

New aquatic insect (Ephemeroptera, Trichoptera, and Plecoptera) records for Alaska, U.S.A.: range extensions and a comment on under-sampled habitats

Author(s): Daniel J. Rinella , Daniel L. Bogan , Rebecca S. Shaftel , and Dustin Merrigan

Source: Pan-Pacific Entomologist, 88(4):407-412. 2012.

Published By: Pacific Coast Entomological Society

DOI: <http://dx.doi.org/10.3956/2012-37.1>

URL: <http://www.bioone.org/doi/full/10.3956/2012-37.1>

BioOne (www.bioone.org) is a nonprofit, online aggregation of core research in the biological, ecological, and environmental sciences. BioOne provides a sustainable online platform for over 170 journals and books published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Web site, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/page/terms_of_use.

Usage of BioOne content is strictly limited to personal, educational, and non-commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

**New aquatic insect (Ephemeroptera, Trichoptera, and Plecoptera)
records for Alaska, U.S.A.: range extensions and a comment
on under-sampled habitats**

DANIEL J. RINELLA*, DANIEL L. BOGAN, REBECCA S. SHAFTEL, & DUSTIN MERRIGAN
Alaska Natural Heritage Program, University of Alaska Anchorage,
Beatrice McDonald Hall, 3211 Providence Drive, Anchorage, Alaska 99508
e-mail: rinella@uaa.alaska.edu, bogan@uaa.alaska.edu,
rsshafte@uaa.alaska.edu, dwmerrigan@alaska.edu

Abstract. We report new records for eight aquatic insect taxa in Alaska, each representing a North American range extension. The new records, collected primarily from non-wadeable streams and lentic habitats, consist of four mayflies (*Ametropus neavei* McDunnough 1928, *Caenis amica* Hagen 1861, *C. youngi* Roemhild 1984, and *Labiobaetis dardanus* McDunnough 1923), three caddisflies (*Philarctus bergrothi* McLachlan 1880, *Sphagnophylax* sp. and *Triaenodes injustus* Hagen 1861), and one stonefly (*Malenka* sp. Ricker 1952). Our surveys throughout Alaska suggest that the distribution and diversity of aquatic insects in non-wadeable streams and lentic habitats is poorly documented compared to that in wadeable streams. Samples from 85 lakes, ponds, and non-wadeable streams produced seven of the new records while samples from 450 wadeable streams produced only one (i.e., *Malenka* sp.). Further, our sampling shows that two of the taxa, *C. youngi* and *L. dardanus*, are common and abundant within their respective habitats throughout the geographic extent of our sampling.

Key Words. *Ametropus neavei*, *Caenis amica*, *Caenis youngi*, *Labiobaetis dardanus*, *Malenka* sp., *Philarctus bergrothi*, *Sphagnophylax* sp., *Triaenodes injustus*.

INTRODUCTION

In addition to elucidating biogeographical patterns, documenting species distributions in high latitude regions will help to predict the effects of rapid climate change on freshwater biodiversity (Heino et al. 2009). Here we report new records for eight aquatic insect taxa (genera or species) in Alaska (Fig. 1); each record representing an extension of the known range into northwestern North America. The new records, collected as immatures in benthic samples primarily from non-wadeable streams and lentic habitats, consist of four mayfly (Ephemeroptera) taxa, three caddisfly (Trichoptera) taxa, and one stonefly (Plecoptera) taxon. Voucher collections are maintained by the Alaska Natural Heritage Program, Beatrice McDonald Hall, University of Alaska Anchorage.

EPHEMEROPTERA

We collected *Ametropus neavei* McDunnough 1928 (Ametropididae) at three sites on the mainstem Yukon River (64.67482 N, 156.35811 W; 64.85971 N, 157.89373 W; 64.62896 N, 158.28887 W), interior Alaska, during July of 2009. These samples were collected as part of a 50-site sampling effort that spanned 950 km of the mainstem Yukon River, from Fort Yukon downstream to Kaltag. This taxon was found intermittently within the lower 200 km of the survey (approximately Galena to

* Corresponding author.

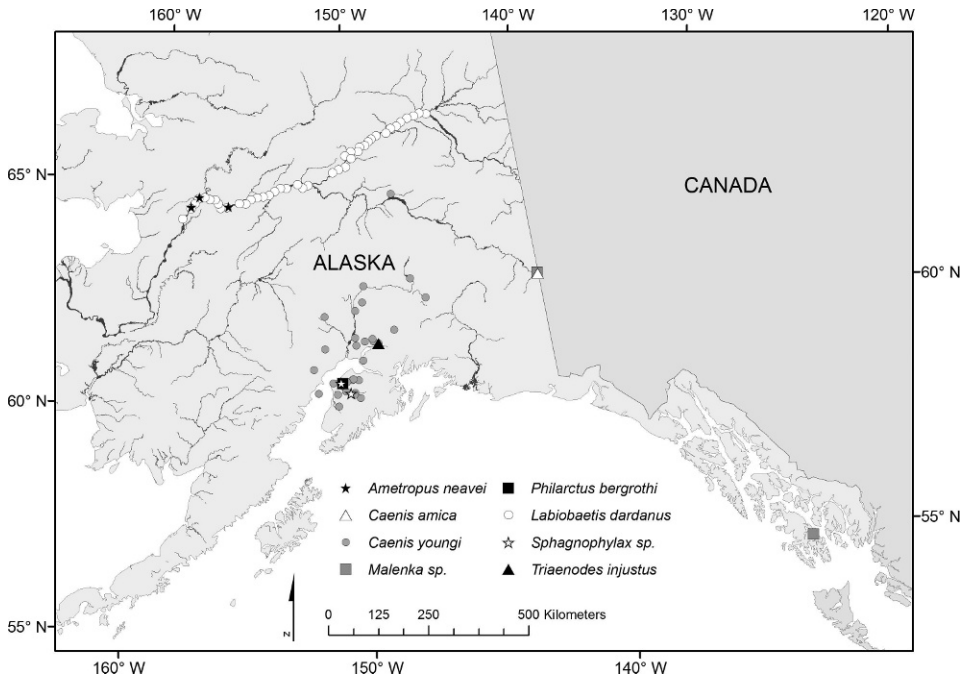


Figure 1. Distribution of new aquatic insect records within Alaska.

Kaltag), but not within the upper 750 km. Samples were collected from shoreline habitat which, in this large, glacier-fed river, consisted primarily of fine sediment. *Ametropus neavei* was previously known from rivers in the Intermountain West (McCafferty et al. 2012) and Great Plains (Waltz et al. 1998, Guenther & McCafferty 2005), northward to Alberta, Saskatchewan, and the Northwest Territories (Allen & Edmunds 1976, Clifford & Barton 1979, Cobb et al. 1995), with a disjunct population reported from Michigan's Upper Peninsula (Steven & Hilsenhoff 1979). This collection expands the known range of *A. neavei* to the northwest by over 1000 km and is the first record for this family in Alaska.

We found *Caenis amica* Hagen 1861 (Caenidae) in Scottie Creek (62.63956 N, 141.01802 W), a deep, sandy, low-gradient stream in eastern interior Alaska, during July of 2007 and 2008. *Caenis amica* is widespread and common in North America, yet was previously undocumented northwest of southern British Columbia, Alberta, and Saskatchewan (Provonsha 1990). This report extends the known range of *C. amica* northward by approximately 2000 km.

We collected *Caenis youngi* Roemhild 1984 (Caenidae) from 25 lakes in the Cook Inlet basin during July and August of 2007 and 2008: Christiansen Lake (62.31478 N, 150.06268 W), Coal Lake (61.48876 N, 151.56769 W), Falk Lake (61.55663 N, 149.05208 W), Finger Lake (61.60426 N, 149.28134 W), Goose Lake (61.19479 N, 149.82025 W), Hidden Lake (60.48532 N, 150.26604 W), Nikolai Lake (60.19647 N, 151.03493 W), Pothole Lake (60.36776 N, 150.03970 W), Reed Lake (61.66275 N, 149.31744 W), Silver Lake (60.64410 N, 150.79746 W), Snowshoe Lake (60.77394 N, 150.38538 W), Trapper Joe Lake (60.76049 N, 150.07860 W), Vera Lake (61.71164 N, 150.14062 W), Visnaw Lake (61.61890 N, 149.67911 W), West Papoose Lake

(61.53580 N, 150.09498 W), Wik Lake (60.71818 N, 151.25177 W), and nine unnamed lakes (62.48276 N, 146.60063 W; 62.20952 N, 151.54278 W; 62.93950 N, 147.25722 W; 62.85056 N, 149.59147 W; 62.49176 N, 149.69456 W; 61.03093 N, 152.12273 W; 61.83044 N, 148.26412 W; 60.79420 N, 150.33039 W; 60.50065 N, 151.93440 W). We also collected *C. youngi* from four unnamed ponds on the Kenai Peninsula (60.73238 N, 150.61914 W; 60.46235 N, 151.07440 W; 60.52278 N, 150.67840 W; 60.44332 N, 150.30700 W) during June 2011. Examination of material at the University of Alaska Fairbanks' Museum of the North revealed additional unreported specimens from Ballaine Lake (64.8690 N, 147.8248 W) in Fairbanks, interior Alaska. *Caenis youngi* appears to be widely distributed across the United States and southern Canada (Provonsha 1990, McCafferty and Randolph 1998, McCafferty et al. 2012), with populations also reported from the Yukon and Northwest Territories (Cobb et al. 1995).

Labiobaetis dardanus McDunnough 1923 (Baetidae) was collected at 42 of 50 sampling sites along the mainstem Yukon River between Fort Yukon (66.56243 N, 145.43874 W) and Kaltag (64.35731 N, 158.69674 W), interior Alaska, during July of 2009 (see *A. neavei*, above, for information on Yukon River sampling and habitat). *Labiobaetis dardanus* has a transcontinental distribution (McCafferty & Meyer 2007) and was previously known to occur northward to Alberta (Soluk 1981) and Saskatchewan (Miyazaki & Lehmkuhl 2011). Our records extend the known range to the northwest by about 1500 km.

TRICHOPTERA

We collected *Philarctus bergrothi* McLachlan 1880 (Limnephilidae) from a shallow roadside pond (60.71423 N, 150.81540 W) on the Kenai Peninsula in south-central Alaska during May of 2010. This taxon appears to be distributed widely across western and north-central North America, and was previously reported from Yukon, Canada, approximately 800 km to the east (Wiggins & Parker 1997).

We found *Sphagnophylax* sp. (Limnephilidae) in two ephemeral ponds on the Kenai Peninsula (60.71805 N, 150.88450 W; 60.48316 N, 150.45580 W) during June 2011 and May 2010, respectively. This genus is considered an arctic tundra relict and was previously known only from ephemeral tundra ponds in the Yukon and Northwest Territories (Wiggins & Winchester 1984, Wiggins & Parker 1997). Discovery of this taxon in a boreal forest ecosystem in south-central Alaska represents a substantial departure from its previously documented biogeographic setting. *Sphagnophylax meiops* is the only species currently described from this genus (Wiggins & Winchester 1984), and morphological differences between our larval specimens and the published description make it imprudent to assume they are *S. meiops* until adult specimens can be examined.

Triaenodes injustus Hagen 1861 (Leptoceridae) was collected from Falk Lake (61.55663 N, 149.05208 W), a large kettle pond in the Cook Inlet basin, during July of 2008. This species has a transcontinental distribution and has previously been reported northward to central Alberta and Saskatchewan (Glover 1993, 1996). This record extends the known range of *T. injustus* to the northwest by about 2000 km.

PLECOPTERA

We collected *Malenka* sp. Ricker 1952 (Nemouridae) from Desper Creek (62.66097 N, 141.05092 W), a deep, low-gradient, sandy stream in eastern interior

Alaska, during June of 2010. We also collected specimens from two adjacent steep and rocky unnamed streams on Prince of Wales Island, southeastern Alaska (55.39902 N, 132.33366 W; 55.39850 N, 132.33139 W) during April 2003 and July of 2010 and 2011. Adult specimens are required for species-level identification (K. Stewart personal communication). The genus *Malenka* is restricted to the western Nearctic (Stewart & Stark 2002). Of the 16 described species, three have been documented northward to British Columbia and Alberta (Stewart & Oswood 2006), making the Desper Creek record a substantial range extension for this genus. Furthermore, marked habitat differences suggest that the interior and southeast specimens may belong to different species.

DISCUSSION

The distributions of several taxa discussed in this paper appear to be interrupted for 1000 km or more in the western Canadian provinces. If these geographic disjunctions are genuine, and not artifacts of low sampling effort across the intervening landscape, they may be related to North America's glacial history. Parts of present-day Alaska, Yukon, and Northwest Territories were isolated from the rest of North America by vast ice sheets during the Pleistocene, when it served as a refugium for boreal and arctic species (see McCafferty 1985, Wiggins & Parker 1997). Thus these populations have potentially persisted in isolation for thousands of years, and further studies will be needed to decipher their biogeographic history and taxonomic status.

Our surveys throughout Alaska suggest that the distribution and diversity of aquatic insects occurring in non-wadeable streams and lentic habitats is poorly documented compared to that in wadeable streams. Samples from approximately 450 wadeable streams have produced only one new distributional record (i.e., the southeastern Alaska *Malenka* sp. record). In contrast, samples from a substantially smaller number of lakes (50), ponds (32), and non-wadeable streams (5), have produced the remaining 7 new records described here. In addition, we previously described a new Alaskan record for the limnephilid caddisfly *Phanocelia canadensis* Banks 1924 from the soft-bottomed outlet stream of a wetland (Rinella & Bogan 2008). Given that this rare caddisfly had previously been reported only from ponds (Fairchild & Wiggins 1989, Colburn & Garretson Clapp 2006), it is possible that the upstream wetland was the primary habitat for this population. Together these records show that a relatively modest sampling effort in habitats other than gravel-bottomed, wadeable streams has produced a disproportionate number of new records for Alaska.

Further, our sampling shows that two of the previously unrecorded mayfly taxa are common and abundant within their respective habitats throughout the geographic extent of our sampling. We found *C. youngi* in 25 of 50 lakes surveyed across the Cook Inlet watershed, an area which is home to more than half of Alaska's human population. We also found this taxon in 4 of 32 ponds sampled on the Kenai Peninsula and in University of Alaska museum collections. We found *L. dardanus* at 42 of 50 sampling sites spanning 970 km of the mainstem Yukon River, Alaska's largest river. Previous efforts to catalog and synthesize Alaska's mayfly diversity (McCafferty 1985, 1994; Randolph & McCafferty 2005) have failed to document these taxa, supporting our assertion that diversity is relatively poorly characterized in non-wadeable streams and lentic habitats.

ACKNOWLEDGMENTS

Sampling efforts were funded by the U.S. Environmental Protection Agency, the Alaska Department of Environmental Conservation, and the U.S. Fish and Wildlife Service. Thanks to James Glover, Pat McCafferty, Chuck Parker, and Ken Stewart taxonomic confirmations. For help with field sampling we thank Skip Call, Ron and Joan Leighton, Terri Lomax, Elaine Ramos, Grace Russell, Jeff Skaza, and James Willacker. Thanks to Derek Sikes for help navigating the Museum of the North's insect collection.

LITERATURE CITED

- Allen, R. K. & G. F. Edmunds, Jr. 1976. A revision of the genus *Ametropus* in North America (Ephemeroptera: Ametropididae). *Journal of the Kansas Entomological Society* 49(4): 625–635.
- Clifford, H. F. & D. R. Barton. 1979. Observations on the biology of *Ametropus neavei* (Ephemeroptera: Ametropididae) from a large river in northern Alberta, Canada. *Canadian Entomologist* 111:855–858.
- Cobb, D. G., J. F. Flannagan, P. M. L. Flannagan & R. D. Wickstrom. 1995. Chapter 13. Collections of Ephemeroptera from Kluane National Park, Yukon Territory, and Nahanni National Park, Northwest Territories, Canada, pp. 177–184. In: L. D. Corkum & J. J. H. Ciborowski (Eds.). *Current Direction in Research on Ephemeroptera*. Canadian Scholars' Press, Toronto, 345 pp.
- Colburn, E. A. & F. M. Garretson Clapp. 2006. Habitat and life history of a northern caddisfly, *Phanocelia canadensis* (Trichoptera: Limnephilidae), at the southern extreme of its range. *Northeastern Naturalist* 13(4):537–550.
- Fairchild, W. L. & G. B. Wiggins. 1989. Immature stages and biology of the North American caddisfly genus *Phanocelia* Banks (Trichoptera: Limnephilidae). *Canadian Entomologist* 121:515–519.
- Glover, J. B. 1993. *The Taxonomy and Biology of the Larvae of the North American Caddisflies in the Genera Triaenodes and Ylodes (Trichoptera: Leptoceridae)*. Ph.D. dissertation, University of Louisville, 253 pp.
- Glover, J. B. 1996. *Larvae of the Caddisfly Genera Triaenodes and Ylodes (Trichoptera: Leptoceridae) in North America*. Ohio Biological Survey, Columbus, 89 pp.
- Guenther, J. L. & W. P. McCafferty. 2005. Mayflies (Ephemeroptera) of the Great Plains. III: North Dakota. *Transactions of the American Entomological Society* 131(3/4):491–508.
- Heino, J., R. Virkkala & H. Toivonen. 2009. Climate change and freshwater biodiversity: Detected patterns, future trends and adaptations in northern regions. *Biological Reviews* 84:39–54.
- McCafferty, W. P. 1985. The Ephemeroptera of Alaska. *Proceedings of the Entomological Society of Washington* 87(2):381–386.
- McCafferty, W. P. 1994. Additions and corrections to the Ephemeroptera of Alaska. *Proceedings of the Entomological Society of Washington* 96(1):177.
- McCafferty, W. P. & M. D. Meyer. 2007. Insecta, Ephemeroptera: Transcontinental range extensions in western North America. *Check List* 3(1):51–54.
- McCafferty, W. P. & R. P. Randolph. 1998. Canada mayflies: A faunistic compendium. *Proceedings of the Entomological Society of Ontario* 129:47–97.
- McCafferty, W. P., R. P. Randolph & L. M. Jacobus. 2012. *Mayflies of the Intermountain West*. American Entomological Institute, Gainesville, 316 pp.
- Miyazaki, R. & D. M. Lehmkuhl. 2011. Chapter 6. Insects of the Saskatchewan River System in Saskatchewan, pp. 119–157. In: K. D. Floate (Ed.). *Arthropods of Canadian Grasslands, Volume 2: Inhabitants of a Changing Landscape*. Biological Survey of Canada, Ottawa.
- Provonsha, A. V. 1990. A revision of the genus *Caenis* in North America (Ephemeroptera: Caenidae). *Transactions of the American Entomological Society* 116(4):801–884.
- Randolph, R. P. & W. P. McCafferty. 2005. The mayflies (Ephemeroptera) of Alaska, including a new species of Heptageniidae. *Proceedings of the Entomological Society of Washington* 107(1):190–199.

- Rinella, D. J. & D. L. Bogan. 2008. Significant westward range extension for the limnephilid caddisfly *Phanocelia canadensis* (Trichoptera): First record from Alaska, U.S.A. *Entomological News* 119(3):295–297.
- Soluk, D. A. 1981. The larva of *Baetis dardanus* McDunnough (Ephemeroptera: Baetidae). *Entomological News* 92(4):147–151.
- Steven, J. C. & W. L. Hilsenhoff. 1979. *Ametropus neavei* (Ephemeroptera: Ametropodidae) in the Upper Peninsula of Michigan. *Great Lakes Entomologist* 12(4):226.
- Stewart, K. W. & M. W. Oswood. 2006. *The Stoneflies (Plecoptera) of Alaska and Western Canada*. The Caddis Press, Columbus, 325 pp.
- Stewart, K. W. & B. P. Stark. 2002. *Nymphs of the North American Stonefly Genera (Plecoptera)*. The Caddis Press, Columbus, 510 pp.
- Waltz, R. D., G. F. Edmunds, Jr & G. Lester. 1998. New distributions for *Rapthoheptagenia cruentata* and *Ametropus neavei* (Ephemeroptera: Heptageniidae, Ametropodidae). *Entomological News* 109(3):213–214.
- Wiggins, G. B. & C. R. Parker. 1997. Chapter 25. Caddisflies (Trichoptera) of the Yukon, with analysis of the Beringian and Holarctic species of North America, pp. 787–866. In: H. V. Danks & J. A. Downes (Eds.). *Insects of the Yukon*. Biological Survey of Canada, Ottawa, 1034 pp.
- Wiggins, G. B. & N. N. Winchester. 1984. A remarkable new caddisfly genus from northwestern North America (Trichoptera, Limnephilidae, Limnephilinae). *Canadian Journal of Zoology* 62:1853–1858.

Received 24 May 2012; Accepted 2 Oct 2012 by M. E. Benbow; Publication date 14 Jan 2013.