

NEW AND ADDITIONAL RECORDS OF SMALL MINNOW MAYFLIES (EPHEMEROPTERA: BAETIDAE) FROM TEXAS^{1,2}

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ABSTRACT: Eleven genera and 31 species of mayflies of the family Baetidae are reported from 32 counties in the state of Texas. Twenty-six species among the genera *Acentrella*, *Acerpenna*, *Apobaetis*, *Baetis*, *Centroptilum*, *Fallceon*, *Paracloeodes*, and *Procloeon* represent new state records. Other Texas genera include *Baetodes*, *Callibaetis*, and *Camelobaetidius*. Annotations to the species list presented indicate that the baetid fauna of Texas is made up of widespread continental (three species), elements of the southwestern United States and/or Mexico (10 species), elements of the central and/or eastern United States and Canada (10 species), and elements that are endemic or unresolved (eight species).

New data on the Baetidae of Texas, as presented below, are based on extensive collections made in 1977 by the first author and others associated with the Laboratory of Aquatic Entomology at Purdue University, miscellaneous Texas samples present in the Purdue Entomological Research Collection (PERC), and material taken by the second author and others associated with stream surveys conducted by the Texas Water Commission or privately since 1976. The latter are held in the private collection of the second author (JRD). Samples were variously acquired by benthic, aquatic-drift, aerial-net, and black-light sampling techniques. Some of the larval material was reared to adults for stage correlation.

Prior to this report, Texas records of only five species of the family baetidae have been published, quite remarkable considering the size of Texas and the emphasis placed on benthic macroinvertebrates in relation to water quality assessment during the past 25 years. We present new state records for 26 species of Baetidae, in addition to presenting additional records for the five previous reported species. Twenty-three of the species are nominal; others represent distinctive populations, sometimes from several locales, but for one reason or another (as explained in the annotations), they are not given formal names at this time. Three new species not reported herein, in addition to a new subspecies and a pre-

¹ Received March 26, 1992. Accepted May 2, 1992.

² Published as Purdue Experiment Station Journal No. 13366.

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viously unknown adult stage of a nominal species, are being described elsewhere by the first author and A. V. Provonsha. Even with the considerable additions presented below, only 32 of the 254 Texas counties are represented in our samples. We expect many more additions forthcoming, especially if larvae can be reared to adults for proper association. This will be particularly important for the application of appropriate specific names in genera such as *Centroptilum* and *Procloeon*.

Species representing new state records are asterisked in the following annotations, and depositions of cited material examined are indicated as PERC or JRD.

ANNOTATIONS

**Acentrella ampla* Traver

New Records. JRD: Brewster Co., Rio Grande at Santa Elena Canyon, III-24-1976, J. R. Davis (larvae).

Remarks. This species was previously known only from the mid-western and southeastern United States (Moriyama and McCafferty 1979b).

**Acentrella carolina* (Banks)

New Records. JRD: Bastrop Co., Colorado R. at FM 969, near Utley, XII-11-1984, J. R. Davis (larvae); Presidio Co., Rio Grande, 13 mi downstream from Presidio, III-26-1976, J. R. Davis (larvae).

Remarks. The correct placement of these larvae remains somewhat tentative pending further study of cognates. It is possible that the Texas material will prove to be pale variants of *A. turbida* (McDunnough), which has not been described as larvae but which is currently being studied by the first author and R. D. Waltz.

**Acentrella insignificans* (McDunnough)

New Records. JRD: El Paso Co., Rio Grande at Hwy. 273, XII-27-1991, J. R. Davis (larvae).

Remarks. This is a broad ranging western species, and Texas represents the eastern limit of its known range. It is known from New Mexico, and its presence in the Rio Grande was to be expected.

****Acerpenna pygmaea* (Hagen)**

New Records. PERC: Blanco Co., Blanco R. 6 mi W Blanco, V-6-1977, W. P. McCafferty, A. V. Provonsha, D. Morihara (adults). JRD: Austin Co., Mill Cr. at County Road, SW Bellville, VII-19-1988, S. Twidwell (larvae); Waller Co., Ponds Cr. at County Road off FM 1098, N Prairie View, VII-19-1988, S. Twidwell (larvae).

Remarks. Texas represents the westernmost record for this species; it had been reported from throughout the east as far west as Missouri (Morihara and McCafferty 1979b).

****Acerpenna* sp. 1**

New Records. PERC: Denton Co., Clear Cr., Hwy 2164, light trap, VI-30-1977, P. M. Grant (adults).

Remarks. This species agrees well the description of *A. harti* (from Illinois), but is much lighter and slightly larger. Only one male was available to us, and we have deferred naming a new species until more data are available.

****Apobaetis indepressus* Day**

New Records. JRD: Jackson Co., Arenosa Cr. at County Road off U. S. 59, 3.5 mi N Inez, IX-16-1988, S. Twidwell (larvae).

Remarks. This North American genus is thus far known from two described species: *A. indepressus* in the West and *A. etowah* (Traver) from Georgia. *Apobaetis indepressus* has been reported from Kansas and California, and the first author has seen specimens from Colorado. Although the Texas larvae agree with the previous description of *A. indepressus* by Day (1955), the larval stage of *A. etowah* is still unknown, and therefore the placement of the Texas larvae to species remains somewhat tentative. Since elements from the Southeast appear to influence the Texas baetid fauna to about the same extent as elements from the Southwest, it could well prove to be *A. etowah*.

****Baetis caelestis* Allen and Murvosh**

New Records. PERC: Culberson Co., stream in McKittrick Canyon, ca 2 mi W Info. Center, Guadalupe Mountains National Park, near Pine Springs, VII-18-1985, A. R. Brigham, J. L. Brower (larvae).

Remarks. This species was previously known from California, New Mexico, and the Baja Peninsula. With respect to the diagnosis of this species, the Texas material, unlike some other southwestern populations, has no robust setae on the edges of some gills. All gills, however, are clearly serrate.

****Baetis ephippiatus* Traver**

New Records. JRD: Dallas Co., Trinity R. at Continental Ave. in Dallas, VIII-25-1987, J. R. Davis (larvae); Gregg Co., Sabine R. above Longview WTP intake, X-21-1987, J. R. Davis (larvae); El Paso Co., Rio Grande at Hwy. 273, VII-14-1984, J. R. Davis (reared adult and larval exuviae).

Remarks. This is one of three species of the *propinquus* group of *Baetis* species that are reported here from Texas for the first time. It has previously been regarded as a southeastern species although it is also known from Indiana (Moriyara and McCafferty 1979b).

****Baetis flavistriga* McDunnough**

New Records. PERC: Austin Co., Brazos R. at Austin State Historical Park at light, V-9-1977, W. P. McCafferty, A. V. Provonsha, D. Moriyara (adults).

Remarks. Texas adults of this species fit the color variation originally described for *B. pallidulus* McDunnough. Bergman and Hilsenhoff (1978) synonymized the latter with *B. phoebus* McDunnough, and Moriyara and McCafferty (1979b) subsequently synonymized *B. phoebus* with *B. flavistriga*. This is one of the most common and widespread species in eastern North America; its most western record is from the Black Hills of South Dakota. Texas represents a significant southwestern extension of its known range, although it may prove to be rare in Texas because we have not as yet found larvae. The first author has previously discussed the distribution of this species (McCafferty 1990) and more recently has seen material from Colorado.

Baetis intercalaris McDunnough

New Records. PERC: Bandera Co., Medina R., 4 mi N Medina at Texas Hwy. 16, V-6-1977, W. P. McCafferty, A. V. Provonsha, D. Morihara (larvae); Jasper Co., small stream at bridge on Farm Road 156, 10 mi SE Colmesneil, V-4-1977, W. P. McCafferty, A. V. Provonsha, D. Morihara (larvae); Walker Co., Cobb Cr., Hwy. 207, 10 mi E Huntsville, IV-20-1990, Baumann & Nelson (larvae). JRD: Freestone Co., Trinity R. at U. S. 79 near Oakwood, X-7-1987, J. R. Davis (larvae); Hays Co., Blanco R. at Hays County Road 295, VI-4-1985, J. R. Davis, (larvae); Henderson Co., Trinity R. near Trinidad, X-7-1987, VI-23-1988, J. R. Davis (larvae); Houston Co., Trinity R. at State Hwy. 7 near Crockett, VI-24-1988, X-13-1988, J. R. Davis (larvae).

Remarks. Texas represents a significant southwestern extension of the known range of this common and widespread eastern North American species. It is known as far west as Manitoba to the north. Texas larvae presently identifiable as *B. intercalaris* may eventually prove to be the closely related *B. ochris* Burks, for which the larval stage has not yet been described (R. D. Waltz, personal communication).

**Baetis longipalpus* Morihara and McCafferty

New Records. PERC: Austin Co., Brazos R. at Austin State Historical Park, overnight drift, V-10-1977, W. P. McCafferty, A. V. Provonsha, D. Morihara (larvae). JRD: Henderson Co., Trinity R. near Trinidad, VIII-27-1987, X-7-1987, VI-23-1988, J. R. Davis (larvae).

Remarks. This species was previously known from Indiana and Wisconsin (Morihara and McCafferty 1979a). Evidently, it may be common throughout the central United States.

**Baetis notos* Allen and Murvosh

New Records. PERC: Kendall Co., Block Cr. 5 mi NE Comfort, V-7-1977, W. P. McCafferty, A. V. Provonsha, D. Morihara (larvae).

Remarks. This species was previously known from Arizona and New Mexico [see *B. sp. C* of Morihara and McCafferty (1979b)].

**Baetis propinquus* (Walsh)

New Records. PERC: Austin Co., San Bernard R. at I-10, near Sealy, V-9-1977, W. P. McCafferty, A. V. Provonsha, D. Morihara (larvae and adults).

Remarks. This species is known from throughout eastern North America to Mississippi and Indiana. Its discovery in Texas extends its known range westward to a considerable extent.

****Baetis punctiventris* (McDunnough)**

New Records. PERC: Bandera Co., Medina R. 4 mi N Medina at Texas Hwy. 16, V-6-1977, W. P. McCafferty, A. V. Provonsha, D. Morihara (larvae); Kerr Co., Turtle Cr. at Texas Hwy. 16, V-6-1977, W. P. McCafferty, A. V. Provonsha, D. Morihara (larvae).

Remarks. This species is found throughout much of North America but had not been taken in the Southwest [see recent synonymies of this species in McCafferty and Waltz (1990)]. Larval cerci in this species show both the typical *punctiventris* pattern and the *myrsum* pattern (see Burks 1953).

****Baetis* sp. 1**

New Records. PERC: Kendall Co., Guadalupe R. 1 mi S Sisterdale at Ranch Road 1376, V-7-1977, W. P. McCafferty, A. V. Provonsha, D. Morihara (larvae).

Remarks. These larvae lack hindwingpads, and their rather pale and diffuse color pattern does not match any larvae that have been described variously under the names *Acentrella*, *Baetis*, or *Pseudocloeon*. Specific identification of these and some other *Baetis* larvae lacking hindwingpads in North America must be considered tentative until further research is conducted on species characteristics and larva-adult associations.

***Baetodes edmundsi* Koss**

Additional Records. PERC: Blanco Co. (Pedernales R.); Kendall Co. (Guadalupe R.); Kerr Co. (Guadalupe R.).

Remarks. This evidently is a common species in the southwestern United States. It was first reported from Texas (Uvalde Co.) by Edmunds (1950) as *Baetodes* sp. and has been taken several times since then. Some material attributed to this species, however, could possibly be *Baetodes inermis* (see remarks below).

****Baetodes inermis* Cohen and Allen**

New Records. PERC: Bandera Co., Medina R. 4 mi. N Medina at Tex. Hwy. 16, V-16-1977, W. P. McCafferty, A. V. Provonsha, D. Morihara (larvae); Blanco Co., Blanco R. 6 mi W Blanco, V-6-1977, W. P. McCafferty, A. V. Provonsha, (larvae); Kendall Co., Block Cr. 5 mi NE Comfort, V-7-1977, W. P. McCafferty, A. V. Provonsha, D. Morihara (larvae).

Remarks. This species was previously known only from Mexico (Cohen and Allen 1978). The Texas material matches previous descriptions of this species precisely except the pronotal tubercle can be difficult to detect because it appears more like a midposterior hump. The mesonotal tubercle is also poorly developed. If the Cohen and Allen (1978) key to larvae is relied on solely and followed exactly (i.e., at the geographic couplet 3 one chooses Texas vs Mexico), it would be possible to incorrectly key (force) this species to *B. edmundsi* since, according to those authors, only *B. edmundsi* and possibly *B. arizonensis* are to be expected in Texas. Actually, two additional, new species of *Baetodes* have been collected from the central hill country of Texas and are being described in a separate paper by McCafferty and Provonsha (in manuscript). We doubt that *B. arizonensis* will be found in Texas because it is thus far known only from mountainous regions in Arizona.

****Callibaetis californicus* Banks**

New Records. PERC: Blanco Co., Pedernales R. 1 mi N Johnson City at U. S. Hwy. 281, V-6-1977, W. P. McCafferty, A. V. Provonsha, D. Morihara (larvae); Rancho de Palmas, Nueces R., III-5-1936 (larvae).

Remarks. The discovery of this distinctive species in Texas suggests that it occurs across the Southwest, being previously recorded only from southern California.

****Callibaetis floridanus* Banks**

New Records. PERC: Austin Co., Brazos R. at Austin State Historical Park, in overnight drift sample, V-10-1977, W. P. McCafferty, A. V. Provonsha, D. Morihara (larvae); Hidalgo Co., Edinburg, 1935, Mulaik (larvae); Reagan Wells, XI-6-1936, J. G. Needham (larvae). JRD: Guadalupe Co., Geronimo Cr. off FM 20 near Seguin, IV-10-1990, D. Buzan, E. Hornig (larvae); Jasper Co., swamp adjacent to Sandy Cr. near Jasper, V-29-1985, M. G. Dick (larvae).

Remarks. The discovery of this species throughout much of Texas may indicate a broad distribution across the southeastern and south central states. It was previously known from Florida, although the senior author has also seen it from Arkansas, Kentucky, and southern Indiana. Berner and Pescador (1988) have discussed the biology, ecology, and variation in this relatively ubiquitous species in some detail. It develops in small streams and swampy habitats in Texas; and it has been reported from the everglades in Florida.

Callibaetis montanus Eaton

Additional Records. PERC: Hidalgo Co. (Weslaco); Victoria Co. (Guadalupe R.).

Remarks. This primarily Mexican and Central American species occurs in central and southern Texas. Traver (1935) first reported this species from Texas (Weslaco and Austin). She indicated one specimen from Weslaco at Cornell University; one of the specimens in PERC is from Weslaco but is accompanied by little other information. The considerable materials we have studied from Texas appear to represent a distinct geographic variant of this species and are being described elsewhere as a new subspecies by McCafferty and Provonsha (in manuscript).

Callibaetis pictus Eaton

Additional records. PERC: Blanco Co. (Pedernales R., spring at Pedernales Falls); Culberson Co. (McKittrick Canyon Cr.); El Paso Co. (Keystone Outlet Conduit); Kerr Co. (Robinson Cr., Turtle Cr.); Uvalde Co. (Rio Frio); Arroyo at U.S. 83. JRD: El Paso Co. (Rio Grande).

Remarks. This broad ranging western species occurs in several color variations in Texas, especially in the larval stage. Populations tend to be large and have not been found coexisting with other species of *Callibaetis*.

**Callibaetis pretiosus* Banks

New Records. JRD: Jasper Co., swamp adjacent Sandy Cr. near city limit of Jasper, IV-24-1985, M. G. Dick (larvae).

Remarks. East Texas may represent the westernmost limit of this strikingly patterned eastern species.

Camelobaetidius mexicanus (Traver and Edmunds)

Additional Records. PERC: Austin Co. (Brazos R.); Bandera Co. (Medina R.); Blanco Co. (Blanco R.); Kendall Co. (Block Cr., Guadalupe R.); Kerr Co. (Turtle Cr.); Presidio Co. (Rio Grande). JRD: Val Verde Co. (Devil's R., Rio Grande).

Remarks. This species is a common and widespread small minnow mayfly in Texas.

**Camelobaetidius* sp. 1

New Records. JRD: Brewster Co., Rio Grande at Santa Elena Canyon, IX-28-1977, J. R. Davis (larvae); Presidio Co., Rio Grande, 13 mi downstream from Presidio, VI-28-1977, J. R. Davis (larvae); Val Verde Co., Rio Grande at Foster Ranch near Langtry, V-2-1977 (larvae).

Remarks. This species is unlike any thus far known from North or Central America. Its spatulate claws possess 16-18 denticles and in this respect are most similar to those of some undescribed South American species and *C. cayumba* (Traver and Edmunds 1968), the latter of which is known only from Peru. We are not naming this species at this time because the material is somewhat immature and a larger series may be required to assess variability since McCafferty and Waltz (1990) noted that several specific synonyms may be required in this genus.

**Centroptilum* sp. 1

New Records. JRD: Dallas Co., Elm Fork Trinity R. near SH 356 in Dallas, X-6-1987, J. R. Davis (larvae); Guadalupe Co., Geronimo Cr. off FM 20 near Seguin, IV-10-1990, D. Buzan, E. Hornig (larvae).

Remarks. This species is most similar to *C. alamance* (Traver) and *C. triangulifer* (McDunnough) in overall structure and in lacking hindwings, but it is distinct from them in terms of abdominal color pattern.

**Centroptilum* sp. 2

New Records. PERC: Austin Co., San Bernard R. at I-10, near Sealy, V-9-1977, W. P. McCafferty, A. V. Provonsha, D. Morihara (larvae). JRD: Bosque Co., North Bosque R. at Hwy. 6, SW Iredell, IV-25-1978, D. Petrick (larvae); Bosque Co., North Bosque R. at Hwy 22 in Meridian, IV-25-1978, D. Petrick (larvae); Jackson Co., Arenosa Cr. at County Road off U. S. 59, 3.5 mi N Inez, IX-6-1988, S. Twidwell (larvae); McLennan Co., South Bosque R. at Hwy. 84 NE McGregor, IV-25-1978, D. Petrick (larvae).

Remarks. These *Centroptilum* larvae possess hindwingpads but cannot be matched to any described larvae. They are distinctive because of a dark brown transverse bar across the anterior portion of abdominal sternum 8 (absent in some immature specimens). The species does not appear to be a member of the genus *Procloeon*, to which most North American species originally described as *Centroptilum* have recently been moved (McCafferty and Waltz 1990).

Fallceon quilleri (Dodds)

Additional Records. PERC: Bandera Co. (Sabinal R.); Blanco Co. (Pedernales R.); Brewster Co. (Big Bend National Park); Gonzales Co. (Gonzales); Kendall Co. (Guadalupe R., West Sister Cr.); Kerr Co. (Robinson Cr.); Williamson Co. (Brushy Cr.); Uvalde Co. (Rio Frio). JRD: Val Verde Co. (Rio Grande).

Remarks. This species is one of the most common small minnow mayflies in Texas and was first reported there by Morihara and McCafferty (1979b). We have seen numerous color variations of adults from the state, including some typical *leechi*, *endymion*, and *quilleri* variations, but at this time we are following the conservative classification that recognizes only one variable species (see McCafferty and Waltz 1990).

**Paracloeodes minutus* (Daggy)

New Records. JRD: Austin Co., Mill Cr. at County Road, SE Bellville, VII-19-1988, S. Twidwell (larvae); Jackson Co., Arenosa Cr. at County Road off U. S. 59, 3.5 mi N Inez, IX-6-1988, S. Twidwell (larvae); Lipscomb Co., Wolf Cr. at FM 1454 E Lipscomb, VII-18-1990, S. Twidwell (larvae); Wheeler Co., Sweetwater Cr. at U. S. 83 N Wheeler, IX-9-1987, S. Twidwell (larvae).

Remarks. The larvae from Texas agree sufficiently with Daggy's (1945) original description of Minnesota larvae to consider them the same species. In particular, larvae possess the distinctive spot on abdominal tergum 2. The first author has seen this species from Illinois and Indiana. It has been reported from Kansas, and it probably occurs throughout central North America.

**Procloeon* sp. 1

New Records. PERC: Blanco Co., Blanco R. 6 mi W Blanco, V-6-1977, W. P. McCafferty, A. V. Provonsha, D. Morihara (adults).

Remarks. This material consists entirely of numerous female adults that are striking because of their white and semi-hyaline bodies and the large black tracheal branching impressions covering much of the lateral and dorsal abdomen. The determination of female adults with hindwings as either *Centroptilum* or *Procloeon* remains somewhat tentative at this time.

****Procloeon* sp. 2**

New Records. JRD: Austin Co., Mill Cr. at County Road, SW Bellville, VII-19-1988, S. Twidwell (larvae).

Remarks. These larvae possess hindwingpads, and their gills are all single with no flaps. The species might be related to the eastern *P. album* (McDunnough).

****Procloeon* sp. 3**

New Records. JRD: Kinney Co., Pinto Cr. at U. S. 277 near Bracketville, VI-30-1990, S. Twidwell (larvae).

Remarks. These distinctive larvae possess hindwingpads in addition to small anterior gill flaps on gills 1 and 2 and a tiny anterior flap on gill 3.

LITERATURE CITED

- Bergman, E. A. and W. L. Hilsenhoff. 1978. *Baetis* (Ephemeroptera: Baetidae) of Wisconsin. Great Lakes Entomol. 11: 125-135.
- Berner, L. and M. L. Pescador. 1988. The mayflies of Florida, revised edition. Univ. Florida Press, Gainesville.
- Burks, B. D. 1953. The mayflies, or Ephemeroptera, of Illinois. Bull. Ill. Nat. Hist. Surv. 26: 1-216.
- Cohen, S. D. and R. K. Allen. 1978. Generic revision of mayfly nymphs III. *Baetodes* in North and Central America. J. Kans. Entomol. Soc. 51: 253-269.
- Daggy, R. H. 1945. New and previously undescribed naiads of some Minnesota mayflies (Ephemeroptera). Ann. Entomol. Soc. Am. 38: 373-396.
- Day, W. C. 1955. New genera of mayflies from California. Pan-Pac. Entomol. 31: 121-137.
- Edmunds, G. F. Jr. 1950. New records of the mayfly genus *Baetodes*, with notes on the genus. Entomol. News. 61: 203-205.
- McCafferty, W. P. 1990. Biogeographic affinities of the Ephemeroptera of the Black Hills, South Dakota. Entomol. News. 101: 193-199.
- McCafferty, W. P. and R. D. Waltz. 1990. Revisionary synopsis of the Baetidae (Ephemeroptera) of North and Middle America. Trans. Am. Entomol. Soc. 116: 769-799.
- Morihara, D. K. and W. P. McCafferty. 1979a. Systematics of the *propinquus* group of *Baetis* species (Ephemeroptera: Baetidae). Ann. Entomol. Soc. Am. 72: 130-135.
- Morihara, D. K. and W. P. McCafferty. 1979b. The *Baetis* larvae of North America (Ephemeroptera: Baetidae). Trans. Am. Entomol. Soc. 105: 139-221.
- Traver, J. R. 1935. Part II, Systematic. pp. 239-739 In: J. G. Needham, J. R. Traver and Y. C. Hsu [eds.]. The biology of mayflies with a systematic account of North American species. Comstock Publ. Co., Ithaca, New York.
- Traver, J. R. and G. F. Edmunds, Jr. 1968. A revision of the Baetidae with spatulae clawed nymphs (Ephemeroptera). Pacific Ins. 10: 629-677.