



Notes on presumed Neotropical records and species of *Hesperinus* Walker, 1848 (Diptera: Bibionidae)

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Abstract. *Hesperinus* Walker, 1848, a member of Bibionidae (Diptera), is a Holarctic and Oriental genus. The genus has been reported from the Neotropical Region twice: i) *Hesperinus conjungens* Schiner, 1868, transferred to *Plecia* Wiedemann, 1828 by Hardy in 1967, and ii) additional specimens identified as *Hesperinus* sp. by Messias Carrera in 1944. In this study, we revisited the Carrera's specimens, identifying them as *Plecia* sp. Additionally, we discussed the taxonomy of *Plecia conjungens* and compiled a list of articles that consider the species as *Hesperinus*.

Keywords: Bibionomorpha; Geographic distribution; Hesperininae; Nomenclature; Taxonomy.

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Hesperinus Walker, 1848 (Diptera: Bibionomorpha) is a member of Bibionidae and it has been considered the only genus of the subfamily Hesperininae by some authors (HARDY 1966; PINTO & AMORIM 2000; FITZGERALD 2004). Conversely, other authors placed *Hesperinus* in a separate family, Hesperinidae (KRIVOSHEINA 1997; SKARTVEIT 2009; PAPP 2010). In both classifications, Bibionidae is a monophyletic group, with or without *Hesperinus*, according to the following phylogenetic hypothesis based on morphological characters (PINTO & AMORIM 2000; FITZGERALD 2004): *Hesperinus* + [*Penthetria* Meigen, 1803 + (*Plecia* Wiedemann, 1828 + Bibioninae)]. Ševčík *et al.* 2016 proposed a novel hypothesis based on molecular evidence: [(*Hesperinus* + *Penthetria*) + *Plecia*] + Bibioninae. Consequently, *Hesperinus* would no longer be the sister of the remaining Bibionidae and Hesperinidae would make Bibionidae paraphyletic. However, this new topology requires that morphological characters that support Bibionidae exclusive of *Hesperinus* be independently derived several times or derived only once and secondarily lost in *Hesperinus* (ŠEVČÍK *et al.* 2016). Thus, further studies are needed to clarify the position of the genus within Bibionidae (ŠEVČÍK *et al.* 2016). Skartveit & Ansoerge (2020) incorporated *Penthetria* into Hesperininae, according to molecular evidence (ŠEVČÍK *et al.* 2016) and morphological similarities. However, these similarities are not well explored and no morphological synapomorphy supporting the *Hesperinus* + *Penthetria* clade has been presented (SKARTVEIT & ANSORGE 2020). In this context, Hesperininae is treated here as a monotypic subfamily within Bibionidae.

Seven extant species of *Hesperinus* are currently recognized: *Hesperinus brevifrons* Walker, 1848, the type species from the Nearctic Region, and six from the Palaearctic Region, namely *Hesperinus cuspidistylus* Hardy & Takahashi, 1960; *Hesperinus graecus* Papp, 2010; *Hesperinus imbecillus* (Loew, 1858); *Hesperinus nigratus* Okada, 1934; *Hesperinus ninae* Papp & Krivosheina, 2010 and *Hesperinus rohdendorfi* Krivosheina & Mamaev, 1967 (PAPP 2010). Additionally, FITZGERALD (2004) reported a female specimen from Malaysia, the first record for the Oriental Region, and apparently an undescribed species from Japan. Four valid fossil species have been described: *Hesperinus electrus* Skartveit, 2009; *Hesperinus hyalopterus* Skartveit, 2009 and *Hesperinus macrolatus* Skartveit, 2009, all from Eocene Baltic amber (SKARTVEIT 2009), and *Hesperinus heeri* (Heyden & Heyden, 1865) from German Oligocene deposits (SKARTVEIT & WEDMANN 2021). Additional specimens of undetermined *Hesperinus* have also been found in French Oligocene deposits (NEL & SKARTVEIT 2012). Thus, all known fossil records of *Hesperinus* are from the Palaearctic Region.

Hesperinus conjungens Schiner, 1868, described from Brazil, is the only Neotropical species ever proposed. This species was subsequently included in catalogs, such as HUNTER (1900) and HARDY (1959, 1966), which primarily focused on South American and Neotropical fauna, respectively. It was also included in KERTÉSZ (1902), a world catalog of Diptera. However, HARDY (1967) later transferred *H. conjungens* to the genus *Plecia*.

Besides, CARRERA (1944) reported specimens of *Hesperinus* sp. from Brazil. As the Holarctic distribution of *Hesperinus* is well-documented, these specimens from the Neotropical Region are unexpected, particularly owing to the rarity of the genus in collections (PAPP 2010). Although Carrera's material is mentioned in HARDY (1959) catalog, no other study mentioned it, and consequently, the material has not been reexamined by any further

study that could question the taxonomic identity of the specimens.

In this study, a reexamination of the material reported by CARRERA (1944) is conducted. Additionally, we compiled articles that have listed *Plecia conjungens* (Schiner, 1868) as a species of *Hesperinus* and critically discussed them.

MATERIAL AND METHODS

Two pinned specimens housed in the MZUSP collection (Museu de Zoologia da Universidade de São Paulo, São Paulo, Brazil) were examined and photographed. The terminology used in this study adheres to the standards set by CUMMING & WOOD (2017).

The literature that refers to *H. conjungens* are presented in chronological order, detailing how the taxon was referenced, either explicitly or implicitly. An explicit reference is characterized by the appearance of the species name within the paper. Conversely, an implicit reference is identified when the paper merely states the existence of a single Neotropical, South American, or Brazilian species of *Hesperinus*, or the occurrence of eight genera of Bibionidae in the Neotropical Region, thereby implying the presence of the genus in the Region.

List of abbreviations used: *art.*, article; *des.*, designated; *distr.*, geographic distribution; *mon.*, by monotypy; *orig. des.*, by original designation; *refs.*, references; *sp.*, species; *syn.*, synonymized.

RESULTS

Genus *Plecia* Wiedemann, 1828

Plecia Wiedemann, 1828: 72. Type species: *Hirtea fulvicollis* Fabricius, 1805: 53 (des. by Blanchard, 1840: 576).

= *Protomyia* Heer, 1849: 231. Type species: *Protomyia lygaeoides* Heer, 1849: 232 (des. by Carpenter, 1992: 414) Study of the type by Skartveit & Nel, 2017.

= *Rhinoplecia* Bellardi, 1859: 16. Type species: *Rhinoplecia rostrata* Bellardi, 1859: 15 (mon.).

= *Penthera* Philippi, 1865: 639. Type species: *Penthera nigra* Philippi, 1865: 640 (mon.).

= *Epiplecia* Giard, 1879: 13. Type species: *Protomyia joannis* Oustalet, 1870: 143 (mon.).

= *Heteroplecia* Hardy, 1950: 75 (as subgenus of *Plecia* Wiedemann). Type species: *Plecia visenda* Hardy, 1950: 75 (mon.).

= *Pleciodes* Hardy, 1952: 76 (as subgenus of *Plecia* Wiedemann). Type species *Plecia ephippium* Speiser, 1909: 38 (des. by Hardy 1952: 76).

= *Lacibibio* Hong, in Hong *et al.* 1980: 47. Type species: *Lacibibio fushunensis* Hong, in Hong *et al.* 1980: 47-48 (orig. des.) Syn. by Zhang, 1989: 336.

Refs.: FITZGERALD 2004: 273; FITZGERALD *et al.* 2020: 50.

Plecia sp. (Figures 1A-C, 2)

Material examined. 1 male [BRASIL, São Paulo] Monte Alegre [do Sul], Fazenda Sta. [Santa] Maria, Alt. [Altitude] 1.100 mts. [1,100 m], 24-30.XI.1942, F. Lane col. (MZUSP); 1 male, label 1: BRASIL - SÃO PAULO, Monte Alegre [do Sul], Faz. [Fazenda] N.S. [Nossa Senhora] [Da] Incarnação [Encarnação], 750 ms. [m] 14.27-X-1942, L. Trav. F. & Almeida; label 2: *Hesperinus* sp., ♂, M. CARRERA DET. 1943 (MZUSP).

Comments. CARRERA (1944) reported three specimens of *Hesperinus* sp. from the municipality of Monte Alegre do Sul, state of São Paulo, Brazil. He mentioned one male and one female from Faz. [Fazenda] N. S. [Nossa Senhora] [Da] Encarnação (750 mts. [m]), 14/27-X-42, L. Trav. F. & Almeida col., and one male from Faz. [Fazenda] Sta. [Santa] Maria (1.100 mts. [1,100 m]), 24/30-XI-1942, F. Lane col. Only the two male specimens were located in the MZUSP collection.

The specimens are not *Hesperinus*. Firstly, the male eyes are holoptic (Figure 1C), while they are dichoptic in *Hesperinus* (see HARDY 1981, p. 219, Figure 13.2). Secondly, the antennal flagellomeres are compact and compressed, except for the first flagellomere (Figure 1A). This contrasts with the filiform flagellomeres of *Hesperinus*, in which each article is longer than wide, excluding the apical segment (see HARDY 1981, p. 219, Figure 13.2). Thirdly, the vein R_{2+3} is relatively short (less than a third of the length of R_{4+5}) and slightly oblique with respect to R_{4+5} , and has a distinct basal bend (Figure 1B), unlike the relatively medium length (almost half the length of R_{4+5}), more distinctly oblique with respect to R_{4+5} , and without a distinct basal bend as in *Hesperinus* (see HARDY 1981, p. 220, Figure 13.8). Additionally, the R_{2+3} is not sinuous (Figure 1B), unlike *Hesperinus*, which may present a slight (see HARDY 1981, p. 220, Figure 13.8) or prominent (see KURINA 2013, p. 3, Figure 2b) sinuosity. Lastly, the apex of R_{4+5} is only slightly arched posteriorly (Figure 1B), rather than being distinctly arched posteriorly as in *Hesperinus* (see HARDY 1981, p. 220, Figure 13.8) (FITZGERALD 2004).

A synapomorphic character of Bibionidae, excluding *Hesperinus*, is the presence of holoptic eyes in males (PINTO & AMORIM 2000; FITZGERALD 2004). However, in a few species such as *Penthetria funebris* Meigen, 1804 and *P. conjungens*, males are dichoptic (HARDY 1967; FITZGERALD 2004). *Hesperinus* consistently exhibits dichoptic eyes, usually widely separated, as seen in *H. brevifrons* and *H. nigratus*, although it can be weakly dichoptic, as seen in *H. macroculatus* (FITZGERALD 2004; SKARTVEIT 2009; PAPP 2010). Another synapomorphy of Bibionidae, excluding *Hesperinus*, is the presence of compressed antennal flagellomeres in males (FITZGERALD 2004). The R_{2+3} of *Plecia* is relatively short and can be oblique, curved, straight, or even with a distinct basal bend (FITZGERALD 2004). In *Hesperinus*, R_{2+3} is relatively medium in length (usually longer than *Plecia* and shorter than *Penthetria*) and oblique (FITZGERALD 2004). However, in fossils of *Hesperinus* the length of R_{2+3} can be more variable than in extant species, i.e., shorter or longer with respect to R_{4+5} (SKARTVEIT 2009). The distinctly arched posterior apex of R_{4+5} is a synapomorphy of *Hesperinus* (FITZGERALD 2004). Based on our observations, it is evident that the specimens do not belong to *Hesperinus*. They can also not be Bibioninae, as the vein R_{2+3} is present and the fore tibia lacks a strong apical spine seen in Bibionini or the sets of spines seen in *Dilophus* Meigen, 1803 (FITZGERALD 2004). The remaining options are *Penthetria* and *Plecia*. The specimens have a diagnostic feature of *Plecia*, which is a short R_{2+3} and subparallel to R_{4+5} (diagnosis for *Penthetria*) (FITZGERALD 2004). Hence, they do not belong to *Penthetria*, but to *Plecia*.

Since Carrera identified these specimens only to genus, we decided here to correct his genus misidentification and assign it to *Plecia* rather than *Hesperinus*. This material can be identified at the species level or even described as a new species in a further study, which is not the scope of the present study.

Plecia conjungens (Schiner, 1868)

Hesperinus conjungens Schiner, 1868: 23.

Hesperinus conjungens (erroneous spelling) [in Hunter, 1900:



Figure 1. *Plecia* sp., male. A. Habitus, lateral view. Scale bar: 5 mm. B. Wing. Scale bar: 2 mm. C. Head, dorsal view. Scale bar: 1 mm.

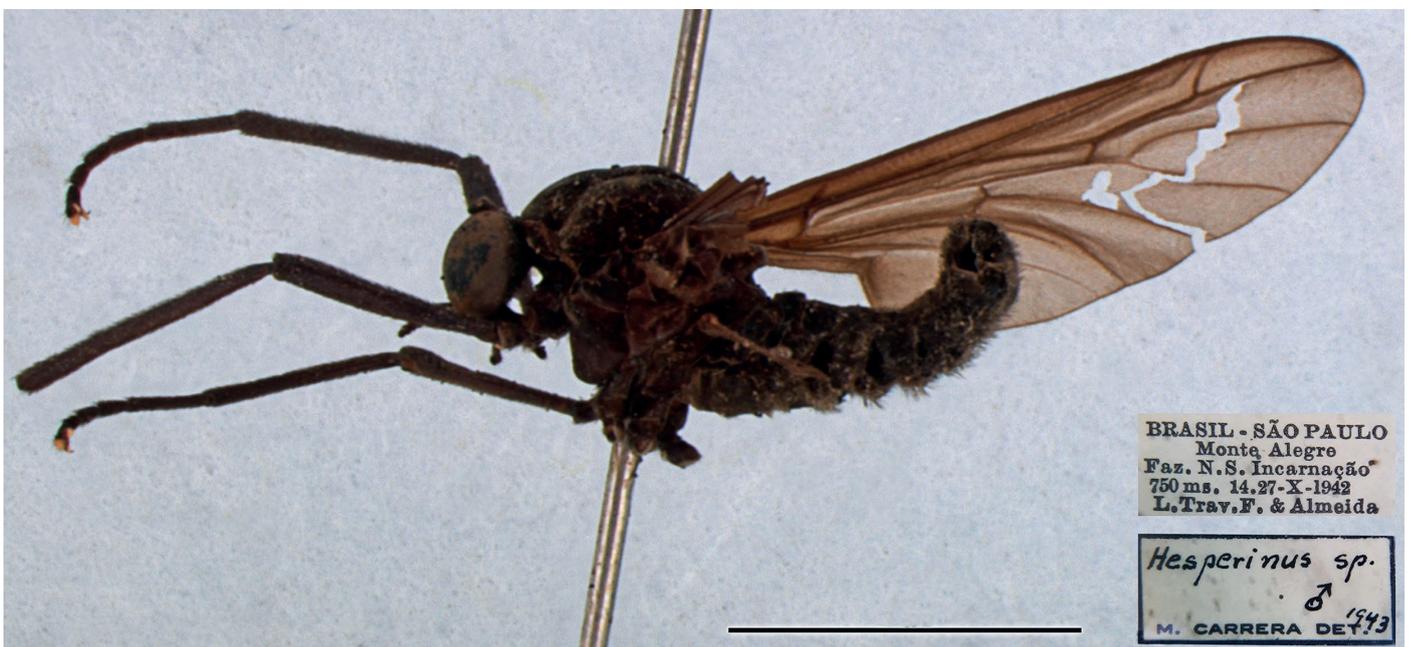


Figure 2. *Plecia* sp., male. Habitus, lateral view. Scale bar: 5 mm.

296; Hardy, 1967: 170; Mohrig et al., 1975: 339; Krivosheina & Krivosheina, 2015: 313].

Plecia conjugens (Schiner, 1868) (erroneous spelling) [syn. by Hardy, 1967: 170].

Type locality: Brazil, Rio de Janeiro, Novara-R. Distr.: Brazil.

Refs.: HARDY 1966: 1; HARDY 1967: 170.

SCHINER (1868) described *H. conjugens* based on one male from Brazil. Despite having described it as *Hesperinus*, Schiner reported that the specimen was more similar to *Plecia* in relation to several generic characteristics, such as short antennae and male terminalia, except for the "peculiar slender body structure and the long legs". Possibly another feature that led it to be placed in *Hesperinus* was the presence of dichoptic eyes of the specimen, something unusual for males of *Plecia* and always present in *Hesperinus*. HARDY (1967) did not explicitly justify the transfer of the species to *Plecia*, but he probably considered the wing venation, especially the R_{2+3} vein, and other features already observed by Schiner, such as the short antennae. After HARDY (1967), no other author examined the specimen. Unfortunately, the type whereabouts is unknown. We also contacted Dr. Neal Luit Evenhuis, senior entomologist at the Bishop Museum collection, because Dr. Dilbert Elmo Hardy worked at this museum and the specimen could be there, and Dr. Scott J. Fitzgerald, because he has been working with Neotropical *Plecia* for many years. Unfortunately, the type specimen was not found and it is presumed to be lost.

Two spellings of the specific name appear in the literature: "*conjugens*", the original spelling (SCHINER 1868), and "*conjungens*", a misspelling that apparently appears for the first time in HUNTER (1900). According to EVENHUIS & PAPE (2023), "*conjugens*" is a name in prevailing usage and is available by the ICZN Art. 33.3.1 (ICZN 1999). However, we found six studies that use "*conjugens*", including the original work (SCHINER 1868; KERTÉSZ 1902; HARDY 1959, 1966; KRIVOSHEINA & MAMAEV 1967a; PAPP 2010), and only four that use "*conjungens*" (HUNTER 1900; HARDY 1967; MOHRIG *et al.* 1975; KRIVOSHEINA & KRIVOSHEINA 2015), excluding online databases such as EVENHUIS & PAPE (2023). Therefore, we decided here to use the original spelling "*conjugens*".

Some studies correctly considered *P. conjugens* in *Plecia* and not in *Hesperinus*, or just considered that *Hesperinus* does not occur in the Neotropical Region (PINTO & AMORIM 2000; FITZGERALD 2004; FALASCHI *et al.* 2016). It is important to note that CARRERA (1944) records were ignored by these works. On the other hand, several articles erroneously listed *P. conjugens* as a species of *Hesperinus*, ignoring HARDY (1967) reclassification. These articles also ignored Carrera's records. Of the fourteen publications, three explicitly mention *H. conjugens*, while the remainder do so implicitly (Table 1). The references employed by these articles to consider the species within *Hesperinus* may (1) predate HARDY (1967), such as HARDY (1966), used by AMORIM *et al.* (2002) or (2) postdate HARDY (1967), such as PAPP (2010), used by NEL & SKARTVEIT (2012). PAPP (2010), in turn, uses KRIVOSHEINA & MAMAEV (1967a), an article prior to HARDY (1967).

A plausible reason for these errors could be the significant roles of Dilbert Elmo Hardy and Nina P. Krivosheina in Bibionidae studies. Hardy was a major contributor to Bibionidae taxonomy (EVENHUIS & THOMPSON 2004), publishing catalogs (HARDY 1959, 1966) that were crucial for research on the Neotropical fauna of Diptera. Consequently, some studies, such as FALASCHI *et al.* (2018), may have relied on Hardy's catalogs, trusting his scientific authority. However, they may have done so without conducting a comprehensive literature review, thereby overlooking that *H. conjugens*

was reclassified under *Plecia* shortly after the 1966 catalog's publication by the same author. Similarly, Krivosheina, who has been publishing on *Hesperinus* since the 1960s (KRIVOSHEINA & MAMAEV 1967a, 1967b), may have been referenced in studies that used her works (KRIVOSHEINA 1997, 1999) containing the erroneous Neotropical *Hesperinus*. The subsequent studies may have failed to review all the literature, trusting the scientific authority of the previous authors.

Another plausible reason is the lack of an updated world catalog of the family. The most recent world catalog found is KERTÉSZ (1902), published more than a century ago. Also, the most recent catalogs focused on Neotropical fauna predates HARDY (1967) (HARDY 1959, 1966). Online databases, such as the Catalogue of Life (COL) (ITIS 2023) and Global Biodiversity Information Facility (GBIF 2023), erroneously list *H. conjugens* instead of *P. conjugens* based on EVENHUIS & PAPE (2023). So, if there is no updated world catalog of Bibionidae, which involves a deep scanning of the literature, subsequent authors will rely on someone else's work, whether updated or outdated.

This underscores the importance of both literature reviews in taxonomy, irrespective of the authors' prominence, and the need to publish reliable world catalogs for the fauna, in addition to updating online databases.

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REFERENCES

- Amorim, DS, VC Silva & MIPA Balbi, 2002. Estado do conhecimento dos Diptera neotropicais, pp. 29-36. *In*: Costa, C, SA Vanin, JM Lobo & A Melic (Eds.). Proyecto de Red Iberoamericana de Biogeografía y Entomología Sistemática, PRIBES 2002i. Zaragoza: Sociedad Entomológica Aragonesa y CYTED.
- Carrera, M, 1944. Relação de alguns Dipteros capturados em Monte Alegre, Estado de São Paulo. Papéis Avulsos do Departamento de Zoologia. 6: 38.
- Cumming, JM & DM Wood, 2017. Adult Morphology and Terminology. *In*: Kirk-Spriggs, AH & BJ Sinclair (Eds.). Manual of Afrotropical Diptera. Vol. 1. Introductory chapters and keys to Diptera families. Suricata 4. South African National Biodiversity Institute, Pretoria.
- Evenhuis, NL & T Pape, 2023. Systema Dipterorum. Version 4.4, 12 September 2023. Available in: <<http://diptera.org/Nomenclator/Details/754>>. [Access: 07.xi.2023]
- Evenhuis, NL & FC Thompson, 2004. Bibliography of and New Taxa Described by D. Elmo Hardy (1936-2001). Bishop Museum Bulletin in Entomology. 12: 179-222.
- Falaschi, RL, SS Oliveira & DS Amorim, 2016. Family Bibionidae. Zootaxa, 4122: 20-25. DOI: <https://doi.org/10.11646/zootaxa.4122.1.5>
- Falaschi, RL, SS Oliveira & CJE Lamas, 2018. Catalogue of Bibionidae (Diptera: Bibionomorpha) types housed in the collection of the Museu de Zoologia da Universidade de São Paulo, Brazil. Papéis Avulsos de Zoologia, 58: e20185827. DOI: <https://doi.org/10.11606/1807-0205/2018.58.27>

- Fitzgerald, SJ, 2004. Evolution and classification of Bibionidae (Diptera, Bibionomorpha). Ph.D. dissertation, Oregon State University, Corvallis, Oregon.
- Fitzgerald, SJ, CR González & M Elgueta, 2020. A catalog of the Bibionidae (Diptera: Bibionomorpha) of Chile. *Zootaxa*, 4766: 48-60. DOI: <https://doi.org/10.11646/zootaxa.4766.1.2>
- GBIF (Global Biodiversity Information Facility), 2023. Global Biodiversity Information Facility. Available in: <https://www.gbif.org/species/11196612>. [Access: 07.xi.2023].
- Hardy, DE, 1959. Catalogue of the Neotropical Bibionidae (Diptera, Nematocera). *Acta Zoologica Lilloana*, 17, 437-476.
- Hardy, DE, 1966. Family Bibionidae, pp. 1-20. *In*: Papavero, N (Ed.), A Catalogue of the Diptera of the Americas South of the United States. São Paulo: Departamento de Zoologia da Secretaria da Agricultura do Estado de São Paulo.
- Hardy, DE, 1967. The types of Bibionidae (Diptera) in the Naturhistorisches Museum, Wien. *Annalen des Naturhistorisches Museum in Wien*, 70: 169-181.
- Hardy, DE, 1981. Bibionidae, pp. 217-222. *In*: McAlpine, JF, BV Peterson, GB Shewell, HJ Teskey, JR Vockeroth & DM Wood (Eds.). *Manual of Nearctic Diptera*. Vol. 1. Agriculture Canada Monograph, 27.
- Hunter, WD, 1900. Catalogue of the Diptera of South America. Part. I. Bibliography and Nematocera. *Transactions of the American Entomological Society*. 26: 296.
- ITIS (Integrated Taxonomic Information System), 2023. Catalogue of Life, Annual Checklist. Integrated Taxonomic Information System. Available in: <https://www.checklistbank.org/dataset/272972/taxon/8CBQL>. [Access: 07.xi.2023].

Table 1. List of all papers that cites *Plecia conjungens* as a species of *Hesperinus*. First column: articles that include *Plecia conjungens* as part of *Hesperinus*. Second column: if taxon is cited explicitly or implicitly. Third column: references used by the articles of the first column to place the species in *Hesperinus*.

Articles using <i>Hesperinus conjungens</i> erroneously	How the taxon is cited	References in chronological order
MOHRIG <i>et al.</i> (1975)	Explicitly	KRIVOSHEINA & MAMAEV (1967a)
KRIVOSHEINA (1997)	Implicitly	KRIVOSHEINA & MAMAEV (1967a, 1967b)
KRIVOSHEINA (1999)	Implicitly	KRIVOSHEINA & MAMAEV (1967a, 1967b)
AMORIM <i>et al.</i> (2002)	Implicitly	HARDY (1966)
PARAMONOV (2005)	Implicitly	KRIVOSHEINA & MAMAEV (1967a) KRIVOSHEINA (1999)
PAPE (2009)	Implicitly	KRIVOSHEINA (1997)
PAPP & KRIVOSHEINA (2010)	Implicitly	KRIVOSHEINA & MAMAEV (1967a) MOHRIG <i>et al.</i> (1975) KRIVOSHEINA (1997) PAPP (2010)
PAPP (2010)	Explicitly	KRIVOSHEINA & MAMAEV (1967a) MOHRIG <i>et al.</i> (1975) KRIVOSHEINA (1997) PAPP & KRIVOSHEINA (2010)
NEL & SKARTVEIT (2012)	Implicitly	KRIVOSHEINA (1997) PAPP & KRIVOSHEINA (2010) PAPP (2010)
KURINA (2013)	Implicitly	KRIVOSHEINA & MAMAEV (1967a) MOHRIG <i>et al.</i> (1975) KRIVOSHEINA (1997) PAPE (2009) PAPP & KRIVOSHEINA (2010) PAPP (2010) NEL & SKARTVEIT (2012)
KRIVOSHEINA & KRIVOSHEINA (2015)	Explicitly	KRIVOSHEINA & MAMAEV (1967a) MOHRIG <i>et al.</i> (1975) KRIVOSHEINA (1997) PAPP & KRIVOSHEINA (2010) PAPP (2010)
ÖZGÜL (2015)	Implicitly	KRIVOSHEINA (1997) PAPP (2010)
FALASCHI <i>et al.</i> (2018)	Implicitly	HARDY (1959, 1966) AMORIM <i>et al.</i> (2002)
PODENAS <i>et al.</i> (2020)	Implicitly	KRIVOSHEINA & MAMAEV (1967a) PARAMONOV (2005) PAPP & KRIVOSHEINA (2010) PAPP (2010) NEL & SKARTVEIT (2012) KURINA (2013) KRIVOSHEINA & KRIVOSHEINA (2015)

- ICZN (International Commission of Zoological Nomenclature), 1999. International Code of Zoological Nomenclature. Fourth edition. London: The International Trust for Zoological Nomenclature, The Natural History Museum.
- Kertész, C, 1902. Catalogus dipterorum Hucusque Descriptorum. Vol. I. Budapestini: Lipsiae.
- Krivosheina, NP, 1997. Family Hesperinidae, pp. 35-39. *In*: Contributions to a manual of Palaearctic Diptera. Vol. 2. (Nematocera and Brachycera). Budapest: Science Herald.
- Krivosheina, NP, 1999. Fam. Hesperinidae. *In*: Lehr, PA (Ed.). Opredelitel' nasekomykh Dal'nego Vostoka Rossii [Keys to the insects of the Russian Far East], Diptera and Siphonaptera, 6: 130-134.
- Krivosheina, NP & MG Krivosheina, 2015. To the biology of *Hesperinus ninae* Papp et Krivosheina, 2010 (Diptera: Hesperinidae) with description of immature morphology. Russian Entomological Journal, 24: 313-317. DOI: <https://doi.org/10.15298/rusentj.24.4.06>
- Krivosheina, NP & BM Mamaev, 1967a. New data on the families Hesperinidae and Pachyneuridae and their position in the order Diptera. Zoologicheskii Zhurnal, 46: 235-247.
- Krivosheina, NP & BM Mamaev, 1967b. Opredelitel' licinok dvukrylykh nasekomykh - obitatelej drevesyiny. Moscow: Nauka.
- Kurina, O, 2013. *Hesperinus ninae* Papp & Krivosheina (Diptera: Hesperinidae) from Georgia: the second record of this peculiar species. Biodiversity Data Journal, 1: e1023. DOI: <https://doi.org/10.3897/bdj.1.e1023>
- Meigen, JW, 1803. Versuch einer neuen Gattungs Eintheilung der europäischen zweiflügligen Insekten. Magazin für Insektenkunde, 2: 259-281.
- Mohrig, W, BM Mamaev & L Matile, 1975. Zur Kenntnis flügelreduzierter Dipteren der Bodenstreu. VII. Beitrag. Gattung *Hesperinus* (Diptera, Hesperinidae). Zoologischer Anzeiger, 194: 339-344.
- Nel, A & J Skartveit, 2012. Occurrence of the genus *Hesperinus* Walker (Diptera, Hesperinidae) in the Oligocene of France. Studia Dipterologica, 18: 85-89.
- Özgül, O, 2015. First Records of Species of the Hesperinidae and Cylindrotomidae (Diptera: Nematocera) from Turkey. Zoology in the Middle East, 61: 144-147. DOI: <https://doi.org/10.1080/09397140.2015.1020613>
- Pape, T, 2009. Chapter five. Palaearctic Diptera - from tundra to desert, pp. 121-154. *In*: Pape, T, D Bickel & R Meier (Eds.). Diptera diversity: status, challenges and tools. Leiden: Koninklijke Brill.
- Papp, L & MG Krivosheina, 2010. Description of a new species of *Hesperinus* Walker, 1848 from the North Caucasus (Diptera: Hesperinidae). Russian Entomological Journal, 18: 293-297.
- Papp, L, 2010. A study on *Hesperinus* Walker with description of a new species (Diptera: Hesperinidae). Acta Zoologica Academiae Scientiarum Hungaricae, 56: 347-370.
- Paramonov, NM, 2005. First record of the family Hesperinidae (Diptera) from Sakhalin. Zoosystematica Rossica, 13: 232. DOI: <https://doi.org/10.31610/zsr/2004.13.2.232>
- Pinto, LG & DS Amorim, 2000. Bibionidae (Diptera: Bibionomorpha). Morfologia, e análise filogenética. Série Teses, Dissertações e Monografias 2. Ribeirão Preto: Holos Editora.
- Podenas, S, S-J Park & AY Kim, 2020. Hesperinidae (Diptera: Bibionomorpha) a new family from the Korean Peninsula. Journal of Species Research, 9: 170-173.
- Schiner, JR, 1868. Diptera, pp. 1-388. *In*: Wüllerstorff-Urbair, B. von (Ed.). Reise der österreichischen Fregatte Novara um die Erde in den Jahren 1857, 1858, 1859 unter den Befehlen des Commodore B. von Wüllerstorff-Urbair. Zoologischer Theil. Vol. 2. Abt. I. K. Wien: Gerold's Son. DOI: <https://doi.org/10.5962/bhl.title.7913>
- Ševčík, J, D Kaspřák, M Mantič, S Fitzgerald, T Ševčíková, A Tóthová & M Jaschhof, 2016. Molecular phylogeny of the megadiverse insect infraorder Bibionomorpha sensu lato (Diptera). PeerJ, e2563. DOI: <https://doi.org/10.7717/peerj.2563>
- Skartveit, J, 2009. Fossil Hesperinidae and Bibionidae (Diptera: Bibionidae) from Baltic amber. Studia Dipterologica, 15: 3-42. <<https://www.semanticscholar.org/paper/Fossil-Hesperinidae-and-Bibionidae-from-Baltic-und-Skartveit/8a66c7b3395105af96038cffb34b8927486a7c60>>.
- Skartveit, J & J Ansorge, 2020. A new genus and subfamily of fossil Bibionidae (Diptera) from the Lower Cretaceous, with new classification of the Bibionidae. Palaeoentomology, 3/2: 163-172. DOI: <https://doi.org/10.11646/palaeoentomology.3.2.5>
- Skartveit, J & S Wedmann, 2021. Revision of fossil Bibionidae (Diptera) from the Oligocene of Germany. Zootaxa, 4909:1-77. DOI: <https://doi.org/10.11646/zootaxa.4909.1.1>
- Walker, F, 1848. List of the specimens of dipterous insects in the collection of the British Museum. Part I. British Museum, London.
- Wiedemann, CRW, 1828. Aussereuropäische zweiflügelige Insekten, pp. 72-81. Vol. 1. *In*: der Schulzischen Buchhandlung, Hamm.

