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# New and less known Orthoptera from biodiversity hotspots of Mozambique and Zambia (Tettigoniidae; Acrididae)

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**Abstract**
The study of a lot of specimens collected in Mozambique and Zambia by the African Naturalist Research Trust allowed to find out four new species, namely: *Conocephalus* (*Anisoptera*) *maputensis* **n. sp.** (from Mozambique), *Eulioptera zambesiana* **n. sp.** (from Zambia), *Melidia pif* **n. sp.** (from Zambia), and *Plangia geroi* **n. sp.** (from Zambia). Further eleven species are newly recorded from Zambia or Mozambique.

**Key words**: South-East Africa, taxonomy, new species, new records.

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## Introduction

The African Natural History Research Trust (ANHRT, Hereford, UK), established as a charity trust in 2010, is an institute dedicated to the study of African insects. The team of ANHRT organizes and conducts collecting and research expeditions to a wide range of countries in Africa, in partnership with host institutions and government bodies; the same collecting sites may be visited over a number of years and in different seasons to build up a picture of the insect fauna at each site. The ANHRT sent on loan to the present author a remarkable number (255 on the whole) of Orthoptera (mainly Phaneropterinae) collected during the entomological expeditions to Zambia and Mozambique to be identified. From the orthopterological point of view this area has been sufficiently explored (e.g.: Hemp 2013; Hemp & Heller 2019; Naskrecki & Guta 2019; Massa 2021a); however, new taxa are still discovered, visiting scarcely known natural sites, as those here listed.

In the present paper, the results of the study of the most interesting species are reported. Additionally, some new species of the genus *Eurycorypha* Stål, 1873 will be described in a separate paper within the revision of the genus in collaboration with Claudia Hemp.

## Study areas

**Mozambique**. Southern miombo woodland remnants/farmland mosaic on the edge of the Tacuane village (Fig. 1). A mosaic of diverse coastal habitats in the Maputo Special Reserve, comprising open woodland, grassland and forests on sand or sandy soils: Maputo Special Reserve, West Gate, Sand Thicket, 26°30’14”S, 32°42’59”E; Maputo Special Reserve, West Gate, Sand Forest 26°30’14.2”S, 32°42’59.6”E; Maputo Special Reserve, Ponta Milibangalala, Dune Grassland 26°26’58.6”S, 32°55’29.8”E; Maputo Special Reserve, Futi Corridor, Sand Forest Woodland Mosaic 26°26’58.6”S, 32°55’29.8”E (Figs 2, 3). Maputo Special Reserve in an important component of the Lubombo Transfrontier Conservation and Resource Area; marine, coastal and inland humid habitats are represented with high conservation value. In the reserve are present lakes, wetlands, swamp forests, grasslands and mangrove forests, with a pristine coastline that lies within the Maputaland Centre of Endemism.

**Zambia**. Gwabi River Lodge, Chirundu, gallery forest surrounded by mopane woodland, 15°57’04.8”S, 28°51’34.4”E; Sinazongwe (Lakeview Lodge), a well-watered lodge garden surrounded by disturbed mopane woodland (493m) 17°16’12.9”S, 27°27’54.3”E (Fig. 4); Luangwa

(Redcliff Lodge), a mosaic of mopane woodland/scrub and dry miombo woodland on the edge of the Lower Zambezi National Park (350m) 15°38'34.2"S, 30°16'32.9"E (Fig. 5); Choma (Bruce-Miller Farm), dry miombo woodland interspersed with patches of grassland and woody grassland, 16°37'58.6"S, 27°02'45.8"E (Fig. 6). The Lower Zambezi National Park, established in 1983, lies on the north bank of Zambezi river and is one of the few pristine wilderness areas left in Africa. On the opposite bank is the Zimbabwe's Mana Pools National Park; both parks lie on the Zambezi flood plain ringed by mountains and could form a massive transfrontier park. They are very rich in endemic and rare species and have a very high conservation value.

For other localities cited in the text see Massa (2021a).

## Methods

Sampling method of staff of ANHRT is focused on Lepidoptera, but other insect orders are also sampled; two main methods to collect Orthoptera are used: 1) Hand collecting: grasshoppers, katydids, are collected using nets; 2) Light trap: nocturnal insects are attracted to a specially engineered white tent containing a bright mercury vapour bulb where they can be collected. The ANHRT-designed Edward's Trap is placed under the bulb collecting the smallest insects which would otherwise be missed. As different insects are attracted to different wavelengths of light, smaller ultraviolet lights are also used, sometimes in combination with an automatic bucket trap. Among these the most fruitful method resulted to be the light trap, used with four different kinds of lamps: ultraviolet lights (UV), bright mercury vapour bulb, 300-700nm (Lepiled trap), actinic light, 445nm (Actinic trap), and mercury vapour light (MV trap); they revealed to be very attractive for most Ensifera species.

**Abbreviations used in the text**
ANHRT: African Natural History Research Trust, Hereford, UK
BMPC: Bruno Massa Collection, Palermo, Italy

**Annotated list of species**
**Fam. Tettigoniidae Krauss, 1902**
**Subfam. Pseudophyllinae Burmeister, 1838**
**Tribe Cymatomerini Brunner von Wattenwyl, 1895**
***Cymatomera denticollis* Schaum, 1853**

**Material examined**. **Mozambique**: Maputo Special Reserve, West Gate, Sand Thicket, Actinic Light Trap 9-17.II.2018, G. Laszlo, J. Mulvaney, L. Smith (1♀); **Mozambique**: Maputo Special Reserve, West Gate, Sand Thicket, MV Light Trap 9-17.II.2018, G. Laszlo, J. Mulvaney, L. Smith (1♀); **Mozambique**: Maputo Special Reserve, Ponta Milibangalala, Dune Grassland, MV Light Trap 17-21.II.2018, G. Laszlo, J. Mulvaney, L. Smith (1♀); **Zambia**: Gwabi River Lodge, Chirundu, MV Light Trap 8-11.III.2019, V. Dérozier, M. Imakando, W. Miles, L. Mulvaney (1♀); **Zambia**: Lakeview Lodge, Sinazongwe (493m), MV Light Trap 23-28.II.2019, V. Dérozier, M. Imakando, W. Miles, L. Mulvaney (3♀); **Zambia**: Lakeview Lodge, Sinazongwe (493m), General Collection 23-28.II.2019, V. Dérozier, M. Imakando, W. Miles, L. Mulvaney (1♂) (ANHRT).

**Remarks**. Previously it was known from Tanzania, Zimbabwe, Mozambique, South Africa, Botswana, and Namibia (Naskrecki & Guta 2019), it is newly recorded from Zambia.




**Figs 1-2** – Collecting site in Mozambique. 1, Mozambique, Tacuane Village; 2, Mozambique, Maputo Special Reserve, open woodland near Maputo river (photos by Guyla Laszlo).

### *Cymatomerella spilophora* (Walker, 1870)

**Material examined**. **Zambia**: Redcliff Zambezi Lodge, Luangwa (350m), MV Light Trap 11-17.III.2019, V. Dérozier, M. Imakando, W. Miles, L. Mulvaney (1♀); **Zambia**: Lakeview Lodge, Sinazongwe (493m), General Collection 23-28.II.2019, V. Dérozier, M. Imakando, W. Miles, L. Mulvaney (1♀); **Zambia**: Lakeview Lodge, Sinazongwe

(493m), MV Light Trap 23-28.II.2019, V. Dérozier, M. Imakando, W. Miles, L. Mulvaney (1♀ nymph) (ANHRT).

**Remarks**. Already known from Tanzania, Mozambique, Zambia, Zimbabwe, and South Africa (Naskrecki & Guta 2019).

**Subfam. Conocephalinae Burmeister, 1838**
**Tribe Conocephalini Burmeister, 1838**
***Conocephalus* (*Anisoptera*) *maputensis* new species**
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**Material examined**. **Mozambique**: Maputo Special Reserve, Futi Corridor, Sand Forest Woodland Mosaic, Actinic Light Trap 23-24.II.2018, G. Laszlo, J. Mulvaney, L. Smith (♂ holotypus) (ANHRT).

**Measurements (mm)**. Body length: 12.0; length of pronotum: 2.9; height of pronotum: 2.0; length of tegmina: 1.8; length of hind femora: 12.9.

**Diagnosis**. *Conocephalus maputensis* n. sp. is characterized by two small spines on the sternum, thus it belongs to the subgenus *Anisoptera* Latreille, 1829. It is a very small micropterous species, easily distinguished by the two robust inner spines on the stout cerci.

**Description**. Male (Fig. 7a). Colour. Light brown with a median blackish band on the head, two blackish stripes on the pronotum and black tegmina. Abdominal tergites yellowish, antennae of the same colour of the body.

Head. Fastigium compressed, antennae exceeding the apex of femora. Pronotum short with anterior and posterior margins straight, lower lateral margins rounded (Fig. 7b). Fore tibiae with 5 spines on each lower margin, middle tibiae and hind tibiae with 7 spines on each lower margin. Tegmina reaching the apical margin of the first abdominal tergite (Figs 7b, 7c). Abdomen. Supragenital plate a little pointed apically, cerci robust, short, inwards curved, apically blunt; a first small couple of teeth in the inner side before the middle, and a second much stouter and longer couple of teeth before the apex of cerci (Fig. 7e). Subgenital plate widely arcuate, styli pointed (Fig. 7d).

Female. Unknown.

**Distribution**. Presently known only from the Maputo Special Reserve (Mozambique).

**Etymology**. After Maputo Special Reserve, important component of the Lubombo Transfrontier Conservation and Resource Area; it is a link between a mosaic of marine, coastal and inland habitats with important biodiversity conservation value.

**Affinities**. Among the micropterous taxa belonging to the subgenus *Anisoptera* the following species have been described from tropical Africa: *Conocephalus bechuanensis* (Péringuey, 1916) (Botswana, Bechuanaland, Southern Africa) (holotype male, not female, as reported by Péringuey 1916, as pointed out by Uvarov 1928, who depicted the cerci); *C. caudalis* (Walker, 1869) (KwaZulu-Natal, Southern Africa), whose male was described by Redtenbacher (1891) as *Xiphidium natalense* (later synonymized with *C. caudalis*); and *C. rhodesianus* (Péringuey, 1916) (South Tropical Africa, Zimbabwe). These three species show different male cerci compared with those of *C. maputensis* n. sp. (Fig. 7f), which could be endemic to the wetlands of Maputo Special Reserve.



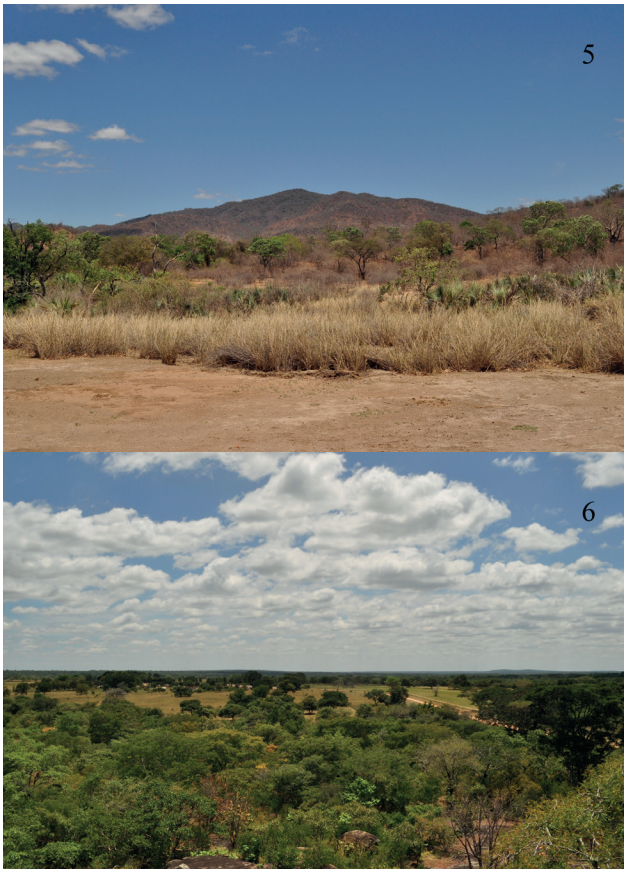

**Figs 3-4 –** Collecting sites in Mozambique and Zambia. 3, Mozambique, Maputo Special Reserve, Ponta Milibangalala, Dune Grassland (photo by Guyla Laszlo); 4, Zambia, Sinazongwe landscape, February 2019 (photos by William Miles).

**Tribe Copiphorini Karny, 1912**
***Pseudorhynchus hastifer* (Schaum, 1853)**

**Material examined**. **Mozambique**: Maputo Special Reserve, Ponta Milibangalala, Dune Grassland, MV Light Trap 17-21.II.2018, G. Laszlo, J. Mulvaney, L. Smith (1♀) (ANHRT).

**Remarks**. Known from Mozambique, sub-Saharan Africa and Madagascar (Ragge 1969); according to Naskrecki & Guta (2019) in Mozambique it has only been collected in the Sofala Province, albeit its presence in other parts of the country was likely.

**Subfam. Phaneropterinae Burmesister, 1838**
**Tribe undetermined**




**Figs 5-6 –** Collecting sites in Zambia. 5, Zambia, Luangwa landscape, October 2018; 6, Zambia, Choma landscape, March 2019 (photos by William Miles).

### *Oxyecous magnus* Ragge, 1956

**Material examined**. **Zambia**: Lakeview Lodge, Sinazongwe (493m), MV Light Trap 23-28.II.2019, V. Dérozier, M. Imakando, W. Miles, L. Mulvaney (2♂); **Zambia**: Lakeview Lodge, Sinazongwe (493m), Lepiled Light Trap 23-28.II.2019, V. Dérozier, M. Imakando, W. Miles, L. Mulvaney (1♂).

**Remarks**. Previously known from Democratic Republic of Congo, Tanzania, and Mozambique, now recorded also from Zambia.

### *Oxyecous lesnei* Chopard, 1935

**Material examined**. **Mozambique**: Maputo Special Reserve, West Gate, Sand Forest, Actinic Light Trap 21-22.II.2018, G. Laszlo, J. Mulvaney, L. Smith (7♂); **Mozambique**: Maputo Special Reserve, West Gate, Sand Forest, MV Light Trap 13-15.II.2018, G. Laszlo, J. Mulvaney, L. Smith (1♂); **Mozambique**: Maputo Special Reserve, West Gate, Sand Forest, Actinic Light Trap 13-15.II.2018, G. Laszlo, J. Mulvaney, L. Smith (7♂); **Mozambique**: Maputo Special Reserve, Futi Corridor, Sand Forest Woodland Mosaic, Actinic Light Trap 23-24.II.2018, G. Laszlo, J. Mulvaney, L. Smith (2♂).

**Remarks**. Described from Mozambique, recorded also from Democratic Republic of Congo, Zambia, Zimbabwe, Malawi and South Africa. Some specimens above listed had traces of the spermatophylax, indicating recent mating. According to Naskrecki & Guta (2019) adults are seen between March and early May; thus, February collecting of mating adults seems to be precocious.

### Tribe Acrometopini Brunner von Wattenwyl, 1878
### *Horatosphaga scalata* Hemp, 2019

**Material examined**. **Zambia**: Redcliff Zambezi Lodge, Luangwa, Lepiled Light Trap 11-17.III.2019, V. Dérozier, M. Imakando, W. Miles, L. Mulvaney (2♂); **Zambia**: Redcliff Zambezi Lodge, Luangwa, Actinic Light Trap 11-17.III.2019, V. Dérozier, M. Imakando, W. Miles, L. Mulvaney (2♂, 1♀); **Zambia**: Bruce-Miller Farm, Choma, Lepiled Light Trap 28.II-8.III.2019, V. Dérozier, M. Imakando, W. Miles, L. Mulvaney (1♂); **Zambia**: Bruce-Miller Farm, Choma, Actinic Light Trap 28.II-8.III.2019, V. Dérozier, M. Imakando, W. Miles, L. Mulvaney (9♂); **Zambia**: Gwabi River Lodge, Chirundu, Actinic Light Trap 8-11.III.2019, V. Dérozier, M. Imakando, W. Miles, L. Mulvaney (1♂); **Zambia**: Gwabi River Lodge, Chirundu, MV Light Trap 8-11.III.2019, V. Dérozier, M. Imakando, W. Miles, L. Mulvaney (1♂); **Zambia**: Lakeview Lodge, Sinazongwe (493m), MV Light Trap 23-28.II.2019, V. Dérozier, M. Imakando, W. Miles, L. Mulvaney (1♂) (ANHRT).

**Remarks**. Characters of the above listed specimens match quite well with those of *H. scalata* (cf. Figs 8a, 8c, 8d, 8e and compare them with figures in Hemp & Heller 2019), known only from central Tanzania (Hemp 2021). *H. scalata* belongs to a group of species with an unmodified tenth abdominal tergite, hind wings longer than forewings, and tympanic auricles inflated in the male; interestingly, *H. hemporum* Massa, 2021 from Zambia belongs to the same group too (Massa 2021a).

**Description of the female**. Similar in size and colour as male (cf. Hemp in Hemp & Heller 2019), tympanic auricles of fore tibiae conchate, not inflated, tegmina shorter and wider, and hind wings stronger reduced than in male, ca. 4.0 mm long (Fig. 8b). Subgenital plate with triangular apex. Ovipositor stout, slightly up-curved and strongly serrated (Fig. 8f). Cerci thick and short.

**Measurements of the female (in mm)**. Body length: 23.6; length of pronotum: 6.3; height of pronotum: 3.7; length of hind femora: 29.9; length of tegmina: 29.8; width of tegmina: 9.8; length of ovipositor: 13.8.

### Tribe Phaneropterini Burmeister, 1838
### *Eulioptera zambesiana* new species

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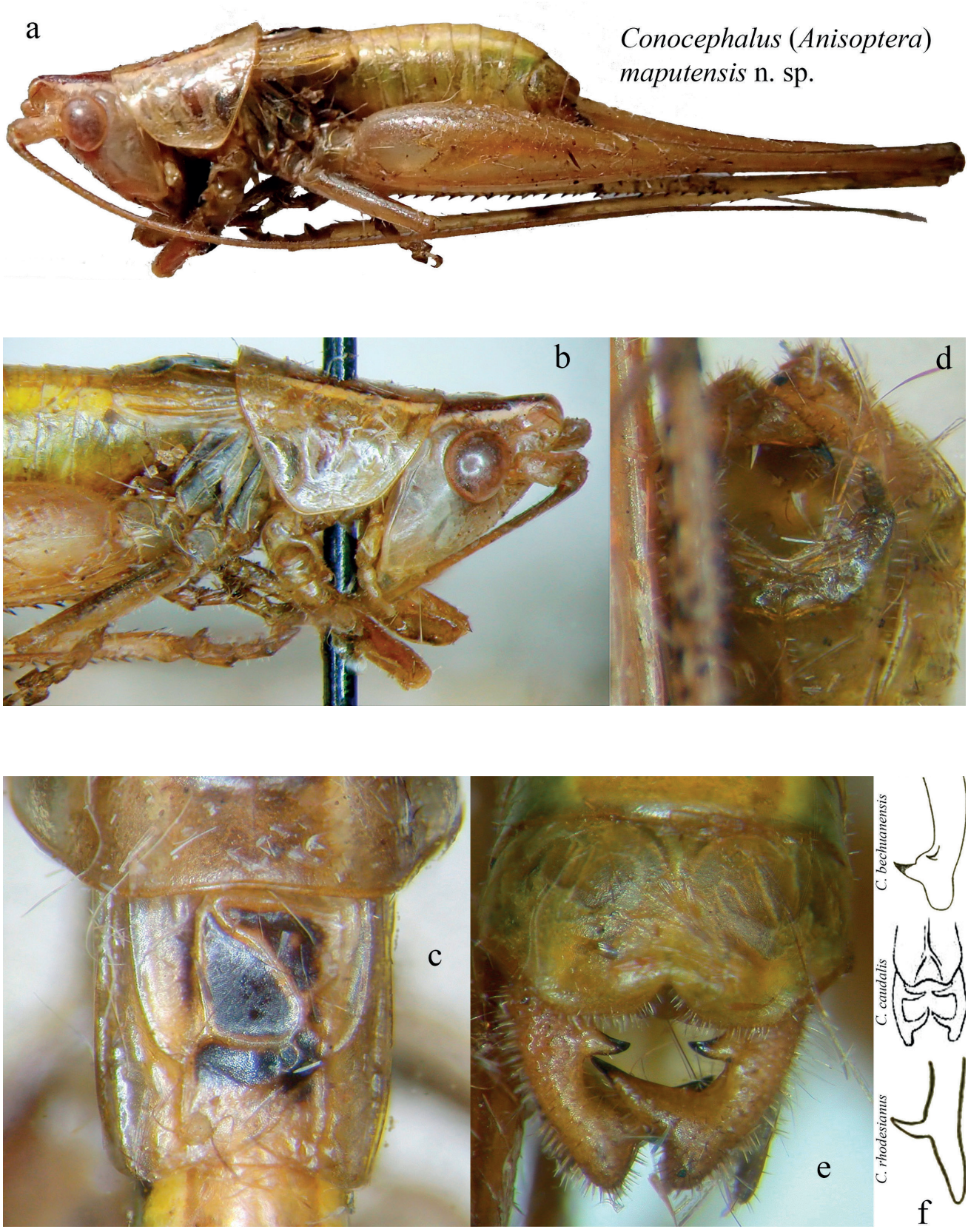



**Fig. 7 –** *Conocephalus* **(***Anisoptera***)** *maputensis* **n. sp.**: **a**, habitus of the holotypus male; **b**, lateral view of head, pronotum and tegmina; **c**, dorsal view of tegmina; **d**, ventral view of the subgenital plate; **e**, dorsal view of cerci; **f**, cerci of *C. bechuanensis* (after Uvarov 1928), *C. caudalis* (after Redtenbacher 1891) and *C. rhodesianus* (after Péringuey 1916).

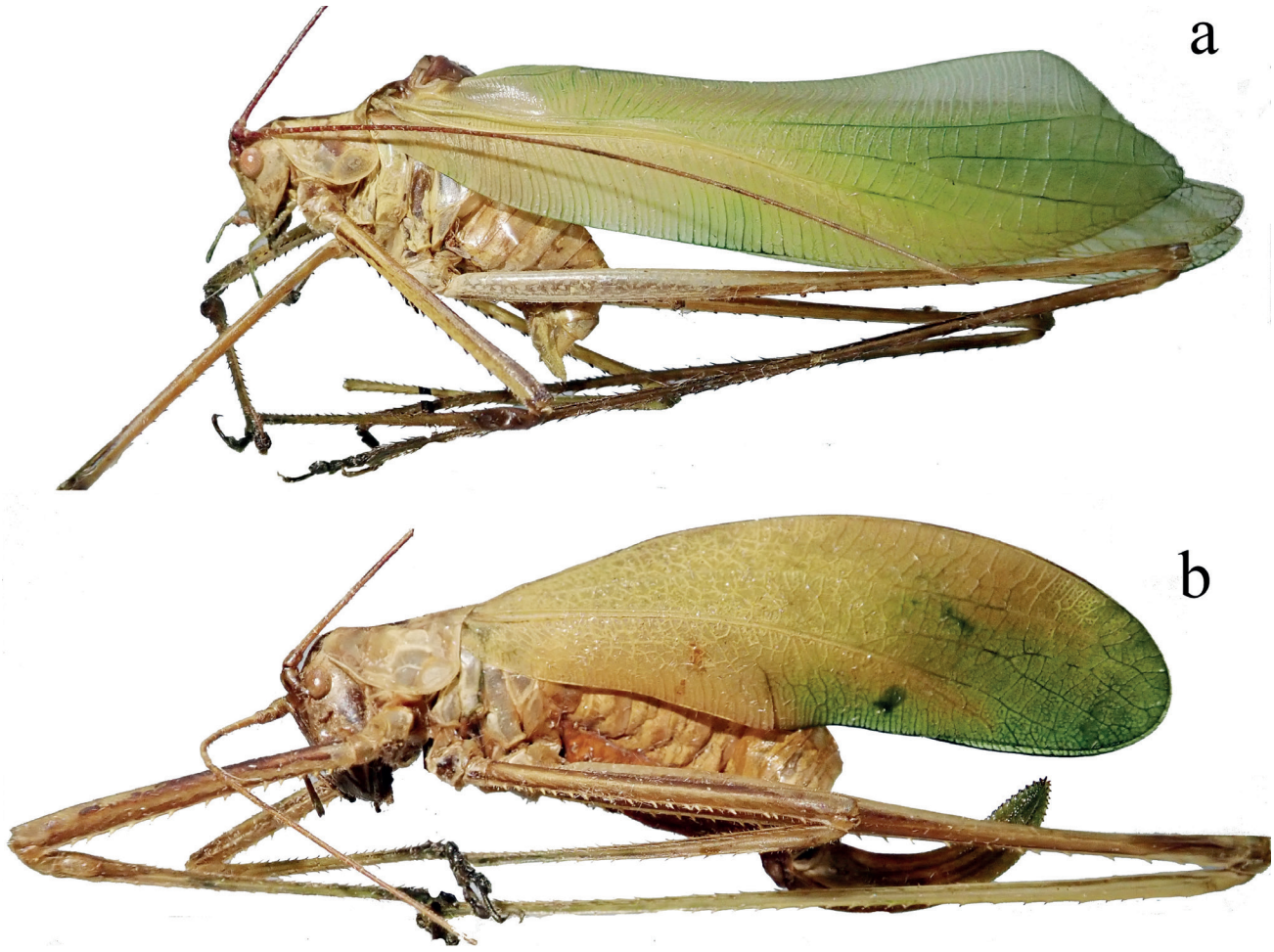



**Fig. 8 –** *Horatosphaga scalata* Hemp, 2019 from Zambia: a, habitus of the male; b, habitus of the female; c, tympanic auricles of fore tibiae in the male; d, male cerci and subgenital plate in dorsal view; e, stridulatory file under the left tegmen of male; f, lateral view of the ovipositor.

**Material examined**. **Zambia**: Lakeview Lodge, Sinazongwe (493m), MV Light Trap 23-28.II.2019, V. Dérozier, M. Imakando, W. Miles, L. Mulvaney (1♂ holotypus, 3♂ paratypi) (holotypus and 2 paratypi in ANHRT, 1 paratypus in BMPC); **Zambia**: Redcliff Zambezi Lodge, Luangwa, Lepiled Light Trap 11-17.III.2019, V. Dérozier, M. Imakando, W. Miles, L. Mulvaney (1♂ paratypus) (ANHRT).

**Measurements (mm)**. Male. Body length: 17.3-20.2; length of pronotum: 3.5-3.7; height of pronotum: 3.3-3.5; length of hind femora: 18.0-19.2; length of tegmina: 27.4-29.6.

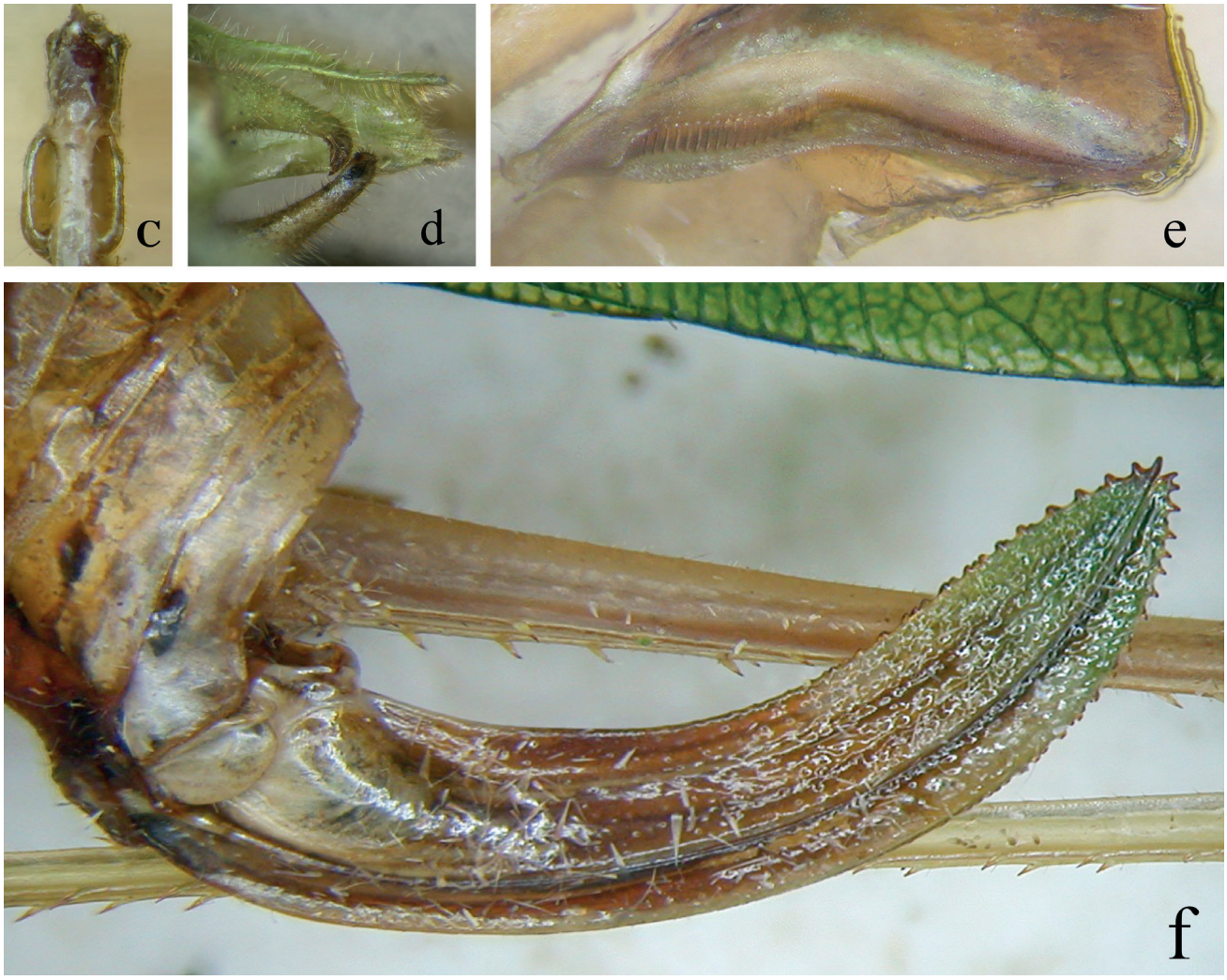
**Diagnosis**. *E. zambesiana* n. sp. is a medium sized *Eulioptera*, characterized by the male subgenital plate long and upcurved, divided into two laterally flattened lobes.

**Description**. Male (Fig. 9a). Colour. Green with black spots on hind margin of tegmina. Stridulatory area reddish or yellowish. Head typical of the genus, eyes round prominent, fastigium of vertex compressed, just raised at the apex, narrower than scapus, not contiguous with fastigium of frons. Antennae reaching the tip of tegmina. Pronotum without lateral carinae, anteriorly and posteriorly straight, longer than high. Hind wings extending beyond tegmina by quarter-fifth of latter. Stridulatory area on left tegmen small raised, mirror on right tegmen wide (Fig. 9b). Stridulatory file ca. 0.9-1.0 mm, consisting of ca. 140 more or less evenly spaced teeth (Fig. 9c). Fore coxae armed with a small spine. Fore femora with 4-5 small spines on inner margin, mid femora armed with 3-4 couples of spines on lower margins, hind femora armed with 4-5 spines on outer and 2-3 on inner lower margins. Fore tibiae with 5-6 spines on inner and outer lower margins, mid tibiae with 10-11 spines on outer lower margin and 6-7 on inner lower margin. Hind tibiae with a dozen of spines on inner and outer lower margins + 3 spurs on each side.

Tenth tergite unmodified, cerci thin, long and at the middle length incurved, with pointed apex. Subgenital plate divided into two long lobes, laterally flattened and apically rounded, gently upcurved (Figs 9d, 9e).

Female. Unknown.

**Etymology**. *E. zambesiana* n. sp. is named after the river Zambesi, where the specimens were collected.




**Affinities**. *E. zambesiana* n. sp. is similar to *E. montana* Ragge, 1980 (Chyulu Hills, Kenya), which has a different male subgenital plate (compare Figs 9e and 9g), a little different stridulatory file (ca. 125 teeth), and a smaller size (body length of male 26.0 mm, length of hind femur 14.9, length of tegmina 18.7; Ragge 1980). It is also related to *E. monticola* Ragge, 1980, characterized by red-brown spots on much of the body and a black mark on the stridulatory area; cerci are less incurved and the subgenital plate is shorter than in *E. zambesiana* n. sp. (compare Figs 9e and 9f), while the stridulatory file consists of 130-155 teeth (Ragge 1980).

**Distribution**. Presently *E. zambesiana* n. sp. is known only from the two localities above listed, between them about 350 km away; they are located along the river Zambesi.

**Discussion**. The genus *Eulioptera* Ragge, 1956 is closely related to *Phaneroptera* Serville, 1831 and, like it, is distributed over most of tropical Africa. Presently, this genus is represented by 22 species plus two subspecies (probably to be raised to species level), and possibly others will be discovered in the future years with increasing researches by using light traps. However, differently from *Phaneroptera*, *Eulioptera* generally are local species, most of them are known from one or a few localities, and only singles specimens. Very likely they have a great propensity to speciate by isolation.

## *Dannfeltia nana* Sjöstedt, 1902

**Material examined**. **Mozambique**: Maputo Special Reserve, Futi Corridor, Sand Forest Woodland Mosaic, Actinic Light Trap 23-24.II.2018, G. Laszlo, J. Mulvaney, L. Smith (2♂); **Mozambique**: Maputo Special Reserve, Futi Riverine Forest 5.XII.2016, M. Aristophanous, J. Cristovão, G. Laszlo, W. Miles (2♂); **Mozambique**: Maputo Special Reserve, West Gate, Sand Forest, Actinic Light Trap 13-15.II.2018, G. Laszlo, J. Mulvaney, L. Smith (7♂, 1♀); **Mozambique**: Maputo Special Reserve, West Gate, Sand Thicket, Actinic Light Trap 24-25.II.2018, G. Laszlo, J. Mulvaney, L. Smith (3♂); **Mozambique**: Maputo Special Reserve, West

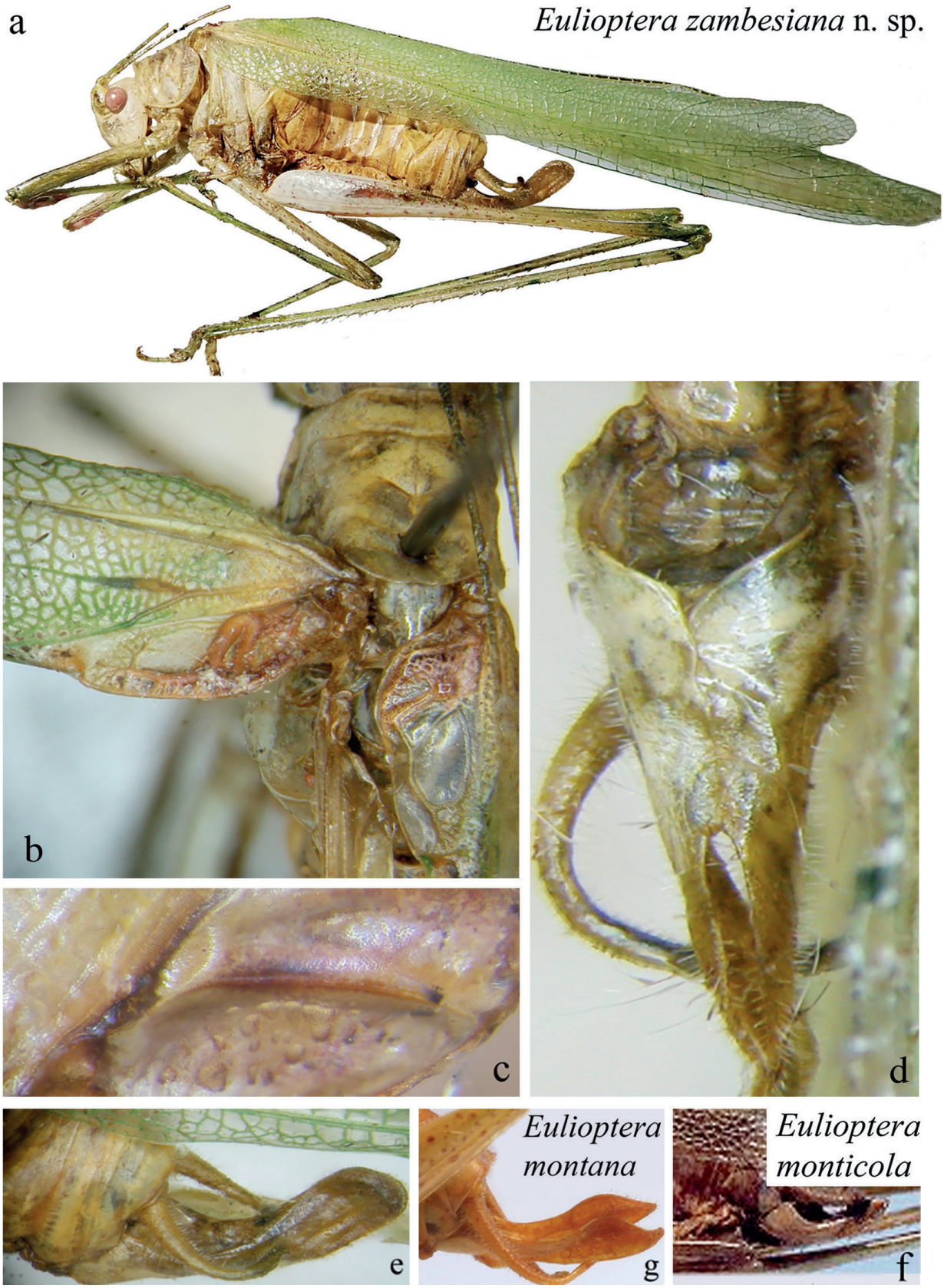



**Fig. 9 –** *Eulioptera zambesiana* **n. sp.**: **a**, habitus of the male; **b**, dorsal view of the stridulatory area on the left tegmen and mirror on the right tegmen; **c**, stridulatory file under the left tegmen; **d**, ventral view of the subgenital plate; **e**, lateral view of the subgenital plate; **f**, lateral view of the subgenital plate of *Eulioptera monticola* Ragge, 1980; **g**, lateral view of the subgenital plate of *Eulioptera montana* Ragge, 1980.

Gate, Sand Thicket, Actinic Light Trap 9-17.II.2018, G. Laszlo, J. Mulvaney, L. Smith (6♂, 1♀); **Mozambique**: Maputo Special Reserve, West Gate, Sand Forest, Actinic Light Trap 21-22.II.2018, G. Laszlo, J. Mulvaney, L. Smith (3♂); **Mozambique**: Maputo Special Reserve, Ponta Milibangalala, Dune Grassland, MV Light Trap 17-21.II.2018, G. Laszlo, J. Mulvaney, L. Smith (1♂); **Mozambique**, Maputo Special Reserve, Ponta Milibangalala, Dune Grassland, Actinic Light Trap 17-21.II.2018, G. Laszlo, J. Mulvaney, L. Smith (2♂); **Mozambique**: Maputo Special Reserve, West Gate, Sand Thicket, MV Light Trap 10-17.II.2018, G. Laszlo, J. Mulvaney, L. Smith (1♀) (ANHRT).

**Remarks**. *Dannfeltia nana*, thought synonym of *Phaneroptera sparsa* Stål, 1857, was recently reinstated as different genus on the basis of the stridulatory file shape and other characters (Massa 2021a). An overlooked character that allows to separate *Dannfeltia* from *Phaneroptera* is the ratio between the length of hind wings and tegmina; in *Phaneroptera* it is 1.4-1.5, while in *Dannfeltia* is 1.2-1.3, the hind wings exceeding not so much tegmina as in *Phaneroptera*. *D. nana* is presently known from Democratic Republic of Congo (holotype), Mozambique (present specimens), Gabon, Central African Republic, and Ivory Coast.

**Description of the female**. Among specimens collected in Mozambique also 3 females of this species were collected, whose habitus was previously unknown. Characters are the same of the male (see the re-description in Massa 2021a), with the exception of the subgenital plate, which is short, and triangularly pointed. The ovipositor is more upcurved than in *Phaneroptera*.

**Measurements of the females (in mm)**. Body length: 13.0-13.9; length of pronotum: 3.2-3.4; height of pronotum: 2.4-2.5; length of hind femora: 13.7-14.3; length of tegmina: 18.7-18.8; width of tegmina: 3.9-4.0; length of ovipositor: 3.9-4.0.

## *Melidia brunneri* Stål, 1876

**Material examined**. **Mozambique**: Maputo Special Reserve, West Gate, Sand Forest, MV Light Trap 13-15.II.2018, G. Laszlo, J. Mulvaney, L. Smith (2♂); **Mozambique**: Maputo Special Reserve, West Gate, Sand Forest, MV Light Trap 24.II.2018, G. Laszlo, J. Mulvaney, L. Smith (1♂); **Mozambique**: Maputo Special Reserve, West Gate, Sand Forest, Actinic Light Trap 13-15.II.2018, G. Laszlo, J. Mulvaney, L. Smith (1♂) (ANHRT); **Mozambique**: Maputo Special Reserve, West Gate, Sand Forest, Actinic Light Trap 21-22.II.2018, G. Laszlo, J. Mulvaney, L. Smith (2♂) (BMPC); **Mozambique**: Maputo Special Reserve, Ponta Milibangalala, Dune Grassland, MV Light Trap 17-21.II.2018, G. Laszlo, J. Mulvaney, L. Smith (2♂) (ANHRT).

**Remarks**. *M. brunneri* (Figs 10a, 10b, 11a, 11f, 11i) is the most widespread species of the genus *Melidia* in tropical Africa, known from Namibia, Zimbabwe, South Africa, Mozambique, and Nigeria (Ragge 1980; Naskrecki & Guta 2019).

## *Melidia claudiae* Massa, 2015

**Material examined**. **Zambia**: Redcliff Zambezi Lodge, Luangwa 15°38'34.2"S 30°16'32.9"E Actinic Light Trap 11-17.III.2019, V. Dérozier, M. Imakando, W. Miles, L. Mulvaney (9♂, 1♀) (ANHRT, 1♂ in BMPC).

**Measurements (in mm)**. Males. Body length: 14.9-17.5; length of pronotum: 3.2-3.5; height of pronotum: 2.7-2.9; length of tegmina: 21.9-22.8; width of tegmina: 3.5-4.0; length of hind femora: 16.4-17.1. Females. Body length: 16.9; length of pronotum: 3.2; height of pronotum: 2.7; length of tegmina: 26.3; width of tegmina: 4.0; length of hind femora: 19.6; length of ovipositor: 5.0.

**Remarks**. *M. claudiae* (Figs 10c, 10d, 11b, 11g, 11l) was described from Democratic Republic of Congo from two males (Massa 2015); further measurements of this species taken at the Royal Belgian Institute of Natural Sciences have been reported by Massa (2017); the new series from Zambia allowed a new comparison with *M. brunneri* and with the new species below described.

### *Melidia pif* new species

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**Material examined**. **Zambia**: Gwabi River Lodge, Chirundu, Actinic Light Trap 8-11.III.2019, V. Dérozier, M. Imakando, W. Miles, L. Mulvaney (1♂ holotypus, 2♂ paratypi); **Zambia**: Gwabi River Lodge, Chirundu, MV Light Trap 8-11.III.2019, V. Dérozier, M. Imakando, W. Miles, L. Mulvaney (1♀ paratypus); **Zambia**: Gwabi River Lodge, Chirundu, Lepiled Light Trap 8-11.III.2019, V. Dérozier, M. Imakando, W. Miles, L. Mulvaney (1♂ paratypus); **Zambia**: Lakeview Lodge, Sinazongwe (493m), Actinic Light Trap 23-28.II.2019, V. Dérozier, M. Imakando, W. Miles, L. Mulvaney (4♂ paratypi); **Zambia**: Lakeview Lodge, Sinazongwe (493m), Lepiled Light Trap 23-28.II.2019, V. Dérozier, M. Imakando, W. Miles, L. Mulvaney (3♂ paratypi) (ANHRT); **Zambia**: Bruce-Miller Farm, Choma, Lepiled Light Trap 28.II-8.III.2019, V. Dérozier, M. Imakando, W. Miles, L. Mulvaney (1♂ paratypus) (BMPC).

**Measurements (in mm)**. Males. Body length: 13.5-14.5; length of pronotum: 3.3-3.4; height of pronotum: 2.7-2.8; length of tegmina: 20.3-23.0; width of tegmina: 3.1-3.5; length of hind femora: 16.5-18.0. Female. Body length: 15.3; length of pronotum: 3.4; height of pronotum: 2.9; length of tegmina: 24.1; width of tegmina: 3.5; length of hind femora: 17.0; length of ovipositor: 5.6.

**Diagnosis**. *Melidia pif* n. sp. is very similar to *M. brunneri* Stål, 1876 and *M. claudiae* Massa, 2015, but it differs from them mainly by its very peculiar male cerci, stout, downcurved and provided with an inner long pointed spine.

**Description**. Male (Fig. 10e). Colour. Yellowish with green tegmina, antennae brownish, stridulatory area of left tegmen brown, abdomen yellowish. Head and antennae. Fastigium of vertex very narrow, scarcely furrowed above, separated from the fastigium of frons, which is tuberculated. Eyes rounded, well projecting. Thorax. Pronotum little narrowing anteriorly, flat above, anterior margin straight, posterior rounded, humeral sinus evident, lower margin of lateral lobes of pronotum rounded. Tegmina comparatively narrow with convex fore margin and rounded apex, wings longer than tegmina. Stridulatory area of left tegmen wide. The stridulatory file is widely arched and consists of three parts: the distal with 13 teeth evenly spaced, the central with 5 bigger teeth more spaced, and the proximal with 4-5 small teeth (Fig. 10f). Legs comparatively long. Fore coxae armed with a small spine, fore tibiae sulcate on upper margin, distinctly widening on tympanum area. Tympana open on inner and outer sides. Fore femora armed on inner ventral margin with 3-4 spines, fore tibiae with 2 spines + 1 spur on inner and outer ventral margins, 1 spur on outer dorsal margin; mid femora armed with 2 spines on outer ventral margin, mid tibiae with 5-6 on outer and inner ventral margins + 1 spur on each side; hind femora armed with 1-2 small spines on outer ventral margin, hind tibiae with many spines on ventral and dorsal margins + 3 spurs on each apical side. Abdomen. Tenth tergite with a straight margin, subgenital plate long and apically deeply divided into two in-curved lobes, styli absent (Fig. 11h). Cerci stout, downcurved and apically flattened and blunt; a long inner spine sinuous spine present in their middle (Figs 11c, 11d).

Female (Fig. 12e). Same characters as the male, with the exception of the subgenital plate which is narrow and apically divided (Fig. 10m), and the ovipositor, gently upcurved and with two lateral bulges at its base (Fig. 12f).

**Etymology**. This species is friendly dedicated to Pif, nickname of Pierfrancesco Diliberto, director, radio-television host, screenwriter and actor, highly appreciated for his proximity to social and environmental problems; '*pif*' should be treated as a noun in apposition.

**Affinities**. The most related species are *M. brunneri* and *M. claudiae*, whose males have a subgenital plate very similar to that of *M. pif* n. sp. (Figs 11f, 11g). However, in *M. pif* n. sp. the apical lobes are short, more similar to those of *M. brunneri*, and cerci are very different, their diagnosis is immediate (Figs 11c, 11d). Concerning the stridulatory file, very small differences are detectable in *M. brunneri* and *M. claudiae* (Figs 10b, 10d). *M. laminata* Chopard, 1954 (Kenya and Tanzania) has a longer subgenital plate and cerci similar to *M. brunneri* and *M. claudiae*. *M. adfinia* Hemp, 2019 (central Tanzania) has the subgenital plate similar to that of *M. brunneri* (Hemp 2021). *M. kenyensis* Chopard, 1954 (Kenya) is known only from the holotype female (Figs 12a, 12b) and the comparison with the general habitus of the female of *M. claudiae* (Figs 12c, 12d) and *M. pif* n. sp. (Figs 12e, 12f) confirms differences in the tegmina shape and the ovipositor. The subgenital plate of the female of *M. pif* n. sp. (Fig. 11m) differs from that of *M. brunneri*, which is widely divided at the apex (Fig. 11i) and from that of *M. claudiae* which is short and pointed (Fig. 11l).

**Discussion**. The genus *Melidia* Stål, 1876 is also related to *Phaneroptera*, but it is more robust, has relatively broader tegmina, a different ratio hind wings length / tegmina length (1.2 on average), and a brown patch in the stridulatory area of the left tegmen. When Ragge (1980) revised the African Phaneropterinae with open tympana, three specie of *Melidia* were known: *M. brunneri*, *M. kenyensis* and *M. laminata*; other two species were recently described: *M. claudiae* and *M. adfinia*. Males of all described species (*M. kenyensis* is known only from the female sex) are characterized by a more or less elongate subgenital plate with the apex divided into two lobes, and thin and incurved cerci. Only the newly discovered Zambian *M. pif* n. sp. has cerci completely different from the general model, but its habitus is the same of the others. *Melidia* species are generally uncommon (probably except for *M. brunneri*, well present in the museum collections), and small series of specimens are difficult to be obtained. The use of light traps in the present study allowed to capture in Zambia and Mozambique three of the six presently known species.

**Tribe Amblycoryphini Brunner von Wattenwyl, 1878**
**Genus *Plangia* Stål, 1873**

Massa (2021a) highlighted that some specimens from Zambia do not belong to described species, but a more extensive study of long series of specimens should be necessary to establish the correct identification. Thus, thanks to the new material obtained from Zambia and Mozambique, presently it is possible to understand better the taxonomy of these east African specimens.

***Plangia graminea* (Serville, 1838)**

**Material examined**. **Zambia**: Camp near Kanyama (Miombo/Riverine Dambo mosaic) (1375m) 4-7.XII.2019, M. Bashford, W. Miles, L. Mulvaney (1♂); **Mozambique**: Maputo Special Reserve, West Gate, Sand Thicket, Actinic Light Trap 9-17.II.2018, G. Laszlo, J. Mulvaney, L. Smith (1♂) (ANHRT).

**Remarks**. The specimens above listed match quite well with the images presented by Hemp et al. (2015) for *P. graminea*; the stridulatory file of Zambian specimen has ca. 70 teeth, very similar to 67 teeth reported by Hemp et al. (2015). Thus, *P. graminea* should be present in Zambia and Mozambique, other than South Africa.

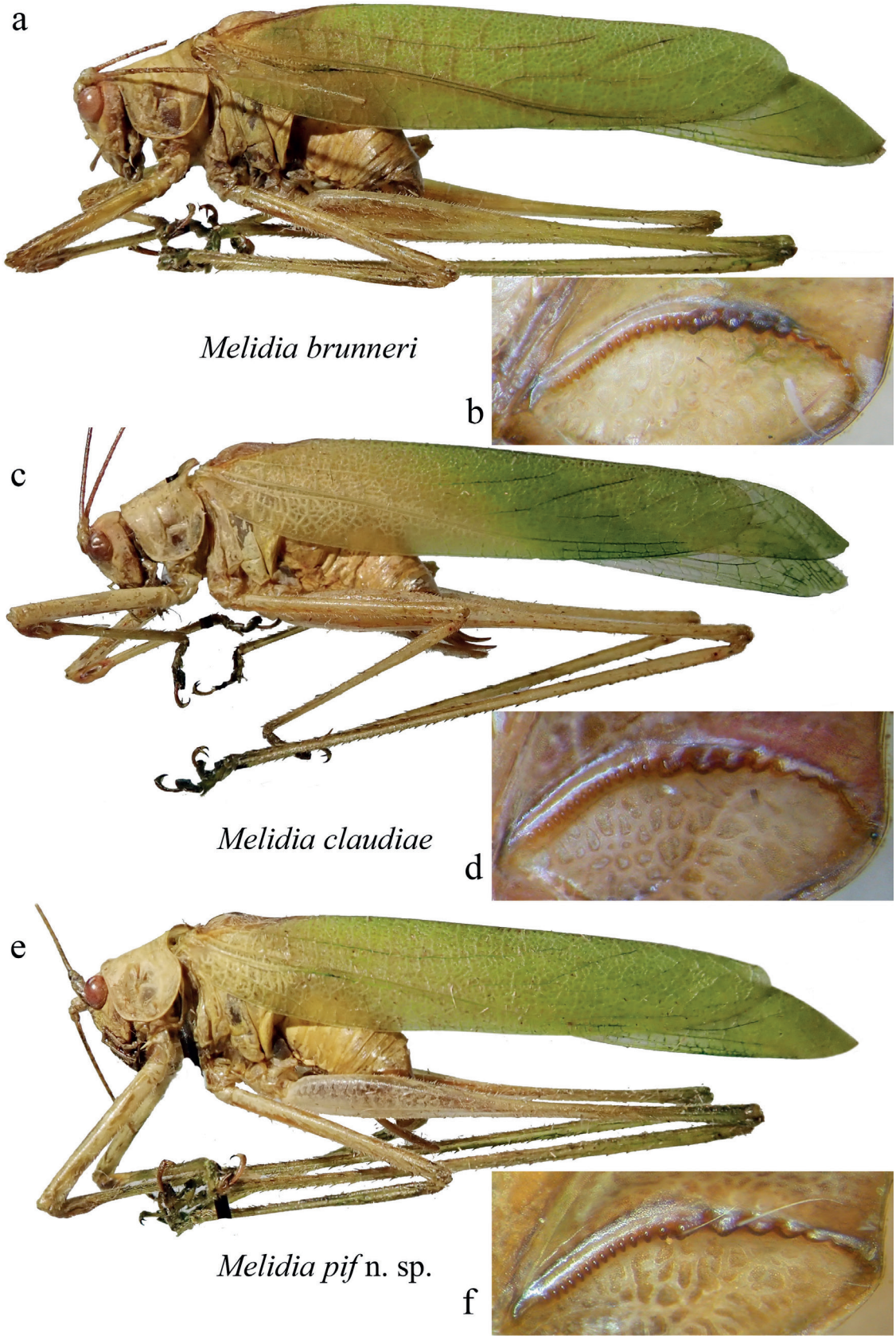



**Fig. 10 – a**, habitus and b, stridulatory file of *Melidia brunneri* Stål, 1876; **c**, habitus and d, stridulatory file of *Melidia claudiae* Massa, 2015; **e**, habitus and **f**, stridulatory file of *Melidia pif* **n. sp.**

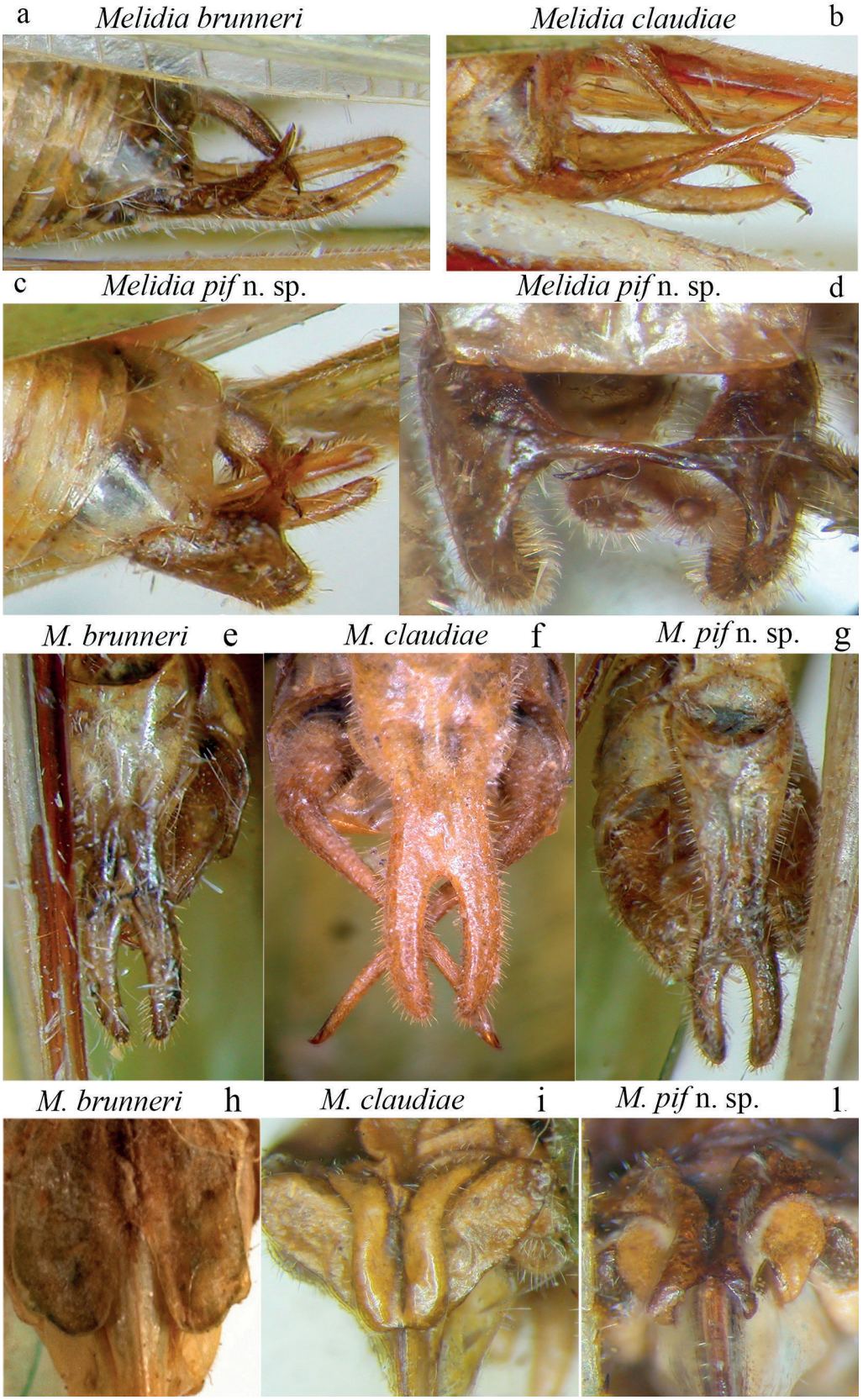



**Fig. 11 –** Dorso-lateral view of cerci and subgenital plate of **a**, *Melidia brunneri*, **b**, *M. claudiae*, **c**, *M. pif* **n. sp.**; **d**, dorsal view of cerci of *M. pif* **n. sp.**; ventral view of the male subgenital plate of **e**, *M. brunneri*, **f**, *M. claudiae*, **g**, *M. pif* **n. sp.**; ventral view of the female subgenital plate of **h**, *M. brunneri*, **i**, *M. claudiae* (l), **l**, *M. pif* **n. sp.**

***Plangia satiscaerulea* Hemp, 2015**

**Material examined**. **Zambia**: Jiwundu Swamp (1340m) 25-30.X.2017 (MV light trap) (1♂) (BMPC); **Zambia**: Zambezi Rapids (Miombo Riverine forest mosaic) (1205m), 4-9.XI.2018, MV light trap, M. Aristophanous, V. Dérozier, G. Laszlo, D. Oram (2♂) (ANHRT).

**Remarks**. The above listed Zambian specimens match well with *P. satiscaerulea*, previously known from north Tanzania.

***Plangia geroi* new species**
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**Material examined**. **Zambia**: Lakeview Lodge, Sinazongwe (493m), MV Light Trap 23-28.II.2019, V. Dérozier, M. Imakando, W. Miles, L. Mulvaney (1♂ holotypus, 4♂ paratypi in ANHRT, 1♀ paratypus in BMPC); **Zambia**: Lakeview Lodge, Sinazongwe (493m), Lepiled Light Trap 23-28.II.2019, V. Dérozier, M. Imakando, W. Miles, L. Mulvaney (1♂ paratypus in BMPC); **Zambia**: Redcliff Zambezi Lodge, Luangwa, Lepiled Light Trap 11-17.III.2019, V. Dérozier, M. Imakando, W. Miles, L. Mulvaney (2♂, 1♀ paratypi in ANHRT); **Zambia**: Gwabi River Lodge, Chirundu, Actinic Light Trap 8-11.III.2019, V. Dérozier, M. Imakando, W. Miles, L. Mulvaney (1♂ paratypus in ANHRT, 1♂ paratypus in BMPC); **Zambia**: Gwabi River Lodge, Chirundu, MV Light Trap 8-11.III.2019, V. Dérozier, M. Imakando, W. Miles, L. Mulvaney (1♂, 1♀ paratypi in ANHRT); **Zambia**: Gwabi River Lodge, Chirundu, Lepiled Light Trap 8-11.III.2019, V. Dérozier, M. Imakando, W. Miles, L. Mulvaney (4♂ paratypi in ANHRT, 1♂ paratypus in BMPC); **Zambia**: Mayukuyuku, Kafie NP, 21-26. XI.2013, Light trap, D. Oram, L. Smith, H. Takano (1♀ paratypus in ANHRT).

**Measurements (in mm)**. Males. Body length: 21.8-25.0; length of pronotum: 5.5-5.9; height of pronotum: 5.4-5.7; length of hind femora: 14.8-16.8; length of tegmina: 32.5-35.1. Females. Body length: 22.8-25.3; length of pronotum: 5.8-5.9; height of pronotum: 5.6-5.7; length of hind femora: 15.7-17.4; length of tegmina: 33.0-35.7; length of ovipositor: 6.1-6.2.

**Diagnosis**. *P. geroi* n. sp. is a large species of *Plangia*, lacking of the black spot on the left tegmen and characterized by thin, incurved and pointed cerci.

**Description**. Male (Fig. 13a). Colour. Yellow-green, tibiae brown with blackish stripes, hind tibiae with black-tipped spines. Head and antennae. Fastigium of vertex as wide as scapus, not contiguous with the fastigium of frons. Face smooth. Thorax and legs. Anterior margin of pronotum concave, posterior margin rounded. Fore coxae armed with a spine. Fore femora short and compressed, with 3 spines on the inner ventral margin, fore tibiae a little compressed at the base, with open tympana, sulcate above, with 2 outer and inner ventral spines + 1 apical spur on each side, and 1 outer dorsal spur. Mid femora with 3 spines on outer ventral margin, mid tibiae with 3 outer and inner ventral spines + 1 apical spur on each side and 1 inner dorsal spur. Hind femora just compressed, with 4 spines on outer ventral margin, hind tibiae with 12 outer and inner dorsal spines and 9 outer and inner ventral spines + 3 apical spurs on each side. Wings. Tegmina 3.3 times longer than wide, with fore and hind margins more or less parallel, the fore margin only apically rounded. Stridulatory area of the left tegmen just raised, mirror on the right tegmen triangular (Fig. 13e); stridulatory file under the left tegmen arched and consisting of ca. 100 teeth evenly spaced (Fig. 13d). Abdomen. Cerci stout, pointed, in-curved and black-tipped (Fig. 13c); subgenital plate triangular, styli very small (Fig. 13f).

Female (Fig. 13b). Same characters as the male, length/width tegmina 3.3, ovipositor short, gently up-curved, with many small teeth dorsally and a few apical teeth ventrally. Subgenital plate triangular and pointed (Figs 13g, 13h).

**Etymology**. *Plangia geroi* n. sp. is dedicated to Calogero Piazza (nickname 'Gero'), excellent sports doctor and a very good friend.

**Affinities**. Among the African species of *Plangia* without a black spot on the left tegmen the following have cerci shaped as in *P. geroi* n. sp.: *P. astylata* Massa 2021, which, however, has a much smaller size than *P. geroi* n. sp. and lacks of styli; *P. graminea* (Serville, 1838) has cerci pointed, but they are stouter than those of *P. geroi* n. sp. (Hemp et al. 2015). We do not know the male of *P. villiersi* Chopard, 1954 (described from the female sex); however, the female of *P. villiersi* has more oval tegmina (Chopard 1954) than the female of *P. geroi* n. sp. Additionally, *P. geroi* n. sp. has been compared with the following species of *Plangia* with a black spot on the left tegmen: *P. satiscaerulea* Hemp, 2015 (see above) has quite similar cerci, but the stridulatory file has only 68-74 teeth, while in *P. geroi* n. sp. teeth are ca. 100; *P. unimaculata* Chopard, 1955 (from South Africa), characterized by an evident round black spot on the left and right tegmina (Chopard 1955), has cerci stout and incurved, not pointed, as in *P. geroi* n. sp. Finally, *P. amaniensis* Hemp, 2017 has long, decussate cerci and *P. variacantans* Hemp, 2017 has unusually long styli.

**Discussion**. *Plangia* is a widespread genus, whose species are very difficult to distinguish between them, and for this reason the number of existing sibling species has been underestimated. Only recently researches carried out in east and southern Africa by Claudia Hemp (Hemp et al. 2015, Hemp 2017) have shown that undescribed taxa live in those countries. Thus, the genus *Plangia* is richer in species than it is generally believed. Presently, three species are endemic to Madagascar, namely *P. segonoides* (Butler, 1878), *P. guttatipennis* Karsch, 1889

and *P. ovalifolia* Bolívar, 1912. Hemp et al. (2015) and Hemp (2017) have revised the *P. graminea* complex in East and southern Africa, finding that *P. graminea* (Serville, 1838) is very probably only distributed in southern Africa, while four previously unknown species are present in Tanzania: *P. satiscaerulea* Hemp, 2015 (Mt. Kilimanjaro), now found in Zambia, *P. multimaculata* Hemp, 2015 (Mt. Kilimanjaro), *P. amaniensis* Hemp, 2017 (Usambara Mts.) and *P. variacantans* Hemp, 2017 (Uluguru Mts.). Material collected in central and west tropical Africa allowed to highlight the high species diversity in the genus *Plangia* also in those forests, where Massa (2021b) described *P. astylata*, *P. chopardi*, and the male of *P. karschi* Chopard, 1954. Only the female of *P. villiersi* Chopard, 1954 (Guinea, Côte d'Ivoire and Gabon) is currently known. From central and west tropical Africa *P. nebulosa* Karsch, 1890 and the small *P. deminuta* Griffini, 1908 are also known. Finally, *P. unimaculata* Chopard, 1955 has been described from South Africa (only the holotype male is known). Including *P. geroi* n. sp., presently the number of species amounts to sixteen species.

**Tribe Holochlorini Brunner von Wattenwyl, 1878**
***Arantia* (*Euarantia*) *tanzanica* Hemp & Massa, 2017**

**Material examined**. **Zambia**: Redcliff Zambezi Lodge, Luangwa, Actinic Light Trap 11-17.III.2019, V. Dérozier, M. Imakando, W. Miles, L. Mulvaney (1♂).

**Remarks**. Described from Tanzania, *A. tanzanica* has been recorded from Zimbabwe, Mozambique, South Africa, and Swaziland (Naskrecki & Guta 2019). Now it has been recorded also from Zambia.

**Tribe Otiaphysini Karsch, 1889**
***Debrona cervina* Walker, 1870**

**Material examined**. **Zambia**: Redcliff Zambezi Lodge, Luangwa, Lepiled Light Trap 11-17.III.2019, V. Dérozier, M. Imakando, W. Miles, L. Mulvaney (1♂); **Zambia**: Redcliff Zambezi Lodge, Luangwa, Actinic Light Trap 11-17.III.2019, V. Dérozier, M. Imakando, W. Miles, L. Mulvaney (1♂).

**Remarks**. *Debrona cervina* is known from South Africa, Tanzania, Zimbabwe and Mozambique (Naskrecki & Guta 2019); previously unrecorded from Zambia.

**Subfamily Saginae Brunner von Wattenwyl, 1878**
***Clonia (Clonia) wahlbergi wahlbergi* Stål, 1855**

**Material examined**. **Zambia**: Lusaka, Kilimanjaro Lodge (1302m), 15°28'23.2"S, 28°29'26.1"E, 20-23.X.2017 (light), M. Carter, W. Miles, D. Oram (1♂).

**Remarks**. Previously known from eastern parts of South Africa, Zimbabwe, and Mozambique, unrecorded from Zambia.

**Family Acrididae MacLeay, 1821**
**Subfamily Catantopinae Brunner von Wattenwyl, 1893**
***Pachycatantops* sp.**

**Material examined**. **Zambia**: Lakeview Lodge, Sinazongwe (493m), Lepiled Light Trap 23-28.II.2019, V. Dérozier, M. Imakando, W. Miles, L. Mulvaney (1♂) (ANHRT).

**Remarks**. The habitus and size of this specimen (Fig. 14) is quite similar to that of *P. crassipes* (Ramme, 1929) (described from Kenya and known also from Somalia and Tanzania: Rowell & Hemp 2018). However, the single male collected in Zambia is more brachypterous than *O. crassipes*, and cerci are pointed and bifurcate, while in *P. crassipes* they are with subacute obliquely truncate apex (Dirsh 1965; Rowell & Hemp 2018). In absence of other specimens, it is preferable not to describe it as new.

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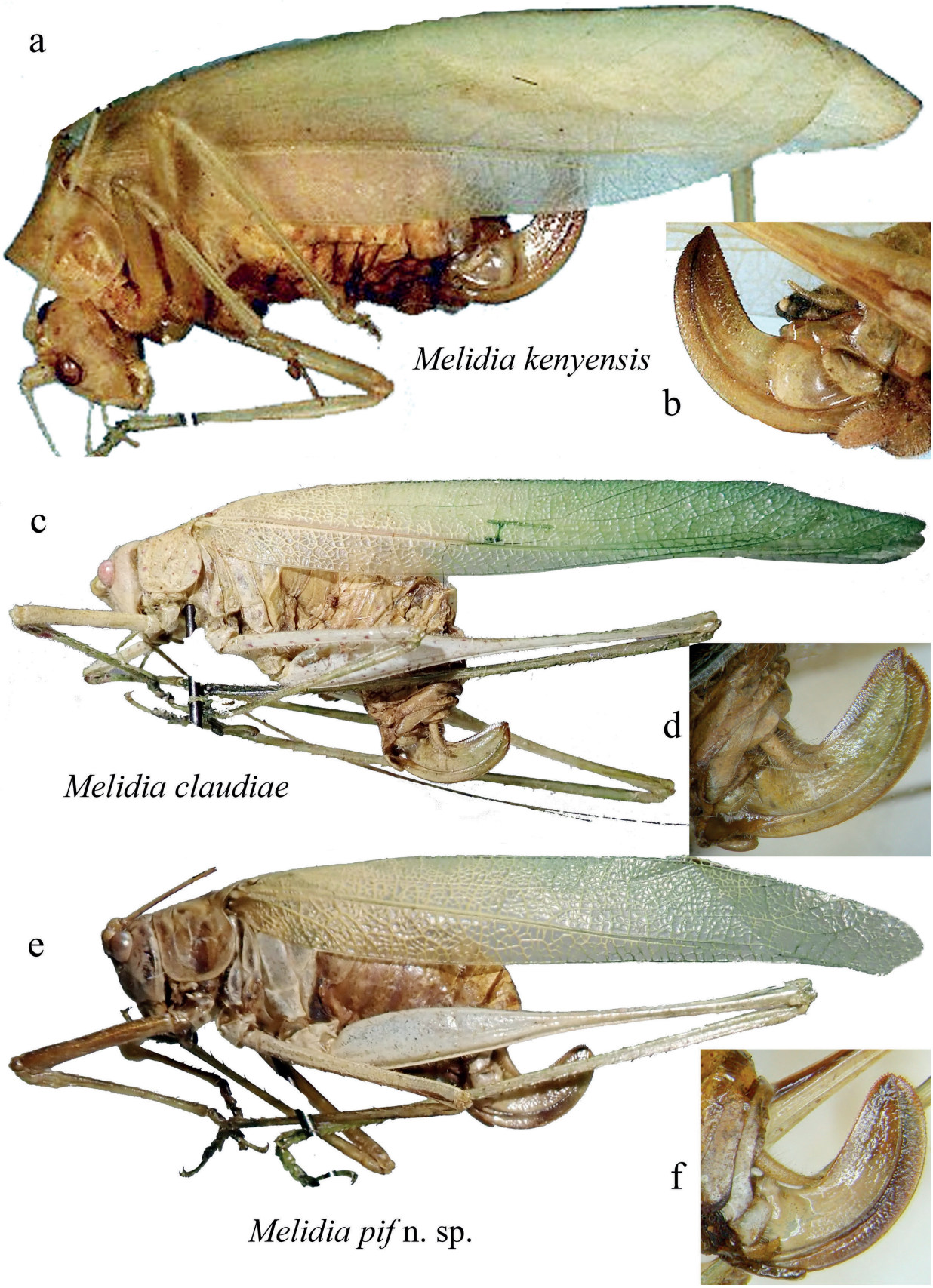



**Fig. 12 – a**, Habitus of the female and **b**, ovipositor of *Melidia kenyensis*; **c**, habitus of the female and **d**, ovipositor of *M. claudiae***; e**, habitus of the female and **f**, ovipositor of *M. pif* **n. sp.**

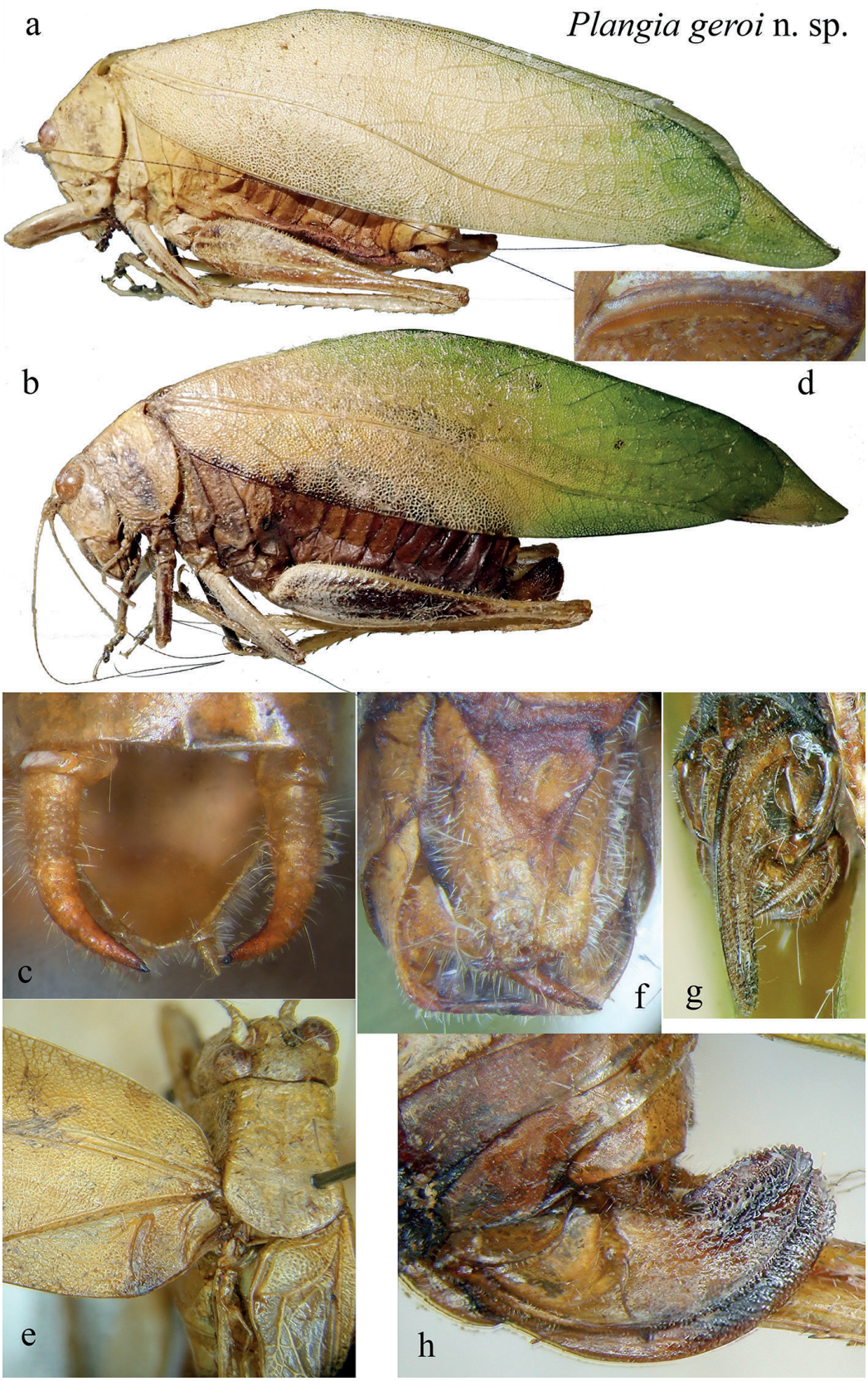



**Fig. 13 –** *Plangia geroi* **n. sp.**: **a**, habitus of the male; **b**, habitus of the female; **c**, dorsal view of cerci and subgenital plate; **d**, stridulatory file under the left tegmen; **e**, stridulatory area on the left tegmen and mirror on the right tegmen; **f**, ventral view of the subgenital plate; **g**, ventral view of the subgenital plate and ovipositor; **h**, lateral view of the ovipositor.

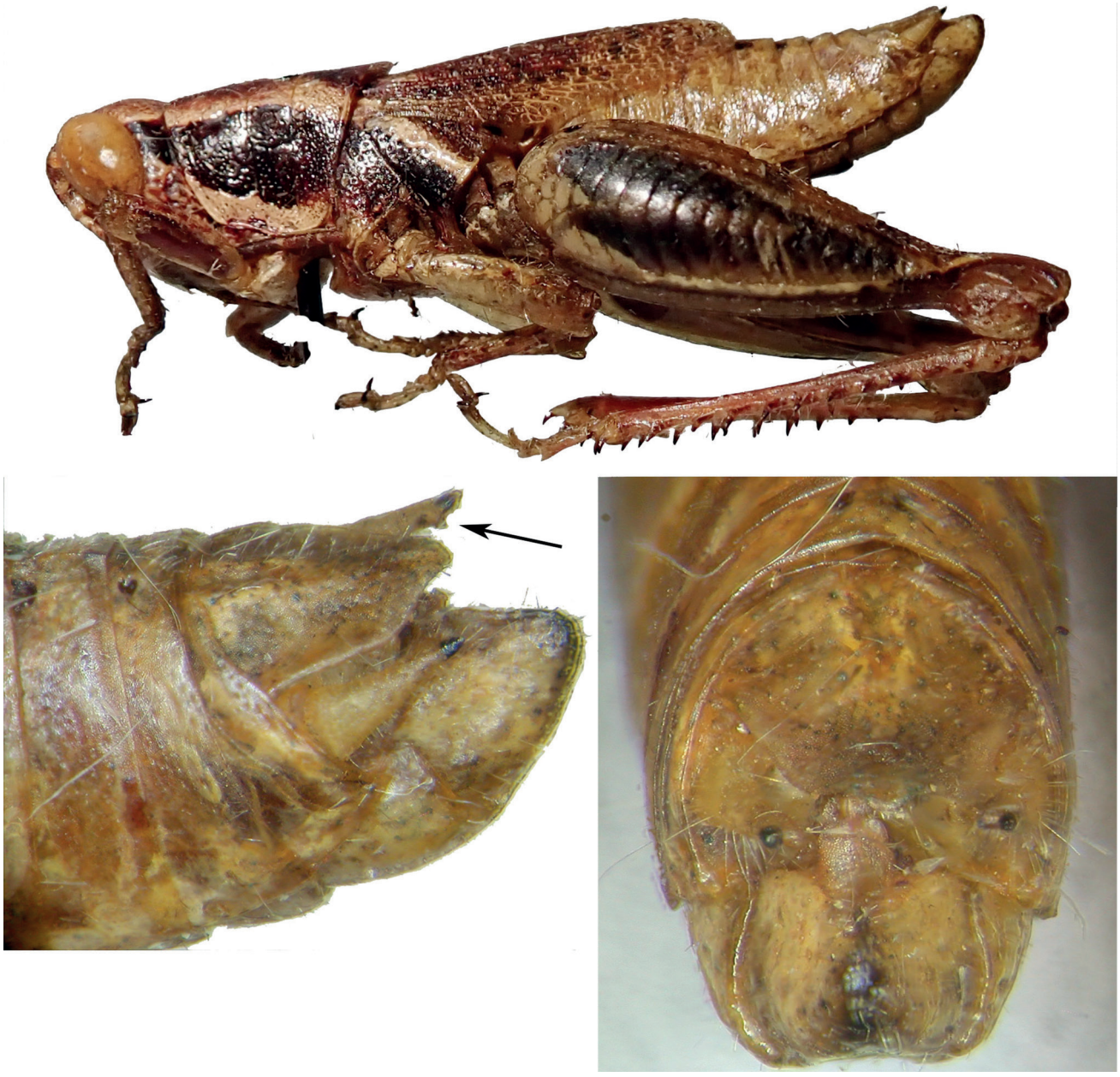


**Fig. 14 –** *Pachycatantops* **sp.:** habitus in lateral view and abdominal apex in lateral and dorsal view; the arrow indicates cerci shape.

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