



Cold-water coral growth and mound formation on the Pen Duick Escarpment, Gulf of Cadiz

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Abundant skeletal remains of cold-water corals in sediments around the Pen Duick Escarpment, southern Gulf of Cadiz, suggest that corals thrived in the area in a relatively recent past. Cold-water coral carbonate mounds with heights of up to 60 m are found at about 550 m water depth on the edge of an elevation delimited by the Pen Duick Escarpment. Coral debris is abundantly present in the sediment on the carbonate mounds as well as on the escarpment, with *Lophelia pertusa* and *Madrepora oculata* as most common species. However, living coral is rare, and a mud drape of a few cm to tens of cm thick is usually found covering the coral-bearing sediment. On and off mound sediment cores are presently investigated in detail to determine the timing of the decline of cold-water coral communities on the Pen Duick Escarpment. Planktonic foraminifera oxygen isotope stratigraphy and U/Th datings of coral debris from the on mound core show that the main framework building cold-water corals *Lophelia pertusa* and *Madrepora oculata* were present on the mound during glacial periods (Marine Isotope Stage 2, 6 and 8) and the early Holocene, but absent during the late Holocene. During glacial periods a dense framework of cold-water corals existed and sedimentation rates were high. Both on and off mound cores show low magnetic susceptibility values until marine isotope stage 3, after which values are increasing. A large hiatus is found between 36 and 141 kyr. Our finding that cold-water corals on Pen Duick escarpment occurred mostly during glacial times contrasts with that of cold-water corals on the Rockall Trough margins and in the Porcupine Seabight, where they seem to have mainly lived during interglacials. The reason for the late Holocene decline of cold-water corals on Pen Duick escarpment is still a matter of speculation. Observations made with CTD and long-term deployment of benthic landers indicate activity of internal waves in the area with semi-diurnal periodicity, inducing cyclic fluctuations in near-bottom currents with peaks up to 25 cm s⁻¹, and a temperature varying around 11°C and a salinity around 35.8. Measurements clearly show that at the moment Mediterranean Outflow Water (MOW) is not present in the area and mounds are bathed in the North Atlantic Central Water (NACW). These values fall within the range of what has been observed at other cold-water coral occurrences of the European continental margin, and thus do not seem to present a limitation to cold-water coral growth on the Pen Duick Escarpment. However, low present-day surface productivity and relatively high sediment load in the water column may be factors that have hampered coral growth and stopped mound development. Therefore, the demise and burial of cold water corals in the Gulf of Cadiz is considered as mainly related to changing environmental conditions.