

A new stenopterous genus of the tribe Gaetuliini Fennah (Hemiptera, Fulgoroidea, Tropiduchidae) from southern Africa — particular intercontinental convergence

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ABSTRACT

Afroelfus bothryogaster gen. et sp. n. is described from the Republic of South Africa. The new genus belongs to the tribe Gaetuliini of the family Tropiduchidae. It is characterized by the presence of sterno-abdominal sensory pits in the imago and its stenopterism. The distribution of these two attributes within planthoppers is discussed and the new genus is recognised as convergently similar to the Australian genus *Alleloplasis* Waterhouse, 1839.

KEY WORDS: Hemiptera, Fulgoroidea, Tropiduchidae, new species, stenoptery, sternal sensory pits, adaptation, convergence, southern Africa.

INTRODUCTION

The systematics of the Tropiduchidae is well advanced as Fennah (1982) divided the family in 15 tribes. How they can be grouped together has still to receive consideration, though, because Fennah did not provide any subfamilic division. Currently, the family includes 19 existent and extinct tribes (Szwedo & Stroiński 2010). The new genus described below belongs to the tribe Gaetuliini Fennah, recently transferred to the Tropiduchidae from the Nogodinidae by Gnezdilov (2007) on the basis of the hemispherical gonoplocs. The tribe Gaetuliini comprises 28 genera, including the new one, and is distributed across arid zones from southern USA via South America, southern Africa, and Madagascar to Australia (Gnezdilov 2007; Stroiński & Gnezdilov 2009). Externally, the new genus looks like the Australian genus *Alleloplasis* Waterhouse, 1839, one of the most peculiar and bizarre planthopper genera, characterized by extremely narrow and long fore wings (stenopterism) and by the presence of sensory pits on abdominal sternites in the imago (Fig. 6). The last character is unique within Fulgoroidea and also recorded only for *Fovealvus nama* Gnezdilov & Wilson, 2007 (Nogodinidae) from Namibia (Gnezdilov & Wilson 2007); in the Issidae genera *Kathleenum* Gnezdilov, 2004 and *Balduza* Gnezdilov & O'Brien, 2006, each with two species from southern USA and Mexico (Gnezdilov & O'Brien 2006); and in *Lethierium* Dlabola, 1980, with three species from Algeria and Morocco (unpublished).

MATERIAL AND METHODS

The terminology of the head and thorax follows Anufriev & Emeljanov (1988) and Emeljanov (1995).

Pictures of the new species were obtained using a Leica Z16 APOA with Leica video camera DFC490. The picture of *Alleloplasis darwini* Waterhouse, 1839 is of the specimen in the Natural History Museum (London, UK). It was taken using a Leica MZ8 with JVC video camera KY F70B. Images were produced using the software Leica Application Suite ver. 2.8.1., Auto-Montage Essentials, and Adobe Photoshop.

The holotype of the new species described below is to be deposited in the collection of the Iziko South African Museum, Cape Town, Republic of South Africa (SAMC).

TAXONOMY

Family Tropiduchidae Stål, 1866

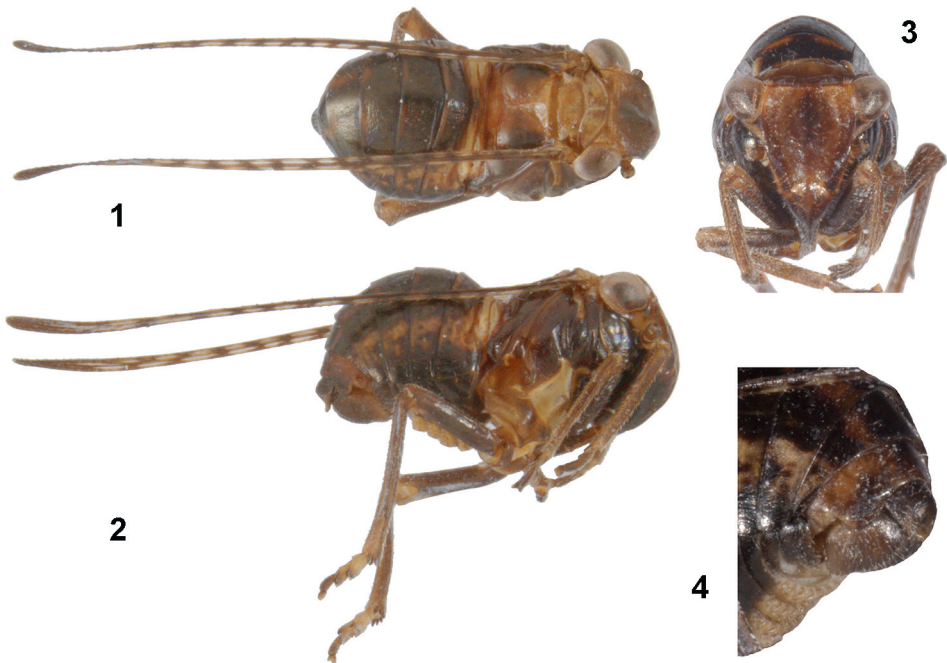
Tribe Gaetuliini Fennah, 1978

Genus **Afroelfus** gen. n.

Etymology: The generic name is derived from 'Africa' and 'elf' (fantastic character).

Type species: *Afroelfus bothryogaster* sp. n.

Diagnosis: Head and body covered by setae, more dense on metope, clypeus, anal tube, and gonoplags. Metope wide, flat, joint with coryphe at obtuse angle (in lateral view), with median carina running through post- and anteclypeus and sublateral carinae (Figs 2, 3, 11). Lateral keels and median carina of metope elevated. Scape short, cylindrical. Pedicel nearly globular, with sensory organs. Coryphe transverse, very narrow, with slightly concave anterior margin and distinctly concave posterior margin (Figs 1, 10). Coryphe with keeled margins. Pronotum with median carina, anterior margin convex, posterior margin concave (Fig. 10). Paradiscal fields of pronotum are covered by eyes. Paranotal lobes wide, elongate. Mesonotum has no carination, nearly as long as pronotum medially, with widely rounded apex. Meso- and metanotum are divided by deep furrow (Fig. 1). Metanotum with two furrows converging apically in the shape of a triangle. Forewings with setae on costal and claval margins on both sides, 1.5 times as long as



Figs 1–4. *Afroelfus bothryogaster* gen. et sp. n., holotype: (1) dorsal view; (2) lateral view; (3) frontal view; (4) ovipositor, lateral view.

the body, very narrow, with only 2 longitudinal veins joint apically and rudimentary triangular clavus (Figs 1, 2, 9). Hind wings rudimentary, in shape of small scales. Hind tibia with 7 apical spines and single lateral spine distally. First and second metatarsomeres equal in length, with ventral surface covered by long setae. First metatarsomere with 2 latero-apical spines and entire row of 7 or 8 intermediate spines with subapical setae. Second metatarsomere with only 2 latero-apical spines. Pretarsus expands the apices of claws, with two long, narrow dorsolateral plates. Abdomen squat, weakly convex (in lateral view) (Fig. 2). Abdominal sternite III with a row of 7 sensory pits and the sternites IV–VI each with a row of 8 sensory pits on their hind margins medially (Fig. 5). Hind margin of sternite VII widely concave. Hind margin of pygofer with pair of semicircular processes alongside anal tube (Figs 4, 12). Gonoplags hemisphaerical, with no carination. Anal tube wide, short, narrowing apically (Fig. 12). Anal column short. Comparison: As judged by the wide metope with median carina, narrow coryphe, and squat body, the new genus is closely related to the genera *Gamergus* Stål, 1859 and *Gamergomorphus* Melichar, 1906 from southern Africa. The latter is also characterized by stenoptery (Melichar 1906), but less so than the new genus.

***Afroelfus bothryogaster* sp. n.**

Figs 1–5, 9–12

Etymology: From the Greek *βόθρος* (hollow) and *γαστήρ* (belly).

Description:

Metope yellowish brown. Postclypeus black, except for light yellow markings near metopoclypeal suture; anteclypeus black. Rostrum dark brown. Scape and pedicel yellowish light brown. Genae, coryphe, pro- and mesonotum light yellow. Metanotum yellowish dark brown. Paranotal lobes black. Episterna and epimera dark brown or black except for

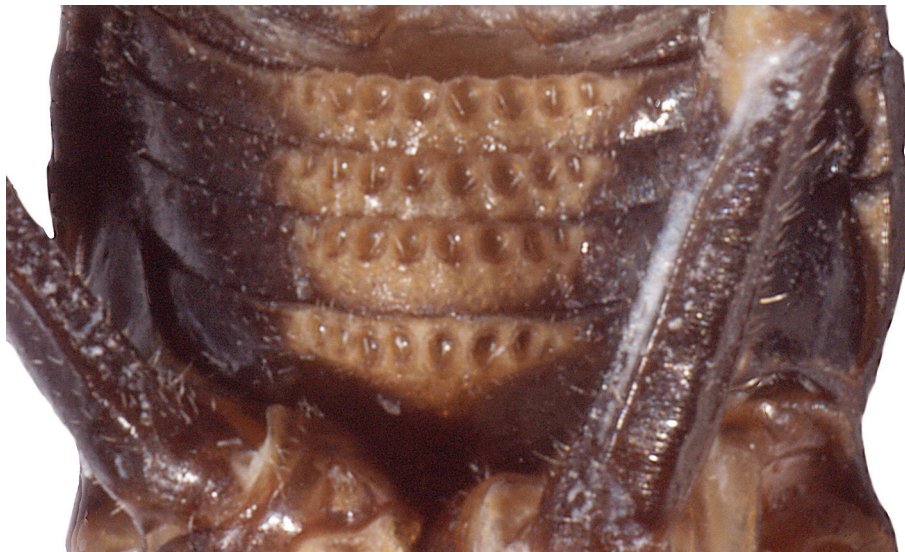


Fig. 5. *Afroelfus bothryogaster* gen. et sp. n., holotype, abdomen in ventral view.



Fig. 6. *Alleloplasis darwini* Waterhouse, female (Albany, Western Australia), lateral view.

yellow vertical stripe on mesoepimera. Forewings dark brown with yellow marginal spots and yellow clavus with dark brown margin. Hind coxae yellowish brown. Femora dark brown or black. Tibiae and tarsi dark brown except for yellowish brown first and second metatarsomeres. Apices of spines black. Abdominal tergites I–II light yellowish white except for black or dark brown medial parts (Fig. 1). Abdominal tergites III–VII black, each with light brown spots combined in two lateral stripes and with brown patches on hind margins (Figs 1, 2). Abdominal sternites black except for light yellow areas around sensory pits (Fig. 5). Pygofer brown, with dark brown semicircular processes. Anal tube black, with yellowish hind margin. Gonoplares brown or dark brown. Gonocoxa VIII dark brown or black.

Body length 4.0 mm, forewing length 6.5 mm.

Holotype: ♀ SOUTH AFRICA: *Northern Cape*: Cosy Mountain, Kamieskroon (30°11'S 17°56'E), 830 m, 16.x.2007, J. Deckert, at light (SAMC).

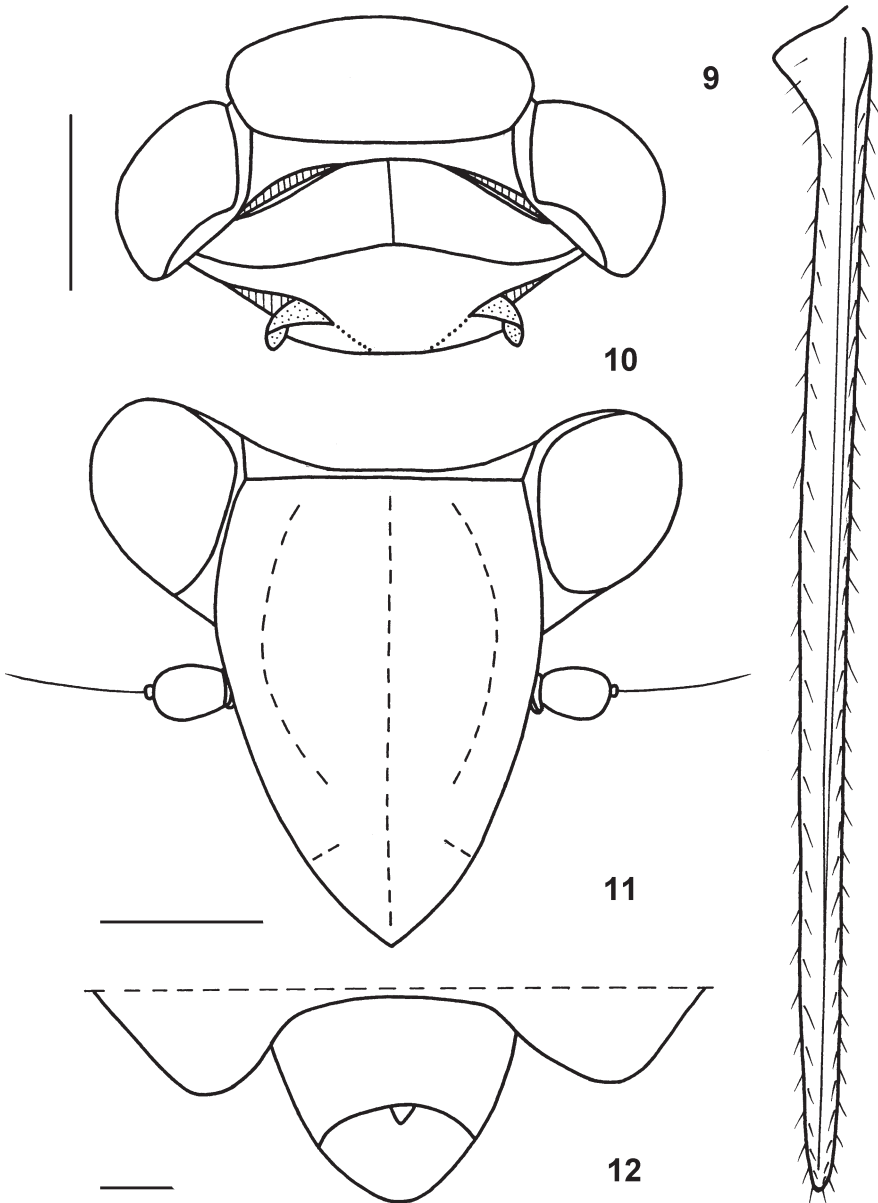
DISCUSSION

It is safe to say that the narrow fore wings and presence of sternal sensory pits in the imago are convergent features rather than evidence of a close relationship between *Afroelfus* gen. n. and *Alleloplasis* Waterhouse. The new genus differs from the latter as follows: rows of sensory pits present on sternites III–VI medially (Fig. 5) (sensory pits are situated on sternite IV medially and on sternites V–VI laterally in *Alleloplasis*, Fig. 6); coryphe very transverse and narrow (rather elongate and wide in *Alleloplasis*); pedicel nearly globular (cylindrical elongate in *Alleloplasis*). It is doubtful whether the two genera belong to the same tribe. However, similar trends in morphological modifications in both genera is a display of the law of homologous series in variation proposed by the Russian geneticist and botanist Nikolay I. Vavilov (1920, 1922): “closely related species and genera are characterized by similar homologous series in their genetic variability” (Kupzow 1975).

According to Emeljanov (1980, 2001), sensory pits are strictly of tergal origin and their presence on the sternites is a result of metatopy, i.e. removal of some structures



Figs 7, 8. Kamieskroon, type locality of *Afroelfus bothryogaster* gen. et sp. n. (Photos by J. Deckert)



Figs 9–12. *Afroelfus bothryogaster* gen. et sp. n., holotype: (9) fore wing (scale bar = 1 mm); (10) head, pro-, and mesonotum, dorsal view (scale bar = 0.5 mm); (11) head, frontal view (scale bar = 0.5 mm); (12) anal tube and pygofer, dorsal view (scale bar = 0.1 mm).

from one place to another (Emeljanov 1987, 2000). All taxa with sternal sensory pits in the imagos mentioned above inhabit arid biotopes (Doering 1938; Fennah 1949; Gnezdilov & O'Brien 2006; Gnezdilov & Wilson 2007; Fletcher 2009). *Alleloplasis darwini* Waterhouse, the type species of the genus *Alleloplasis*, was described on the basis of the specimen that had been collected by Charles Darwin by “sweeping in coarse grass

and brushwood” in King George’s Sound on the southern coast of Western Australia (Waterhouse 1839). *Afroelfus* gen. n. is known from the succulent Karoo biome (Figs 7, 8; J. Deckert pers. comm.) in a region of South Africa that is close to the Namibian border. As Šulc (1928) and later Liebenberg (1956) suggested that sensory pits probably are used as receptors for atmospheric humidity, the presence of sensory pits on abdominal sternites in the imago might be associated with a kind of adaptation to dry habitats.

Within Gaetuliini, except for the already mentioned *Alleloplasis* Waterhouse, *Ga-mergomorphus* Melichar, and *Afroelfus* gen. n., stenoptery is also character of the genus *Danepteryx* Uhler with six species from southern USA (Doering 1940). Another stenopterous tropiduchid, *Terannon stenopteryx* Fennah, 1969 from New Caledonia (Fennah 1969), belongs to the tribe Neommatissini Fennah, 1982. Generally, flightlessness may be explained as a response to three types of selective pressure (Hackman 1964; Fennah 1967; Kerzhner 1981; Bickel 2006): adaptation to cold or windy climate, life in forest litter or in low dense/sparse vegetation, and parasitism. To these, mimicry should be added. The type locality of *Afroelfus bothryogaster* gen. et sp. n. is a very windy, dry place, with succulent Karoo vegetation (J. Deckert pers. comm.). Thus, we can assume that wing reduction in the new species took place under the influence of a windy climate and living in specific succulent vegetation. Stenoptery and the convex abdomen make *Alleloplasis* spp. similar to wasps. *Afroelfus* gen. n., in contrast, has a robust abdomen. Another possible reason for the narrow wings may be mimicry of the antennae of any other insect as was proposed by Emeljanov (2009) for larval wax nails on the apex of the abdomen in the lophopid species *Maana emeljanovi* Soulier-Perkins, Bourgoïn & Riedel, 2006. In the case of *Afroelfus*, the stenopterous species mimics the head on its abdomen.

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