

## A NEW NORTH AMERICAN GENUS OF BAETIDAE (EPHEMEROPTERA) AND KEY TO *BAETIS* COMPLEX GENERA<sup>1, 2</sup>

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**ABSTRACT:** *Plauditus*, n. gen. (Ephemeroptera: Baetidae) is established for certain North American *Baetis* complex species that lack hindwingpads and a developed median caudal filament in the larval stage and that were recently transferred from *Pseudocloeon* to *Baetis* or *Barbaetis*. Thus, *P. alachua*, n. comb., *P. armillatus*, n. comb., *P. bimaculatus*, n. comb., *P. cestus*, n. comb., *P. cinctatus*, n. comb., *P. dubius*, n. comb., *P. elliotti*, n. comb., *P. futilis*, n. comb., *P. punctiventris*, n. comb., *P. rubrolateralis*, n. comb. *P. veteris*, n. comb., and *P. virilis*, n. comb. are contained in the new genus. *Plauditus cestus* is the type species. The larval stage of *Plauditus* is differentiated from other genera of the *Baetis* complex by numerous characteristics, and the adult stage is differentiated from other North American baetids also having double marginal intercalaries in the forewings and lacking hindwings (certain *Acentrella*, *Apobaetis*, and *Paracloeodes*). A new, simplified, and illustrated generic key to the North American *Baetis* complex larvae is provided.

Small minnow mayflies (Ephemeroptera: Baetidae) are relatively well known in North America north of Mexico, with 143 species among 20 genera currently reported (McCafferty 1996, 1997a; see also McCafferty and Silldorff 1998, Wiersema 1998, Wiersema and McCafferty 1998). Larvae are distinguished by having the initial lateral branches of the epicranial suture located anterior to (below) the lateral ocelli (Wang and McCafferty 1996: Figs. 1-6) and the femoral apices with a ventrally oriented dorsal lobe (Wang and McCafferty 1996: Figs. 13-16). Adults are distinguished by having forewing veins IMA, MA<sub>2</sub>, IMP, and MP<sub>2</sub> basally detached, and three-segmented mid- and hindtarsi. Male adults are further distinguished by the presence of membranous penes and turbinate compound eyes (the South American genus *Aturbina* Lugo-Ortiz and McCafferty [1996] lacks turbinate compound eyes). Despite being easily recognized at the family level, several North American baetid species have been difficult to assign to genera. This situation is primarily due to the fact that reductive trends and relative high frequency of homoplasy within the family have limited the number of reliable diagnostic characteristics of use at the genus level.

North American species previously assigned to *Pseudocloeon* Klapálek are examples that have required revised generic placement as our knowledge

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of genus level systematics has improved. North American species once assigned to *Pseudocloeon* have the following combination of characteristics: absence of hindwings (and hindwingpads), presence of double marginal intercalaries in the forewings, and presence of a highly reduced medial caudal filament in the larval stage. As a result of the restriction of the concept of *Pseudocloeon* to its Oriental type (Waltz and McCafferty 1985, 1987), all North American species once considered to belong to *Pseudocloeon* were transferred to *Apobaetis* Day (Waltz and McCafferty 1986), *Acentrella* Bengtsson (Waltz and McCafferty 1987), *Baetis* Leach (McCafferty and Waltz 1990), and *Barbaetis* Waltz and McCafferty (McCafferty and Waltz 1990).

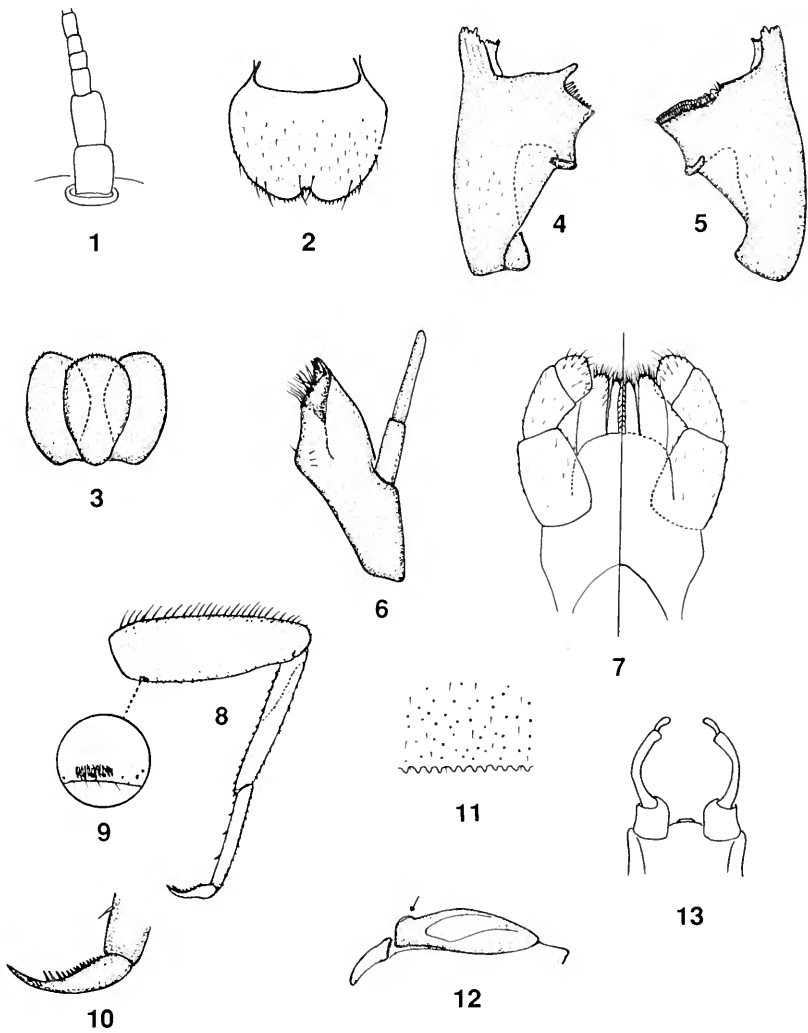
Our research indicates that all 11 species of *Pseudocloeon* that were provisionally assigned to *Baetis* by McCafferty and Waltz (1990) and also *Barbaetis cestus* (Provonsha and McCafferty) (originally described in *Pseudocloeon*) represent a new *Baetis*-complex genus distinguishable by numerous characteristics. We herein describe the new genus and provide a revised generic key to the North American larvae of the *Baetis* complex.

### *Plauditus* Lugo-Ortiz and McCafferty, NEW GENUS

**Larva.** Head: Antennae as long as head capsule or longer; scapes without distal notch, subequal in length in length to pedicels (Fig. 1). Labrum (Fig. 2) broadly rounded anteriorly, with anteromedial notch. Hypopharynx (Fig. 3) with lingua and superlinguae broadly rounded apically. Left mandible (Fig. 4) with incisors fused; prosthema apically broad and denticulate. Right mandible with incisors apically fused (Fig. 5) or slightly cleft; prosthema slender, apically denticulate. Maxillae (Fig. 6) with palps two segmented. Labium (Fig. 7) compact; glossae slightly shorter than paraglossae, apically narrower than base; paraglossae broad, broadly rounded apically; palps three segmented; palp segment 1 slightly longer than segments 2 and 3 combined; palps segment 2 as long as or slightly longer than segment 3; segment 3 relatively broad apically, approaching truncate, sometimes appearing slightly concave, medial margin straight to slightly convex distally (never convergent apically from base). Thorax: Hindwingpads absent. Legs (Fig. 8) with femora with villopore present (Fig. 9) and dorsal row of long, robust setae. Tarsal claws (Fig. 10) somewhat elongate and with only weak curvature, with one row of long, sharp denticles. Abdomen: Gills on abdominal segments 1-7, broadly rounded, untracheated or poorly tracheated, marginally smooth. Terga (Fig. 11) creased, with minute, sharp, triangular spines, or with minute, fine, simple setae scattered over surface. Cerci with abundant fine, simple setae medially. Medial caudal filament subequal in length to abdominal segment 10.

**Adult.** Head: Male compound eyes circular, somewhat enlarged. Male foretibiae 1.3-1.5x length of femora. Mesoscutum with small, rounded anterior process in lateral view (Fig. 12). Forewings with paired marginal intercalaries. Hindwings absent. Genital forceps (Fig. 13) three segmented; segment 1 distomedially produced; segment 2 slender, strongly arched; segment 3 slender, ellipsoidal.

**Type species.** *Pseudocloeon cestus* Provonsha and McCafferty.



Figs. 1-11. *Plauditus punctiventris*. 1. Antennal scape and pedicel. 2. Labrum (dorsal). 3. Hypopharynx. 4. Left mandible. 5. Right mandible. 6. Left maxilla. 7. Labium (left-ventral; right-dorsal). 8. Right foreleg (posterior face). 9. Villopore. 10. Tarsal claw. 11. Detail of tergum 4. 12. Adult mesoscutum (lateral). 13. Male genitalia.

**Included species.** (In addition to the recombined species listed below, a new species is presently being described by McCafferty and Waltz [1998], and one other is in manuscript [R. D. Waltz, pers. comm.]).

- Plauditus alachua* (Berner), n. comb.  
*Pseudocloeon alachua* Berner 1940:58 (larva; male, female adults).  
*Baetis alachua* (Berner): McCafferty and Waltz 1990:775.
- Plauditus armillatus* (McCafferty and Waltz), n. comb.  
*Pseudocloeon parvulum* McDunnough 1932:210 (larva; male, female adults).  
 [secondary homonym].  
*Baetis armillatus* McCafferty and Waltz 1990:775. [renamed].
- Plauditus bimaculatus* (Berner), n. comb.  
*Pseudocloeon bimaculatum* Berner 1946:79 (larva; male, female adults).  
*Baetis bimaculatus* (Berner): McCafferty and Waltz 1990:775.
- Plauditus cestus* (Provonsha and McCafferty), n. comb.  
*Pseudocloeon cestum* Provonsha and McCafferty 1982:28 (larva; male, female adults).  
*Barbaetis cestus* (Provonsha and McCafferty): McCafferty and Waltz 1990:777.
- Plauditus cinctatus* (McCafferty and Waltz), n. comb.  
*Pseudocloeon cingulatum* McDunnough 1931:85 (male, female adults); Ide 1937:236  
 (larva). [secondary homonym].  
*Baetis cinctatus* McCafferty and Waltz 1990:776. [renamed].
- Plauditus dubius* (Walsh), n. comb.  
*Cloeon dubium* Walsh 1862:380 (male, female adults).  
*Pseudocloeon dubium* (Walsh): McDunnough 1924b:115; Ide 1937:237 (larva).  
*Pseudocloeon chlorops* McDunnough 1923:45.  
*Baetis dubius* (Walsh): McCafferty and Waltz 1990:775.
- Plauditus elliotti* (Daggy), n. comb.  
*Pseudocloeon elliotti* Daggy 1945:392 (male, female adults).  
*Baetis elliotti* (Daggy): McCafferty and Waltz 1990:775.
- Plauditus futilis* (McDunnough), n. comb.  
*Pseudocloeon futile* McDunnough 1931:86 (male, female adults).  
*Baetis futile* (McDunnough): McCafferty and Waltz 1990:775.  
*Baetis futilis* (McDunnough): McCafferty 1997b:318.
- Plauditus punctiventris* (McDunnough), n. comb.  
*Pseudocloeon punctiventris* McDunnough 1923:45 (male, female adults); Ide 1937:237  
 (larva).  
*Pseudocloeon anoka* Daggy 1945:391.  
*Pseudocloeon edmundsi* Jensen 1969:14.  
*Pseudocloeon myrsum* Burks 1953:139.  
*Baetis punctiventris* (McDunnough): McCafferty and Waltz 1990:776.
- Plauditus rubrolateralis* (McDunnough), n. comb.  
*Pseudocloeon rubrolaterale* McDunnough 1931:86 (male, female adults).  
*Baetis rubrolaterale* (McDunnough): McCafferty and Waltz 1990:776.  
*Baetis rubrolateralis* (McDunnough): McCafferty 1997a:318.
- Plauditus veteris* (McDunnough), n. comb.  
*Pseudocloeon veteris* McDunnough 1924a:8 (male, female adults).  
*Baetis veteris* (McDunnough): McCafferty and Waltz 1990:776.
- Plauditus virilis* (McDunnough), n. comb.  
*Cloeon virile* McDunnough 1923:46 (male, female adults).  
*Pseudocloeon virile* (McDunnough): McDunnough 1924b:116; Ide 1937:239 (larva).  
*Baetis virile* (McDunnough): McCafferty and Waltz 1990:776.  
*Baetis virilis* (McDunnough): McCafferty 1997b:312.

**Distribution.** Species of *Plauditus* are presently known from the conterminous USA and the lower tier of provinces of Canada. There remains the possibility that the genus may eventually be found in Mexico because it is presently well represented in Texas (Lugo-Ortiz and McCafferty 1995, Wiersema and McCafferty 1998). It is also possible that *Plauditus* is represented in the eastern Palearctic by certain species that otherwise may have been variously regarded as *Acentrella*, *Baetis*, or *Pseudocloeon*. We have no evidence of this at the present.

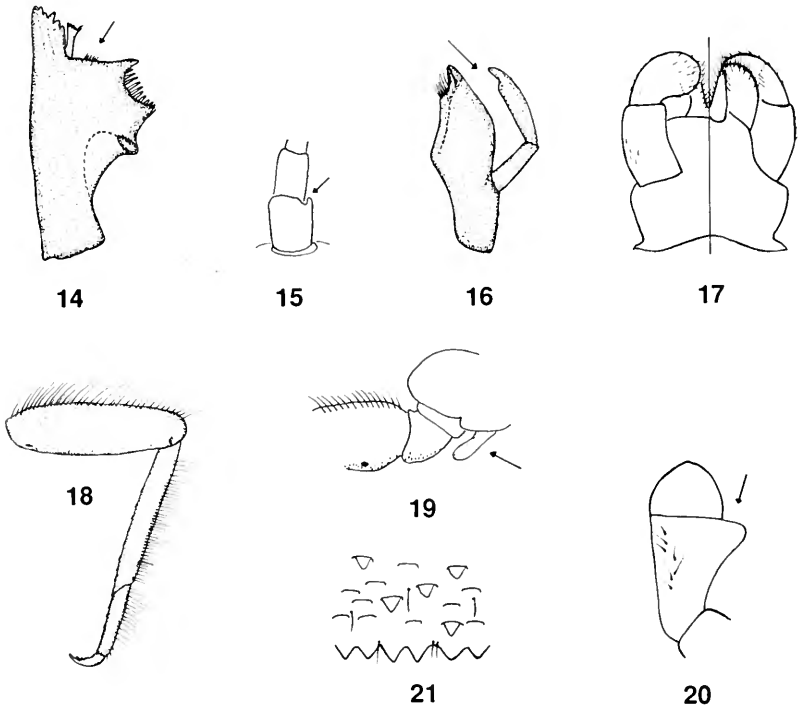
**Etymology.** The generic name is an arbitrary combination of Latin letters having a transliteral meaning of "little applause."

**Diagnosis.** The presence of the larval femoral villopore indicates that *Plauditus* is a member of the *Baetis* complex of genera, represented in North America north of Mexico by *Acentrella*, *Baetis*, *Barbaetis*, *Heterocloeon* McDunnough, and *Labiobaetis* Novikova and Kluge. Within that complex, larvae of *Plauditus* are distinguished by the following combination of characteristics: lacking a medial field of setae dorsally on the labrum (Fig. 2); having the right mandible with an apically denticulate prosthema (Fig. 5); lacking a protuberance on the apex of maxillary palp segment 3 (Fig. 6); having glossae shorter than paraglossae, relatively broad paraglossae, and a subquadrate palp segment 3 (Fig. 7); lacking dorsal setae on the apical half of the glossae (viz. well-developed medial aspect) (Fig. 7); lacking hindwingpads; lacking procoxal osmobranchia; lacking clavate setae on the dorsal margin of the tibiae and tarsi (Fig. 8); and having a highly reduced medial caudal filament (Provonsha and McCafferty 1982: Fig. 8). A more detailed diagnosis of *Plauditus* larvae in relation to those of other *Baetis*-complex genera can be performed using the identification key provided below.

Adults of *Plauditus* are similar to hindwingless *Acentrella*, *Apobaetis* Day, and *Paracloeodes* Day. Adults of *Plauditus* differ from those of *Acentrella* in having a small, rounded anterior process on the mesoscutum (Fig. 12), and from those of *Apobaetis* by lacking a subconical process between the male genital forceps (Fig. 13). Adults of *Plauditus* differ from those of *Paracloeodes* in that segment 2 of the male genital forceps is slightly produced distomedially and tends to be more slender and strongly arched (Fig. 13).

KEY TO LARVAE OF NORTH AMERICAN *BAETIS*-COMPLEX GENERA

1. Both mandibles lacking tuft of setae between incisors and prostheca (Figs. 4, 5); villopore usually apparent on femora (Fig. 9); claws never approaching or exceeding length of tarsi (Figs. 8, 10) . . . . . *Baetis* complex, 2
- One or both mandibles with tuft of setae between incisors and prostheca (Fig. 14); villopore absent from femora; claw length variable . . . . . other Baetidae
2. Antennal scapes with distal notch (Fig. 15); maxillary palp segment 2 with subapical excavation (Fig. 16); hindwingpads present; median caudal filament developed . . . . . *Labiobaetis*
- Antennal scapes without distal notch (Fig. 1); maxillary palp segment 2 without subapical excavation (Fig. 6); hindwingpads present or absent; median caudal filament developed or highly reduced . . . . . 3
3. Median caudal filament developed; hindwingpads present . . . . . 4
- Median caudal filament reduced; hindwingpads present or absent . . . . . 5
4. Antennae approximately twice length of head capsule . . . . . *Baetis*
- Antennae subequal in length to head capsule . . . . . *Barbaetis*
5. Procoxae with (Fig. 19) or without gills; claws with two rows of denticles (second row minute and sometimes conspicuous only under high magnification) . . . . . *Heterocloeon*
- Procoxae without gills; claws with one row of denticles . . . . . 6
6. Hindwingpads absent . . . . . 7
- Hindwingpads present, sometimes minute . . . . . 8
7. Femora, tibiae, and tarsi without row of long setae (Fig. 8); labial palp segment 3 subquadrate, with medial margin almost straight (not receding from base) and sometimes appearing slightly convex apically (Fig. 7) . . . . . *Plauditus*
- Femora, tibiae, and tarsi with row of long setae (Fig. 18); labial palp segment 3 apically rounded, with medial margin receding from base (Fig. 17) . . . . . *Acentrella*
8. Labial palp segment 2 with well-developed distomedial thumb (Fig. 20); abdominal tergal scales present (Fig. 21) . . . . . *Baetis*
- Labial palp without well-developed distomedial thumb (Fig. 17); abdominal tergal scales absent . . . . . *Acentrella*



Figs. 14-21. 14. *Fallceon quilleri*, left mandible (pointer towards setal tuft) (modified from Lugo-Ortiz et al. [1994]). 15-16. *Labiobaetis propinquus* 15. Antennal scape and pedicel (pointer towards notch) (modified from McCafferty and Waltz [1995]). 16. Left maxilla (pointer towards excavation) (modified from McCafferty and Waltz [1995]). 17-18. *Acentrella turbida*. 17. Labium (modified from McCafferty et al. [1994]). 18. Right foreleg (modified from McCafferty et al. [1994]). 19. *Heterocloeon bernerii*, forecoxal gill (pointer towards gill) [modified from Müller-Liebenau [1974]]. 20-21. *Baetis bicaudatus*, labial palp (pointer towards thumb) (modified from Morihara and McCafferty [1979]). 21. Detail of tergum 4.

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