Great Barrier Reef hopes on ice in Aussie Outback

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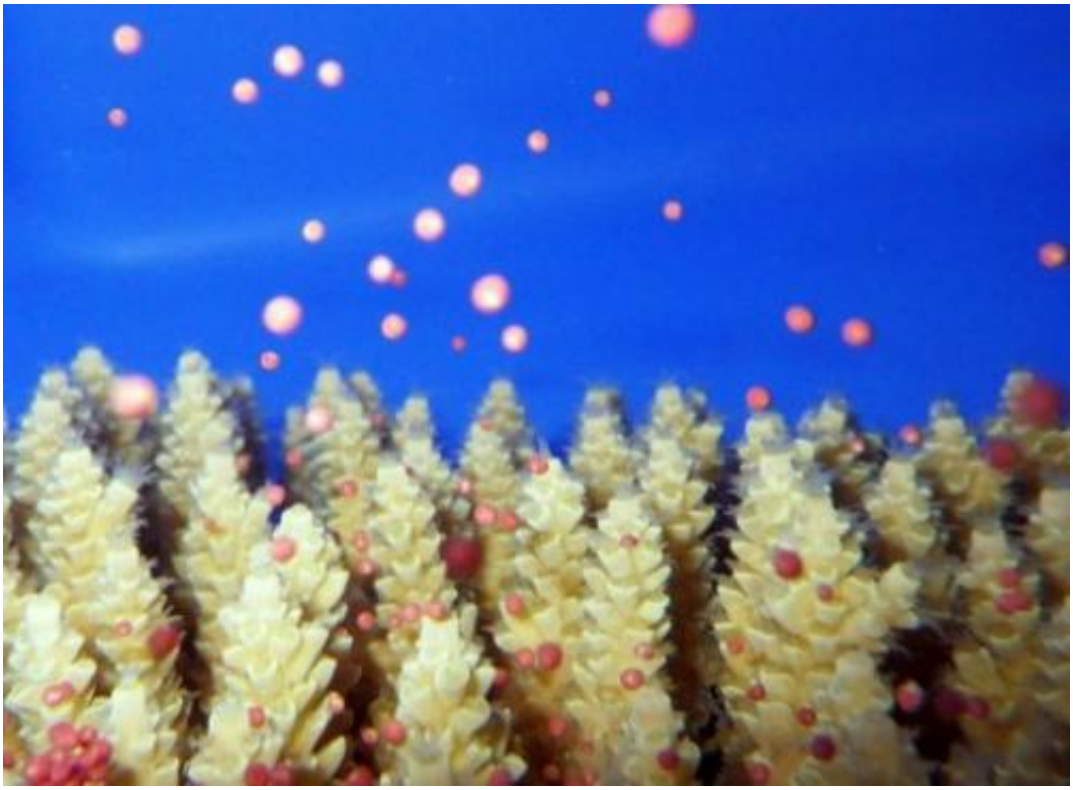

Acropora tenuis coral let off sperm and egg packages as part of an annual 3-day spawning event at the Australian Institute of Marine Science laboratory in Townsville.

The arid plains fringing Australia's desert centre are more suited to camels than blooms of coral but here, hundreds of miles from the coast, a piece of the Great Barrier Reef has been put on ice.

Suspended in a liquid nitrogen chamber of minus-196 degrees Celsius (-320 Fahrenheit), the 70 billion sperm and 22 billion coral embryos are part of an ambitious Australian-first project to preserve and perhaps one day regenerate the world-famous reef.

"We know the Great Barrier Reef is in deep, deep trouble because of a number of different things -- global threats including climate change and acidification of waters as well as the warming of waters," said the project's director, Rebecca Spindler.

"We will never have as much genetic diversity again as we do right now on the reef, this is our last opportunity to save as much as we possibly can."

Spindler's team is working with Hawaii-based Mary Hagedorn from the Smithsonian Institute to collect and freeze samples from the World Heritage-listed reef, a sprawling and vivid natural wonder visible from space.

In order to maximise the amount of reproductive cells -- gametes -- collected the team cut away sections of the reef and took them back to land-based tanks to spawn, an event that only occurs for three days a year.

Experts from the Australian Institute of Marine Science, a major partner in the research, then tagged the reef sections and returned them to Orpheus Island, literally gluing them back to their original sites.

They plan to build up a catalogue of coral species as insurance against increasing bleaching linked to ocean warming and acidification and threats including chemical run-off, dredging and damage from cyclones and floods.

Reproductive biologists Nana Satake and Tamara Keeley with the 'Frozen Zoo' and 'Reef Recovery Project' chambers, full of animal and coral sperm and egg samples and embryos at Dubbo's Western Plains Zoo on January 12, 2012. The Project aims to store genetic samples from the Great Barrier Reef in the hope of one day restoring coral affected by climate change and other human impacts.

Eventually Spindler hopes to grow in-vitro reefs which can be used to reseed wild populations -- something she is "confident" will be possible in a few years time.

Experts at Dubbo's Taronga Western Plains Zoo, Australia's top wildlife reproductive lab, keep the frozen reef ticking over with regular liquid nitrogen top-ups while they explore optimal conditions for reviving and mating the coral.

Some 400 kilometres (248 miles) inland from the coast and far closer to desert than ocean, Dubbo seems an unlikely location for marine research.

Giraffes, rhinos and elephants roam the 300-hectare (740-acre) zoo and the lab, which backs onto a mating enclosure for the endangered Tasmanian devil, is a hive of hormonal experiments using animal droppings and urine.

Spermologist Nana Satake did her doctorate in pig reproduction and usually works with African and native animals, but she sees the Reef Recovery Project as an exciting challenge.

"The Great Barrier Reef is really a bit of an enigma -- there's very little (research been) done on coral reef production from (its) coral species," Satake said, describing it as the "rainforest of the ocean".

"Coral is one of the most unique species of the world, really of any organism, because they actually have all types of reproduction -- they can reproduce asexually and sexually."

Once more had been learned from this initial round of samples, taken from two foundational types of coral, Satake said work could be done on more endangered species "which the Great Barrier Reef has quite a few of".

Spindler said Australia's corals had so far dodged the kind of damage from climate change, disease and human impacts seen in the world's other reefs but described the next few years as critical, with some species already feared lost.

"We've had a little bit (of damage), but really just a taste, and I think the next five years are going to be incredibly important in terms of

maintaining the health of the reef and capturing as much of that genetic diversity as we possibly can," she said.

Any loss of the reef -- worth some Aus$6 billion in tourism annually -- would be devastating, and not only to the one-third of all marine species that occupy a reef at some point in their lives, she added.

"We also know they provide, just physically, structures (that) keep wave action down and stop areas from being impacted by tidal waves," said Spindler.

"Ecologically, economically and socially we can't lose these reefs, we just can't."