

**ESF Short Visit Grant - Report generated by:
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The Short Visit entitled “Cold Water Coral mounds in the Mediterranean Sea ” was held from December 03 to December 04 2012 in the University of Milano “Bicocca” (Italy), in the framework of the ESF Research Networking Programme entitled “Cold-water CARbonate mounds in shallow and DEep time – The European Research Network – COCARDE-ERN”.

Purpose of the visit

Different sizes, shapes and ages have been reported for cold-water coral (CWC) mounds along the European continental margins, ranging from low relief mounds to giant carbonate mounds, spanning in time from the Pliocene to the late Quaternary. Even though the occurrence of CWC communities has been well documented in several locations of the Mediterranean Sea, CWC mounds have been only occasionally reported. There is still paucity of data on CWC mound dynamics and evolution in the Mediterranean Sea and many questions on this complex issue are still open. The purpose of the ESF short visit was to assess the state of the art in the study of CWC mounds in the Mediterranean Sea and propose possible comparative studies between the different Mediterranean basins.

At a larger scale, the main aim of the meeting held in Milan was to start a collaborative study between scientists working on Mediterranean cold-water coral bioconstructions in order to (i) gather morphological, geochemical, paleontological and biological data of the so far known Mediterranean CWC mounds and therefore (ii) to evidence differences and similarities for a better understanding of their evolution through time. During the meeting a first attempt was made to fix possible and different strategies to improve the actual knowledge of CWC mounds in the Mediterranean, both in a paleo-environmental and actual context.

Description of the work carried out during the visit

The participants to the meeting were Dr Claudio Lo Iacono (NOC, Southampton-UK and CSIC, Spain), Dr Agostina Vertino (University of Milano Bicocca) and Dr Alessandra Savini (University of Milano Bicocca).

During the first day, December 3rd, the participants first presented their personal expertise and interest in the field of CWC mounds, focussing in their specific areas of study in the Mediterranean Sea.

Presentations can be summarized as follows:

Claudio Lo Iacono: CWC mounds in the Alboran Sea. I presented the state of the art in the study of the mounds mapped so far in the Alboran Sea. The Eastern Alboran Sea is the densest area of the Mediterranean, with mounds present both in the Spanish than in the Moroccan Margin (Chella Bank, Western and Eastern Melilla Mound Field). Though the morphology and internal structure of these features has been characterized through geophysical methodologies, there is still paucity of data regarding the evolution and the age of these mounds, up to 80 tall and 9 km long.

Further studies are being produced to define the paleo-environmental governing factors during their evolution in the Quaternary.

Agostina Vertino and Alessandra Savini: CWC mounds from the The Santa Maria di Leuca province (Apulian margin). The two Italian scientists presented the main results from data collected within the framework of national (APLABES) and European research programmes (EU-FP6 Hermes and EU-FP7 CoralFISH). The SML coral province shows a prevalent rough seafloor topography as a result of large-scale tectonics and recent complex sedimentary processes, e.g., current triggered erosion and sedimentation, failures, mass-flow events. In the eastern sector, between 600 and 900 m depth, a broad area (at least 400 km²) is characterized by down-slope mass-transport deposits and shaped by a hummocky topography consisting of widespread mound-like features (50–300 m wide and up to 25 m high). All the examined mounds (through ROV and/or sampling) are capped by dead and/or live coral frameworks, particularly well developed on the north-eastern upper margins of the topographic features. This preferential coral location is clearly linked to a main current flow coming from NE. The SML mound-like features have been interpreted as mass transport-related features (i.e. detached blocks of sediment), however, the uppermost part of the highest reliefs appears to be mainly made up of coral rudstone. This implies that, due to their high frame-building potential, CWC colonies from SML have at least emphasized through time the seafloor roughness.

In the conclusive part of the first day, it emerged that the Alboran and Leuca mounds show not only differences in size, being the former much more developed both in height and lateral extension than the latter, but also as coral coverage. The Alboran mounds show indeed a much denser coverage of coral colonies and/or rubble than the Ionian ones which are mostly characterized by metric aggregations of live and dead coral colonies interspersed with muddy sediment. Coral rubble apron is absent in the Leuca mounds, but seems to characterize at least some Alboran reliefs. There is still much work to do towards a comprehensive understanding of the start-up and evolution phases of the presented CWC mounds (Alboran Sea, Ionian Sea), considered so far as the most extended features in the Mediterranean, even though some work on dating the first meters on the mound subsurface has been already attempted. Based on existing data, it appears that the giant CWC mounds of the Eastern Alboran Sea started to develop in a much earlier phase compared to the mounds of the Central Mediterranean.

During the second day (half-day work), December 4th, we started to compile data on fossil and “live” Mediterranean coral mounds known so far. The bases for a comprehensive dataset in GIS were set down.

Description of the main results obtained

The meeting on “Cold Water Coral mounds in the Mediterranean Sea” was important for making each other aware of the own research areas, methodologies and main results obtained so far in the study of Mediterranean Sea mounds. In terms

of a future strategy and based on what discussed in the meeting, we proposed two approaches of study with the intent to compare the mound systems of the Mediterranean, trying to contribute in defining common patterns both in a paleo-environmental and actual context.

The “Past” approach will consist in collecting all available data coming from dating, geochemical and paleontological studies on CWC mounds. An important step forward for a better understanding of the two main mound systems known so far will be made defining differences and affinities in paleo-environmental settings of the Alboran and Ionian Seas during the Plio-Quaternary. This task will be tackled starting from the careful analysis of scientific papers dealing with paleo-climate and – environment reconstructions in these areas produced in the last ten years. We are aware that available data on the past of Mediterranean coral mounds is still poor and that collaborations with specialists (in particular geochemists, palaeontologists) should be made to strengthen this line. An important point proposed by Agostina Vertino is to dedicate a special attention to the CWC successions outcropping in the eastern Sicilian coasts (Messina) and trying to include them in the common paleo-environmental context of the Mediterranean CWC mounds. In light of this, well preserved coral specimens from Sicilian outcrops will be dated as soon as possible. The “Actual” approach is aimed to compare the modern status of CWC mounds. Our goal is to start from the two main CWC mound ecosystems (Alboran, Ionian) by comparing their biodiversity (selecting dominant macrofauna groups), dead/live coral coverage, available oceanographic data. The outcomes of this task can be useful to figure out the actual environmental constraints on the mounds of different Mediterranean areas for a better understanding of their evolution through time.

Future collaboration

We agreed that the proposed tasks are considerably challenging and that open collaborations must be soon started up, trying to fill current data gaps, developing innovative approaches and individuating potential and still undiscovered areas hosting CWC mounds.

Projected publications

A possible paper regarding the actual status of CWC mounds in the Mediterranean, focussing on the fauna content and environmental governing factors of Alboran Sea and Ionian Sea mounds can represent a first affordable milestone.

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