Description of the Immature Stages and the Adult Female of Aulacigaster africana, the first Known for the Afrotropical Aulacigastridae (Diptera: Schizophora)

Author: Papp, László

Source: African Invertebrates, 49(2) : 227-232

Published By: KwaZulu-Natal Museum

URL: https://doi.org/10.5733/afin.049.0211

African Invertebrates Vol. 49 (2) Pages 227–232 Pietermaritzburg December, 2008

Description of the immature stages and the adult female of *Aulacigaster africana*, the first known for the Afrotropical Aulacigastridae (Diptera: Schizophora)

László Papp

Hungarian Natural History Museum and Animal Ecology Research Group of the Hungarian Academy of Sciences, P.O. Box 137, H-1431 Budapest, Hungary; lpapp@nhmus.hu

ABSTRACT

Hitherto unknown adult female and the immature stages (egg, 2nd and 3rd instar larvae) of *Aulacigaster africana* Barraclough, 1993, from South Africa are described and illustrated. Submarginal lateral setae of female 8th sternite are strong, ordered in one row, and far less numerous than in *A. leucopeza*. Eggs are asymmetrically and broadly oval in lateral view, the dorsal part with a pair of dark flanges, and medial hatching strip, with dark cellules in more or less two rows. The lateral and ventral parts of the egg have thin, partly confluent longitudinal ribs. The anterior spiracle of 3rd instar larva has 15 or 16 pairs of twig-like processes (6–8 pairs in *A. leucopeza*). The mandible is long and curved, bearing two pairs of accessory teeth. The parastomal bar is long, thin and dorsally curved at its middle; the intermediate sclerite consists of three parts (the posteroventral one clearly divided into an anterior ventral and a posterior longish section); there is an additional long sclerite, of an intricate form, between the intermediate sclerite and mandible. The 2nd instar differs from the 3rd instar larva in that the mandible has no accessory teeth. The dorsal cornu is very short; only the long ventral process of the intermediate sclerite seems to be characteristic.

KEY WORDS: Aulacigastridae, *Aulacigaster africana*, Afrotropical, morphology, immatures.

INTRODUCTION

Barraclough (1993) described *Aulacigaster africana* from South Africa and *A. perata* from Cameroon, as the first Afrotropical aulacigastrid flies, and suggested a relic nature of these and another undescribed species on the continent. The original description of *A. africana* was based on four males from the Royal Natal National Park (KwaZulu-Natal).

The immature stages of Aulacigastridae are relatively better known, compared with some of the other acalyptrate flies. Ferrar (1987) summarised the biology and morphology of the larval stages and puparium, but his figures (10.1–.9) were inadequately detailed. Papp (1988) published a short description, with detailed figures of the third instar larva and the puparium of *A. leucopeza* (Meigen, 1830). Papp (1998) later reported that other three *Aulacigaster* species occur in the Palaearctic Region, and re-identified the larvae and puparium described in the previous paper as *A. falcata* L. Papp, 1998, with an explanation why copies of the original figures were published as *A. falcata* in the Manual of Palaearctic Diptera (Papp 1998: figs 23:12–20). Papp (1998) commented on the need for a revision of the larvae of *A. afghanorum* L. Papp, *A. falcata* and *A. leucopeza*, which are in the collection of the HNHM. No such revision has yet been made.

Four males and three females of *A. africana* were captured during a visit to the Republic of South Africa in January 2007. Eggs and larvae of this species were also collected.

A description is given of the adult female, as well as the egg, 2nd and 3rd instar larvae, and they are compared with known (Palaearctic) species.

MATERIAL AND METHODS

Three adults of *A. africana* were located and captured from wounded trees in the Tsitsikamma Forest near the coast (Eastern Cape). Black oozing sap of the largest wounds

was scraped into a vial of tepid water and examined for eggs and larvae by means of a stereo-microscope. Numerous *Aulacigaster* larvae were found, and were rinsed in lukewarm water, removed, and then transferred to boiling water, in which they were washed, and left for a further 4–5 minutes. The larvae were then transferred to 70 % ethanol and then re-transferred a day later to fresh 70 % ethanol.

The abdomen with genitalia of one female specimen was prepared with hot sodium hydroxide, washed in water, treated with lactic acid, washed again and preserved in glycerol. Cephalopharyngeal skeletons of larvae were treated likewise. Larval anterior spiracles received no treatment. Figures showing female terminalia, larval cephalopharygeal skeleton, and anterior spiracle were drawn from specimens in glycerol on an excavated slide. The excavation was partly covered by a normal coverslip. Spermatheca, eggs and total larvae were examined and drawn from specimens in water.

The material has been deposited in the Diptera collection of the Department of Zoology, Hungarian Natural History Museum, Budapest (HNHM) and in the Natal Museum, Pietermaritzburg (NMSA).

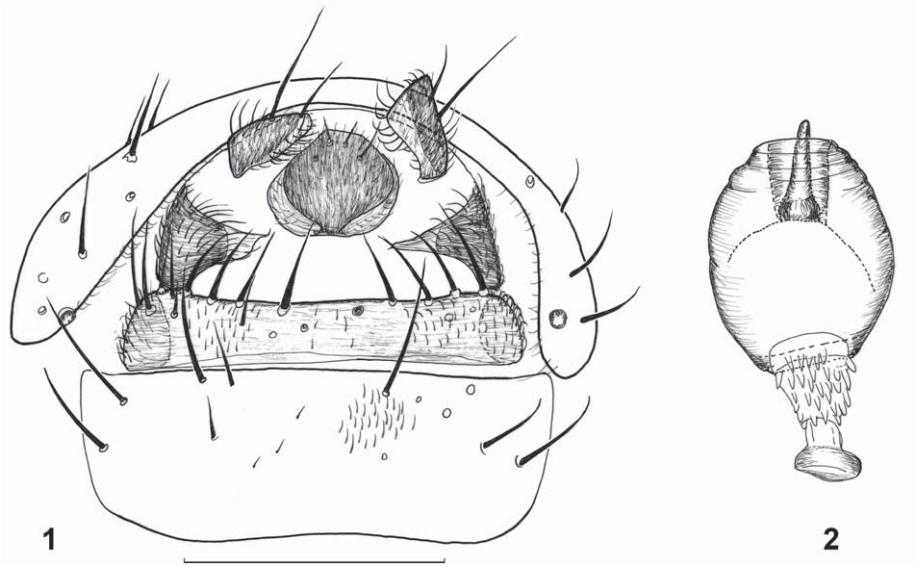
Material studied: SOUTH AFRICA: *Eastern Cape*: 3♂ 1♀ Hogsback, Wolf Ridge Road (32°35'42.2"S: 26°56'51.3"E), 1143 m, on rocks, 7.i.2007, L. Papp & M. Földvári (HNHM, 1♂ in NMSA); 1♂, 2♀ Forest nr R102 (33°56'57.3"S:23°36'20.8"E), 224 m, 15–16.i.2007, L. Papp & M. Földvári (1♂ 1♀ in HNHM, 1♀ in NMSA); 9 eggs, 40 L2, 18 L3 (in 70% ethanol) same locality, from sap of a wound of a deciduous tree, 16.i.2007, L. Papp & M. Földvári (HNHM, except 5 L2 and 2 L3 in NMSA).

MORPHOLOGY

Aulacigaster africana Barraclough, 1993

Aulacigaster africana: Barraclough 1993: 34, figs 1–4; 1995: 112, fig. 27; Duxbury & Barraclough 1994: 35, fig. 4.

This species is rather characteristic, and keys out to *A. falcata* in the key to the Palaearctic species of *Aulacigaster* (Papp 1998), having an orange transverse band on



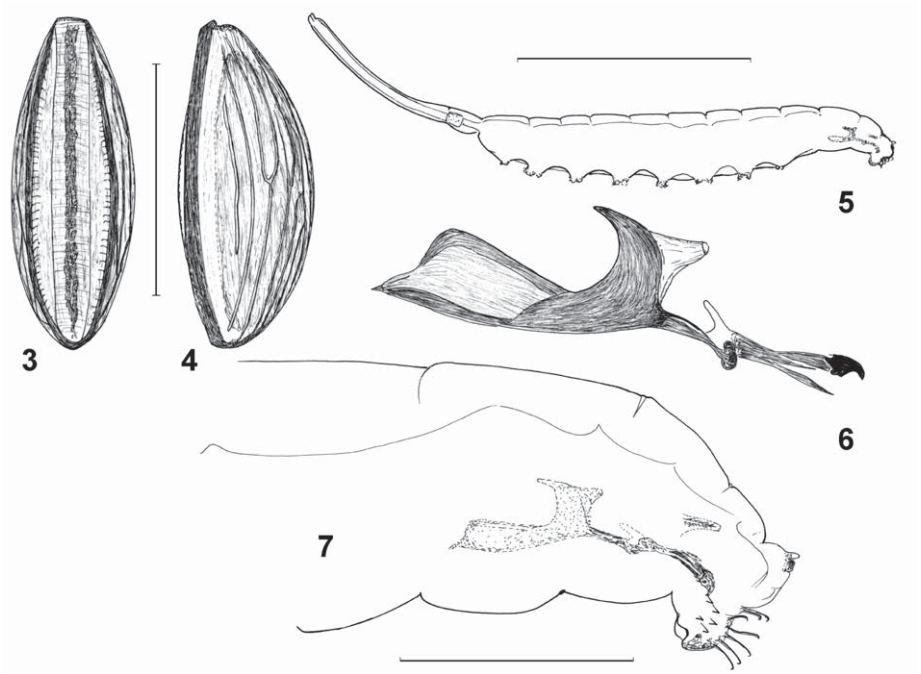
Figs 1, 2. *A. africana*, female: (1) terminalia, caudal view; (2) the unpaired spermatheca, lateral view. Scale bar: Fig. 1 = 0.2 mm, Fig. 2 = 0.1 mm.

frons broader than half-distance of lunule to fore ocellus; acrostichal setae in two rows, and male epandrium densely setose ventrally. This differs from *A. falcata* by having the thorax almost entirely dark (postpronotal (humeral) callus lighter in some specimens). Besides the key characters mentioned above, *Aulacigaster africana* shares a glossy scutellum and mesoscutum (posterior to suture) with *A. falcata*; wing membrane smoky-brown fumose (infuscated) subcostally and apically. The resemblance of the surstylar lobe to that of *A. falcata* is superficial, as the base of surstylar lobe of *A. africana* is more cranial on epandrium than in *A. falcata*. The basic structure of the female terminalia is similar to that of the Palaearctic species, but details differ (see below).

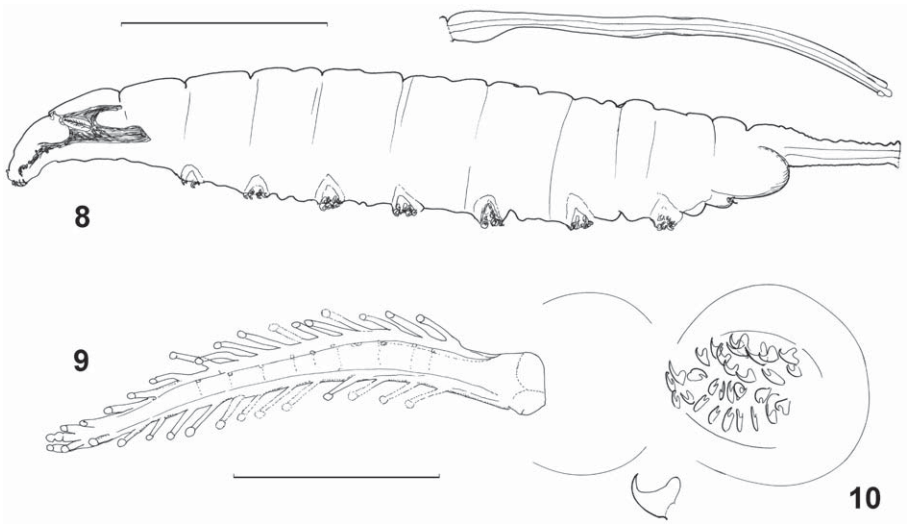
There is no sexual dimorphism in external characteristics, but male genital characters are regarded as the most reliable in identification (at least so for some Palaearctic species of *Aulacigaster*). A description of the female postabdomen is provided, as it can be useful in the species identification.

Female.

Female terminalia (Fig. 1) with 7th tergite comparatively large (posteroventrally with the stigmal openings). Sternite 7 rather large but apparently narrower than in *A. leucopeza*. Submarginal lateral setae of female 8th sternite (Fig. 1) strong, ordered in one row and far less numerous (15 or 16) than in *A. leucopeza* (up to 25). Tergite 8 consisting of two lateral parts, dorsal connection wholly membranous. Hypoproct with two distinct parts, the central portion large and darker, the lateral portion smaller and lighter in coloration;



Figs 3–7. *A. africana*, egg and second instar larva: (3) egg, dorsal view; (4) egg, lateral view; (5) second instar larva, habitus, lateral view; (6) cephalopharyngeal skeleton of the 2nd instar larva; (7) an outline of the head and thorax of 2nd instar, lateral view. Scale bars: Fig. 5 = 1.0 mm, Figs 3, 4 = 0.4 mm, Fig. 7 = 0.2 mm, and Fig. 6 = 0.1 mm.



Figs 8–10. *A. africana*, third instar larva: (8) habitus, lateral view; (9) anterior spiracle; (10) left creeping welt on the 3rd abdominal segment, with a spine in lateral view. Scale bars: Fig. 8 = 1.0 mm, Fig. 10 = 0.4 mm, Fig. 9 = 0.2 mm.

central portion with 4 short setae, as in *A. leucopeza* (see Papp 1998: fig. 19). Female cerci comparatively small, free, with 2 pairs of stronger setae. Three (1+2) spermathecae.

Spermathecae (Fig. 2) globose (spherical) to cylindrical, paired spermathecae slightly smaller than unpaired one. Apical third of spermathecae with fine annulation, sclerotised basal portion (containing the apex of spermathecal duct) covered with small scales. Apical half of spermatheca with a cylindrical inner tube, which contains a more or less conical sclerotised "plug" (see Papp 1998: fig. 20). This "plug" can move up and down inside the tube, depending on the pressure inside the spermatheca.

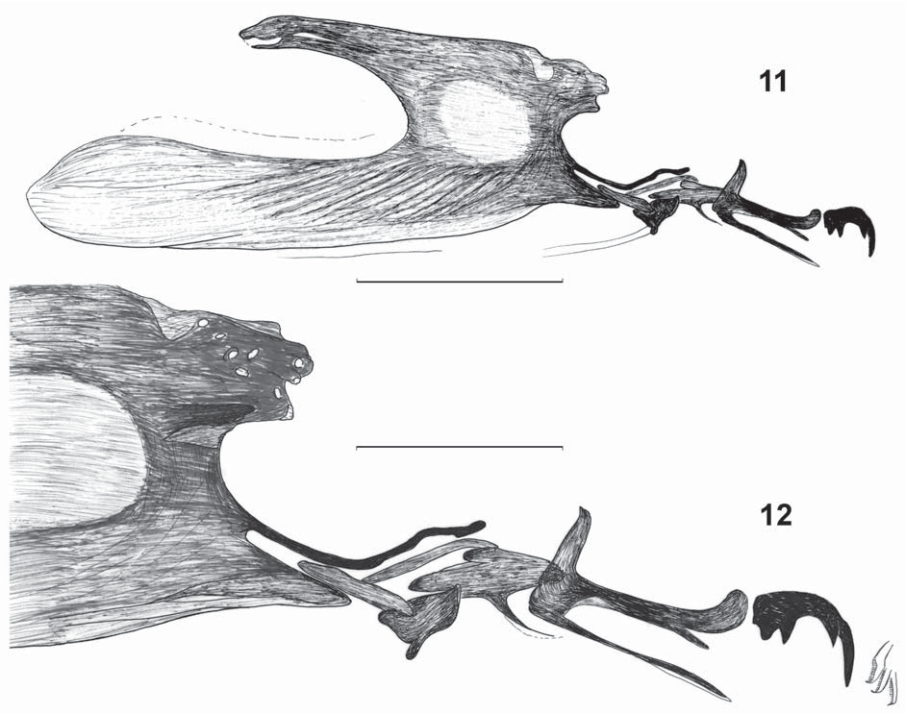
Egg.

Length 0.55–0.59 mm, maximum width (equivalent to height) 0.205–0.220 mm. Light brown (ochre) (coloration maybe a consequence of the staining effect of the black sap, in which the eggs were found). Eggs oval in dorsal view, asymmetrically broadly oval in lateral view (Figs 3, 4). Dorsal part with a pair of dark flanges, hatching strip narrower than the space between flanges (at least so on our rather extended egg specimens). Hatching strip medially with dark cellules in more or less two rows. Lateral and ventral (broader, more oval) parts of egg with thin partly confluent longitudinal ribs. The honeycomb reticulation of the chorion is weak, hardly discernible.

The egg of *A. leucopeza* has been described and illustrated by Robinson (1953). The figure has been reproduced in Papp (1998). I have no mature eggs of *A. leucopeza*, but examining unripe eggs from the abdomen of *A. leucopeza* females, it appears that the longitudinal ribs are smoother than portrayed in Robinson's figure. Thus, the egg of *A. leucopeza* may actually be more similar to that of *A. africana* than would be judged from comparison between the figure in this paper, and that from Robinson (1953).

Second instar larva.

Second instar similar to the third instar in shape, but smaller (Fig. 5). Longest larvae 2.70 mm long. When at rest, mouth opening is more ventrocaudal than ventral (Fig. 7).



Figs 11, 12. *A. africana*, third instar larva, cephalopharyngeal skeleton: (11) lateral view; (12) cranial half in a higher magnification. Scale bars: Fig. 11= 0.2 mm, Fig. 12 = 0.1 mm.

Cephalopharyngeal skeleton (Fig. 6) thin, differing from the 3rd instar larva in the following aspects: mandible without accessory teeth, dorsal cornu very short; only the long ventral process of the intermediate sclerite seems to be characteristic.

Robinson's (1953) record of 4.1 mm for the maximum length of the 2nd instar larvae *A. leucopeza* may be in dispute. All second instar larvae of *A. africana* that I have examined have a total body length less than 2.70 mm, even with the respiratory siphon stretched to its maximum. Note that the maximum length of the 3rd instars was given as 6.0 mm in that same paper.

Third instar larva (Figs 8–10).

Length from 2.60 mm (smallest 3rd instars, after moulting slightly smaller than largest 2nd instars) to 6.49 mm (longest larva). Generally similar to third instar larva of *A. falcata* (Papp 1988: figs 29, 31), though thoracic part is comparatively shorter. Shape long subcylindrical, elongate, slender (0.65–0.70 mm at the thickest), white, partly transparent, cephalic part strongly curved ventrally and completely retractile, anal part slightly upturned in profile, with very long siphon. Antennal and maxillary palpus buds are small but well discernible. Thoracic segments free of spinose pads. Abdominal segments each with a ventral spiniferous locomotory pad ('pseudopods') (Fig. 8): first segment with 1 row of anterior and 1 row of posterior spines, segments 2–7 with 2+2 rows, 8th segment with 1 or 1.5 rows of anterior spines but no posterior row. Last abdominal segment with a small perianal pad. Spines (Fig. 10) broad based, curved and sharp. Anterior (prothoracic) spiracle (Fig. 9) narrow and small, retractable into a pair

of deep narrow pockets. As a consequence, prothoracic spiracles are not visible in most of the specimens (only under higher magnification, through the cuticle). Anterior spiracle with 15 or 16 pairs of twig-like processes (with 6–8 pairs in *A. falcata*), plus additional bulbs on the apical part. Lateral processes are fragile. Posterior spiracles on a long respiratory tube (siphon) in two parts. Basal part rather short and non-retractile (Fig. 8), apical retractile part may be far stretching, left and right spiracle openings not separated, each with bristle-like inter-spiracular processes.

Cephalopharyngeal skeleton (Figs 11, 12): mandible well developed long and curved bearing 2 pairs of accessory teeth, one at anterior third and one sub-basally; dorsal bridge with some less-pigmented spots; dorsal cornu much shorter than ventral one but still not weak; parastomal bar long, thin and dorsally curved at its middle (strongly and angulately dorsally curved in *A. falcata*, see Papp 1988: fig. 23; intermediate sclerite consisting of three parts, the most caudal and ventral one clearly divided into an anterior ventral and a posterior longish section (less divided in *A. falcata*, Papp 1988: fig. 23). There is a long sclerite of an intricate form between intermediate sclerite and mandible. This was not reported by Ferrar (1987: 81).

Puparium is not characterised to date, but morphological transformation is expected to be as conspicuous as in *A. leucopeza* or in *A. falcata* (Papp 1988: figs 20, 21 *vs* figs 29, 31). If correct, it should have at least 16 short twig-like processes on its respiratory tube.

ACKNOWLEDGEMENTS

I would like to express my most sincere thanks to Dr R.M. Miller and Dr M.B. Mostovski (Natal Museum, Pietermaritzburg) for their help with our studies at the NMSA, and to Dr D.A. Barraclough (University of KwaZulu-Natal, Durban) for advice. I am grateful to Dr Mihály Földvári (HNHM), who assisted during our collection trip to the Republic of South Africa.

This study was supported by the Hungarian National Scientific Research Fund (OTKA, No. K 60593).

REFERENCES

Barraclough, D.A. 1993. The Afrotropical species of *Aulacigaster* Macquart (Diptera: Aulacigastridae: Aulacigastrinae). *Annals of the Natal Museum* **34** (1): 31–42.

———1995. An illustrated identification key to the acalyptrate fly families (Diptera: Schizophora) occurring in southern Africa. *Annals of the Natal Museum* **36**: 97–133.

Duxbury, K.J. & Barraclough, D.A. 1994. Rarely encountered Diptera families in southern Africa: an intriductory conservation perspective. *Annals of the Natal Museum* **35**: 25–43.

Ferrar, P. 1987. A guide to the breeding habits and immature stages of Diptera Cyclorrhapha. *Entomonograph* **8** (1): 1–478, (2): 479–907.

Papp, L. 1988. *Periscelis kabuli* sp. n. and *P. kaszabi* sp. n. with notes on larvae and pupae of the families Aulacigastridae and Periscelididae (Diptera). *Acta Zoologica Academiae Scientiarum Hungaricae* **34** (2–3): 273–284.

———1998 [for 1997]. The Palaearctic species of *Aulacigaster* Macquart (Diptera: Aulacigastridae). *Acta Zoologica Academiae Scientiarum Hungaricae* **43** (3): 225–234.

———1998. 3.23. Family Aulacigastridae. *In*: Papp, L. & Darvas, B., eds, *Contributions to a Manual of Palaearctic Diptera*, Vol. 3. Budapest: Science Herald, pp. 279–284.

Robinson, I. 1953. The postembryonic stages of the life cycle of *Aulacigaster leucopeza* (Meigen) (Diptera Cyclorrhapha: Aulacigastridae). *Proceedings of the Royal Entomological Society London* **28**: 77–84.