

THE PREDACEOUS MIDGES OF THE WORLD



(Diptera: Ceratopogonidae, Tribe Ceratopogonini)

by
Willis W. Wirth and William L. Grogan, Jr.



FLORA & FAUNA HANDBOOK NO. 4

Predaceous Midges Of The World Diptera Ceratopogonidae Tribe Ceratopogonini

**William L. Grogan, Gustavo R.
Spinelli, María M. Ronderos, Carla G.
Cazorla**

Predaceous Midges Of The World Diptera Ceratopogonidae Tribe Ceratopogonini:

Predaceous midges of the world (Diptera: Ceratopogonidae: Ceratopogonini) Willis Wagner Wirth, William L. Grogan, 1988 **The Predaceous Midges of the World** Willis Wirth, William Grogan, 2023-09-25 *Catalog of the Biting Midges of the World (Diptera: Ceratopogonidae)* Art Borkent, author 1, Patrycja Dominiak, author 2, author 3, 2020 Abstract A list of all valid 6 206 extant and 296 fossil species of Ceratopogonidae described worldwide is provided along with all their synonyms A full citation and the country of origin of the type is given with some larger countries also providing a more specific state or province For the first time worldwide nomina dubia are identified Numbers of species of each genus and subgenus are listed Within subfamilies and tribes genera are listed alphabetically Five species have newly recognized authors four have new names and 28 new combinations are recognized with these listed in a table A commentary on the state of the systematics in the family and particularly of Culicoides Latreille is given The museums of the world are listed with the types of various authors of Ceratopogonidae species indicated Authors providing regional catalogs as well as summation of various collections are tabulated The rate of description since 1758 indicates a steady progression of description with for example 1 231 valid species described since the compilation of the world species by Borkent Wirth 1997 till the end of 2018 The diversity in each Region is compared and the numbers of species shared between adjacent Regions presented Keywords Diptera species list taxonomy no see ums distribution fossil Culicoides rate of description new names new combinations Page 4 *The Pupae of the Biting Midges of the World (Diptera : Ceratopogonidae), with a Generic Key and Analysis of the Phylogenetic Relationships Between Genera* Art Borkent, 2014 The pupae of species in each of the 45 genera of Ceratopogonidae known in this stage are diagnosed and described A standard set of terms is provided with a glossary for all pertinent structures of the pupal stage within a context of other Culicomorpha The variety of terms provided by previous authors are synonymized Some pupal structures are directly related to developing adult structures and these are discussed A key to the genera and to the subgenera of Forcipomyia Meigen allows for their identification Pupation and pupal behaviour is summarized A table of all previous descriptions of each stage of the immatures egg larva pupa is provided showing that 13% of all validly named extant Ceratopogonidae are known as pupae This study examined 45% of these species All species known as fossil pupae are discussed A phylogenetic analysis based primarily on pupal characters confirms the relationships between the subfamilies as well as the relationships between the genera in Leptoconopinae Forcipomyiinae and Dasyheleinae The question of the monophyly of the Culicoidini remains unresolved Results confirm the paraphyly of the Ceratopogonini and for the first time the Sphaeromiini sensu lato which is divided into Hebetulini new tribe Johannsenomyiini Crampton new status and Sphaeromiini sensu novum Sphaeromiini sensu novum includes Sphaeromias Curtis Leehelea Debenham Homoehelea Kieffer and Xenoehelea Kieffer and forms the sister group of the Palpomyiini Other genera in Sphaeromiini sensu lato not known as pupae are discussed The genus Mallochohelea Wirth is shown to be polyphyletic and one group of species is

therefore recognized as members of the new genus *Anebomyia* type species *Mallochohelea atripes* Wirth A number of species previously placed in *Stilobezzia* Kieffer are shown to belong to *Schizonyxhelea* Clastrier Study of the type species of the monotypic genus *Nemoromyia* Liu and Yu showed it to be a member of the *Palpomyia distincta* species group and the generic name is therefore a new junior synonym of *Palpomyia* Examination of pupae showed that the following species were misplaced and are now in other genera as follows *Schizonyxhelea brevicostalis* Das Gupta Wirth 1968 28 *Stilobezzia* new combination *Schizonyxhelea bulla* Thomsen 1935 289 *Stilobezzia* new combination *Schizonyxhelea caribe* Lane Forattini 1958 208 *Stilobezzia* new combination *Schizonyxhelea diminuta* Lane Forattini 1958 209 *Stilobezzia* new combination *Schizonyxhelea obscura* Lane Forattini 1958 216 *Stilobezzia* new combination *Schizonyxhelea panamensis* Lane Forattini 1958 218 *Stilobezzia* new combination *Schizonyxhelea thomsenae* Wirth 1953 83 *Stilobezzia* new combination *Schizonyxhelea scutata* Lane Forattini 1961 92 *Stilobezzia* new combination *Pellucidomyia geari* de Meillon Wirth 1981 547 *Macropeza* new combination *Dibezzia prominens* Johannsen 1932 435 *Johannsenomyia* new combination *Nilobezzia theileri* de Meillon Wirth 1981 552 *Sphaeromias* new combination *Anebomyia atripes* Wirth 1962 281 *Mallochohelea* new combination *Anebomyia fluminea* de Meillon Wirth 1981 550 *Mallochohelea* new combination *Anebomyia siricis* de Meillon 1961 50 *Sphaeromias* new combination *Anebomyia texensis* Wirth 1962 283 *Mallochohelea* new combination *Anebomyia yunnana* Yu Zou in Yu et al 2005 1503 *Mallochohelea* new combination *Bezzia goezii* Schrank 1803 72 *Tipula* new combination also a nomen nudum *Palpomyia nemorosa* Liu Yu 1991 26 *Nemoromyia* new combination *Bezzia xanthogaster* Kieffer 1919 130 *Probezzia* is a junior homonym of *Probezzia xanthogaster* Kieffer 1917 329 *Bezzia* and is here given the new name *Bezzia gilvigaster* Borkent The fossil genus *Paraculicoides* Pierce 1966 94 and its type species *Paraculicoides rouseae* Pierce 1966 94 are removed from the *Ceratopogonidae* and likely belong in the *Psychodidae* The North American Predaceous Midges of the Genus *Palpomyia* Meigen (Diptera: *Ceratopogonidae*) William L. Grogan, Willis W. Wirth, 1979

Biting Midges (Diptera, Ceratopogonidae) Willis Wagner Wirth, 1981 **Neotropical Ceratopogonidae (Diptera: Insecta)** Art Borkent, Gustavo R. Spinelli, 2007 **World species of biting midges** Art Borkent, 1997 **World Species of Biting Midges (Diptera, Ceratopogonidae). Bulletin of the AMNH**, *A Bibliography and Keyword Index of the Biting Midges* William R. Atchley, 1981 **Biting Midges (Diptera: Ceratopogonidae)** Willis W. Wirth, Terry L. Erwin, William L. Grogan, 1981 **The Biting and Predaceous Midges of Guadeloupe (Diptera: Ceratopogonidae). I. Species of the Subfamily Ceratopogoninae** William L. Grogan, Gustavo R. Spinelli, María M. Ronderos, Carla G. Cazorla, 2013 We provide new records of biting and predaceous midges *Diptera Ceratopogonidae* from Guadeloupe in the subfamily *Ceratopogoninae* including descriptions and illustrations of three new predaceous species in the genera *Parabezzia* *Malloch* *Stilobezzia* Kieffer and *Palpomyia* Meigen respectively and the first records of the New World predaceous genus *Amerohelea* Grogan and Wirth from the Caribbean region We also provide the first Guadeloupe records of the biting midges

Culicoides Anilomyia decor Williston C *Avaritia pusillus* Lutz C *Drymodesmyia bredini* Wirth and Blanton C D *poikilonotus* Macfie C *Haematomyidium hoffmani* Fox C *Hoffmania insignis* Lutz C *rangeli* Ortiz and Mirsa and C *trilineatus* Fox and the predaceous midges *Brachypogon* *Brachypogon bifidus* Spinelli and Grogan B B *telesfordi* Spinelli and Grogan B B *woodruffi* Spinelli and Grogan *Monohalea maya* Felipe Bauer Huerta and Ib ez Bernal *Stilobezzia* *Stilobezzia diminuta* Lane and Forattini S S *thomsenae* Wirth *Amerohalea galindoi* Grogan and Wirth *Bezzia* *Bezzia flinti* Spinelli and Wirth B *Homobezzia venustula* Williston and *Palpomyia insularis* Spinelli and Grogan

Catalog of the New World Biting Midges South of the United States of America (Diptera: Ceratopogonidae) Art Borkent, Gustavo R. Spinelli, 2000 The Phylogeny of the Genera of Biting Midges (Diptera: Ceratopogonidae) of the World Art Borkent, 2024

Abstract A phylogenetic analysis of all extant genera of Ceratopogonidae worldwide indicates there are now 109 valid genera including two that are unnamed All potential morphological features were considered with 364 adult characters surveyed Of these 146 adult characters were considered informative and these were combined with 40 pupal features previously interpreted by Borkent 2014 16 larval and two egg characters The resulting phylogeny confirmed the relationships between the early lineages including Leptoconopinae Forcipomyiinae and Culicoidini other than Washingtonhelea previously interpreted The remainder are Ceratopogoninae and these are divided into 11 tribes of which four are new Washingtonheleini Parabezziini Neurobezziini and Echinoheleini The last three were previously considered as members of the Ceratopogonini Remaining Ceratopogonini are still recognized as a paraphyletic group with some lineages poorly resolved phylogenetically Some genera are realigned within the tribes Sphaeromiini Johannsenomyiini and Palpomyiini Poorly understood genera are discussed in some detail Available autapomorphies of genera are presented showing that some genera lack evidence of monophyly Previously considered features of adults as well as those newly investigated but found to be of uncertain value phylogenetically are presented and discussed in detail Previously published phylogenetic interpretations are discussed in the light of the current analysis Six extant genera are newly placed three as new synonyms and three lowered in rank from full genera to subgenera with their type species subsequently as new combinations Another is once again placed in synonymy and one previously considered a generic synonym is recognized as a valid genus The changes are as follows *Guihelea* Yu Qian in Yu et al 2005 1496 New synonym of *Johannsenomyia* Malloch 1915 332 *Johannsenomyia jingxiensis* Yu Qian in Yu et al 2005 1497 New combination *Heteroceratopogon* Wirth Grogan 1988 55 New synonym of *Ceratopalpomyia* Szadziewski 1988 171 *Ceratopalpomyia poguei* Wirth Grogan 1988 57 *Ceratopalpomyia* New combination *Hypsimyia* Yu in Yu et al 2005 1433 New synonym of *Ceratopogon* Meigen 1803 261 *Ceratopogon emeiensis* Yu Li in Yu et al 2005 1433 *Hypsimyia* New combination *Chairpogon* Yu in Yu et al 2005 1430 New status as subgenus of *Culicoides* Latreille 1809 251 *Culicoides Chairpogon chengdeiensis* Yu Hao in Yu et al 2005 1430 *Chairpogon* New combination *Oxyria* Yu in Yu et al 2005 1436 New status as subgenus of *Forcipomyia* Meigen 1818 73 75 *Forcipomyia Oxyria xui* Yu in Yu et al 2005 1437 *Oxyria* New combination

Sinicohelea Yu Wang Tan in Wang et al 2012 42 New status as subgenus of Forcipomyia Meigen 1818 73 75 Forcipomyia
Sinicohelea xuanjui Yu Wang Chen in Wang et al 2012 Sinicohelea New combination The type species of Paralluaudomyia is
once again named Alluaudomyia maculata Clastrier 1960 and the genus is a synonym of Alluaudomyia New status Boreohelea
was most recently considered a synonym of Allohelea and is now returned to generic status New status Key words
morphology no see ums pupa larva egg aquatic Culicomorpha cladistic Page 5 World Species of Bloodsucking Midges [?],
[?],2006

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