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A FLIGHTLESS GRASSHOPPER OF THE GENUS *UGANDA* BOLIVAR, FROM THE ABERDARES NATIONAL PARK, KENYA (ORTHOPTERA, ACRIDIDAE)

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ABSTRACT

A new species of the genus *Uganda*, *U. darlingtonae*, is described from moorland above 3000 m in the Aberdares National Park, Kenya. The habitat of the species is described and morphological characters distinguishing *U. darlingtonae* from the other montane species of the genus are described and figured with comparative measurements.

INTRODUCTION

The montane grasshopper fauna of Africa contains a number of short-winged species which are usually recognisably derived from lowland macropterous species, as for example in such genera as *Coryphosima* and *Eyrepocnemis*. Uvarov (1977) commented that *Paracinema* was replaced at higher altitudes by the closely related brachypterous genus *Uganda*.

The genus *Paracinema* was last revised by Key (1936) who recognised two species, *Paracinema luculenta* Karsch and *P. tricolor* (Thunberg). *P. luculenta* occurs in West and Central Africa (Togo, Ghana, Sierra Leone, Zaire) while *P. tricolor* occurs throughout the wetter parts of Africa and into Madagascar and southern Europe. In East Africa, *P. tricolor* occurs as subspecies *montana* Key in Ethiopia (Wouramboulchi, nr. Djem Djem), at around 2800 metres (Key 1936). Specimens of the nominate subspecies have been found at around 2400 metres in the Impenetrable (Bwindi) Forest, SW Uganda (Ritchie, unpublished) and material intermediate between the two subspecies was recorded from the same altitude in Ethiopia (Key 1936). Both species of *Paracinema* are macropterous although in *P.t. montana* the tegmina and wings only just exceed the hind knees in length.

The genus *Uganda* was described by Bolivar (1909) without any included species and was later placed by its author in the group *Paracinemae* (Bolivar 1914). He cited two included species of which one, the type species, *U. kilimandjarica* (Sjöstedt), occurs at between 2300 and 4300 m on Mt. Kilimanjaro in Tanzania where the syntype series was collected at Kiboscho at 3000 m (Sjöstedt 1909). The other species, *U. acutipennis* Bolivar, was apparently collected at low altitude

on the Sesse Islands, Lake Victoria, Uganda (Bolivar 1914). It is not mentioned again in the literature after its original description by Bolivar. Since this species has not been recognised subsequently in collections from lowland southern Uganda, there must be some suspicion that it is not a member of the genus *Uganda* but a brachypterous representative of another acridine genus, such as *Gymnbothrus* or *Gymnbothroides*. The location of the type specimens is unknown to me, and no material referable to this species has been examined during this study.

The new species of *Uganda* described here was first brought to my attention by Dr Johanna Darlington, and is named in her honour. Most of the specimens were collected from the vicinity of Muir's Massif (0°17'S 36°37'E) at the northern end of the Aberdares Range, Kenya at altitudes ranging from 3250 to 3650 metres. Subsequently a single female was found to have been collected in 1934 at 3700 m on Mt. Kinangop at the southern end of the Aberdare Range.

RESULTS

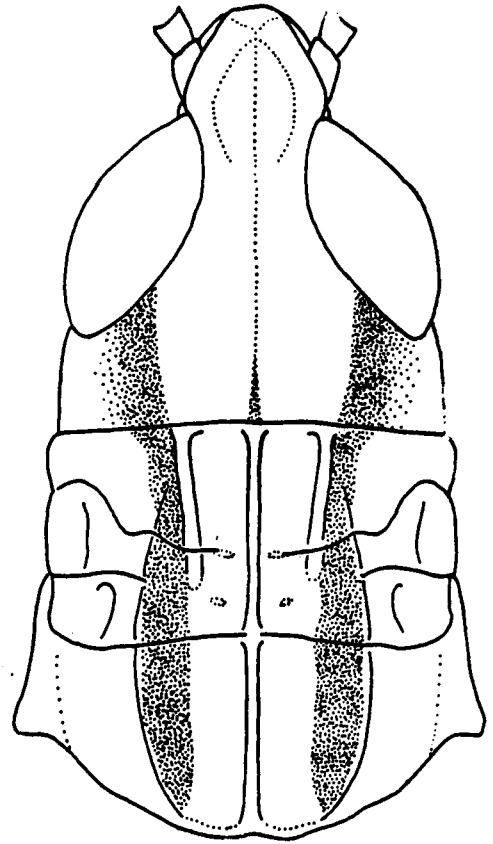
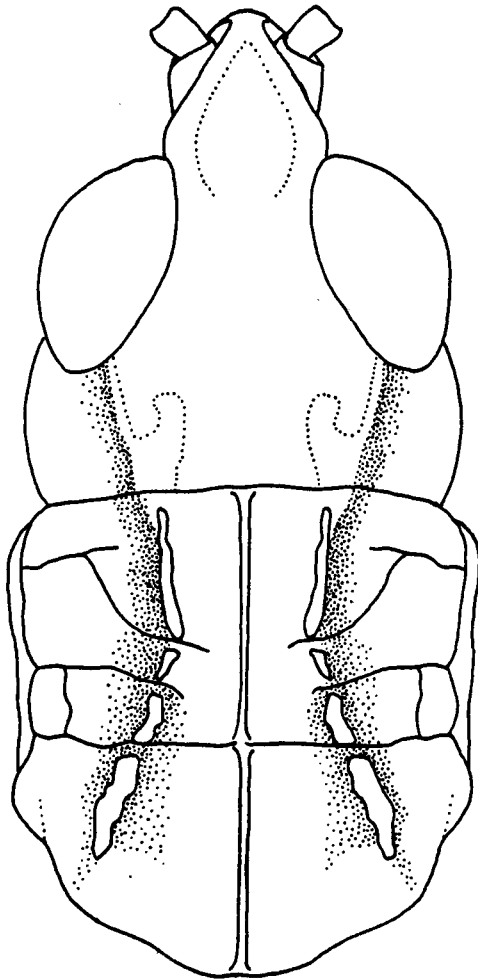
Key to montane species of *Uganda* Bolivar

1. Larger species (Table 1). Total length: male, 11.5 - 13.8mm (mean 12.99mm); female, 22.8 - 27.5mm (mean 24.32mm). Dorsum of pronotum with pale, raised, shiny lateral carinae, visible in metazona as well as prozona (Fig. 1). General colouration dark brown, with variable degree of green colour in some specimens; hind femur lower outer and inner areas and hind tibia distinctly orange-red. (Kilimanjaro) *U. kilimandjarica* (Sjöstedt)
2. Smaller species (Table 2). Total length: male, 10.1 - 11.3mm (mean 10.6mm); female, 18.1 - 20.9mm (mean 19.4mm). Dorsum of pronotum with pale, raised, shiny lateral carinae visible in prozona only (Fig. 2). General colouration greenish or straw; hind femur inner area and hind tibia sometimes faintly tinged with orange-red but lower outer area of femur never orange-red. (Aberdares) *U. darlingtonae* sp. n.

Table 1. Measurements (mm) of adult material of *Uganda kilimandjarica* (Sjöstedt) from Mt. Kilimanjaro, Tanzania

	Total length	Head width*	Pronotum length	Tegmen length	Femur length	Femur length
Male						
Mean	12.99	2.63	2.84	3.84	9.08	2.2
Range	11.55-13.8	2.4-2.9	2.7-3.1	3.4-4.2	8.6-9.9	2.15-2.25
Number measured	7	7	7	7	5	5
Female						
Mean	24.32	4.62	4.69	5.89	14.28	3.29
Range	22.8-27.45	4.3-5.35	4.15-5.6	5.0-7.8	12.35-17.5	3.05-3.7
Number measured	9	7	9	9	8	8

* across genae



2mm

Figure 1. *Uganda kilimandjarica* (Sjöstedt)

Figure 2. *U. darlingtonae* sp.n.

head and pronotum, male, dorsal view

Table 2. Measurements (mm) of all known adult material of *Uganda darlingtonae* sp. n.

	Total length	Head width*	Pronotum length	Tegmen length	Femur length	Femur length
Male						
Mean	10.57	2.19	2.39	3.39	8.37	1.84
Range	10.1-11.25	2.05-2.25	2.3-2.5	3.2-3.5	8.1-8.8	1.75-1.95
Number measured	4	4	4	4	4	4
Female						
Mean	19.4	3.7	3.79	5.15	12.73	2.84
Range	18.15-20.9	3.55-3.85	3.65-3.9	4.4-5.65	12.55-12.95	2.75-2.95
Number measured	5	5	5	5	5	5

* across genae

Description of new species*Uganda darlingtonae* sp. n.

Male. Small species (total length 10.1 - 11.3mm) (Table 2.). Antenna with 18 segments, distinctly shorter than length of head and pronotum combined (longer in *Paracinema* species). Interocular distance little more than one third as long as long axis of eye. Frons oblique, curved; frontal ridge constricted at apex to half its basal width, slightly sulcate at median ocellus, smoothly convex above, meeting vertex in acutely rounded curve; fastigium of vertex lanceolate, angular in front, rounded behind, forming a shallow depression with rounded margins; fastigial foveolae absent. Pronotum weakly tectiform with obtuse median carina, crossed by posterior transverse sulcus; lateral carinae straight in prozona, diverging forwards, converging and obsolescent before posterior sulcus; metazona with obtuse excurved outer lateral carinae bordered internally by dark fascia (Fig. 2); metazona slightly shorter than prozona, with rounded posterior margin. Mesosternal interspace rectangular, distinctly wider than long (longer than wide in *Paracinema* species). Elytra and wings reduced; elytra lateral, lanceolate, touching or slightly overlapping dorsally, with reduced venation and reticulation (Fig. 3), shiny, reaching to middle of third abdominal tergite; tympanum well developed, covered by elytron. Hind femur about 4.5 times as long as maximum depth; lower lobes of hind knee rounded; hind tibia expanded in apical third, with 9 outer and 10 inner spines; tibial spurs unspecialised, arolium of normal size. Supra-anal plate spade-like, apically rounded, barely longer than wide; subgenital plate subconical with subacute apex. Cercus elongate, finger-like. Epiphallus variable (Figs. 4 & 5), of typical acridine form, subrectangular to rhomboidal, with widely-spaced ancorae and bilobate lophi; aedeagus slender and unspecialised, with ventral sub-apical lobe (absent in *P. tricolor* but present in *U. kilimandjarica* and *P. luculenta*).

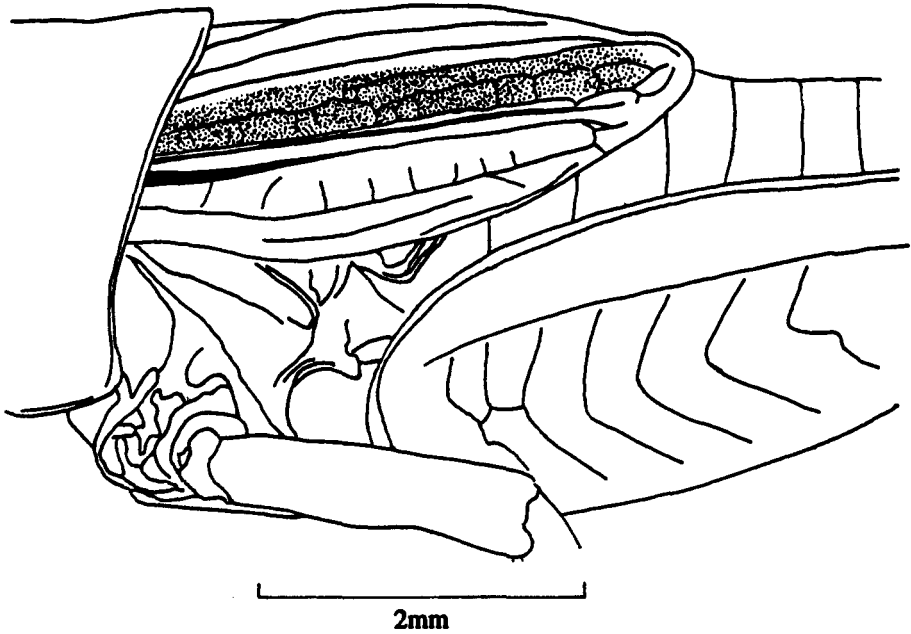


Figure 3. *U. darlingtonae* sp. n. thorax and left tegmen, lateral view

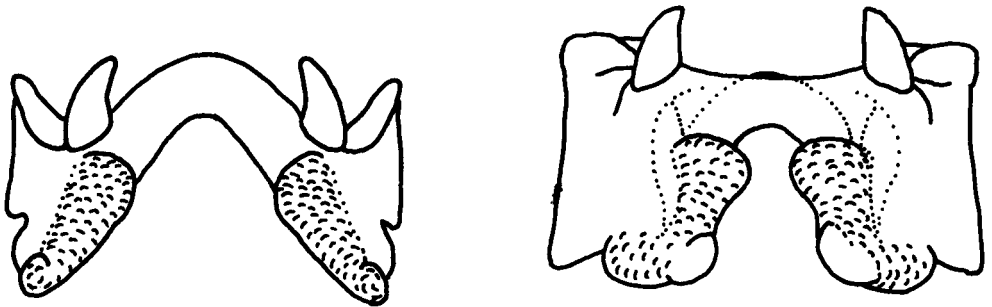


Figure 4.

Figure 5.

1 mm

Figures 4 and 5: *U. darlingtonae* sp. n. epiphallus, dorsal view, showing the range of variability

Colouration

General colouration pale green fading to straw-coloured after preservation; antennae reddish-brown; head behind eyes and pronotum with longitudinal dark chocolate brown lateral fasciae (Fig. 2) continuing on elytra and abdominal tergites; lateral surfaces of pronotum, meso- and metanotum with indistinct dark markings; hind femur with dark longitudinal fascia along upper half of external medial area, fading to ground colour in lower half; internal ventral surface straw-coloured, sometimes faintly tinged with pale red; hind knee lunules dark brown; tibiae and tarsi straw-coloured with or without faint pale orange red tinge, spines black tipped.

Female

Similar to male but much larger and stockier (total length 18.1 - 20.9mm). Hind femur internal ventral surface and hind tibia distinctly flushed with pale orange-red. Ovipositor short with robust valves curving at apices.

Measurements

See Table 2.

Material examined

KENYA: Holotype male, 3 male, 4 female paratypes, 1 female nymph, Aberdares National Park, 0°14'S 36°35'30"E, *Alchemilla/Eleusine/Andropogon/Agrostis* moorland, SE foot of Chebuswa, alt. 3250 m, 19.iii.1987, (J.M. Ritchie) (1 male paratype in British Museum (Natural History) (BMNH), London, remainder in National Museums Kenya (NMK), Nairobi); 1 female paratype, Aberdares Nat. Pk, north end, Muir's Massif, 0°17'S 36°37'E, alpine moorland, alt. 3650 m, 7.ix.1985 (J.P.E.C. Darlington) (NMK); 1 female paratype, Aberdare Range, Mt. Kinangop, 12000 ft, 30.ix.1934, (F.W. Edwards) (BMNH).

DISCUSSION

The pronotal morphology of the new species allies it with *P. tricolor*, especially in the presence of anterior dorso-lateral carinae which reach only as far as the first transverse sulcus (Fig. 2). In *P. luculenta* there are no such carinae and in *Uganda kilimandjarica* the carinae continue posteriorly beyond the first sulcus (Fig. 1). The distinctive pair of dark longitudinal dorsal bands on the pronotum also allies *U. darlingtonae* to *P. tricolor*. However, the genitalia and general appearance of *U. darlingtonae* indicate a very close relationship with *U. kilimandjarica*. The epiphallus and aedeagus of the two taxa are not readily distinguishable, suggesting a recent common ancestry, perhaps during a period of climatic amelioration during the Pleistocene (<1 million years before present) which could have enlarged the available area of moorland habitat sufficiently to permit exchange of populations between Mt. Kilimanjaro and the Aberdare Range nearly 300 km apart.

The montane moorland habitat

The Aberdares Range, together with Mt. Kenya, 50km to the east, form the eastern highlands of Kenya separated from the Western highlands by the Gregory Rift Valley. The Aberdares are the highest mountain range in Kenya after Mt. Kenya and Mt. Elgon. The climate at above 3000m is extreme, with frequent night frosts. For much of the day the sun is concealed by cloud and rain falls almost daily. The temperature regime during March and April in a similar habitat on the west side of Mt. Kenya was examined by Beck *et al.* (1981) who found that in an average period of

24 hours, the air temperature at ground level was below 0°C for more than 6 hours and between 0° and 5° for a further 6 hours. Overall temperatures varied between -5°C and 25°C. At a depth of 20 mm below the soil surface the low temperatures were less severe, seldom falling below 0°C but averaging more than 12 hours between 0° and 5°C.

The vegetation on Muir's Massif is shown in Plate 1. This is typical of the habitat where *U. darlingtonae* was collected (3650 m) but with less bare ground and thicker vegetation than the slightly lower collecting locality at the foot of Chebuswa (3250 m). The afro-montane moorland of the northern Aberdare Range is an open habitat with dwarf shrubs, herbs and grasses.

In the more open areas of true moorland at the foot of Chebuswa hill the flora is dominated by grasses, of which 10 - 20% cover is accounted for by tussocks of *Eleusine jaegeri* Pilg., 20 - 30% by *Andropogon amethystinus* Steud. and 10% by *Eragrostis schweinfurthii* Chiov. *Festuca abyssinica* A. Rich. occurs occasionally and the dwarf shrub *Alchemilla argyrophylla* Oliv. is also present. Up to 20% of the area is bare soil as a result of the activities of mole rats (*Tachyoryctes splendens* (Rüppell)). Forbs include *Anagallis* cf. *serpens* D.C., *Trifolium cryptopodium* A. Rich. (common), *Anthemis tigris* A. Rich., *Geranium arabicum* Forssk. (frequent), *Gnaphalium luteoalbum* L. and *Trifolium rueppellianum* Fresen. In this habitat *U. darlingtonae* was found but was less common than another flightless grasshopper, *Coryphosima* sp., which is perhaps the most noticeable invertebrate at this altitude.

Within the open moorland habitat, some denser patches of vegetation occur, with up to 75% cover of *A. argyrophylla* and 20% cover of a small tussock grass, *Agrostis* cf. *gracilifolia* C.E. Hubbard. Herbs and bare ground make up the remaining 5%, with *Euphorbia brevicornu* Pax. (common), *Satureja kilimandschari* (Guerke Hedb.) (frequent), and *Polygonum afro-montanum* Greenway. *T. rueppellianum* and young *Hypericum revolutum* Vahl ssp. *keniense* (Schweinf.) N. Robson as occasionals. Here also *U. darlingtonae* was present, but only emerged from the dense *Agrostis* tussocks and *Alchemilla* and became active when the sun had been shining for half an hour and the air temperature had begun to feel pleasantly warm (c.15°C). The onset of rain towards midday caused the insects to disappear once again.

Near Chebuswa Hill the moorland grades into a *Hagenia* woodland/*Stoebe* bushland mosaic with scattered trees of *Hagenia abyssinica* (Bruce) J.F. Gmel. Here the common shrubs are *Stoebe kilimandscharica* O. Hoffm. var. *densiflora* O. Hoffm., *H. keniense* and *A. argyrophylla*, *P. afro-montanum*, *Erlangea fusca* S. Moore, *Hebenstretia dentata* L. and *Clutia kilimandscharica* Engl.* The herbs include at least nine species and there are four scramblers and climbers. *U. darlingtonae* was not found within this formation though it may well occur. In such an extreme habitat it is likely that a gramivorous grasshopper like *Uganda* would tend to spend most of its periods of activity in more open areas with grasses offering greater opportunities to bask and feed during the infrequent periods of bright sunshine.

ACKNOWLEDGEMENTS

I am indebted to Dr Henk Beentje for his company on a collecting trip to the northern Aberdares and for identifying the principal plant species occurring in the moorland habitat of *P. darlingtonae*. Thanks are also due to Dr Johanna Darlington who provided a photograph of the moorland below Muir's Massif. I am grateful to the Director, Wildlife Conservation and Management Department, Ministry of Tourism and Wildlife, Kenya, for permission to work in the Aberdares National Park. Mr. Quentin Luke kindly provided the plant authorities.

* The type specimen has been destroyed. This is probably *Clutia robusta* Pax, but would be called *C. kilimandscharica* Engl. if it could be proved that they are synonymous.

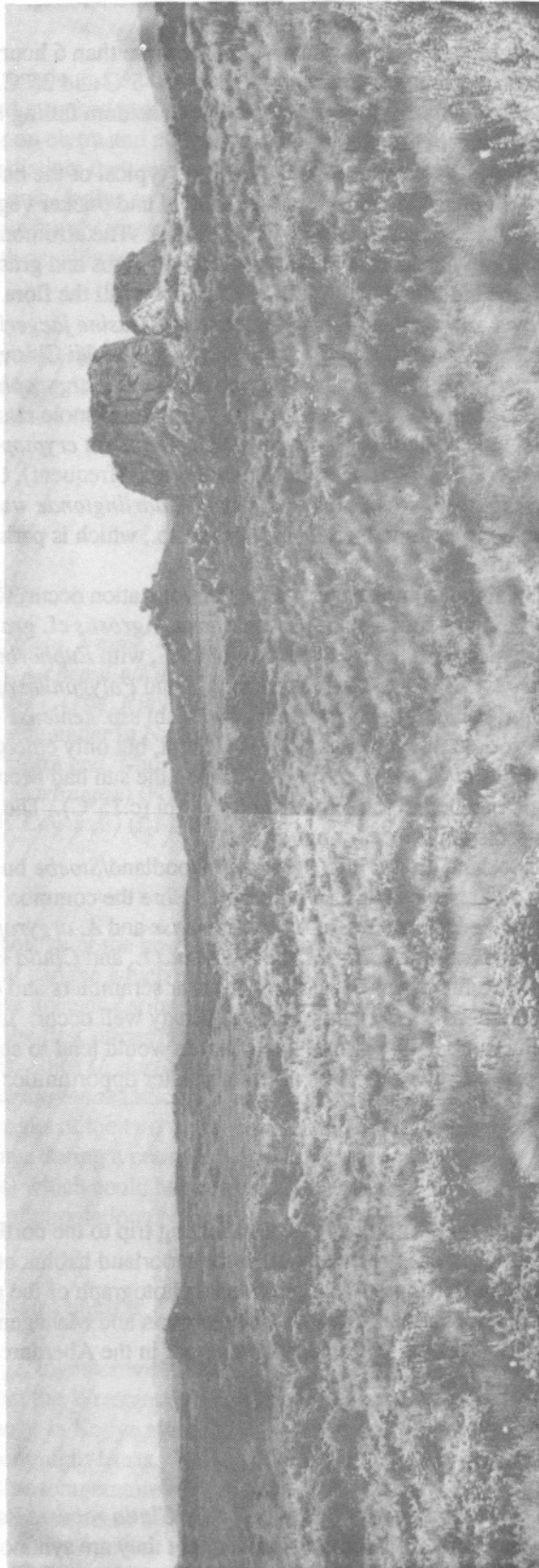


Plate. 6. Muir's Massif, northern Aberdare Range, Kenya, looking north west towards Lake Ol Bolossat. Afroalpine moorland, altitude 3650 m.
Photo J.P.E.C. Darlington.

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