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# A new species of *Odonturoides* Ragge (Orthoptera: Tettigoniidae: Phaneropterinae) from the highlands of Tanzania

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## Abstract

A new species of *Odonturoides* Ragge, 1980 is described from the east African highlands. *O. hanangensis* Hemp, n. sp., occurs on the lower border of the montane forest of Mt Hanang, the third highest mountain of Tanzania. Morphological and ecological data are presented for all known species of this genus.

## Key words

katydid, bush cricket, montane forest, new species, Africa

## Introduction

The genus *Odonturoides* was erected by Ragge (1980) on *Odontura plasoni* Ebner. Ragge (1980) described another two species, *O. jagoi* and *O. insolitus*, all from Tanzanian localities.

All *Odonturoides* species are characterized by a compressed fastigium verticis which is narrower than the first antennal segment. The eyes are oval or circular and prominent. The pronotum has no lateral carinae. The male middle tibiae have three internal spurs, of which at least two are modified. The forewings are reduced and the alae vestigial or absent in the male and absent in females. For more characters defining the genus *Odonturoides* see Ragge (1980).

Ragge (1980) noted that all three species here united under *Odonturoides*, are superficially similar and are not very uniform. The fourth species *O. hanangensis*, described in this paper, fits morphologically into this genus. Molecular studies are necessary to clarify the status of *Odonturoides*.

## Material and Methods

**Identification.**—*Odonturoides* specimens were identified using the key given by Ragge (1980) and by checking the material against the entomological collection of the Natural History Museum, London (NHML), which holds material of all three known species of *Odonturoides*.

Images presented in this paper for *O. jagoi* and *O. insolitus* are of holotype material held in the NHML. The holotype of *O. plasoni* was not studied, but I did examine material of this species, collected by Jago in 1966 from Sumbawanga, Nkundi Plantation, and placed in the NHML. This same series had been revised and identified by Ragge (1980).

**Collection.**—*O. hanangensis* was collected by net sweeping from herbaceous plants at the lower border of the montane forest of Mt. Hanang.

**Measurements.**—Total body length, dorsal aspect, refers to the mid-line length of the insect from fastigium verticis to abdomen tip, including the cerci of the males. Tegminal length was measured from above, from the articulation of one of the forewings to its tip as seen from above, disregarding the curvature.

**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 the author.

## Results

*Odonturoides hanangensis* sp. n.  
Figs 1-5

**Holotype.**—Male: Tanzania, southern slopes of Mt Hanang, lower border of montane forest, lush herb vegetation, UTM zone 36 M 0769816 E 9505197 S, 1950 m, May 2006, C. Hemp coll.; depository NMB.

**Paratypes.**—1 male, same collection data as holotype, depository NHML; 1 male, same collection data as holotype, depository EDNMK.

**Additional paratype material examined.**—All Tanzania, all C. Hemp coll.: 24 males, same data as holotype.

**Description.**—Male: in living insect color dark green, with conspicuous white stripe along costal field of tegmina. Abdomen dorsally with pattern of light brown triangular-shaped patches, with a central black spot on each segment (Figs 3, 4). Antennae, eyes and femorotibial leg joints reddish to red-brown; in preserved insect color and pattern fading to a more or less uniform tawny color. Head: antennae red-brown, especially scapus, flagellum patchy dark and red to brown-red, becoming lighter in color to apex; length of antennae 1.5 to 2 times length of insect. Antennal sockets with elevated margin medially. Cuticle of head smooth, fastigium of vertex compressed, sulcate above (Fig. 1 A). Eyes spherical globose, prominent; face in living insect conspicuously green with pattern of white stripes (Fig. 4) (this pattern also fades in the preserved insect); pronotum without lateral carinae, saddle-shaped with elevated posterior margin (Fig. 1 E). Tegmina and wings: tegmina reduced, attaining posterior margin of first abdominal segment (Fig. 1 E), moderately inflated; alae absent. Legs: all femora unarmed.

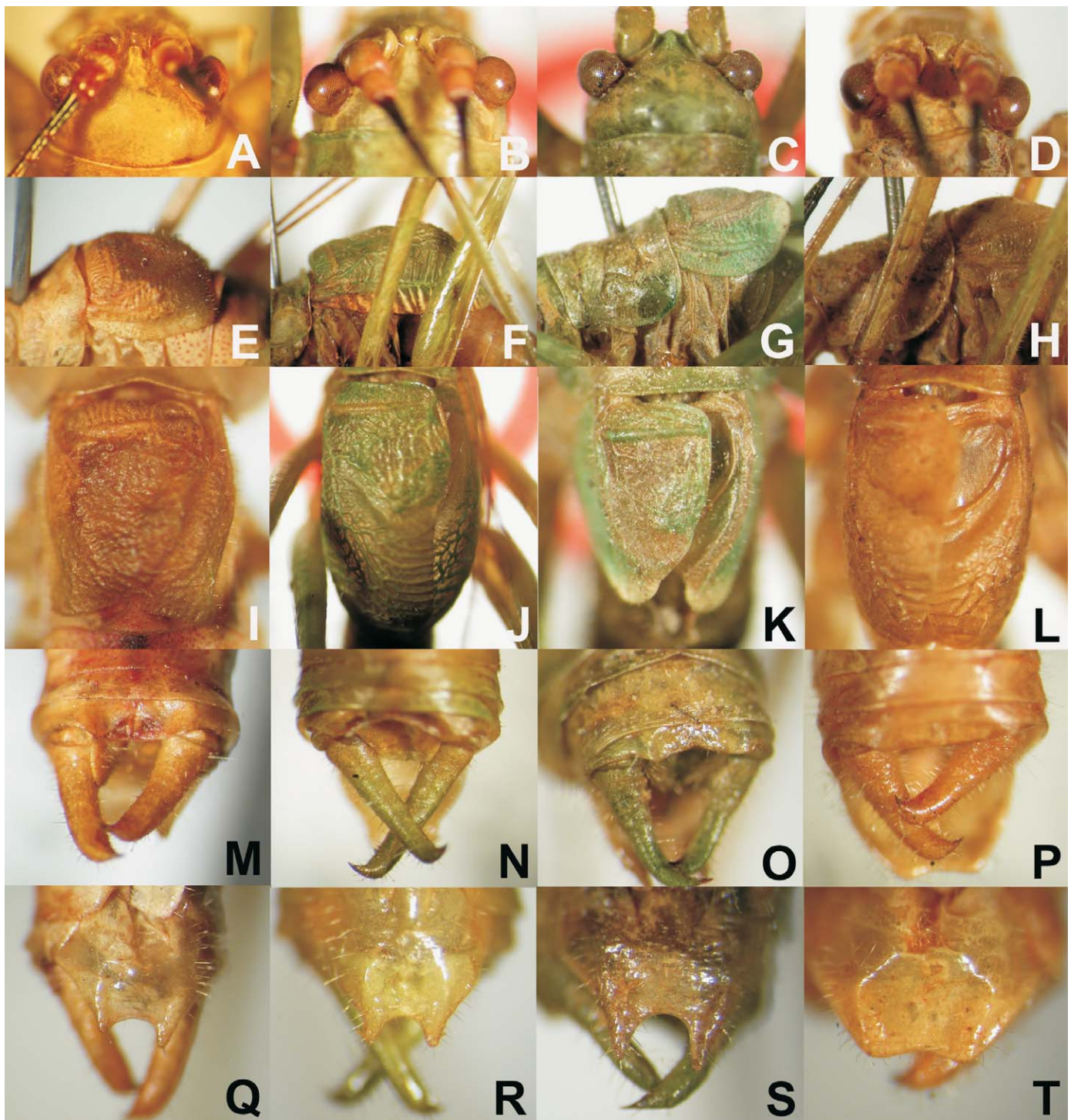


Fig. 1. Detail images of *Odonturooides* species. A, E, I, M, Q: male *O. hanangensis* n. sp. Paratype, Tanzania, Mt Hanang. B, F, J, N, R: male *O. jagoi*, Holotype, Tanzania, Mt Rungwe (NHML). C, G, K, O, S: *O. insolitus*, Holotype, Tanzania, 44 miles north of Dodoma (NHML). D, H, L, P, T: male *O. plasoni*, Tanzania, Sumbawanga (NHML). A-D: dorsal aspect of head of male. E-H: lateral view of pronotum and tegmina of male. I-L: dorsal view of male tegmina. M-P: dorsal view of male abdominal apex. Q-T: ventral view of male subgenital plate. For color version, see Plate VI.

Male midtibia spurs as in Fig. 2: innermost one (A) moderately enlarged, flattened and bent horizontally at its tip; middle one (B) much more enlarged, flattened, abrupt bend apically, outermost (C) one small, unmodified. Hind tibiae with three apical spurs on each side. Genitalia: male tenth abdominal tergite as in Fig. 1 M, male subgenital plate as in Fig. 1 Q.

**Measurements.**— Male (n = 10) Total length of body 14 to 17 mm (mean 15.5 mm); median length of pronotum 2.9 to 3.2 mm (mean 3.1 mm); length of hind femur 14 to 16 mm (mean 15 mm); length of tegmen 2.9 to 3.3 mm (mean 3.1 mm).

Female: unknown.



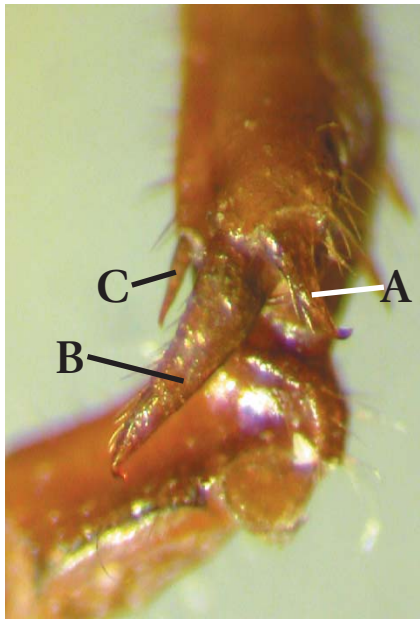


Fig. 2. Posterior view of apex of male right midtibia of *O. hanangensis*. A,B modified spurs.

**Habitat.**—*O. hanangensis* lives on the lower border of the montane forest belt on the southern slopes of Mt. Hanang. It was collected in May 2006 from tall herbs with large leaves, where individuals were basking in the evening sun. *O. hanangensis* was plentiful at this time of the year, with many males sitting no further apart than 0.5 to 1 m, along a trail with high herbs and bushes on one side and a wheat field on the other. Most of the 27 males obtained were caught within a small strip of vegetation (described above) of about 50–100 m. No females were seen, although vegetation was intensively searched.

**Song.**—Males perform their song after sunset. Screening with a bat detector showed that the song lies in the ultrasonic range and is not audible to the human ear.

**Co-occurring Saltatoria.**—For *O. hanangensis* n. sp., a list of co-occurring Saltatoria species is given in Hemp & Hemp (2008).

**Diagnosis.**—*O. hanangensis* is another species of this genus without alae, thus also differing distinctly from *O. insolitus*, the only *Odonturoides* species with protruding alae (Fig. 1K). Closest relative to *O. hanangensis* morphologically is *O. jagoi*. Morphological similarities lie in the general body shape and size of the males, the shape of the fastigium (Fig. 1A, B), the inflated tegmina with white lateral stripes (Fig. 1E, F) and the subgenital plates of the males (Fig. 1Q, R). However, the tegmina are much more strongly inflated in *O. jagoi* and the posterior end of the acoustical chamber formed by the tegmina, more rounded and thus more closed in *O. jagoi* than in *O. hanangensis* (Fig. 1I, J). Also the male cerci are distinctly different between these two species: in *O. hanangensis* they are stout and thick (Fig. 1M), more slender in *O. jagoi* (Fig. 1N). Differences are also found in the modification of the midtibial spurs of the male. In *O. jagoi* the middle spur is greatly enlarged, but not flattened over its whole length as in *O. hanangensis*. Furthermore this spur has a bent apex in *O. hanangensis*; it is acute in *O. jagoi*. The same is true for the midtibia inner spur: in *O. jagoi* it is enlarged and round in section, while it is flattened in *O. hanangensis* (Fig. 2 and see Ragge 1980: p. 101, Fig. 38).



Fig. 3. Male *O. hanangensis*. Note color pattern of tegmina and abdomen. For color version, see Plate VI.

*O. plasoni* differs from the other *Odonturoides* species, including *O. hanangensis*, in the shape of the eyes: oval in *O. plasoni*, while globose in the other three *Odonturoides* species (Fig. 1A–D). The posterior margin of the subgenital plate of male *O. plasoni* is only slightly incised (Fig. 1T), while the other three species have male subgenital plates which are deeply u-shaped incised (Fig. 1Q–S).

**Distribution, habitat and altitudinal ranges of *Odonturoides* species.**—Literature data are compiled (Table 1) for *O. plasoni*, *O. jagoi* and *O. insolitus* and listed together with data of *O. hanangensis* n. sp. Except for *O. insolitus*, which was collected from dry *Acacia* woodland in central Tanzania, all species occur in montane habitats, and were collected from montane forest and forest plantations. *O. hanangensis* is now the most northerly occurring species, while the other species of *Odonturoides* occur in central and south Tanzania (Table 1, Fig. 5).



Fig. 4. Male *O. hanangensis*. Note color pattern of face. For color version, see Plate VI.

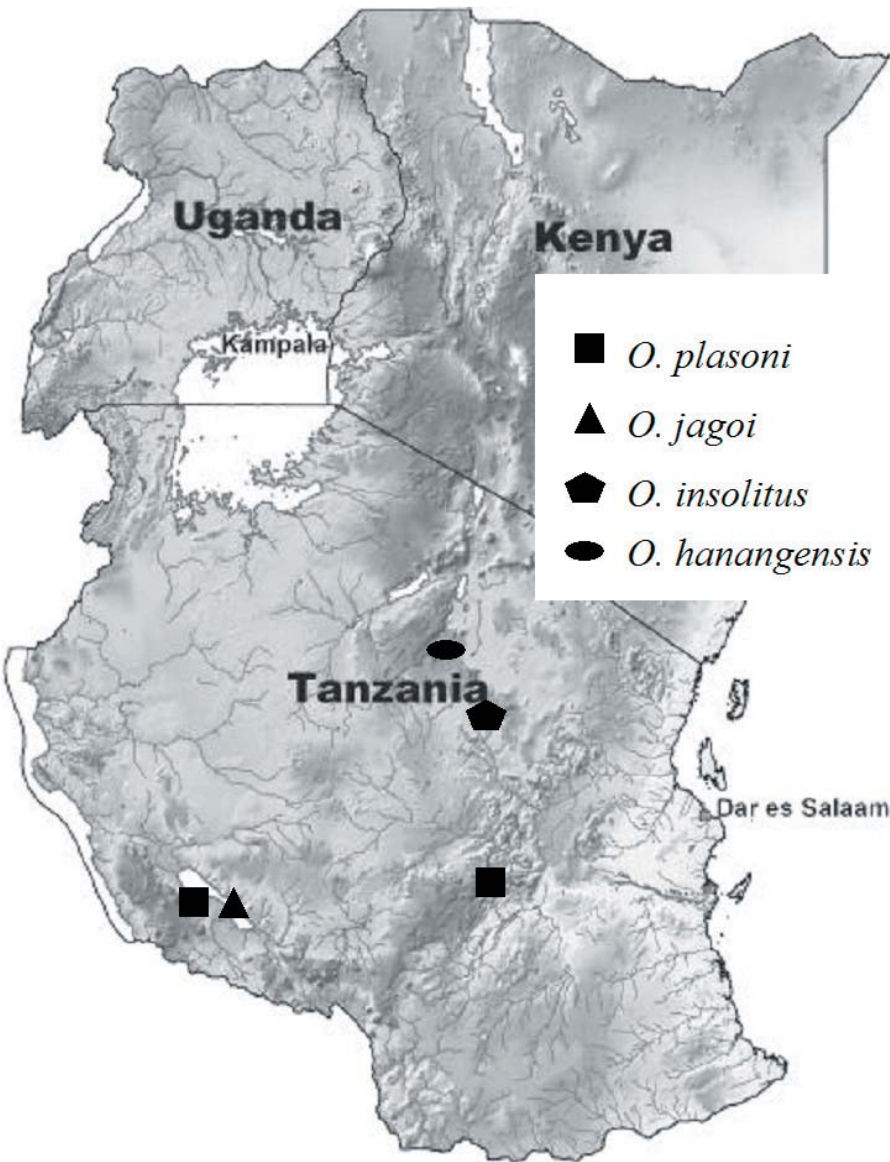


Fig. 5. Distribution of *Odonturoides* species in East Africa.

Table 1. Locality, habitat and altitudinal ranges of *Odonturoides* species.

Species	locality	habitat	altitudinal range
<i>O. plasoni</i> Ebner, 1915	Tanzania: Tossamaganga Hill, Watta forest reserve Sumbawanga, Mbisi forest Sumbawanga, Nkundi	plantations, montane forest (Ragge 1980)	1800-2300 m*
<i>O. jagoi</i> Ragge, 1980	Tanzania: Mt Rungwe, Kiwira forest	montane forest	1700-? m**
<i>O. insolitus</i> Ragge, 1980	Dodoma District, 70 km north of Dodoma	<i>Acacia</i> woodland (Ragge 1980)	1100-1550 m***
<i>O. hanangensis</i> n. sp.	Tanzania: Mt Hanang	montane forest edge	1800-1900 m

\* Altitudes taken from topographical maps.  
\*\* *O. jagoi* was collected from Kiwira forestry station on Mt Rungwe. This station lies at the lower border of the forest belt. Mt Rungwe looms to a height of over 2900 m. Thus, *O. jagoi* probably occurs from 1700 m upwards.  
\*\*\* 70 km north of Dodoma a mountain range is located with its highest crests at about 1550m (e.g., Chenene Hill). Elevation of the road lies at about 1110 m. *O. insolitus* occurs in these mountains and was collected by Nick Jago, probably from the roadside.

## Discussion

Mt. Hanang is a solitary mountain and was thrown up in connection with the formation of the rift valley. At over 3400 m, it is the third highest volcano of Tanzania. As with other high mountains in East Africa, it harbors various endemic species of mostly flightless *Saltatoria* in its submontane and montane zones. Mt. Hanang is surrounded by dry and hot savanna vegetation, isolating its upper zones. Flightless insects are thus particularly constrained in their distribution by current conditions, and so these high mountains in East Africa provide a situation conducive to allopatric speciation.

Examples of endemic flightless *Saltatoria* species on this mountain are *Altihoratosphaga hanangensis* Hemp, 2009 (Hemp *et al.* 2009a), *Parepistaurus* sp. (molecularly screened by Schultz 2007), *Parasphena hanangensis* Hemp (Hemp *et al.* in press 2009c), two *Phlesirtes* species of the submontane and montane zones respectively, and probably new species of the genera *Anthraxes*, *Amytta*, and *Pronomapyga* (Hemp unpub.). However, a limited spread of flightless species must have been possible in the past, as indicated by the distributions of, e.g., species such as *Monticolaria manyara* Hemp, 2009 (Hemp *et al.* 2009b) and *Usambilla hanangensis* Hemp, 2008 (Hemp & Hemp 2008), these two species occurring both on the mountain and also on the adjacent rift-valley escarpment.

## Acknowledgements

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