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Helophorus (*Thaumhelophorus*) *inexpectatus* ANGUS, 1995: description of male genitalia and notes on distribution, morphological variability and bionomy (Coleoptera: Helophoridae)

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Abstract

Description of male genitalia, discussion on variability of the external features and notes on bionomy of *Helophorus* (*Thaumhelophorus*) *inexpectatus* ANGUS, 1995 (Coleoptera: Helophoridae) are given. This species is known only from India so far, occurring in the states of Meghalaya and Rajasthan.

Key words: Coleoptera, Helophoridae, *Helophorus, Thaumhelophorus*, morphology, variability, bionomy, distribution, Oriental Region, India.

Introduction

Helophorus (*Thaumhelophorus*) *inexpectatus* ANGUS, 1995 was described from material collected in India during 1978 by C. Besuchet and I. Löbl. Because of the unusual morphology of the species, the description was based on the only female and the species was placed in a separate subgenus, *Thaumhelophorus* ANGUS, described in the same paper (ANGUS 1995). Recently, some additional material of this species was found by both authors. In this paper, we sum up the data about this species and on their basis discuss its morphological variability, possible taxonomic position, distribution and bionomy.

Material and methods

This paper is based on the study of all known specimens of *H. inexpectatus*, including the type specimen. Male specimens from both Rajasthan state (3 exs.) and Meghalaya state (1 ex.) were examined. Material was examined using an Olympus SD30 binocular microscope, and the photographs of aedeagophores were prepared using a Leitz Orthoplan photomicroscope. The morphological terms follow ANGUS (1992). Nomenclature of the subgenera of *Helophorus* follows HANSEN (1999).

Acronyms:

FHCD	coll. F. Hebauer (Grafling, Germany)
MFPC	coll. M. Fikáček (Praha, Czech Republic)
MHNG	Muséum d'Histoire naturelle, Genève (I. Löbl)
NHMW	Naturhistorisches Museum Wien (M.A. Jäch)
RALC	coll. R.B. Angus (London, UK)

Systematic part

Helophorus (*Thaumhelophorus*) *inexpectatus* ANGUS, 1995

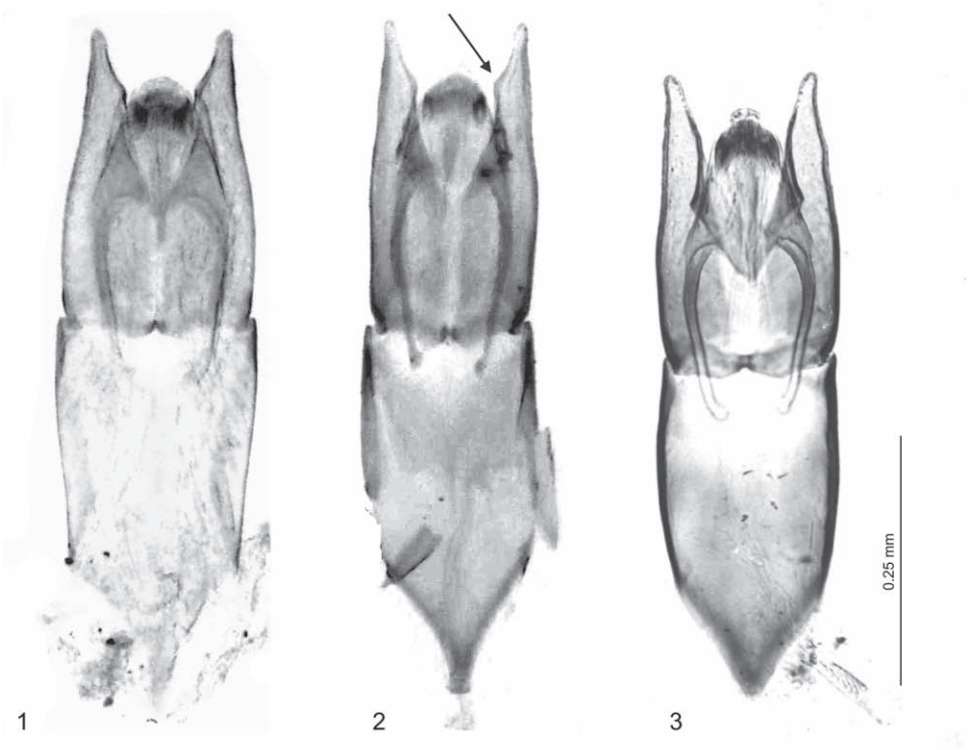
Helophorus (*Thaumhelophorus*) *inexpectatus* ANGUS, 1995: 194.

TYPE LOCALITY: India: Khasi Hills.

EXAMINED MATERIAL (6 specimens):

I N D I A: MEGHALAYA: Khasi Hills, 1000 m, Mawsynram – Balat [i.e. ca. 16 km by road from Mawsynram to Balat – I. Löbl, pers.comm.], 27.X.1978, Besuchet & Löbl leg. 1 ♀ (holotype), Angus det. (MHNG); Jaitia Hills, Jowai, 1350 m, 25°27'N 92°12'E, 6.–8.VI.1996, Šauša & Jendek leg., 1 ♀, Angus det. (NHMW); W Garo Hills, Bagmara, ca. 100 m, 25°11.5'N 90°38.5'E, 19.–21.V.1996, Jendek & Šauša leg., 1 ♂, Angus det. (NHMW). RAJASTHAN: Bharatpur [i.e. Bharatpur env. Keoladeo National Park – Riedel pers.comm.], 11.VIII.1989, A. Riedel leg., 1 ♂, Angus det. (FHCD); Bharatpur env.; 220 m, 27°12.42'N 77°30.48'E, 31.VIII.–5.IX.2002, Šípek & Fikáček leg. , 2 ♂♂, Fikáček det. (MFPC, RALC).

DESCRIPTION OF MALE GENITALIA (Figs. 1–3): Total length of aedeagus 0.56–0.70 mm. Length of parameres / length of basal piece ratio 0.70–0.95. Parameres relatively narrow, outer edge nearly parallel-sided, with top slightly bent outwards. Inner margin strongly angled at apical fifth in Rajasthan specimens; angle much weaker, almost indistinct, parameres thus widened almost regularly from apices to bases in Meghalaya male.



Figs. 1–3: Aedeagophores of *Helophorus inexpectatus*, 1–2) specimens from Bharatpur (both Fikáček & Šípek leg.), 3) specimen from the Garo Hills (Jendek & Šauša leg.). The arrow shows the angle on the inner margin of the paramere mentioned in the description.

VARIABILITY OF EXTERNAL CHARACTERS: Because *H. inexpectatus* was described on the basis of the only specimen, any notes on the variability of this species could not be given. However, examination of the known specimens shows that this species is rather variable in some external characters. These characters are discussed below. In the case of variability which seems to be influenced geographically, the origin of the specimens is given.

LENGTH: Males: 3.3–3.5 mm. Females: 3.6–3.9 mm.

HEAD: Granulation of head somewhat stronger and more distinct in specimens from Rajasthan, granules bigger and not so distant from each other; granulation becoming denser on clypeus in all specimens. Stem of Y-groove rather parallel-sided (Rajasthan) or slightly widened anteriorly (Meghalaya). Maxillary palpi distinctly asymmetrical in most specimens. Antennae with 8 antennomeres in all specimens.

PRONOTUM: General shape of pronotum rather variable – lateral margins more strongly curved, anterolateral angles more pronounced and pronotum widest in anterior 0.25 in the three males; lateral margins more weakly curved, anterolateral angle not so distinctly produced forwards and pronotum widest in anterior 0.3 of pronotum in the two females. Pronotal coloration similar in all specimens. Shape of intervals and grooves almost the same in all specimens; only submarginal groove slightly variable in shape, with its anterior widening more distinct in Rajasthan specimens than in Meghalaya ones. Granulation slightly denser than on head on internal and middle intervals, becoming sparser on external intervals; granulation much finer with granules smaller and more distant in Meghalaya specimens than in Rajasthan specimens. Suprapleural area similar in all examined specimens, wide anteriorly and distinctly narrowed posteriorly.

ELYTRA: Intercalary stria absent in all specimens. Suture and interstices 2, 4, 6 and 8 raised into distinct ridges. Ridges more distinctly pronounced in Rajasthan specimens, extending to elytral apex and in most specimens; not so distinct and not reaching elytral apex in male from the Garo Hills (Meghalaya). Elytral coloration variable, Rajasthan specimens slightly darker than Meghalaya ones. Elytra with distinct Λ-mark consisting of dark spots on sutural interstice and interstice 2, and with additional spot on interstice 6 in Meghalaya specimens (in female from the Jaitia Hills spots on sutural interstice not very distinct). Elytra with dark spots on interstices 3 and 6 only and Λ-mark absent in specimens from Rajasthan. In all specimens, interstices 2, 4 and 6 paler (only weakly in male from Garo Hills). Elytral flanks and epipleura similar in all examined specimens, flanks distinctly wider than epipleura, reaching apical sixth of elytral length. Epipleura strongly narrowed opposite to metaventrite.

The overall differences between the specimens are slight, and with such limited material very difficult to evaluate. On the present information there appears to be a slight difference between the pronotal shapes of males and females, and some geographical differences between Meghalaya and Rajasthan material.

Distribution and bionomy

All known specimens were collected in northern India. According to present knowledge, this species has disjunct distribution, being known from the states of Rajasthan and Meghalaya. The specimens were collected under these circumstances:

MEGHALAYA STATE:

Khasi Hills, Mawsynram – Balat: 1000 m, sifted in "small ravine with degraded vegetation" (I. Löbl, pers. comm.).

Jaitia Hills, Jowai: 1350 m, at light on sheer slope ca. 200 m from small stream with sparse ruderal bank-vegetation (E. Jendek, pers comm.).

Garo Hills, Bagmara: 100 m, at light near middle-sized stream (in stifling, cloudy weather) (E. Jendek, pers. comm.).

RAJASTHAN STATE:

Bharatpur, 11.VIII.1989: At light inside Keoladeo National Park (A. Riedel, pers. comm.).

Bharatpur, 31.VIII.–5.IX. 2002: In the small puddles between the fields near to the border of Keoladeo National Park. Both puddles had muddy bottoms and were exposed and strongly warmed, one of them was completely without any vegetation, the other (ca 1 km distant from the first) was sparsely vegetated. One specimen was not fully sclerotised.

Fig. 4: Known distribution of *Helophorus inexpectatus*.

Interpretation of the known distribution is difficult. The neighborhood of Bharatpur (Rajasthan state) has semidesert conditions, with rains from mid June to September and annual precipitation ca 60–80 cm. There is a dry period during winter. Vegetation consists of bushes and solitary deciduous trees. The whole area has a relatively extensive agriculture. In the Keoladeo National Park, there are secondary forests and water bodies and the area is relatively wet during the whole

year (because of irrigation from a nearby dam). On the other hand, southern part of Meghalaya state belongs to the area with the highest annual precipitation in the whole of India (ca. 800–1600 cm per year), with rains from the beginning of June to the middle of October and moderate rainfall during winter period (winter monsoon). The locality Jowai (Meghalaya state) is situated on an elevated plateau with extensive agriculture and the remains of secondary oak forest (E. Jendek, pers.comm.).

According to the present knowledge, this species seems to be aquatic, living in shallow muddy exposed temporary water bodies in more or less open terrain. Like other species of *Helophorus*, this one flies and can be collected at light. All specimens at our disposal were collected from May to October (i.e. in the end of monsoon rains); the find of a not fully sclerotised specimen in Bharatpur indicates that larval development occurs also in this period.

It seems probable that *H. inexpectatus* is distributed more widely – it can be expected in the whole of northern India as well as in Bangladesh, Nepal and Myanmar. However, it seems remarkable, that this species remained undetected for so long, although at least the areas in north-eastern India and some places in northern India are relatively often visited by entomologists. This could indicate that the species is very rare in this area, or that it could have some specialized bionomy and is therefore found only rarely using the classical collecting methods.

Taxonomic conclusions

As noted in the original description (ANGUS 1995) *Thaumhelophorus* has an unusual suite of morphological characteristics. The general surface granulation, ridged elytral interstices and broad elytral flanks (pseudepipleura) all place it in the group of subgenera comprising *Empleurus* HOPE, *Transithelophorus* ANGUS, *Kyphohelophorus* KUWERT and *Orphelophorus* d'ORCHYMONT. These subgenera are part of a group which characteristically has intercalary striae on the elytra (even *Orphelophorus* has one or two punctures representing these striae). The known species of these subgenera are not aquatic, but may occur in damp places. Their tarsi bear stiff setae rather than fine swimming-hairs. The aquatic subgenera *Trichohelophorus* KUWERT, *Eutrichelophorus* SHARP, *Gephelophorus* SHARP and *Helophorus* s.str. have distinct intercalary striae on the elytra and variably ridged alternate interstices, as well as fairly (though variably) wide elytral flanks. They generally show reduced granulation on the head and pronotum, though this granulation is well-developed in *Gephelophorus*. Their tarsi bear fine swimming-hairs. These subgenera, the "intercalary striae group", are a diverse and not very speciose group, contrasting with the mainly aquatic *Rhopalohelophorus* KUWERT, which is both speciose and morphologically rather uniform. *Thaumhelophorus* agrees with *Empleurus* and *Transithelophorus* in its granulate head and pronotum and ridged elytra with broad flanks, but differs in lacking all trace of intercalary striae and in having fine swimming-hairs on its tarsi. Some of the subgenera in the "intercalary striae" group of subgenera have larvae lacking a tuft of hairs on the outer retinacular tooth of the mandibles (ANGUS 1992), and some members of this group have a diploid chromosome number of 18 rather than 22 (ANGUS 1989). It would be very interesting to know these features for *Thaumhelophorus*. The "intercalary striae" group of subgenera, diverse but low in species numbers, gives the impression of being the remains of a first adaptive radiation of Helophoridae, while *Rhopalohelophorus* appears more recent. *Thaumhelophorus* appears to represent a taxonomically (and geographically) isolated offshoot of the "intercalary striae" group which has colonised aquatic habitats independently of other sections of the genus. A phylogenetic analysis of *Helophorus*, probably including DNA analysis, would be however needed to confirm this hypothesis.

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