"The days flowed by in Bass Strait, with one robot submarine deployment after another, constantly moving from site to site. Seals leaped and played in the waters around the ship, tailing us like faithful dogs. We would often see them hovering around the sub as it was coming in to be retrieved, drawn by curiosity to the alien lights and whirring propellers of the torpedo-shaped machine."

The truth about sponges

writer and photographer ***Asher Flatt***

The air in Bass Strait is crisp and cold in early July. This is an area known for its foul weather, but for the first few days of our voyage we are treated to sun and calm seas, the water reflecting the sky like liquid glass. We are out here conducting a survey of temperate reef systems, part of an ongoing effort to assess and quantify how they are structured over space and through time.

The oceans are the lifeblood of the earth, driving our weather patterns, producing more than half of the world's oxygen, and providing a vast wealth of food and other materials to our hungry civilisation. They cover more than 70 per cent of our planet's surface, but more than 95 per cent of the world's oceans remain unexplored. So much remains unknown.

Dr Neville Barrett, from the University of Tasmania and the Institute for Marine and Antarctic Studies, has been studying temperate reef ecosystems around Tasmania

Sunset in Bass Strait

opposite The robot submarine in water off Cape Barren Island
opposite below Images from the submarine
left Adjusting the submarine
below left Dr Neville Barrett with the submarine

for more than 30 years. His work is part of a broader project for the National Environmental Science Programme Marine Biodiversity Hub, a study that is building a picture of reef habitats on the continental shelf around Australia – and trying to get an idea of how best to protect these fragile habitats from the ravages of the outside world.

"If you think of a reef in this part of the world, they're not coral reefs like you find in the tropics. They're rocky reefs – just a rocky, hard bottom that a range of things grow on," Dr Barrett said. "In shallow waters, reefs are completely covered in seaweeds, down to depths of 20 or 30 metres. Beyond that, the light drops out and those plants can't grow, so the bottom tends to be covered in things like sponges instead."

Sponges (phylum Porifera) are some of the simplest organisms in the animal kingdom, lacking tissues, organs or even bodily symmetry, like most other animals. They feed by driving water currents through their bodies, using specialised cells called choanocytes, trapping food and nutrients on the way.

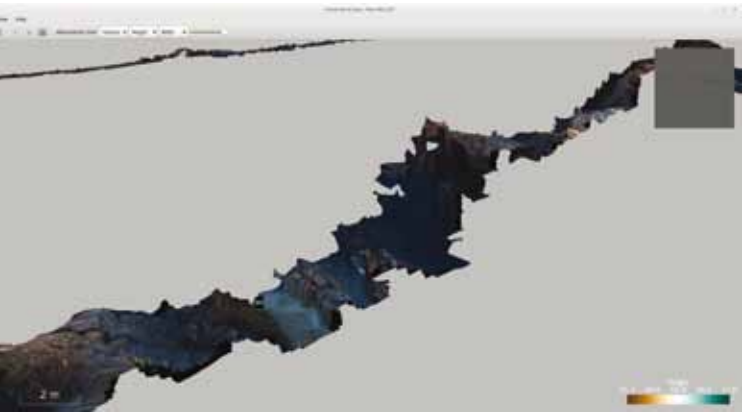
Many are surprised to hear that they are animals; they may be even more surprised to hear that sponges may play a key role in marine ecosystems.

"We're just starting to learn about the importance of sponge communities," Dr Barrett said. "People tend to think of sponges as fairly passive, but really they're concentrating a lot of the nutrients that are swept past in the currents, providing a range of food for the other species that live there."

It is this ability to concentrate nutrients that has recently elevated the humble sponge from supporting role to headline act on tropical coral reefs. Coral reef ecosystems have been a mystery ever since Darwin's day. How can the lush abundance and diversity of a coral reef exist in an environment that has been likened to a marine desert? This is known as "Darwin's paradox" and has long baffled scientists. Recently, however, a Dutch marine biology PhD student, Jasper de Goeij, found the missing link in the riddle of a coral reef.

Sponges, it seems, are able to cycle about 10 times more nutrients than corals, and are responsible for producing more food for other animals, in the clear coral waters, than all the coral and algae combined. They do this by filtering their food from passing currents, everything from plankton to dissolved organic matter, including the excess sugars the corals produce, inaccessible to all but the sponges.

This invisible bounty is then turned into a form of nutrition that is accessible to the other



above Battling rain and heavy seas in Bass Strait
left One of the 3D topographical maps of the seabed

animals of the reef – what has been dubbed "sponge poop". Sponges have an extremely high cell turnover rate, shedding this excess skin and mucus (an appetizing mouthful) off into the surrounding waters for other animals to feed on. These are, in turn, eaten by larger animals, which are eaten by larger animals still, and thus you have a coral reef, with all the diversity of life it contains, an ecosystem derived from the leavings of coral and a simple sponge.

"We think probably the same sorts of things are happening in temperate reef systems," Dr Barrett said, "and that, therefore, places like sponge gardens are an incredibly productive part of the seascape."

Making these kinds of observations, however, isn't easy and requires highly specialised equipment, starting with a robot submarine. This piece of techno-wizardry is capable of going where divers cannot and making observations of the sea floor that would otherwise be impossible. Dubbed an autonomous underwater vehicle, it is part of Australia's Integrated Marine Observing System. Hovering just above the sea floor, this eye in the water records images that are collated into beautiful 3D maps of the topography beneath the waves.

Intrepidly going where no one has gone before, Dr Barrett is sending one such submarine to chart the unknown waters of the Beagle Commonwealth Marine Reserve, a 2,928 square kilometre patch near Flinders Island.

"This reserve was declared nearly 10 years ago on the basis of having extensive sponge gardens,

but no-one's been out there to collect any imagery or understanding of what's going on. So we're going out there and doing that for the first time."

The second aim of this voyage of discovery, is to revisit a number of sites in the neighbouring Flinders Commonwealth Marine Reserve. These sites have been looked at once or twice before and will help to assess changes in the environment over time.

"With these sites, we're really trying to understand how fast the sponge communities grow, what sort of things influence them, if their cover changes a lot from year to year, if they are subject to things like climate change or whether they hardly vary through time at all," Dr Barrett said.

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High winds and rough seas eventually caught up to us, forcing us to take shelter in a cove next to Deal Island. In these moments the difficulty of this sort of work becomes apparent and there is an appreciation of why this is the least explored and least understood area of our planet.

This research is funded by the Australian Government through the National Environmental Science Programme Marine Biodiversity Hub and Parks Australia. Asher Flatt joined the voyage as a guest of the Institute for Marine and Antarctic Studies, the Marine Biodiversity Hub and the Australian Maritime College.