

## **Maerl beds in Galician Marine Protected Areas. How the scientific research can contribute to their management.**

*Viviana Peña, Rodolfo Barreiro, Ignacio Bárbara, Javier Cremades, Pilar Díaz, Cristina Pardo, Lúa López, Belén Carro, Cristina Piñeiro, Verónica García.*

*Grupo de investigación BioCost, Departamento de Biología Animal, Vegetal e Ecoloxía, Facultade de Ciencias, Universidade da Coruña, Campus de A Coruña, 15071, A Coruña, Spain. Email: vpena@udc.es.*

Since 2003, the BioCost research group has investigated the Atlantic Iberian maerl beds. This presentation summarizes the main scientific advances made on different subjects with a focus on results that might improve the management of the maerl beds located in Galician Marine Protected Areas. In addition, new maerl areas are proposed to be included in further conservation actions based on their ecological relevance within the Galician rías.

### **Introduction**

Maerl (or rhodolith) beds are composed of unattached coralline algae that are worldwide distributed (Foster 2001). They are considered biogenic habitats with the highest associated diversity, playing an important ecological role due to their carbonate composition (Hall-Spencer *et al.* 2010). The more common maerl species *Phymatolithon calcareum* and *Lithothamnion corallioides* were listed in the Annex V of the European Community Habitats Directive 1992 as species whose exploitation requires management. However, their slow growth rate and accumulation together with scarce recovery suggested that they should not be considered a renewable resource (BIOMAERL Team 2003). In Galicia, maerl beds are mainly distributed in the southern rías from the low intertidal to 47 m depth (Peña 2010). These rías include several Marine Protected Areas of the Natura 2000 network together with the Islas Atlánticas National Marine Park. Since 2003, the BioCost research group (Universidade da Coruña) has investigated the Atlantic Iberian maerl beds within several research projects funded by Spanish and Galician Governments. Our research encompassed mapping the distribution of maerl beds, ascertaining the taxonomic identity of maerl-forming species, and assessing the diversity of the associated flora as well as the conservation status of these important habitats. Here it is summarized our scientific contribution that might improve the management of maerl beds located in Galician Marine Protected Areas. In addition, new maerl areas are proposed to be included in further conservation actions.

### **Materials and Methods**

First, a detailed database on Galician maerl beds was built searching literature from early XXth, grey literature, own data and from the SANT-Algae Herbarium (Universidade de Santiago de Compostela) as well as records provided by local fishermen and SCUBA divers. Data were checked and georeferenced with extensive field surveys by dredging and SCUBA diving. Samples were also collected in order to identify the maerl species, and assessing the diversity of associated seaweeds. The diversity of the maerl species has been studied with an integrative approach that combines molecular (DNA barcoding) and morphological methods. In addition, the conservation status of each maerl area was assessed according to different features (maerl species diversity, maerl cover, alive/dead maerl ratio, thickness of the living maerl layer, size of the maerl, associated diversity) and potential threats detected.

### **Results and Discussion**

From the total estimated maerl area in Galicia (22 km<sup>2</sup>), almost a quarter part (ca 6 km<sup>2</sup>) is located in protected areas: the Islas Atlánticas National Park (archipelagos of Sálvora, Ons and Cíes) and two Red Natura 2000 sites (Costa Ártabra and Complejo Ons-Grove) (Peña and Bárbara 2009). They are distributed from 1 to 41 m depth. Large areas with the highest maerl cover and alive/dead maerl ratio (76-100% cover) were recorded within the Sálvora archipelago and the Natura 2000 site Complejo Ons-O Grove. Apart from *Phymatolithon calcareum* and *Lithothamnion corallioides*, our maerl beds are composed by two other new species: *Mesophyllum sphaericum* (Peña *et al.* 2011), and *Phymatolithon* sp.3 (Carro *et al.* 2014). Within the Galician protected areas, *Phymatolithon* sp.3 has been commonly recorded mixed with the main two maerl species. The resulting shape of the three species is mainly modelled by dominant hydrodynamic conditions, therefore the employment of external morphological features for species identification is not longer applicable. Our studies on the NE Atlantic maerl beds have also pointed out that *Phymatolithon* sp.3 is becoming abundant southward, replacing other maerl species with northern distribution (Carro *et al.* 2014, Pardo *et al.* 2014). The associated flora of the Galician maerl beds is highly diverse (257 species, 40% of the total seaweed diversity reported in this region, Peña *et al.* 2014). Almost the half of the total associated flora was recorded within the Islas Atlánticas National Park (130 species), including species almost confined to maerl beds (ie. *Cruoria cruoriaeformis*) (Peña and Bárbara 2006).

According to our investigations, only 28% of the Galician maerl beds are susceptible to be included in management and conservation plans, whereas 16% is located in the vicinity of aquaculture areas. Only maerl beds located in the Islas Atlánticas National Park were specifically reported and, therefore, protection measures could be successfully applied. Based on our results, 19 new maerl areas are proposed for conservation according to their features, potential threats detected and their ecological relevance within the Galician rías.

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