

Figure 1 © Amelia Rose/University of Oxford

The Story of the Lost Brain Coral

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As a child, I was entranced by the fantastical fictional tales of Conan Doyle's *The Lost World*, and later, by its real-life (and admittedly slightly less exotic but nonetheless enthralling) counterpart, the telling of Marjorie Courtney-Latimer's rediscovery of the long thought extinct coelacanth, amongst a rotting waste pile of landed fish on the docks of East London, South Africa in 1938.

In my frequent young flights of fancy, I often imagined myself some great explorer of old, pushing through dense undergrowth into a jungle clearing, only to see the merest flash of something disappearing into the thicket—the striped tail of a thylacine, the flecked breast of a Mauritius kestrel, or possibly even the comedically portly rump of a dodo.

And then the furious chase that followed (possibly more of a clumsy lunge in the case of the dodo). The capture! And the return home a hero, to share my discovery with the

world and conserve the species for posterity and eventual reintroduction back into its jungle home.

Despite it being the 1980s, those dreams always seemed to be illuminated by Victorian flash photography, possibly in tribute to the tall tales of that time, who knows. Of course, that was some decades ago and whilst my dreams have become slightly jaded by the realisation of the hundreds of extinctions that have happened since my childhood, I have always held on to that same bookwormish fantasy. And then, several decades later, I finally took that flight of fancy...

Early in April 2019 and having only just joined the Bertarelli Program in Marine Science (BPMS) several months before, I found myself on their annual expedition to the British Indian Ocean Territory (BIOT), aboard the Patrol Vessel Grampian Frontier, forcing its way through an unseasonable Indian Ocean surge and chatting on deck with

Professor Charles Sheppard, a wonderful character known to many at CCT and in my romantic mind, a passionate marine scientist straight out of the rumpled pages of my copy of *The Lost World*.

As the warm winds tugged at our hair (well, certainly mine, at any rate), Charles was regaling me with glorious and nostalgic chronicles of his time diving in the Chagos Archipelago in the 1970s, and the tragic demise of one of its most iconic denizens, the Chagos brain coral (*Ctenella chagius*), an endemic to this region of the world.

As he eloquently described in his article for CCT several years ago ('The Chagos brain coral *Ctenella chagius*: falling into the red'; *Chagos News*, No. 52 July 2018), this beautiful hemispherical coral (Figure 1) was once one of the most common in the archipelago.

However, recent warming events in the Indian Ocean have disproportionately decimated its once abundant populations, such that on a previous expedition to BIOT in 2017, not a single live colony was found and there were fears that it had become extinct. Upon their return to the archipelago the following year however, a small number of diminished extant living fragments were discovered in the northern atolls of Salomon and Peros Banhos, and with it, the chance that the species was not lost to science after all.

After hearing this and forever being the optimist, I had on something of a whim included a permit for *Ctenella* when applying to the BIOT Administration to sample for a number of other more commonly-occurring coral species, on the off chance (nay, the inspired hope!) that I would stumble upon one on my upcoming dives.

As luck would have it, our expedition began in the south-west corner of Peros Banhos Atoll, surveying Ile du Coin, and as we sailed steadily northwards and clockwise in the coming days, my anticipation to dive the northern islands of the atoll grew.

On the third day's sail, the vessel arrived at Ile Diamant to anchor for a day or two, whilst we used the inflatable boats to survey the reefs of the islands nearby. At the seaward sites of Ile de la Passe and Ile Diamant, I continued to search for and sample the abundant *Acropora* and *Porites* species which form the focus of our research into reef health at Oxford, whilst always keeping half an eye out for *Ctenella*.

The occasional surge of hope was more often than not a false one, colonies of similar-looking brain corals *Goniastrea* and *Leptoria* easy to mistake at depth. That afternoon, buffeted by a slight swell, we skipped across the waves to anchor just off Moresby Island, named after the eighteenth century cartographer who surveyed these islands.

The site comprised a wide terrace at six metres depth, sloping down to 11 metres and then dropping off—it was a wonderful place, and with hindsight, one of my favourite on that expedition, with high coral cover and diversity. And yet also a challenging dive, the subsurface current increasing steadily throughout the hour underwater. Employing my usual survey tactic of heading upcurrent to begin and then drift-diving back to the anchor, my research associate (Amelia Rose) and I finned across the reef looking for corals to sample and tag.

And within the first ten minutes, we spotted our first glimpse of the enigmatic *Ctenella*, albeit a very pale and sorry-looking fragment, a small surviving part of what was once a much larger colony (Figure 2) and likely one of the specimens that Charles had spotted the year before. Six more similarly sorry-looking findings followed and I couldn't help but be slightly underwhelmed—and terribly sad.

The photos Charles had showed me were of pink-hued and beachball-sized giant underwater brains and these fragments were mere shadows of those. Still, where I could, I tagged the colonies and gently took thumbnail-sized tissue samples for which I'd so optimistically applied for a permit those months before, in the hope that some

contribution to the paucity of knowledge concerning this little coral could be made.

The six or seven weeks that followed our return to the UK were nervous ones—far too many times in my career have samples gone missing or spoiled during their inexorable progress home around the globe—the sensation heightened by the thoughts that given another unparalleled warming event in the central Indian Ocean, that these could be the last samples of this coral ever taken.

But arrive they did and in unspoiled condition, in a toughened-plastic trunk festooned with permits and airline stickers, where they were immediately transferred to the -80C freezer in our molecular lab at the University of Oxford's John Krebs Field Station for safekeeping.

So very little is known about *Ctenella*, and all that is comes from Charles' sterling work in recent decades, so almost anything that we learn will add to our knowledge of the coral.

Therefore, with the tissue samples I had collected, I fervently hoped I might be able to extract enough DNA to sequence its genome—and some months later, by incredible good

fortune, I was lucky enough to be awarded a global research award to do just that by QIAGEN, one of the world's leading biotechnology companies. And as I write this, I have received the first results back, and am currently delving into the first ever genome data for this coral, hoping that the secrets of its enigmatic and tenuous existence might finally be revealed.

Buoyed up by last year's finding, in February of this year, I headed out once again on the annual BPMS expedition to BIOT, little knowing the global chaos that would soon ensue.

Arriving just before the main expedition team, our first week was to be based on the island of Diego Garcia (DG), assessing its feasibility to be an ecological study site representing the wider (and less easily accessible) archipelago.

It was hoped that we might find *Ctenella* around DG, but that was tempered by the very real expectation that it was highly unlikely we would do so. Fortune however favours the brave, and only our second dive of the expedition, at the seaward side

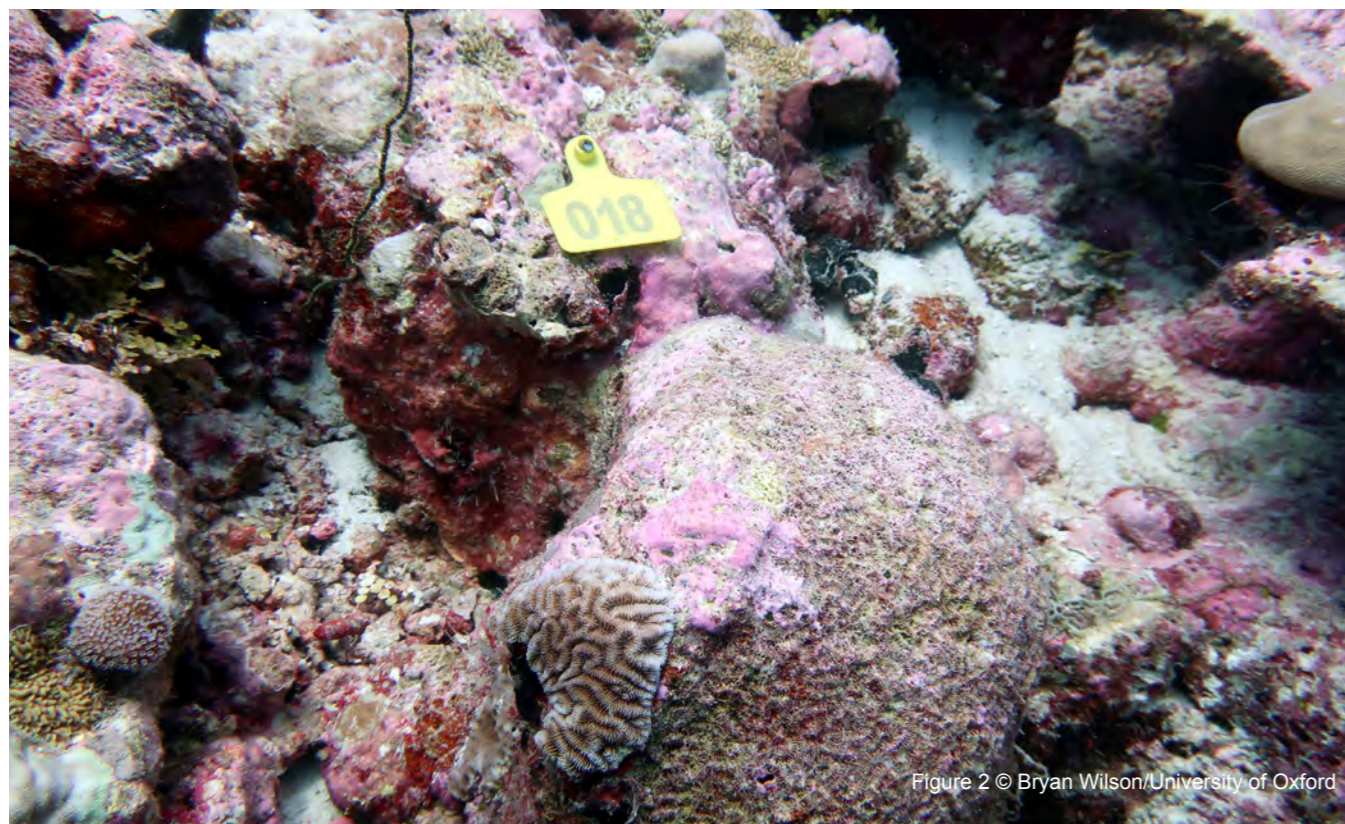


Figure 2 © Bryan Wilson/University of Oxford

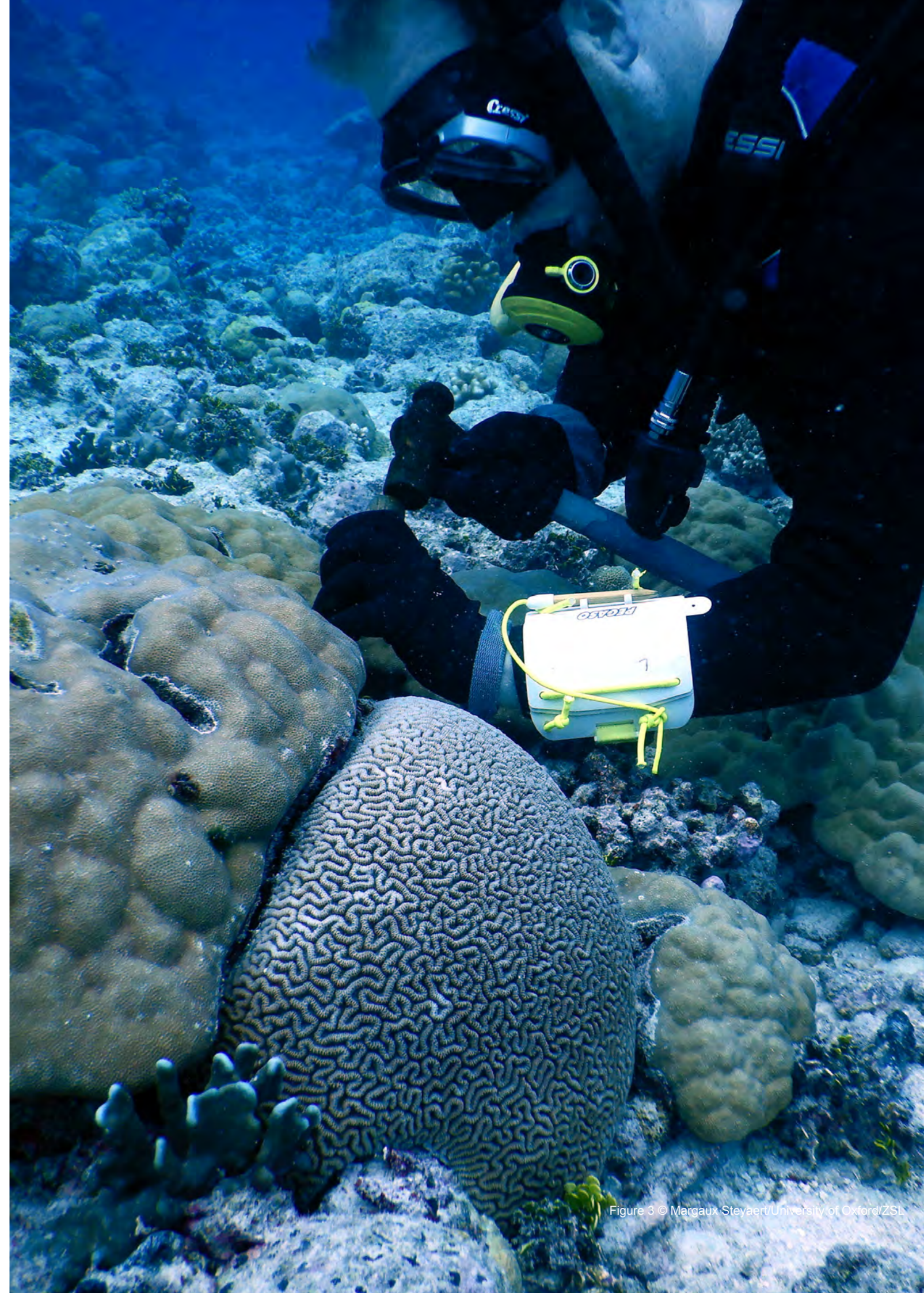


Figure 3 © Margaux Steyaert/University of Oxford/ZSL

of Barton Point at the northern end of the island, we dropped over the boat's side into a rough swell and literally on top of the largest *Ctenella* colony I had yet seen, a full and beautifully coloured hemisphere likely five to ten years old, an incredible sight to behold.

From one of the leading edges of the colony, I took a small tissue sample as before (Figure 3), whilst warily looking over my shoulder at a large grey reef shark lurking almost out of sight some thirty metres behind in the gloom (Figure 4).

My Reef0 team (comprising Margaux Steyaert and Vivian Cumbo) and I enthusiastically searched for more colonies in the tens of metres around this colony, but to no avail, and the earlier nascent joy of the dive soon ebbed away.

For this coral to survive and reproduce, teetering on the edge of extinction as it is, there needs to be a biologically viable population of colonies within suitable spawning distance of each other and this sadly was not it.

Indeed, no further colonies were seen in the surveys around DG that week, nor in the coming days after the remaining members

of the expedition joined us on the Grampian Frontier and we sailed northwards and up through the archipelago.

My sombre mood was exacerbated by distressing reports that were beginning to come in from around the globe that a novel coronavirus had taken hold in an increasing number of countries and that national borders were suddenly springing shut worldwide.

Two days before the expedition was summarily aborted and we were ordered to make for the Maldives with unseemly haste, the expedition team found themselves on what would unknowingly be one of our last dives in the Chagos Archipelago; Middle Brother Island, one of the Three Brothers in the centre of the Great Chagos Bank.

Margaux and I had just completed a survey of Middle Brother Lagoon, a wonderfully sandy and protected basin replete with large puppy-like grey nurse sharks, and close to our safe air limit for surfacing, were making our way back along a reef wall to the inflatable boats anchored nearby.

And there, in the shadows of the base of the wall, were two unmistakable colonies

of *Ctenella* (Figure 5), dark-coloured and apparently healthy.

As my heart began to race, Margaux spotted another—and then two more several metres further along.

All in all we spotted some fifteen colonies in that hundred metre swim back to the boat, my depleted air supply diminishing faster still in the heady rush of my childlike excitement as we swam overhead just below the surface, in what to my mind was an Aladdin's Cave of *Ctenella* richer than any I could have imagined.

The very fact that this happened in the last minutes of our final dive here, low on air and knowing that we were steaming northwards the following day, unsure as to when we would next return, made the surface swim back that much more bittersweet.

J. L. B. Smith (the amateur ichthyologist who confirmed Marjorie Courtney-Latimer's Coelacanth discovery) once wrote of his feelings that momentous day, when he realised what lay before him: "Although I had come prepared, that first sight hit me like a white-hot blast and made me feel shaky and

queer, my body tingled. I stood as if stricken to stone."¹

And on what was my first dry St Patrick's Day in decades, as our inflatable made its steady way back to the Grampian Frontier for a journey home to a suddenly uncertain world, I elatedly realised that I knew exactly how he felt that day in 1938. And that I'd been awaiting that feeling my entire life.

Where there was none before, there is real tangible hope now borne that this lagoon—and others unexplored in the archipelago—might offer a last stronghold for the species, a refugia for this critically endangered and iconic coral, especially given that these colonies would predate the recent warming events in the region.

Where we find viable populations, there exists a chance that the coral can be conserved and recovered, and whilst that chance might indeed be slight, as Charles so optimistically ended his 2018 article, "...we must still try!"

¹Old Fourlegs: The Story of the Coelacanth by J.L.B. Smith. New York: Longmans, Green & Co., 1956



Figure 4 © Vivian Cumbo/University of Oxford

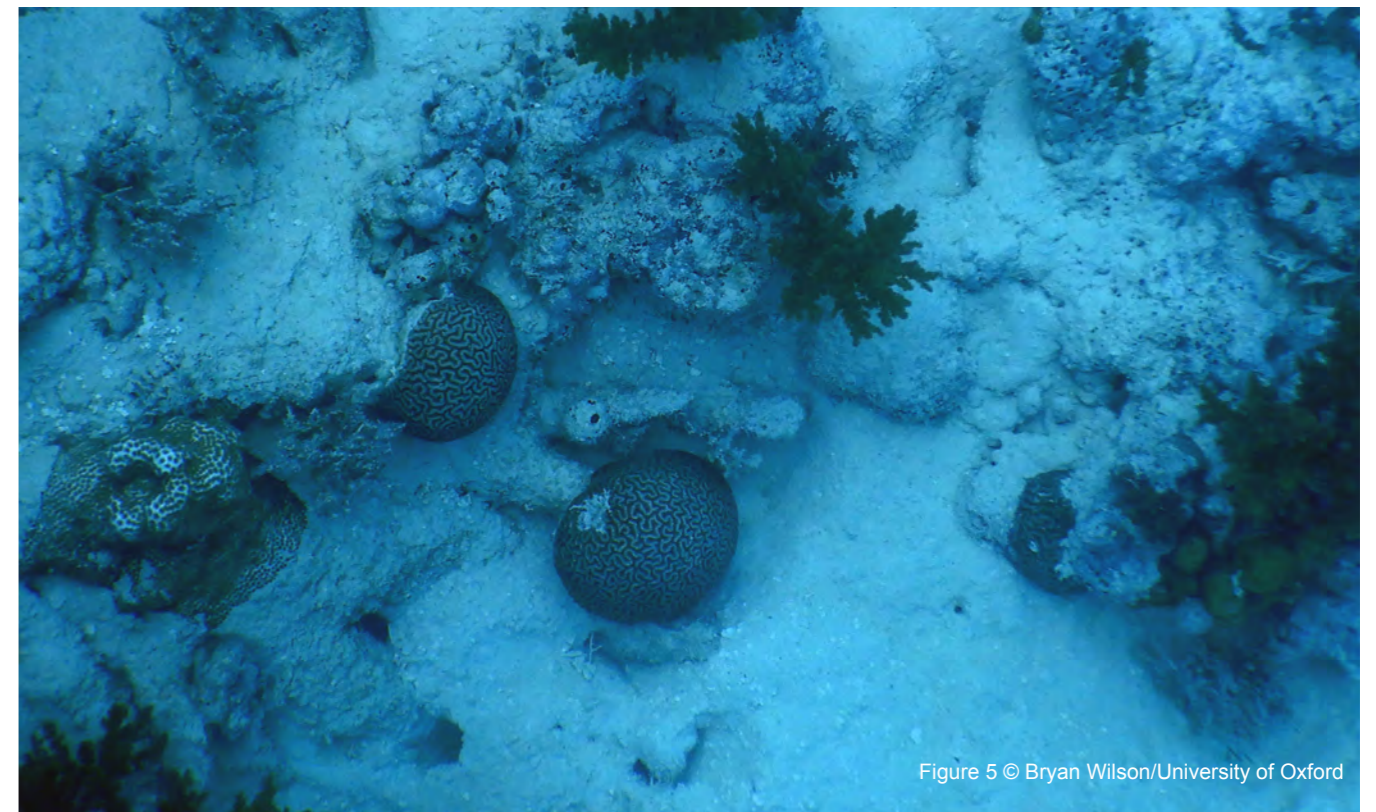


Figure 5 © Bryan Wilson/University of Oxford