

**DESCRIPTION OF THE LAST-INSTAR LARVA OF  
*PHYLLOGOMPHUS BRUNNEUS* PINHEY, 1976  
(ANISOPTERA: GOMPHIDAE)**

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The last-instar larva is described, and tentatively compared with the larvae of 4 other *Phyllogomphus* spp., all of which are keyed. Some notes on biology are appended.

## INTRODUCTION

The genus *Phyllogomphus* includes 16 species across the tropical regions of the African continent (BRIDGES, 1993). The larval morphology of most of these species is still unknown. The larvae of the *Phyllogomphus* spp. so far described are unusual and clearly distinguishable from other Gomphidae. To date, the only species known from South Africa is *P. brunneus* Pinhey (PINHEY, 1985). Here the last-instar larva of this species is described.

## METHODS

Descriptions here are from four last-instar exuviae. Two last-instar larvae were reared in the laboratory until emergence, and the species determined from the teneral imagos. In addition, two exuviae were collected in the field. The exuviae were stored in 75% ethyl alcohol, and drawn using a stereomicroscope and camera lucida (50 × magnification).

Measurements were to the nearest 0.1 mm using a micrometric eyepiece. P.S. CORBET's (1953) terminology for the labium was used. Abdominal segments are indicated as S1... S10.

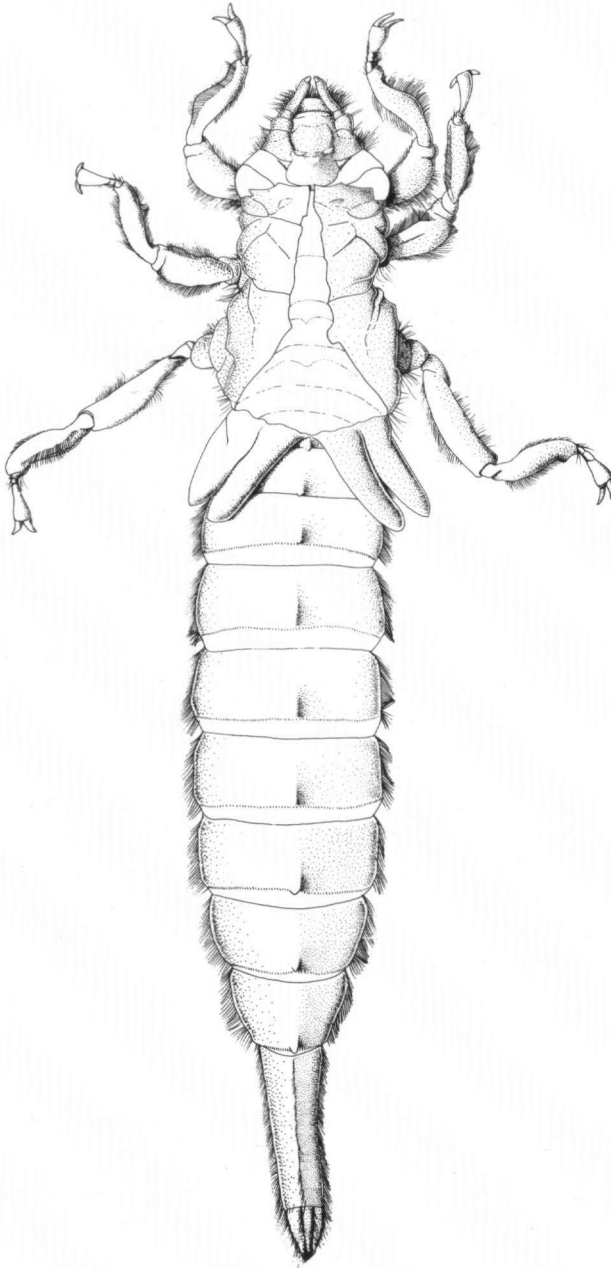


Fig. 1. *Phyllogomphus brunneus*, male exuviae: habitus.

## DESCRIPTION

**Material.** — South Africa, Eastern Transvaal, Kruger National Park, Sabie River nr Skukuza: 2 ♂ exuviae, 2 ♀ last-instar larvae, all December 1992, M. Di Domenico leg.

Body elongated, brown or dark brown, densely setose along the lateral edges of the head and abdomen. Head stout, wider than long, but not wider than the thorax. Eyes large. Labrum half the length of antennae, fringed with a line of short hairs (Fig. 1). Antennae 4-segmented, third segment being the longest, and as long as the distance between their insertions, or a little longer. Fourth antennal segment short, not curved, with a rounded apex (Fig. 2a).

Prementum quadrate, with two groups of short, thin setae on the superior surface and along the lateral margins (Fig. 3a). Distal margin of prementum

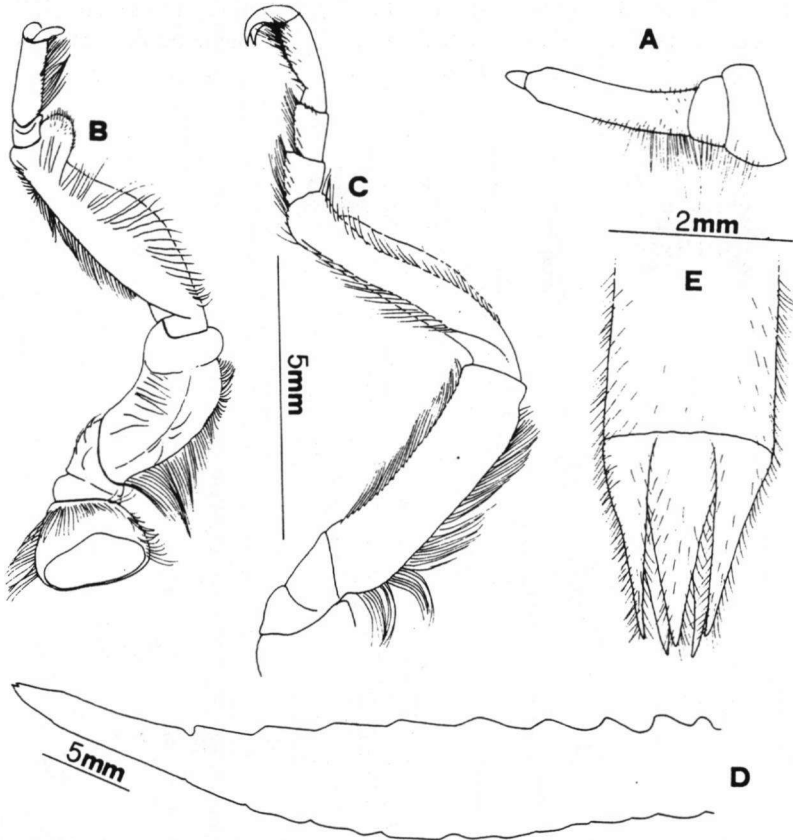


Fig. 2. *Phyllogomphus brunneus*, male exuvia: (A) antenna, dorsal view; — (B) fore leg; — (C) hind leg; — (D) profile of the abdomen; — (E) anal pyramid.

shallowly concave, with two series of 10-15 small teeth, each bearing a basal spiniform seta (Fig. 3b). Palpus stout, with 10-12 teeth on medial third of inner margin, proximal teeth the largest, the remainder gradually decreasing in length (Fig. 3c). Movable hook long and sharp, weakly curved (Fig. 3a).

Mandible with two series of teeth, four distal ones largest (Figs, 3d, e).

Legs short and strong, moderately flattened, setose. Fore and mid legs with two tarsal segments, hind legs with three. Fore- and mid-tibiae distally with a rounded tooth on the outer side, as long as the first tarsal segment, hind legs without tooth on tibia (Figs. 2b, c).

Wing-sheaths distinctly divergent in the exuviae, not reaching the distal margin of third abdominal segment.

Abdomen long and only distally reduced in width. Segments S1-S7 approximately equal in width (Fig. 1). Obtuse dorsal spines on segments S1-S3 and S9, other segments with slight dorsal keels (Fig. 2d). Lateral spines absent. S10 very elongated, as long as, or a little longer than S9+S8, triangular in section, with a row of thin setae on dorsal keel.

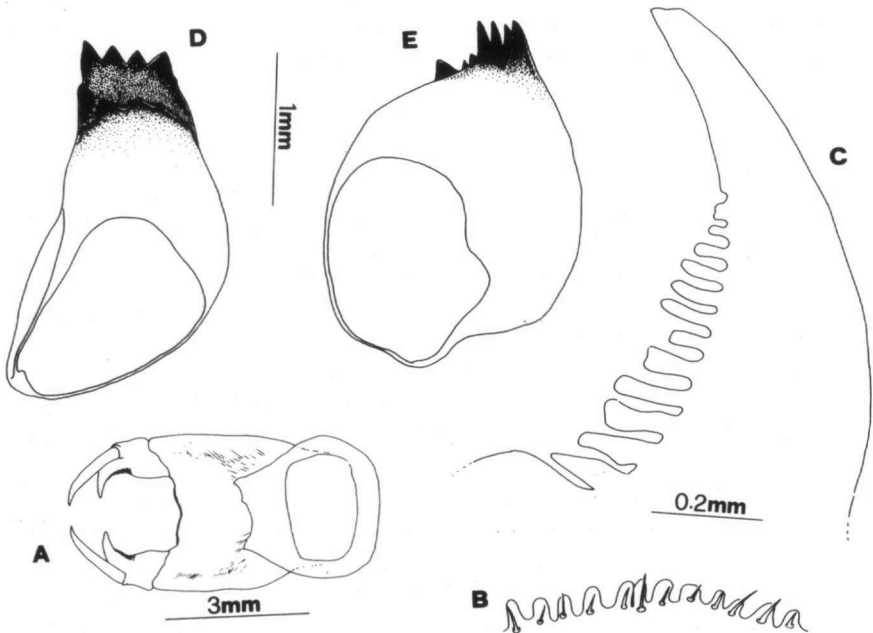


Fig. 3. *Phyllogomphus brunneus*, male exuviae: (A) prementum, dorsal view; - (B) distal margin of prementum, dorsal view; - (C) inner margin of palpus; - (D) right mandible, inner surface; - (E) right mandible, dorsal view.

Anal pyramid extremely small, not more than 1/25th of the body length. Cerci, epiproct and paraprocta approximately equal in length (Fig. 2e).

For measurements see Table I.

### BIOLOGICAL NOTES

There is little information on the biology of *Phyllogomphus* spp. especially the larval stages. The adults fly along the shores

of rivers and pools rich in vegetation (FRASER, 1957; PINHEY, 1985).

We have collected the last-instar larvae of *P. brunneus* both in running and in still waters, in mud and in river gravel. Further, we have observed some exuviae on vertical rockfaces, which is unusual for the Gomphidae, which normally prefer horizontal surfaces for emergence. The larvae that were reared in the laboratory emerged in the same way, climbing vertically up the floating cage. The adults emerged at night, and their colours were fully developed by the following morning.

### DISCUSSION

The larvae of four *Phyllogomphus* spp. have been described to date:

- (1) *P. selysi* Schouteden. According to FRASER (1957), this species was described as *P. aethiops* Sélys by NEEDHAM (1904).
- (2) *P. orientalis* Fraser. According to S.A. CORBET (1977), P.S. CORBET (1956) described this species as *P. aethiops*. PINHEY (1959) gave a further brief description of the species.
- (3) *P. aethiops* Sélys. Described by FRASER (1957).
- (4) *P. montanus* Fraser. Described by FRASER (1957) and redescribed by S.A. CORBET (1977). The two descriptions of this species are not in complete agreement.

Only the descriptions by P.S. CORBET (1956) and S.A. CORBET (1977) are based on specimens determined from the emerged adults. The other descriptions were based on only the exuviae or on dead larvae. In the case of the larvae, the determinations were also based on the habitat type. These uncertainties throw doubt on the original determinations as suggested anyway by NEEDHAM (1904) and by FRASER (1957; for *P. aethiops* only).

Despite some uncertainties, *P. brunneus* appears to be similar in shape and proportions to the other described *Phyllogomphus* larvae. In particular, it is virtually indistinguishable from *P. orientalis*, from which it differs in only a few

Table I

*Phyllogomphus brunneus*: measurements of the last-instar larva - [Data from 4 specimens]

Character	Range (mm)
Total length	50.2-59.2
Head width	6.7- 6.9
Distance between antennae insertions	2.5- 3.2
Mask length	3.8- 4.0
Mask width	3.4- 3.7
Metatibia length	4.4- 4.6
S10 length	6.7- 7.5
Anal pyramid length	2.0- 2.4

details: *P. orientalis* has a more deeply concave distal margin to the prementum, a curved, sharper movable hook, and a smaller pointed fourth antennal segment. In contrast, *P. brunneus* differs from the other three species in that their segments S8 and S9 have sharp lateral spines, completely lacking in *P. brunneus*. Among these three species, *P. montanus* is quite different from the others, especially in the shape of the distal margin of prementum, which is excavated into a triangular sinus with straight margins, and not convex like those of the other species. Further, *P. selysi* differs in the shape of the S10, which is shorter than S9 + S8. All these three last species bear strong, pointed teeth on the outer margin of fore- and mid-tibiae, while *P. brunneus* has rounded teeth, not longer than the first tarsal segment. According to P.S. CORBET's (1956) and PINHEY's (1959) descriptions, *P. orientalis* does not have teeth on the outer margin of the fore and mid legs. This being the case, *P. orientalis* is readily distinguishable from all the other known spp. of *Phyllogomphus*, which possess the character.

PINHEY (1959) does not describe the legs of *P. orientalis* and his illustration of the body is too small to distinguish this character. P.S. CORBET (1956) describes the legs as "adapted for digging" but even his more exact drawing is also too small to determine unequivocally the distal shape of fore- and mid-tibiae. This means that *P. orientalis* may indeed bear a tooth on its fore- and mid-tibiae, similar to the one in *P. brunneus* (i.e. small and rounded). For this reason, this character was omitted in the comparisons. Nevertheless, the burrowing habit of all *Phyllogomphus* spp. suggests that all are likely to have this tooth.

The first tarsal segments of FRASER's (1956) (see his fig. 3). "*Phyllogomphus ? aethiops*" each appear to bear a burrowing tooth. This character is not discussed by FRASER (1956), but is clearly an important feature. As this character does not appear in FRASER's (1957) description of *P. aethiops* and is also absent in the other spp. of *Phyllogomphus* so far described, it is probably that the specimen figured in FRASER's (1956) paper is not *P. aethiops*.

#### TENTATIVE KEY FOR THE FIVE KNOWN SPECIES OF *PHYLLOGOMPHUS*

This key is only preliminary, using features known to date.

- |   |  |                   |
|---|--|-------------------|
| 1 | No lateral spines on S9 and S8. Fore- and mid-tibiae without or with, rounded distal burrowing teeth ..... | 2                 |
| – | Lateral spines on S9 and S8. Fore- and mid-tibiae with sharp burrowing teeth .....                         | 3                 |
| 2 | Distal margin of the prementum with curved and sharp spines .....  | <i>orientalis</i> |
| – | Distal margin of the prementum with rounded, not sharp spines .....  | <i>brunneus</i>   |
| 3 | Distal margin of prementum excavated into a triangular sinus with lateral border straight ....             |                   |
| – | .....  | <i>montanus</i>   |
| – | Distal margin of prementum excavated as a sinus with lateral border convex .....                           | 4                 |
| 4 | S10 cylindrical .....  | <i>aethiops</i>   |
| – | S10 triquetral .....   | <i>selysi</i>     |

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## REFERENCES

- BRIDGES, C.A., 1993. *Catalogue of the family-group, genus-group and species-group names of the Odonata of the world*. [2nd ed.]. Bridges, Urbana/IL.
- CORBET, P.S., 1953. A terminology for the labium of larval Odonata. *Entomologist* 86: 191-196.
- CORBET, P.S., 1956. Larvae of East African Odonata. 4-5: 4. *Lestinogomphus angustus* Martin. 5. *Phyllogomphus aethiops* Sélys. *Entomologist* 89: 216-219.
- CORBET, S.A., 1977. Gomphids from Cameroon, West Africa (Anisoptera: Gomphidae). *Odonatologica* 6: 55-68.
- FRASER, F.C., 1956. Results from the Danish expedition to the French Cameroons 1949-50. XIII, XIV. Odonata. *Bull. Inst. fr. Afr. noire* 18: 938-959.
- FRASER, F.C., 1957. A revision of the genus *Phyllogomphus* Selys with descriptions of five new species. *Revue Zool. Bot. afr.* 56: 9-32.
- NEEDHAM, J.G., 1904. New dragon-fly nymphs in the United States National Museum. *Proc. U.S. natn. Mus.* 27: 685-720.
- PINHEY, E., 1959. Notes on African Odonata nymphs. *J. ent. Soc. sth. Afr.* 22: 469-488.
- PINHEY, E., 1984. A survey of the dragonflies (Odonata) of South Africa. Part 2. Anisoptera. *J. ent. Soc. sth. Afr.* 48: 1-48.