

## Two New Species of Phymeurus from East Africa (Orthoptera: Acrididae: Euryphyminae)

Author: Rowell, C.H.F.

Source: Journal of Orthoptera Research, 24(2) : 83-93

Published By: Orthopterists' Society

URL: <https://doi.org/10.1665/034.024.0201>

---

The BioOne Digital Library (<https://bioone.org/>) provides worldwide distribution for more than 580 journals and eBooks from BioOne's community of over 150 nonprofit societies, research institutions, and university presses in the biological, ecological, and environmental sciences. The BioOne Digital Library encompasses the flagship aggregation BioOne Complete (<https://bioone.org/subscribe>), the BioOne Complete Archive (<https://bioone.org/archive>), and the BioOne eBooks program offerings ESA eBook Collection (<https://bioone.org/esa-ebooks>) and CSIRO Publishing BioSelect Collection (<https://bioone.org/csiro-ebooks>).

Your use of this PDF, the BioOne Digital Library, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at [www.bioone.org/terms-of-use](http://www.bioone.org/terms-of-use).

Usage of BioOne Digital Library content is strictly limited to personal, educational, and non-commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

---

BioOne is an innovative nonprofit that sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

## Two new species of *Phymeurus* from East Africa (Orthoptera: Acrididae: Euryphyminae)

C.H.F. ROWELL

Zoologisches Institut der Universität Basel, Switzerland.

### Abstract

Two new species of the euryphymine genus *Phymeurus* are described, one from Moroto Mountain, eastern Uganda (*morotoensis* n.sp.), and the other from West Central Tanzania, near Lake Tanganyika (*kisuluensis* n.sp.). The genus now contains 20 species, the majority in southern Africa.

### Key words

Grasshopper, taxonomy, new species, Uganda, Tanzania

### Introduction

The genus *Phymeurus* (Orthoptera: Acrididae: Euryphyminae) currently contains 18 species (Eades *et al.* 2015) in equatorial and southern Africa. It was revised by Mason (1966), who then erected 5 new species. Most species are from the Democratic Republic of the Congo or from Angola. Six species are recorded from East Africa: four of these are found in Tanzania (*Ph. fitzgeraldi* Mason 1966, *Ph. granulatus* Uvarov 1922, *Ph. brachypterus* I. Bolívar 1889, and *Ph. rufipes* Ramme 1929), two in Kenya (*Ph. bigranosus* Uvarov 1922 and *Ph. granulatus*) and one of these latter (*granulatus*) is also found on Mt. Elgon (Kenya and Uganda) and on the Imatong Mountains of southern South Sudan, on the northern Ugandan border. There is one further species in each of Cameroon, Sierra Leone and Guinea. In the more equatorial countries, the genus is found predominantly in alpine grasslands, usually above 2000 m asl. Further details of its biology are unknown.

In 1966 and 1967 the present author collected grasshoppers in the alpine grasslands of Mt. Moroto (3964 m), an isolated volcanic mountain in Karamoja District, eastern Uganda, part of the eastern wall of the Eastern Rift Valley, overlooking the Turkana desert of N.W. Kenya. Among the specimens collected was a new species of *Phymeurus*. These insects were passed for examination to Dr. N.D. Jago, and became part of the collection of the National Resources Institute (NRI). With the cessation of acridological work at the NRI in the 1990s and the death of Dr. Jago in 2005, the specimens ultimately came to the Natural History Museum, London (NHM). The need to compile a list of East African Euryphyminae for another publication activated the author to obtain the specimens from the NHM for description.

Examination of NHM specimens identified as *Ph. brachypterus* revealed a further undescribed species of *Phymeurus* from the area near Kisulu (Kigoma district, Tanzania, near the border with Burundi, close to the East shore of Lake Tanganyika). This species is also described below.

### Methods

Standard taxonomical methods were used. Measurements (Tables 1 and 2) were made under 5-25× magnification with a digital stage and a graticule eyepiece. Specimens were relaxed in water, the phallic complex dissected out and macerated in cold 8% NaOH solution, neutralised in dilute acetic acid, stained in acid fuchsin and stored in glycerin. Drawings were made using a Wild M5 microscope with drawing tube and elaborated in Photoshop CS5 (Adobe Systems Inc., San José, California, USA).

### Results

*Phymeurus* Giglio-Tos, 1907  
= *Platyphymus* Uvarov, 1922 (Uvarov, 1954).

**Type species:** *Ph. pardalis* Giglio-Tos, 1907.

The genus was redescribed by Dirsh (1965) and Mason (1966) as follows:

Of medium size, robust. Integument rugose or smooth. Antennae filiform, shorter or longer than head and pronotum together. Fastigium wide, slightly concave, with well-developed obtuse lateral carinulae; occipital carinula mostly present; frontal ridge flat or with shallow depression under ocellus, without distinct lateral carinulae. Pronotum low tectiform, crossed by three deep sulci; medial carina linear; lateral carinae irregular, wrinkle-like, or partly obliterated; metazona shorter, longer, or equal to prozona, its posterior margin widely obtuse angular. Prosternal process short, widely conical or tongue-shaped, antero-posteriorly compressed with acute or obtuse apex. Elytra lobiform, lateral, fully or partly covering tympanum. Wings shorter than elytra. Hind femur robust, widened, with serrated upper margin and expanded lower marginal area. Arolium large. Last abdominal tergite of male with narrow marginal sclerotisation and roughly serrated or smooth posterior margin. Supra-anal plate (SAP) elongate or transverse or angular, with two or four tubercles or without tubercles, apical process of plate short-rounded or short-angular or narrow-elongate. Cercus strongly elongate with rounded or obtuse apex, rarely shallowly bi- or trilobate at tip, strongly upcurved. Epiphallus divided medially, with moderately small or large ancorae, small lateral plates and long, narrow, upcurving lophi with acute apices. Subgenital plate short, with slightly angular, almost rounded apex. Ovipositor short, robust, with curved valves, lower valve with large, wide, external, lateral projection. Female subgenital plate trilobate, usually with medial lobe longer than the lateral lobes.

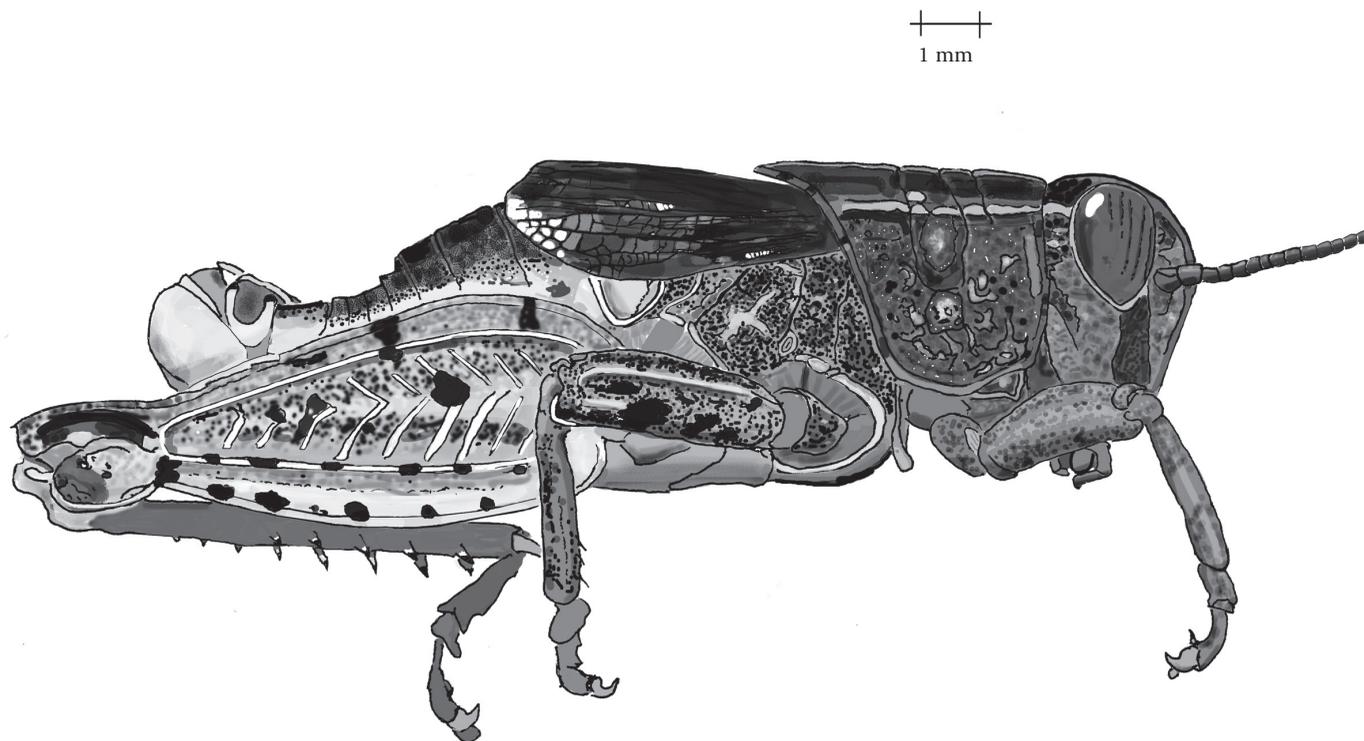


Fig. 1. *Phymeurus morotoensis* n.sp., male, habitus, lateral view. The antenna in this specimen is broken after the 12 flagellar segment, the intact antenna has 20-21 segments.

To this generic description I would add only that the hind femur is deeply sculptured on its outer face, the hind tibiae are slightly flared distally, and that the antennae, though filiform, are relatively thick and flattened dorsoventrally along their entire length. The paraprocts of the male each have a well-developed posterior process that sometimes projects beyond the hind edge of the SAP.

*Phallic complex.* — *Phymeurus* has a typical euryphymine phallus, having a characteristic divided epiphallus with strikingly large, acutely pointed triangular lophi and fairly large ancorae. The arch sclerite is large and its connection with the paired dorsal aedeagal valves very clear. The ectophallic membrane is unusually well developed and sclerotized to form structures rarely seen in other subfamilies, including especially a rigid tubular sheath surrounding the aedeagal valves, with a varying degree of sculptured ornamentation, and lateral sclerites weakly attached to the rami of the cingulum. At the level of the cingulum the ectophallic membrane forms two pointed, laterally directed conical processes. There is also a dorsal sclerotization of the membrane immediately posterior to the epiphallus; Mason

(1966) and subsequent authors (*e.g.*, Naskrecki 1995) refer to this too as a sclerotization of the ectophallic membrane, but to the present author it seems more likely that this is part of the epiphallic membrane, homologous with the post-epiphallic sclerites of the Ommatolampinae (Carbonell *et al.* 1980). In *Phymeurus* the dorsal sclerotization shows signs of a medial division, suggesting that it too, like the post-epiphallic sclerites, is originally a paired structure.

*Phymeurus morotoensis* n. sp.  
(Figs 1-6, Plate 1-2)

urn:lsid:Orthoptera.speciesfile.org:TaxonName:472623

**Holotype:** UGANDA: Karamoja region: Moroto District: Mt. Moroto, alpine grassland at 2750 – 3250 m. 15.8.1966 (C.H.F. Rowell). 1 ♂, specimen no. 66105. NHM London.

**Paratypes:** 6 ♂♂, data as holotype, specimen numbers 66107 – 66112. 2 ♀♀, data as holotype, specimen nos. 66106, 66113. 7 ♀♀,

Table 1. Dimensions (in mm, means and ranges) of *Phymeurus morotoensis* n.sp.

	N	Mean	Min	Max	mean M/mean F
<b>MALES</b>					
Body length	7	18.01	16.15	19.82	0.68
Pronotum	7	4.97	4.66	5.19	0.78
Elytron	7	6.17	5.51	6.67	0.77
Hind femur	7	11.01	10.67	11.55	0.82
<b>FEMALES</b>					
Body length	9	26.57	25.20	29.00	
Pronotum	9	6.39	5.90	6.8	
Elytron	8	8.04	7.10	9.1	
Hind femur	9	13.50	12.56	14.39	

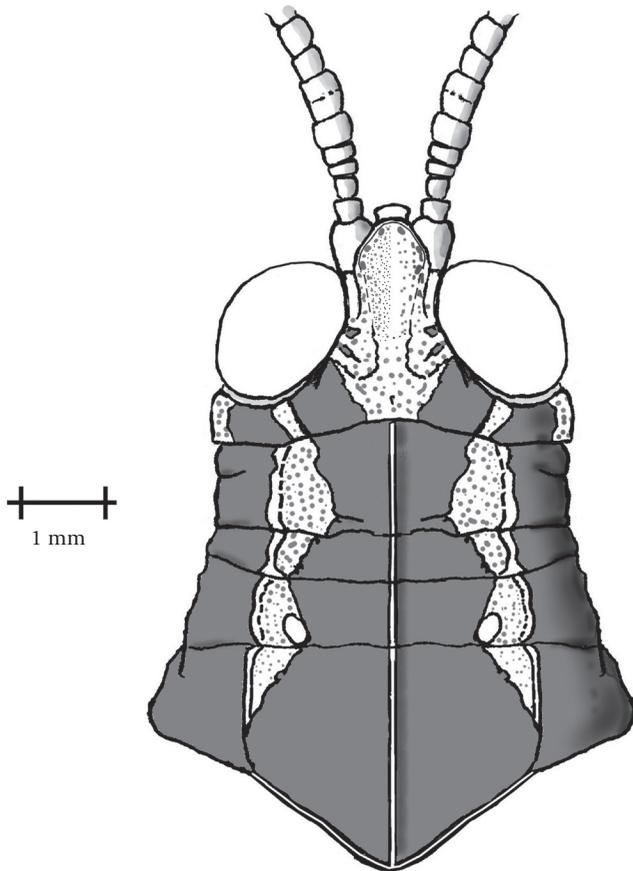


Fig. 2. *Phymeurus morotoensis* n.sp., male. Dorsal view of head and pronotum. Note pale tubercles just anterior to the main sulcus.

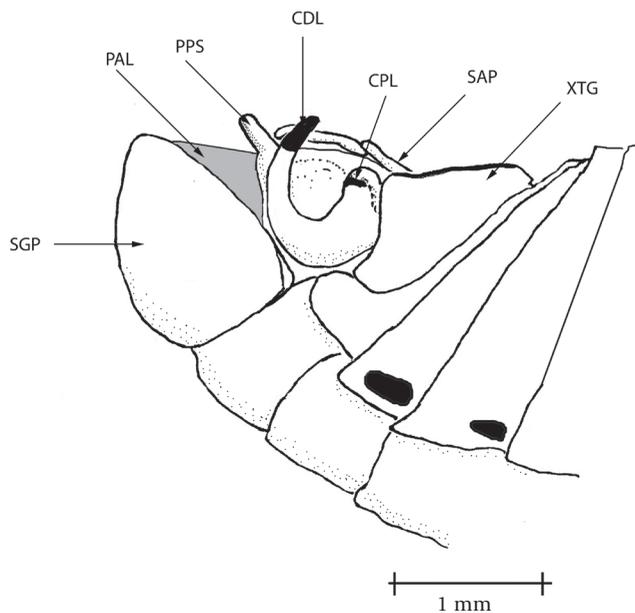


Fig. 4. *Phymeurus morotoensis* n.sp., male. Lateral view of terminalia. CDL, cercus, distal lobe. CPL, cercus, proximal lobe. PAL, pallium. PPS, style of paraproct. SAP, supra-anal plate. SGP, subgenital plate. XTG, 10<sup>th</sup> abdominal tergite.

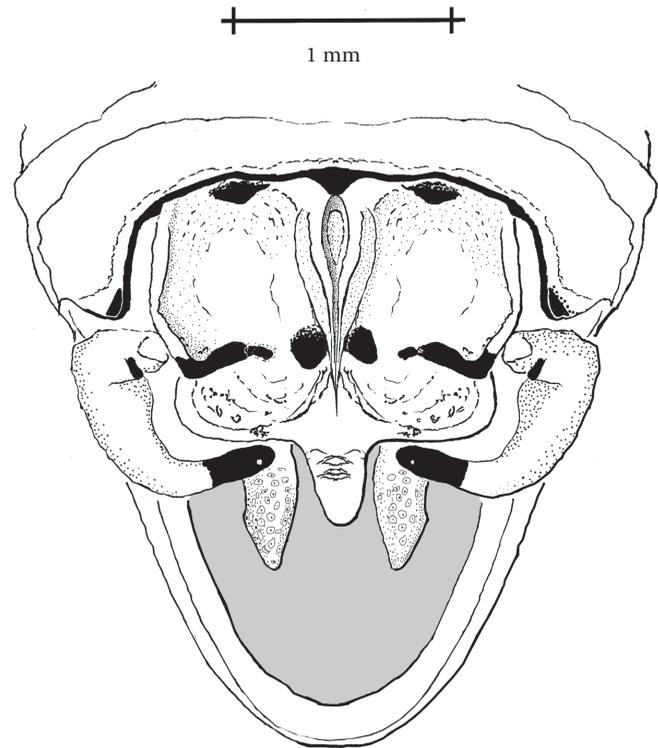


Fig. 3. *Phymeurus morotoensis* n.sp., male. Dorsal view of terminalia. Plain shaded grey area is the pallial membrane.

data as holotype, but 15.2.1967, specimen numbers 67109-67116.

**Male:** Of medium size (Dimensions, see Table 1 and Fig. 1). Integument finely rugose.

**Head.**—Antennae very slightly shorter than head and pronotum together, thick filiform, slightly flattened dorsoventrally, with 20 flagellar segments. Fastigium (Fig. 2) twice as long as wide, concave, with well marked lateral carinae, extending backwards to end behind the centre of the interocular space. Occipital carina very weak. Frontal ridge almost flat, coarsely punctate, slightly sulcate around medial ocellus.

**Thorax.**—Prozona of pronotum about 25% longer than metazona. Medial carina sharp, well developed, crossed by three narrow but deep sulci. A pair of small pale tubercles on the pronotal disc just anterior to the posterior sulcus. Lateral carinae strong, straight, diverging towards the rear, deeply cut by the three transverse sulci, but obsolete near the hind margin of the metazona. Posterior margins of pronotum straight, forming a rounded obtuse angular apex. Prosternal process strongly compressed in anterior-posterior direction and expanded laterally, in frontal view almost rectangular, much wider than deep. Mesosternal interspace wider than long, the mesosternal lobes almost rectangular with rounded corners. Metasternal interspace narrow, laterally compressed, much smaller than the mesosternal interspace. Tegmina and wings lobiform, strongly reduced, trailing edges just touching dorsally. Apices of tegmina rounded, the tips touching or just short of the posterior margin of the 2<sup>nd</sup> abdominal tergite. Wings reduced, considerably smaller than tegmina.

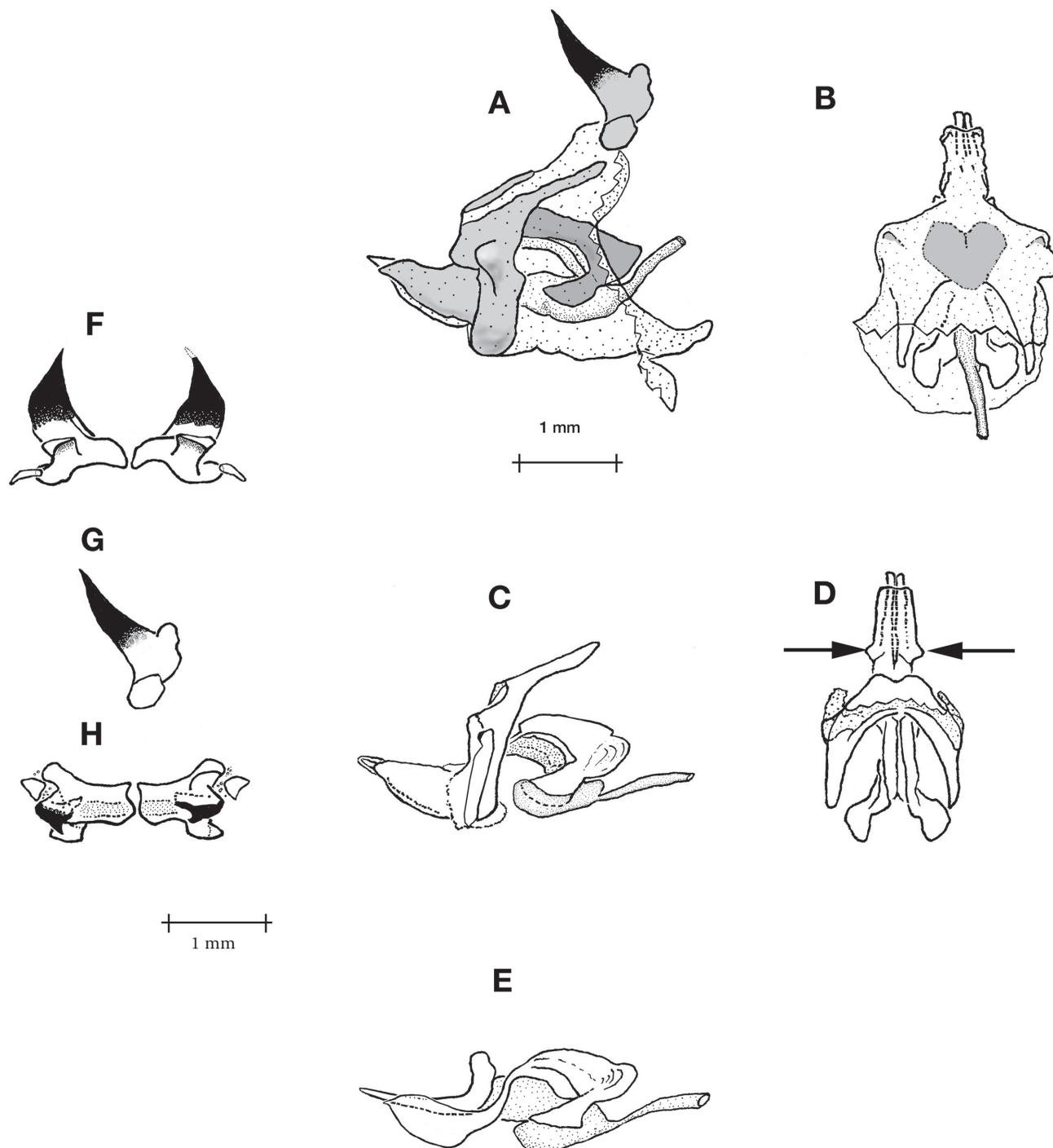


Fig. 5. *Phymeurus morotoensis* n.sp., male. Phallic complex. A, lateral view of entire complex with epiphallus attached. B, dorsal view of complex after removal of epiphallus; the shaded area is the "dorsal sclerotisation" of previous authors. C, phallic complex after removal of the membranous parts of the ectophallus. D, as C, but in dorsal view. The lateral tubercles of the ectophallic sheath of the aedeagal valves are arrowed. E, the endophallus in lateral view, with ectophallic arch sclerite and dorsal aedeagal valves, after removal of the remaining ectophallus, including the aedeagal sheath. F, G, H, epiphallus in axial, lateral, and dorsal views.

*Abdomen.*—Posterior margin of 10<sup>th</sup> abdominal tergite thickened and slightly raised, its posterior edge melanised, with a very small medial point projecting horizontally over the SAP, and several smaller points scattered along its length, not necessarily symmetrically disposed. SAP (Fig. 3) roughly rectangular in dorsal view, its lateral margins thickened and raised, with a posterior medial process; proximally and medially a shallow sulcus, wide at the front, narrowing pro-

gressively towards the rear; a pair of small black tubercles situated close to the anterior margin of the SAP, either side of the sulcus, another pair, more closely set, where the sulcus narrows to a point, just posterior to the midpoint of the SAP, and a pair of laterally expanded black tubercles running from the medial tubercles towards the lateral margins of the plate. Paraprocts well developed, with concave external surfaces visible under the SAP, and long posterior processes. In the male these exceed the posterior edge of the SAP

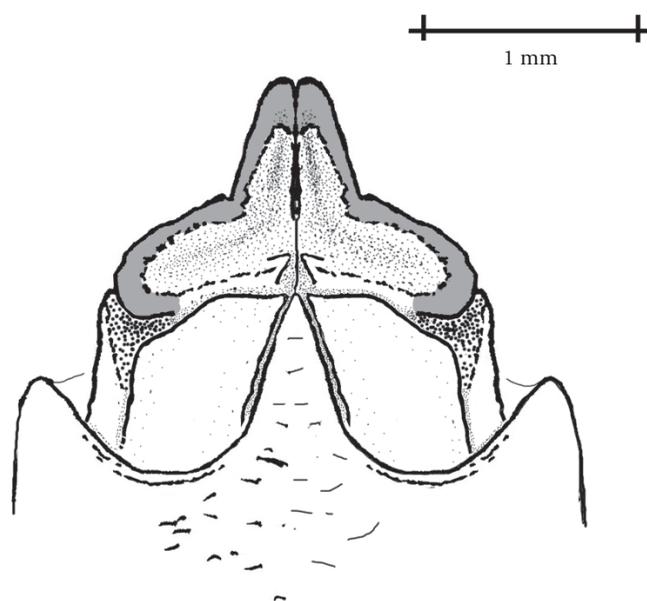


Fig. 6. *Phymeurus morotoensis* n.sp., female. Ventral view of the ventral ovipositor valves and the subgenital plate.

and are visible in dorsal view lying alongside the medial lingulate process of the SAP (Fig. 3). Cerci robust at base, long and narrow distally, strongly upturned and projecting above the level of the SAP, the tips melanised and rounded apically. The whole cercus in side view (Fig. 4) strongly U-shaped, the tips curving upwards and inwards to touch the margins of the SAP.

**Hind leg.**—Hind femur robust, with a strongly sculptured outer face; dorsal carina slightly serrate, ventral carina smooth. External and internal lobes of hind knee small and smoothly rounded. Hind tibia somewhat shorter than femur, with 7 internal and 7 external spines, external apical tibial spine absent. The inner pair of tibial spurs are almost twice the length of the outer spurs. Foot about 30% of tibial length; 1<sup>st</sup> and 3<sup>rd</sup> tarsal segments about equal in length, the 2<sup>nd</sup> tarsal segment much shorter.

**Phallic complex.**—In *Ph. morotoensis* the phallus (Fig. 5) agrees with the generic description above. The aedeagal sheath shows a pair of pointed tubercles in dorsal view (arrowed in Fig. 5D), but is not otherwise sculptured or heavily ornamented. The distal extremities of the ventral (endophallic) valves are widened into a pointed leaf shape. The dorsal (ectophallic) valves project beyond the apices of

the ventral valves (Fig. 5E), and protrude from the end of the sheath.

**Female:** Similar to male but larger, much more robust and thickset. Sexual dimorphism M/F ratios (mean lengths of pronotum, elytron, and hind femur) = 0.78 – 0.82 (Table 1). Disc of pronotum flatter and less tectate; lateral carinae of pronotum curved slightly outwards at midlength, rather than being straight. Meso- and metasternal interspaces wider than in male. Ovipositor valves robust, slightly hooked at tips. The ventral valves have a large external lateral flange at their base (Fig. 6). Subgenital plate trilobed, the outer ones rounded and the central one acutely pointed.

**Coloration.**—(see Fig. 1, and Plates 1 and 2): general color light olive grey, with dark brown, black and yellow-orange marbling on the dorsal surface, especially in females. Some males are heavily suffused with black pigment (see Plate 1). Tegmina and disc of pronotum darker than rest of the body. The wings are dark brown. Underside and sides of abdomen light bluish grey or ochraceous, with black spotting. In male only, hind tibia and ventral face of hind femur scarlet, internal face of hind femur scarlet proximally with a pregenicular yellow patch preceded by a black stripe. Hind knee dark brown. Antennae dark brown or blackish, palps and mouthparts yellowish brown.

**Distribution.**—Currently known only from the type locality, but may well occur on other Karamojan mountains to the north of Moroto Mt.; the most northerly Ugandan mountain, Zulia, at 2149 m asl, is perhaps most likely to provide a further possible habitat.

*Phymeurus kisuluensis* n. sp.  
(Figs 7-11, Plate 3-4)

urn:lsid:Orthoptera.speciesfile.org:TaxonName:472624

**Holotype:** TANZANIA: Kigoma Region: 15 miles W. of Kisulu, 18.9.1964 (N.D. Jago), 1 ♂ (NHM London).

**Paratypes:** Same data as holotype, 2 ♀♀ (NHM London).

Note: the following description is based on a very small sample consisting of only one male and two female adults, all museum specimens.

**Male:** Of medium size (dimensions, see Table 2). Very similar in form and size to *Ph. morotoensis*, apart from the longer tegmina and wings. Integument finely rugose.

Table 2. Dimensions (in mm, means and ranges) of *Phymeurus kisuluensis* n.sp.

	N	Mean	Min	Max	Mean M/Mean F
<b>MALES</b>					
Body length	1	17.9			0.76
Pronotum	1	5.01			0.74
Elytron	1	8.25			0.78
Hind femur	1	10.38			0.78
Antenna	1	6.72			0.90
<b>FEMALES</b>					
Body length	2	23.51	22	25.02	
Pronotum	2	6.74	6.57	6.9	
Elytron	2	10.63	10.62	10.63	
Hind femur	2	13.33	13.09	13.57	
Antenna	1	7.5			

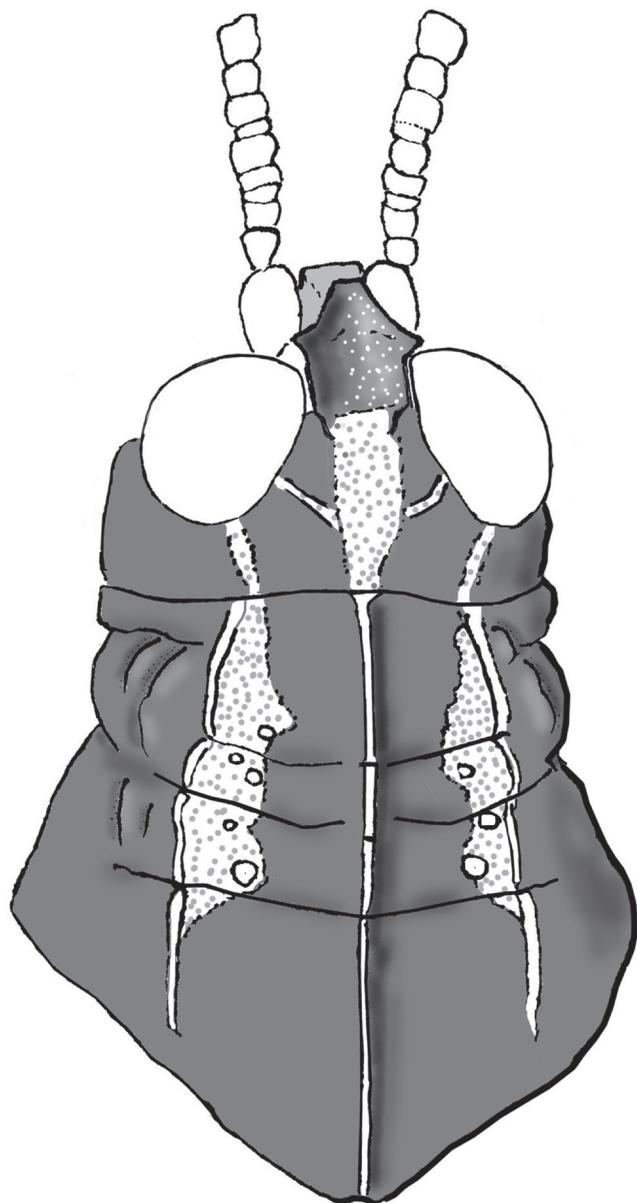


Fig. 7. *Phymeurus kisuluensis*, n.sp., male. Dorsal view of head and pronotum. Note pair of larger pale tubercles just anterior to the main sulcus, and other smaller tubercles distributed anterior to them.

*Head*.—Antennae shorter than head and pronotum together, thick filiform, flattened on dorsoventral surfaces. Fastigium (Fig. 7) nearly twice as long as wide, concave with well marked lateral carinae, extending backwards to end in the interocular space. Occipital carina absent in the male, very weak in females, visible only behind fastigium. Frontal ridge shallowly sulcate over almost its entire length, especially in females.

*Thorax*.—Metazona of pronotum 13% longer than prozona. Medial carina of pronotum sharp, well developed, especially in the metazona, and crossed by three sulci. A pair of colorless tubercles

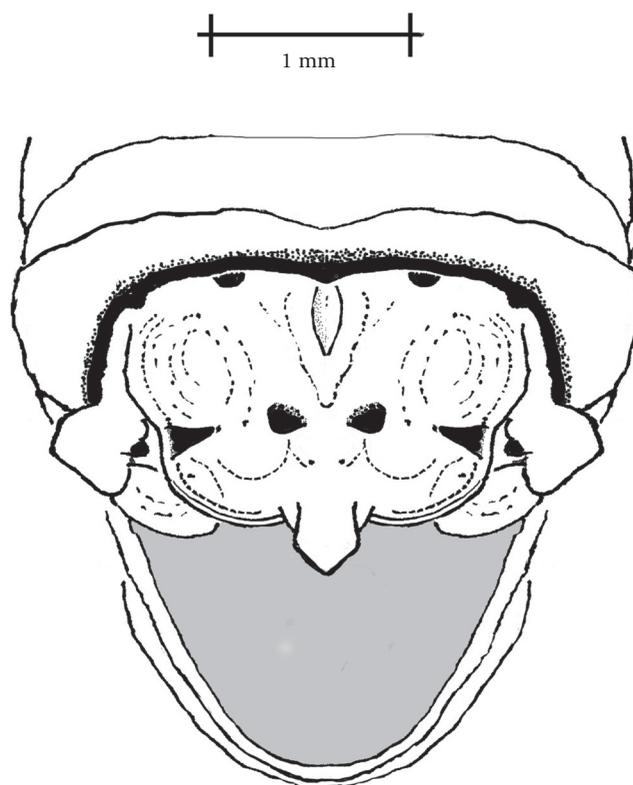


Fig. 8. *Phymeurus kisuluensis*, n.sp., male. Dorsal view of terminalia. Note that the distal tips of the cerci are tucked under the SAP and are invisible in this view.

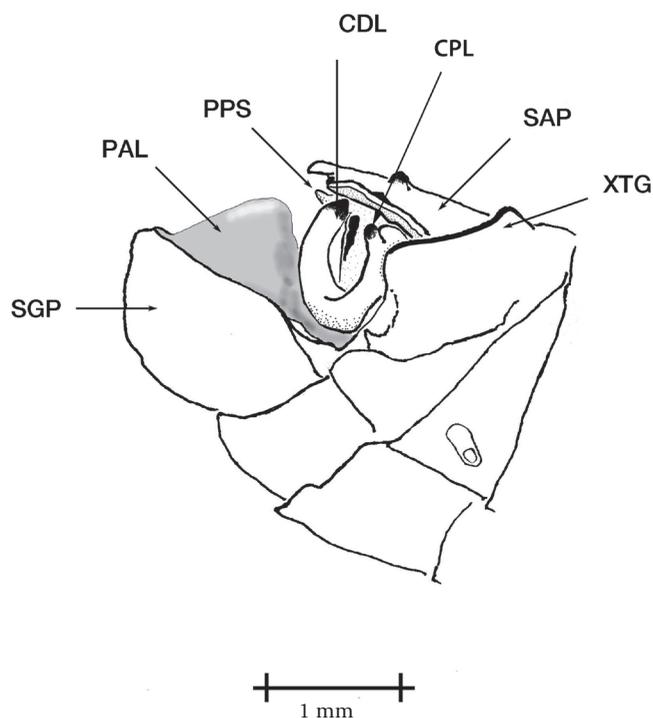
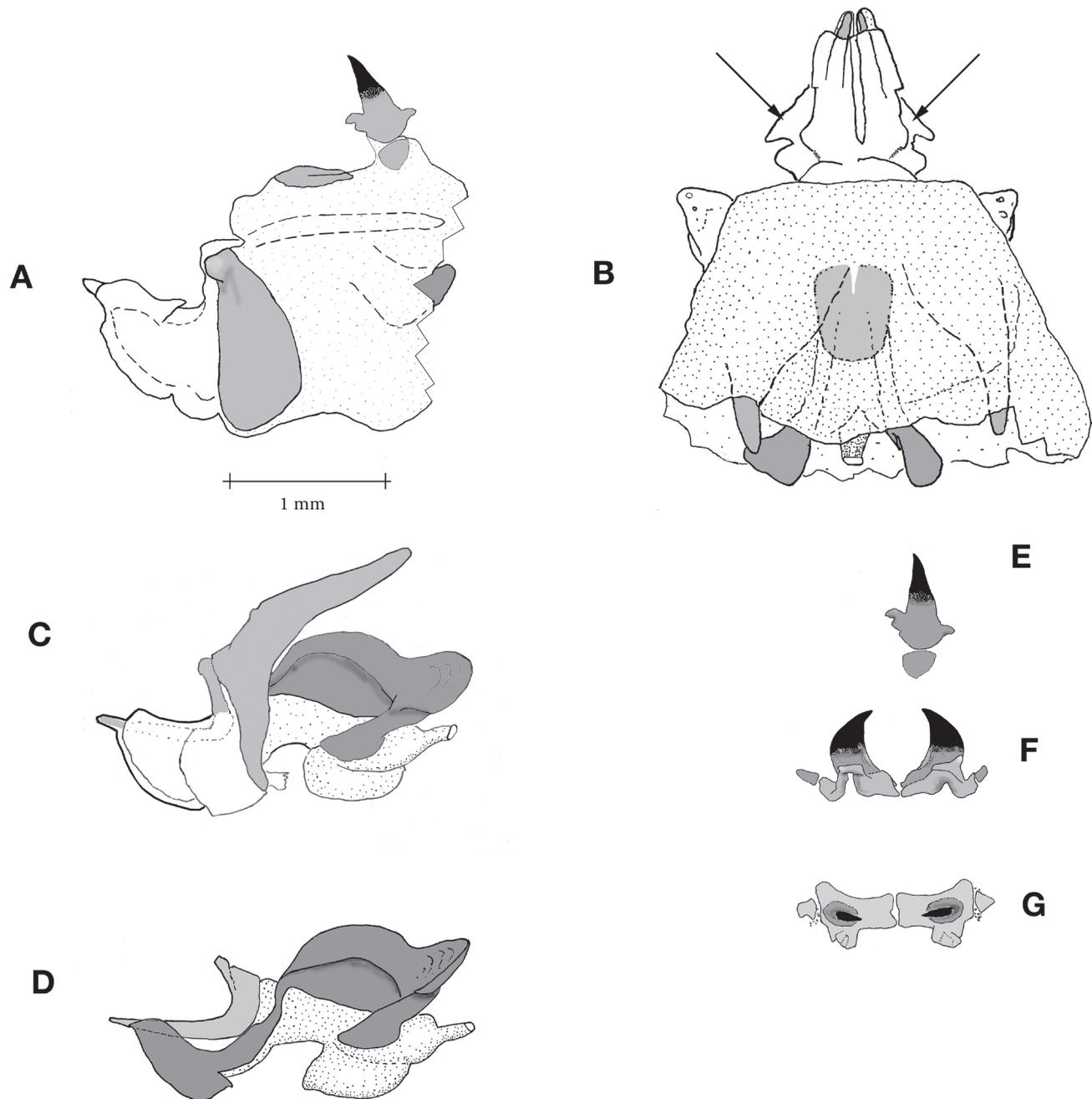


Fig. 9. *Phymeurus kisuluensis*, n.sp., male. Lateral view of terminalia. CDL, cercus, distal lobe. CPL, cercus, proximal lobe. PAL, pallium. PPS, style of paraproct. SAP, supra-anal plate. SGP, subgenital plate. XTG, 10<sup>th</sup> abdominal tergite.



**Fig. 10.** *Phymeurus kisuluensis*, n.sp., male. Phallic complex. A, entire complex, with epiphallus attached. B, as A, but dorsal view after removal of epiphallus. Flared flanges of the ectophallic sheath of the aedeagus are arrowed. C, Ecto- and endophallus after removal of the ectophallic membrane (but not the aedeagal sheath). D, Endophallus, with ectophallic arch sclerite and dorsal aedeagal valves, after removal of other ectophallic structures, including the aedeagal sheath. E, E, G, epiphallus in lateral, axial and dorsal views.

on the pronotal disc just anterior to the posterior sulcus, and several other smaller pale tubercles scattered anterior to them. Lateral carinae strong, straight, diverging towards the rear, cut by the three transverse sulci, obsolete near the hind margin of the metazona, and somewhat irregular between the first and second transverse sulci. Posterior margins of pronotum more or less straight, forming a slightly truncated right angular apex (Fig. 7). Prosternal process strongly compressed in anterior-posterior direction and expanded laterally, in frontal view almost rectangular but with rounded corners ventrally, and slightly tapering; there is a suggestion of a midline notch apically. Mesosternal interspace wider than long, the meso-

sternal lobes almost rectangular with rounded corners. Metasternal interspace smaller than the mesosternal, laterally compressed, but still somewhat wider than long. Tegmina and wings only slightly brachypterous, the apices of the tegmina rounded, as long as, or just exceeding the posterior margin of, the 10<sup>th</sup> abdominal tergite. (In one of the two females examined the elytra are shorter, just reaching the sixth abdominal tergite, showing that tegminal length is variable in this species). Wings as long as tegmina.

*Abdomen.*—Posterior margin of 10<sup>th</sup> abdominal tergite thickened and slightly raised, its posterior edge melanised, with a minute medial

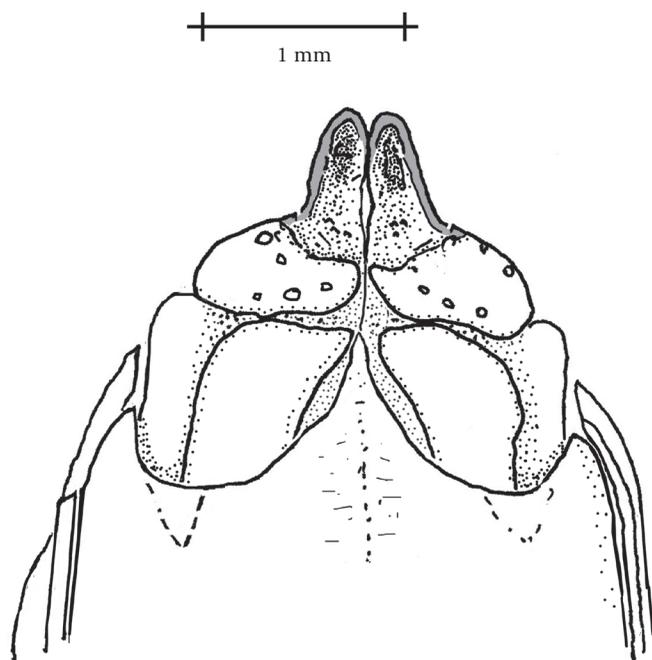


Fig. 11. *Phymeurus kisuluensis* n.sp., female. Ventral view of the ventral ovipositor valves and the subgenital plate.

point projecting horizontally over the SAP, and several smaller points scattered along its length, not necessarily symmetrically disposed. SAP (Fig. 8) roughly rectangular in dorsal view, but tapering distally, tending towards the triangular or semicircular; lateral margins thickened and raised, with a very short posterior medial process; proximally and medially a shallow sulcus, wider at the front, narrowing progressively towards the rear; a pair of very small black tubercles situated at the anterior margin of the SAP, almost hidden under the margin of the 10<sup>th</sup> abdominal tergite, either side of the sulcus; another pair, more closely set, where the sulcus narrows to a point, just posterior to the midpoint of the SAP, and a pair of laterally expanded black tubercles running from the lateral margins of the plate inwards towards the posterior medial tubercles. Paraprocts well developed, with a vertical black stripe near their rear margin visible in lateral view under the SAP, but their posterior processes are relatively short and do not project beyond the margins of the male SAP. Cerci robust at base, long and narrow distally, strongly upturned and projecting almost to the level of the SAP, the tips slightly melanised and rounded apically. The whole cercus in side view (Fig. 9) is strongly U-shaped, the distal tips curving upwards and inwards to touch the margins of the SAP.

**Hind leg.**—Hind femur robust, with a strongly sculptured outer face; dorsal carina serrate, ventral carina smooth but provided with long fringing hairs. External and internal lobes of hind knee small and smoothly rounded. Hind tibia somewhat shorter than femur, with 8 internal and 8 external spines, apical external tibial spine absent. The inner pair of tibial spurs are almost twice the length of the outer spurs. Foot about 30% of tibial length; 1<sup>st</sup> and 3<sup>rd</sup> tarsal segments about equal in length, the 2<sup>nd</sup> tarsal segment much shorter.

**Phallic complex.**—(Fig. 10) similar to that of *Ph. morotoensis*, but distinguished by the inwardly curving tips to the epiphallic lophi, the rather wider distal extremities of the ventral aedeagal valves, and the much more elaborately sculptured ectophallic aedeagal sheath.

In dorsal view this sheath shows two backwardly flared plates [arrowed in Fig. 10B, and also seen in *Ph. brachypterus* – see Fig. 16 of Mason (1966)]. The lateral processes of the ectophallic membrane are also more prominent than in *Ph. morotoensis*.

**Female:** Similar to male but much more robust and thickset. Disc of pronotum flatter and less tectate; lateral carinae of pronotum straight. Meso- and metasternal interspaces wider than in male. As noted above, the elytra of females are of variable length. Ovipositor valves robust, slightly hooked at tips. The ventral valves (Fig. 11) have a large external lateral flange at their base. Subgenital plate trilobed, the outer ones somewhat rounded and the central one acutely pointed. Sexual dimorphism of linear measures (Table 2) lies between 0.74 and 0.78, somewhat less than in *Ph. morotoensis*. As is common in grasshoppers, the female antenna is relatively shorter than in the male.

**Coloration.**—(Note that these notes are based on 50 year old museum specimens, the animal has not been seen alive, and museum specimens often give a poor idea of the coloration in life). General color light reddish-brown, with bold black markings on the dorsal surface. The central area of the pronotal disc is black, and bordered within the lateral carinae by a pale brown or yellow area. The tegmina are boldly spotted in black, and the wings are almost transparent, slightly infumate, with brown longitudinal venation. The dorsal external face of the hind femur bears three transverse black bands, which, however, do not form major fascia on the outer face. Underside and hind tibia light yellow brown. Internal face of hind femur pale yellow, with a lighter pregenicular patch and some black spotting on the dorsal internal face. Hind knee light brown. Antennae blackish, palps and mouthparts yellow. This species is more contrastingly patterned than is *Ph. morotoensis*.

**Distribution.**—Currently known only from the type locality. May extend into nearby Burundi.

**Differential diagnosis.**—The species of *Phymeurus* form a very homogenous assemblage, and are quite difficult to distinguish. The most useful characters are those of the male terminalia and of the phallic complex, together with the coloration of the hind femur and tibia. Mason (1966) provided a key to all the known species (of which there were then 18). I will not attempt a new key to the genus, as I lack access to most species, but the East African species of the genus can be distinguished as follows:

**Key to E. African species of *Phymeurus***  
(modified from Mason, 1966).

1. Tegmina reaching or exceeding tip of abdomen . . . . . 2.
- 1A. Tegmina reduced in both sexes, at maximum reaching the 10<sup>th</sup> abdominal tergite, but often much shorter . . . . . 4.
2. Tegmina reaching or exceeding hind knee. Male supra-anal plate narrowing towards apex. Basal part of male cercus more than half the length of apical part. Female subgenital plate with very reduced lateral lobes, approximately 1/7 the length of median lobe. . . . . *Phymeurus fitzgeraldi*
- 2A. Tegmina not reaching hind knee, but exceeding end of abdomen, at least in males. . . . . 3.
3. Apex of male cercus expanded, basal part three quarter of length of apical part . . . . . *Phymeurus bigranosus*

- 3A. Male cercus narrowing to an obtuse apex, basal part approximately half the length of apical part. Lateral carinae of pronotum sharp for whole length and comparatively straight . . . . . *Phymeurus granulatus*
4. Tegmina short, extending only to 2<sup>nd</sup> or 4<sup>th</sup> abdominal tergite. . . . . 5.
- 4A. Tegmina longer, extending to at least the 6<sup>th</sup> abdominal tergite. . . . . 6.
5. Tegmina reach posterior margin of 2<sup>nd</sup> abdominal tergite. In male, styles of paraprocts project beyond tip of the medial projection of supra-anal plate; hind tibiae and internal face of hind femur bright red, with a yellow pregenicular band. In female, hind tibiae and internal face of hind femur light yellow or whitish, the femur with a weak pregenicular dark fascia. . . . . *Phymeurus morotoensis* n.sp.
- 5A. Tegmina reach posterior margin of 4<sup>th</sup> abdominal tergite. Posterior margin of last abdominal tergite not greatly expanded and upcurved, medial projection of tergite absent or very small; supra-anal plate approximately rectangular in apical part. Body robust and large. Prosternal tubercle weakly notched at the apex. Hind tibia orange, internal face of hind femur yellow . . . . . *Phymeurus brachypterus*
6. Tegmina reach abdominal tergite 6. Posterior margin of last abdominal tergite greatly expanded and upcurved, its medial projection elongate; supra-anal plate narrowing towards apex. Tip of male cercus sharply narrowing at posterior side to subacute apex. Basal projection small. Hind tibia and internal face of hind femur both orange red . . . . . *Phymeurus rufipes*
- 6A. Tegmina extend at least into 6<sup>th</sup>, sometimes to 10<sup>th</sup> abdominal tergite. In male, styles of paraprocts do not extend beyond margin of supra-anal plate. Medial projection of 10<sup>th</sup> abdominal tergite minute. Hind tibia and internal face of hind femur yellow with a weak pregenicular dark fascia, in both sexes . . . . . *Phymeurus kisuluensis* n.sp.

## Discussion

Bazelet and Naskrecki (2014) caution that the genera of the Euryphyminae typically show a wide range of intraspecific variation between individuals, which implies that large samples are necessary to distinguish between species on morphological grounds alone. This is a condition that the present work does not meet. However, the fact that E. African *Phymeurus* have low mobility and are typically confined to isolated alpine "islands" makes it highly probable that the geographically widely separated populations have diverged significantly genetically, as well as in morphology, and are likely to have formed local species.

Mason (1966), in her revision of the genus, found that all species (with the possible exception of the South African *Ph. illepidus*) fell into one of two groups, each defined on the morphology of the ventral (endophallic) valves of the male aedeagus. In the first group (predominantly southern and southwestern in distribution), which includes the type species *Ph. pardalis*, the distal extremities of the endophallic (ventral) valves of the aedeagus are long and narrow, comparable in size and shape to the ectophallic (dorsal) valves that lie between them. In the second group of species, the distal extremities of the endophallic valves are widened into leaf-like forms that enclose the ectophallic valves like the two halves of a clam shell. In both groups the aedeagal valves are covered by a sclerotised ectophallic sheath, but in the second group the dorsal

valves are appreciably longer than the ventral valves and protrude from the end of the sheath. With the exception of *Ph. rufipes* and *Ph. fitzgeraldi*, both confined to Southwest Tanzania, all the E. African species of the genus belong to the second group, including both the new species described here and the species found in Cameroon (*Ph. reductus*), Sierra Leone (*Ph. loamensis*) and Guinea (*Ph. nimbaensis*). Thus it seems likely that the more northern species of the genus are all rather closely related, and have colonized most of the alpine zones of the equatorial region.

## Acknowledgements

It is a pleasure to thank Dr. J. Marshall and Dr. B. Price of the Natural History Museum, London, for their help in obtaining access to these specimens, and Prof. Dr. D. Ebert, Zoologisches Institut der Universität Basel, for helping me with the bureaucracy that this entailed.

## References

- Bazelet C.S., Naskrecki P. 2014. Taxonomic revision of the southern African genus *Pachyphymus* Uvarov, 1922 (Orthoptera: Acridoidea: Euryphyminae). *Zootaxa* 3753: 401-420.
- Carbonell C.S., Mesa A., Conduita V.L. 1980. Systematics and karyotype of the grasshopper genera *Omalotettix* and *Abracris*. *Proceedings Academy of Natural Science Philadelphia* 132: 279-284.
- Dirsh V.M. 1965. *The African Genera of the Acridoidea*. Cambridge: Cambridge University Press. 579 pp.
- Eades D.C., Otte D., Cigliano M.M., Braun H. 2015. Orthoptera Species File. Version 5.0/5.0. [consulted July 2015]. <http://Orthoptera.SpeciesFile.org>.
- Mason J.B. 1966. Revision of the genus *Phymeurus* Giglio-Tos, 1907. *Eos, Revista Española de Entomología* 41: 395-457.
- Naskrecki P. 1995. A review of the Euryphyminae of Namibia and Angola (Insecta, Acridoidea). *Cimbebasia* 14: 71-83.
- Giglio-Tos E. 1907. *Ortotteri Africani. Parte I. Bolletino dei Musei di Zoologia e Anatomia Comparata della Università di Torino* 22: 27-28.
- Uvarov B.P. 1922. Notes on the Orthoptera in the British Museum. 2. The group of Calliptamini. *Transactions of the Royal Entomological Society* 48: 117-177.

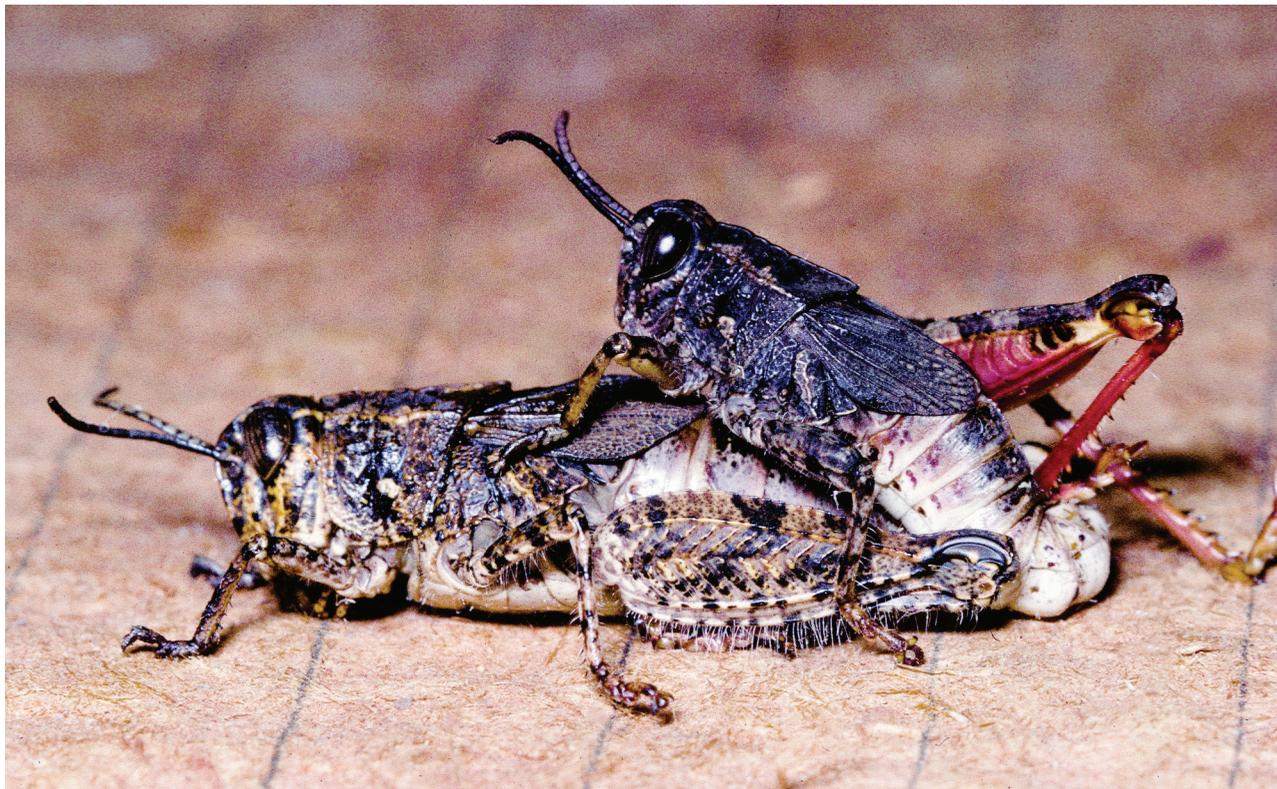


Plate 1. *Phymeurus morotoensis* n.sp. Mating pair. The lines on the substrate are 10 mm apart. This is a particularly darkly colored male; other specimens are closer to the female shown here.

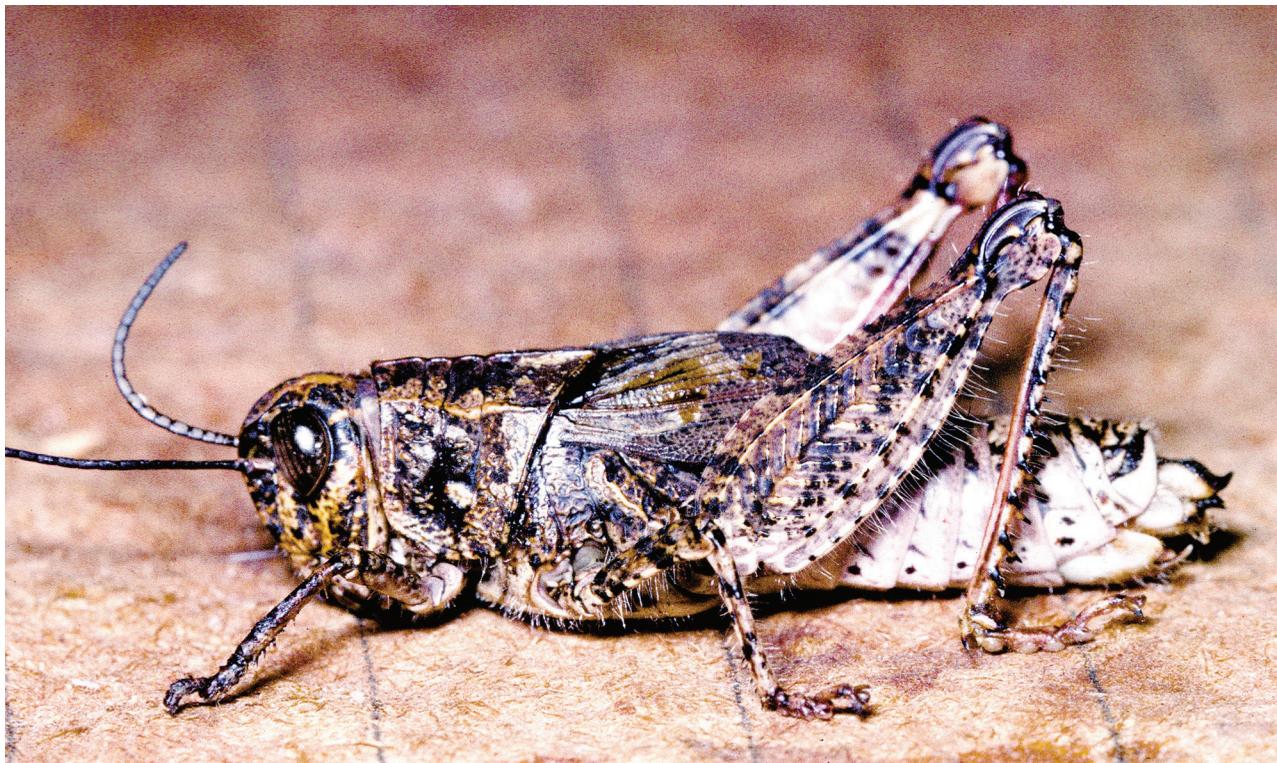


Plate 2. *Phymeurus morotoensis* n.sp. Adult female. The lines on the substrate are 10 mm apart. Note that the hind tibiae and inner face of the hind femur are much less brightly colored than in the male (Plate 1).



Plate 3. *Phymeurus kisuluensis* n.sp. Adult male (holotype, NHM London) in lateral and dorsal views.

