



## Taxonomic revision of the spider family Penestomidae (Araneae, Entelegynae)

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### Abstract

Conflicting character evidence and a scarcity of male specimens has historically made placement of the spider subfamily Penestominae Simon problematic. The Penestominae was recently removed from the family Eresidae and promoted to family rank based on the results of a molecular phylogenetic study; a complementary taxonomic revision of the Penestomidae is presented here. Penestomidae contains a single genus, *Penestomus* Simon, 1902. The genus *Wajane* Lehtinen, 1967 was previously included in the Penestominae, and distinguished from *Penestomus* based on the lack of a cribellum. *Wajane* is, in fact, cribellate, and is here synonymized with *Penestomus*. **New synonymy.** Nine *Penestomus* species are recognized: four species are redescribed (*P. planus* Simon, 1902, *P. croeseri* Dippenaar-Schoeman, 1989, *P. stilleri* (Dippenaar-Schoeman, 1989), **new combination**, and *P. armatus* (Lehtinen, 1967)) **new combination**, and five species are newly described (*P. egazini* **sp. nov.**, *P. kruger* **sp. nov.**, *P. montanus* **sp. nov.**, *P. prendinii* **sp. nov.**, and *P. zulu* **sp. nov.**). Male specimens are rare in collections; only *P. egazini*, *P. montanus*, and *P. armatus* are known from

males, and only *P. armatus* is unknown from females. A dichotomous key to the species is provided. Data elements in this work have been disseminated across multiple electronic venues, including images on Morphbank, distribution data exposed through GBIF and explorable using Google Earth, new nomenclatural acts registered with ZooBank, and species pages on the Encyclopedia of Life. Where available, species descriptions include links to molecular sequence data on GenBank.

**Key words:** cribellum, cybertaxonomy, Eresidae, *Penestomus*, South Africa, *Wajane*, Zodariidae

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## Introduction

Penestomidae Simon are small (ca. 4–6 mm long) dorsoventrally flattened, short-legged spiders endemic to South Africa and the enclave of Lesotho. Until recently, they were considered a subfamily of Eresidae C. L. Koch (the Penestominae) containing two genera, *Penestomus* Simon and *Wajane* Lehtinen. They are relatively rare in collections and little is known of their biology. Previously, only eight adult specimens (four species) were documented in the literature. This work brings the number of adult specimens to 60 (nine species); of these, only four are male (three species).

Their rarity, limited distribution, and an unusual combination of morphological characteristics have made this group one of the most enigmatic lineages in spider systematics. The first penestomine was described from the female only and placed in the family Eresidae. Even in the original description (Simon 1902), it was noted that these spiders were atypical eresids. Nevertheless, there are several morphological characters that appear to support placement within Eresidae including the presence of a clypeal hood (Fig. 1C; compare to Griswold et al. 2005, fig. 129A), specialized white setae, a subrectangular carapace, and stout legs (Fig. 1B). In addition, penestomines lack tarsal trichobothria; eresids and most other spiders outside of the RTA clade (see below) symplesiomorphically lack tarsal trichobothria (Griswold et al. 1999; Griswold et al. 2005).

Ambiguity about the proper placement of penestomines deepened with the description of the first male (Lehtinen 1967) because the male pedipalps do not resemble those of other eresids and feature a strong retrolateral tibial apophysis (RTA). The RTA defines a major clade of spiders (more than half of spider diversity) exclusive of Eresidae (Coddington & Levi 1991; Griswold et al. 2005). Penestomine males also have a median apophysis (MA). This pedipalpal sclerite has a more complicated evolutionary history than the RTA, but it is common in RTA clade taxa and orbicularians (orb-web building spiders and their descendents), and absent from other eresids (Coddington 1990; Griswold et al. 1998; Griswold et al. 1999; Griswold et al. 2005).

The conflicting morphological data suggest one of two scenarios: either the RTA and MA evolved independently in penestomine eresids and RTA-clade spiders, or penestomines are misplaced in Eresidae and belong instead within the RTA-clade. To resolve this conflicting character evidence and to test the phylogenetic position of the Penestominae, Miller et al. (2010) assembled a matrix of molecular sequence data (fragments from four genes, ca. 3500 aligned nucleotide positions). Taxon sampling emphasized both Eresidae and the RTA clade. Phylogenetic analysis indicated that penestomines belong within the RTA clade close to Zodariidae. This relationship has significantly better support (Shimodaira & Hasegawa 1999) than the most likely tree constrained to contain a monophyletic Eresidae including Penestominae. Based on this analysis, Miller et al. (2010) removed Penestominae from Eresidae and promoted it to family rank. Penestomidae joins Chummidae Jocqué to become the second spider family endemic to South Africa (including the enclave of Lesotho). The spider fauna of southern Africa is quite distinct and includes several endemic lineages; selected examples are listed in Table 1.