

Ecology of coralligenous mesophotic rings in the Mediterranean Sea

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INTRODUCTION

The origin of **coralligenous rings**, circular habitats with an average size of 20 m in diameter, is still unknown. Hundreds of them have been recently found off Cap Corse (Western Mediterranean Sea) in the mesophotic zone at ca 120-m depth¹. These rings typically show a concentric structure with a central **coralligenous core** surrounded by a circular **halo** of **sediments** limited by an external **crown** of **rhodoliths** (Fig. 1).

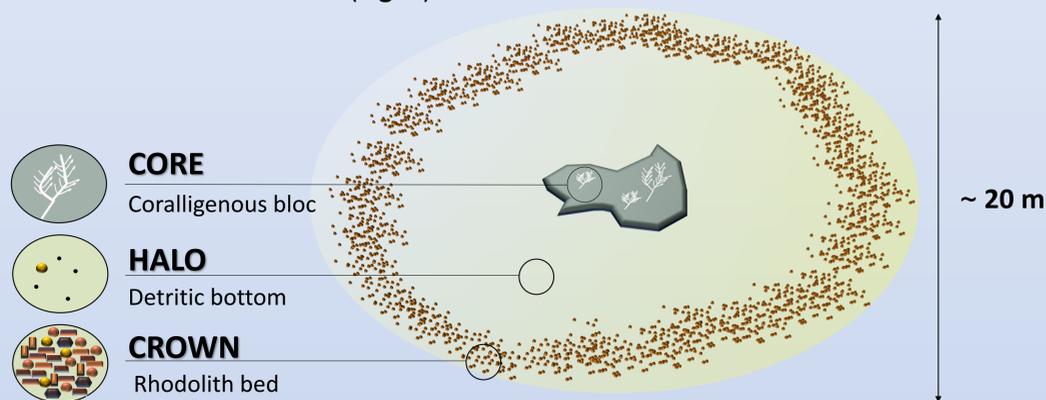


Figure 1: Morphological overview of the coralligenous ring habitat.

In this study, we characterized the ecology of coralligenous rings by investigating the environmental properties and microbial community characteristics of the different parts of the rings. **Our objectives are:**

- To describe the environmental properties of the different parts of the rings, including the biochemical composition of organic matter and grain size.
- To identify patterns in microbial abundances associated to the different parts of the rings.

MATERIALS & METHODS

At ca 120 m depth, sediment samples were collected from the core, halo, and crown of four different rings as well as from a control site outside the rings in summer 2021 (sites **G6-16** and **G6-19**, Fig. 2) and 2023 (**G6-44** and **G6-45**, Fig. 2). Two different areas were sampled: area NORD 2 (G6-16 and G6-44) and NORD 4 (G6-19 and G6-45).

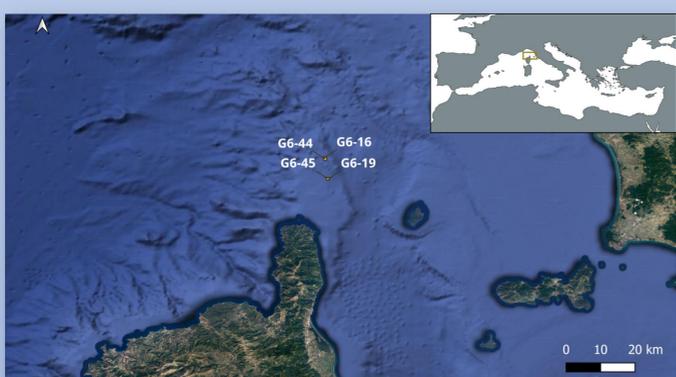


Figure 2: Sampling sites of the four studied coralligenous rings.

Laboratory analyses included organic matter and grain size characterization as well as viral and prokaryotic abundances² (Fig. 3).

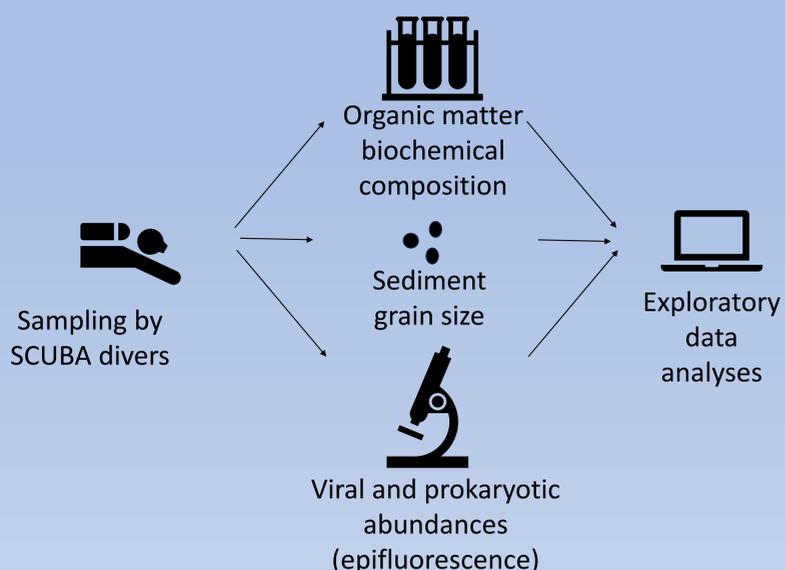


Figure 3: Scheme of sampling, laboratory and data analyses.

RESULTS

The organic matter and the photosynthetic pigment composition differ in the various parts of the rings and the control sites. In both years, controls and halos showed similar organic matter composition, while the 2021 coralligenous cores had a greater chlorophyll-a/phaeopigments ratio (Fig. 4).

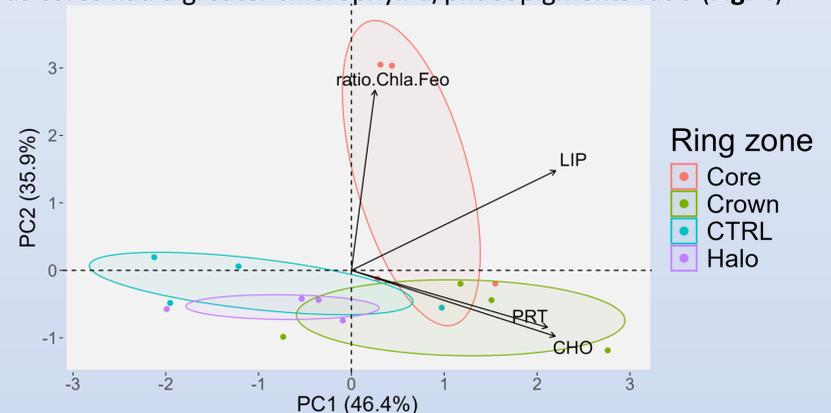


Figure 4: Principal component analysis (PCA) on environmental variables (Chla.Feo: ratio of chlorophyll-a and phaeopigment concentrations; LIP: lipids; PRT: proteins; CHO: carbohydrates concentrations; CTRL: control).

As expected, grain size is coarser in the cores of the rings (Fig. 5).

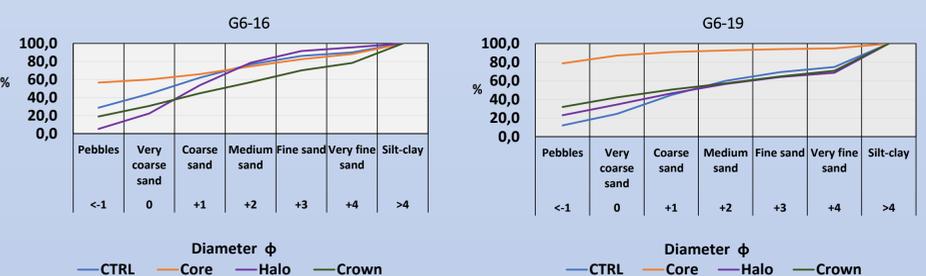


Figure 5: Grain size from the different parts of the rings.

Viral and prokaryotic abundances and biomasses showed similar patterns in 2021, with cores characterized by greater abundances (Fig. 6). In 2023, prokaryotic abundances of the G6-44 site also showed similar patterns to the 2021 ones.

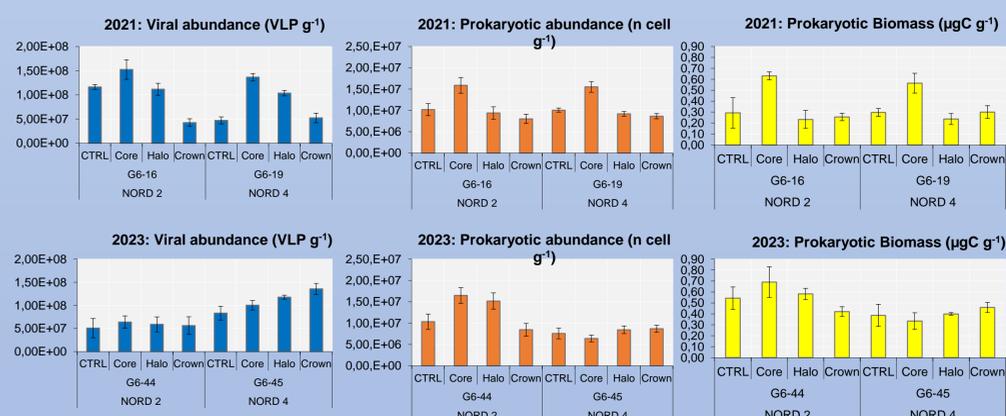


Figure 6: Viral and prokaryotic abundances with estimated prokaryotic biomass.

DISCUSSION

In our study, we highlighted different patterns in environmental properties and microbial communities of the coralligenous rings. Further analyses will include the study of biodiversity in the different parts of the rings and how the microbial metabolism might influence it.

REFERENCES

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2. Danovaro. *Methods for the study of deep-sea sediments, their functioning and biodiversity*, 1st Edition (2009).

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