Source: *The Straits Times,* pB12
Date: 14 July 2017

(From far left) Dr Toh Tai Chong, Professor Chou Loke Ming and Mr Lionel Ng, who were involved in the NUS study. It examined the marine life on reef enhancement units at six sites around Singapore's southern islands in 2014 – more than a decade after they were first placed underwater. The results showed that coral cover went up across all six sites. ST PHOTO: KEVIN LIM

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Artificial structures help reefs bloom again

NUS study shows that fibreglass units placed underwater can nurture life in the long term

Audrey Tan

A structure which looks like an overturned flower pot could help degraded coral reefs bloom again.

Called a reef enhancement unit, the fibreglass structure, which is covered in holes, provides nooks and crannies for free-floating coral larvae – each barely the size of a grain of salt – to settle down and grow.

A new study by marine biologists from the National University of Singapore (NUS) has shown that these artificial reefs are capable of nurturing life in the long term.

Published in science journal Aquatic Conservation: Marine And Freshwater Ecosystems, the study examined the marine life on the units at six sites around Singapore's southern islands in 2014 – more than a decade after they were first placed underwater. The results showed that coral cover – the average percentage of hard coral on each unit – went up across all six sites.

Scientists also recorded some 119 species of marine life which had made the units their home, including corals, lobsters and cuttlefish.

Examinations of coral tissue showed the corals growing on the units were sexually mature, and had likely taken part in mass coral spawning – a yearly event where corals release eggs and sperm bundles in a spectacular fashion to reproduce.

NUS marine biologist Lionel Ng, 33, who did the study, said the results were significant, as it showed that reef enhancement units could be used to help restore Singapore's reefs even though the water is heavily sedimented. Sedimentation is normally the bane of coral growth.

Corals reproduce by releasing their eggs and sperm, where they join to form free-floating larvae, which float in the water column until they find a suitable home, usually a hard surface to latch on to. With fewer suitable places on degraded reefs ravaged by climate change or development works, the larvae become vulnerable to being eaten by predators such as fish, or smothered by sediment stirred up by currents.

While there are many studies showing the short-term benefits of installing artificial reef structures, few have been done to look at how the structures fare over time.

"But data from long-term monitoring is important in gauging the success of an artificial reef, especially as corals are slow-growing animals," explained lecturer Toh Tai Chong, 32, who also worked on the study.

Added Mr Ng: "Other than measuring coral cover, it is also important to determine if the corals eventually attain sexual maturity and participate in mass spawning events for a better understanding on the effectiveness of reef restoration."

The study also showed that while coral cover improved at all sites, some had better coral growth. The highest coral cover was recorded off Pulau Satumu – the Republic's southernmost island. Coral cover on the units there went up from 3.2 per cent in 2004, to 36.7 per cent in 2014. In comparison, units at the site at Lazarus Island recorded the lowest coral cover, from 0.6 per cent in 2004, to 1.2 per cent in 2014.

Coral expert Chou Loke Ming, an adjunct research professor at NUS who supervised the latest study, said this could be due to the way coral larvae disperse in Singapore waters. The dispersal patterns, he said, are influenced by various factors, such as currents and hydrodynamics.

"The study shows that reef enhancement units are a good starting point to encourage coral larvae to settle down in an area that was initially not conducive for them. Once they begin to grow and colonise the area, natural recruitment could help to expand the reef cover," noted Professor Chou, 70.

The study was funded by the Wildlife Reserves Singapore (WRS) Conservation Fund. Dr Sonja Luz, director for conservation, research and veterinary services at WRS, said the study had practical implications for conservation of local coral reefs.

"Its findings emphasised the importance of conducting long-term monitoring and assessment of coral reef restoration efforts... The results also demonstrated the feasibility of deploying fibreglass artificial reef units on Singapore's reefs to boost the recruitment and establishment of reef fauna, thereby enhancing their conservation," she said.

audreyt@sph.com.sg

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