



Drop Chapter

Recent Discoveries of Extensive Cold-Water Coral Assemblages in Maltese Waters

Leyla Knittweis, Julian Evans, Ricardo Aguilar, Helena Álvarez, Joseph A. Borg, Silvia García, and Patrick J. Schembri

Abstract

Recent deep-water remotely operated vehicle surveys around the Maltese Islands resulted in the discovery of highly diverse habitats, including extensive hard bottom areas dominated by gorgonians and living cold-water corals with a rich variety of associated fauna. Black coral (*Leiopathes glaberrima*) forests were dominant at 200–400 m, whilst stony reef-forming corals (in particular *Madrepora oculata*) were most abundant in waters deeper than 500 m. The gorgonian *Callogorgia verticillata* was dominant in places over the entire depth range, but was particularly abundant at depths of 800–1000 m. Such cold-water coral assemblages are of high conservation interest, and offshore marine protected areas are urgently required in order to protect these very diverse, but highly vulnerable, deep-sea habitats.

Keywords

Alcyonacea · Anthozoa · Antipatharia · Biodiversity · Central Mediterranean · Scleractinia · Sicily channel

Malta hosts one of the six cold-water coral (CWC) provinces known from the Mediterranean, the ‘South Malta CWC province’ (Taviani et al. 2017; see also Chimienti et al., [this volume](#)). Observations of the deep sea surrounding the Maltese Islands are scant and, with few exceptions (Freiwald et al. 2009; Costantini et al. 2010), are mainly based on trawl surveys of sedimentary bottoms. In June–July 2015, remotely operated vehicle (ROV) surveys in Maltese waters were carried out by the research vessel ‘*Oceana Ranger*’ as part of the project ‘LIFE BaHAR for N2K’ (“Benthic Habitat Research for Marine Natura 2000 Site Designation”); see

<http://lifebahar.org.mt>). The surveys were carried out within the 25-nautical mile Fisheries Management Zone (Fig. 22.1a) around the Maltese Islands, and mostly focused on previously unstudied deep-sea areas such as the Malta Trough.

The ROV surveys revealed new areas with extensive and diverse CWC assemblages at depths of 300–1000 m extending some 20 km along the edge of the Malta Graben. The most abundant habitat-forming species on escarpments included the scleractinian *Madrepora oculata*, the antipatharian *Leiopathes glaberrima* and the alcyonacean *Callogorgia verticillata* (Figs. 22.1b and 22.2a). Several other locally abundant habitat-forming species were also encountered, including *Acanthogorgia hirsuta*, *Corallium rubrum*, *Dendrobrachia bonsai*, *Lophelia pertusa*, *Muriceides lepida*, *Paramuricea macrospina*, *Placogorgia massiliensis*, *Swiftia pallida* and *Villogorgia bebrycoides* (Fig. 22.2b). Colonies of the precious red coral *C. rubrum* were observed at depths of down to 1016 m, which represents the first time that this species has been recorded at depths exceeding 800 m (Knittweis et al. 2016). A high diversity of associated fauna (especially sponges, echinoderms, molluscs, crustaceans and fish) was also present.

The depth distribution of the corals and alcyonaceans revealed a vertical stratification in the presence of the main habitat-forming taxa. *L. glaberrima* was the dominant species at depths of 200–400 m, where it formed black coral forests, while the framework-forming *M. oculata* dominated in deeper waters, with peak abundances at depths of 500–700 m. Alcyonaceans had a more patchy distribution but *C. verticillata* was dominant in places, particularly at depths of 800–1000 m.

These recent findings indicate that the deep sea around Malta represents an important biodiversity hotspot with a variety of different assemblages dominated by sessile suspension feeders (mainly cnidarians) as habitat-forming taxa. The Malta Trough, in particular, seems to serve as a conduit for Levantine Intermediate Water (LIW) (Freiwald et al. 2009; Chimienti et al., [this volume](#); Hayes et al., [this volume](#)), trans-

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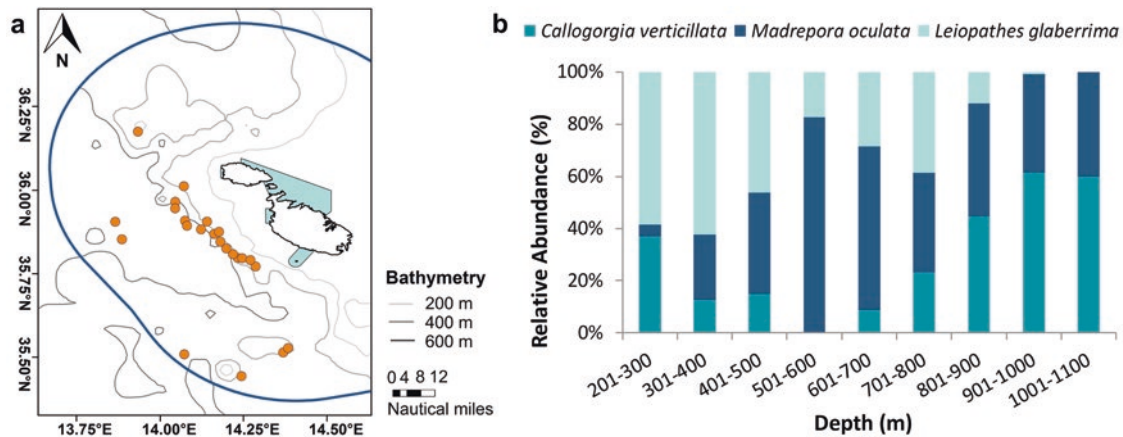


Fig. 22.1 (a) Map of the Maltese Islands showing the sites with living cold-water corals (orange circles), identified during the 2015 survey. The partial extent of the 25-nautical mile Fisheries Management Zone (dark blue oval around the Maltese Islands), and the location of current Marine Protected Areas for benthic habitats in Maltese waters (light

blue shading) are also shown. (b) Relative abundance (as percent of total sightings) of the three main habitat-forming species, *Callogorgia verticillata* (n = 312), *Madrepora oculata* (n = 387) and *Leiopathes glaberrima* (n = 252), recorded from different depth intervals

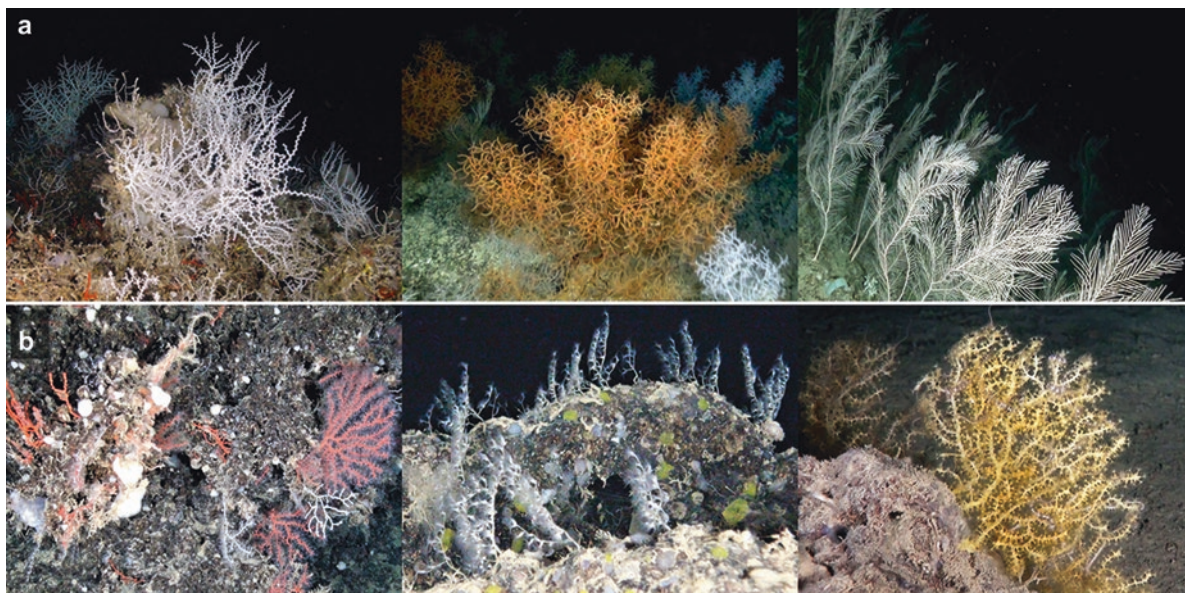


Fig. 22.2 (a) Coral and alcyonacean assemblages formed by *Madrepora oculata* (left), *Leiopathes glaberrima* (centre), and *Callogorgia verticillata* (right), found at depths of 300–1000 m in Maltese waters. (b) Examples of locally abundant habitat-forming spe-

cies: *Corallium rubrum* (left), *Dendrobrachia bonsai* (centre), and *Paramuricea macrospina* (right). (Photo copyright: OCEANA © LIFE BaHAR for N2K)

porting seston and thus providing favourable conditions for suspension feeders, which in turn provide habitats to a large diversity of associated fauna. Similarly, newly discovered CWC grounds off Sardinia were found to occur at depths corresponding to the core of the LIW (Taviani et al. 2017).

Cold-water coral reefs are included in Annex I of the EU ‘Habitats Directive’ (Natural habitat types of Community interest whose conservation requires the designation of special areas of conservation; Council Directive 92/43/EEC), and are listed in the UNEP/MAP/RAC-SPA “Reference list

of marine habitat types for the selection of sites to be included in the national inventories of natural sites of conservation interest” (UNEP/MAP/RAC-SPA 2006). Moreover, several of the identified species (*C. rubrum*, *L. pertusa*, *L. glaberrima*, *M. oculata*) are designated as ‘endangered’ in the IUCN Red List of anthozoans in the Mediterranean (IUCN 2016). The present results thus highlight the need for the relevant authorities to consider establishment of offshore marine protected areas in order to protect these very diverse, but highly vulnerable, deep-sea habitats.

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