Taxonomy and Systematics of Thelephorales
– Glimpses Into its Hidden Hyperdiversity

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ABSTRACT

The order Thelephorales is a widespread group of many thousands of species of ecologically important, ectomycorrhizal fungi, of which only a fraction have been described to date. Most species are corticioid (skin-like) and form complexes of morphologically similar, closely related species. At the same time the names that do exist are often old, have unclear synonymy and their common presence within such complexes often hinders the description of new species. For the comparatively few stipitate (with cap and stipe) Thelephorales species taxonomic knowledge is more complete but the phylogenetic relationships between taxa is largely unknown; most existing genera have been circumscribed based on macromorphology. Many stipitate species occurring in the Nordic countries are dependent on old growth forest and are hence included in the national Red Lists, while the conservational situation for nearly all corticioid species is unknown, due to their unclear taxonomy.

Pseudotomentella tristis s.l. is a seemingly common, widespread and ecologically very plastic, corticioid morphospecies with an old name and nine heterotypic synonyms. Through a combination of type studies, precise spore measurements, ecological data and a multi-gene phylogeny, three species are identified under already existing names and another ten are described as new. One species, *P. umbrina* is found to indeed be a common and widespread species with a wide ecological amplitude, while the remaining 12 are less common, possibly less widespread, have narrower ecological niches and in a few cases seem to be host-restricted. In similarity to stipitate species, a large proportion of the newly described species seem to only occur in old growth forest.

Three corticioid species from the Scandes mountains, two *Pseudotomentella* species and one *Tomentella*, are described as new, based on ITS-LSU phylogenies. The *Pseudotomentella* species belong to the *P. tristis* group, where they are more or less cryptic with another newly described species.

A new, stipitate species in the hitherto corticioid genus *Amaurodon* is described, the stipitate genera *Hydnellum* and *Sarcodon* are delimited against each other and the stipitate genus *Polyozellus* is delimited against the corticioid genus *Pseudotomentella* – the former two with phylogenies based on ITS and LSU sequences and the latter based on a multi-gene dataset. *Hydnellum* is found to make *Sarcodon* paraphyletic, as does *Polyozellus Pseudotomentella*. To amend this, twelve species are recombined from *Hydnellum* to *Sarcodon*, while all species, including the type, are moved from *Pseudotomentella* to *Polyozellus*.

In conclusion, this thesis demonstrates that corticioid species complexes in Thelephorales with many taxa and old names can be successfully disentangled and presents a method for doing so; it identifies molecular markers and sets a standard of measuring spores and collating ecological data that will facilitate further taxonomic work within the order. In addition, it shows that basidiomata shape is a poor predictor of generic affinity, even when derived from such striking differences as the separation of stipitate and corticioid forms. Consequently, the extinction threat previously documented for stipitate species is likely not restricted to such, and this is also tentatively shown for corticioid *Polyozellus* species.

Keywords: *Thelephorales, Tomentella, Polyozellus, Pseudotomentella, Amaurodon, Hydnellum, Sarcodon*, species delimitation, cryptic species, molecular systematics, ectomycorrhiza, basidiomata shape.