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Scientists here grow coral babies in lab to help revive dying reefs

If successful, the effort can also supply corals for research and aquarium trade

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To breathe life into a dying reef, scientists usually start by raising an army of clones.

They retrieve coral fragments, which are clones of the animals they were taken from, grow them in a laboratory until they reach a suitable size, and then transplant them onto a degraded reef, where they spread and grow.

But reefs here could one day be replenished not with coral clones, but their offspring.

Just days after the full moon last month, hard corals in Singapore – both in the wild and the laboratory – had their annual baby-making session, releasing pink bundles of sperm and eggs en masse, under the watchful eye of scientists here. It was an underwater spectacle, and one critical in the procreation of these reef-makers.

After the bundles are released, the eggs and sperm combine in the waters to produce larvae, which can eventually settle on suitable substrate and develop into new coral colonies. Hard corals are builders of a reef, which also hosts a variety of other marine life, from fish to crustaceans to sea worms.

Dr Lionel Ng, from the National University of Singapore's (NUS) Tropical Marine Science Institute, is part of a team involved in an effort which started last year to collect egg-sperm bundles from spawning corals in the laboratory.

Its aim was to propagate the corals sexually so stock could be readily available for research, in addition to the usual asexual means of producing more of them via fragmentation, he said. "Corals derived from sexual methods have the advantage of being more genetically diverse, which increases the population's gene pool and enhances its chances of survival in times of stress."

But many coral babies usually do not make it to adulthood. In the wild, larvae could be eaten by predators before they get the chance to anchor to a suitable substrate, like a rock. In the laboratory, too, mortality rates can be high, said Dr Ng.

"The embryos derived from this spawning work will now need to settle on substrates and develop into coral recruits," he said. "The next step would be to find ways to enhance the survival and growth of the new recruits in the lab, such as supplementing the coral babies with different diets."

If the team's efforts to nurture the coral babies to adulthood are successful, it means that coral restoration works in the future could be enhanced with more genetically diverse corals, Dr Ng said.

Such lab-grown corals could also be used for research or to support the aquarium trade, reducing the need to harvest wild coral, he added.

To meet these aims, the team is exploring ways to increase coral yield by both asexual and sexual methods, Dr Ng said.

He explained: "Corals that are derived asexually will not contribute to increasing the population's genetic diversity, but the nurtured fragments would already be of a certain size and may be more resistant to environment stresses. They are therefore more likely to survive and grow better."

Both methods of propagation are needed to maximise success in reef conservation and restoration efforts, he said.

Last year, the research team had also observed coral spawning in the lab, but that effort had mainly been to work out the logistics involved in the collection and fertilisation of the egg-sperm bundles.

Dr Ng said: "This year, we were able to refine our workflow, prepare the logistics necessary for specific tasks, as well as sharpen our eyes on what to look out for in the field prior to collection and in the lab, before and during spawning."

The researchers collected 11 large fragments and colonies, each about 15cm to 20cm wide, from two *Acropora* species this year. Dr Ng said these sizes were chosen as corals need to reach a certain dimension to be considered sexually mature and viable for releasing egg-sperm bundles.

Only the five *Acropora millepora* colonies were observed spawning in the lab. The six *Acropora valida* did not. Dr Ng said they could have spawned before or after the nights that they were being actively monitored.

In the wild, about 20 species of coral were estimated to have spawned during the monitoring period, which was a few days after the full moon last month, said Dr Karenne Tun, a director at the National Parks Board's (NParks) National Biodiversity Centre.

She added that the spawning was not as robust as the one in 2021, with fewer species and number of individuals per species participating in the process.

But Dr Tun said it is possible this figure is an underestimate, as the peak spawning night could have taken place before the planned monitoring period, based on pre-spawning observational data by researchers from NUS.

The yearly mass spawning dates are estimated based on data from past events over the last two decades. Before the event, scientists can check if the corals are gravid – or carrying eggs – by breaking off a small fragment from the reef to check for the presence of egg-sperm bundles. Usually, a pink colouration indicates the bundles are mature before the predicted spawning event.

Dr Tun said that while the predictions have largely been accurate in identifying the general spawning period, actual dates and intensity of the spawning have varied, and this is part of the normal variability in natural processes.

In March, the Great Barrier Reef in Australia was hit by a mass coral bleaching event caused by a rise in sea surface temperatures.

Hard corals can get stressed by higher-than-usual water temperatures, which cause them to expel the algae that live inside them and provide them with food.

But Singapore's reefs have kept their cool. Said Dr Tun: "Sea surface temperatures have been normal in Singapore this year so far and no coral bleaching has been observed. NParks will continue to monitor sea surface temperature trends in the coming months, and continue with our monitoring, restoration and species recovery efforts."

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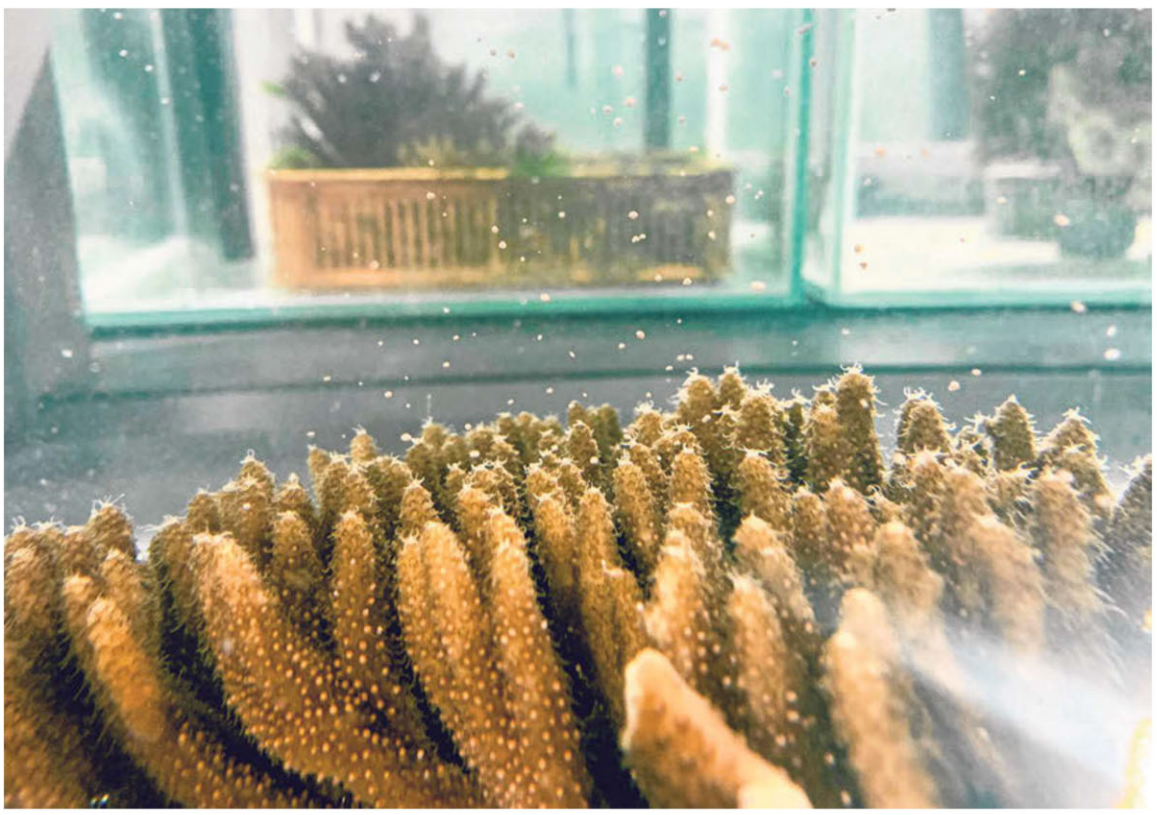

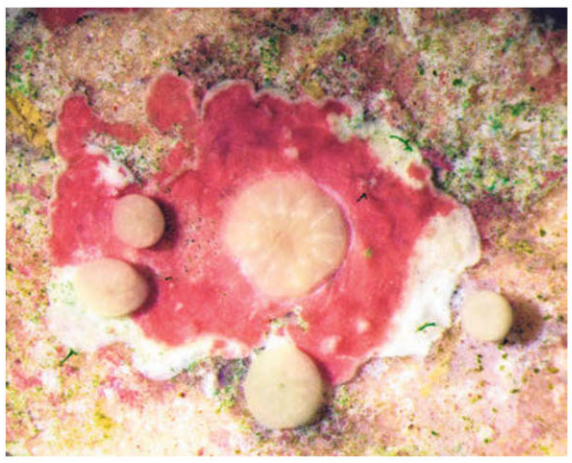

IN THE LAB
Hard corals spawning (above) at the laboratory on St John's Island last month. They release bundles of eggs and sperm (far left), which combine in the water to produce larvae that settle on suitable substrate (left).
PHOTOS: TROPICAL MARINE SCIENCE INSTITUTE

IN NATURE
Hard coral spawning off Raffles Lighthouse between April 20 and 22. In the wild, about 20 species of coral were estimated to have spawned during the monitoring period, which was a few days after the full moon last month.
PHOTO: NATIONAL PARKS BOARD

GREATER CHANCES OF SURVIVAL

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DR LIONEL NG, from the National University of Singapore's Tropical Marine Science Institute, who is part of a team involved in an effort to collect egg-sperm bundles from spawning corals in the laboratory.