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***Phlugis thai* sp.n., a new Phlugidini (Insecta: Ensifera, Tettigoniidae, Meconematinae) from Thailand**

B. Helfert* & K. Snger**

Abstract

A new *Phlugis* species (Tettigoniidae, Meconematinae, Phlugidini) from Thailand is described and diagnosed. Further, the paper provides the first information on stridulation in a member of the tribe Phlugidini.

Key words: taxonomy, new species, Tettigoniidae, Meconematinae, Phlugidini, *Phlugis*, stridulation, Thailand.

Zusammenfassung

Eine neue *Phlugis*-Art (Tettigoniidae, Meconematinae, Phlugidini) aus Thailand wird beschrieben und diagnostiziert. Weiters werden erstmals Daten zur Stridulation einer Phlugidini-Species angegeben.

Introduction

The tribe Phlugidini was erected by EICHLER (1938) and emended by JIN & KEVAN (1992). Presently, it includes four genera from South America, East Africa and the Indo-Australian region. By far the species-richest genus is *Phlugis* STÅL, 1860 (BEIER 1966): it comprises a number of South American as well as Indo-Australian tettigoniids. KEVAN & JIN (1993), however, correctly stated that the Asian species should not be regarded as congeneric with the Neotropical forms. Nevertheless, they assigned several species from the Philippines, Indonesia and New Guinea to *Phlugis* until a proper revision of the genus is available. As we agree in this aspect with KEVAN & JIN (1993), the new tettigoniid will also be assigned to *Phlugis*.

From mainland South-East Asia the genus is only known by *P. thaumasia* HEBARD, 1922, collected in Singapore. This was the hitherto westernmost evidence of the genus and the only one in mainland Asia. All other species are found on the islands of the Sunda- and Sahul regions: *P. dubia* KARNY, 1907 (Pulau Banggi, Sabah), *P. buruensis* KARNY, 1924 (Buru), *P. sulawesi* JIN, 1993 (Sulawesi), *P. borneoensis* JIN, 1993 (Borneo), *P. burgersi* JIN, 1993, *P. novaeguineensis* JIN, 1993, *P. rapax* JIN, 1993 (New Guinea) and *P. philippina* JIN, 1993 (Philippines); a single male that was mentioned but not described by GURNEY (1975) may also belong to the latter species. Nevertheless, the occurrence of members of the genus (or the tribe) was to be expected at least in the peripheral areas of the Malesian region, which is confirmed now by the new record of *Phlugis* in Southern Thailand.

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Material and methods in laboratory investigations

To study songs, adult specimens of *P. thai* (3 ♂♂, 6 ♀♀) were maintained in large gauze cages (40 x 50 x 80 cm) and continuously observed over 27 days. Sound recording took place in a soundproof chamber at 24 °C with an ultrasound detector (PETTERSON D 980) in conjunction with a DAT recorder (SONY TCD-D10 PROII). Sound analysis was carried out using AVISOFT SAS Lab Programme 3.1 for Microsoft Windows.

Syllable numbers and intervals during one 30 s. segment in each of 3 - 5 songs per male were determined.

The stridulatory files of both forewings were embedded in Mark André II and investigated by means of Differential Interference Contrast.

The material is preserved in alcohol and deposited in the Natural History Museum, Vienna.

Results

Phlugis thai sp.n. (Figs. 1, 2)

Type material: Holotype, ♂: Khao Luang (Province Nakhon Si Thammarat, Thailand); wet evergreen rain forest (sensu WHITMORE 1984), 3.II.1997. **Paratypes:** 1 ♂, 30.I.1997; 2 ♀♀, 3.II.1997; 2 ♀♀, 7.II.1997; 6 ♂♂, 4 ♀♀, 13.II.1997; 6 ♂♂, 3 ♀♀, 15.IX.1997, all same locality; 3 ♂♂, 2 ♀♀, 23.IX.1997, Khao Phra Taew (Province Phuket, Thailand), moist evergreen rain forest (sensu WHITMORE 1984).

Further material: Larvae in different stages: 1 ♀, 30.I.1997; 1 ♀, 13.II.1997; 1 ♂, 5 ♀♀, 15.IX.1997, Khao Luang; 1 ♀, 21.IX.1997, Sri Phang Nga (Province Phangnga, Thailand), moist evergreen rain forest (sensu WHITMORE 1984); 2 ♂♂, 1 ♀, 23.IX.1997, Khao Phra Taew.

Description:

Measurements:

Tab. 1: Measurements of type specimens (mean, standard deviation, range). Body length is apex of the vertex to posterior margin of ultimate tergite, head length is vertex to clypeal suture. n ♂♂ = 17, n ♀♀ = 13; H = Holotype, P = Paratypes.

Length in mm	H/ ♂	\bar{x}	P/ ♂♂ ±s	range	\bar{x}	P/ ♀♀ ±s	range
Body	12.9	12.7	0.8	10.8 - 13.8	12.8	0.9	10.8 - 14.4
Head	1.5	1.4	0.1	1.3 - 1.6	1.5	0.1	1.3 - 1.8
Pronotum	3.2	3.4	0.2	3.0 - 3.6	3.1	0.2	2.8 - 3.3
Elytra	5.2	5.2	0.2	4.8 - 5.6	5.2	0.3	4.5 - 5.8
Metafemur	11.2	11.2	0.3	10.8 - 11.8	11.5	0.3	11.0 - 11.9
Metatibia	11.4	11.4	0.3	11.0 - 12.1	11.7	0.3	11.2 - 12.2
Ovipositor					4.9	0.5	4.1 - 5.5

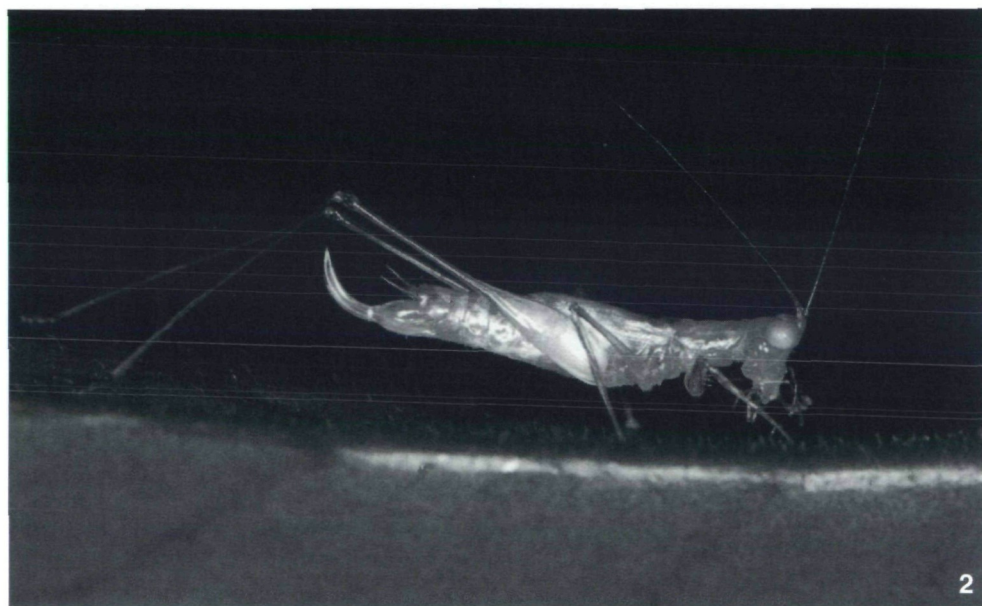
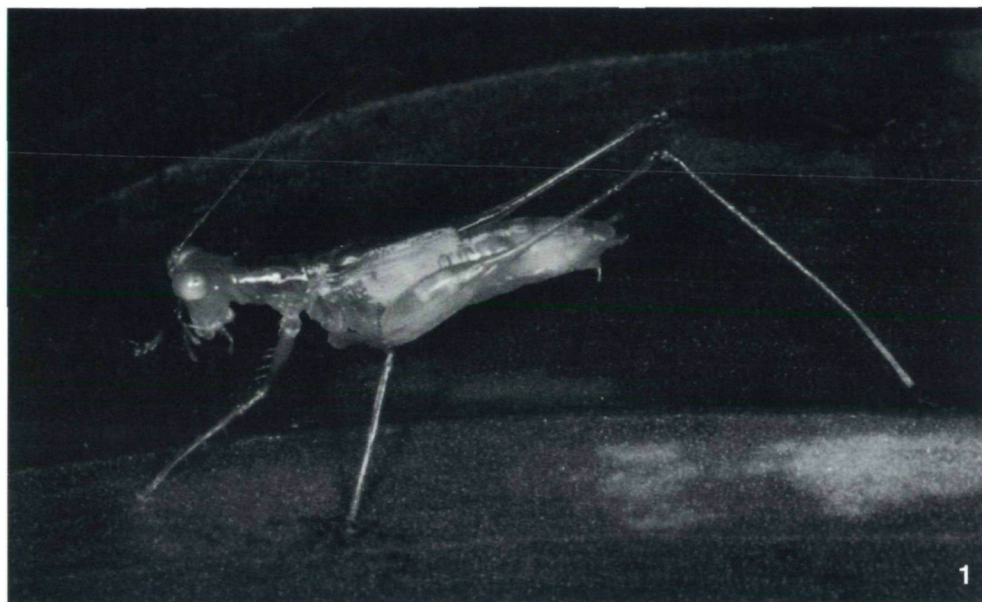


Fig. 1, 2: *Phlugis thai*, (1) ♂, (2) ♀.

Small, delicate animals. Head similar to the other members of the genus. Eyes globular, no distinct fastigium verticis visible. Pronotum cylindrical, anterior margin slightly concave, posterior margin convex, metazona elevated; anterior sulcus vaguely indicated, posterior sulcus weak. Lateral lobes of the pronotum (= paranota) shallow, anterior margin convex, ventral margin nearly straight, posterior margin oblique. Foramen prothoracicum

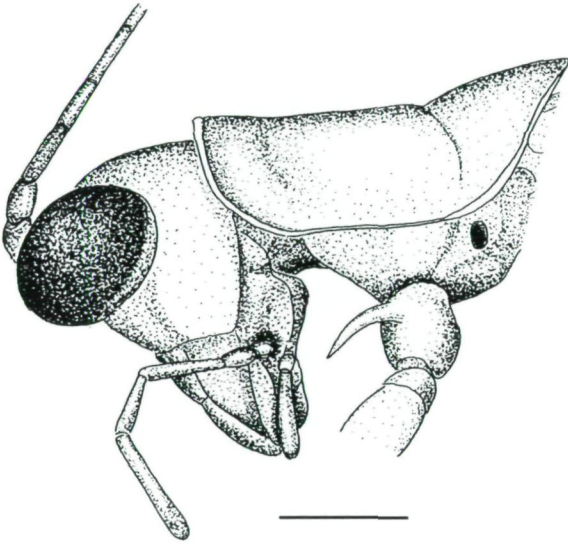


Fig. 3: *Phlugis thai*, ♂; head and pronotum in lateral view. Scale bar = 1 mm.

exposed, elliptical. Prosternum unarmed, mesosternum with one pair of blunt processes, metasternum with blunt lobes. Micropterous (sensu HARZ 1969), elytra reaching the middle of abdomen; alae slightly shorter (in most males) to slightly longer (in most females) than elytra. Procoxa with a long, downcurved spur (Fig. 3). Profemur with 4 inner and 4 outer spines. In two paratypes (both females), one profemoral spine is indicated only by a blunt hump. Protibia with open tympana on the inner and outer side and with 4 long inner and 4 outer spines and 1 small apical spur on both sides. Mesocoxa, metacoxa, mesofemur and metafemur unarmed. Mesotibia with 1 small apical spur on the inner and outer side. Metatibia dorsally with 24 - 37 inner and 24 - 34 outer spines and dorsally and ventrally with 1 apical spur on the inner and outer side.

Genital segments:

Male (Fig. 4 a-c):

Posterior margin of ultimate tergum slightly concave, supra-anal plate small, semi-circular, directed ventrad, not visible in dorsal view. Cerci flattened, with blunt apices and long, inward-curved, pointed internal processes, which are located directly at the base. Without sclerotised titillators. Subgenital plate broad, posterior margin slightly concave; styli long, slender, cylindrical, directed ventrad.

Female (Fig. 4 d-e):

Supra-anal plate small; cerci with relatively broad bases, apically tapering, slightly curved inwards, about half the length of ovipositor. Basal part of ovipositor distinctly expanded, distal part flat, strongly upcurved, slightly longer than basal part, ventral valves at apex minutely serrated. Subgenital plate nearly triangular, apex truncate.

Colouration in vivo:

General colour translucent green, frons and genae whitish green, labrum white, eyes ventrally white, dorsally green, maxillary palpus and labial palpus proximally whitish

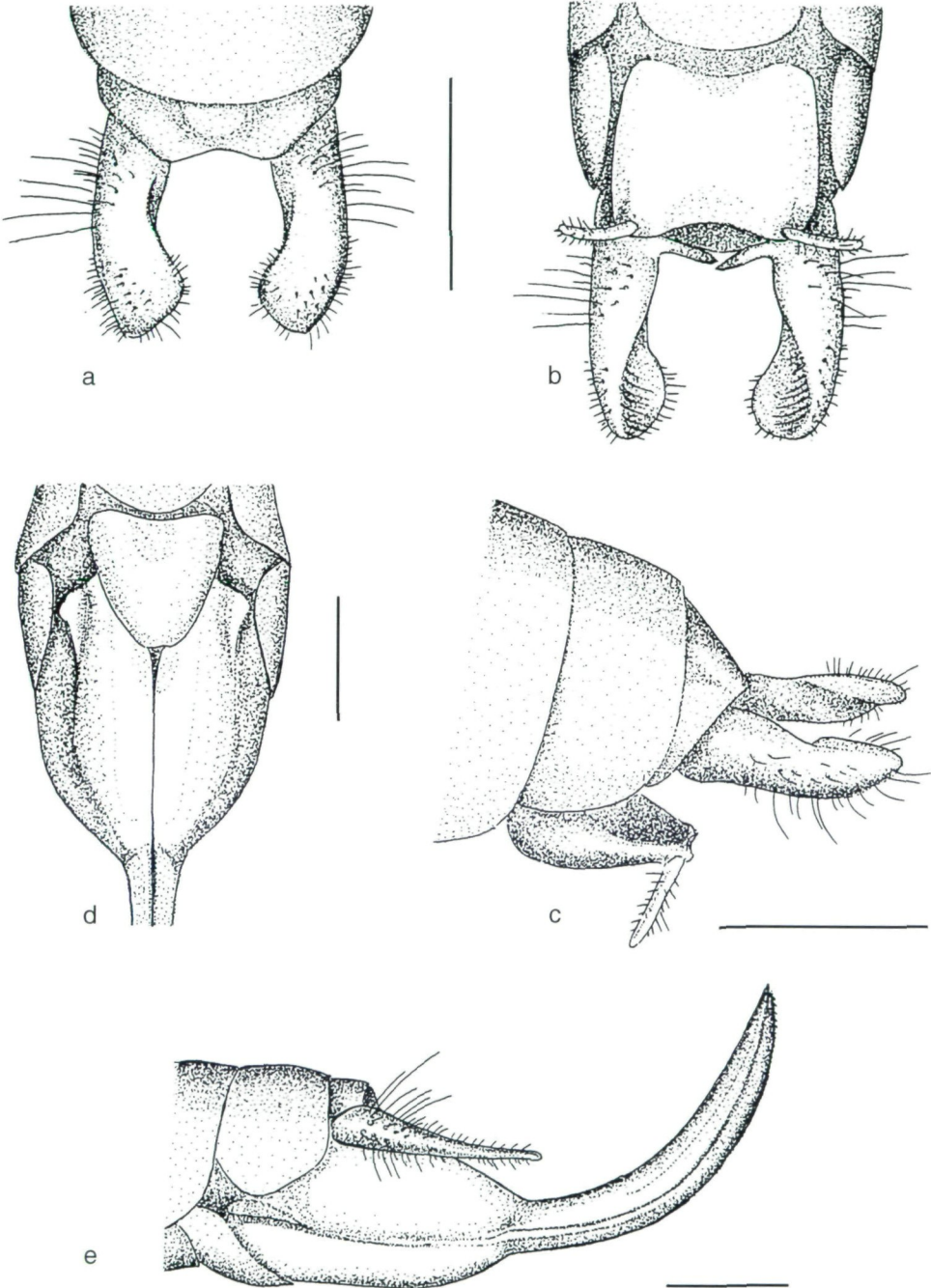


Fig. 4: Ultimate segments of *Phlugis thai* (a-c: ♂, d-e: ♀); (a) in dorsal view, (b, d) in ventral view, (c, e) in lateral view. All scale bars = 1 mm.

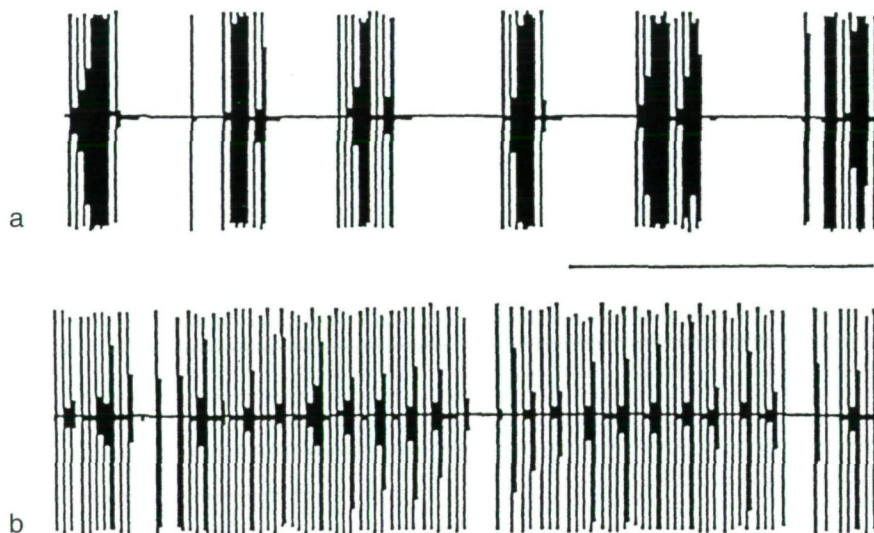


Fig. 5: Song types of *Phlugis thai*; (a) slow, less intense type; (b) rapid, intense type. Scale bar = 1 s.

green, distally light-grey; mandible whitish, apically grey, scapus whitish green, pedicellus bright green, flagellum light-brown, dark-brown annulated; vertex and pronotum dorsally with delicate bright green markings, distal margin of discus olive; elytra translucent green, with bright green veins, alae colourless, with green venation; abdominal tergites yellow-green, the distal margins bright green. Legs translucent green, apex of the metafemora greyish brown, tibiae distally whitish grey, protibial spines whitish grey, metatibial spines grey, pro- and mesotarsi grey, metatarsi black. Ventral side whitish green, subgenital plate whitish green, cerci bright green. Ovipositor basally whitish green, distally whitish brown, apically chestnut.

Colouration ex alcohol:

General colour whitish to tawny, flagellum brown, metatarsi dark-brown. Distal part of ovipositor chestnut.

Diagnosis:

P. thai is the northernmost and westernmost of the hitherto known Asian *Phlugis*-species. The length of the wings corresponds with *P. burgersi* and *P. rapax*. The cerci of *P. thai* bear a long, inwards-curved process, which branches off directly from the base. Among the Asian species only *P. sulawesi* has a similar process, which is not located at the base, but at the basal quarter of the cercus. In *P. sulawesi* the distal parts of the cerci are long and slender, whereas *P. thai* has cerci with a rounded apex. Furthermore, the wings are considerably shorter than in *P. sulawesi*. The ovipositor of *P. thai* shows similarities with *P. rapax*, but in the latter species the subgenital plate is narrowly triangular and not broadly triangular with truncate apex like in *P. thai*. *P. thaumasia*, the only species hitherto found in Mainland Asia, has different-looking genital segments and the elytra reach the hind knees; the females are unknown.

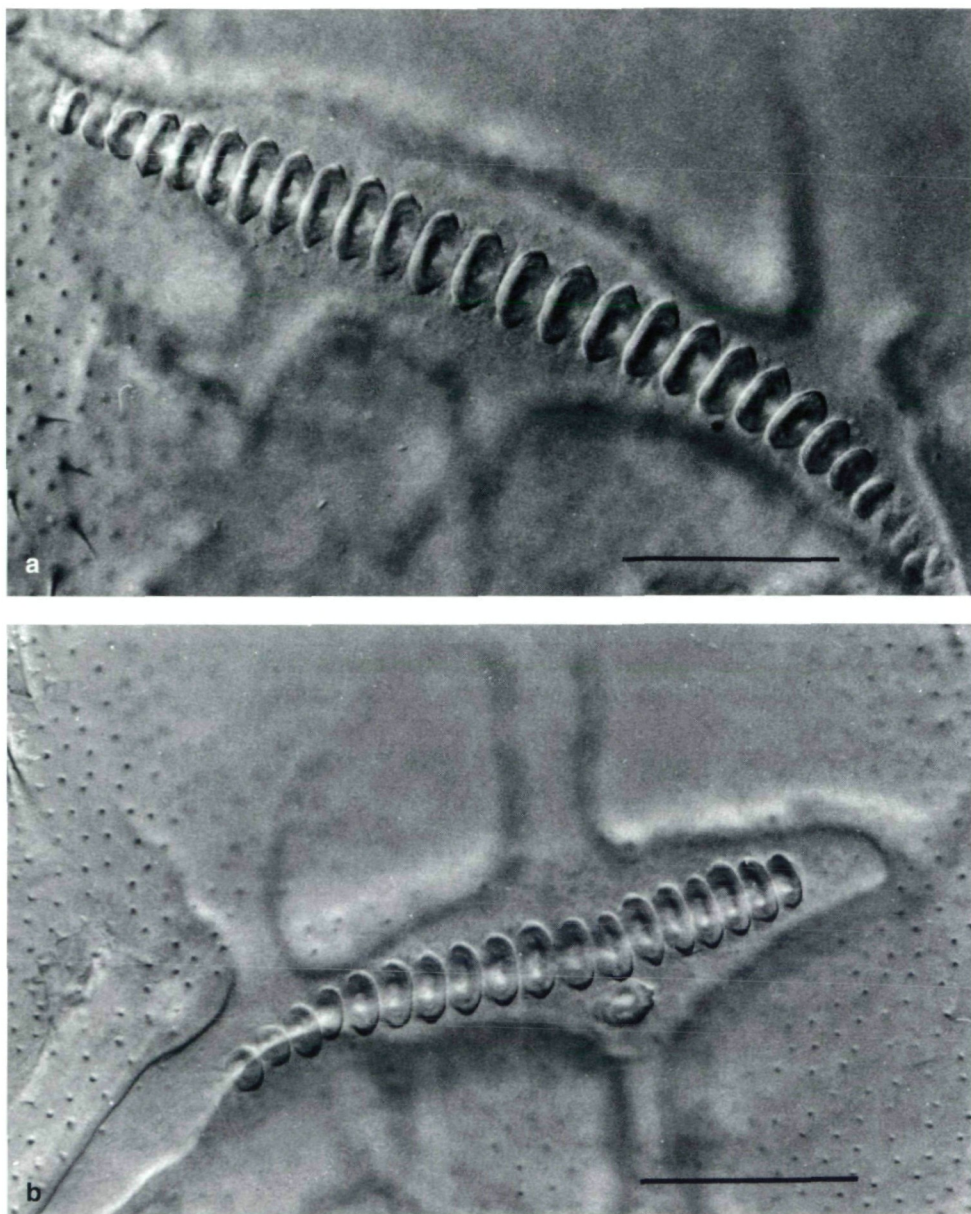


Fig. 6: Stridulatory files of *Phlugis thai*; (a) left elytra, (b) right elytra. Scale bar =0.1 mm.

Etymology: Named after the country of origin, Thailand.

Stridulation:

During the investigation period no calling song was registered in *P. thai*, only a poly-syllabic courtship song. This song consists of regularly repeated chirps and is performed

in two different intensities, depending on behaviour of the mate. Approaching females are courted with a less intense, slow song comprising short syllables (mean duration = 210 ± 70 ms) followed by comparatively long intervals (mean duration = 390 ± 110 ms) (Fig. 5a). If no copulation takes place and the female turns away, the male reacts with considerably increased stridulation. This intense, rapid song consists of prolonged syllables (mean duration = 750 ± 190 ms) and reduced syllable intervals (mean duration = 130 ± 30 ms) (Fig. 5b). Sound duration is increased and the pause diminished approximately by a factor of three. During the investigation period no intermediate song was observed. The maximum frequency lies between 30 and 50 kHz. As these observations and sound records of a *Phlugidini* are the first ever made, comparative analyses of sexual behaviour in connection with stridulation remain to be done.

Stridulatory files: Stridulatory files exist in both elytra (Fig. 6a, b). The file on the left elytra has 26 - 27 teeth, the file on the the right elytra has 16 - 18 teeth (number of examined males = 3).

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