

## Tiny treasures: Five other types of freshwater crabs native to Singapore



**Johnson's freshwater crab (*Irmengardia johnsoni*)**  
This endangered crab can be found only in the Bukit Timah and Central Catchment nature reserves, and nowhere else in the world. Growing up to 2cm, it feeds on leaf litter and small invertebrates.



**Swamp forest crab (*Parathelphusa reticulata*)**  
This endangered crab usually buries itself in leaf litter during the day, and emerges at night to forage for food. It can grow up to 4cm and can be found only in Singapore, in places such as the Nee Soon Swamp Forest.



**Little Land Crab (*Geosesarma nemesis*)**  
Found in Singapore and Johor, Malaysia, this crab has been observed to be semi-terrestrial, digging burrows or taking shelter under rocks on the stream bank. It can be found at Bukit Timah Hill, in areas

which get plenty of shade and with heavy leaf cover. It was named after the mythical Greek goddess of divine anger and retribution, Nemesis, for the adult crab's bright red colours and fierce disposition.



**Lowland freshwater crab (*Parathelphusa maculata*)**  
This nocturnal crab is commonly found in Singapore, in streams across the island and in nature reserves. It can also be found in Malaysia and the southern part of Sumatra, Indonesia. It can grow up to 6cm.



**Peracca's land crab (*Geosesarma peraccae*)**  
This crab, which can grow up to 1.15cm, is considered vulnerable to extinction here. It is semi-terrestrial. It has reportedly been found around pitcher plants and, on occasion, inside the pitcher itself.

PHOTOS: NPARKS SOURCE: A GUIDE TO THE FRESHWATER FAUNA OF NEE SOON SWAMP FOREST, NPARKS

# Crab hatching in captivity a breakthrough for NParks

## It spells hope for the endangered Singapore freshwater crab

**Audrey Tan**  
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At first glance, the tiny, colourless baby crabs kept in tanks at the National Parks Board's (NParks) Botanic Gardens headquarters are hardly impressive.

But looks are deceiving: These crablets, each barely the length of a fingernail, will play a crucial role in helping to ensure the survival of their kind.

The brood of more than 40 crablets represents a glimmer of hope in the future of the critically endangered Singapore freshwater crab (*Johora singaporensis*).

They hatched in January, the first time this has occurred in captivity, under the watchful eye of Dr Daniel Ng, manager of NParks' National Biodiversity Centre and one of the scientists involved in the conservation of the Singapore freshwater crab.

NParks now plans to closely study these elusive crustaceans before releasing them into the wild, in a bid to boost populations. Currently, there are only an estimated few hundred mature individuals out there, according to NParks.

As scavengers, crabs play important roles in the ecosystem, helping to clean up the environment by feeding on waste material.

The Singapore freshwater crab, found only in certain areas in the Republic and nowhere else in the world, was discovered in 1986 by crab expert Peter Ng, now the head of the Lee Kong Chian Natural History Museum at National University of Singapore (NUS).

In 2014, a freshwater crab working group led by NParks and comprising experts from institutions such as NUS and the Wildlife Reserves Singapore (WRS) was formed to look into a long-term population enhancement, monitoring and breeding programme for the Singapore freshwater crab. NParks' latest breakthrough is part of this effort.

NUS Assistant Professor Darren

Yeo, who studies crabs, said the brooding and hatching of juvenile crabs in an individual female *Johora singaporensis* was a "very positive development". Captive breeding of these freshwater crabs is tricky because the biology of these animals is relatively poorly understood.

He added: "An important next step would be to try to ascertain and understand the environmental conditions that led to the successful brooding... to hopefully replicate or apply them to facilitate breeding of these crabs in captivity."

Indeed, little else is known about the crab, except that it is a fussy creature, starting with where it lives. The crab can be found only in the hilly streams of Bukit Timah Nature Reserve, Bukit Batok and Bukit Gombak, nutrient-rich rivulets formed from ground water and rain.

"These crabs seem to thrive in oxygen-rich waters, and hilly streams are usually fast-flowing, which helps to aerate the water," said NParks' Dr Ng.

Conditions also have to be just right before they decide to have their babies. The latest batch of baby crabs was the first successful hatching after some three years of work by the researchers.

In earlier attempts, the mother crab simply would not carry the eggs to term, Dr Ng said.

Freshwater crabs such as *Johora singaporensis* carry their eggs under their abdomen until the crablets – baby crabs that look similar to adults – emerge, unlike marine crabs which release eggs as tiny larvae that drift through the currents.

Scientists were left scratching their heads as to why the eggs would not hatch. But nature knows best, they decided, and tried to ensure that the tanks the crabs were kept in were kept as similar to their natural environment as possible.

One change in the successful brooding attempt, for example, was to ensure that water in the tanks came from the streams in which the crabs were found. Previously, the scientists had mixed nutrients with treated tap water. The "au naturel" strategy seemed to work, with the crablets hatching after about a month.

## Differences between marine and freshwater crabs

Crabs living in freshwater and marine environments have different life cycles, which helps them survive in the different environments. Their differences in clutch size lie in various factors, such as their habitats, biology, and reproductive strategies, said Assistant Professor Darren Yeo from the National University of Singapore.

### MARINE CRABS



**EGGS**  
Marine crabs produce very large numbers of small eggs, which hatch into tiny larvae that drift in the sea as plankton.



**LARVAL STAGES**  
The crab goes through several larval stages before eventually metamorphosing into juvenile crabs. They are prone to predation during these stages.



**CRABLET**  
At this stage, the baby crab resembles the adult.



**ADULT**



*Leelumnus radium*

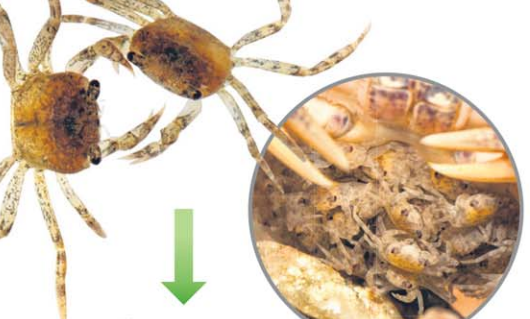
### FRESHWATER CRAB (JOHORA SINGAPORENSIS)



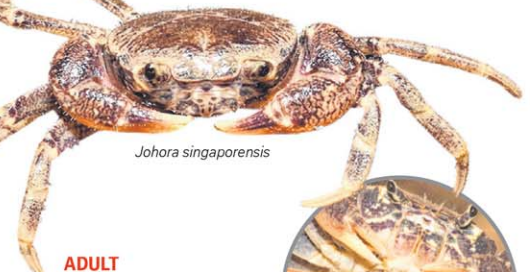
**EGGS**  
Each clutch from a freshwater crab usually consists of a few hundred eggs, which are larger than eggs from a marine crab. For the family of freshwater crabs that *Johora singaporensis* belongs to, the eggs are generally 2-3mm in diameter and eggs are generally carried for one to two months before hatching.



**CRABLETS**  
Females of freshwater species such as *Johora singaporensis* carry their eggs under the abdomen until they hatch directly into crablets that look like miniature versions of the adults. They remain in inland fresh waters since they do not get swept down to sea as drifting larvae



*Johora singaporensis*



**ADULT**  
Keeping its young close is one way to ensure that more crablets grow to reach maturity and are not eaten by predators.

Sources: NATIONAL PARKS BOARD, ASSISTANT PROFESSOR DARREN YEO  
PHOTOS: LIM YAOHUI, NATIONAL PARKS BOARD, JOSE CHRISTOPHER ESCANO MENDOZA STRAITS TIMES GRAPHICS

A spokesman for WRS said: "Water and substrate from the stream, although not critical for growth and survival of the crabs, seem to be essential for the successful hatching of crablets. The working group will continue to learn more about the various requirements for this species to ensure a safe and healthy population for them in Singapore." Being able to observe the baby crabs up close also gave the scien-

tists the opportunity to collect valuable information. For example, they found that the crabs grew very slowly. When they hatched in January, the crablets measured about 3mm. Now, two months later, they are about 4mm. Adults grow to 2-3cm in size and live for about three years.

On NParks' latest breakthrough, NUS' Prof Ng, told *The Straits Times*: "I am heartened to know

NParks has managed to get these animals to cooperate. I congratulate them and the people who have made this happen – it's good news.

"I discovered this critter over 30 years ago by chance – my job is long since done – it's now up to the next generation of biologists to make sure it is around for another million years!"

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