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Resolving cryptic species with morphology and DNA; thrips as a potential biocontrol agent of Brazilian peppertree, with a new species and overview of *Pseudophilothrips* (Thysanoptera)

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Abstract

Molecular and morphological evidence is presented to support the description of a second species of *Pseudophilothrips* from Brazil in association with *Schinus terebinthifolius*, an invasive weedy tree in North America. *Pseudophilothrips* is here recognized as a weakly defined genus comprising 13 described species from the Americas. This genus is presumably derived from within, rather than sister-genus to, the worldwide genus *Liothrips* of leaf-feeding species.

Key words: *Pseudophilothrips gandolfoi* **sp. n.**, *Pseudophilothrips ichini*, weed biological control, mtDNA COI gene, cryptic species

Introduction

Brazilian peppertree, *Schinus terebinthifolius* (Anacardiaceae), is an invasive weed that infests natural and agricultural areas in the subtropics of many areas of the world including the USA and Australia. Originally from eastern Brazil, northern Argentina, Uruguay, and Paraguay, this species was introduced into Florida between about 1898 and 1900 (Williams *et al.*, 2007). In the southern USA it now invades both disturbed and undisturbed plant communities, ranging from pinelands, hammocks, and mangrove coastal areas (Johnson, 1994). Currently, this weed infests over 280,000ha in Florida and is one of the most difficult invasive plant species to control (Schmitz *et al.*, 1997). Moreover it has been a problem in Hawaii for many years (USFS PIER, 2010) and is becoming increasingly invasive in California (Randall, 2000). Regardless of the duration of the infestation, classical biological control constitutes one of the best options for sustained population reductions of this invasive species.

Classical weed biological control seeks specialized herbivore species from the weed's native range that will inflict damage to invasive populations while causing minimal harm to valued plants. Correct identification of both the target weed and of the potential biological control agent is of paramount importance, but traditionally has depended upon morphological determinations. However, the occurrence of hidden, or cryptic, species complexes poses unforeseen complexity and challenges. Although species with narrower host ranges may emerge from the analysis of these cryptic species complexes, the methods of distinguishing them may require a combination of both traditional morphological and novel molecular techniques (Smith *et al.*, 2008). Recent examples demonstrate the potential of this approach to improve natural enemy selections for weed biological control projects (Goolsby *et al.*, 2006; Madeira *et al.*, 2006; Tracy and Robbins, 2009). The information presented here constitutes a further example of the importance of collaboration between morphological taxonomists and molecular specialists. The complexities of natural field associations in the target's home range must be carefully evaluated and assessed before a potential control agent can be selected for importation into quarantine for study and subsequent safety testing.

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