

Classification of the leafhopper genus *Macrosteles* Fieber and allied genera of the world (Hemiptera: Cicadellidae)

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Abstract

All of the known species of *Macrosteles* and allied genera, *Davisonia*, *Sagatus*, and *Sonronius*, previously treated as subgenera of *Macrosteles*, along with *Nabiya* gen. nov., are reviewed, primarily based on the genitalia and abdominal apodemes of males. These genera are also redefined as constituent taxa of the subtribe Macrostelina (partim, s. str.) to distinguish them from other closely related genera. A total of 135 species in 5 genera are treated, of which 45 species are new to science. Particularly, 19 new synonymies are made, while 1 species is removed from synonymy and recognised as valid, while 17 lectotypes and 2 neotypes are designated. The new genus, *Nabiya* gen. nov., is also established to encompass *Macrosteles* (*Sagatus*) *flavalis* Hamilton, 1972. All the species are described and illustrated showing the diagnostic features for both sexes where these are known. Keys for the identification of males, distribution ranges, host plants, and additional characters of the higher taxa are provided. The present monograph has been published by the National Institute of Biological Resources, Korea, in 2022.

Key words: Taxonomy, Morphology, Distribution, Deltocephalinae, Macrostelina.

Preface

The leafhoppers of the subtribe Macrostelina (s. str.) distribute throughout the world except in Australia, Oceanic islands, and Antarctica. Some species, such as *Macrosteles sordidipennis* and *M. maritimus* sp. nov., are well adapted to salt marshes. Whereas others, such as *M. cyane* and *M. viridigriseus*, are inhabitants of wet vegetation, while *M. lineatifrons* are adapted to subarctic region, and *M. ossiannilssoni* occurs from the cool temperate to Afrotropical area. There also exists an introduced species, *M. spinosu* in New Zealand originating from Europe.

The present taxon has shown the greatest radiation in the transboreal area predominantly. Since most leafhoppers are of tropical origin, it is interesting that there are very few member species represented in the Old World tropics with only a single endemic species, *M. ngweseus*, and *M. ossiannilssoni* of the Palaearctic element found in the Afrotropical area. In the Pacific Oriental region, *M. abludens* and *M. striifrons*, which also occur throughout the Far East are the only tropical species represented. A number of endemic taxa are known in the Neotropical region, as it has not been “well” surveyed, further extensive investigation will probably disclose many additional taxa. The use of male genitalia in the taxonomy of the Macrostelina provides more detailed and reliable characters than previously envisioned, especially the fine structure of the aedeagus. The male abdominal apodemes also provide a number of diagnostic characters in association with their acoustic behavioural function.

Within the Macrostelina, there is a considerable diversity of lineages which makes it difficult to decide whether a particular character is primitive or derived. A great deal of work remains to be done to clarify phylogenetic relationships. Other approaches, such as the acoustic signalling behaviour, hybridization experiment as well as molecular taxonomy, may help reinforce the present morphological survey. The taxonomy of the genus *Macrosteles* consisting of the main part of this lifetime project was initiated since 1985, as a doctoral dissertation for the senior author who was attracted to mysterious structure of the abdominal apodemes as an emitting resource of the specific acoustic behaviour in these leafhoppers. Subsequently, numerous loan and visitation efforts to ensure specimens from world institutions as well as field expeditions have been conducted. Expanding to subtribal taxa as well as further cooperative survey on the world fauna, the junior author has joined to reinforce the present classification scheme. Eventually, a sum of 104 species belonging to *Macrosteles* included in the dissertation (1988) have now been increased to a total of 135 species under 5 genera, along with 45 species and 1 genus new to science.

Check list of the subtribe Macrostelina

Genus 1. *Macrosteles* Fieber, 1866

- 1) *Macrosteles abludens* Anufriev, 1968
- 2) *Macrosteles albicostalis* Vilbaste, 1968
- 3) *Macrosteles alpinus* (Zetterstedt, 1828)
- 4) *Macrosteles alticola* Vilbaste, 1965
- 5) *Macrosteles arizonus* sp. nov.
- 6) *Macrosteles bahamamus* sp. nov.
- 7) *Macrosteles bandii* sp. nov.
- 8) *Macrosteles bifurcatus* Beirne, 1952
- 9) *Macrosteles borealis* (Dorst, 1931)
- 10) *Macrosteles brochus* Zhang et Lu, 2013
- 11) *Macrosteles brunneus* Anufriev, 1968
- 12) *Macrosteles brunneus* Zhang et Lu, 2013
- 13) *Macrosteles buzensis* (Matsumura, 1902)
- 14) *Macrosteles canadensis* Kwon, 2010
- 15) *Macrosteles chilensis* sp. nov.
- 16) *Macrosteles chobauti* Ribaut, 1952
- 17) *Macrosteles claridgei* sp. nov.
- 18) *Macrosteles conspicuus* sp. nov.
- 19) *Macrosteles cristatus* (Ribaut, 1927)
- 20) *Macrosteles curvatus* Beirne, 1952
- 21) *Macrosteles cyane* (Boheman, 1845)
- 22) *Macrosteles denhollanderi* sp. nov.
- 23) *Macrosteles dietrichi* sp. nov.
- 24) *Macrosteles divivus* (Uhler, 1877)

- 25) *Macrosteles ehensis* Zhang et Lu, 2013
- 26) *Macrosteles elegans* sp. nov.
- 27) *Macrosteles elongatus* Beirne, 1952
- 28) *Macrosteles empetri* (Ossiannilsson, 1935)
- 29) *Macrosteles falcatus* Zhang et Lu, 2013
- 30) *Macrosteles fieberi* (Edwards, 1889)
- 31) *Macrosteles forficulus* (Ribaut, 1927)
- 32) *Macrosteles frigidus* Kwon, 2010
- 33) *Macrosteles frontalis* (Scott, 1875)
- 34) *Macrosteles galeae* Hamilton, 1987
- 35) *Macrosteles glacialis* sp. nov.
- 36) *Macrosteles gracilis* Zhang et Lu, 2013
- 37) *Macrosteles guttatus* (Matsumura, 1915)
- 38) *Macrosteles hamiltoni* sp. nov.
- 39) *Macrosteles harperatus* Zhang et Lu, 2013
- 40) *Macrosteles hastatus* sp. nov.
- 41) *Macrosteles heitiacus* Kuoh, 1981
- 42) *Macrosteles hidalgonis* sp. nov.
- 43) *Macrosteles horvathi* (Wagner, 1935)
- 44) *Macrosteles ignarus* sp. nov.
- 45) *Macrosteles indrimus* (Singh-Pruthi, 1930)
- 46) *Macrosteles informis* Kwon, 2010
- 47) *Macrosteles insignis* sp. nov.
- 48) *Macrosteles imundatus* Hamilton, 1987
- 49) *Macrosteles jungsukae* sp. nov.

- 50) *Macrosteles jussiaeae* Moore et Ross, 1957
- 51) *Macrosteles kijungae* sp. nov.
- 52) *Macrosteles koreanus* sp. nov.
- 53) *Macrosteles laevis* (Ribaut, 1927)
- 54) *Macrosteles lagus* Hamilton, 1983
- 55) *Macrosteles lepidus* (Van Duzee, 1894)
- 56) *Macrosteles lindbergi* Dlabola, 1963
- 57) *Macrosteles lineatifrons* (Stål, 1858)
- 58) *Macrosteles lividus* (Edwards, 1894)
- 59) *Macrosteles longicornis* sp. nov.
- 60) *Macrosteles maculosus* (Then, 1897)
- 61) *Macrosteles manitobanus* sp. nov.
- 62) *Macrosteles maritimus* sp. nov.
- 63) *Macrosteles medius* sp. nov.
- 64) *Macrosteles mendosus* sp. nov.
- 65) *Macrosteles meridianus* sp. nov.
- 66) *Macrosteles mexicanus* sp. nov.
- 67) *Macrosteles michoacanus* sp. nov.
- 68) *Macrosteles mongolicus* sp. nov.
- 69) *Macrosteles nabiae* Kwon, 2013
- 70) *Macrosteles newickus* sp. nov.
- 71) *Macrosteles ngweseus* sp. nov.
- 72) *Macrosteles nielsoni* sp. nov.
- 73) *Macrosteles nubilus* (Ossiannilsson, 1936)
- 74) *Macrosteles obsoletus* (Dorst, 1931)
- 75) *Macrosteles occidentalis* sp. nov.
- 76) *Macrosteles omani* sp. nov.
- 77) *Macrosteles oregonensis* sp. nov.
- 78) *Macrosteles oshanini* Razvjazkina, 1957
- 79) *Macrosteles ossiannilssoni* Lindberg, 1954
- 80) *Macrosteles otavalonus* sp. nov.
- 81) *Macrosteles pallidus* (Osborn, 1915)
- 82) *Macrosteles parafalcatus* Naveed et Zhang, 2018
- 83) *Macrosteles parastriifrons* Zhang et Lu, 2013
- 84) *Macrosteles parvidens* Kwon, 2010
- 85) *Macrosteles patricius* sp. nov.
- 86) *Macrosteles patruelis* Kwon, 2010
- 87) *Macrosteles patzumus* sp. nov.
- 88) *Macrosteles polygoni* sp. nov.
- 89) *Macrosteles potiorius* (Ball, 1900)
- 90) *Macrosteles provoensis* sp. nov.
- 91) *Macrosteles pygmaeus* Vilbaste, 1974
- 92) *Macrosteles quadrilineatus* (Forbes, 1885)
- 93) *Macrosteles quadrimaculatus* (Matsumura, 1900)
- 94) *Macrosteles quadripunctulatus* (Kirschbaum, 1868)
- 95) *Macrosteles queretaronus* sp. nov.
- 96) *Macrosteles rabaticus* Lindberg, 1963
- 97) *Macrosteles ramosus* Ribaut, 1952
- 98) *Macrosteles raoi* Zahniser, McKamey et Dmitriev, 2012
- 99) *Macrosteles rotundicornis* sp. nov.
- 100) *Macrosteles salsolae* (Puton, 1872)
- 101) *Macrosteles sardus* Ribaut, 1948
- 102) *Macrosteles scriptus* (DeLong, 1924)
- 103) *Macrosteles separatus* sp. nov.
- 104) *Macrosteles septemnotatus* (Fallén, 1806)

- 105) *Macrosteles serratus* Kwon, 2010
- 106) *Macrosteles severini* Hamilton, 1983
- 107) *Macrosteles sexnotatus* (Fallén, 1806)
- 108) *Macrosteles similis* Kwon, 2010
- 109) *Macrosteles skalkahiensis* Beirne, 1952
- 110) *Macrosteles sloosoni* (Van Duzee, 1893)
- 111) *Macrosteles sordidipennis* (Stål, 1858)
- 112) *Macrosteles spinosus* Kwon, 2013
- 113) *Macrosteles striifrons* Anufriev, 1968
- 114) *Macrosteles superior* sp. nov.
- 115) *Macrosteles tessellatus* Hamilton, 1983
- 116) *Macrosteles texanus* sp. nov.
- 117) *Macrosteles tibetensis* Dai et al., 2008
- 118) *Macrosteles urticae* Moore et Ross, 1957
- 119) *Macrosteles validus* sp. nov.
- 120) *Macrosteles variatus* (Fallén, 1806)
- 121) *Macrosteles vilbastei* Hamilton, 1983
- 122) *Macrosteles viridigriseus* (Edwards, 1924)
- 123) *Macrosteles vulgaris* Kwon, 2010
- 124) *Macrosteles wilburi* Dorst, 1937
- 125) *Macrosteles wilsoni* sp. nov.

Genus 2. *Davisonia* Dorst, 1937

- 126) *Davisonia americana* (Van Duzee, 1891)
- 127) *Davisonia major* (Dorst, 1931)
- 128) *Davisonia snowi* (Dorst, 1931)
- 129) *Davisonia yunae* sp. nov.

Genus 3. *Nabiya* gen. nov.

- 130) *Nabiya flavalis* (Hamilton, 1972) gen. et comb. nov.

Genus 4. *Sagatus* Ribaut, 1948

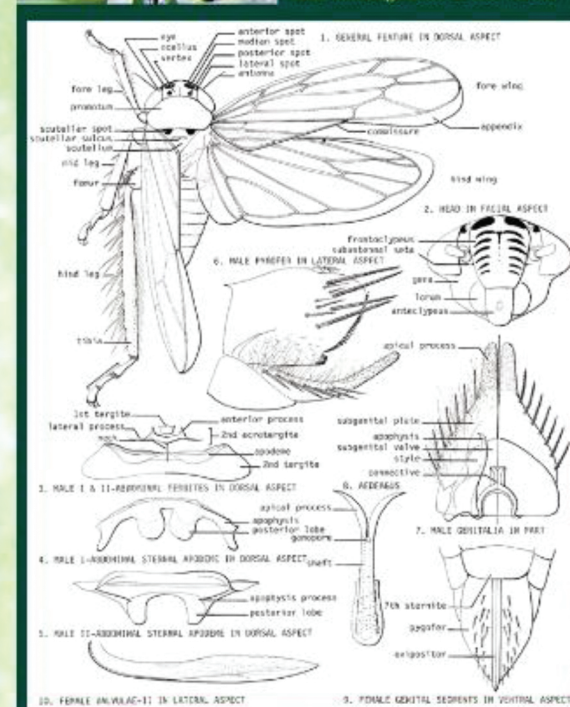
- 131) *Sagatus punctifrons* (Fallén, 1826)

Genus 5. *Sonronius* Dorst, 1937

- 132) *Sonronius anderi* (Ossiannilsson, 1948)
- 133) *Sonronius binotatus* (Sahlberg, 1871)
- 134) *Sonronius clavatus* (DeLong et Davidson, 1934)
- 135) *Sonronius maculipes* (Zetterstedt, 1806)



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Classification of the leafhopper genus *Macrosteles* Fieber and allied genera of the world (Hemiptera: Cicadellidae)

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Fig. 1. Cover of the present monograph.