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A new species of *Horatosphaga* Schaum, 1853 (Orthoptera: Tettigoniidae: Phaneropterinae) from savanna grasslands of Kenya

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Abstract

A new species of *Horatosphaga* Schaum, 1853 is described from east African highlands. *Horatosphaga tenera* Hemp, new species, occurs on savanna plains of south-central Kenya. Notes on the phenology, habitat and co-occurring Saltatoria species are given.

Key words

katydid, *Horatosphaga*, Kenya, savanna grasslands, new species

Introduction

Horatosphaga is the largest genus in the tribe Acrometopini (Ragge 1960, see African spp Acrometopini Hemp 2006). Characters which unite this group are the lack of a forecoxal spine, biconchate foretibiae, a sloping fastigium verticis, stridulatory modification of the male forewings (beyond that of the stridulatory organ itself) and most obviously, the high degree of sexual dimorphism (Ragge 1960).

Ragge (1960) in his revision of the Acrometopae noted that *Horatosphaga* is a heterogenous genus, and that when more material became available, would probably be divided into several genera. Ragge (1960) listed the two species *H. meruensis* (Sjöstedt) and *H. nuda* (Ragge) as compromising one new genus among five potential new genera in *Horatosphaga*. A new species *Horatosphaga tenera* Hemp, n. sp. is morphologically closely related to this group of two: it is from the savanna plains of southern Kenya and is described in this paper.

Material and Methods

Identification.—Acridoidea spp. were identified to genus using mainly the keys of Dirsh (1965), and to species level by keys of, *e.g.*, Ragge (1960, 1964), Jago (1968, 1996) and Ritchie (1982). The material was checked again against the entomological collections of the National Museums of Kenya, Nairobi, at the Natural History Museum, London, and the Naturkunde Museum, Berlin.

Collection plots.— Long-term plots were laid on the savanna plains in the foothills of the Ngong Hills, near Isinya and near Kajiado. Using a modified method of Braun-Blanquet (1964), the abundance of Saltatoria was estimated; relevés are summarized in a table, following the method presented in Hemp and Hemp (2003). Saltatoria coenoses were obtained — by netting, by song recording and visual detection.

Measurements.—Total body length, dorsal aspect, refers to the midline length of the insect from fastigium verticis to tip of the abdomen, disregarding terminalia and tegmina. In females the ovipositor is included in body length. Length of the ovipositor separately is measured laterally as a straight line from the base of the subgenital plate to the apex, 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 and Discussion

Horatosphaga tenera sp. n.
Figs 1-7

Holotype.— **Male**: Kenya, foothills of Ngong Hills near Kiserian, savanna grassland, UTM zone 37 M 0257518 E 9815845 S, 1700 m, June 2006, C. Hemp coll.; depository NMB.
Paratypes.- All Kenya. 1 female, same collection data as holotype, but May 2006; depository NMB; 1 male, same collection data as holotype; depository NHML. 1 female, near Kajiado, savanna grassland, UTM zone 37 M 0256902 E 9800511 S, 1700 m, May 2006; depository NHML. 1 male, same collection data as holotype, but May 2006; depository EDNMK; 1 female, same collection data as holotype, but May 2006; depository EDNMK.

Additional material examined.— all Kenya, all C. Hemp coll.: 2 males, same data as holotype but April 2002; 1 female, same data as holotype, but May 2006; 1 female, between Kiserian and Isinya, UTM zone 37 M 0245832 E 9838050 S, 1900 m, savanna grassland with intermingled *Acacia* trees, cattle-grazed, May 2006.

Description.— **Male**: Color light green with tawny-yellowish parts; stridulatory area of right tegmen with brownish yellow (tawny) markings along stridulatory veins and along main veins of tegmen (Fig. 1). Head: antennae reddish to yellow, each segment with annulate red markings and red dots; length of antennae about 1.5 to 2 × length of insect. Cuticle of head smooth, fastigium of vertex with sulcate ridges between antennae, forming conus projecting in front of antenna; face uniformly green, on vertex of head tawny mixed with reddish markings having the same color as on dorsum of pronotum; eyes small, oval. Thorax: pronotum without lateral carinae, but this

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Fig. 1. Male *Horatosphaga tenera.* See also PLATE VI.



Fig. 2. Female *Horatosphaga tenera* on *Ornithogalum tenuifolium*. See also PLATE VI.

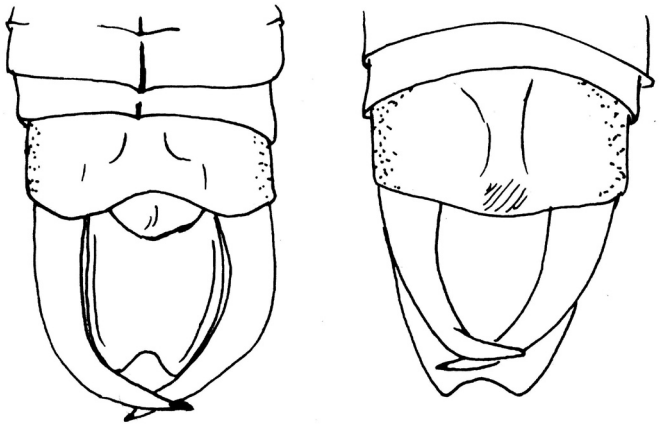


Fig. 3. Dorsal view of abdominal apices of male *H. tenera* (left) and *H. meruensis* (right).

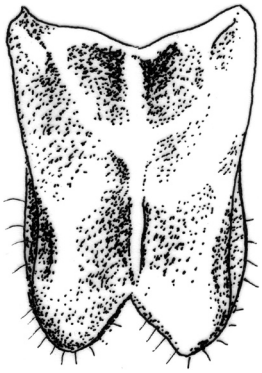


Fig. 4. Ventral view of male subgenital plate of *H. tenera.*

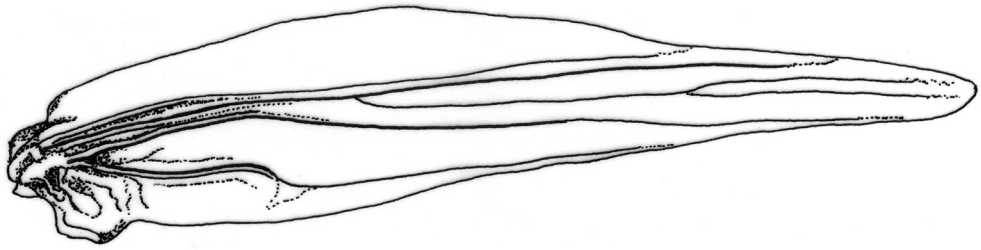


Fig. 5. Venation of right tegmen of male *H. tenera.*

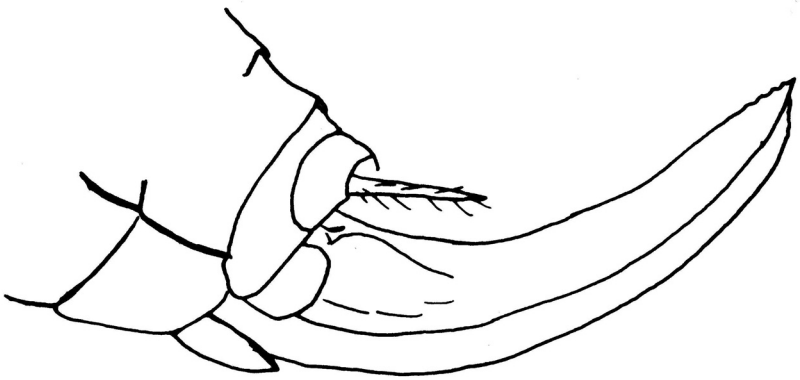


Fig. 6. Lateral view of ovipositor of *H. tenera.*

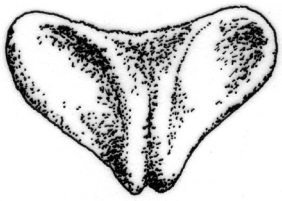


Fig. 7. Ventral view of subgenital plate of female *H. tenera.*

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area indicated by pair of reddish fasciae; dorsal disk of pronotum smooth, irregular grooves at lateral lobes of pronotum. Tegmina and wings: tegmina surpassing body by 1/3, very slender, tapering to more-or-less acute tip, ratio length to width about 5. Venation of right forewing as in Fig. 5; alae reduced, hidden under forewings, about 1.5 to 2.0 mm long. Legs: yellow to tawny in color, tympanic auricles conchate, area slightly inflated. All femora unarmed; fore- and midtibiae armed ventrally with slender spinules, in hind tibiae these spinules more densely distributed; dorsally all tibiae unarmed. Genitalia: subgenital plate incised posteriorly, forming two wide lobes (Figs 3, 4). Tenth abdominal tergite unmodified. Supra-anal plate in living insect vertically oriented, not visible in living specimens, becoming apparent in death when stretched horizontally. In Figure 3 the supra-anal plate is indicated for *H. tenera* only. Cerci of *H. tenera* slender and decussate (Fig. 3).

Measurements.— **Male** (n= 5). Total length of body: 17 to 21 mm (mean: 19 mm); median length of pronotum: 3.7 to 4.3 mm (mean: 4.0 mm); length of hind femur: 18 to 21 mm; length of tegmen: 16 to 18 mm (mean: 17.2 mm).

Female: General facies: habitus very similar to males (Fig. 2); sexual dimorphism not very pronounced, as typical for other Acrometopae; color also similar to males but more green and fewer tawny or yellow parts. Legs: as in male. Genitalia: subgenital plate as in Fig. 7. Ovipositor slender and only moderately up-curved, weakly serrate at apex (Fig. 6). Cerci slender and straight.

Measurements.— **Female** (n = 3). Total length of body: 15 to 18 mm; median length of pronotum: 4.2 to 4.4 mm; length of hind femur: 20 to 22 mm; length of tegmen: 20 to 21mm; length of ovipositor: 7 to 9 mm.

Habitat.—*H. tenera* is a species well adapted to grasslands, as indicated by the slender grass-like shape of its body and the coloration of the whole insect, in which the green, reddish and yellow colors match the surrounding environment (Figs 1, 2). It was found in savanna grasslands at elevations between 1700 and 1900 m, between Kajiado, Isinya and Kiserian of south-central Kenya (Figs 8, 9).

Table 1 lists Saltatoria species living syntopically with *H. tenera*. Most of these species are typical grassland dwellers, many of them fully winged widespread forms in savanna grasslands of Africa (e.g, *Orthochtha dasycnemis*, *Acorypha glaucopsis*, *Cataloipus oberthuri*); some even occur on adjacent continents (e.g., *Acrida bicolor*, *Cyrtacanthacris tatarica*, *Eyprepocnemis plorans*, *Acrotylus patruelis* or *Morphacris fasciata*). However, some of the species found on these plots (see Table 1) belong to the indigenous fauna of East Africa and there are even endemic species that, like *Horatosphaga tenera*, are only encountered in this area — the lower slopes of the Ngong Hills and adjacent plains at higher elevations (1700 m and above).

The high mountains and highlands of East Africa are known for their high degree of biodiversity and endemism. A survey of the Saltatoria fauna endemic to such regions (East African mountains and highlands) is presented in Hemp (forthcoming). Species restricted to the Kenyan highlands, found in the herein investigated plots, are, besides *H. tenera*— *Parasphena nairobiensis*, *Gymnobothroides keniensis*, *Odontomelus pallidus*, and *Phlesirtes* spp.

The taxonomic status of *Horatosphaga regularis* is quite puzzling and Ragge (1960) pointed out that it is possible *H. regularis* may be conspecific with *H. elongata* (Rehn, 1914) and *H. reticulata* (Karsch, 1889). If so then this species would be confined in its distribution to the rift-valleys of eastern Africa. On the other hand, when more material becomes available it might well turn out that *H. regularis* is a species confined to a certain area and *H. elongata* and *reticulata* are valid species as well.

Notes on Phenology.— Individuals of *H. tenera* were first found in April, 2002, on plot 408 (Table 1) when the grasslands were high and green, following the long rains that start usually in March/April. Two weeks later no more individuals of this species could be located in this plot. In the following years plot 408 was visited many times, mainly in search of this new species, but without success. Then in 2006, during long rains which delivered sufficient precipitation, many nymphs and freshly moulted female adults of *H. tenera* were noticed mid-May. About 4 wk later only a few male nymphs were collected: all adults encountered were males with apparently no females present on this grassland. It may be concluded that the species is frequent only in certain years under favorable conditions and that its development is rapid, its life span short.

Similar observations were made with *Horatosphaga meruensis* (Sjöstedt, 1909), which is closely related to *H. tenera*. *H. meruensis* is only known from savanna grasslands between Mt. Meru and Mt. Kilimanjaro of northern Tanzania. Specimens were first collected here in the '*El Niño*' year 1997/98. From October 1997, to the normal onset of the long rains in April 1998, a period when it is usually dry and hot, there were many rainfalls. The grasslands at the western side of Mt. Kilimanjaro, near Ngare Nairobi were very high and lush and contained many *H. meruensis*. This area was visited in many subsequent years in search of more individuals of *H. meruensis*, but without success.

In "normal" years this area is heavily degraded by cattle-grazing and vegetation is sparse or absent over wide areas, especially in the dry and hot period January to March. In 2006, also from October, rainfall occurred continuously, lasting as in the '*El Niño*' year of 1997/98, till April, and merging into the long rains. Again in December 2006 and January 2007, many individuals of *H. meruensis* were present in the area at elevations of 1200 to 1400 m. Individuals of this species were collected in a period of only about 4 wk: thereafter, by the end of January 2007, specimens could no longer be found.

Diagnosis.— *Horatosphaga tenera* is a fragile and slender *Horatosphaga* species. Both sexes have reduced hind wings. Only two other *Horatosphaga* species are known with the same combination of characters – slender tapering tegmina and reduced hind wings in both sexes: *H. meruensis* and *H. nuda*. These other two species also have a restricted distribution. *H. nuda* is known only from the Imatong Mts of Sudan, but Ragge (1960) suggested it also may occur in northern Uganda. *H. meruensis* is endemic to savanna grasslands of the Mt. Kilimanjaro / Mt. Meru area of northern Tanzania (Fig. 10). All three species also share unarmed femora, a character not found in any other known *Horatosphaga* species.

Differences between *H. meruensis* and *H. nuda* are to be found in the male genitalia, the subgenital plates having a different shape. While *H. meruensis* has rounded lobes, the lobes of male *H. nuda* males are more acute. Ragge (1960) stated that *H. meruensis* and *nuda* are separated only by minor morphological differences, and he could not exclude the possibility that both species might prove to be conspecific when more material became available (Table 2). But *H. tenera*, occurring geographically between *H. meruensis* in the south and *H. nuda* in the north, shows clear differences in the male genitalia: the male cerci surpass the subgenital plate in *H. tenera*,

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Table 1. Saltatoria composition of *H. tenera* habitats in south-central Kenya: **Plot 408**: beside road between Kiserian and Isinya, near Isinya, 1700 m, savanna grassland, partly heavily cattle-grazed, UTM zone 37 M 0257518 E 9815845 S, (Fig. 8). Plot 408 was checked 10 times, a vegetation relevé was made only when Saltatoria species were noted on the plot 4/02, 8/02, 11/02, 5/05, 5/06 and 6/06.; **Plot 508:** beside road Isinya to Kajiado, near Kajiado, savanna grassland with intermingled shrubs of *Acacia* sp., cattle-grazed, 1700 m, UTM zone 37 M 0256902 E 9800511 S, (Fig. 9), Plot 508 was checked twice: 5/06 and 12/06; **Plot 428:** beside road between Kiserian and Isinya, near Kiserian, UTM zone 37 M 0245832 E 9838050 S; 1900 m, savanna grassland with intermingled *Acacia* trees, cattle-grazed, eight checks; Saltatoria species were recorded 5/04, 5/05, 5/06, 12/06.

Species/plot	408	508	428
Pyrgomorphidae			
Parasphena nairobiensis Sjöstedt, 1933		x	x
Acrididae			
Acridinae			
Acrida bicolor (Thunberg, 1815)	x	x	x
Coryphosima stenoptera stenoptera (Schaum, 1853)			x
Gymnobothroides keniensis Johnston, 1937			x
Lobopoma ambages Karsch, 1896			x
Minihippus reductus (Uvarov, 1941)	x	x	
Odontomelus pallidus Sjöstedt, 1912	x		
Orthochtha dasycnemis dasycnemis (Gerstaecker, 1869)			x
Calliptaminae			
Acorypha glaucopsis (Walker, 1870)	x		
Cyrtacanthacridinae			
Cyrtacanthacris tatarica (Linnaeus, 1758)	x		
Euryphyminae			
Phymeurus granulatus (Uvarov, 1922)	x		
Eyprepocnemidinae			
Cataloipus oberthuri (Bolivar, 1890)	x		
Eyprepocnemis plorans (Charpentier, 1825)	x	x	x
Taramassus cunctator (Karsch, 1900)	x		x
Gomphocerinae			
Gomphocerinae sp.	x	x	
Stenohippus sp.	x		
Oedipodinae			
Acrotylus patruelis (Herrich-Schaeffer, 1838)	x		
Gastrimargus verticalis (Saussure, 1884)	x		x
Morphacris fasciata (Thunberg, 1815)	x		
Trilophidia conturbata (Walker, 1870)	x		
Tettidoniidae			
Conocephalinae			
Conocephalus (Anisoptera) maculatus (Le Guillou, 1841)			x
Phlesirtes sp.	x		x
Ruspolia sp.	x		x
Phaneropterinae			
Horatosphaga regularis (Bolivar, 1922)	x	x	x
Horatosphaga tenera n. sp	x	x	x
Lamecosoma inermis Ragge, 1961			x
Peronura clavigera Karsch, 1889		x	x
Tylopsis irregularis Karsch, 1893	x		

Saltatoria abundancies and composition varied much depending on the rain regime and the time of the year. Highest species numbers and abundancies were usually found after a good rainy season, mostly in April to June.

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Fig. 8. Habitat of *H. tenera* (plot 408, see Table 1): savanna grassland in the dry season beside the road Kiserian-Isinya in central-southern Kenya. The Ngong Hills in the background. See also PLATE VII.



Fig. 9. Savanna grasslands (plot 508, see Table 1) during the rainy season in May 2006 at 1700 m with scattered *Acacia*-bushes along the road Isinya-Kajiado; habitat of *H. tenera*. See also PLATE VII.

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Table 2. Comparison of morphological characters separating *H. tenera*, *H. meruensis* and *H. nuda*. Measurements, drawings, distribution and collection dates for *H. nuda* and *H. meruensis* taken from Ragge (1960).

	H. tenera	*H. meruensis*	*H. nuda*
Subgenital plate			
Right tegmen of male			
Total length	male: 17.0 to 21.0 mm female: 15.0 to 18.0 mm	male: 22.4 mm female: 25.1 to 27.2 mm	male: 25.0 to 25.6 mm female: 24.4 to 27.3 mm
Median length of pronotum	male: 3.7 to 4.3 mm female: 4.2 to 4.4 mm	male: 4.3 mm female: 4.2 to 4.7 mm	male: 5.3 mm female: 5.3 to 5.4 mm
Length of hind femur	male: 18.0 to 21.0 mm female: 20.0 to 22.0 mm	male: 20.4 mm female: 19.0 to 20.4 mm	male: 19.2 mm female: 17.6 to 19.7 mm
Length of fore wing	male: 16.0 to 18.0 mm female: 20.0 to 21.0 mm	male: 18.9 mm female: 20.4 to 21.6 mm	male: 19.9 to 20.8 mm female: 18.0 to 20.8 mm
Length of ovipositor	7.0 to 9.0 mm	9.5 mm	11.7 to 12.7 mm
Distribution	Kenya, Ngong Hills and vicinity	Tanzania, between Mt. Meru and Mt. Kilimanjaro	Sudan, Imatong Mts
Collection dates	Apr 2002 May to Jun 2006	Jan 1906 (Ragge 1960) Jan to Apr 1906 (Ragge 1960) Dec 1997 Dec 2006 to Jan 2007	Feb 1936 (Ragge 1960)
Elevation	1700 to 1900 m	1300 to 1400 m	2700 m, 2900 m

while they are shorter and more stout in *H. meruensis* (Fig. 3). The tenth abdominal tergite is much longer in *H. meruensis* than in *H. tenera* and the surface differently sculptured. Furthermore, the posterior margin of the tenth abdominal tergite is roundly incised in *H. tenera*, while it is slightly protruding in *H. meruensis*. In *H. tenera* the abdominal tergites are sharply keeled while the tergites of *H. meruensis* are smooth.

All three species are confined to higher elevations in east Africa and are thus isolated from each other, supporting species status as well. *Horatosphaga nuda* is recorded from elevations of about 2700-2900 m; *H. meruensis* occurs at an elevation of 1200-1400 m only in savanna grassland between the Mountains Meru and Kilimanjaro and *H. tenera* is found at an elevational range of 1700-1900 m in the highlands of central-southern Kenya (Figs 8, 9). These areas are separated from each other by lower elevations and different plant communities. Preliminary molecular data also support the status of *H. tenera* as a separate species from *H. meruensis* (Voje 2007, Lysne Voje *et al*., forthcoming).

Acknowledgements

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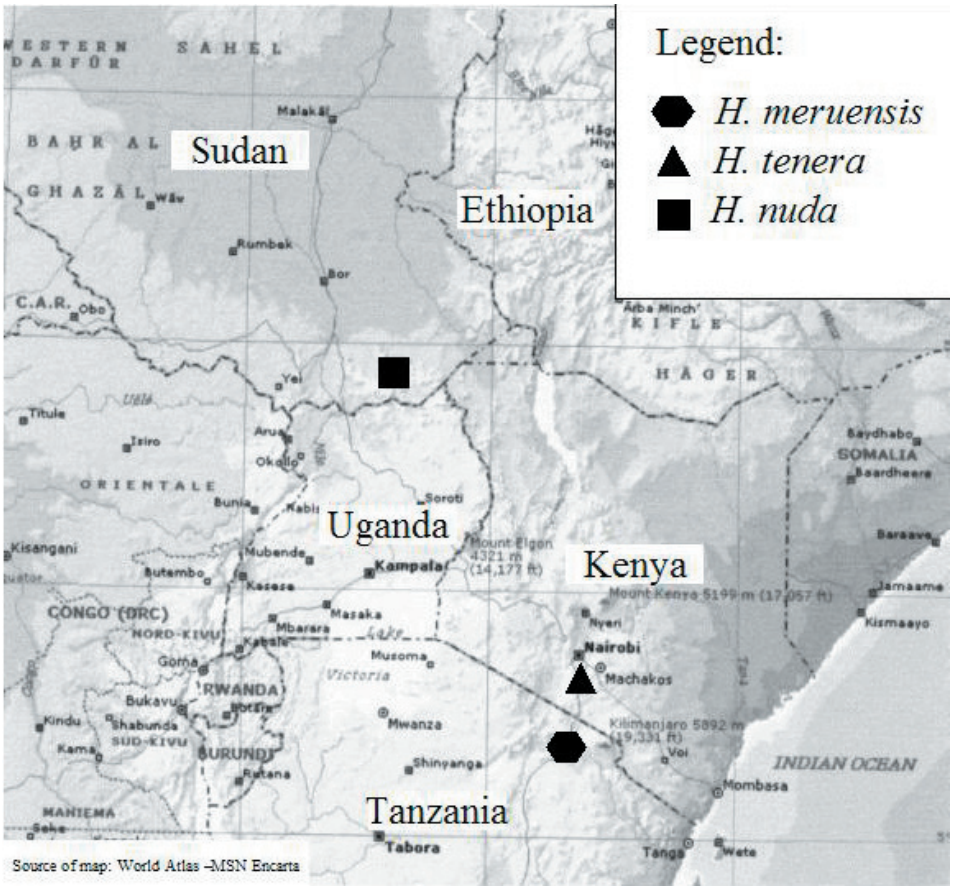


Fig. 10. Distribution map of investigated *Horatosphaga* species in East Africa.

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