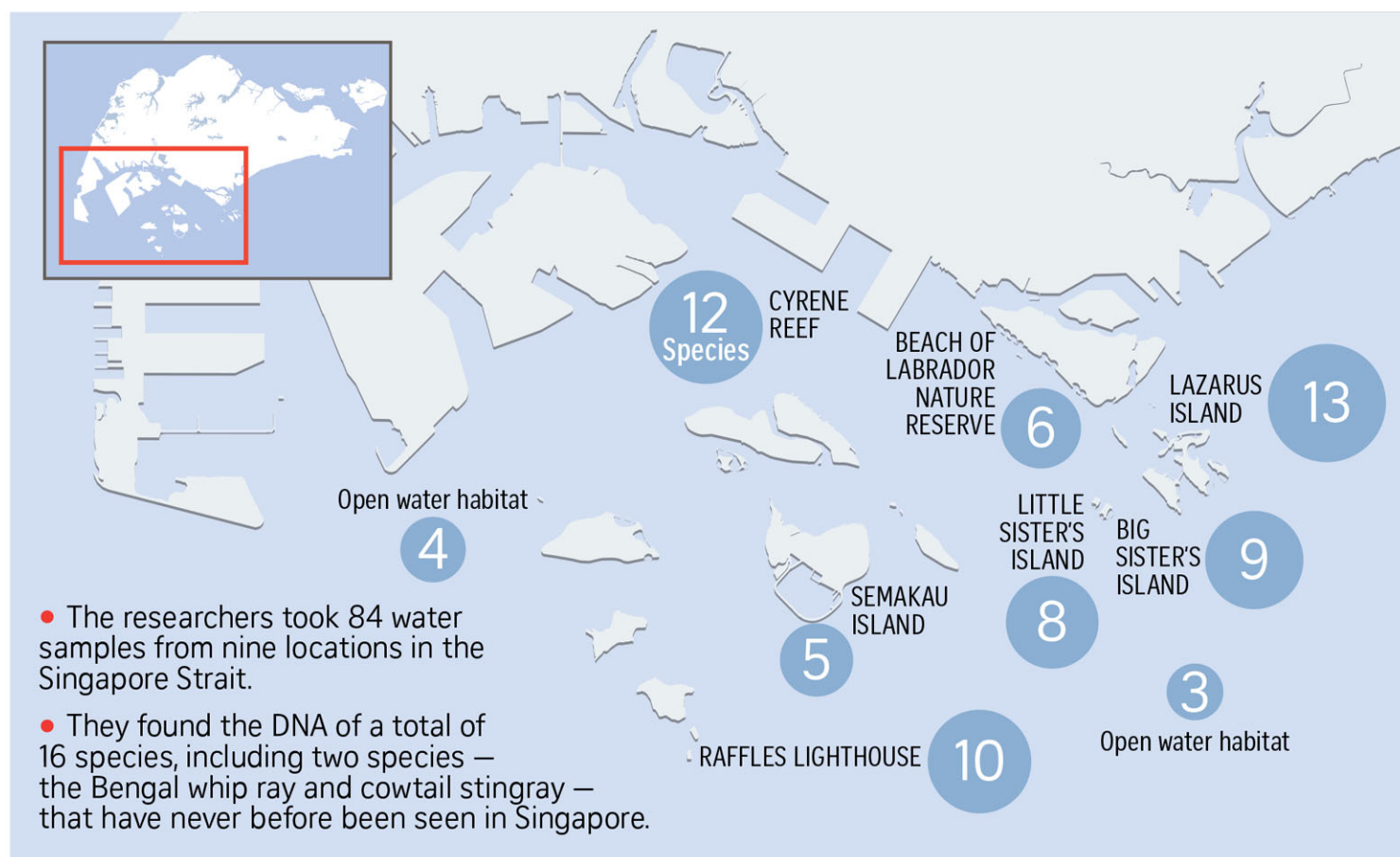
Sharks and rays belong to a group of marine creatures known as elasmobranchs.

Museum records going back to the 1960s at the Lee Kong Chian Natural History Museum at NUS show that 37 elasmobranch species have been found in local waters.

But of the 37, only seven have been sighted in Singapore waters by anglers and scuba divers in the

Looking for the unseen

Researchers from the National University of Singapore have found that 16 species of sharks and rays could be swimming in Singapore waters, even though only seven species have been seen in the past two decades. Environmental forensics paved the way for their discovery, with the scientists finding traces of the creatures' DNA in water samples.



Source: Ip et al (2021) STRAITS TIMES GRAPHICS

past two decades. They include the black-tipped reef shark and blue-spotted ray.

Previous studies have suggested that elasmobranchs are sparse in highly urbanised and turbid envi-

ronments. These creatures are also globally threatened because of overfishing or bycatch.

But the new study led by Mr Aden Ip, a doctoral student at the Reef Ecology Lab in NUS, suggests

that up to 16 species – including the two new ones – could have swum in Singapore waters recently.

This shows that the nation's waters still have suitable habitats for

some of the large predators that are often indicators of coral reef health. These predators prey on marine animals that live on a reef, and their presence signifies that the ecosystem is healthy enough to support them.

The scientists did not discover the presence of these animals in the usual way creatures are found, such as through chance encounters or camera trap footage.

Instead, environmental forensics paved the way for their discovery.

Just like how a strand of hair left by a murderer at a crime scene can help police pinpoint the culprit, these creatures also leave behind traces of their presence as they swim by.

The researchers took 84 water samples from nine locations in the Singapore Strait south of the mainland. Coral reef habitats, which elasmobranchs are usually associated with, are found mainly in this area.

They then ran tests on the water samples to see if genetic fragments of the various species could be picked up.

"A seawater sample is like a big pot of soup with many different food items – akin to the many strands of eDNA (environmental DNA) from different species," said Mr Ip.

"We use DNA primers – which are designed to target specific regions of the DNA of interest – like a spoon or ladle to specifically scoop up the contents that we want to consume."

Asked if the eDNA could have been transported from elsewhere into Singapore waters by the currents, Mr Ip said this was possible but unlikely, because eDNA de-

grades rapidly in the tropics.

"We infer that eDNA would not last more than a day here. This works in our favour, as we can be more certain that the signals we detect are recent... and it would be unlikely to have been transported by the currents from far away," he noted.

The study also found that three sites south of Singapore – Cyrene Reef, Lazarus Island and Raffles Lighthouse – hosted a larger array of shark and ray species.

Said Mr Ip: "Hopefully, future work in this field can better shed light on why these three sites are more diverse – could it be because there are site-specific conditions that are more favourable for them to reside in or to function as nurseries?"

Dr Karenne Tun, director of the coastal and marine branch at the National Parks Board's (NParks) National Biodiversity Centre, said the latest study yielded insightful information on the possible presence of shark and ray species within Singapore's coastal waters, including two potential new records.

"This illustrates the potential of using eDNA for species detection," she noted.

She said NParks will be embarking on a three-year research project to better understand marine fish diversity, distribution and connectivity in the coastal waters.

It will tap multiple survey, sampling and modelling techniques, including eDNA, and involve researchers from NUS, including members of the current study team.

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