Systematic revision of the genera *Geckobiella* Hirst, 1917 and *Hirstiella* Berlese, 1920 (Acari: Prostigmata: Pterygosomatidae) with description of a new genus for American species parasites on geckos formerly placed in *Hirstiella*

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Abstract

A cladistic analysis based on 274 morphological characters was performed including the 13 previously recognized species of the scale mite genus Hirsiella, 2 new species, 5 species in closely related genera, and 3 more distant out-group species. An analysis based on 148 informative characters resulted in one most parsimonious tree (L = 400, CI = 0.57 and RI = 0.79). According to this, the genus Hirsiella in its current concept is a polyphyletic taxon whose member species belong to three different clades. The first lineage (Bremer support and jackknife values 2 and 73%) includes the type species H. trombidiiformis and seven additional species of Hirsiella that are parasites on iguanian lizards. The genus Geckobiella is included in this lineage, and the latter taxon name has priority over Hirsiella; therefore, the genus Hirsiella is considered a synonym of Geckobiella and no longer valid. For the second lineage (Bremer support and jackknife values of 2 and 73%) we propose the name Bertrandiella gen. nov.: it includes H. tenuipes, H. otophila, H. jimenezi and Bertrandiella chamaelaensis sp. nov. The third lineage, and sister taxon of Bertrandiella, is a clade comprising Pimeliaphilus and the species H. sharifi and H. insignis. The latter taxa are transferred back to Pimeliaphilus (Bremer support and jackknife values >4 and 100%). Updated diagnoses are provided for the genera Geckobiella sensu nov. (including a new species Geckobiella donnae sp. nov.) and Bertrandiella gen. nov., and for all their species, as well as for the genera Pimeliaphilus sensu nov. and Tequisistlana, based on the results of the phylogenetic analyses. The analyses support the hypothesis that lizards are the ancestral hosts for Pterygosomatidae; associations with arthropods (in Pimeliaphilus) appear to be secondary, the result of host switching from lizards.

Key words: Bertrandiella gen. nov., Pimeliaphilus, Bertrandiella chamaelaensis sp. nov., Geckobiella donnae sp. nov., phylogeny, serial homology

Introduction

The family Pterygosomatidae includes 10 genera with approximately 156 described species, most of them (eight genera) are external parasites of lizards, but the species of one genus, Pimeliaphilus Trägårdh, 1905 are found on arthropods and another monotypic genus Bharatoliophilus Prasad, 1975 was found on a dove.

Within Pterygosomatidae the genera Geckobiella Hirst 1917, Hirsiella Berlese 1920 and Pimeliaphilus, have been considered less specialized and more "primitive or plesiomorphic, based on their general shape (body longer than wide and with long legs) (Cruz 1984; Bertrand 2002).

The genus Geckobiella currently includes two species of mite parasites of iguanian lizards, G. texana (Banks, 1904) on Phrynosomatidae in Central and North America and G. harrisii Davidson, 1958 on Tropiduridae in South America. This genus was diagnosed by Hirst (1917; 1926), Lawrence (1953), Lane (1954) and Davidson (1958), but of all the characters enumerated, the only valid autapomorphy is the presence of a specific type of idiosomal hypertrichy on the dorsum (different from that seen in Geckobia and Pterygosoma). Apart from these taxonomic studies, the biology of Geckobiella was studied by Goodwing (1954) and additional distributional records for G. texana were presented by Jack (1959), Hoffmann (1969) and Paredes-León et al. (2008).

The genus Hirsiella includes species of mite parasites of iguanian and gekkotan lizards. Thirteen species have been assigned to this genus, which was proposed originally for Geckobiella (Hirsiella) trombidiiformis Berlese from Mexico off an unknown host. Later, Cunliffe (1949a; 1952) described three more species and carried out the first revision of Hirsiella and Pimeliaphilus, transferring two species to the former genus (Pimeliaphilus insignis (Berlese) and P. tenuipes (Hirst)). Jack (1961) made the second examination of both genera, described another species, and transferred Pimeliaphilus sharifi Abdussalam to Hirsiella. Subsequent studies of Hirsiella include the description of new species by Newell and Ryckman (1964), Hunter and Loomis (1966), Baker (1998) and Paredes-León and Morales-Malacara (2009). Cruz (1984) described the genus Cyclurobia with a single species, C. javieri Cruz, an ectoparasite of Cuban iguanas. This genus has been synonymized with Hirsiella by Bochkov (2008).

The genus Pimeliaphilus was proposed for P. podapolipopagous Trägårdh a mite associated with tenebrionid beetles. Geckobia insignis Berlese was also included in this genus. Pimeliaphilus has been assigned to the family Raphignathidae by Trägårdh (1905), Vitzthum (1942) and Jack (1961; 1964), and to the Pterygosomatidae by Hirst (1917; 1926) and Cunliffe (1952). Further, Vitzthum (1942) proposed the genus Pimeliaphiloides Vitzthum for two species of Pimeliaphilus parasitic on lizards (i.e., P. insignis (Berlese) as type species and P. tenuipes Hirst) but Cunliffe (1952) synonymized Pimeliaphiloides with Hirsiella. Despite these issues, the genus Pimeliaphilus has