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On the monophyly of subfamily Tectarioideae (Polypodiaceae) and the phylogenetic placement of some associated fern genera

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Abstract

The fern genus *Tectaria* has generally been placed in the family Tectariaceae or in subfamily Tectarioideae (placed in Dennstaedtiaceae, Dryopteridaceae or Polypodiaceae), both of which have been variously circumscribed in the past. Here we study for the first time the phylogenetic relationships of the associated genera *Hypoderris* (endemic to the Caribbean), *Cionidium* (endemic to New Caledonia) and *Pseudotectaria* (endemic to Madagascar and Comoros) using DNA sequence data. Based on a broad sampling of 72 species of eupolypods I (= Polypodiaceae *sensu lato*) and three plastid DNA regions (*atpA*, *rbcL* and the *trnL-F* intergenic spacer) we were able to place the three previously unsampled genera. Our results show that *Cionidium*, like *Ctenitopsis*, *Fadyenia*, *Hemigramma* and *Quercifilix*, is embedded in *Tectaria*, and the monophyly of *Tectaria* is therefore corroborated only if these segregate genera are included. *Hypoderris* is sister to *Tectaria brauniana* and together they are sister to *Triplophyllum*, which was found to be monophyletic. Despite their morphological similarity with *Tectaria*, the genera *Pleocnemia* and *Pseudotectaria* were placed in Dryopteridoideae. Polypodiaceae subfamily Tectarioideae (former family Tectariaceae) is hereby defined to include *Arthropteris*, *Hypoderris*, *Pteridrys*, *Tectaria* and *Triplophyllum*. *Aenigmopteris* may also belong here, but this genus remains unsampled.

Key words: *Cionidium*, Dryopteridaceae, eupolypods I, *Hypoderris*, leptosporangiate ferns, neoteny, paedomorphism, *Pseudotectaria*, *Tectaria brauniana*, Tectariaceae, *Triplophyllum*

Introduction

The fern genus *Tectaria* Cav. is currently considered a part of Tectariaceae (*sensu* Smith *et al.* 2006, Christenhusz *et al.* 2011) or Polypodiaceae subfamily Tectarioideae (*sensu* Christenhusz & Chase 2014), the classification followed in this paper. Tectarioideae is a medium-sized group of ferns with a pantropical distribution. The species have diverse morphologies, especially in characters such as leaf shape, venation, soral organisation, indumentum and variability in indusia, and several species show leaf dimorphism. Ever since Tectariaceae was first described as a family by Ching (1940), there has been taxonomic controversy on its circumscription and placement.

Most authors have included between 15 and 25 genera in the loosely defined lineage containing *Tectaria* (e.g. Ching 1940, 1978, Holttum 1947), but the identities of these genera have varied greatly. In Holttum's (1947) classification, the group was placed in Dennstaedtiaceae as subfamily Tectarioideae. It included the genera *Amphiblestra* C.Presl, *Arcypteris* Underw., *Ctenitis* (C.Chr.) C.Chr., *Cyclopeltis* J.Sm., *Dictyoxiphium* Hook., *Hemigramma* Christ, *Heterogonium* C.Presl, *Lastreopsis* Ching, *Pleocnemia* C.Presl, *Pleuroderris* Maxon,

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