

Molecular diversity of Arctic and Antarctic mat-forming Zygnematophyceae

Martina Pichrtová, Jana Kulichová, David Ryšánek & Yvonne Němcová



Department of Botany, Faculty of Science, Charles University in Prague, Prague, Czech Republic
e-mail: martina.pichrtova@natur.cuni.cz

Background

Filamentous Zygnematophyceae (conjugating green algae) typically form extensive mats in polar hydro-terrestrial habitats, such as snow-fed streams and shallow pools. The taxonomy of the group is based on the morphology of zygospores, resistant zygotes. However, sexual reproduction in *Zygnema* spp. is very rare in the Arctic and Antarctic and, therefore, the diversity of this group remained unknown and investigations based on molecular data were urgently needed.

Results

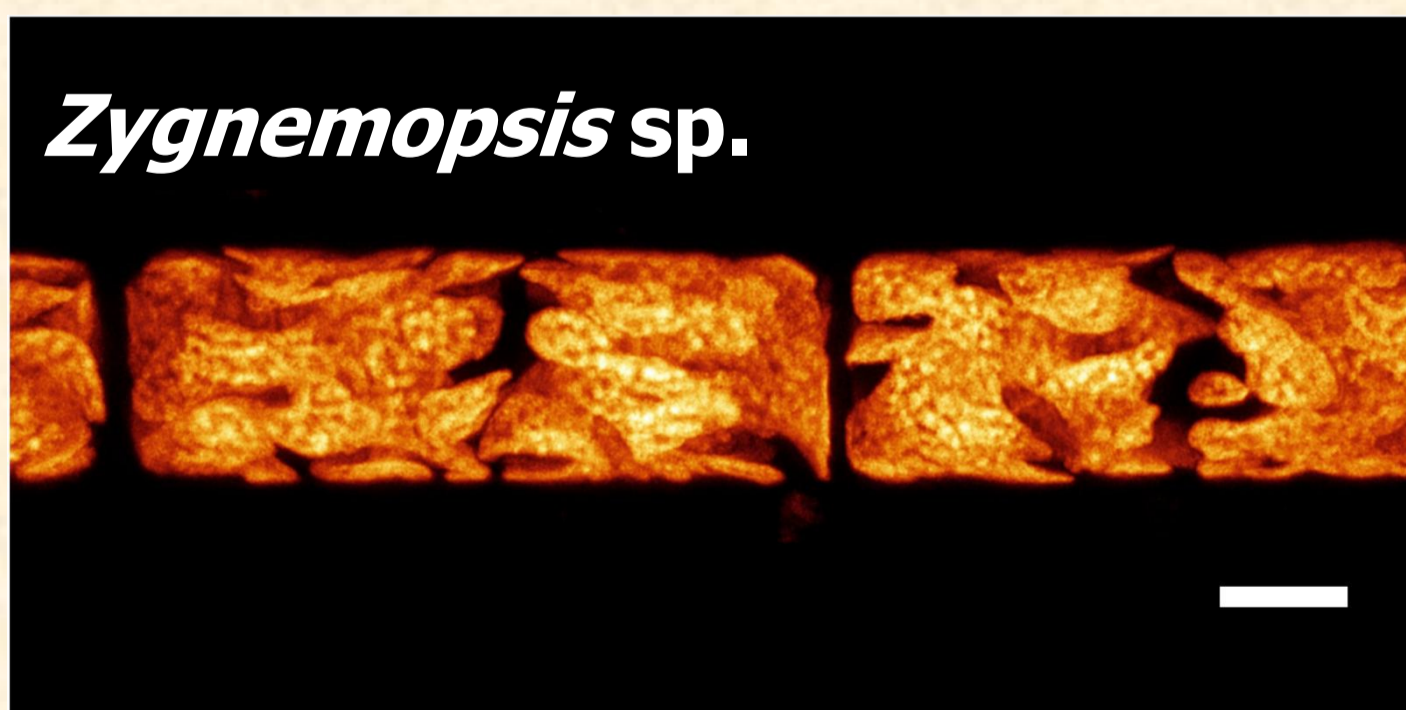
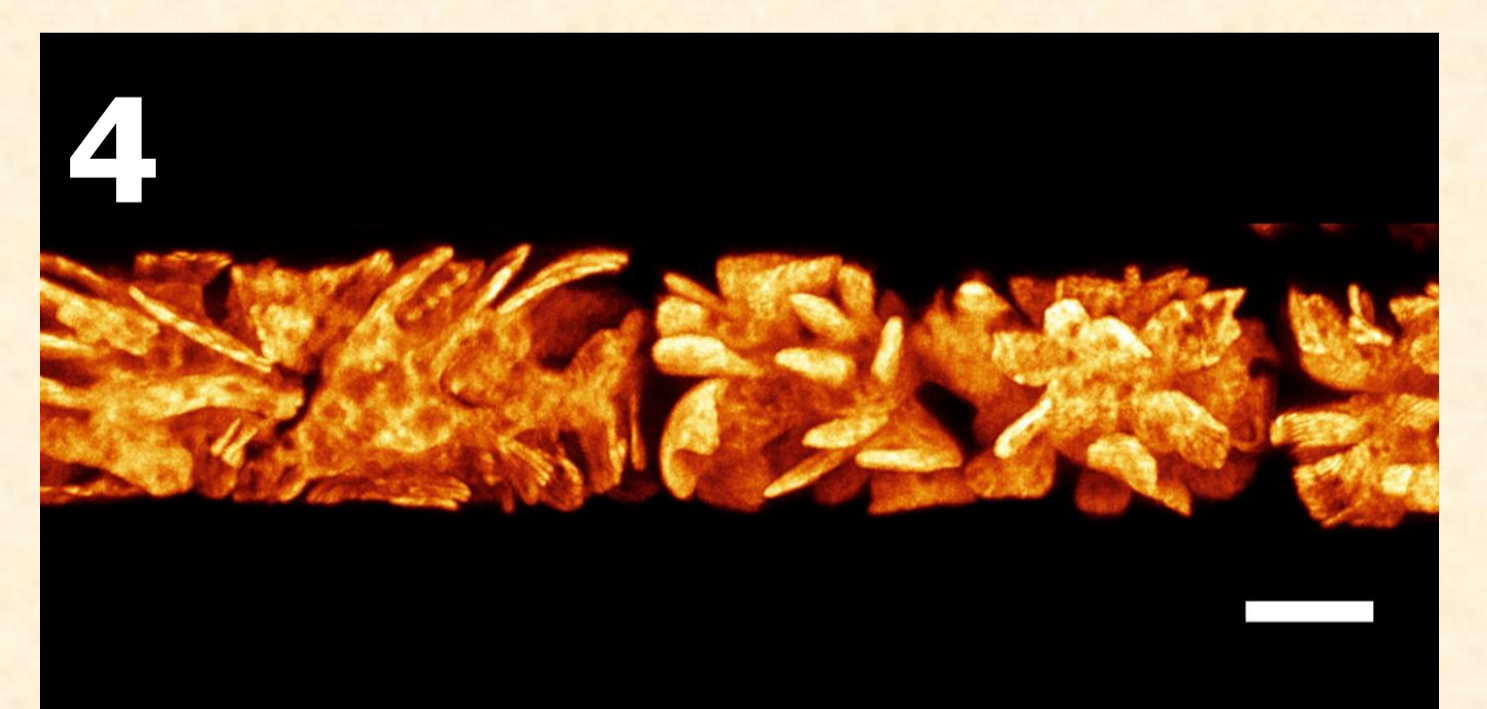
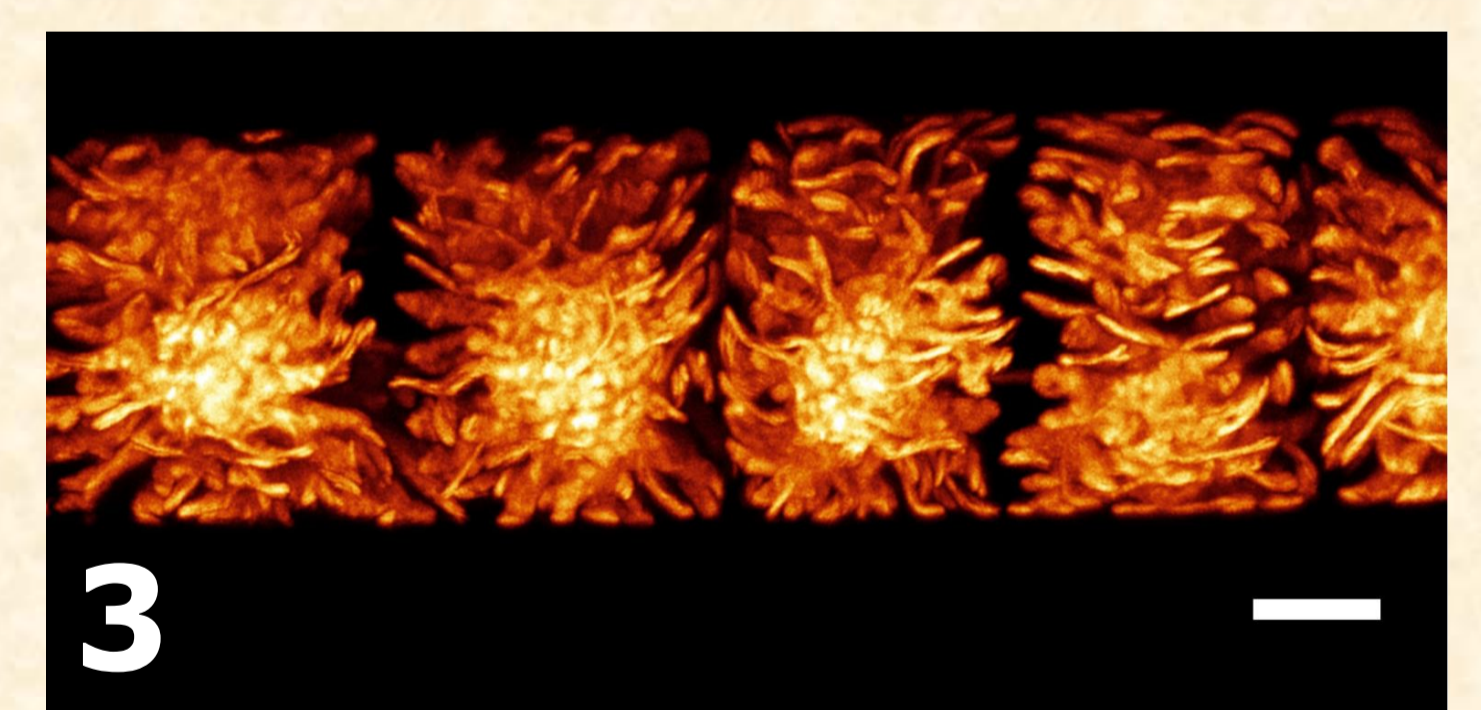
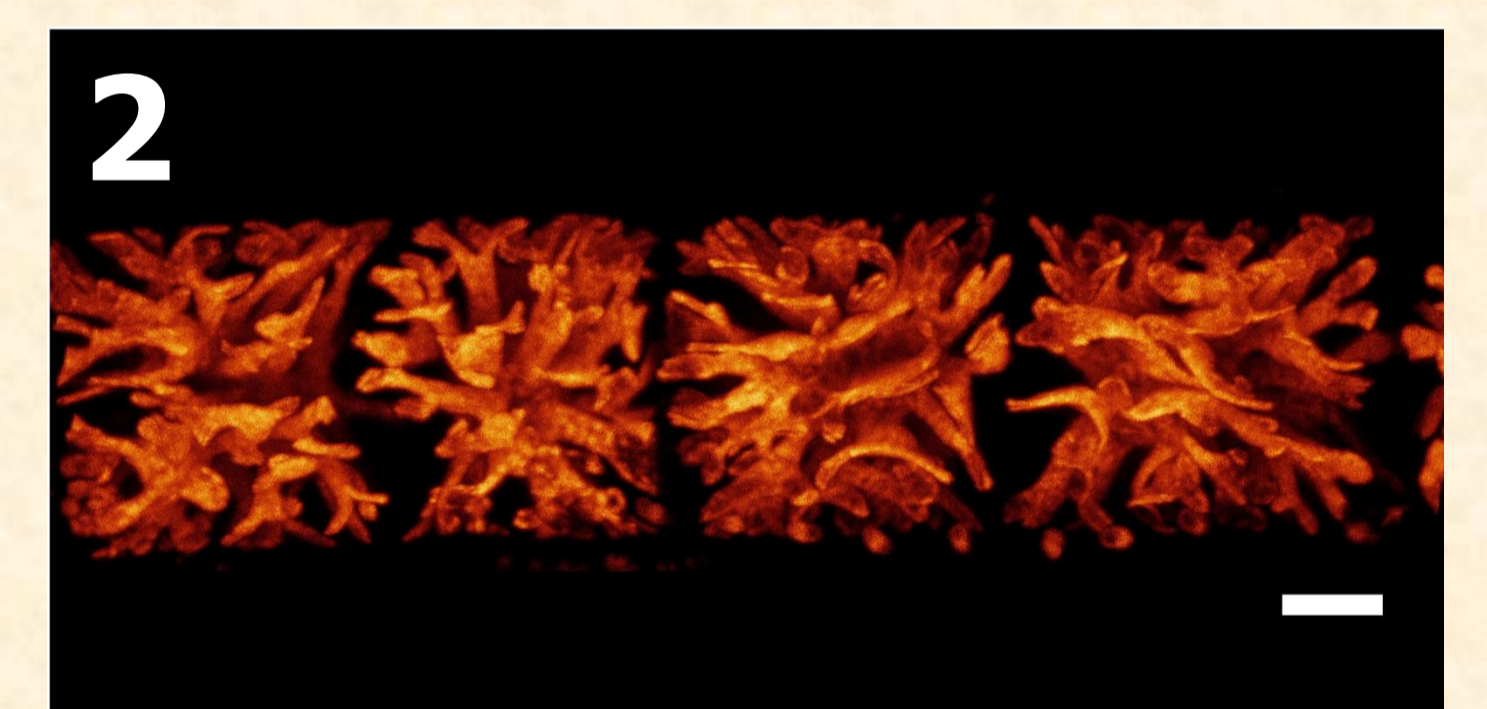
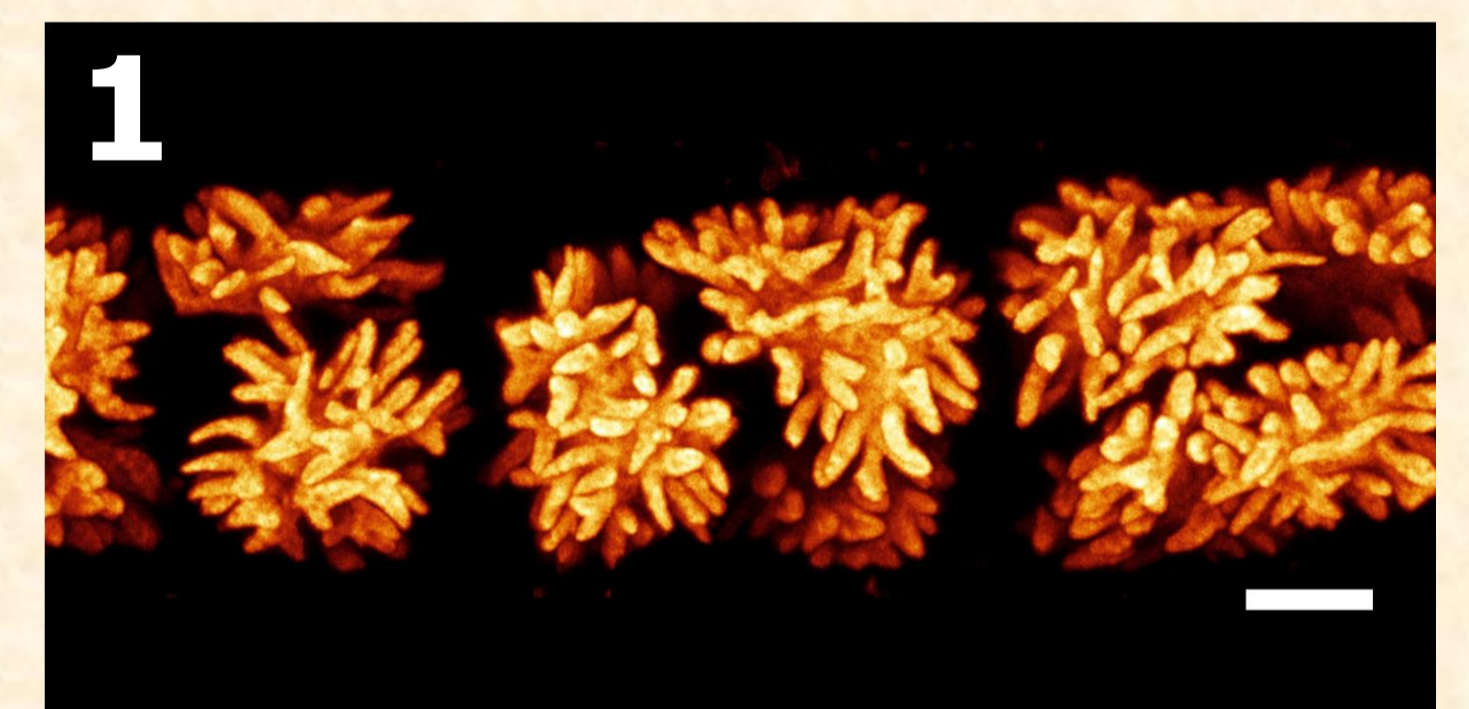
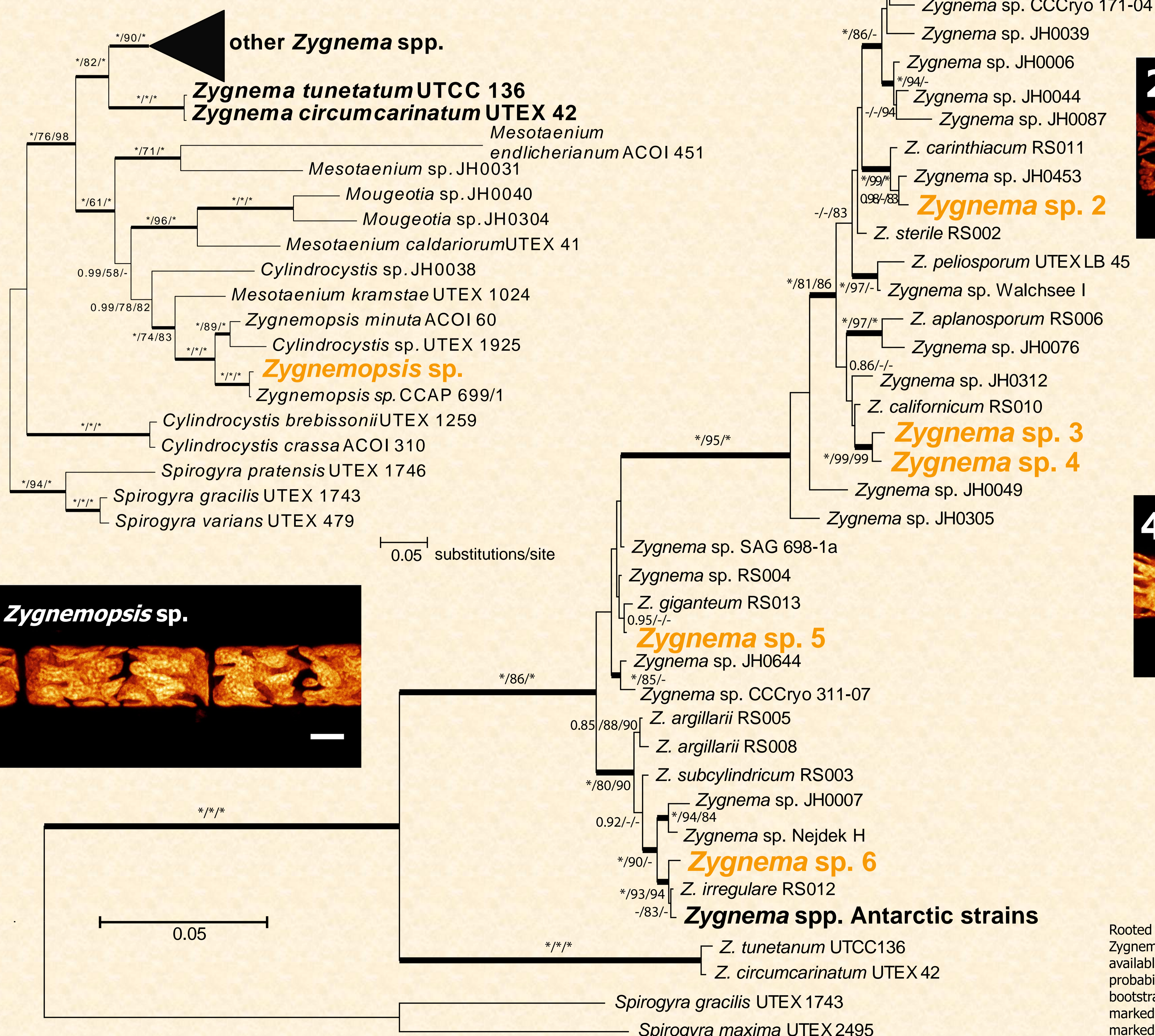
Almost 100 *Zygnema* sp. strains were isolated from various sites on Svalbard (High Arctic) or obtained from culture collections. Phylogenetic analyses based on the chloroplast marker *rbcL* revealed an unexpectedly high diversity within the samples collected on Svalbard: 6 different *Zygnema* spp. were found that belong to separate lineages within the genus. In addition, one *Zygnemopsis* sp. was also identified. Its vegetative morphology is similar to *Zygnema* sp., but the two genera are only distantly related. We also sequenced all four Antarctic *Zygnema* sp. strains available in culture collections - they all share identical *rbcL* sequence. Finally, confocal laser scanning microscopy was applied to characterize individual lineages based on the morphology of their star-shaped chloroplasts.



Sampling area around Billefjorden, Central Svalbard



Zygnema sp. hydro-terrestrial mat near Pyramiden



Rooted Bayesian trees of *Zygnema* strains and some closely related Zygnematales based on own and all other GenBank *rbcL* sequences available. Values at the branches indicate MrBayes posterior probabilities, maximum likelihood bootstrap and maximum parsimony bootstrap values. Values of BI PP = 1.00 and ML & MP BS = 100 are marked with asterisk, values of BI PP < 0.8 and ML & MP BS < 50 are marked with dash. Branches with BI PP = 1.00 are thickened; Arctic strains are shown in colour.