

Comparative Taxonomic Studies on the Genus *Klebsormidium* (Charophyceae) in Europe

by Gijbert M. Lokhorst

Cryptogamic Studies Vol. 5 Edited by Walter Jülich



1. ABSTRACT

A new classification of the green algal genus *Klebsormidium* in Western and Central Europe is proposed. Comparative studies were mainly carried out on field collections, uni-algal cultures, and type herbarium collections. Where it was deemed necessary, scanning electron microscopy (SEM) and transmission electron microscopy (TEM) were involved to augment the understanding of the identifying quality of some light microscopic (LM) traits like, e.g., the texture of cell wall surface, the shape of parental **H**-shaped wall remnants wrapping transverse cell walls of relative progeny cells, and the architecture of discharge pore in the lateral wall of empty zoosporangial cells.

Most taxonomic value has been attached to the cell diameter range (despite occurring overlap), cell length/width ratio, the shape of the chloroplast, the form (cylindrical *versus* doliiform) of vegetative cells during advanced maturation of filaments, the length of the individual filaments (reflecting determinate *versus* indeterminate growth), the presence or absence of **H**-shaped pieces, the surface characteristics of the cell wall, the germination pattern of settled zoospores, the form of the aperture through which zoospores leave the zoosporangial cells, and the mode of reproduction (usual or sporadic fragmentation of filaments in combination with the formation of zoospores and/or aplanospores, or otherwise). These major attributes are discussed comprehensively.

The ecological distributional pattern (aerophytic algae ("Luftalgen") *versus* aquatic algae ("Wasserlinsen")), traditionally used as an important identification mark, appears to be of little significance for the recognition of the species of *Klebsormidium*.

In the present paper eight species of *Klebsormidium* are dealt with, among which the two new species *Klebsormidium bilatum* and *K. elegans*. Where it was at all possible current names are maintained. Where (neo)typification of the species was necessary, dried specimens were prepared from the "type" cultures and preserved at the research institute Rijksherbarium/Hortus Botanicus at Leiden.

For unequivocal identification of especially the smaller *Klebsormidium* species, it is almost mandatory that the species are examined under controlled culture conditions.

It was quite surprising to assess that - on account of the *Ulothrix* status of its type specimen - the traditional species *Hormidium rivulare* Kützing, having a widespread occurrence in fast-streaming waters, could not be assigned to the present genus *Klebsormidium*.

The evolutionary position of *Klebsormidium* among the charophycean green algae - nowadays considered to be most closely related to the ancestors of higher land plants - is briefly discussed. Special evolutionary significance is attributed to species of *Klebsormidium* that occasionally produce a longitudinal septum and possess a reduced form of aplanosporogenesis. They are thought to embody a distinct transition between unbranched and branched filamentous green algae. A concise comment is given on the taxonomic affinity of *Klebsormidium* with morphologically related genera, on the distributional patterns of *Klebsormidium* species in natural habitats, and on some promising aspects for further (cytological) studies in the genus *Klebsormidium*.

Finally, the genealogical relationships among the *Klebsormidium* species are determined by a phylogenetic analysis approach.