



What about intraspecific variation? Reassessment of taxonomic and phylogenetic characters in the genus *Synoeca* de Saussure (Hymenoptera: Vespidae: Polistinae)

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Abstract

Morphological variation within and between species of the genus *Synoeca* was studied to test species status and to propose characters that fulfill the principles of communicability, unit delimitation, and conjunction for taxonomic and phylogenetic analyses. Twenty-six morphological characters obtained from the literature were analyzed; 16 of these characters clearly exhibited delimited states but only four of them were unique for each species. The status of every species of the genus was supported by geometric morphometrics of the head (front view, dorsal view and metasomal tergum 1) and by the presence of unique character states for each species. Phylogenetic analyses included nest and genitalia characters. Character reassessment provided a less resolved tree to that previously published. Including polymorphic characters did not improve tree resolution or clade support, while applying the conjunction test offered a more resolved and better supported tree. The study revealed the importance of analyzing variation in taxonomic and phylogenetic studies within and between species. A new key to species and a phylogenetic hypothesis are offered.

Key words: Epiponini, geometric morphometrics, polymorphism, conjunction test, Neotropical region

Introduction

The genus *Synoeca* was described by Henri de Saussure in 1852 and in 1978 Richards conducted a revision where he defined five species. Species of *Synoeca* are found from the extreme north of Mexico down to the north of Argentina (Richards 1978). The genus is part of a clade consisting of the genera *Clypearia* de Saussure, *Metapolybia* Ducke, *Occipitalia* Richards, and *Asteloeaca* Raw (Carpenter 1991; Wenzel 1998). Colonies contain around 200 individuals and the nest is Astelocyttrous, consisting of a comb directly attached to the substrate and a convex envelope attached to the margin of the comb; when the nest grows a series of partially overlapping extensions can be observed in a row. This envelope may present regular transverse corrugations resembling the back of an armadillo (Dasypodidae) which explains the species' common name in many parts of Latin-America (“cachicamas”, “armadillas” or “conchajonas”) (Du Buysson 1906; Castellón 1980a, 1980b, 1982a, 1982b). The species of this genus are well known for their painful sting and by the vigorous defense of their nests and sting autotomy has been reported.

Synoeca exhibits wide morphological variation, as has been indicated by the multiple synonyms (Richards 1978) and this characteristic was not properly solved by Richards' revision of descriptions and key since the poorly described characters and the lack of illustrations usually turn user to need a reference collection to key out upcoming specimens. Subsequent publications have partially solved this problem on character definition and description. Since taxonomy should be explicit about character statements and should rely less on a researcher's “good judgment” for delimiting units (Serenó 2007; Vogt *et al.* 2009), an integrative study of species' variation including analysis and standardization of qualitative traits, and a testable study of shape through geometric morphometrics may contribute towards solving the problem of species delimitation. Geometric morphometrics has made possible to test