THE EAST MELILLA COLD-WATER CORAL PROVINCE IN THE ALBORAN SEA

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Abstract
Impressive seafloor structures formed by cold-water corals (CWC) characterize parts of the seafloor in the Alboran Sea east of the Spanish enclave Melilla forming the East Melilla Cold-Water Coral Province (EMCP). These up to 100 m high structures are composed of a mixture of CWC fragments and hemipelagic sediments, reflecting the growth of CWC and their capacity to baffle sediments resulting in the partly rapid build-up of these structures. Under present-day conditions, CWC still thrive in the EMCP, however, not as strong as in the past.

Keywords: Deep sea corals, Sediments, Paleoceanography, Continental slope, Alboran Sea

The East Melilla Cold-Water Coral Province (EMCP) is located in the Alboran Sea off the Moroccan coast, east of the Spanish enclave Melilla [1, 2]. ROV-based video observations conducted during cruise P385 with the German R/V Poseidon revealed a sparse living cold-water coral (CWC) community with small, patchy distributed, live colonies (15–20 cm) of the common cold-water coral species Lophelia pertusa and Madrepora oculata. These are accompanied by large amounts of fossil coral debris admixed with sediments [3] with especially the fossil coral framework being colonised by a diverse associated fauna comprising sponges, soft corals, echinoderms and many other benthic organisms.
The mixture of coral fragments and hemipelagic sediments forms impressive seabed structures called cold-water coral mounds and ridges, which occur in water depths of between 250 and 450 m. With respect to the distribution of these structures, the EMCP can be divided into three different morphological zones (Figure 1). In the north the so-called Brittlestar Ridges extend seaward from the Banc de Provencaux. These are long-winded, very steep ridges rising 50-150 m above the surrounding sea floor. Video-footage and sediment cores revealed that the upper parts (max. 70 m) of these ridges are made up by the coral-sediment mixture typical for CWC mounds. These ridges are accompanied by very distinct moats.

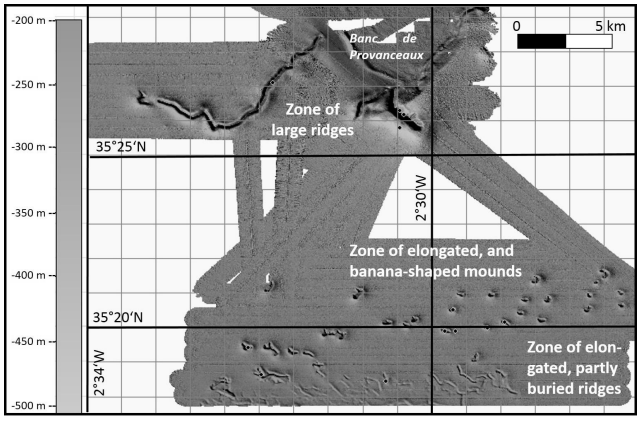

Fig. 1. The East Melilla Cold-Water Coral Province in the Alboran Sea.

Further to the south a gently rising flat sea floor shows for ~5 nm no indications for any mound- or ridge-like structures, neither as a surface expression nor as a subseafloor structure. Landward (i.e. south) of the 300 m isobath, a zone with numerous elongated or banana-shaped single mounds occurs. These mounds are characterized by very steep flanks often reaching slope angles of >30°. The average height of these mounds above the sea floor is 20-40 m, and even more, when considering the depressions of the moats also accompanying these mounds.
Also for the elongated ridges forming the third zone in the south, a distinct amount of CWC in the sedimentary record has been proven. These ridges rise up to 10 m above the surrounding sea floor and appear to get buried further to the south by a veneer of sediments. Nevertheless, in the subsurface, coral fragments can be traced at least to a depth of ~60 m below the seafloor.
Hydroacoustic data reveal that in the subsurface the CWC mounds and ridges are characterized by an acoustic transparence as often found in such structures. Between the ridges in the north and the mounds in the south, as well as in between the mounds, the hydroacoustic profiles provided a penetration of up to 100 m revealing mostly nicely layered hemipelagic sediments. The strongest dynamics in the sedimentary setting are displayed by clearly contouritic sediments close to the mounds, where various erosional phases of moat formation and depositional phases of moat filling are observed.
Short sediment cores revealed that the CWC colonized the area during most of the Holocene since ~14 ka BP [2]. During expedition MSM 36 with the German R/V Maria S. Merian, up to 70 m long sediment cores have been taken from these structures with the MeBo, the Bremen Seafloor Drill Rig [4].

References
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