Lophelia pertusa - a cold water coral

The word coral instantly conjures up images of clear blue waters and tropical reefs. Yet corals are frequently found in temperate waters, such as those around the British Isles: here, a few species of hard or scleractinian coral exist, as do many soft corals.

Temperate hard corals, such as the Devonshire cup coral, are usually solitary - but Lophelia pertusa (or Lophelia to its friends) is an exception. This hard coral comprises a colony of individual polyps and it is also unusual because unlike its tropical cousins, it is found in deep, dark, cold waters. Most sightings come from the north-east Atlantic, but it has also been recorded in the Mediterranean Sea, along the coasts of eastern north America, Brazil, west Africa and on the mid-Atlantic Ridge.

Corals are related to sea anemones - and like anemones, each coral polyp has a ring of tentacles surrounding a single opening into the animal’s body cavity. The polyp produces a hard calcium carbonate skeleton and is able to retract its tentacles into the skeleton for protection.

Unlike many of its tropical relations, Lophelia does not contain symbiotic algae (zooxanthellae). Like all plants, the zooxanthellae in tropical corals capture energy from sunlight and they produce sugars through the process of photosynthesis. Most of these sugars are transferred from the zooxanthellae and help to feed the coral host. Lophelia is found far beyond the reach of sunlight, unusually at depths of between 200 and 400 metres, and it relies on capturing passing food in the water column.

Lophelia colonies tend to be found in areas where there are strong currents - on rocky ledges or in narrow regions of some Norwegian fjords, for example. These currents are believed to supply food and to remove sediment which could smother the coral polyps.
The coral colony can take several different growth forms: some are compact and bushy while others can be elongated and slender. Individual polyps are usually about five millimetres in diameter but the colonies themselves vary tremendously in size. All corals are relatively slow-growing animals and it is likely that *Lophelia* is even slower than the others because of the temperature, depth of water and lack of light where it is found.

In British waters along the Atlantic margin, *Lophelia* colonies occur in groups or patches which are thought to be no more than five or ten metres in diameter and can often be a lot smaller. As growth may be measured only in millimetres per year, these coral outcrops could well be more than 100 years old.

At other sites in the north-east Atlantic, *Lophelia* colonies can accumulate to form vast banks or bioherms and coral reefs. One such reef can be found on the Sula Ridge, a submarine structure in about 250 metres of water in the Norwegian Sea. This *Lophelia* reef was recently surveyed and found to be more than 13 kilometres in length and, in some places, to rise more than 30 metres above the sea bed. (pers. comm. Freiwald and Wilson, 1998)

*Lophelia* reefs provide a habitat for many other species and the diversity of some groups of animals associated with these deep water coral banks can approach that found in the tropics. For example, the number of sponges, polychaete worms, echinoderms (starfish, sea urchins, brittle stars) and bryozoans (sea mats) found on *Lophelia* reefs is very similar to that found on shallow water tropical reefs. However, tropical reefs contain many species of coral and the diversity of other animal groups such as fish is higher on a shallow water tropical reef.

Even so, the habitats provided by both living coral and the dead skeleton create biodiversity hot spots on the edge of the continental shelf.

Living coral colonies have been seen by only a handful of adventurous scientists in submersibles which take them down to 200 to 300 metres where the coral banks are usually found. Very little is understood about the basic biology of *Lophelia*. By examining the skeleton it is possible to see that the polyps can split or bud to form new polyps - but nothing is known about sexual reproduction or the larvae this species produces. As with other corals, *Lophelia* needs a hard surface on which larvae can settle and attach themselves. Once settled, it is thought that the colony can expand across a muddy seafloor by growing outwards, breaking and so providing new areas of hard surface on which more coral polyps can grow.

Until relatively recently, the deep waters where *Lophelia* is found remained entirely undisturbed by human activity. This is no longer the case. Fishing trawlers are moving into ever deeper water and although skippers attempt to avoid the coral which can shred their nets, it is still trawled up and thrown back over the side.

Technological advances during the last 20 years have now made it economically viable to extract oil and gas in deep waters such as the Atlantic Frontier to the west of Shetland. Little is known about this coral, or about the impact of human exploitation.

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