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From an old sound recording to a new species in the genus *Horatosphaga* (Orthoptera: Tettigonioidea: Phaneropterinae: Acrometopini)

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Among insects, Orthoptera are a group famous for communicating by sound. This is especially true for bush-crickets (or katydids; Tettigonioidea). All acoustically active species produce sound by rubbing the fore wings (tegmina) against each other, using a stridulatory file situated on the lower side of the left tegmen and a scraper formed by the inner edge of the right tegmen (see e.g., Ragge & Reynolds 1998). Bush-cricket species of the tribe Acrometopini often have complicated stridulatory files and also complex songs, as shown in a recent study (Hemp *et al*. 2017). During the preparation of that paper we discovered a sound record of a species of the group taken on 16th March 1972 by the entomologist David Hollis in Angola as part of the multi-disciplinary entomological South Western Africa Expedition (for more details see Lane *et al*. 2011, Pethers 2016). Hollis (principally a hemipterist) published several papers on different groups of insects (see http://bionames.org/authors/David%20Hollis; incomplete), including Orthoptera (see Ingrisch & Willemse 2004). The sound recording was deposited in the British Museum (Natural History) Library of Recorded Insect Sounds, and was later made openly accessible in the BioAcoustica repository (Baker *et al*. 2015). Hollis had found the animal at light, recorded it on the same day singing on a bush, and brought the specimen (together with two conspecific males) to the Natural History Museum (NHM), London. Here it was later identified as *Horatosphaga ?stuhlmanni* (Karsch 1896) by D. Ragge, the curator of Orthoptera at the NHM at that time. Under this name (*Horatosphaga ?stuhlmanni*) the song was described in Hemp *et al*. 2017. *Horatosphaga* males are fully winged while females are flightless and plump; sexual dimorphism reaches its extreme form in this group of species. Species of this genus are mostly recorded from open grasslands in savanna habitats up to montane elevations (e.g. *H. heteromorpha*, Hemp 2013).

According to the careful revision of the African species of the tribe Acrometopini by Ragge (1960) the species *H. stuhlmanni* was known only from the Albert-Edward-Kivu-rift-valley. It is probably due to the large distance between this area and the collection site in Angola that Ragge was in doubt about the identity of these specimens. However, he appears to have overlooked the study of La Baume (1911) where localities of this species from Ethiopia, Tanzania and Angola were listed (see Fig. 1). One of these localities (Quisoli, collector Kaml, in La Baume 1911, probably to be corrected to Quisoll, near Malange/ Malanje (9°32′S, 16°21′E), where Kaml also collected Lepidoptera; see Strand 1911) is quite close to the place where Hollis found the specimens. So at first glance *H. stuhlmanni* seemed to be another widespread *Horatosphaga* species like, e.g., *H. serrifera* Schaum 1853, the type species of the genus. The comparison of the stridulatory file of one of the Angolan specimens with that of the holotype of *H. stuhlmanni* should have been only a simple confirmation. Surprisingly, however, both files were very different in number and distribution of the stridulatory teeth, and the specimens from Angola turned out to belong to a new species which is described below.

Results

Horatosphaga raggei n. sp.

http://lsid.speciesfile.org/urn:lsid:Orthoptera.speciesfile.org:TaxonName:499339

Type locality: ANGOLA, 7 mls W Gabela, 16.iii.1972 (co-ordinates Gabela: 10°51′S, 14°22′E)

Holotype male NHMUK010211290, paratypes 2 males NHMUK010211288-89

All types bear the labels: (1) ANGOLA (A30), 7 mls W Gabela, 16.iii.1972, (2) Southern African Exp. B. M. 1972-1, (3) Orange paper: The stridulation of this * specimen has been recorded. Tape No. 83, Recording No. 2; * or 1 of 2 others, (4) at light, (5) Horatosphaga stuhlmanni ?, det. D.R Ragge, 1975 (6) NHM#.

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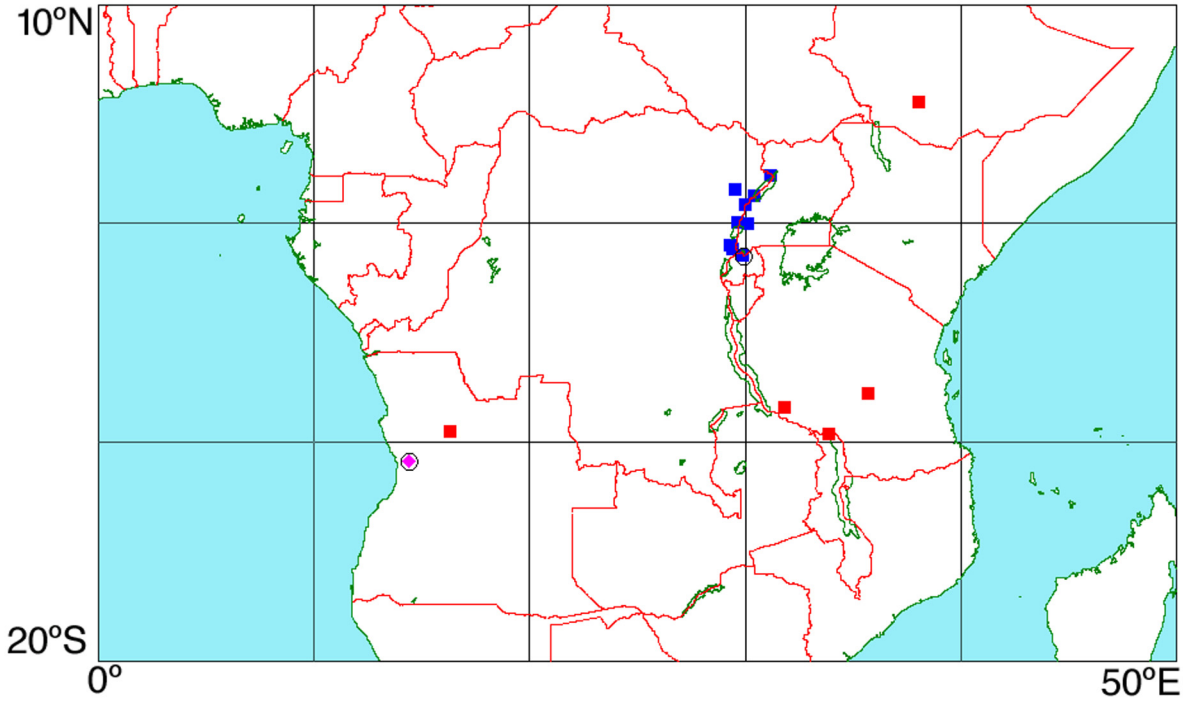

FIGURE 1. Distribution of *H. stuhlmanni* and *H. raggei* **n. sp.** (squares *H. stuhlmanni*, blue: data from Ragge 1960, red: from La Baume 1911, diamond *H. raggei* **n. sp.**, circles type localities).

Depository. NHM.London

Diagnosis. *H. raggei* **n. sp.** differs from the otherwise similar *H. stuhlmanni* in the structure of the stridulatory file, which has far fewer teeth and intervals between teeth becoming increasingly larger from the basal to the distal end (Fig. 2). In *H. stuhlmanni* and the also similar *H. leggei* (Kirby) (see Ragge 1960: p. 286) the teeth intervals do not vary strongly (Fig. 5). The stridulatory vein is longer than in many related *Horatosphaga* species, except for *H. stuhlmanni*.

Description. Male (see Fig. 3, 4). As typical (Ragge 1960: p. 282) for members of the genus, and especially *H. stuhlmanni,* except for the stridulatory file. Stridulatory file with ca. 90 teeth (Fig. 2), basally becoming very small and hard to count, tooth intervals see Fig. 5.

FIGURE 2. Stridulatory file in the holotypes of A *H. stuhlmanni* and B *H. raggei* **n. sp.**

FIGURE 3. *Horatosphaga raggei* **n. sp**, paratypes. A lateral view NHMUK010211289, B dorsal view NHMUK010211288

FIGURE 4. Left tegmen of the holotypes of A *H. stuhlmanni* (mirror image of a picture taken from the lower side) and B *H. raggei* **n. sp.** (asterisks mark the division of Radius sector).

Measurements (in mm): Total length 39.8–40.4 (n=2), median length of pronotum 5.0–5.6 (n=3), length of hind femur 24.3–27 (n=2), length of stridulatory vein 3.2–3.4 (n=3).

Female unknown.

Song. Described and figured under *H. ?stuhlmanni* in Hemp *et al*. 2017: "In the single recording"..available.."the animal sang continuously for about 40 seconds, increasing very slowly in amplitude. During this time two impulse groups were continuously repeated at a rate of about 7 Hz, however, slightly changing their amplitude modulation". The song can be downloaded from BioAcoustica at http://bio.acousti.ca/node/10298.

Derivatio nominis. Named after Dr. D. Ragge acknowledging his many valuable studies on the African Tettigonioidea (for a list see Ingrisch & Willemse 2004), especially his great work on Acrometopini, and his important contributions to Orthopteran bioacoustics, including founding the British Museum (Natural History) Library of Recorded Insect Sounds.

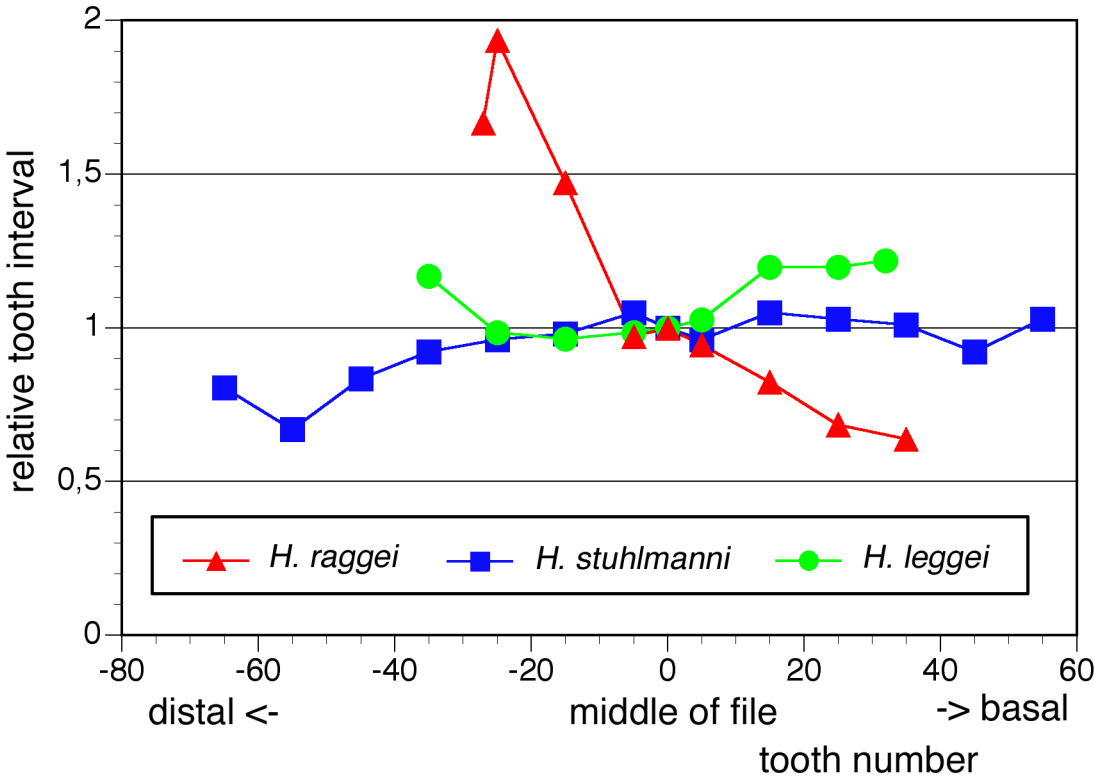

FIGURE 5. Distribution of intervals between the teeth of the stridulatory files in the holotypes of *H. raggei* **n. sp.**, *H. stuhlmanni* and *H. leggei* (interval in the middle of the file set to 1 in each species).

Distribution and similar species. *H. raggei* **n. sp.** is at present known only from the type locality. However, the specimens from Quisoll, the Angolan locality of *H. stuhlmanni* (La Baume 1911; see above), may also belong to *H. raggei* **n. sp.** The centre of the distribution of the genus *Horatosphaga* (and the whole tribe Acrometopini) is obviously East Africa (Ragge 1960). Few species are either more widespread, or found only in other parts of Africa. From Angola only three species are known besides *H. raggei* **n. sp.** *H. serrifera* is clearly larger (hind femur > 30 mm), *H. stylifera* (Karny) differs in the shape of the male subgenital plate (see Ragge 1960) and in *H. media* Ragge the Radius sector is dividing near its base and not in the distal half as usually in *H. stuhlmanni* and *H. raggei* **n. sp.** (see asterisks in Fig. 4).

Interestingly, the locus typicus of *H. raggei* **n. sp.** is also the type locality of *Stylogaster angolensis* Stuke 2015 (Diptera, Conopidae), collected on the same expedition.

The identification of a new species from an archived recording demonstrates not only the importance of collections of recorded wildlife sound, but also the benefit of providing researchers with open access to their contents. This is particularly true for the acoustically communicating species of Orthoptera where song is often the easiest character from which to identify species.

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