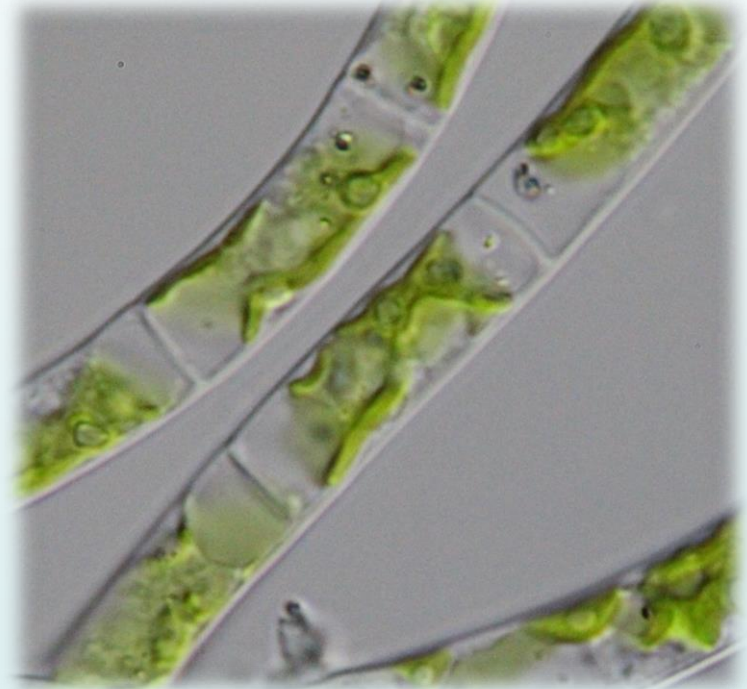
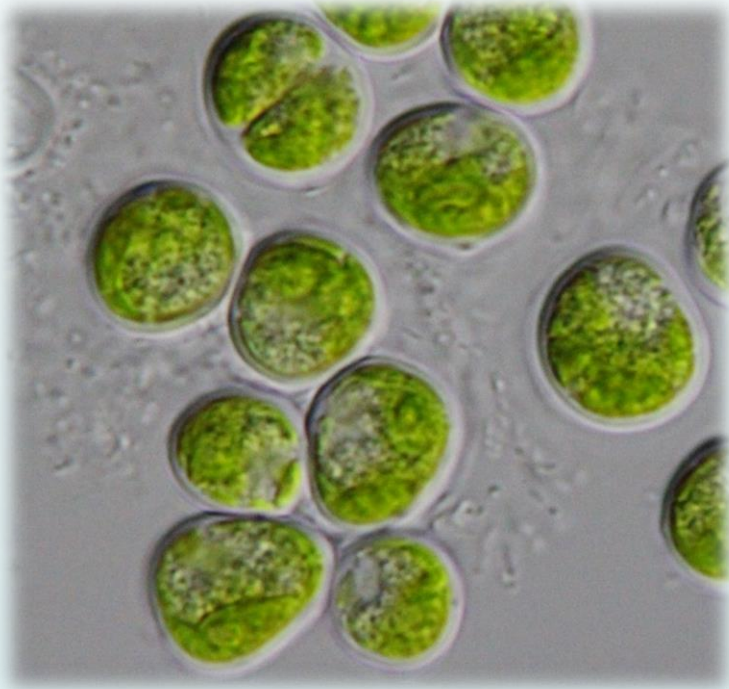


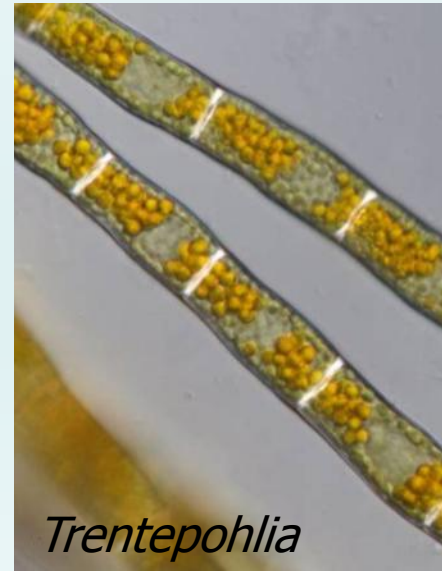
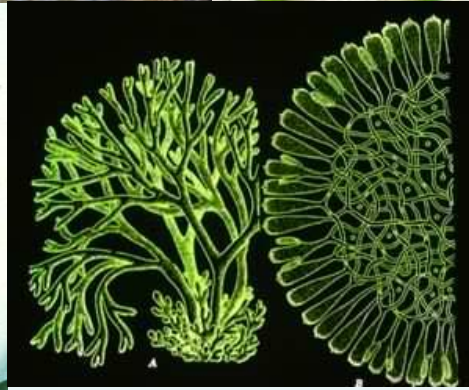
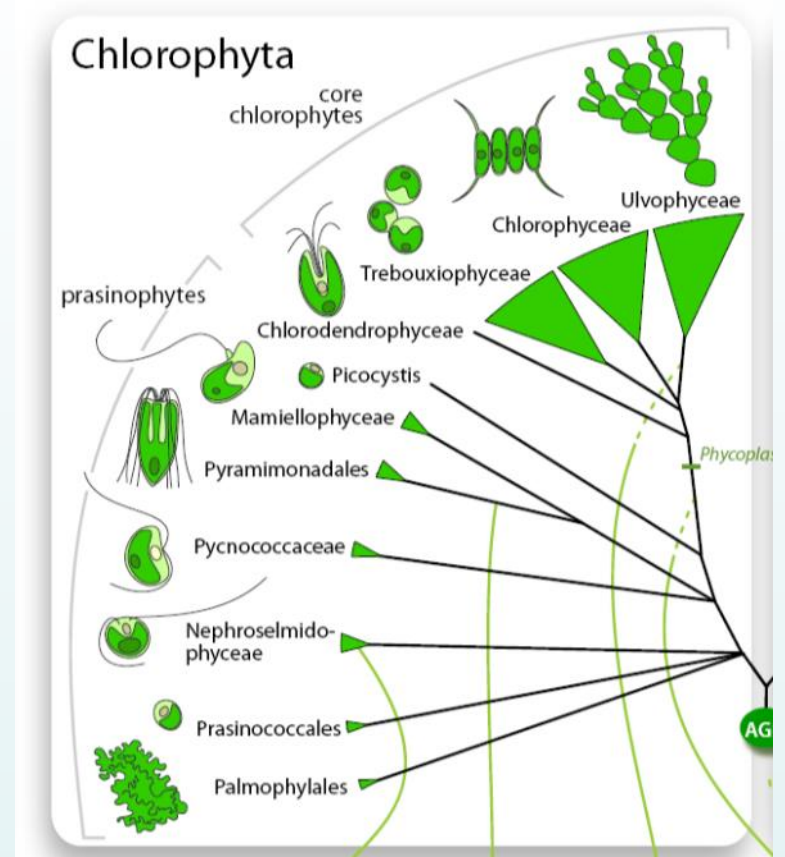
Molecular evolution and taxonomy of freshwater and terrestrial Ulvophyceae



Pavel Škaloud, Fabio Rindi, Christian Boedeker, Frederik Leliaert, Michala Klimešová,
Veronica Malavasi, Alena Lukešová

Chlorophyta, Ulvophyceae

- usually macroscopic organisms
- prevalently marine algae

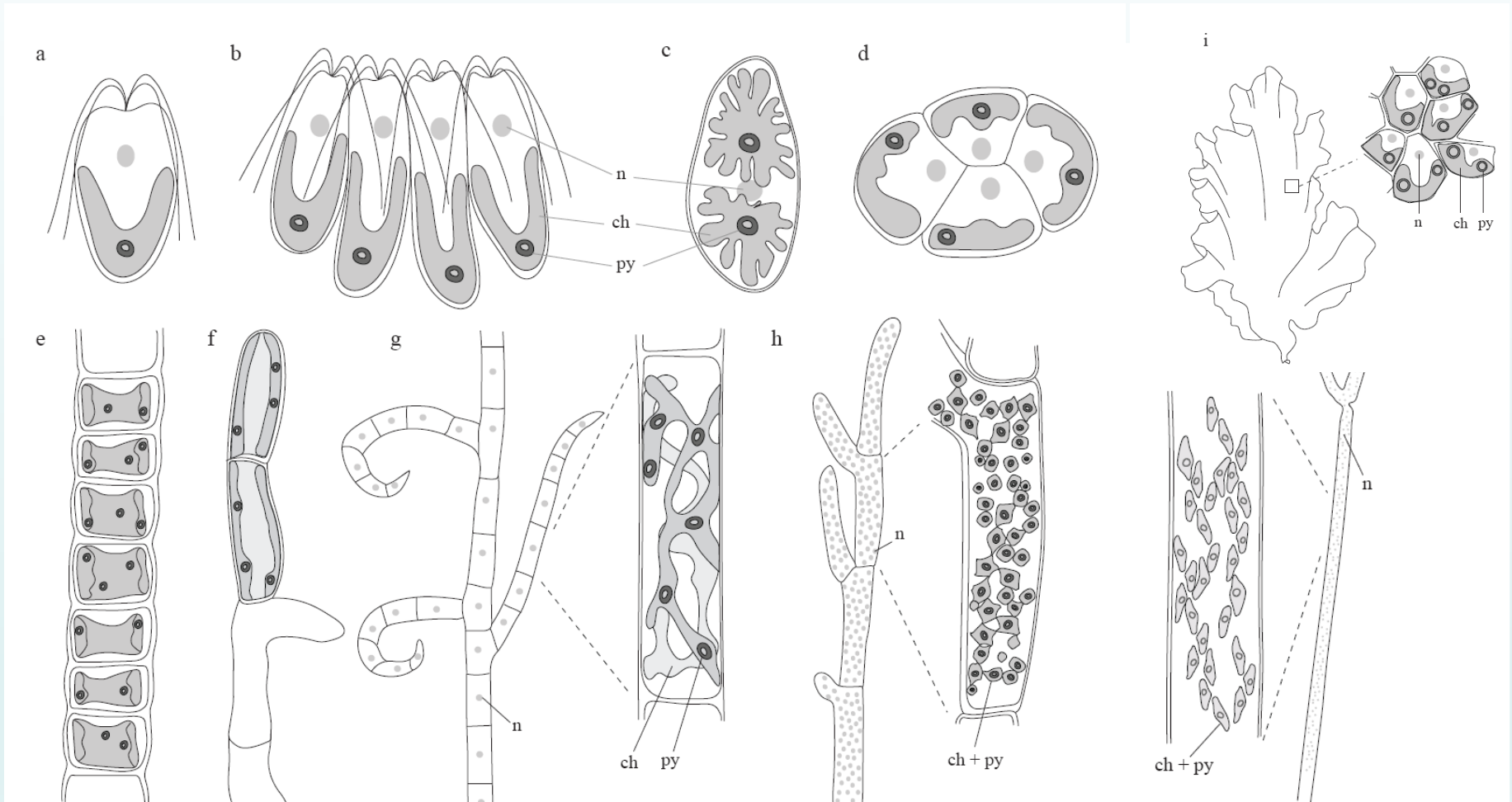


Ulva

Codium

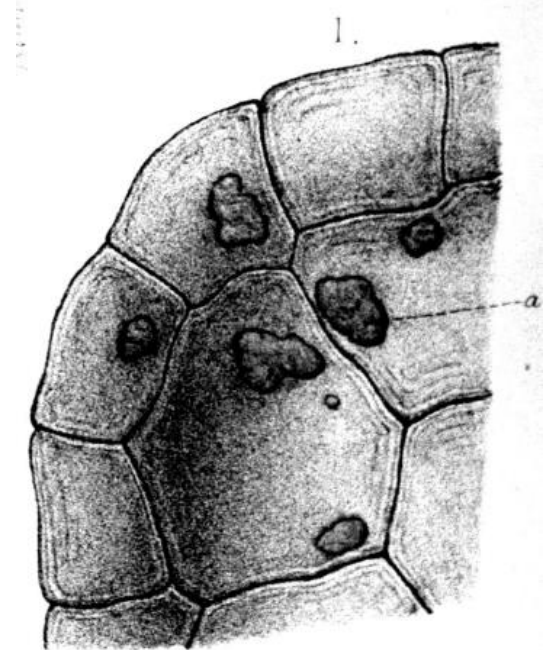
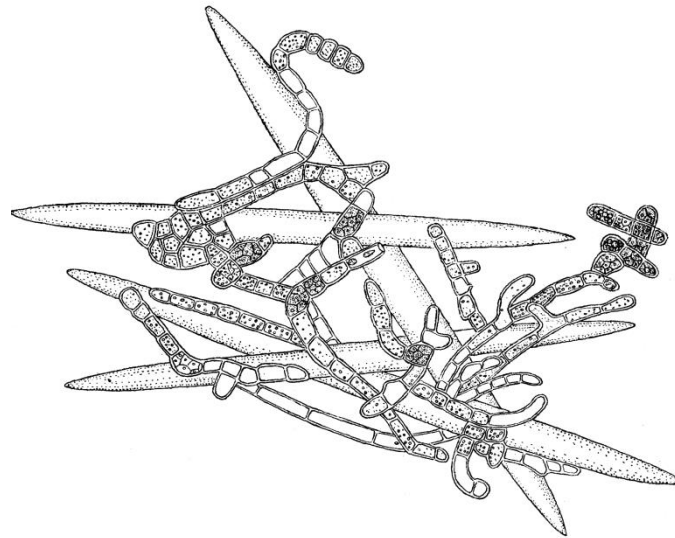
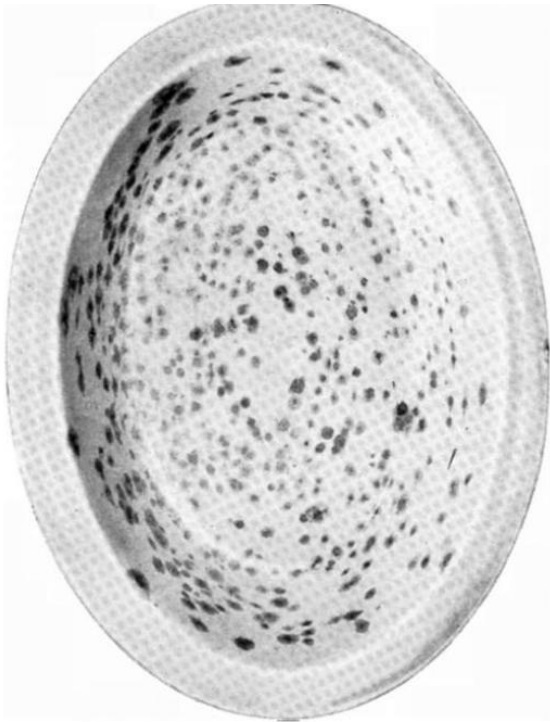
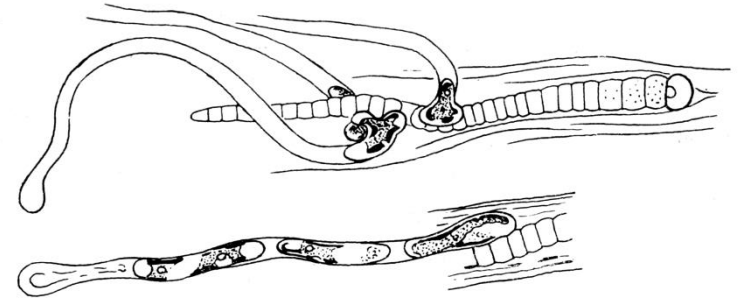
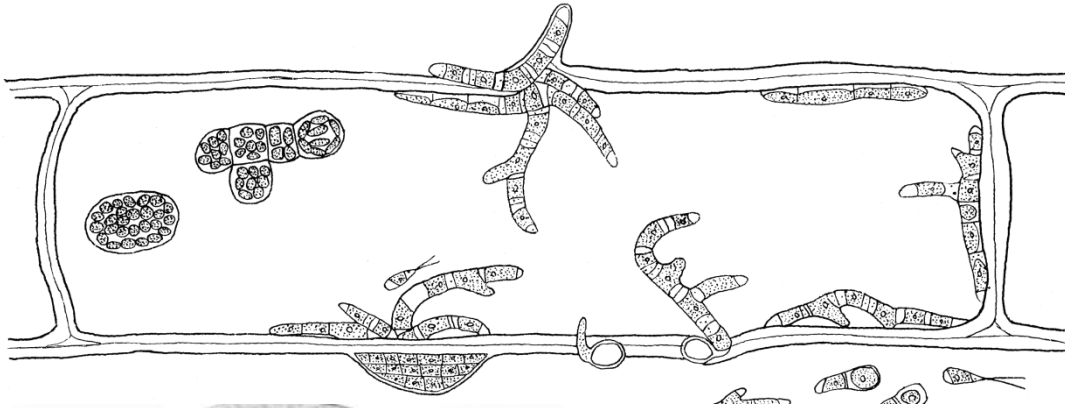
Trentepohlia

Ulvophyceae – thallus types

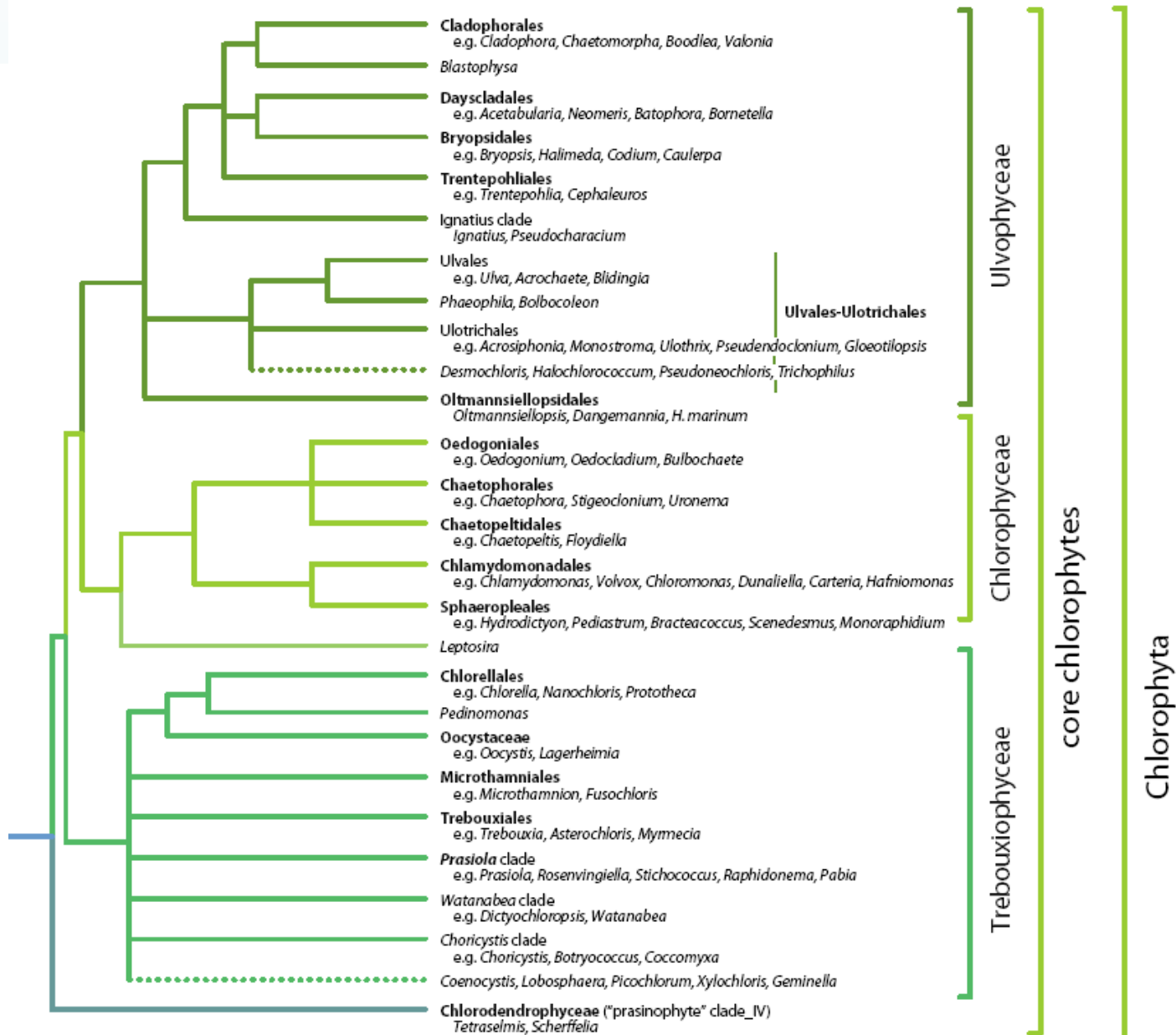


Ulvophyceae – various ecological habitats

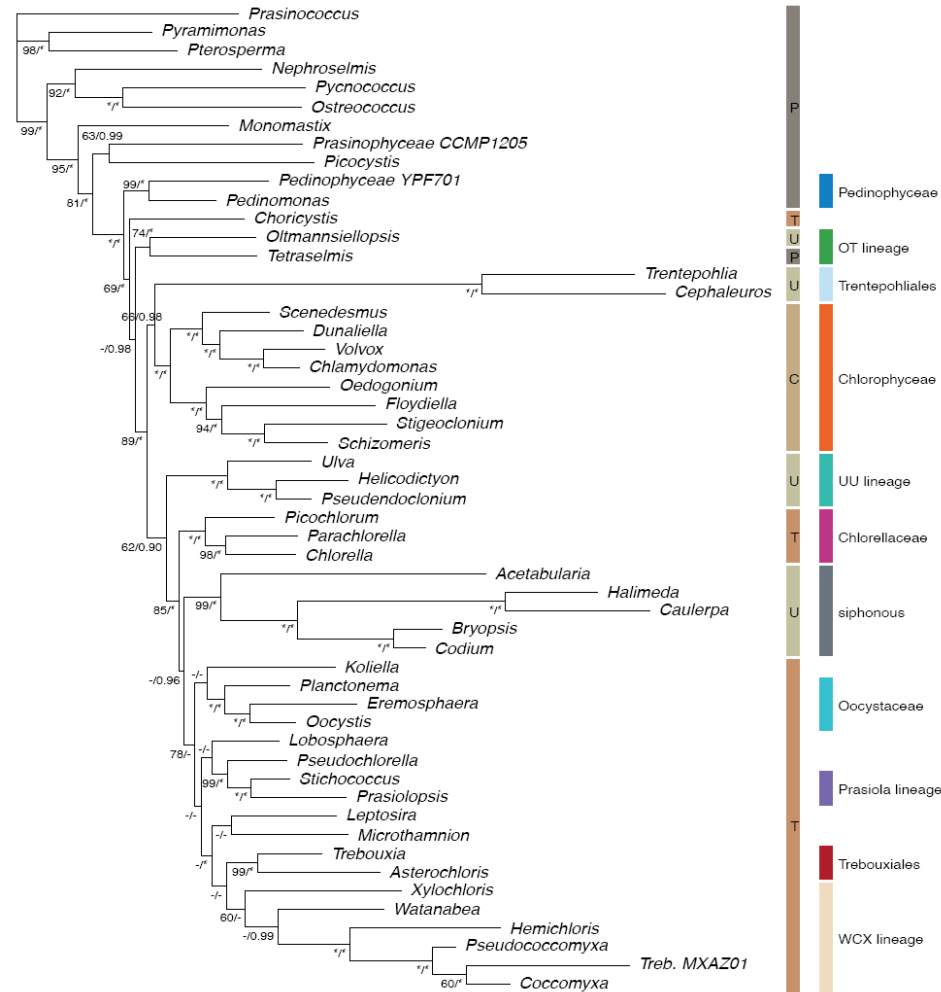
- Marine, brackish, freshwater, terrestrial, epiphytic or endophytic on algae, endozoic in sponges, epizoic on turtles, ...



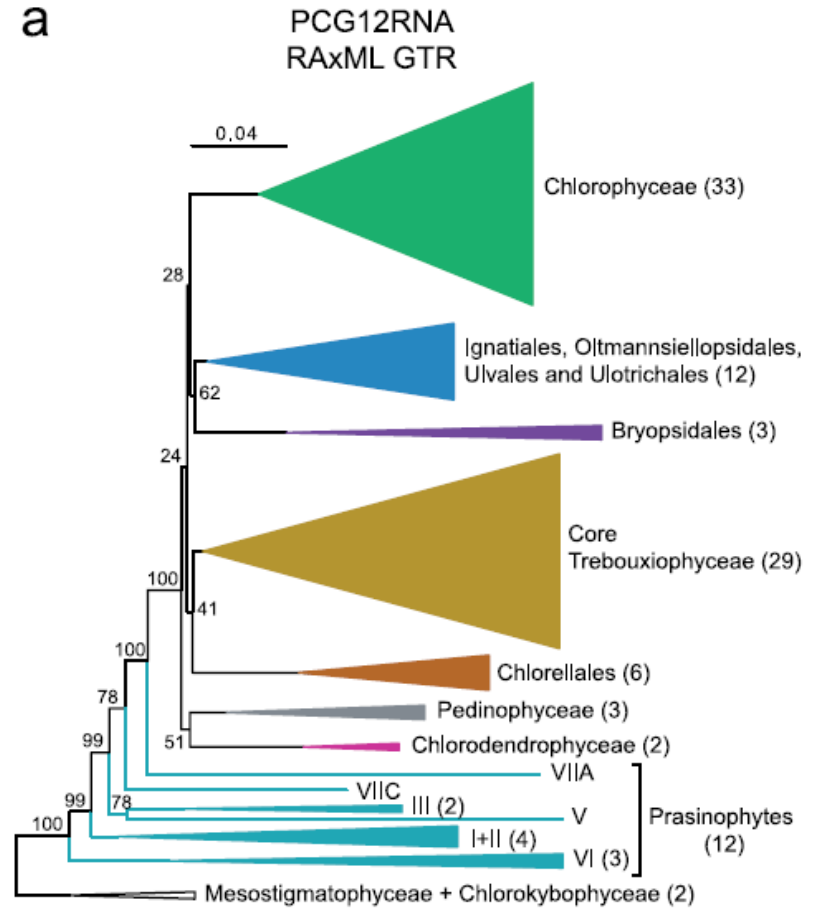
Ulvophyceae – phylogeny



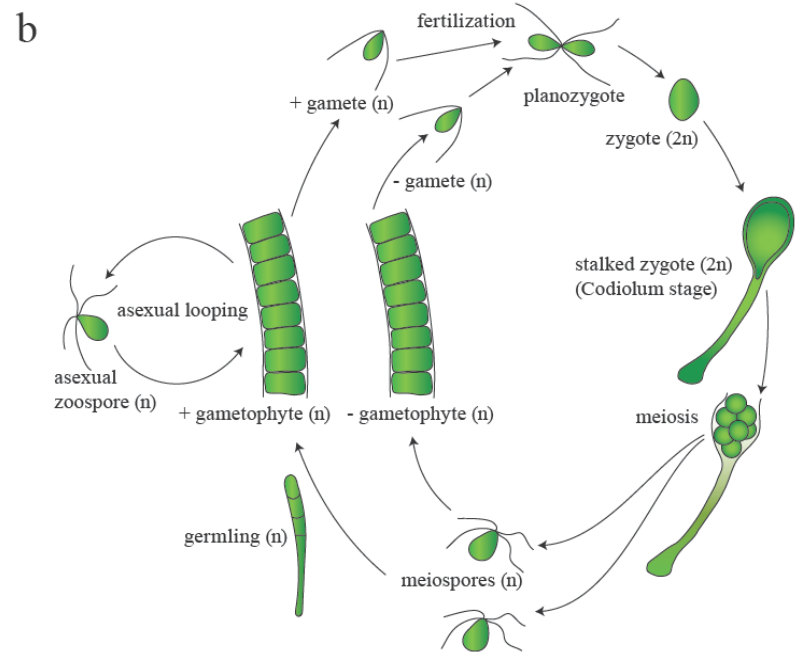
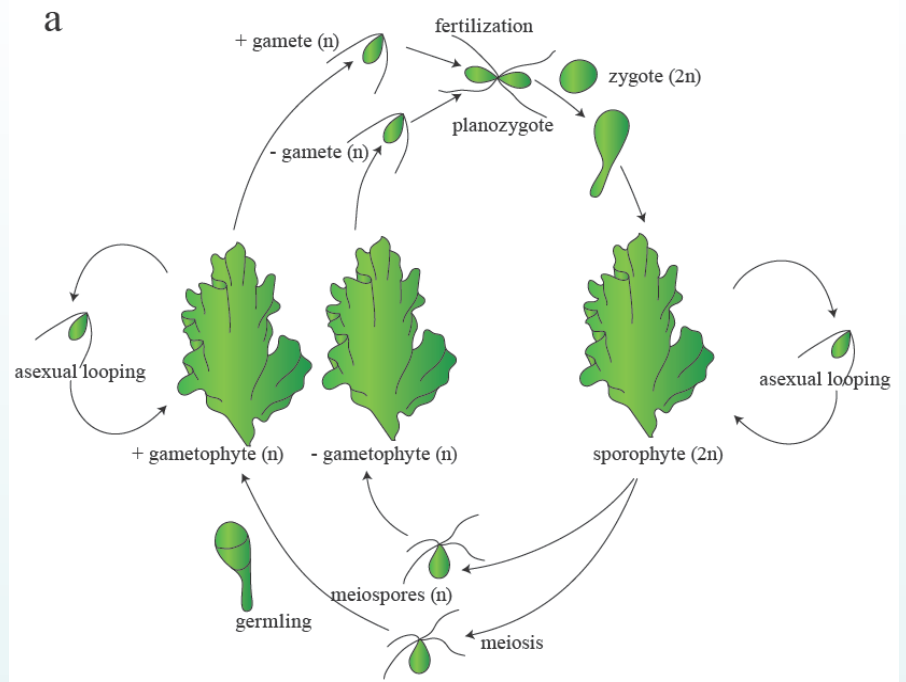
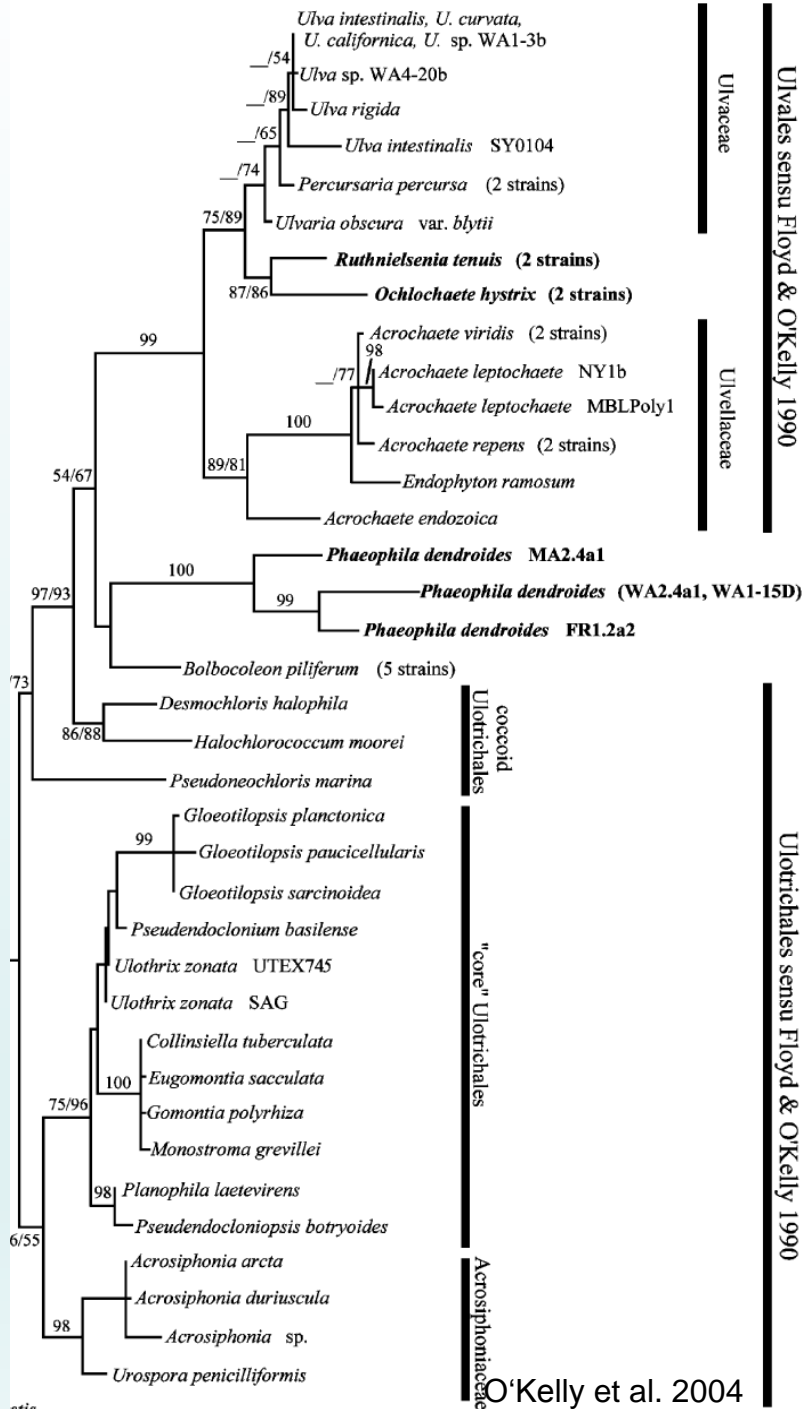
Ulvophyceae – phylogeny

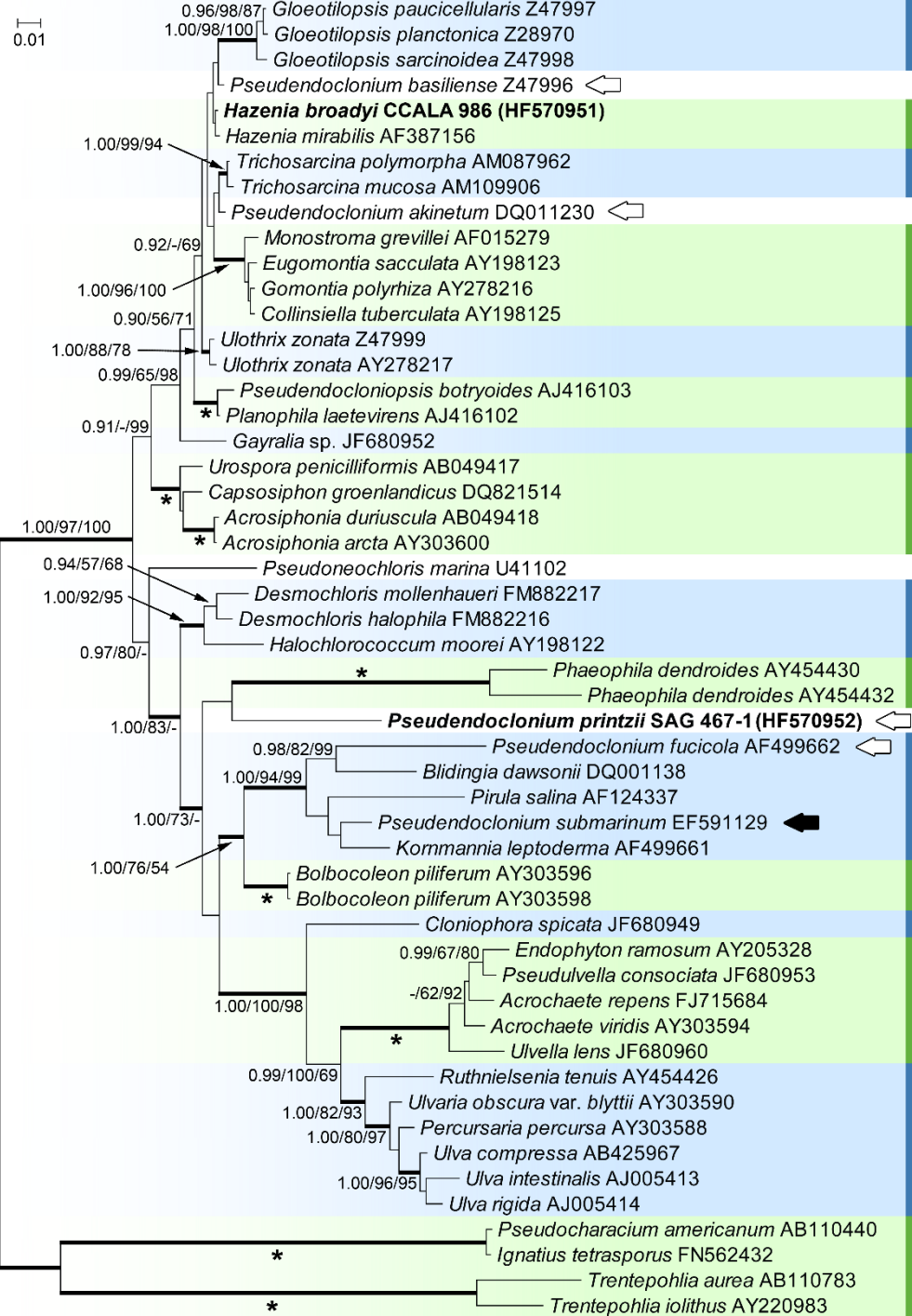


Fučíková et al. 2014



Turmel et al. 2017





Gomontiaceae

Hazenia

Monostromataceae

Ulotrichaceae

Gayraliaceae

Acrosiphoniaceae

Phaeophilaceae

Kornmanniaceae

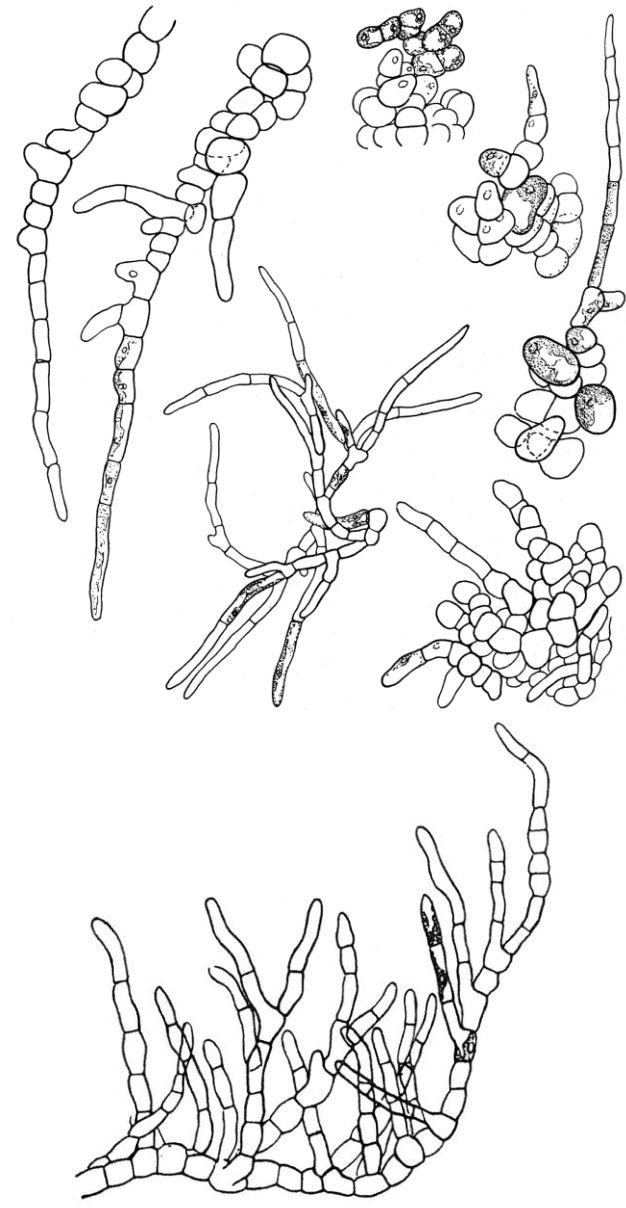
Bolbocoleonaceae

Cloniophoraceae

Ulvellaceae

Ulvaceae

outgroup



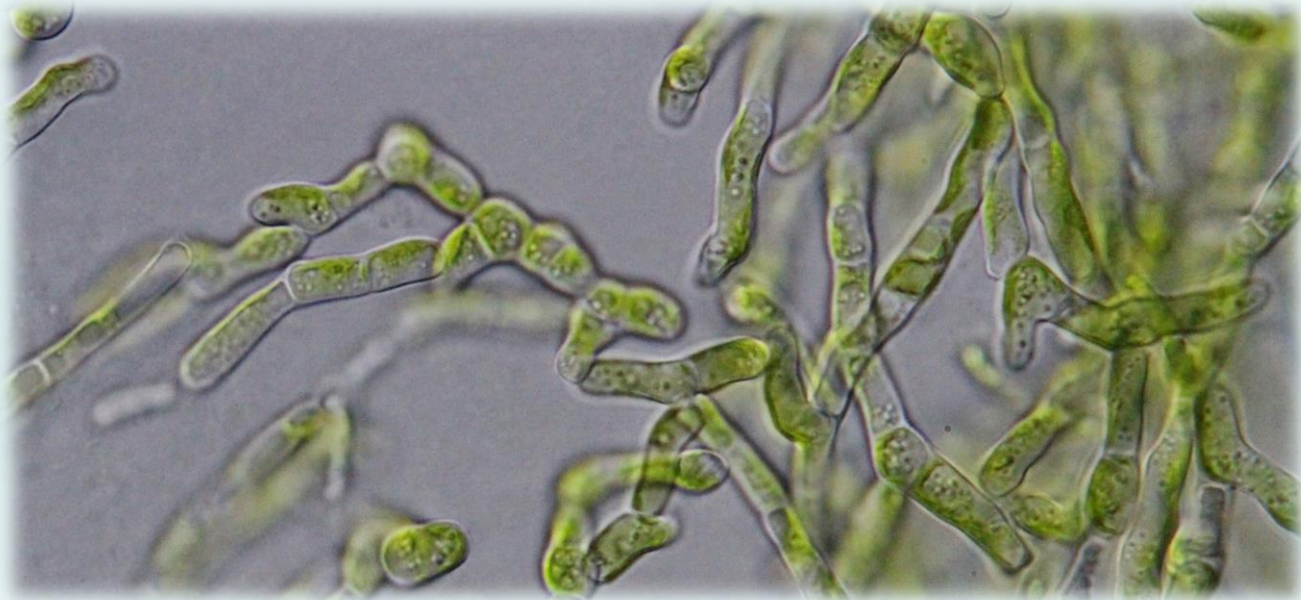
Goals

- Resolving the higher taxonomy of Ulvophytes
- Improving our knowledge on the diversity and evolution of freshwater and terrestrial Ulvophytes
- Taxonomic revision of polyphyletic genera



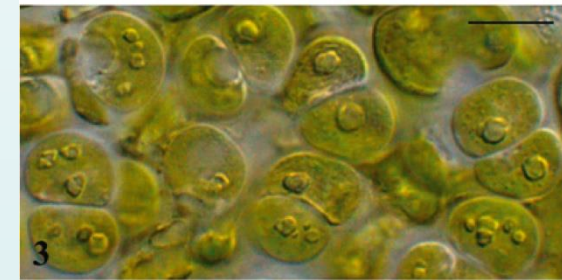
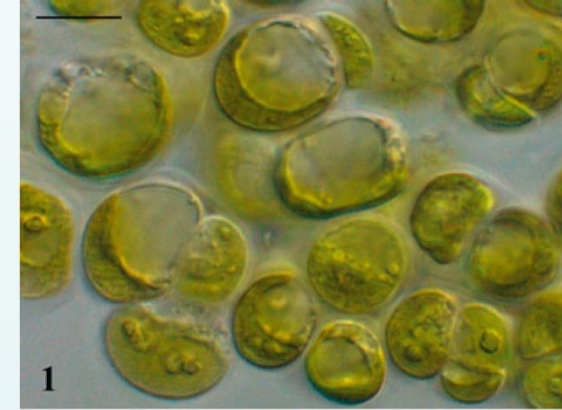
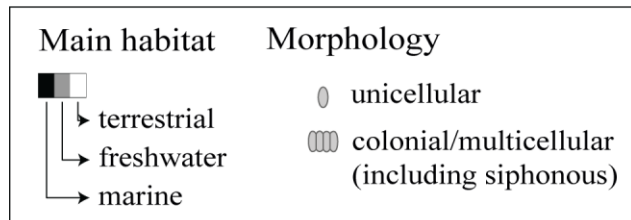
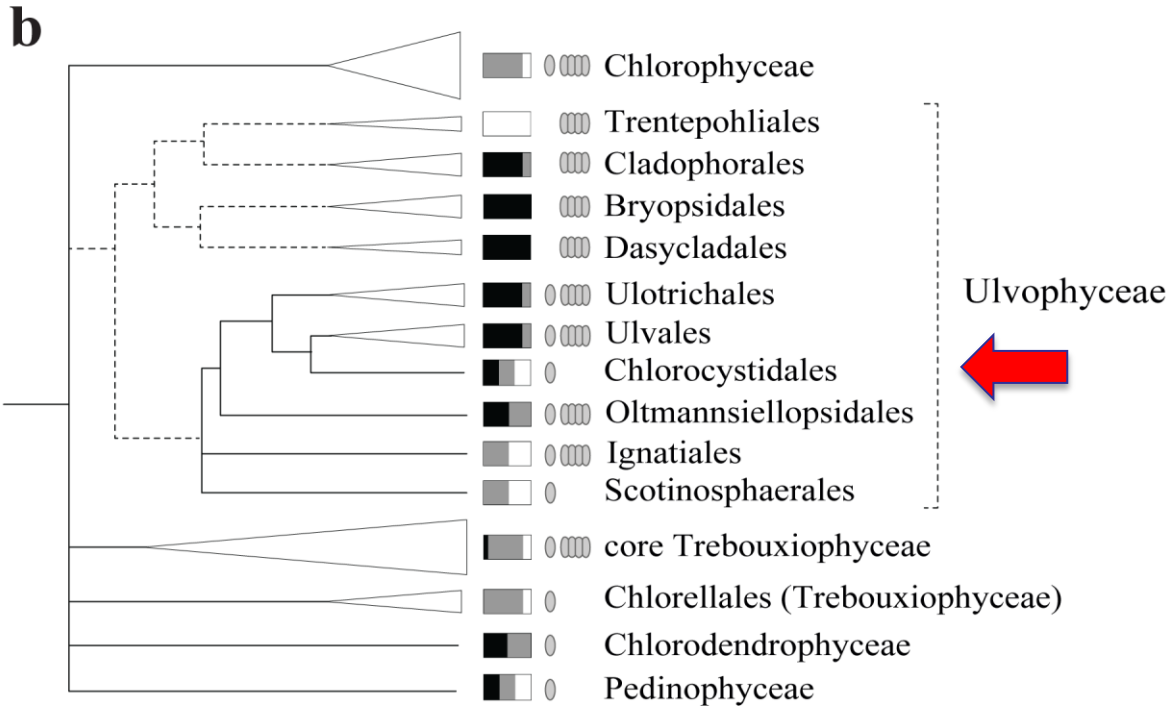
Methods

- 64 strains from 11 algal culture collections (ACOI, ASIB, CAUP, CCAC, CCALA, CCCryo, CCAP, CPCC, FACHB, SAG, UTEX) – incl. 12 types
- 36 strains from own sampling
- Molecular analyses (18S rDNA, ITS, rbcL, tufA)
- Morphological investigations (cell dimensions, shape of pyrenoids, pattern of filament branching, shape of colonies)



Higher taxonomy

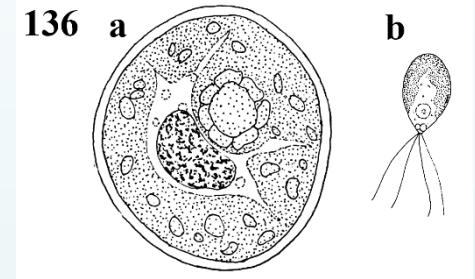
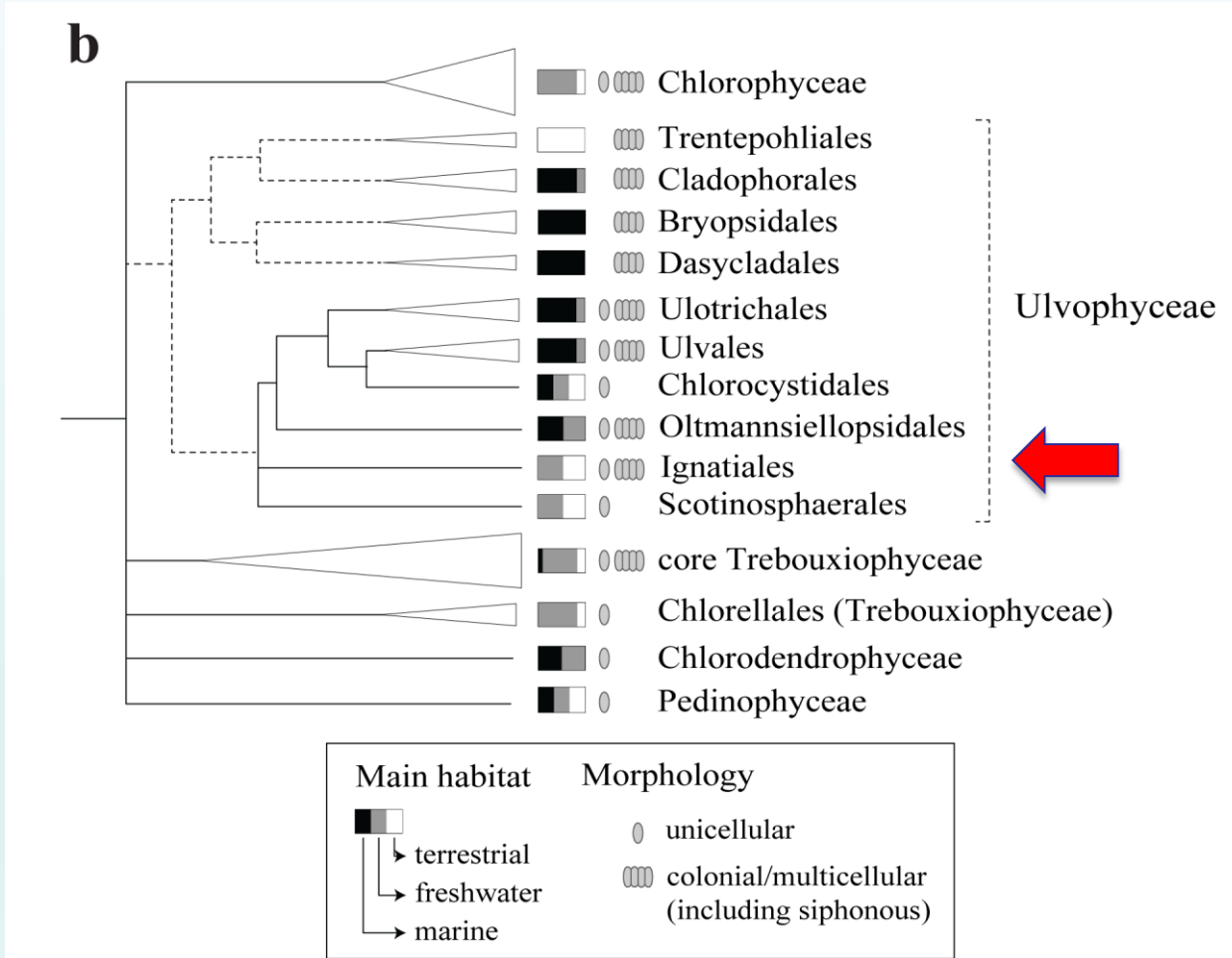
- Resurrecting the order **Chlorocystidales** to make Ulvales and Ulotrichales monophyletic



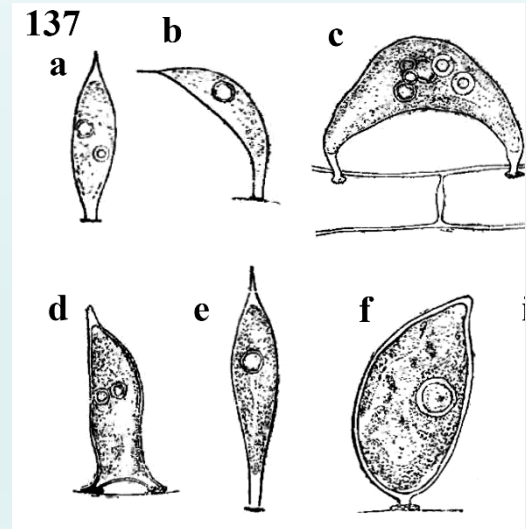
Desmochloris

Higher taxonomy

- Validation of the order **Ignatiales**



Ignatius

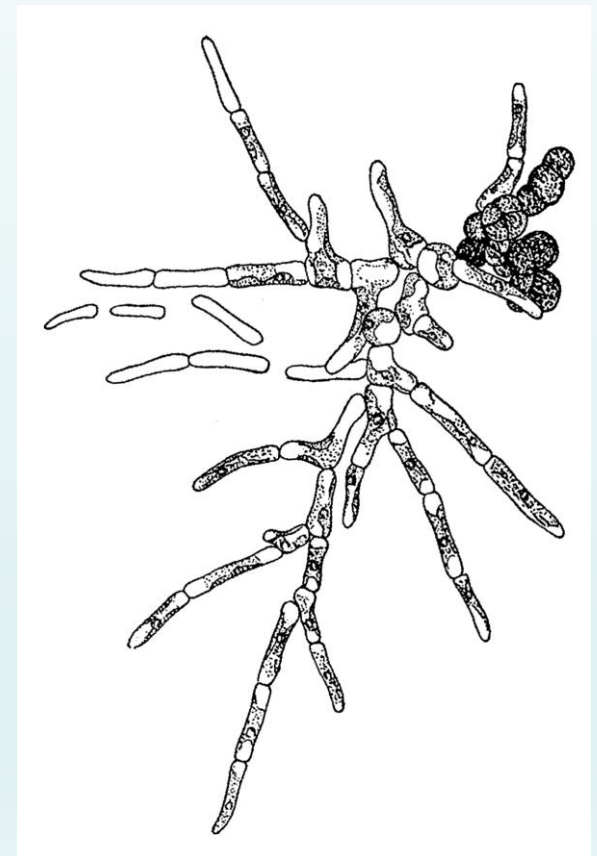


Pseudocharacium

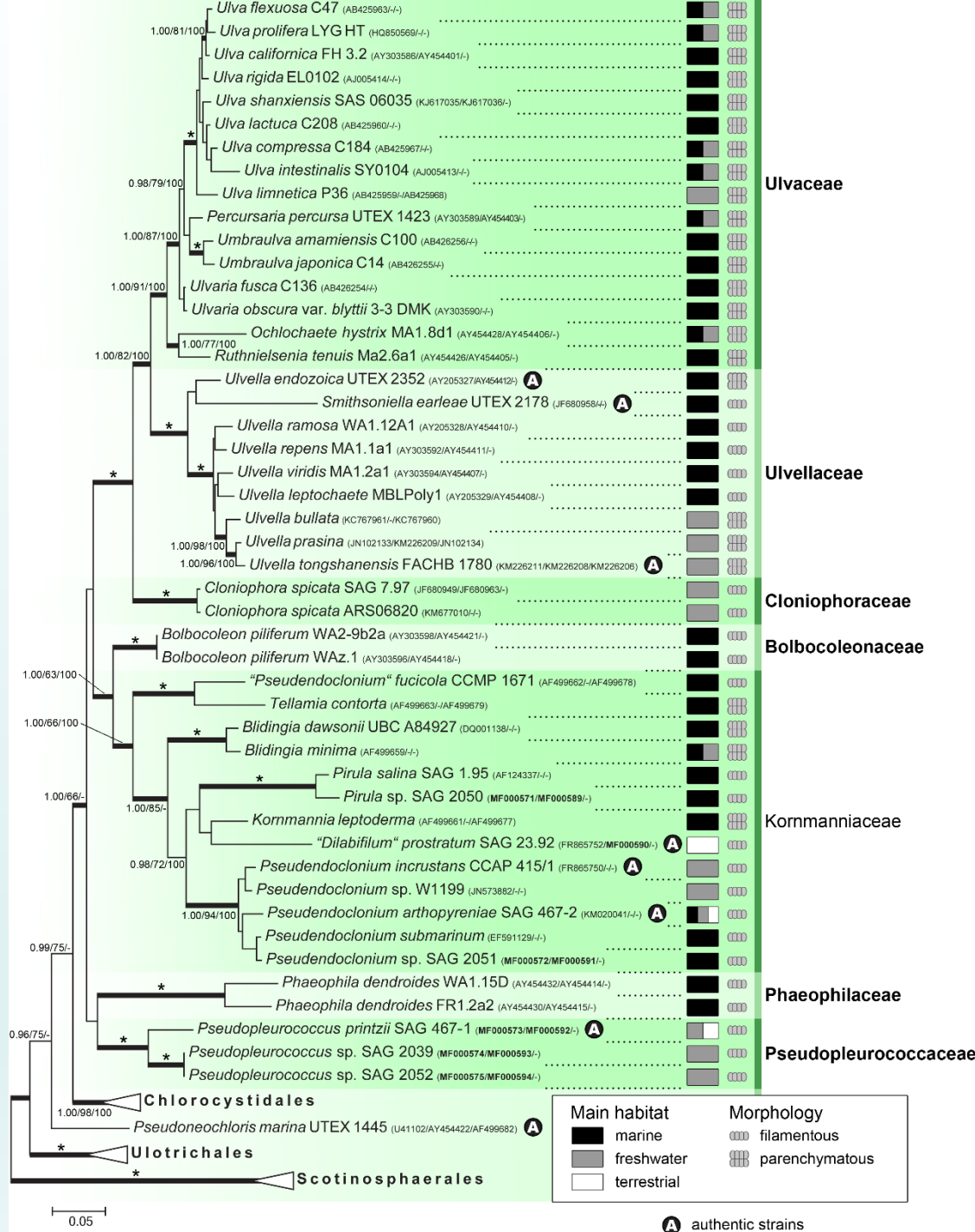
Higher taxonomy

- Ulvales: describing the family

Pseudopleurococcaceae



Pseudopleurococcus

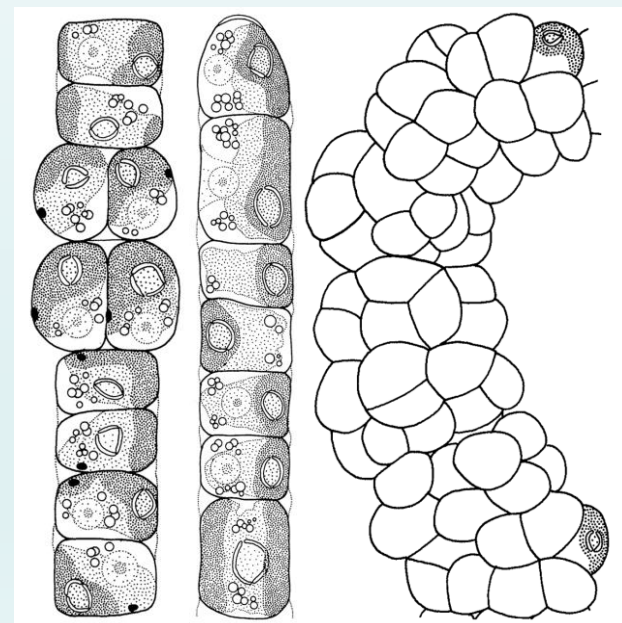




Higher taxonomy

- Ulotrichales: describing the families

- Hazeniaceae**
- Planophilaceae**
- Trichosarcinaceae**
- Neocloniaceae**
- Binucleariaceae**



Trichosarcina

Main habitat	Morphology
■ marine	○ unicellular
■ freshwater	▨ filamentous
□ terrestrial	▨ parenchymatous

A authentic strains

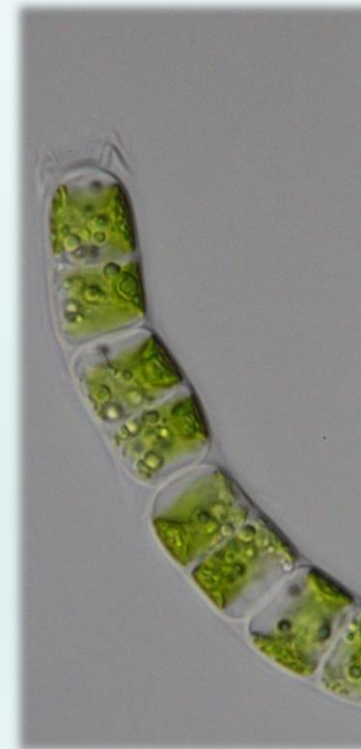
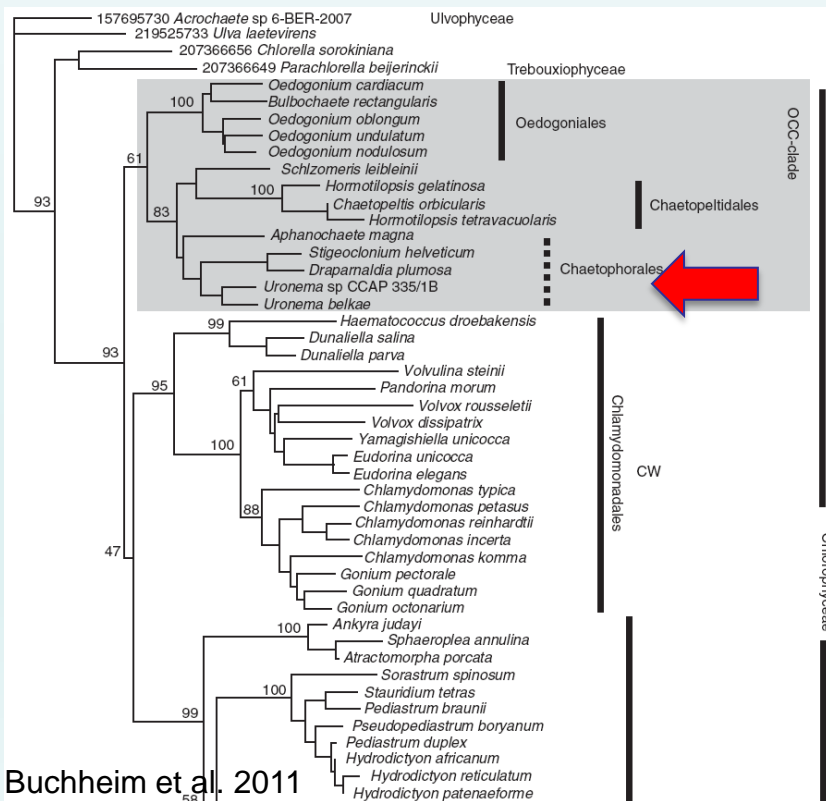
Problem of types

- Taxonomic position of **Ulothrix**



- **Uronema:**

- *Ulothrix acuminata* FACHB 1747
- *Ulothrix* sp. FACHB 781
- *Ulothrix* sp. CPCC 546
- *Ulothrix belkae* SAG 34.86
- *Ulothrix acuminata* UTEX 1178 T



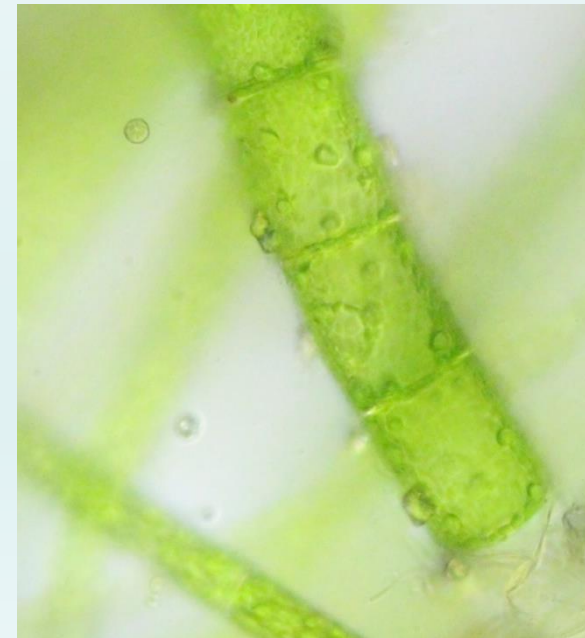
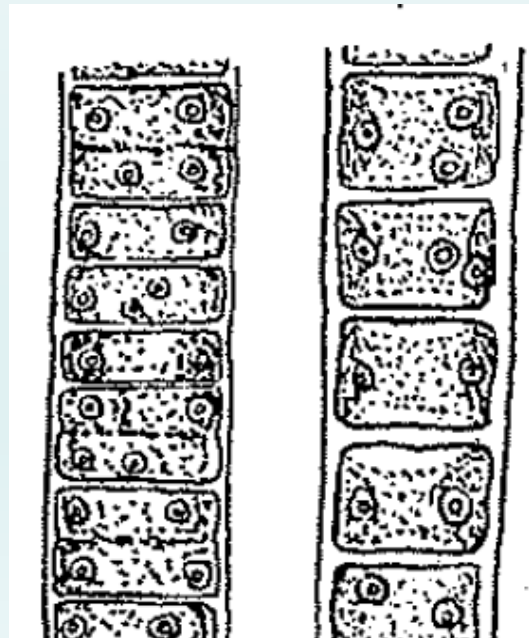
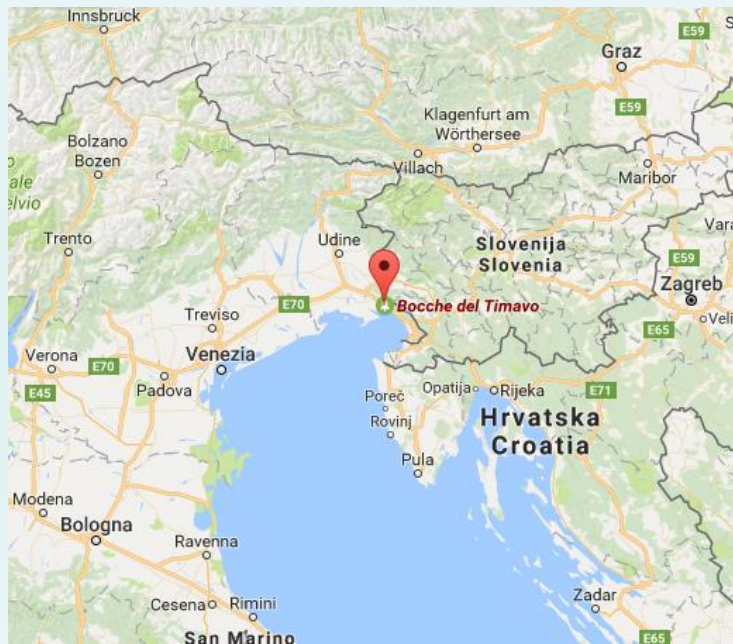
Ulothrix



Uronema

Problem of types

- Taxonomic position of **Ulothrix**
- *Ulothrix tenuissima*
Kützing 1833
- Timavo, Italy



Misidentifications and "molecular" identifications

Binuclearia sp. CCAC 4824

Binuclearia sp. SAG 39.91

Ulothrix cf. *variabilis* CCCryo 149, 150

Ulothrix sp. CPCC 509, 568

Ulothrix crenulata SAG 35.86

Ulothrix sp. SAG 90.91

...

➤ *Microspora*

➤ *Klebsormidium*

➤ *Klebsormidium*

➤ *Klebsormidium*

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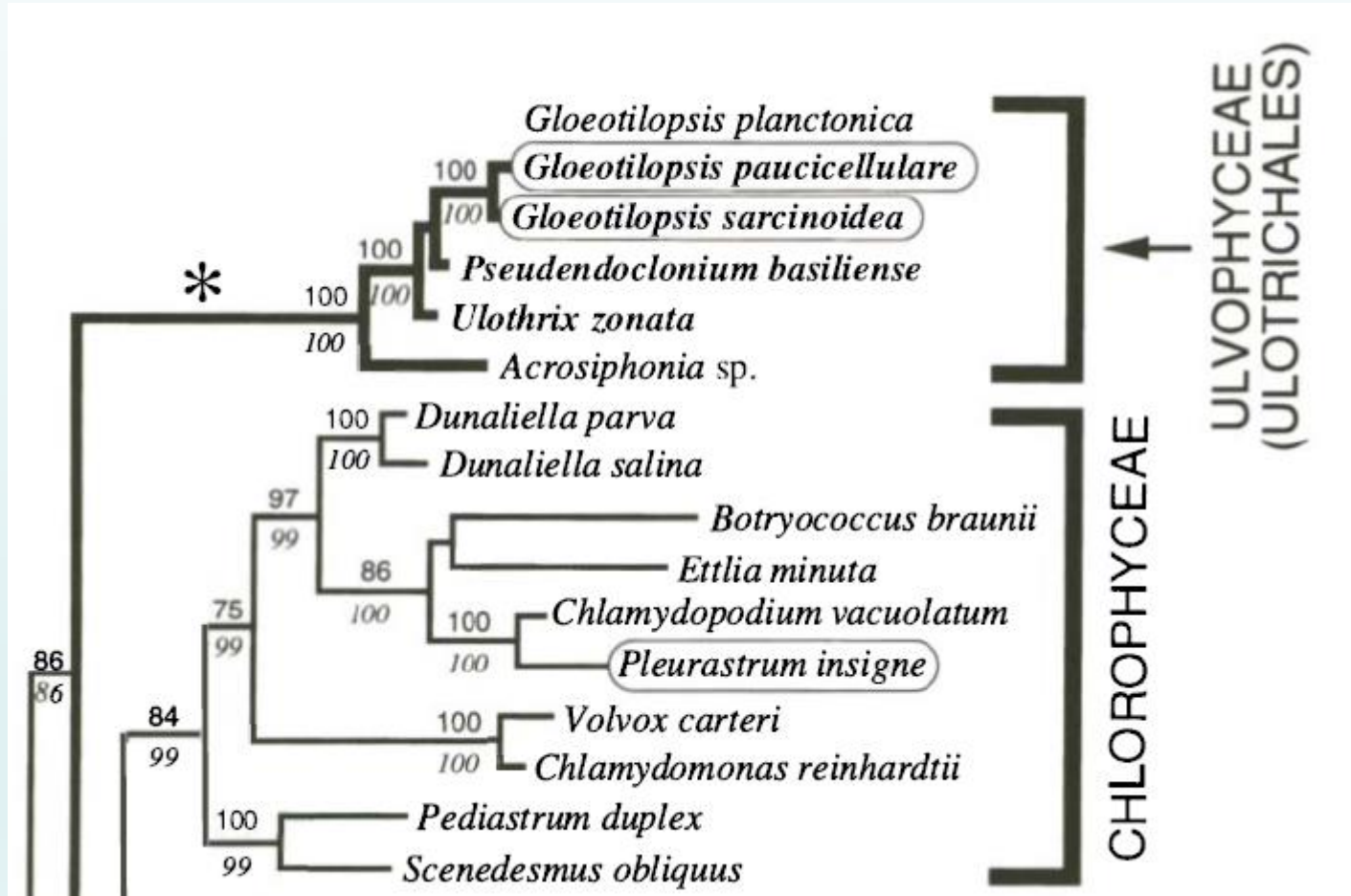
➤ *Geminella*

➤ ...



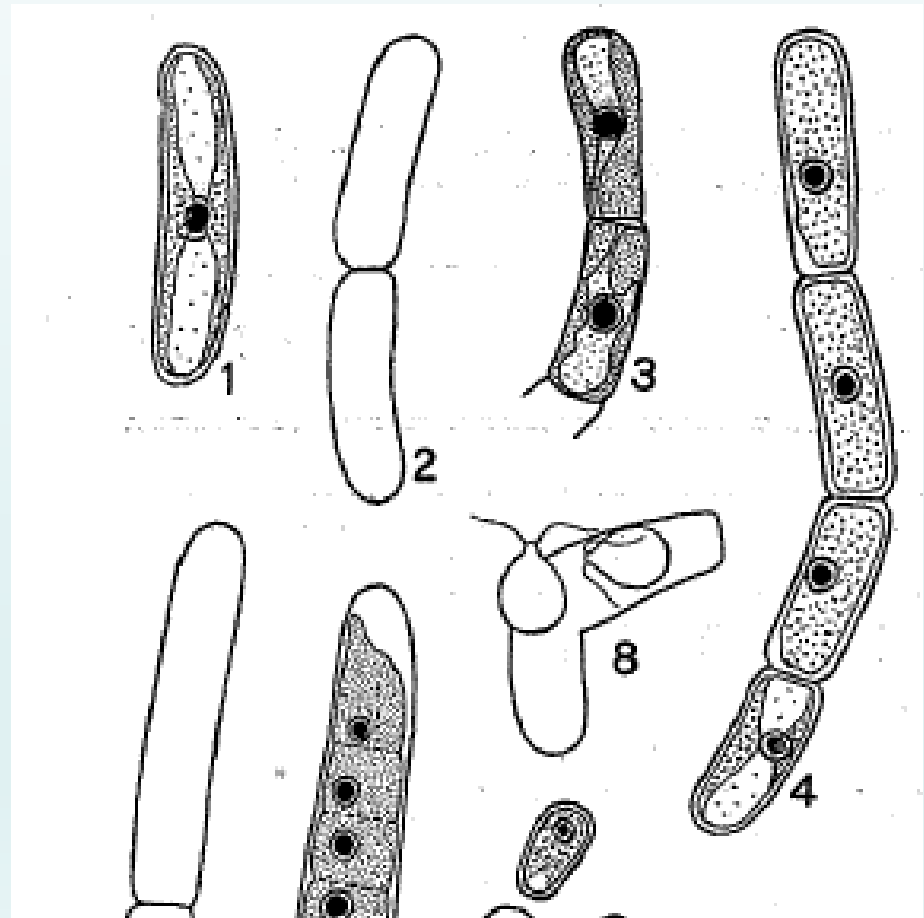
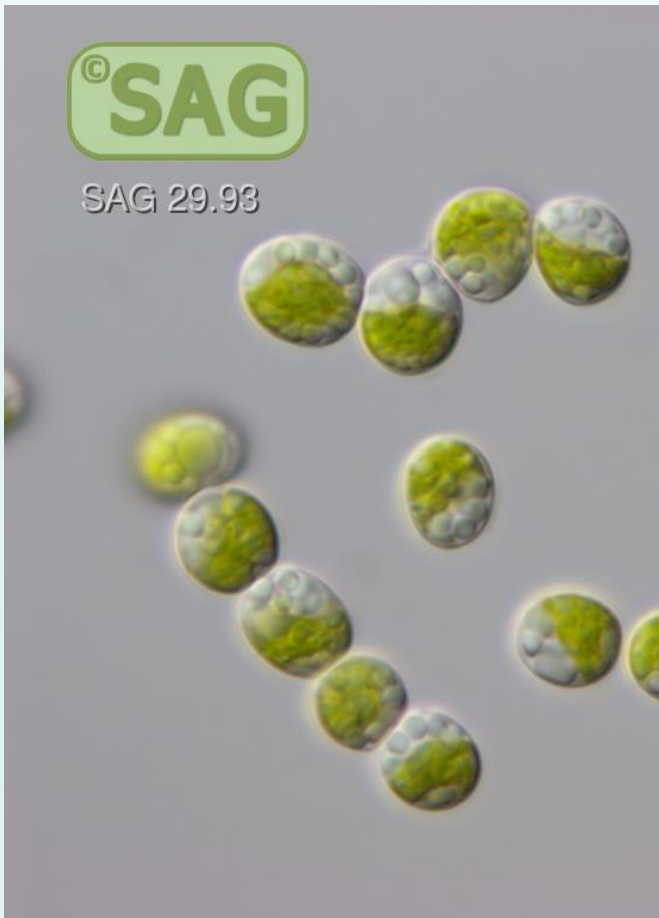
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- Sluiman (1991): *Gloeotilopsis planctonica* – SAG 29.93
- Friedl (1996): new combinations for *Rhexinema* and *Pleurastrum* species



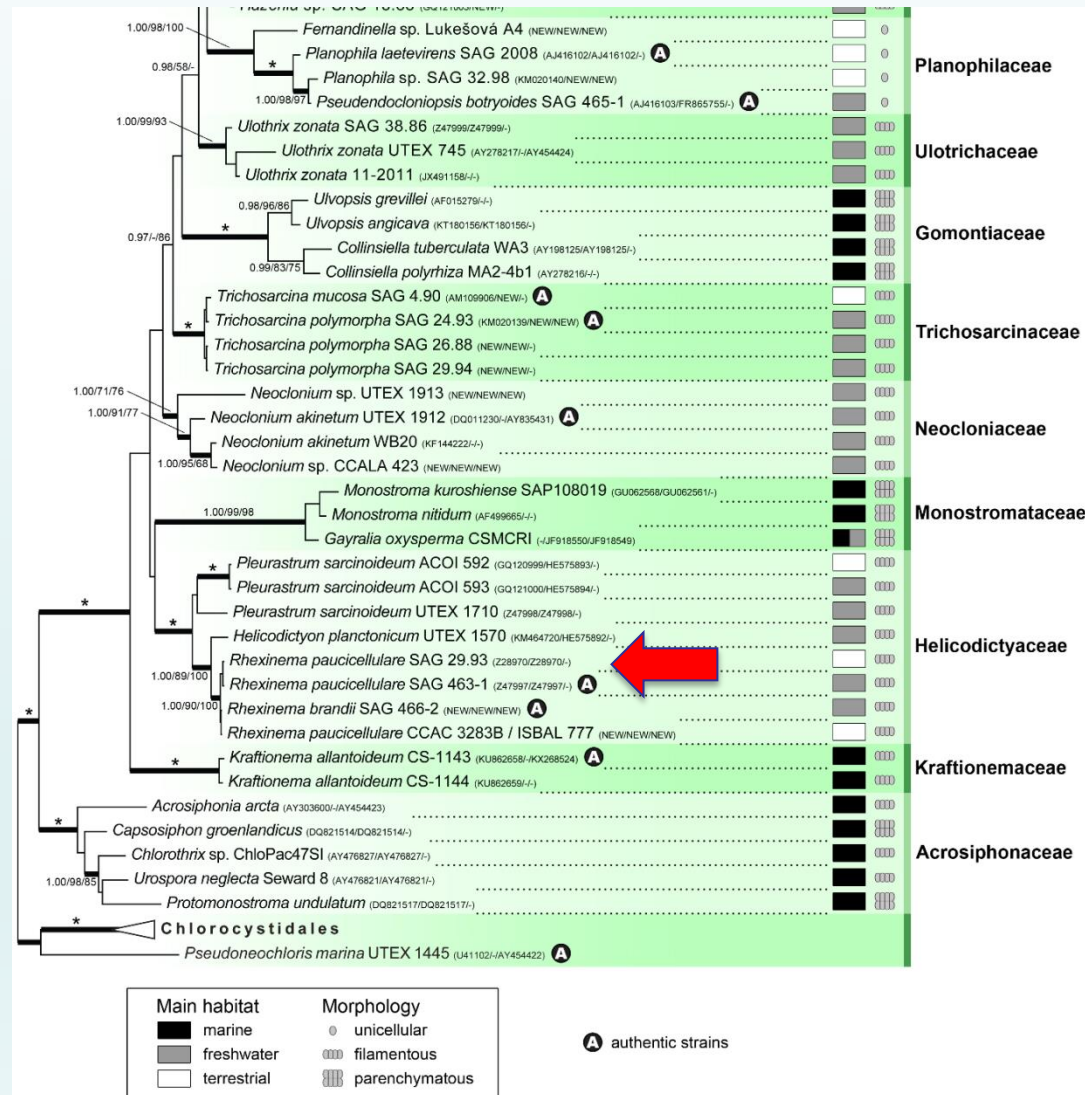
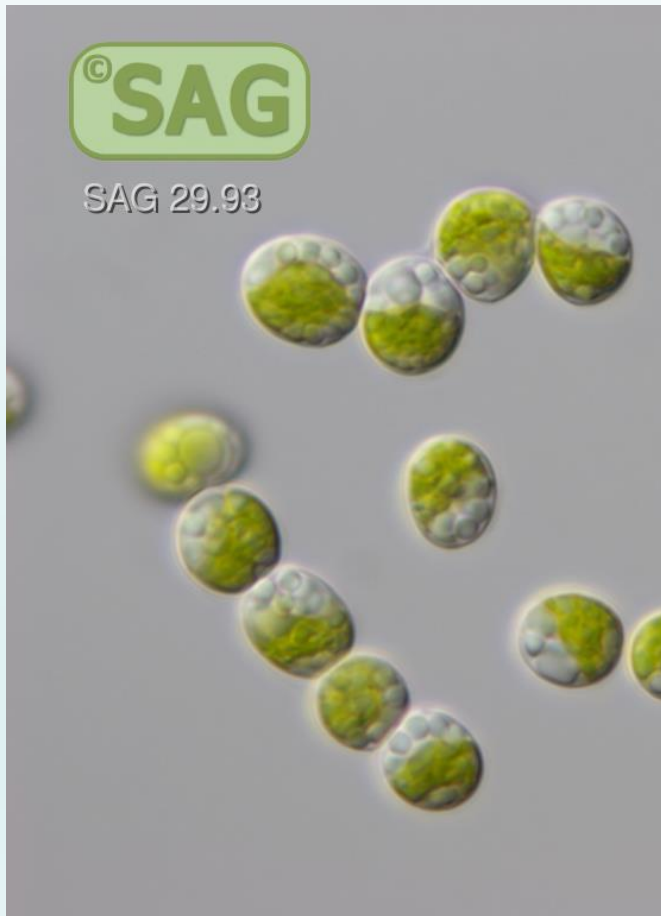
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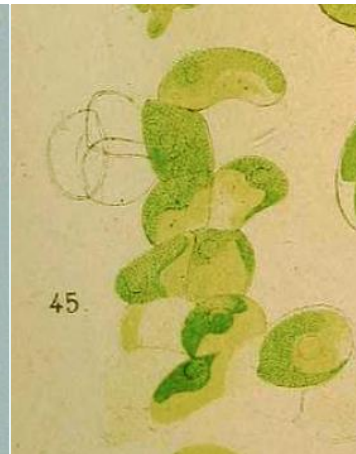
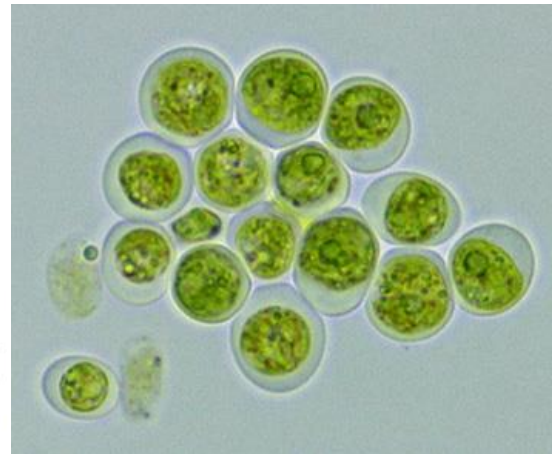
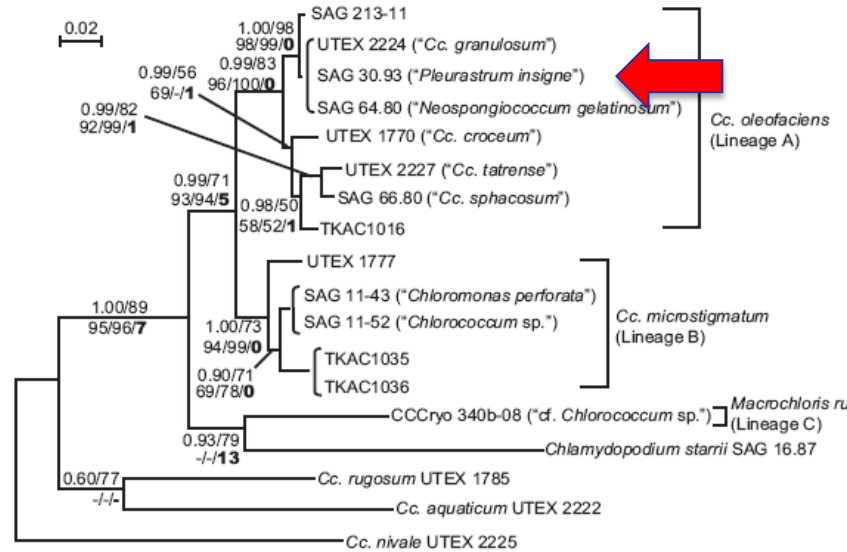
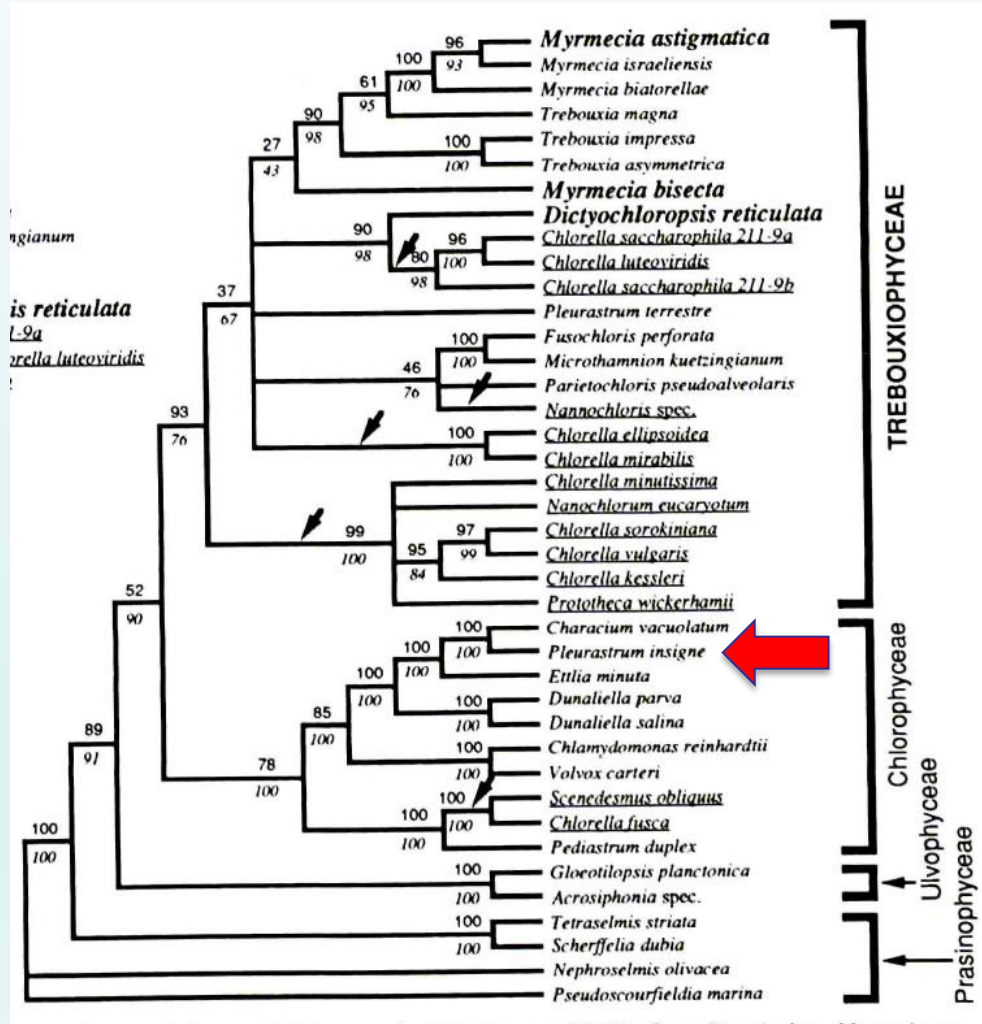
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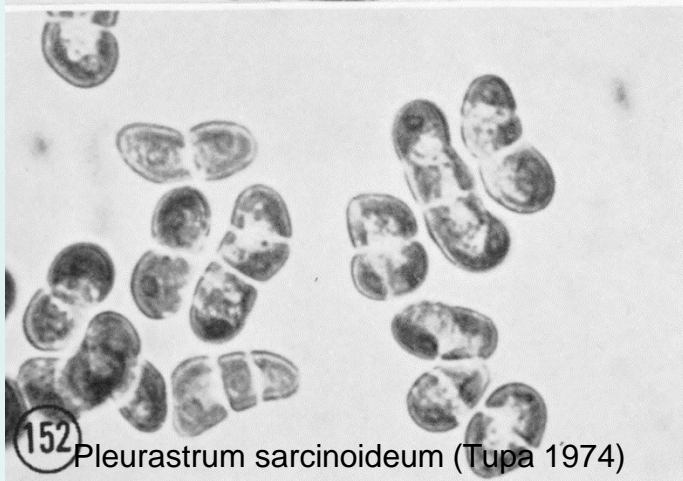
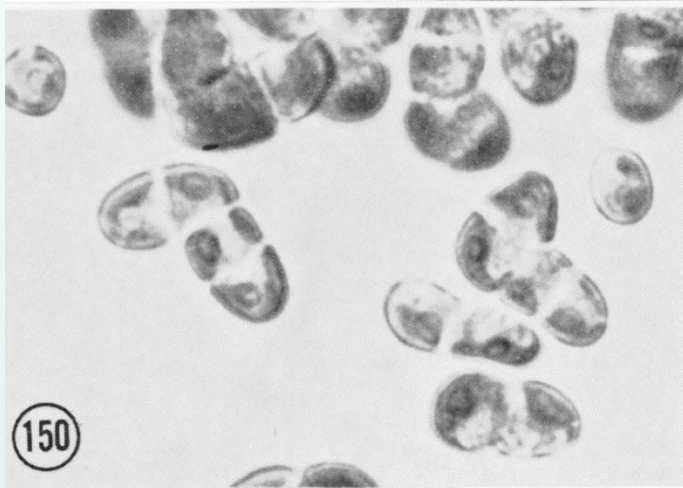
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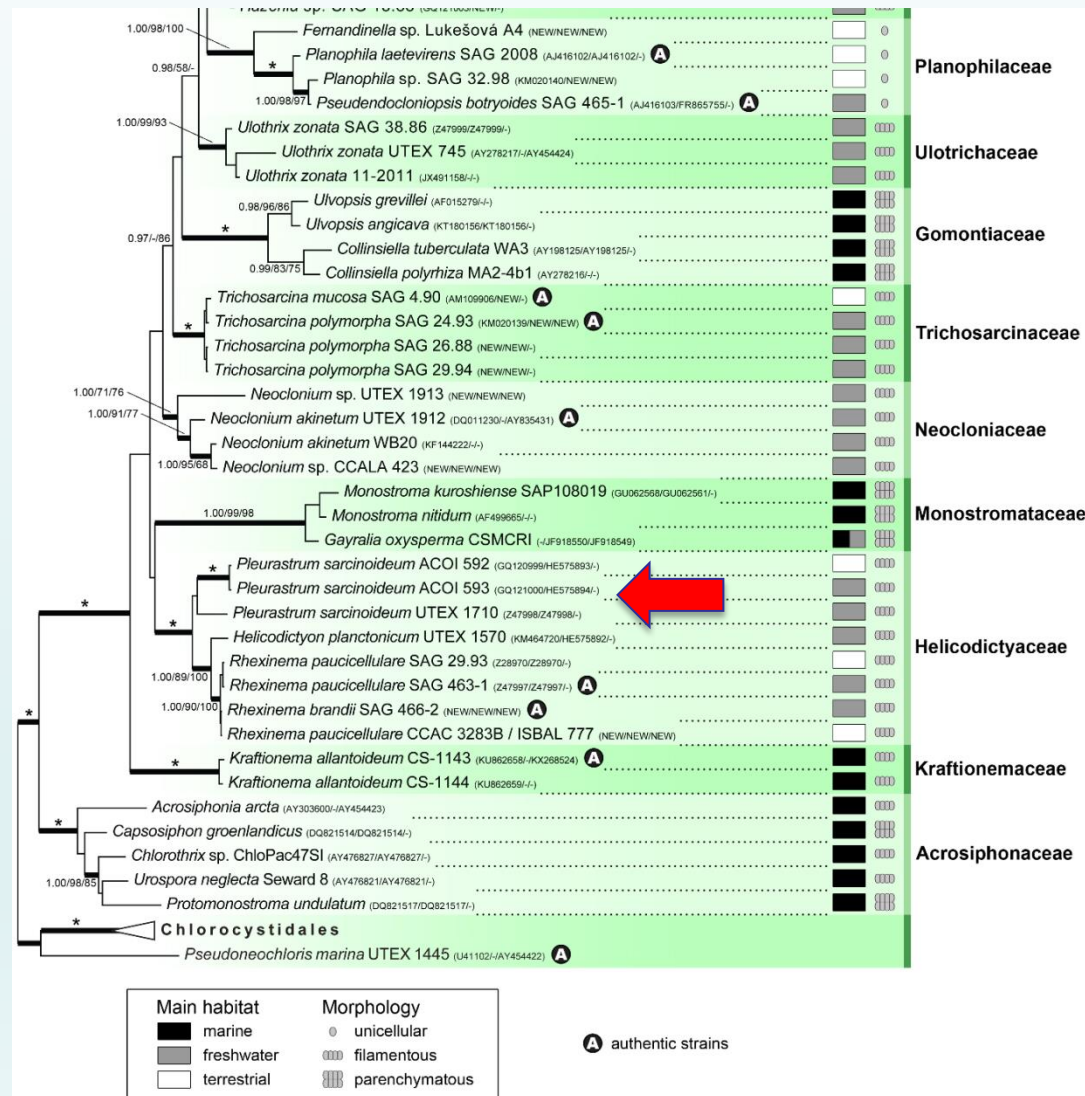


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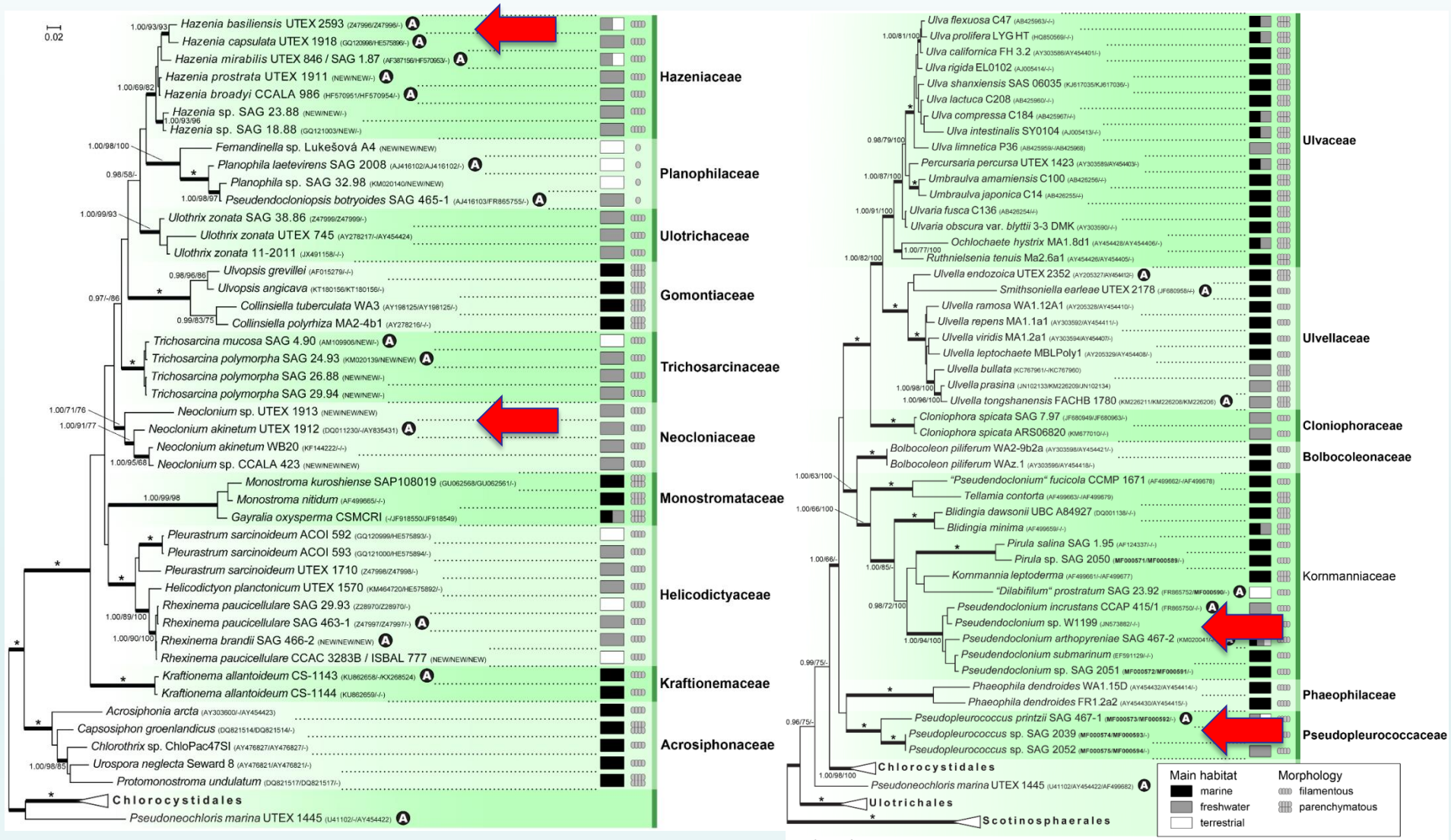


152 *Pleurastrum sarcinoideum* (Tupa 1974)



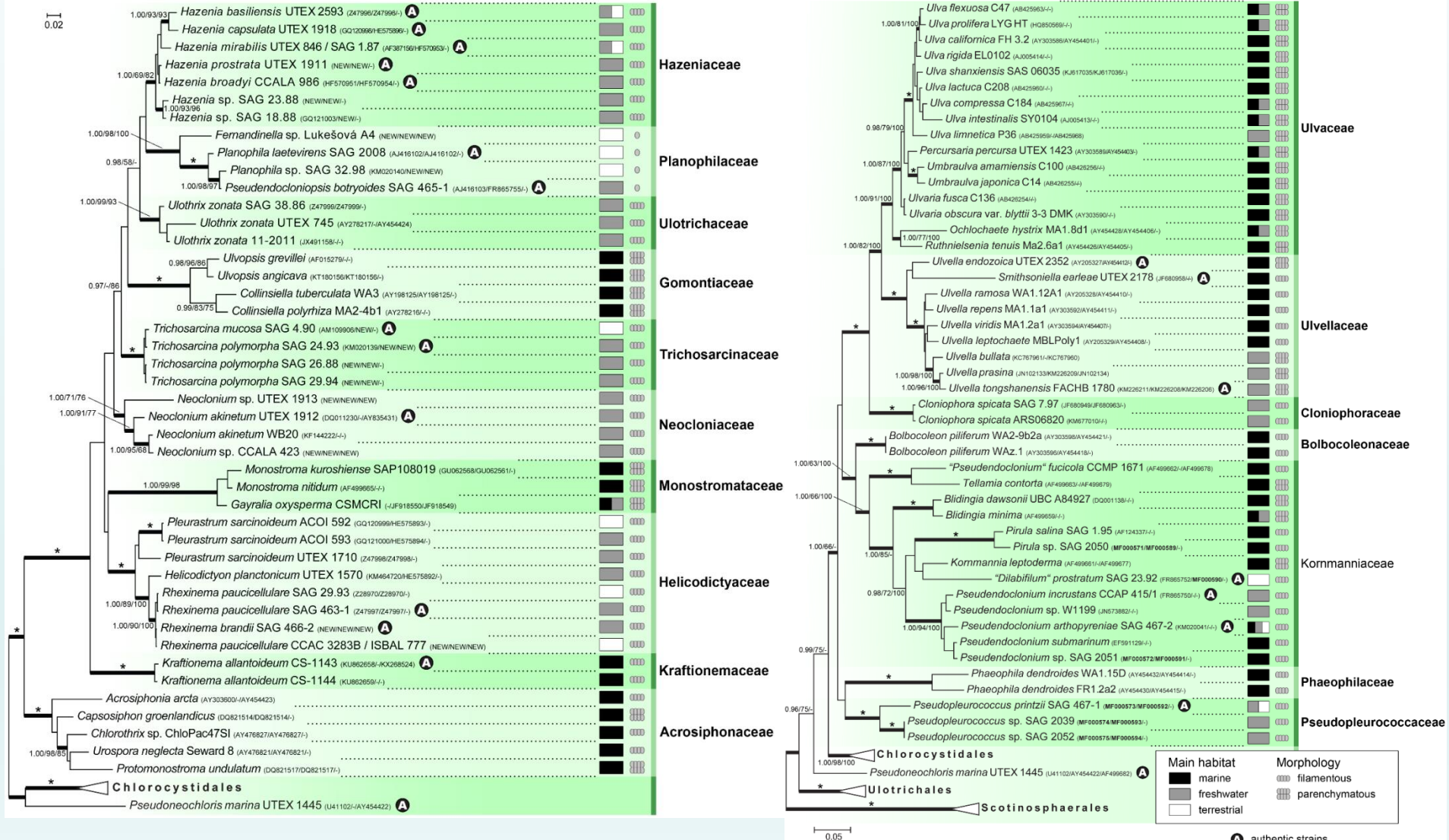
Considerable cryptic diversity

- Pseudendoclonium* morphotype in at least 4 independent lineages



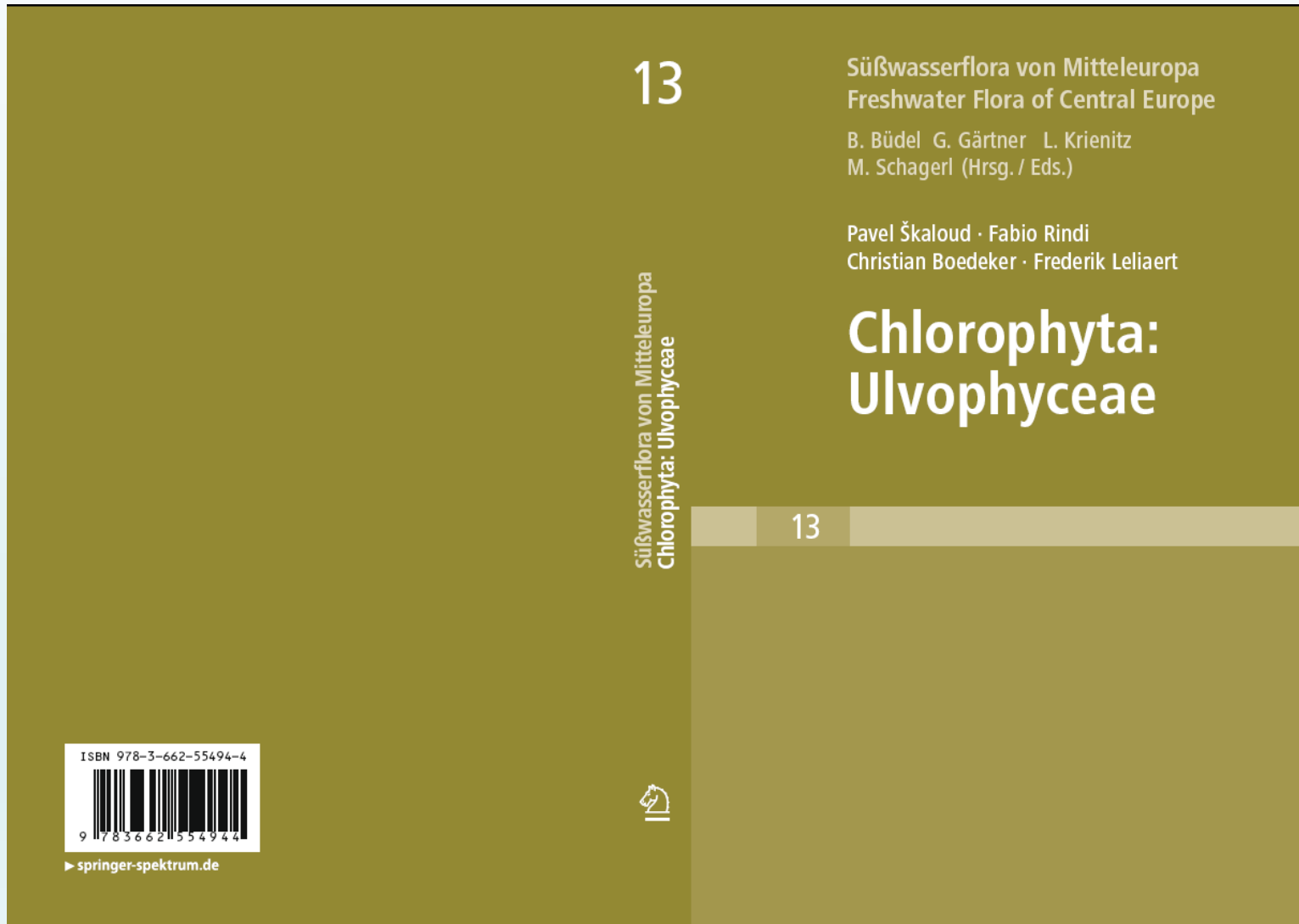
Ecological consequences

- numerous transitions between marine and freshwater habitats
- terrestrial taxa evolved from freshwater relatives
- broad ecological range of *Pseudendoclonium*

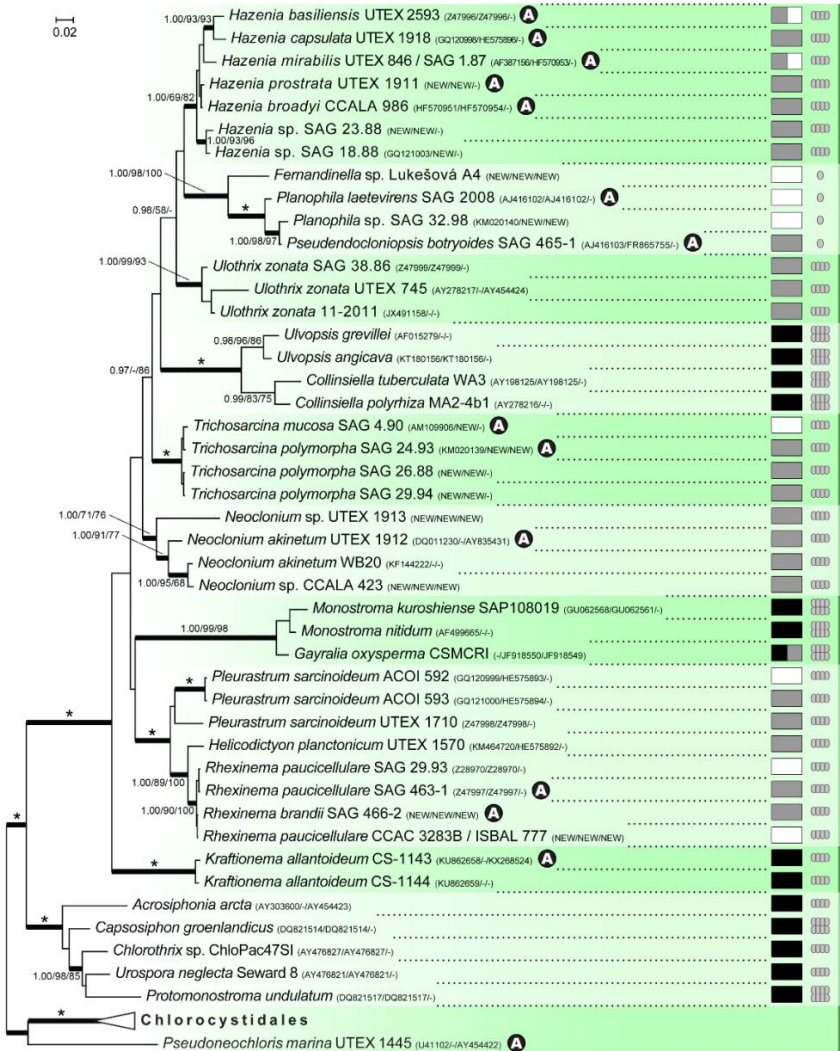


Freshwater Flora of Central Europe

- to be released early in 2018



Thank you for your attention!



Ulotrichales

Ulvales