Coral reefs found growing in cold, deep ocean

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Imagine descending in a submarine to the ice-cold, ink-black depths of the ocean, 800 metres under the surface of the Atlantic. Here the tops of the hills are covered in large coral reefs. NIOZ-researcher Furu Mienis studied the formation of these unknown cold-water relatives of the better-known tropical corals.

Furu Mienis studied the development of carbonate mounds dominated by cold-water corals in the Atlantic Ocean at depths of six hundred to a thousand metres. These reefs can be found along the eastern continental slope from Morocco to Norway, on the Mid-Atlantic Ridge and on the western continental slope along the east coast of Canada and the United States. Mienis studied the area to the west of Ireland along the edges of the Rockall Trough.

In her research Mienis analysed environmental factors like temperature, current speed and flow direction of seawater as these determine the growth of cold-water corals and the carbonate mounds. The measurements were made using bottom landers, observatories placed on the seabed from the NIOZ oceanographic research vessel 'Pelagia' and brought back to the surface a year later.

Food highways down to the deep

Cold-water corals are mainly found on the tops of carbonate mounds in areas where the current is high due to strong internal waves. These waves

are caused by tidal currents and lead to an increase in local turbulence that results in the seawater being strongly mixed in a vertical direction. The outcome is the creation of a kind of highway between the nutrient-rich, sunlit zone at the sea surface and the deep, dark strata where the 380 metre-high tops of the mounds are found. This allows the cold-water corals to feed on algae and zooplankton that live in the upper layers of the sea. Lophelia pertusa and Madrepora oculata are the most important coral species found on the European continental slopes.

Carbonate mounds

How the carbonate mounds were formed was investigated by using a piston core from the research vessel to take samples of up 4.5 metres of sediment. These cores were then cut into thin slices that were analysed separately; the deeper the layer, the older the sediment. The samples studied were aged up to 200,000 years old. Large hiatuses found in the core were possibly caused by major changes in tidal currents. The groups of carbonate mounds develop in the direction of the strongest current and their tops are of equal height. The mounds were found to be built up from carbonate debris and sediment particles caught in between coral branches. These cold-water coral reefs have, therefore, not developed as a result of leakage of natural gas from the sea bed. However, that may well be the case in the Gulf of Mexico. This area is currently being studied from the American research vessel 'Nancy Foster' by Furu Mienis, her supervisor Tjeerd van Weering and NIOZ associate researcher Gerard Duineveld.

Threats

Climate change has exerted a considerable influence on the growth of corals and the development of carbonate mounds. For example, corals stopped growing during ice ages. Present-day global warming and the

resulting acidification of the oceans also pose a threat: organisms are less effective at taking up carbonate from seawater that is too acidic. This is true not only for corals but also for some species of algae that are a source of food for the corals. Other activities on the seabed that can cause damage to the coral reefs are offshore industries and bottom trawlers. A number of European areas containing cold-water coral reefs have thankfully already obtained protected status.

Source: Netherlands Organization for Scientific Research