Phytotaxa 189 (1): 007–038
www.mapress.com/phytotaxa/

Article

ISSN 1179-3155 (print edition)
PHYTOTAXA
ISSN 1179-3163 (online edition)

http://dx.doi.org/10.11646/phytotaxa.189.1.4

One hundred and seventy-five new species of Graphidaceae: closing the gap or a drop in the bucket?

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Abstract

Recent studies of the global diversity of the lichenized fungal family Graphidaceae suggest that there are a large number of species remaining to be discovered. No less than 640 species have been described since 2002, including 175 new species introduced in a collaborative global effort in a single issue in this journal. These findings suggest that the largest family of tropical crustose lichens may have an even higher number of species than Parmeliaceae. To estimate whether

Accepted by Mohammad Sohrabi: 20 Jun. 2014; published: 19 Dec. 2014

conserved tropical rain forest; (3) not well-studied but with increasing amount of molecular data becoming available; and (4) global identification tools becoming available, such as the interactive key to thelotremoid taxa including tribe Ocellularieae assembled by Gaswick & Lücking (2012) and a global key for species in the genus *Fissurina* (Lücking, in prep.). This contrasts with the comparatively low proportion of new species in the large genera *Graphis*, *Phaeographis*, and *Thelotrema*. Both *Graphis* and *Thelotrema* are mostly found in (semi-)exposed situations in montane regions, and for both genera, global identification tools have been available for a few years already. This could suggest that the rate of species discoveries in these genera is decreasing and the bulk of new species have been discovered in the past few years. The low number of new species in *Phaeographis*, on the other hand, is apparently due to the lack of reliable nomenclatural and taxonomic resources in this group, which makes formal new species descriptions difficult. We therefore predict that the majority of undiscovered species belong to the genera *Fissurina*, *Ocellularia*, and *Phaeographis* and their relatives, in particular *Myriotrema*, *Rhabdodiscus*, *Sacrographa*, and *Stegobolus*. Some of these species might not be genuinely new but correspond to names in historical publications that had been subsumed into synonymy or never revised after their original descriptions.

Geographically, our findings suggests that most of this unknown diversity is to be discovered in Mexico, the Andean countries from Venezuela down to Bolivia, the eastern Amazon, most of tropical West Africa, parts of continental southeast Asia (in particular China and adjacent areas to the southwest, such as Myanmar), and Indonesia and Papua New Guinea. Considering that substantial efforts in the past decade to catalogue the diversity of Graphidaceae have concentrated on a few regions only (southeastern North America, Costa Rica, the western Amazon, small parts of tropical Africa, India, Sri Lanka, Thailand, Australia, New Caledonia), and these efforts have unearthed over 600 new species, finding an additional 1,850 new species in the vast area covered by the aforementioned "discovery hotspot" regions seems not out of the ordinary. If we assume a similar-sized global task force and a continued collaborative effort as currently available, 600 species described in ten years translates to about 30 years required to describe an additional 1,850 species. However, this is only possible if there is continued substantial support for fieldwork, taxonomic work, and molecular work at a global scale, which will require increased efforts of taxonomists to explain the importance of this fundamental research for our understanding of the diversity of the globe to the public and funding agencies.

Acknowledgements

Data obtained for this study were gathered as part of several projects funded by the National Science Foundation: *TICOLICHEN* (DEB 0206125 to The Field Museum; PI Robert Lücking), *Phylogeny and Taxonomy of Ostropalean Fungi, with Emphasis on the Lichen-forming Thelotremataceae* (DEB 0516116 to The Field Museum; PI H. T. Lumbsch; Co-PI R. Lücking), *Neotropical Epiphytic Microlichens—An Innovative Inventory of a Highly Diverse yet Little Known Group of Symbiotic Organisms* (DEB 715660 to The Field Museum; PI R. Lücking), and *ATM—Assembling a taxonomic monograph: The lichen family* Graphidaceae (DEB-1025861 to The Field Museum; PI T. Lumbsch, CoPI R. Lücking). The Caterpillar® company provided funds to study lichens and other cryptogams from Panama, especially with regard to molecular approaches. The curators and collections managers at the many herbaria from which type specimens and other collections were studied are thanked for their collaboration. Without their continuous efforts, a work such as the present one would not be possible.

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