

## The mayflies (Ephemeroptera) of New Hampshire: Seasonality and Diversity of the Stream Fauna<sup>(1)</sup>

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### ABSTRACT

Season-long sampling in streams and rivers produced 112 species of mayflies, which with other records totals 121 species for New Hampshire; 88 of these are new state records. Appearance of blackwing/mature larvae were used to develop statements on seasonality of species. Distinct differences were found between the faunas of southern and north-central New Hampshire, with an important factor being water temperatures through the season. A biogeographic analysis coupled with known habitat preferences reinforced the hypothesis that water temperature was a critical factor in determining species distributions in the state.

Despite their value as indicators of water quality, the mayfly fauna of north-eastern North America is poorly known for some areas. The fauna of the Canadian Maritime provinces has been recently covered (McCafferty and Randolph, 1998), and two New England states (Maine and Connecticut) and New York have having their mayfly faunas treated in the past 15 years. Burian & Gibbs (1991) treated the Maine fauna, and provided an annotated checklist of the 160 species that they found. Burian & Bednarik (1994) recorded 109 species for Connecticut, and Jacobus and McCafferty (2001) noted 173 species for New York. Most of these species should occur in New Hampshire, Vermont, and Massachusetts. The mayfly fauna of these New England states has been sparsely covered through occasional data in a few generic revisions and small papers, with a total of 30 species being formally recorded from New Hampshire.

In order to present a thorough documentation of the stream insect fauna of New Hampshire, and by extension a good part of New England, we systematically sampled streams of southern and then north-central New Hampshire (Fig. 1) throughout two separate seasons (2003, 2004). Our goal was to document species presence, abundance, and seasonality as part of a project to develop identification keys to the stream macroinvertebrates of New England. Extensive data were gathered on the stream mayflies, the largest subset of the total mayfly fauna.

We found 112 stream species during this study. An additional four stream species are known: two northern species are present in the UNH collection, and there are two literature records documenting presence of *Dipheter hageni* (Eaton) and *Dentatella coxalis* (McDunnough) in the state. Five additional species records are based on larvae collected in ponds and lakes, or on adults taken at lights,

bringing the total known fauna for New Hampshire to 121 species. Eighty-eight species represent new records for New Hampshire, with 19 of these species not recorded from Maine. When compared to the Maine list of species (Burian & Gibbs, 1991), those New Hampshire species not taken in Maine were uncommon and collected in southern New Hampshire (*Acentrella parvula*, *Baetisca obesa*, *Heterocloeon anoka*, *Plautidius simplex*, *Leucrocuta juno*, *Maccaffertium pudicum*), or were uncommon Appalachian species at the northern limits of their range (*Ameletus cryptostimulus*, *Plautidius cestus*, *Plautidius cingulatus*, *Brachycercus nitidus*, *Ephemerella exrucians*). A few others are in difficult groups (two species of *Tricorythodes*, two species of *Centroptilum*), the larvae are undescribed (*Ameletus walleyi?*, *Siphonurus* sp. A), or were described later (*Eurylophella macdunnoughi* and *Plautidius gloveri*). Genera such as *Tricorythodes* and *Leucrocuta* Flowers are in need of revision, and determinations are especially uncertain for some of the color forms near *Leucrocuta minerva* (McDunnough). Several species recorded from the northern portion of Maine were not found, and may be present in the extreme northern portion of New Hampshire, which was not sampled for this study. A few of the other species taken in Maine can only be identified through collection of adult males, with the larvae either being undescribed or, if collected during the study, were unknowingly treated by us as variants of other better-known species.

#### PROCEDURE

The state was divided into two regions for sampling, based primarily on the ecological sections given by McNab & Avers (1994): 1) the southern highlands and coastal lowlands [the southern portion of the state], and 2) the White Mountain region [the middle portion]. The southern portion of the state was sampled in 2003, and the middle portion in 2004. Sampling protocols were the same for both years, but sampling strategy differed. Samples were taken every 2-3 weeks from early May to mid-September (southern) or mid-May to early October (northern rivers). In 2005 a set of samples was taken in mid-April (southern rivers) or mid-May (northern rivers, during a very cold spring) to ensure that the earliest emerging species were collected. These species data from each river were later used to test whether separation of the state into two sampling regions reflected real faunal differences. The summary species data for each site with a full season of samples were compared by producing similarity statistics based on the Sorenson incidence-based index (Magurran, 2004) using the software program EstimateS (Colwell, 2000). These statistics were then imported into NTSYSpc (Rohlf, 2000; version 2.1 ), and a clustering statistic generated using the complete-linkage option, with these then used to produce a tree indicating clustering of rivers based on similarity of their species lists. Similar results were obtained by using BioSim2 with 0/0 matches ignored (Pearson, *et al.*, 2005).

Temperature and pH were taken with a YSI Ecosense® pH10 meter. Water temperatures of the first set of samples from the southern rivers ranged from 9-14°C, and pH from 5.6-7.0. For northern rivers temperatures for the first set of samples ranged from 6-14°C, and pH from 5.5-6.9. Stream discharge was measured at least once during the year by establishing the average stream depth across a transect and the rate of flow, or obtained from a real-time U.S. Geological Survey website (<http://nh.water.usgs.gov/WaterData/index.htm>) when the monitor-

ing site was within a few kilometers of the sampling site. These measurements were taken when stream flows were uniformly low for the region, so that all but the largest rivers could be safely crossed for the width measurement: early June or early July in 2003, late July or early September in 2004. Percent canopy cover was also estimated at this time. Structure of the river bottoms was characterized for a 1 meter wide transect using the Wentworth scale for particle sizes and based on a visual estimate (granule and pebble were lumped together as “gravel”).

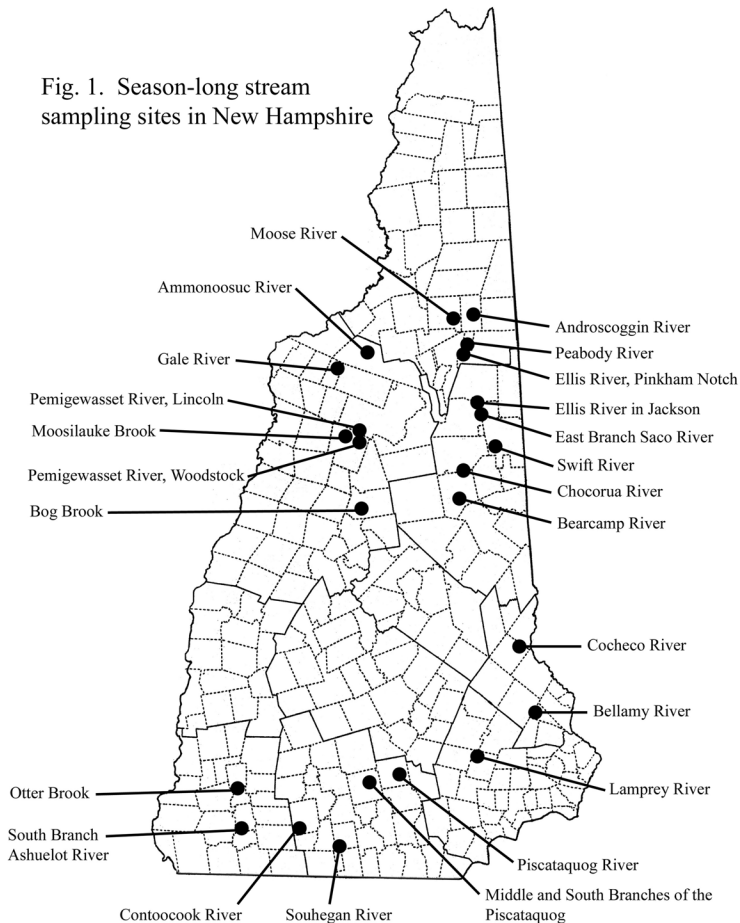
### **Southern Rivers, 2003**

Eight wadeable rivers in the southern third of the state were sampled 9 times from May 5 to September 16 in 2003, and one early sample was taken from each site from April 17-19, 2005. Two other southern rivers were sampled in a similar manner at other times: the Souhegan River in 1998, and the Lamprey River in 2004 (Fig. 1). Occasional samples were taken from other southern sites, and much of this data is included in the species records below. For each river two sites within 30 m to one km of each other were chosen, one with a faster flow rate and the other with a slower flow rate. Each site was sampled by “kicking” the river bottom and rubbing larger rocks upstream from a 1 meter wide seine for 2 minutes (to cover approximately 2 m<sup>2</sup>), and by using a D-frame net to “jab” 20 times through aquatic vegetation, root mats under stream banks, and just above mucky or backwater areas along the stream margins (the minimum recommended sampling sizes by the EPA [Barbour *et al.*, 1999]). Initially the second technique was used at all sites with a maximum of 20 jabs or 5 minutes of effort, but had ceased at most sites by mid-summer when water levels became so low that this technique could not be pursued or was non-productive.

Samples were placed in a white enamel pan with water, and larger pieces of debris were removed after shaking and a brief examination for clinging insects. The sample was then transferred to a 600 cm<sup>3</sup> container holding 70% ethanol, and returned to the laboratory. In the laboratory alcohol was drained off, and specimens were sorted in water in a white enamel pan. A large ring-light with magnifier was used to scan for specimens. Each sample was sorted completely three times, and QA/QC checks performed by the senior author. All samples were sorted within two weeks of collection. Mayflies removed from samples were preserved in 70% ethanol and initially identified to species by G.D. Whitmore.

Specimens were identified using the most recent keys for each genus, with these identifications occasionally checked by the senior author. Consultation/confirmation concerning the more difficult groups was undertaken with the assistance of Steve Burian (all taxa), Boris Kondratieff (*Siphonurus* Eaton), Nick Wiersema (*Centroptilum* Eaton, *Plauditus* Lugo-Ortiz & McCafferty, *Proclleon* Bengtsson), and Jeff Webb (*Leucrocuta*). A set of all but the rarest taxa was given to Steve Burian, while the rest were placed in the UNH Insect Collection. All species and abundance data are maintained in a QuattroPro® spreadsheet. The following list of rivers is presented so that the citations for species distributions may be kept short, and includes data on stream size, bottom composition, and the total mayfly fauna. There are a few records from rivers that were more casually sampled, and the full data for these is given in the species treatments.

Fig. 1. Season-long stream sampling sites in New Hampshire

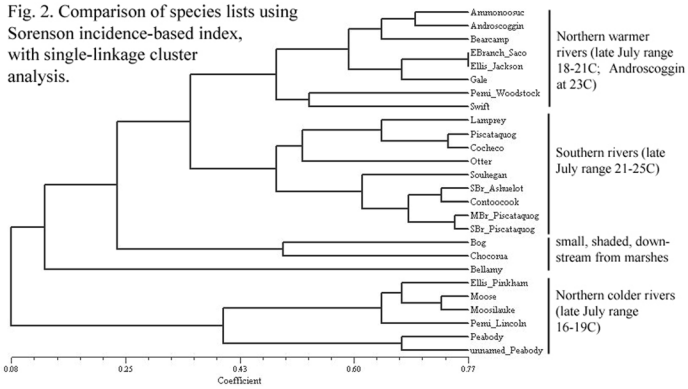


COASTAL RIVERS (east):

**Bellamy River**, Strafford Co., Madbury, Nute Road, N43.1887, W70.9773, elevation 47 m. Bottom: boulders 15%, cobble 55%, gravel 20%, sand/silt 15%. June 2 2003 width 6.5 m, discharge 1.29 m<sup>3</sup>/s. Canopy cover: 60%. Species taken: 14.

**Cochecho River**, Strafford Co., 1.6 km SE Farmington, off of Hwy. 153, N43.3759, W71.0413, elevation 75 m. Bottom: boulder <5%, cobble 20%, gravel 25%, sand/silt 50%. June 4 2003, width 11.5 m, discharge 3.54 m<sup>3</sup>/s (USGS data). Canopy cover: 15%. Species taken: 50.

**Lamprey River** [2004], Rockingham Co., 2.7 km W Raymond, N43.0403, W71.1997, elevation 55 m. Bottom: boulder 5%, cobble 70%, gravel 25%. Width about 20 m, stream discharge measurements not taken, but about quite low in late summer. Canopy cover: 15%. Species taken: 44.



#### CONNECTICUT RIVER DRAINAGE (west):

**Otter Brook**, Cheshire Co., 6.5 km NE Keene, Hwy. 9, N42.9710, W72.2173, 247 m. Bottom: boulder 40%, cobble 40%, gravel 15%, sand 5%. June 4 2003 width 15.7 m, discharge 2.87 m<sup>3</sup>/s. Canopy cover: 30%. Species taken: 34.

**South Fork Ashuelot River**, Cheshire Co., 3.2 km NW Troy, Hwy. 12, N42.8605, W72.2033, elevation 258 m. Bottom: boulder 40%, cobble, 40%, gravel 15%, sand 5%. June 4 2003 width 7.6 m, 2.14 m<sup>3</sup>/s. Canopy cover: 30%. Species taken: 34.

#### MERRIMACK RIVER DRAINAGE (south):

**Contoocook River**, Hillsborough Co., 3.2 km SW Peterborough, Hwy. 202, N42.8360, W71.9753, elevation 247 m. Bottom: boulder 15%, cobble 60%, gravel 20%, sand 5%. June 4 2003 width 15.7 m, discharge 2.44 m<sup>3</sup>/s. Canopy cover: 30%. Species taken: 40.

**Piscataquog River**, Hillsborough Co., 1.6 km E Goffstown, Hwy. 114, N43.0132, W71.5443, elevation 49 m. Bottom: cobble 60%, gravel 30%, sand 10%. July 14 2003 width 26.2 m, discharge 4.33 m<sup>3</sup>/s. Canopy cover: 20%. Species taken: 62.

**Piscataquog River - Middle Branch**, Hillsborough Co., 3.2 km NE New Boston, Ryan Road, N43.0019, W71.6615, elevation 105 m. Bottom: boulder 25%, cobble 40%, gravel 30%, sand 5%. June 6 2003 width 11.9 m, discharge 3.26 m<sup>3</sup>/s. Canopy cover: 50%. Species taken: 40.

**Piscataquog River - South Branch**, Hillsborough Co., 3.2 km NE New Boston, Hwy. 13, N43.0013, W71.6618, elevation 104 m. Bottom: boulder 5%, cobble 55%, gravel 20%, sand 20%. June 6 2003 width 15.8 m, discharge 3.81 m<sup>3</sup>/s. Canopy cover: 20%. Species taken: 44.

**Souhegan River**, Hillsborough Co., 4 km N Greenville, Hwy. 31, N 42.7965, W 71.7857, elevation 183 m. Bottom: boulder 30%, cobble 40%, gravel 15%, sand 10%. August 26 1998 width 8.2 m, discharge 0.9 m<sup>3</sup>/s. Canopy cover: 20%. Species taken: 29.

Other rivers sampled:

**Merrimack River** (Merrimack River drainage), Merrimack Co., Manchester, at Granite Street Bridge, N42.9855, W71.4693, elevation 41 m. Bottom: much cobble, many boulders (not determined, river over 0.1 km wide at this point); one species record from quiet backwater with sand/silt bottom. June 10 2004 width over 100 m, discharge 136.2 m<sup>3</sup>/s.

**Nissitissit River** (Merrimack River drainage), Hillsborough Co., 4.8 km SE Brookline, near Massachusetts border, N42.7051 W71.6204, elevation 67 m. Bottom: boulders 5%, cobble 50%, gravel 25%, sand 20%. June 5, 2005 width 8 m, discharge not calculated.

**North Branch Sugar River** (Connecticut River drainage), Sullivan Co., 0.5 km NE of bridge at Croydon Flat, N43.4162, W72.1796, 216 m. Channel width about 30 m. Burian (2002) characterizes this site.

#### **Northern Rivers, 2004:**

Fourteen wadeable rivers and one small, unnamed brook were sampled in the White Mountain region in 2004, and the Pemigewasset River at Woodstock was sampled in 2005 (Fig. 1). All are in or near the White Mountain National Forest. In 2004 samples were taken every three weeks from May 18 to early October 2, and one early season sample was taken the following year from each site (May 11, 2005, during a cold spring), for a total of 9 samples from each site. The sampling protocol was the same, but sampling by “jabbing” with a D-frame net became reduced and eventually ceased at sites with many boulders which would lose the appropriate habitats as water levels receded by mid-summer.

#### **ANDROSCOGGIN RIVER DRAINAGE (northeast):**

**Androscoggin River**, Coos Co., Gorham, Hwy. 16, N44.3933, W71.1856, elevation 238 m. Bottom: cobble 90%, gravel 10% close to shore - full reach of river could not be evaluated. July 23 2004 width not taken, about 100 m, discharge 37.95 m<sup>3</sup>/s (USGS data). Canopy cover: 10%. Species taken: 38.

**Moose River**, Coos Co., 6.5 km W Gorham (in Randolph), Hwy. 2, N44.3735, W71.2721, elevation 375 m. Bottom: 10% boulders, 75% cobble, 5% gravel, 10% sand. September 6 2004 width 7.2 m, 0.34 m<sup>3</sup>/s. Canopy cover: 10%. Species taken: 44.

**Peabody River**, Coos Co., 1.6 km N Pinkham Notch, Hwy. 16, N44.2744, W71.2319, elevation 530 m. Bottom: boulders 80%, cobble 15%, gravel 5%. September 6 2004 width 6.7 m, discharge 1.01 m<sup>3</sup>/s. Canopy cover: 25%. Species taken: 13.

**Peabody River, unnamed branch**, Coos Co., 1.6 km N Pinkham Notch, Hwy 16, N44.2740, W71.2315, elevation 564 m. Bottom: boulders 60%, cobble 20%, gravel 20%. September 6 2004 width 2.9 m, discharge too low between rock pools for flow rate measurements. Canopy cover: 100%. Species taken: 12.

#### **CONNECTICUT RIVER DRAINAGE (northwest):**

**Ammonoosuc River**, Grafton Co., 6.5 km E Bethlehem, River Road, N44.2781, W71.6385, elevation 357 m. Bottom: boulders 40%, cobble 35%, gravel 20%, sand 5%. July 23 2004 width not taken, about 30 m, discharge 1.59 m<sup>3</sup>/s (USGS data). Canopy cover: 5%. Species taken: 46.

**Gale River**, Grafton Co., 1.6 km N Franconia, N44.2382, W71.7589, elevation 274 m. Bottom: boulders 15%, cobble 70%, gravel 5%, sand 10%. Septem-

ber 6 2004 width 23.5 m, discharge 4.0 m<sup>3</sup>/s. Canopy cover: <5%. Species taken: 54.

#### MERRIMACK RIVER DRAINAGE (south):

**Bog Brook**, Grafton Co., 4.8 km N Plymouth, Bog Road, N43.8042, W71.6858, elevation 207 m. Bottom: boulders 50%, cobble 40%, gravel 10%. September 6 2004 width 10.7 m, discharge 0.1 m<sup>3</sup>/s. Canopy cover: 100%. Species taken: 22.

**Moosilauke Brook**, Grafton, Co., 2.7 km W North Woodstock on road to Kinsman Notch, N44.0282, W71.7190, elevation 283 m. Bottom: boulders 65%, cobble 20%, gravel 105, sand 5%. September 6 2004 width 6.4 m, discharge 0.11 m<sup>3</sup>/s. Canopy cover: 10%. Species taken: 31.

**Pemigewasset River**, Grafton Co., 0.8 km S Lincoln, N44.0418, W71.6862, elevation 238 m. Bottom: boulders 10%, cobble 80%, gravel 5%, sand 5%. July 23 width 20 m, 3.31 m<sup>3</sup>/s. Canopy cover: 10%. Species taken: 22.

**Pemigewasset River**, Grafton Co., 2.4 km N Woodstock, Hwy. 175, high gradient site, N43.9955 W71.6730, elevation 195 m. Bottom: composite of 2 of the 4 channels, boulders 20%, cobble 50%, gravel 10%, sand 20%. July 5 2005 width not measured, about 35 m for three channels, discharge 6.66 m<sup>3</sup>/s (USGS data). Canopy cover: 5%. Species taken: 51.

#### SACO RIVER DRAINAGE (east):

**Bearcamp River**, Carroll Co., Hwy. 113, 3.2 km E S. Tamworth, along old road. N43.8319, W71.2654, elevation 139 m. Bottom: boulders 45%, cobble 35%, gravel 10%, sand 10%. July 23 width 20.5 m, discharge 0.9 m<sup>3</sup>/s (USGS data). Canopy cover: 10%. Species taken: 49.

**Chocorua River**, Carroll Co., 4.8 km N Chocorua, N43.9189, W71.2370, elevation 187 m. Bottom: boulders 5%, cobble 80%, gravel 10%, sand 5%. July 23 2004 width 7.2 m, discharge 0.5 m<sup>3</sup>/s. Canopy cover: 65%. Species taken: 23.

**East Branch Saco River**, Carroll Co., Hwy 16, Lower Bartlett, N44.1003, W71.1495, elevation 168 m. Bottom: boulders 25%, cobble 60%, gravel 10%, sand 5%. July 23 2004 width 26.5 m, discharge 2.0 m<sup>3</sup>/s. Canopy cover: 5%. Species taken: 42.

**Ellis River**, Carroll Co., 0.8 km S Jackson, Hwy 16, N44.1382, W71.1877, elevation 226 m. Bottom: boulders 30%, cobble 20%, gravel 30%, sand 20%. September 6 2004 width 24.1 m, discharge 3.12 m<sup>3</sup>/s. Canopy cover: 5%. Species taken: 42.

**Ellis River at Pinkham Notch**, Coos Co., Hwy. 16, N44.2552, W71.2526, elevation 610 m. Bottom: boulders 5%, cobble 70%, gravel 20%, sand 5%. September 6 2004 width 7.9 m, discharge 0.49 m<sup>3</sup>/s. Canopy cover: 5%. Species taken: 24.

**Swift River**, Carroll Co., West Side Road at covered bridge in Conway, N43.9849, W71.1199, elevation 134 m. Bottom: boulders 15%, cobble 50%, gravel 10% gravel, 5% sand. July 23 2004 width 20.7 m, discharge 4.21 m<sup>3</sup>/s. Canopy cover: 5%. Species taken: 29.

#### Seasonality:

Although emergent adults provide the best evidence for maturation of populations, this study focused entirely on collecting larval stages, though rearing was done for a number of the mature (blackwing) individuals for several of the gen-

era. The onset of adult emergence follows closely the appearance of larvae with black or very dark wing pads for most genera. Additional valuable evidence is provided by the appearance of "mature" larvae (those larvae that are near or in the final instar based on their size being similar to that of blackwing individuals). Final instar larvae of Baetiscidae, Tricorythidae, and some Ephemerellidae lack conspicuously darkened wing pads when mature, and adult emergence was assumed to shortly follow collection of the largest larvae. By recording the "mature" and "blackwing" developmental stages when identifying specimens, and noting when small larvae of the same taxon appeared in samples, times of adult emergence and larval presence could be used to form a complete picture of species seasonality.

Clifford (1982) provides seasonality data for 297 world species, with an emphasis on the northern hemisphere fauna. Clifford's comments on mayfly species voltinism generally apply well to the New Hampshire populations. His decisions are given in the "Notes" section for the species treated below, and unless there is a conflict with the data we have collected, no further comments are made. Several additional studies in the early 1980's (Harper & Harper, 1982, 1984; Harper *et al.*, 1983) for southeastern Canada are cited where they provide additional information on species collected during this study. We have adopted a simple set of Clifford's categories, with the addition of the "univoltine spring or spring/early summer cycle," that provides a more accurate description of the life cycle of several species for the seasonal/climatic variation found in New Hampshire:

**Univoltine winter cycle:** those species where small larvae appear from July to October and grow throughout the winter, with mature larvae found in the spring or early summer. Termed an "extended" univoltine winter cycle when mature individuals are found from spring through the summer.

**Univoltine spring or spring/early summer cycle:** those species that are present as small larvae or larvae appear shortly after the initiation of sampling in mid-spring, with maturation of these larvae during the spring or by early summer.

**Univoltine summer cycle:** those species that first appear as small larvae in the late spring or early summer, and are mature by the middle or end of summer.

**Bivoltine or multivoltine:** those species with two or more generations that mature during the summer. Several species in the Baetidae and Isonychiidae have clusters of mature individuals appearing in early and late summer, or throughout the summer, particularly in southern New Hampshire rivers.

**Two-year semivoltine cycle:** only one riverine species seems to follow this cycle, *Ephemera varia* Eaton. There are two different size classes when blackwings appear in the Gale River, and semivoltinism is common in the family Ephemeridae (Clifford, 1982).

## RESULTS

### DIVERSITY ANALYSIS

The tree (Fig. 2) produced by the cluster analysis has three distinct large clusters, rather than the two (northern and southern) expected. Familiarity with the sites immediately suggested the importance of water temperatures and general location in the state in determining species associations. The outlying cluster of 6 rivers holds the coldest northern rivers (late July range 16-19°C). The largest cluster holds two separate groups, eight northern warmer rivers (late July range 18-21°C), and the nine southern rivers (late July range 21-25°C). Three rivers



(two northern, one southern) are outliers to this group - all are small, densely-shaded, and downstream from large marshes or bogs. These three rivers move around widely in the tree when other clustering algorithms are tried, but the three primary clusters remain stable. The diversity pattern indicate that the White Mountain region and southern New Hampshire do have a group of species unique to each area within this regional analysis, and recognition of these two areas will be useful in discussing faunas.

The robustness of these groups inspired an analysis of species distributions, and the collection data reveals that 31 species were collected in the White Mountain region that were either restricted to that area, or were found additionally in one southern river; 23 species were either restricted to southern rivers, or were found additionally in one northern river (Table 1). This difference is further enhanced by many of the remaining species being clearly more common/occurring in more streams in one region than the other.

Table 1. Species from study strongly associated with either the White Mountain region or southern rivers. NE = species known only from New England and adjacent Canada.

White Mountain species - 31	Southern NH species - 23
<b>Appalachian/Northeast Boreal</b>	<b>Appalachian/Northeast Boreal</b>
- cold streams	- slower, warmer streams
<i>Ameletus browni</i> - NE	<i>Arthroplea bipunctata</i>
<i>Ameletus cryptostimulus</i>	<i>Acentrella parvula</i>
<i>Ameletus tertius</i>	<i>Centroptilum minor</i>
<i>Ameletus walleyi?</i> NE	<i>Heterocloeon anoka</i>
<i>Centroptilum album</i> (lentic)	<i>Heterocloeon curiosum</i>
<i>Centroptilum semirufum</i> (lentic)	<i>Procloeon rufostrigatum</i>
<i>Plauditus gloveri</i>	<i>Leucrocuta hebe</i>
<i>Baetisca berneri</i>	<i>Leucrocuta juno</i>
<i>Baetisca carolina</i>	<i>Maccaffertium pudicum</i>
<i>Baetisca laurentina</i>	<i>Tricorythodes mosegus</i>
<i>Baetisca rubescens</i> - NE	<i>Leptophlebia intermedia</i>
<i>Brachycercus nitidus</i>	<i>Leptophlebia nebulosa</i>
<i>Attenella margarita</i> (boreal)	<i>Anthopotamus distinctus</i>
<i>Ephemera varia</i>	<b>Appalachian /Midwest species</b>
<i>Cinygmula subaequalis</i>	<i>Procloeon simplex</i>
<i>Epeorus fragilis</i>	<i>Eurylophella prudentialis</i>
<i>Heptagenia pulla</i>	<i>Eurylophella temporalis</i>
<i>Nixe perfida</i>	<i>Maccaffertium mediopunctatum</i>
<i>Rhithrogena impersonata</i>	<i>Maccaffertium terminatum</i>
<i>Rhithrogena jejeuna</i>	<i>Stenonema femoratum</i>
<i>Rhithrogena manifesta</i>	<b>Widespread</b>
<i>Habrophlebiodes americana</i>	<i>Plauditus punctiventris</i>
<i>Leptophlebia johnsoni</i> (cool slow streams)	<i>Leucrocuta maculipennis</i>
<b>Appalachian/Midwest species</b>	<b>Boreal, slow rivers</b>
<i>Ameletus ludens</i>	<i>Siphloplecton basale</i>
<i>Acerpenna macdunnoughi</i>	<i>Siphonurus alternatus</i>
<i>Plauditus cestus</i>	
<i>Drunella lata</i>	
<i>Ephemerella excrucians</i>	
<i>Maccaffertium luteum</i>	
<b>Widespread in cool streams</b>	
<i>Baetis tricaudatus</i>	
<i>Plauditus virilis</i>	

All of these species are more widely distributed than just New Hampshire, and all but three are found more widely than New England and the adjacent Canadian provinces. Differences in biogeographic patterns were investigated as one approach to resolve the regional differences found in New Hampshire. Examination of the known distributions of these species reveals a few common biogeographic patterns that could be synthesized from the literature:

**Appalachian/Northeast Boreal** - found along the Appalachian Mountains to eastern Canada, and often west to the northern Midwest states/Ontario or even the Canadian plains provinces. Species common in the northern Appalachian region.

**Appalachian/Midwest** - a similar pattern but more southern, species common in the Midwest, with records from New England/Maritime provinces representing the extreme northern limit of their range.

**Boreal** - widespread through eastern Canada, with New England forming the southern limit of their range.

**Widespread** - throughout eastern North America, and often ranging to the Pacific Northwest

The Appalachian/Northeast Boreal pattern forms the largest group for New Hampshire, holding 36 of the 54 species in Table 1 (based on compilations of data from Randolph & McCafferty, 1998; Unzicker & Carlson, 1982; Anonymous, 2006, Mayfly Central; all relevant generic revisions). This pattern is shared between the two groups, and in itself does not provide an explanation for the difference between the two regions in New Hampshire. Careful reading of the literature reveals that many of the White Mountain species are known to prefer cold streams, while many of those found only in the southern New Hampshire are known to prefer slower, warmer, and/or larger streams and rivers. Average temperature for the southern rivers was 14.1°C in late May (SE 0.24), and 23.2°C (SE 0.41) in late July, and for northern rivers it was 11°C in late May (SE 0.66), and 19.7°C in early August (0.42). While these temperatures were taken in different years for the two areas, they are strongly suggestive that the White Mountain species will be found at higher elevations of the Appalachian region where streams are colder, while those typical of the southern New Hampshire rivers will be found more at intermediate elevations and the coastal plain. Unzicker and Carlson (1982) provide a more thorough analysis of this situation for North Carolina, covering some of the species treated here.

#### SEASONALITY

Most of the species exhibit well-defined univoltine patterns of seasonality, except for many species of Baetidae, which tend to be bi- or multivoltine (Clifford, 1982). A few species seem to have seasonally extended winter univoltine patterns (*Stenacron interpunctatum* (Say), *Epeorus pleuralis* (Banks), *Epeorus vitreus* (Walker)), where mature larvae may be taken throughout the season. Species that were represented by very few specimens are difficult to place into a seasonal pattern without additional information, and thus often were not placed for this discussion. Summer water temperatures are generally lower for northern rivers, but unfortunately between-year differences in climate, and different water tem-

perature dates in those years does not readily permit a definitive statement relative to comparative peak emergence times. However, these differences show up clearly in the species that are equally common in both areas of the state, such as *Siphonurus typicus* Eaton, with a spring univoltine cycle (larvae present from May to June) in southern New Hampshire, and a summer univoltine cycle (larvae present from June to August) in the White Mountain region.

Seasonal cycles and representative members from this study are as follows (generic names organized in alphabetical order by family and genus, as in the following species list; supporting data given in the notes section for each species discussion):

**Univoltine winter cycle** (37 species): most *Ameletus* (5), all *Baetisca* (4), most *Ephemerella* (6), some *Eurylophella* (5), most *Epeorus* (2), *Heptagenia flavescens*, most *Maccaffertium* (6), most *Rhithrogena* (3), most *Leptophlebia* (3), *Siphloplecton basale*, *Anthopotamus distinctus*.

**Univoltine spring, spring/early summer cycle** (21 species): *Ameletus tertius*, *Arthroplea bipunctata*, *Acentrella parvula*, *Heterocloeon anoka*, all *Drunella* (3), *Ephemerella dorothea*, some *Eurylophella* (4), *Serratella deficiens*, *Cinygmula subaequalis*, *Leucrocuta junco*, *Rhithrogena manifesta*, *Leptophlebia johnsoni*, most *Siphonurus* (4).

**Univoltine summer cycle** (27 species): some *Baetis* (2), *Heterocloeon curiosum*, some *Plautidius* (3), *Brachycercus nitidus*, *Attenella* (2), *Dannella simplex*, most *Serratella* (2), *Epeorus fragilis*, *Heptagenia pulla*, some *Leucrocuta* (2), all *Nixe* (2), *Isonychia obscura*, all *Tricorythodes* (2), *Habrophlebia vibrans*, *Habrophlebiodes americana*, some *Paraleptophlebia* (2), some *Siphonurus* (2).

**Bi- or multivoltine cycle** (19 species, mainly Baetidae): most *Baetis* (4), some *Plautidius* (3), most *Procloeon* (3), *Pseudocloeon frondale*, *Caenis latipennis*, *Leucrocuta minerva*, *Isonychia bicolor*, plus 5 others.

**Two-year semivoltine cycle:** *Ephemera varia*.

#### SPECIES RECORDS AND BIOLOGICAL NOTES

\*\*Species not taken during this study, but known from New Hampshire.

\* New state records.

#### AMELETIDAE

\**Ameletus browni* McDunnough, 1933: [*Northern Rivers*]: Ellis River at Pinkham Notch, VI-17-2004 (1, kick, **mature**), X-2-2004 (1, net). **Notes:** Univoltine winter cycle; only taken from northern rivers. A mature specimen was taken in June, and a small specimen in October from the coldest river surveyed. Maine larvae were taken from April-June, and adults in June (Burian & Gibbs, 1991).

\**Ameletus cryptostimulus* Carle, 1978: [*Northern Rivers*]: East Branch Saco River, V-11-2005 (1, net), VI-8-2005 (1, net). Ellis River at Pinkham Notch, VI-17-2004 (4, kick, **mature**), IX-6-2004 (1, kick). Moose River, V-11-2005 (1, net), VII-8-2004 (1, net, **mature**). Pemigewasset River - Woodstock, V-19-2005 (12, net), VI-8-2005 (2, net, **mature**). **Notes:** Univoltine winter cycle; taken only from northern rivers. Larvae were first found in May, with mature specimens appearing in June and July; the specimen collected in September was small.

\**Ameletus lineatus* Traver, 1932: [*Northern Rivers*]: Bog Brook, V-18-2004 (1 net). Ellis River, V-11-2005 (2, net), V-18-2004 (2, net). Ellis River at Pinkham Notch, V-11-2005 (1, net). Gale River, V-11-2005 (10, net), V-18-2004 (5, net), VI-3-2004(4, net). Moose River, VI-3-2004 (1, net). [*Southern Rivers*]: Coheco River, IV-19-2005 (1, net). Piscataquog River, V-5-2003 (1, kick). Piscataquog River - Middle Branch, V-5-2003 (1, net). **Notes:** Univoltine winter cycle; taken primarily with nets. Larvae were present from April to June. In Maine larvae were also taken from May-June, with adults collected in May (Burian & Gibbs, 1991).

\**Ameletus ludens* Needham, 1905: [*Northern Rivers*]: Ellis River, V-18-2004 (1, net). Gale River, V-18-2004 (5, net). Moose River, VI-3-2004 (1, net). **Notes:** Univoltine winter cycle; taken only by net in northern rivers. Larvae were collected in May and June, as were larvae from Maine (Burian & Gibbs, 1991).

\**Ameletus tertius* McDunnough, 1938: [*Northern Rivers*]: Ammonoosuc River, V-11-2005 (1, kick), V-18-2004 (1, kick), VI-13-2004 (5, net, **blackwing**). Androscoggin River, VI-17-2004 (1, kick). East Branch Saco River, V-18-2004 (1, kick; 6, net), VI-3-2004 (3, kick), VI-8-2005 (1, net), VI-17-2004 (1, net), VI-23-2005 (17, net, **blackwing**). Ellis River, V-18-2004 (2, kick), VI-3-2004 (1, kick; 3, net, **blackwing**). Ellis River at Pinkham Notch, VII-8-2004 (1, net, **blackwing**). Gale River, V-11-2005 (1 kick, 2 net). Moose River, V-11-2005 (1, kick), VI-3-2004 (1, net). Moosilauke Brook, V-19-2005 (1, kick; 1, net), VI-3-2004 (8, kick), VI-17-2004 (7, kick). Peabody River - unnamed branch, V-18-2004 (1, kick), VI-3-2004 (2, kick), VI-8-2005 (11, kick). Pemigewasset River - Lincoln, V-19-2005 (1, kick), VI-3-2004 (1, kick). Pemigewasset River - Woodstock, V-19-2005 (2, kick, 35, net), VI-8-2005 (1, kick; 89, net, **blackwing**), VI-23-2005 (7, net, **blackwing**). **Notes:** Univoltine spring cycle; found only in northern rivers. Larvae were present from May [small in size] to July. Blackwings appeared primarily in June, with one collection in July. In Maine larvae were found from May to June, and adults in June (Burian & Gibbs, 1991)

\**Ameletus walleyi*? Harper, 1970: [*Northern Rivers*]: Peabody River - unnamed branch, V-11-2005 (1, kick), V-18-2004 (1, kick). **Notes:** Univoltine winter cycle; two large individuals were taken from a small, cold stream in May. These specimens are not members of the other eastern species of *Ameletus*, and share the gill characteristics of the western members of this group, as does *A. walleyi* from Ontario. The larva of this species is still undescribed, and so we tentatively place these specimens as members of this species.

#### ARTHROPLEIDAE

*Arthroplea bipunctata* (McDunnough, 1924): [*Southern Rivers*]: Coheco River, V-5-2003 (15, net), V-17-2003 (14, net), VI-4-2003 (4, net). Piscataquog River, V-5-2003 (4, net), V-17-2003 (2, net). **Notes:** Clifford (1982) reports a univoltine summer cycle, but this is clearly a univoltine spring cycle for rivers in New Hampshire. Collected from May to early June in two southern rivers by nets in grassy areas where the water was moving slowly. In Maine larvae and adults were found from May to June (Burian & Gibbs, 1991).

## BAETIDAE

\**Acentrella parvula* (McDunnough, 1932): [*Southern Rivers*]: Nissitissit River, VI-7-2005 (1, kick; 2 net). Piscataquog River, VI-4-2003 (1, kick). Piscataquog River - Middle Branch, VI-16-2003 (1, net, **blackwing**). **Notes:** Univoltine spring cycle. An uncommon species, taken only in June from three southern rivers. The single blackwing was taken in June.

\**Acentrella turbida* (McDunnough, 1924): [*Northern Rivers*]: Ammonoosuc River, VI-3-2004 (2, kick), VI-17-2004 (2, kick), VII-8-2004 (1, kick), X-2-2004 (14, kick). Androscoggin River, VI-3-2004 (4, kick, **blackwing**), VI-17-2004 (3, kick), VII-23-2004 (1, kick), IX-6-2004 (2, kick), X-2-2004 (10, kick, **blackwing**). Bearcamp River, VI-3-2004 (1, net). East Branch Saco River, VI-3-2004 (41, kick, **blackwing**), VI-17-2004 (3, kick), VI-23-2005 (21, kick, **blackwing**), IX-6-2004 (4, kick, **blackwing**), X-2-2004 (15, kick, **blackwing**). Ellis River, VI-3-2004 (1, kick, **blackwing**), VI-17-2004 (6, kick, **blackwing**; 1, net, **blackwing**), IX-6-2004 (3, kick, **blackwing**), X-2-2004 (25, kick, **blackwing**). Gale River, VI-3-2004 (1, net), VII-8-2004 (6, kick), IX-6-2004 (1, kick). Moose River, IX-6-2004 (3, kick, **blackwing**), X-2-2004 (11, kick, **blackwing**). Moosilauke Brook, VI-17-2004 (2, kick, **blackwing**). Pemigewasset River - Lincoln, VII-8-2004 (1, kick). Pemigewasset River - Woodstock, VII-5-2005 (2, net), VIII-25-2005 (1, kick). [*Southern Rivers*]: Contoocook River, VI-4-2003 (1, kick), VIII-25-2003 (1, kick). Merrimack River, VIII-25-2003 (2, kick), IX-16-2003 (2, kick, **blackwing**). Otter Brook, VII-23-2003 (1, kick). Piscataquog River, V-17-2003 (3, kick), VII-23-2003 (1, kick). Piscataquog River - Middle Branch, V-17-2003 (1, kick). Piscataquog River - South Branch, VIII-25-2003 (1, kick). South Branch Ashuelot River, IX-16-2003 (2, net). **Notes:** Bivoltine, with blackwings being taken in June, and in September-October (this pattern most distinct at the East Branch of the Saco River). Larvae were present from May to October, while in Maine larvae were taken from June to September, and the adults in July (Burian & Gibbs, 1991; as *A. carolina* (Banks)).

\**Acerpenna macdunnoughi* (Ide, 1937): [*Northern Rivers*]: Bog Brook, V-19-2005 (1, net). Chocorua River, V-11-2005 (38, net), VI-3-2004 (11, kick, **blackwing**; 5, net), VI-17-2004 (1, kick; 1, net), VII-8-2004 (8, net, **blackwing**), VII-23-2004 (1, net). East Branch Saco River, VI-23-2005 (1, net). Ellis River, VI-3-2004 (4, net, **blackwing**). Gale River, V-18-2004 (1, net), VI-3-2004 (2, net). Moose River, VI-17-2004 (3, net, **blackwing**). Moosilauke Brook, VI-3-2004 (2, kick), VI-17-2004 (2, kick). Pemigewasset River - Lincoln, VII-8-2004 (1, kick). Pemigewasset River - Woodstock, VI-8-2005 (1, net), VI-23-2005 (2, net, **blackwing**), VIII-9-2005 (1, kick; 1, net), VIII-25-2005 (2, net). [*Southern Rivers*]: Otter Brook, IV-17-2005 (2, net). **Notes:** Clifford (1982) reports a bivoltine winter-summer cycle, which may be correct for New Hampshire, while Harper and Harper (1984) found a 3-4 generations in Ontario. Larvae were present from May to August in northern rivers, and were found in April in one southern river. Blackwings were taken in June and July. In Maine larvae were taken from March to August, and the adults from May to August (Burian & Gibbs, 1991).

\**Acerpenna pygmaea* (Hagen, 1861): [*Northern Rivers*]: Bearcamp River, V-19-2005 (1, net, **blackwing**). Chocorua River, V-11-2005 (2, kick, **mature**), VI-3-2004 (1, kick). East Branch Saco River, VI-8-2005 (1, net). Swift River, VI-3-2004 (5, net, **blackwing**). [*Southern Rivers*]: Lamprey River, V-14-2004 (7, net, **blackwing**), VI-18-2004 (5, net, **blackwing**), VII-14-2004 (13, net, **blackwing**), VII-28-2004 (3, net, **blackwing**), VIII-25-2005 (1, kick, **blackwing**). Nissitissit River, VI-7-2005 (3, net). Piscataquog River, VI-4-2003 (4, kick). Piscataquog River - South Branch, VI-4-2003 (1, net). **Notes:** Clifford (1982) indicates a bivoltine winter-summer cycle; it does appear to be at least a bivoltine cycle in New Hampshire based on data from the Lamprey River. Data from Harper *et al.* (1983) indicates a possible trivoltine cycle in Quebec. Larvae and blackwings were collected from May to August, with most being taken with nets. In Maine larvae were taken from April to August, with adults present from July to August (Burian & Gibbs, 1991).

*Baetis brunneicolor* McDunnough, 1925: [*Northern Rivers*]: Ammonoosuc River, VI-17-2004 (1, net), VII-8-2004 (1, kick), VII-23-2004 (5, kick, **blackwing**; 1, net, **blackwing**), X-2-2004 (1, kick, **blackwing**). Androscoggin River, VII-23-2004 (1, kick), IX-6-2004 (5, kick), X-2-2004 (1, kick). Bearcamp River, VI-3-2004 (1, net), VI-17-2004 (8, kick, **blackwing**), VII-8-2004 (19, kick, **blackwing**), VII-23-2004 (2, kick), X-2-2004 (9, kick, **blackwing**). Bog Brook, VI-17-2004 (3, kick). Chocorua River, VI-17-2004 (4, kick; 6, net), VII-8-2004 (1, kick). East Branch Saco River, VII-8-2004 (4, kick), VII-23-2004 (7, kick, **blackwing**), IX-6-2004 (6, net). Ellis River, VII-8-2004 (5, kick, **blackwing**), VII-23-2004 (60, kick, **blackwing**), VIII-13-2004 (3, kick), IX-6-2004 (13, kick, **blackwing**). Gale River, V-11-2005 (9, net, **blackwing**), VII-8-2004 (1, kick), VII-23-2004 (5, kick, **blackwing**; 1, net, **blackwing**), X-2-2004 (1, kick, **blackwing**). Moose River, IX-6-2004 (1, kick). Moosilauke Brook, IX-6-2004 (51, kick, **mature**). Peabody River, IX-6-2004 (2, kick). Pemigewasset River - Woodstock, IX-13-2005 (1, net, **blackwing**). Swift River, VIII-8-2004 (1, kick, **blackwing**). [*Southern Rivers*]: Cochecho River, VIII-25-2003 (1, net). Contoocook River, VI-4-2003 (3, kick, **blackwing**), VI-16-2003 (9, kick), VIII-6-2003 (1, kick), VIII-25-2003 (18, kick, **blackwing**), IX-16-2003 (6, kick). Lamprey River, VI-18-2004 (1, net), VIII-25-2005 (1, kick, **blackwing**). Nissitissit River, VI-28-2005 (10, kick). Otter Brook, VIII-6-2004 (1, kick; 2, net), IX-16-2003 (10, kick, **blackwing**). Piscataquog River, VI-4-2003 (5, net), VI-16-2003 (10, kick, **blackwing**), VII-23-2003 (3, kick, **blackwing**), VIII-6-2003 (3, kick, **blackwing**). Piscataquog River - Middle Branch, V-5-2003 (1, net), VI-4-2003 (1, kick; 1, net), VI-16-2003 (1, kick), VIII-25-2003 (2, kick), IX-16-2003 (4, kick; 1, net). Piscataquog River - South Branch, V-5-2003 (1, net), V-17-2003 (5, net), VI-16-2003 (1, kick), VII-23-2003 (2, kick), VIII-6-2003 (3, kick, **blackwing**), VIII-25-2003 (5, kick; 3, net). Souhegan River, VI-11-1998 (52, kick; 8 Surber), VII-31-1998 (2, kick). South Branch Ashuelot River, VI-4-2003 (1, net), VI-16-2003 (1, kick; 2, net), VII-23-2003 (1, kick), IX-16-2003 (6, kick, **blackwing**). **Notes:** Clifford (1982) reports a variable cycle (uni- or bivoltine); this species appears to have at least a bivoltine summer cycle in New Hampshire. Larvae were present from May to October, with blackwings being taken from June to September in southern rivers, and in May, July and September/October in northern rivers. The Gale river had three separate periods of appearance of blackwings, with the May emergence

probably representing an overwintering third generation in the larval stage. In Maine larvae were taken from May to September, with adults appearing from June to August (Burian & Gibbs, 1991).

*Baetis flavistriga* McDunnough, 1921: [*Northern Rivers*]: Ammonoosuc River, VI-17-2004 (7, kick, **blackwing**; 9, net, **blackwing**), VII-8-2004 (8, **mature**). Androscoggin River, VII-8-2004 (1, kick), IX-6-2004 (2, kick, **blackwing**), X-2-2004 (1, kick). Bearcamp River, VI-17-2004 (1, kick). East Branch Saco River, VI-3-2004 (1, kick), VII-8-2004 (2, kick, **blackwing**), VII-23-2004 (1, kick, **blackwing**), IX-6-2004 (6, kick, **blackwing**), X-2-2004 (1, net, **blackwing**). Ellis River, VI-17-2004 (41, kick, **blackwing**; 4, net), VII-8-2004 (3, kick, **blackwing**), VII-23-2004 (5, kick, **blackwing**), VIII-13-2004 (14, kick, **blackwing**), IX-6-2004 (23, kick, **blackwing**). Ellis River - Pinkham Notch, VII-23-2004 (9, kick, **blackwing**; 5, net). Gale River, VI-17-2004 (30, kick, **blackwing**), IX-6-2004 (6, kick), X-2-2004 (1, kick, **blackwing**). Ellis River at Pinkham Notch, VII-23-2004 (9, kick, **blackwing**; 5, net). Moose River, VI-17-2004 (1, net), VII-8-2004 (12, kick, **mature**), VII-23-2004 (1, kick). Moosilauke Brook, VI-17-2004 (10, kick), VII-8-2004 (25, kick, **blackwing**), VII-23-2004 (7, kick, **blackwing**), IX-6-2004 (22, kick, **blackwing**), X-2-2004 (2, kick, **blackwing**). Peabody River, VII-23-2004 (1, kick), IX-6-2004 (1, kick). Pemigewasset River - Lincoln, VII-8-2004 (1, kick). Pemigewasset River - Woodstock, VI-23-2005 (24, net), VII-5-2005 (79, kick, **blackwing**; 11, net), VII-25-2005 (5, kick), VIII-9-2005 (7, kick), VIII-25-2005 (62, kick), IX-13-2005 (8, kick, **blackwing**). Swift River, VI-17-2004 (2, kick), IX-6-2004 (3, kick). [*Southern Rivers*]: Cochecho River, VI-4-2003 (1, kick; 2, net), VI-16-2003 (1, kick), VIII-6-2003 (1, kick). Contoocook River, VI-4-2003 (9, kick, **blackwing**; 3, net, **blackwing**), VI-16-2003 (1, kick), VII-11-2003 (1, kick), VIII-6-2003 (2, kick), VIII-25-2003 (3, kick, **blackwing**), IX-16-2003 (4, kick; 4, net, **blackwing**). Merrimack River, VII-23, 2003 (1, kick; 1, net). Otter Brook, VII-11-2003 (1, kick), IX-16-2003 (1, kick; 1, net, **blackwing**). Piscataquog River, VI-4-2003 (3, kick), VI-16-2003 (2, kick). Piscataquog River - Middle Branch, VI-4-2003 (2, kick, **blackwing**). Piscataquog River - South Branch, VI-4-2003 (1, kick). Souhegan River, V-27-1998 (4, kick; 8, Surber), VI-4-1998 (4, Surber; VI-11-1998 (24, kick; 12, Surber). South Branch Ashuelot River, VI-4-2003 (13, kick), VI-16-2003 (7, kick, **blackwing**), VII-11-2003 (3, kick), VII-23-2003 (1, kick), IX-16-2003 (3, kick). **Notes:** Clifford (1982) indicates a seasonal bivoltine cycle, and Harper and Harper (1984) 3-4 generations in the year. This species is at least bivoltine in New Hampshire. Larvae are present from late May to October, with blackwings present during June/July and September/October in the northern rivers, and in the southern rivers blackwings are present in June and in August/September. In Maine larvae were taken from May to September, and adults from June to August (Burian & Gibbs, 1991).

\**Baetis intercalaris* McDunnough, 1921: [*Northern Rivers*]: East Branch Saco River, IX-6-2004 (11, kick, **blackwing**). Gale River, IX-6-2004 (2, kick, **blackwing**). Pemigewasset River - Lincoln, VII-8-2004 (1, kick). Pemigewasset River - Woodstock, VI-8-2005 (2, net). [*Southern Rivers*]: Cochecho River, VI-16-2003 (3, kick), VIII-25-2003 (2, net, **blackwing**), IX-16-2003 (2, kick, **blackwing**). Contoocook River, VI-4-2003 (1, net), VIII-6-2003 (2, kick, **blackwing**), VIII-25-2003 (2, net), IX-16-2003 (2, net, **blackwing**). Merrimack

River, VII-23-2003 (1, kick), VIII-25-2003 (80, kick, **blackwing**), IX-16-2003 (35, kick, **blackwing**). Otter Brook, IV-17-2005 (2, net), VIII-6-2003 (1, kick), IX-16-2003 (1, kick). Piscataquog River, VI-4-2003 (1, kick, **blackwing**), VII-23-2003 (1, kick), VIII-25-2003 (1, kick). Piscataquog River - Middle Branch, VI-16-2003 (2, kick, **blackwing**), VII-11-2003 (1, kick), VIII-6-2003 (2, kick, **blackwing**). Piscataquog River - South Branch, V-17-2003 (1, kick), VI-16-2003 (1, net, **blackwing**). Souhegan River, VI-11-1998 (6, kick). South Branch Ashuelot River, V-5-2003 (2, net), V-17-2003 (1, net). **Notes:** Clifford (1982) indicates a univoltine summer cycle; possibly a bivoltine summer cycle in southern New Hampshire based on data from the Middle Branch of the Piscataquog River. In southern rivers larvae were present from May to September, and blackwings appeared in June and in August/September. In northern rivers the first larvae were seen in July, and blackwings appeared in September. In Maine larvae and adults were taken from June to August (Burian & Gibbs, 1991).

*Baetis pluto* McDunnough, 1925: [*Northern Rivers*]: Ammonoosuc River, VI-17-2004 (1, net). Bearcamp River, VI-3-2004 (2, net). Ellis River, VI-17-2004 (1, net). Pemigewasset River - Woodstock, VII-5-2005 (2, net). [*Southern Rivers*]: Cochecho River, VI-16-2003 (3, kick). Contoocook River, VIII-6-2003 (2, kick, **blackwing**). Nissitissit River, VI-7-2005 (1, kick). Piscataquog River, VI-28-2005 (5, kick). **Notes:** Univoltine summer cycle; uncommon, taken by net in northern rivers, and by kick-sampling in southern rivers. Most records are from June, with single collections in July and August - the one blackwing was taken in early August. In Maine larvae were present from June to July (Burian & Gibbs, 1991).

\**Baetis tricaudatus* Dodds, 1923: [*Northern Rivers*]: Ammonoosuc River, V-11-2005 (8, kick; 3, net), V-18-2004 (1, kick; 8 net), VI-3-2004 (1, kick, **blackwing**). Androscoggin River, V-11-2005 (13, kick, **blackwing**), VII-8-2004 (1, kick). Bearcamp River, V-11-2005 (9, kick; 2, net), VI-3-2004 (1, kick; 1, net). East Branch Saco River, V-11-2005 (42, kick; 45, net), V-18-2004 (8, kick), VI-3-2004 (7, kick). Ellis River, V-11-2005 (23, kick; 3, net), V-18-2004 (1, kick; 6, net, **blackwing**), VI-3-2004 (2, net), VI-8-2005 (21, kick, **blackwing**; 5, net), VI-23-2005 (5, kick, **blackwing**; 2, net, **blackwing**), VII-8-2004 (3, kick, **blackwing**), VII-23-2004 (9, kick, **blackwing**), IX-6-2004 (54, kick, **blackwing**). Ellis River at Pinkham Notch, VI-17-2004 (37, kick; 4, net, **blackwing**), VII-8-2004 (4, kick, **blackwing**), VII-23-2004 (5, kick, **blackwing**), IX-6-2004 (7, kick, **blackwing**). Gale River, V-11-2005 (18, kick, **blackwing**), V-18-2004 (2, kick; 2, net, **blackwing**). Moose River, V-18-2004 (3, kick), VI-3-2004 (1, kick; 3, net, **blackwing**), VI-17-2004 (3, kick; 2, net), VII-8-2004 (2, kick; 2, net, mature). Moosilauke Brook, V-19-2005 (15, kick, **blackwing**; 15, net, **blackwing**), VI-17-2004 (1, kick), VII-23-2004 (9, kick, **blackwing**), IX-6-2004 (14, kick). Peabody River, V-18-2004 (12, kick), VI-3-2004 (11, kick; 1, net), VI-17-2004 (3, kick, **blackwing**; 2, net). Peabody River - unnamed branch, V-18-2004 (6, kick), VI-3-2004 (1, kick; 2, net, **blackwing**), VI-8-2005 (2, kick), VI-17-2004 (2, kick). Pemigewasset River - Lincoln, V-18-2004 (2, kick, **blackwing**), V-19-2005 (3, kick). Pemigewasset River - Woodstock, V-19-2005 (24, kick, **blackwing**; 114, net, **blackwing**), VI-8-2005 (12, kick; 26, net), VI-23-2005 (3, kick), VII-5-2005 (4, net), VII-25-2005 (4, kick), VIII-25-2005 (7, kick, **blackwing**). Swift River, V-11-2005 (1, kick), V-18-2004 (1, kick, **blackwing**). [*Southern Rivers*]: Merrimack River, VII-23-2003 (1, net). **Notes:** Clifford (1982) reports at least a



bivoltine cycle, and Harper and Harper (1984) found 3-4 generations. Appearing to be at least a winter/summer trivoltine cycle in New Hampshire, with one generation overwintering as larvae. Larvae and blackwings are present from May to September, and were taken nearly entirely from northern rivers. In Maine larvae were taken from April to September, and adults from June to August (Burian & Gibbs, 1991).

*Callibaetis ferrugineus* (Walsh, 1862): [*Northern Rivers*]: Pemigewasset River - Woodstock, VIII-9-2005, lagoon (1, net). **Notes:** One specimen was taken in a weedy lagoon. In Maine larvae were found from April to July, and adults from May to September (Burian & Gibbs, 1991).

\**Callibaetis pretiosus* Banks, 1914: [*Southern Rivers*]: Merrimack River, X-23-2003 (1, net). **Notes:** Clifford (1982) reports this species as being polyvoltine in the southern portion of its range, but may have a summer univoltine cycle in New Hampshire. A small larva was taken in a backwater area in October. In Maine larvae and adults were taken in August (Burian & Gibbs, 1991).

\**Centroptilum album* (McDunnough, 1926): [*Northern Rivers*]: Bearcamp River, VI-17-2004 (4, net, **blackwing**). Swift River, VI-17-2003 (1, net). **Notes:** Uncommon in rivers. The larvae (including blackwings) were taken with nets from two northern rivers in June.

\**Centroptilum minor* (McDunnough, 1926): [*Southern Rivers*]: Lamprey River, VI-1-2004 (5, kick), VI-18-2004 (6, net), VII-14-2004 (3, net), VII-28-2004 (1, net). Piscataquog River, VIII-6-2003 (1, net, **blackwing**). **Notes:** Uncommon in rivers. Taken using nets in southern rivers. The larvae were found from June to August; the blackwing was taken in August.

\**Centroptilum semirufum* (MacDunnough, 1926): [*Northern Rivers*]: Bearcamp River near West Ossipee, VII-13-2005 (1, net). Chocorua River, VI-17-2004 (1, net, **blackwing**). **Notes:** Univoltine summer cycle? Uncommon, larvae taken in June and July from two of the slower, more enriched sites in the northern rivers. One blackwing was collected in June using a net. In Maine a male was collected in July (Burian & Gibbs, 1991).

\**Centroptilum triangulifer* (McDunnough, 1931): [*Northern Rivers*]: Gale River, IX-6-2004 (1, net, **blackwing**). Pemigewasset River - Woodstock, VIII-9-2005 (1, net). [*Southern Rivers*]: Cocheco River, V-17-2003 (3, net); VIII-27-2003 (1, net). Lamprey River, VI-18-2004 (1, net), IX-13-2005 (1, net). Otter Brook, VII-11-2003 (8, net, **blackwing**), VII-23-2003 (3, net, **blackwing**). Piscataquog River, VIII-6-2003 (2, net), VIII-25-2003 (1, net). Piscataquog River - South Branch, VII-23-2003 (2, net), VIII-25-2003 (2, net, **blackwing**). **Notes:** Clifford (1982) lists this species as being polyvoltine based on data from a pond study, and riverine populations may be bivoltine in southern New Hampshire, based on blackwings appearing in July and late August. Larvae were present from May to September, with single records from May and June in two of the slower southern rivers. This species was slightly more common in a few southern rivers, with single specimens being taken from two northern rivers. In Maine larvae were found from July to August, and the adults in August (Burian & Gibbs, 1991).

\*\**Dipheter hageni* (Eaton, 1885): [*Southern Rivers*]: Sullivan Co., Grantham (McCafferty *et al.*, 2004). Clifford (1982) reports a bivoltine cycle, with one generation overwintering as larvae, and a following summer generation. Harper and Harper (1984) found 3-4 generations in Ontario. In Maine larvae were found from May to June and in August (Burian & Gibbs, 1991).

\**Heterocloeon amplum* (Traver, 1932): [*Northern Rivers*]: Ammonoosuc River, VII-8-2004 (3, kick), VII-23-2004 (2, kick), VIII-13-2004 (1, kick), X-2-2004 (6, kick, **blackwing**). Androscoggin River, VIII-13-2004 (2, kick), IX-6-2004 (3, kick), X-2-2004 (1, kick). Bearcamp River, VI-17-2004 (2, kick, **mature**), VII-8-2004 (1, kick, **mature**). Bog Brook, VI-17-2004 (1, kick). East Branch Saco River, X-2-2004 (1, kick, **blackwing**). Ellis River, IX-6-2004 (1, kick). Gale River, VII-8-2004 (2, net, **blackwing**), X-2-2004 (3, kick, **blackwing**). Moose River, V-11-2005 (1, net). Pemigewasset River - Lincoln, X-2-2004 (1, kick). [*Southern Rivers*]: Merrimack River, VII-23-2003 (15, kick, **blackwing**), VIII-25-2003 (11, kick), IX-16-2003 (1, kick). Piscataquog River, V-17-2003 (1, kick), VIII-25-2003 (3, kick). Piscataquog River - Middle Branch, V-5-2003 (2, net), IX-16-2003 (2, kick). Souhegan River, VI-11-1998 (40, kick; 40, Surber); VII-21-1988 (2, kick; 8 Surber); VII-31-1998 (6, kick); VIII-17-2004 (4, kick; 6, Surber), VIII-26-1998 (18 kick; 6, Surber). **Notes:** Univoltine or bivoltine summer cycle. Blackwings were generally taken in July (warmer, southern rivers), and in September-October (colder, northern rivers), though at the Gale River (northern) they were collected in both July and October. Larvae were found from May to October, and blackwings during June, July, and October. In Maine larvae were taken from April to June, and adults were collected in June (Burian & Gibbs, 1991).

\**Heterocloeon anoka* (Daggy, 1945): [*Southern Rivers*]: Lamprey River, V-14-2004 (6, net), VI-18-2004 (1, kick, **blackwing**; 7, net). Hillsborough Co., Greenville, small stream, VI-4-1998 (2, Surber, **blackwing**), VI-11-1998, J.F. Burger & D.S. Chandler (2, Surber sample). Nissitissit River, VII-25-1996, D.S. Chandler (1, Surber sample); VI-7-2005 (1, kick, **mature**), D.S. Chandler, L. Wolff, & S. Grieve. **Notes:** Possibly a univoltine spring cycle. Larvae were present from May to July in a few southern rivers, and blackwings were taken in June.

\**Heterocloeon curiosum* (McDunnough, 1923): [*Southern Rivers*]: Coheco River, VIII-25-2003 (1, net), IX-16-2003 (2, net). Lamprey River, IX-13-2005 (1, kick). Merrimack River, VIII-25-2003 (60, kick), IX-16-2003 (3, kick, **blackwing**). Otter Brook, IX-16-2003 (1, kick). Piscataquog River, VIII-25-2003 (1, kick). Piscataquog River - South Branch, VIII-25-2003 (2, kick). **Notes:** Univoltine summer cycle. This is a late-season species with larvae present from August to September in southern rivers, with blackwings collected in September. In Maine larvae were taken from June to September, and adults in August (Burian & Gibbs, 1991).

\**Plauditus cestus* (Provonsha & McCafferty, 1982): [*Northern Rivers*]: Ammonoosuc River, VI-17-2004 (1, kick, **mature**). East Branch Saco River, VI-17-2004 (1, kick). Ellis River, VII-23-2004 (2, kick, **blackwing**). Moose River, VII-8-2004 (2, kick). Pemigewasset River - Woodstock, VII-5-2005 (1, net). **Notes:** Univoltine summer cycle. Larvae of this uncommon species were taken from June to July in northern rivers, with blackwings appearing in July.

*\*Plauditus cingulatus* (McDunnough, 1931): [*Northern Rivers*]: Bearcamp River, VI-3-2004 (11, kick, **blackwing**; 1, net). East Branch Saco River, VI-23-2005 (1, kick, **blackwing**). Gale River, VII-6-2004 (1, kick). Swift River, VI-17-2004 (4, kick, **blackwing**). [*Southern Rivers*]: Lamprey River, VIII-25-2005 (1, kick). Piscataquog River, VIII-6-2003 (2, net). **Notes**: Possibly a bivoltine summer cycle. Larvae were collected from June (blackwings) to July in northern rivers, and in August in southern rivers. Perhaps the first generation of this uncommon species was missed in the southern rivers.

*\*Plauditus dubius* (Walsh, 1862): [*Northern Rivers*]: Ammonoosuc River, VI-17-2004 (15, kick, **blackwing**), VII-23-2004 (5, kick, **blackwing**; 1, net, **blackwing**), VIII-13-2004 (3, kick, **blackwing**), X-2-2004 (4, kick). Androscoggin River, VI-17-2004 (1, kick). Bearcamp River, VI-3-2004 (2, kick, **blackwing**; 1, kick, **blackwing**), VII-18-2004 (1, kick), VII-23-2004 (1, kick), X-2-2004 (1, kick). Chocorua River, VI-3-2004 (14, kick, **blackwing**; 18, net, **blackwing**), VI-17-2004 (4, kick; 16, net). East Branch Saco River, VI-3-2004 (114, kick), VI-17-2004 (4, kick, **mature**), VI-23-2005 (36, kick), VII-23-2004 (4, kick, **blackwing**; 1, net, **blackwing**), IX-6-2004 (12, kick; 1, net), X-2-2004 (4, kick, **blackwing**). Ellis River, VI-17-2004 (48, kick, **blackwing**), VII-8-2004 (1, kick), IX-6-2004 (3, kick, **blackwing**), X-2-2004 (3, kick). Gale River, VI-3-2004 (1, kick), VI-17-2004 (23, kick; 3 net), VII-8-2004 (7, kick), VII-23-2004 (4, kick; 1, net), IX-6-2004 (15, kick; 1, net, **blackwing**). Moose River, VI-17-2004 (2, net), VII-8-2004 (2, net, **blackwing**). Moosilauke Brook, VI-17-2004 (3, kick). Pemigewasset River - Lincoln, VI-17-2004 (1, net), VII-8-2004 (1, kick), VII-23-2004 (2, kick). Pemigewasset River - Woodstock, VI-23-2005 (3, kick), VII-5-2005 (34, kick; 2, net), VII-25-2005 (1, kick), VIII-9-2005 (79, kick, **blackwing**), VIII-25-2005 (42, kick; 1, net), IX-13-2005 (23, kick, **blackwing**). Swift River, VI-3-2004 (3, kick, **blackwing**; 1, net), VI-17-2004 (1, kick, **blackwing**), IX-6-2004 (1, kick). [*Southern Rivers*]: Cochecho River, VI-4-2003 (5, kick; 2, net), VI-16-2003 (6, kick), VII-11-2003 (1, net), VII-23-2003 (6, net), VIII-6-2003 (1, kick; 1, net), VIII-25-2003 (7, kick, **blackwing**; 12, net, **blackwing**), IX-16-2003 (2, kick, **blackwing**; 3, net, **blackwing**). Contoocook River, V-17-2003 (7, kick), VI-4-2003 (8, kick, **blackwing**), VIII-25-2003 (5, kick), IX-16-2003 (5, kick). Lamprey River, V-14-2004 (1, kick; 28, net), VI-18-2004 (2, kick, **blackwing**; 2 net, **blackwing**), VII-14-2004 (2, kick; 11, net), VII-28-2004 (1, kick), IX-13-2005 (1, net, **blackwing**), X-21-2004 (1, kick; 1, net). Nissitissit River, VI-7-2005 (19, kick, **blackwing**). Otter Brook, VI-16-2003 (1, kick), VII-11-2003 (2, kick), VII-23-2003 (4, kick, **blackwing**; 1, net), VIII-6-2003 (4, kick, **blackwing**), VIII-25-2003 (7, kick; 1, net, **blackwing**), IX-16-2003 (5, kick, **blackwing**). Piscataquog River, VI-4-2003 (2, kick; 1, net), VI-16-2003 (1, kick, **blackwing**; 3, net), VIII-6-2003 (2, kick, **blackwing**; 7, net, **blackwing**), VIII-25-2003 (2, kick, **blackwing**; 1, net, **blackwing**). Piscataquog River - Middle Branch, VI-4-2003 (3, net, **blackwing**), IX-16-2003 (1, kick). Piscataquog River - South Branch, VI-4-2003 (4, kick; 2, net, **blackwing**), VI-16-2003 (1, kick), VII-23-2003 (1, kick), VIII-6-2003 (3, kick; 1, net), IX-16-2003 (3, kick). Souhegan River, V-27-1998 (8, kick; 24, Surber), VI-11-1998 (20, kick; 2, Surber); VIII-17-1998 (26, kick; 12, net). South Branch Ashuelot River, VI-4-2003 (30, kick; 1, net), VI-16-2003 (4, net, **blackwing**), VII-11-2003 (1, kick), VII-23-2003 (3, kick, **blackwing**), IX-16-2003 (18, kick, **blackwing**). **Notes**: Bivoltine (Harper & Harper, 1984) or possi-

bly multivoltine summer cycle based on data from the Lamprey and Piscataquog Rivers. Larvae of this species appeared in June for most rivers (May for the Lamprey and Souhegan Rivers). Blackwings were found in the southern rivers from June to September; in the northern rivers during June-July and September-October. In Maine larvae were taken from June to September, and adults from May to August (Burian & Gibbs, 1991).

\**Plauditus gloveri* (McCafferty & Waltz, 1998): [*Northern Rivers*]: Ammonoosuc River, VII-8-2004 (1, net). Gale River, VII-23-2004 (1, net). Swift River, VII-8-2004 (2, kick). [*Southern Rivers*]: Souhegan River, VII-21-1998 (2, Surber). **Notes:** An apparent univoltine summer cycle. Larvae were collected in July in three northern rivers and one southern river.

\**Plauditus punctiventris* (McDunnough, 1923): [*Northern Rivers*]: Chocorua River, VI-3-2004 (2, net). [*Southern Rivers*]: Cochecho River, VII-11-2003 (2, net), IX-16-2003 (2, kick). Contoocook River, VII-23-2003 (1, net). Lamprey River, V-14-2004 (6, net), VI-18-2004 (1, kick, **blackwing**; 7, net). Piscataquog River, VIII-6-2003 (1, net). Piscataquog River - Middle Branch, V-17-2003 (4, kick), VI-4-2003 (1, kick), VII-23-2003 (1, kick), VIII-25-2003 (3, kick). Souhegan River, VII-3-1998 (1, kick, **blackwing**). **Notes:** Clifford (1982) reports southern populations as being polyvoltine, and is at least bivoltine in New Hampshire based on collections from the Middle Branch of the Piscataquog River (see also Harper & Harper, 1984). Larvae were taken occasionally from May to September in southern rivers (one found in the southernmost northern river), and blackwings were found in June and July. In Maine larvae were taken from June to September, and adults in June (Burian & Gibbs, 1991).

\**Plauditus virilis* (McDunnough, 1923): [*Northern Rivers*]: Ammonoosuc River, VII-23-2004 (2, kick, **blackwing**; 1, net). Bearcamp River, VI-3-2004 (2, kick, **blackwing**). East Branch Saco River, VI-3-2004 (5, kick), VI-17-2004 (4, kick), VI-23-2005 (3, kick small cobble; 12, kick large cobble, **blackwing**; 1, net). Ellis River, VI-17-2004 (3, net, **blackwing**). Moosilauke Brook, VI-17-2004 (2, kick), VI-23-2005 (4, kick), VII-8-2004 (1, kick). **Notes:** A univoltine summer cycle. Larvae and blackwings were taken in June and July from northern rivers. In Maine larvae were taken from June to August, and adults were collected in May (Burian & Gibbs, 1991).

\**Procloeon rivulare* (Traver, 1935): [*Northern Rivers*]: Ammonoosuc River, VII-8-2004 (1, net), VII-23-2004 (3, kick). Bearcamp River, VI-17-2004 (1, kick). East Branch Saco River, VII-8-2004 (1, net), VII-23-2004 (1, kick). Gale River, VII-8-2004 (1, kick; 3, net, **blackwing**). Moose River, VII-23-2004 (2, net, **blackwing**). Moosilauke Brook, IX-6-2004 (2, kick). Pemigewasset River - Woodstock, VII-5-2005 (2, net), VII-25-2005 (4, net, **blackwing**), VIII-9-2005 (1, net), VIII-25-2005 (2, net), IX-13-2005 (1, net). Swift River, VII-8-2004 (2, kick). [*Southern Rivers*]: Bellamy River, VI-16-2003 (1, kick; 1, net), VII-23-2003 (2, net), IX-16-2003 (1, kick). Contoocook River, VI-16-2003 (1, kick; 1 net), VII-23-2003 (2, net), IX-16-2003 (1, kick). Otter Brook, VI-16-2003 (3, net). Piscataquog River - Middle Branch, VIII-25-2003 (5, kick). Piscataquog River - South Branch, VIII-6-2003 (1, kick; 3, net, **blackwing**), VIII-25-2003 (3,

net, **blackwing**). Souhegan River, VI-11-1998 (2, kick). South Branch Ashuelot River, VI-16-2003 (2, net, **blackwing**), VII-11-2003 (9, kick, **blackwing**; 1, net), VII-23-2003 (1, kick; 9, net, **blackwing**), VIII-6-003 (1, net, **blackwing**), IX-16-2003 (2, kick; 10, net, **blackwing**). **Notes:** Bivoltine or an extended univoltine summer cycle. Blackwings were found from June to September at the South Branch Ashuelot River; other rivers with blackwings collected from July to August. In Maine larvae were taken during August, and adults from July to August (Burian & Gibbs, 1991).

*Procloeon rubropictum* (MacDunnough, 1923): [*Northern Rivers*]: Bearcamp River, VI-17-2004 (4, net, **blackwing**). Gale River, IX-6-2004 (1, net). Swift River, VI-17-2004 (1, net). [*Southern Rivers*]: Contoocook River, VIII-25-2003 (4, kick), IX-16-2003 (1, kick). Otter Brook, VI-16-2003 (20, net), VII-11-2003 (1, kick; 3, net, **blackwing**), VII-23-2003 (2, net), VIII-6-2003 (1, net). Piscataquog River - South Branch, VII-23-2003 (2, net), VIII-25-2003 (2, net). **Notes:** Possible bivoltine summer cycle; uncommon in rivers. Larvae were present from June to September, with blackwings being taken in June and July. Larvae were taken almost entirely by using nets. In Maine were larvae taken from June to September, and adults from June to August (Burian & Gibbs, 1991; as *Procloeon album* and *P. convexum* (Ide)).

\**Procloeon rufostrigatum* (McDunnough, 1924): [*Northern Rivers*]: Pemigewasset River - Woodstock, VII-25-2005 (1, net), VIII-25-2005 (3, kick; 3, net, **blackwing**). [*Southern Rivers*]: Bellamy River, VI-16-2003 (25, net). Lamprey River, VI-18-2004 (84, net), VII-14-2004 (9, net). Otter Brook, VII-11-2003 (2, net), VII-23-2003 (1, net), VIII-6-2003 (1, net). Piscataquog River, VIII-6-2003 (12, net, **blackwing**). Piscataquog River - Middle Branch, VIII-25-2003 (5, kick). South Branch Ashuelot River, VII-11-2003 (2, kick, **blackwing**; 6, net, **blackwing**); IX-16-2003 (1, net, **blackwing**). **Notes:** Clifford (1982) reports a seasonal univoltine summer cycle, with this species being appearing to be at least bivoltine in New Hampshire. Larvae were present from May to September, and blackwings were taken from July to September. In Maine adults were taken from July through August (Burian & Gibbs, 1991).

\**Procloeon simplex* (MacDunnough, 1925): [*Northern Rivers*]: Bearcamp River, 0.5 km W West Ossipee, VII-23-2005, D.S. Chandler, L. Wolff, S. Grieve (1, net). [*Southern Rivers*]: Otter Brook, VII-11-1003 (2, net). **Notes:** uncommon in rivers. Larvae were taken only in July.

\**Pseudocloeon frondale* (McDunnough, 1925): [*Northern Rivers*]: Chocorua River, VI-17-2004 (11, net, **blackwing**), VII-8-2004 (1, net), VII-23-2004 (4, net). Gale River, IX-6-2004 (2, net). Pemigewasset River - Woodstock, VIII-25-2005 (1, net). [*Southern Rivers*]: Bellamy River, VI-4-2003 (5, net), VI-16-2003 (6, kick; 101, net, **blackwing**). Cochecho River, VII-11-2003 (1, net, **blackwing**), VII-23-2003 (18, net, **blackwing**), VIII-6-2003 (9, net, **blackwing**), VIII-25-2003 (20, net, **blackwing**), IX-16-2003 (4, net). Contoocook River, VI-4-2003 (1, net), VI-16-2003 (10, kick, **blackwing**), VII-23-2003 (4, net). Lamprey River, VI-18-2004 (26, net), VII-14-2004 (63, net), VII-28-2004 (3, kick), IX-13-2005 (1, net). Nissitissit River, VI-7-2005 (15, net). Otter Brook, VII-11-2003 (10, net, **blackwing**), VII-23-2003, 1, net), VIII-6-2003 (4, net), VIII-25-2003 (3, net).

Piscataquog River, VI-4-2003 (1, net), VI-16-2003 (31, net), VII-23-2003 (2, net, **blackwing**). Piscataquog River - Middle Branch, VI-4-2003 (2, net), VI-16-2003 (14, net, **blackwing**), VII-23-2003 (1, net), VIII-25-2003 (1, net). Piscataquog River - South Branch, VII-23-2003 (1, kick), VIII-6-2003 (3, net), VIII-25-2003 (1, net). South Branch Ashuelot River, VI-16-2003 (11, net), VII-11-2003 (1, net). **Notes:** Clifford (1982) reports a seasonably variable cycle (uni- or bivoltine); either an extended univoltine or bivoltine summer cycle in New Hampshire based on data from the Cocheco River. Larvae were present from June to September, with blackwings collected from June to August. This species was taken primarily with nets, and was uncommon in northern rivers. In Maine larvae were found from June to September, and adults were collected in August (Burian & Gibbs, 1991).

#### BAETISCIDAE

*\*Baetisca berneri* Tarter & Kirchner, 1978: [*Northern Rivers*]: Ammonoosuc River, V-11-2005 (1, kick), V-18-2004 (1, net, **mature**), VI-3-2004 (6, net, **mature**), VI-17-2004 (2, kick), VII-8-2004 (3, kick), VII-23-2004 (1, kick), VIII-6-2004 (32, kick), X-2-2004 (6, kick). Androscoggin River, VII-8-2004 (3, kick). Gale River, V-11-2005 (2, kick), IX-6-2004 (9, kick), X-2-2004 (3, kick). Moose River, V-11-2005 (2, kick), V-18-2004 (1, kick, **mature**), VII-23-2004 (1, kick). Pemigewasset River - Woodstock, VI-8-2005 (1, net, **mature**). **Notes:** Univoltine winter cycle. Large larvae were present from May to June in northern rivers, with small larvae appearing in July. In Maine larvae were taken in September (Burian & Gibbs, 1991).

*\*Baetisca carolina* Traver, 1931: [*Northern Rivers*]: Ammonoosuc River, V-11-2005 (3, kick, **mature**), VI-3-2004 (1, net, **mature**), VIII-13-2004 (1, kick). **Notes:** Univoltine winter cycle, mature larvae present in May and June, with a small larva taken in July. In Maine larvae were taken from May to June, and adults were collected in June (Burian & Gibbs, 1991).

*Baetisca laurentina* McDunnough, 1932: [*Northern Rivers*]: Pemigewasset River - Woodstock, V-19-2005 (1, net), VI-8-2005 (1, net), IX-13-2005 (1, kick). **Notes:** Univoltine winter cycle. Large larvae were present in May and June, and a small one was collected in September. In Maine larvae were taken from April to June, and adults from May to June (Burian & Gibbs, 1991).

*Baetisca obesa* (Say, 1839): [*Southern Rivers*]: Nissitissit River, IX-13-1996, D.S. Chandler & K. Blozie, small cobble (1 kick). **Notes:** a small, multicolored specimen that best fits this species. A presumed univoltine winter cycle, similar to the other *Baetisca* in New Hampshire.

*Baetisca rubescens* (Provancher, 1876): [*Northern Rivers*]: Ammonoosuc River, VII-8-2004 (2, net), VII-23-2004 (5, kick), VIII-13-2004 (4, kick). Gale River, IX-6-2004 (1, kick). **Notes:** Univoltine winter cycle. Mature larvae were not collected, and those found from July to September in northern rivers were small to almost half-grown. In Maine larvae were taken from April to June, and adults were found from May to June (Burian & Gibbs, 1991).

## CAENIDAE

\**Brachycercus nitidus* (Traver, 1932): [*Northern Rivers*]: Bearcamp River, 0.5 km W West Ossipee, VII-23-2005, D.S. Chandler, L. Wolff, S. Grieve (1, net). Gale River, VII-8-2004 (1, net), VII-23-2004 (1, net). **Notes:** Univoltine summer cycle. Three specimens were taken from two northern rivers.

*Caenis amica* Hagen, 1861: [*Southern Rivers*]: Nissitissit River, VII-28-1995, D.S. Chandler, UV trap (adults).

\**Caenis latipennis* Banks, 1907: [*Northern Rivers*]: Ammonoosuc River, VII-23-2004 (1, kick). East Branch Saco River, VII-23-2004 (1, net, **blackwing**). Pemigewasset River - Woodstock, VII-25-2005 (1, net). [*Southern Rivers*]: Bellamy River, VI-4-2003 (1, kick), VII-11-2003 (1, kick; 1, net), VIII-6-2003 (2, net), VIII-25-2003 (1, kick). Cochecho River, V-5-2003 (2, kick; 4, net), V-17-2003 (2, kick; 5, net), VI-4-2003 (4, kick), VII-11-2003 (6, net, **blackwing**), VII-23-2003 (1, kick; 3, net), VIII-6-2003 (1, kick; 4, net), VIII-25-2003 (10, net, **blackwing**), IX-16-2003 (7, kick; 3, net, **blackwing**). Contoocook River, VI-16-2003 (1, net), VIII-25-2003 (9, kick). Lamprey River, V-14-2004 (11, kick), VI-1-2004 (7, kick, **blackwing**), VI-18-2004 (12, net, **blackwing**), X-21-2004 (2, kick). Otter Brook, VIII-6-2003 (1, kick). Piscataquog River, VI-4-2003 (1, net, **blackwing**), V-17-2003 (1, net), VI-16-2003 (1, net), VIII-6-2003 (10, kick; 4, net). Piscataquog River - Middle Branch, V-17-2003 (1, net), VI-16-2003 (1, net). Piscataquog River - South Branch, V-5-2003 (1, net), VI-4-2003 (2, net), VII-23-2003 (1, kick), VIII-6-2003 (1, kick; 2, net). Souhegan River, VI-11-1998 (1, kick). South Branch Ashuelot River, VII-23-2003 (5, kick, **blackwing**), VIII-6-2003 (3, kick; 1, net). **Notes:** Clifford (1982) indicates that *Caenis* species have flexible voltinism cycles; appearing at least bivoltine in New Hampshire based on data from the Cochecho River. Larvae were present from May to October, and blackwings were taken from July to September in the Cochecho River, but only during a narrow time period in the other rivers. Uncommon in northern rivers, but found in a number of southern rivers, usually in low numbers. In Maine larvae and adults were taken from June to August (Burian & Gibbs, 1991).

## EPHEMERELLIDAE

\**Attenella attenuata* (McDunnough, 1925): [*Northern Rivers*]: Chocorua River, VII-8-2004 (3, net), VII-23-2004 (1, net). Gale River, VII-2-2004 (2, net). Pemigewasset River - Woodstock, VII-25-2005 (3, net, **blackwing**). Swift River, VII-8-2004 (3, kick). [*Southern Rivers*]: Bellamy River, VI-16-2003 (1, net). Cochecho River, VII-11-2003 (10, kick, **blackwing**; 5, net), VII-23-2003 (1, kick). Lamprey River, VI-18-2004 (21, kick; 90, net, **blackwing**), VII-14-2004 (1, kick; 11, net, **blackwing**). Nissitissit River, VI-7-2005 (27, kick, **blackwing**; 17, net, **blackwing**), VI-28-2005 (17, kick, **blackwing**). Otter Brook, VI-16-2003 (3, kick), VII-11-2003 (6, net), VII-23-2003 (3, net). Piscataquog River, VI-16-2003 (3, kick; 10, net), VII-11-2003 (1, kick), VII-23-2003 (1, net, **blackwing**). Piscataquog River - Middle Branch, VI-16-2003 (2, net). Souhegan River, VI-11-1998 (3, Surber), VII-31-1998 (1, Surber). **Notes:** Univoltine summer cycle. Larvae and blackwings were present from June to July. In Maine larvae were taken from June to August, and adults from June to July (Burian & Gibbs, 1991).

*Attenella margarita* (Needham, 1927): [*Northern Rivers*]: Ammonoosuc River, VII-8-2004 (3, kick, **mature**). Androscoggin River, VII-8-2004 (6, kick). Bog Brook, VII-8-2004 (1, kick). East Branch Saco River, VII-23-2004 (1, kick). Ellis River, VII-8-2004 (24, kick, **blackwing**), VII-23-2004 (6, kick, **blackwing**). Gale River, VII-8-2004 (22, kick, **blackwing**; 12, net, **blackwing**), VII-23-2004 (3, kick, **blackwing**). Moose River, VII-8-2004 (2, net, **mature**), VII-23-2004 (3, kick). **Notes:** Univoltine summer cycle. Larvae and blackwings taken only during July in northern rivers. In Maine adults were collected only during July (Burian & Gibbs, 1991).

*Dannella simplex* (McDunnough, 1925): [*Northern Rivers*]: Ammonoosuc River, VI-17-2004 (2, kick; 3, net), VII-8-2004 (1, kick, **blackwing**; 6, net, **blackwing**). Gale River, VI-17-2004 (5, kick; 1 net), VII-8-2004 (21, kick, **mature**), VII-23-2004 (2, kick). Moose River, VII-8-2004 (12, kick), VII-23-2004 (4, kick). Pemigewasset River - Lincoln, VII-8-2004 (1, kick). Pemigewasset River - Woodstock, VII-5-2005 (3, net, **mature**). Swift River, VII-23-2004 (3, kick). [*Southern Rivers*]: Cochecho River, VI-16-2003 (1, kick), VII-11-2003 (3, net). Lamprey River, VI-18-2004 (2, kick, **blackwing**; 1, net). Nissitissit River, VI-7-2005 (42, kick, **blackwing**; 3, net, **blackwing**). Piscataquog River, VI-4-2003 (1, kick), VI-16-2003 (3, kick). Piscataquog River - Middle Branch, IX-16-2003 (1, kick). Piscataquog River - South Branch, VI-16-2003 (3, kick). Souhegan River, VIII-17-1998 (5, Surber), VIII-26-1998 (2, Surber). South Branch Ashuelot River, VII-11-2003 (1, net), VII-23-2003 (2, net). **Notes:** Univoltine summer cycle. Larvae and blackwings were present during June and July, with a solitary specimen found in September. In Maine larvae were taken from June to July, and adults in July (Burian & Gibbs, 1991).

**\*\****Dentatella coxalis* (McDunnough, 1926): [*Southern Rivers*]: [records from Burian (2002)] Cheshire Co., Ashuelot River, Gilsum, above old dam, X-14-1993. Sullivan Co., North Branch Sugar River, Croydon Flat, X-1997; IV-24-1998, V-11-2000, S.K. Burian; Skinner Brook, Grantham, X-1997. **Notes:** Univoltine winter cycle. Mature larvae were taken in May.

*Drunella lata* (Morgan, 1911): [*Northern Rivers*]: Androscoggin River, V-11-2005 (5, kick), V-18-2004 (1, kick), VI-3-2004 (9, kick), VI-17-2004 (22, kick), VII-8-2004 (21, **mature**), VII-23-2004 (4, kick, **blackwing**). Bearcamp River, V-11-2005 (1, kick), V-18-2004 (1, kick), VI-3-2004 (1, kick), VI-8-2005 (7, kick), VI-17-2004 (3, kick), VII-8-2004 (4, kick), VII-23-2004 (3, kick). Bog Brook, V-18-2004 (2, kick), V-19-2005 (3, kick), VI-3-2004 (21, kick, **mature**), VI-17-2004 (15, kick), VII-8-2004 (6, kick). East Branch Saco River, V-11-2005 (1, kick; 1, net), VI-3-2004 (7, kick), VI-8-2005 (6, kick), VI-17-2004 (48, kick), VI-23-2005 (96, kick), VII-8-2004 (31, kick), VII-23-2004 (44, kick **blackwing**; 1 net). Ellis River, VI-17-2004 (10, kick), VII-8-2004 (8, kick), VII-23-2004 (7, kick, **blackwing**). Ellis River at Pinkham Notch, VI-17-2004 (2, kick), VII-8-2004 (4, kick, **mature**), VII-23-2004 (8, kick, **blackwing**). Gale River, V-18-2004 (1, kick), VI-3-2004 (4, kick), VI-17-2004 (18, kick), VII-8-2004 (22, kick), VII-23-2004 (2, kick, **blackwing**). Moose River, V-11-2005 (3, kick), VI-3-2004 (2, net), VI-17-2004 (6, kick; 1, net), VII-8-2004 (36, kick; 1, net, **mature**), VII-23-2004 (4, kick, **mature**). Moosilauke Brook, V-19-2005 (1, net), VI-3-2004 (1,



kick), VI-17-2004 (13, kick), VII-23-2004 (4, kick, **mature**). Peabody River, V-18-2004 (3, kick), VI-3-2004 (2, kick), VI-17-2004 (10, kick), VII-8-2004 (4, kick). Peabody River - unnamed branch, VI-3-2004 (4, kick), VI-8-2005 (8, kick), VI-17-2004 (6, kick), VI-23-2005 (16, kick), VII-8-2004 (10, kick, **mature**). Pemigewasset River - Lincoln, V-18-2004 (1, net). Pemigewasset River - Woodstock, V-19-2005 (11, kick), VI-8-2005 (42, kick), VI-23-2005 (21, kick, **mature**; 4, net, **mature**), VII-5-2005 (2, kick, **mature**; 1, net, **mature**). Swift River, VI-3-2004 (1, kick), VI-17-2004 (2, kick). [*Southern Rivers*]: Piscataquog River - South Branch, VI-4-2003 (6, kick), VII-23-2003 (2, kick, **blackwing**). **Notes:** Univoltine spring/early summer cycle. Very small larvae were collected in May, with mature and blackwing individuals present in July. A characteristic member of the northern rivers, and found only in one southern river. In Maine larvae were taken from June to July and in September, with adults collected during July (Burian & Gibbs, 1991). *Drunella cornuta* (Morgan, 1911) and *D. cornutella* (McDunnough, 1931) were recently placed as junior synonyms of this species by Jacobus and McCafferty (2004).

\**Drunella tuberculata* (Morgan, 1911): [*Northern Rivers*]: Androscoggin River, VI-17-2004 (3, kick). Bog Brook, VI-3-2004 (1, kick). [*Southern Rivers*]: Lamprey River, VI-18-2004 (6, kick, **mature**; 2, net, **mature**). Piscataquog River, VI-28-2005 (4, kick). Sugar River, VI-7-2005 (5, kick). **Notes:** Univoltine spring cycle. All larvae were taken in June, with a few appearing to be mature. Burian & Gibbs (1991) found larvae in June and July, and adults in July. Jacobus and McCafferty (2004) recently restricted *D. allegheniensis* (Traver) to the central and southern Appalachians, implicitly transferring all New England records of this species to *D. tuberculata*.

\**Drunella walkeri* (Eaton, 1884): [*Northern Rivers*]: Ammonoosuc River, VI-3-2004 (4, kick). Androscoggin River, V-18-2004 (5, kick), VI-3-2004 (4, kick). Androscoggin River, V-18-2004 (6, kick; 1, net), VI-17-2004 (16, **mature**). Bearcamp River, VI-3-2004 (1, kick). Bog Brook, V-19-2005 (1, kick), VI-17-2004 (2, kick). Ellis River, VII-8-2004 (3, kick, **blackwing**). Gale River, V-11-2005 (1, kick), V-18-2004 (1, kick), VI-17-2004 (1, kick). Pemigewasset River - Woodstock, V-19-2005 (2, net, **mature**), VI-8-2005 (3, net, **blackwing**), VIII-25-2005 (1, net). [*Southern Rivers*]: Cocheco River, V-17-2003 (1, kick). Lamprey River, V-14-2004 (16, kick, **mature**), VI-18-2004 (5, kick, **mature**). Piscataquog River - Middle Branch, V-17-2003 (2, kick), VI-4-2003 (3, kick), VI-16-200 (3, kick). Sugar River, VI-7-2005 (15, kick, **mature**). **Notes:** Univoltine spring cycle. Larvae were present from May to July, with blackwings collected in June and early July. In Maine larvae were found from June to July, and adults were collected in July (Burian & Gibbs, 1991).

*Ephemerella aurivillii* (Bengtsson, 1908): [*Northern Rivers*]: Ammonoosuc River, V-11-2005 (1, net, **mature**). Androscoggin River, VII-23-2004 (2, kick). Bearcamp River, VI-17-2004 (1, kick, **mature**). East Branch Saco River, VII-23-2004 (2, net). Ellis River, V-11-2005 (20, net, **blackwing**), IX-6-2004 (40, kick). Ellis River at Pinkham Notch, VI-17-2004 (2, kick; 29, net, **mature**), VII-13-2004 (70, kick), IX-6-2004 (30, kick), X-2-2004 (22, kick; 33, net). Gale River, V-11-2005 (6, net), V-18-2004 (1, net, **mature**). Moose River, V-11-2005 (1, kick; 4, net), V-18-2004 (1, kick, **mature**), VI-3-2004 (1, kick, **mature**; 4, net, **blackwing**),

VI-17-2004 (2, kick), VII-8-2004 (2, kick), VII-23-2004 (4, net), VIII-13-2004 (2, kick). Moosilauke Brook, V-19-2005 (1, kick; 1, net). Peabody River, VI-3-2004 (2, kick), IX-6-2004 (1, kick), X-2-2004 (1, kick). Peabody River - unnamed branch, VI-8-2005 (1, kick, **mature**), VIII-13-2004 (1, kick). Pemigewasset River - Lincoln, X-2-2004 (1, kick). Pemigewasset River - Woodstock, V-19-2005 (2, net, **mature**), VI-8-2005 (3, net, **blackwing**). [*Southern Rivers*]: Cochecho River, VI-4-2003 (3, kick), VI-16-2003 (1, kick). Contoocook River, VII-23-2003 (1, kick). **Notes:** Clifford (1982) indicates a univoltine winter cycle. Larvae were present from May to October, with mature and blackwing individuals taken in May and early June, and small or medium-sized individuals found from July to October. This species occurred in two southern rivers, but was clearly most abundant in colder, northern rivers. In Maine larvae were taken from May to June and in August, with adults collected from May to June (Burian & Gibbs, 1991).

*Ephemere* *dorothea* Needham, 1908: [*Northern Rivers*]: Ammonoosuc River, V-18-2004 (6, net), VI-3-2004 (6, kick; 64, net), VI-17-2004 (14, kick; 32, net, **mature**). Androscoggin River, V-18-2004 (7, kick; 37, net), VI-3-2004 (57, kick), VI-17-2004 (19, kick, **mature**). Bearcamp River, V-11-2005 (3, kick), V-18-2004 (10, kick), VI-3-2004 (8, kick; 13, net), VI-8-2005 (8, kick), VI-17-2004 (21, kick, **blackwing**). Bog Brook, V-18-2004 (11, kick; 1, net), V-19-2005 (3, kick; 6, net), VI-3-2004 (30, kick), VI-17-2004 (10, kick, **mature**). Chocorua River, VI-3-2004 (5, kick, **mature**; 2, net, **mature**), VI-17-2004 (1, net). East Branch Saco River, VI-3-2004 (14, kick; 20, net), VI-8-2005 (16, kick; 40, net), VI-17-2004 (32, kick; 9, net, **mature**), VI-23-2005 (50, kick, **blackwing**; 28, net, **mature**). Ellis River, V-18-2004 (26, net), VI-3-2004 (5, kick; 16, net), VI-17-2004 (54, kick, **blackwing**; 72, net, **blackwing**). Ellis River at Pinkham Notch, VI-17-2004 (3, net). Gale River, V-11-2005 (5, kick; 2, net), V-18-2004 (3, kick; 14, net), VI-3-2004 (23, kick; 43, net), VI-17-2004 (12, kick; 18, net). Moose River, V-11-2005 (1, kick), V-18-2004 (1, kick), VI-3-2004 (72, net), VI-17-2004 (36, kick, **mature**; 17, net, **mature**), VII-8-2004 (1, kick, **blackwing**), VII-23-2004 (1, kick). Moosilauke Brook, VI-3-2004 (7, kick), VI-17-2004 (15, kick, **mature**). Pemigewasset River - Lincoln, V-18-2004 (1, kick; 1, net), VI-17-2004 (2, kick). Pemigewasset River - Woodstock, V-19-2005 (1, kick; 1 net), VI-8-2005 (28, kick; 17, net), VI-23-2005 (28, kick, **mature**; 8 net, **mature**), VII-5-2005 (2, net, **blackwing**). Swift River, V-11-2005 (2, kick), V-18-2004 (2, kick; 2, net), VI-3-2004 (2, kick; 11, net, **blackwing**), VI-17-2004 (2, kick). [*Southern Rivers*]: Cochecho River, V-5-2003 (4, kick), V-17-2003 (18, kick; 4, net), VI-4-2003 (29, kick, **blackwing**). Contoocook River, VI-4-2003 (2, kick). Piscataquog River, IV-19-2005 (2, net). Piscataquog River - Middle Branch, V-5-2003 (7, kick), V-17-2003 (3, net), VI-4-2003 (4, kick; 1, net). Piscataquog River - South Branch, many small specimens appearing from July to September V-17-2003 (1, net). Souhegan River, V-27-1998 (1, kick; 4, Surber), VI-11-1998 (24, kick; 9, Surber). South Branch Ashuelot River, IV-17-2005 (1, net), VI-4-2003 (1, kick). **Notes:** Clifford (1982) reports a univoltine winter cycle, while in New Hampshire the data indicates a univoltine spring cycle. Larvae were present from April to July, with those in April and May being quite small. Blackwings were seen almost entirely in June, the exception being early during July from the northernmost river (Moose River). In Maine larvae taken from May to June, and adults were collected in June (Burian & Gibbs, 1991).

\**Ephemerella excrucians* Walsh, 1862: [*Northern Rivers*]: Grafton Co., 2.4 km SE Bristol, Coolidge Road, Pemigewasset River - Lincoln, 350', V-17-2004, G.D. Whitmore (1, kick); Ellis River, V-11-2005 (1, net); Livermore, East Pond Brook, VI-10/26-1982, J.F. Burger & L. Pistrang (3, kick). **Notes:** Clifford (1982) indicates a univoltine winter cycle. Larvae of this uncommon species were taken in May and June from three northern rivers. There are two bleached specimens from a southern river [Strafford Co., Dover, Bellamy River, XI-20-1970, P.D. Tucker] that are tentatively placed as this species.

\**Ephemerella invaria* (Walker, 1853): [*Northern Rivers*]: Ammonoosuc River, V-18-2004 (2, kick, **blackwing**; 4, net, **blackwing**), VI-3-2004 (1, kick). Androscoggin River, V-11-2005 (170, kick, **blackwing**), V-18-2004 (127, kick; 33, net), VI-3-2004 (42, kick, **mature**), VI-17-2004 (1, **mature**). Bearcamp River, V-11-2005 (10, kick; 12, net), V-18-2004 (6, kick, **blackwing**). Bog Brook, V-18-2004 (7, kick, **blackwing**; 1, net, **blackwing**), V-19-2005 (5, kick, **mature**; 4, net, **mature**). Chocorua River, V-11-2005 (1, kick, **mature**), V-18-2004 (4, kick, **mature**). East Branch Saco River, V-11-2005 (1, kick; 6, net), V-18-2004 (1, kick), VI-3-2004 (1, kick), VI-8-2005 (1, kick; 1, net). Ellis River, V-11-2005 (6, kick, **mature**; 5, net, **mature**), V-18-2004 (3, kick, **blackwing**; 17, net, **blackwing**), VI-3-2004 (9, kick, **blackwing**; 2, net, **blackwing**). Gale River, V-11-2005 (47, kick, **mature**; 11, net), V-18-2004 (4, kick, **mature**; 15, net, **mature**), VI-3-2004 (2, kick, **blackwing**; 3, net, **blackwing**). Moose River, V-11-2005 (11, kick; 2, net), V-18-2004 (3, kick, **mature**), VI-3-2004 (2, net, **mature**), VI-17-2004 (4, kick, **blackwing**). Moosilauke Brook, V-19-2005 (2, kick; 1, net). Peabody River - unnamed branch, V-18-2004 (1, kick). Pemigewasset River - Lincoln, V-18-2004 (1, net), V-19-2005 (1, kick). Pemigewasset River - Woodstock, V-19-2005 (26, kick, **mature**; 31, net), VI-8-2005 (126, kick, **mature**; 27, net, **blackwing**), VIII-25-2005 (3, kick; 5, net), IX-13-2005 (34, kick; 3, net). Swift River, V-11-2005 (1, kick), V-18-2004 (6, kick), VI-3-2004 (2, kick). [*Southern Rivers*]: Bellamy River, V-5-2003 (7, kick), V-17-2003 (7, kick), VI-4-2003 (6, kick). Cochecho River, IV-19-2005 (16, kick; 33, net), V-5-2003 (2, kick), V-17-2003 (9, kick; 8, net), VI-4-2003 (20, kick; 3, net). Contoocook River, IV-17-2005 (44, kick, **mature**), V-5-2003 (3, net), V-17-2003 (1, net), VI-4-2003 (1, kick). Lamprey River, IV-17-2005 (4, net, **blackwing**), V-14-2004 (9, kick, **mature**; 9, net, **mature**). Otter Brook, IV-17-2005 (2, net). Piscataquog River, IV-19-2005 (145, kick; 80, net), V-5-2003 (6, net), V-17-2003 (30, kick; 4, net), VI-4-2003 (12, kick, **blackwing**), VI-16-2003 (2, kick). Piscataquog River - Middle Branch, IV-17-2005 (4, kick), V-5-2003 (5, net), V-17-2003 (4, net), VI-4-2003 (1, kick). Piscataquog River - South Branch, IV-17-2005 (17, net), V-5-2003 (1, net), V-17-2003 (1, net), VI-4-2003 (2, kick, **blackwing**). South Branch Ashuelot River, IV-17-2005 (60, kick; 55, net), V-5-2003 (4, net), V-17-2003 (9, kick; 15, net), VI-4-2003 (22, kick, **blackwing**), IX-16-2003 (7, kick). **Notes:** Univoltine winter cycle. Large larvae and blackwings were seen from April to June, with very small larvae appearing in late August and September. In Maine larvae were taken from April to June, and adults from May to June (Burian & Gibbs, 1991).

Jacobus and McCafferty (2001) placed *Ephemerella rotunda* Morgan as a junior synonym of *E. invaria*, and this synonymy is followed here but with some reservations. We have seen many larvae of this species, and in their later instars they may be readily sorted to two "forms" based on the characteristics of the

abdominal tubercles given by Allen and Edmunds (1965). The larvae of the form "*E. rotunda*" seem to consistently reach the mature/blackwing stage shortly before those of *E. invaria*, though both are commonly found in the same rivers at similar times.

\**Ephemerella needhami*, 1925 McDunnough: [*Northern Rivers*]: Androscoggin River, V-18-2004 (1, kick). Swift River, V-18-2004 (1, net, **blackwing**). [*Southern Rivers*]: Cocheco River, VI-4-2003 (1, kick). Lamprey River, V-14-2004 (3, kick; 32, net), VI-18-2004 (3, kick; 4, net, **mature**). Piscataquog River, V-17-2003 (1, kick). Piscataquog River - Middle Branch, V-17-2003 (4, kick; 7, net), VI-4-2003 (2, net), VI-16-2003 (1, net). Piscataquog River - South Branch, V-17-2003 (2, kick; 11, net), VI-4-2003 (5, kick; 3, net). South Branch Ashuelot River, V-5-2003 (13, net), V-17-2003 (10, net), VI-4-2003 (1, net). **Notes:** Data here indicates a univoltine winter cycle. Larvae were taken from May to mid-June. The only blackwing was collected in May, though a few mature specimens were taken in June. Uncommon in northern rivers, with only single specimens taken from two rivers. In Maine larvae taken from May to June, and adults were found in June (Burian & Gibbs, 1991).

\**Ephemerella septentrionalis* McDunnough, 1925: [*Northern Rivers*]: Ammonoosuc River, V-18-2004 (1, net), VI-3-2004 (2, net), VI-17-2004 (1, kick). Gale River, V-18-2004 (2, net), VI-3-2004 (3, kick), VI-17-2004 (4, net, **mature**). Moose River, VI-17-2004 (9, net, **mature**). Pemigewasset River - Lincoln, V-18-2004 (1, net, **mature**), V-19-2005 (1, kick), X-2-2004 (1, kick). [*Southern Rivers*]: Cocheco River, V-5-2003 (1, kick), V-17-2003 (22, kick; 10, net), VI-4-2003 (18, kick, **blackwing**); 1, net, **blackwing**), VII-11-2003 (1, kick). Contoocook River, V-17-2003 (1, net). Lamprey River, V-14-2004 (2, kick; 2, net). Piscataquog River - Middle Branch, V-17-2003 (2, net), VI-16-2003 (2, net). Piscataquog River - South Branch, V-17-2003 (1, net). **Notes:** A univoltine winter cycle is indicated by the data. Mature and blackwing larvae were found from May to early June (one July straggler), with a small larva appearing in October. In Maine larvae were taken from April to June, and adults in June (Burian & Gibbs, 1991).

\**Ephemerella subvaria* McDunnough, 1931: [*Northern Rivers*]: Ammonoosuc River, V-11-2005 (3, kick), X-2-2004 (50, kick). Androscoggin River, V-11-2005 (1, kick, **blackwing**), X-2-2004 (60, kick). Bearcamp River, V-11-2005 (4, kick; 4, net, **blackwing**), X-2-2004 (20, kick). Bog Brook, X-2-2004 (6, kick). East Branch Saco River, V-11-2005 (3, kick; 6, net, **blackwing**), IX-6-2004 (31, kick; 1, net), X-2-2004 (6, kick; 2, net). Ellis River, V-11-2005 (1, kick; 1, net, **mature**), IX-6-2004 (46, kick), X-2-2004 (8, kick). Ellis River - Pinkham Notch, V-11-2005 (kick, 1). Gale River, V-11-2005 (2, kick, **mature**), V-18-2004 (2, net, **blackwing**), IX-6-2004 (3, kick), X-2-2004 (80, kick; 25, net). Moose River, X-2-2004 (25, kick; 1, net, **blackwing**). Moosilauke Brook, V-19-2005 (1, net), X-2-2004 (4, kick). Pemigewasset River - Woodstock, V-19-2005 (7, kick, **blackwing**). [*Southern Rivers*]: Cocheco River, IV-19-2005 (2, kick, **blackwing**). Contoocook River, IV-17-2005 (72, kick, **mature**; 34, net, **blackwing**), V-5-2003 (5, net, **blackwing**). Lamprey River, IV-17-2005 (12, kick; 1, net), X-21-2004 (16, kick; 29 net). Piscataquog River, IV-19-2005 (36, kick, **mature**; 260, net, **mature**). Piscataquog River - Middle Branch, IV-17-2005 (3, kick). Piscataquog

River - South Branch, IV-17-2005 (12, kick, **mature**), V-5-2003 (1, net). South Branch Ashuelot River, IV-17-2005 (6, kick, **mature**; 2, net, **mature**), V-5-2004 (6, net, **blackwing**). **Notes:** Clifford (1982) indicates a univoltine winter cycle. Mature and blackwing specimens were found from April to early May (one in October), and small individuals began appearing in September. In Maine larvae were collected from April to May, with adults appearing from May to June (Burian & Gibbs, 1991).

*\*Eurylophella aestiva* (McDunnough, 1931): [*Northern Rivers*]: Androscoggin River, V-18-2004 (135, net), VII-8-2004 (1, kick, **mature**). Bearcamp River, VI-17-2004 (1, net). Bog Brook, V-19-2005 (1, net), VII-8-2004 (2, kick). Ellis River, VII-8-2004 (4, net). Ellis River at Pinkham Notch, VII-23-2004 (5, kick). Gale River, VII-23-2004 (1, kick; 1, net). Moose River, VII-8-2004 (5, net, **mature**). Peabody River - unnamed branch, VII-8-2004 (1, kick), VII-23-2004 (5, kick). Pemigewasset River - Lincoln, V-18-2004 (3, net, **mature**). [*Southern Rivers*]: Bellamy River, VII-11-2003 (2, net). Cocheco River, V-17-2003 (2, kick), VII-11-2003 (1, kick). Contoocook River, VII-23-2003 (3, net). Lamprey River, VI-18-2004 (51, net, **blackwing**). Nissitissit River, VI-7-2005 (9, net, **blackwing**). Otter Brook, VI-16-2003 (1, kick), VII-11-2003 (4, net, **blackwing**), VII-23-2003 (8, net, **blackwing**). Piscataquog River, VI-4-2003 (2, net), VII-11-2003 (2, kick; 9, net), VII-23-2003 (3, net), VIII-6-2003 (1, net). Piscataquog River - Middle Branch, VI-16-2003 (18, net). Piscataquog River - South Branch, V-5-2003 (2, net), VII-23-2003 (1, net). **Notes:** Appearing to be a univoltine spring/early summer cycle for New Hampshire. Larvae were taken from May to July, with blackwings appearing in June and July. In Maine larvae were found from April to August, with adults collected from June to July (Burian & Gibbs, 1991).

*\*Eurylophella bicolor* (Clemens, 1913): [*Northern Rivers*]: Ammonoosuc River, V-18-2004 (6, net). Androscoggin River, VI-17-2004 (2, kick, **mature**). Bearcamp River, VI-17-2004 (8, kick, **blackwing**). Chocorua River, VI-17-2004 (1, net, **blackwing**). Ellis River at Pinkham Notch, VI-17-2004 (1, net). Moose River, V-11-2005 (4, kick). Moosilauke River, V-19-2005 (1, net). Pemigewasset River - Lincoln, V-18-2004 (2, kick; 10, net). Pemigewasset River - Woodstock, VI-8-2005 (1, net), VI-23-2005 (1, kick; 15, net), VII-5-2005 (2, kick; 21, net, **blackwing**), VII-25-2005 (5, net). [*Southern Rivers*]: Cocheco River, VII-11-2003 (1, net). Otter Brook, V-17-2003 (1, net), VI-4-2003 (2, kick), VI-16-2003 (3, kick; 3, net, **blackwing**), VII-11-2003 (1, net, **blackwing**). Nissitissit River, VI-7-2005 (3, net, **mature**). Piscataquog River, V-17-2003 (30, kick; 40 net), VI-4-2003 (23, kick; 45, net, **blackwing**), VI-16-2003 (21, kick; 21, net, **blackwing**), VII-11-2003 (1, kick, **blackwing**). Piscataquog River - Middle Branch, V-17-2003 (1, net), VI-16-2003 (1, kick; 2, net, **blackwing**). Piscataquog River - South Branch, V-17-2003 (1, kick; 18, net), VI-4-2003 (46, net). Souhegan River, V-27-1998 (2, kick). South Branch Ashuelot River, VI-16-2003 (1, net). **Notes:** Clifford (1982) indicates a univoltine winter cycle, though appearing to be a univoltine spring cycle in New Hampshire. Larvae were present from May to July, and blackwings were collected in June and July. Maine larvae were taken from May to July and in September, and adults were found from June to July (Burian & Gibbs, 1991).

*Eurylophella funeralis* (McDunnough, 1925): [*Northern Rivers*]: Ammonoosuc River, V-11-2005 (1, net). Bearcamp River, V-11-2005 (1, net). East Branch Saco River, VI-8-2005 (7, net, **blackwing**), VI-23-2005 (2, net, **mature**). Ellis River, V-11-2005 (1, net). Ellis River at Pinkham Notch, VI-17-2004 (6, net). Gale River, V-11-2005 (6, net). Moose River, V-11-2005 (1, net). Moosilauke River, V-19-2005 (11, net), VII-8-2004 (1, net). Peabody River, VI-17-2004 (1, kick; 1 net). Peabody River - unnamed branch, V-11-2005 (1, kick), VI-8-2005 (2, kick, **mature**), VI-23-2005 (4, kick), X-2-2004 (1, kick). Pemigewasset River - Woodstock, VI-8-2005 (3, net, **mature**), VI-23-2005 (3, net, **blackwing**), VII-5-2005 (1, net, **blackwing**), VII-25-2005 (1, net), VIII-9-2005 (4, net), VIII-25-2005 (8, net), IX-13-2005 (12, net). [*Southern Rivers*]: Cocheco River, V-5-2003 (5, net). Contoocook River, IV-17-2005 (2, kick), IX-16-2003 (7, net). Nissitissit River, VI-7-2005 (1, net). Otter Brook, IV-17-2005 (3, net), V-5-2003 (1, net), VII-11-2003 (2, kick), VII-23-2003 (1, net), VIII-25-2003 (2, net), IX-16-2003 (1, kick; 3, net). Piscataquog River, IV-19-2005 (21, net). Piscataquog River - South Branch, VIII-25-2003 (1, net). Souhegan River, VII-3-1998 (2, kick), VII-31-1998 (4, kick), VIII-26-1998 (2, Surber). South Branch Ashuelot River, IV-17-2005 (1, net), V-5-2003 (1, net), IX-16-2003 (2, net). **Notes:** Clifford (1982) reports a univoltine winter cycle. Larvae were present from April to October, with blackwings appearing during June and July, and small larvae in August. In Maine larvae were found from May to July and in September, and adults were taken in June (Burian & Gibbs, 1991).

\**Eurylophella macdunnoughi* Funk, 1994: [*Northern Rivers*]: Chocorua River, VI-17-2004 (2, net, **blackwing**). East Branch Saco River, VI-23-2005 (1, net). Gale River, VII-8-2004 (1, kick), VII-23-2004 (5, net, **blackwing**). Moose River, VII-8-2004 (1, net, **mature**). [*Southern Rivers*]: Bellamy River, V-17-2003 (1, kick). Cocheco River, V-5-2003 (1, net), V-17-2003 (1, net). Otter Brook, IV-17-2005 (6, net), V-17-2003 (13, kick; 3, net), VI-16-2003 (2, kick, **blackwing**). Piscataquog River, V-17-2003 (8, kick; 3, net). Piscataquog River - South Branch, VI-4-2003 (4, net). South Branch Ashuelot River, VI-16-2003 (1, net). **Notes:** Univoltine spring/early summer cycle. Larvae were present from April to July, and blackwings appeared in June and July.

\**Eurylophella minimella* (McDunnough, 1931): [*Northern Rivers*]: Ammonoosuc River, VI-3-2004 (1, net). Androscoggin River, VII-8-2004 (6, kick). Gale River, V-11-2005 (5, kick), V-18-2004 (2, kick), VI-3-2004 (6, net), VI-17-2004 (1, kick), VII-8-2004 (5, net, **blackwing**). Ellis River at Pinkham Notch, VI-17-2004 (6, net). Moose River, VI-3-2004 (1, net), VII-23-2004 (1, net). Moosilauke Brook, VI-3-2004 (3, kick). Peabody River, VI-3-2004 (1, net). Peabody River - unnamed branch, VI-3-2004 (1, kick). Pemigewasset River - Lincoln, VI-3-2004 (1, kick), VI-17-2004 (7, kick, **mature**). Pemigewasset River - Woodstock, VI-8-2005 (4, net), VI-23-2005 (5, kick, **mature**). [*Southern Rivers*]: Contoocook River, VII-11-2003 (1, net), VII-23-2003 (2, net). Nissitissit River, VI-7-2005 (1, net). Otter Brook, V-17-2003 (2, net), VI-4-2003 (5, kick), VII-11-2003 (1, kick; 20, net, **blackwing**), VII-23-2003 (1, kick; 1 net). Piscataquog River - South Branch, V-17-2003 (5, net). South Branch Ashuelot River, V-5-2003 (1, net), VI-16-2003 (2, net), VII-11-2003 (1, net), VII-23-2003 (2, net). **Notes:** Univoltine spring/early summer cycle. Larvae were present from April (small) to July, with

blackwings being taken in July. In Maine larvae were found during June (Burian & Gibbs, 1991).

*\*Eurylophella prudentialis* (McDunnough, 1931): [*Southern Rivers*]: Bellamy River, V-17-2003 (1, net), VI-4-2003 (1, net). Cocheco River, V-17-2003 (7, net), VI-4-2003 (3, kick; 2, net). Contoocook River, VII-11-2003 (2, net, **blackwing**). Lamprey River, VI-18-2004 (1, net), X-21-2004 (4, net). Otter Brook, V-5-2003 (3, net), V-17-2003 (1, net), VI-16-2003 (2, net, **blackwing**), VII-11-2003 (1, kick; 4, net). Piscataquog River, V-5-2003 (1, net), V-17-2003 (8, net), VI-4-2003 (7, net). South Branch Ashuelot River, VI-16-2003 (1, net). **Notes:** Univoltine winter cycle. Larvae present from May to July, with small individuals appearing in October. Blackwings were found in June and July. Collected only in southern rivers with nets. In Maine larvae were present from May to June, and adults from June to July (Burian & Gibbs, 1991).

*\*Eurylophella temporalis* (McDunnough 1924): [*Northern Rivers*]: Pemigewasset River - Woodstock, V-19-2005 (1, net). [*Southern Rivers*]: Bellamy River, V-17-2003 (2, net), VI-16-2003 (1, net), VII-11-2003 (2, net). Cocheco River, V-5-2003 (1, kick), V-17-2003 (3, net), VI-17-2003 (1, kick; 6, net). Contoocook River, VI-16-2003 (1, net), IX-16-2003 (3, net). Lamprey River, V-14-2004 (1, kick; 1, net), VI-1-1004 (6, kick), VI-18-2004 (1, net). Nissitissit River, VI-23-1995 (3, **blackwing**). Piscataquog River, V-17-2003 (3, kick; 11, net). VI-4-2003 (4, net), VI-16-2004 (1, net). Souhegan River, VI-11-1998 (2, kick; 8, Surber). South Branch Ashuelot River, VI-4-2003 (1, net). **Notes:** Clifford (1982) reports a univoltine winter cycle. Larvae were found from May to July, and were usually taken by net in southern rivers. Blackwings were found in June, and small larvae appeared in September. In Maine larvae were present from April to July, and adults from May to July (Burian & Gibbs, 1991).

*\*Eurylophella verisimilis* (McDunnough, 1930): [*Northern Rivers*]: Ammonoosuc River, V-11-2005 (1, net), VI-3-2004 (13, net), VI-17-2004 (34, kick), VII-8-2004 (7, net, **blackwing**). Bearcamp River, VI-3-2004 (1, net). Chocorua River, VI-3-2004 (2, net). East Branch Saco River, V-11-2005 (15, net), V-18-2004 (1, kick; 36, net), VI-3-2004 (2, kick), VI-8-2005 (14, net), VI-17-2004 (34, net, **mature**), VI-23-2005 (net, 22), VIII-13-2004 (2, kick), IX-6-2004 (10, net), X-2-2004 (15, net). Ellis River, V-18-2004 (6, net), VI-3-2004 (9, net, **blackwing**), VI-17-2004 (2, net, **blackwing**). Ellis River at Pinkham Notch, VI-17-2004 (7, kick, **mature**), VII-8-2004 (1, net), VII-23-2004 (1, net), IX-6-2004 (5, kick), X-2-2004 (2, net). Gale River, V-18-2004 (2, kick; 9, net), VI-3-2004 (23, net), VI-17-2004 (15, net, **blackwing**). Moose River, V-18-2004 (1, kick), VI-3-2004 (12, net), VI-17-2004 (21, net, **blackwing**), VII-23-2004 (3, net). Moosilauke Brook, VI-3-2004 (2, kick), VII-8-2004 (1, kick), IX-6-2004 (1, kick). Peabody River, VI-3-2004 (2, kick), VI-17-2004 (2, net). Peabody River - unnamed branch, IX-6-2004 (1, kick), X-2-2004 (1, kick). Pemigewasset River - Lincoln, V-18-2004 (12, net), VI-17-2004 (29, net, **blackwing**), IX-6-2004 (5, kick). VI-3-2004 (3, kick). Swift River, VI-3-2004 (3, net). [*Southern Rivers*]: Cocheco River, IV-19-2005 (3, net), V-5-2003 (1, kick), V-17-2003 (2, kick). Contoocook River, VI-4-2003 (2, net), VI-16-2003 (1, kick). Lamprey River, VI-18-2004 (4, net). Nissitissit River, VI-7-2005 (62, net), VI-28-2005 (55, kick). Piscataquog River, V-17-2003

(5, net), VI-4-2004 (4, net), VI-16-2003 (1, kick; 10, net), VII-11-2003 (4, net). Piscataquog River - Middle Branch, V-5-2003 (1, net), VI-4-2003 (2, net). Piscataquog River - South Branch, V-17-2003 (4, net). Souhegan River, V-27-1998 (4, kick), VI-4-1998 (1, Surber), VI-11-1998 (8, kick). South Branch Ashuelot River, V-5-2003 (1, net), V-17-2003 (3, net), VI-4-2003 (1, kick; 7, net), VI-16-2003 (4, net). **Notes:** Clifford (1982) indicates a univoltine winter cycle. Large larvae were present from May to July (blackwings June and July), and small individuals appeared from August to October. In Maine larvae were taken from April to July, and adults from May to July (Burian & Gibbs, 1991).

*Serratella deficiens* (Morgan, 1911): [*Northern Rivers*]: Ammonoosuc River, VI-3-2004 (9, kick, **mature**), VI-17-2004 (3, kick), VII-8-2004 (1, kick, **blackwing**). Androscoggin River, V-18-2004 (1, net), VI-3-2004 (14, kick), VI-17-2004 (14, kick, **mature**), VII-8-2004 (4, kick, **blackwing**). Bearcamp River, VI-17-2004 (13, kick, **mature**), VII-8-2004 (7, kick, **mature**), VII-23-2004 (1, kick, **mature**). Bog Brook, V-18-2004 (3, kick), VI-3-2004 (9, kick, **mature**), VI-8-2005 (1, kick), VI-17-2004 (13, kick, **mature**), VII-8-2004 (1, kick, **blackwing**). Chocorua River, V-18-2004 (1, kick). East Branch Saco River, VI-3-2004 (5, kick), VI-8-2005 (1, net), VI-17-2004 (16, kick, **mature**; 2, net), VI-23-2005 (8, kick; 8, net, **mature**), VII-8-2004 (1, kick, **mature**). Ellis River, VI-3-2004 (1, net), VI-17-2004 (8, kick, **mature**; 40, net), VII-8-2004 (3, kick, **blackwing**). Ellis River at Pinkham Notch, VI-17-2004 (2, net). Gale River, VI-3-2004 (1, kick, **blackwing**; 1, net), VI-17-2004 (1, kick, **mature**; 12, net, **blackwing**), VII-8-2004 (4, net, **blackwing**). Moose River, VI-17-2004 (2, net), VII-8-2004 (8, kick, **mature**; 1, net, **mature**), VII-23-2004 (1, net, **mature**). Moosilauke Brook, V-19-2005 (2, net), VI-17-2004 (2, kick). [*Southern Rivers*]: Contoocook River, VI-4-2003 (4, kick), VI-16-2003 (1, kick), VII-11-2003 (2, kick; 2, net), VII-23-2003 (1, net). Lamprey River, VI-18-2004 (1, kick, **mature**), VII-14-2004 (1, kick, **blackwing**; 3, net, **blackwing**), VIII-9-2005 (1, net). Piscataquog River, V-17-2003 (2, kick; 4, net), VI-4-2003 (6, kick; 3, net), VI-16-2003 (9, kick; 6, net), VII-11-2003 (4, net), VII-23-2003 (1, kick). Piscataquog River - Middle Branch, V-5-2003 (5, net), VI-4-2003 (2, kick), VI-16-2003 (7, kick, **blackwing**; 4, net), VII-23-2003 (1, kick). Piscataquog River - South Branch, VI-16-2003 (1, kick), VII-23-2003 (1, kick; 1, net). Souhegan River, VI-11-1998 (6, kick; 2, net), VII-21-1998 (2, kick), VII-31-1998 (2, kick). South Branch Ashuelot River, VI-4-2003 (7, kick), VI-16-2003 (4, net), VII-23-2003 (2, kick, **blackwing**). **Notes:** Clifford (1982) reports a univoltine winter cycle, but appearing to be more a univoltine spring/early summer cycle in New Hampshire. A few small specimens were taken in May, with this species quite common in June and July (one collection in August). Blackwings were found from June to July. In Maine larvae and adults were present from June to August (Burian & Gibbs, 1991).

\**Serratella molita* (McDunnough, 1930): [*Northern Rivers*]: Ammonoosuc River, VII-23-2004 (1, kick). East Branch Saco River, VII-23-2004 (1, net). Ellis River, VII-8-2004, (1, net, **blackwing**). [*Southern Rivers*]: Cochecho River, VII-11-2003 (1, kick), VII-23-2003 (1, net). Contoocook River, VII-11-2003 (2, net), VII-23-2003 (2, kick; 1, net). Lamprey River, VII-14-2004 (1, net, **blackwing**). Merrimack River, VII-23-2003 (1, kick), VIII-25-2003 (1, kick, **blackwing**). Piscataquog River, VII-23-2003 (2, kick; 1, net), VIII-6-2003 (2, kick), VIII-25-2003 (1, kick).



Piscataquog River - Middle Branch, VI-16-2003 (1, kick; 1, net), VII-11-2003 (2, kick), VII-23-2003 (2, kick), VIII-6-2003 (1, kick; 1, net). Piscataquog River - South Branch, VIII-25-2003 (1, kick, **mature**). Souhegan River, VII-3-1998 (5, kick), VII-21-1998 (8, kick; 1, Surber), VII-31-1998 (3, kick; 2, Surber), VIII-17-1998 (13, kick; 1, Surber), VIII-26-1998 (4, kick). **Notes:** Univoltine summer cycle. All larvae, including blackwings, were taken in July and August. This species is uncommon in northern rivers. In Maine larvae and adults were present from July to August (Burian & Gibbs, 1991).

\**Serratella serrata* (Morgan, 1911): [*Northern Rivers*]: Ammonoosuc River, VII-8-2004 (20, kick; 4, net), VII-23-2004 (13, kick, **blackwing**; 2, net). Androscoggin River, VII-8-2004 (2, kick). Bearcamp River, VII-8-2004 (1, kick). East Branch Saco River, VII-23-2004 (6, kick). Ellis River, VII-8-2004 (1, net, **mature**), VII-23-2004 (8, kick), VIII-13-2004 (3, kick). Gale River, VII-8-2004 (16, kick; 5, net), VII-23-2004 (10, kick, **blackwing**; 4, net, **blackwing**). [*Southern Rivers*]: Coheco River, VII-11-2003 (4, kick, **blackwing**), VIII-6-2003 (2, kick). Contoocook River, VII-11-2003 (1, kick; 1, net), VII-23-2003 (3, net). Merrimack River, VII-23-2003 (2, kick). Piscataquog River, VII-11-2003 (1, kick), VII-23-2003 (3, kick), VIII-6-2003 (3, kick), VIII-25-2003 (1, kick, **blackwing**). Piscataquog River - Middle Branch, VI-16-2003 (2, kick), VII-11-2003 (6, kick, **blackwing**), VII-23-2003 (4, kick), VIII-6-2003 (1, kick), VIII-25-2003 (1, net). Piscataquog River - South Branch, VII-23-2003 (3, kick). Souhegan River, VI-11-1998 (14, kick; 32, Surber), VII-3-1998 (2, Surber), VII-21-1998 (7, Surber), VII-31-1998 (1, Surber), VIII-17-1998 (1, Surber). South Branch Ashuelot River, VII-23-2003 (4, kick). **Notes:** Clifford (1982) indicates a univoltine summer cycle. Larvae were present from June to August, with blackwings collected in July and August. In Maine larvae were taken in July (Burian & Gibbs, 1991). Jacobus and McCaffery (2003) placed *Serratella sordida* (McDunnough) as a junior synonym of *S. serrata*.

#### EPHEMERIDAE

\**Ephemera guttulata* Pictet, 1843: [*Southern Rivers*]: Strafford Co., Durham, Oyster River, X-27-1939, Beattie (adult). **Notes:** Clifford (1982) notes that many members in this genus are on a 2-year cycle. A single adult record from October. In Maine larvae were found from May-June and in September, and adults from May to June (Burian & Gibbs, 1991).

*Ephemera varia* Eaton, 1883: [*Northern Rivers*]: Bearcamp River, V-11-2005 (1, kick). Gale River, VI-3-2004 (3, net), VI-17-2004 (4, net), VII-8-2004 (8, kick, **blackwing**; 4, net), IX-6-2004 (2, net), X-2-2004 (8, net). [*Southern Rivers*]: Contoocook River, VIII-25-2003 (1, kick), IX-16-2003 (1, kick). **Notes:** Clifford reports a two-year cycle for some species in this genus, and the mixture of sizes taken at the Gale River during the summer supports a two-year semivoltine cycle. Large and half-grown larvae were found from June to July, and blackwings were taken in July. The smallest larvae appeared in August and September. In Maine larvae were taken from April to July, and adults from June to August (Burian & Gibbs, 1991).

*Hexagenia limbata* (Serville, 1829): [*Southern Rivers*]: Lamprey River, VII-23-2003 (2, adult). Nissitissit River, VII-7-1995 (1 larva), VIII-17-1995 (1 adult), D.S. Chandler & D. Pederson. Also: Rockingham Co., Barrington, VI-31-1948, L.P. Wolfe (10 adults). Strafford Co., Durham, VI-17-1960, W.J. Morse (2, light). North Hampton, VII-8-1973, R.D. Michaud (1, adult). **Notes:** Clifford (1982) notes that this species is usually on a 2-year cycle, but that some studies found a variable 1 or 2 year cycle. Adults were taken from June to August at lights in New Hampshire. In Maine larvae were taken from June to September, and adults were present from late June to August (Burian & Gibbs, 1991).

\**Litobrantha recurvata* (Morgan, 1913): [*Northern*]: Coos Co., Clarksville, West Pond, nr. Rt. 146, X-10-1982, J.F. Burger, small pond (larva). [*Southern*]: Strafford Co., Durham, V-2-1962, J.G. Conklin (1, adult). **Notes:** Clifford (1982) notes that most ephemerals have a 2-year cycle. Large larvae were found in October, and an adult was taken in May. In Maine larvae were present from April to June, and adults were taken in May (Burian & Gibbs, 1991).

#### HEPTAGENIIDAE

\**Cinygmula subaequalis* (Banks, 1914): [*Northern Rivers*]: Ammonoosuc River, V-11-2005 (2, kick), VI-3-2004 (1, net). Androscoggin River, V-11-2005 (41, kick). Bearcamp River, VI-3-2004 (1, net). East Branch Saco River, V-11-2005 (10, kick), V-18-2004 (3, kick), VI-3-2004 (11, kick, **blackwing**), VI-8-2005 (29, kick), VI-23-2005 (10, kick, **blackwing**). Ellis River, V-18-2004 (5, kick), VI-3-2004 (3, kick). Ellis River at Pinkham Notch, VI-17-2004 (8, kick). Gale River, V-11-2005 (6, kick), V-18-2004 (6, kick, **blackwing**; 2, net). Moose River, V-11-2005 (4, kick), V-18-2004 (1, kick), VI-17-2004 (10, kick). Moosilauke Brook, VI-3-2004 (3, kick), VI-17-2004 (1, kick, **blackwing**). Peabody River, V-18-2004 (1, kick). Pemigewasset River - Lincoln, V-18-2004 (3, kick), V-19-2005 (5, kick), VI-17-2004 (1, kick). Pemigewasset River - Woodstock, V-19-2005 (21, kick), VI-8-2005 (40, kick) [*Southern Rivers*]: Piscataquog River - South Branch, IV-17-2005 (1, kick). **Notes:** Univoltine spring cycle. Larvae were present from April to June, with almost all larvae taken in April and early May being very small. Blackwings were collected in May and June, and this species was clearly more abundant in northern rivers. In Maine larvae were found from March to June, and adults were taken in June (Burian & Gibbs, 1991).

\**Epeorus fragilis* (Morgan, 1911): [*Northern Rivers*]: Ammonoosuc River, VI-3-2004 (1, kick). Bearcamp River, VI-3-2004 (1, net), VII-8-2004 (6, kick). Moose River, VII-8-2004 (1, net, **mature**). Peabody River - unnamed branch, VII-23-2004 (8, kick). [*Southern Rivers*]: Merrimack River, VII-23-2003 (1, net). **Notes:** Univoltine summer cycle. Larvae were taken in June and July, and primarily from northern rivers. One mature specimen was collected in July. In Maine larvae were taken from May to August, and adults in July (Burian & Gibbs, 1991).

\**Epeorus pleuralis* (Banks, 1910): [*Northern Rivers*]: Ammonoosuc River, V-18-2004 (5, kick). Androscoggin River, V-11-2005 (33, kick), VI-3-2004 (1, kick), VII-23-2004 (1, kick, **blackwing**). Bearcamp River, V-11-2005 (8, kick; 1, net, **blackwing**), V-18-2004 (1, kick, **blackwing**). Bog Brook, V-19-2005 (1, net). Chocorua River, V-18-2004 (1, kick). East Branch Saco River, V-11-2005 (116,

kick), VI-3-2004 (3, kick), VI-8-2005 (67, kick, **blackwing**), VI-17-2004 (9, kick), VI-23-2005 (8, kick, **blackwing**). Ellis River, V-11-2005 (19, kick), VI-3-2004, 1, kick), VII-8-2004 (40, kick), IX-6-2004 (9, kick, **blackwing**). Ellis River at Pinkham Notch, VI-17-2004 (35, kick, **blackwing**; 1, net), VII-23-2004 (30, kick, **blackwing**), VIII-13-2004 (90, kick, **blackwing**), X-2-2004 (5, kick). Gale River, V-11-2005 (11, kick), V-18-2004 (1, kick). Moose River, V-11-2005 (1, kick), V-18-2004 (13, kick, **blackwing**), VI-17-2004 (12, kick). Moosilauke Brook, V-19-2005 (25, kick; 65, net), VI-3-2004 (8, kick), VI-17-2004 (2, kick), X-2-2004 (8, kick). Peabody River, V-18-2004 (2, kick), VI-3-2004 (3, kick), VI-17-2004 (1, kick), VII-23-2004 (10, kick, **blackwing**), VIII-13-2004 (1, kick). Peabody River - unnamed branch, V-11-2005 (3, kick), V-18-2004 (8, kick), VI-3-2004 (12, kick), VI-8-2005 (36, kick), VI-17-2004 (3, kick), VI-23-2005 (11, kick, **mature**), VII-8-2004 (20, kick). Pemigewasset River - Lincoln, V-19-2005 (3, kick). Pemigewasset River - Woodstock, V-19-2005 (24, kick), VI-8-2005 (18, kick, **blackwing**), VI-23-2005 (3, kick). Swift River, V-11-2005 (3, kick), V-18-2004 (5, kick). [*Southern Rivers*]: Coheco River, IV-19-2005 (21, kick, **blackwing**). Lamprey River, IV-17-2005 (1, net). Otter Brook, IV-17-2005 (2, kick). Piscataquog River, VI-28-2005 (1, kick, **blackwing**). **Notes:** Clifford reports as univoltine winter cycle, though an extended univoltine cycle since blackwings were taken in every month from April to September. A mixture of sizes are always present, though the smallest larvae are present in late summer and early spring. This species is common in northern rivers, and was found sparingly in four southern rivers. In Maine larvae and adults were taken from April to June (Burian & Gibbs, 1991).

\**Epeorus vitreus* (Walker, 1853): [*Northern Rivers*]: Ammonoosuc River, V-18-2004 (1, kick), VI-3-2004 (2, kick), VII-23-2004 (1, kick). Androscoggin River, V-11-2005 (9, kick), V-18-2004 (2, kick), VI-3-2004 (3, kick, **blackwing**), VI-17-2004 (3, kick). Bearcamp River, V-11-2005 (50, kick), V-18-2004 (23, kick), VI-3-2004 (8, kick), VI-8-2005 (44, kick), VI-17-2004 (30, kick), VII-8-2004 (18, kick, **blackwing**), VII-23-2004 (9, kick), IX-6-2004 (2, kick), X-2-2004 (15, kick). Bog Brook, V-18-2004 (5, kick), V-19-2005 (22, kick), VI-3-2004 (8, kick), VI-17-2004 (7, kick), X-2-2004 (7, kick). Chocorua River, V-18-2004 (3, kick). East Branch Saco River, V-11-2005 (4, kick), V-18-2004 (23, kick), VI-3-2004 (14, kick), VI-8-2005 (25, kick), VI-17-2004 (9, kick, **blackwing**), VI-23-2005 (34, kick, **blackwing**), VII-8-2004 (2, kick), VII-23-2004 (2, kick), X-2-2004 (1, kick). Ellis River, V-18-2004 (5, kick), VI-3-2004 (5, kick), VI-17-2004 (25, kick, **blackwing**), VII-8-2004 (11, kick), VII-23-2004 (2, kick, **mature**), IX-6-2004 (10, kick), X-2-2004 (2, kick). Gale River, V-18-2004 (4, kick), VI-3-2004 (1, kick), VII-8-2004 (1, net), VII-23-2004 (1, net). Moose River, V-18-2004 (5, kick), VI-17-2004 (6, kick), X-2-2004 (3, kick). Moosilauke Brook, V-19-2005 (1, net), VI-3-2004 (7, kick), VI-17-2004 (18, kick, **blackwing**), VII-23-2004 (3, kick, **blackwing**). Pemigewasset River - Woodstock, V-19-2005 (1, kick), VI-8-2005 (16, kick), VI-23-2005 (10, kick, **blackwing**). Swift River, V-11-2005 (1, kick), V-18-2004 (3, kick, **blackwing**), VI-3-2004 (3, kick), VI-17-2004 (16, kick, **blackwing**), VII-8-2004 (2, kick), VII-23-2004 (3, kick), X-2-2004 (1, kick). [*Southern Rivers*]: Coheco River, VII-11-2003 (1, kick). Contoocook River, IV-17-2005 (1, kick), V-17-2003 (1, net), VI-4-2003 (2, kick), VII-11-2003 (1, kick). Lamprey River, V-14-2004 (1, kick), VI-18-2004 (1, kick), VII-28-2004 (9, kick).

Otter River, IV-17-2005 (4, kick), VI-4-2003 (2, kick), VIII-6-2003 (1, kick, **blackwing**), VIII-25-2003 (1, kick). Piscataquog River, V-17-2003 (1, kick), VI-16-2003 (1, kick), VII-23-2003 (1, kick), VIII-25-2003 (1, kick). Piscataquog River - Middle Branch, VIII-6-2003 (7, kick). Piscataquog River - South Branch, IV-17-2005 (16, kick), V-17-2003 (1, kick), VI-4-2003 (2, kick), VIII-25-2003 (2, kick). Souhegan River, V-27-1998 (4, Surber), VI-11-1998 (3, Surber), VII-3-1998 (2, Surber), VII-21-1998 (5, Surber), VII-31-998 (13, kick), VIII-17-1998 (9, kick; 2 Surber), VIII-26-1998 (4, kick; 4, Surber). South Branch Ashuelot River, IV-17-2005 (3, kick). **Notes:** Clifford (1982) reports a univoltine winter cycle; here appearing to be an extended univoltine cycle. Mixed sizes of larvae were present throughout the sampling period, and blackwings were found from May to early August. In Maine larvae were taken from May to September, and adults from June to August (Burian & Gibbs, 1991).

\**Heptagenia flavescens* (Walsh, 1862): [*Northern Rivers*]: Ammonoosuc River, VII-23-2004 (1, kick). Androscoggin River, VI-17-2004 (1, kick). Bearcamp River, VI-17-2004 (8, kick), VII-8-2004 (2, kick), VII-23-2004 (2, kick). Moose River, V-19-2005 (5, net), IX-6-2004 (2, kick). Moosilauke Brook, VII-23-2004 (2, kick). Pemigewasset River - Woodstock, VII-25-2005 (1, kick). [*Southern Rivers*]: Contoocook River, VI-4-2003 (7, kick), VII-11-2003 (3, kick, **blackwing**). Lamprey River, IX-13-2005 (1, net, **blackwing**). Merrimack River, VII-23-2003 (1, net). Piscataquog River, VI-16-2003 (1, kick). Piscataquog River - Middle Branch, VI-4-2003 (3, kick), VI-16-2003 (1, kick). Piscataquog River - South Branch, VIII-6-2003 (1, kick). Souhegan River, V-27-1998 (5, kick), VI-4-1998 (3, Surber), VI-11-1998 (8, kick; 8, Surber), VII-3-1998 (4, Surber). South Branch Ashuelot River, VI-16-2003 (3, kick). **Notes:** Clifford (1982) reports a univoltine winter cycle. Larvae were taken primarily from June to July, but a few were found in May and in August/September. Blackwings were collected in July and September. In Maine larvae were taken in September (Burian & Gibbs, 1991).

\**Heptagenia pulla* (Clemens, 1913): [*Northern Rivers*]: Androscoggin River, VII-8-2004 (5, kick), VII-23-2004 (3, kick, **mature**). Moose River, VIII-13-2004 (1, kick). Peabody River, VI-3-2004 (1, kick). **Notes:** A univoltine summer cycle. Found only in northern rivers, with larvae present from June to August, and mature specimens being taken in July. In Maine larvae were taken in May and from July to August, with adults present from June to August (Burian & Gibbs, 1991).

\**Leucrocuta hebe* (McDunnough, 1924): [*Southern Rivers*]: Cocheco River, VI-4-2003 (2, kick, **mature**), VI-16-2003 (1, kick, **mature**). Piscataquog River - Middle Branch, VII-23-2003 (1, kick, **blackwing**). Piscataquog River - South Branch, VI-4-2003 (2, kick), VI-16-2003 (2, kick, **blackwing**), VII-11-2003 (1, kick, **blackwing**), VII-23-2003 (7, kick). **Notes:** Clifford (1982) lists this species as having a seasonal univoltine cycle where most individuals overwinter as eggs, but a small number overwinter as nymphs. In New Hampshire appearing to be a univoltine summer cycle. Found only in southern rivers, with larvae present from June to July, and blackwings appearing in July. In Maine larvae and adults were found from May to September (Burian & Gibbs, 1991).

\**Leucrocuta juno* (McDunnough, 1924): [*Southern Rivers*]: Nissitissit River, VI-17-2005 (13, kick), VI-28-2005 (1, kick; 1, net). Sugar River, VI-17-2005 (1, net). **Notes:** Univoltine spring/early summer cycle. Found only in southern rivers, with larvae present in June.

\**Leucrocuta maculipennis* (Walsh, 1863): [*Northern Rivers*]: Bearcamp River, VI-3-2004 (1, kick). [*Southern Rivers*]: Merrimack River, VII-23-2003 (1, kick, **blackwing**). Piscataquog River - South Branch, VII-23-2003 (1, kick). **Notes:** Univoltine summer cycle. Larvae were collected in June and July, with blackwings being taken in July. In Maine larvae were found from July to August, and adults were collected in August (Burian & Gibbs, 1991).

\**Leucrocuta minerva* (McDunnough, 1924): [*Northern Rivers*]: Androscoggin River, VI-17-2004 (1, kick), VII-8-2004 (2, kick, **blackwing**), IX-6-2004 (2, kick, **blackwing**). Bearcamp River, VI-3-2004 (2, kick), VI-17-2004 (3, kick), VII-8-2004 (20, kick, **blackwing**), VII-23-2004 (15, kick, **blackwing**), VIII-13-2004 (6, kick, **blackwing**), IX-6-2004 (7, kick). Chocorua River, VII-8-2004 (1, kick). East Branch Saco River, V-18-2004 (4, kick), VI-3-2004 (1, kick). Ellis River, VI-17-2004 (1, kick), VII-23-2004 (5, kick, **blackwing**), VIII-13-2004 (20, kick). Gale River, VI-17-2004 (5, kick), VII-23-2004 (2, kick). [*Southern Rivers*]: Piscataquog River, VI-4-2003 (2, kick, **blackwing**; 1, net), VI-16-2003 (1, kick; 1, net), VI-28-2005 (19, kick, **blackwing**), VII-11-2003 (1, kick, **blackwing**), VII-23-2003 (4, kick), VIII-6-2003 (1, kick), VIII-25-2003 (11, kick). Piscataquog River - Middle Branch, VII-11-2003 (1, kick), VII-23-2003 (1, kick), VIII-6-2003 (2, kick), VIII-25-2005 (4, kick). Piscataquog River - South Branch, V-17-2003 (3, kick), VI-4-2003 (12, kick), VI-16-2003 (4, kick, **blackwing**), VII-23-2003 (1, net), VIII-6-2003 (10, kick), IX-16-2003 (2, kick, **blackwing**). **Notes:** Probably a bivoltine summer cycle; larvae were present throughout the summer and blackwings were taken at two widely separated times at the Androscoggin and South Branch of the Piscataquog Rivers. Larvae were present from May to September, and blackwings were found from June to September. In Maine adults were taken in July (Burian & Gibbs, 1991).

\**Maccaffertium ithaca* (Clemens & Leonard, 1924): [*Northern Rivers*]: Androscoggin River, V-18-2004 (2, kick), IX-6-2004 (10, kick), X-2-2004 (1, kick). Bearcamp River, V-11-2005 (7, kick), VI-3-2004 (1, kick), VI-8-2005 (5, kick), VI-17-2004 (3, kick). Bog Brook, IX-6-2004 (1, kick), X-2-2004 (4, kick). VI-17-2004 (1, net). Ellis River, VI-17-2004 (1, net). Swift River, VI-17-2004 (1, kick), X-2-2004 (2, kick). [*Southern Rivers*]: Contoocook River, IV-17-2005 (1, kick), V-5-2003 (1, kick), V-17-2003 (1, kick; 1, net), VI-16-2003 (3, kick; 1, net). Lamprey River, VII-28-2004 (1, net). Merrimack River, VII-23-2003 (1, kick). Otter Brook, V-17-2003 (2, kick). Piscataquog River, V-17-2003 (1, kick), VI-16-2003 (8, kick, **blackwing**). Piscataquog River - South Branch, IV-17-2005 (1, kick), VI-4-2003 (1, net). Souhegan River, VI-11-1998 (12, kick; 8, Surber), VII-3-1998 (3, kick; 4 Surber). South Branch Ashuelot River, V-5-2003 (1, net), V-17-2003 (6, kick), VI-4-2003 (4, kick), VI-16-2003 (13, kick). **Notes:** Univoltine winter cycle. Larger larvae were present from April to July, with small individuals appearing in September. In Maine larvae were taken from May to July (Burian & Gibbs, 1991).

*\*Maccaffertium luteum* (Clemens, 1913): [*Northern Rivers*]: Ammonoosuc River, VIII-13-2004 (8, kick). Androscoggin River, IX-6-2004 (1, kick). Bog Brook, V-18-2004 (1, kick). Pemigewasset River - Woodstock, VI-8-2005 (1, kick). [*Southern Rivers*]: Contoocook River, VIII-25-2003 (1, kick; 1 net), IX-16-2003 (3, net). **Notes:** Probably a univoltine winter cycle. Larvae were taken from May to June, and from August to September. In Maine larvae were taken from May to June and in August (Burian & Gibbs, 1991).

*\*Maccaffertium mediopunctatum* (McDunnough, 1926): [*Northern Rivers*]: Gale River, V-11-2005 (1, kick). [*Southern Rivers*]: Lamprey River, X-21-2004 (3, net). Piscataquog River, V-17-2003 (3, kick), VI-4-2003 (7, kick), VI-16-2003 (5, kick), VII-23-2003 (7, kick, **mature**), VIII-6-2003 (3, kick, **mature**). Piscataquog River - Middle Branch, VI-4-2003 (1, kick), VI-16-2003 (3, kick). Piscataquog River - South Branch, VI-16-2003 (2, kick). South Branch Ashuelot River, V-17-2003 (1, net). **Notes:** An extended univoltine winter cycle. Larvae were collected from May to early August, and in October. Mature larvae were found in July and August, and the smallest larvae were found in October. Primarily taken from southern rivers. In Maine larvae were collected from June to September, and adults were taken from June to August (Burian & Gibbs, 1991).

*\*Maccaffertium modestum* (Banks, 1910): [*Northern Rivers*]: Ammonoosuc River, VIII-13-2004 (2, kick). Androscoggin River, VI-3-2004 (1, kick), IX-6-2004 (3, kick), X-2-2004 (1, kick). Bearcamp River, V-18-2004 (1, kick), VI-3-2004 (1, kick), VII-8-2004 (1, kick). Chocorua River, V-11-2005 (2, kick; 7, net), V-18-2004 (8, kick), VI-3-2004 (18, kick; 5, net, **mature**), VI-17-2004 (8, kick; 7, net), VII-8-2004 (23, kick; 4, net), VII-23-2004 (15, net), IX-6-2004 (12, kick), X-2-2004 (50, kick). East Branch Saco River, VIII-13-2004 (1, kick). Ellis River, V-18-2004 (1, kick), VI-3-2004 (1, net, **blackwing**). Pemigewasset River - Woodstock, VIII-3-2005 (59, kick), VIII-25-2005 (12, kick). Swift River, VII-23-2004 (1, kick). [*Southern Rivers*]: Bellamy River, IV-20-2005 (34, kick; 19, net), V-5-2003 (62, kick; 11, net), V-17-2003 (42, kick; 1, net), VI-4-2003 (17, kick), VI-16-2003 (10, kick, **blackwing**), VII-11-2003 (15, kick; 19, net), VII-23-2003 (5, kick; 37, net), VIII-6-2003 (172, kick; 69, net), VIII-25-2003 (114, kick; 210, net), IX-16-2003 (100, kick; 202, net). Cocheco River, IV-19-2005 (1, kick; 1, net), V-5-2003 (2, kick), V-17-2003 (7, kick), VI-4-2003 (8, kick, **blackwing**; 1, net), VII-23-2003 (2, kick; 2, net), VIII-6-2003 (30, kick; 5, net), VIII-25-2003 (23, net), IX-16-2003 (60, kick; 30, net). Contoocook River, V-5-2003 (3, kick), V-17-2003 (2, net), VI-4-2003 (2, net), VI-16-2003 (2, net), VII-23-2003 (3, net), VIII-6-2003 (2, net), VIII-25-2003 (4, kick; 4, net), IX-16-2003 (1, kick; 5, net). Lamprey River, IV-17-2005 (3, net), V-14-2004 (1, net), VI-1-1004 (1, kick), VI-18-2004 (2, kick; 1 net), VII-14-2004 (2, kick), VII-28-2004 (1, kick; 1, net), VIII-9-2005 (10, kick), VIII-25-2005 (9, kick; 4, net), IX-13-2005 (4, kick; 3, net), X-21-2004 (24, kick; 6, net). Merrimack River, VII-23-2003 (5, kick; 1, net). Nissitissit River, VI-7-2005 (16, kick; 7, net, **blackwing**), VI-28-2005 (5, kick, **blackwing**). Otter Brook, IV-17-2005 (4, net), VI-4-2003 (1, kick). Piscataquog River, IV-19-2005 (7, kick; 9, net), V-17-2003 (4, kick), VI-4-2003 (4, kick, **blackwing**), VI-16-2003 (2, kick), VII-23-2003 (4, kick). Piscataquog River - Middle Branch, V-5-2003 (1, net), VI-16-2003 (1, net). Piscataquog River - Middle Branch, V-17-2003 (1, kick), VI-4-2003 (1, kick).

Piscataquog River - South Branch, VI-4-2003 (12, net). Souhegan River, V-27-1998 (5, kick; 4, Surber), VI-4-1998 (1, Surber), VI-11-1998 (2, kick; 2, Surber), VII-21-1998 (13, kick; 12, Surber). South Branch Ashuelot River, IV-17-2005 (5, kick; 10, net), V-5-2003 (5, net), V-17-2003 (2, kick; 1, net), VI-4-2003 (1, net), VI-16-2003 (3, kick), IX-16-003 (3, net). **Notes:** Univoltine winter cycle. Larvae present from May to October, with small larvae appearing as early as August, and blackwings found in June. In Maine larvae were found from March to September, with adults appearing from June to August (Burian & Gibbs, 1991).

\**Maccaffertium pudicum* (Hagen, 1861): [*Southern Rivers*]: Lamprey River, VII-14-2004 (1, net). Piscataquog River, VI-4-2003 (1, kick). Souhegan River, VIII-17-1998 (78, kick; 44, Surber). **Notes:** Larvae were only collected three times, and were found in June, July, and August in three southern rivers.

\**Maccaffertium terminatum* (Walsh, 1862): [*Southern Rivers*]: Piscataquog River, VI-16-2003 (1, kick). **Notes:** Clifford (1982) lists this species as univoltine winter species. A single specimen was taken in June. In Maine adults were taken in June and August (Burian & Gibbs, 1991).

*Maccaffertium vicarium* (Walker, 1853): [*Northern Rivers*]: Ammonoosuc River, V-11-2005 (1, net), V-18-2004 (1, kick; 1, net), VIII-13-2004 (6, kick), X-2-2004 (1, kick). Androscoggin River, V-11-2005 (2, kick), VI-3-2004 (1, kick), IX-6-2004 (10, kick), X-2-2004 (1, kick). Bearcamp River, V-11-2005 (1, kick), VIII-13-2004 (10, kick), IX-6-2004 (10, kick), X-2-2004 (11, kick). Bog Brook, IX-6-2004 (2, kick). Chocorua River, V-18-2004 (1, kick, **blackwing**). East Branch Saco River, V-11-2005 (1, kick; 1, net), VIII-13-2004 (5, kick), IX-6-2004 (6, kick), X-2-2004 (9, kick). Ellis River, V-11-2005 (1, net), IX-6-2004 (1, kick), X-2-2004 (2, kick). Gale River, V-11-2005 (1, kick), V-18-2004 (3, kick), IX-6-2004 (5, kick; 4, net), X-2-2004 (2, kick; 1, net). Moose River, V-11-2005 (1, kick), V-18-2004 (5, kick), VI-3-2004 (2, net), VI-17-2004 (4, kick, **blackwing**), VII-8-2004 (3, kick), VIII-13-2004 (1, kick), IX-6-2004 (4, kick), X-2-2004 (4, kick). Moosilauke Brook, V-19-2005 (1, net), IX-6-2004 (4, kick), X-2-2004 (6, kick). Pemigewasset River - Woodstock, VIII-25-2005 (91, kick; 7, net). Swift River, VIII-13-2004 (1, kick), X-2-2004 (2, kick). [*Southern Rivers*]: Cochecho River, IV-19-2005 (1, kick), V-17-2003 (2, kick), VI-4-2003 (6, kick, **blackwing**), IX-16-2003 (4, kick). Contoocook River, IV-17-2005 (1, kick; 1, net), V-17-2003 (1, net), VI-4-2003 (2, kick), VIII-25-2003 (18, kick), IX-16-2003 (13, kick; 6, net). Lamprey River, IV-17-2005 (4, kick), V-14-2004 (3, kick, **mature**), VII-28-2004 (13, kick), VIII-9-2005 (5, kick), VIII-25-2005 (9, kick; 5, net), IX-13-2005 (4, kick), X-21-2004 (15, net). Otter Brook, IV-17-2005 (3, kick), V-5-2003 (2, net), V-17-2003 (1, kick), VII-23-2003 (2, kick), VIII-6-2003 (2, kick), VIII-25-2003 (7, kick), IX-16-2003 (8, kick). Piscataquog River, VI-4-2003 1, kick). Piscataquog River - Middle Branch, VIII-25-2003 (1, kick). Piscataquog River - South Branch, V-17-2003 (4, kick), IX-16-2003 (3, kick). Souhegan River, VIII-26-1998 (24, kick; 40, Surber). South Branch Ashuelot River, IV-17-2005 (1, kick), V-17-2003 (5, net), VIII-25-2003 (1, net), IX-16-2003 (2, net). **Notes:** Clifford (1982) reports this species as a univoltine winter species. Larvae were present throughout the sampling season, with small larvae appearing in August or later, and blackwings taken during May and June. Larger larvae often found un-

der rocks near the stream margin and on the periphery of the normal sampling area in the stream. In Maine larvae were taken from April to August, and adults from May to July (Burian & Gibbs, 1991).

\**Nixe lucidipennis* (Clemens, 1913): [*Northern Rivers*]: Ammonoosuc River, VII-8-2004 (2, kick). Androscoggin River, VII-8-2004 (2, kick), VIII-13-2004 (3, kick). Ellis River, VII-8-2004 (50, kick, **blackwing**), VII-23-2004 (7, kick, **blackwing**). Moose River, VII-8-2004 (5, kick). [*Southern Rivers*]: Cochecho River, VI-4-2003 (2, kick), VI-16-2003 (9, kick), VII-11-2003 (2, kick, **blackwing**). Lamprey River, VI-18-2004 (8, kick, **mature**). Piscataquog River, VI-4-2003 (8, kick), VI-16-2003 (50, kick, **blackwing**), VIII-6-2003 (1, kick). Piscataquog River - Middle Branch, VI-4-2003 (12, kick), VI-16-2003 (1, kick). **Notes:** Clifford (1982) reports a univoltine summer cycle. Larvae were found from June to August, and blackwings were taken in June and July. In Maine larvae were collected in September, and adults in July (Burian & Gibbs, 1991).

\**Nixe perfida* (McDunnough, 1926): [*Northern Rivers*]: Ellis River, VII-8-2004 (1, net). Gale River, VII-8-2004 (26, kick, **blackwing**). [*Southern Rivers*]: Cochecho River, VII-11-2003 (2, kick, **blackwing**). **Notes:** Univoltine summer cycle. Larvae (including blackwings) were taken only in July. In Maine adults were found in July (Burian & Gibbs, 1991).

*Rhithrogena brunneotincta* McDunnough, 1933: [*Northern Rivers*]: Coos Co.: Cold Brook, 9 mi W Berlin, 467 m, X-26-1979 (2), IV-26-1980 (1), D.P. Mason; Dixville, VI-2-1976, P. LaScala (1, **blackwing**); Mill Brook, 3.2 km S Meadows, 397 m, X-26-1979, D.P. Mason (2). Grafton Co.: W Branch Mad River, 492 m, X-26-1979 (2), VI-10-1980, D.P. Mason (1, **blackwing**). **Notes:** Burian & Gibbs (1991) found this species at a few sites in Franklin County, close to the White Mountain region where the New Hampshire specimens were taken. The larvae are undescribed, and Burian & Gibbs (1991) based their identifications on reared adult males. In Maine this species was found at many more sites than the other large *Rhithrogena* taken, *R. amica* Traver, which was collected only in the northernmost counties in Maine. A univoltine winter cycle, with moderate sized larvae present in October and blackwings taken in early June from cold northern rivers. In Maine larvae were taken from March to June and from September to November, while adults were collected from June to July (Burian & Gibbs, 1991).

\**Rhithrogena impersonata* (McDunnough, 1925): [*Northern Rivers*]: Bearcamp River, V-18-2004 (1, kick, **blackwing**). East Branch Saco River, 5 mi E Jackson, 366 m, VI-11-1980, D.P. Mason (1, **blackwing**); Gale River, V-18-2004 (1, net). Moosilauke Brook, X-2-2004 (3, kick). Swift River, VI-3-2004 (2, kick). **Notes:** Clifford (1982) reports a univoltine winter cycle. Larvae were present from May to early June in northern rivers, with blackwings seen from May to early June, and much later small larvae appeared in October. In Maine larvae were taken from May to June, and adults from June to July (Burian & Gibbs, 1991).

\**Rhithrogena jejuna* Eaton, 1885: [*Northern Rivers*]: Ammonoosuc River, V-18-2004 (5, kick, **blackwing**). Bearcamp River, V-11-2005 (10, kick). Swift River, V-11-2005 (18, kick), VII-8-2004 (3, kick). Pemigewasset River - Woodstock, V-



19-2005 (1, kick), VI-8-2005 (7, kick, **blackwing**). **Notes:** Clifford (1982) lists a univoltine winter cycle. Larvae (including blackwings) were found from May to June in northern rivers, with a single collection of small larvae in July. In Maine larvae were taken in August, and adults were found from May to July (Burian & Gibbs, 1991).

\**Rhithrogena manifesta* (Eaton, 1885): [*Northern Rivers*]: Androscoggin River, V-11-2005 (1, kick). Bearcamp River, V-18-2004 (15, kick), VI-17-2004 (1, kick). Pemigewasset River - Woodstock, V-19-2005 (1, kick). Swift River, V-11-2005 (1, kick), VI-17-2004 (4, kick). **Notes:** Clifford (1982) reports a univoltine summer cycle. More precisely a univoltine spring cycle in New Hampshire, with small larvae taken in May, larger larvae in June from northern rivers. In Maine adults were collected in July (Burian & Gibbs, 1991).

\**Stenacron interpunctatum* (Say, 1839): [*Northern Rivers*]: Androscoggin River, IX-6-2004 (1, kick). Bog Brook, VI-3-2004 (2, kick), VII-8-2004 (1, kick). East Branch Saco River, V-18-2004 (5, kick), VIII-13-2004 (1, kick). Ellis River, VI-3-2004 (1, kick), VI-17-2004 (2, kick), X-2-2004 (4, kick). Moose River, V-11-2005 (3, kick), VI-3-2004 (1, net). Pemigewasset River - Lincoln, VIII-13-2004 (1, kick). Swift River, VI-17-2004 (3, kick), VII-8-2004 (1, kick). [*Southern Rivers*]: Bellamy River, V-5-2003 (11, kick; 1, net), V-17-2003 (2, kick), VI-4-2003 (6, kick), VI-16-2003 (1, kick), VII-11-2003 (1, kick), VIII-6-2003 (2, kick). Cochecho River, V-17-2003 (3, kick), VI-4-2003 (2, kick), VII-23-2003 (1, kick), VIII-25-2003 (1, net), IX-16-2003 (7, kick). Contoocook River, VIII-25-2003 (10, kick), IX-16-2003 (4, kick). Lamprey River, X-21-2004 (1, net). Merrimack River, VII-23-2003 (2, kick), VIII-25-2003 (3, kick), IX-16-2003 (3, kick). Otter Brook, VI-4-2003 (1, kick). Piscataquog River, V-17-2003 (7, kick), VI-4-2003 (1, kick), VI-16-2003 (1, kick), VIII-6-2003 (4, kick). Piscataquog River - Middle Branch, VIII-25-2003 (1, net). Piscataquog River - South Branch, V-17-2003 (1, kick), VII-23-2003 (2, kick), IX-16-2003 (1, kick). South Branch Ashuelot River, V-5-2003 (4, net), VI-4-2003 (6, kick), VI-16-2003 (1, kick), VII-11-2003 (6, kick), VII-23-2003 (2, kick), VIII-6-2003 (2, kick, **blackwing**), VIII-25-2003 (3, kick), IX-16-2003 (12, kick). **Notes:** Clifford (1982) notes that this species lacks a clear-cut pattern, which is true for New Hampshire. Apparently a seasonally extended univoltine cycle. Larvae were present from May to October, and the only blackwings observed were found in August. In Maine larvae were found from March to September, and adults from June to August (Burian & Gibbs, 1991).

\**Stenonema femoratum* (Say, 1823): [*Southern Rivers*]: Cochecho River, V-17-2003 (2, kick). Merrimack River, VII-23-2003 (1, net). Souhegan River, VI-11-1998 (2, Surber). **Notes:** Clifford (1982) noted that some populations of this species appeared to be polyvoltine. Five larvae were taken in May, June, and July from three southern rivers. In Maine larvae were taken in August, and adults from July to September (Burian & Gibbs, 1991).

## ISONYCHIIDAE

*Isonychia bicolor* (Walker, 1853): [*Northern Rivers*]: Ammonoosuc River, VII-23-2004 (4, kick), VIII-13-2004 (3, kick). Bearcamp River, VII-8-2004 (3, kick), VII-23-2004 (5, kick). Gale River, VII-23-2004 (2, kick; 2, net), IX-6-2004 (1, net, **blackwing**). [*Southern Rivers*]: Cochecho River, VII-23-2003 (2, kick), VIII-6-2003 (4, kick), VIII-25-2003 (2, kick, **blackwing**; 5, net, **blackwing**), IX-16-2003 (2, net). Contoocook River, VII-11-2003 (26, kick; 13, net), VII-23-2003 (24, kick; 10, net), VIII-6-2003 (1, kick; 5, net), VIII-25-2003 (1, kick; 1, net, **blackwing**). Lamprey River, IV-17-2005 (1, net), VI-18-2004 (1, net, **blackwing**), VII-28-2004 (3, kick, **blackwing**), VIII-9-2005 (2, kick, **blackwing**; 1, net, **blackwing**), VIII-25-2005 (37, kick, **blackwing**; 4, net), IX-13-2005 (14, kick), X-21-2004 (19, net). Merrimack River, VII-23-2003 (14, kick). Nissitissit River, VI-7-2005 (1, kick, **blackwing**), VI-28-2005 (8, kick). Piscataquog River, VI-4-2003 (1, kick), VII-11-2003 (19, kick), VII-23-2003 (58, kick; 1, net), VIII-6-2003 (1, kick), VIII-25-2003 (2, kick, **blackwing**). Piscataquog River - Middle Branch, IV-17-2005 (4, kick), V-5-2003 (7, kick), V-17-2003 (1, net), VI-4-2003 (9, kick, **blackwing**; 4, net), VI-16-2003 (1, kick), VII-11-2003 (11, kick), VII-23-2003 (1, kick; 5, net), VIII-6-2003 (1, kick; 2, net), VIII-25-2003 (20, net), IX-16-2003 (38, net, **blackwing**). Piscataquog River - South Branch, IV-17-2005 (4, kick), VI-4-2003 (1, kick), VII-23-2003 (2, kick; 1, net), IX-16-2003 (2, kick, **blackwing**). Souhegan River, VIII-17-1998 (2, kick; 2, Surber). South Branch Ashuelot River, VIII-6-2003 (1, kick; 2, net). **Notes:** Clifford (1982) reports a bivoltine winter-summer cycle for this species. It does appear to be bivoltine in some southern rivers with blackwings appearing in June and September at the Middle Branch of the Piscataquog. Larvae are present from April to October in several southern rivers. In Maine larvae were taken from May to June and from August to October, with adults being collected during July and August (Burian & Gibbs, 1991).

\**Isonychia obscura* Traver, 1932: [*Northern Rivers*]: Bearcamp River, VII-8-2004 (13, kick), VII-23-2004 (15, kick, **blackwing**). Gale River, IX-6-2004 (1, net). [*Southern Rivers*]: Nissitissit River, VI-7-2005 (32, kick), VI-28-2005 (12, kick). Piscataquog River, VI-4-2003 (7, kick), VI-16-2003 (17, kick), VII-11-2003 (1, kick). Piscataquog River - Middle Branch, VI-4-2003 (101, kick), VI-16-2003 (35, kick; 9, net), VII-11-2003 (14, kick), VII-23-2003 (1, kick; 1, net). Piscataquog River - South Branch, VI-4-2003 (2, net), VI-16-2003 (8, kick), VII-11-1003 (3, kick), VII-23-2003 (3, kick; 2, net, **blackwing**), VIII-6-2003 (4, kick), VIII-25-2003 (1, kick), IX-16-2003 (8, kick). **Notes:** Univoltine summer cycle. Larvae are present from June to September, with blackwings appearing in July. This emergence period is between the emergence periods of *I. bicolor* when they occur in the same river. In Maine larvae and adults were taken from July to August (Burian & Gibbs, 1991).

## LEPTOHYPHIDAE

\**Tricorythodes cobbi* Alba-Tercedor & Flannagan, 1995: [*Northern Rivers*]: Bearcamp River, VII-8-2004 (2, kick), VII-23-2004 (2, kick). Ellis River, VI-3-2004 (2, net). [*Southern Rivers*]: Cochecho River, VII-23-2003 (1, kick), VIII-25-2003 (4, net), IX-16-2003 (2, kick). Contoocook River, VII-23-2003 (6, kick; 2, net), VIII-6-2003 (1, kick), VIII-25-2003 (1, kick), IX-16-2003 (1, kick). Lam-

prey River, VII-14-2004 (14, kick; 7, net), VII-28-2004 (2, net), VIII-9-2005 (3, kick; 2, net). Otter Brook, VIII-25-2003 (1, net). Piscataquog River, VII-11-2003 (6, kick), VII-23-2003 (1, net), VIII-6-2003 (1, kick), VIII-25-2003 (14, kick; 16, net), IX-16-2003 (1, kick). Piscataquog River - Middle Branch, VII-23-2003 (1, kick; 2, net). Piscataquog River - South Branch, VII-23-2003 (5, kick), VIII-6-2003 (1, net). South Branch Ashuelot River, VII-23-2003 (3, kick). **Notes:** Probably a univoltine summer cycle. Larvae were present from June to September, with blackwings not being detected. Both species of *Tricorythodes* were most common in southern rivers.

\**Tricorythodes mosegus* Alba-Tercedor & Flannagan, 1995: [*Northern Rivers*]: Bearcamp River, VII-23-2004 (20, kick). [*Southern Rivers*]: Cocheco River, VII-23-2003 (1, kick), VIII-25-2003 (1, net). Contoocook River, VII-23-2003 (1, net), VIII-6-2003 (4, kick), VIII-25-2003 (5, kick), IX-16-2003 (1, kick). Lamprey River, VII-14-2004 (6, kick, **mature**), VII-28-2004 (3, net), X-21-2004 (9, net). Otter Brook, VIII-25-2003 (1, kick; 1 net). Merrimack River, VII-23-2003 (1, kick; 2, net). Piscataquog River, VII-11-2003 (42, net), VII-23-2003 (32, kick; 5 net), VIII-6-2003 (18, kick; 4, net), VIII-25-2003 (4, kick), IX-16-2003 (2, net). Piscataquog River - Middle Branch, VII-11-2003 (1, kick), VII-23-2003 (1, kick), VIII-25-2003 (1, net), IX-16-2003 (1, net). Piscataquog River - South Branch, VII-23-2003 (4, kick; 12, net), VIII-6-2003 (10, kick; 2, net). Souhegan River, VII-3-1998 (2, kick), VII-31-1998 (26, kick; 8 Surber), VIII-17-1998 (2, Surber), VIII-26-1998 (2, Surber). South Branch Ashuelot River, VII-23-2003 (1, kick), VIII-6-2003 (2, kick), IX-16-2003 (1, kick). **Notes:** Probably a univoltine summer cycle. Larvae were present from July to October, with mature individuals taken in July

#### LEPTOPHLEBIIDAE

\**Habrophlebia vibrans* Needham, 1907: [*Northern Rivers*]: Chocorua River, V-11-2005 (1, kick; 4, net), VI-3-2004 (15, kick; 1, net), VII-23-2004 (1, net). East Branch Saco River, VI-8-2005 (1, net), VI-17-2004 (3, net), VI-23-2005 (6, net). Moose River, VI-17-2004 (1, net). Moosilauke Brook, VII-8-2004 (2, kick, **blackwing**). Pemigewasset River - Lincoln, VI-17-2004 (1, net). Pemigewasset River - Woodstock, VI-8-2005 (1, net), VI-23-2005 (1, kick), VII-5-2005 (1, net, **blackwing**). [*Southern Rivers*]: Otter Brook, V-17-2003 (1, net), VI-4-2003 (4, kick), VI-16-2003 (2, kick), VII-11-2003 (1, kick; 1, net, **blackwing**). South Branch Ashuelot River, VI-16-2003 (2, net, **blackwing**), VII-11-2003 (1, net, **blackwing**). **Notes:** Univoltine summer cycle. Larvae were taken from May to July, with blackwings being present from June to July. In Maine larvae were found from May to August, and adults from June to July (Burian & Gibbs, 1991).

\**Habrophlebiodes americana* (Banks, 1903): [*Northern Rivers*]: Bog Brook, VII-8-2004 (5, kick, **blackwing**). Chocorua River, VI-3-2004 (21, kick; 5, net), VI-17-2004 (10, kick; 7, net, **blackwing**), VII-8-2004 (8, kick, **blackwing**). **Notes:** Based on the collections here, this species has a univoltine summer cycle. Larvae (including blackwings) were collected in June and July from two northern rivers. Both collecting sites were downstream from a large marsh or bog. In Maine larvae were taken from April to September, and adults from June to August (Burian & Gibbs, 1991).

*Leptophlebia cupida* (Say, 1823): [*Northern Rivers*]: East Branch Saco River, IX-6-2004 (1, net), X-2-2004 (11, net). Ellis River, X-2-2004 (1, kick). Gale River, X-2-2004 (19, net). [*Southern Rivers*]: Lamprey River, IV-17-2005 (3, net). Piscataquog River, IV-19-2005 (6, net). **Notes:** Clifford (1982) reports a univoltine winter cycle. Large larvae were present in April, and small larvae were taken in September and October. The genus *Leptophlebia* Westwood was revised and extensively figured by Burian (2001), where additional New Hampshire records for March, May, and June are given. In Maine larvae were taken from March to June, and adults from April to early June (Burian & Gibbs, 1991)..

*Leptophlebia intermedia* (Traver, 1932): [*Northern Rivers*]: Chocorua River, V-11-2005 (1, net). [*Southern Rivers*]: Bellamy River, IV-17-2005 (113, net, **mature**), V-5-2003 (10, kick; 49, net, **blackwing**), V-17-2003 (37, net, **blackwing**), VI-4-2003 (1, kick, **blackwing**; 3, net, **blackwing**), IX-16-2003 (6, kick). Coheco River, IV-17-2005 (4, net, **blackwing**), V-5-2003 (2, net, **blackwing**). Lamprey River, IV-17-2005 (1, net), X-21-2004 (24, kick; 103, net). Otter Brook, IV-17-2005 (1, net). Piscataquog River, IV-19-2005 (1, net, **blackwing**). **Notes:** Univoltine winter cycle. Large larvae and blackwings were found in May and early June, with small larvae appearing in September and October. Burian (2001) also lists a record from March (Hudson, Hillsborough Co.). A single individual was found in one northern river, while this species was common in three southern rivers. In Maine larvae were taken from March to June, and adults from April to early June (Burian & Gibbs, 1991).

*Leptophlebia johnsoni* McDunnough, 1924: [*Northern Rivers*]: Pemigewasset River - Woodstock, VI-8-2003 (2, net, **blackwing**), VI-23-2005 (1, kick, **blackwing**). **Notes:** Univoltine spring cycle. Blackwing larvae were found in a backwater area of a single river. Burian (2001) lists an additional record from June (Jaffrey, Cheshire Co.). In Maine larvae were taken from April to July, and adults from June to early July (Burian & Gibbs, 1991).

*Leptophlebia nebulosa* (Walker, 1853): [*Northern Rivers*]: Pemigewasset River - Woodstock, V-18-2005 (2, net), IX-13-2005 (1, net). [*Southern Rivers*]: Bellamy River, V-5-2003 (2, net), V-17-2003 (1, net). Coheco River, IV-19-2005 (5, net, **blackwing**). Contoocook River, IV-17-2005 (8, kick), VI-4-2003 (1, net). Piscataquog River, IV-19-2005 (1, net), V-17-2003 (1, net). **Notes:** Univoltine winter cycle. A few large larvae and blackwings were taken during April and May using nets, with small larvae appearing in September. Burian (2001) lists a record in June from Milford (Hillsborough Co.). In Maine larvae were taken in April and September, and adults found from April to June (Burian & Gibbs, 1991).

\**Paraleptophlebia adoptiva* (McDunnough, 1929): [*Northern Rivers*]: Ammonoosuc River, VII-8-14 (14, kick), VII-23-2004 (7, kick, **blackwing**; 2, net). Androscoggin River, VII-8-2004 (4, kick, **blackwing**). Bearcamp River, VII-8-2004 (4, kick). East Branch Saco River, VII-8-2004 (15, kick), VII-23-2004 (1, net, **blackwing**). Gale River, VII-8-2004 (25, kick), VII-23-2004 (7, kick, **blackwing**). Moose River, VII-23-2004 (6, kick, **blackwing**). Moosilauke Brook, VI-17-2004 (2, kick). Swift River, VI-17-2004 (9, kick). Pemigewasset River - Woodstock, VIII-9-2005 (1, net). [*Southern Rivers*]: Contoocook River, IV-17-

2005 (1, kick, **blackwing**), V-5-2003 (1, kick, **blackwing**). **Notes:** Clifford (1982) indicates a univoltine winter cycle, which is supported by the few records from southern rivers, but a univoltine summer cycle is suggested by data from the northern rivers. Blackwings were found in April and May in southern rivers, and in July for northern rivers. In Maine larvae were taken from April to June and in August, while adults were found from April to early June (Burian & Gibbs, 1991).

*\*Paraleptophlebia debilis* (Walker, 1853): [*Northern Rivers*]: Ammonoosuc River, VII-23-2004 (1, kick). Bearcamp River, VII-8-2004 (2, kick, **blackwing**). East Branch Saco River, VI-23-2005 (2, net), VII-8-2004 (2, kick). Ellis River, VII-8-2004 (1, net). Gale River, VII-23-2004 (1, net). Moosilauke Brook, VI-17-2004 (2, kick). Pemigewasset River - Woodstock, VII-5-2005 (1, net, **blackwing**), VII-25-2005 (1, kick; 4, net), VIII-25-2005 (9, net). Swift River, VI-17-2004 (1, kick). [*Southern Rivers*]: Lamprey River, VI-18-2004 (3, kick), VII-14-2004 (1, kick). South Branch Ashuelot River, VIII-6-2003 (1, net). **Notes:** Clifford (1982) reports a univoltine summer cycle. Larvae were present from June to August, with blackwings collected in July. In Maine larvae were found from July to August, and adults from July to October (Burian & Gibbs, 1991).

*\*Paraleptophlebia guttata* (McDunnough, 1924): [*Northern Rivers*]: Ammonoosuc River, VI-3-2004 (2, net), VII-23-2004 (2, kick). Androscoggin River, VI-17-2004 (1, kick). Bearcamp River, V-18-2004 (2, kick), VI-3-2004 (2, kick). East Branch Saco River, VI-3-2004 (6, kick), VI-8-2005 (2, kick), VI-23-2005 (1, kick), VII-8-2004 (2, kick, **blackwing**), VII-23-2004 (3, kick, **blackwing**), IX-6-2004 (2, net). Ellis River, V-18-2004 (1, kick), VI-3-2004 (5, net), VI-17-2004 (15, kick, **blackwing**; 3, net, **blackwing**). Ellis River at Pinkham Notch, IX-6-2004 (1, kick). Gale River, VI-3-2004 (1, kick), VI-17-2004 (3, kick, **mature**), VII-23-2004 (4, kick, **blackwing**), IX-6-2004 (6, net). Moose River, VI-3-2004 (2, net), VII-8-2004 (4, net, **mature**). Moosilauke Brook, VI-3-2004 (5, kick), VI-17-2004 (12, kick, **blackwing**). Pemigewasset River - Lincoln, VI-17-2004 (2, kick), VIII-13-2004 (1, kick). Pemigewasset River - Woodstock, VI-23-2005 (6, net), VII-5-2005 (9, kick, **mature**), VII-25-2005 (1, net), VIII-9-2005 (3, net). Swift River, V-18-2004 (2, net), VII-8-2004 (3, kick, **blackwing**). [*Southern Rivers*]: Piscataquog River - Middle Branch, VIII-25-2003 (2, kick, **blackwing**). Piscataquog River - South Branch, VII-23-2003 (4, kick), VIII-6-2003 (2, kick). Souhegan River, VII-3-1998 (2, kick). **Notes:** Univoltine or bivoltine winter-summer cycle. Larvae were present from May to September in northern rivers, and just from July to August in southern rivers. Blackwings were present during August for southern rivers, and from June to July for northern rivers. In Maine larvae were taken from June to September, and adults from June to August (Burian & Gibbs, 1991).

*Paraleptophlebia mollis* (Eaton, 1871): [*Northern Rivers*]: Ammonoosuc River, VI-3-2004 (1, kick; 2, net), VI-17-2004 (80, kick; 5, net, **blackwing**), VII-8-2004 (55, kick, **blackwing**), VII-23-2004 (1, kick). Androscoggin River, V-11-2005 (9, kick), V-18-2004 (3, kick), VI-3-2004 (27, kick, **mature**), X-2-2004 (1, kick). Bearcamp River, V-11-2005 (9, kick, **blackwing**; 4, net, **blackwing**), VI-8-2005 (6, kick). Bog Brook, V-18-2004 (7, kick), VI-3-2004 (9, kick, **blackwing**), VI-17-2004 (10, kick, **blackwing**). Chocorua River, VI-3-2004 (15, kick). East Branch

Saco River, VI-17-2004 (42, kick, **blackwing**), IX-6-2004 (2, kick). Ellis River, V-11-2005 (7, net, **blackwing**), V-18-2004 (5, kick), VI-3-2004 (4, kick; 1, net), VI-17-2004 (9, kick, **blackwing**), VI-23-2005 (7, kick, **blackwing**; 1, net), VII-8-2004 (13, kick), VII-23-2004 (4, kick, **blackwing**). Ellis River at Pinkham Notch, V-11-2005 (2, net, **blackwing**). Gale River, V-11-2005 (4, net, **mature**), V-18-2004 (1, kick), VI-3-2004 (2, kick), VI-17-2004 (23, kick, **blackwing**), IX-6-2004 (3, kick), X-2-2004 (X-2-2004). Moose River, V-11-2005 (4, kick, **mature**; 1, net, **mature**), V-18-2004 (1, kick), VI-3-2004 (7, net), VI-17-2004 (23, kick; 7, net, **mature**), VII-8-2004 (34, kick, **blackwing**), IX-6-2004 (2, kick). Moosilauke Brook, VI-17-2004 (6, kick, **mature**). Pemigewasset River - Lincoln, VII-8-2004 (10, kick, **blackwing**), X-2-2004 (1, kick). Pemigewasset River - Woodstock, V-19-2005 (3, kick; 1, net, **blackwing**), VI-8-2005 (12, kick, **mature**; 4, net), VI-23-2005 (143, kick, **blackwing**; 35, net, **blackwing**), VII-5-2005 (2, kick, **blackwing**; 3, net, **blackwing**). Swift River, V-11-2005 (1, kick), VI-3-2004 (2, kick; 2 net), VII-8-2004 (1, kick). [*Southern Rivers*]: Cocheco River, IV-19-2005 (1, kick; 1, net, **mature**). Contoocook River, IV-17-2005 (15, kick, **blackwing**; 1, net, **mature**). Piscataquog River, IV-19-2005 (1, net, **blackwing**). Piscataquog River - South Branch, IV-17-2005 (5, kick), V-17-2003 (3, kick), VI-4-2003 (4, kick, **blackwing**). **Notes:** Clifford (1982) indicates a univoltine winter cycle, which is extended to July in New Hampshire. Large and blackwing larvae were present from April to July, with small larvae appearing in September and October. In Maine larvae were taken from May to July and in September, and adults were collected from July to August (Burian & Gibbs, 1991).

#### METRETOPODIDAE

*Siphloplecton basale* (Walker, 1853): [*Southern Rivers*]: Lamprey River, IV-17-2005 (4, net, **blackwing**), X-21-2004 (2, net). **Notes:** Clifford (1982) reports a univoltine winter cycle. Small larvae were taken in October and blackwings were found during April in the Lamprey River. In Maine larvae were taken during April and September, and adults in May (Burian & Gibbs, 1991).

#### POTAMANTHIDAE

\**Anthopotamus distinctus* (Traver, 1935): [*Northern Rivers*]: Gale River, X-2-2004 (1, kick). [*Southern Rivers*]: Piscataquog River, VI-4-2003 (1, kick). Piscataquog River - South Branch, IV-17-2005 (9, kick), V-5-2003 (6, kick), V-17-2003 (2, kick), VI-16-2003 (11, kick), VII-5-2005 (9, kick, **blackwing**), VII-11-2003 (5, kick, **blackwing**), VII-23-2003 (1, kick), VIII-6-2003 (1, kick), IX-16-2003 (1, kick). **Notes:** Univoltine winter cycle. Large larvae were present from April to July, with small larvae found in September and October. Blackwings appeared in July. Frequent in only one southern river, the South Branch of the Piscataquog River. The single specimen from the Gale River is very small, and is tentatively placed as this species. In Maine larvae were taken from late May to July and in October, with adults appearing from June to July (Burian & Gibbs, 1991).

#### SIPHONURIDAE

\**Siphonurus alternatus* (Say, 1824): [*Southern Rivers*]: Cocheco River, VIII-6-2003 (1, net). Lamprey River, VI-1-2004 (3, kick, **mature**). **Notes:** Clifford (1982) indicates a univoltine summer cycle. Larvae were taken in June and August, with

mature larvae present in June. In Maine larvae and adults were taken from June to August (Burian & Gibbs, 1991).

*Siphonurus mirus* (Eaton, 1885): [*Northern Rivers*]: Ellis River, VI-3-2004 (1, adult). [*Southern Rivers*]: Piscataquog River, VI-4-2003 (1, net, **blackwing**). **Notes:** Univoltine spring cycle. A blackwing and an adult were taken in early June from a northern and southern river. In Maine larvae were taken from April to May, and adults were collected from May to June (Burian & Gibbs, 1991).

\**Siphonurus quebecensis* (Provancher, 1878): [*Northern Rivers*]: Pemigewasset River - Woodstock, VI-23-2005 (8, net, **blackwing**), VII-5-2005 (1, net, **blackwing**), VII-25-2005 (9, net, **blackwing**), VIII-9-2005 (3, net, **blackwing**). [*Southern Rivers*]: Cocheco River, VI-4-2003 (50, net, **blackwing**). Nissitissit River, VI-7-2005 (1, net, **blackwing**). **Notes:** Univoltine summer cycle. Blackwings taken in early June from southern rivers, and from June to August in northern rivers. In Maine larvae were present from May to June, and adults were collected from June to July (Burian & Gibbs, 1991).

*Siphonurus rapidus* McDunnough, 1924: [*Northern Rivers*]: Bearcamp River, V-11-2005 (4, net, **blackwing**). Pemigewasset River - Woodstock, VII-5-2005 (1, net). [*Southern Rivers*]: Cocheco River, IV-17-2005 (3, net, **mature**), VI-4-2003 (6, net), VII-11-2003 (1, net). Nissitissit River, VI-7-2005 (6, net). **Notes:** Univoltine spring cycle or possibly bivoltine. Larvae were taken from April to July with nets. The only mature and blackwing individuals were taken during the spring, but large individuals were also taken in June and July. In Maine larvae were taken from May to June, and adults from May to July (Burian & Gibbs, 1991).

\**Siphonurus* sp. A: [*Northern Rivers*]: Ammonoosuc River, VI-17-2004 (1, net). East Branch Saco River, V-18-2004 (1, net). Ellis River at Pinkham Notch, VI-17-2004 (26, kick; 1, net), VII-8-2004 (36, net), VII-23-2004 (13, net), IX-6-2004 (3, kick). Moose River, VI-3-2004 (1, net), VII-8-2004 (1, net, **mature**), VII-23-2004 (1, net). Peabody River, VI-17-2004 (1, net). Pemigewasset River - Woodstock, V-19-2005 (1, net), VI-8-2005 (53, net), VI-23-2005 (83, net), VII-5-2005 (24, net), VII-25-2005 (4, net). [*Southern Rivers*]: Cocheco River, VI-4-2003 (2, net, **blackwing**). Piscataquog River, V-17-2003 (6, net). **Notes:** Univoltine spring/early summer cycle. Larvae were present from May to July, with blackwings taken in June (southern river) and a mature individual in July (northern river). The one September record was from a side channel of the coldest river (Ellis River at Pinkham Notch).

*Siphonurus typicus* Eaton, 1885: [*Northern Rivers*]: Ellis River at Pinkham Notch, VII-23-2004 (7, net), VIII-13-2004 (12, net). Moose River, VI-17-2004 (1, net). Pemigewasset River - Woodstock, VII-5-2005 (5, net, **blackwing**), VII-25-2005 (1, net). [*Southern Rivers*]: Cocheco River, V-5-2003 (91, net), V-17-2003 (352, net), VI-4-2003 (119, net, **blackwing**). Otter Brook, VI-4-2003 (1, net). Piscataquog River, V-17-2003 (57, net), VI-4-2003 (1, net). **Notes:** Univoltine spring/summer cycle. Larvae were present from May to early June in southern rivers, and from June to August in northern rivers. Blackwings were found in

early June (southern rivers), and July (northern rivers). In Maine larvae were taken from May to June, and adults from May to July (Burian & Gibbs, 1991).

#### ACKNOWLEDGMENTS

Nathan D. Chandler provided assistance with the collecting and processing samples in 2003, 2004, and 2005. Additional field assistance was rendered by Elizabeth Wolff and Chris Johnstone in 2004 and 2005, and by Matthew K. Chandler and Sarah Grieve in 2005. Boris Kondratieff (Colorado State University, Fort Collins, CO) assisted with identification of some *Siphonurus*; Jeff Webb (Purdue University, Lafayette, IN) assisted with the problems in identifying *Nixe* and *Leucrocuta*, Nick Wiersema (Austin, TX) kindly examined our problem members of *Centroptilum*, *Plauditus*, and *Procloeon*, and Pat McCafferty (Purdue University, Lafayette, IN) graciously provided some data on species records. A significant portion of this study is based on the MS thesis of Greg Whitmore [2004. The mayfly fauna of southern New Hampshire and its value in aquatic biomonitoring. ix + 118 pp.]

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