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Distribution of Cold-Water Corals in the Gulf of Cádiz under changing Late Quaternary climate conditions

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Over the last decades, spectacular discoveries of scleractinian coral reefs thriving in cold and deep waters have been made along the western European continental margin. To name are, as the most impressive examples, the Sula Reef off Norway where corals grow on ancient moraines and the Porcupine Seabight off Ireland where giant carbonate mounds are covered by extensive thickets of cold-water corals. In many of these places corals do not occur continuously throughout the geological record. For example, recent studies indicate that the occurrence of coral banks west off Ireland may probably be connected to the intensity of northward flowing Mediterranean Outflow Water (MOW). During glacial times, the water mass exchange between the Mediterranean Sea and the Atlantic was significantly reduced due to a lowered sea level and no MOW reached the Celtic continental margin. As a result, up to now no corals dated to a glacial age have been recovered from these well-known Irish carbonate mound provinces. In contrast, cold-water coral ecosystems in the Mediterranean Sea were well developed during glacial times.

Recently, cold-water corals have also been reported from the Gulf of Cádiz (Spain), where the corals are hosted by mud volcanoes whose formation is related to active venting of fluids and/or gases. This might play an important role in linking Mediterranean and NE-Atlantic coral occurrences. Therefore, the cold-water corals in the Gulf of Cádiz have been investigated as a contribution to the ESF-Euromargins project MOUNDFORCE.

Of special interest is the history of these cold-water corals under changing climate conditions during the Late Quaternary. Radiocarbon dating on a number of corals

from one single grab sample revealed that apparently different species inhabited the area through the last 50.000 yrs in specific time intervals. The grab sample has been retrieved from the Hesperides mudvolcano, which is strongly affected by erosion allowing for such a widespread range of ages in only one surface sediment sample. In addition, U/Th datings on a number of cold-water coral bearing sediment cores also revealed the importance of erosion. Although showing no obvious evidence for hiatuses within the individual cores, none of these have recent (or Holocene) sediments on top. Based on U/Th dates on the corals and stable oxygen isotope data measured on benthic foraminifera, it appears that the presence of cold-water corals in the available records is restricted to intermediate climate conditions not comprising fully glacial or interglacial settings. This has also been found for cold-water coral occurrences along the Celtic continental margin and might be related to changes in the production of MOW, driven by glacial/interglacial sea level variations which strongly affected the geometry of the Strait of Gibraltar.