



<http://dx.doi.org/10.11646/zootaxa.3931.2.2>

<http://zoobank.org/urn:lsid:zoobank.org:pub:96928F85-8A0A-4C90-9223-B460436E5915>

The Neotropical genus *Ginungagapus* gen. nov. (Hesperiidae, Hesperinae, Moncini): phylogenetic position and taxonomic review

EDUARDO CARNEIRO, OLAF H. H. MIELKE & M. M. CASAGRANDE

Laboratório de Estudos em Lepidoptera Neotropical, Departamento de Zoologia, Universidade Federal do Paraná. Caixa Postal 19020, 81531-980 Curitiba, Paraná, Brasil. E-mail: carneiroeduardo@hotmail.com

Abstract

A taxonomic and phylogenetic study based on morphological characters revealed the type species of the genus *Lucida* Evans, 1955, *Lucida lucia* (Capronnier, 1874) to be paraphyletic to other species of the genus. As a result, a new genus, *Ginungagapus* gen. nov., is erected including four species previously placed in *Lucida*: *Ginungagapus schmithi* (Bell, 1930) comb. nov., *Ginungagapus bocus* (Bell, 1947) comb. nov., *Ginungagapus ranesus* (Schaus, 1902) comb. nov., and *Ginungagapus rogan* (Evans, 1955) comb. nov.; and four new species are added: *Ginungagapus awarreni*, sp. nov., *Ginungagapus tangerinii*, sp. nov., *Ginungagapus fiedleri*, sp. nov. and *Ginungagapus brasilia*, sp. nov. The new genus is taxonomically revised, genitalia are illustrated, except of the female of *G. rogan* (Evans, 1955) and of the male of *G. brasilia*, sp. nov., which are still unknown. An identification key is provided.

Key words: skipper systematics, new species, identification key, cladistics

Introduction

Moncini is one of the most poorly known groups of butterflies gathering 82 genera of small brown skippers, (Warren *et al.* 2009). Although established by molecular characters, Moncini lacks morphological putative synapomorphies and so far its phylogenetic relationship is basically unknown (Warren *et al.* 2008, 2009). The same scenario is expected to most of its genera, as their monophyly were never formally tested beyond taxonomical arrangement (Evans 1955). Therefore, systematic studies of Moncini often starts as a step in the dark, as similar species may be misplaced in different genera, and several genera actually represent polyphyletic groups (Burns 1990). Additionally, new genera have been described to include single species (Austin 1997; Turland *et al.* 2012).

In this study, *Lucida* Evans, 1955 species were investigated taxonomically and phylogenetically. *Lucida* was proposed as a grouping of four known plus one new species based on the antennae length (compared to wing costa), nudum segments exclusive on apiculus, presence of few long spines on mid tibiae and broad-ended uncus (Evans 1955). Formerly, some species placed by Evans (1955) in *Lucida*, were originally combined to different genera, e.g. *Carystus* Hübner, [1819], *Pamphila* Fabricius, 1807, *Megistias* Godman, 1900, *Eutocus* Godman, 1901 (Mielke 2005), probably because of the lack of wing color markings, which has historically been applied in skippers or butterflies systematics as a whole. Because not only *Lucida*, but also several of the Moncini genera have homogeneous brown wings, taxonomy and systematics of these skippers still lack detailed descriptions, especially regarding genera diagnoses.

Lucida schmithi and *Lucida bocus* were described in *Eutocus* Godman, 1901, while *Lucida ranesus* was described in *Megistias* (Schaus, 1902), a synonym of *Cybaenes* Scudder, 1872. All those species were thereafter transferred by Evans (1955) to *Lucida* together with the description of *Lucida rogan* and the description of the proper genus. All other authors mention *Lucida* species only in geographical distribution studies and catalogues. After Evans (1955), no other systematical or taxonomical study has been made to elucidate the monophyly of *Lucida* or the phylogenetic relationships between their species. Therefore, the monophyly of *Lucida* was here tested using morphological characters. Given its non-monophyly, a new genus is here described for four *Lucida* species and the description of four new species from Brazil is added.

Virga) can be more related to its projection beyond second segment clothing than to the length itself. This is not the first time that this character showed to be problematic, as it also may vary between species in other Moncini genera (Lindsey 1921; Warren *et al.* 2009). In the present study the long length of the third segment of the palpus showed to be homoplastic, thus not corroborating the monophyly of neither *Apaustus* subgroup of Evans nor all other subgroups of *Apaustus* group.

The present study did not attempt to elucidate phylogenetic relationships between other groups besides *Ginungagapus*, *Lucida* and its closest allies. However, a few results obtained from out-group relationships deserve minor observations, as systematic hypotheses of these genera are basically unknown. Genitalia morphology in Hesperiiidae is usually considered fundamental for distinguishing taxa at the generic level in Hesperinae (Lindsey 1921; Burns 1994, 1996). Therefore, as long as the genitalia pattern of new taxa fits the pattern found in a particular, described genus, or to Evans (Evans 1955) catalogue key, the new taxa are placed in this genus. However, if these features are not congruent, new genera are described, even to include a single species (Austin 1997; Steinhauser 2008; Turland *et al.* 2012), which adds little systematic information to the group. The arbitrariness thus remains in determining what a genitalia pattern is or which characters define a general appearance to a taxonomist.

The Phanes subgroup of Evans (1955) is filled with monotypic genera (e.g. *Gallio*, *Methion*, *Saniba*), plus other genera with only two species (*Venas*, *Repens*, *Thargella*). This classification is justified, as observed in the present study, since genitalia of males and females of monotypic genera are remarkably unique. Accordingly, the monophyly of the two species genera tested was recovered, even in suboptimal trees (not published), as genitalia of species in these genera are much more alike, sharing most of the characters coded. The relationships between the genera therefore, require more detailed studies.

The Phanes subgroup of Evans is not monophyletic. Instead, it is formed by a miscellaneous group of genera, whose phylogenetic origin could be more closely related to a variety of other Moncini that were not sampled in the present study. The presence, for example, of a brand parallel to CuA and/or 2A veins in *Sabina*, *Repens* and *Thargella* is shared with very distinct genera of Moncini, such as *Adlerodea*, *Callimormus*, *Mnasicles*, *Morys*. Additionally, the cleft between ampulla and harpe and the shape of both structures in valva of male genitalia, as stated as diagnostic characters of Anhoptini (Warren *et al.* 2009), is found in *Pamba*, *Thargella* and *Saniba*. As our results are not conclusive about the relationships between these genera and Anhoptini, future studies are required to identify their phylogenetic origin and possible misplacing of genera on Hesperinae tribes.

While facing much incongruence in genus-species combination, Burns (1994) claimed that skipper genera “are a mess”. Unfortunately, since then little progress has been made in Hesperinae systematics at genus level, despite the current development of phylogenetic systematic methods. The use of this methodology is crucial for better understanding the relationships of Moncini, redefine its 81 genera, and test whether each of them actually belongs to the tribe.

Acknowledgements

The authors are thankful to Aline Miranda (IOC), Alexandre Soares (MNRJ), Andrew D. Warren (MGCL), Blanca Huertas (BMNH) and John Burns (USNM) for providing access to specimens in the referred collections. Diego Dolibaina (UFPR) kindly gathered data and pictures from AMNH, MGCL, USNM collections. The present study was made possible by grants from Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq): EC 150718/2013-6, OM 304639/2014-1, MC 308247/2013-2.

Literature cited

- Austin, G.T. (1997) Notes on Hesperiiidae in northern Guatemala, with descriptions of new taxa. *Journal of the Lepidopterists' Society*, 51, 316–332.
- Brazeau, M.D. (2011) Problematic character coding methods in morphology and their effects. *Biological Journal of the Linnean Society*, 104, 489–498.
<http://dx.doi.org/10.1111/j.1095-8312.2011.01755.x>
- Burns, J.M. (1990) *Amblyscirtes*: problems with species, species groups, and genus groups beyond—a look at what is wrong

- with the skipper classification of Evans (Hesperiidae). *Journal of the Lepidopterists' Society*, 44, 11–27.
- Burns, J.M. (1994) Genitalia at the generic level: *Atrytone* restricted, *Anatrytone* resurrected, new genus *Quasimellana* —and yes! We have no *Mellanas* (Hesperiidae). *Journal of The Lepidopterists' Society*, 48, 273–337.
- Burns, J.M. (1996) Genitalia and the proper genus: *Codatractus* gets *mysie* and *uvydixa* —in a compact cyda group—as well as a *hysterectomy*, while *Cephise* gets part of *Polythrix* (Hesperiidae: Pyrginae). *Journal of The Lepidopterists' Society*, 50, 173–216.
- Carneiro, E., Mielke, O.H.H. & Casagrande, M.M. (2012) Head Morphology of some Neotropical Hesperiidae (Lepidoptera). *Zootaxa*, 3198, 1–28.
- Carneiro, E., Mielke, O.H.H. & Casagrande, M.M. (2013) Thorax and abdomen morphology of some Neotropical Hesperiidae (Lepidoptera). *Insecta Mundi*, 2013, 1–47.
- Dmitriev, D.A. & Dietrich, C.H. (2008) Rapid taxonomic revisions using Internet-integrated relational databases: an example using *Erythroneura* (sensu lato). *Bulletin of Insectology*, 61, 113–114.
- Evans, W.H. (1949) *A catalogue of the Hesperiidae from Europe, Asia and Australia in the British Museum (Natural history)*. British Museum (Natural History), London, xix + 502 pp., 53 pls.
- Evans, W.H. (1955) *A catalogue of the American Hesperiidae: indicating the classification and nomenclature adopted in the British Museum (Natural History). Part IV. Hesperinae and Megathyminae*. British Museum (Natural History), London, v + 499 pp., pls. 54–88.
- Fitch, W.M. (1971) Toward defining the course of evolution: minimum change for a specific tree topology. *Systematic Biology*, 20, 406–416.
<http://dx.doi.org/10.1093/sysbio/20.4.406>
- Goloboff, P.A., Carpenter, J.M., Arias, J.S. & Esquivel, D.R.M. (2008a) Weighting against homoplasy improves phylogenetic analysis of morphological data sets. *Cladistics*, 24, 758–773.
<http://dx.doi.org/10.1111/j.1096-0031.2008.00209.x>
- Goloboff, P.A., Farris, J.S. & Nixon, K.C. (2008b) TNT, a free program for phylogenetic analysis. *Cladistics*, 24, 774–786.
<http://dx.doi.org/10.1111/j.1096-0031.2008.00217.x>
- Hawkins, J.A., Hughes, C.E. & Scotland, R.W. (1997) Primary homology assessment, Characters and Character States. *Cladistics*, 13, 275–283.
<http://dx.doi.org/10.1111/j.1096-0031.1997.tb00320.x>
- Lindsey, A.W. (1921) *The Hesperioidea of America north of Mexico: a generic revision and synopsis of the species*. University of Iowa, Iowa City, 114 pp.
<http://dx.doi.org/10.5962/bhl.title.9335>
- Mabille, P. (1904) Lepidoptera Rhopalocera, Fam. Hesperiidae. In: *In P. Wytzman (ed) Genera Insectorum*. Verleneuil & Desmet imp.-édit., Brussels, pp. 210.
- Mielke, O.H.H. (1968) Lepidoptera do Planalto Central Brasileiro. V. Novas espécies de Hesperiidae e anotações sobre outras espécies conhecidas. *Revista Brasileira de Biologia*, 28, 447–455.
- Mielke, O.H.H. (1992) Notas sinonímicas sobre Hesperiidae neotropicais, com descrições de novos gêneros, espécies e subespécies (Lepidoptera). *Revista Brasileira de Zoologia*, 7, 503–524.
<http://dx.doi.org/10.1590/S0101-81751990000400009>
- Mielke, O.H.H. (2005) *Catalogue of the American Hesperioidea: Hesperiidae (Lepidoptera). Vol. 1–6*. Sociedade Brasileira de Zoologia, Curitiba, 1536 pp.
- Mirande, M.J. (2009) Weighted parsimony phylogeny of the family Characidae (Teleostei: Characiformes). *Cladistics*, 25, 574–613.
<http://dx.doi.org/10.1111/j.1096-0031.2009.00262.x>
- Sereno, P.C. (2007) Logical basis for morphological characters in phylogenetics. *Cladistics*, 23, 565–587.
- Steinhauser, S.R. (1981) A revision of the proteus group of the genus *Urbanus* Hübner (Lepidoptera: Hesperiidae). *Bulletin of the Allyn Museum*, 62, 1–14.
- Steinhauser, S.R. (2008) New genus and four new species of Hesperinae from Guyana and Peru (Lepidoptera: Hesperiidae). *Bulletin of the Allyn Museum*, 152, 1–13.
- Steinhauser, S.R. & Austin, G.T. (1993) New species of Hesperiidae from Costa Rica. *Tropical Lepidoptera*, 4, 12–20.
- Turland, V.A., Warren, A.D. & Lewis, D.S. (2012) A new genus and species of Moncini from Jamaica, West Indies (Lepidoptera, Hesperiidae, Hesperinae). *Tropical Lepidoptera Research*, 22, 66–73.
- Warren, A.D., Ogawa, J.R. & Brower, A.V.Z. (2008) Phylogenetic relationships of subfamilies and circumscription of tribes in the family Hesperiidae (Lepidoptera: Hesperioidea). *Cladistics*, 24, 642–676.
<http://dx.doi.org/10.1111/j.1096-0031.2008.00218.x>
- Warren, A.D., Ogawa, J.R. & Brower, A.V.Z. (2009) Revised classification of the family Hesperiidae (Lepidoptera: Hesperioidea) based on combined molecular and morphological data. *Systematic Entomology*, 34, 467–523.
<http://dx.doi.org/10.1111/j.1365-3113.2008.00463.x>
- Watson, E.Y. (1893) A proposed classification of the Hesperiidae, with a revision of the genera. *Proceedings of the Zoological Society of London*, 1893, 3–132.