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SHORT COMMUNICATIONS

THE LAST INSTAR LARVA OF *GYNACANTHA VILLOSA* GRUENBERG AND *G. MANDERICA* GRUENBERG (ANISOPTERA: AESHNIDAE)*

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The larval morphology of the 2 spp. is described for the first time from specimens collected in East Africa, and a comparison between the spp. is given.

INTRODUCTION

The genus *Gynacantha* Rambur, 1842 includes more than 80 species widespread in southern continents (DAVIES & TOBIN, 1985) and 14 of these are present in Africa (DIJKSTRA, 2005). As far as we know, there are several descriptions of larval morphology of the genus concerning American and Asiatic species, while there are no descriptions of larval morphology of African taxa, except for *G. cylindrata* Karsch, 1891, described briefly by PINHEY (1959) and *G. bispina* Rambur, 1842, a species actually occurring only in Mauritius and Reunion, more recently described by COUTEYEN & PAPAZIAN (2000). Here is provided in detail the larval morphology of the African species *G. manderica* Gruenberg, 1902 and *G. villosa* Gruenberg, 1902. The former is widespread in different regions of the African continent, while the latter is restricted to East Africa.

* Dedicated to the memory of the recently deceased Professor Dr Philip S. CORBET. Aside of his exceptional contribution to the study of the Odonata, we are in debt to him for the kind gift of his African Odonata exuviae collection. Both the present paper and our previous publication on *Hadrothemis* are based on his specimens and we hope to honour his memory with other descriptions of his material in the future.

METHODS AND TERMINOLOGY

The material was collected in the field and reared to adult emergence. Exuviae were stored dry, but the mask, one mandible and one maxilla of one *G. manderica* and two *G. villosa* specimens were mounted on microscopic slides. The drawings were done by using a stereomicroscope and a camera lucida. All measurements were to the nearest 0.02 mm using a micrometric eyepiece. The following measurements were made: head width, distance between antennae insertions, prementum length and width, anterior tibiae length, abdomen width, distance between apices of lateral spines at S9 (dorsal view), epiproct length and cerci length (lateral view). Since part of the material was damaged, it was not possible to obtain all measurements for each specimen. For SEM observations, the dry samples were glued onto observation supports, gold sputtered and observed with a scanning electron microscope (LEICA STEREOSCAN S 440) and digitalized pictures were taken. Abdominal segments are indicated as S1-S10. We adopted CORBET's (1953) terminology for the mask and WATSON's (1956) terminology for mandibles, but for the latter we choose to use the terms "dorsal" and "ventral" instead of "anterior" and "posterior" respectively, because they better describe the actual position of the mandibles in a prognathous insect as the Aeshnidae larvae.

MORPHOLOGICAL DESCRIPTION

GYNACANTHA MANDERICA GRUENBERG

Figures 1-3, 7, 9, 11, 13-18, 28-31

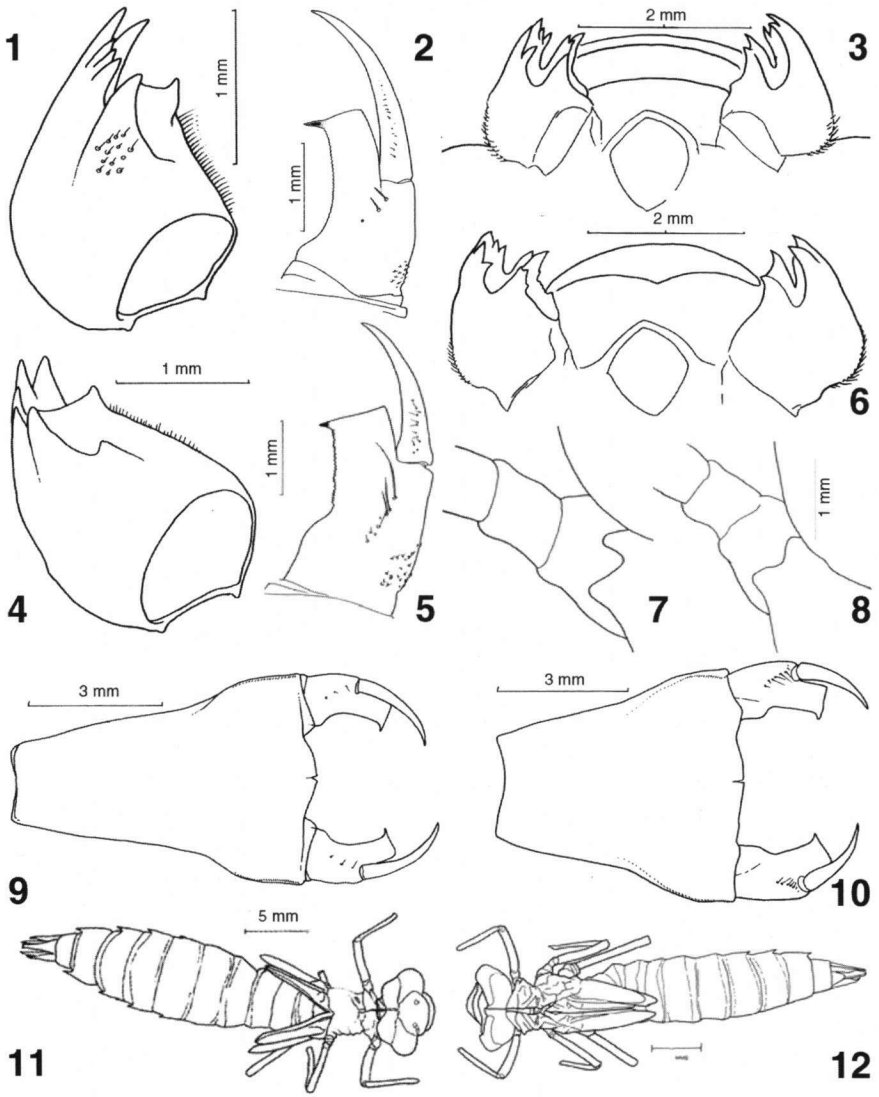
M a t e r i a l. – 5 last instar exuviae (2 ♂, 2 ♀ and one of undeterminable sex), Bugungu, Uganda, from 24-V-1954 to 20-V-1956, P.S. Corbet leg.

Habitus resembling that of the European species of the genus *Aeshna* (Fig. 11). Colour pattern pale brown with a dorsal darker double stripe along the abdomen. Body smooth and glabrous. Eyes large and spherical. Antennae probably 7-segmented, the third being the longest, but all specimens had incomplete antennae (Fig. 18). The articulation between prementum and postmentum is not identifiable in the material, but it is presumably behind the mesocoxae. Mandibles with two sets of teeth divided by a deep depression; the set of incisors (external) with four sharp distinct teeth, the set of molars (inner) blade-like (Figs 1, 3, 28-31). Mandibular formula:

L 1234 ab k
R 1234 ab k

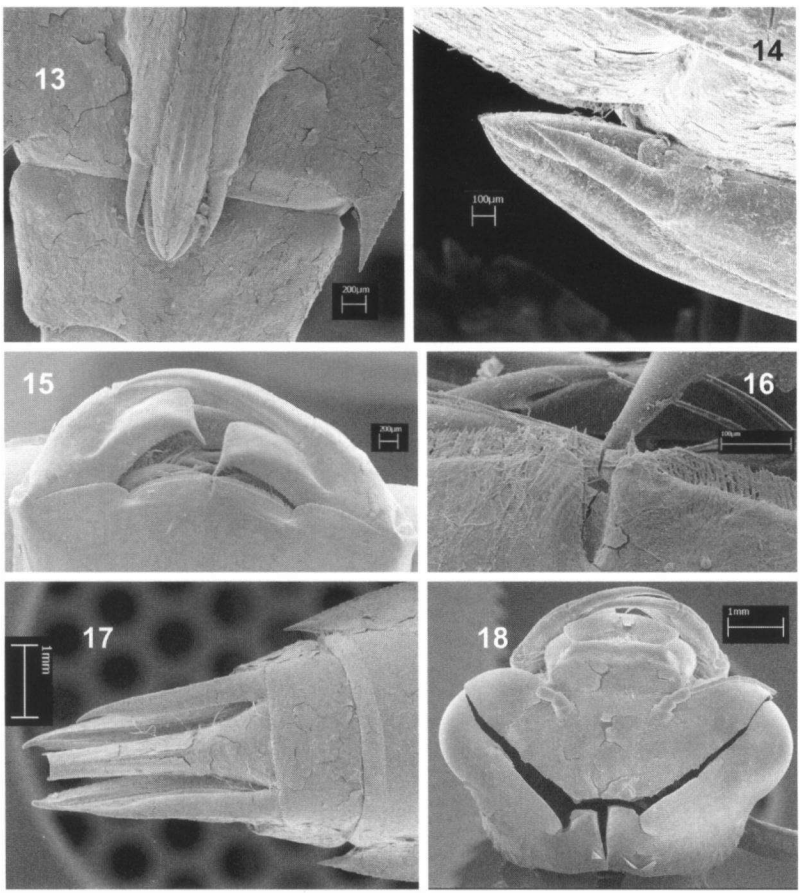
In some specimens, however, the more ventral tooth (4) is bifid. In left and right mandible molar crest lower than the incisors; a and b sharp. All incisors sharp, being 3 and 4 > 1 and 2.

A group of short spiniform setae is on the dorsal face (Figs 1, 28) and a larger one on the ventral face (Fig. 31), appearing as a row in dorsal view (Fig. 1). Mask as usual in Aeshnidae, prementum with a row of very small spiniform setae along the distal part of the lateral margins (Fig. 9); distal margin with a thick fringe of setae and with a cleft in the middle (Fig. 16). The cleft appears open in the SEM picture, but this is an artefact probably due to the SEM preparation procedure;



Figs 1-12. *Gynacantha* structural features: (1) *G. manderica* left mandible, dorsal view; – (2) *G. manderica* right palpus, dorsal view; – (3) *G. manderica* mandibles *in situ*, ventral view after mask was removed; – (4) *G. villosa* left mandible, dorsal view; – (5) *G. villosa* right palpus, dorsal view; – (6) *G. villosa* mandibles in situ, ventral view after mask was removed; – (7) *G. manderica* supracoxal projection, dorsal view; – (8) *G. villosa* supracoxal projection, dorsal view; – (9) *G. manderica* mask, dorsal view; – (10) *G. villosa* mask, dorsal view; – (11) *G. manderica* schematic drawing of final exuviae; – (12) *G. villosa* schematic drawing of final exuviae.

the cleft is closed in the remaining material. Palpus with two groups of setae: one alignment of a few longer setae near the articulation with movable hook and one patch of several small spiniform setae near the articulation with prementum (Fig. 2); distal and inner margins crenated and with a long and acuminate tooth on the corner (Figs 2, 16). Movable hook with a row of small spiniform setae (Fig. 2). Wing sheaths reaching the posterior margin of S3. Bifid supracoxal projections moderately pointed (Fig. 7). Abdomen with lateral spines at S9-S6 (Fig. 11); ovipositor not reaching to half of S10, the third valve with an acuminate conical tip (Figs 13, 14). Anal pyramid as long as S9 + S10, with cercus length about 9/19 of the length of the epiproct (Fig. 17, Tab. I), male projection triangular in shape, about 1/3 the length of the epiproct.



Figs 13-18. *Gyncantha manderica*: (13) ovipositor, ventral view; – (14) ovipositor, lateral view; – (15) palps, ventral view; – (16) median distal margin of the prementum and teeth of the palpus, dorsal view; – (17) anal pyramid, dorsal view; – (18) head, dorsal view.

GYNACANTHA VILLOSA GRUENBERG

Figures 4-6, 8, 10, 12, 19-27

Material. – 5 last instar exuviae (1 ♂, 4 ♀), Bugungu, Uganda, from 24-V-1954 to 11-X-1955, P.S. Corbet leg; 1 last instar exuviae (♂), river Nawanga, Busembatia, 28-V-1954, P.S. Corbet leg.

Habitus like *G. manderica* (Fig. 12), but clearly bigger (Tab. I) and with a lighter colour pattern. Eyes large and spherical (Fig. 25), antennae 7-segmented, the third being the longest. Occiput with several alignments of spiniform setae (Figs. 24, 25). The articulation between prementum and postmentum is not identifiable in the material, but it is presumably not behind the mesocoxae. Mandibles with two sets of teeth divided by a deep depression; the set of incisors (external) with four sharp distinct teeth, the set of molars (inner) blade-like (Figs. 4, 6). Mandibular formula:

L 1234 ab k
R 1234 ab k

All incisors sharp, being 3 and 4 > 1 and 2. Molar crest lower than the incisors; a sharp, b obtuse.

Only few sparse spiniform setae on the anterior face and a band of spiniform setae on the ventral face, appearing as a row in dorsal view (Fig. 4). There are some differences between the two mandibles: the right one has a supplementary tooth over the 4, the molar blade between a and b is crenate, while it is smooth in the left mandible, right k blunt and conical, left k sharp. Mask short and stout, prementum with a row of very small spiniform setae along the distal part of the lateral margins reaching up to half of the lateral margins (Fig. 10); distal margin with a thick fringe of setae and with a cleft apparently open in the middle (Fig. 26) (but see explanation for *G. manderica*) and a group of small spiniform setae near the articulation with palpus (Fig. 8). Palpus with a row of spiniform setae in the middle, the setae closer to the insertion of movable hook being longer, and a patch of smaller spiniform setae near the articulation of the prementum (Fig.

Table I
Summary of dimensions (in mm) of *Gynacatha villosa* and *G. manderica*

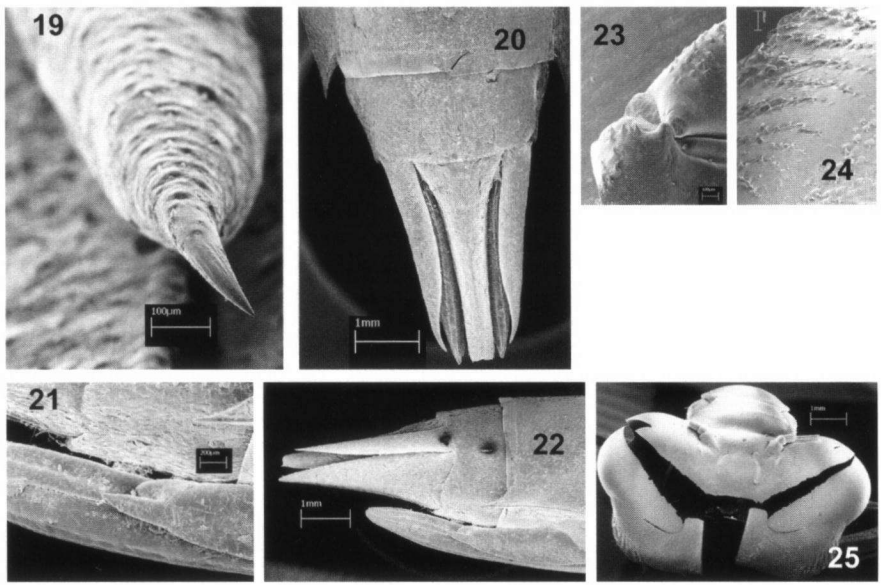
Features	*G. villosa*	*G. manderica*
head width	8,2-8,6 (n=4)	7,0-7,2 (n=2)
distance between antennae insertions	2,3-2,4 (n=3)	1,8-2,1 (n=2)
prementum length	6,9-7,3 (n=4)	7,3 (n=1)
prementum width	4,8-5,5 (n=4)	3,6 (n=1)
anterior tibiae length	5,2-5,3 (n=2)	4,9 (n=1)
max. abdominal width at	S6	S6
distance between tips of lateral spines at S9	4,1-4,3 (n=5)	3,3-3,6 (n=2)
epiproct length (dorsal view)	3,4-3,6 (n=4)	2,8-3,0 (n=4)
cerci length (lateral view)	3,1-3,3 (n=5)	2,5-2,9 (n=4)

5); distal and inner margins finely crenated and with a stout tooth on the corner (Figs 5, 26). Movable hook with a band of small spiniform setae (Figs 5, 27).

Wing sheaths reaching to the posterior margin of S4. Bifid supracoxal projections moderately obtuse (Fig. 8). Abdomen with lateral spines at S9-S6; ovipositor reaching to half of anal pyramid (Fig. 22), the third valve with an acuminate conical tip (Figs 19, 21). Anal pyramid a little shorter than S9 + S10, with cercus only a little shorter than the epiproct (Fig. 20, Tab. I), male projection triangular in shape, about 1/3 of the length of the epiproct (Fig. 12).

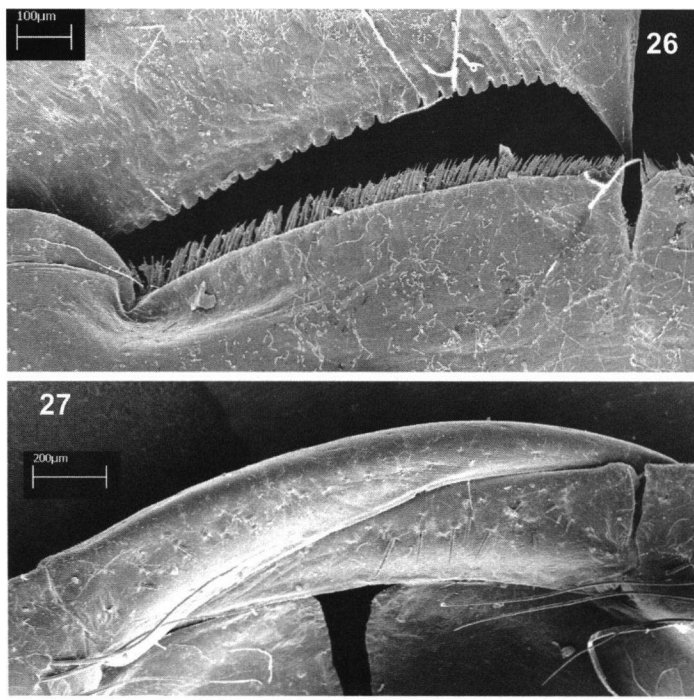
DISCUSSION

The larval morphology of the two species appears to be similar to the other Aeshnidae genera, including mandibular features, with the remarkable exception of the very large dimension of the ovipositor, particularly in *G. villosa*. Furthermore, the ovipositor differs also for the presence of acuminate points on the third valve. This is not surprising, as *Gynacantha* adult females have a very distinctive ovipositor, even if the larval morphology does not perfectly match that of the adult. Another remarkable character is the presence of spiniform setae on both palpus and movable hook. This feature, even if present in all of the four African

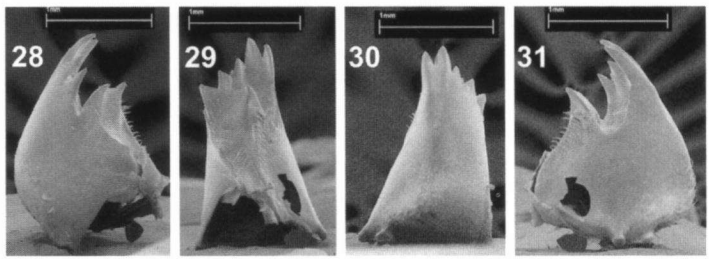


Figs 19-25. *Gynacantha villosa*: (19) apical tip of the third valve of the ovipositor; – (20) anal pyramid, dorsal view; – (21) apical tip of the third valve of the ovipositor, lateral view; – (22) anal pyramid and ovipositor, lateral view; – (23) articulation between palpus and prementum, dorsal view; – (24) head, rows of setae on the occiput, dorsal view; – (25) head, dorsal view.

described species, cannot be considered as a discriminating factor, as it is also present in the African Aeshnidae species *Aeshna minuscula* (SAMWAYS et al., 1993). It would be interesting to check this character on a large sample of species and to assess if it is linked to differences in feeding habits, however this is beyond the goal of this paper. The larvae of *G. manderica* and *G. villosa* differ in several characters, each one sufficient enough to distinguish one from the other: palpal shape and features, prementum shape and length, supracoxal projections, cerci/epiproct ratio, ovipositor length, body size and others above described. *G. bispina* too shows several differences from the two species here described. *G. bispina* resembles *G. manderica* for mask length and sharp supracoxal projections and *G. villosa* for the short palpal tooth and for the cerci/epiproct ratio, while it differs from both species for the ovipositor intermediate length. Unfortunately the description of *G. cylindrata* allows us to compare only the cerci/epiproct ratio, which is similar to those of *G. villosa* and *G. bispina*. However, the cerci/epiproct ratios of *G. cylindrata* and *G. bispina* were calculated from measures taken by us on the figures of the two cited papers, and consequently they are less precise than those of *G. manderica* and *G. villosa*.



Figs 26-27 *Gynacantha villosa*: (26) distal margin of the prementum and inner margin of the palpus and its teeth, dorsal view; – (27) movable hooks, dorsal view.



Figs 28-31. *Gyncantha manderica*, left mandible: (28) dorsal view; – (29) inner view; – (30) external view; – (31) ventral view.

The fact that there are so many differences among the species concurs with the conclusions of a recent revision (DIJKSTRA, 2005) of the African species of the genus, which identifies three groups which may be regarded as separate genera. According to this revision, *G. manderica* should be included in the *bullata* group, *G. villosa* and *G. cylindrata* in the *africana* group and *G. bispina* in, of course, the homonymous one. Because we recently obtained material of further African *Gynacantha* species, we plan to make a more extensive comparison among the species of the genus after the description of other African species.

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