

Survey of Iowa Mayflies (Ephemeroptera)

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ABSTRACT: From newly and previously collected specimens of Ephemeroptera from Iowa, 62 species were determined. Of these, 39 are new state records. With the addition of another six species based only on literature records, the known Iowa fauna numbers 68 species. The mayfly fauna in Iowa is similar to, but apparently less diverse than, other Midwestern states east of the Mississippi River. Partially because of sampling bias, known mayfly diversity is greatest in central Iowa. Records of *Camelobaetidius waltzi*, *Fallceon quilleri*, *Baetis longipalpus*, and *Caenis youngi* in Iowa are important for interpreting the distribution patterns of these taxa.

The mayfly (Ephemeroptera) fauna of Iowa has not been closely studied. No faunal surveys have been published from the state, and few Iowa records are in taxonomic and ecological literature. Therefore, a study was conducted to determine the species composition of mayflies in Iowa. In addition, distribution records within Iowa were analyzed to determine if Iowa represents a significant transition zone between eastern and western faunal groups.

Materials and Methods

Extensive collecting trips were conducted throughout Iowa in 1991 and 1992. Specimens were collected from a variety of substrates, habitats, and locations. D-framed aquatic nets and visual inspection of substrate were the primary sampling techniques. However, netting, blacklight trapping, and rearing were used to collect adults. Specimens were preserved in 70% ethanol.

Specimens from existing collections also were examined. Collections included those from Iowa State University Departments of Entomology and Animal Ecology, and University of Northern Iowa Department of Biology. These specimens, in combination with specimens collected during the study, resulted in very good coverage of mayfly habitats in Iowa. Voucher specimens are deposited in the Iowa State Insect Collection, Iowa State University, Ames, Iowa.

Data were stored and sorted in Paradox SE database (Borland International, Scotts Valley, CA). To analyze the distribution patterns of mayflies within Iowa, each collection record was assigned to one of five geographic zones: northwest, southwest, central, northeast, and southeast Iowa (Fig. 1). Zone boundaries were based on convenient, arbitrary transects created by US Highway 30 and Interstate Highway 35. The central zone was formed by a polygon connecting the communities of Carroll, Osceola, Tama, and Clear Lake.

Results

THE IOWA FAUNA: A list of species determined from Iowa is presented in Table 1, showing both published and new records. Of the 68 species listed in Table 1, 39 represent new state records, as indicated by asterisks. Only six records are based solely on previously published data and are indicated with “#” symbols.

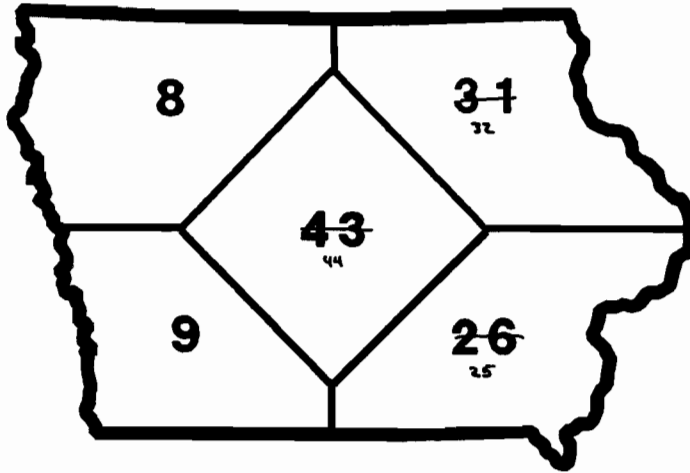


Fig. 1. Geographic regions of Iowa and the number of mayfly species known for each region.

Two families, Baetidae and Heptageniidae, are well-represented in the state and comprise 31% and 26% of known Iowa species, respectively.

The Iowa mayfly fauna is distinctly eastern and is very similar to that of Wisconsin and Illinois. All species collected in this study are found east of the Mississippi River. Clearly, Iowa does not represent a transition zone between eastern and western faunal groups. However, considerably greater mayfly diversity has been discovered in other states, including West Virginia (106 spp., Faulkner and Tarter, 1977), Alabama (112 spp., Kondratieff and Harris, 1986), and Wisconsin (148 spp., Hilsenhoff, 1981). In just two Minnesota counties, Lager et al. (1982) collected 54 different species. The reduced species diversity in Iowa may be due to a combination of agricultural influences and habitat availability.

MAYFLY DIVERSITY WITHIN IOWA: Some variation in mayfly faunal structure exists across the state. The number of species known from each of the five regions within the state are central (44), northeast (32), southeast (25), southwest (9), and northwest (8) (from Table 1). The central and two eastern zones have the greatest known diversity, due in part to greater sampling intensity. Northwest Iowa has the lowest known mayfly diversity, with only a few lakes and marshes in Dickinson County being adequately sampled.

Iowa's largest rivers, the Mississippi and Missouri, are on the east and west borders of the state, respectively, and contain obligate large-river species such as *Pentagenia vittigera*. Such species are absent from the relatively smaller rivers and streams of central Iowa. Several species common to Wisconsin and Minnesota, including *Stenonema femoratum*, *Stenonema mediopunctatum* and *Baetisca laurentina* were collected only in northeastern Iowa.

The only known Iowa ephemereids were found in the northeast corner of the state (Winneskie Co.) during late March, 1976. However, this site has not been sampled in recent years. Ephemereids are common in appropriate habitats in Wisconsin and Minnesota (Hilsenhoff, 1981; Lager et al., 1982). Burks (1953), however, reported that ephemereids were relatively less common in Illinois. Although many watersheds in Iowa have been affected by agricultural land use,

Table 1. Records and within-state distributions of Iowa mayflies. Species names preceded by an asterisk (*) are new state records. Species names preceded by a "†" symbol have been recorded in literature previously, but were not detected in this survey. Geographic zones within Iowa are indicated in bold print.

BAETIDAE

- **Acentrella carolina* (Banks); NE: Larva, Upper Iowa River, Kendallville, IX-22-1991, T. Klubertanz.
- **Baetis armillatus* McCafferty and Waltz; C: Larva, Des Moines River, Dolliver St. Pk., V-18-1992, T. Klubertanz. NE: Larva, Volga River, Fayette Co., VI-27-1990, K. Pontasch.
- **B. brunneicolor* McDunnough; NE: Larva, Chimney Rock Park, Blufton, IX-22-91, T. Klubertanz.
- **B. dubius* (Walsh); C: Reared Adult, Skunk River, Iowa State University Hinds Irrigation Farm, Ames, Story Co., VI-25-1992, T. Klubertanz, NE: Larva, Wipsipnicon River, Otterville Wildl. Pk., Buchanan Co. Rd. D16, V-8-1992, T. Klubertanz.
- **B. flavistriga* McDunnough; SW: Larva, Middle Raccoon River, S. E. Robinson Wildl. Area, Guthrie Co., V-11-1991, T. Klubertanz. C: Adult, Rock Quarry, 5 mi NE of Story City, Hamilton Co., VI-30-1991, T. Klubertanz. NE: Adult, Volga River, Fayette Co., VIII-14-1990, K. Pontasch.
- **B. intercalaris* McDunnough; NW: Adult, Lake Okaboji, Iowa Lakeside Labs, V-27-1988, T. Klubertanz. C: Adult, Skunk River, Iowa State University Hinds Irrigation Farm, Ames, Story Co., VII-17-1991, T. Klubertanz. NE: Larva, Upper Iowa River, 1.5 mi S. Cresco, Hwy V58, IX-21-1991, T. Klubertanz. SE: Larva, Des Moines River, Lacy Keosauqua State Pk., Van Buren Co., VIII-29-1992, T. Klubertanz.
- **B. longipalpus* Morihara and McCafferty; C: Larva, Des Moines River, Ledges State Park, Boone Co., IX-12-1991, T. Klubertanz. SE: Adult, collected at light, Palace Cafe, Keokuk, ~~VI-19-1957~~, ^{VII-10} 1957, C. Fremling.
- **B. propinquus* (Walsh); C: Skunk River, Iowa State University Hinds Irrigation Farm, Ames, Story Co., VI-19-1991, T. Klubertanz. NE: Larva, Upper Iowa River, 1.5 mi S Cresco, Hwy V58, IX-21-1991, T. Klubertanz.
- **B. punctiventris* (McDunnough); C: Larva, Skunk River, Iowa State University Hinds Irrigation Farm, Ames, Story Co., IV-29-1992, T. Klubertanz. NE: Larva Wipsipnicon River, Otterville Wildl. Pk., Buchanan Co. Rd. D16, V-8-1992, T. Klubertanz.
- **B. tricaudatus* Dodds; C: Larva, Des Moines River, Ledges State Park, Boone Co., V-4-1988, P. Rice. NE: Larva, Yellow River, Mountain Maple Hollow Preserve, Allamakee Co., VII-27-1991, M. Zeiss and P. Matteson.
- **Barbaetis cestus* (Provonsha and McCafferty); C: Larva, Skunk River, Iowa State University Hinds Irrigation Farm, Ames, Story Co., IX-19-1987, T. Klubertanz.
- **Callibaetis ferrugineus* (Walsh); C; Burks (1953); Check (1982)
- C. fluctuans* (Walsh); C, SE; Burks (1953); Check (1982)
- **C. floridanus* Banks; SE: Larva, Marsh, Pella Wildlife Area, Hwy 163, S of Pella, Marion Co., VIII-29-1992, T. Klubertanz.
- C. pallidus* Banks; C; Check (1982)
- **C. pictus* Eaton; NW: Larva, McBreen Marsh, Dickinson Co., X-12-1991, K. van Rees-Siewert. *Camelobaetidius waltzi* McCafferty; SE; McCafferty & Klubertanz (1994)
- **Centroptilum* sp.; NW: Adult, Lake Okaboji, Iowa Lakeside Labs, V-27-1988, T. Klubertanz. C: Adult, near Iowa State University campus, Ames, Story Co., VIII-11-1991, P. Matteson. SE: Subimaginal male, Des Moines River, Lacy Keosauqua State Park, Van Buren Co., VIII-29-1992, T. Klubertanz.
- **Fallceon quilleri* (Dodds); C: Larva, Des Moines River, Ledges State Park, Boone Co., IX-12-1991, T. Klubertanz.
- **Paracloeodes minutus* (Daggy); C: Larva, Skunk River, Iowa State University Hinds Irrigation Farm, Ames, Story Co., VI-20-1987, T. Klubertanz.
- †*Proclaeon walshi* (McDunnough); Burks (1953)
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Table 1. Continued.

BAETISCIDAE

- **Baetisca lacustris* McDunnough; C: Larva, Skunk River, Iowa State University Hinds Irrigation Farm, Ames, Story Co., IV-29-1992, T. Klubertanz. NE: Larva, Turkey River, 5 mi S Cresco, Howard Co., IX-21-1991, T. Klubertanz.
 **B. laurentina* McDunnough; NE: Larva, Turkey River, 5 mi S Cresco, Howard Co., IX-21-1991, T. Klubertanz.

CAENIDAE

- **Amercaenis ridens* (McDunnough); C: Adult, Ames, Story Co., VIII-2-1953. SE: Adult, attracted to light, Palace Cafe, Keokuk, VIII-10-1957, C. Fremling.
 **Brachycercus* sp.; SE: Adult, collected from spider web, Mississippi River, Fort Madison, VI-12-1992, T. Klubertanz.
Caenis amica Hagen; C: Provonsha (1990)
C. anceps Traver; NW, NE; Provonsha (1990)
C. hilaris (Say); C, NE, SE; Provonsha (1990)
C. latipennis Banks; SE, C, NE, SE; Provonsha (1990)
 **C. punctata* McDunnough; SE: Larva, Dunlap Lake, Harrison Co., III-1966. C: Larva, Des Moines River, Ledges State Park, Boone Co., V-15-1956. NE: Larva, Turkey River, 5 mi S Cresco, IX-21-1991, T. Klubertanz. SE: Larva, Lake, Lacy Keosauqua St. Pk., Van Buren Co., VI-12-1992, T. Klubertanz.
 **C. tardata* McDunnough; C: Adult, Quarry Lake, 5 mi NE Story City, Hamilton Co., VI-30-1991, T. Klubertanz.
 **C. youngi* Roemhild; C: Adult, Little Wall Lake, Hamilton Co., VI-9-1992, T. Klubertanz.

EPHEMERELLIDAE

- **Ephemerella invaria* (Walker); NE: Larvae, Spring run, Twin Springs Park, Winneshiek Co., III-26-1976, D. Huggins and P. Liechti.

EPHEMERIDAE

- **Hexagenia atrocaudata* McDunnough; SE: Larva, Lake, Lacy Keosauqua St. Pk., Van Buren Co., VI-12-1992, T. Klubertanz.
H. bilineata (Say); C, SE; Gooch (1967); McCafferty (1975)
H. limbata (Serville); SE, C, SE; Gooch (1967); McCafferty (1975)
 †*H. rigida* McDunnough; Burks (1953); McCafferty (1975)

HEPTAGENIIDAE

- Heptagenia diabasia* Burks; SW, C, NE, SE; Burks (1953)
H. flavescens (Walsh); C, NE, SE; Burks (1953)
 †*Leucrocuta hebe* (McDunnough); Burks (1953)
 **L. maculipennis* (Walsh); C: Adult male, Skunk River, Iowa State University Hinds Irrigation Farm, Ames, Story Co., VII-17-1991, T. Klubertanz. SE: Adult male, attracted to light, Palace Cafe, Keokuk, VII-31-1957, C. Fremling.
 †*Macdunnoa perisimplex* (McDunnough); Burks (1953)
 **Nixe rusticalis* (McDunnough); C: Adult male, Skunk River, Iowa State University Hinds Irrigation Farm, Ames, Story Co., VII-24-1991, T. Klubertanz.
 †*Pseudiron centralis* McDunnough; Burks (1953)
 †*Raptoheptagenia cruentata* (Walsh); Burks (1953)
 **Rithrogena pellucida* Daggy; C: Larva, Des Moines River, Ledges State Park, Boone Co., IX-12-1991, T. Klubertanz. NE: Larva, Upper Iowa River, 2 mi N Kendallville, IX-22-1991, T. Klubertanz.
Stenacron interpunctatum (Say); NW, SW, C, NE, SE; Burks (1953)
 **Stenonema exiguum* Traver; C: Larva, Skunk River, Soper's Mill Pk., 7 mi N Ames, Story Co., VI-20-1991, T. Klubertanz. NE: Larva, Cedar River, Janesville, Bremer Co., VII-15-1991, T. Klubertanz. SE: Larva, Skunk River, Wever, VIII-19-1991, T. Klubertanz.
S. femoratum (Say); NE; Burks (1953), Bednarik & McCafferty (1979)

Table 1. Continued.

**S. luteum* (Clemens); C: Adult male, Skunk River, Iowa State University Hinds Irrigation Farm, Ames, Story Co., VI-15-1992, T. Klubertanz.

**S. modestum* (Banks); NE: Adult, Volga River, Fayette Co., VI or VII-1990, K. Pontasch.

**S. mediopunctatum* (McDunnough); NE: Larva, Upper Iowa River, 1.5 mi S Cresco, Hwy V58, IX-21-1991, T. Klubertanz.

S. mexicanum integrum (McDunnough); SW, C, NE, SE; Bednarik & McCafferty (1979)

S. pulchellum (Walsh); C; Burks (1953); Bednarik & McCafferty (1979)

S. terminatum (Walsh); NW, SW, C, NE, SE; Bednarik & McCafferty (1979)

LEPTOPHLEBIIDAE

**Leptophlebia cupida* (Say); C: Larva, 3 mi SE Sheffield, Franklin Co., V-3-1963.

**Paraleptophlebia praepedita* (Eaton); NW: Adult, Pilot Knob St. Pk., 1935 (date and collector unknown). C: Adult, Ames, Story Co., VI-25-1951.

METRETOPODIDAE

**Siphloplecton interlineatum* (Walsh); C: Larva (in poor condition), Des Moines River, Jester Co. Pk. near Sailorville Lk., IV-18-1963.

OLIGONEURIIDAE

**Isonychia bicolor* (Walker); C: Larva, Beaver Creek, K. Young Pk., Webster City, IX-10-1991, T. Klubertanz. NE: Adult, Volga River, Fayette Co., VIII-14-1990, K. Pontasch; Larva, Upper Iowa River, Chimney Rock Pk., Blufton, IX-22-1991, T. Klubertanz.

I. rufa (McDunnough); C, NE; Kondratieff & Voshell (1983)

I. sicca (Walsh); SE; Burks (1953); Kondratieff & Voshell (1983)

PALINGENIIDAE

Pentagenia vittigera (Walsh); SE; Burks (1953); McCafferty (1975)

POLYMITARCYIDAE

Ephoron album (Say); NW, C, NE SE; McCafferty (1975)

**E. leukon* Williamson; NE; Larva, Volga River, Fayette Co., VI or VII-1990, K. Pontasch.

†*Tortopus primus* (McDunnough); C; McCafferty (1975)

POTAMANTHIDAE

Anthopotamus myops (Walsh); SW, C, NE, SE; Burks (1953); McCafferty (1975)

SIPHONURIDAE

**Siphonurus alternatus* (Say); SE: Larva, collected from small stream, 5 mi W. Keokuk, V-30-1987, T. Klubertanz.

TRICORYTHIDAE

**Tricorythodes stygiatus* McDunnough; NE: Adult male, Volga River, Fayette Co., VI or VII-1990, K. Pontasch.

several relatively isolated sites in northeast Iowa have not produced ephemereids. Additional research is needed to determine factors responsible for the low ephemereid diversity in this region.

CONTRIBUTIONS OF THE IOWA MAYFLY FAUNA: Although most species collected during the survey are common throughout the Midwest, some species records merit discussion:

Camelobaetidius waltzi McCafferty

Camelobaetidius (Baetidae) larvae are characterized by spatulate and multi-denticulate tarsal claws. Species in this genus are known from western North America, east to the Great Plains, and south to Central and South America (Traver

and Edmunds, 1968; Allen and Chao, 1978; Liechti, 1982; McCafferty, 1990; McCafferty and Davis, 1992). In August 1991, several *Camelobaetidius* larvae were collected from the Des Moines River in extreme southeast Iowa (Farmington). Mature larvae also were collected in August, 1992, from the Des Moines River at Lacy Keosauqua State Park, also in southeast Iowa, where larvae were abundant. These larvae represented a previously unknown species and have been described elsewhere as *C. waltzi* (McCafferty and Klubertanz, 1994). *C. waltzi* also has been taken from the Wabash River in Indiana (McCafferty and Waltz, 1990; McCafferty and Klubertanz, 1994). These data show that *Camelobaetidius* is more widely distributed across North America than previously believed.

Baetis longipalpus Morihara and McCafferty

Baetis longipalpus (Baetidae) is a large-river species known only from Wisconsin, Indiana, Louisiana, Kansas, and Texas (Morihara and McCafferty, 1979a; Liechti, 1980; Lager, 1985; McCafferty and Davis, 1992; Lugo-Ortiz and McCafferty, 1993). Larvae of this species were found consistently in eastern and southeastern Iowa and once in central Iowa (Des Moines River, Ledges State Park). Iowa is only the third state west of the Mississippi River known to have *B. longipalpus* populations. Larvae were common by late summer in larger rivers throughout eastern Iowa and were found on large stones and logs in deep riffle areas (60–120 cm deep). Adults were collected in southeast Iowa (Keokuk, near the Mississippi River) from late July to middle August.

Fallceon quilleri (Dodds)

Fallceon quilleri (Baetidae) were collected periodically in central Iowa from 1987 to 1992. Mature larvae from Iowa have a broad, mid-dorsal yellow stripe on the head, thorax, and abdomen and have banded tails. However, based on Morihara and McCafferty (1979a), this species should have unbanded tails. Other morphological features match those previously illustrated for *F. quilleri* (Morihara and McCafferty, 1979a; Waltz and McCafferty, 1987; McCafferty and Waltz, 1990).

Fallceon quilleri larvae were common in the Skunk River near Ames in August 1987. During 1988 and early summer 1989, severe drought reduced the river to a few small, isolated pools. Despite the return of flowing water in 1989, *F. quilleri* larvae were not found again at the site until July 1991. In 1992, almost four years after the drought, this species finally was common at the site.

Caenis youngi Roemhild

The known distribution of *Caenis youngi* (Caenidae) is disjunct, with previous records only from Montana, Colorado, Alberta, and the upper peninsula of Michigan (Provonsha, 1990; McCafferty et al., 1993). Adults of this species were collected in central Iowa in June 1992, making its distribution considerably more contiguous.

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