

FAUNA OF INDIA CHECKLIST

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ARTHROPODA: INSECTA: PLECOPTERA

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Comments on the checklist:
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ZOOLOGICAL SURVEY OF INDIA
Ministry of Environment, Forest & Climate Change

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Introduction : The order name Plecoptera comes from the Latin word *plecto*, meaning “folded,” and the Greek word *pteron*, meaning “wing,” and refers to the ability of adults to fold their wings. They are moderate sized to fairly large, elongated, flattened, soft bodied insects. Commonly known as stoneflies, they are a small order of aquatic insects found in high altitude temperate streams to cooler areas of subtropics and tropics. Stoneflies are abundant in highly oxygenated rocky streams and rivers; they play a very important role in food web of freshwater ecosystem and also good indicators of clean water. The ancient insect order Plecoptera diverged as early as late Carboniferous. The divergence of most stonefly families took place very early, probably in the Triassic or in the Permian (Cui *et al.*, 2016).

Global Diversity : Globally 3984 extant species are known from seventeen families of order Plecoptera (DeWalt *et al.*, 2022) and greatest regional diversity is recognized from Temperate Asia with 1179 species and only 498 species are reported from Tropical Asia (DeWalt and Ower, 2019).

Diversity in India : Currently 146 valid species belonging to 27 genera under eight families are known from India. The stonefly fauna of India distinctly differs between the areas north and south of the Indo-Gangetic plain. There are eight families known from the Himalaya and Eastern India and only one family Perlidae occurring in the states of peninsular India and one species of Nemouridae is known from Tamil Nadu. State wise species diversity and endemism is provided in the table-1.

Table-1: Diversity of Plecoptera in the various States of India

| Sl. No. | State/UT | No. of Species | No. of Endemic Species |
|---------|--------------------|----------------|------------------------|
| | India Total | 146 | 91 |
| 1 | Andhra Pradesh | 0 | 0 |
| 2 | Arunachal Pradesh | 35 | 24 |
| 3 | Assam | 29 | 14 |
| 4 | Bihar | 0 | 0 |
| 5 | Chhattisgarh | 0 | 0 |
| 6 | Gujarat | 0 | 0 |
| 7 | Goa | 0 | 0 |
| 8 | Haryana | 0 | 0 |
| 9 | Himachal Pradesh | 25 | 14 |
| 10 | Jharkhand | 1 | 1 |
| 11 | Karnataka | 10 | 8 |
| 12 | Kerala | 8 | 7 |
| 13 | Madhya Pradesh | 2 | 1 |
| 14 | Maharashtra | 3 | 2 |

| Sl. No. | State/UT | No. of Species | No. of Endemic Species |
|---------|------------------------------------|----------------|------------------------|
| 15 | Manipur | 17 | 13 |
| 16 | Meghalaya | 26 | 13 |
| 17 | Mizoram | 2 | 0 |
| 18 | Nagaland | 0 | 0 |
| 19 | Odisha | 2 | 2 |
| 20 | Punjab | 0 | 0 |
| 21 | Rajasthan | 0 | 0 |
| 22 | Sikkim | 8 | 5 |
| 23 | Tamil Nadu | 15 | 10 |
| 24 | Telangana | 0 | 0 |
| 25 | Tripura | 0 | 0 |
| 26 | Uttar Pradesh | 0 | 0 |
| 27 | Uttarakhand | 17 | 8 |
| 28 | West Bengal | 27 | 9 |
| 29 | Andaman & Nicobar | 0 | 0 |
| 30 | Chandigarh | 0 | 0 |
| 31 | Dadra Nagar Haveli, Daman & Diu | 0 | 0 |
| 32 | Delhi | 0 | 0 |
| 33 | Jammu & Kashmir | 7 | 0 |
| 34 | Ladakh | 2 | 0 |
| 35 | Lakshadweep | 0 | 0 |
| 36 | Puducherry | 0 | 0 |

Endemism : Due to poor dispersal capacity, adults remains on underside of riparian vegetation or rocks adjacent to the streams and shows a high percentage of endemism. A total of ninety-one species are endemic to India, of these high endemism is recorded from Eastern India (61 species), Western Himalaya (18 species) and Western Ghats (16 species).

Habitat : Stoneflies are most sensitive order of aquatic insects and many species are restricted to habitats with high oxygenated fast flowing perennial cold streams and rivers. The nymphs are usually associated with specific substrates such as cobbles, surfaces of stones or boulders, decaying leaves or leaf packs, and wood debris in streams and rivers. Adults are weak fliers and remains in shady areas on riparian vegetation or underside of rocks very close to the streams.

Ecological Significance : Stoneflies constitute a significant ecological component of running water ecosystems (Fochetti. and Tierno de Figueroa, 2008). They play a very important role in food web of freshwater ecosystem and also indicate water quality. Generally, most of the stoneflies nymphs are either shredders (herbivores) or detritivores (dead organic material, especially plant detritus) or predators (mobile hunters). They are one of the top invertebrate predators in the small perennial streams. The predators of stonefly nymphs are larger invertebrates such as dobsonfly larvae and dragonfly nymphs and in vertebrates mostly stream fishes.

Human Significance : Stoneflies require clean and well oxygenated water to survive and they are extremely sensitive to water pollution. Stoneflies are one of the aquatic insects most commonly used by ecologists as indicators of water purity along with mayflies and caddisflies.

Threatened species as per IUCN : Species from India are not assessed for IUCN threat categories

Protected species as per WPA (2022) : Stoneflies are not listed under any schedules of Wildlife Protection Act (2022).

Species under CITES : Indian stoneflies are not listed under any appendices of CITES.

Invasive alien species : No Stonefly species are reported to be invasive in Indian waters.

Gap areas : Stoneflies are poorly documented from many states, especially from Western Ghats, Eastern Ghats, Eastern and Western Himalaya. Many species are only known from the type collections.

Systematic list of Plecoptera of India (Endemic species marked with *)

Order Plecoptera

Superfamily Nemouroidea Newman, 1853

Family Capniidae Banks, 1900

1. *Capnia bifida* Jewett, 1960*
2. *Capnia gibbera* Jewett, 1960*
3. *Capnia hingstoni* Kimmins, 1946*
4. *Capnia longicauda* Zhiltzova, 1969
5. *Capnia manii* Jewett, 1958
6. *Capnia montana* Kimmins, 1946
7. *Capnia pedestris* Kimmins, 1946

Family Leuctridae Klapálek, 1905

8. *Rhopalopsale aculeata* Harper, 1977
9. *Rhopalopsale magnicerca* (Jewett, 1958)
10. *Rhopalopsale assamensis* Sivec & Harper, 2008*

Family Nemouridae Newman, 1853

11. *Amphinemura amatulai* Aubert, 1967*
12. *Amphinemura baumanni* Murányi & Li, 2013*
13. *Amphinemura bilolai* Aubert, 1967*
14. *Amphinemura bomdilai* Aubert, 1967*
15. *Amphinemura cherrapunji* (Aubert, 1967)*
16. *Amphinemura elegans* Zwick, 1980*
17. *Amphinemura lithami* Aubert, 1967*
18. *Amphinemura luteipes* Kimmins, 1946
19. *Amphinemura manipurensis* Aubert, 1967*
20. *Amphinemura moshingi* Aubert, 1967*
21. *Amphinemura nigrifrons* Zwick, 1977
22. *Amphinemura nongrimi* Aubert, 1967*
23. *Amphinemura nubila* Kimmins, 1950*
24. *Amphinemura paraluteipes* Aubert, 1967
25. *Amphinemura pseudoluteipes* Aubert, 1967*
26. *Amphinemura pulchra* Zwick, 1977
27. *Amphinemura rahungi* Aubert, 1967
28. *Amphinemura renata* Kimmins, 1950*
29. *Amphinemura talungdzongi* Aubert, 1967*
30. *Amphinemura tricantha* (Jewett, 1958)
31. *Indonemoura adunca* (Harper, 1974)
32. *Indonemoura assami* (Aubert, 1967)
33. *Indonemoura dirangdzongi* (Aubert, 1967)*

34. *Indonemoura gigaoni* (Aubert, 1967)*
35. *Indonemoura indica* (Kimmins, 1946)
36. *Indonemoura kamengi* (Aubert, 1967)*
37. *Indonemoura loebli* Zwick, 1980*
38. *Indonemoura manipuri* (Aubert, 1967)*
39. *Indonemoura mclachlani* (Kimmins, 1950)*
40. *Indonemoura nahkui* (Aubert, 1967)*
41. *Indonemoura nyukmadongi* (Aubert, 1967)*
42. *Indonemoura quadridentata* (Kimmins, 1950)*
43. *Indonemoura sangtii* (Aubert, 1967)*
44. *Indonemoura shergaoni* (Aubert, 1967)
45. *Mesonemoura brachyfiligera* (Aubert, 1967)*
46. *Mesonemoura falcata* (Kimmins, 1950)*
47. *Mesonemoura filigera* (Kimmins, 1946)
48. *Mesonemoura metafiligera* (Aubert, 1967)
49. *Mesonemoura mishmica* (Kimmins, 1950)*
50. *Mesonemoura parafiligera* (Aubert, 1967)*
51. *Mesonemoura pseudofiligera* (Aubert, 1967)*
52. *Mesonemoura skardui* (Aubert, 1959)
53. *Mesonemoura vaillanti* Navás, 1922
54. *Protonemura scutigera* Kimmins, 1950*
55. *Sphaeronemoura paraproctalis* (Aubert, 1967)
56. *Sphaeronemoura siveci* Murányi & Li, 2013*
57. *Illiesonemoura ampula* (Jewett, 1958)*
58. *Illiesonemoura cordata* (Jewett, 1958)
59. *Illiesonemoura lilami* (Aubert, 1959)
60. *Illiesonemoura polystigma* (Aubert, 1959)
61. *Illiesonemoura punctata* (Jewett, 1958)*
62. *Illiesonemoura punjabensis* (Jewett, 1958)*
63. *Nemoura auberti* Zwick, 1977*
64. *Nemoura bituberculata* Kimmins, 1950*
65. *Nemoura bokhari* Aubert, 1967*
66. *Nemoura brevicauda* Zwick, 1980
67. *Nemoura chattriki* Aubert, 1967*
68. *Nemoura chugi* Aubert, 1967*
69. *Nemoura khasii* Aubert, 1967*
70. *Nemoura kuhleni* Aubert, 1967*
71. *Nemoura lahkipuri* Aubert, 1967*
72. *Nemoura magnicauda* Zwick, 1980*
73. *Nemoura mawlangi* Aubert, 1967*
74. *Nemoura rahlae* Jewett, 1958*
75. *Nemoura serrarimi* Aubert, 1967*
76. *Nemoura spinosa* Wu, 1939
77. *Nemoura triangulifera* Zwick, 1980
78. *Nemoura unicornis* Jewett, 1975a
79. *Nemoura indica* (Needham, 1909)*

Family Taeniopterygidae Klapálek, 1905

80. *Kyphopteryx dorsalis* Kimmins, 1946
81. *Mesyatsia karakorum* (Šámal, 1935)

Superfamily Perloidea Latreille, 1802

Family Chloroperlidae Okamoto, 1912

82. *Sweltsa assam* Zwick, 1971*

83. *Plesioperla assamensis* Zwick, 1967*
84. *Xanthoperla kishanganga* (Aubert, 1959)
85. *Xanthoperla acuta* Zwick, 1980
- Family Perlidae Latreille, 1802**
86. *Brahmana benigna* (Needham, 1909)*
87. *Brahmana chrysostoma* Klapálek, 1916*
88. *Brahmana microphthalma* Klapálek, 1916*
89. *Flavoperla needhami* (Klapálek, 1916)*
90. *Claassenia semibrachyptera* Wu & Claassen, 1934
91. *Chinoperla nigriceps* (Banks, 1914)*
92. *Neoperla agumbe* Stark & Sivec, 2015*
93. *Neoperla asperipenis* Zwick, 1980*
94. *Neoperla banksi* Illies, 1966
95. *Neoperla biseriata* Zwick & Anbalagan, 2007*
96. *Neoperla emarginata* Stark & Sivec, 2015*
97. *Neoperla hamata* Jewett, 1975
98. *Neoperla indica* Needham, 1909*
99. *Neoperla katmanduana* Harper, 1977
100. *Neoperla lushana* Wu, 1935
101. *Neoperla moesta* Banks, 1939*
102. *Neoperla montivaga* Zwick, 1977
103. *Neoperla nitida* Kimmins, 1950
104. *Neoperla obscura* Zwick, 1981*
105. *Neoperla ochracea* Zwick, 1981*
106. *Neoperla orissa* Stark & Sivec, 2015*
107. *Neoperla perspicillata* Zwick, 1980
108. *Neoperla primitiva* Geijskes, 1952
109. *Neoperla quadrata* Wu & Claassen, 1934
110. *Neoperla schlitzi* Stark & Sivec, 2008*
111. *Neoperla schmidiana* Zwick, 1981*
112. *Neoperla tortipenis* Zwick, 1980
113. *Neoperla venosa* Kimmins, 1950*
114. *Phanoperla amorphia* Zwick, 1982*
115. *Phanoperla cornuta* Zwick, 1982*
116. *Phanoperla himalayana* Zwick, 1977
117. *Phanoperla maindroni* (Navás, 1926)*
118. *Phanoperla parva* Zwick, 1982*
119. *Phanoperla peniculus* Kawai, 1968
120. *Phanoperla schmidi* Zwick, 1982*
121. *Phanoperla sertispina* Jewett, 1975
122. *Phanoperla testacea* (Hagen, 1858)
123. *Phanoperla limosa* (Hagen, 1858)
124. *Phanoperla flaveola* (Klapálek, 1910)
125. *Kamimuria sikkimensis* (Enderlein, 1909)*
126. *Kamimuria atricornis* Klapálek, 1912
127. *Perla carletoni* Banks, 1920*
128. *Perla ione* Needham, 1909*
129. *Perla nirvana* Banks, 1920*
130. *Perla xenocia* Banks, 1914*
131. *Tyloperla agumbe* Stark & Sivec, 2014*
132. *Tyloperla barog* Stark & Sivec, 2014*
133. *Tyloperla karnataka* Stark & Sivec, 2014*

134. *Tyloperla schmidi* Stark & Sivec, 1991*

Family Perlodidae Klapálek, 1909

135. *Neofilchneria uncata* (Kimmins, 1946)

136. *Filchneria amabilis* (Jewett, 1958)*

137. *Filchneria shobhaae* (Singh & Ghosh, 1969)*

138. *Filchneria kuenluensis* (Šámal, 1935)

Superfamily Pteronarcyioidea Newman, 1853

Family Peltoperlidae Claassen, 1931

139. *Cryptoperla fraterna* (Banks, 1938)

140. *Cryptoperla kali* Stark, 1989*

141. *Cryptoperla kumari* Stark, 1989*

142. *Cryptoperla naga* Stark, 1989*

143. *Cryptoperla pentagonalis* Zwick & Sivec, 1980

144. *Cryptoperla sinensis* (Wu & Claassen, 1934)

145. *Cryptoperla torva* Needham, 1909*

146. *Peltopteryx zwicki* Stark, 1989*

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