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CHANGES IN SYSTEMATICS OF CETRARIOID LICHENS

Die Veränderungen in der Systematik der cetrarioiden Flechten

by

Tiina RANDLANE & Andres SAAG

Key words: Parmeliaceae, cetrarioid lichens, systematics.
Schlagwörter: Parmeliaceae, cetrarioide Flechten, Systematik.

Summary: Changes in the systematics of cetrarioid lichens (about 130 species) during last four years are commented. 22 genera are shortly characterized. Lately described species are listed.

Zusammenfassung: Änderungen in der Systematik der cetrarioiden Flechten (etwa 130 Arten) während der letzten vier Jahre werden kommentiert. 22 Arten werden kurz charakterisiert. Kürzlich beschriebene Arten werden aufgezählt.

Introduction

The family Parmeliaceae, which consists of c. 60 genera and about 1000 species, has colloquially been divided into three simple but somewhat ill-defined morphological categories: alectorioid, parmelioid and cetrarioid. Alectorioid lichens are beard-like or truly fruticose, pendant or caespitose. Parmelioid lichens are clearly foliose, possessing laminal apothecia and pycnidia, and are usually more or less closely adnate to the substrate. Cetrarioid lichens, on the other hand, form a somewhat vague and undelimited group between these two, having a strap-shaped, subfruticose or ascending foliose thallus, possessing mainly marginal apothecia and pycnidia. However, this arrangement is based mainly on morphology and, as most morphological characters, often displays a large degree of variability. Evidently, these familiar categories (alectorioid, cetrarioid and parmelioid) have little to do with phylogeny. It was

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convincingly shown already at the beginning of nineties (KÄRNEFELT et al. 1992) that the cetrarioid group of lichens is doubtlessly polyphyletic and therefore all these species cannot be placed in one or two genera as it was done, for instance, by the Russian lichenologist Ksenya RASSADINA (1950) or by the Finn Veli RÄSÄNEN (1952). Ksenya RASSADINA incorporated 76 species into the genus *Cetraria*. Today we can count more than 130 cetrarioid lichen species which are divided between 22 genera. The process of splitting the polymorphic genus *Cetraria* was initiated by Dr-s William and Chicita CULBERSONS who presented three new genera - *Asahinea, Cetrelia* and *Platismatia* - in 1960-ies (CULBERSON & CULBERSON 1965, 1968). These genera are now accepted by everybody without a doubt. We are quite sure that the same will happen to the most of the new cetrarioid genera which predominantly are described on the complex of different characters with special emphasis on the anatomical characters.

Four years ago 14 genera of cetrarioid lichens could be listed (RANDLANE & SAAG 1993), at present there are 22 of them. A short review of all cetrarioid genera is presented as following.

Ahtiana GOWARD (1985) - 3 species

Originally it was described as a monotypic genus for quite a parmelioid-looking lichen *A. sphaerosporella,* today two other species *(A. aurescens* and *A. pallidula)* from North America with yellowish foliose thallus and globose ascospores have been added.

Allocetraria KUROK. & M. J. LAI (1991) - 10 species

This genus, segregated from *Cetraria* on thallus morphology and anatomy mainly, originally included three yellowish species from high altitudes in South-East Asia. The most widely known of them is probably the former *Cetraria everniella* - with the correct name *Allocetraria stracheyi* now. Our studies have shown that very clear anatomical and pycnidial characters, especially the presence of palisade plectenchymatous cortex and filiform pycnoconidia separate this genus from other cetrarioid taxa. A number of species have been combined here, including also sorediate and more widely distributed *A. oakesiana.* Two species - *A. flavonigrescens* A. THELL & RANDLANE and *A. sinensis* X. Q. GAO have been described lately.

Arctocetraria KÄRNEFELT & A. THELL (1993) - 2 species

This new genus has strong morphological affinities to *Cetraria* but it differs from the latter in certain anatomical (one-layered cortex, paraphyses with extremely broad bases, bifusiform pycnoconidia) and chemical characters (presence of rangiformic acid in medulla). *Arctocetraria andrejevii* and *A. nigricascens* have been converted here.

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Asahinea W. L. Culb. & C. F. Culb. (1965) - 2 species

A well-known by now genus which includes species with large foliose thalli missing rhizines; apothecia (rarely present, imperforate) are marginal till entirely laminal. It is worth mentioning that only two and not three species are recognized at present - the third species, a japanese endemic *A. kurodakensis* was shown to be conspecific with *A. scholanderi* (Gao 1991). Thus *A. chrysantha* and *A. scholanderi* are the two representatives.

Cetraria Ach. (1803) - 33 species,

of which 16 are "true". *Cetraria* comprised 8 taxa when Acharius described the genus. Today it is proposed to delimit the genus as the so-called *Cetraria islandica* group only and this comprises 16 species (including also 4 species that have been transferred from the former genus *Coelocaulon*) (Kärnefelt et al. 1993). Anatomy of the thallus (usually two-layered cortex) and also of asci (comparatively small axial body and a distinctive amyloid ring structure) are important characters in these re-arrangements.

Still, there are 10 more species described originally as *Cetrarias* that evidently do not belong to this group *(C. albopunctata, C. annae, C. antarctica, C. dermatoidea, C. hypotrachyna, C. kurokawae, C. microphylla, C. nova-zelandiae, C. subscutata* and *C. xizangensis)*. The material available concerning these species has been sterile or too poor for deciding their true generic location and therefore they are still artificially situated in *Cetraria*. The suitable generic position is not clear either for the *Cetraria fendleri* group (four species from North-America), *Cetraria melaloma-leucostoma* complex (two species from Himalaya) and for *Cetraria sepincola* but it seems necessary to exclude them all from *Cetraria* s. str. in the future.

Cetrariella Kärnefelt & A. Thell (1993) - 2 species

Two species, *C. delisei* and *C. fastigiata,* differ essentially from *Cetraria* by their ascus shape (broadly clavate), type of pycnoconidia (sublageniform) and medullary chemistry (gyrophoric and hiascic acids).

Cetrelia W. L. Culb. & C. F. Culb. (1968) - 17 species

This is a well-known and firmly recognized genus where only the number of species may cause some argument. At present we incline to accept the so-called chemical species concept in this genus (Culberson, C. F. & Culberson, W. L. 1976; Randlane & Saag 1991). All the species are characterized by large folious thalli with punctiform pseudocyphellae on the upper surface, apothecia if present are situated laminally and are commonly perforate.

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Cetreliopsis M. J. Lai (1981) - 5 species

Another genus with large foliose thallus that was described as monotypic (for *Cetreliopsis rhytidocarpa)* but now it has turned out to comprise some more species. There are some very well defined diagnostic characters that help to separate the genus from *Nephromopsis* or even *Cetrelia*, such as the presence of laminal pseudocyphellae on both surfaces of the thallus, or production of fumarprotocetraric acid in medulla. *Cetreliopsis papuae* Randlane & Saag, an endemic of New Guinea, is a lately described representative of the genus.

Coelopogon Brusse & Kärnefelt (1991) - 2 species

Consists of two species from the southern hemisphere, earlier accommodated in *Coelocaulon* (the latter unit is now included in *Cetraria*, see above). Both species, *C. abraxas* and *C. epiphorellus* are known as sterile only, therefore the anatomy of thallus cortex (one-layered) and also the medullary chemistry (epiphorellic acid) are of great importance.

Cornicularia Hoffm. (1794) - 1 species

Cornicularia normoerica has quite a unique morphology characterized by a low erect fruticose thallus arising from a rudimentary foliose-squamulose base. Absence of any medullary substances supports its separation from *Cetraria.*

Dactylina Nyl. (1860) - 2 species

The genus comprises only two species today - *D. arctica* and *D. ramulosa.* They both are characterized by hollow fruticose thallus, globose to subglobose ascospores and oblong citriform pycnoconidia. Two earlier *Dactylinas* - *D. madreporiformis* and *D. endochyrsea* - have lately been transferred to *Allocetraria* (Kärnefelt & Thell 1996). The latter genus differs from *Dactylina* by its compact foliose or fruticose thallus, very broad axial body and filiform pycnoconidia.

Esslingeriana Hale & M. J. Lai (1981) - 1 species

A monotypic genus from North America with the type species *E. idahoensis.* Gray foliose thallus, marginal up to laminal apothecia and presence of an antraquinone endocrocin in the medulla are diagnostic features for this taxon.

Flavocetraria Kärnefelt & A. Thell (1994) - 2 species

This newly desribed unit includes two yellow coloured erect species, *F. cucullata* and *F. nivalis.* A thin one-layered cortex, bifusiform pycnoconidia and presence of usnic acid are the diagnostic characters for segregating the taxon from *Cetraria.*

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Kaernefeltia A. Thell & Goward (1996) - 2 species

Although the two mainly North American species *(K. californica* and *K. merrillii)* are morphologically not very similar to each other, their ascomatal (ellipsoidal ascospores in clavate asci) and pycnidial characters (bifusiform, disc-bar-shaped pycnospores) refer to their close affinities.

Masonhalea Kärnefelt (1977) - 1 species

The monotypic genus *Masonhalea* with the type species *M. richardsonii* differs from *Cetraria* in many characters including the anatomy of the upper cortex (thick, prosoplectenchymatous), form of pycnoconidia (bacillariform) and secondary chemistry (alectoronic acid only). The presence of large decorticate patches over the lower surface is also diagnostic.

Nephromopsis Müll. Arg. (1891) - 11 species

The species included in this genus possess broad-lobed yellowish or greenish thalli with pseudocyphellae on the lower surface and they are distributed in Eastern Asia only. Originally they were characterized as having nephromoid apothecia (developing on the underside of margins) but today this is not considered an essential character. Two earlier *Cetrariopsis* species have lately been transferred to *Nephromopsis* as the only separating character was the laminal position of apothecia in *Cetrariopsis*. As the result, *Nephromopsis pallescens* (Schaer.) Park is now the correct name for *Cetraria wallichiana*. *N. laii* (A. Thell & Randlane) Saag & A. Thell is a lately described taxon from that group.

Nimisia Kärnefelt & A. Thell (1993) - 1 species

The type species *N. fuegiae* morphologically somewhat reminds of *Cornicularia* but anatomically it differs from all the other cetrarioid lichens in the structure of medulla and lower cortex. No secondary compounds have been observed. Only type locality in Tierra del Fuego, Argentina, is known.

Parmelaria D. D. Awasthi (1987) - 2 species

Species of *Parmelaria (P. thomsonii* and *P. subthomsonii)* which are distributed in India and Nepal only, have parmelioid thallus with perforated submarginal apothecia and very significant marginal pycnidia. May be closely related to *Cetrelia*.

Platismatia W. L. Culb. & C. F. Culb. (1968) - 10 species

Also related to *Cetrelia* but clearly distinguished from it by several anatomical and chemical characters as it was shown already by Culbersons (1968).

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Tuckermannopsis Gyeln. (1933) - 11 species

Described by Gyelnik in a very short manner: "Affinis generi *Nephromopsi* sed thallus subtus pseudocyphellis deficientibus" - this is the whole description we have. The genus was forgotten for almost 50 years and then resurrected by Lai (1981) and strongly supported by Hale (Egan 1987). Today we must admit that this is one of the cetrarioid genera that is still in a very bad need of thorough monographic treatment. Although the placing of some species in this genus (e.g. *T. platyphylla* and also recently transferred *T. inermis* and *T. subalpina)* is causing some doubt, we agree that it is the best solution at present.

Tuckneraria Randlane & A. Thell (1994) - 5 species

This genus is characterized by the morphology similar to *Nephromopsis* i.e. foliose yellowish thallus, marginally situated apothecia, plus presence of cilia, and the anatomy of ascocarps similar to *Tuckermannopsis*. Four species are from south-eastern Asia and one species - *Tuckneraria laureri* - is distributed also in Europe. Probably the most closely related to *Ahtiana*, the small genus from North America. One species - *Tuckneraria ahtii* Randlane & Saag is recently described.

Vulpicida J.-E. Mattsson & M. J. Lai (1993) - 6 species

Species with intensely yellow coloured foliose or subfruticose thallus are incorporated in this unit. The main diagnostic character of the genus is the presence of pinastric and vulpinic acids while ascomatal and pycnidial characters differ somewhat between the six species.

References

Culberson, C. F. & W. L. Culberson (1976): Chemosyndromic variation in lichens. - Systematic botany **1**: 325-339.

Culberson, W. L. & W. L. Culberson (1965): *Asahinea*, a new genus in the Parmeliaceae. - Brittonia **17**: 182-190.

Culberson, W. L. & Culberson, W. L. (1968): The lichen genera *Cetrelia* and *Platismatia* (Parmeliaceae). - Contributions U. S. National Herbarium **34**: 449-558.

Egan, R. S. (1987): A fifth checklist of the lichen-forming, lichenicolous and allied fungi of the continental United States and Canada. - Bryologist **90**: 77-173.

Gao, X. (1991): Studies in species of the lichen genus *Asahinea*. - Nordic Journal of Botany **11**: 483-485.

Kärnefelt, I., Mattson, J.-E. & A. Thell (1992): Evolution and phylogeny of cetrarioid lichens. - Plant Systematics and Evolution **183**: 113-160.

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KÄRNEFELT, I., MATTSON, J.-E. & A. THELL (1993): The lichen genera *Arctocetraria, Cetraria* and *Cetrariella* (Parmeliaceae) and their presumed evolutionary affinities. - Bryologist **96**: 394-404.

KÄRNEFELT, I. & A. THELL (1996): A new classification for the *Dactylina/Dufourea* complex. Nova Hedwigia **62**: 487-511.

LAI, M. J. (1981): Studies on the cetrarioid lichens in Parmeliaceae of east Asia.- I. Quarterly Journal of the Taiwan Museum **33**: 215-229. Taipeh.

RANDLANE, T. & A. SAAG (1991): Chemical and morphological variation in the genus *Cetrelia* in the Soviet Union. - Lichenologist **23**: 113-126.

RANDLANE, T. & A. SAAG (1993): World list of cetrarioid lichens. - Mycotaxon **47**: 395-403.

RANDLANE, T., SAAG, A. & A. THELL (1997): A second updated world list of cetrarioid lichens. - Bryologist **100**: 109-122.

RÄSÄNEN, V. (1952): Studies on the species of the lichen genera *Cornicularia, Cetraria* and *Nephromopsis*. - Kuopion Luonnon Yhdistyksen Julkaisuja B **2 (6)**: 1-53.

RASSADINA, K. A. (1950): *Cetraria* in the U. S. S. R. Plantae Cryptogamae, Ser. 2, **5**: 171-304 (in Russian).

Addresses:

Tiina RANDLANE
Institute of Botany and Ecology
University of Tartu
Lai Street 38
EE-2400 Tartu
Estonia
Fax: +372-7-441 272
E-Mail: randlane@ut.ee

Andres SAAG
Institute of Botany and Ecology
University of Tartu
Lai Street 38
EE-2400 Tartu
Estonia
Fax: +372-7-441 272
E-Mail: asaag@ut.ee

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