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A new *Usambilla* species (Acridoidea, Lentulidae) from the northwestern highlands of Tanzania and distribution data on the genus *Usambilla*

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Abstract

A new species of *Usambilla* Sjöstedt, 1909, is described from the highlands of northwestern Tanzania. *U. hanangensis* Hemp n. sp. occurs in the montane zone on Mt. Hanang and on montane grasslands of the Mbulu District. Notes on habitat and co-occurring Saltatoria species are given. The known species of *Usambilla* are compiled with information on their ecology and biogeography.

Key words

Lentulidae, *Usambilla*, Tanzania, Mt. Hanang, distribution, new species, East Africa

Introduction

The genus *Usambilla* Sjöstedt, 1909 was revised by Jago (1981); he described four new genera among taxa formerly combined under *Usambilla*, mainly on the basis of male genitalic structures. Including those newly described by Jago, twelve species remained under *Usambilla*.

The genus *Usambilla* was founded on *Usambilla olivacea*, which was placed as a subspecies of *U. turgidicrus* in Jago's (1981) revision. However, molecular data has since shown that *U. olivacea* is a separate species, leading Schultz *et al.* (2007) to reinstate *U. olivacea*.

The center of diversity of the genus *Usambilla* is Tanzania, where seven species are recorded. Many of these live in mountain areas inhabiting forest, forest edge and semishade vegetation within plantations. *Usambilla* also occurs in western parts of East Africa in submontane wetforests.

Morphology, distribution and molecular analysis (Schultz *et al.* 2007, Schultz 2007) showed that Mt. Hanang harbors a new species of *Usambilla*, which is described in this paper.

Material and Methods

Identification.—Acridoidea spp. co-occurring with *Usambilla hanangensis* n. sp. were identified to genus level with keys of Dirsh (1965), and to species level with keys of Green (1998) or Jago (1982). Tettigoniid species were identified using Ragge (1960, 1980). The material was checked again at the entomological collection of the National Museums of Kenya, Nairobi, the Natural History Museum, London, and the Naturkunde Museum, Berlin.

Collection plots.—Saltatoria specimens were collected by netting at the lower border of the montane forest of the southern slopes of Mt. Hanang within an altitudinal span of 1800-1900 m a.s.l. and on montane grassland of the Mbulu highlands.

Measurements.—Total body length in dorsal aspect refers to the midline length of the insect from fastigium verticis to abdomen tip.

Depositories.—MNB: Museum für Naturkunde, Zentralinstitut der Humboldt-Universität zu Berlin. NHML: Natural History Museum London, UK. EDNMK: Entomological Department National Museums of Kenya, Nairobi. All other material remains in the collection of C. Hemp.

Results

Usambilla hanangensis

C. Hemp n. sp.

Holotype.—Male: Tanzania, southern slope of Mt. Hanang, 1900 m, UTM zone 36 M 0769816m E 9505197m N, 1970 m a.s.l., herbaceous vegetation along hedge at lower border of strongly disturbed forest, 5/06; depository, MNB.

Paratypes.—One female, same data as holotype; depository MNB; 1 male, 1 female, same data as holotype; depository NHML; 1 male, 1 female, same data as holotype; depository EDNMK. Further paratype material studied: 15 males, 16 females, same data as holotype; 2 males, UTM zone 36 M 0769088m E 9539373m N, grassland Mbulu District, 2100 m, 2/05. Material remains in collection of C. Hemp.

Male Description.—Color: a pattern of brown, green and cream (Figs 1, 9).

Head and antennae: head with deeply grooved fastigium of vertex (Fig. 5), as in *U. turgidicrus* and *olivacea* forming a notch at its point of contact with upper end of frons (Figs 4, 12). Sides of vertex in front of eyes and area of ocellus on each side, protruding just below pit (Figs 4, 5). This pit not as deep as in *U. turgidicrus* but clearly developed. Antennae greenish at base with black specks further distad. At end, black with white tips (Fig. 1). Eyes in living insects mottled brown, in preserved ones red-brown.

Thorax: pronotum with faint median carinula (Fig. 5). Lateral black-brown stripe angularly bent (Figs 1, 9), bordered by cream-white stripes at upper and lower borders. This stripe black in area of head where it starts and on 3rd and 4th abdominal tergites where it ends. In some individuals this lateral stripe is more black, in others more brown to light brown, but area on head and 3rd and 4th abdominal tergites always black. Pronotal disk light brown.

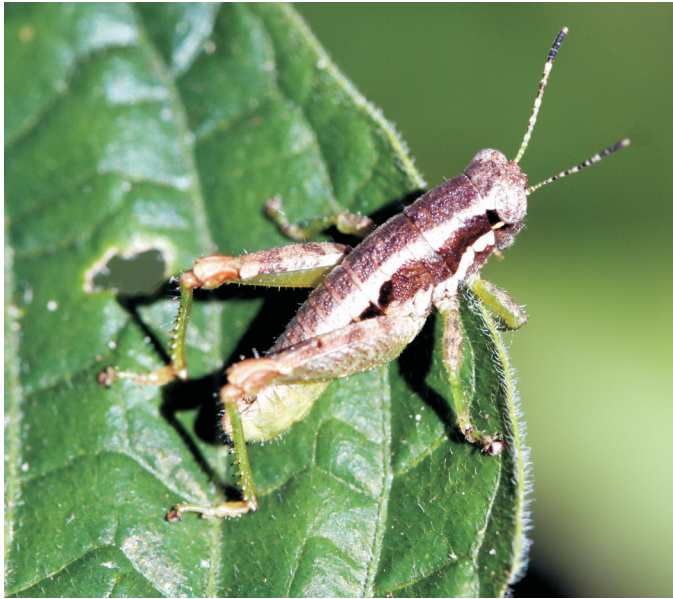


Fig. 1. Male *Usambilla hanangensis* n. sp. See also Plate I.

Legs: green mixed with brown; front legs more brownish, middle legs more green. Hind legs with outer side of femora green to dark brown or a mixture of green and brown; hind knees light brown; hind tibiae greenish with tarsi light brown to yellowish.

Abdomen: brown with cream dorsolateral stripes continuing pattern of pronotum till 5th-6th abdominal segment; then color fading into uniform mix of brown to light brown and faint green; supra-anal plate in most specimens with 10 tubercles, two pairs at anterior margin of supra-anal plate and three tubercles on each side of the plate at posterior margin (Figs 6, 13). Some specimens with an additional 1-2 tubercles at posterior margin of supra-anal plate. Lateral margins of supra-anal plate in most specimens marked black. Phallic complex as in Fig. 14.

Female.— Larger and more plump than male (Figs 2, 10). Color dull brown, pattern of lateral brown fasciae very faint to almost absent; hind tibiae faint orange; supra-anal plate triangular with anterior margins rounded; surface sculptured (Fig. 7). Dorsal valves smoothly rounded and spoon-like excavated. Ventral valves as in Fig. 8. Abdominal apex hairy.

Measurements (mm).—

	males n = 10	females n = 10
Head width	3.4-3.5 (\bar{x} =3.45)	4.0-4.4 (\bar{x} =4.24)
Inter-ocular distance	0.5-0.6 (\bar{x} =0.53)	1.0-1.1 (\bar{x} =1.04)
Pronotum	2.5-2.6 (\bar{x} =2.53)	3.2-3.5 (\bar{x} =3.29)
Posterior femur length	7.2-8.1 (\bar{x} =7.66)	8.7-9.5 (\bar{x} =9.21)
Posterior femur depth	2.1-2.3 (\bar{x} =2.22)	2.7-3.0 (\bar{x} =2.77)
Total body length	11.0-13.6 (\bar{x} =12.56)	15.0-17.0 (\bar{x} =15.75)

Diagnosis.—*U. hanangensis* is a typical *Usambilla* species as seen in its general habitus, the vertex (interocular sulcus), male supra-anal plate (marginal callosities and elevated black nodules), the male internal genitalia (penis morphology and position of aedeagal barbs) and in its habitat.

The male supra-anal plate and the color pattern of *U. hanangensis* are the easiest characters with which to identify the species



Fig. 2. Female *Usambilla hanangensis* n. sp. See also Plate I.

and distinguish it from the majority of other *Usambilla* species. *U. hanangensis* has a pair of anterior tubercles on each side and three anterior tubercles at the posterior margin of the supra-anal plate; these are found also in *U. affinis*. *U. sagonai* also has a supra-anal plate with two anterior pairs of tubercles, but the anterior three tubercles on each side may be reduced to two as in most other *Usambilla* species.

The supra-anal plate of *U. affinis* is more elongate and at its anterior margin less wide (0.9-1 mm) than in *U. hanangensis* (1.2-1.3 mm). *U. affinis* is restricted to mountainous areas of the Uluguru and Nguru Mts and the Mpwawwa plateau of central Tanzania. *U. hanangensis* is hitherto known only from the Mbulu highlands and Mt. Hanang of northwestern Tanzania. The ranges of both species are ecologically separated and geographically distant from each other. *U. hanangensis* has dull brown and cream fasciae while *U. affinis* (Fig. 15) is more brightly colored, with a pattern of dark brown to black stripes with yellow fasciae. Females of *U. affinis* (Fig. 16) also show a conspicuous pattern of lateral brown and cream bands, while *U. hanangensis* females are almost uniformly brown with only traces of fasciae; they are stockier than *U. affinis* females. The fastigium verticis of male *U. hanangensis* is strongly protruding, while the fastigium of *U. affinis* is less so.

U. sagonai is a brightly colored species of wet evergreen forest



Fig. 3. Montane zone on the southern slopes of Mt. Hanang at the lower border of the strongly disturbed montane forest. Wheat field in the foreground; lush herbaceous vegetation on the right side is habitat of *U. hanangensis* n. sp. See also Plate I.



Fig. 4. Face of male *U. hanangensis*; note pits in protruding area above antennae (arrow). See also Plate I.



Fig. 5. Dorsal view of head and pronotum of male *U. hanangensis*. Note notch of fastigium verticis (arrow). See also Plate I.



Fig. 6. Supra-anal plate of male *U. hanangensis*. See also Plate II.

in western East Africa and the United Republic of Congo. Very conspicuous bright yellow stripes of the males contrast with black fasciae. Legs and the rear part of the abdomen are green: thus this species has a very different color pattern than *U. hanangensis*.

Distribution.— *U. hanangensis* occurs in northwestern Tanzania on the highlands south of the district city Mbulu and on Mt. Hanang (see map Fig. 11).

Co-occurring Saltatoria species.—Saltatoria species co-occurring with *U. hanangensis* were noted at two localities on Mt. Hanang and on a grassland south of the city Mbulu.

Mt. Hanang, high herbaceous vegetation (> 1 m height) along border with wheat field, 1900 m (Fig. 3): *Acanthacris ruficornis ruficornis* (Fabricius, 1787), *Gymnobothroides* sp., *Gymnobothrus flexuosus* (Schulthess, 1898), *Heteracris coeruleascens* (Stål, 1876), *Horatosphaga* sp. (near *H. nou* Hemp, 2007), *Parepistaurus* sp., *Phaeocatantops* sp., *Amytta* sp., *Odonturoides* sp. (near *jagoi* Ragge, 1980), and *Taphronota calliparea* (Schaum, 1853).

Mt. Hanang, *Hyparrhenia* grassland, 1900 m: *Ailopus thalassinus thalassinus* (Fabricius, 1781), two *Phlesirtes* spp., *Coryphosima stenoptera stenoptera* (Schaum, 1853), *Duronion chloronota* (Stål, 1876), *Gastrimargus verticalis verticalis* (Saussure, 1884), *Gymnobothroides* sp., *Gymnobothrus flexuosus*, *Heteropternis coulouiana* (Saussure, 1884), *Horatosphaga* sp. (near *H. nou* Hemp, 2007), *Lamecosoma* sp., *Odonturoides* sp. (near *O. jagoi* Ragge, 1980), *Morphacris fasciata* (Thunberg, 1815), *Oxya hyla hyla* (Serville, 1831), and *Taphronota calliparea*.

South of district city Mbulu, grassland with scattered shrubs, 2100 m (UTM zone 36 M 0769088m E 9539373m N): *Lophothericles* sp., *Gastrimargus verticalis verticalis* (Saussure, 1884), *Duronion chloronota* (Stål, 1876), *Phlesirtes* sp., *Gymnobothroides* sp., and *Spathosternum brevicorne* (Uvarov, 1953).

Habitat range and distribution of species of the genus Usambilla.—*Usambilla* species live in a variety of habitats ranging from moist to dry lowland to montane forest, forest edge, montane grasslands and plantations.

Discussion

As shown in Schultz *et al.* 2007, *U. hanangensis* is molecularly a separate species. Its description was deferred by Schultz *et al.* since only two specimens from the Mbulu highlands were investigated. Additional material has now become available from Mt. Hanang and more samples molecularly screened (Schultz 2007), confirming the separate-species status of *U. hanangensis*. Closest relatives to *U. hanangensis* are *U. affinis* and *U. sagonai*, a relationship reflected in their genital morphology.

Members of the genus *Usambilla* occur in habitats with a wide altitudinal span (Table 1). In southern Tanzania, species such as *U. leptophrygana*, inhabit drier woodland at lower altitudes and therefore have a large area of occurrence (Fig. 11). The same applies to *U. oraria*, found in coastal forest of Kenya and Tanzania. *U. sagonai* inhabits, with two subspecies, a larger area in Uganda and western Kenya, but is restricted to rainforest communities of the submontane and montane zones. These three species are more widely distributed since their habitats remain connected with each other, or still were connected comparatively recently geologically (Jago 1970).

U. leptophrygana inhabits woodland communities, a vegetation cover widely found in southern and central Tanzania. The same holds true for the coastal forests of Tanzania and Kenya, which were a continuous belt until about 100 years ago, before the human population cleared wide areas, reducing coastal forest to a few isolated patches along the coast (Burgess & Clarke 2000). The consequences for the Saltatoria fauna of changing from a forest habitat to open-land vegetation in coastal areas were discussed in Hemp (2005).

U. turgidicus is a species found in riverine forests and shrub in the colline zones of mountains, e.g., on the eastern slopes of Kilimanjaro, the South Pare Mts and the Taita Hills. In the Kenyan highlands it is reported from *Commiphora* and *Acacia* woodland and other woodlands and plantations (see Jago 1981). Due to its habitat preferences at lower elevations and in vegetation units frequent in the Kenyan highlands and further south (East Kilimanjaro, northern

Table 1. Species and subspecies of *Usambilla*, their distribution, habitats and altitudinal spans.

Species	Distribution	Habitat	Altitude
<i>U. turgidicus</i> (Karsch, 1896)	Kenya: Kitui; Kibwezi, Taita Hills, Athi River Tanzania: S Pare, Mt. Kilimanjaro	Upland scrub and woodland (Jago 1981) Savanna woodland and juniper plantations (Jago 1981) Colline to submontane riverine forests	430-1000m (Jago 1981) -1200 m
<i>U. olivacea</i> Sjöstedt, 1909	Tanzania: W Usambara, N Pare, Mt. Kilimanjaro	Colline to submontane riverine forests	450-1400m
<i>U. affinis affinis</i> Kevan & Knipper, 1961	Tanzania: Uluguru Mts., Nguru Mts	Submontane to montane plantations, disturbed forest and forest edge	700-1300-?m
<i>U. affinis kikomboensis</i> Jago, 1981	Tanzania: Ilonga, Mpwapwa Nguru Mts	Submontane plantations	1460m (Jago 1981) 600-850m
<i>U. emaliensis</i> Jago, 1981	Kenya: Emali Range (Jago 1981), Machakos, Nunguni	Eucalyptus plantations, disturbed montane forest and montane forest edge	2000-2200m
<i>U. chlorophrygana</i> Jago, 1981	Tanzania: Kikombo, Mpwapwa	Drier woodland at lower altitudes (Jago 1981)	1000-1200m*
<i>U. leptophrygana</i> Jago, 1981	Tanzania: Dodoma area, Old Shinyanga, Mkwini, Ruaha N. P.	Drier woodland at lower altitudes (Jago 1981)	1100-1300m*
<i>U. insolita</i> (Rehn, 1914)	United Republic of Congo: Lake Kivu, Kwidschwi	Clearings of wet forests (Jago 1981)	1500m*
<i>U. sagonai sagonai</i> Ramme, 1929	United Republic of Congo: Lakes Region; Rwanda: Kisenye; Uganda: Toro (Kibale forest), Kilembe, Nsagu, Rwenzori; Kenya: Kakamega forest	Clearings of wet forests (Jago 1981); in lush vegetation along forest roadsides and in disturbed forest	1520-2610m (Jago 1981)
<i>U. sagonai fractolineata</i> Jago, 1981	Uganda: Budongo forest, Mpanga forest, Mabira forest, Bugoma forest, Mubende, Bunyoro	Clearings of wet forests (Jago 1981) lush vegetation along forest roads and in disturbed forest	1000-1500m*
<i>U. haematogramma</i> Jago, 1981	Tanzania: Ilemba, Nsangu forest, Ufipa Escarpment, Mpui, Mbisi forest, Rukwa valley	forest edge (Jago 1981)	2120m (Jago 1981)
<i>U. hanangensis</i> n. sp.	Tanzania: Mt. Hanang, Mbulu District	montane forest edge, montane grasslands	1800-2100m

* elevation taken from topographical maps



Fig. 7. Supra-anal plate of female *U. hanangensis*. For color version, see Plate II.

side of the Eastern Arc Range in Tanzania), this species also has a larger area of occurrence. *U. olivacea* dwells in more moist riverine forests and submontane forests of the northern branch of the Eastern Arc mountains in Tanzania, occurring also on the southern slopes of Mt. Kilimanjaro. It probably spread along the southern side of the Eastern Arc mountains, using the riverine vegetation of the Pangani river system.

However, some *Usambilla* species do show a restricted distribution, probably being endemic to isolated mountain areas: *U. chlorophrygana* on the Mpwapwa plateau of central Tanzania, *U.*

haematogramma on the Ufipa plateau of southern Tanzania, *U. emaliensis* in the eastern Kenyan highlands, and *U. hanangensis* in the Mbulu highlands and on Mt. Hanang of northwestern Tanzania.

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Fig. 8. Subgenital-plate and ventral valves of females *U. hanangensis*. See also Plate II.



Fig. 9. Habitus male *U. hanangensis*. See also Plate II.

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Fig. 10. Habitus female *U. hanangensis*. See also Plate III.

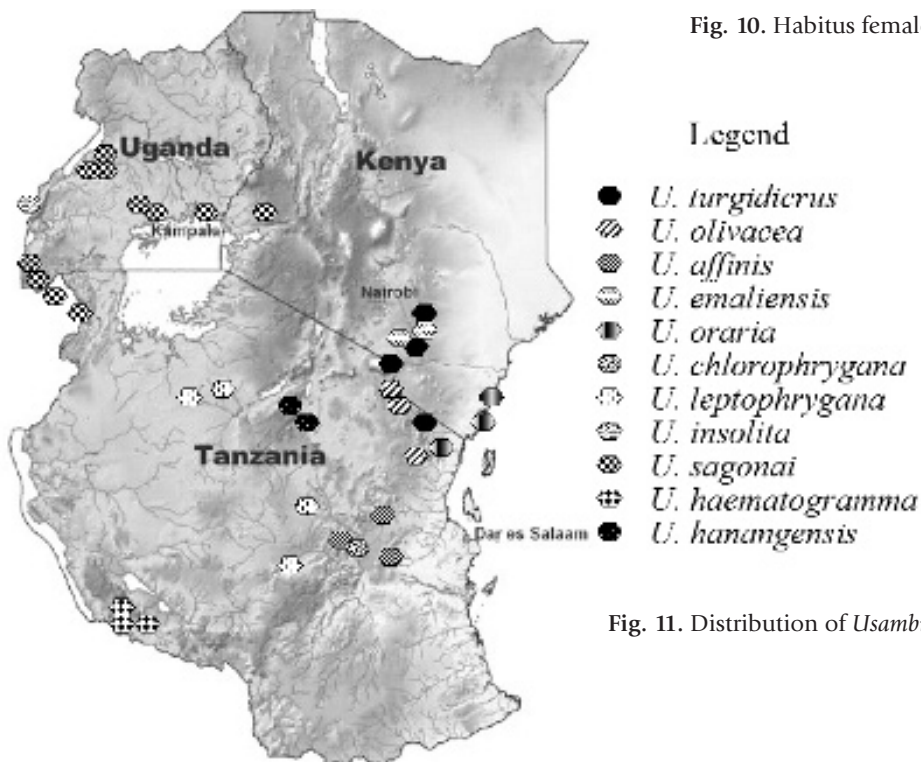


Fig. 11. Distribution of *Usambilla* species in East Africa.



Fig. 12. Dorsal aspect of head of male *U. hanangensis*.



Fig. 13. Male supra-anal plate of male *U. hanangensis*.

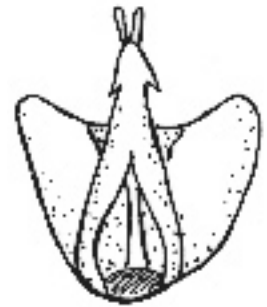


Fig. 14. Phallic complex of male *U. hanangensis*: aedeagus, posterior apical aspect.

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Fig. 15. Male *U. affinis kikomboensis* from the plantation belt of the Nguru Mts above Turiani, Mhonda mission. See also Plate III.



Fig. 16. Female *U. affinis kikomboensis*, same locality as male in Fig. 15. See also Plate III.