

S'pore study makes headway in finding methods to farm sea snails



A one-year-old Arabian cowrie (left) and a Tiger cowrie. Both cowrie species are endangered in Singapore due to habitat loss and over-collection. PHOTOS: NUS

Clean seawater, suitable diets and identifying behavioural cues are key for growing cowrie larvae

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The larva development of two cowrie species native to Singapore waters has been successfully recorded by marine biologists from the Tropical Marine Science Institute (TMSI) at the National University of Singapore in a study published in April.

Offspring of the cowries from one of the two sea snail species – the Arabian cowrie (*Mauritia arabica*) – even survived into the second life stage of the animal and remain alive to this day.

Ms Teresa Tay, the TMSI research assistant on this study, said: “Previous reproduction studies have managed to collect egg masses from the wild and rear their larvae, but none of them reported success in getting the larvae to develop and settle into juveniles.”

Both the Tiger and Arabian cowrie species are endangered in Singapore because of habitat loss and over-collection, and this study seeks to develop farming methods so that the production of cowries can be scaled up for research, conservation and the aquarium trade.

Cowries, especially the rare species, are popular among shell collectors and aquarium hobbyists because of their polished ornate shells and striking appearance when their mantle is fully extended.

Cowries are often harvested from the wild and are not protected under any international agreement like the Convention on International Trade in Endangered Species of Wild Fauna and Flora (Cites), which makes them vulnerable to overexploitation, said Dr Neo Mei Lin, senior research fellow at TMSI and principal investigator of the study.

Cites regulates the international trade in over 36,000 species of plants and animals.

“Previous reproductive studies on cowries have also not reported success in breeding juvenile cowries, which meant that the trade in cowries would continue to rely on wild harvesting that may become unsustainable in the near future,” she added.

The life phases of cowries can be divided into three stages – the larva stage, where the hatched larvae are in their swimming forms as their shell volume increases, before settling on the seabed as juveniles. Their shell continues to thicken even as they mature into adulthood and reach sexual maturity.

Dr Neo said: “Our study found that growing cowrie larvae require clean seawater and suitable microalgae diets to thrive. In addition, being able to identify the behavioural cues of larvae was critical for the metamorphosis from larvae



Arabian cowrie in brooding



Tiger cowrie in brooding

IN A COWRIE SHELL

Scientists in Singapore have successfully bred the Tiger and Arabian cowries in captivity. The two species are native to the waters of the Republic. The effort was reported recently by the Tropical Marine Science Institute at the National University of Singapore. **Lynda Hong** traces the life stages and development of the Arabian cowries.

1 MATERNAL PROTECTION

In general, cowrie eggs are fertilised internally before they are laid. Arabian cowries emerge 10 days after the eggs are laid while it takes 17 days for the Tiger cowries to emerge.

During brooding, the mother feeds on a minimal diet by scraping the surrounding algae while at the same time covering the egg mass completely with her foot to protect it from predators and prevent algae from growing on it.

2 INFANT COWRIES

The Arabian cowrie larvae emerge from the egg capsules after seven to 10 days and are able to swim and feed.

3 LARVAL LIFE

The study recorded the Arabian cowrie larvae's growth before they settled as young juveniles 70 days after hatching.

HATCH DAY



The translucent larvae are tiny at only 162 to 205 micrometers – or as thick as a strand of hair – when they first emerge from the egg capsules, and each has eyes, a foot and a swimming organ.

4 DAYS



The shell grows rapidly, doubling its length in days. The shell becomes more opaque and patterns emerge as it turns reddish-brown. Over half of the larvae do not survive past the fifth and sixth days. They succumb to parasite attacks and algae growth.

14 DAYS



The swimming organ divides into four arms that are twice as long as its shell.

26 DAYS



A layer of tissue develops between the shell and the body. Calcium carbonate is secreted to form the hard shell. Its foot is well-developed.

33 DAYS



The swimming organs are longer and two prominent tentacles can be seen around the head region.

60 DAYS



The cowrie starts to crawl, with its shell elongating at the 65th day after hatching.

70 DAYS (Metamorphosis to juvenile)



The larvae face higher mortality. Researchers deduce this is likely due to inadequate nutrition to support the high-energy demands required for growth. Only four juveniles of the hundreds that hatched survive to this stage.

100 DAYS (Bulla stage)



The juveniles have settled into the bulla stage as their thicker shells darken and elongate. By March 2023, two surviving Arabian cowries have lived past the one-year mark and grown to 4cm long.

4 ADULTHOOD

The Tiger cowrie is one of the largest cowrie species and measures up to 15cm long, while the medium-sized Arabian cowrie can reach up to 8cm in length.



TIGER COWRIE

15cm



ARABIAN COWRIE

8cm

Source: TROPICAL MARINE SCIENCE INSTITUTE
PHOTOS: NATIONAL UNIVERSITY OF SINGAPORE, ISTOCKPHOTO
STRAITS TIMES GRAPHICS

to juvenile, and settlement.”

Researchers had to wait eight months before their study subjects of 14 Tiger cowries (*Cypraea tigris*) and seven Arabian cowries produced egg masses.

The study began in July 2021 and

took over a year to complete. The strongest larva of the tiger cowrie species survived for 37 days.

More than 80 per cent of the tiger larvae survived the first four days after hatching.

But the surviving larvae kept dy-

ing from day five to day 14, and the study concluded that a few batches of the Tiger larvae were ravaged by severe algal growth on their shells, which can impede shell growth. At the same time, they were also attacked by parasites.

Dr Neo concluded that the results can be incorporated into how to culture the larvae “to increase the success of cowrie reproduction in captivity”.

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