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Morphology, Genitalia, and Natural History Notes on the Enigmatic Tiger Beetle, *Mantica horni* Kolbe, 1896 (Coleoptera, Cicindelidae)

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Abstract. The morphology of the extremely rarely collected tiger beetle, *Mantica horni,* is described on the basis of a large series from a new locality near Maltahöhe, southern Namibia. Male genitalia and female external genitalia are described for the first time and compared with those of the presumed sister genus, *Manticora*. Additionally, we firstly report on habitat and behaviour of the species.

Key words. *Manticora*, habitat, Namibia.

1. INTRODUCTION

The cicindelid tribe Manticorini consists of two genera, *Mantica* Kolbe, 1896 and *Manticora* Fabricius, 1792 and contains very large, crespuscular to nocturnal, exclusively southern African species. In contrast to the comparably well known genus *Manticora* (e.g., KLUG 1849; ROER 1984; MAREŠ 1976, 1995, 1997, 2002; LEFFLER 1980; WERNER & WIESNER 1994, 1995; WERNER 2000), the only species of the genus *Mantica*, the southern Namibian *M. horni* Kolbe, 1896, is regarded as extremely rare and its biology is virtually unknown. Since the original description, which is based on two males (KOLBE 1896), only a very few additional individuals have been collected, most of them presumably incidentally (MAREŠ 1976, 2002; WERNER & WIESNER 1994, 1995; WERNER 2000). Comprehensive information on the morphology of the species is only given in the original description, where KOLBE (1896) presents a fairly good description of the two male syntypes (for an English translation of the original description see PÉRINGUEY 1896). Subsequently, there were almost no data added, with the exception of a few comparative features mentioned by HORN (1910) and some basic habitat data ("Sand plateau on top of the Fish River Canyon without almost no vegetation", "long grass and other scattered plants near Karasburg") by MAREŠ (2002). Most recently, good photographs of almost all collected specimens including one of the syntypes (not "holotype" as mentioned by MAREŠ 2002) were published by WERNER & WIESNER (1994), WERNER (2000), and especially MAREŠ (2002). However, until today almost any detailed information on habitat, biology and even female morphology are lacking.

In February 2003, O. and W. Heinz discovered a mass aggregation of *Mantica horni*. This gave us the opportunity to report firstly on certain aspects of the morphology, genitalia, habitat, behaviour, and prey of this enigmatic species.

2. MATERIAL AND METHODS

In total 45 specimens (24 males, 21 females) were examined. The series was collected on 5 February 2003, approximately 3-5 km W of Maltahöhe (Namibia, Hardap district) at the upper course of the Hudup River (a tributary of the Fish River), 24°50'S, 16°54'E, 1300 m a.s.l. All specimens are currently in the authors' collections.

MAREŠ (1995) found no distinguishing characters among male genitalia of *Manticora* species. Consequently, we compared *Mantica* genitalia only with one male of *Manticora livingstoni* from 30 km E of Rundu, Namibia, and one female of *Manticora* cf. *latipennis* from an unknown locality in the Republic of South Africa (both in the collection of M. Franzen).

Measurements taken are: total length (without labrum), body width (across the widest points of the elytrae), and elytral length. The internal sacs of two male aedeagi were gradually blown out with water. Toothpaste was than injected into the fully blown out sacs to keep them in form; finally they were fixed and stored in 5% formaldehyde solution. Female genitalia were removed from two individuals, which had their ovipositors everted. The nomenclature of the male genitalia follows ISHIKAWA (1978) and MATALIN (1998), and those of the female genitalia FREITAG (1972).

3. RESULTS

3.1. Description

3.1.1. Morphology. Coloration entirely shiny black. **Head.** Antennal scape and antennal segments 2 to 4 with scattered semierect setae additionally to sensories (Fig. 1a). Left mandible (Fig. 1b, c) slightly longer than right in males; in a very few individuals mandible lengths appear almost equal; mandible lengths equal in all females; outer basal half of mandibles with long erect setae. Labrum (Fig. 1d) much wider than long, with 6-10 (mostly 8) submarginal setae; indistinctly quadridentate, "teeth" appear as rounded bulges. Clypeus with some 12-15 long erect setae. Frons and vertex smooth (except for setigerous punctures), shiny; frons with median field of long erect setae, extending anteriorly to eyes; a conspicuous ridge present from above insertation of antennae to middle of eye; row of four supraorbital setae extending posteriorly to irregular row of 10-12 setae submarginally across head. Eyes small. Genae with scattered, long, erect, thin setae. **Prothorax.** Pronotal shape globose, with very deeply impressed anterior and posterior transverse sulci, latter forming two somewhat rounded-triangular, posteriorly reaching lobes; a minute bulge at posterior angle; median longitudinal sulcus indistinct if visible; a short lateral bead extends from shortly after anterior transverse sulcus to posterior third of pronotum; pronotal surface shiny, with scattered long, erect setae along anterior, posterior, and lateral margins; anterior setose margin reaching to anterior transverse sulcus, lateral margin reaching onto disc; centre of disc almost glabrous except some single short setae. Proepisterna shiny with smooth surface. Prosternum with transverse ridge bearing row of short erect setae. **Pterothorax.** Mesepisterna glabrous, females lack coupling sulcus. **Elytra.** Shape of elytrae ovoid, apically pointed, shoulders rounded; surface of elytrae and epipleura of elytrae with numerose large carinate tubercles (largest ending in a cylindrical cone), each one bearing a fine, long seta at its posterior base; tubercles have their highest point posteriorly; tubercles very small and almost lacking on anterior elytrae along suture and densest and highest within apical third of elytrae; apically largest tubercles form two oblique, serrated ridges, starting at posterior central third and extending to apical tip of suture. **Abdomen.** Sterna with transverse rows of fine, long semierect setae. **Legs.** Coxae with fine long setae, densest posteriorly; trochanters adpressed setose; femora, tibiae, and tarsomeres with dense cover of thick, black, erect setae; tarsi not dilated in males.

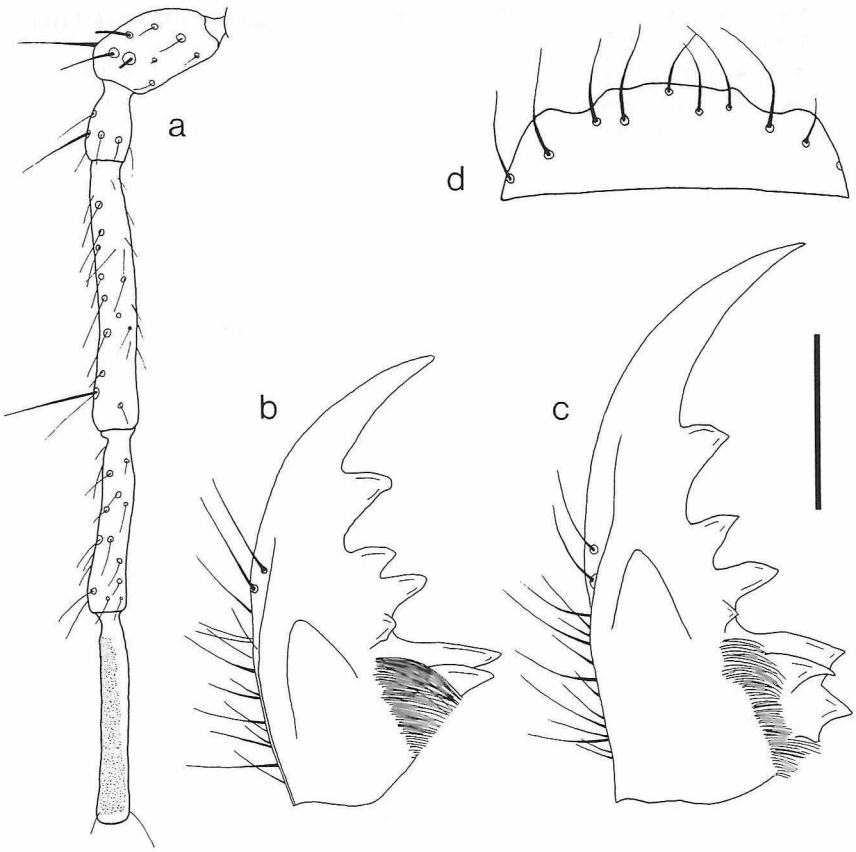

Fig. 1: *Mantica horni.* **a)** first five antennal segments, male; **b)** left mandible, female; **c)** left mandible, male; **d)** labrum, male. Scale bar: 2 mm.

3.1.2. Male genitalia. Shape of aedeagus moderately elongate and evenly curved, with considerably thickened basal part and very tiny apical knob (Fig. 2c); it lacks any structures like concavities, lateral flanges or lobes; dorsal ostium (apical orifice) very long, forming about 40% of aedeagal length, and basally divided by narrow, sclerotized thorn (Fig. 2c). Internal sac (Fig. 2a, b) strongly elongate, with large and protuding, thumb-like basal bladder; dorsally a long sclerite which is probably identical with ligula sensu ISHIKAWA (1978). Truncal tube extremely elongate, formed by basi-lateral right bladder. Sclerites and bladders on apical portions only indistinctly discernible in our specimen. The identifiable stuctures include a prominent praeputial pad, very long flagellum, relatively small medial tooth, upper limitator, and shield (Fig. 2a, b).

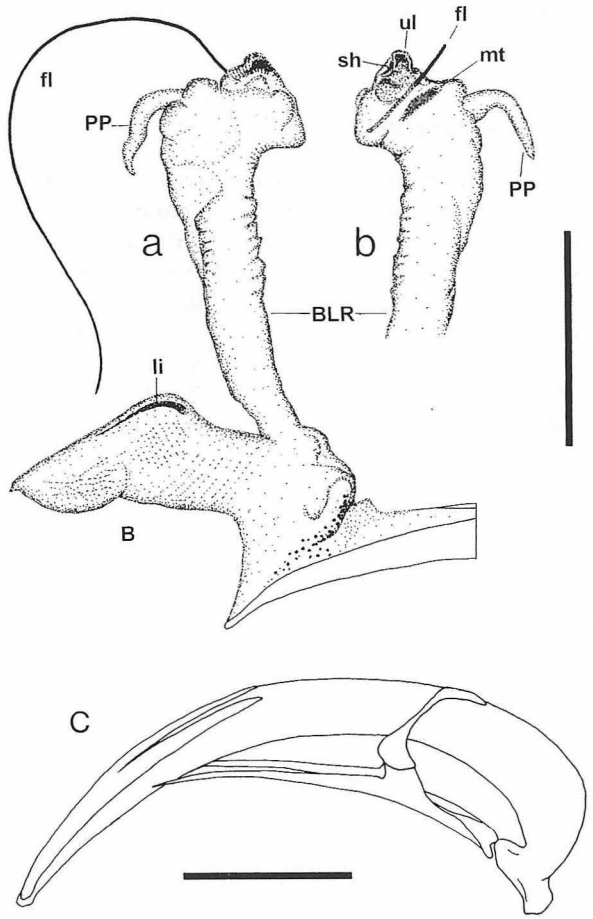

Fig. 2: Male genitalia of *Mantica horni*. **a)** internal sac, right lateral view; **b)** apex of internal sac, left lateral view; **c)** adeagus. Sclerites: fl = flagellum, li = ligula, mt = median tooth, sh = shield, ul = upper limitator; bladders: B = basal bladder, BLR = basi-lateral right bladder, PP = praeputial pad. Scale bars: 3 mm.

The aedeagus and the general internal sac proportions and structures resemble those of *Manticora livingstoni* almost completely. The only exception is the lack of a praeputial pad in *Manticora*. However, it may be that this structure has been incompletely blown in the latter.

3.1.3. Female external genitalia. In two females ovipositors everted with a length of 32-34 mm (oviduct + ovipositor). Sternum eight (Fig. 3a, b) apically broadly rounded, with narrow, triangular medial emargination; apex with numerous short, fine setae. Second gonocoxa with no ventral groove or notch, inner apical sides with some scattered very fine short setae (Fig. 3a). Second gonapophyses short and broad; lateral portions somewhat triangular and distinctly shorter than medial, both portions curved dorso-medially (Fig. 3a, b). Syntergum 9&10 appearing somewhat ovoid with lateral portions slightly pointed at apex (Fig. 3c); apical two-thirds of lateral portions with numerous setae.

Female external genitalia of *Manticora* resemble those of *Mantica horni* almost completely, with the exception of less broadened medial and lateral portions of second gonapophyses, less pointed lateral portions of syntergum 9&10, and the overall larger size in *Manticora*.

3.1.4. Sexual dimorphism. Besides different mandible lengths and a tendency to have the left mandible longer than the right in males (see above), there are several morphometric characters which separate males from females: males have slightly shorter total lengths than females and possess shorter and narrower elytra (see Table 1.: EL/TL, BW/TL, BW/EL).

Table 1: Morphometric values of *Mantica horni*. TL = total length; EL = elytral length; BW = body width.

	TL	EL/TL	BW/TL	BW/EL
Males (n = 24)				
mean	28.0	0.60	0.39	0.66
standard deviation	1.08	0.01	0.01	0.03
range	26.0-30.0	0.58-0.62	0.37-0.41	0.61-0.71
Females (n = 21)				
mean	30.0	0.62	0.42	0.69
standard deviation	1.11	0.01	0.01	0.02
range	27.5-32.0	0.59-0.65	0.40-0.44	0.66-0.73

3.2. Habitat and natural history observations

All specimens were collected from a gravel road leading between the Hudup River and the south-facing slopes of the directly adjoining hilly terrain. The steep slopes (inclination about 30°) were rocky and had about 40% rocks, stones and gravel on the surface, with interspersed fine loamy substrate. However, loamy areas dominated near to the river. The vegetation consisted of grasses and shrubs, with interspersed thorn bushes. Vegetation cover was approximately 50%, with bushes making about 15%.

On February 5, the locality was visited two times. During the first visit, about two hours before dusk, no beetles were observed. Returning one hour later, the mass aggregation was observed. From that time activity continued until dusk and then markedly decreased. During the observations the weather was clear and air temperature was around 30°C. On the previous day, a heavy thunderstorm brought the first heavy rains after a long dry season and there was much humidity around with puddles and small rivulets along the road. The locality was revisited in early morning of the next day, but without finding any more *Mantica*.

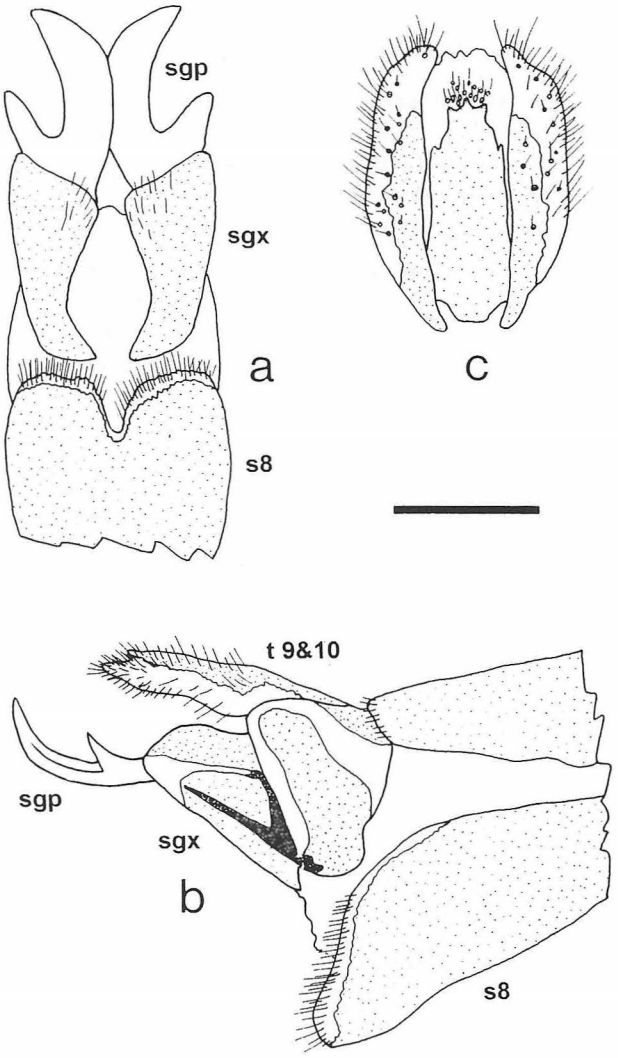

Fig. 3: Female external genitalia of *Mantica horni*. **a)** apex of sternum, ventral view; **b)** apex of sternum, lateral view; **c)** syntergum 9&10, dorsal view. s8 = sternum eight, sgp = second gonapophysis, sgx = second gonocoxa, t9&10 = syntergum 9 & 10. Scale bar: 2 mm.

It appeared that during the beginning of the observations beetles' movements were directed downhill towards the road/river. Later, individuals stayed on the road. Coupling pairs comprised about 30% of the beetles observed. In addition, two females were presumably taken during oviposition because they had their ovipositors everted. Most individuals (including mating couples) were found actively foraging on swarming termites. Movements were fast and if disturbed, individuals tried to escape by running even more quickly into dark, shaded areas (e.g., under the car). Single individuals or couples were observed every 10 to 100 m along the road.

Although no individuals of the series were teneral, three males possessed comparably soft aedeagi and it appears that hardening after emergence may not have been fully completed in these individuals. Thus, at least a part of the series may have been taken only several days after emergence (see WILLIS 1967: 189-190 for a timetable of hardening after emergence in some North American *Cicindela*).

4. DISCUSSION

The new locality extends the known range of the species some 190 km to the north (measured from the formerly known northernmost precise locality ("Bethanien [Hanam Plateau]": WERNER & WIESNER 1994). Despite this considerable range extension, we could not find any obvious morphological differences among our new material and the previously collected specimens (compared with the photographs in MAREŠ 2002; WERNER 2000; WERNER & WIESNER 1994). We found only one external character mentioned by KOLBE (1896), which is differing in our new material: KOLBE (1896) states that right and left mandible lengths are equal in males. Although indistinctly visible in some individuals, most of our males possess a slightly longer left mandible.

The close relationship of *Mantica* and *Manticora* is stressed by several unique characters (see also MAREŠ 2002): both genera possess unequal mandible lengths in males (but character heterogenous in *Mantica*), lack dilated tarsi in males, possess ciliated apical palpal segments and long setae on the outer mandible sides, have similar organized dorsal elytral tubercles which form two oblique ridges apically, and have rather similar male and female genitalia. By contrast, both genera are well separated by the longer, asymmetrically formed mandibles of *Manticora,* more labral teeth in *Manticora* (6 vs. 4), the generally much more "robust" habitus of all *Manticora* species, which is basically expressed by broader heads and elytrae, and pronounced bulged elytral shoulders.

The observations at Maltahöhe indicate that short surface activity of *Mantica* is linked with rare and strongly localized rains in its arid habitats. WERNER (2000) mentioned several observations that *Manticora* species were

found abundantly under the same conditions, i.e. hunting for myriapods and tenebrionids after rainfall. Prey items have never been reported for *Mantica*, but we presume that the species is an opportunistic feeder, predominantly preying on such invertebrates, which share their seasonal surface activity with the tiger beetle.

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