ON THE GENERIC POSITION OF CLEOON PAPUANUM VAN BRUGGEN, 1957 (Ephemeroptera, Baetidae)

by

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Soon after I published the description of “Cleoem” papuanum (Van Bruggen, 1957) I received a letter from my distinguished colleague Dr. G. DEMOULIN of the Brussels Museum pointing out that the species had been placed in the wrong genus. He suggested to reconsider the matter, which I have now done.

At first sight it could be assumed that “Cleoem” papuanum, which has been described from the Wissel Lakes, West-central New Guinea, belongs to the genus Pseudocloeem KLAPPAEKE on account of the double marginal intercalaries in the wings. A closer examination, however, shows that the species possesses a rather remarkable combination of characters. Unfortunately no nymphs are yet available, so that study is restricted to the adult insects. Nowadays there is a rather marked tendency to classify Ephemeroptera mainly on the larval structures, in my opinion unjustifiable. Therefore this discussion is merely preliminary.

Six genera in the family Baetidae are known to have in common the following characters: hindwings completely reduced (thus absent) and intercalaries paired in the forewings.1) These genera are:

Apolobelia Day, 1955 (U.S.A.), type species A. independens Day;
Baetiaella Užum, 1951 (Japan), type species A. japonica INAIHIDA;
Brongersia Harder, 1927 (Australia), type species B. horrida HASKER;
Cloeem Harder, 1927 (Puerto Rico), type species C. maculipes TRAVER;
Paraboloides Day, 1955 (U.S.A., Puerto Rico), type species P. abditus Day;
Pseudocloeem KLAPPAEKE, 1905 (U.S.A. and Canada, South America, Malaysia, West and South Africa), type species P. bregmatai KLAPPAEKE.

The first five genera are sufficiently well established, but Pseudocloeem seems to include some very different species. Very probably this genus will have to be

1) The last-mentioned character applies particularly to male specimens, although usually the females show at least some paired intercalaries.
split into two or more units, since some groups of species in various parts of the world seem to form more or less natural taxa, e.g., those in Malaysia (P. truncatellus, P. bettigeri Uhl. and P. obscurus Uhl.). Further details are discussed at the end of this paper.

It appears that for the comparison of adult insects we must consider characters of the legs, of the genitalia, and of the wings; at the conclusion of the paper a synthesis will be presented. In Table I the proportions of the segments of the fore and of the hind legs are compared. In the tarsal formulae the tarsal segments are listed from the longest to the shortest. In the middle and hind legs the first segment of the tarsus is fused with the tibia, therefore number 1 has been omitted in the formula. Generally the middle legs are very similar to the hind legs. Most data were taken from the literature or measured from published camera lucida figures. Unfortunately a number of authors while describing new *Pseudoclytia* species mentioned the colour of the legs only (e.g., Blacker, Cass, Dagg, McDunnough, etc.), therefore the data on *Pseudoclytia* in
Table I are taken only from three Malayesian species discussed by Ulmer (1924). Additional data on Bungona were supplied by Miss Harker, while Prof. Ueno kindly sent a camera lucida drawing of the legs of Bastetia japonica (Izumi). For the sake of completeness and in order to record his data the drawings are reproduced here (figs. 1-2).

The table shows that the group under discussion is rather heterogeneous in the composition of the legs. Apparently Bungona has a unique position on account of the short tibia and the fusion of first and second segments in the tarsus of the first pair of legs, and the long tarsi in the hind legs. On the whole there is a remarkable resemblance in the tarsal formulae of the fore legs, while on the other hand the tarsal formulae of the hind legs show more differences. The position of "Cloeum" papuanum is not at all clear. It shows affinities with most of the genera except, of course, Bungona; however, it does not agree with the general aspect of these taxa.

Next the male genitalia have to be considered, viz. the segments of the forelegs or genosyles, in the various genera. Table II shows the results of a comparison of the shape of the joints. The data on Pseudocloeom are derived from African species [Hanzinae Crisis, magaie Barkwood, minima Crisis desc. Daggoy ex Craseaeum Baskard 1] (top) and from Asiatic species [boettcheri Ulmer, klaupehl Klappalek, eobersum Ulmer] (bottom). Unfortunately many authors either do not figure the male genitalia or describe them inadequately.

It is extremely difficult to comment upon Table II. It appears that Bungona agrees well with what is seen in the other genera; this is certainly contradictory to what has been found in studying the legs. The last segment of the forelegs may be very different, either it may be broadly attached to the third joint (Bastetia, some species of Pseudocloeom, and "Cloeum" papuanum) or only have a narrow point of attachment to the third segment (Aphobartz, Bungona, Cloedex, Paraclodees and some species of Pseudocloeom). However, it does not seem to be of any taxonomic importance. A more interesting point of discussion is offered by the fusion of the second and third joints as is observed in the genera Aphobartz, Paraclodees and in some species of Pseudocloeom. It may be suggested that the genera that do not possess this phenomenon are older than the others; "Cloeum" papuanum, which very probably is endemic to the island of New Guinea, belongs to the latter group. Many of the faunal elements of New Guinea have reject characters; on the strength of the male genitalia "Cloeum" papuanum might well belong to these faunal elements.

Finally we have to compare the wings of the six genera under consideration and of "Cloeum" papuanum. It is impossible to tabulate differences; therefore certain characters must be considered point by point. The wings of Cloedex have not been figured, but fortunately at least sketchy descriptions are available (Traver, 1935). Of Pseudocloeom only figures of four South African and one Malayesian species were available; the wings of some Canadian species are inadequately.

1) Fide Crase, in litt.
Table I

Comparison of the first and third pairs of legs of the genera under discussion and "Cloeon" papuanum.

Abbreviations: fe = femur, ti = tibia, ta = tarsus, I = fore legs, III = hind legs.

<table>
<thead>
<tr>
<th>Genus</th>
<th>fe</th>
<th>ti</th>
<th>tarsal formula fore legs</th>
<th>tarsal formula hind legs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aplobactis</td>
<td>fe</td>
<td>ti</td>
<td>ti = 2, 4, 5, 1</td>
<td>ti = 2 ta</td>
</tr>
<tr>
<td>Batiella</td>
<td>fe</td>
<td>ti</td>
<td>ti = 5 ta</td>
<td>ti = 2 ta</td>
</tr>
<tr>
<td>Bungona</td>
<td>a</td>
<td>ta</td>
<td>1 + 2 = 3, 4, 5</td>
<td>ti = 2 ta</td>
</tr>
<tr>
<td>Cloedos</td>
<td>a</td>
<td>ta</td>
<td>ti = 3 ta</td>
<td>ti = 2 ta</td>
</tr>
<tr>
<td>Paracroleo</td>
<td>fe</td>
<td>ti</td>
<td>ti = 2 ta</td>
<td>ti = 2 ta</td>
</tr>
<tr>
<td>Pseudocroleo</td>
<td>fe</td>
<td>ta</td>
<td>2, 4, 5 ta</td>
<td>2, 3, 4 or</td>
</tr>
<tr>
<td>&quot;Cloeon&quot; papuanum</td>
<td>fe</td>
<td>ti</td>
<td>ti = 3 ta</td>
<td>ti = 3 ta</td>
</tr>
</tbody>
</table>
The generic position of Cliron papuanum described, while those of some U.S. species are only slightly better known (e.g. Daugy, 1945).

The interpretation of the veins is extremely difficult in the Ephemeroptera. The whole group discussed here shows marginal cross-veins; they vary somewhat in number and shape but they do not give any clues as to relationships. There is also nothing particularly remarkable in the marginal intercalaries, except perhaps in Afrophanta where they do not reach much further than the middle of the wing. However, there are considerable differences in the position of the cross-veins; in this respect "Cliron" papuanum comes nearest to Bungona and Batiella because most cross-veins, especially in the cubital and medial regions, form a rather irregular pattern. In other genera, e.g. Pamplocoede and many species of Pseudocoleon, these cross-veins are more or less arranged in a continuous line which runs partly parallel to the hind margin of the wing. The wing of "Cliron" papuanum shows more peculiarities, viz., the comparatively narrow field of MA (MA-MA\# or the veins nos. 8, 9 and 10, counted from the anal region), the joining of MP and MP\# (the fifth and sixth veins counted as before), and the presence of only one IC\#. The last-mentioned character is also found in the genus Bungona. It has been said before that homologizing and therefore comparison of veins in wings of Ephemeroptera is very difficult, especially since usually there is some variation, interspecific as well as intraspecific.

The general shape of the wings as a rule is rather uniform, except for Batiella; as far as can be judged from Imashiro's figure (in Ťeho, 1931, fig. 39) the wing in this genus is long and narrow. It should be noted that in the figure of "Cliron" papuanum (van Bruggen, 1937, fig. 39) the anal angle of the wing has been drawn a bit too angular.

Summarizing the evidence of the wings we can say that those of "Cliron" papuanum do not agree completely with those of any of the genera discussed, but that the species comes near to Bungona and to a much lesser degree to Batiella. This is more or less in accordance with the distribution of the species: Bungona marilia — Australia, "Cliron" papuanum — New Guinea, Batiella japonica — Japan.

From the genera and species under discussion only the nymph of "Cliron" papuanum is so far unknown; it is thus not possible to make comparisons with described nymphs. Interesting discussions on the comparison of nymphs in some of the genera are presented by Travez (1838) and Daugy (1955). Moreover there is at present no agreement on the genus Pseudocoleon; it appears for instance that nymphs of the Neartic and of the Oriental Regions have two tails only, while South African species are known to possess three caudal filaments. A reconsideration of the genus is therefore necessary.

The results of the foregoing comparative studies are as follows: "Cliron" papuanum has been compared with six genera in the family Batiellaceae which apparently are its closest relatives. It has been shown that in the composition of the legs it does not fit in with any of these genera; it shows affinities with most of them, except Bungona. A study of the segments of the forelegs (male
Table II
Comparison of the joints of the genotypes of the males of the six genera under discussion and “Cloeon” pappiunum.
A brace indicates that the connected joints are fused.

<table>
<thead>
<tr>
<th>Genus</th>
<th>first</th>
<th>second</th>
<th>third</th>
<th>fourth joint</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aphaniurus</td>
<td>long and thick</td>
<td>long and slender</td>
<td>slender, small, too broadly attached to 3rd</td>
<td></td>
</tr>
<tr>
<td>Brachytera</td>
<td>large and thick</td>
<td>very short</td>
<td>elongate and incurved</td>
<td>small, clavate, apex rounded</td>
</tr>
<tr>
<td>Bungonia</td>
<td>short and stout</td>
<td>broad and short, arched on inner surface</td>
<td>slender, long and bowed or -shaped</td>
<td>narrow and short, not broadly attached to 3rd</td>
</tr>
<tr>
<td>Cloeodes</td>
<td>short and stout</td>
<td>short, not too slender</td>
<td>slender, long, -shaped on inner surface</td>
<td>small, roundish, not broadly attached to 3rd</td>
</tr>
<tr>
<td>Paracleoide</td>
<td>long, thick, almost cylindrical</td>
<td>long and slender</td>
<td>slender, not broadly attached to 3rd</td>
<td></td>
</tr>
<tr>
<td>Pseudocloeoides</td>
<td>short and (rather) stout</td>
<td>long and slender (incurved)</td>
<td>long and slender, or shorter and rounded, not broadly attached to 3rd</td>
<td></td>
</tr>
<tr>
<td>Pseudocloeoides</td>
<td>OR</td>
<td>OR</td>
<td>OR</td>
<td></td>
</tr>
<tr>
<td>“Cloeon” pappiunum</td>
<td>short and wide</td>
<td>short and wide</td>
<td>long and narrow, almost cylindrical</td>
<td>oval, broadly attached to 3rd</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>rounded, base broadly attached to 3rd</td>
</tr>
</tbody>
</table>
genitalia) revealed that "Cluv" papuanum cannot be assigned to any one of the genera, but that it shows weak affinities to Bungina. Finally, an examination of the wings showed that the New Guinea species is perhaps nearer to Bungina than to the other genera. Summarising we can conclude that "Cluv" papuanum certainly merits a genus to itself on the strength of morphological characters of the adult-insect; this is in accordance with the isolated geographic position on the island of New Guinea. The new genus would have to be classified next to the Australian genus Bungina, although showing considerable differences in the composition of the legs. However, the author prefers to refrain from naming the new genus and proposes to leave it in abeyance until nymphs of the New Guinea species become available, for there is always a possibility that it might be assigned to one of the known genera on the strength of larval characters. The student is referred to the discussions on the value of larval characters by Verbeek (1958).

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References