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Nursing a dying seafloor back to life

Planting coral fragments in shallow waters has helped degraded reefs recover. Now scientists from the National University of Singapore's Tropical Marine Science Institute (TMSI) also want to bring reef life back to Singapore's deeper waters.

TMSI science communication lead **Audrey Tan** and Straits Times infographic artist **Lim Yong** dive into the details of the first-of-its-kind effort to transplant corals in areas where less light reaches.

KEY FACTS AND FIGURES

Up to 60% **of Singapore's reefs have been lost since the 1960s due to development.**

The total reef area in Singapore (sq km)

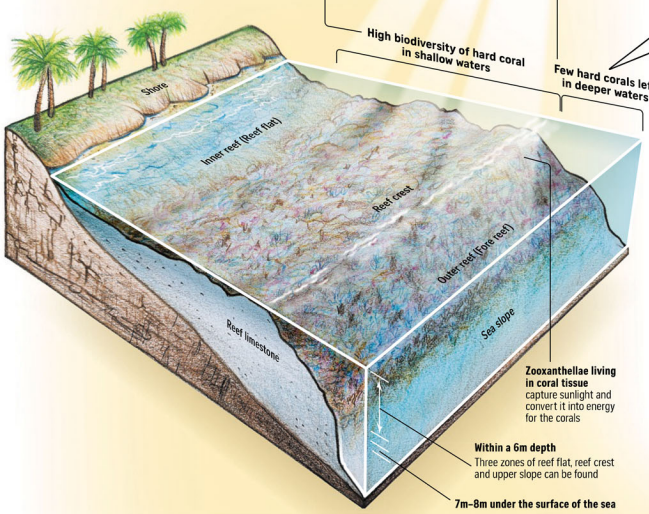
The situation today

Today, most hard corals in Singapore are found less than 6m under the surface, as light can penetrate only this far.

- Coral reef area is estimated to be up to half of what it once was in the 1980s.
- Coral restoration efforts have helped increase live coral cover in degraded reef areas and on structures such as seawalls, about 2m to 4m under the surface.

Hard corals in deeper waters, between 7m and 10m under the sea surface, have dwindled due to sediment blocking out light.

- Live coral cover at this depth is now just a fraction of what it once was in the 1980s.
- TMSI scientists are testing to see if coral transplanted into deeper waters can help improve the live coral cover there.



THE PROJECT

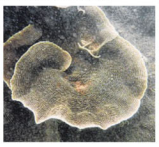
- The first deep-water coral planting session under the research project, led by TMSI senior research fellow Jani Tanzil, will take place **off Kusu Island and at Bendera Bay on St John's Island** later in February.
- The project is supported by the World Wide Fund for Nature (Singapore) and done in collaboration with the National Parks Board (NParks).
- It follows an earlier phase of study which involved, among other things, the growing of coral fragments in nurseries at the St John's Island National Marine Laboratory (right).

Coral species that will be planted in the initial phase of the project

Three species of hard corals will be planted onto aluminium frames about 7m to 8m under the sea surface.

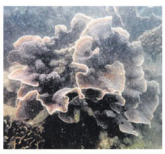
- Researchers will monitor the growth of the planted corals over time. As corals take a long time to grow, with some species growing just 1cm every year, it could take years for results to show.
- Fast-growing species were chosen as these can grow up to 5cm a year under the right conditions.
- If successful, Singapore's degraded seafloors could be given a new lease of life.

Pachyseris speciosa



Mycedium elephantotus

- These two species are found in deeper waters in Singapore today.
- This shows that they are shade-tolerant species that can do well even under low-light conditions.

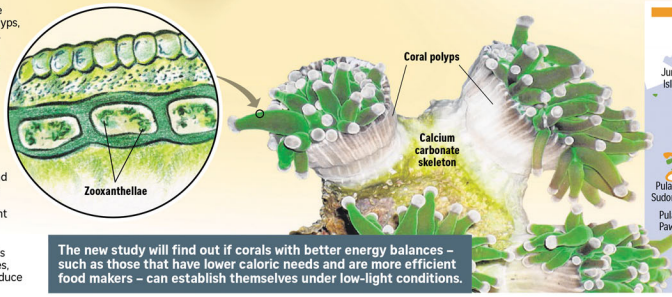


Echinopora lamellosa

- This species is usually found in shallower waters.
- Scientists have been growing them in lower-light conditions in the nurseries, hoping that they will thrive under similar conditions when transplanted.

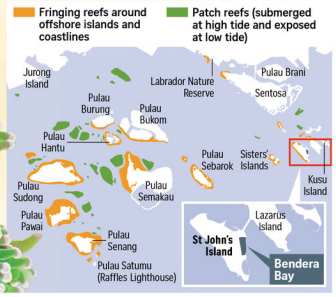
WHY CORALS NEED LIGHT TO GROW

- Hard corals rely on tiny algae living inside their tissue, or polyps, to provide them with nutrition.
- These algae are known as **zooxanthellae,** and they need sunshine to photosynthesise.
- The food the zooxanthellae makes through photosynthesis is shared with the coral. In return, the coral provides the zooxanthellae with shelter.
- Earlier research funded by NParks and led by Dr Tanzil and her team found that different corals have different energy needs – similar to how different people have different caloric requirements.
- The efficiency at which corals make their own food also varies, with some species able to produce more nutrition with less light.



The new study will find out if corals with better energy balances – such as those that have lower caloric needs and are more efficient food makers – can establish themselves under low-light conditions.

CORAL REEFS IN SINGAPORE



A HISTORY OF CORAL RELOCATION EFFORTS IN SINGAPORE

Earlier efforts in Singapore paved the way for developments in this field

Early 1990s

- Volunteers are mobilised by the Nature Society (Singapore) as part of a salvage effort to move corals from areas earmarked for land reclamation.
- Transplant survival rates are low, at about 11 per cent.

2001–2004

- Artificial reef structures, called Reef Enhancement Units (below), are first used to improve degraded areas.
- More than 100 are deployed around the Southern Islands in a project initiated by the Singapore Tourism Board and NUS.

2014–2017

- The Maritime and Port Authority of Singapore funds a project led by TMSI to collect fragments from corals affected by the development of Tuas Port.
- Fragments are taken to coral nurseries and some are eventually transplanted onto the seawalls of Lazarus and Kusu islands. Survival rates are high, at more than 80 per cent, due to improvements in transplant methods and site selection.

2014

- The Sisters' Islands Marine Park opens (bottom right).

2015

- More than 700 coral colonies are relocated from a lagoon in Singapore's offshore landfill to the Sisters' Islands Marine Park (below).

2016

- NParks' Plant-a-Coral, Seed-a-Reef programme is launched. This is a platform that allows organisations and individuals to support reef enhancement efforts at the Sisters' Islands Marine Park. Under the programme, small coral fragments are transplanted from a coral nursery to Reef Enhancement Units.

2018

Industrial developer JTC and NParks announce the creation of an artificial reef habitat at the Sisters' Islands Marine Park.

2020

- TMSI senior research fellows, Dr Neo Mei Lin and Dr Tanzil, as well as TMSI's research affiliate, Associate Professor Huang Danwei, embark on a research project that includes looking at how coral fragments can be grown more efficiently in aquarium nurseries.
- This will enable a more sustainable stream of locally grown coral fragments for research and restoration.

February 2023

Singapore's first deep-water coral planting session takes place.