A morphometric evaluation of the *Cladonia chlorophaea* group and allied taxa (Cladoniaceae, Ascomycota)

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The *Cladonia chlorophaea* group represents a complex of morphologically and chemically similar taxa that have long perplexed taxonomists. Until now, few studies have systematically evaluated morphological characters in the group. A morphometric analysis of samples belonging to the taxa of the *Cladonia chlorophaea* and *C. humilis* groups as well as *C. fimbriata*, was performed using various fundamental statistical methods. It revealed four unambiguously distinct morphological aggregates of samples, corresponding to four well known, cosmopolitan species, namely *C. asahinae*, *C. chlorophaea*, *C. fimbriata* and *C. humilis*. The analysis highlights the most reliable diagnostic characters distinguishing the obtained groups which can be applied for species determination. A chemical race of *C. asahinae* with fumarprotocetraric acid chemosyndrome only is reported from Europe and a chemotype of *C. fimbriata* with fumarprotocetraric and bourgeanic acids was revealed during the study. Morphometric analyses may be a very useful tool for evaluation of features within the genus *Cladonia* and other lichen genera containing cryptic species.

**Key words:** Lichens, Lecanorales, morphological variability, multivariate statistics, chemotypes, taxonomy.

**Introduction**

The great variety of growth forms and sizes, along with the great diversity of thallus architecture are hallmarks that combine to make members of the genus *Cladonia* very attractive lichens. At the same time, unfortunately, these attributes cause many taxonomic problems. The taxonomy of the genus is based primarily on the morphology of individuals, i.e. the shape of podetia and/or primary squamules, the presence and distribution of vegetative structures and propagules, and the colour of the apothecia. The composition of secondary compounds is also significant and chemotaxonomy is useful in routine identification of specimens (see Ahti 2000). Because both morphological and chemical diversity within *Cladonia* is indeed enormous and because it is also one of the species-richest of lichen genera, the delimitation of many species is still problematic and widely discussed.