

Mi Ca₊₂-sa es su Ca₊₂-sa: På jakt etter dårlig kjente marin grønnalge-arter knytta til skjell.

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Marine green algae are common components of marine ecosystems but have been historically neglected. The proposed project, focusing on small microfilamentous marine green algae (MFGA) addresses a huge knowledge gap within Norway. Everyone has seen empty shells of mollusks with a green color, dead, and broken, but actually full of life. Calcareous organisms host a wide range of small (<0.5 cm), often concealed associate minute algae. Some species possessed the ability of growing into calcareous material others doesn't. These minute algae play a role in the cycling of biogenic elements and can be a major agent of carbonate bioerosion. Taxonomic work on MFGA is challenging due to their minute size and difficulty of finding and identifying them in the field, and the lack of defining morphological features. The existence of cryptic diversity (where species cannot be distinguished based on morphology) further complicates the taxonomy of this group. Additionally, different species are often found cohabiting, necessitating isolation and cultivation for species identification. As a result, these algae have largely gone unnoticed, creating a significant gap in taxonomic and biogeographic knowledge, not only in Norway, but also worldwide. The relatively low number of species confirmed for the Norwegian flora is considered a consequence of limited collections made rather than their absence from the flora. There has also been little focus on DNA barcoding and mapping the total diversity of green algae in Norway. Our preliminary data on shell associated MFGA, based on limited surveys and a total of 11 strains, shows 5 new species for science, and in addition 2 species which need to be added to the Norwegian flora. Furthermore, we have produced high-throughput sequencing data for 7 of these strains, and organelle genomes could readily be obtained from the data.

In this MSc thesis project, you will learn to isolate and cultivate small filamentous green algae. From going out to the shore, selecting host material, prepare nutrient media, to isolate and clean the samples, how to characterize your strains, until preservation for long deposition in collections.

It helps if you have experience with botany. You need basic knowledge on microbiology, how to use the microscope and how to work sterile and keep cultures clean. You will need a lot of patience, a firm hand, and you must know how to swim as samples are taken from the shore. In this master thesis project, you will help us to maintain our algae collection at NMBU.

You will learn on taxonomy of algae and cultivation techniques which are standard for many algae. You will improve your microbiological work skills, and you will have fun with algae. Spoiler alert: we will increase the biodiversity of Norway.

“Mi Ca₊₂-sa es su Ca₊₂-sa”: hunting poorly known marine green algal species associated with shells.

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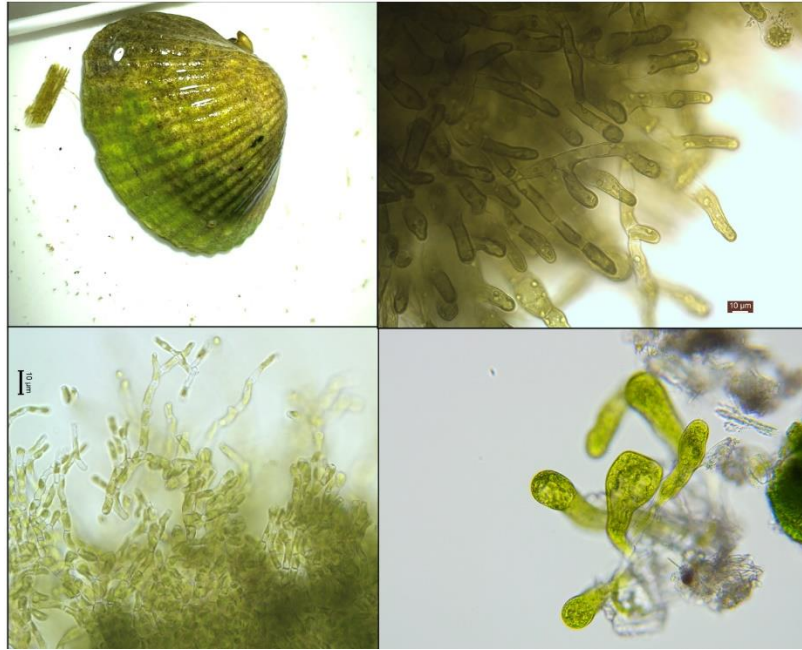


Figure 1. An empty shell full of life, and three pictures of different species successfully isolated from it and growing under cultivation. Species present very simple morphologies.

Related literature

Darienko, T. & T. Pröschold. 2017. Toward a monograph of non-marine Ulvophyceae using an integrative approach. Molecular phylogeny and systematics of terrestrial Ulvophyceae II. *Phytotaxa* 324(1):1-41.

Gunnarsson, K. & R. Nielsen. 2016. Culture and field studies of Ulvellaceae and other microfilamentous green seaweeds in subarctic and arctic waters around Iceland. *Nova Hedwigia* 103:17–46.

Kylin H. 1935. Über einige kalkbohrende Chlorophyteen. *Kungl. Fysiografiska Sällskapet i Lund Förhandlingar*. Lund 5(19): 1–19.

Nielsen R. 1972. A study of the shell-boring marine algae around the Danish island Læsø. *Botanisk Tidsskrift* 67: 245–269.

Nielsen R. 1987. Marine algae within calcareous shells from New Zealand. *New Zealand Journal of Botany* 25: 425–438.

Nielsen, R., G. Petersen, O. Seberg, N. Daugbjerg, C.J. O’Kelly & B. Wysor. 2013. Revision of the genus *Ulvella* (Ulvellaceae, Ulvophyceae) based on morphology and *tufA* gene sequences of species in culture, with *Acrochaete* and *Pringsheimiella* placed in synonymy. *Phycologia* 52:37–56.

Rinkel, B.E., P. Hayes, C. Gueidan & J. Brodie. 2012. A molecular phylogeny of *Acrochaete* and other endophytic green algae (Ulvales, Chlorophyta). *J. Phycol.* 48(4):1020–1027.