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New Baetidae (Ephem.) from South Africa

by

J. D. AGNEW

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INSTITUTO DE INVESTIGAÇÃO CIENTÍFICA DE MOÇAMBIQUE

LOURENÇO MARQUES

NEW BAETIDAE (EPHEM.) FROM SOUTH AFRICA

by

J. D. Agnew

(National Institute for Water Research, P. O. Box 395, Pretoria, South Africa)

(Rec.: 10-10-1961)

Imagines of all the new species described below have been obtained by breeding out the nymphal stages in the laboratory. This provides a correlation between nymph and imago. In the case of one of the new species (mentioned in the text), the nymphal remains were not preserved so that the nymph described under that species is an assigned form. All other nymphal forms are definitive.

In defining the baetid species, it is advisable to have nymphal material, as the nymphs can be readily identified to species — in some cases more easily than the imagines, e. g. in *Pseudocloeon maculosum* CRASS. This helps to define the limits of variability in imagines, where small venational differences often present problems. The size of the imago can sometimes be deceptive, as this seems to depend on the favourability or otherwise of conditions during nymphal life (feeding, temperature and so on). In nymphs, it is usually sufficient to note the abdominal colouration, the presence or absence of a hindwing bud, number and morphology of the gills, and the labial palp, although immediately prior to the final nymphal ecdysis (into subimago) the nymph shows extensive colour changes. Juvenile nymphs are less easily identified. Detailed data on the ecology of the nymphs is not given here, as this has, in some cases, already formed part of other papers published by this Institute. In hydrobiological work, baetid nymphs form an important element in the associations of many biotopes.

Both imagines and nymphs have been described from specimens stored in 70 % ethanol, which invariably affects the colour pattern somewhat, depending on the length of time the specimens have been in the liquid. In only one case has it been possible to use living imagines for a description of the colouration.

Where necessary, e. g. in the case of genitalia, mouth parts and appendages, microscopic mounts have been made of the structures. These were mounted directly in Euparal after dehydration in 100 % ethanol, but wings were mounted dry. Drawings were made by means of a Zeiss Drawing Attachment.

Holotypes and slides prepared from them will be deposited in the Transvaal Museum, Pretoria; where paratypes are available, these will be sent to the British Museum (Natural History), London.

The catalogue numbers (in the National Institute for Water Research) of the specimens used in this study are given below. Where structures have been dissected, the slide numbers of these mounts are put against the specimens from which they were taken. The dates of collection are given last:

Cloeon elevatum n. sp.:

GEN 593A	Holotype ♂ (117-119), 8-IV-1961.
GEN 593B	Paratype ♂, 8-IV-1961.
GEN 138B	Assigned nymphs (120-127), 8-VII-1959.

Cloeon crassii n. sp.:

VAL 72A	Holotype ♂ and nymphal skin (154, 155, 158, 159), 18-IV-1956.
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Pseudocloeon saxophilum n. sp.:

GBG 123	Holotype ♂ (152, 153), 10-XI-1950.
GBG 81A	Nymphs (156, 157), 27-IX-1950.

Baetis quintus n. sp.:

GEN 604B	Holotype ♂ (129-131), 11-XII-1960.
GEN 538B	Nymphs (132-134), 11-XII-1960.

Baetis glaucus n. sp.:

VAL 1325A	Holotype ♂ (142-143), 11-VIII-1960.
VAL 1325B	Allotype ♀, 11-VIII-1960.
VAL 1325C	Paratype ♂, 11-VIII-1960.
VAL 1325D-F	Nymphs (144 from 1325D), 11-VIII-1960.
VAL 1325G-L	6 Paratype ♂♂, 11-VIII-1960.

Baetis latus n. sp.:

GBG 418A	Holotype ♂ (150-151), 31-X-1951.
GBG 418B	Allotype ♀ (subimago), 31-X-1951.
GBG 339A	Nymphs, 29-VIII-1951.

Mr. R. S. CRASS, of the Natal Parks, Game and Fish Preservation Board, has supplied me with much of the material used in this paper, and suggested three of the new names used here. He writes that «*Pseudocloeon minutum* CRASS (a name already preoccupied by *P. minutum* DAGGY) falls into synonymy with *P. vinosum* BRNRD.», and that «*Austrocloeon paludinosum* CRASS is synonymous with *A. virgiliae* BRNRD. BARNARD described the nymph of this species as having a double sixth gill. I have examined his type, and the gills, besides other features, are identical with my species». Mr. M. H. MASON, of this Institute, prepared all the mounted material and Mr. F. M. CHUTTER, also of this Institute, supplied me with imagines and nymphs of one of the new species. All these gentlemen deserve my thanks for their help and advice.

* * *

CLOEON ELEVATUM N. SP.

(Fig. 1)

Diagnosis. — (1) ♂ imago: Turbinate eyes pale yellow in dorsal view, basally slightly more orange, oval with longer axis longitudinal, not contiguous. Basal eyes white, subequally divided into three portions by two longitudinal sienna stripes. Ocelli colourless, antennal scape white with reddish-brown suffusions. Thoracic mesonotum pale with darker central stripe. Legs pale colourless, with a little reddish-brown suffusion. Proportion of (apparent) first metatarsal joint to second joint 2 : 1, as illustrated. Abdominal tergites with red pattern on a colourless background. This becomes more intensified towards the last segments, segments VIII and IX being wholly bright vermilion on the dorsal surface. Pleura with a red stripe, also present medially on the sternites. Forceps colourless, as illustrated. Forceps-base (containing muscles) stout, basal lobe short and stout, second

lobe longer with slightly dilated end, holding minute terminal lobe which is pear-shaped and non-truncate. Cerci partly broken in specimens, colourless with some suggestion of reddish-brown colouration at the nodes, but only proximally. Wings completely clear, as illustrated. No cross-veins before bulla, two in pterostigmal area. Cross-veins connecting $Sc-R_1-R_2-1R_2$. Marginal intercalaries single. Length 7 mm, wing 6.5 mm, cerci at least 10.5 mm.

(2) ♀ imago: Unknown.

(3) Assigned nymph, in penultimate instar: Gills on segments I-VII. First six gills double, foliaceous, with distinct tracheation. Seventh gill single. Head relatively large and flexed downwards. Antennae partly broken off in specimens, but at least as long as body. Nymph rather colourless, without distinct pattern. Mouth parts as illustrated, maxillary palp 3-jointed. Claw slender. Posterior borders of abdominal tergites denticulate. Length 7 mm.

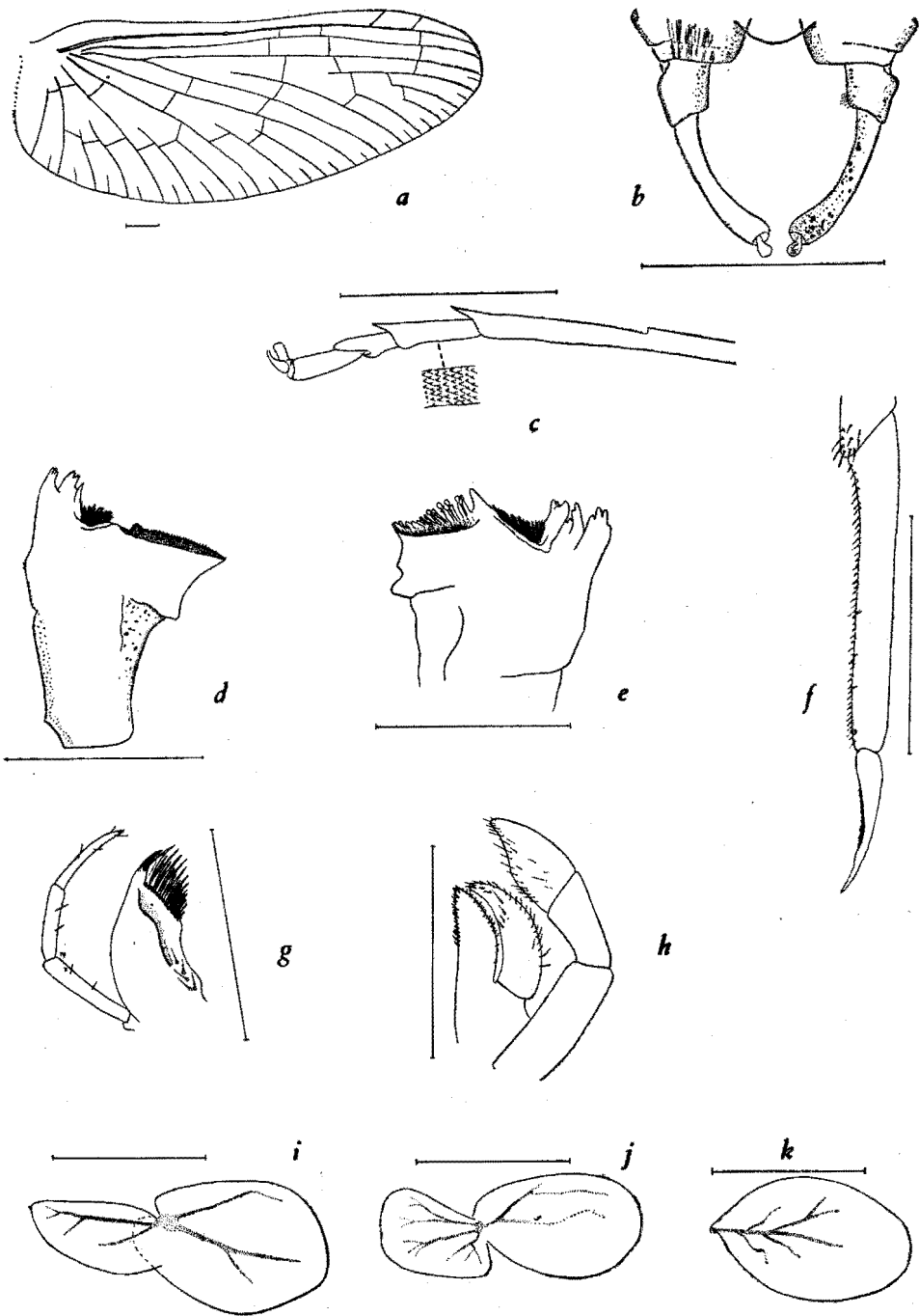
Locus typicus. — Near Mount Anderson, Eastern Transvaal. Altitude ca. 2000 m.

Remarks. — Nymphs of the type described above were first collected at Mount Anderson, Eastern Transvaal, in July, 1959. They were found in small mountain trickles and pools at one of the source zones of the Sabie River. There were no other baetid nymphs present. Later living material was brought back and kept in the laboratory and the two ♂ imagines emerged. Unfortunately the nymphs were not examined before being placed in the tank nor were any nymphal shucks retained after ecdysis of the imagines, so that the correlation is circumstantial.

The imago may be recognised by its relatively large size and the red pattern on the abdomen, its nearest relative being perhaps *Austrocloeon virgiliae* BRNRD. or one of the Central African species.

BARNARD (1932) described seven species of *Cloeon*, one of which was placed in his new genus *Austrocloeon* (= *Cloeon* LEACH 1815, see EDMUNDS & TRAVER 1954), to which he also transferred *Cloeon africanum* E-P.

Fig. 1. — *Cloeon elevatum* n. sp. — a-c, ♂ imago; d-k, nymph: a, forewing; b, genitalia; c, metatarsus; d, e, mandibles; f, first claw; g, maxilla; h, labium; i, first gill; j, sixth gill; k, seventh gill (Scale = 0.5 mm)



His new genus seemed to be founded mostly on nymphal characters, such as two-jointed maxillary palp, which tended toward *Procloeon*. The nymph described above would not fall into BARNARD'S *Austrocloeon*. Of his six other species, *Cloeon rhodesiae* has been transferred to *Procloeon* (KIMMINS 1960). Unfortunately, as far as his remaining five are concerned, the descriptions give no attention to the ♂. Three of them, however, have no cross-veins connecting $Sc-R_1-R_2-1R_2$ which leaves *Cloeon lacunosum* and *Cloeon perkinsi*. These two have other venational characters not shared by *Cloeon elevatum* n. sp. *A. exiguum* CRASS is a smaller species.

The paratype ♂ is slightly smaller and has lost much of its colour.

CLOEON CRASSII N. SP.

(Fig. 2)

Diagnosis. — (1) ♂ imago: Colouration lost in alcohol. Turbinate eyes suboval, not contiguous, with suggestion of previous orange colouration. Basal eyes oval, whitish, with two horizontal dark stripes. Thorax light castaneous. Wings clear with some milkiness in the pterostigmal area. Cross-veins distally connecting $Sc-R_1-R_2$ but no distal connection between R_2-1R_2 . Two complete pterostigmal cross-veins. Abdomen with indications of reddish pattern, probably most strong on tergites of distal segments. Forceps colourless and as illustrated. Ratio of (apparent) first metatarsal joint to second metatarsal joint is 2 : 1. Length 4 mm, forewing 4.5 mm.

(2) ♀ imago: Uncorrelated with nymphal type described below.

(3) Nymphs (description based on skin from which holotype ♂ described above emerged): Posterior borders of abdominal tergites denticulate. Gills 1-6 double, very similar to those of *Austrocloeon virgiliae* BRNRD. 7th gill single, much larger than preceding gills, subtriangular. Length 5.5 mm.

Locus typicus. — Vaal River where crossed by road from Vanderbijlpark to Sasolburg.

Remarks. — Nymphs of this species are found in the vegetation of quiet waters. Mr. R. S. CRASS writes as follows on this species: «The adult seems nearer to my *Austrocloeon exiguum* than any other species, but there is an unusual amount of variation in the number of distal cross-veins.

The nymph is well characterized by the gills alone. The double 6th gill and the large lamella of the 7th gill distinguish it from other species».

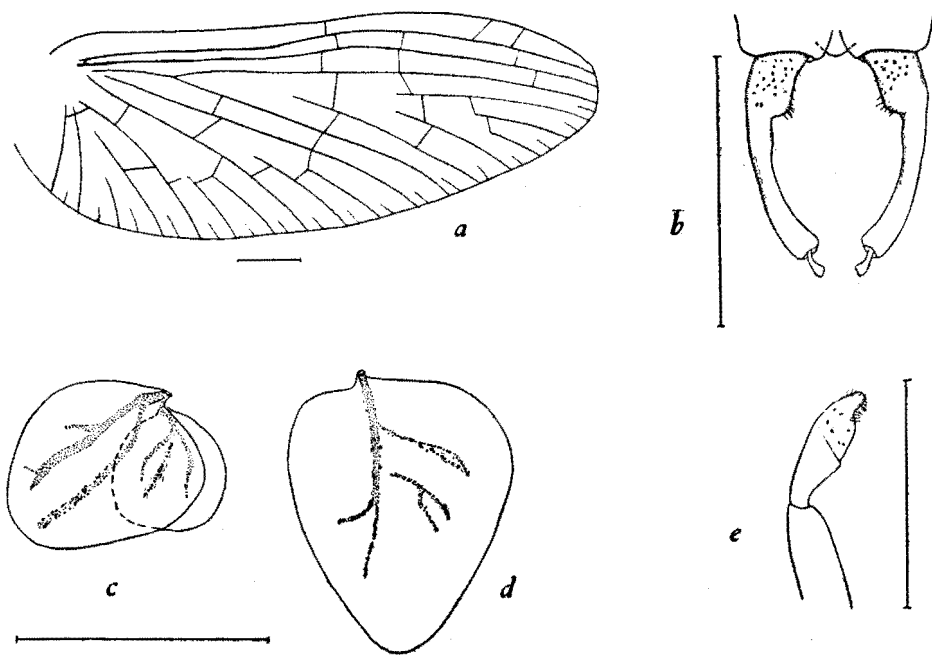


Fig. 2. — *Cloeon crassii* n. sp.: a, ♂ wing; b, genitalia; c, sixth gill of nymph; d, seventh gill of nymph; e, labial palp of nymph (Scale = 0.5 mm)

Nymphs of this species are also found in the marginal vegetation of Hartbeestpoort Dam, near Pretoria (see ALLANSON 1961, in press, where this species is referred to as «*Austrocloeon* sp. A»).

PSEUDOCLOEON SAXOPHILUM N. SP.

(Fig. 3)

Diagnosis. — (1) ♂ imago: Colouration, if any, lost in alcohol. Turbinate eyes narrow-oval, not contiguous. Basal eyes black, subtriangular in lateral view. Thorax light brown. Forewing clear but yellowish.

Three (or four according to CRASS) pterostigmal cross-veins, the proximal cross-vein being incomplete. Double intercalaries extending to $M_1 + 2$ in holotype ♂ (according to CRASS to 1Cu). Abdomen and forceps light yellowish. Forceps as illustrated, with terminal lobe elongate and slightly bulbous. Length 4.1 mm, forewing 4.0 mm.

(2) ♀ imago: Size as in ♂ above. Eyes black, ocelli opaque whitish ringed with black. Thorax and abdomen dorsally light brown.

(3) Nymph: Gills seven in number, narrow-oval, with indistinct tracheation. Living nymphs have a whitish appearance, but preserved specimens are brownish with an indication of a central white stripe down the dorsal side of the abdomen, as in *Pseudocloeon vinosum* BRNRD. Labial palp similar to that of *Pseudocloeon inzingae* CRASS. Femora with row of small slender truncated subclavate spines (10–15 in number) on posterior border. Mature nymphs 5 mm in length, with cercus and median filament both 1.7 mm long.

Locus typicus. — Upper Great Berg River, C. P., in the French Hoek Forest Reserve.

Remarks. — Nymphs of this species are found in stony pools and backwaters, and are limited to the Southern and Western Cape Province. It has been recorded from the Kruis River, Tzitzikamma Forest Reserve.

This species is very similar to *Pseudocloeon inzingae* CRASS, but there are probably colour differences and the terminal lobe of the forceps is shorter. There are also venational differences between the two species. The nymph may be distinguished from other baetid nymphs on its seven gills, small size, spinose posterior borders of the femora, shape of the labial palp and the absence of a hindwing bud. The species is well characterized on the nymph alone.

HARRISON (1958) gives some ecological data on this species, where he refers to it as (*Pseudocloeon* sp. A).

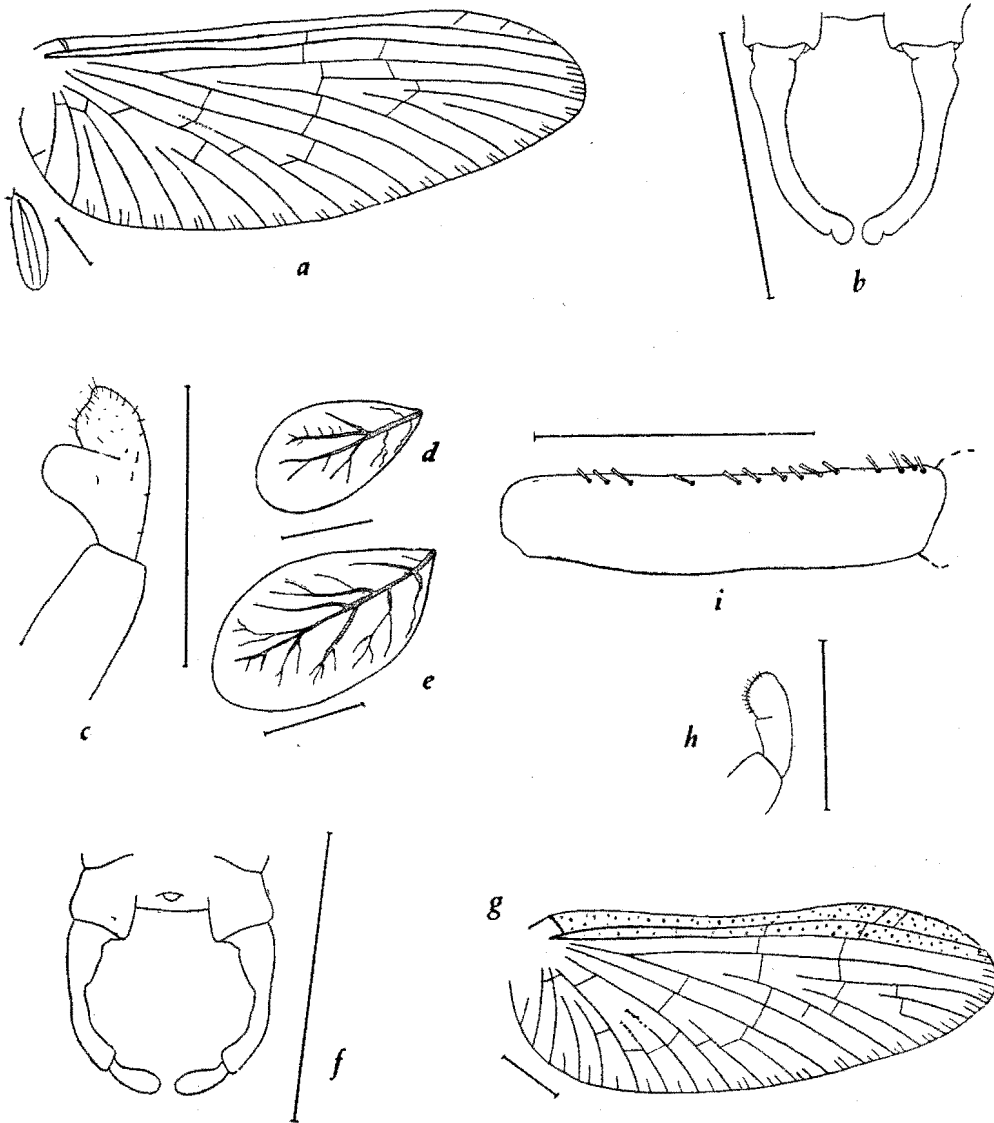


Fig. 3. — *Baetis latus* n. sp.: a, ♂ wings; b, ♂ genitalia; c, labial palp of nymph; d, first nymphal gill; e, fourth nymphal gill.
Pseudocloeon saxophilum n. sp.: f, ♂ genitalia; g, ♂ wing; h, labial palp of nymph; i, profemur of nymph (Scale = 0.5 mm)

BAETIS QUINTUS N. SP.

(Fig. 4)

Diagnosis. — (1) ♂ imago: Turbinate eyes bright orange, basally lighter, somewhat telescoped, contiguous, oval in dorsal view. Basal eyes dark grey or black, subtriangular in lateral view. Ocelli whitish, ringed with grey basally. Head and antennal base light brown. Thorax pale except for numerous castaneous sclerites. Mesonotum rich brown with a thin median black stripe. Mesonotum and thoracic venter castaneous. Both front legs missing in holotype, other legs pale with very light brown suffusions on the femur. Abdomen very pale, translucent, with little evidence of pattern, which may be fugitive in preservative. Cerci and forceps pale. Forewing completely hyaline, and as illustrated. 1A forked near margin, marginal intercalaries double. Hindwing narrow-oval with two subparallel veins, no costal process. Length 6.7 mm, forewing 5.5 mm.

(2) ♀ imago: Unknown.

(3) Nymph, final instar: Gills simple, seven in number. First gill smallest thereafter becoming larger until the fourth or fifth gill, the remaining gills slightly smaller. Tracheation inconspicuous. Posterior borders of abdominal segments minutely denticulate, but posterior segments only very feebly so. Abdomen dorsally with distinct pattern (drawing done from nymphal shuck which produced ♂ imago described above). Mesonotum with a distinct darker V-shaped mark and two darker dots on either side of the V, just anterior to wing-pads. Length 7 mm, cercus 4.25 mm, median filament 2.8 mm, i.e. median filament is ca. 2/3 cercus.

Locus typicus. — Orange River at Prieska, Cape Province. Altitude ca. 975 m.

Remarks. — Nymphs of this species were found clinging to small stones on a sandy bottom. The water was shallow but moving fairly rapidly. More than three-quarters (numerically) of the association consisted of *Simulium* larvae, and a few nymphs of *Centroptiloides* were present. No nymphs (of *B. quintus* n. sp.) were found in vegetation at the same station, where their place was taken by nymphs of *Baetis latus* n. sp. (see below).

The imago of this species is closely allied to *Baetis bellus* BRNRD., on the basis of the hindwing and the ♂ forceps. The nymph is rather similar to that of *B. glaucus* n. sp. (see below) but it may be most easily distinguished from that species by the fact that the lighter patches on abdominal tergi-

tes III to V are completely surrounded by darker colouration, giving the appearance of two large squares lying next to one another, although the

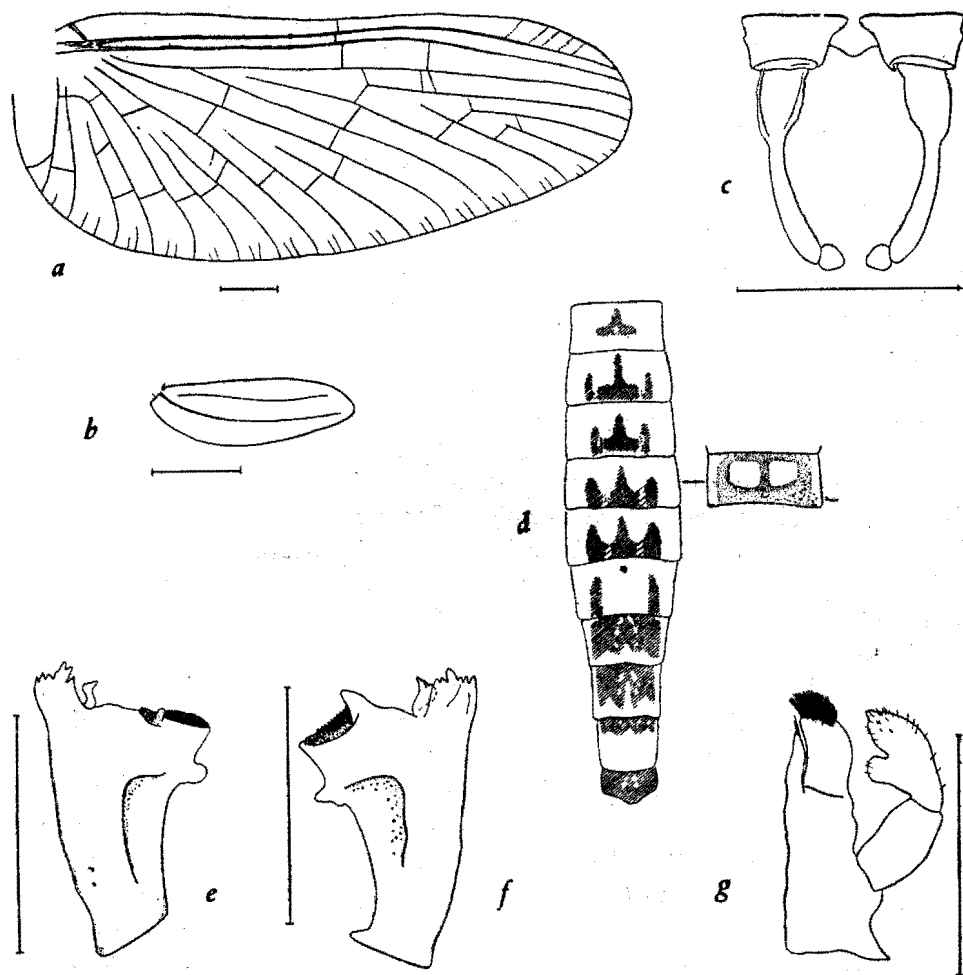


Fig. 4. — *Baetis quintus* n. sp. — a-c, ♂ imago; d-g, nymph: a, forewing; b, hindwing; c, genitalia; d, abdominal pattern of empty nymphal shuck, and pattern on corresponding segment of nymph; e, f, mandibles; g, labium (Scale = 0.5 mm)

anterior boundary of the clear zone is sometimes absent. The general background colour of the nymph is also a dull yellowish brown, whereas in *B. glaucus* nymphs it is grey. Nymphs of both *B. quintus* and *B. glaucus*

have the sixth abdominal segment almost clear and the remaining segment are rather similar. It is much rarer than *B. glaucus*.

Nymphs of this species have also been found in the Kafferspruit (a small tributary of the Vaal) where crossed by the road from Ermelo to Bethal, Transvaal. The habitat was similar to that described above. Altitude ca. 1700 m.

BAETIS GLAUCUS N. SP.

(Fig. 5)

Diagnosis. — (1) ♂ imago (living): Turbinate eyes orange dorsally, yellow on sides of column, oval, not contiguous. Basal eyes dark, almost black. Pronotum, thoracic dorsum and attachment of forewing dark fumose, verging on black. Thorax ventrally dark fumose, but conspicuous orange area between pro- and mesosternum. Some reddish-orange colouration just anterior to forewing attachment. Forewing with light yellow-green fluorescence, specially along anterior margin. Forking of 1A near margin broken, marginal intercalaries double, further as illustrated. Hindwing narrow-oval with two subparallel veins, no costal process. Abdomen opaque olive-yellow without prominent pattern. Forceps and cerci somewhat paler than abdomen. Forceps as illustrated. Legs pale, with some light fumosity on dorsal surfaces of forelegs.

(2) ♀ imago (living): Wings as in ♂. Thorax dorsally deep brown, ventrally pale. Conspicuous reddish-brown suffusions on frons and area anterior to forewing attachment. Eyes grey, ocelli opaque whitish. Abdominal tergites with olive-yellow background and some diffuse reddish colouration laterally. Ventrally with same background colour and two darker spots on segments II–VII, in anterior part of segment.

(3) Nymph (final instar, preserved): Very similar to that of *B. quintus*, but with greyish abdominal pattern, as illustrated. Segment VI almost clear. Juvenile nymphs are darker and segment VI is not clear. As in *B. quintus* the nymphs also have a V-shaped mark on the mesonotum.

For further differentiation of the two species, see remarks on *B. quintus* above. Gills simple, seven in number, as in *B. quintus*. Median filament ca. 2/3 cercus. Length 7 mm.

Locus typicus. — Wilge River at Frankfort, Orange Free State. Altitude ca. 1700 m.

Remarks. — This species is closely allied to the previous one (cf. imaginal hindwing and nymphal characteristics). Nymphs are found clinging to stones where there is a current, often in association with *Beatis harrisoni* BRNRD., or in stony backwaters. It may be distinguished from specimens of *B. quintus* by the distinctive colour pattern (see description of

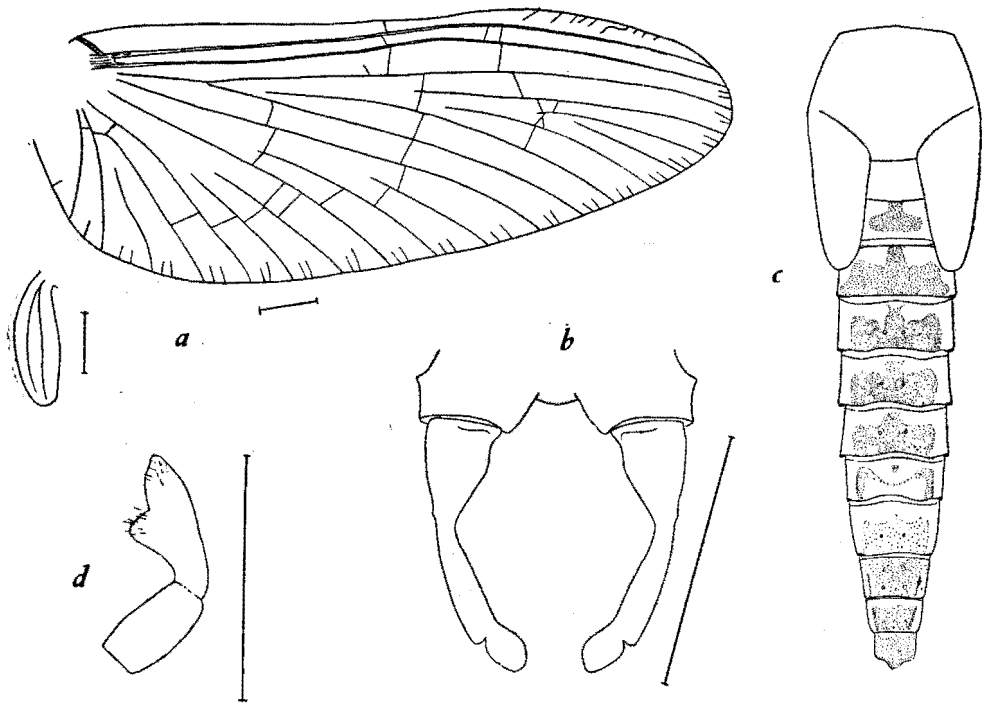


Fig. 5. — *Baetis glaucus* n. sp. — a-b, ♂ imago; c-d, nymph: a, wings; b, genitalia; c, abdominal pattern; d, labial palp (Scale = 0.5 mm)

B. quintus above), although the two species have never been found in association. This species is widespread in streams of the Vaal Dam catchment area, and also at Lindeques Drift below Vaal Barrage. It has also been recorded in the Tugela system, Natal [see OLIFF 1960 (a) and 1960 (b) where it is referred to as «*Baetis* sp. 1»], and in the Great Berg River, Cape Province (see HARRISON 1958, where it is referred to as «*Baetis* sp. A»). It should be noted that in OLIFF 1960 (a), p. 374, the reference to *Baetis glaucus* CRASS is an anticipation and should be deleted, as it is equivalent to «*Baetis* sp. 1» in the rest of the text). It is a common species.

SCHOONBEE (personal communication) has recorded this species in the Umgeni River System, Natal, and notes that the colouration of the nymphs is variable and that «there is also a change in the intensity of colouration during the seasons».

BAETIS LATUS N. SP.

(Fig. 3)

Diagnosis. — (1) ♂ imago: The holotype ♂ has lost all colour in the alcohol. Turbinate eyes suboval, not contiguous. Basal eyes somewhat projecting laterally and black. Thorax castaneous. Wings clear, as illustrated. Forking of 1A at margin broken, intercalaries double. No cross-veins either before or after bulla, three incomplete veins in pterostigmal area. Hindwing narrow-oval with two parallel veins, no costal process. Genitalia as illustrated. Length 5.5 mm, forewing 5.2 mm.

(2) ♀ subimago: In very poor condition. Wings similar to ♂. Thorax somewhat more robust.

(3) Nymph: Gills 7 in number, oval, first gill smallest, thereafter becoming larger until the fourth gill. Gills sometimes milky with indistinct tracheation. Strong dentritic tracheation, with smaller branches on both sides of the central stem. Posterior borders of abdominal tergites minutely denticulate. Colour pattern of abdomen rarely distinct, when present consisting of four small whitish dots arranged at the corners of a rectangle in the anterior half of the segment. Abdomen somewhat dorsoventrally flattened. Nymphs often colourless and white when preserved, otherwise an overall light reddish brown. Length 8 mm, cercus 4 mm, medium filament 3 mm.

Locus typicus. — Great Berg River, C. P., at farm Kersfontein, at head of estuary.

Remarks. — Nymphs of this species are found in the marginal vegetation of flowing streams, and appear to have a distribution throughout South Africa. It has recently been recorded from the Mazoe River, Southern Rhodesia (A. D. HARRISON, personal communication). HARRISON (1958) refers to this species as «*Baetis* sp. B» and gives valuable ecological data. OLIFF [1960 (a) and (b)] refers to this species as «*Baetis* sp. 2» and records it in all zones of the Tugela River System, Natal, except the Source Zone and the Estuary Zone.

The nymphs of this species most closely resemble those of *B. bellus* BRNRD., but the abdomen is more dorsoventrally flattened and lacks the distinctive colour pattern of *B. bellus*. The labial palp is somewhat different.

* * *

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