LIFE HIDDEN IN ROCKS –

BIODIVERSITY OF MARINE ENDOLITHIC CYANOBACTERIA

Student Wiktoria Chudzik and mentors Ilona Złoch, Katarzyna Palińska

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Faculty of Oceanography and Geography,
University of Gdansk,
Al. Piłsudskiego 46, 81-378 Gdynia, Poland

w.chudzik.543@studms.ug.edu.pl, ilona.zloch@ug.edu.pl, katarzyna.palinska@ug.edu.pl

Marine phycoflora is a diverse group of photosynthetic organisms. Among the groups belonging to this ecological formation, there are also **cyanobacteria**. These prokaryotic organisms are common in aquatic ecosystems. These include taxa occupying environments that are inaccessible and difficult for other organisms to function in, being exposed to abiotic factors such as high or very low temperatures, high solar radiation, hypersalinity, or variability and high dynamics of tides in coastal zones. For this reason, they are called **extremophile taxa**. The organisms covered by this poster constitute a unique **group of extremophiles - endoliths**. These are organisms that **colonize rocks**. They have developed the **ability to dissolve and drill through rocks**, which allows them to colonize them and hide inside them, potentially as protection against environmental stress factors occurring in a given area. As organisms that penetrate rock fragments, they can also drill through skeletal fragments of living organisms. Their role in marine ecosystems, as well as an understanding of the **biodiversity and distribution of endolithic cyanobacterial taxa** in the rock profile, is one of the goals of the conducted research. Here we present microscopic insight of biodiversity of marine endoliths.

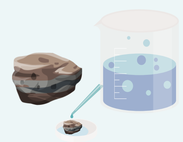
METHODOLOGY

SAMPLING

Rock fragments were collected from the coast in three different areas from Croatia (Fig. 1) and two from Sweden (Fig. 2).

Samples were collected across vertical profile of cliffs. The rock fragments were properly described and stored in a dry place for further analysis.

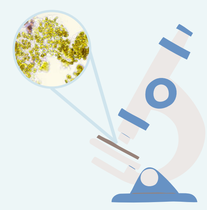
EXTRACTION



Rock fragments were separated into smaller fragments after photographic documentation.

Pieces measuring approximately 1cm x 1cm were placed in a buffer with a pH of approximately 5-6. After dissolving the stone, it was possible to collect the biofilm.

IDENTIFICATION



The material isolated from the stones was subjected to taxonomic identification using a light microscope. After identifying the organisms, the dominance in the samples was determined based on visual microscopic observation. 5 separated rock fragments from the starting material were analyzed for each level from one sampling area.

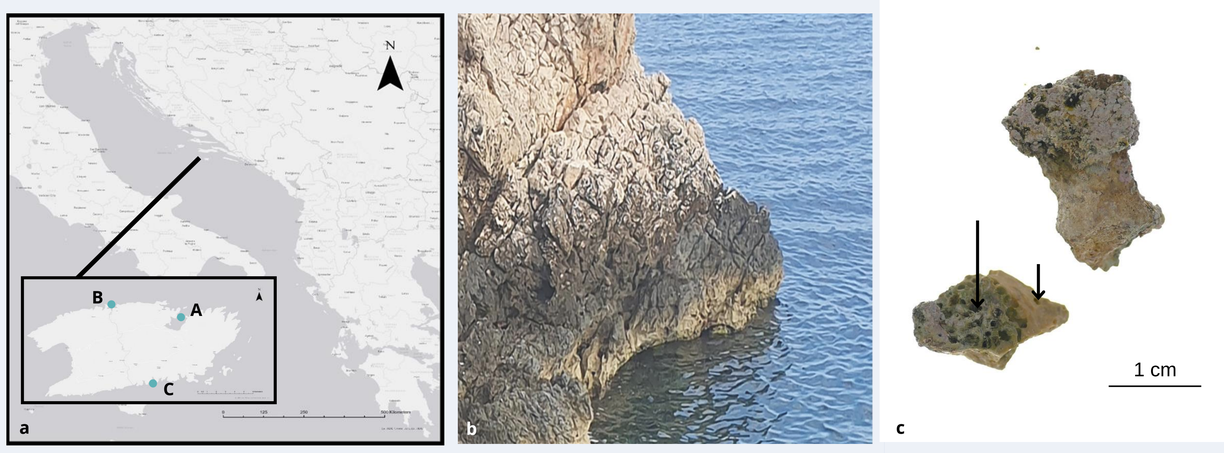


Fig. 1. a) Sampling places from Croatia: Island of Vis (ArcGIS Pro 2.8.0) **b)** cliff on the coast of Croatia, Island of Vis (Photo: K. Palińska) **c)** stone sample taken from the cliff from the underwater level (sub), visible rock porosity and holes.

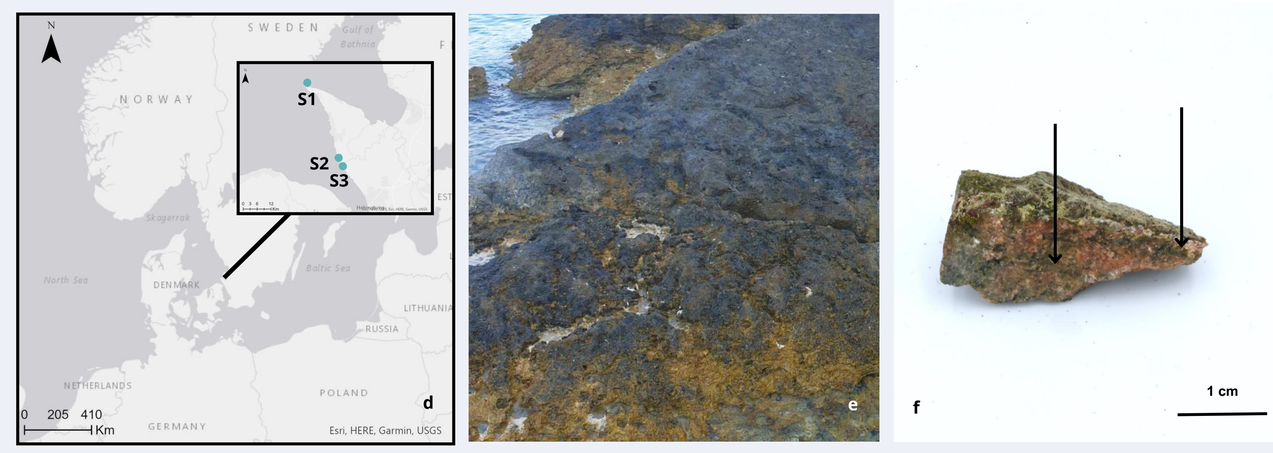
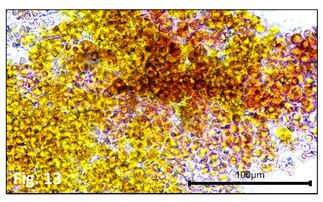


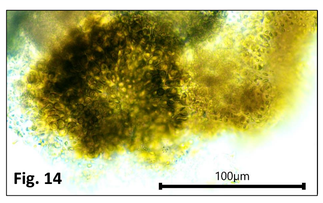
Fig. 2. d) Sampling place from Sweden: Viken and Moelle (ArcGIS Pro 2.8.0) **e)** the coast of Sweden from which samples were taken (Photo: K. Palińska) **f)** stone sample taken from a cliff (black-brown level) with visible characteristic bands of enodlithic organisms.

MICROSCOPY INSIGHT

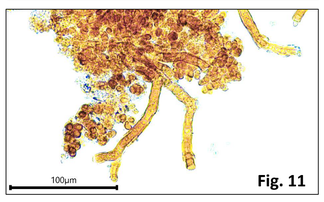
CROATIA

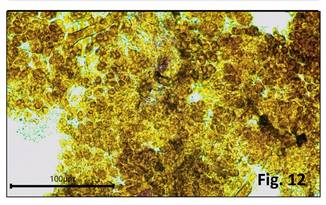
+ 4 level — rock pools



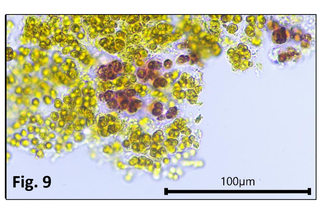


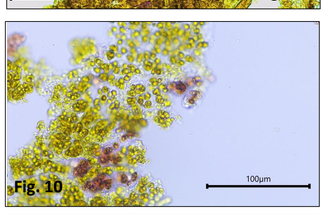
+ 3 level — top white



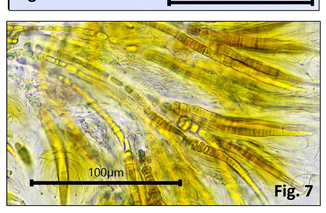


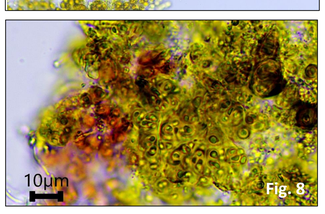
+ 2 level — grey



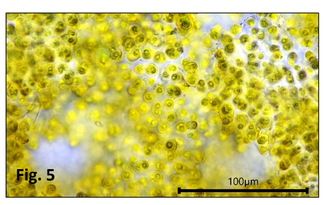


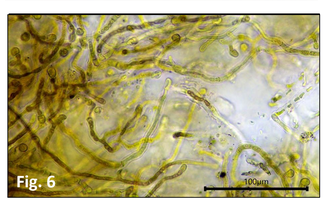
+ 1 level — black



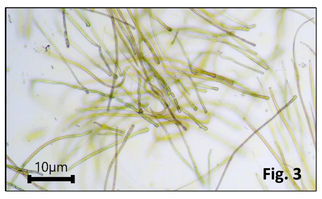


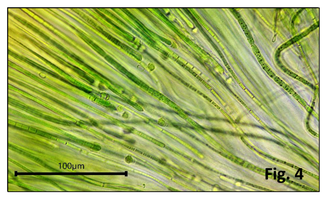
0 level — olive





-1 level — sub





Croatia

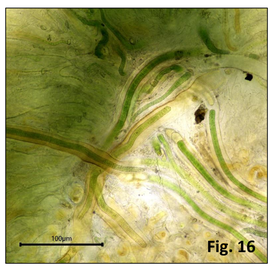
Based on microscopic observations, 12 taxa were identified in site A in Croatia. **Figures 3-14** present the taxa most common in the analyzed samples from every level in the vertical profile: ***Schizotrix* sp. (3), *Rivularia* sp. (4), *Hormatonema violacea-nigrum* (5, 8, 9, 10, 12, 13), *Mastigocoleous testarum* (6), *Calotrix* sp. (7), *Scytonema endoliticum* (11), Pleurocapsales (14).**
Also, a characteristic taxon identified in samples from Croatia is ***Kyrtutrix* sp**. The remaining identified endoliths included taxa such as **Chroccocales, *Hyella* sp., *Solentia* sp., *Stigonema* sp.**

Sweden

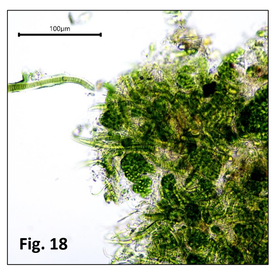
13 taxa were identified in samples taken from station S1 in Sweden. **Figures 15-26** present the taxa most common in the analyzed samples from every level in the profile: ***Scytonema endoliticum* (16, 25, 26), *Rivularia* sp. (15, 19, 20), *Calotrix* sp. (17, 18), *Schizotrix* sp. (18), *Hyella* sp. (18, 21, 22), *Hormatonema violacea-nigrum* (23, 24).**
Other identified taxa include **Chroccocales**, ***Kyrtutrix* sp., *Mastigocoleous testarum*, *Plectonema* sp., *Solentia* sp., Pleurocapsales.**

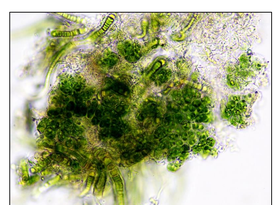
SWEDEN

SUB MERG



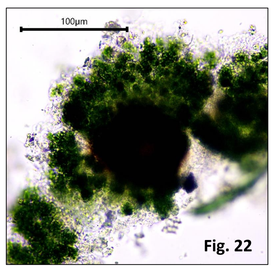
GREEN

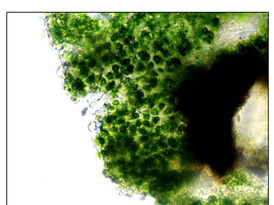




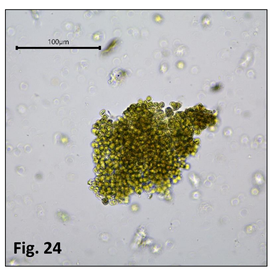
BROWN

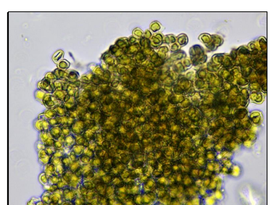
BLACK



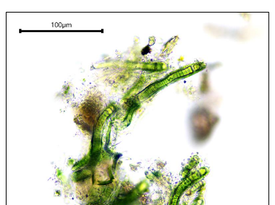


TOP





SUPRA



SUMMARY

- **The rocks of the coastal cliffs provide a habitat for organisms** that have adapted to colonize such an extreme niche.
- **The same endolithic taxa for the tropics**, were also found **in the cold regions of Sweden** e.g., *Callotrix* sp., *Hormathonema* sp., *Hyella* sp., *Kyrtuthrix* sp., *Mastigocoleus* sp., *Schizotrix* sp., *Scytonema* sp., *Solentia* sp.
- Changes in species composition and biodiversity are observed in the **vertical profile of cliffs in Croatia**. In the case of taxa from **Sweden**, the organisms form **patches** with characteristic colors depending on the species composition and dominants.

Parallel research and future plans include molecular analysis and examination of other areas, e.g. samples from the coast of Japan.

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