Proliferation and demise of Mediterranean deep-sea corals

M.T. McCulloch[1], M. Taviani[2], P.Montagna[3], G. Mortimer[1] and A. Remia[2]

[1] Research School of Earth Sciences, Australian National University; Malcolm.McCulloch@anu.edu.au; Graham.Mortimer@anu.edu.au

[2] ISMAR-CNR, Bologna, Italy; marco.taviani@ismar.cnr.it; alessandr.remia@ismar.cnr.it

[3] ICRAM, Rome, Italy; paolomontagna@hotmail.com

The abundance and distribution of deep-sea cold-water corals in the Mediterranean have only recently been revealed by oceanographic surveys. Living specimens are relatively rare, with *Desmophyllum dianthus* (solitary) and the main reef framebuilder *Madrepora oculata* (colonial) being the most widespread, whereas *Lophelia pertusa* (colonial) is known in only several locations. Although cold-water corals are now in recession, fossil examples are much more abundant, occurring throughout the Mediterranean basin either as *in-situ* assemblages, patch reefs, or coral-bearing sedimentary mounds, at depths ranging from 250 to 3000 m. Thus, in contrast to fossil occurrences in the North Atlantic where specimens are commonly patinated by thin films of Fe-Mn, the post- Last Glacial Maximum (LGM) occurrences on the Mediterranean continental shelves often maintain their original luster, making it difficult to discriminate between fossil and modern samples.

U-series dating of these corals reveals a surprisingly narrow range of ages, with the majority falling between 13,500 to 11,000 yrs BP, indicating that they flourished during the cooler more glacial-like conditions of the Younger Dryas (YD) period. Prolific deep-sea coral growth, however, ended abruptly at ~11,000 yrs BP, approximately 500 yrs after the cessation of the Younger Dryas with many of the deposits draped in a thin veneer of mud. Radiocarbon ages show that, since the LGM, the intermediate depth waters of the Mediterranean generally had similar $\Delta^{14}C$ compositions to surface waters, except for a short period in the early YD (12,500 ± 100 yrs) when atmospheric-like compositions are registered, indicative of extremely rapid over-turning and mixing.

The demise of deep-sea corals in the Mediterranean was probably due to the combined effects of a rapid 6-8^{o}C rise in ocean temperatures that occurred at the end of the YD, and unusually high sediment influx from increased river discharge driven by glacial meltwater pulses. These findings also raise the question of whether the remaining extant population of Mediterranean deep-sea corals will survive present-day global warming conditions of increasing ocean temperatures and salinities.