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(*Rev. Zool. Bot. Afr.*, LXI, 1-2)

(*A paru le 30 mars 1960*)

Larvae of
certain East African Ephemeroptera

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The three species of Ephemeroptera dealt with in this paper were described first by KIMMINS in 1956. All form an important part of the lithophilic insect fauna in the Victoria Nile. For each species I have given a description of the larva and brief biological notes.

Specimens from which descriptions were made have been deposited at the British Museum (Natural History), London and, when material permitted, also at the East African Fisheries Research Organisation, Jinja, Uganda.

The habitats from which material was derived are listed below. Sites 1-5 are in Lake Victoria, and sites 7-10 in the swiftly-flowing Victoria Nile at and below Jinja. Collections at sites 6 and 7 were made before the Ripon Falls were submerged in accordance with the Owen Falls Hydro-electric Scheme. All collections were made after construction of the Owen Falls Dam. Material from sites 1-3 and 8 came from the stomachs of fishes caught there, and all other specimens (including some also from site 8) were collected by hand from the surfaces of stones, roots and other submerged objects.

Site 1. Two places at the northern end of Napoleon Gulf on the Busoga shore, c. 1 and 2 km. respectively above the Ripon Falls, Jinja. A gravel bottom, about 5-7 m. deep, with rock outcrops and sparse rooted vegetation of *Najas* and *Potamogeton*.

Site 2. Three places at the northern end of Napoleon Gulf on the Mengo shore within 100 m. of Bugungu pier. A bottom of sand, gravel or rock, about 1-7 m. deep. Rooted vegetation, if present, sparse *Najas*.

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Site 3. Within 100 m. of the island in Ekunu Bay, about 17 km. WSW of Jinja on the Busoga shore. A bottom of mud, with shingle and rock nearby, about 3-6 m. deep, and with rooted vegetation sparse or absent. Shore exposed to the Buvuma Channel.

Site 4. Busungwe. Exposed shore facing east towards the open lake.

Site 5. Entebbe. Exposed shore in bay about 100 m. west of break-water near Geological Survey Department.

Site 6. Rapids on the Ripon Falls, Jinja.

Site 7. About 100 m. below the Ripon Falls on the west bank.

Site 8. Several places 50-500 m. below the Owen Falls Dam on the east bank.

Site 9. Kimaka. Rapids about 2,75 km. below the Owen Falls Dam on the east bank.

Site 10. Nalongo. Rapids about 34 km. below Jinja on an island in the river.

HEPTAGENIIDAE

Afronurus ugandanus KIMMINS

Material

Two males, six females emerged, 28-9.I.56, and four males, two females emerged, 1-2.II.56 from larvae from site 8.

Larvae from site 4, 21.IV.55; site 5, 6.V.59; site 6, 1 and 4.III.54, 1.III.56; site 7, 6.IV.52, 28.VI.53 (R. H. LOWE); site 8, 4.XI.54 (C. C. CRIDLAND), 24 and 27.I.56, 5.IV.56. Larvae from stomachs of the fishes *Barbus altianalis radcliffi* BOULENGER (site 2); *Bagrus docmac* (FORSKAL), *Clariallabes petricola* GREENWOOD, *Gnathonemus longibarbis* HILGENDORF, *G. victoriae* WORTHINGTON and *Mastacembelus victoriae* BOULENGER, all from site 8.

Description

Larva (Fig. 1) strongly dorso-ventrally flattened. Head large, anteriorly rounded, carapace-like and forming widest part of body. Compound eyes and ocelli prominent, antennae short. Femora strongly flattened. Wing-sheaths in final instar larva extend posteriorly to about abdominal segment IV.

The markings on the dorsum of head, thorax and abdomen, and on the anterior surfaces of the femora, vary considerably in intensity and extent, but the abdominal pattern remains recognisable as a diagnostic character of this species.

Abdominal gills attached to posterior margins of segments I-VII inclusive; those on I-VI bear filaments on the posterior faces; that on VII does not. Gill I lanceolate (Fig. 5); gills II-IV sub-trian-

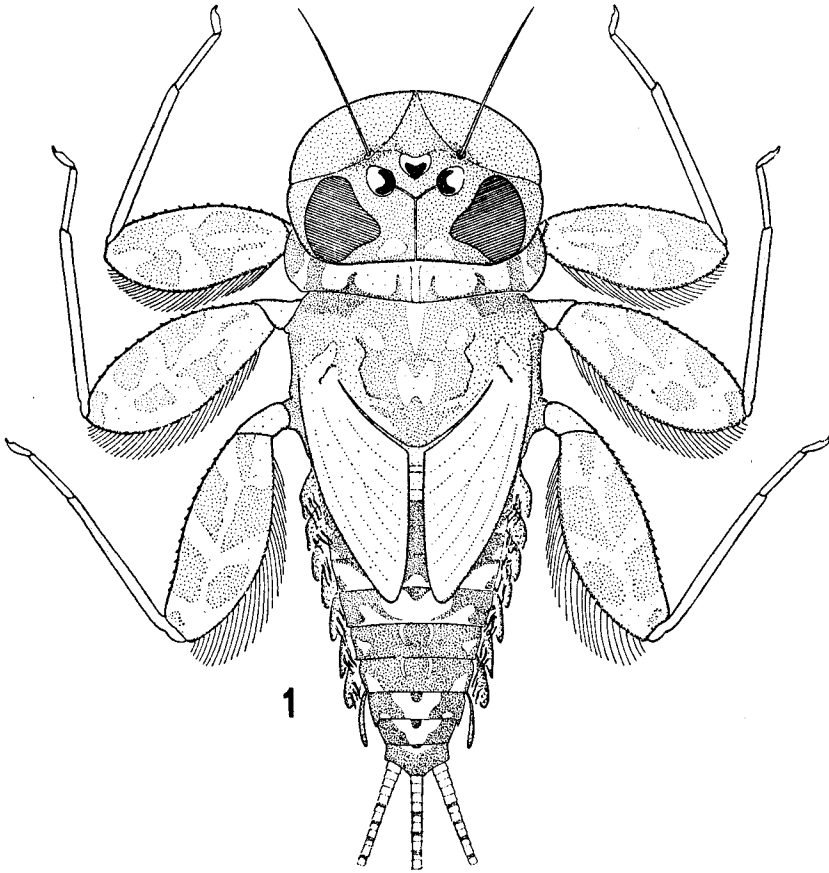


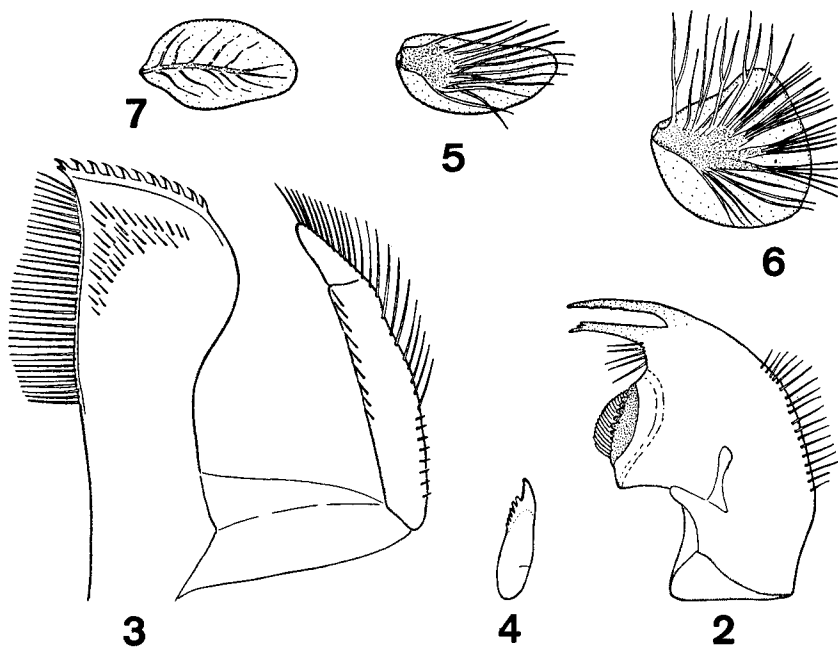
Fig. 1. - *Afronurus ugandanus*. Final instar larva (cerci omitted).

gular (Fig. 6); gill V and VI sub-triangular but each with an apical filament, this being longer on VI; gill VII (Fig. 7) lanceolate and without filament.

Dimensions of final instar larvae, male (and female), to nearest $\frac{1}{2}$ mm.: body-length 9 (10); including cerci 19 ($21\frac{1}{2}$); head-width $2\frac{1}{2}$ ($2\frac{1}{2}$); wing-sheaths 3 (3).

Remarks

Amongst African species of *Afronurus*, and of the closely allied *Notonurus* (CRASS, 1947; DEMOULIN, 1956a), larvae are now known of *A. peringueyi* (ESBEN-PETERSEN), *A. harrisoni* BARNARD, *A. ugandanus* KIMMINS, *A. CORBET* sp. n. (in press), and *N. cooperi* CRASS. In addition, DEMOULIN (1956b) has described an undetermined larva of *Afronurus* from rivers in the Belgian Congo.



Figs. 2-7. - *A. ugandanus*. 2, right mandible, dorsal view; 3, right maxilla and palpus, dorsal view; 4, tarsal claw of right fore leg; 5-7, right abdominal gills, posterior view; 5, segment I; 6, segment II; 7, segment VII.

Although descriptions of these larvae show them to be very much alike, the larva of *A. ugandanus* can be distinguished readily from those of *A. peringueyi* (see BARNARD, 1932) and *A. sp. n.* (in press) by the abdominal pattern. The same character serves to separate these species from larvae of an unidentified species of *Afronurus* known from highland streams on Mount Elgon, Uganda, and it would therefore seem desirable that future descriptions of larvae of this group should include details of abdominal pattern.

Larvae of *A. ugandanus* provide an important item in the food of small fishes feeding amongst stones in the Victoria Nile at Jinja (see CORBET, 1958). In 1956, larvae were found to occur in 18-27 % of stomachs of *Mastacembelus victoriae*, and in 9 % of *Clariallabes petricola*, in which larvae may provide more than half of the volume of food in the stomach in 2 % of fishes. FRYER (1959) found larvae of *Afronurus* spp. to provide food for several species of fishes on rocky shores in Lake Nyasa.

Since 1950, attention has been focussed on larvae of *Afronurus* as partners in phoretic associations involving three species of *Simulium* (MARLIER, 1950; VAN SOMEREN and McMAHON, 1950). In Kenya, VAN SOMEREN and McMAHON found *A. peringueyi* to be the species involved, and recently CORBET (1960) has discovered *A. sp. n.*, bearing pupae of *S. copleyi marlieri* in western Uganda. It is therefore of particular interest to record that *A. ugandanus* can now be added to the list of species which carry *Simulium*, for amongst larvae collected by Miss R. H. LOWE from the Ripon Falls (site 7) in April 1952 are some which bear pupal cocoons of *Simulium* in the customary position on the wing-sheaths. Two of the larvae carrying pupae are in the penultimate instar. The *Simulium*, *S. lumbwanus* DE MEILLON, belongs to a species not previously known from the region. Only 58 days after this material was collected, the Victoria Nile was treated with DDT for the first time to eradicate *Simulium damnosum*. Miss LOWE collected more *A. ugandanus* larvae from the same site some 14 months later, but none of them bore *Simulium*.

LEPTOPHLEBIIDAE

Euthraulius bugandensis KIMMINS

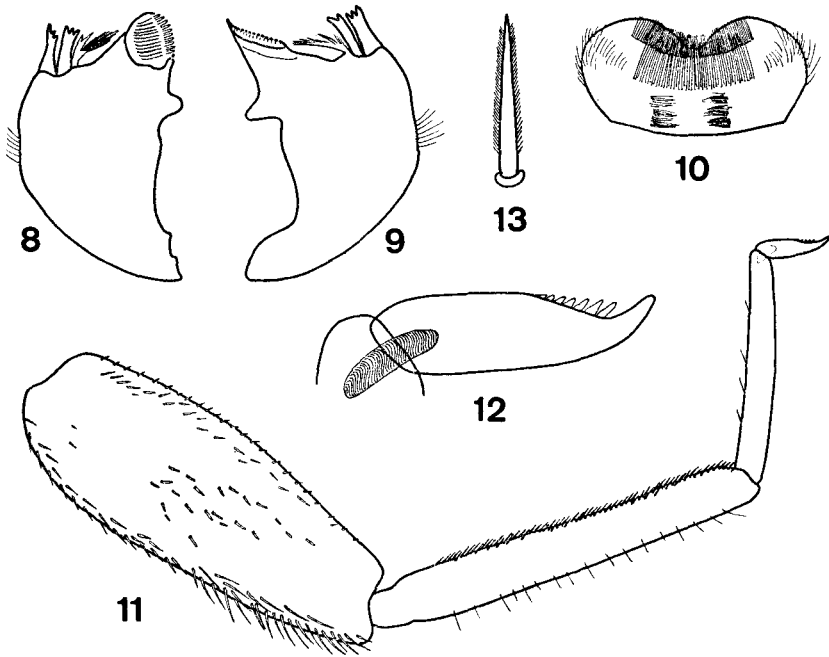
Material

One male emerged I.56 from larva from site 8. One male emerged 7.V.59 from larva from site 5.

Description

Larva uniform dark brown, and resembling very closely that of *E. elegans* BARNARD as figured by BARNARD (1932, p. 250), and those of *E. tropicalis* GILLIES, *E. usambarae* GILLIES and *Euthraulius sp. A* (GILLIES, 1957). The characters selected by GILLIES to distinguish the three species he described are included in Figs. 8-13. It appears that in the number and distribution of spiniform setae on the fore femur,

and also in the relative widths of the transverse rows of setae on the labrum, *E. bugandensis* differs from the three East African species described by GILLIES. Certain setae (called « spines » by GILLIES) on the fore leg appear feathered under high magnification (Fig. 13). Such setae occur only on the basal third on the anterior margin of the femur; three or four only in the middle of the posterior margin of the femur; and along the whole length of the anterior margin of the tibia.



Figs. 8-13. - *Euthraulius bugandensis*. 8 and 9, left and right mandibles, dorsal view; 10, labrum, dorsal view; 11, right fore leg; 12, tarsal claw of right fore leg; 13, feathered seta from fore femur.

The setae in the centre of the femur are all simple, and correspond to GILLIES' « peg-like spines »

Dimensions of final instar larvae (male) to nearest $\frac{1}{2}$ mm. : body-length 8; including cerci $9\frac{1}{2}$; head-width 2; wing-sheaths 2.

Remarks

In Lake Victoria and the Victoria Nile two closely similar species of *Euthraulius* occur : *E. bugandensis* and *E. curtus* KIMMINS. Until the

larva of *E. curtus* is described, it will not be possible to make specific determinations of *Euthraulius* larvae in this region.

Larvae of *Euthraulius* occur commonly on stones in the Victoria Nile and also in more exposed situations in Lake Victoria. In both places they may provide a small part of the food of insectivorous fishes.

TRICORYTHIDAE

Tricorythus tinctus KIMMINS

Material

One male emerged 1.II.56, one female emerged 2.II.56 from larvae from site 8.

Larvae from site 6, 4.III.54, 3.V.54, 26.VII.54 and 1.III.56; site 8, I.56; site 10, 23.III.55. Larvae from the stomachs of fishes *Barbus altianalis radcliffi* (sites 1 and 8), *Bagrus docmac* (site 8), *Clariallabes petricola* (site 8), *Clarias mossambicus* PETERS (site 8), *Gnathonemus longibarbis* (site 8), *G. victoriae* (sites 1 and 8), *Marcusenius grahami* NORMAN (site 8), *Mormyrus kannume* FORSKAL (sites 1, 2, 3 and 8), *M. macrocephalus* WORTHINGTON (site 8), *Petrocephalus degeni* BOULENGER (site 8), *Mastacembelus victoriae* (site 8), *Protopterus aethiopicus* HECKEL (site 8), *Gara johnstoni* (BOULENGER) (site 8), *Haplochromis chilotes* (BOULENGER) (site 2).

Description

Larva (Fig. 14) moderately flattened dorso-ventrally, and of an appearance characterised by the prominent, setiferous mandibles and the wide, flanged pronotum. Femora robust, ridged and bearing a row of spiniform setae across the fore femur.

Colour mottled grey with an ill-defined and variable pattern of paler areas.

Dimensions of final instar larvae, male (and female), to nearest $\frac{1}{2}$ mm. : body-length $5\frac{1}{2}$ ($6\frac{1}{2}$); including cerci $8\frac{1}{2}$ ($11\frac{1}{2}$); head-width $1\frac{1}{2}$ (2); wing-sheaths 2 (2).

Remarks

In 1957 DEMOULIN described from rapids in the Congo River near Léopoldville, a larva which he assigned provisionally to *Tricorythus*. The present study confirms DEMOULIN's diagnosis, since his larva resembles that of *T. tinctus* extremely closely. Inspection of DEMOULIN's

careful description makes it seem probable that in future differences between species of *Tricorythus* may be found in the shapes of the pronotum, mandibles, gill filaments and tarsal claws, and possibly also in the extent of ciliation on the distal margin of the labrum.

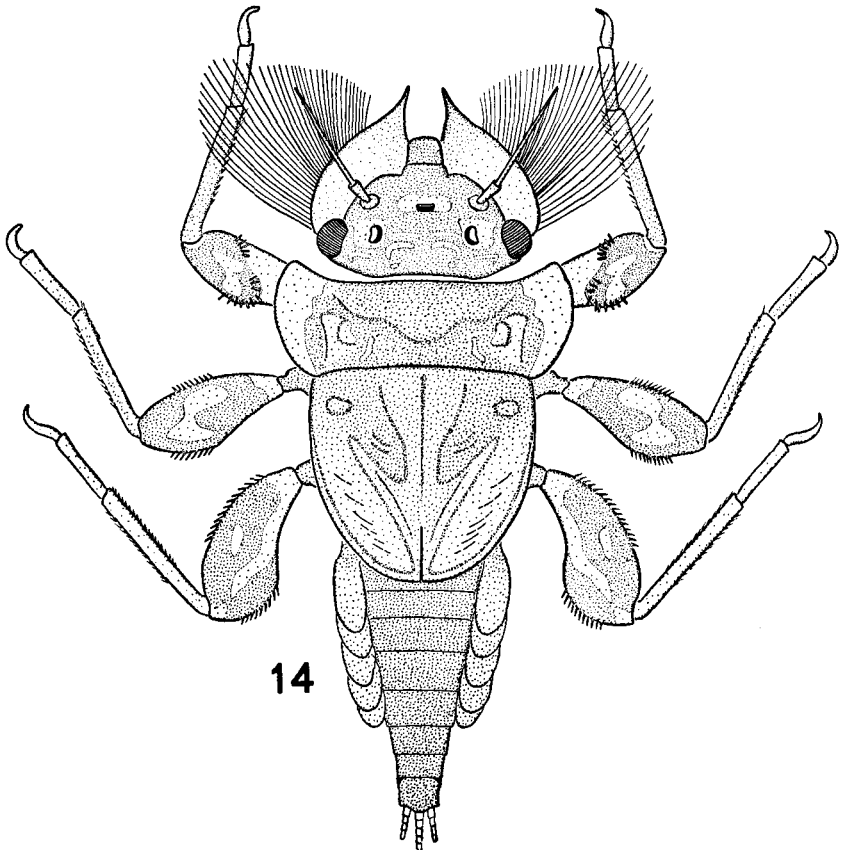
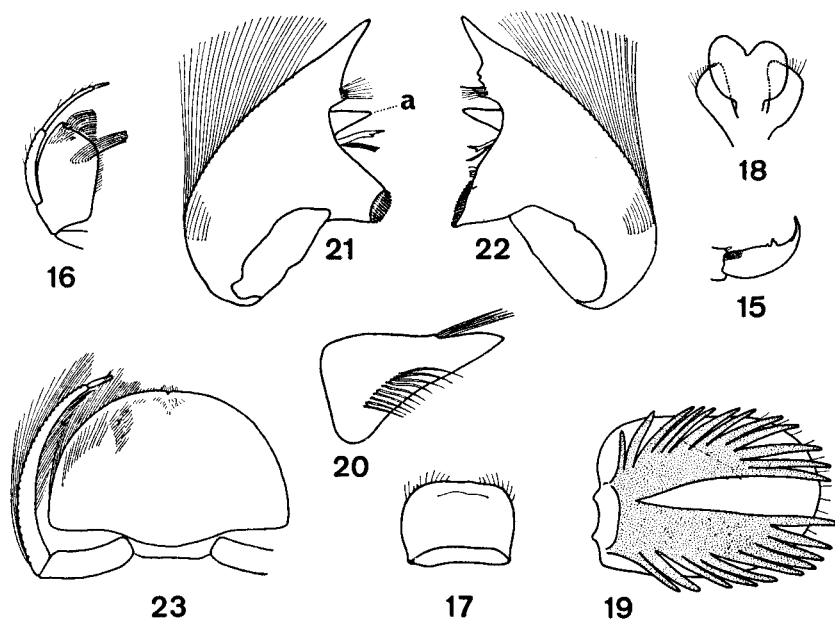


Fig. 14. - *Tricorythus tinctus*. Final instar larva (cerci omitted).

T. tinctus appears to be restricted to rivers where the water flows swiftly. The few larvae found in fish stomachs in Lake Victoria could all have been derived from the rapidly-flowing water immediately above the Ripon Falls. In torrential situations larvae can achieve a high density, and below the Owen Falls on occasions in 1956 they occurred on at least 66 % of stones sampled on the river bed. This

species, with *A. ugandanus*, was severely affected at site 8 by the DDT treatment in 1956, and this circumstance was considered to be largely responsible for the marked change in feeding habits of the fishes *Clariallabes petricola* and *Mastacembelus victoriae*. Before the dosing, larvae of *T. tinctus* had occurred in about 67 % and 80 % of stomachs, respectively, of the two species (CORBET, 1958). It appears that, where



Figs. 15-23. - *T. tinctus*. 15, tarsal claw of right mid-leg; 16, left maxilla, dorsal view; 17, labrum, dorsal view; 18, hypopharynx, dorsal view; 19, right abdominal gill, segment II, posterior view; 20, spine *a* on left mandible, magnified; 21 and 22, left and right mandibles, dorsal view; 23, labium, dorsal view (details omitted of right half).

abundant, *T. tinctus* can provide a major element in the food of fishes feeding amongst the stones of a river bed.

At Jinja, Uganda, adults of *T. tinctus* cause inconvenience at the Owen Falls Dam, where very large numbers are attracted to lights at night. They arrive at irregular, short intervals and form piles of rotting insects which cause embarrassment both inside and outside buildings. The cause of these swarms is not known, but it seems possible that in 1956 at any rate the times of their occurrence may have been influenced by fluctuations in the amount of water passing over the Ripon Falls.

Were this to have been so, it would indicate an effective method whereby short-lived rheophilic insects in equatorial regions could synchronise their emergence. It is worth noting that *T. tinctus* also occurs commonly at the site of another proposed hydro-electric scheme — the Karuma Falls, at Amenyi, between Atura and the Murchison Falls. Indeed it is likely that habitats suitable for hydro-electric projects in tropical Africa will also support large populations of *Tricorythus*.

ACKNOWLEDGMENTS

I wish to thank Dr. P. FREEMAN for identifying material of *Simulium lumbwanus*.

SUMMARY

This paper contains descriptions of larvae of three species of East African Ephemeroptera and notes on their biology.

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