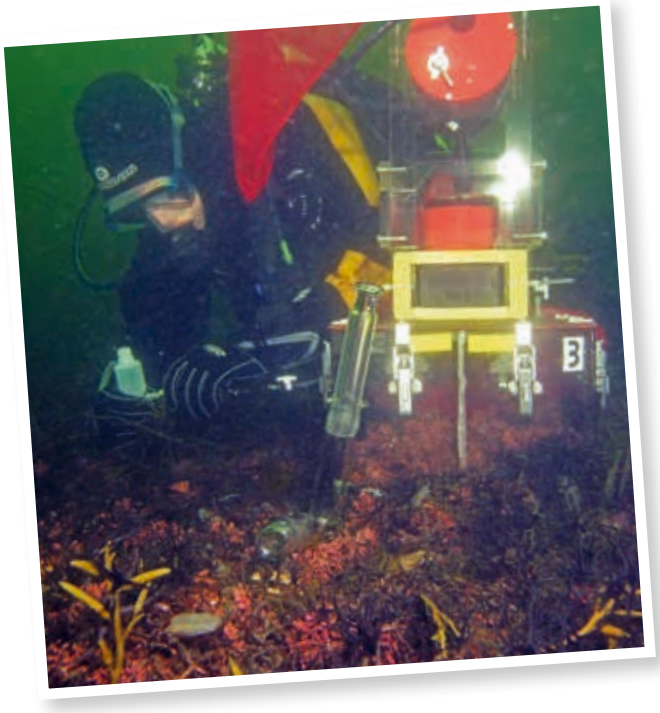
Trees of the sea share their secrets

Coralline algae are found on nearly every shore in the world and could be holding important clues to climate change. Kelvin Boot explores.

Coralline algae in the hand. Susannah Anderson, Flickr



Sampling gasses being released by a maerl bed. Nick Kamenos

If you've ever been to any seaside you will have probably stepped on coralline algae's pink crunchy coatings on rocks exposed as the tide recedes. Dr Nick Kamenos of the University of Glasgow and his co-workers from the Marine Alliance for Science and Technology for Scotland have been studying coralline algae, some of which form tangled beds known as maerl, for years.

Most of us wouldn't give them a second thought but the more Kamenos' team looks, the more they realise that these simple algae are globally important. They build habitats, produce gases that affect our weather and absorb carbon that would otherwise increase global warming.

Fossil record

Kamenos calls them 'the trees of the sea' because corallines grow slowly, and like trees they form annual rings which record their growth. Cutting them open gives a unique record of sea temperatures and chemistry stretching back long before instrument records began.

This record in their skeletons lets scientists investigate our changing environment thousands of years into the past. And they play a key role in the marine ecosystem by protecting many young organisms.

"Not only do these records cover a longer time span – as much as 600 or 1000 years – they also

A simple experiment shows that when queen scallops are given the choice between live and dead mearl the juveniles nearly all move to the live maerl. Nick Kamenos

offer a level of precision which is unprecedented in climate studies," Kamenos says. "Although other natural climate records might go back over longer time scales the bi-weekly precision is not there. Plus, because the algae can form extensive beds which can survive in the fossil record, by overlapping and using fossil specimens they can take us back in time up to 20,000-30,000 years at a level of detail unobtainable elsewhere", he adds.

The record is precise enough to give a temperature reading every two weeks showing how over the centuries our summers have been warming at faster rate than our winters. The coralline algae also provides a number of other useful measures in mapping climate change such as data about times in the past when the ocean has been more acidic and about how much cloud cover there has been at different times.

The records from the algae offer a level of precision unprecedented in climate studies.

Carbon capture

As their name suggests, coralline algae look like corals that form reefs – but there the resemblance ends. Unlike corals, coralline algae are plants – seaweeds that need light for photosynthesis and lock away atmospheric carbon in the process. They are common around the globe, so they could be burying huge amounts of carbon – millions of tonnes a year, according to one study that Kamenos took part in. This natural carbon capture technology would make them as vital for the climate as seagrasses, mangroves or salt marshes.

Cloud control

As well as absorbing carbon dioxide, they also emit another gas – dimethylsulphide (DMS), which is crucial in cloud formation, influencing weather and helping regulate the climate. It's made by living things, and contributes almost half the sulphur in the atmosphere. More than 90 per cent of this comes from the sea, with plankton, seaweed and corals thought to be the main contributors – but it now seems that red coralline algae are also a major source.

Safe havens

We now know some coastal habitats are immensely important as nurseries where juveniles of many groups and species can shelter. "The pristine living maerl beds provide the perfect, loose but intricate, texture required of an effective nursery area for many organisms including sea urchins and the common starfish, as well as commercially-important species like the queen scallop and some fish," says Kamenos.

Often these animals seem to prefer the tangled maerl to other types of seabed. The team's even found that the maerl doesn't just give young scallops a secure place to hide – it also appears to provide them with a sense of calm. They monitored the heart rate of the shellfish around live and dead maerl, as well as on more open sandy habitat. It dropped when they were close to sanctuary in the maerl, though this only seemed to happen when predators were present. The chemical signal of the predator, which would normally lead to increased heart rate, a sign of stress, seems to become secondary to the maerl's 'feel-good factor'.

Precious resource

Although coralline algae are increasingly recognised as globally important, Kamenos points out that we need to do more to protect them. "Maerl is fragile and easily damaged by a variety of human activities such as fishing. Protecting its future is essential because of the services it provides to the ecosystem, our environment and even to commercial fishery yields," he says. "They are on a par with seagrass beds, mangroves and kelp forests, and like those better known habitats we need to look after them for our sake as well as for the wider marine environment."

Find out more about Nick's work at www.gla.ac.uk. Kelvin Boot is a science communicator working with the Marine Alliance for Science and Technology for Scotland which funded this work alongside NERC and the Royal Society of Edinburgh.

Further reading at doi:10.5194/bgd-12-7845-2015 and doi: 10.1002/2015GB005274.