

Clawing back territory for the natives

NUS team trying to find out extent of invasion by red-claw crayfish, a non-native

Carolyn Khew

A popular aquarium pet, the red-claw crayfish has made its way into the wild.

It is among a growing number of alien species taking over reservoirs in Singapore. But unlike most invasive fish which cannot leave the water, it has crawled up into freshwater streams, home to our precious native crabs found nowhere else in the world.

Since the crayfish can outgrow and out-eat the local crustaceans, it could well wipe them out.

"Native species likely play important ecological roles in our local natural ecosystems that non-native species may not necessarily be able to replace," said Assistant Professor Darren Yeo, a freshwater ecology expert at the National University of Singapore's department of biological sciences.

"They are part of our natural national heritage, so they deserve our appreciation and effort, as custodians of the land, to protect them."

Prof Yeo, 43, and his graduate student, Mr Zeng Yiwen, 28, have therefore stepped up to study how extensive the crayfish are, and the potential damage they could cause.

Mr Zeng is pitting crab against crayfish in the laboratory, to see which emerges the victor.

He places the crayfish, which are more than double the size of lowland crabs – the most common of the country's freshwater crabs – and the lowland crab in tanks containing only one burrow.

"The crab usually retreats into the burrow slightly, before both the crayfish and the crab start jostling for ownership of the burrow," said Mr Zeng.

Preliminary data shows the larger crayfish is more likely to secure the shelter, but its status as an invasive species, one that harms native populations, is still not fully known.

Said Prof Yeo: "A competition experiment under controlled laboratory conditions is one thing; the real test is in the field where other factors might affect the outcome differently."

"The invasive effects (of the crayfish) could be seen in other ways, such as modifying or disturbing the habitat by burrowing or foraging in the bottom sediment."

This is why Mr Zeng is also trying to find out where the crayfish have spread to, and to understand the environmental conditions of the streams where they can be found.

Also known by the scientific name *Cherax quadricarinatus*, the crayfish, which can grow up to



Assistant Professor Darren Yeo (left) and graduate student Zeng Yiwen with the red-claw crayfish in their lab at NUS. PHOTO: LIM YAOHUI FOR THE STRAITS TIMES

25cm from head to tail, are native to freshwater habitats in northern Australia and Papua New Guinea.

The first record of this species from a reservoir in Singapore dates back to 2001, and it was most likely to have been released illegally by people who bought them from the aquarium trade.

"Now it seems that they're spreading into the streams, with reproducing populations in several streams," said Mr Zeng.

Prof Yeo, who is supervising Mr Zeng's research, added: "A lot of non-natives are in the reservoirs while a lot of the natives are in the forest streams and freshwater swamps. They tend not to mix and we tend to assume that it's the environmental differences that keep them apart."

IMPORTANT ECOLOGICAL ROLES

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DR DARREN YEO, NUS assistant professor

"But now, one of the things that we are learning is that it may not be just environmental differences. Other factors such as interactions between native and non-native species also need to be considered."

Unlike fish which cannot swim out of the reservoirs into streams, these crayfish are able to make their way there.

This despite challenging conditions such as higher acidity levels and lower calcium concentrations in streams, which could hinder their ability to create strong shells, grow and reproduce.

So far, the crayfish have been spotted in four streams in the Central Catchment Nature Reserve which, at 3,000ha, is the largest of its kind in Singapore, encompassing the Nee Soon Swamp Forest.

These streams contain native crabs such as the lowland freshwater crab and the Johnson's Freshwater Crab, listed as a vulnerable species by the International Union for Conservation of Nature.

Like the swamp forest crab, the Johnson's Freshwater Crab is found in Singapore and nowhere else.

The National Parks Board lists 88 freshwater fish species in local reservoirs alone.

Among them, 52 are alien species, a marked increase from the 31 recorded in 2007, out of 68 species in total. These include large predators such as the Peacock Bass and Giant Snakehead or Toman.

However, the fish list is by no means complete.

NParks, national water agency PUB and the Agri-Food and Veteri-

nary Authority of Singapore said in a joint reply to *The Straits Times*: "This list is not exhaustive as it includes only records reported from reservoirs and does not account for alien species in other freshwater water bodies, such as forest streams and urban canals."

"With increasing ornamental fish trade and cases of public release of unwanted fish, it is expected that there will be more of such non-native species out there."

Prof Yeo has a word of warning: "The more alien species there are in the reservoirs, the higher the chances that eventually one or more might be able to penetrate natural forest streams and potentially cause impacts."

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