SYSTEMATICS OF PSEUDOCLOEON, ACENTRELLA, BAETIELLA, AND LIEBEBIELLA, NEW GENUS (EPHEMEROPTERA: BAETIDAE)

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Abstract.—Detailed character analysis has allowed a more natural classification in the Baetidae as follows. Pseudocloeon Klapalek must presently be restricted to the type species, *P. kraepelini* Klapalek, a species known only from adults. Certain *Pseudocloeon* species are placed in the genera treated here. Liebebiella, new genus, includes: *L. orientale* (Müller-Liebenau), new combination (type species); *L. ambiguа* (Müller-Liebenau), new combination; *L. atoki* (Müller-Liebenau), new combination; Liebebiella deigma, n. sp.; *L. difficila* (Müller-Liebenau); *L. klapaleki* (Müller-Liebenau), new combination; *L. proxima* (Müller-Liebenau), new combination; *L. siveci* (Braasch), new combination; and *L. vera* (Müller-Liebenau), new combination. Acentrella Bengtsson is revised to include: *A. lapponica* Bengtsson (type species); *A. ampla* Traver; *A. carolina* (Banks), new combination; *A. chantauensis* (Kluge), new combination; *A. fenestra* (Kazlauskas), new combination; *A. gnom* (Kluge), new combination (= *Pseudocloeon ultimum* Müller-Liebenau, new synonymy); *A. insignificans* (McDunnough), new combination; *A. lata* (Müller-Liebenau), new combination; *A. siveci* (Braasch), new combination; *A. tonneri* (Braasch and Soldán), new combination; and *A. tuberculata* (Kazlauskas), new combination. Baetid mayflies classified in the genera Acentrella Bengtsson, Baetiella Ueno, *Barbaetis* Waltz and McCafferty, *Heterocloeon* McDunnough, *Platybaetis* Müller-Liebenau, as well as most Holarctic *Baetis* Leach (Waltz and McCafferty, 1987a) and *Pseudocloeon* Klapalek sensu auctt. are distinguished from the larvae of all other baetids by their synapomorphic possession of a ventral femoral patch (Figs. 1, 4, 5, 12, 17). Within this grouping, which we call the *Baetis* complex of genera, generic classification has been dubious and polyphyletic, at least in part, because of the historical use of phyletically unreliable adult characters as *prima facie* generic criteria. In particular, the number of forewing marginal intercalaries and the relative size and venational characters of the hindwings have been emphasized. Our extensive morphological study of the *Baetis* complex of genera indicates that such wing characters do not necessarily reflect phyletic relationships. The reduction of the hindwing and its venation, although apomorphic, cannot be used alone for deciphering generic relationships because they are highly subject to parallel evolution and often accompany the widespread and independent reductionistic tendencies found among many different lineages of baetids.

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Recent studies of *Baetis*, e.g., Müller-Liebenau (1970, 1973a) and Morihara and McCafferty (1979a, b), have elucidated numerous larval characters of systematic use for *Baetis* species that are also generally applicable to other genera of the *Baetis* complex but not to all Baetidae. Species-level systematics of Baetidae is now primarily based on larval morphology (Müller-Liebenau, 1981; Müller-Liebenau and Hubbard, 1986) but, to a large degree, generic limits have remained adult oriented. Our incorporation of cladistically informative larval characterization for defining generic limits has led to the revisionary systematics of the *Baetis* complex genera *Pseudocloeon*, *Acentrella*, and *Baetiella*, and the description of a new genus.

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*Pseudocloeon* Klapálek, 1905

**Description.** Larva. Unknown. Adult. The adult was recently redescribed by Waltz and McCafferty (1985a).

*Type species. Pseudocloeon kraepelini* Klapálek 1905:105, by monotypy.


*Distribution.** Java.

*Remarks.* The only *bona fide* material of the genus *Pseudocloeon* is represented by the type series of four adult specimens deposited at the University of Hamburg. Other adult Baetidae that have been classified as species of *Pseudocloeon* are considered provisionally placed (Müller-Liebenau, 1981) because the genus has been historically characterized solely by the combined characters of paired intercalaries along the forewing margin and the absence of hindwings. Since hindwings have been lost numerous times in many independent lineages of Baetidae (Edmunds et al., 1976; Gillies, 1979; Müller-Liebenau, 1978, 1980, 1981, 1984a; Waltz and McCafferty, 1985b, c, 1986, 1987b, c, d), it follows that not only is there a strong possibility that the group of species presently assigned to *Pseudocloeon* are polyphyletic, but that the type species itself is congeneric with another genus. For example, our review of the type species, *P. kraepelini* (Waltz and McCafferty, 1985a), suggests a close, if not congeneric relationship with some *Baetis* species known in the *Baetis atrebatinus* complex (Müller-Liebenau, 1981, 1984a).

The doubt surrounding the integrity of *Pseudocloeon* would be soluble if the larval stage (the stage necessary for addressing phyletic affinities and taxonomic delimitation in the family Baetidae) of the type species of *Pseudocloeon* were known. Such is not the case and any larvae of species now assigned to *Pseudocloeon* are no more reliably representative of the type species of *Pseudocloeon* than are their associated adults. As the larval stages of the presumed species of *Pseudocloeon* have become known in detail, these species have generally been reclassified into genera with the appropriate
larval affinities (Edmunds, 1974; Edmunds et al., 1976; Müller-Liebenau, 1981; Waltz and McCafferty, 1985b, 1986, 1987b, c). We do not, however, agree with the indiscriminate move of all present *Pseudocloeon* into *Baetis* as per Keffermüller (1980) because there are in fact many included species that will require reassignment to genera other than *Baetis*.

Based on the above we propose that *Pseudocloeon* be restricted at this time to include only the type species from Java, *P. kraepelini*, although we are cognizant that many species will remain by default in *Pseudocloeon* until their larval stages are known and they can be correctly placed to genus. This taxonomic move essentially allows workers to proceed with the necessary revision of the Baetidae without relying on only presumptive concepts of *Pseudocloeon* and also precludes the further proliferation of a nomenclature that most probably would have to be revised at a later date. In keeping with this, we herein transfer many of the Oriental species previously placed in *Pseudocloeon* (Müller-Liebenau, 1981, 1982a, b, 1984b, 1985; Braasch, 1983) to the following new genus in addition to revising the genera *Acentrella* and *Baeiella* to include numerous species previously placed in *Pseudocloeon*.
Figs. 4-7. *Liebebiella* spp. larvae. 4. *L. orientale*, ventral femoral patch. 5. *L. vera*, ventral femoral patch. 6. *L. orientale*, tarsus and claw. 7. *L. orientale*, claw. (Scale: Figs. 4, 5, 7—bar = 10 µm; Fig. 6—bar = 100 µm)

**Liebebiella**, new genus

*Description.* Larva. Antennae ca. 1.5 × length of head capsule. Mandibular incisors fused (Müller-Liebenau 1982b: figs. 1f, 2d, 3e, 4d, 5d). Maxillary palp two segmented (*ibid.*: figs. 1c, 2c, 3d, 4c, 5c). Labium (*ibid.*: figs. 1b, 2b, 3b, 4b, 5b) with palps shortened (as in Fig. 2); segment 2 of palp with weakly developed inner lobe; segment 3 of palp rounded, weakly tapered, or flattened apically.

Prothorax with distinctive *lapponica*-type color pattern (*ibid.*: figs. 7, 9, 11) or without such pattern. Femora of all legs with long, multilaterally ciliate bristles (the cilia are relatively long and dense) (Müller-Liebenau, 1981: fig. 4i); ventral femoral patch present (Figs. 1, 4, 5). Metatibia with one or two (*ibid.*: fig. 4i) rows of long ciliate bristles. Tarsus (Fig. 6) of all legs with long, ventral subapical bristle. Claws (Fig. 7) with one row of denticles and one pair of long subapical bristles.

Abdomen without dorsal tubercles; not dorsoventrally flattened. Tergal scales absent, median row of long, hyaline bristles present dorsally; tube scales (Fig. 8) present or absent. Posterior marginal spines (Figs. 9, 10; Müller-Liebenau, 1982b: figs. 8, 10, 12, 13, 14) distinct and entire. Gills simple and without serrate margins. Cerci without (only in the species *L. atoki*) or with (Fig. 11) lateral bristles along interior margin.

**Adult.** Unknown.


_Material examined._ *Pseudocloeon difficilum* Müller-Liebenau, 3 larvae, FC30/b, 10.xii.1970, We-ganga in Balangopa (Belihuluya), leg. Starmülner, det. Müller-Lie-

Included species. Nominal species of *Liebebiella* (previously Oriental *Pseudocloeon*) include *L. orientale* (Müller-Liebenau), 1982b, New Combination (type species); *Liebebiella ambigu*a (Müller-Liebenau), 1982b, New Combination; *L. atoki* (Müller-Liebenau), 1982a, New Combination; *L. difficila* (Müller-Liebenau), 1982b, New Combination; *L. klapaleki* (Müller-Liebenau), 1982b, New Combination; *L. proxima* (Müller-Liebenau), 1984b, New Combination; *L. siveci* (Braasch), 1983, New Combination; and *L. vera* (Müller-Liebenau), 1982b, New Combination.

We give *Pseudocloeon* sp. 1 of Ulmer (1939) [characterized and illustrated also by
Müller-Liebenau (1981) and diagnostically compared with other species by Müller-Liebenau (1982b)] the formal name *Liebebiella deigma*, n. sp. We designate type specimens of *L. deigma* from Ulmer's original material as follows: Holotype; mature larva, FM 7, Tjurup, Musi in Ajer Simpang, 6.v.1929, slidemounted (Müller-Liebenau) in euparal(?), deposited Zoological Institut and Zoologisches Museum, University Hamburg. Paratypes, 4 larvae, same data as holotype, 3 larvae (missing head capsules) in alcohol, 1 male larva with mouthparts, legs, forewing of subimago (extracted from larval wingpads), slidemounted (Müller-Liebenau) in euparal(?), remainder of body in alcohol; male larva, South Sumatra, FM8b, Musi-Gebeit, warm spring Subang Ajam on the Kali Djervih in Tjurup, Mooskaskade, 32°–35°C, 7.v.1929. Prof. Feuerborn, leg slidemounted (Müller-Liebenau) in euparal(?), deposited Zoological Institut and Zoologisches Museum, University Hamburg.

**Distribution.** Oriental.

**Etymology.** Feminine gender. *Liebebiella*—an arbitrary combination of letters based upon the surname of Ingrid Müller-Liebenau, the German ephemeroid and ichthyologist.

**Remarks.** The genus *Liebebiella* is distinguished from all other *Baetis* complex genera by the form of its labium (similar to *Acentrella*) along with the combined presence of dorsal femoral bristles that are multilaterally ciliate (the ciliae are relatively long and dense), a greatly elongated distal bristle on the tarsus, and two well-defined rows of metatibial bristles (one row only in the species *L. atoki*).

As previously alluded to by Müller-Liebenau (1981, 1982b), the group of species that we have placed in the genus *Liebebiella* is clearly derived from an *Acentrella*-like ancestor possessing all of the apomorphies discussed herein under that genus. In addition, *Liebebiella* possesses a distinctive set of autapomorphic characters, including the presence of multilaterally ciliate (ciliae relatively long and dense) dorsal femoral bristles, two rows of long multilaterally ciliate metatibial bristles (except in *L. atoki*), a long distal tibial bristle, and a distinctive medial row of long hyaline bristles on the abdominal terga [independently derived in other unrelated taxa, e.g., *Baetodes* Needham and Murphy (Cohen and Allen, 1978)].

*Acentrella* Bengtsson, 1912

*Acentrella* frequently has been placed in synonymy with the genus *Baetis* (e.g., Edmunds and Traver, 1954; Grandi, 1956, 1960; Müller-Liebenau, 1965, 1970; Edmunds et al., 1976; Morihara and McCafferty, 1979a), or regarded as a subgenus of *Baetis* (e.g., Demoulin, 1970). Most recently it has been recognized as a distinct genus closely allied to Oriental species provisionally assigned to *Pseudocloeon* (Müller-Liebenau, 1981, 1982b).

**Description.** Larva. Antennae ca. 1.5 × length of head capsule and situated in lower one-third of head capsule (Edmunds et al., 1976: fig. 11). Mandibular incisors completely fused or partially fused (i.e., discernible one from another). Maxillary palp two segmented (Müller-Liebenau, 1970: fig. 46c). Labium (Fig. 2) compact with labial palps (Morihara and McCafferty, 1979a: fig. 13b; Müller-Liebenau, 1970: fig. 46d) reduced; segment 2 of labial palps with weakly developed inner lobe; segment 3 of labial palps evenly rounded to slightly truncate.

Thorax broad and dorsoventrally flattened. Prothorax generally with distinctive *lapponica*-type pattern (Müller-Liebenau, 1970: figs. 43, 44). Femora (ibid.: figs. 46c,
Figs. 12–16. Acentrella spp. larvae. 12. A. gnom, ventral femoral patch. 13. A. ampla, tergal posterior margin. 14. A. gnom, tergal posterior margin. 15. A. turbida, tergal posterior margin. 16. A. turbida, sternal friction pad. (Scale: Figs. 12–16—bar = 10 µm; Fig. 14—no bar)

49e) of all legs with long setae minutely, multilaterally ciliate (the ciliae are relatively short and sparse) or with short glabrate bristles dorsally (ibid.: fig. 46e); ventral femoral patch present (Figs. 1, 12). Metatibia with one row of bristles dorsally. Tarsus of all legs without long, ventral subapical seta. Claws with one row of denticles.

Abdomen without dorsal tubercles; often dorsoventrally flattened. Tergal scales and scale bases absent (Figs. 13, 14); median row of long hyaline bristles present or absent dorsally; tube scales present (as in Fig. 8) or absent. Posterior marginal spines (Figs. 13–15) poorly developed, often spiculate or multidentate. Gills simple and
without serrate margins. Cerci with lateral bristles. Median terminal filament generally reduced.

Adult. Forewings with paired marginal intercalaries; crossveins and adjoining membranes unpigmented. Hindwings present or reduced and without costal process, or hindwings absent. Metascutellum flattened and directed posterad (Edmunds et al., 1976: fig. 261). Male genitalia often with strongly sclerotized and rectangular process (Müller-Liebenau, 1970: fig. 42a, b; Traver, 1935: fig. 168) present between forceps bases.

**Type species.** *Acentrella lapponica* Bengtsson 1912:110, by original designation.


Numerous collections of Nearctic *Baetis amplus* (Traver), *Baetis insignificans* McDunnough, and *Pseudocloeon carolina* (Banks) (BK, CU, PERC, SWRC, USNM, UU, VPI).

**Included species.** Nominal species that we can presently assign to *Acentrella* are *A. lapponica* Bengtsson, 1912 (type species); *A. ampla* Traver, 1932; *A. carolina* (Banks), 1924, New Combination (previously Nearctic *Pseudocloeon*); *A. chantauensis* (Kluge), 1981, New Combination (previously Palearctic *Baetis*); *A. fenestrata* (Kazlauskas), 1963 New Combination (previously Palearctic *Pseudocloeon*); *A. gnom* (Kluge), 1983, New Combination (previously Palearctic and Oriental *Pseudocloeon*) [=*Pseudocloeon ultimum* Müller-Liebenau, 1985, New Synonymy]; *A. insignificans* (McDunnough), 1926, New Combination (previously Nearctic *Baetis*); *A. lata* (Müller-Liebenau), 1985, New Combination (previously Palearctic *Pseudocloeon*); *A. sibirica* (Kazlauskas), 1963, New Combination (previously Palearctic *Pseudocloeon*); *A. sinaica* Bogoescu, 1931; *A. tonneri* (Braasch and Soldán), 1983, New Combination (previously Palearctic *Baetielia*) and *A. turbida* (McDunnough) 1924, New Combination (previously Nearctic *Pseudocloeon*). We regard *Acentrella suzukiella* Matsumura (1931) as provisionally assignable to *Acentrella* on the basis of published descriptions. The Afrotropical species *A. capensis* Barnard (1932), *A. monticola* Crass (1947), *A. natalensis* Crass (1947), and *A. sp. A* Kimmins (1955) are not congeneric with *Acentrella* but cannot be formally reclassified until a comprehensive review of these species is possible.

**Distribution.** Holarctic and Oriental.

**Remarks.** As redefined herein larvae of the genus *Acentrella* Bengtsson may be separated from all other *Baetis* complex genera by the following combined characters: compact labium with reduced and apically rounded to truncate labial palps; femora, and often the tibia, with relatively long (compared to other *Baetis* species) dorsal bristles; only one row of metatibial bristles; absence of a long distal tibial bristle; absence of tergal scales; poorly developed posterior marginal spines of the abdominal terga; and cerci with prominent lateral setae.

*Acentrella* includes species with hindwings, species with reduced hindwings, and
species without hindwings. The previous diagnoses (Müller-Liebenau, 1981, 1985) of this genus, which were based on reduced size and sexually dimorphic character states of the adult hindwing, are untenable on the basis of larval characters described herein.

Based on outgroup (Holarctic Baetis) comparisons, the genus Acentrella appears to have been derived from a Baetis-like ancestor that as larvae possessed short, glabrous dorsal femoral and tibial bristles, well-developed hindwing pads, scaled abdominal terga, well-developed posterior marginal spines, spinous margined gills, and a median terminal filament subequal to the cerci. From this a derived lineage constituting Acentrella demonstrates the following apomorphies in its most ancestral species: 1) compaction of the mouthparts including a reduction in the relative lengths of the labial palp segments, 2) reduction of the hindwing pads, 3) loss of abdominal tergal scales, 4) reduction of the posterior marginal spines, 5) loss of marginal spines on the gills, and 6) reduction in the size of the median terminal filament relative to the cerci.

Genera closely allied to Acentrella include Heteroclœon McDunnough (Morihara and McCafferty, 1979c) and Liebebiella. Species previously associated with Pseudoclœon that were found to be closely allied to Heteroclœon by Morihara and McCafferty (1979c) belong to Acentrella.

Within Acentrella several apomorphic larval characters appear that may be indicative of phyletically related subgroups of species within the genus. One such character is the presence of spiculate or multidentate posterior marginal spines (Fig. 15) of the abdominal terga. Although all species of Acentrella possess reduced posterior marginal spines, some species, e.g., A. lapponica, A. carolina, A. chantauensis, A. fenestrata, A. sibirica, A. sinaica, and A. turbida, possess posterior marginal spines that are very reduced and that form distinct spiculae, some or all of which may be multidentate depending on the species considered. The relatively more ancestral posterior marginal spines found in the remaining species of Acentrella retain the appearance of a single row of distinctly formed spines that are not spiculate (Fig. 13). The subgroup including A. lapponica also shows a tendency for a dorsoventral flattening of the abdomen and a correlated increase in the size of the paired abdominal friction pads (Fig. 16) that individually may extend to cover about one-third of each abdominal sternite, and a tendency for dark-colored abdominal terga 2–6 in the adult stage rather than light colored terga as may be found in other species.

In the majority of Acentrella species we examined, the clypeus and labrum are distinctly folded beneath the head capsule as described and illustrated by Edmunds et al. (1976: fig. 111), although at least one of the relatively more enigmatic species, A. ampla, does not possess this character. We have seen baetids including members of the Nearctic Baetis propinquus species group (Morihara and McCafferty, 1979b) and other species, which are clearly unrelated to Acentrella and its cognates, that have independently derived a similar positioning of the clypeus and labrum beneath the head capsule.

Baetiella Ueno, 1931


The genus *Baetiella* Ueno has been variously regarded as a subgenus of *Pseudocloeon* Klapálek (Kazlauskas, 1963) or a synonym of *Pseudocloeon* (Bogoescu and Tabacaru, 1957; Gose, 1980; Müller-Liebenau, 1985). We regard *Baetiella* as a distinct and valid genus.

**Description.** Larva. Antennae ca. 1.5 × length of head capsule. Mandibular incisors (Müller-Liebenau, 1985: fig. 6e) discernible one from another, i.e., with visible fusion line. Maxillary palp two segmented (*ibid.*: fig. 6d). Labium (Fig. 3; *ibid.*: fig. 6b) with palps shortened; segment 2 of palp with weakly developed inner lobe; segment 3 of palp distinctly coniform and symmetric.

Prothorax without distinctive *lapponica*-type color pattern. Femora of all legs with long, non-ciliate bristles (*ibid.*: fig. 6m); ventral femoral patch present (Figs. 1, 17). Metatibia with one row of long dorsal bristles. Tarsus of all legs without long ventral subapical bristle. Claws (Figs. 18, 19) with one row of denticles.

Abdomen with single or paired dorsal tubercles (Fig. 20; *ibid.*: fig. 13; Gose, 1980: fig. 53) or without dorsal tubercles and not dorsoventrally flattened. Scales present or absent, median row of long, hyaline bristles absent dorsally; tube scales sometimes present. Posterior marginal spines (Fig. 21) numerous, distinct, and entire. Gills simple and without serrate margins. Cerci with numerous bristles or with numerically reduced lateral bristles (Figs. 22, 23) on interior margin. Median terminal filament shorter than cerci.

Adult. Forewings (Gose 1965: fig. 1) with paired marginal intercalaries and often
with distinctly pigmented areas adjoining and including the crossveins. Metascutellum (Edmunds et al., 1976: fig. 262) not flattened but projecting dorsoposteriorly. Male genitalia without medial process (Gose, 1965: fig. 4).

_Type species._ *Acentrella japonica* Imanishi, 1930:110, by original designation (Ueno, 1931).


_Included species._ *Baetiella japonica* (Imanishi), 1930 (type species); *Baetiella aino* (Matsumura), 1931, New Combination (previously Palearctic *Pseudocloeon*); *B. armata* Braasch; *B. ausobskyi* Braasch; *B. bispinosa* (Gose), 1980, New Combination (previously Palearctic *Pseudocloeon*) [= _Neobaetiella macani_ Müller-Liebenau, 1985: 108, New Synonymy] [= _Neobaetiella imanishi_ Müller-Liebenau, 1985:108, fig. 19, Nomen Nudum (an editorial oversight)]; *B. imanishii* Braasch; *B. innnotata* (Braasch), 1978, New Combination (previously Palearctic *Baetis*); *B. ladakae* Traver, 1939; *B. marginata* Braasch; *B. muchei* (Braasch), 1978, New Combination (previously Palearctic *Pseudocloeon*); *B. tuberculata* (Kazlauskas), 1963, New Combination (previously Palearctic *Pseudocloeon*) [= _Neobaetiella uenoi_ Müller-Liebenau (1985:107), unavailable name, Articles 1b(6) and 13b ICZN]; and *B. ursina* (Kazlauskas), 1963, New Combination (previously Palearctic *Baetis*).

_Distribution._ Palearctic, Oriental.

_Remarks._ Larvae of *Baetiella* are distinct from all other *Baetis* complex genera by the uniquely conical form of the third labial palpal segment; femora with relatively long (compared to other *Baetis* complex species) dorsal bristles; numerous and distinct posterior marginal spines; and an abdomen that is not dorsoventrally flattened.

Although we do not know the general applicability of Kluge's (1983) biological and behavioral observations regarding *B. tuberculata*, we do emphasize two points that may eventually be found to have systematic significance. First, is an observation that the subimago of *B. tuberculata* rests with its wings outstretched. Other baetid subimagos that we know of hold the wings vertically uplifted over the body. The second observation is that the pigmentation of the forewings takes approximately 24–48 hours to develop fully. This latter observation has obvious implications in that preserved specimens of teneral adults (less than 24 hr old) may not possess the characteristic pigmentation of the wings.

_Baetiella_ appears to have been derived independently of *Acentrella*. This conclusion is supported by numerous character data. We hypothesize that *Baetiella* was derived from a *Baetis*-like ancestor, but the particular species complex for outgroup comparisons of *Baetiella* is not clear. Müller-Liebenau (1970) suggested that *B. ursina*,...
which we regard as a relatively plesiomorphic species of *Baetiella*, appeared to be related to the *Baetis niger* group of species. Our own review of this species, based in part on adult data presented by Kluge (1983), indicates a possible relationship with *Baetis lutheri* Müller-Liebenau due to similarities of the male genitalia and striking similarities in the larval mouthpart and tergal structures. The synapomorphies defining *Baetiella*, i.e., the uniquely formed mouthparts, tergal armature, gills, reduced median terminal filament and characters of the cerci, are evidently derived from within the *Baetis* complex of genera and independent of the *Acentrella* lineage.

The relatively most ancestral species of *Baetiella* are the distinctive and possibly synonymous Palearctic *B. ursina* and *B. innotata*. These retain a moderately developed median terminal filament, cerci that bear numerous bristles along the interior margin and that are shorter than the body in length, tergal scales, and a well-developed hindwing pad in the larval stage. In all other known *Baetiella* the median terminal filament of the larval stage is reduced to one segment, the cerci bear numerically reduced bristles along the interior margin and are of variable length but often longer than the body in length, tergal scales are absent, and the hindwing pad is greatly reduced or absent. Kluge (1983) has described the adult of *B. ursina*, which apparently differs from other known *Baetiella* species by the retention of the relatively plesiomorphic condition (determined by outgroup comparisons, i.e., *Baetis*) of forewings.
that are clear and unpigmented. Other known adults of *Baetiella* possess clearly pigmented areas adjacent to and including the crossveins of the forewings.

*Baetiella japonica na* Imanishi and *Baetiella japonica* (Imanishi), the type species, are not the same. The type species of *Neobaetiella* was improperly designated by Müller-Liebenau (1985) to be the descriptively proposed and temporary taxon *Baetiella japonica na* Imanishi, 1940, for which she proposed the new name *Neobaetiella uenoi* Müller-Liebenau (1985:107) (erroneously cited as new combination). The designation of a new name for the above taxon does not meet the criteria of name availability [International Code of Zoological Nomenclature, 3rd ed., Article 1, b(6) and Article 13] because the description of *Baetiella japonica na* by Imanishi was clearly intended as a temporary reference [Article 1, b(6)] and not a formally described taxon. Furthermore, Kluge (1983) demonstrated that the proper name to which Imanishi’s (1940) larva refers was Pseudocloeon tuberculatum Kazlauskas, 1963 (now *Baetiella tuberculata*). In addition, *Baetiella nosegawensis* Gose, 1965, was designated a junior synonym of *P. tuberculatum* by Kluge (1983). Müller-Liebenau (1985) included discussions of *P. tuberculatum* in her review, but did not formally transfer it to *Neobaetiella* (1985:108). In any case, her intended type of *Neobaetiella* is actually synonymous with *B. tuberculata*.

Based on our study of *B. tuberculata*, we found that in all characters (both larval and adult) this species is not generically distinct from other *Baetiella* and is congeneric with *B. japonica* (the type species of *Baetiella*). *Baetiella tuberculata, B. ausobskyi, B. armata,* and *B. imanishii* are uniquely characterized among all other described *Baetiella* by the presence of a dorsal tubercle on the posterior margin of the abdominal terga. *Baetiella bispinosa* [the only other nominal species originally placed in *Neobaetiella* as *N. macani* by Müller-Liebenau (1985)] possesses bilobed tubercles on the posteriormost abdominal terga and a single tubercle on segments 1–3. The presence and condition, or absence, of tubercles is intragenerically variable in at least some other baetid genera, e.g., *Jubabaetis* (unpublished) and the New World genus *Baetodes* (Cohen and Allen, 1978). Further, the distinctive and highly derived *B. bispinosa* possesses all of the synapomorphic characters that we regard as diagnostic for larvae of the genus *Baetiella*.

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