

3.6 Baetidae

The taxonomy of the Baetidae is poorly known and, until recently, the classification of the family was considered to be ‘absurd’ (Edmunds et al. 1976). Increased knowledge about the larval stages and the implementation of cladistic analyses has clarified the generic relationships within the North American Baetidae, and to a lesser extent, the world fauna. Gillies (1991) found three main clades: the Callibaetinae, Cloeoninae, and Baetinae. The Callibaetinae is the most basal group and is represented by *Callibaetis* Eaton and is characterized by the presence of a stippled cuticle. The Cloeoninae is the sister group to the Baetinae and is characterized by the presence of single marginal intercalaries in the fore wing. *Centroptilum* Eaton, *Cloeon* Leach, and *Procloeon* Bengtsson are the Saskatchewan genera of Cloeoninae. The Baetinae possess double marginal intercalaries. Within the Baetinae, the *Baetis*-complex forms a well-defined clade and is characterized by the possession of a villipore (a patch of setae on the basal, ventral edge of the femora). Saskatchewan representatives of the *Baetis*-complex include *Acentrella* Bengtsson, *Baetis* Leach, *Plauditus* Lugo-Ortiz and McCafferty, and *Pseudocloeon* Klapalek. The relationships of the other genera in the Baetinae are less well understood; Saskatchewan genera include *Acerpenna* Waltz and McCafferty, *Apobaetis* Day, *Dipheter* Waltz and McCafferty, and *Fallceon* Waltz and McCafferty.

Numerous changes in the taxonomy of the North American baetids have occurred. McCafferty and Waltz (1990) summarized the changes up to 1990 and provided literature references for each genus. Lugo-Ortiz and McCafferty (1998b) and Lugo-Ortiz et al. (1999) further studied the supra-specific taxonomy of North American Baetidae.

The Baetidae is the largest family of mayflies present in Saskatchewan with 39 species represented (two of which cannot be verified and likely do not actually occur here). Twelve

genera occur in Saskatchewan. An additional ten genera occur in other parts of North America. Most species are found in lotic habitats, but several species of *Procloeon*, *Cloeon*, and *Callibaetis* occur in lentic environments.

3.6.1 Key to the Genera of Baetidae: Larvae

- 1a. Tarsal claws spatulate (Fig. 57); coxal gills present*Camelobaetidius*
- 1b. Tarsal claws not spatulate (Figs. 85, 88); coxal gills absent2

- 2a. Labrum without a medial notch (Fig. 36); tarsal claws nearly as long as tarsi (Fig. 37)
*Apobaetis*
- 2b. Labrum with a median notch (Fig. 105); tarsal claws variable, but usually much shorter than
 tarsi3

- 3a. Terminal segment of labial palps truncate (Fig. 96) or obliquely truncate (Fig. 72b); caudal
 filaments with every 3rd to 5th segment darkened (Figs. 59, 60, 62)4
- 3b. Terminal segment of labial palps not truncate; caudal filaments not as above6

- 4a. Incisors of mandible fused or only slightly separated (Fig. 98); prosthema of right mandible
 robust (Fig. 98); third segment of maxillary palp, if present, shorter than second; gills
 variable; hind wing pads present or absent5
- 4b. Incisors of at least right mandible separated to base or nearly to base (Fig. 70); prosthema of
 right mandible slender (Fig. 70); second and third segments of maxillary palp subequal;

abdominal gills simple; hind wing pads present in all Saskatchewan species

.....*Centroptilum*

5a. A patch of setae present on galea-lacinia just anterior to the maxillary palp insertion (Fig. 72a); terminal segment of labial palp obliquely truncate (Fig. 72b)*Cloeon*

5b. No patch of setae on galea-lacinia just anterior to the maxillary palp insertion (except for possibly *P. ingens* (McDunnough)); terminal segment of labial palp usually expanded mesally (Fig. 96)*Procloeon*

6a. All gills with a large ventral flap*Callibaetis*

6b. All gills consisting of a simple lamella7

7a. Apex of abdominal gill 7 pointed and asymmetrical (Fig. 33); labial palp with a thumb-like lobe (Fig. 32)*Acerpenna*

7b. Apex of abdominal gill 7 rounded and nearly symmetrical, similar to preceding gills (Fig. 39)8

8a. Antennal scape with a prominent lobe (Fig. 104); terminal segment of maxillary palp with a subapical excavation (Fig. 107).....*Pseudocloeon*

8b. Antennal scape without a lobe; terminal segment of maxillary palp without an excavation.....9

- 9a. Abdominal segment 1 without a gill; prostheca of right mandible bifurcate (Fig. 74)
.....*Dipheter*
- 9b. Gill present on abdominal segment 1; prostheca of mandible not as above10
- 10a. Two caudal filaments present; subterminal segment of labial palp without a mesal extension
(Figs. 25, 77)11
- 10b. Three caudal filaments present, if only two caudal filaments present then subterminal
segment of labial palp with a distinct mesal extension (Figs. 44, 49) ...12
- 11a. Femora and tibiae usually with a long fringe of setae (Fig. 26); terminal segment of labial
palp rounded (Fig. 25); medial margin of incisor on right mandible smooth (Fig. 27)
.....*Acentrella*
- 11b. Fringe of setae on femora and tibiae not as long as that found in *Acentrella* (Fig. 90);
terminal segment of labial palp subquadrate (Fig. 79); medial margin of incisor of right
mandible serrate (Fig. 91).....*Plauditus*
- 12a. Villipore present (Fig. 111); no brush of setae between prostheca and incisor of mandible
.....*Baetis*
- 12b. Villipore absent; a brush of setae between prostheca and molar region of mandible (Fig. 76)
.....*Fallceon*

3.6.2 Key to the Genera of Baetidae: Adult Males

- 1a. Forewings with single marginal intercaleries (Fig. 64)2

- 1b. Forewings with double marginal intercaleries (Fig. 45)4
- 2a. Spinelike process usually present between the bases of forceps (Fig. 71), if spine-like process absent, then a distinct swelling or bulge on second segment of genital forceps; terminal segment of genital forceps long*Centroptilum*
- 2b. Spinelike process between forceps bases absent; no distinct bulge or swelling on second segment of genital forceps3
- 3a. Styliger plate coniform (Fig. 73)*Cloeon*
- 3b. Plate between bases of forceps usually rectangular, never coniform*Procloeon*
- 4a. Hind wing with numerous crossveins (Fig. 54); abdomen and wings freckled with brown blotches (Figs 53, 56)*Callibaetis*
- 4b. Hind wing and abdomen not as above5
- 5a. Hind wing with costal projection broadly based (Fig. 58)*Camelobaetidius*
- 5b. Hind wing with costal projection with a narrow base (Fig. 46), or costal projection absent, or hindwing absent6
- 6a. Anterior process of mesonotum pointed (Fig. 28); hind wing present or absent.....*Acentrella*
- 6b. Anterior process of mesonotum rounded (Fig. 78); hind wing present or absent7

7a. Hind wing present	8
7b. Hind wing absent	12
8a. Hind wing with 2 nd longitudinal vein forked (Fig. 75); terminal segment of forceps long	<i>Dipheter</i>
8b. Hind wing with 2 nd longitudinal vein unforked; terminal segment of forceps variable	9
9a. Hind wing without costal process (Fig. 102), or costal projection minute (Fig. 109); terminal segment of forceps short (Figs. 103, 110)	<i>Pseudocloeon</i>
9b. Hind wing with well developed costal projection	10
10a. Costal projection of hind wing hooked (Fig. 77)	<i>Fallceon</i>
10b. Costal projection of hind wing not hooked (Fig. 46)	11
11a. Hind wing with anterior margin undulate (Fig. 31); terminal segment of forceps long (Fig. 30)	<i>Acerpenna</i>
11b. Hind wing with anterior margin not undulate (Fig. 46); terminal segment of forceps short (Figs. 41, 51)	<i>Baetis</i>
12a. Prominent rectangular penes cover present	<i>Apobaetis</i>
12b. No prominent penes cover	<i>Plauditus</i>

3.6.3 *Acentrella* Bengtsson

In the past, *Acentrella* was considered to be synonymous with *Baetis* but was recently reinstated as a full genus (Muller Liebenau 1981, 1982 cited in Waltz and McCafferty 1987b). McCafferty et al. (1994) provide keys to the species of North American *Acentrella*, excluding *A. parvula* (McDunnough) and *A. alachua* (Berner) which were not transferred to *Acentrella* from *Plauditus* until 2000 (Wiersema 2000).

Three of the six North American species are present in Saskatchewan: *A. insignificans* (McDunnough), *A. parvula*, and *A. turbida* (McDunnough). All are found in lotic waters throughout the province but are most commonly collected in the Saskatchewan River.

Larvae of *Acentrella* are differentiated from those of other Saskatchewan baetids by the combination of the presence of a villipore on the femora, a fringe of long, fine setae on the femora and (usually) tibiae and tarsi, and the rounded terminal segment of the labial palp.

Adults of *Acentrella* are distinguished from those of other Saskatchewan Baetidae by the presence of double marginal intercalaries in the fore wing and the dorsally pointed mesoscutem. *Plauditus virilis* (McDunnough), and possibly other *Plauditus spp.*, possess a slightly pointed mesoscutem and the adults of these species cannot be readily distinguished from those of *Acentrella* without associated larvae or exuviae.

Key to the species of *Acentrella*: larvae

- 1a. Hind wing pads present and conspicuous (Fig. 21)*A. insignificans*
- 1b. Hind wing pads present but reduced to minute extensions of the metanotum (Fig. 23)
.....2

- 2a. Caudal filaments without any dark bands; gills without a dark subapical spot
*A. turbida*
- 2b. Caudal filaments with alternating light and dark bands; gills usually with a subapical dark
 spot (Fig. 24)*A. parvula*

Key to the species of *Acentrella*: adult males

- 1a. Hind wings present*A. insignificans*
- 1b. Hind wings absent2
- 2a. Abdominal segments 2-6 of pinned specimens pale*A. parvula*
- 2b. Abdominal segments 2-6 of pinned specimens olive-brown.....*A. turbida*

***Acentrella insignificans* (McDunnough), 1926**

Figs. 21, 22

Distribution Map: Fig. 276

Baetis insignificans McDunnough, 1926

Descriptions: Adult: Traver (1935)

Larva: Morihara and McCafferty (1979a)

Diagnostic Characters:

Larvae of *A. insignificans* are easily identified. The presence of hind wing pads and the unique abdominal colour pattern distinguish it from other Saskatchewan *Acentrella*. Adult males are recognizable by presence of hind wings.

Distribution and Biology:

Acentrella insignificans is distributed throughout western North America. The eastern-most populations occur in South Dakota (Moriyara and McCafferty 1979a). In Saskatchewan, *A. insignificans* is common in the Saskatchewan River system, in streams along the Manitoba Escarpment and in streams around Lake Athabasca. Mature larvae were collected between early-June and mid-August. It is unknown whether this species is univoltine with an extended emergence period or bivoltine in Saskatchewan. Moriyara and McCafferty (1979a) state that most populations have two generations per year.

Material Examined: 57 larvae, 6 imagos

Archibald River, near S shore of L. Athabasca, 18 VI 1986 LD and DWP; Bainbridge R. at Hwy 9, 20 VII 2000 JMW; Fredette River, 0.4km ENE of Uranium City, 29 VI 1986 JC and ERW; McFarlane R, 59-09N, 107-54W, 19 VI 1980 JC; North Saskatchewan River at Borden Bridge, 2 X 1999 JMW; North Saskatchewan River at Cecil Ferry, 6 VI 2000 JMW, 11 VI DML; South Saskatchewan River at Birch Hills Ferry, 14 IX 1972 DHS, 24 VIII 1972 DHS; South Saskatchewan River at Clarkboro Ferry, 29 V 1972 DHS, 9 VI 1972 DHS; South Saskatchewan River at Fenton Ferry, 11 VI 1986 ERW; South Saskatchewan River at Hague Ferry, 17 VIII 1972 DHS, 8 IX 1972 DHS, 20 VII 1972 DHS; South Saskatchewan River at Lemsford Ferry, 23 V 1998 JMW, 14 VII 1971 DML, 16 X 1999 JMW and Bpol; stream on Hwy 55, 53 28' 02"N 102 33' 41"W, 20 VII 2000 JMW; Waskwei River At Hwy 9, 23 VII 2001 JMW.

Acentrella parvula (McDunnough), 1932

Figs. 23, 24, 25, 26, 27

Distribution Map: Fig. 277

Baetis armillatus McCafferty & Waltz, 1990

Plauditus armillatus (McCafferty & Waltz), 1990

Plauditus parvulus (McDunnough), 1932

Pseudocloeon parvulum McDunnough, 1932

Descriptions: Adult: McDunnough (1932, as *Pseudocloeon parvulum*), see also Wiersema (2000)

Larva: McDunnough (1932, as *Pseudocloeon parvulum*), Ide (1937, as

Pseudocloeon parvulum)

Diagnostic Characters:

Acentrella parvula larvae are readily differentiated from those of other *Acentrella* in Saskatchewan by the alternating light and dark segments of the caudal filaments and the dark sub-apical spot of each abdominal gill (these are occasionally absent).

The absence of hind wings will separate adult males of *A. parvula* from *A. insignificans* and the pale colour of abdominal segments 2-6 will distinguish it from *A. turbida*.

Distribution and Biology:

Acentrella parvula has undergone numerous name changes since its original description. McCafferty and Waltz (1990) transferred the species from *Pseudocloeon sensu lato* to *Baetis* and changed the specific epithet to *armillatus* to avoid creating a homonym with another species of *Baetis*. Lugo-Ortiz and McCafferty (1998b) erected the genus *Plauditus* for many of the species previously included in *Pseudocloeon sensu lato*, including *parvula* (the specific epithet *armillatus* was no longer needed and was dropped). Wiersema (2000) transferred the species to *Acentrella* based on larval and adult morphology.

Acentrella parvula is known from Florida north to Quebec and west to Alberta. In Saskatchewan, it was most commonly collected in the Saskatchewan River system and other

large rivers, but was also found in small creeks in the eastern boreal forest. In Florida *A. parvula* was found on the distal portion of *Vallisneria* leaves in swift current Berner and Pescador (1988). In Saskatchewan, *A. parvula* was also found in the swiftest portions of the river, but over fine gravel. Mature larvae have been collected in May, June, July, and September. In Ontario, McDunnough (1932) found a spring and a summer generation.

Material Examined: 88 larvae, 1 imago

Battle River At Hwy 21, 1 VII 2000 JMW; McVey Creek at Hwy55, 6 VI 1980 ERW; North Saskatchewan River at Borden Bridge, 2 X 1999 JMW; North Saskatchewan River at Cecil Ferry, 6 VI 2000 JMW; South Saskatchewan River at Birch Hills Ferry, 19 VI 1974 DHS; South Saskatchewan River at Clarkboro Ferry, 16 VII 2000 JMW, 30 V 1998 JMW; South Saskatchewan River at Fenton Ferry, 11 VI 1986 ERW; South Saskatchewan River at Lemsford Ferry, 23 V 1998 JMW; Weyakwin River at Hwy 2, 7 VII 2000 JMW; Whitefox River at Hwy 35, 2 VII 1986 VK.

Acentrella turbida (McDunnough), 1924

Fig. 28

Distribution Map: Fig. 278

Acentrella carolina (Banks), 1924

Cloeon carolina Banks, 1924

Pseudocloeon carolina (Banks), 1924

Pseudocloeon turbidum McDunnough, 1924

Descriptions: Adult: McDunnough (1924a, as *Pseudocloeon turbidum*), see also McCafferty et al. (1994)

Larva: McCafferty et al. (1994)

Diagnostic Characters:

Larvae of *A. turbida* are differentiated from those of *A. insignificans* by the absence of hind wing pads and from those of *A. parvula* by the lack of alternating light and dark segments of the caudal filaments.

Adults are distinguished from those of *A. insignificans* by the lack of hind wings.

Acentrella turbida males can be distinguished from those of *A. parvula* by the darker abdominal segments.

Distribution and Biology:

Acentrella turbida is widespread in North America. In Saskatchewan it was collected in the Saskatchewan River system and throughout the eastern boreal forest in fast-flowing streams. In the Saskatchewan River system larvae were only present between August and October, but in other streams larvae have been collected as early as late-May. Apparently the life history varies between populations as McCafferty et al. (1994) found adults emerged in fall, but Cobb et al. (1991) found *A. turbida* to be univoltine with adults emerging in June and July.

Material Examined: 41 larvae, 7 imagos

Bow River at Hwy 165, 13 VI 2000 JMW; creek at km 65 of Hwy 9, 20 VII 2000 JMW; Green Bush Creek at Hwy 3, 19 VII 2000 JMW; Meeyomoot River at Hwy 165, 17 VI 1971 DHS; North Saskatchewan River at Borden Bridge, 2 X 1999 JMW; North Saskatchewan River at Cecil Ferry, 21 IX 1972 DHS; Pasquia River at Hwy 9, 20 VII 2000 JMW; South Saskatchewan River at Lemsford Ferry, 16 IX 2000 JMW; South Saskatchewan River at Queen Elizabeth

Power Station, 14 X 1999 JMW; South Saskatchewan River at Saskatoon, 10 VIII 1971 DML; stream on Hwy 9, S of Hudson Bay 52 40'03"N 102 22'19"W, 24 V 2001 JMW; Torch River N of Hwy 35, 25 V 2000 JMW and DWP; Waskwei River At Hwy 9, 23 VII 2001 JMW.

3.6.4 *Acerpenna* Waltz and McCafferty

Acerpenna was erected to include the *macdunnoughi* – group of *Baetis sensu Morihara and McCafferty 1979a* (Waltz and McCafferty 1987a). Four named species occur in North America. *Acerpenna pygmaea* (Hagen) and an unnamed species occur in Saskatchewan. The male imago of *A. sp. A* is not known so no key is presented to the species of adult males of *Acerpenna*.

Acerpenna akataleptos (McDunnough) occurs in southern Alberta and likely occurs in Saskatchewan as well. The larva is unknown but it is possible *A. sp. A* is *A. akataleptos* (Jacobus and McCafferty 2002). Adult males can be distinguished from *A. pygmaea* by the prominent setose penis-cover between the bases of the forceps (see Fig. 29) and the brown versus pale middle abdominal terga.

Larvae of *Acerpenna* are easily identified by the pointed gill 7, the thumb-like extension of the second segment of the labial palp, and the absence of a villipore.

Adult males of *Acerpenna* are differentiated from those of other Baetidae by the long terminal segment of the genital forceps and the hind wing with an acute costal process and an undulate margin.

Key to species of *Acerpenna*: larvae

1a. Abdominal colour pattern as in Fig. 34.....*A. pygmaea*

1b. Abdominal colour pattern as in Fig. 35.....*A. sp. A*

Acerpenna pygmaea (Hagen), 1861

Figs. 30, 31, 32, 33, 34

Distribution Map: Fig. 279

Acerpenna sp. 1 McCafferty & Davis, 1992

Acerpenna harti (McDunnough), 1924

Baetis harti McDunnough, 1924

Baetis pygmaeus (Hagen), 1861

Baetis spiethi Berner, 1940

Cloe pygmaea Hagen, 1861

Descriptions: Adult: Traver (1935), Burks (1953), see also Waltz et al. (1998)

Larva: Morihara and McCafferty (1979a, as *Baetis pygmaeus*), see also Waltz et al. (1998)

Diagnostic Characters:

The brown abdomen with a longitudinal pale mid-dorsal stripe immediately distinguishes *A. pygmaea* larvae from all those of all other Baetidae.

The absence of a prominent process between the bases of the forceps should differentiate adult male *A. pygmaea* from those of other *Acerpenna spp.* Although the adult male of *A. sp. A* is unknown, it is predicted to possess the prominent process (see the comments in the treatment of *A. sp. A*).

Distribution and Biology:

Acerpenna pygmaea is widely distributed in North America east of the Rocky Mountains. In Saskatchewan specimens were collected from throughout the boreal forest, the Cypress Hills, and parts of the Saskatchewan River System. No specimens were collected from the South Saskatchewan River upstream of Lake Diefenbaker. Additionally, a single larva was found a small reservoir in the prairies; possibly the larva came from the flowing canal which enters into the reservoir. Young larvae were collected in early-May, and adults occurred in both late-May and July. I observed a group of less than 10 males swarming 1-2m above the ground in a clearing adjacent to a stream; the swarming occurred in the late afternoon. Berner and Pescador (1988) observed that in Florida swarming occurred in mid-morning, and that small groups of males amalgamated to form a large swarm of over 200 individuals. Larvae occurred at all times of the year. Shapas and Hilsenhoff (1976) state *A. pygmaea* (as *Baetis pygmaeus*) is primarily a detritivore.

Material Examined: 107 larvae, 10 imagos

Ace Creek at Ace Lake Road, 9.1 km ESE of Uranium City, 30 VI 1986 JC and ERW; Arsenault River at Hwy 903, 10 VI 2001 JMW and MSP; Battle Creek at Ranger Station, Cypress Hills Prov. Park, W Block, 25 VI 2000 JMW, 30 VII 2000 JMW; Bone Creek at Hwy 633, 19 V 2000 JMW; Bradwell Reservoir, 16 IX 1988 NC; Crackingstone R. at Laredo Road Bridge, 8km SW of Uranium City, 29 VI 1986 JC and ERW; Fir River at Hudson Bay Regional Park, 24 VII 1999 JMW; Frenchman River at Ravenscrag, 22km west of Eastend, 23 VI 2000 JMW, 29 VII 2000 JMW; Giekie River 15km upstream of Hwy 905, 12 VI 1980 ERW; Green Bush Creek at Hwy 3, 19 VII 2000 JMW; Meeyomoot River at Hwy 165, 13 VI 2000 JMW; North Saskatchewan River at Cecil Ferry, 13 VII 1981 DML, 14 VII 1981 DML; Overflowing River at Hwy 9, 20 V 1980 ERW, 19 VII 2000 JMW, 17 VII 1999 JMW; Red Deer River At Rendek Elm Forest, 8 V 2001

JMW and DWP, 24 V 2001 JMW, 8 VII 2001 JMW; South Saskatchewan River at Fenton Ferry, 11 VI 1986 ERW; stream on Hwy 3, 52 50' 32"N 102 44' 20"W, 19 VII 2000 JMW; stream on Hwy 9, S of Hudson Bay 52 40'03"N 102 22'19"W, 24 V 2001 JMW; Torch River at Hwy 35, 22 VII 1986 ERW, 27 V 1986 ERW, 2 VII 1986 VK; Torch River N of Hwy 35, 22 VII 2001 JMW, 9 VII 2000 JMW, 25 V 2000 JMW and DWP; Waskesiu River at Hwy 2, 12 VI 2000 JMW, 19 VI 1982 ERW; Weyakwin River at Hwy 2, 12 VI 2000 JMW; Whitefox River at Hwy 35, 2 VII 1986 VK.

Acerpenna sp. A Jacobus and McCafferty, 2002

Fig. 35

Distribution Map: Fig. 280

Descriptions: Adult: N/A

Larva: N/A, but see Jacobus and McCafferty (2002) for comments

Diagnostic Characters:

Larvae of A. sp. A can be differentiated from those of *A. pygmaea* by the dorsal abdominal colour pattern. Most specimens have terga 2, 6, and 7 brown and the remaining terga pale or mostly pale. Occasionally, individuals have dark colouration extending onto terga 5 and/or 8. Some specimens have a colour pattern somewhat similar to that of *A. pygmaea* in that they show a faint longitudinal mid-dorsal stripe on some terga; these specimens may not be identifiable. Adult males need to be associated with the larva of *A. sp. A* to determine the validity of this species.

The adult male of *A. sp. A* is unknown. It is possible that *A. sp. A* is the undescribed larva of *A. akataleptos*. If this is the case than adult males can be differentiated from those of *A. pygmaea* by the prominent penis cover between the bases of the genital forceps.

Distribution and Biology:

Acerpenna sp. A. is known only from Saskatchewan and Alberta (Jacobus and McCafferty 2002). In Saskatchewan larvae were collected in swiftly-flowing streams along the Manitoba Escarpment. In every location where *A. sp. A* was collected *A. pygmaea* was present as well, indicating that the two species are possibly conspecific. Mature larvae were collected in late-May and July.

Material Examined: 26 larvae

Overflowing River at Hwy 9, 17 VII 1999 JMW, 9 VII 2001 JMW; Fir River at Hudson Bay Regional Park, 24 VII 1999 JMW; Torch River at Hwy 35, 22 VII 1986 ERW, 27 V 1986 ERW; Torch River N of Hwy 35, 9 VII 2001 JMW; Red Deer River At Rendek Elm Forest, 8 V 2001 JMW and DWP, 24 V 2001 JMW; stream on Hwy 9, S of Hudson Bay 52 40'03"N 102 22'19"W, 24 V 2001 JMW.

3.6.5 Apobaetis Day

The genus *Apobaetis* was described from larvae and adults collected from the Tuolumne River in California (Day 1955). The genus was initially thought to be endemic to the Nearctic region, but *A. signifer* Lugo-Ortiz and McCafferty was recently described from Brazil and Paraguay (Lugo-Ortiz and McCafferty 1997). Three species occur in North America; only *A. indoprensus* Day is found in Saskatchewan. *Apobaetis lakota* McCafferty was described from North Dakota and Nebraska and may eventually be found in Saskatchewan. Larvae can be

differentiated from *A. indepressus* by the large, rounded mesal extension of the terminal segment of the labial palp (rather than sharply pointed) and the three, rather than four, segmented maxillary palp. The adult male of *A. lakota* is unknown. See McCafferty (2000b) for further information on *A. lakota*.

Larvae of *Apobaetis* are easily distinguished from those of other Baetidae occurring in Saskatchewan by the absence of a medial notch in the labrum, the shape of the labial palps, and the long tarsal claws.

Adult male *Apobaetis* are differentiated from those of other Saskatchewan Baetidae by the presence of two marginal intercalaries, the absence of hind wings, and the presence of a prominent rectangular penes cover between the bases of the forceps.

***Apobaetis indepressus* Day, 1955**

Figs. 36, 37, 38

Distribution Map: Fig. 281

Descriptions: Adult: Day (1955)

Larva: Day (1955)

Diagnostic Characters:

The diagnostic characters provided in the genus treatment will serve to differentiate specimens from *A. indepressus* from those of all other Saskatchewan Baetidae.

Distribution and Biology:

Apobaetis indeprensus has rarely been reported in the literature, but the records come from many areas of North America. No records have been reported from the southeastern United States. In Canada, *A. indeprensus* is known only from Saskatchewan. The paucity of records of *A. indeprensus* is likely because most specimens are too small to be collected by standard sampling equipment (Lugo-Ortiz and McCafferty 1997).

Larvae were collected in the South Saskatchewan River from shifting sand bars. *Apobaetis indeprensus* is one of the few large-river specialist species found downstream of Gardiner Dam. Day (1955) also found *A. indeprensus* to be pollution tolerant. Mature larvae were collected in late-July and early-August and a single male subimago was collected in early-June.

Material Examined: 10 larvae, 1 subimago

South Saskatchewan River at Birch Hills Ferry, 7 VI 1972 DHS; South Saskatchewan River at Lemsford Ferry, 5 VIII 1998 JMW, 30 VII 2000 JMW, 10 VIII 1971 DML.

3.6.6 *Baetis* Leach

The generic concept of *Baetis* has changed greatly over the last 15 years. *Baetis sensu Morihara and McCafferty (1979a)* was found to be polyphyletic and is now split into multiple genera (Waltz and McCafferty 1987a, 1987b; Lugo-Ortiz and McCafferty 1998b; Lugo-Ortiz et al. 1999; McCafferty and Waltz 1990). Saskatchewan species of *Baetis sensu Morihara and McCafferty (1979a)* are now variously placed in *Acentrella*, *Plauditus*, *Pseudocloeon*, *Acerpenna*, *Dipheter*, *Fallceon*, and *Baetis sensu stricto*.

Of the 22 North American species of *Baetis*, 7 occur in Saskatchewan. Three species-groups occur: *B. bicaudatus* Dodds and *B. tricaudatus* Dodds are in the *rhodoni*-group, *B.*

brunneicolor McDunnough, *B. bundyae* Lehmkuhl., and *B. hudsonicus* Ide are in the *vernus*-group, and *B. flavistriga* McDunnough and *B. intercalaris* McDunnough are in the *fuscatus*-group (Moriyama and McCafferty 1979a). Larvae of all groups generally inhabit swiftly flowing streams throughout the province. Most species are detritivores, although diatoms often make up a considerable portion of their diet (Shapas and Hilsenhoff 1976).

Larvae of *Baetis* can be distinguished from those of all other Saskatchewan Baetidae by the combination of the presence of a villipore and hind wing pads, maxillary palp without a subterminal excavation, antennal scape without a process, and femora without a long fringe of setae.

Adult males of *Baetis* can be distinguished from those of all other Saskatchewan Baetidae by the presence of double marginal intercalaries in the forewing, hindwing with a well defined costal process and with the margin between the point of attachment and apex of costal process not forming a straight line, second longitudinal vein of the hindwing unforked, terminal segment of genital forceps short and the anterior process of mesonotum rounded.

Key to the species of *Baetis*: larvae

- 1a. Two caudal filaments, median filament reduced to a few segments; extreme northwestern Saskatchewan.....*B. bicaudatus*
- 1b. Three well developed caudal filaments.....2
- 2a. All gills elongate, more than 2X longer than wide (Fig. 42)3
- 2b. Gills less than 2x longer than wide (Fig. 39)4

- 3a. Median caudal filament subequal in length to cerci*B. hudsonicus*
- 3b. Median caudal filament <0.8X length of cerci*B. bundyae*
- 4a. Caudal filaments with a dark band near middle5
- 4b. Caudal filaments without a dark band near middle6
- 5a. Abdominal terga with 2 large, kidney shaped light marks; widespread (Fig. 43)
*B. flavistriga*
- 5b. Abdominal terga usually with 3 pale spots along posterior margin (Fig. 47) *or* with paired
 submedian parentheses- shaped marks along the anterior margin of terga and remainder
 of each tergum flat grey*B. intercalaris*
- 6a. Antennal scape and pedicel and abdominal sterna with robust setae (Fig. 49); pronotum
 usually with a pair of dark, bilobed marks (Fig. 48)*B. tricaudatus*
- 6b. Robust setae absent on antennal scape and pedicel and abdominal sterna; pronotum without
 dark bilobed marks; abdominal colour pattern usually either uniform brown or with 3
 pale areas along posterior margin.....*B. brunneicolor*

Key to the species of *Baetis*: adult males ^a

- 1a. Genital forceps of the *tricaudatus*- type, without a constriction near the middle (Fig.
 51).....2

- 1b. Genital forceps of the *intercalaris*- type, with a constriction near the middle and usually a distinct tubercle on base of forceps (Fig. 41)3
- 2a. Abdominal terga uniformly brown; turbinate eyes small and on a long stalk
.....*B. bicaudatus*
- 2b. Abdominal terga shaded with brown and usually with posterior edges pale; paired submedian brown marks on tergites and sternites; turbinate eyes large
.....*B. tricaudatus*
- 3a. Abdominal terga 2-6 white or only tinged with brown on lateral edges.....4
- 3b. Abdominal terga 2-6 mostly brown.....5
- 4a. Thorax yellow-brown or brown.....*B. flavistriga*
- 4b. Thorax usually shiny black but may be dark brown.....*B. intercalaris*
- 5a. Turbinate eyes grey or yellow brown.....*B. bundyae*
- 5b. Turbinate eyes orange to reddish orange.....*B. brunneicolor*

a. The male of *B. hudsonicus* is unknown.

Baetis bicaudatus Dodds, 1923

Distribution Map: Fig. 282

Baetis minimus Dodds, 1923

Descriptions: Adult: Edmunds (1952)

Larva: Dodds (1923), Morihara and McCafferty (1979a)

Diagnostic Characters:

Larvae of *B. bicaudatus* are distinguished from those of other Saskatchewan *Baetis* by the median caudal filament being reduced to less than 1/10 the length of the cerci.

Adult males of *B. bicaudatus* can be differentiated from those of other Saskatchewan *Baetis* by the presence of *tricaudatus*-type genital forceps, the uniformly brown abdominal terga, and the small turbinate eyes set on a long stalk.

Distribution and Biology:

Baetis bicaudatus is found in small, fast flowing streams throughout the mountainous areas of western North America east to the Black Hills of South Dakota (McCafferty and Kondratieff 1999). *Baetis bicaudatus* is also known from the Palearctic (McCafferty 1994). In Saskatchewan, *B. bicaudatus* was collected from the extreme northwestern portion of the province. A single specimen of this species was collected from the Cypress Hills, which has previously been shown to contain many montane species (Doddall and Lehmkuhl 1979). However, this specimen was collected from an habitat atypical for *B. bicaudatus* and it is possible it is a variant of *B. tricaudatus*.

Material Examined: 9 larvae

Battle Creek near Alberta border, 17 V 2000 JMW; Berth Creek, 20m upstream from Melville Lake, 4.2km E of Uranium City, 26 VI 1986 JC and ERW; Crackingstone R. at Laredo Road Bridge, 8km SW of Uranium City, 29 VI 1986 JC and ERW; Shaft Creek, 20m upstream from Melville Lake, 4.0km ENE of Uranium City, 26 VI 1986 JC and ERW.

Baetis brunneicolor McDunnough, 1925

Figs. 39, 40, 41

Distribution Map: Fig. 283

Baetis anachris Burks, 1953

Baetis hiemalis Leonard, 1950

Baetis phyllis Burks, 1953

Descriptions: Adult: McDunnough (1925b), Burks (1953 as *B. anachris* and *B. phyllis*).

Larva: Ide (1937), Morihara and McCafferty (1979a).

Diagnostic Characters:

Baetis brunneicolor larvae are distinguished from those of other Saskatchewan *Baetis* by the three unbanded caudal filaments, lack of dark bilobed marks on the pronotum, and the lack of robust setae on the abdominal sterna, pedicel, and scape.

Adult males are differentiated from those of other Saskatchewan *Baetis* by the *intercalaris*- type genital forceps, the brown abdominal terga 2-6, and the reddish turbinate eyes.

Distribution and Biology:

Baetis brunneicolor is a widespread eastern species. It is not known any further west than the Black Hills of South Dakota (McCafferty 1990) and Saskatchewan (McCafferty and Randolph 1998). In Saskatchewan, *B. brunneicolor* was found in small to medium sized streams with a gravel or cobble substrate. It was usually sympatric with *B. tricaudatus*. Larvae were first collected in May and the adults emerged throughout the summer.

Material Examined: 373 larvae, 30 imagos

Ace Creek upstream from Ace Lake, 9.9 km E of Uranium City, 27 VI 1986 JC and ERW;
Arsenault River at Hwy 903, 10 VI 2001 JMW and MSP; Bainbridge R. at Hwy 9, 20 VII 2000
JMW; Battle Creek at Ranger Station, Cypress Hills Prov. Park, W Block, 25 VI 2000 JMW;
Bear Creek at Hwy 155, 9 VI 2001 JMW and MSP; Benson Creek at Battle Creek Road, West
Block Cypress Hills Prov. Park, 30 VII 2000 JMW; Bisset Creek at Hwy 106, 10 VI 1986 ERW;
Bone Creek at Hwy 633, 29 VII 2000 JMW; Broad Creek at Hwy 904, 10 VI 2001 JMW and
MSP, 1 VII 2000 JMW; Cole Creek at Hwy 903, 10 VI 2001 JMW and MSP, 30 VI 2000 JMW;
Crean River at Hwy 2, 6 VII 2000 JMW; creek at km 65 of Hwy 9, 20 VII 2000 JMW; creek
from Jean L./Bushell Rd., 5.6km SW of Uranium City 59 32' 31"N 108 41' 33"W, 29 VI 1986 JC
and ERW; creek from Strike Lake, 9.6km E of Uranium City, 27 VI 1986 JC and ERW; Crooked
Lake Fen, 28 IX 2001 DWP and Jhal; Low Creek at Hwy 904, 1 VII 2000 JMW, 10 VI 2001
JMW and MSP; McVey Creek at Hwy55, 20 VII 2000 JMW; Meeyomoot River at Hwy 165, 13
VI 2000 JMW; North Saskatchewan River at Cecil Ferry, 17 V 1972 DHS; Otosquen Creek at
Hwy 9, 9 VII 2001 JMW; Pasquia River at Hwy 9, 20 VII 2000 JMW; river 10 miles north of
Green Lake, 10 VII 1974 NC; stream at Km 170 of Hwy 903 55 25'54"N 108 46' 10"W, 10 VI
2001 JMW and MSP; stream at km 175 of Hwy 903, 10 VI 2001 JMW and MSP; stream at km
75 of Hwy 955, 30 VI 2000 JMW; stream on Hwy 3, 52 50' 32"N 102 44' 20"W, 19 VII 2000
JMW; stream on Hwy 905, 57 15'07"N 103 59'54"W, 8 VIII 2000 JMW; stream/beaver pond at
km 155 of Hwy 955, 30 VI 2000 JMW; Strike creek, 80m downstream from Strike Lake, 9.8km
E of Uranium City, 27 VI 1986 JC and ERW; Umpherville River At Hwy 905, 8 VIII 2000
JMW; Waskesiu River at Hwy 2, 12 VI 2000 JMW, 6 VII 2000 JMW; Weyakwin River at Hwy
2, 7 VII 2000 JMW.

Baetis bundyae Lehmkuhl, 1973

Fig. 42

Distribution Map: Fig. 284

Baetis macani bundyae Lehmkuhl, 1973

Descriptions: Adult: Morihara and McCafferty (1979b as *B. macani bundyae*)

Larva: Lehmkuhl (1973), Morihara and McCafferty (1979a)

Diagnostic Characters:

Baetis bundyae larvae are differentiated from those of other Saskatchewan *Baetis* by the elongate gills and the short median caudal filament (<0.8X length of cerci). It is likely that *B. bundyae* is a synonym of *B. hudsonicus* as the only difference between the species is the length of the median caudal filament. In other *Baetis*, the length of the median caudal filament often varies, even within populations. Once the adult males of *B. hudsonicus* are reared the status of these two species can be determined.

The adults of *B. bundyae* are differentiated from those of other Saskatchewan *Baetis* by the *intercalaris*-type genital forceps, the brown abdominal terga and the yellow-grey eyes.

Distribution and Biology:

Baetis bundyae was described as larvae from ponds in the Northwest Territories (Lehmkuhl 1973). McCafferty and Randolph (1998) reported *B. bundyae* from British Columbia, Yukon, Northwest Territories, Manitoba, Quebec, and Labrador. It is also known from Minnesota (Lager et al. 1982), Wyoming (Durfee and Kondratieff 1999) and Scandanvia (McCafferty 1994). Lehmkuhl (1973) and Durfee and Kondratieff (1999) list the habitat of *B. bundyae* as ponds, but in Saskatchewan all specimens were collected from slowly flowing portions of streams.

Material Examined: 86 larvae, 2 imagos

Berth Creek, 20m upstream from Melville Lake, 4.2km E of Uranium City, 26 VI 1986 JC and ERW; Shaft Creek, 20m upstream from Melville Lake, 4.0km ENE of Uranium City, 26 VI 1986 JC and ERW; stream at Km 75 of Hwy 955, 9 VI 2001 JMW and MSP, 30 VI 2000 JMW; stream on Hwy 955 57 04' 29"N, 109 04' 15"W, 30 VI 2000 JMW.

Baetis flavistriga McDunnough, 1921

Figs. 43, 44, 45, 46

Distribution Map: Fig. 285

Baetis cingulatus McDunnough, 1925

Baetis levitans McDunnough, 1925

Baetis nanus McDunnough, 1923

Baetis ochris Burks, 1953

Baetis pallidula McDunnough, 1924

Baetis pallidulus McDunnough, 1924

Baetis phoebus McDunnough, 1923

Baetis quebecensis Hubbard, 1974

Baetis sinuosus Navas, 1924

Descriptions: Adult: Traver (1935), Burks (1953)

Larvae: Ide (1937), Morihara and McCafferty (1979a)

Diagnostic Characters:

In Saskatchewan, *B. flavistriga* larvae are differentiated from those of all other *Baetis* by the presence of 3 banded caudal filaments, the large dark spot on the middle femora, the presence of 2 kidney shaped pale areas on the posterior margin of the abdominal terga, and by the broad labial palps.

The adult males of *B. flavistriga* are differentiated from those of other Saskatchewan *Baetis* by having genital forceps of the *intercalaris*- type, whitish or yellowish abdominal terga 2-6, and a yellow or brown thorax. In Saskatchewan, the abdominal terga 2-6 of nearly all specimens were white with only dark spiracular markings. In other parts of North America brown or yellow-brown shading is often found along the posterior or lateral margins of the abdominal terga.

Distribution and Biology:

Baetis flavistriga occurs throughout North America east of the Rocky Mountains, except for the southeast. Its western range limits are New Mexico (McCafferty et al. 1997) and Utah (McCafferty and MacDonald 1994). It is also present in Mexico (Lugo-Ortiz and McCafferty 1993). Saskatchewan is the western range limit for *B. flavistriga* in Canada (McCafferty and Randolph 1998). This species is generally found in mountainous areas but it is also abundant in streams around the Great Lakes (McCafferty and MacDonald 1994). In Saskatchewan, *B. flavistriga* is present in most small to medium sized, fast flowing streams with gravel or cobble substrates. It is absent from the Saskatchewan River system. Larvae were first collected in late-May and emergence occurred from mid-June to mid-August. It is unclear whether this species is univoltine with an extended emergence period or whether there are two overlapping generations (Bergman and Hilsenhoff 1978).

Material Examined: 356 larvae, 12 imagos

Arsenault River at Hwy 903, 10 VI 2001 JMW and MSP; Battle Creek at Ranger Station, Cypress Hills Prov. Park, W Block, 25 VI 2000 JMW, 30 VII 2000 JMW; Bone Creek at Hwy 633, 19 V 2000 JMW, 29 VII 2000 JMW; Broad Creek at Hwy 904, 10 VI 2001 JMW and MSP, 1 VII 2000 JMW; Cole Creek at Hwy 903, 10 VI 2001 JMW and MSP, 30 VI 2000 JMW; Colin R. at Lake Athabasca, 18 VI 1986 LD and DWP; Crean River at Hwy 2, 6 VII 2000 JMW, 4 VI 1974 DML; creek at km 65 of Hwy 9, 23 VII 2001 JMW; Fir River at Hudson Bay Regional Park, 24 VII 1999 JMW, 23 VII 2001 JMW; Frenchman River at Ravenscrag, 22km west of Eastend, 30 VII 1999 JMW, 19 V 2000 JMW; Green Bush Creek at Hwy 3, 19 VII 2000 JMW, 17 VII 1999 JMW; Low Creek at Hwy 904, 1 VII 2000 JMW, 10 VI 2001 JMW and MSP; McVey Creek at Hwy55, 20 VII 2000 JMW, 22 VI 1980 ERW; Montreal River at Hwy 2, 8 VIII 2000 JMW; Otosquen Creek at Hwy 9, 24 VII 1999 JMW, 9 VII 2001 JMW; Overflowing River at Hwy 9, 9 VII 2001 JMW, 19 VII 2000 JMW, 17 VII 1999 JMW; Pasquia River at Hwy 9, 20 VII 2000 JMW, 17 VII 1999 JMW; South White Poplar Creek at Hwy 9, 24 VII 1999 JMW; stream at km 165 of Hwy 903 55 24' 55"N 108 43' 06"W, 10 VI 2001 JMW and MSP; stream at Km 170 of Hwy 903 55 25'54"N 108 46' 10"W, 10 VI 2001 JMW and MSP; stream on Hwy 3, 52 50' 32"N 102 44' 20"W, 19 VII 2000 JMW; stream on Hwy 9, S of Hudson Bay 52 40'03"N 102 22'19"W, 24 V 2001 JMW; Waskesiu River at Hwy 2, 12 VI 2000 JMW, 6 VII 2000 JMW; Waskwei River At Hwy 9, 23 VII 2001 JMW; Weyakwin River at Hwy 2, 12 VI 2000 JMW, 7 VII 2000 JMW; Whitefox River at Hwy 35, 2 VII 1986 VK.

Baetis hudsonicus Ide, 1937

Distribution Map: Fig. 286

Descriptions: Adult: N/A.

Larva: (Ide 1937; Morihara and McCafferty 1979a)

Diagnostic Characters:

Baetis hudsonicus larvae are easily distinguished from those of all other *Baetis* by the elongate abdominal gills and the subequal cerci and median caudal filament. As discussed under *B. bundyae*, the similarity of the larvae and the variable nature of the length of the median caudal filaments in other species leads me to believe that the two species are synonymous.

The adult male of *B. hudsonicus* is unknown, but is expected to have genital forceps of the *intercalaris*-type and brown abdominal terga due to its close relationship with *B. bundyae* and *B. brunneicolor*.

Distribution and Biology:

Baetis hudsonicus is known only from Saskatchewan, Manitoba, and Ontario (McCafferty and Randolph 1998). The biology of *B. hudsonicus* is unknown.

Material Examined: 2 larvae

Stream at mile 2 of Hwy 165, 17 VI 1971 DHS.

Baetis intercalaris McDunnough, 1921

Fig. 47

Distribution Map: Fig. 287

Baetis lasallei Banks, 1924

Descriptions: Adult: Traver (1935), Burks (1953)

Larva: (Ide 1937; Morihara and McCafferty 1979a)

Diagnostic Characters:

Baetis intercalaris larvae are differentiated from those of all other Saskatchewan *Baetis* by the presence of 3 banded caudal filaments, a large dark spot on the middle femora, wide labial palps, and the three, round pale areas on the posterior margin of the abdominal terga. (Waltz et al. 1996) found that the tergal colouration can vary; in some specimens the three pale areas of the terga are minute or absent. This form of *B. intercalaris* are distinguished from other *Baetis* by the uniform grey or brown abdominal colour and the paired submedian parentheses- like marks along the anterior margin of the terga. Only 'normal' *B. intercalaris* have been found in Saskatchewan.

Adult males of *B. intercalaris* can be differentiated from those of other Saskatchewan *Baetis* by the *intercalaris*- type genital forceps, the white abdominal terga 2-6, and the black or dark brown thorax. Traver (1935) separated *B. intercalaris* from other similar species by the long marginal intercalaries in the first interspace of the forewing but (Waltz 1995) suggests this character is prone to variation in species synonymized with *B. flavistriga*. This character likely varies in *B. intercalaris* as well and should not be considered diagnostic.

Distribution and Biology:

Baetis intercalaris is found throughout much of Eastern North America. It is nearly always sympatric with *B. flavistriga* except in the Southeast where *B. flavistriga* is absent (Moriwara and McCafferty 1979a). Prior to this study the westernmost reports were the Black Hills of South Dakota (McCafferty 1990) and Texas (McCafferty and Davis 1992). *Baetis intercalaris* is uncommonly collected in Saskatchewan. Specimens were found in the Frenchman R. in the Cypress Hills and in streams along the Manitoba escarpment.

The life cycle of *B. intercalaris* is unknown in Saskatchewan, but in Wisconsin it is univoltine (Bergman and Hilsenhoff 1978). In other regions of North America *B. intercalaris* is

bivoltine (Waltz et al. 1996). (Shapas and Hilsenhoff 1976) found *B. intercalaris* consumed equal amounts of detritus and diatoms.

Material Examined: 10 larvae

Carrot River at Hwy 55, 23 VII 2001 JMW; Fir River at Hudson Bay Regional Park, 23 VII 2001 JMW; Frenchman River at Ravenscrag, 22km west of Eastend, 23 VI 2000 JMW; Red Deer River at Hudson Bay Regional Park, 19 VII 2000 JMW.

Baetis tricaudatus Dodds, 1923

Figs. 48, 49, 50, 51

Distribution Map: Fig. 288

Baetis intermedius McDunnough, 1925

Baetis incertans Dodds, 1923

Baetis jesmondis McDunnough, 1938

Baetis moffatti Dodds, 1923

Baetis vagans McDunnough, 1925

Descriptions: Adult: (Dodds 1923)

Larva: (Dodds 1923; Morihara and McCafferty 1979a)

Diagnostic Characters:

Baetis tricaudatus larvae are distinguished from those of all other Saskatchewan *Baetis* by the three unbanded caudal filaments, dark bilobed markings on the pronotum, and robust setae on the abdominal sterna, paraprocts, and antennal scape and pedicel.

Adult males are distinguished from those of all other Saskatchewan *Baetis* except *B. bicaudatus* by the *tricaudatus*-type genital forceps. Morihara and McCafferty (1979a) state that the adult of *B. tricaudatus* and *B. bicaudatus* are indistinguishable but (Durfee and Kondratieff 1999) found males of *B. bicaudatus* have much smaller tubinate eyes on a longer stalk than those of *B. tricaudatus*. The uniformly brown abdominal terga of *B. bicaudatus* will also separate it from those of *B. tricaudatus*.

Distribution and Biology:

Baetis tricaudatus is the most widespread *Baetis* in North America, being absent only from the extreme southeast (Morihara and McCafferty 1979a). *Baetis tricaudatus* was first reported from Saskatchewan by (Lehmkuhl 1976b), as *B. vagans*). In Saskatchewan, it is present in virtually all running waters where it inhabits the fastest flowing sections. *Baetis tricaudatus* emerges throughout the ice-free season with adults or mature larvae being present in every month between April and September. It is likely that this species is bivoltine in most streams rather than univoltine with an extended emergence period, as populations in the South Saskatchewan River have two distinct generations; one with adults emerging in April and May, and another with adults emerging throughout the fall. Overwintering occurred in the larval stage. (Bergman and Hilsenhoff 1978) found *B. tricaudatus* (as *B. vagans*) to have a similar life cycle in Wisconsin.

Material Examined: 883 larvae, 18 imagos

Ace Creek at Ace Lake Dam, at outflow, 9.2km E of Uranium City, 26 VI 1986 JC and ERW, 28 VI 1986 JC and ERW; Ace Creek at Ace Lake Road, 9.1 km ESE of Uranium City, 30 VI 1986 JC and ERW, 30 VI 1986 LD and DWP; Ace Creek upstream from Ace Lake, 9.9 km E of Uranium City, 27 VI 1986 JC and ERW; Archibald River, near S shore of L. Athabasca, 18 VI

1986 LD and DWP; Arsenault River at Hwy 903, 3 VI 1971 DHS; Bainbridge R. at Hwy 9, 25 V 2000 JMW and DWP, 20 VII 2000 JMW; Battle Creek at Ranger Station, Cypress Hills Prov. Park, W Block, 17 V 2000 JMW, 30 VII 2000 JMW, 19 V 2000 JMW, 25 VI 2000 JMW; Battle Creek near Alberta border, 17 V 2000 JMW; Battle River, Bridge south of Lashburn, 27 VIII 1972 DHS; Beaver River At Hwy 4, 10 VI 2001 JMW and MSP; Benson Creek at Battle Creek Road, West Block Cypress Hills Prov. Park, 17 V 2000 JMW, 25 VI 2000 JMW; Bow River at Hwy 165, 13 VI 2000 JMW; Bow River, 13 miles N of Molanosa, 8 VI 1970 DML, 27 V 1971 DML; Broad Creek at Hwy 904, 10 VI 2001 JMW and MSP, 1 VII 2000 JMW; Canoe River at Hwy 155, 4 VI 1971 DHS; Churchill River at Otter Rapids, 31 V 1970 DML; Clearwater River at Hwy 955, 30 VI 2000 JMW; Cole Creek at Hwy 903, 10 VI 2001 JMW and MSP; Colin R. at Lake Athabasca, 18 VI 1986 Ld and DWP; Courtney Lake at Hwy 905, 13 VI 2000 JMW; Crackingstone R. at Laredo Road Bridge, 8km SW of Uranium City, 29 VI 1986 LD DWP; creek at km 65 of Hwy 9, 23 VII 2001 JMW; creek from Strike Lake, 9.6km E of Uranium City, 27 VI 1986 LD and DWP; creek into NE end of Jean L., 2.2km NNW of Uranium City, 30 VI 1986 JC and ERW; Fir River at Hudson Bay Regional Park, 24 VII 1999 JMW; Fredette R. at Fredette L. outflow, 3.6km NNE of Uranium City, 29 VI 1986 JC and ERW; Fredette River, 0.4km ENE of Uranium City, 29 VI 1986 JC and ERW; Green Bush Creek at Hwy 3, 17 VII 1999 JMW, 19 VII 2000 JMW; Jean Creek at Bushell Road Bridge, 5.6km SW of Uranium City, 29 VI 1986 LD and DWP; Little Red River at Prince Albert, 17 V 1972 DHS, 14 V 1986 ERW; Low Creek at Hwy 904, 1 VII 2000 JMW, 10 VI 2001 JMW and MSP; McDougal Creek at Hwy 120, 21 VIII 1974 DL, 26 IV 1976 LD; McFarlane R, 59-09N, 107-54W, 19 VI 1980 JC; McVey Creek at Hwy55, 22 VI 1980 ERW, 20 VII 2000 JMW, 24 IV 1980 ERW; Meeyomoot River at Hwy 165, 13 VI 2000 JMW, 17 VI 1971 DHS; Montreal River at Hwy 2, 15 VII 1960 NC;

Nemeiben River near Lac LaRonge 22 VII 1969 DML; North Saskatchewan River at Borden Bridge, 27 VII 1999 JMW, 3 V 2000 JMW, 31 VII 1972 DHS; North Saskatchewan River at Cecil Ferry 13 VII 1981 DML, 6 VI 2000 JMW, 8 V 2001 JMW and DWP; North Saskatchewan River at Lacolle Falls, 25 IV 1984 LD and BJ, 1 V 1984 ERW; North White Poplar Creek at Hwy 9, 25 V 2000 JMW; Otosquen Creek at Hwy 9, 24 VII 1999 JMW; Overflowing River at Hwy 9, 19 VII 2000 JMW, 8 V 2001 JMW and DWP, 9 VII 2001 JMW, 17 VII 1999 JMW; Pasquia River at Hwy 9, 20 V 1980 ERW, 20 VII 2000 JMW, 17 VII 1999 JMW; Red Deer River at Hudson Bay Regional Park, 19 VII 2000 JMW; Saskatchewan River at Gronlid, 21 VII 1971 DHS; Saskatchewan River at Nipawin, 2 VIII 1972 DHS; Shuard Creek 11 miles South of Piapot, 19 V 1976 LD; South Saskatchewan River 15 miles North of Saskatoon, 7 V 1970 DML and DHS; South Saskatchewan River at Batoche Ferry, 4 VI 1970 DML; South Saskatchewan River at Birch Hills Ferry, 13 VI 1984 ERW, 21 IX 1972 DHS, 14 IX 1972 DHS; South Saskatchewan River at Clarkboro Ferry, 30 V 1998 JMW, 12 V 2000 JMW, 10 V 1998 JMW, 16 VII 2000 JMW; South Saskatchewan River at Hague Ferry, 8 IX 1972 DHS, 20 VII 1972 DHS; South Saskatchewan River at Lemsford Ferry, 3 IX 1970 DML, 30 IV 1998 JMW, 2 VI 1971 DML, 12 V 1971 DML, 14 VII 1971 DML, 17 V 2000 JMW, 30 IV 1998, 19 IX 1971 DML, 20 V 1971 DML; South Saskatchewan River at Queen Elizabeth Power Station, 24 IV 2001 JMW, 28 IV 2000 JMW, 2 VI 2000 JMW; South Saskatchewan River at Saskatoon, 16 III 2001 JMW, 14 VII 1999 JMW, 21 IV 1971 DML; South Saskatchewan River at St. Laurent Ferry, 29 IV 1980 ERW; South White Poplar Creek at Hwy 9, 24 VII 1999 JMW; stream 1/3 mile sw of East Block Cypress Hills park gate, 19 V 1976 LD, stream 2 miles South of Hudson Bay, 27 VIII 1969 DML; stream at km 105 of Hwy905, 13 VI 2000 JMW; stream at km 135 of Hwy 102, near N end of Mclennan Lake, 13 VI 2000 JMW, stream at km 165 of Hwy 903 55 24' 55"N 108 43'

06"W, 10 VI 2001 JMW and MSP; stream on #1 Hwy 55, 25 V 2000 JMW and DWP; stream on Hwy 3, 52 50' 32"N 102 44' 20"W, 19 VII 2000 JMW; stream on Hwy 55, 53 28' 02"N 102 33' 41"W, 20 VII 2000 JMW; Thickbush Creek at Hwy 9, 25 V 2000 JMW and DWP; Torch River at Hwy 35, 22 VII 1986 ERW, 27 V 1986 ERW, 2 VII 1986 VK; Torch River N of Hwy 35, 25 V 2000 JMW and DWP, 8 V 2001 JMW and DWP; Wapomon Lake, 21 VIII 1973 NC; Waskesiu River at Hwy 2, 16 VI 1971 DHS, 6 VII 2000 JMW, 12 VI 2000 JMW; Waskwei River At Hwy 9, 23 VII 2001 JMW; Waterhen River at Hwy 26, 15 VI 1971 DHS; Weyakwin River at Hwy 2, 7 VII 2000 JMW, 12 VI 2000 JMW.

3.6.7 Callibaetis Eaton

Callibaetis is common in lakes, permanent ponds, and slow-flowing portions of streams throughout North America. The species of the genus are difficult to identify due to extensive geographical and temporal variation. Unlike other groups of mayflies, the female imago is used for species identification. Early season and fall male imagos can usually be accurately identified but those emerging in mid-summer typically do not show enough colour to be reliably identified. (Check 1982) revised the North American species of *Callibaetis* and provided keys to both larvae and adult males and females. However, not all of the synonymies presented by (Check 1982) have been accepted by the community of mayfly researchers, and there is a possibility that his larval keys may be unreliable.

Thirteen species of *Callibaetis* occur in North America; *C. ferrugineus* (Walsh), *C. pallidus* Banks, and *C. skokianus* Needham have been reported from Saskatchewan. The report of *C. skokianus* from Saskatchewan by (Thew 1959) is probably referable to *C. pallidus*, but the specimens were not available for study. Therefore, *C. skokianus* is not treated in this study.

Callibaetis fluctuans (Walsh) and *Callibaetis pictus* (Eaton) were reported from South Dakota and may eventually be found in Saskatchewan (McCafferty 1990). Larvae of *C. fluctuans* can be differentiated from those of *C. pallidus*, *C. pictus*, and *C. ferrugineus* by having the ventral lamellae of gills 3-6 narrowly joined to the dorsal lamella. Larvae of *C. pictus* can be differentiated from those of *C. ferrugineus* and *C. pallidus* by the absence of robust setae on the tibiae and tarsi. Imagos of both *C. fluctuans* and *C. pictus* can be distinguished from those of *C. pallidus* and *C. ferrugineus* by the presence of relatively few cross veins in the fore wing which form a single row across the disk of the wing; *C. pallidus* and *C. ferrugineus* have numerous cross veins which form at least two rows across the disk of the wing. *Callibaetis pictus* can be distinguished from *C. fluctuans* by the double marginal intercalaries and conspicuous W-shaped white markings on abdominal terga 6 and 9. See (Check 1982) for more details.

Larvae of *Callibaetis* are differentiated from those of other Baetidae by the presence of slightly rounded, rather than truncate, labial palps, and the large compound gills.

Imagos of *Callibaetis* are differentiated from those of other Saskatchewan Baetidae by the numerous brown spots on the abdomen and the hind wings with numerous cross veins.

Key to species of *Callibaetis*: larvae [(modified from Check (1982)]

- 1a. Femora usually with a dark sub-apical band; apical seta of tarsi at base of tarsal claw relatively short (Fig. 52)*C. ferrugineus*
- 1b. Femora without a sub-apical band; apical seta of tarsi relatively long (Fig. 55)*C. pallidus*

Key to species of *Callibaetis*: female imagos and early-season male imagos (based on Check 1982)

- 1a. Costal margin and vitta of fore wing with dark brown staining with extensive pale areas (Fig. 53)*C. ferrugineus*
- 1b. Costal margin and vitta of fore wing with yellow-brown staining and few pale areas (Fig. 56)*C. pallidus*

***Callibaetis ferrugineus* (Walsh), 1862**

Figs. 52, 53, 54

Distribution Map: Fig. 289

Baetis ferrugineus (Walsh), 1862

Cloe ferruginea Walsh, 1862

Baetis tessellata Hagen, 1861

Callibaetis americanus Banks, 1900

Callibaetis carolus Traver, 1935

Callibaetis coloradensis Banks, 1900

Callibaetis evergreenensis Thew, 1959

Callibaetis fuscus Dodds, 1923

Callibaetis hageni Eaton, 1885

Callibaetis hebes Upholt, 1936

Callibaetis nigrinus Banks, 1918

Callibaetis tessellatus (Hagen), 1861

Descriptions: Adult: (Check 1982), Traver (1935)

Larva: (Check 1982)

Diagnostic Characters:

Larvae of *C. ferrugineus* can be distinguished from those of *C. pallidus* by the presence of a dark sub-apical band on the femora. (Check 1982) noted that the dark band is absent in some western populations of *C. ferrugineus*; the relatively short (5-7.5X longer than wide) apical seta of the tarsi will differentiate these specimens from *C. pallidus*.

Adults of *C. ferrugineus* can be distinguished from those of *C. pallidus* by the darker brown and blotchier colouration of the fore wings. Males collected in the spring and fall can usually be accurately identified, but those collected in mid-summer may be too pale to identify. (Check 1982) notes that *C. ferrugineus* swarms over open water while *C. pallidus* swarms over the shoreline. However, I observed *C. ferrugineus* swarming over the shore of the North Saskatchewan River so swarming behaviour is more variable than Check (1982) indicated.

Distribution and Biology:

Callibaetis ferrugineus is widely distributed throughout North America and is absent only from the southeast. In Saskatchewan, it was present in all regions except the southeast corner but this may be an artefact of the small number of samples examined from this region.

Adults were collected between May and September and it is likely that more than one generation occurs per year. (Clifford 1969) found only a single generation per year in an Alberta stream. Possibly, the number of generations per year varies between populations and depends on the habitat type.

Material Examined: 35 larvae, 50 imagos

Amber Lake at km 135 of Hwy 955, 30 VI 2000 JMW; Brightsand Lake at Nature Trail, 6 VI 2001 DWP and Jhal; Emma Lake, 1 VII 1970 Dkan; Frenchman River at Ravenscrag, 22km west

of Eastend, 20 V 2000 JMW, 19 V 2000 JMW; Lakeview Pond, Saskatoon, 20 VIII 2001 JMW; LaRonge, 9 VIII 1970 RH; Nemeiben River near Lac LaRonge, 22 VII 1969 DML; North Saskatchewan River at Borden Bridge, 14 IX 2000 JMW; Pond 2Km W of Hwy 11 on Baker Road, S of Saskatoon, 13 IX 1997 JMW; Rystom's Pond, 4km SE of Saskatoon, 11 VIII 1986 DWP; stream 11 miles (17.6km) South of Piapot, 19 VII 1975 DHS and DE; stream at km 105 of Hwy905, 19 VI 1982 ERW; stream on Hwy 955 57 04' 29"N, 109 04' 15"W, 30 VI 2000 JMW; stream on Hwy 965 55 06'55"N 107 54' 51"W, 9 VI 2001 JMW and MSP; Strike Lake near Lake Athabasca, 27 VI 1986 JC; Sturgeon River at Hwy 240, 4 VIII 1969 DML; Swift Current Creek at Twin Forks, 25 V 1974 RD; Turtle Lake, 16 V 2001 JMW and DWP; Weyakwin Lake at Boat Launch, 12 IX 1993 BV.

***Callibaetis pallidus* Banks, 1900**

Figs. 55, 56

Distribution Map: Fig. 290

Callibaetis semicostatus Banks, 1914

Descriptions: Adult: (Check 1982; Traver 1935)

Larva: (Check 1982)

Diagnostic Characters:

Larvae of *C. pallidus* are differentiated from those of *C. ferrugineus* by the absence of a dark sub-apical band on the femora and the longer apical seta on the tarsi.

Adults of *C. pallidus* are differentiated from those of *C. ferrugineus* by the lighter brown colouration of the fore wings. Additionally, the colouration of the forewings tends to be more continuous with fewer large gaps.

Distribution and Biology:

Callibaetis pallidus is widely distributed throughout the midwestern United States and Canada. Specimens were collected from all regions of Saskatchewan.

Adults have been collected most of the ice-free months. (Parker 1992) found adults emerging between mid-June and mid-October with a small peak of emergence in June and a larger peak emergence occurring in August. Overwintering likely occurs in the larval stage (Parker 1992).

Material Examined: 100 larvae, 15 imagos

Amber Lake at km 135 of Hwy 955, 9 VI 2001 JMW and MSP; Battle R below old dam, Battleford, 25 VII 1971 DML; Battle River S of Delmas, 16 V 2001 JMW and DWP; Bradwell Reservoir, 16 IX 1988 NC; Crystal Lake, 3 VIII 1975 DHS; Frenchman River at Ravenscrag, 22km west of Eastend, 30 VII 1999 JMW, 23 VI 2000 JMW; Lake 2 miles S of Hague, 24 VII 1974 DHS; LaRonge, 3 VIII 1970 DML; Light Trap at Saskatoon Forestry Farm, 19 VIII 1972 Snay and F; North Saskatchewan River at Borden Bridge, 28 IV 1970 DML; Pond 5 miles SE of Saskatoon, 29 IX 1969 WS; Pond 8 miles E of Saskatoon, on Hwy 5, 22 IX 1969 WS; Pond L.C. near Saskatoon, 31 VII 1986 DWP; Quill Lake, 15 VIII 1988 DWP; Saskatoon, 18 IX 1972 DHS; Souris River at Hwy 47, 10 X 1988 CM; South Saskatchewan River at Clarkboro Ferry, 16 VII 2000 JMW; South Saskatchewan River at Lemsford Ferry, 23 V 1998 JMW; South Saskatchewan River at Saskatoon, 25 X 1970 DML; Spruce River, 245 VIII 1986 VK; Torch River At Hwy 120, 8 VIII 2001 DWP and Jhal; Waterhen R at Hwy 4, 3 VI 1971 DHS; Waterhen River at Hwy 26, 2 VI 1971 DHS.

3.6.8 Camelobaetidius Demoulin

Species of *Camelobaetidius* are primarily found in warm, silty rivers in the southwestern United States, Mexico, and Central and South America. (Lugo-Ortiz and McCafferty 1995) and (McCafferty and Randolph 2000) studied the North and Central American species and provided keys to the larvae. The key provided by (Lugo-Ortiz and McCafferty 1995) should be used with caution as *C. warreni* (Traver and Edmunds) will incorrectly key to *C. similis* Lugo-Ortiz and McCafferty because it was incorrectly stated that *C. warreni* lacked coxal gills (osmobranchiae of (McCafferty and Randolph 2000)). There are no keys to the species of adult males. Nine species occur in North America; only *C. warreni* (Traver and Edmunds) occurs in Saskatchewan.

Larvae of *Camelobaetidius* are easily differentiated from those of other Baetidae by the presence of spatulate tarsal claws.

Adult males of *Camelobaetidius* are differentiated from those of other Baetidae by the broadly based costal process of the hind wing. Males of *Acerpenna* and *Camelobaetidius* can be difficult to separate, but *Acerpenna* has a more conspicuous undulation beyond the costal process of the hind wing. Additionally, *Camelobaetidius* never has more than two longitudinal veins in the hind wing; *Acerpenna* often possesses a third longitudinal vein or a long intercalary near the hind margin.

Camelobaetidius warreni (Traver & Edmunds), 1968

Figs. 57, 58

Distribution Map: Fig. 291

Camelobaetidius cepheus (Traver & Edmunds), 1968

Camelobaetidius navis (Allen & Chao), 1978

Camelobaetidius trivialis (Allen & Chao), 1978

Camelobaetidius zenobia (Traver & Edmunds), 1968

Dactylobaetis cepheus Traver & Edmunds, 1968

Dactylobaetis navis Allen & Chao, 1978

Dactylobaetis trivialis Allen & Chao, 1978

Dactylobaetis warreni Traver & Edmunds, 1968

Dactylobaetis zenobia Traver & Edmunds, 1968

Descriptions: Adult: (Traver and Edmunds 1968)

Larva: (Traver and Edmunds 1968), see also (McCafferty and Randolph 2000)
and (Lugo-Ortiz and McCafferty 1995)

Diagnostic Characters:

The diagnostic characters provided in the genus treatment will serve to differentiate specimens from *C. warreni* from those of all other Saskatchewan Baetidae.

Distribution and Biology:

Camelobaetidius warreni is the most widespread species of *Camelobaetidius* in North America and occurs in most western states. In Canada it is known only from Saskatchewan although it likely also occurs in Alberta. All Saskatchewan specimens were collected in the South Saskatchewan River upstream of Lake Diefenbaker. Larvae were found near the shore over a silty gravel and rubble substrate in moderate current (Lehmkuhl, unpublished). Mature larvae were collected between July and mid-October. It is unknown whether overwintering occurs in the larval or egg stage.

A female imago and a male subimago identified as *C. warreni* by WP McCafferty of Purdue University were collected from the Puskwakau River at Hwy 106. Based on the collection location and time (May), I feel this specimen probably represents a variant of an

Acerpenna sp., but until further specimens from this location are available, I will continue with Dr. McCafferty's identification.

Material Examined: 19 larvae, 1 subimago, 1 imago

Puskwakau River at Hwy 106, 30 V 1976 LD; South Saskatchewan River at Lemsford Ferry, 14 VII 1971 DML, 3 IX 1971 DML, 10 VIII 1971 DML, 26 IX 1970 DML, 28 VIII 1971 DML, 16 X 1999 JMW and Bpol, 30 VII 2000 JMW, 16 IX 2000 JMW, 20 VIII 2001 JMW.

3.6.9 *Centroptilum* Eaton

Of the 15 North American species of *Centroptilum*, *C. album* McDunnough, *C. bifurcatum* McDunnough, *C. conturbatum* McDunnough, and *C. victoriae* McDunnough occur in Saskatchewan. *Centroptilum walshi* McDunnough and *C. convexum* Ide (Fig. 68) occur in Manitoba and may eventually be found in eastern Saskatchewan. The identification of most species is difficult. It is likely that numerous synonymies will be found within the genus. Larvae of *Centroptilum* are generally found in small streams, except *C. bifurcatum* is found primarily in the Saskatchewan River System.

Larvae of *Centroptilum* are distinguished from those of other Saskatchewan Baetidae by following combination of characters: terminal segment of the labial palp truncate, caudal filaments with every 3rd to 5th segment darkened, prosthema of mandible slender, second and third segments of the maxillary palps of equal length, incisors of the right mandible divided to their bases. The larva of *Procloeon irrubrum* Lowen and Flannagan will key to *Centroptilum* except the third segment of the maxillary palp is shorter than the second.

Adult males of *Centroptilum* are differentiated from those of other Saskatchewan Baetidae by the single marginal intercalaries and the presence of a small spine between the bases

of the forceps. In *C. conturbatum* the small spine is absent and in *C. album* it may be reduced or vestigial. These species of *Centroptilum* without a spine can be differentiated from those of *Procloeon* Bengtsson by the large protuberances on the inner margins of the second segment of the genital forceps. All Saskatchewan *Centroptilum* have hind wings but several other North American species do not.

Key to species of *Centroptilum*: larvae

- 1a. Caudal filaments with a dark band at tip *and* near middle (Fig. 59); posterior margin of tergum 9 lacking a median protuberance (Fig. 61) *C. album*
- 1b. Caudal filaments with a dark band near tip only; posterior margin of tergum 9 with a median protuberance (Fig. 63) 2

- 2a. Lateral spines absent, or <4 on segment 8 and <8 on segment 9.....*C. conturbatum*
- 2b. Lateral spines present on at least segments 8 and 9, if absent on segments 1-7 than >6 on segment 8 and >8 on segment 9.....3

- 3a. Lateral spines present on at least abdominal segments 5-9.....*C. bifurcatum*
- 3b. Lateral spines absent on segments 1-7, numerous on segments 8 and 9....*C. victoriae*

Key to species of *Centroptilum*: adult males

- 1a. Spine between bases of genital forceps absent or vestigial (Figs. 67, 68); styliger plate conical (Fig. 67, 68) 2

- 1b. Spine between bases of genital forceps present (Fig. 71); styliger plate bent dorsally, apex appearing concave (Fig. 65)3
- 2a. Apical abdominal segments brown; thorax black.....*C. conturbatum*
- 2b. Apical abdominal segments pale; thorax yellowish brown.....*C. album*
- 3a. Hind wing with costal process hooked*C. victoriae*
- 3b. Hind wing with costal process without a hook*C. bifurcatum*

Centroptilum album McDunnough, 1926

Figs. 59, 60, 61

Distribution Map: Fig. 292

Procloeon album (McDunnough), 1926

Procloeon sp. 2 McCafferty and Davis, 1992

Descriptions: Adult: (Lowen and Flannagan 1991), (McDunnough 1926), Traver (1935)

Larvae: (Lowen and Flannagan 1991)

Diagnostic Characters:

Larvae of *C. album* are identified by the presence of 2 dark bands on the caudal filaments and the absence of a median projection on the posterior margin of tergum 9. The pronotum and mesonotum are dark laterally and pale medially in male larvae.

Adult males are identified by the rounded styliger plate and pale apical abdominal segments.

Distribution and Biology:

Centroptilum album is found throughout North America except the far north. In Saskatchewan, larvae were collected in small streams throughout the boreal forest. Mature larvae were collected between early-June and early-August.

Material Examined: 14 larvae

Broad Creek at Hwy 904, 1 VII 2000 JMW, 10 VII 2001 JMW and MSP; Green Bush Creek at Hwy 3, 19 VII 2000 JMW; Low Creek at Hwy 904, 1 VII 2000 JMW; Ootosquen Creek at Hwy 9, 9 VII 2001 JMW; Overflowing River at Hwy 9, 19 VII 2000 JMW; Stream at Km 170 of Hwy 903 55 25'54"N 108 46' 10"W, 10 VI 2001 JMW and MSP; Umpherville River At Hwy 905, 8 VIII 2000 JMW; Weyakwin River at Hwy 2, 7 VII 2000 JMW.

Centroptilum bifurcatum McDunnough, 1924

Figs. 62, 63, 64, 65

Distribution Map: Fig. 293

Descriptions: Adult: (Lowen and Flannagan 1991), (McDunnough 1924a), (McDunnough 1929), Traver (1935)

Larvae: (Lowen and Flannagan 1991)

Diagnostic Characters:

Larvae are identified by the presence of lateral spines on terga 5-9. The dorsal abdominal colour pattern is unique.

Adult males are identified by the presence of a minute spine between the bases of the forceps and the absence of a hook on the costal process of the hind wing.

Distribution and Biology:

Centroptilum bifurcatum is distributed from Ontario to eastern British Columbia in Canada, and also occurs in the northern Rocky Mountain States. In Saskatchewan, *C. bifurcatum* was found primarily in large rivers. Mature larvae first appeared in early-June, and adults were collected between late-June and mid-July. A second generation occurred in late summer and fall. Mature larvae were collected as late as mid-October.

Material Examined: 366 larvae, 23 imagos, 1 subimago

Battle River At Hwy 21, 1 VII 2000 JMW; Beaver River at Hwy 4, 1 VII 2000 JMW, 10 VI 2001 JMW and MSP; McVey Creek at Hwy 55, 20 VII 2000 JMW; North Saskatchewan River at Borden Bridge, 18 VI 1976 PGM, 2 X 1999 JMW; North Saskatchewan River at Cecil Ferry, 11 VI 1971 DML, 21 IX 1972 DHS, 24 VI 1981 no collector, 6 VI 2000 JMW, 28 VIII 2000 JMW; North Saskatchewan River at Maymont Ferry, 6 VI 1972 DHS; Saskatoon, 13 VII 1993 Bsam; South Saskatchewan River at Clarkboro Ferry, 16 VII 2000 JMW; South Saskatchewan River at Fenton Ferry, 11 VI 1986 ERW; South Saskatchewan River at Hague Ferry, 4 VII 1972 DHS; South Saskatchewan River at Lemsford Ferry, 3 IX 1970 DML, 26 IX 1970 DML, 10 VIII 1971 DML, 28 VIII 1971 DML, 19 IX 1971 DML, 24 VI 1976 PGM, 29 VI 1976 PGM, 23 V 1998 JMW, 5 VIII 1998 JMW, 16 X 1999 JMW, Bpol and MS, 16 IX 2000 JMW, 20 VIII 2001 JMW; South Saskatchewan River at Queen Elizabeth Power Station, 27 VI PGM, 10 VII 1999 JMW, 18 VI 2000 JMW; South Saskatchewan River at Saskatoon, 10 VIII 1970 DML, 24 VI 1992 ERW; Torch River at Hwy 35, 2 VII 1986 VK.

***Centroptilum conturbatum* McDunnough, 1929**

Figs. 66, 67

Distribution Map: Fig. 294

Procloeon conturbatum (McDunnough), 1929

Descriptions: Adult: (Lowen and Flannagan 1991), Traver (1935), (McDunnough 1929)

Larvae: (Lowen and Flannagan 1991)

Diagnostic Characters:

Larvae of *C. conturbatum* are identified by the absence of lateral spines (or only a small number on terga 8 and 9) and the presence of a median projection on the posterior margin of tergum 9. In some specimens the dark band at the apices of the caudal filaments is absent.

Adult males are differentiated from those of other Saskatchewan *Centroptilum* by the conical styliger plate, absence of a small spine between the bases of the forceps, and the black thorax and dark abdominal segments 7-10.

Distribution and Biology:

Centroptilum conturbatum is distributed from Manitoba to British Columbia in Canada. In the United States it is found in California, New Mexico, Utah, and Wyoming. *Centroptilum conturbatum* was not previously known from Saskatchewan. This species was found in swiftly-flowing streams in the boreal forest and Cypress Hills in Saskatchewan. Mature larvae were collected between late-June and late-July.

Material Examined: 16 larvae

Battle Creek at Ranger Station, Cypress Hills Prov. Park, W Block, 26 VI 2000 JMW, 30 VII JMW; Low Creek at Hwy 904, 1 VII 2000 JMW; Pasquia River at Hwy 9, 20 VII 2000 JMW; stream on Hwy 955 57 04' 29"N, 109 04' 15"W, 30 VI 2000 JMW.

Centroptilum victoriae McDunnough, 1938

Figs. 69, 70, 71

Distribution Map: Fig. 295

Descriptions: Adult: (McDunnough 1938), (Lowen and Flannagan 1991)

Larvae: (Lowen and Flannagan 1991)

Diagnostic Characters:

Larvae of *C. victoriae* are differentiated from those of other Saskatchewan *Centroptilum* by the presence of a median projection on the posterior margin of tergum 9 and the presence of numerous lateral spines on terga 8 and 9 and the absence of lateral spines on terga 1-7.

Adult males of *C. victoriae* are differentiated from those of other Saskatchewan *Centroptilum* by the presence of a spine between the bases of the forceps and a hook on the costal process of the hind wing.

Distribution and Biology:

Centroptilum victoriae is endemic to Canada (McCafferty and Randolph 1998). Saskatchewan is the western range limit. Larvae were collected larger, medium-gradient streams and the Saskatchewan River System. Mature larvae occurred in June and July.

Material Examined: 16 larvae, 1 imago

Green Bush Creek at Hwy 3, 19 VII 2000 JMW; North Saskatchewan River at Cecil Ferry, 11 VI 1971 DML; Red Deer River at Hudson Bay Regional Park, 19 VII 2000 JMW; South Saskatchewan River at Lemsford Ferry, 12 VII 1972 DML; Torch River at Hwy 35, 22 VII 1986 ERW; Torch River N of Hwy 35, 9 VII 2001 JMW.

3.6.10 *Cloeon* Leach

Cloeon is represented in North America by a single species, *C. dipterum* (Linnaeus). Flowers (1978) states that all North American records of *C. dipterum* are referable to *C. cognatum* Stephens. However, Randolph et al. (in press) state that Flowers (1978) is incorrect, and all North American specimens should once again be called *C. dipterum*.

In North America, *Cloeon* used to refer to those species possessing single marginal intercaleries and lacking hind wings. However, (McCafferty and Waltz 1990) transferred all of those species except *C. dipterum* to either *Procloeon* or *Centroptilum*.

Larvae of *Cloeon* are distinguished from those of other Baetidae by the presence of obliquely truncate labial palps, dark bands present on every few segments of the caudal filaments, and a patch of setae on the galea-lacinia just anterior to the insertion of the maxillary palp. Larvae of *Cloeon* are difficult to distinguish from those of *Procloeon*; however, the terminal segment of the labial palps is less expanded than those found in *Procloeon*, and the patch of setae just anterior to the insertion of the maxillary palp into the galea-lacinia is absent in all Saskatchewan species of *Procloeon* (except for perhaps *P. ingens* (McDunnough); see the discussion for that species for more information).

Adult males of *Cloeon* are distinguished from those of other Saskatchewan Baetidae by the single marginal intercaleries in the fore wing, the absence of a small spine between the bases of the forceps, and the presence of a conical styliiger plate. In their key to the Ephemeroptera genera, (Edmunds and Waltz 1996) state the terminal segment of the genital forceps of adult male *Cloeon* is small and rounded. This does not appear to be the case in the single Saskatchewan male I examined. However, their key is based on *C. cognatum* being the North

American species. (Sowa 1975), in his treatment of the *Cloeon dipterum* species-group in Europe, shows *C. dipterum* having the terminal segment more elongate than *C. cognatum*'s.

Cloeon dipterum (Linnaeus), 1761

Figs. 72, 73

Distribution Map: Fig. 296

Cloeon annulatum Müller, 1776

Cloeon rufulum Müller, 1776

Cloeon szegedi Jacob, 1969

Cloeon cognatum Stephens 1835 (misidentification)

Descriptions: Adult: (Sowa 1975)

Larvae: (Sowa 1975)

Larvae of *C. dipterum* are distinguished from those of other Baetidae by the characters listed in the genus treatment.

Adult males of *C. dipterum* are distinguished from those of other Baetidae by the characters listed in the genus treatment.

Distribution and Biology:

Cloeon dipterum has been reported from the northeastern United States. Randolph et. al (in press) provide the first Canadian records from Quebec and Saskatchewan. Larvae were collected from beds of *Myriophyllum* in Pike Lake, an oxbow lake in central Saskatchewan. Mature larvae and adults were collected in September.

Material Examined: 11 larvae, 3 subimagos, 2 imagos

Pike Lake at Boat Launch, 27 IX 1994 ERW, 18 IX 2001 JMW, 26 IX 2001 JMW.

3.6.11 *Dipheter* Waltz and McCafferty

In North America, *Dipheter* is represented by a single species, *D. hageni* (Eaton). A second species from the west coast of North America *D. devinctus* (Traver) was recently synonymized with *D. hageni* after the discovery of the larva (Meyer and McCafferty 2001).

Larvae of *Dipheter* are differentiated from those of other Saskatchewan Baetidae by the absence of abdominal gill 1, the lack of a villipore on the femora, and the forked prostheca on the right mandible.

Adults are separated from those of other Baetidae in Saskatchewan by the presence of 2 marginal intercalaries on the forewing, the forked second longitudinal vein of the hind wing, and the elongate terminal segment of the male's genital forceps. Although the forked second longitudinal vein of the hind wing is characteristic of *Dipheter*, some adults of some *Baetis magnus* McCafferty and Waltz share this character (Durfee and Kondratieff 1993). If any Saskatchewan *Baetis* are found with a forked second longitudinal vein in the hind wing they can be differentiated from adult males of *Dipheter* by the shorter terminal segment of the genital forceps.

Dipheter hageni (Eaton), 1885

Figs. 74, 75

Distribution Map: Fig. 297

Baetis hageni Eaton, 1885

Baetis herodes Burks, 1953

Baetis parvus Dodds, 1923

Baetis unicolor (Hagen), 1861

Cloe unicolor Hagen, 1861

Dipheter devinctus (Traver), 1935

Descriptions: Adult: Traver (1935 as *Baetis parvus* and *B. devinctus*), Burks (1953, as *Baetis herodes*)

Larva: Morihara and McCafferty (1979a, as *B. hageni*), Ide (1930a as *B. hageni*)

Diagnostic Characters:

Diagnostic characters for *D. hageni* are the same as the generic characters. Additionally, larvae can often be identified in the field by the white apical abdominal segments (Morihara and McCafferty 1979a).

Distribution and Biology:

Dipheter hageni is known from most regions of North America except the southwest. In Saskatchewan, *D. hageni* was collected in small streams in the western boreal forest and the Cypress Hills. Mature larvae were present in late-June and July. In Wisconsin, *D. hageni* eggs hatch in the fall and adults emerge in spring; a second summer generation is present as well (Bergman and Hilsenhoff 1978).

Material Examined: 20 larvae

Battle Creek at Ranger Station, Cypress Hills Prov. Park, W Block, 25 VI 2000 JMW; Beaver River At Hwy 4, 10 VI 2001 JMW and MSP; Broad Creek at Hwy 904, 1 VII 2000 JMW; Crean River at Hwy 2, 4 VI 1974 LD; Fredette River at Uranium City, 21 VI 1986 JC and ERW, 21 VI 1986 LD and DWP; Low Creek at Hwy 904, 10 VI 2001 JMW and MSP, 1 VII 2000 JMW; McFarlane R, 59-09N, 107-54W, 19 VI 1980 JC; Pine Creek at Hwy 169, 17 VI 1971 DHS.

3.6.12 **Fallceon** Waltz and McCafferty

Fallceon is one of the genera erected to include species lacking a villipore which were previously included in *Baetis* (Waltz and McCafferty 1987a). Four species occur in North American but only *F. quilleri* (Dodds) is found north of Mexico. Based on its distribution patterns, *Fallceon* probably has a South American center of origin (McCafferty 1998).

Larvae of *Fallceon* are differentiated from those of other Baetidae by the absence of a villipore, the shape of the labial palp (ie. not truncate and without a well-developed mesal extension), and by the presence of a brush of setae between the molar region and prostheca of the mandibles.

Adult males of *Fallceon* are differentiated from those of other Saskatchewan Baetidae by the combination of the presence of double marginal intercalaries and a hooked costal process.

Fallceon quilleri (Dodds), 1923

Figs. 76, 77, 78

Distribution Map: Fig. 298

Baetis buenoi Allen, 1985

Baetis byblis Allen & Murvosh, 1983

Baetis cleptis Burks, 1953

Baetis endymion Traver, 1935

Baetis erebus Traver, 1935

Baetis leechi Day, 1954

Baetis quilleri Dodds, 1923

Baetis sonora Allen & Murvosh, 1987

Fallceon buenoi (Allen), 1985

Fallceon byblis (Allen & Murvosh), 1983

Descriptions: Adult: Traver (1935), Burks (1953)

Larva: Morihara and McCafferty (1979a)

Diagnostic Characters:

The diagnostic characters provided in the genus treatment will serve to differentiate specimens of *F. quilleri* from those of all other Saskatchewan Baetidae.

Distribution and Biology:

Fallceon quilleri is found throughout North America west of Indiana and Louisiana (McCafferty 1990) and also occurs in Central America (McCafferty 1998) but is most common in the southwest. In Saskatchewan, specimens were collected from the Saskatchewan River System. Adults were collected between mid-July and mid-September.

Material Examined: 146 larvae, 141 imagos, 2 subimagos

North Saskatchewan River at Borden Bridge, 11 VIII 1993 Bsam, 2 X 1999 JMW, 27 VII 1999 JMW, 14 IX 2000 JMW, 6 VII 2001 JMW; North Saskatchewan River at Cecil Ferry, 24 VIII 1972 DHS, 14 IX 1972 DHS; North Saskatchewan River at Prince Albert, 5 VIII 1986 ERW and DML; South Saskatchewan River at Birch Hills Ferry, 24 VIII 1972 DHS, 6 VII 1972 DHS; South Saskatchewan River at Clarkboro Ferry, 16 VII 2000 JMW; South Saskatchewan River at Fenton Ferry, 14 VII 1986 ERW, 21 VII 1986 ERW and LD; South Saskatchewan River at Gabriel's Bridge, 15 VIII 1979 ERW; South Saskatchewan River at Lemsford Ferry, 20 VIII 2001 JMW, 30 VII 2000 JMW; South Saskatchewan River at Saskatoon, 15 VII 1970 DML, 14 VII 1999 JMW; Torch River at Hwy 35, 22 VII 1986 ERW.

3.6.13 *Plauditus* Lugo-Ortiz and McCafferty

Plauditus was erected to include many of the species which were previously included in *Pseudocloeon* and *Baetis* (Lugo-Ortiz and McCafferty 1998b). More information is provided in the discussions of *Pseudocloeon* and *Acentrella*). The species of *Plauditus* are poorly known, and their identification is difficult. Larvae are poorly described, with the exception of some recently described species. The characters used for adult identifications fade almost immediately after alcohol-preservation, and characters which were initially thought to be diagnostic for several species have been found to vary considerably. Until a generic revision is conducted the identification of some material is impossible. For these reasons, and a lack of adult material, a key to the species of adult *Plauditus* of Saskatchewan is not included in this treatment.

Thirteen nominal species of *Plauditus* occur in North America. *Plauditus cestus* (Provonsha and McCafferty), *P. dubium* (Walsh), *P. gloveri* McCafferty and Waltz, *P. punctiventris* (McDunnough) and *P. virilis* occur in Saskatchewan. All occur in lotic habitats in eastern Saskatchewan and in the Saskatchewan River system. *Plauditus ellioti* (Daggy), *P. futilis* (McDunnough), and *P. rubrolateralis* (McDunnough) are reported from nearby states and provinces, and may eventually be found in Saskatchewan. The larvae are unknown for all three species.

Larvae of *Plauditus* are differentiated from those of other Saskatchewan Baetidae by the presence of a villipore on the femora, the sub-quadrate terminal segment of the labial palp without a mesal extension, two well developed caudal filaments, the absence of hind wing pads, the serrate medial margin of the inner incisor of the right mandible, and the absence of extremely long setae on the tibiae and tarsi.

Adult males of *Plauditus* are differentiated from those of other Saskatchewan Baetidae by the paired marginal intercaleries in the fore wing, the absence of hind wings, the rounded anterior process of the mesonotum, and the absence of a penes cover between the bases of the genital forceps.

Key to the species of *Plauditus*: larvae

- 1a. Antennae shorter than, or subequal to, length of head capsule (Fig. 80); abdominal terga usually creamy white with tergum 5 solid brown, giving body a distinctly banded appearance (Fig. 81, 82)*P. cestus*
- 1b. Antennae at least 1.5X length of head capsule (Figs. 83, 84, 86); abdominal terga not as above2
- 2a. Dorsal setae of femora short (Fig. 87); ventral setae of tibiae and tarsi relatively long and numerous (Fig. 87)3
- 2b. Dorsal setae of femora long (Fig. 90)4
- 3a. Tarsal claws sharply hooked and with denticles all of nearly the same length (Fig. 88); abdominal terga usually with a pale median dorsal stripe (Fig. 86)*P. punctiventris*
- 3b. Tarsal claws not sharply hooked, apical denticles distinctly longer than basal ones (Fig. 84); abdominal tergum 2 with a distinct dark, V-shaped marking on midline; abdominal terga never with a pale dorsal stripe*P. gloveri*

4a. Abdominal terga of male larvae as in Fig. 83*P. dubius*

4b. Abdominal terga of male larvae as in Fig. 89*P. virilis*

Plauditus cestus (Provonsha & McCafferty), 1982

Barbaetis cestus (Provonsha & McCafferty), 1982

Pseudocloeon cestum Provonsha & McCafferty, 1982

Figs. 79, 80, 81, 82

Distribution Map: Fig. 299

Descriptions: Adult: Provonsha and McCafferty (1982)

Larva: Provonsha and McCafferty (1982), Lugo-Ortiz and McCafferty (1998a),

McCafferty and Jacobus (2001)

Diagnostic Characters:

Larvae of *P. cestus* are differentiated from those of other Saskatchewan *Plauditus* by the short antennae (shorter than the length of the head capsule) and the cream coloured abdomen with a brown band encircling abdominal segment 5. In some specimens sternum 5 is pale, but in all Saskatchewan specimens tergum 5 is brown. Lugo-Ortiz and McCafferty (1998a) found the abdominal colour patterns differ in some southeastern populations.

Distribution and Biology:

Plauditus cestus is found throughout much of the eastern and midwestern United States as well as Colorado and Idaho. In Canada, *P. cestus* has been reported from Ontario

(McCafferty and Randolph 1998). *Plauditus cestus* was not known from Saskatchewan prior to this study.

Larvae are found in moderately-flowing streams in shallow water with pea-sized gravel (Provonsha and McCafferty 1982). In Saskatchewan, specimens were collected from streams along the Manitoba Escarpment. Young larvae were collected in early-May and mature larvae between mid-June and late-July. Larvae were not collected between late-July and freeze-up so it is likely overwintering occurs as eggs.

Material Examined: 26 larvae

Green Bush Creek at Hwy 3, 17 VII 1999 JMW, 19 VII 2000 JMW; Red Deer River at Rendek Elm Forest, 24 V 2001 JMW; Torch River at Hwy 35, 22 VII 1986 ERW, 2 VII 1986 VK.

Plauditus dubius (Walsh), 1862

Fig. 83

Distribution Map: Fig. 300

Baetis dubius (Walsh), 1862

Cloe dubia Walsh, 1862

Cloeon chlorops McDunnough, 1923

Cloeon dubium (Walsh), 1862

Pseudocloeon chlorops (McDunnough), 1923

Pseudocloeon dubium (Walsh), 1862

Descriptions: Adult: Burks (1953), Traver (1935)

Larva: Ide (1937)

Diagnostic Characters:

Larvae of *P. dubius* are sexually dimorphic. Male larvae are distinguished by the combination of the long setae on the dorsal edge of the femora, slightly hooked tarsal claws, and the abdominal colour pattern (Fig. 83). I am not able to reliably differentiate the female larvae of *P. dubium* and *P. virilis*.

Distribution and Biology:

Plauditus dubius is found throughout the eastern United States and much of Canada. In Saskatchewan, *P. dubius* was collected in the Saskatchewan River system as well as larger boreal rivers. In the Torch R. and Red Deer R. of eastern Saskatchewan, *P. dubius* and *P. virilis* were sympatric. Mature larvae were collected in late-May, early-June, and late-July to August. I collected mature larvae as late as mid-September in the Athabasca River in Alberta. Two generations likely occur. In Wisconsin, *P. dubium* feeds on both diatoms and detritus (Shapas and Hilsenhoff 1976).

Material Examined: 47 larvae, 2 imagos

North Saskatchewan River at Cecil Ferry, 6 VI 2000 JMW; Red Deer River at Hudson Bay Regional Park, 19 VII 2000 JMW; South Saskatchewan River at Clarkboro Ferry, 30 V 1998 JMW; South Saskatchewan River at Fenton Ferry, 14 VII 1986 ERW; South Saskatchewan River at Saskatoon, 6 VIII 2000 DWP; Torch River at Hwy 35, 2 VII 1986 VK, 22 VII 2001 JMW; Waskesiu River at Hwy 2, 6 VII 2000 JMW.

***Plauditus gloveri* McCafferty and Waltz, 1998**

Figs. 84, 85

Distribution Map: Fig. 301

Descriptions: Adult: N/A

Larva: McCafferty and Waltz (1998), Mccafferty and Jacobus (2001)

Diagnostic Characters:

Larvae of *P. gloveri* are distinguished from those of other Saskatchewan *Plauditus* by the short dorsal setae on the femora, the relatively straight claw with the apical denticles distinctly longer than the basal denticles, and the dark 'V' on tergum 2. The presence of three dark bands on the caudal filament is also diagnostic, but is only visible on some specimens.

Distribution and Biology:

Plauditus gloveri is known only from Texas, South Carolina, and New York (Mccafferty and Jacobus 2001). It's presence in Saskatchewan represents a significant range extension.

Larvae were often sympatric with *P. cestus* in medium-sized streams with a gravel substrate along the Manitoba Escarpment. Late-instar larvae were collected between late-May and late-July. Nothing is known of the biology of *P. gloveri*.

Material Examined: 9 larvae

Green Bush Creek at Hwy 3, 19 VII 2000 JMW; McVey Creek at Hwy 55, 20 VII 2000 JMW; stream on Hwy 9, S of Hudson Bay, 24 V 2001 JMW; Whitefox River at Hwy 35, 2 VII 1986 ERW.

Plauditus punctiventris (McDunnough), 1923

Figs. 86, 87, 88

Distribution Map: Fig. 302

Baetis punctiventris (McDunnough), 1923

Baetis sp. 1 McCafferty & Davis, 1992

Cloeon punctiventris McDunnough, 1923

Pseudocloeon anoka Daggy, 1945

Pseudocloeon edmundsi Jensen, 1969

Pseudocloeon myrsum Burks, 1953

Pseudocloeon punctiventris (McDunnough), 1923

Descriptions: Adult: Traver (1935)

Larva: Ide (1937), Burks (1953)

Diagnostic Characters:

Larvae of *P. punctiventris* are differentiated from those of other Saskatchewan *Plauditus* by the sharply hooked tarsal claws and the pale mid-dorsal abdominal stripe. The presence of a single, dark spot on each of the middle sterna used to be considered diagnostic for *P. punctiventris*; however, in some specimens these spots are completely absent and the ventral spotting is found in some individuals of other species such as *P. gloveri*.

Distribution and Biology:

P. punctiventris occurs throughout North America except the far north. In Saskatchewan, it was common in the Saskatchewan River system and in medium-sized streams along the Manitoba Escarpment. It was also found in larger streams in the southern boreal forest. Larvae were collected in July and August. In Florida, it emerges throughout the year (Berner and Pescador 1988).

Material Examined: 55 larvae

Battle River, Bridge south of Lashburn, 27 VIII 1972 DHS, Montreal River at Hwy 2, 8 VIII 2000 JMW; Overflowing River at Hwy 9, 19 VII 2000 JMW; Red Deer River at Hudson Bay Regional Park, 19 VII 2000 JMW; South Saskatchewan River at Clarkboro Ferry, 16 VII 2000 JMW, 30 V 1998; South Saskatchewan River at Lemsford Ferry, 16 IX 2000 JMW; South

Saskatchewan River at Queen Elizabeth Power Station, 2 VI 2000 JMW; Torch River at Hwy 35, 2 VII 1986 VK, 8 VII 1986 VK; Waskesiu River at Hwy 2, 6 VII 2000 JMW; Weyakwin River at Hwy 2, 7 VII 2000 JMW; Whitefox River at Hwy 35, 2 VII 1986 VK.

Plauditus virilis (McDunnough), 1923

Figs. 89, 90, 91

Distribution Map: Fig. 303

Acentrella sp. 1 Lugo-Ortiz & McCafferty, 1995

Acentrella sp. 2 Lugo-Ortiz & McCafferty, 1995

Baetis virile (McDunnough), 1923

Baetis virilis (McDunnough), 1923

Cloeon virilis (McDunnough), 1923

Pseudocloeon virile (McDunnough), 1923

Pseudocloeon virilis (McDunnough), 1923

Descriptions: Adult: McDunnough (1923), Traver (1935)

Larva: (Ide 1937)

Diagnostic Characters:

Larvae of *P. virilis* are sexually dimorphic. Male larvae are differentiated from those of other *Plauditus* by the combination of long setae on the dorsal edge of the femora, slightly hooked tarsal claws, and the dorsal abdominal colour pattern (Fig. 89). I am unable to reliably distinguish female larvae from those of *P. dubius*.

Distribution and Biology:

Plauditus virilis is widespread throughout North America. In Saskatchewan, they were found alongside other *Plauditus* species in medium- to large-sized streams of a medium-gradient along the Manitoba Escarpment. They were not collected from the high-gradient streams in this area. Mature larvae and adults were collected in late May and July and August, indicating that two discrete generations occur per year.

Material Examined: 88 larvae, 1 imago, 1 subimago

Green Bush Creek at Hwy 3, 19 VII 2000 JMW, 17 VII 1999 JMW; Overflowing River at Hwy 9, 17 VII 1999 JMW; Red Deer River at Hudson Bay Regional Park, 19 VII 2000 JMW; Red Deer River At Rendek Elm Forest, 24 V 2001 JMW; stream 2 miles South of Hudson Bay, 27 VIII 1969 NC; stream on Hwy 3, 52 50' 32"N 102 44' 20"W, 19 VII 2000 JMW; stream on Hwy 9, S of Hudson Bay 52 40'03"N 102 22'19"W, 24 V 2001 JMW; Whitefox River at Hwy 35, 2 VII 1986 VK.

3.6.14 *Procloeon* Bengtsson

Procloeon is one of the most poorly known genera of mayflies in North America. Many larvae are undescribed or poorly described. Most adult descriptions are based on colour patterns of dried specimens while more recently collected specimens are usually preserved in alcohol, which eventually causes colour patterns to fade. Therefore, identification of alcohol preserved adults may not always be possible, and it is preferable to have associated larvae. It is likely that several species of *Procloeon* will be found to be synonymous.

Of the 25 nominal species of North American *Procloeon*, *P. ingens* (McDunnough), *P. irrubrum* Lowen and Flannagan, *P. pennulatum* (Eaton), *P. quaesitum* (McDunnough), *P.*

rubropictum (McDunnough), *P. rufostrigatum* (McDunnough), and *P. simplex* (McDunnough) occur in Saskatchewan, as well as one undetermined species. The larvae generally are found in vegetation of the depositional areas of streams, although some also occur in lentic habitats.

Procloeon bellum (McDunnough) is known from British Columbia (McCafferty and Randolph 1998) and Alberta and Manitoba (Jacobus and McCafferty 2001); it may eventually be found in Saskatchewan. Adult males will key to *P. pennulatum* as terga 2-6 are relatively pale with a dark posterior border. Males of *P. bellum* have a better developed tubercle on the inner margin of the second segment of the genital forceps and a more robust hind wing than *P. pennulatum*. Larvae will also key to *P. pennulatum*. The larva of *P. bellum* is described by Ide (1930a), but not enough information is given to reliably distinguish it from *P. pennulatum*.

Procloeon rivulare (Traver), an eastern species, was reported by Mason and Lehmkuhl (1983) from the Saskatchewan River. Their specimens were likely *P. pennulatum*, the larva of which was not described at the time of their paper. However, their specimens could not be located to check their identification. At this time I do not consider *P. rivulare* to occur in Saskatchewan.

Larvae of *Procloeon* are distinguished from those of other Saskatchewan Baetidae by the following combination of characters: simple, truncate terminal segment of the labial palps, caudal filaments with a dark band every third to fifth segment, third segment of the maxillary palps shorter than the second or absent, mandibular incisors fused for at least half of their length (except *P. irrubrum*, which has the incisors of the right mandible divided to their bases), and the absence of a patch of setae just anterior to the insertion of the maxillary palp into the galealacinia (*P. ingens* may have this patch of setae; see the species discussion for more details). Additionally, in all Saskatchewan species except *P. irrubrum*, the prostheca of the right mandible

is relatively broad. In general, the larvae of *Procloeon* are larger and more robust than larvae of the closely related *Centroptilum*.

Adult male *Procloeon* are identified by the single marginal intercalaries, an absence of a distinct swelling on the second segment of the genital forceps and the absence of a spine-like process between the bases of the genital forceps.

Key to species of *Procloeon*: larvae

- 1a. All abdominal gills simple, without dorsal lamellae; anterior margins of sterna 7-9 or 8-9 with a transverse dark stripe (Fig. 92)*P. irrubrum*
- 1b. At least abdominal gill 1 with a dorsal lamella.....2

- 2a. Hindwing pads absent.....3
- 2b. Hindwing pads present.....6

- 3a. Abdominal gill 1 with a dorsal lamella, 2-7 simple.....*P. rubropictum*
- 3b. Abdominal gills 1-5 ,6, or 7 with dorsal lamellae.....4

- 4a. Abdominal gill 7 with a small dorsal lamella.....*P. ingens*
- 4b. Abdominal gill 7 simple, without a lamella.....5

- 5a. Abdominal terga predominately pale, with indistinct brown markings (Fig. 100) *P. spl*

5b. Abdominal terga predominately brown with distinct pale markings (Fig. 99)
..... *P. simplex*

6a. Abdominal gill 1 with a dorsal lamella, gills 2-7 simple*P. rufostrigatum*

6b. Abdominal gills 1-6 with dorsal lamellae7

7a. Lateral spines present only on abdominal segments 8-9; preceding segments have only a
posterolateral spine (Fig. 93)*P. pennulatum*

7b. Lateral and posterolateral spines present on at least abdominal segments 5-9 (Fig. 95)
.....*P. quaesitum*

Key to species of *Procloeon*: adult males

1a. Hind wings present2

1b. Hind wings absent4

2a. Abdominal terga 2-6 without distinct red markings on the posterior margin, but with entire
dorsum shaded with red *P. quaesitum*

2b. Abdominal terga 2-6 with distinct red marks on posterior margin (Figs. 94, 97)3

3a. Abdominal terga 2-6 with a pair of red sub-lateral, transverse marks on each side; thorax dark
brown or black*P. rufostrigatum*

3b. Entire posterior margin of abdominal terga 2-6 dark red (Fig. 94)*P. pennulatum*

4a. Abdominal terga 2-6 brown*P. ingens*

4b. Abdominal terga 2-6 white or pale yellow, brown or red markings present or absent
.....5

5a. Abdominal terga 2-6 with submedian transverse red marks along posterior margin (Fig. 97)
.....*P. rubropictum*

5b. Abdominal terga without red markings *P. simplex*

Procloeon ingens (McDunnough), 1923

Distribution Map: Fig. 304

Cloeon ingens McDunnough, 1923

Descriptions: Adult: McDunnough (1923), Traver (1935)

Larvae: McDunnough (1930)

Diagnostic Characters:

Larvae of *P. ingens* are differentiated from those of other Saskatchewan *Procloeon* by the presence of dorsal lamellae on all abdominal gills. McCafferty (pers. comm.) has seen populations of *P. ingens* where gill 7 lacks the characteristic dorsal lamella. These specimens would likely key out to *P. simplex*, as McDunnough (1930) shows the abdomen being dark with distinct pale spots. McDunnough (1930) shows *P. ingens* having a patch of setae on the galealacinia at the base of the maxillary palp; this is absent in *P. simplex*. The single Saskatchewan specimen of *P. ingens* is an early instar and does not possess this patch of setae; the setal patch may not develop until larvae are in later instars.

Adults of *P. ingens* can be identified by their large size, lack of hind wings, brown abdominal terga (usually with a thin, transverse black line on posterior margin of each tergum) and black thorax.

Distribution and Biology:

Procloeon ingens is distributed throughout northern North America. In Saskatchewan, a single specimen was found in vegetation in a pool of a medium-gradient stream. *Procloeon ingens* was not previously reported from Saskatchewan. The life cycle is unknown.

Material Examined: 1 larva

Overflowing River at Hwy 9, 19 VII 2000 JMW.

Procloeon irrubrum Lowen and Flannagan, 1992

Fig. 92

Distribution Map: Fig. 305

Descriptions: Adult: Lowen and Flannagan (1992 female only – male unknown)

Larvae: Lowen and Flannagan (1992)

Diagnostic Characters:

Larvae of *P. irrubrum* are easily distinguished from those of other Saskatchewan *Procloeon* by the lack of dorsal lamellae on any gills. Additionally, a transverse, black line is usually present on the anterior margins of abdominal sterna 7-9.

Adult males are unknown, and the species may be parthenogenetic (Lowen and Flannagan 1992). It is possible that the male of *P. irrubrum* has already been described under another name.

Procloeon irrubrum may actually be better placed in *Centroptilum*. Like larvae of *Centroptilum*, the incisors of the right mandible are separated to the base, the prosthema of the right mandible is slender, and all abdominal gills are simple. However, like other *Procloeon*, the third segment of the maxillary palp is shorter than the second. Once the adult male is known, the generic placement of *P. irrubrum* can be positively determined.

Distribution and Biology:

Larvae are known from Manitoba, Iowa and Missouri. In Saskatchewan, mature larvae were collected in the North Saskatchewan River in July and October, indicating that two generations are present. All larvae were found over silt-covered, medium-sized cobbles.

Material Examined: 16 larvae, 1 imago

Battle River at Hwy 21, 1 VII 2000 JMW; Fir River at Hudson Bay Regional Park, 23 VII 2001 JMW; North Saskatchewan River at Borden Bridge, 14 VII 1999 JMW, 2 X 1999 JMW.

***Procloeon pennulatum* (Eaton), 1870**

Figs. 93, 94

Distribution Map: Fig. 306

Centroptilum infrequens McDunnough, 1924

Centroptilum pennulatum Eaton, 1870

Pseudocentroptilum pennulatum (Eaton), 1870

Descriptions: Adult: Lowen and Flannagan (1990)

Larva: Lowen and Flannagan (1990)

Diagnostic Characters:

Procloeon pennulatum larvae are separated from those of other Saskatchewan *Procloeon* by the presence of dorsal flaps on abdominal gills 1-6, hind wing pads, and the absence of lateral spines anterior to abdominal segments 8 and 9.

Adult males are identified by the presence of hind wings and pale abdominal terga with red posterior margins.

Distribution and Biology:

This Holarctic species is widespread throughout Canada east of the Rocky Mountains. It is present in the eastern U.S. as well. In Saskatchewan, it was abundant in the Saskatchewan River system, boreal streams and northern lakes. In the South Saskatchewan River, *P. pennulatum* was rare upstream of Gardiner Dam and its associated impoundment, but was abundant downstream of the dam. In Manitoba emergence occurs between mid-July and mid-September and winter is spent in as eggs (Lowen and Flannagan 1990). In Saskatchewan emergence occurred between mid-June and early-October.

Material Examined: 232 larvae, 15 imagos.

Arsenault River at Hwy 904, 10 VI 2001 JMW and MSP; Battle Creek at Ranger Station, Cypress Hills Prov. Park, W Block, 30 VII 2000 JMW; Battle River At Hwy 21, 1 VII 2000 JMW; Beaver River at Hwy 21, 1 VII 2000 JMW, 10 VI 2001 JMW and MSP; Broad Creek at Hwy 904, 1 VII 2000 JMW, 10 VI 2001 JMW and MSP; Chemong Creek at Hwy 9, 17 VII 1999 JMW; Courtney Lake at Hwy 905, 8 VIII 2000 JMW; Creek at Km 65 of Hwy 9, 23 VII 2001 JMW; Frenchman River at Ravenscrag, 22km west of Eastend, 29 VII 2000 JMW; Green Bush Creek at Hwy 3, 19 VII 2000 JMW; Iskwatan Lake, 20 VIII 1973 NC; Little Red River at Prince Albert, 16 VI 1971 DHS; Low Creek at Hwy 904, 1 VII 2000 JMW; McVey Creek at Hwy 55, 23 VII 2001 JMW; Montreal River at Hwy 2, 8 VIII 2000 JMW; North Saskatchewan River 20

miles north of Lloydminster, 4 VII 1970 DML; North Saskatchewan River at Borden Bridge, 14 VII 1999 JMW, 2 X 1999 JMW, 14 IX 2000 JMW; North Saskatchewan River at Cecil Ferry, 6 VI 2000 JMW, 11 VI 1971 DML, 9 VI 1971 DML, 24 VI 1981; Otosquen Creek at Hwy 9, 9 VII 2001 JMW, 24 VII 1999; Red Deer River at Hudson Bay Regional Park, 19 VII 2000 JMW; Saskatchewan River at Nipawin, 14 VII 1981; South Saskatchewan River at Clarkboro Ferry, 30 V 1998 JMW, 16 VII 1999; South Saskatchewan River at Lemsford Ferry, 6 VI 2001 JMW; South Saskatchewan River at Queen Elizabeth Power Station, 10 VII 1999 JMW; South Saskatchewan River at Saskatoon 14 VII 1999 JMW; stream at km 165 of Hwy 903, 10 VI 2001 JMW and MSP; Torch River at Hwy 35, 2 VII 1986 VK; Wapomon Lake, 21 VIII 1973; Waskwei River At Hwy 9, 23 VII 2001 JMW; Wollaston Lake, 11 VII 1972 NC, 29 VII 1972 NC, 25 VII 1972 NC, 16 VIII 1972 NC, 31 VII 1972 NC; Wollaston Lake at Hidden Bay, 7 VIII 2000 JMW.

Procloeon quaesitum (McDunnough), 1931

Figs. 95, 96

Distribution Map: Fig. 307

Centroptilum quaesitum McDunnough, 1931

Descriptions: Adult: McDunnough (1931b), Burks (1953), Lowen and Flannagan (1992)

Larvae: Lowen and Flannagan (1992)

Diagnostic Characters:

Larvae of *P. quaesitum* are identified by the presence of hind wing pads, dorsal flaps on abdominal gills 1-6, and lateral spines on at least abdominal segments 5-9.

Adult males are identified by the presence of hind wings and the reddish abdominal terga with pale lateral margins.

Distribution and Biology:

Procloeon quaesitum is known from the eastern U.S. and western Canada. In Saskatchewan, it was found in depositional areas of medium-sized rivers throughout the boreal forest. Larvae were also found in northern lakes. Mature larvae were collected in June and July.

Material Examined: 13 larvae; 1 imago.

Frenchman River at Ravenscrag, 22km west of Eastend, 23 VI 2000 JMW; Overflowing River at Hwy 9, 19 VII 2000 JMW; stream/beaver pond at km 155 of Hwy 955, 30 VI 2000 JMW; Torch River At Hwy 120, 8 VIII 2001 DWP and JH; Wollaston Lake, 6 VII 1972.

Procloeon rubropictum (McDunnough), 1923

Fig. 97

Distribution Map: Fig. 308

Cloeon rubropictum McDunnough, 1923

Descriptions: Adult: McDunnough (1925b, 1931b), Burks (1953)

Larva: Lowen and Flannagan (1992)

Diagnostic Characters:

Larvae of *P. rubropictum* are easily identified by the absence of hind wing pads and the absence of dorsal lamellae on gills 2-7.

Adults are identified by the lack of hind wings and the transverse, red markings along the posterior margin of the abdominal terga.

Distribution and Biology:

Procloeon rubropictum is widespread throughout eastern North America and the boreal forest. In Saskatchewan it was found in medium-sized boreal streams. A single adult possibly of this species was also found in the South Saskatchewan River. Mature larvae were collected between early-July and mid-August. McCafferty and Randolph (1998) list *P. rubropictum* from Saskatchewan in their material examined but neglect to include it in their Saskatchewan species list.

Material Examined: 22 larvae; 1 imago

Battle River At Hwy 21, 1 VII 2000 JMW; Beaver River At Hwy 4, 1 VII 2000 JMW; McVey Creek at Hwy 55, 23 VII 2001 JMW; Montreal River at Hwy 2, 8 VIII 2000 JMW; Nemeiben River near Lac La Ronge, 22 VII 1969 DML; Overflowing River at Hwy 9, 19 VII 2000 JMW; South Saskatchewan River at Saskatoon, 29 VI 1970 DML; Stream at Km 105 of Hwy 905, 8 VIII 2000 JMW; stream on Hwy 3, 19 VII 2000 JMW.

Procloeon rufostrigatum (McDunnough), 1924

Fig. 98

Distribution Map: Fig. 309

Centroptilum bistrigatum Daggy, 1945

Centroptilum rufostrigatum McDunnough, 1924

Descriptions: Adult: Traver (1935), Burks (1953), Lowen and Flannagan (1992)

Larva: Lowen and Flannagan (1992)

Diagnostic Characters:

Larvae of *P. rufostrigatum* are differentiated from other Saskatchewan *Procloeon* by the presence of hind wing pads and a dorsal lamella on abdominal gill 1 only.

Adults of *P. rufostrigatum* are identified by the presence of hind wings, the dark brown abdominal terga 7-10, and the presence of transverse red dashes present on the posterior margin of terga 2-8.

Distribution and Biology:

Procloeon rufostrigatum is known from northeastern and midwestern North America. Saskatchewan represents its western and northern range limit. *Procloeon rufostrigatum* had not previously been reported from Saskatchewan. All specimens were collected from lower-gradient streams along the Manitoba Escarpment. Mature larvae were collected in late July.

Material Examined: 9 larvae.

Carrot River at Hwy 55, 23 VII 2001 JMW; Fir River at Hudson Bay Regional Park, 23 VII 2001 JMW; Green Bush Creek at Hwy 3, 19 VII 2000 JMW; Red Deer River at Hudson Bay Regional Park, 19 VII 2000 JMW; Red Deer River At Rendek Elm Forest, 09 VII 2001 JMW.

Procloeon simplex (McDunnough), 1925

Fig. 99

Distribution Map: Fig. 310

Cloeon simplex McDunnough, 1925

Descriptions: Adult: Traver (1935), Burks (1953)

Larva: Ide (1937)

Diagnostic Characters:

The larva of *P. simplex* is differentiated from those of other Saskatchewan *Proclleon* by the absence of hind wing pads, the presence of dorsal lamellae on gills 1-6, the absence of a patch of setae on the galea-lacinia just anterior to the insertion point of the maxillary palp, and the dorsal abdominal colour pattern.

Adult males are identified by the lack of hind wings and the completely pale abdominal segments.

Distribution and Biology:

Proclleon simplex is known from Manitoba, Ontario, Quebec, New Brunswick and the northeastern United States. Larvae were collected from vegetation in slow-flowing streams throughout the boreal forest and Cypress Hills. Mature larvae were collected in June and July.

Material Examined: 79 larvae

Battle Creek at Ranger Station, Cypress Hills Prov. Park, W Block, 30 VII 2000 JMW; Beaver River at Hwy 4, 1 VII 2000 JMW; Frenchman River at Ravenscrag, 22km west of Eastend, 29 VII 2000 JMW, 23 VI 2000 JMW, 30 VII 1999 JMW; Overflowing River at Hwy 9, 19 VII 2000 JMW; stream on Hwy 965 55 06'55"N 107 54' 51"W, 30 VI 2000 JMW; Waskesiu River at Hwy 2, 6 VII 2000 JMW.

Proclleon sp. 1

Fig. 100

Distribution Map: Fig. 311

Descriptions: Adult: N/A

Larva: N/A

Diagnostic Characters:

Larvae of *P. sp.1* are identified by the absence of hind wing pads, the presence of dorsal lamellae on gills 1-6, the lack of a patch of setae on the galea-lacinia anterior to the insertion of the maxillary palp, and the colour pattern of the tergum. Adults have not been associated with the larvae.

Distribution and Biology:

A single larva was collected in a slow-flowing, brown-water stream in northeastern Saskatchewan. It most closely resembles *Procloeon mendax* (Walsh), but until further material can be obtained a specific name cannot be applied. There are additional larvae collected from Wollaston Lake that are also probably this species.

Material Examined: 5 larvae

Stream at Km 105 of Hwy 905, 8 VIII 2000 JMW; Wollaston Lake, 17 VIII 1972, 23 VIII 1973.

3.6.15 *Pseudocloeon* Klapálek

Historically, *Pseudocloeon* in North America referred to those species possessing double marginal intercaleries in the fore wing and lacking hind wings as adults, and lacking both hind wing pads and a median caudal filament as larvae. It was determined that the North American species were not congeneric with the type species from Indonesia, and all species were reassigned to *Acentrella*, *Baetis*, *Apobaetis*, and *Barbaetis* Waltz and McCafferty by McCafferty and Waltz (1990). Many of these species were later placed in *Plauditus* (Lugo-Ortiz and McCafferty 1998b).

The species presently included in *Pseudocloeon* were formerly known as the *propinquus*-group of *Baetis* (*sensu* Morihara and McCafferty 1979a). McCafferty and Waltz (1995) placed these species in the sub-genus *Labiobaetis* Novikova and Kluge and raised it to generic rank, but Lugo-Ortiz et al. (1999) synonymized *Labiobaetis* with *Pseudocloeon*. Six species of *Pseudocloeon* occur in North America; two of these occur in Saskatchewan. Larvae are found in lotic waters.

Larvae are easily distinguished by the presence of a villipore on the femora, a projection on the antennal scape and an excavation at the terminus of the maxillary palp.

Adult males of Saskatchewan *Pseudocloeon* are distinguished from all other Baetidae by the presence of double marginal intercalaries in the forewing, a reduced or absent costal projection in the hindwing, and the presence of a basal enlargement on the genital forceps and the short terminal segment of the genital forceps.

Key to the species of *Pseudocloeon*: larvae

- 1a. Labrum with simple submarginal setae (Fig. 106)*P. propinquum*
- 1b. Labrum with branched submarginal setae (Fig. 101)*P. dardanum*

Key to the species of *Pseudocloeon*: male adults

- 1a. No spine present between forceps bases, basal enlargement of forceps short (Fig. 103)
.....*P. dardanum*
- 1b. Spine present between forceps bases, basal enlargement of forceps long, often produced into a projection (Fig. 110).....*P. propinquum*

Pseudocloeon dardanus (McDunnough), 1923

Figs.101, 102, 103

Distribution Map: Fig. 312

Baetis dardanus McDunnough, 1923

Baetis elachistus Burks, 1953

Labiobaetis dardanus (McDunnough), 1923

Descriptions: Adult: Morihara and McCafferty (1979c)

Larva: Soluk (1981)

Diagnostic Characters:

Larvae of *P. dardanus* can be distinguished from those of other Saskatchewan *Pseudocloeon* by the branched submarginal setae on the labrum.

Adult males can be distinguished from those of other Saskatchewan *Pseudocloeon* by the lack of a spine between the bases of the genital forceps and the poorly developed basal enlargement of the forceps.

Distribution and Biology:

Pseudocloeon dardanus was synonymized with *P. propinquum* (Burks 1953), but examination of type material of *P. propinquum* led Morihara and McCafferty (1979c) to reinstate *P. dardanus* as a valid species. *Pseudocloeon dardanus* is widespread throughout western and central North America. In Saskatchewan, all collections were from the Saskatchewan River system. A single generation occurred with adults emerging in mid-summer.

Material Examined: 205 larvae, 141 imagos

North Saskatchewan River 20 miles N of Lloydminster, 4 VII 1970 DML; North Saskatchewan River at Borden Bridge, 4 VIII 1972 DHS, 31 VII 1972 DHS; North Saskatchewan River at

Cecil Ferry, 11 VI 1971 DML, 15 VI 1986 ERW; North Saskatchewan River at Maymont Ferry, 6 VI 1972 DHS; Saskatchewan River at Gronlid, 21 VII 1971 DHS; Saskatchewan River at Nipawin, 14 VII 1981 NC, 2 VIII 1972 DHS; Saskatoon, 13 VII 1993 Bsam; South Saskatchewan River at Birch Hills Ferry, 12 VI 1972 DHS; South Saskatchewan River at Clarkboro Ferry, 17 VIII 1972 DHS; South Saskatchewan River at Lemsford Ferry, 30 VII 1999 JMW, 10 VIII 1971 DML, 12 VII 1970 DML, 21 VI 1971 DML, 20 VIII 2001 JMW, 6 VI 1998 JMW, 5 VII 1998 JMW, 5 IX 1998 JMW, 30 VII 2000 JMW, 21 VI 1971 DML, 30 VII 1999 JMW, 7 VII 1974 DHS, 28 VIII 1971 DML, 1 VII 1984 ERW, 18 VI 1983 ERW, 25 VI 1972 DHS; South Saskatchewan River at Queen Elizabeth Power Station, 5 VII 1972 DHS, 23 VII 1972 DHS, 10 VII 1999 JMW; South Saskatchewan River at Saskatoon, 13 VII 1971 DML.

Pseudocloeon propinquum (Walsh), 1863

Figs. 104, 105, 106, 107, 108, 109, 110, 111

Distribution Map: Fig. 313

Baetis propinquus (Walsh), 1863

Baetis spinosus McDunnough, 1925

Cloe propinqua Walsh, 1863

Cloe vicina Walsh, 1862

Labiobaetis propinquus (Walsh), 1863

Descriptions: Adult: Morihara and McCafferty (1979c)

Larva: Bergman and Hilsenhoff (1978), Morihara and McCafferty (1979a)

Diagnostic Characters:

Larvae of *P. propinquum* can be distinguished from *P. dardanum* by the simple submarginal larbral setae.

Adult males are differentiated from *P. dardanum* by the long, basal enlargement of the genital forceps and the presence of a spine between the forcep bases. The hindwings of *P. propinquum* usually have a small costal process present on the hindwing whereas this is always absent in *P. dardanum*.

Distribution and Biology:

Pseudocloeon propinquum is primarily an eastern species but has recently been found as far west as New Mexico (McCafferty et al. 1997) and Texas (Wiersema 1998). In Saskatchewan *P. propinquum* was collected throughout the southern boreal forest and the Saskatchewan River system. Imagos were collected between mid-June and mid-August. In Wisconsin there are 2 summer generations followed by a winter diapause in the egg stage (Bergman and Hilsenhoff 1978, as *Baetis spinosus*).

Material Examined: 57 larvae, 120 imagos

Battle River At Hwy 21, 1 VII 2000 JMW; Beaver River At Hwy 4, 1 VII 2000 JMW; Green Bush Creek at Hwy 3, 19 VII 2000 JMW; Little Red River at Prince Albert, 16 VI 1971 DHS; Overflowing River at Hwy 9, 19 VII 2000 JMW; Saskatchewan River at Gronlid, 29 VII 1972 DHS; South Saskatchewan River at Fenton Ferry, 11 VI 1986 ERW, 28 VII 1986 DML; South Saskatchewan River at Hague Ferry, 17 VIII 1972 DHS; South Saskatchewan River at Queen Elizabeth Power Station, 19 VII 1972 DHS, 19 VII 1979 ERW; South Saskatchewan River at St. Louis, 14 VII 1986 ERW; Sturgeon River at Hwy 240, 4 VIII 1969 DML; Torch River at Hwy 35, 2 VII 1986 VK.

