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An Update and Errata for the Catalog of the Biting Midges of the World (Diptera: Ceratopogonidae)

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Abstract

A list of corrections as well as the addition of new taxa described since Borkent & Dominiak (2020) published a catalog of the Ceratopogonidae of the world is provided. We record a further 70 extant and 7 fossil species and 2 new fossil genera. Beyond the summary provided by Borkent & Dominiak (2020, Table 1), the family now includes 6276 extant and 303 fossil species and 23 fossil genera. The number of species names that are *nomina dubia* is now 181.

Key words: Species list, biodiversity

Introduction

Providing accurate catalog information is particularly challenging for diverse and large groups of organisms. This includes the Ceratopogonidae which were reported to have 6206 extant species in 112 genera, and 296 fossils in 44 genera (21 of which are extinct). Unfortunately, the catalog lacked perfection and here we list a number of errata and take the opportunity to list species and genera described since then until the end of 2021. The format replicates that presented in Borkent & Dominiak (2020). Authors with two or more publications in a given year in the world catalog were given a letter after the date and these same letters are used in the references here to complement those in the world catalog. Similarly, the use of 'and' for additional authors in the catalog itself is followed here.

Results

Errata and Explanations of New Taxonomic Information

A number of errata do not require comment, being merely incorrect page numbers or dates. Those and all others, requiring some explanation below are listed in Table 1, making it easy for readers to make corrections to the original catalog.

Borkent & Dominiak (2020: 21) explained how some names originally attributed to Kieffer (1915c), who described the adults, were named earlier by Rieth (1915), who described the immatures. It appears that Rieth's (1915) publication in *Archiv für Hydrobiologie*, *Suppl.* 2, 377–442, published on June 8 of that year was further preceded by his thesis, published April 28 by Rieth (1915a) with exactly the same print as is in the 1915 journal version. The April 28th date is provided in *Monatsverzeichnis der an den deutschen Universitäten und Technischen Hochschulen erschienenen Schriften*, 1915, 3: 165. As such the names Borkent & Dominiak (2020) referred to Rieth (1915) must now refer to Rieth (1915a) as cited here, with the correction presented here in Table 1. Otherwise, the pagination remains the same.

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In consultation with our Chinese colleague Xiaohui Hue (Zunyi Medical University), it is now clear that although given in the publication as "Ma and Yu," the first author's name in the following species is actually Mahe: *Dasyhelea biungula* Ma and Yu and *Brachypogon turpanensis* Ma and Yu.

Nie *et al*. (2021) described *Leptoconops pallidipes* Nie and Yu on the basis of a male collected on a ship in China which had come from Malaysia. They did not place the species in a subgenus but their figure of the genitalia indicates it is a *L*. (*Holoconops*), as we have placed it below.

Yu and Liu, 2000a: 48 described *Atopomyia* as a new subgenus of *Forcipomyia* to include two Chinese species, both of them new. The type species was *Forcipomyia atopia* Yu and Liu, by original designation. The generic name is a junior homonym of *Atopomyia* Austen, 1923 a name now placed in *Pantophthalmus* Thunberg (Panthophthalmidae). Here we propose the name *Atopopogon* Borkent, Dominiak and Díaz as a **new replacement name**.

Forcipomyia maculosa Yu, Wang and Yu, 2015 (*in* Yu *et al.* 2015c) is a junior homonym of *Forcipomyia maculosa* Ingram and Macfie, 1931a and is hereby renamed *Forcipomyia neomaculosa* Borkent, Dominiak and Díaz, **new replacement name**.

The authorship of *Atrichopogon muelleri*, originally given as Müller (1905) is incorrect considering the footnote in his publication states that Kieffer is the author. The catalog entry for this species, should therefore read as:

muelleri (Kieffer, *in* Müller 1905): 224 (*Ceratopogon*). Poland.
muelleri (Kieffer, 1906b): 336 (*Ceratopogon*). Germany.

Gagné & Jaschhof (2021) placed *Changania* Tseng, 1965 and its type species *Changania choui* Tseng in Ceratopogonidae. The taxon has been transferred to Chironomidae by Spies *et al.* (2022).

The Remm collection in Estonia is not present in the IZBE but in the TUZ as follows: TUZ - Natural History Museum, University of Tartu. Vanemuise 46, Tartu, 51014, Estonia.

The generic name *Aspinus* Hong, 1981 is a junior synonym of *Forcipomyia* and because it was preoccupied, was replaced by *Amberaspinus* Evenhuis, 1994. Subsequently Hong (2002: 215) proposed *Succinaspinus* as an unnecessary replacement name for *Aspinus*, as indicated in *Systema Dipterorum* (Evenhuis & Pape 2021).

Culicoides carbonelli was published as having Spinelli and Martínez as authors. However, there is no evidence that Martínez wrote any of the description and the name must therefore be attributed to Spinelli alone.

Culicoides riouxi Callot and Kremer, 1961a belongs to the subgenus *C*. (*Wirthomyia* Vargas, 1973). The correct affiliation of this species was stated by Vargas (1973). This species is also treated as a member of this subgenus in an online key for females of *Culicoides* by Mathieu *et al*. (2012).

Brachypogon singularis (Santos Abreu, 1918) from the Canary Islands was redescribed and placed in the subgenus *Brachypogon* (*Isohelea* Kieffer, 1917b) by Dominiak *et al*. (2020). Additionally, two new synonyms were proposed by the same authors: *Brachypogon rufigastris* (Santos Abreu, 1918) and *Brachypogon obscurus* (Santos Abreu, 1918). All three names were treated in the catalog as *nomina dubia*.

Bezzia calceata was stated by Walker (1856a) to be described by Haliday and he is the proper author of this species. Similarly, the names in Table 1 previously attributed to Meigen (1818) are indicated in that paper by quoted descriptive matter to be authored by Wiedemann.

The following are three additional *nomina nuda*:

Atrichopogon illiesi Bologna and Havelka, 1985: 78.
Atrichopogon mittmanni Frenzel, Havelka and Brandi, 1998: 37.
Atrichopogon ruediger Frenzel, Havelka and Brandi, 1998: 37.

New Taxa and New Taxonomic Information

In this section we provide new taxa of Ceratopogonidae proposed since Borkent & Dominiak (2020) till the end of 2021 and new taxonomic information public during that same time. The subfamilies and tribes are provided for reference. For previously proposed generic names we do not provide further documentation, nor any synonyms as given in Borkent & Dominiak (2020). Myanmar here replaces the previous use of Burma.

TABLE 1. List of corrected errata from Borkent and Dominiak (2020).

As in Borkent & Dominiak (2020)	Corrected to
Alluaudomyia longzhouensis Hao and Yu, 1991: 45.	Alluaudomyia longzhouensis Hao and Yu, 1991: 42.
Austroconops perrichoti Dominiak, Szadziewski and Nel, 2018: 232. Lower Cretaceous.	Austroconops perrichoti Dominiak, Szadziewski and Nel, 2018: 232. France. Lower Cretaceous.
ATRICULICOIDINAE SZADZIEWSKI, 1999: 51.	ATRICULICOIDINAE SZADZIEWSKI, 1996: 51.
BESSAMYIA Yu, Liu, Liu, Liu, Hao, Yan and Zhao, 2006: 355 (as subgenus of *Atrichopogon*).	BESSAMYIA Yu , *in* Yu *et al*. 2005a: 355 (as subgenus of *Atrichopogon*).
Bezzia calceata (Walker, 1856a): 239 (*Ceratopogon*).	Bezzia calceata (Haliday, *in* Walker 1856a: 239) (*Ceratopogon*).
Bezzia danica Kieffer, 1915c: 291.	Bezzia danica Rieth, 1915a: 403. Denmark. Kieffer, 1915c: 291.
Brachypogon turpanensi Ma and Yu, *in* Ma *et al*. 2017: 64.	Brachypogon turpanensis Mahe and Yu, *in* Mahe *et al.* 2017: 64.
Culicoides bojarskii Szadziewski and Dominiak, 2019: 538.	Culicoides bojarskii Szadziewski and Dominiak, *in* Szadziewski *et al.* 2019a: 538.
Culicoides burmiticus Szadziewski and Dominiak, 2019: 539.	Culicoides burmiticus Szadziewski and Dominiak, *in* Szadziewski *et al*. 2019a: 539.
Culicoides ellenbergeri Szadziewski and Dominiak, 2019: 540.	Culicoides ellenbergeri Szadziewski and Dominiak, *in* Szadziewski *et al*. 2019a: 540.
Culicoides myanmaricus Szadziewski and Dominiak, 2019: 541.	Culicoides myanmaricus Szadziewski and Dominiak, *in* Szadziewski *et al*. 2019a: 541.
Dasyhelea biungula Ma and Yu, *in* Mahe *et al.* 2018: 76.	Dasyhelea biungula Mahe and Yu, *in* Mahe *et al*. 2018: 76.
Dasyhelea brachystyla Grogan, Díaz, Spinelli and Ronderos, 2017: 241.	Dasyhelea brachystyla Grogan, Díaz, Spinelli and Ronderos, 2016: 241.
BALIOHELEA Yu and Liu, 2006: 476 (as subgenus of *Forcipomyia*).	BALIOHELEA Yu and Liu, *in* Yu *et al*. 2005a: 476 (as subgenus of *Forcipomyia*).
Forcipomyia danica Rieth, 1915: 403. Denmark. Kieffer, 1915c: 280.	Forcipomyia danica Kieffer, 1915c: 280. Denmark.
Forcipomyia fuliginosa (Meigen, 1818): 86 (*Ceratopogon*).	Forcipomyia fuliginosa (Wiedemann), *in* Meigen 1818: 86 (*Ceratopogon*).
Forcipomyia meinerti Rieth, 1915: 434. Denmark. Kieffer, 1915c: 281.	Forcipomyia meinerti Rieth, 1915a: 434. Denmark. Kieffer, 1915c: 281.
GROGANOMYIA Szadziewski and Dominiak, 2019: 536 (as subgenus of *Culicoides*).	GROGANOMYIA Szadziewski and Dominiak, *in* Szadziewski *et al.* 2019a: 536 (as subgenus of *Culicoides*).
Mallochohelea breviforceps (Rieth, 1915): 410 (*Palpomyia*). Denmark. (Kieffer, 1915c): 289 (*Palpomyia*).	Mallochohelea breviforceps (Rieth, 1915a): 410 (*Palpomyia*). Denmark. (Kieffer, 1915c): 289 (*Palpomyia*).
Mallochohelea microcera (Rieth, 1915): 410 (*Palpomyia*). Denmark. (Kieffer, 1915c): 287 (*Palpomyia*).	Mallochohelea microcera (Rieth, 1915a): 410 (*Palpomyia*). Denmark. (Kieffer, 1915c): 287 (*Palpomyia*).
Palpomyia bispinosa Rieth, 1915: 410. Denmark. Kieffer, 1915c: 286.	Palpomyia bispinosa Rieth, 1915a: 410. Denmark. Kieffer, 1915c: 286.
Palpomyia succincta (Meigen, 1818): 85 (*Ceratopogon*).	Palpomyia succincta (Wiedemann, *in* Meigen 1818: 85) (*Ceratopogon*).
Palpomyia terrea (Meigen, 1818): 85 (*Ceratopogon*).	Palpomyia terrea (Wiedemann, *in* Meigen 1818: 85) (*Ceratopogon*).
Probezzia borealis (Clastrier, 1962a): 119 (*Bezzia*).	Probezzia borealis (Clastrier, 1962a): 118 (*Bezzia*).

SUBFAMILY LEPTOCONOPINAE NOÈ, 1907: 143

Genus LEPTOCONOPS Skuse

Subgenus HOLOCONOPS Kieffer

pallidipes Nie and Yu *in* Nie *et al*. 2021: 330. China (Hebei) [on ship from Malaysia].

Genus MINYOHELEA Borkent

nexuosa Pielowska-Ceranowska, *in* Pielowska-Ceranowska *et al*. 2021: 3. Lebanon. Lower Cretaceous.

SUBFAMILY ATRICULICOIDINAE SZADZIEWSKI, 1996: 51

Genus BURMAHELEA Szadziewski and Sontag

Burmahelea Szadziewski and Sontag, *in* Szadziewski *et al.* 2019b: 659. Type species: *Burmahelea neli* Szadziewski and Sontag, by original designation.
neli Szadziewski and Sontag, *in* Szadziewski *et al.* 2019b: 659. Myanmar. Lower Cretaceous.

SUBFAMILY FORCIPOMYIINAE LENZ, 1934: 96

TRIBE DASYHELEINI LENZ, 1934: 96

Genus DASYHELEA Kieffer

aliciae Grogan, Díaz, Spinelli and Ronderos, 2019: 308. Netherlands (Curaçao).
aprojecta Brahma, Chatterjee and Hazra, 2020: 69. India.
bulbosa Brahma, Chatterjee and Hazra, 2020: 69. India.
curacaoensis Grogan, Díaz, Spinelli and Ronderos, 2019: 317. Netherlands (Curaçao).
cyrstostyla Grogan, Díaz, Spinelli and Ronderos, 2019: 314. Netherlands (Curaçao).
jinshajangensis Chen, Qian and Yu, *in* Han *et al*. 2020: 463. China (Sichuan).
latiala Grogan, Díaz, Spinelli and Ronderos, 2019: 311. Netherlands (Curaçao).
multiforamina Brahma, Chatterjee and Hazra, 2020: 56. India.
patiae Szadziewski and Gwizdalska-Kentzer, 2020: 595. United Arab Emirates.
recurva Grogan, Díaz, Spinelli and Ronderos, 2019: 310. Netherlands (Curaçao).
rhopaloparamera Grogan, Díaz, Spinelli and Ronderos, 2019: 319. Netherlands (Curaçao).

TRIBE FORCIPOMYIINI LENZ, 1934: 96

Genus ATRICHOPOGON Kieffer

janseni Pessoa and Farias, *in* Farias *et al*. 2021: 227. Brazil (Amazonas).
riopardensis Farias, Pessoa and Paulino-Rosa, *in* Farias *et al.* 2021: 280. Brazil (Amazonas).
ruijinensis Liu, Yu and Chen, 2021a: 463. China (Jiangxi).
sergioluzi Farias, Santos and Pessoa, *in* Farias *et al*. 2021: 284. Brazil (Amazonas).

Genus FORCIPOMYIA Meigen

Subgenus ATOPOPOGON Borkent, Dominiak and Díaz

ATOPOMYIA Yu and Liu 2000a: 48 (as subgenus of *Forcipomyia*), (preoccupied by *Atopomyia* Austen, 1923). Type species: *Forcipomyia atopia* Yu and Liu, by original designation.
ATOPOPOGON Borkent, Dominiak and Díaz, in this work. New name for *Atopomyia* Yu and Liu, 2000a. Type species: designated here: *Forcipomyia atopia* Yu and Liu.

Subgenus EUPROJOANNISIA Brèthes

grumula Yu and Wang, 2021: 261. China (Hainan).

Subgenus FORCIPOMYIA Meigen

neomaculosa Borkent, Dominiak and Díaz, in this work. New name for *Forcipomyia maculosa* Yu, Wang and Yu. *maculosa* Yu, Wang and Yu, *in* Yu *et al*. 2015c: 499 (preoccupied by *Forcipomyia maculosa* Ingram and Macfie, 1931a). China (Yunnan).
pyrenaica Szadziewski, Dominiak and Withers, 2020: 113. France.
rasnitsyni Szadziewski, Sontag and Pankowski, 2021: 441. Ethiopia. Miocene.
szadziewskii Navai, 2021: 241. Afghanistan.

Subgenus THYRIDOMYIA Saunders

parvus Yu and Wang, 2021: 262. China (Hainan).

SUBFAMILY CERATOPOGONINAE NEWMAN, 1834: 388

TRIBE CULICOIDINI KIEFFER, 1911d: 1, 1911b: 319

Genus CULICOIDES Latreille

Subgenus BELTRANMYIA Vargas

beishanensis Li and Liu, in Li *et al*. 2020: 175. China (Heilongjiang).

Subgenus HAEMATOMYIDIUM Goeldi

dellapei Spinelli, Ronderos and Díaz, 2021: 404. Argentina (Buenos Aires).

Subgenus HOFFMANIA Fox

proximus Nandi and Mazumdar, 2013: 51. India.

Subgenus MEIJEREHELEA Wirth and Hubert

mahasarakhamense Pramual, Jomkumsing, Piraonapicha and Jumpato, 2021: 2. Thailand.

Subgenus MONOCULICOIDES Khalaf

obtusus Chatterjee, Brahma and Hazra, 2020: 24. India.

Subgenus OECACTA Poey

hekouensis Zhou, Yang and Liu, 2020: 408. China (Yunnan).

Subgenus WIRTHOMYIA Vargas

riouxi Callot and Kremer, 1961a: 679. France.

Subgenus unplaced, *eublepharus* species group

carbonelli Spinelli, *in* Spinelli *et al*. 2021: 402. Uruguay.

Subgenus unplaced, *ornatus* species group

aequalispinus Nandi, Mazumdar and Das Gupta, 2013: 224. India.
fuscitibialis Nandi, Mazumdar and Das Gupta, 2013: 226. India.
pateli Nandi, Mazumdar and Das Gupta, 2013: 228. India.

Subgenus unplaced, *reticulatus* species group

hildebrandoi Farias, Pereira Júnior, Felippe-Bauer, Pessoa, Medeiros and Santarém, 2016: 107. Brazil (Rondônia).

Subgenus unplaced, *shermani* species group

cornus Chatterjee, Brahma and Hazra, 2020: 32. India.

Fossil species of CULICOIDES

paleopestis Peñalver, Arillo Aranda, Szadziewski and Stilwell, 2021: 3. Australia (Victoria). Eocene.

TRIBE CERATOPOGONINI NEWMAN, 1834: 388

Genus ALLUAUDOMYIA Kieffer

douchangensis Liu and Yu, *in* Liu *et al*. 2021b: 92. China (Jiangxi).
ruijinensis Yu, Liu and Chen, *in* Liu *et al*. 2021c: 458. China (Jiangxi).

Genus BRACHYPOGON Kieffer

Subgenus ISOHELEA Kieffer

singularis (Santos Abreu, 1918): 317 (*Ceratolophus*). Canary Islands (Spain).
obscurus (Santos Abreu, 1918): 323 (*Ceratolophus*, as variety of *rufigastris* Santos Abreu). Canary Islands (Spain).
rufigastris (Santos Abreu, 1918): 321 (*Ceratolophus*). Canary Islands (Spain).
surma Dominiak, Szadziewski and Salmela, 2020: 236. Finland.

Genus DOWNESHELEA Wirth and Grogan

alia Santarém, Borkent and Felippe-Bauer, 2020: 12. Costa Rica.
avizi Santarém, Borkent and Felippe-Bauer, 2020: 15. Brazil (Pará).
bahiana Santarém, Borkent and Felippe-Bauer, 2020: 17. Brazil (Bahia).
bifida Santarém, Borkent and Felippe-Bauer, 2020: 21. Colombia.
capra Santarém, Borkent and Felippe-Bauer, 2020: 23. Costa Rica.
curta Santarém, Borkent and Felippe-Bauer, 2020: 41. Costa Rica.
divergentis Santarém, Borkent and Felippe-Bauer, 2020: 46. Brazil (Amazonas).
gladius Santarém, Borkent and Felippe-Bauer, 2020: 51. Costa Rica.
jurgeni Santarém, Borkent and Felippe-Bauer, 2020: 55. Costa Rica.
kuna Santarém, Borkent and Felippe-Bauer, 2020: 59. Colombia.
magna Santarém, Borkent and Felippe-Bauer, 2020: 61. Costa Rica.
pulla Santarém, Borkent and Felippe-Bauer, 2020: 67. Belize.
quechua Santarém, Borkent and Felippe-Bauer, 2020: 70. Bolivia.
rodriguezi Santarém, Borkent and Felippe-Bauer, 2020: 71. Bolivia.
spatha Santarém, Borkent and Felippe-Bauer, 2020: 75. Costa Rica.
tripunctata Santarém, Borkent and Felippe-Bauer, 2020: 80. Costa Rica.
venus Santarém, Borkent and Felippe-Bauer, 2020: 81. Brazil (Amazonas).
wirthiana Santarém, Borkent and Felippe-Bauer, 2020: 84. Bolivia.

Genus MEUNIEROHELEA Szadziewski

anglesensis Peñalver, Arillo Aranda, Szadziewski and Stilwell, 2021: 2. Australia (Victoria). Eocene.
fundalai Szadziewski, Sontag and Bojarski, 2020: 286. Dominican Republic. Miocene.

Genus MONOHELEA Kieffer

morinjiensis Kanasugi, 2019: 75. Japan.
ozeana Kanasugi, 2019: 78. Japan.
mediterranea Szadziewski, Dominiak and Withers, 2020: 118. Algeria.

Genus NELOHELEA Szadziewski and Sontag

NELOHELEA Szadziewski and Sontag, *in* Szadziewski *et al.* 2019b: 600. Type species: *Nelohelea neli* Szadziewski and Sontag, by original designation.

neli Szadziewski and Sontag, *in* Szadziewski *et al.* 2019b: 661. Myanmar. Lower Cretaceous.

Genus PARABEZZIA Malloch

carlae Huerta, Spinelli and Grogan, 2021: 3. Mexico (Guerrero).

Genus STILOBEZZIA Kieffer

Subgenus STILOBEZZIA Kieffer

tobiasi Huerta and Grogan, 2021: 297. Mexico (Yucatán).

TRIBE JOHANNSENOMYIINI CRAMPTON, 1925: 61

Genus NILOBEZZIA Kieffer

bamenwana Li and Li, 2019: 136. China (Hainan).

TRIBE PALPOMYIINI ENDERLEIN, 1936: 49

Genus BEZZIA Kieffer

amblystyla Grogan, 2020: 447. USA (Florida).
brunneipedia Grogan, 2020: 450. USA (Florida).
folkertsi Grogan, 2020: 452. USA (Florida).
huberti Grogan, 2020: 455. USA (Maryland).
leptostyla Grogan, 2020: 457. USA (Florida).
marylandensis Grogan, 2020: 459. USA (Maryland).
titanochela Grogan, 2020: 462. USA (Florida).

Genus PALPOMYIA Meigen

auakua Huerta and Spinelli, 2021: 556. Mexico (Hidalgo).

Genus PARYPHOCONUS Enderlein

inesae Díaz, Spinelli and Ronderos, 2021: 85. Brazil (Amazonas).

Summary

In this article we record 70 extant and 7 fossil species and 2 new fossil genera described since Borkent & Dominiak (2020). In addition to the summary provided in that publication, the family now includes 6276 extant and 303 fossil species and 23 fossil genera. The number of species names that are *nomina dubia* is now 181.

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