

A CHECKLIST OF THE BURROWING MAYFLY FAMILY EPHEMERIDAE

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Abstract

A checklist of the Ephemeridae is provided including 96 species, 7 genera and two subfamilies (Ephemerinae: *Ephemera* Linnaeus and *Afromera* Demoulin; Hexageniinae: *Denina* McCafferty, *Hexagenia* Walsh, *Litobranca* McCafferty, *Eatonigenia* Ulmer and *Eatonica* Navas). Original and selected secondary reference sources and distributions are provided.

Key words: Ephemeroptera; Ephemeridae; Ephemerinae; Hexageniinae; checklist.

Introduction

The burrowing mayfly family Ephemeridae is nearly cosmopolitan in distribution being absent only in Australia and the oceanic islands. They inhabit fine substrates such as gravel, sand, silt, or mud in lotic and lentic habitats. The family presently includes 96 species in 7 genera and two subfamilies (Ephemerinae: *Ephemera* Linnaeus and *Afromera* Demoulin; Hexageniinae: *Denina* McCafferty, *Hexagenia* Walsh, *Litobranca* McCafferty, *Eatonigenia* Ulmer and *Eatonica* Navas) (McCafferty, 2004).

The largest subfamily Ephemerinae includes *Ephemera* and *Afromera*, each of which includes 68 and seven species, respectively. The largest portion of *Ephemera* species (34 spp.) is known in Southeast Asia with a majority (30 spp.) recorded in Southern China. The Ephemeridae and related burrowing mayfly families were studied mainly by McCafferty (McCafferty 1973, 1991, McCafferty and Gilles 1979). The generic and familial catalogs of Ephemeridae were provided by McCafferty (1973, 1991, 2004), Hubbard (1978, 1990), McCafferty and Gilles (1979), etc. and the classification follows a recent phylogenetic classification by McCafferty (2004).

Although members of the family have been studied relatively frequently due to large body size, common occurrence and ecological importance in freshwater habitats, the species taxonomy and generic revisions are still needed in particular on the species groups in the Oriental Region. In the present paper, we provide an up-to-date checklist of the species and higher taxa of Ephemeridae with their original and

selected secondary reference sources and known distributional data for further revisionary studies of the family.

Checklist

Subfamily Ephemerinae Latreille

Genus *Ephemera* Linnaeus, 1758

1. *Ephemera annandalei* Chopra, 1937
Ephemera annandalei Chopra, 1937 (in Hafiz, 1937: 360) (Ms, F).
Distribution: India, Burma.
2. *Ephemera axillaris* Navas, 1930
Ephemera axillaris Navas, 1930: 138 (M).
Distribution: China.
3. *Ephemera blanda* Traver, 1932
Ephemera blanda Traver, 1932: 104 (L).
Distribution: USA.
4. *Ephemera compar* Hagen, 1875
Ephemera compar Hagen, 1875: 578; Eaton, 1883-88: 65 (M).
Distribution: USA.
5. *Ephemera consors* Eaton, 1891
Ephemera consors Eaton, 1891: 412 (M).
Distribution: India.
6. *Ephemera danica* Müller, 1764
Ephemera danica Müller, 1764 (cited from Walker, 1853); Eaton, 1871: 72 (M, F); Eaton, 1883-88: 61 (M, F, Ms).
Distribution: England, France, Switzerland, Germany.
7. *Ephemera diffusa* Chopra, 1937
Ephemera diffusa Chopra, 1937 (in Hafiz, 1937: 355) (M, Ms, Fs).
Distribution: India.
8. *Ephemera distincta* Hubbard, 1982
Ephemera distincta Hubbard, 1982: 192 (M).
Distribution: India.
9. *Ephemera duporti* Lestage, 1921
Ephemera duporti Lestage, 1921: 216 (M, F, Ms, Fs).
Distribution: Vietnam.
10. *Ephemera exspectans* (Walker), 1860
Potamanthus expectans Walker, 1860: 198 (Fs).
Ephemera exspectans (Walker): Eaton, 1871: 74 (Fs); Hafiz, 1937: 366 (M).
Distribution: India, Burma.
11. *Ephemera flaveola* Walsh, 1862
Ephemera flaveola Walsh, 1862: 377 (M, F, Ms, Fs).
Distribution: USA.

12. *Ephemera formosana* Ulmer, 1919
Ephemera formosana Ulmer, 1919: 6 (M, F, Ms, Fs); Kang and Yang, 1994: 394 (L).
Distribution: China, Japan, Taiwan.
13. *Ephemera fulvata* Navas, 1935
Ephemera fulvata Navas, 1935: 100 (M, F).
Distribution: India.
14. *Ephemera glaucops* Pictet, 1843
Ephemera glaucops Pictet, 1843: 132 (M, F, Ms).
Distribution: Algeria, France, Germany, Italy, Portugal, Russia, Sweden, Switzerland.
15. *Ephemera guttulata* Pictet, 1843
Ephemera guttulata Pictet, 1843: 135; Eaton, 1883-88: 66 (M, F).
Distribution: Canada, USA.
16. *Ephemera hainanensis* Zhang, Gui and You, 1995
Ephemera hainanensis Zhang, Gui and You, 1995: 71 (M, F, Ms, Fs).
Distribution: China.
17. *Ephemera hasalakensis* Hubbard, 1983
Ephemera (Ephemera) hasalakensis Hubbard, 1983: 387 (M, F, Ms, Fs).
Distribution: Sri Lanka.
18. *Ephemera hongjiangensis* Zhang, Gui and You, 1995
Ephemera hongjiangensis Zhang, Gui and You, 1995: 71 (M, F, Ms, Fs).
Distribution: China.
19. *Ephemera hsui* Zhang, Gui and You, 1995
Ephemera hsui Zhang, Gui and You, 1995: 72 (M, F, Ms, Fs).
Distribution: China.
20. *Ephemera immaculata* Eaton, 1871
Ephemera immaculata Eaton, 1871: 74 (M); Hafiz, 1937: 363 (M).
Distribution: India.
21. *Ephemera innotata* Navas, 1922
Ephemera innotata Navas, 1922: 54 (M).
Distribution: Vietnam.
22. *Ephemera japonica* McLachlan, 1875
Ephemera japonica McLachlan, 1875: 169 (M); Eaton, 1883-88: 74 (M, F); Tshernova, 1973: 222 (M, L).
Distribution: China, Japan, Far East Russia.
23. *Ephemera javana* Navas, 1936
Ephemera javana Navas, 1936 (cited from Ueno, 1969); Ueno, 1969: 233 (M).
Distribution: Thailand.
24. *Ephemera jianfengensis* Zhang, Gui and You, 1995
Ephemera jianfengensis Zhang, Gui and You, 1995: 69 (M, F, Ms, Fs).
Distribution: China.

25. *Ephemera kirinensis* Hsu, 1931
Ephemera kirinensis Hsu, 1931-32: 40 (M, Fs); Hsu, 1936-37a: 287 (M, F, Fs).
 Distribution: China.
26. *Ephemera koshunensis* Matsumura, 1931
Ephemera koshunensis Matsumura, 1931:1468 (F).
 Distribution: Japan.
27. *Ephemra lankensis* Hubbard, 1983
Ephemra (Ephemera) lankensis Hubbard, 1983: 386 (M, F, Ms, Fs).
 Distribution: Sri Lanka.
28. *Ephemera lineata* Eaton, 1870
Ephemera lineata Eaton, 1870: 1; Eaton, 1883-88: 63 (M, F, Ms);
 Tshernova, 1973:222 (M, L).
 Distribution: Throughout Europe (not recorded in Italy), USSR, China.
29. *Ephemera longiventris* Navas, 1917
Ephemera longiventris Navas, 1917: 9 (F).
 Distribution: Vietnam.
30. *Ephemera lota* Navas, 1933
Ephemera lota Navas, 1933: 6; Hsu, 1936-37a: 289 (Fs).
 Distribution: China.
31. *Ephemera maoyangensis* Zhang, Gui and You, 1995
Ephemera maoyangensis Zhang, Gui and You, 1995: 68 (M, F, Ms, Fs).
 Distribution: China.
32. *Ephemera media* Ulmer, 1936
Ephemera media Ulmer, 1935-36: 204 (M, F, Fs).
 Distribution: China.
33. *Ephemera mooiana* McCafferty, 1971
Ephemera mooiana McCafferty, 1971a: 60 (M, L).
 Distribution: South Africa.
34. *Ephemera nadinae* McCafferty and Edmunds, 1973
Ephemera (Aethephemera) nadinae McCafferty and Edmunds, 1973:
 306 (L).
 Distribution: India.
35. *Ephemera nathani* Hubbard, 1982
Ephemera nathani Hubbard, 1982: 194 (Ms, Fs).
 Distribution: India.
36. *Ephemera nigroptera* Zhou, 1998
Ephemera nigroptera Zhou, 1998: 139 (M, F).
 Distribution: China.
37. *Ephemera orientalis* McLanclan, 1875
Ephemera orientalis McLanclan, 1875: 168 (M); Tshernova, 1973: 225
 (M, F, Ms, L).
 Distribution: China, Japan, Korea, Mongolia, Russia.

38. *Ephemera parnassiana* Demoulin, 1958
Ephemera parnassiana Demoulin, 1958: 226 (M, F).
Distribution: Greece.
39. *Ephemera paulea* Grandi, 1955
Ephemera paulea Grandi, 1955: 202 (M, F).
Distribution: Italia.
40. *Ephemera pictipennis* Ulmer, 1924
Ephemera pictipennis Ulmer, 1924: 28 (M).
Distribution: China.
41. *Ephemera pictiventris* McLanclan, 1904
Ephemera pictiventris McLanclan, 1904 (cited from Wu, 1935); Hsu, 1936-37a: 293 (M, F, Fs).
Distribution: China.
42. *Ephemera pieli* Navas, 1934
Ephemera pieli Navas, 1934: 5; Hsu, 1936-37a: 295 (Ms).
Distribution: China.
43. *Ephemera postica* (Banks), 1914
Rhoenanthus posticus Banks, 1914: 613 (M).
Ephemera postica (Banks): Hubbard, 1983: 384 (M, F, Ms).
Distribution: Sri Lanka.
44. *Ephemera pramodi* Dubey, 1971
Ephemera pramodi Dubey, 1971: 525 (M, F).
Distribution: Nepal.
45. *Ephemera pulcherrima* Eaton, 1892
Ephemera pulcherrima Eaton, 1892: 185 (Fs); Hsu, 1936-37b: 433 (M, F, Fs).
Distribution: Burma, China, Hong Kong, India.
46. *Ephemera punctata* (Navas), 1922
Nirvius punetatus Navas, 1922: 56 (M).
Ephemera punctata (Navas): Lestage, 1922: 253.
Distribution: Malaysia.
47. *Ephemera purpurata* Ulmer, 1919
Ephemera purpurata Ulmer, 1919: 8 (M, Ms); Ueno, 1969: 234 (F).
Distribution: China.
48. *Ephemera quadriguttata* Lestage, 1927
Ephemera quadriguttata Lestage, 1927: 93 (M).
Distribution: Vietnam.
49. *Ephemera remensa* Eaton, 1891
Ephemera remensa Eaton, 1891: 410 (M, F).
Distribution: India.
50. *Ephemera rufomaculata* Zhou and Zheng, 2003
Ephemera rufomaculata Zhou and Zheng, 2003: 666 (M, F, L).
Distribution: China.

51. *Ephemera sachalinensis* Matsumura, 1911
Ephemera sachalinensis Matsumura, 1911: 6; Tshernova, 1973: 226 (M, F, Ms, L).
Distribution: China, Japan, Korea, Russia.
52. *Ephemera sauteri* Ulmer, 1912
Ephemera sauteri Ulmer, 1912: 369 (M, F, Fs); Kang and Yang, 1994: 396 (L).
Distribution: China, Taiwan.
53. *Ephemera separigata* Bae, 1995
Ephemera separigata Bae, 1995: 159 (M, F, L).
Distribution: Korea.
54. *Ephemera serica* Eaton, 1871
Ephemera serica Eaton, 1871: 75 (M, F, Ms).
Distribution: China, Hong Kong, Vietnam.
55. *Ephemera shengmi* Hsu, 1937
Ephemera shengmi Hsu, 1936-37b: 440 (M, Ms); Tshernova, 1973: 228 (M, L).
Distribution: China, Russia.
56. *Ephemera simulans* Walker, 1853
Ephemera simulans Walker, 1853: 536 (M); Eaton, 1883-88: 67 (M, F, Ms).
Distribution: Canada, USA.
57. *Ephemera soanica* Ali, 1967
Ephemera soanica Ali, 1967: 75 (L).
Distribution: Pakistan.
58. *Ephemera pilosa* Navas, 1936
Ephemera pilosa Navas, 1936: 117; Hsu, 1937-38: 53 (M, F).
Distribution: China.
59. *Ephemera strigata* Eaton, 1892
Ephemera strigata Eaton, 1892 (cited from Tshernova, 1973); Tshernova, 1973: 228 (M, L).
Distribution: China, Japan, Korea, Mongolia, Russia.
60. *Ephemera supposita* Eaton, 1883
Ephemera supposita Eaton, 1883-88: 72 (M).
Distribution: China, India, Sri Lanka.
61. *Ephemera transbajkalica* Tshernova, 1973
Ephemera transbajkalica Tshernova, 1973: 229 (M, F).
Distribution: Russia.
62. *Ephemera traversae* Spieth, 1938
Ephemera traversae Spieth, 1938: 5 (M, F).
Distribution: USA.

63. *Ephemera varia* Eaton, 1883
Ephemera varia Eaton, 1883-88: 69 (M, F, Ms).
Distribution: USA.
64. *Ephemera vulgate* Linnaeus, 1758
Ephemera vulgate Linnaeus, 1758: 546; Eaton, 1883-88: 59 (M, F).
Distribution: England, Switzerland, Portugal, France, Russia.
65. *Ephemera wanquanesis* Zhang, Gui and You, 1995
Ephemera wanquanesis Zhang, Gui and You, 1995: 70 (M, F, Ms).
Distribution: China.
66. *Ephemera wuchowensis* Hsu, 1937
Ephemera wuchowensis Hsu, 1937-38: 54 (Ms, Fs).
Distribution: China.
67. *Ephemera yaosani* Hsu, 1937
Ephemera yaosani Hsu, 1937-38: 55 (Ms, Fs).
Distribution: China.
68. *Ephemera zettana* Kimmins, 1937
Ephemera zettana Kimmins, 1937: 431 (M, F).
Distribution: India.
- Genus *Afromera* Demoulin
69. *Afromera aequatorialis* (Kimmins), 1956
Ephemera aequatorialis Kimmins, 1956: 86 (M, F).
Afromera aequatorialis (Kimmins): Kimmins, 1960: 355.
Distribution: Congo, Madagascar, Togoland, Uganda.
70. *Afromera congolana* Demoulin, 1955
Afromera congolana Demoulin, 1955: 293 (M).
Distribution: Congo, Madagascar.
71. *Afromera evae* Gillies, 1979
Afromera evae McCafferty and Gillies, 1979: 172 (M, F, L).
Distribution: Gambia.
72. *Afromera gilliesi* Elouard, 1986
Afromera gilliesi Elouard, 1986a: 170 (M).
Distribution: Guinee.
73. *Afromera natalensis* (Barnard), 1932
Ephemera natalensis Barnard, 1932: 210 (M); Kimmins, 1949: 828 (Ms, F).
Afromera natalensis (Barnard): Demoulin, 1955: 295 (M).
Distribution: Uganda, Madagascar.
74. *Afromera siamensis* (Ueno), 1969
Ephemera siamensis Ueno, 1969: 235 (M, Ms, Fs).
Ephemera (Dicrephemera) siamensis Ueno: McCafferty and Edmunds, 1973: 302 (M, F, L).
Afromera siamensis (Ueno): McCafferty and Gillies 1979: 169.
Distribution: Thailand.

75. *Afromera troubati* Elouard, 1986
Afromera troubati Elouard, 1986a: 171 (M).
 Distribution: Mali, Niger.

Subfamily Hexageniinae McCafferty

Genus *Denina* McCafferty

76. *Denina dubiloca* McCafferty, 1987
Denina dubiloca McCafferty, 1987: 472.
 Distribution: unknown.
 Note: This species is fossil mayfly and deposited in the Paleontological
 Institute of the USSR Academy of Sciences (McCafferty 1987).

Genus *Hexagenia* Walsh

77. *Hexagenia albivitta* (Walker), 1853
Baetis albivitta Walker, 1853: 566 (M).
Hexagenia albivitta (Walker): Eaton, 1871: 64 (M); Spieth, 1941: 270
 (M, L).
 Distribution: Argentina, Brazil, Colombia, Costa Rica, Guyana, Mexico,
 Paraguay, Uruguay.
78. *Hexagenia atrocaudata* McDunnough, 1924
Hexagenia atrocaudata McDunnough, 1924: 92 (M, F); Traver, 1931:
 616 (L).
 Distribution: Canada, USA.
79. *Hexagenia benedicta* Navas, 1922
Hexagenia benedicta Navas, 1922: 55 (F).
 Distribution: Brazil.
80. *Hexagenia bilineata* (Say), 1824
Baetis bilineata Say, 1824: 303 (F).
Hexagenia bilineata (Say): Walsh, 1863: 199; Spieth, 1941: 242
 (M, F, L).
 Distribution: Canada, Mexico, USA.
81. *Hexagenia callineura* Banks, 1914
Hexagenia callineura Banks, 1914: 613 (F).
 Distribution: Colombia, Ecuador.
82. *Hexagenia limbata* (Serville), 1829
Ephemera limbata Serville, 1829 (cited from Walker, 1853).
Hexagenia limbata (Serville): Walsh, 1863: 197; Spieth, 1941: 245
 (M, F).
 Distribution: Canada, Mexico, USA.
83. *Hexagenia mexicana* Eaton, 1885
Hexagenia mexicana Eaton, 1883-88: 50 (M).
 Distribution: Colombia, Ecuador, Mexico, Peru.

84. *Hexagenia orlando* Traver, 1931
Hexagenia orlando Traver, 1931: 608 (M, F).
Distribution: USA.
85. *Hexagenia rigida* McDunnough, 1924
Hexagenia rigida McDunnough, 1924: 90 (M, F); Spieth, 1941: 267 (M, L).
Distribution: Canada, USA.
- Genus *Litobranca* McCafferty
86. *Litobranca recurvata* (Morgan), 1913
Hexagenia recurvata Morgan, 1913: 395 (M, F).
Litobranca recurvata (Morgan): McCafferty, 1971b: 45 (M, L).
Distribution: Canada, USA.
- Genus *Eatonigenia* Ulmer, 1939
87. *Eatonigenia chaperi* (Navas), 1935
Hexagenia chaperi Navas, 1935: 99 (M).
Eatonigenia chaperi (Navas): Ulmer, 1939: 479; McCafferty, 1973: 55
(M, F, L).
Distribution: China, Indonesia (Java and Borneo), Thailand.
88. *Eatonigenia indica* (Chopra), 1924
Hexagenia indica Chopra, 1924: 416 (F).
Eatonigenia indica (Chopra): McCafferty, 1973: 57.
Distribution: India.
89. *Eatonigenia seca* McCafferty, 1973
Eatonigenia seca McCafferty, 1973: 57 (M, F).
Distribution: Thailand.
90. *Eatonigenia trirama* McCafferty, 1973
Eatonigenia trirama McCafferty, 1973: 59 (L).
Distribution: India.
- Genus *Eatonica* Navas
91. *Eatonica crassi* McCafferty, 1971
Eatonica crassi McCafferty, 1971a: 57 (M, F); Elouard, 1986b: 88 (M).
Distribution: Sudan, Tanzania, Malawi.
92. *Eatonica denysae* Elouard and Sartori, 1998
Eatonica denysae Elouard and Sartori, 1998: 2 (Ms, F, Fs).
Distribution: Madagascar.
93. *Eatonica josettae* Demoulin, 1969
Eatonica josettae Demoulin, 1969:5 (Fs).
Distribution: Madagascar.
94. *Eatonica luciennae* Elouard and Oliarinony, 1998
Eatonica luciennae Elouard and Oliarinony, 1998: 4 (F, Ms, Fs).
Distribution: Madagascar.
95. *Eatonica patriciae* Elouard, 1986
Eatonica patriciae Elouard, 1986b: 89 (M, F).
Distribution: Guinee.

96. *Eatonica schoutedeni* (Navas), 1911
Ephemera schoutedeni Navas, 1911: 222 (F).
Eatonica schoutedeni (Navas): Navas, 1913: 181.
 Distribution: Ethiopia, Uganda, Tanzania.

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