

ARTICLES

New records of stoneflies (Plecoptera) from Virginia, U.S.A.

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Kondratieff & Voshell (1979) and Kondratieff & Kirchner (1987) previously have reported 116 and 149 species of stoneflies from Virginia, U.S.A., respectively. Since 1987 numerous new species descriptions and species revisions have been published adding 31 species to the known stoneflies for the state (DeWalt et al. 2016). During 21 May - 20 June 2016, we (BCK, CJV) travelled to Virginia to investigate for the U.S. Fish and Wildlife Service the population status and distribution of *Acroneuria kosztarabi* Kondratieff & Kirchner, 1993 (Perlidae), *Remenus kirchneri* Kondratieff & Nelson, 1995 (Perlodidae), and *Tallaperla lobata* Stark, 1983 (Peltoperlidae). We sampled 113 locations in 27 of the 95 Virginia counties and drove a distance of 15,770 km. Adult stoneflies were collected primarily with beating sheets, although we occasionally used light traps and larval rearing as well. In total, 4,032 adult stoneflies, representing at least 87 species were collected during this study. In addition to the three target species, we collected four species which represent new Virginia state records and two undescribed species, one of these now recently described by Verdone & Kondratieff (2016). We also examined material previously deposited in the C.P. Gillette Museum of Arthropod Diversity, Colorado State University, Fort Collins, Colorado. The museum presently holds more than 26,000 vials of Plecoptera. Among these, we found one new state record, one tentative new state record, and specimens constituting a range extension for an apparently endemic Virginia *Acroneuria* species.

Three of the five new state records are members of the genus *Isoperla* Banks, 1906. *Isoperla cotta* Ricker, 1952, a species known primarily from northeastern North America, was anticipated by Kondratieff & Kirchner (1987) and reported from West Virginia by Tarter & Nelson (2006), was confirmed for Virginia. New Virginia state records for *I. cotta* include the New River in Giles County and Stony Fork in Wythe County. *Isoperla tuteloi* Szczytko & Kondratieff, 2015 was originally described from Caldwell County in the foothills of the Appalachians of western North Carolina. The new Virginia state record is from Brumley Creek, Washington County in southwestern Virginia. *Isoperla zuelligi* Szczytko & Kondratieff, 2015 was originally described from Montgomery County in southcentral North Carolina. The new Virginia state records are from the South Fork Shenandoah River in Page County and the Rapidan River in Madison County, which extends the range of this species 386 km northward.

The southernmost record is from Alabama (Grubbs 2015). Szczytko & Kondratieff (2015) did not list *I. lata* Frison, 1942 from Virginia, but this species was correctly listed by Kondratieff & Kirchner (1987).

Neoperla coosa Smith & Stark, 1998 originally described from Alabama, has been recorded from eastern Tennessee (DeWalt & Heinold 2005), Indiana (DeWalt & Grubbs 2009), Ohio (DeWalt et al. 2012), New York (Myers et al. 2011), and North Carolina (Lenat et al. 2016). Our new Virginia state records are from Wolf Creek in Bland County, the Clinch River in Russell County and the Nottoway River in Sussex County.

Haploperla parkeri Kirchner & Kondratieff, 2005 was originally described from Cove Creek in Haywood County, North Carolina. The Virginia specimen was collected in the Grayson Highlands in 1983 from Big Branch in Smyth County. The Grayson Highlands area is the northernmost locality for several other southern Appalachian species including *Allocapnia fumosa* Ross, 1964, *I. reesi* Szczytko & Kondratieff, 2015, *I. stewarti* Szczytko & Kondratieff, 2015, *Leuctra mitchellensis* Hanson, 1941, *Megaleuctra williamsae* Hanson, 1941, *Strophopteryx limata* (Frison, 1942), *S. urticae* (Ricker, 1952), *Yugus kondratieffi* Nelson, 2001, and *Zapada fumosa* Baumann & Grubbs, 2015.

Acroneuria arida (Hagen, 1861) was originally described from New York and Philadelphia and has been recorded as far south as Georgia (Stark 2004, DeWalt et al. 2016). Kondratieff & Voshell (1979) and Kondratieff & Kirchner (1987) speculated that *A. arida* could occur in Virginia based on its presence in the neighboring states of Tennessee and North Carolina. Three female *Acroneuria* from the Nottoway River in Sussex County, Virginia were examined that possess subgenital plate morphology consistent with *A. arida*. Unfortunately, these specimens lack mature ova, therefore the presence of this uncommonly collected species in Virginia is tentative and requires further study.

Acroneuria yuchi Stark & Kondratieff, 2004 was originally described from Lee County, Virginia. There are no other published records for this species. We recently re-examined specimens previously identified as either *A. evoluta* Klapálek, 1909 or *A. frisoni* Stark & Brown, 1991 from material deposited in the C. P. Gillette Museum of Arthropod Diversity. Stark & Brown (1991) synonymized *A. mela* Frison, 1942 with *A. evoluta* and described *A. frisoni* from specimens previously identified as *A. evoluta*. Previous records of *A. evoluta* from Virginia in Kondratieff & Voshell (1979) and Kondratieff & Kirchner (1987) refer to *A. frisoni*. Based on the aedeagal armature and ova, we determined that these specimens are more correctly assigned to *A. yuchi*. New Virginia state records for *A. yuchi* include Walker Creek in Giles County, Toms Creek and Craig Creek in Montgomery County and the North Fork Holston River in Smyth County. Presently, we cannot substantiate the presence of *A. frisoni* in Virginia, but believe the species may occur in the Potomac River drainage in northern Virginia because it has been reported by Pessino et al. (2014) from Licking Creek in nearby Fulton County, Pennsylvania.

The high diversity of stoneflies now reported from Virginia, at least 186 species (Table 1), is no doubt due to the wide variety of lotic habitats associated with the five physiographic provinces of the state, the Coastal Plain, Piedmont, Blue Ridge, Valley and Ridge, and the Appalachian/Cumberland Plateau (Woodward & Hoffmann 1991). As Morse et al. (1993) have pointed out regarding the southern Appalachians, “This species richness is a result of unique geological, climatological, and hydrological features of the region.”

The list that follows includes species previously reported by Kondratieff & Kirchner (1987) in addition to state records reported for the first time or from other publications. New records are indicated by # and species described since 1987 by +. Species previously reported in

other publications are indicated by superscripts, associated citations are provided in endnotes. Species that probably occur in Virginia but require further study are indicated by *. Additionally, the species of *Leuctra* may change with the ongoing studies by Scott A. Grubbs.

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Table 1. Plecoptera of Virginia.

Family Nemouridae

1. + *Amphinemura appalachia* Baumann, 1996¹
2. *A. delosa* (Ricker, 1952)
3. *A. nigritta* (Provancher, 1876)
4. *A. wui* (Claassen, 1936)
5. *Ostrocera albidipennis* (Walker, 1852)
6. *O. complexa* (Claassen, 1937)
7. *O. prolongata* (Claassen, 1923)
8. *O. truncata* (Claassen, 1923)
9. *Paranemoura perfecta* (Walker, 1852)
10. *Prostoia completa* (Walker, 1852)
11. *P. hallasi* Kondratieff & Kirchner, 1984
12. *P. similis* (Hagen, 1861)
13. *Shipsa rotunda* (Claassen, 1923)
14. *Soyedina carolinensis* (Claassen, 1923)
15. *S. vallicularia* (Wu, 1923)
16. + *Zapada fumosa* Baumann & Grubbs, 2015²

Family Taeniopterygidae

17. *Bolotoperla rossi* (Frison, 1942)
18. *Oemopteryx contorta* (Needham & Claassen, 1925)
19. *Strophopteryx appalachia* Ricker & Ross, 1975
20. *S. fasciata* (Burmeister, 1839)
21. *S. limata* (Frison, 1942)
22. *Taenionema atlanticum* Ricker & Ross, 1975
23. *Taeniopteryx burksi* Ricker & Ross, 1968
24. *T. lita* Frison, 1942
25. *T. lonicera* Ricker & Ross, 1968
26. *T. maura* (Pictet, 1841)
27. *T. metequi* Ricker & Ross, 1968
28. *T. nelsoni* Kondratieff & Kirchner, 1982
29. *T. parvula* Banks, 1918
30. *T. ugola* Ricker & Ross, 1968

Family Capniidae

31. *Allocapnia aurora* Ricker, 1952
32. *A. curiosa* Frison, 1942
33. *A. frisoni* Ross & Ricker, 1964
34. *A. fumosa* Ross, 1964
35. *A. granulata* (Claassen, 1924)
36. *A. harperi* Kirchner, 1980
37. *A. illinoensis* Frison, 1935
38. *A. loshada* Ricker, 1952

39. *A. maria* Hanson, 1942
40. *A. mystica* Frison, 1929
41. *A. nivicola* (Fitch, 1847)
42. *A. pygmaea* (Burmeister, 1839)
43. *A. recta* (Claassen, 1924)
44. *A. rickeri* Frison, 1942
45. *A. simmonsii* Kondratieff & Voshell, 1981
46. *A. stannardi* Ross, 1964
47. *A. virginiana* Frison, 1942
48. *A. vivipara* (Claassen, 1924)
49. *A. wrayi* Ross, 1964
50. *A. zola* Ricker, 1952
51. *Nemocapnia carolina* Banks, 1938
52. *Paracapnia angulata* Hanson, 1961

Family Leuctridae

53. *Leuctra alexanderi* Hanson, 1941
54. *L. carolinensis* Claassen, 1923
55. *L. duplicata* Claassen, 1923
56. *L. ferruginea* (Walker, 1852)
57. *L. grandis* Banks, 1906
58. *L. mitchellensis* Hanson, 1941
59. *L. monticola* Hanson, 1941
60. *L. rickeri* James, 1976
61. *L. sibleyi* Claassen, 1923
62. *L. tenella* Provancher, 1878
63. *L. tenuis* (Pictet, 1841)
64. *L. triloba* Claassen, 1923
65. *L. truncata* Claassen, 1923
66. *L. variabilis* Hanson, 1941
67. *Megaleuctra flinti* Baumann, 1973
68. *M. williamsae* Hanson, 1941
69. *Paraleuctra sara* (Claassen, 1937)
70. *Zealeuctra fraxina* Ricker & Ross, 1969³

Family Pteronarcyidae

71. *Pteronarcys biloba* Newman, 1838
72. *P. comstocki* Smith, 1917
73. *P. dorsata* (Say, 1823)
74. *P. proteus* Newman, 1838
75. *P. scotti* Ricker, 1952

Family Peltoperlidae

76. *Peltoperla arcuata* Needham, 1905
77. *P. tarteri* Stark & Kondratieff, 1987
78. *Tallaperla anna* (Needham & Smith, 1916)
79. *T. cornelia* (Needham & Smith, 1916)
80. *T. lobata* Stark, 1983
81. *T. maria* (Needham & Smith, 1916)

Family Perlodidae

82. *Clioperla clio* (Newman, 1839)
83. *Cultus decesus isolatus* (Banks, 1920)
84. *C. verticalis* (Banks, 1920)
85. *Diploperla duplicata* (Banks, 1920)
86. *D. kanawholensis* Kirchner & Kondratieff, 1984
87. *D. morgani* Kondratieff & Voshell, 1979
88. *D. robusta* Stark & Gaufin, 1974
89. *Helopicus subvarians* (Banks, 1920)
90. *Isogenoides hansonii* (Ricker, 1952)
91. *I. varians* (Walsh, 1862)
92. *Isoperla burksi* Frison, 1942
93. # *I. cotta* Ricker, 1952
94. *I. davisii* James, 1974⁴
95. *I. dicala* Frison, 1942
96. + *I. evanescens* Verdone & Kondratieff, 2016⁵
97. + *I. fauschi* Szczytko & Kondratieff, 2015⁴
98. *I. frisoni* Illies, 1966
99. *I. holochlora* (Klapálek, 1923)
100. + *I. kirchneri* Szczytko & Kondratieff, 2015⁴
101. *I. lata* Frison, 1942
102. *I. major* Nelson & Kondratieff, 1983
103. *I. marlynia* Needham & Claassen, 1925
104. *I. montana* (Banks, 1898)
105. *I. nelsoni* Szczytko & Kondratieff, 2015⁴
106. *I. orata* Frison, 1942
107. + *I. powhatan* Szczytko & Kondratieff, 2015⁴
108. + *I. pseudolata* Szczytko & Kondratieff, 2015⁴
109. + *I. pseudosimilis* Szczytko & Kondratieff, 2015⁴
110. + *I. reesi* Szczytko & Kondratieff, 2015⁴
111. *I. signata* (Banks, 1902)
112. *I. similis* (Hagen, 1861)
113. *I. slossonae* (Banks, 1911)
114. + *I. smithi* Szczytko & Kondratieff, 2015⁴
115. + *I. stewarti* Szczytko & Kondratieff, 2015⁴
116. # *I. tuteloi* Szczytko & Kondratieff, 2015
117. + *I. yuchi* Szczytko & Kondratieff, 2015⁴
118. # *I. zuelligi* Szczytko & Kondratieff, 2015
119. *Malirekus hastatus* (Banks, 1920)
120. *Remenus bilobatus* (Needham & Claassen, 1925)
121. + *R. kirchneri* Kondratieff & Nelson 1995⁶
122. *Yugus arinus* (Frison, 1942)
123. + *Y. kirchneri* Nelson, 2001⁷
124. + *Y. kondratieffi* Nelson, 2001⁷

Family Chloroperlidae

125. *Alloperla atlantica* Baumann, 1974
126. *A. banksi* Frison, 1942
127. *A. biserrata* Nelson & Kondratieff, 1980

128. *A. chloris* Frison, 1934
129. *A. ideii* (Ricker, 1935)
130. *A. imbecilla* (Say, 1823)
131. *A. nanina* Banks, 1911
132. *A. neglecta* Ricker, 1935
133. + *A. petasata* Surdick, 2004⁸
134. + *A. stipitata* Surdick, 2004⁸
135. *A. usa* Ricker, 1952
136. *Haploperla brevis* (Banks, 1895)
137. # *H. parkeri* Kirchner & Kondratieff, 2005
138. *Rasvena terna* (Frison, 1942)⁹
139. *Suwallia marginata* (Banks, 1897)
140. + *Sweltsa holstonensis* Kondratieff & Kirchner, 1998¹⁰
141. *S. lateralis* (Banks, 1911)
142. *S. mediana* (Banks, 1911)
143. *S. naica* (Provancher, 1876)
144. *S. onkos* (Ricker, 1936)
145. + *S. palearata* Surdick, 2004⁸
146. *S. urticae* (Ricker, 1952)
147. + *S. voshelli* Kondratieff & Kirchner, 1991¹¹

Family Perlidae

148. *Acroneuria abnormis* (Newman, 1838)
149. *A. arenosa* (Pictet, 1841)
- **A. arida* (Hagen, 1861)
150. *A. carolinensis* (Banks, 1905)
151. *A. filicis* Frison, 1942
152. *A. flinti* Stark & Gaufin, 1976
- **A. frisoni* Stark & Brown, 1991
153. *A. internata* (Walker, 1852)
154. + *A. kirchneri* Stark & Kondratieff, 2004¹²
155. + *A. kosztarabi* Kondratieff & Kirchner, 1993¹³
156. *A. lycorias* (Newman, 1839)
157. + *A. yuchi* Stark & Kondratieff, 2004¹⁴
158. *Agnestina annulipes* (Hagen, 1861)
159. *A. capitata* (Pictet, 1841)
160. *A. flavescens* (Walsh, 1862)
161. *Attaneuria ruralis* (Hagen, 1861)
162. *Eccopectura xanthenes* (Newman, 1838)
163. *Hansonoperla appalachia* Nelson, 1979
164. *Neoperla carlsoni* Stark & Baumann, 1978
165. *N. catharae* Stark & Baumann, 1978
166. *N. clymene* (Newman, 1839)
167. # *N. coosa* Smith & Stark, 1998
168. *N. occipitalis* (Pictet, 1841)
169. *N. stewarti* Stark & Baumann, 1978
170. *Paragnetina fumosa* (Banks, 1902)
171. *P. immarginata* (Say, 1823)
172. *P. ichusa* Stark & Szczytko, 1981
173. *P. media* (Walker, 1852)
174. + *Perlesta browni* Stark, 1989¹⁵
175. + *P. cranshawii* Kondratieff & Kirchner, 2006¹⁶
176. *P. decipiens* (Walsh, 1862)
177. + *P. durfeeii* Kondratieff, Zuellig & Kirchner, 2008¹⁷
178. *P. frisoni* Banks, 1948
179. + *P. nelsoni* Stark, 1989¹⁵

180. *P. placida* (Hagen, 1861)
 181. + *P. puttmanni* Kondratieff & Kirchner, 2003¹⁸
 182. + *P. roblei* Kondratieff & Kirchner, 2003¹⁸
 183. + *P. shawnee* Grubbs, 2005¹⁹
 184. + *P. teaysia* Kirchner & Kondratieff, 1997²⁰
 185. *Perlinella drymo* (Newman, 1839)
 186. *P. ephyre* (Newman, 1839)

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