

**AN UPDATE ON THE OCCURRENCE OF
THREE SPECIES OF
MAYFLIES (EPHEMEROPTERA) IN MAINE**

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Mayflies, members of the order Ephemeroptera, are a diverse group of aquatic insects. Unlike many kinds of insects that spend most of their lives on land, mayflies spend most of their lives in the water as immature forms called nymphs. Adult mayflies are short lived and reproduce soon after they complete their development to the final winged stage called an imago. Mated adult females deposit their eggs in the waters of streams and ponds, where they hatch. After hatching, nymphs live on or among the sediments and submerged stems of aquatic plants. Nymphs can feed and grow for as much as two years before they complete their development to the first winged stage called a subimago, but often this development is accomplished in one year or less. The subimago is a winged terrestrial form that usually flies away from the water to a place of safety where it soon sheds its skin and becomes the imago. For further details of mayfly biology the reader is directed to publications by Edmunds *et al.* (1976) and McCafferty (1981).

In the late 1980's an extensive survey of Maine's mayfly fauna was conducted (Burian and Gibbs 1990). The results of that work showed Maine to have a diverse mayfly fauna with a majority of its 160 species broadly distributed from the mountains of the Moosehead Plateau to the coast. However, about 41 species (26% of the fauna) were recorded from less than three sites. Species such as these may indeed be rare, endemic, or indicative of special habitats. But, they may have been simply overlooked at other sites or were collected in a life stage that could not be determined to species. In general, mayflies with few records have ranges and habitat requirements that are largely unknown. For these species each new record improves our understanding of its range and habitat. This is especially important for the purpose of habitat management and conservation because critical decisions, usually involving rare species, cannot be made without basic range and habitat information.

In this paper new locality records are presented for *Siphonurus securifer* McDunnough, *Metretopus borealis* Eaton, and *Hexagenia rigida* Eaton, which have few known localities in Maine. *Siphonurus*

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securifer has only been recorded a few times since its original description and may be restricted to southeastern Canada and New England. *Metretopus borealis* occurs across much of Canada, but in the contiguous United States has only been recorded from a few northern States. *Hexagenia rigida* occurs across a wide area of central North America, but is considerably less common in the eastern parts of the continent. In addition, *M. borealis* has been proposed for Special Concern Status on the Maine Endangered Species List. Data originally presented on these taxa by Burian and Gibbs (1991) are updated and discussed. Latitude and longitude coordinates for previous Maine records are summarized, but full location data are not duplicated here. Voucher specimens were deposited in the Ephemeroptera research collection of S. K. Burian at Southern Connecticut State University, New Haven, CT.

METHODS

New locality records were based on specimens obtained on field collecting trips that were part of an advanced seminar on mayfly systematics conducted at the Eagle Hill Wildlife Research Station, Steuben, Maine in June of 1993 and 1994. Specimens were obtained as part of a general study of representative mayfly habitats in the vicinity of Eagle Hill Field Station. Nymphs were collected using aquatic nets to sweep around the submerged stems of aquatic plants and for sampling the bottom directly. Adult mayflies were sampled using aerial nets and a black-light attractor.

Specimens were identified using all published keys and descriptions. In addition, unpublished diagnostic characters (tested in Canada by A.P. Weins of the Freshwater Institute of Canada) for *H. rigida* and *H. limbata* nymphs were used. Further, one specimen (initially determined to be *H. rigida*) was sent to Dr. Donna Giberson, University of Prince Edward Island for verification.

NEW RECORDS

SIPHONURIDAE

Siphonurus securifer McDunnough 1926

New Specimens: 1 Adult (Male).

HANCOCK CO., Chicken Mill Pond (44 29 29N/068 00 57W), Gouldsboro, south of Route 1., 23 June 1994, K. Juentes-Molack.

Currently, it is still necessary to have adult males of this species for positive identification. Traver (1935) provides the only workable keys and a description of the adult male. There are no keys for adult females, subimagos of either sex, or nymphs.

Previously, this species had been reared from nymphs collected along the shore of the North Branch of the Dead River in western Maine (Burian and Gibbs 1990). At that site, nymphs occurred among aquatic

vegetation at the river's edge. The new site in Hancock County was a shallow weedy pond with a thick *Sphagnum* mat extending out into the pond. Beyond the mat were many floating leaf aquatic plants. A single male subimago was collected at about 8:00 p.m. as it flew from the center of the pond toward the shore. At that same time, many other subimagos were observed out over the pond, but none were in net range or were attracted to our black-light. Nearby areas were searched, but no other specimens were found. The single subimago was reared through to the imago stage for positive identification.

The present range of *S. securifer* includes Ontario, Connecticut, Maine, and Massachusetts. The Connecticut records were recently published by Burian and Bednarik (1994). Based on the habitats of the two Maine localities, it seems that *S. securifer* can use both slow moving stream habitats as well as pond/lake habitats. A notable common factor between these habitats was a well developed aquatic plant community. Despite the abundance of these types of habitats in Maine, this species does not seem to be common. During the extensive survey conducted in the 1980's, a number of slow flowing stream and pond/lake habitats were sampled with the species being found at only one site. Continued sampling of aquatic habitats with well developed aquatic plant communities may produce additional new records and help refine our understanding of specific habitat requirements. Latitude and longitude coordinates of the previous locality are given in Table 1.

METRETOPODIDAE

Metretopus borealis Eaton 1901 (Fig. 1)

New Specimens: 2 Nymphs (1Male, 1Female).

WASHINGTON CO., Narraguagus River (44 38 29N/067 57 09W), at the confluence of Lawrence Brook, 9 June 1993, S.K. Burian.

Metretopus borealis is the only species in its genus in North

Table 1. Summary of latitude and longitude coordinates for previous Maine localities of *S. securifer*, *M. borealis*, and *H. rigida*.

Species	Lat./Long. (DgMinSec)	Reference for Record
<i>Siphonurus securifer</i>	45 14 00N/070 27 00W	Burian and Gibbs (1990)
<i>Metretopus borealis</i>	47 04 59N/069 16 54W	Mingo et al. (1979)
	46 42 05N/069 43 05W	
	46 49 30N/069 32 29W	
	47 06 43N/069 05 15W	
	46 56 31N/069 39 05W	
	47 05 08N/069 02 04W	
	44 53 00N/068 06 00W	
	44 41 00N/067 57 00W	Berner (1978)
<i>Hexagenia rigida</i>	45 38 00N/070 15 00W	Koss (1970)

America. Berner (1978) revised the taxonomy of this species and published new descriptions of all life stages. However, no complete figures of the nymph have ever been published. To facilitate the recognition of this species, complete dorsal and ventral views of the nymph are provided here (Figure 1).

In Maine, this species had previously been recorded from several small streams in the far northwestern part of the State and from two tributaries of the Narraguagus River (Table 1). The new locality on the lower Narraguagus River is about 3.2 km (2.0 miles) downstream from the closest previous record on Schoodic Brook. The new record on the lower Narraguagus River is the first evidence since 1974 that *M. borealis* is still present in the river. This is particularly good news because a recent study of the aquatic invertebrates of the Narraguagus River, using the sites originally sampled by Terry Mingo in the 1970's, did not find this species where it had been recorded. At the new locality, two well developed nymphs were collected from around the stems of Horsetail ferns (*Equisetum* spp.) along the edge of the river. Based on the development of wing pads we estimate that emergence probably occurs at this

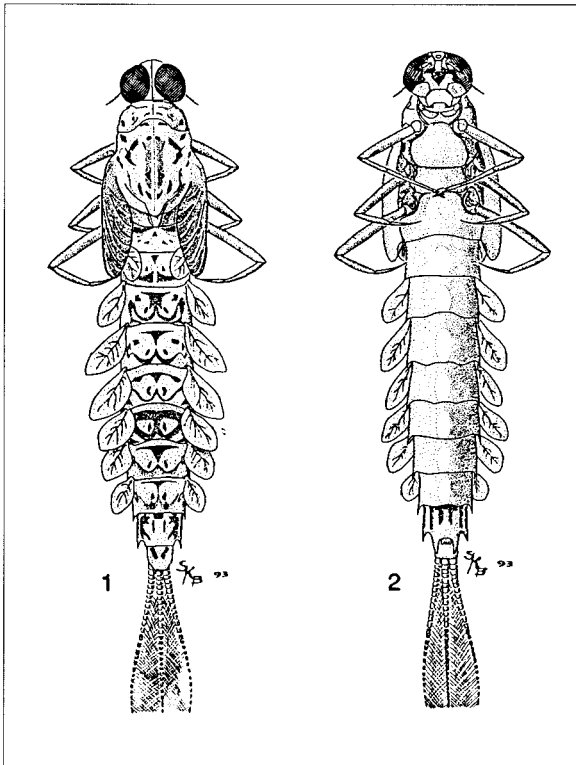


Figure 1. Mature nymph of *Metretopus borealis*: 1 - dorsal view; 2 - ventral view.

site by the second week in June.

Metretopus borealis is a truly boreal species with a range that is believed to extend around the top of the world (Edmunds *et al.* 1976). In North America, its range only extends south to about 44° 30'N latitude. Within Maine the species seems to have a disjunct distribution between some northwestern streams and the Narraguagus River in eastern Maine. To test the reality of this apparent disjunct distribution, new localities were specifically searched for during the mayfly survey conducted in the 1980's. The results of that search did not reveal any new localities between eastern and western populations. This currently supports the hypothesis that the apparent disjunction is real and not an artifact of collecting effort.

EPHEMERIDAE

Hexagenia rigida McDunnough 1924

New Specimens: 1 Nymph (Female).

WASHINGTON CO., Lawrence Brook (44 38 34N/067 56 58W), pool outlet about 100 m west of Route 193 bridge, 22 June 1994, S.K. Burian.

Speith (1941) studied the taxonomy of nymphs and adults of this species and provided keys to both life stages. McCafferty (1975) updated the taxonomy of *H. rigida* and provided new keys for nymphs. Although adult males are easily distinguished using the current keys, nymphs are still difficult to identify.

Previously, this species was known in Maine from a single collection of adult males made by Koss in 1966 from Jackman. Until now the nymphal habitat in Maine has been unknown. In Lawrence Brook, the specimen of *H. rigida* was collected from muck deposits along the stream bank below the outlet of a pool, which was large enough to have floating leaf aquatic plants. Muck deposits, at the collection site, were restricted to the sides of the stream channel. The mid-channel area was dominated by cobbles and boulders surrounded by or resting on deposits of coarse sands and small gravel. Muck sediments had a gray color, fine texture, and a slightly sticky, clay-like consistency. Overlying the muck was mixed organic detritus and woody debris.

Although widely distributed across central North America, the species is apparently uncommon in Maine. In the late 1980's a number of slow flowing stream and pond/lake habitats were sampled and while several specimens of the closely related species *H. limbata* were found, *H. rigida* was not. Throughout the rest of New England, *H. rigida* seems equally uncommon with one record from Massachusetts (Koss 1970) and one record from the Lake Champlain area of Vermont (McDunnough 1924). In Maine, previous searches for *H. rigida* were conducted assuming ponds and lakes to be the primary habitat, as is typical in the central part of the species range, but here near the edge of

the range *H. rigida* might use the slow flowing stream habitats more. Although these habitats were sampled in the past, they were not specifically targeted for this species and if this species is uncommon wherever it occurs, it easily could have been missed. Careful searching of streams as well as lakes may now yield undiscovered populations and provide new clues to the species habitat in Maine.

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