



## Morphometric analysis of the bat wing mite *Periglischrus ojustii* (Mesostigmata: Spinturnicidae) related to different yellow-shouldered bat host species and its distribution\*

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Mammals host a broad diversity of parasite lineages that radiated along with them over their evolutionary history, showing in some cases a co-phylogenetic relationship. Understanding patterns of parasite diversification could provide insights into the processes of co-evolution more broadly. Spinturnicid mites of the genus *Periglischrus* provide an interesting study model since they are specific to phyllostomid bats. Currently, this mite genus has 26 species that range from monoxeny, stenoxeny to, in a few cases oligoxeny. *Periglischrus ojustii* is one oligoxenous mite that is associated with the Yellow-shouldered bats (*Sturnira*), which are abundant and widespread in the Neotropics and diversified during the Pliocene. This study aimed to evaluate the morphometric and geometric variation on *Periglischrus ojustii* associated with the diversification and distribution of its host bat species of the genus *Sturnira*, as possible evidence of co-evolution.

Lineal and geometric morphometric analyses were conducted with specimens from the following collections, Morales-Malacara, Colección Nacional de Ácaros Anita Hoffmann; Colección Nacional de Mamíferos; Laboratorio de Vertebrados y Museo de Zoología “Alfonso L. Herrera”; Centro de Investigaciones Regionales “Dr. Hideyo Noguchi”, UADY; Field Museum of Natural History; Museo Nacional de Costa Rica; Universidad Central de Venezuela; A. Fain collection from Royal Belgian Institute of Natural Sciences, and Instituto Resgatando o Verde, Brasil. All specimens were mounted on slides in Hoyer’s medium and were photographed using a microscope (Zeiss AxioImager A2). We digitalized 18 landmarks on the ventral idiosoma in females, 21 in males, 7 in sternal plate and 14 in sternogenital plate with tpsDig 2.04. Data were standardized using Procrustes superimposition method, and superimposed landmarks were analyzed through principal component analysis (PCA). Then, shape modelling was illustrated in morphospace using thin-plate spline deformation grids. The effect of the locality and the host species was evaluated by one-way unbalanced ANOVA test. The lineal morphometric, measurements were taken from idiosomal features, as well as body and leg setae on adult specimens of both sexes, using a Zeiss Axioskop 2 microscope (ZA2) with phase contrast optics and with a coupled micrometer. Data were examined by discriminant analysis, using Ward method to grouping and principal component analysis. The number of specimens was different between the tests, 121 females and 112 males in geometric morphometry analysis and 130 females, 106 males in lineal morphometry.

Although the ANOVA showed significant effects of the geographic region and host species on the morphological variation in both sexes, there was no clear separation between the geography or host species for either sex through the PCAs that analyzed landmarks and meristic characters. However, the discriminant analysis managed to determine a separation of the specimens found in the host *S. magna* in both sexes, additionally *S. erythromos* in males, *S. tildae* and *S. oporaphilum* in females. Ward clusters showed some clades formed by host species, but they were not related to the other analysis. These results indicate that *P. ojustii* has high intraspecific variation in morphology (e.g., size and shape) across different host species more significantly than across geography. This suggests a certain level of evolutionary conservatism of this mite with respect to their hosts showing incomplete phenotypic differentiation. The addition of specimens on more host species could strengthen the analysis and clarify whether there are phenotypic patterns consistent with the co-evolutionary proposal of the host-parasite relationship.

**Keywords:** Spinturnicid, *Periglischrus ojustii*, bat-ectoparasite, morphometrics