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Environmental protection

This is the heartbeat of efforts to save a global icon. Is it too late?

A research outpost on the Great Barrier Reef has long been at the centre of the fight to preserve the world heritage area.

By Angus Dalton and Janie Barrett

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Coral biologists Emily Howells and David Abrego aren't ready to give up on the reef. JANIE BARRETT



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Pat Hutchings is an authority on sea worms, not guns, but she was pretty sure this guy was packing heat. Next to him stood the prime minister.

The odd trio met in 1980 near Lizard Island Research Station, the remote Australian Museum facility Dr Hutchings helped set up seven years earlier on the northern Great Barrier Reef.

Hutchings was preparing to help retrieve a storm-battered weather buoy with the station's then-director Barry Goldman when they fielded a call from the ultra-exclusive resort on the other side of the island. Malcolm Fraser was here, and he'd like to go for a dive.



Lizard Island houses a reef research centre. JANIE BARRETT

Once the buoy was dealt with, the scientists gave Fraser a crash-course in scuba and took him down into a “blue hole” within the reef. Fraser’s possibly armed ex-navy bodyguard watched the prime minister “like a hawk”.

“It had a high live coral cover, lots of big fish, and it was colourful. I think it made an impression on him,” Hutchings, a senior fellow with the museum, recalls now. Fraser thanked them for the ride with an on-board gin and tonic. He had taken down a Nikon Nikonos film camera and the resulting photos were shown around cabinet, Hutchings says.

“A few days later, he was back down in Townsville, and the decision was made that Australia would nominate the Great Barrier Reef Marine Park as a World Heritage Area.”

This station has been central to the science and protection of Australia’s greatest natural asset for half a century. The extraordinary synchronous spawning of the coral polyps that make up the

Japan-sized Great Barrier Reef was partly discovered in Lizard Island's waters. Station research has generated at least 2700 papers on reef science. Bill Gates and David Attenborough are among the elites who toured the station with veteran directors Dr Anne Hoggett and Dr Lyle Vail.



Visiting scientists Lauren Hardiman, George Roff, Marine Gouezo with one of the new directors of the Lizard Island Research Station, Emily Howells. JANIE BARRETT

Now the scientific outpost finds itself central to the painful question of whether the reef, as we know it, can be saved. Lizard Island was ground zero for major bleaching events in 2016 and 2024 caused predominantly by the burning of coal, oil and gas. The mass bleaching is a relatively new phenomenon that's turned chronic in what UN Secretary-General Antonio Guterres describes as the era of global boiling.

And this storied station is entering a new era of its own. Vail and Hoggett have made the “gut-wrenching” call to step back from the facility they ran for 34 years. Coral biologists Dr Emily Howells and Dr David Abrego landed last month to take the reins, their seven-year-old daughter in tow. And in a yellow research boat, shadowed by a tiger shark, they're jetting us out to one of their favourite spots.

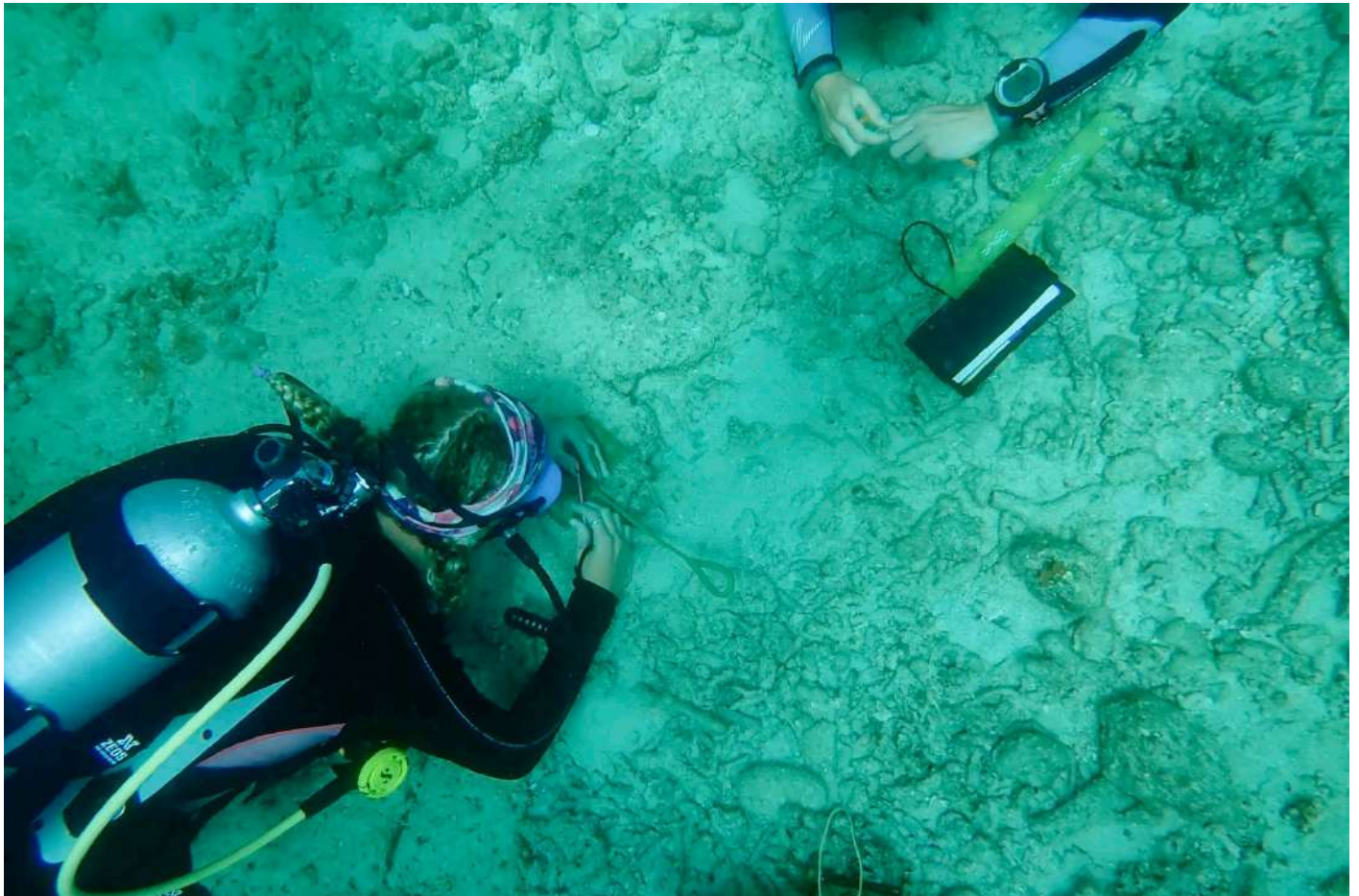
Ruin and recovery

In a crevice on the island's North Point Reef, three giant, dark-bodied groupers are parked like mustangs, serviced by cleaner wrasse picking off gill parasites. Stacks of round table corals radiate

in shades of mauve, flamingo, forest green and oiled bloodwood.

Here rise cobalt-blue antlers, bunches of petrified lavender, flaxen leather folds and brainy curls attended by fish named for parrots, damsels and angels. Teeming clouds of fish fry fill caverns like a golden gas with 10,000 eyes.

Swim back towards the shore by the length of a lap pool and it's a different story. Cold upwellings and deeper currents have soothed the fever of the outer reef, but corals closer to land are stressed, dead or dying. When the water's too warm – as it is now at 29.7 degrees at Lizard Island – the algae within the coral polyps spew highly reactive oxygen molecules that act like tiny bombs to healthy proteins. That triggers the polyps to vomit the algae; the corals' source of photosynthetic energy and colour. If conditions don't cool quickly, the corals die. Brown algae seeds within hours of death and a day or two later the coral skeletons are smothered in scuzz.



Scientists catch and release cleaner wrasse fish on Lizard Island as part of a research project. JANIE BARRETT

“This used to be my favourite part of the reef,” Abrego says, finning over ruined strips of table corals the colour of rot. “You can see the devastation.”

Lizard Island was smashed by major bleaching last year that killed 97 per cent of coral on this reef. But this area also exemplifies the reef's regenerative vigour. After this part of the reef was blasted by severe heat in 2016, ex-director Hoggett says she thought it was finished. “But only six years later, parts had recovered; it just staggered everybody how quickly it could happen.”

That recovery, however, is driven by fast-growing branching corals. The diversity of corals has plunged, which is a hammer-blow for reef creatures adapted to fit every nook.

(Evolution is so finely tuned here there are species of pearlfish designed to live exclusively within the anus of sea cucumbers.) Where the uninitiated see a forest, scientists coming here since the '70s see a monoculture plantation.

"I try to be a glass half-full kind of person," Howells says back on the beach, tearing off a soaking reef bootie. "But it's hard when there's bleaching year on year on year." She spotted corals turning white even on the healthier patch of the reef that were fine two weeks ago. Bleaching has struck every year since 2020. "This is the critical month to see which way it'll go this year."

Howells and Abrego come armed with research suited for the times. Howells, who was born in Melbourne, hunts heat-tolerant coral genes. Abrego, originally from Mexico, is an expert in the critical symbiosis of coral and algae severed by bleaching. They met as students at James Cook University and spent five years together studying reefs off the southern Persian Gulf. Corals there withstand 36-degree waters during summer. The pair [discovered](#) this extreme heat tolerance can be passed onto corals from cooler waters in a single generation via selective breeding. It's an example of "assisted evolution"; methods which could, theoretically, accelerate coral adaption to keep pace with rapid warming. But only to a point.



Scientists Jaimee Moynihan and Marine Gouezo with the collected tiles they placed on the Great Barrier Reef three months ago, so they can study coral regeneration. JANIE BARRETT

The Persian corals have hit the upper threshold of possible tolerance. It's a "crystal ball" for what the Great Barrier Reef faces over the next century.

"They've gone downhill rapidly since we were there," Howells says. "It's an alarm: we are out of time."



Lizard Island Research Station director Emily Howells snorkels above a healthy section of the Great Barrier Reef metres away from a stressed section off Lizard Island. JANIE BARRETT

But those already eulogising the reef annoy these scientists. They've come to the island determined to restore the reef for the next generation. "We truly believe we can make that difference in terms of facilitating really good science," Abrego says.

The running joke is that Abrego and Howells will be here until 2059, should they match Vail and Hoggett's 34-year run. The former directors earned an international reputation for facilitating field research with their "lean and mean" operation style. They also built up the Lizard Island Reef Foundation, which provides the majority of funding for the station, to pay for on-the-ground research.

"It's really its own little community," says Vail. "We deal with our own rubbish and pump our own water and make our own electricity. It's like being the mayor of a small town."

The station can host 37 scientists. One Swiss fish behaviour researcher, Leti Pessina, has stayed here for more than a year, pelting after cleaner wrasse so she can tattoo them with pink dots for

identification. "It's like this teeny tiny world where everyone's super driven and motivated," she says. "You can spend as much time with the fish and the corals and the water as you want."

The station is geared to get researchers off the plane, into a wetsuit and onto the reef within minutes, with the help of a communal four-wheel drive buggy and a fleet of well-maintained boats. No shoes. No seatbelts. Go get your data.

Coral warfare on the millimetre scale

Down the lens of a microscope, there's a single red-brown speck of freshly seeded coral polyps affixed to a limestone tile. And it's war.

Thousands of these tiles were screwed onto the reef by a dual research squad from Southern Cross University and the CSIRO last October and seeded with fertilised coral larvae in December. Now they've been retrieved for analysis in the beachside lab. Here you watch the start of a coral's skirmish for survival.

Pink crustose coralline algae, which emits chemical cues coral larvae home in on for landing, makes up part of the tiles' patchwork. Sponges, sea squirts, worms and marine plants fight for a foothold. Minute white hermit crabs scuttle across the battlefield and a spotted violet nudibranch, tinier than an eyelash, ripples like a flag bearer. New corals deploy sweeper tentacles tipped with nematocyst harpoon stingers to kill competitors. But nutrient pollution tips the scales of their early life struggle in favour of algae.



Viewed through a microscope, a tile placed by scientists on the Great Barrier Reef three months ago, shows small coral regeneration. JANIE BARRETT

“If you have clear oceanic waters with no pollution, corals will naturally overgrow over the top, and chemically destroy anything in its path, basically,” says marine ecologist Dr George Roff.

These tiny nubs of coral have the potential to grow for centuries. Some scientists think coral colonies could go on [cloning themselves](#) for millennia. Given the right conditions, Roff says, “they’re potentially immortal”.

This team were grief-stricken by the March 2024 bleaching. “It was so warm that the tissue was just falling off the skeleton. It was like a soup of dying coral,” Roff says.

First the scientists digested their despair. Then they got to work. They leapt on the chance to gather the spawn of the few corals that survived, with mesh so fine it can catch plankton. They reared the larvae in floating ocean pools to boost fertilisation rates. Now, with these tiles, they’re tracking whether the survivors’ progeny are seeding on the reef as well as corals unaffected by bleaching. “So far, they look pretty good, which is real surprising. It’s a good news story, after a year of just chaotic catastrophe,” Roff says.



A team of scientists collected tiles they placed on the Great Barrier Reef three months ago so they can study coral regeneration. JANIE BARRETT

“Potentially, the heat tolerance of these survivors will be passed on to the next generation of corals, and the next time we see hot water bleaching event, there’ll be more survivors, and they’ll grow.”

Researchers hope to scale up distribution techniques so fertilised spawn could be seeded across kilometres of reef flanks damaged by bleaching, cyclones and crown-of-thorns starfish. But they know such ideas are moot long-term if the climate keeps warming.

“The only solution is for the whole world to get together and stop polluting the earth with carbon emissions,” says Hoggett. “There’s nothing that can be done locally that’s going to save it. It’s a worldwide problem that needs a worldwide answer.”

Many experts have lambasted local solutions as a pipe-dream, fearful it gives the wrong impression that scientists can restore corals on an ecologically meaningful scale while [800,000-year highs of greenhouse gases](#) clog the atmosphere. Some reef experts argued \$1 billion in government funding in 2022 towards controlling crown-of-thorns starfish, improving water quality and boosting new technologies should have just gone to [phasing out fossil fuels](#).



A crown-of-thorns starfish. JANIE BARRETT

Is any work not directed towards arresting climate change just a Band-Aid over a bullet hole?

“Certainly, we must do something about the bigger issue. But what do you do, just let things die?” Abrego says. “I couldn’t do that.”

Even if emissions halted tomorrow, decades of warming are [already baked in](#). If some reefs can be helped in the theoretical interim between now and a heat-stable future, precious genetic diversity and DNA may be conserved to help corals claw back from oblivion. So goes the idea.

Says Howells: "I'd rather have a Band-Aid on a bullet hole than nothing at all."

Out in the water it can be difficult to know where to pin your hope. Corals glow highlighter-yellow and neon purple, delighting naive snorkelers and sickening scientists; coral fluorescence is a pre-bleaching stress response.

On their favourite spot, Vicki's Reef, Abrego points to new corals: spiky clusters jutting from rocks that look like fractal musk sticks and a fist-sized soft coral blooming on reef rubble like a marigold.

"Some of those baby corals are a year old, which means they would have survived last year's bleaching," he says. "They're still here. They're still growing. That's hopeful."

Angus Dalton and Janie Barrett travelled to Lizard Island courtesy of the Australian Museum.

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