



## Taxonomic update, distribution and conservation status of grammitid ferns (Polypodiaceae, Polypodiopsida) in Veracruz State, Mexico

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### Abstract

Grammitid ferns are a group of about 750 species, which have been treated as a distinct family (Grammitidaceae) or as part of the Polypodiaceae. Generic concepts have been in great flux, and especially in the last two decades, several new genera have been segregated on the basis of morphological and molecular data. There are 37 species of grammitids known from Mexico, of which 18 species distributed in seven genera (*Alansmia*, *Cochlidium*, *Galactodenia*, *Melpomene*, *Moranopteris*, *Stenogrammitis*, and *Terpsichore*) are currently known from Veracruz. Most grammitids in Veracruz and Mexico seem to be rare, and occur generally very locally in montane rain and cloud forests, which are one of the country's most threatened ecosystems and have been widely replaced due to human activities. We provide a taxonomically updated species list for Veracruz and an evaluation of conservation status considering the IUCN regional criteria for each species, based on 132 specimens. About 72% of grammitid species from Veracruz belong to a threatened category, mainly because of a very limited number of known populations either in Los Tuxtlas or central area, whose humid montane forests have suffered major habitat destruction within the last decades or still are under severe anthropogenic pressure.

### Introduction

Grammitid ferns are a group of about 750 species characterized by green, usually tetrahedral spores, sporangial stalks of only one row of cells, scaleless leaves, and almost always by leaf traces of single vascular strands (Parris 1990, 1998, Ranker *et al.* 2004, Sundue 2010a, Sundue *et al.* 2010). They have been treated as a distinct family (e.g., Parris 1990, Ranker *et al.* 2004) or as part of the family Polypodiaceae (e.g., Tryon & Tryon 1982, Lellinger 1989, Smith *et al.* 2006). Molecular studies have shown that the grammitids are a monophyletic lineage nested within Polypodiaceae (Ranker *et al.* 2004, Schneider *et al.* 2004). Generic delimitation within grammitid ferns has been highly controversial when based solely on morphological characters, with only one genus recognized by Tryon & Tryon (1982), four genera by Parris (1990), 10 by Smith (1993) for the Neotropics alone, 12 by Copeland (1955), and 18 by Parris (2003). The difficulty in using morphological characters to divide the grammitid ferns into genera is due to the high variability and homoplasy of obvious morphological traits such as blade dissection, and the rather obscure nature of taxonomically informative traits such as hydathodes, rhizome symmetry, root insertion, or even presence of fungal bodies on the blades (Smith 1993, Ranker *et al.* 2004, Sundue 2010a, Sundue *et al.* 2010). Based on these and other characteristics, Bishop (1988, 1989), Smith *et al.* (1991), Bishop & Smith (1992), Smith (1992, 1993), and Smith & Moran (1992) defined 10 genera among the neotropical representatives of the grammitid ferns, with another genus described since then (Murillo & Smith 2003). However, in the last two years, several new genera, largely but not entirely confined to the Neotropics, have been segregated on the basis of morphological and molecular data, including *Alansmia* (Kessler *et al.* 2011: 238), *Ascogrammitis*