

Ecophysiology, growth and reproduction of *Umbilicaria virginis*, a nival lichen

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1. Project description

Lichens are poikilohydric, symbiotic organisms. They are physiologically active when hydrated, but they can survive desiccation in an anabiotic state and reactivate within seconds after rehydration. At the east ridge of Jungfrau we will permanently monitor physiological activity of the symbionts, measure growth rates of selected individuals and document the formation, development and functionality of reproductive structures. The experimental site is shown in Figure 1.



Figure 1. Experimental site at the east ridge of Jungfrau just above the former Swisscom building.

Pulse-amplitude modulated chlorophyll fluorescence and continuous microclimatic measurements will monitor in-situ the physiological activity of the lichen. The project started in August 2021 and the plan was to start with the measurements in September 2021. In August we have set-up the working place together with a local Mountain guide who mounted a fixed rope to allow for safe working conditions during the establishment of the measuring device. We have also collected selected individuals of *U. virginis* and *U. decussata* at the east ridge of Jungfrau and their CO₂ fixation and respiration is currently being measured in the Lab of Prof. Leopoldo García Sancho, Universidad Complutense, Madrid, Spain. Unfortunately, the planned set-up of the chlorophyll fluorescence and the continuous microclimatic measurements had to be postponed to 2022 because in mid-September there was already too much snow at the study site. We have now planned to set up the measuring device in July 2022.

Furthermore, we have collected and identified lichen species that co-exist with *U. virginis* at around 3800 m a.s.l. at the east ridge of Jungfrau. Lichen-forming fungi that grow at this altitude were all found to be associated with green-algal photobionts. Typical species include *Lecanora orbicularis*, *Psorinia conglomerata*, *Umbilicaria cylindrica*, *U. virginis* and *U. decussata* (Figure 2).

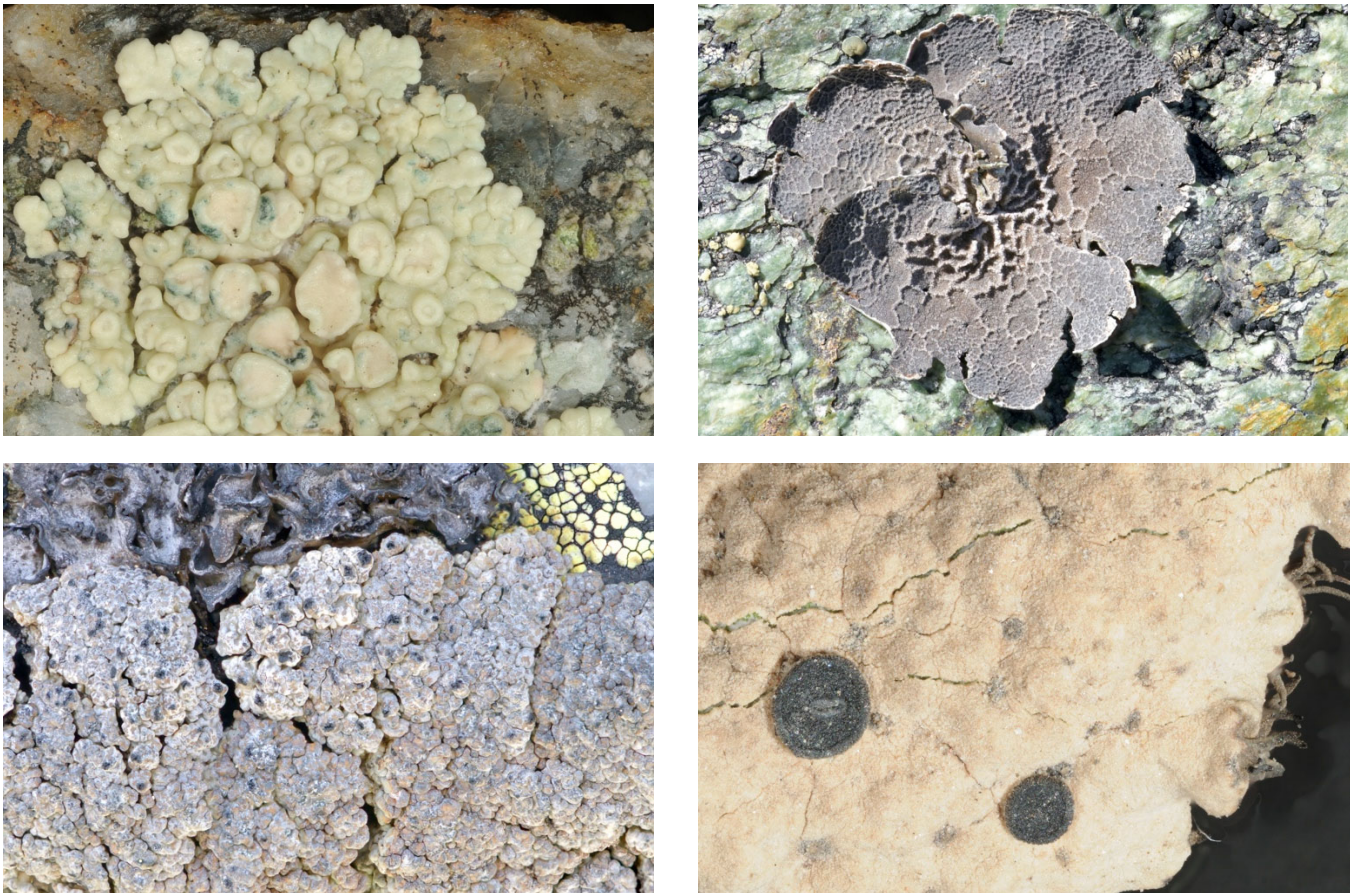


Figure 2. Selected lichens found at the east ridge of Jungfrau. *Lecanora orbicularis* (upper left), *Psorinia conglomerate* (lower left), *Umbilicaria decussata* (upper right) and *U. virginis* (lower right).

In addition, cyanobacterial communities were collected from the east ridge and further down at several rock surfaces at Jungfrauoch and the normal ascent to Mönch. The specimens collected are currently being cultivated, their cyanotoxin-producing genes analysed and their DNA be sequenced during 2022.

Internet data bases

<https://www.wsl.ch/en/index.html>

<https://www.wsl.ch/de/ueber-die-wsl/programme-und-initiativen/forschungsinitiative-blue-green-biodiversity/blue-green-cyanobacteria-diversity-toxins-and-alpine-tourism.html>

Collaborating partners / networks

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