Five new species of Pseudocloeon Klapálek, 1905, 
(Fam. Baetidae) from the Oriental Region 
(Insecta, Ephemeroptera) 
with some general remarks on Pseudocloeon 

Fünf neue Arten von Pseudocloeon Klapálek, 1905, (Fam. Baetidae) 
vom Orient (Insecta, Ephemeroptera) 
mit einigen allgemeinen Bemerkungen über Pseudocloeon 

By I. MÜLLER-LIEBENAU 

With 14 figures and 1 table in the text 

Abstract 

The nymphs of five new species of the genus Pseudocloeon Klapálek (1905) are 
described in detail and distinguishing characteristics are illustrated. The species are: Ps. 
verum sp. n. from Malaysia, and Ps. difficilum sp. n., Ps. orientale sp. n., Ps. ambiguum sp. 
n. and Ps. klapaleki sp. n. from Sri Lanka. A Verification Table for the newly described 
species includes Pseudocloeon sp. 1. Ulmer (1939) from South Sumatra (Müller-Liebenau 1981) 
and Ps. atoki from the Philippines (Müller-Liebenau 1982). Hypothetical 
species groups are established based on mouthpart and leg morphology. 

Introduction 

A great uncertainty still exists in our knowledge of the taxonomic situation 
of the genus Pseudocloeon within the family Baetidae. The genus Pseudocloeon was established by Klapálek (1905) from a male specimen from Java, Ps. 
kræpelinii. The nymph of this species is still unknown. More recent studies of 
this confusing genus (Edmunds et al. 1976; Müller-Liebenau 1981) point out 
that probably many Pseudocloeon species from outside the Oriental Region are 
not congeneric with Klapálek's Pseudocloeon. Based on a review of Ulmer’s 
baetid material, which is stored in the Zoological Museum of the Zoological 
Institut, University Hamburg, an attempt was made (Müller-Liebenau 1981) 
to give a new concept of Klapálek’s genus Pseudocloeon restricting it to the 
Oriental Region. In their catalogue of the Ephemeroptera of the Indian Sub- 
region Hubbard & Peters (1978) do not mention any species of Pseudocloeon 
from Malaysia or Sri Lanka. In this paper detailed illustrated descriptions are 
given of a new species from Malaysia, Ps. verum sp. n., and of four new species 
from Sri Lanka: Pseudocloeon difficilum sp. n. Ps. orientale sp. n., Ps. ambiguum 
sp. n. and Ps. klapaleki sp. n. 

These species are compared with two previously described oriental Pseu- 
docloeon species, Ps. atoki from the Philippines (Müller-Liebenau 1982) and 
Pseudocloeon sp. 1 Ulmer (1939) from South Sumatra (Müller-Liebenau 1981).
The five herein described species of *Pseudocloeon* show a similar color pattern on the pronotum and dorsum of the abdomen. This color pattern, caused by muscle insertions, is typical for the nymphs of the genus *Pseudocloeon* (also in some respect for “*Pseudocloeon*” species form outside the Oriental Region and for the genus *Acentrella Bengtsson*). The darker figures on the pronotum and dorsum of the abdomen are somewhat different in each species. But whereas these are good characteristics for the genus complex (*Pseudocloeon* sensu Klapálek, other “*Pseudocloeon*” auct. and *Acentrella*), they are less reliable in species determination. Nevertheless they are figured in some of the following species descriptions as far as suitable material for photographs is available (Figs. 7, 9, 11).

According to definition the new species have in common a number of generic characters which are quoted here again in general and which are not mentioned in the species descriptions:

**Antennae:** about one and a half length of head capsule. — **Legs:** outer margin of femur and tibia of all three legs with dense row of long, finely feathered bristles, and with two such rows on tibia of third leg. Tarsus also with long, fine bristles on outer margin, but less dense than on femur and tibia; one conspicuous bristle on inner margin of tarsus near apex. In all seven species compared, the tibia of 1st and 2nd leg is about one and a half times as long as femur, tibia of 3rd leg about same length as femur. — **Hind wing pads** are minute, slender¹. — **Cerci** fringed with swimming bristles along inner margin. — Seven pairs of abdominal **gills** are developed. — The hyaline bristles on surface of **terga** are long in a longitudinal median area, in general on terga II—V/VI, and shorter on lateral parts of segments. The long median bristles are easily recognised even at lower magnification because of detritus particles collected between the bristles.

A Verification Table is given for the five newly described species in comparison with *Pseudocloeon* sp. 1 ULMER (1939) from South Sumatra (MÜLLER-LIEBNAU 1981) and *Pseudocloeon atoki* from the Philippines (MÜLLER-LIEBNAU 1982).

*Ps. verum* sp. n. was collected by Dr. J. E. BISHOP, Crafers, Australia, in the River Gombak near Kuala Lumpur, Malaysia. The four species from Sri Lanka were collected by Professor Dr. F. C. STARMÜHLNER and Dr. G. WENINGER, Vienna, and Dr. H. H. COSTA, Kelaniya, during the Austrian-Ceylonese Hydrobiological Mission 1970 of the 1st Zoological Institute, University of

¹ The reduced hind wing pads of nymphs in *Pseudocloeon* (and some *Baetis* species) appear to be relics of originally larger hind wind pads of larger hind wings in the imagos. Fig. 4 g shows a hind wing pad with tendency for a hind wing in subimago, but this will be — if developed in imago at all — too small to recognise.
Five new species of *Pseudocloeon* KLAPÁlek

Vienna (Austria) and the Department of Zoology, Vidyalankara University of Ceylon, Kelaniya.

**Descriptions**

*Pseudocloeon verum* sp. n.

Figs. 1, 7, 8

Material: ca. 72 nymphs.

Mature nymph. — **Coloration:** Pronotum and dorsum of abdomen as in Fig. 7. The middle muscle insertion areas on pronotum triangular. Legs light brownish, tarsi distally somewhat darker, caudal filaments light. — **Body length:** \( \sigma \) 3.1 mm, cerci 2.1 mm; \( \varphi \) 3.2 mm, cerci 2.4 mm. Abdomen somewhat flattened as in *Acentrella*. — **Antennae** (Fig. 1d and e): inner margin of segments serrated. — **Labrum** (Fig. 1a) wider at base than in frontal part, twice as broad as long. — **Mandibles** (Fig. 1f): all canini well developed and of nearly same size. — **Legs** (Figs. 1g, h): a number of short, pointed, submarginal bristles, (shorter than distance between bases of long marginal bristles, Fig. 1i). — Surface and posterior margin of terga as shown in Fig. 8. Hyaline bristles on terga of different length. Spines on posterior margin of terga elongate, pointed.


Paratypes: ca. 65 nymphs in alcohol, 5 slide preparations.

Holotype and some Paratypes are deposited at Zoologische Staatsammlung, München. Some Paratypes are deposited at Zool. Mus. Zool. Inst., University Hamburg, and at Florida A & M University, Entomology and Structural Pest Control, Tallahassee, Florida.

*Pseudocloeon verum* sp. n. appears closely related to *Pseudocloeon* sp. 1 Ulmer (1939). Both species have the inner margin of antennal segments serrated. The most striking morphological difference is the submarginal bristles on femora, which are short and pointed and only half the length of distance between the bases of the long marginal bristles in *Ps. verum* sp. n. (Fig. 1i), whereas they are longer and of nearly same length as distance between bases of long marginal bristles in *Pseudocloeon* sp. 1 Ulmer (1939) (Fig. 6b). Also the abdominal gills appear somewhat different in both species (Fig. 1f and 6d). The hyaline bristles on surface of terga are very long in *Ps. verum* sp. n. (Fig. 8) whereas they are only about 4—5 times as long as broad — and some of them comparatively wide — in *Pseudocloeon* sp. 1 Ulmer (1939).

The ecological difference between both species is evident: *Ps. verum* sp. n. from Malaysia occurs everywhere in the River Gombak and its tributaries at altitudes ranging from about 1,200 m to 30 m (BISHOP 1973), *Pseudocloeon* sp. 1 Ulmer (1939) was collected on South Sumatra in moss cascades in warm springs at 32°—34°C.

Of all species discussed in this paper, *Ps. verum* sp. n. and *Pseudocloeon* sp. 1 Ulmer (1939) are most closely related to the genus *Acentrella* Bengtsson (1912) (MÜLLER-LIEBENAU 1981).

*Pseudocloeon difficilum* sp. n.

Figs. 2, 9, 10

Material: ca. 100 nymphs.

Mature nymph. — **Coloration** (Fig. 9): similar to *Pseudocloeon* in general. The middle muscle insertion areas on pronotum shaped like an "S". — **Body**
Fig. 1. *Pseudocloeon verum* sp. n., nymph: a) labrum; b) left half of labium; c) maxilla; d) antenna; e) segments of antenna with serrated inner margin; f) canini and molar area of left and right mandible; g) 3rd leg; h) claw; i) section of outer margin of femur with one submarginal bristle at higher magnification; j) paraproct; k) left half of metatergum with minute hind wing pads; l) abdominal gills I–VII.

Length: ♂ 3.8 mm, cerci 2.1 mm; ♀ 4.5 mm, cerci 3.0 mm. — Labrum (Fig. 2a): wider at base than in frontal part, less broad than twice the length. — Mandibles (Fig. 2d): all canini of nearly same size. — Legs (Fig. 2h) without small submarginal bristles on outer margin of femur. — Surface and posterior margin of terga as in Fig. 10.


Paratypes: ca. 95 nymphs in alcohol, 3 slide preparations.

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2 Fig. 1i, 3l, 4h, 5h, 6b, 6c are of same magnification.
Five new species of *Pseudocloeon* Klapálek

Fig. 2. *Pseudocloeon difficilum* sp. n., nymph: a) labrum; b) left half of labium; c) maxilla; d) canini and molar area of left and right mandible; e) antenna; f) left half of metatergum with minute hind wing pad; g) paraproct; h) 1st leg; i) claw; j) abdominal gills I—VII.

Holotype and some Paratypes are deposited at Zool. Staatssammlung, München. Some Paratypes are deposited at the Zool. Mus. Zool. Inst., University Hamburg, and at Florida A & M University, Entomology and Structural Pest Control, Tallahassee, Florida.

The morphological details of *Ps. difficilum* sp. n. show close relationship to *Ps. verum* sp. n. — *Ps. difficilum* sp. n. differs from *Ps. verum* sp. n. in having smooth inner margins of antennal segments, which is serrated in *Ps. verum* sp. n. Submarginal bristles near the bases of the long, marginal bristles on the outer margins of the femora are not developed. The spines on the posterior margins of the terga are elongate and pointed in *Ps. verum* sp. n. (Fig. 8) but shorter and rather blunt in *Ps. difficilum* sp. n. (Fig. 10).

*Ps. difficilum* sp. n. was collected in running waters in Sri Lanka at altitudes ranging between 650 m—30 m above sea level, where the nymphs live on and under stones and
Fig. 3. *Pseudocloeon orientale* sp. n., nymph: a) labrum; b) left half of labium; c) paraglossa, ventral; d) maxilla; e) canini and molar area of left and right mandible; f) antenna; g) left half of metatergum with minute hind wing pad; h) 1st leg; i) 2nd leg; j) 3rd leg (black dots along outer margin of femora and tarsi indicate bases of long, fine submarginal bristles; k) claw; l) segment of outer margin of femur with small submarginal bristles at higher magnification; m) paraproct; n) abdominal gills I—VII.

banks in stronger current and in the cascades. The water temperature in collecting sites was between 18.3 and 27.3 °C.
Five new species of *Pseudocloeon* KLAPÁLEK

**Fig. 4. Pseudocloeon ambiguum** sp. n., nymph: a) labrum; b) left half of labium; c) maxilla; d) canini and molar area of left and right mandibles; e) antenna; f) right half of metatergum with minute hind wing pad; g) hind wing pad at higher magnification; h) segment of outer margin of femur with long, fine bristles and with very small submarginal bristles at higher magnification; i) claw; j) paraproct; k) base of caudal filaments with terminal filament reduced; l) abdominal gills I—VII.

Collecting sites in Sri Lanka (COSTA & STARMÜHLNER 1972): 7/b, 7/c, 8/2, 12/c, 13/d, 15/c, 24/2, 30/b, 34/b, 37/c.

**Pseudocloeon orientale** sp. n.

Figs. 3, 11, 12

Material: ca. 200 nymphs.

Mature nymph. — Coloration (Fig. 11): The middle muscle insertion areas on pronotum similar to *Ps. verum* sp. n. but with an indentation near middle of triangular. Legs brownish, a longitudinal light line on basal half of femur which is vertically
Fig. 5. *Pseudocloeon klapaleki* sp. n., nymph: a) labrum; b) left half of labium; c) maxilla; d) canini and molar area of left and right mandibles; e) antenna; f) left half of metatergum with minute hind wing pad; g) paraproct; h) section of outer margin of femur with long, fine bristles and with smaller submarginal bristles at higher magnification; i) claw; j) abdominal gills I—VII.

directed near base of femur. — **Body length**: ♂ 5.1 mm, cerci 4.9 mm; ♀ 5.9 mm, cerci 5.6 mm. — **Labrum** (Fig. 3 a): nearly equal in width at base and in frontal part, and about twice as broad as long. — **Mandibles** (Fig. 3 e): outermost group of canini fused into one blade. — **Legs** (Fig. 3 h, i, j, l): a number of broad and blunt submarginal bristles of different length on femur of all three legs. — **Claw** (Fig. 3 k): two apically bowed bristles near apex. Surface and posterior margin of terga as shown in Fig. 12. Hyaline bristles on surface of different length; spines on posterior margin of terga broad based, blunt at apex.

Five new species of *Pseudocloeon* Klápálek

Fig. 6. *Pseudocloeon* sp. 1 (Ulmer 1939), nymph: a) labrum; b) section of outer margin of femur with long, fine bristles and small, submarginal bristle at higher magnification; — *Pseudocloeon atoki*, nymph: c) section of outer margin of femur with long, fine bristles and with a small submarginal bristle at higher magnification; — d) *Pseudocloeon* sp. 1 Ulmer (1939), nymph: abdominal gills I—VII; e) *Pseudocloeon atoki*, nymph: abdominal gills I—VII.

Paratypes: ca. 195 nymphs in alcohol, 3 slide preparations.

Holotype and some Paratypes are deposited at the Zool. Staatssammlung, München. Some Paratypes are deposited at Zool. Mus. Zool. Inst., University Hamburg, and at Florida A & M University, Entomology and Structural Pest Control, Tallahassee.

*Pseudocloeon orientale* sp. n. is the largest of the newly described species from Malaysia and Sri Lanka. It differs from the preceding species *Ps. verum* sp. n. and *Ps. difficilum* sp. n. in that the outermost group of canini on the mandibles is fused into one blade (also in the next species, *Ps. ambiguum* sp. n.). The submarginal bristles near outer margin of femur are broad and blunt, of different length, in *Ps. orientale* sp. n. (Fig. 31), and short, narrow and pointed in *Ps. verum* sp. n. (Fig. 1 i) whereas such bristles are not developed in *Ps. difficilum* sp. n. The spines on posterior margins of terga are basically broad and blunt at apex.

*Ps. orientale* sp. n. inhabits water courses at altitudes between 1,500—700 m and at water temperatures from 18.3—23.8 °C. Here the nymphs live under and on stones in stronger current and in the cascades.

Collecting sites in Sri Lanka (Costa & Starmühlner 1972): 6/c, 14/b, 16/a, 16/b, 16/c, 19/c, 20/b/c, 23/b, 24/3, 26/b, 27/b, 35/b.

*Pseudocloeon ambiguum* sp. n.

Material: 8 nymphs.
Not fully mature nymph. — Coloration: light brownish in general, similar to *Ps. difficilum* sp. n. (no suitable material is available for a photograph). The middle muscle insertion areas on pronotum similar to those of *Ps. difficilum* sp. n. (Fig. 9). — Body length: $\sigma$ 4.0 mm, cerci 3.8 mm. — Labrum (Fig. 4a): about twice as broad as long, and of nearly same width at base as in distal part. — Mandibles (Fig. 4d): outermost group of canini fused into one blade. — Legs (Fig. 4h): on femora of all three legs only a few extremely small blunt submarginal bristles, which are smaller than the bases of the long marginal bristles. — Claw (Fig. 4i): two apically
Fig. 11. *Pseudocloeon orientale* sp. n., nymphal exuvium.  
Fig. 12. *Pseudocloeon orientale* sp. n., surface and hind margin of nymphal tergum.  
Fig. 13. *Pseudocloeon ambiguum* sp. n., surface and hind margin of nymphal tergum.  
Fig. 14. *Pseudocloeon klapaleki* sp. n., surface and hind margin of nymphal tergum.

Bowed bristles near apex. Surface and posterior margin of terga as shown in Fig. 13. Hyaline bristles on dorsum of different length; spines on posterior margin with broad base, blunt.


Paratypes: Eight nymphs in alcohol.

Holotype and some Paratypes are deposited at the Zool. Staatsammlung, München. Two Paratypes are deposited at Zool. Mus. Zool. Inst., University Hamburg,
and the rest at Florida A & M University, Entomology and Structural Pest Control, Tallahassee, Florida.

_Pseudocloeon ambiguum_ sp. n. is closely related to the preceding species _Ps. orientale_ sp. n. A distinguishing morphological character is mostly seen in the submarginal bristles on outer margin of femur which are considerably smaller than in _Ps. orientale_ (Figs. 31 and 4 h). More evident are the differences in body size of the nymphs and in their habitats. _Ps. ambiguum_ sp. n. is considerably smaller than _Ps. orientale_ sp. n. and whereas the few specimens of _Ps. ambiguum_ sp. n. were collected at about 500–250 m at a water temperature of 25.1–27.2 °C, _Ps. orientale_ sp. n. is frequent at higher altitudes of 1,200–700 m and at water temperatures ranging from 18.3–23.8 °C. As _Ps. orientale_ sp. n., also the nymphs of _Ps. ambiguum_ sp. n. prefer habitats on and under stones in stronger currents and in cascades.

Collecting sites in Sri Lanka (Costa & Starmühlner 1972): 9/c, 10/b, 10/c, 11/c.

**Pseudocloeon klapaleki** sp. n.

Figs. 5, 14

Material: 2 nymphs.

Mature nymph. — Coloration: light brownish in general. The middle muscle insertion areas on pronotum similar to those of _Ps. orientale_ sp. n. (Fig. 11). — Body length: Q 3.9 mm, cerci 6.0 mm. — Labrum (Fig. 5 a): tapering basically, about twice as broad as long. — Mandibles (Fig. 5 d): although the mandibles of both specimens available appear to be worn, certainly the outermost group of canini is fused into a blade. — Legs (Fig. 5 h): blunt submarginal bristles on outer margin of femur of all three legs of about same length as distance between the bases of long marginal bristles. — Claw (Fig. 5 i): two apically bowed bristles near apex. Abdominal gills (Fig. 5 j) elongate. — Surface and posterior margin of terga as shown in Fig. 14. Transverse shagreened structures on terga are more evident than in other species, and only a few threadlike bristles are present in a median longitudinal row.


Paratype: 1 nymph in alcohol.


_Pseudocloeon klapaleki_ sp. n. is clearly distinguished from the other species described herein by the labrum, third segment of labial palpus, submarginal bristles on outer margin of femur, gills and surface of terga. Concerning labrum and labial palp a certain relationship exists to _Ps. atoki_ from the Philippines (Müller-Liebenau 1982).

The cerci of this species are considerably longer than the body, which might indicate adaptation to extremely strong currents. The two nymphs in the collection were found under stones in cascades with water temperatures of 16.1–17.2 °C and at an altitude of 1,850 m above sea level at site 17/c (Costa & Starmühlner 1972).

**Discussion**

This study is the first attempt to give a hypothetical subgroup concept for the complex genus _Pseudocloeon_ Klapálek (1905). However, it would be pre-
mature for the establishment of subgenera or new genera under the present interpretation. The species groups are mainly based on mouthparts as these appear to be stable, viz. the labrum, the 3rd segment of the labial palpus, and the mandibles.

Nevertheless it has to be taken in consideration that of some species only a few specimens were available for study and on the other side it is not possible to tell apart a great number of specimens in one vial, because often the mandibles, a good character for primary orientation, are worn and it is too time-consuming to make slide preparations of a great number of specimens. We do not yet know enough about interspecific variation of the morphological characters used for separation (except mouthparts).

Species which are morphologically not very distinct are clearly differentiated in ecological respects, for example *Ps. verum* sp. n. and *Pseudocloeon* sp. 1. *Ulmér* (1939), *Ps. orientale* sp. n. and *Ps. ambiguum* sp. n. (see Verification Table).

The following species groups are considered:

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<tr>
<th>species group</th>
<th>species</th>
<th>distribution</th>
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<td><em>Ps. verum</em> sp. n.</td>
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<td><em>Ps. sp. 1 Ulmer</em> (1939)</td>
<td>South Sumatra</td>
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<td><em>difficilum</em> group</td>
<td><em>Ps. difficilum</em> sp. n.</td>
<td>Sri Lanka</td>
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<td><em>orientale</em> group</td>
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<td><em>klapaleki</em> group</td>
<td><em>Ps. klapaleki</em> sp. n.</td>
<td>Sri Lanka</td>
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<td><em>atoki</em> group</td>
<td><em>Ps. atoki</em></td>
<td>Philippines</td>
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The groups are characterized as follows:

*verum* group (Fig. 1): both species of this group have a labrum which is a little wider at base than in frontal part and twice as broad as long (Figs. 1 a and 6 a). The third segment of the labial palpus is shorter than broad. Both species are differentiated from all other species considered herein by the serrated antennal segments (Fig. 1 e). *Ps. verum* sp. n. and *Pseudocloeon* sp. 1 Ulmer (1939) are distinguished by the submarginal bristles near outer margin of femur: they are very small and pointed in *Ps. verum* sp. n., but less pointed and about the same length as distance between bases of long, fine bristles on outer margin of femur in *Pseudocloeon* sp. 1 Ulmer (1939) (Figs. 1 i and Fig. 6 b, both same magnification).

*difficilum* group (Fig. 2): the single species has the labrum a little wider at base than in frontal part, but less broad than twice the length; 3rd segment of labial palpus as long as broad; the margin of antennal segments is not serrated (as in all following species). No submarginal bristles are developed near outer margin of femur (Fig. 2 h).
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<th>S. Sumatra</th>
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<td>Labial palpus, 3rd segment</td>
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<td>Caudal filaments</td>
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</tr>
<tr>
<td></td>
<td>(Figs. all of same magnification) pointed, shorter than distance between bases of margin. bristles Fig. 1 i nearly same length as distance between bases of margin. bristles Fig. 1 i broad, blunt, of different length, Fig. 3 i rather blunt, shorter than distance between bases of margin. bristles, Fig. 4 h blunt, about same length as distance between bases of margin. bristles, Fig. 5 h pointed, about same length as distance between bases of margin. bristles, Fig. 6 c without submarginal bristles Fig. 2 h</td>
<td>x</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Tibia of 3rd leg, outer margin with two rows of long bristles</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td></td>
<td>one row of long bristles</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Claw</td>
<td>with two subapical bristles</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>without subapical bristles</td>
<td>x</td>
<td>x</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Abdominal gills</td>
<td>shorter, rounded</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>—</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>elongate</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Spines on posterior margin of terga</td>
<td>elongate, pointed</td>
<td>x</td>
<td>x</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>shorter, more or less pointed</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>broad - based, rounded</td>
<td>—</td>
<td>—</td>
<td>x</td>
<td>x</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Number of specimens in collection</td>
<td>72</td>
<td>4</td>
<td>100</td>
<td>200</td>
<td>8</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>body length mm d</td>
<td>3.1</td>
<td>3.5</td>
<td>3.8</td>
<td>5.1</td>
<td>4.0</td>
<td>—</td>
<td>6.1</td>
</tr>
<tr>
<td>body length mm p</td>
<td>3.2</td>
<td>—</td>
<td>4.5</td>
<td>5.9</td>
<td>—</td>
<td>3.9</td>
<td>—</td>
</tr>
<tr>
<td>altitude of collecting site m above sea level</td>
<td>1200 - 30</td>
<td>—</td>
<td>650 - 30</td>
<td>1500 - 700</td>
<td>500 - 250</td>
<td>1850</td>
<td>2200 - 1600</td>
</tr>
<tr>
<td>water temperature °C</td>
<td>21.3 - 32.5</td>
<td>32.0 - 34.0</td>
<td>18.3 - 27.3</td>
<td>18.3 - 23.3</td>
<td>25.1 - 37.2</td>
<td>16.1 - 17.2</td>
<td>—</td>
</tr>
</tbody>
</table>
Five new species of *Pseudocloeon* Klapálek

orientale group (Figs. 3, 4): both species correspond in having the labrum equal at base and apex and twice as broad as long; 3rd segment of labial palpus as long as broad at base, tapering apically; outermost group of canini of mandibles fused into a blade. *Ps. orientale* sp. n. and *Ps. ambiguum* sp. n. are distinguished by the submarginal bristles near outer margin of femur: they are of different size in *Ps. orientale* sp. n. (from very small to about the distance between the bases of long marginal bristles) whereas they are extremely small in *Ps. ambiguum* sp. n. (Fig. 31 and Fig. 4 h, both same magnification).

klapaleki group (Fig. 5): only one species. Labrum tapering basically; 3rd segment of labial palpus elongate, tapering apically; submarginal bristles near outer margin of femur comparatively large, about as long as distance between the bases of long marginal bristles (Fig. 5 h).

atoki group (Fig. 6 c, e): the single species has a number of characters in common with *Ps. klapaleki* sp. n. Otherwise this species is furnished with several characters that are unique among the discussed species groups. The most striking common characters of *Ps. atoki* and *Ps. klapaleki* sp. n. are 1) the apically tapering labrum, 2) the 3rd segment of labial palpus and 3) the mandibles. The deviating characters of *Ps. atoki* are: caudal filaments without swimming bristles, terminal filament reduced to only one segment, tibia of 3rd leg with only one row of long, finely feathered bristles.

With increasing knowledge of the *Pseudocloeon* complex it could be thinkable to establish a new genus for *Ps. atoki* and probably further closely related species.

**Zusammenfassung**


**Acknowledgement**

I am indebted to Dr. J. E. BishoP, CraferS, Australia, and to Professor Dr. F. Starmühlner, Vienna, Austria, who have kindly provided me with the material for this study. Also I want to thank Professor Dr. H. Strümpel, Zoological Institut and Zoo-
I. Müller-Liebenau, *Pseudocloeon* KLAPÁEK

logical Museum, University Hamburg, for the loan of *Pseudocloeon* specimens from the Ulmer collection, which is deposited at the Zool. Mus. Zool. Inst., University Hamburg.

**Literatur**


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