

Book Review

Contributions towards a new systematics of the lichen family *Thelotrema*aceae. By **Andreas Frisch, Klaus Kalb and Martin Grube.** 2006. (*Bibliotheca Lichenologica* 92) Berlin—Stuttgart: J. Cramer. Pp. 556, 159 figures, 9 tables, 26 plates, 23 × 14 cm. ISBN 3-443-58071-8. Paperback. Obtainable from: Gebrüder Borntraeger Verlagsbuchhandlung, Johannesstr. 3A, D-70176, Stuttgart, Germany, www.schweizerbart.de. Price: €88.

Contents: I. The lichen family *Thelotrema*aceae in Africa by A. Frisch. II. A monograph of *Thelotrema*aceae with a complex structure of the columella by A. Frisch and K. Kalb. III. Molecular phylogeny of the *Thelotrema*aceae by A. Frisch, K. Kalb and M. Grube.
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The lichen family *Thelotrema*aceae is a lichenological highlight of the tropical primary forests. It is most diverse at mid-bole elevations, where the high humidity from the lower strata meets the light passing through the gaps in the upper canopy. The wide climatic and altitudinal variation, the stable gradients in humidity and light in these forests, dominated by slow-growing hardwoods, and the high phorophyte diversity, cause an enormous niche diversity which allows the existence of large numbers of species. However, these lichens grow mostly out of reach of the casual visitor, and the full diversity can only be appreciated by specialized research on freshly felled trees or by using climbing techniques. Consequently the taxonomy of the family is still poorly understood, while it can safely be assumed that large numbers of species are at risk due to primary forest destruction.

A major step forward in the taxonomic knowledge of the family was made by the late Mason E. Hale around 1970–1980. He visited logging sites for collection, used TLC to detect chemical characters and supplied macrophotographs to facilitate identification. His regional treatments for Dominica, Panama and Sri Lanka were eye-openers for the diversity of the family, revealing large numbers of species from limited areas and many newly described species. However, anybody who has tried to identify *Thelotremes* will have discovered that these treatments are still far from exhaustive, and it was very unfortunate that Mason Hale did not have the time to continue his studies.

Without doubt the present book by Frisch, Kalb and Grube is the next milestone on the way to explore this family. Careful microscopic observations have led to the definition of numerous additional morphological characters, in particular those concerning thallus cortex structure, deposition of crystals, excipulum anatomy, ascospore structure, ornamentation, ontogeny, and for the first time, DNA sequences, have been used to assess the phylogeny.

The book consists of three distinct parts, (1) a regional revision of the family for Africa (370 pages),

(2) a revision of the species with complex columellae (146 pages), and (3) a phylogenetic analysis based on DNA sequences (23 pages). In addition there is a comprehensive index.

The first section is a monographic revision of the epiphytic *Thelotrema*aceae in Africa. It treats 94 species and more than doubles the number known from that continent. Informative keys to the genera and species are presented, with very detailed descriptions, good quality habit photographs and drawings of anatomical details for each species. Type material has been investigated to make sure that it fits the new, much more precise definitions of the species. Frequently, significant changes in interpretation of the species and new synonymies have become necessary. Thus, the 17 new species, and the new generic division make this part of the book invaluable for the study, not only of the African *Thelotrema*aceae, but also for those from all over the tropics. In appendices, species lists per country and comments on excluded and dubious names are presented. Personally I am much impressed by the fact that the great majority of the specimens on which this study is based, have been collected by Andreas Frisch himself, during extensive fieldwork in areas with difficult access. Through his efforts Africa is now among the better-known areas for *Thelotrema*aceae, while it was virtually *terra incognita* before.

The second part consists of a worldwide revision of the species with complex columellae. Forty two species are accepted, five of which are described for the first time, and attributed to five new or resurrected genera. The same high standards as in the first part are followed, and detailed keys to the genera and species are presented, with very detailed descriptions and good quality illustrations. Likewise types have been consulted, and this section is certainly indispensable for the identification of *Thelotrema*aceae with complex columellae worldwide. There has never been an adequate treatment of this group before, and it is strongly recommended to check previous identifications with this work. However, care should be taken with the limits of

the treated groups. While some species have discs full of knobs or splits, others have hardly more than a big, central columella. In cases of doubt it seems best to try the key. An omission seems to exist for the *Myriotrema viridiatrum* group, which is said to contain species with a reticulate columella (p. 167), but is not treated in this section.

The third part contains a phylogenetic analysis based on mitochondrial 16S rDNA. In this family, with its notoriously plastic morphology, where generic division has been disputed for centuries, non-morphological data for the assessment of its phylogeny are particularly valuable. Sequences for 46 samples were obtained in spite of the fact that the family poses special problems for DNA extraction. The results confirm some of the newly proposed generic divisions, while others remain undecided. Particularly surprising are the indications that the genus *Graphis* is nested within the *Thelotremataceae*, that *Ocellularia*-like species are closely related to the genus *Fissurina*, and that the recently advocated concept of *Chroodiscus* is polyphyletic.

The book worked well for identifying my own specimens. Many readers will appreciate that it is written in English and not in the mother language of the authors, German. The detailed keys and descriptions allow a convincing identification for most material, unlike in earlier treatments where compact keys could lead easily to misinterpretations and where useful supportive or even essential characters to corroborate the identifications were often missing. How helpful it would be to have further such revisions available! A minor drawback is that the plates with the habitus photographs of the species are scattered throughout the book and are tedious to find. I would have preferred them grouped together. The chapter on morphology in the first part of the book is not exhaustive. I looked there in vain for a description of the *Redingeria* spore type while using the key in part I, and found it in the genus description for *Redingeria* in part II.

Particular attention throughout the book is paid to the development of a new generic classification for the *Thelotremataceae*. Where the long-standing standard Zahlbrucknerian system recognized four, admittedly artificial, genera for the species treated here, and Hale (1980) reduced this to three, now 17 genera are accepted; four of these are new and many taxa are resurrected and emended. As in Staiger's (2002) treatment of the related family *Graphidaceae*, details of ascocarp structure have been used predominantly for a new subdivision. However, the treatment seems less complete and some species groups are left unresolved,

such as the *Ocellularia clandestina* and the *Thelotrema glaucopallens* groups. An impediment for the development of a new classification was certainly that the investigations are biased towards Africa, a continent in which many groups of organisms are poorly represented. My experience is that in *Graphidaceae* most specimens can easily be accommodated within the new generic limits proposed by Staiger (2002), whereas in *Thelotremataceae* from outside Africa, several species, after consulting the present study, have to remain within the traditionally delimited genera of Hale (1980). No attempt will be made here to discuss the validity of each new entity. This seems better postponed until more macromolecular data are available, with more species sampled and different sequences evaluated. One point which may need attention – it seems unlikely to me that *Myriotrema insignis* and *M. pachystomum* are closely related. However, I have seen a *M. insignis*-like specimen from Brazil which is much more like *M. pachystomum* than the specimen in plate 8A, so that a confusable species may be involved. Generally the new generic units look quite promising, although some may turn out to be nested within others, such as *Ampliotrema*, while further groups seem to merit generic status, such as the *Ocellularia clandestina* group. The separation of *Chapsa* from *Chroodiscus* pleased me, because I found it hard to accept that species with such different ecologies would be closely related. My feeling is that *Chroodiscus* is probably closer to *Gomphillaceae* and might better be taken as an outgroup in the cladogram of section 3 instead of *Fissurina dumastii*. That could cure the remarkable position of the *O. clandestina*-group which is placed next to a part of the presumed outgroup.

Concluding, this book sets new standards for the delimitation and description of species in the *Thelotremataceae*, and is a great help in their identification worldwide, and in particular, Africa.

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