

Scientific Note

Wings or hemelytra? brief considerations on terminology in studies with Triatominae (Hemiptera: Heteroptera: Reduviidae)

¿Alas o hemiélitros? breves consideraciones sobre terminología en estudios con Triatominae (Hemiptera: Heteroptera: Reduviidae)

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Abstract. The epidemiological significance and biological character of Triatominae are frequently explored, but errors in morphological terminology are common. We discuss the importance of using morphological terminology correctly. The incorrect use of the term “wing” to describe the hemelytron in the study of Triatominae is pointed out. The correct and standard use of the term hemelytron (pl. hemelytra) to describe the forewings is suggested.

Key words: Forewings; hemelytra; morphology; taxonomy; Triatominae.

Resumen. La importancia epidemiológica y el carácter biológico de Triatominae se exploran con frecuencia, pero los errores en la terminología morfológica son comunes. Se discute la importancia de utilizar correctamente la terminología morfológica. Se señala el uso incorrecto del término “ala” para describir el hemiélitro en el estudio de Triatominae. Se sugiere el uso correcto y estándar del término hemiélitro (pl. hemiélitros) para describir las alas anteriores.

Palabras clave: Alas anteriores; hemiélitros; morfología; taxonomía; Triatominae.

The interest of this article is to draw the attention of the scientific community to the correct use of forewing terminology in studies dealing with members of the suborder Heteroptera Latreille, 1810, mainly those belonging to the subfamily Triatominae Jeannel, 1919. Triatominae currently includes 157 species distributed among 18 genera, and found in the Americas, Asia, and Oceania (Belintani *et al.* 2021; Zhao *et al.* 2021; Dale *et al.* 2021). In Latin American countries several species of this group are vectors of *Trypanosoma cruzi* (Chagas, 1909), the causative agent of Chagas disease (Lent and Wygodzinsky 1979).

Because of the epidemiological and biological importance of the subfamily Triatominae, many studies have been published and various methodological approaches have been

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explored. However, despite extensive literature, there are frequent disagreements in morphological terminology. The nomenclatural misuse in relation to some male genitalia structures was previously pointed by Gil-Santana and Galvão (2013). These inconsistencies are often shared and can become an obstacle to developing the conceptual understanding expected from the study. Therefore, the frequent use of the term “wing”, which incorrectly replaces the correct terminology, is discussed here.

In general, the typical morphology of the triatomines is characteristic and well defined (Lent and Wygodzinsky 1979). Among several features of the subfamily, the forewings are one of the most important typical features (Galvão 2021). According to Capinera (2008), hemelytron (pl. hemelytra) is the term for the forewings of some insects in which the basal part is thickened and the distal part membranous, as originally described for Heteroptera. The anterior chorion is typically more sclerotized than the rest of the hemelytron, with visible veins, while the membranous part is more delicate, slightly wrinkled and with more visible veins. Some species have visible spots in the central region (Lent and Wygodzinsky 1979). As in the current concept, only in one suborder of Hemiptera Linnaeus, 1758, the anterior part is leathery and the posterior part membranous (Gullan and Craston 2005; Schuh and Slater 1995). This characteristic is responsible for the name of the order Hemiptera; Hemiptera, from the Greek hemi = half; pteron = wing (Galvão 2021).

Heteroptera Latreille, 1810 is a suborder of Hemiptera, its more ancestral species have forewings with uniform texture, such as the hindwing, while in most other Heteroptera they are present or in the form of hemelytra, i.e., with differences between the membranous and coriaceous parts (Schuh and Slater 1995).

Most triatomines have a fully developed hemelytra and hindwings (Galvão 2021). However, in some species both are reduced (brachypterous or micropterous) or absent (apterous). For example, the genus *Mepraia* Mazza, Gajardo & Jörg, 1940, which have polymorphic wings. Males of *M. gajardo* Frías, Henry & González, 1998 are brachypterous, *M. parapatrica* Frías, 2010 can be brachypterous or macropterous, and *M. spinolai* (Porter, 1934) can be micropterous, brachypterous or macropterous, all these species are endemic to Chile (Frías *et al.* 2018). In the genus *Triatoma* Laporte, 1832, we have another case of wing reduction in *T. sherlocki* Papa, Jurberg, Carcavallo, Cerqueira & Barata, 2002 in which both sexes are brachypterous.

In Triatomine, incorrect use is common in studies with geometric morphology. It is common to use the term “wings” when evaluating the shape and size variables of hemelytra (Jaramillo *et al.* 2002; Garcia *et al.* 2005; Soto-Vivas *et al.* 2011; Gurgel-Gonçalves *et al.* 2011; Nattero *et al.* 2017; Schachter-Broide *et al.* 2004). Geometric morphometrics are commonly used in studies of several species of Insecta Linnaeus, 1758, e.g., Diptera Linnaeus, 1758 and Hemiptera. Several studies, using geometric morphometrics in triatomines, have also been conducted in other insect groups, mainly to analyze ontogenetic, evolutionary, or taxonomic aspects, focusing on the heads or hemelytra (Dujardin *et al.* 1997; Páez-Colasante and Aldana 2008; Oliveira *et al.* 2017; Kamimura *et al.* 2020).

Recently, Belintani *et al.* (2020) published an extensive phylogenetic study of species of the genus *Triatoma* using the correct terminology for the forewings e.g., hemelytron/hemelytra, and it is expected that this study will continue. Following the suggestions of the reviewers, the term hemelytron was used instead of “wing”. However, two later studies still used inadequate terminology and referred to the hemelytra of triatomines as “wings” (Kamimura *et al.* 2021; Zhao *et al.* 2021).

From the 18th century, the standardization of scientific terminology enabled natural scientists to minimize relatively common problems in scientific communication. For example, these standardizations can minimize errors caused by different languages or ad hoc naming conventions for species. We believe that the correct and up-to-date use of

terminologies should be sought. Therefore, any attempt at standardization has positive impact on dissemination and scientific progress (L'Homme 2015).

Standardization of terminology has proved useful for communication among peers. The vocabularies used to communicate expertise are important tools for describing, understanding, and disseminating knowledge. We hope that this article establishes the correct usage of the term hemelytron (pl. hemelytra) and stimulates discussion of other terms that are misapplied.

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