Crassabwa: a new genus of small minnow mayflies (Ephemeroptera: Baetidae) from Africa

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1. Introduction

Gillies (1990) erected the genus Afroptilum (Ephemeroptera: Baetidae) to accommodate all African species previously assigned to Centroptilum Eaton. He designated A. sudafricanum (Lestage) as the type species. Adults of Afroptilum were defined as having single marginal intercalaries in the forewings, hindwings present or absent in one or both sexes, a single or double costal spur in the hindwings when these are present, and «Baetis-like» genitalia. Larvae were defined as having glossae narrower than the paraglossae, tarsal claws edentate or with one or two rows of denticles, asymmetrical gill lamellae, and terga 8 and 9 without posterolateral spines. Such characterization actually encompasses diverse evolutionary lineages of baetids, and Afroptilum has thus been considered polyphyletic (McCafferty & de Moor 1995, Barber-James & McCafferty, in manuscript). The different generic lineages represented by Afroptilum s. auctt. have begun to be sorted out (Wuillot & Gillies 1994, McCafferty & de Moor 1995, Barber-James & McCafferty, in manuscript).

As part of our revision of Southern Hemisphere Baetidae, we have become engaged in an intensive survey...
of the baetid fauna of Africa to evaluate its systematic status and determine its biogeographic and phylogenetic affinities. The necessity of such evaluations was pointed out by McCafferty & de Moor (1995). In studying fresh material recently collected from South Africa by one of us (WPM), we found *A. flavum* (Crass), originally described under *Centroptilum* (Crass 1947), to represent a new genus distinct from *Afroptilum*. This discovery prompted us to review other African species. We further discovered that *A. badium* (Kopelke), *A. loweae* (Kimmins), and *A. vitreum* (Navás) are also referable to the new genus. Herein we describe and discuss the new genus and designate *A. flavum* as its type, which we redescribe in the larval stage to include important characterization not included in Crass's (1947) original description. All materials studied are housed in the Purdue Entomological Research Collection, West Lafayette, Indiana.

2. **Crassabwa** Lugo-Ortiz & McCafferty, n. gen.

2.1. Description

Mature larva

— **HEAD**

Antennal scapes and pedicels bare. Frontal keel absent.

Labrum (Fig. 1) basally broad, with deep anteromedian cleft. Hypopharynx (Fig. 2) with apically pointed lingua and somewhat narrow superlinguae.

Mandibles (Figs. 3, 4) with incisors fused and prostheca apically denticulate. Right mandible (Fig. 4) with tufts of setae between prostheca and mola and at base of mola.

Maxillae (Fig. 5) with two-segmented palps, extending as far as galealaciniae; segment 2 apically pointed.

Labium (Fig. 6) with three-segmented palps; palp segment 1 as long as segments 2 and 3 combined; palp segment 2 with thumb-like distomedial process; segment 3 somewhat elongate, apically rounded; glossae basally broad, apically pointed, subequal to paraglossae; paraglossae narrow, apically pointed.

— **THORAX**

Hindwingpads present.

Legs (Fig. 7) without villopore; dorsal and ventral margins of femora subparallel; tibiae with small proximal arc of long, fine setae; tarsal claws (Fig. 8) with two enlarged subapical denticles and four to six small basal denticles.

— **ABDOMEN**

Tergal surfaces (Fig. 9) with scale bases and sharp triangular spination on posterior margin.

Gills (Fig. 10) on abdominal segments 1-7, plate-like, anteriorly serrate near distal end (Fig. 11), branches of tracheae posteriorly oriented.

Paraproct as in Figure 12.

Three caudal filaments present; terminal filament subequal to cerci.

— **ADULT**

Male turbinate eyes mounted on short stalks.

— **HEAD**

Male turbinate eyes mounted on short stalks.

— **THORAX**

Forewings [Crass (1947) : Fig. 20d] with single marginal intercalaries. Hindwings [Crass (1947) : Fig. 20f] elongate, with acute costal process and two longitudinal veins, sometimes not reaching wing margin.

— **ABDOMEN**

Genitalia [Crass (1947) : Fig. 20e] with three-segmented forceps; segment 1 cylindrical; segment 2 elongate, basally broad; segment 3 ellipsoidal.

2.2. Etymology

We name this genus after R. S. Crass, in recognition of his extensive pioneering studies on South African Ephemeroptera. The name is feminine, and it consists of an arbitrary combination of letters incorporating Crass's name.

2.3. Type species

*Centroptilum flavum* Crass, 1947 : 78.

2.4. Included species

*Crassabwa badium* (Kopelke), n. comb. ; *C. flavum* (Crass) (Crass), n. comb. ; *C. loweae* (Kimmins), n. comb. ; *C. vitreum* (Navás), n. comb.

2.5. Distribution

Malawi ; South Africa : Kwazulu-Natal, Mpumalanga, Northern Province ; Tanzania ; Uganda ; Zaire.

2.6. Discussion

In our study of species assigned to *Afroptilum*, we have used *A. sudaficanum* as representative of true *Afroptilum* for comparative purposes. Thus, larvae of *Crassabwa* are distinguished by the thumb-like distomedial process of the second segment of the labial palps (Fig. 6), the proximal arc of setae on the tibiae (Fig. 7), the two enlarged subapical denticles in the tarsal claws (Fig. 8), and the seven gill pairs possessing...
Fig. 1: labrum (dorsal view).
Fig. 2: hypopharynx.
Fig. 3: left mandible.
Fig. 4: right mandible.
Fig. 5: left maxilla.
Fig. 6: labium (left: ventral view; right: dorsal view).
Fig. 7: right foreleg.
Fig. 8: tarsal claw.
Fig. 9: detail of hind margin of tergum 4.
Fig. 10: gill 4.
Fig. 11: detail of gill margin.
Fig. 12: paraproct.
posteriorly oriented tracheae and anterodistal marginal serration only (Figs. 10, 11). Adults are distinguished by the two longitudinal veins and elongate, acute costal process of the hindwings [Crass (1947) : Fig. 20f] and the more robust segment 3 of the male genital forcps [Crass (1947) : Fig. 20e].

Phylogenetic relationships of Crassabwa are difficult to ascertain at this moment because of the present dearth of information on the biodiversity of baetids in the Southern Hemisphere. On the basis of the relatively narrow glossae and paraglossae (Fig. 6), presence of proximal arc of setae on the tibiae (Fig. 7), tergal armature (Fig. 9), and general gill morphology (Figs. 10, 11), Crassabwa preliminarily appears to be related to the Pantropical genus Cloeodes Traver. However, adults of Cloeodes have some double marginal intercalaries in the forewings (although there is a tendency in some species to lose one of the intercalaries in some marginal interspaces), and their hindwings, when present, have a basally broad costal process located in the middle (Waltz & McCafferty, 1987). Additionally, the second segment of the male genital forceps has a distinct, setose basal bulge that Crassabwa lacks (Waltz & McCafferty, 1987).

2.7. *Crassabwa badia* (Kopelke), n. comb.

_Afroptilum badium_ (Kopelke) : Gillies, 1990 : 99.

Kopelke (1980) described _C. badia_ based on male and female adults collected from Zaire. Gillies (1990) transferred the species to _Afroptilum_, but did not state the reasons for this transfer. The morphology of the male genitalia [Kopelke (1980) : Fig. 21a] and male and female hindwings [Kopelke (1980) : Figs. 22b, c, d] agree with our concept of _Crassabwa_, and on this basis we transfer Kopelke’s species to the new genus.

2.8. *Crassabwa flavia* (Crass), n. comb.

_Centroptilum flavum_ Crass, 1947 : 78.
_Afroptilum flavum_ (Crass) : Gillies, 1990 : 99.

2.8.1. Description

Mature larva

Body length : 7.5-8.5 mm; caudal filaments length : 2.7-3.0 mm.

—HEAD

Coloration medium brown, with vermiform cream markings on vertex and cream below median ocellus.

Antennae nearly 2.5x length of head capsule.

Labrum (Fig. 1) with one elongate, fine, simple submedian seta and eight to nine elongate, fine, simple submarginal setae on either side of midline. Hypopharynx as in Figure 2.

Left mandible (Fig. 3) incisors with six to seven denticles, enlarged denticule in midregion. Right mandible (Fig. 4) incisors with six large denticles and row of minute denticules on medial margin.

Maxillae (Fig. 5) with four denticules on galealaciniae and four long, simple setae near medial hump.

Labium (Fig. 6) with relatively long, simple setae marginally; palp segment 2 without dorsal seta; palp segment 3 with many short, fine simple setae.

—THORAX

Coloration yellow-brown, with pale yellow-brown markings.

Legs (Fig. 7) pale yellow-brown; femora with medium brown medial mark and medium to dark brown proximally and distally, and with 12-14 simple setae of medium length dorsally and scattered short, stout, simple setae ventrally; tibiae cream, occasionally medium brown proximally and distally, with minute short, simple setae dorsally and scattered short, stout, simple setae ventrally; tarsi cream, occasionally medium brown proximally and distally, with minute short, simple setae dorsally and scattered short, stout, simple setae ventrally; tarsal claws as in Figure 8.

—ABDOMEN

Coloration with complex and variable markings [Crass (1947) : Fig. 21a], usually with terga 1, 4, 7, and 8 paler than others.

Sterna cream to pale yellow-brown.

Tergal surfaces (Fig. 9) covered with scale bases; spines basal width nearly 0.5x spines length.

Gills (Fig. 10) as long as two abdominal segments; marginal serration (Fig. 11) somewhat small.

Paraprocts (Fig. 12) dorsally bare, with five to six sharp marginal spines.

Caudal filaments cream to pale yellow-brown, with medial medium brown band.

Adult

Adequately described by Crass (1947).

2.8.2. Material examined

SOUTH AFRICA : Mpumalanga Province : Buffelspruit at Shalom (Aalwan), 4 km W of Badplaas parallelining Rt 38, off Avantune Rd, 1167 m, X-17-1990, P. and N. McCafferty, larvae ; Kruger Natl. Park, Sabie R at Sabie Gorge, Mozambique/South African border, X-22-1990, P. and N. McCafferty, larvae ; Kruger Natl. Park, Sabie R at Molondozi, X-23-1990, P. and N. McCafferty, exuviae and larvae; Kruger Natl. Park, Sabie R, below Measur. Wall, 9 km N of Zukuza, X-
2.8.3. Discussion

Crass (1947) described *Crassabwa flava* (as *Centroptilum flavum*) based on adults and associated larvae collected from KwaZulu-Natal. Later, Demoulin (1970) reported it from Uganda. Crass's (1947) description of the larvae is brief, and his figures are somewhat schematic. We have therefore redescribed the larval stage and provided new figures showing characters not indicated by Crass (1947).

The larval abdominal color pattern of *C. flava* is extremely variable, and it is of little diagnostic value for the species. The dorsal setation of the labrum (Fig. 1) is probably diagnostic, as is the denticulation of both mandibles (Figs. 3, 4) and the spination of the paraprocts (Fig. 12). The mandibular figures by Crass (1947: Figs. 2f, g) give the impression that the incisors are cleft, and that the right mandible has an acute hump between the prostheca and mola. Close examination, however, revealed that the incisors are not cleft, and that the hump in the right mandible is more broadly based and attenuated. It additionally revealed the presence of minute denticles on the medial margin of the right mandibular incisors (Fig. 4). Our figures of the hypopharynx (Fig. 2) and left maxilla (Fig. 5) differ from those by Crass (1947: Figs. 21e, d) in that we show the apically pointed lingua and second segment of the maxillary palps.

*Crassabwa flava* is possibly related to *C. vitrea* (Demoulin, 1957, 1970). However, *C. vitrea* is only known from female adults (see below), and until the larvae and male adults of that species are described, species relationships cannot be reliably determined.

Crass (1947) indicated that adults of *C. flava* emerge throughout the year, with a peak between March and May. However, Crass (1947) did not provide information on larval habitat. The larvae we studied were collected in abundance by WPM in a mid-sized stream four to seven meters broad at an altitude of 1167 m, amongst cobblestones in shallow riffle areas. Water temperature was 16.2°C and the pH was 7.9.

2.9. *Crassabwa loweae* (Kimmins), n. comb.

*Centroptilum loweae* Kimmins, 1948 : 829.
*Afroptilum loweae* (Kimmins) : Gillies, 1990 : 99.

Kimmins (1948) originally described *C. loweae* from male adults and male and female subimaiagos from Malawi. Later, Kimmins (1960) reported the species from Uganda and Tanzania, and redescribed the male adult and provided new figures of its genitalia. Gillies (1990) transferred the species to *Afroptilum*, but did not provide a rationale for that transfer. The hindwings [Kimmins (1948): Figs. 1, 2] and male genitalia [Kimmins (1960): Fig. 4b] agree with our concept of the male adult of *Crassabwa*, and on this basis we transfer the species to the new genus.

2.10. *Crassabwa vitrea* (Navás), n. comb.

*Cloeon vitreum* Navás, 1930 : 322.

*Centroptilum vitreum* (Navás) : Demoulin, 1957 : 262.


Navás (1930) described this species from a single female specimen from Zaire. Demoulin (1957) redescribed the type specimen, provided figures of the fore- and hindwings, and assigned the species to *Centroptilum*. Gillies (1990) transferred the species to *Afroptilum*, presumably based on Demoulin's (1957, 1970) comments that it was probably a variant of *C. flava*. Although female adults in Baetidae are difficult to correctly assign to genera because of the virtual lack of reliable diagnostic morphological characteristics, we transfer this species to *Crassabwa* on the basis of its possession of an acute and elongate costal process in the hindwings [Demoulin (1957) : Fig. 3].

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References


