ANNOTATIONES ZOOLOGICAE JAPONENSES

Volume 45, No. 3-September 1972

Published by the Zoological Society of Japan

Two New Trechine Beetles from Nepal Himalaya Obtained by the Hokkaido University Scientific Expedition 1968*, **

With 5 Text-figures

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ABSTRACT Trechine beetles of the subgenus *Epaphius* are described for the first time from the Himalayas. They are classified into two, closely related but distinctive species, for which the new names *Trechus tosioi* and *T. himalayanus* are given. An isolated species-group is recognized for these two species, as they are markedly different from the previously known members of the subgenus in having a well developed copulatory piece in their male genitalia.

The subgenus *Epaphius* is one of the most primitive groups within the grand genus *Trechus*. It was regarded by Jeannel (1962, pp. 173, 175) not only as an independent genus but as the type of a particular phyletic series, in which ten primitive trechine groups were assembled. At the same time, he (pp. 174, 185) erected *Parepaphius* for two Chinese trechines, which had originally been placed in the group of *Trechus lederi* (cf. Jeannel, 1957). In my present opinion, *Parepaphius* may be synonymous with *Epaphius*, and the latter is not generically distinctive from *Trechus*, though it is doubtless archaic in chaetotaxial features.

Having originated in East Asia, the trechines of this subgenus are distributed over the northern part of the Eurasian Continent. Two of them have attained to Europe through Siberia, and one of the widespread alate species (*T. ephippiatus* H. W. Bates) was recorded from Amdo in Tsinghai, western China (Jeannel, 1935, p. 274). However, none of the members of *Epaphius* have been known from the Himalayas up to the present.

During the Hokkaido University Scientific Expedition to Nepal Himalaya 1968, carried out under the leadership of Professor Mayumi Yamada, Dr. Tosio Kumata collected many alpine insects in the Gosainkund area in central Nepal.

^{*} Scientific results of Hokkaido University Expeditions to the Himalayas, Entomology No. 12. ** This study is supported in part by a grant in aid for scientific research from the Ministry of Education.

His specimens of carabid beetles were submitted to Dr. Akinobu Habu for identification, who kindly transferred trechines to me for study. There were five specimens of them obtained at two different stations. They looked like a single species at first sight, but a close examination has revealed that in reality the collection contains two different species closely related to each other. Moreover, these species seem to belong to the subgenus *Epaphius*, though their male genitalia are greatly different from those of the previously known forms. In any case, they are doubtless new to science and make very important additions to the trechine fauna of the Himalayas.

In the present paper, these new species will be described. To simplify the descriptions, the following abbreviations are used: HW-greatest width of head, including eyes; PW-greatest width of pronotum; PL-length of pronotum, measured along the mid-line; PA-width of pronotal apex; PB-width of pronotal base; EW-greatest width of elytra; EL-greatest length of elytra.

Trechus (Epaphius) tosioi S. Uéno, sp. nov.

(Figs. 1 – 3)

Length: 2.95-3.00 mm (from apical margin of clypeus to apices of elytra). Not unlike *T. vicarius* H. W. Bates (1883, p. 267) in general appearance, but the fore-body is obviously smaller, the elytra are shorter and more convex, the striae are shallower and fainter, particularly at the sides, and the appendages are shorter and stouter. Decidedly different from *T. vicarius* and from all the other described species of the subgenus in the absence of external groove on each protibia and in the presence of a large, heavily sclerotized copulatory piece.

Relatively small species, with small fore-body and broad oval elytra; inner wings absent. Colour blackish brown, shiny and very faintly iridescent; head more or less darker than pronotum; elytra dark brown, with basal area, interval 1 and lateral margin more or less lighter than the disk; ventral side brown; palpi, basal three segments of antennae, and legs yellowish brown.

Head fairly large and broad, obviously wider than long and depressed above; frontal furrows deep and entire, rather widely distant from each other, obtusely angulate at middle and weakly divergent in front; frons and supraorbital areas moderately convex, the latter having a foveole at the root of anterior supraorbital seta; microsculpture distinct, largely consisting of isodiametric reticulation; eyes small and flat, though longer than genae, which are convex and about three-fifths as long as eyes; neck wide, with sharp neck constriction; labrum deeply emarginate at apex; mentum free, with the tooth large, porrect and bifid at the tip; palpi short and thick, with subconical apical segments; antennae fairly short and stout, subfiliform, nearly reaching basal one-fifth of elytra, with segment 2 about as long as segment 3 or 5 and a little longer than segment 4; each one of antennal segments 6–9 oblong-oval and a little less than twice as long as wide.

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Pronotum transverse subcordate, widest at about two-thirds from base and more rapidly contracted anteriad than posteriad; PW/HW 1.33–1.35, PW/PL 1.39–1.40, PW/PA 1.38–1.40, PW/PB 1.35–1.40; surface convex, with a round foveole on each side before middle; microsculpture largely composed of wide meshes and partially of transverse lines; sides narrowly bordered, the border becoming wider near hind angles, moderately rounded in front, less so behind, but not sinuate



Fig. 1. Trechus (Epaphius) tosioi S. Uéno, sp. nov., 3, of Gosainkund in central Nepal.

before base; marginal setae normal; apex slightly emarginate, with narrowly rounded front angles; base as wide as apex (PB/PA 1.00–1.02), nearly straight at middle but more or less oblique at the sides; hind angles obtusely denticulate and slightly reflexed; median line distinct, somewhat widening in basal area; apical transverse impression nearly obliterated, basal one continuous, arcuate, laterally merging into basal foveae which are deep and extend anteriad; postangular carinae rudimentary; basal area longitudinally strigose.

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Elytra oval, short, broad and convex, widest at about middle; EW/PW 1.60-1.62, EL/EW 1.30-1.34; shoulders distinct though rounded, prehumeral borders feebly arcuate and nearly perpendicular to the mid-line at the innermost portion; sides moderately explanate and reflexed, gently rounded from behind shoulders to near preapical emargination, which is slight; apices rounded, with a very small re-entrant angle at suture; striae superficial, becoming shallower towards the sides, 1-2 entire, rather deeply impressed on the disk and indistinctly crenulate, 3 moderately impressed on the disk but obliterated near base, 4 obviously finer than 3 and disappearing before the level of anterior dorsal pore, 5-6 very slight, 7 effaced, 8 distinct, deeply impressed in apical half; scutellar striole distinct; apical striole short but deep, moderately curved and directed to the site of stria 5; intervals slightly convex near suture but perfectly flat at the sides; apical carina prominent; stria 3 with two setiferous dorsal pores at about 2/9 and 4/9 from base respectively; preapical pore situated on interval 3 at about apical 2/9 or still anterior to that level; microsculpture distinct, consisting of fine transverse lines partially forming very wide meshes.

Ventral surface smooth; anal sternite with a pair of sexual setae as usual. Legs short and stout; each protibia widely dilated towards apex and slightly bowed, with the external face simply convex and not grooved; in \mathcal{J} protarsal segments 1 and 2 widely dilated, each with a stout internal process at apex.

Male genital organ robust and heavily sclerotized. Aedeagus large and thick, about three-eighths as long as elytra, hardly arcuate at middle and not attenuated towards apex; basal part moderately bent ventrad, with a very narrow sagittal aileron; basal orifice large, with the lateral sides not emarginate but subangulate near the articulation of styles; apical lobe very short and narrowly rounded at apex, slightly turned up in lateral view and slightly inclined to the left in dorsal view; ventral side gently emarginate behind middle in profile. Inner sac scaly and armed with a large copulatory piece; scales hardly sclerotized; copulatory piece spine-like, broad at base and gently arcuate towards the right side. Styles broad, left style much larger than the right, each provided with four setae at apex.

Female unknown.

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Type-series. Holotype: 3° , paratype: 1° (5–VI–1968, T. Kumata leg.). The holotype is deposited in the collection of the Entomological Institute, Hokkaido University, Sapporo. The paratype is in the Department of Zoology, National Science Museum, Tokyo.

Type-locality. Gosainkund, 4,300 m alt., central Nepal.

Notes. It is very strange that the present new species possesses a combination of two contradictory features, an archaic condition of the preapical seta on elytra and an advanced type of the copulatory piece inside male genitalia. I have regarded the former as the subgeneric character, since in such archaic groups as *Epaphiopsis* and *Trechiama*, the development of copulatory piece is considerably variable accord-

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ing to species and since the situation may probably be the same in *Epaphius*. On the other hand, the Himalayan species is widely isolated from all the previously known members of *Epaphius* in having no external groove on the protibia. In view of these peculiarities, it is placed in a particular species-group called the group of T. tosioi, whose origin cannot be determined at present. This new species-group also includes T. himalayanus to be described on the following pages.

The combination of elytral chaetotaxy and aedeagal characters is reverse in the group of *T. hingstoni* (cf. Jeannel, 1935, p. 278; Uéno, 1965, pp. 346-349, 1967, pp. 242-245, 1972, pp. 429-433), which belongs to the subgenus *Trechus* and the members of which are widely distributed in the eastern Himalayas. In this speciesgroup, the preapical seta is situated at the apical anastomosis of the second and third elytral striae, while the aedeagal inner sac bears no differentiated copulatory piece. One of its members (*T. perissus* Andrewes) has three setiferous dorsal pores on the third elytral stria, a condition that may be regarded as an intermediary between *Epaphius* and *Trechus* (s. str.). It is possible that the group of *T. hingstoni* is a direct descendant of ancestral *Epaphius* that colonized the Himalayas, while that of *T. tosioi* is a peculiar offshoot of the subgenus, in which an advanced genitalic structure has evolved under an isolated condition.

According to Dr. Kumata, the two specimens of the type-series of T. tosioi were found from under stones at the edge of a small lake near the summit of Gosainkund. The spot was in a barren alpine field surrounded by snow couloirs, but appeared to transform into an alpine meadow in the midsummer. Many alpine insects were found in the same place, mostly from under stones at the borders of glaciers.

This interesting species is dedicated to Dr. Tosio Kumata, whose enthusiastic investigations have brought forth various Himalayan alpine insects. I have avoided to name the new trechine after his family name, because one of the Himalayan trechines bears the name 'T. numatai' (cf. Uéno, 1967, p. 242).

Trechus (Epaphius) himalayanus S. Uéno, sp. nov.

(Figs. 4 – 5)

Length: 3.10-3.15 mm (from apical margin of clypeus to apices of elytra). Closely allied to the preceding species, but the colour is more blackish, the fore-body is evidently larger, the pronotum is more transverse, the elytral striae are much finer, and the microsculpture is largely obliterated. Markedly differing from *T. tosioi* in the structure of male genitalia.

Dorsal side concolorously blackish brown to black, very shiny, with scutellum and suture of elytra somewhat brownish; ventral side of fore-body usually dark brown, that of hind body black, propleura and epipleura always dark brown; palpi, antennae (with segments 4–11 somewhat darker) and legs yellowish brown.

Head obviously larger than in T. tosioi, transverse and depressed above, with





sharply impressed frontal furrows which are obtusely angulate at middle and moderately divergent in front; microsculpture effaced on frons and supraorbital areas, though present as polygonal meshes on cervical area; eyes larger than in *T. tosioi*; genae only slightly convex and more rapidly contracted posteriad than in *T. tosioi*, about two-fifths as long as eyes in \Im and about a half as long as eyes in \Im ; neck

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constriction deep at the lateral sides; mentum tooth and palpi as in *T. tosioi*; antennae reaching basal two-ninths of elytra in \mathcal{F} , at most basal one-sixth of elytra in \mathcal{G} , with segments 6–9 a little more ovate than in *T. tosioi*.

Pronotum larger and more transverse than in *T. tosioi*, widest at about twothirds from base and more rapidly contracted anteriad than posteriad; PW/HW 1.34 in \mathcal{F} , 1.29–1.32 in \mathfrak{PP} , PW/PL 1.46 in \mathcal{F} and \mathfrak{PP} , PW/PA 1.42 in \mathcal{F} , 1.36– 1.39 in \mathfrak{PP} , PW/PB 1.31 in \mathcal{F} , 1.33–1.39 in \mathfrak{PP} ; surface convex, particularly at the sides, with a shallow foveole on each side before middle, which is more apparent in \mathcal{F} than in \mathfrak{P} ; microsculpture nearly obliterated on the disk, though the trace of fine transverse lines is perceptible in marginal areas; sides less evenly arcuate than in *T. tosioi*, moderately rounded in front, evidently less so behind the widest part, and not sinuate before hind angles, which are obtusely denticulate; front angles more widely rounded than in *T. tosioi*; base nearly straight, about as wide as or a little wider than apex, PB/PA 1.08 in \mathcal{F} , 1.00–1.02 in \mathfrak{PP} ; apical transverse impression shallow, somewhat wrinkled; basal transverse impression continuous, deep and arcuate; basal foveae smaller, narrower and evidently more distant from side borders than in *T. tosioi*.

Elytra a little broader in basal area than those of *T. tosioi*, widest at about middle or a little before that level; EW/PW 1.46 in 3° , 1.45–1.52 in 99, EL/EW 1.35 in 3° , 1.29 in 99; shoulders a little more salient than in *T. tosioi*, with prehumeral borders either perpendicular to the mid-line or slightly incurved near basal peduncle; sides feebly arcuate behind shoulders, gently so behind middle, and hardly emarginate before apices, which are rounded; striae much finer than in *T. tosioi*, vaguely crenulate, 1–2 entire, 3–4 disappearing near base, 5 just visible on the disk, 6–7 nearly effaced, 8 deeply impressed in apical half but becoming slight in front; scutellar striole short though distinct; apical striole fairly long, deep, nearly straight at middle and more or less incurved at the terminal portion; intervals flat even near suture; apical carina prominent, almost keeled; stria 3 with two setiferous dorsal pores usually at about 2/9 from base and about middle (or a little before middle); preapical pore situated on interval 3 at 1/6–1/4 from apex; microsculpture composed of fine transverse lines, though more or less degenerated.

Ventral surface smooth; anal sternite with a pair of sexual setae in 3° , two (in the allotype) or three (in the paratype) pair of sexual setae in 2° . Legs somewhat slenderer than those in *T. tosioi*, though similar in structure to the latter.

Male genital organ greatly different in shape from that of *T. tosioi*. Aedeagus about two-fifths as long as elytra, fairly slender, moderately arcuate and gradually attenuated towards apex, with the dorsal side semicircularly rounded in profile; basal part elongate and curved ventrad, with large elongate sagittal aileron; basal orifice with deeply emarginate lateral sides; apical lobe long and narrow, slightly swollen at the extremity in lateral view, narrowly rounded at the tip in dorsal view; ventral side widely emarginate at middle in profile but nearly straight before apex. Inner sac scaly and armed with a large copulatory piece; scales minute and hardly

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sclerotized; copulatory piece elongate and twisted, with the basal part compressed and forming a triangle; apical part of the piece very slender, curved to the right and pointed at the extremity. Styles slender, with very narrow apical part, left style longer than the right, each provided with four, rather short setae at apex.

Type-series. Holotype: \Diamond , allotype: \Diamond , paratype: $1 \diamondsuit$ (6–VI–1968, T. Kumata leg.). The holotype and the allotype are deposited in the collection of the Entomological Institute, Hokkaido University, Sapporo. The paratype is in the Department of Zoology, National Science Museum, Tokyo.

Type-locality. Thare Pati, 3,500 m alt., southeast of Gosainkund, central Nepal.

Notes. This new species was found from under stones in an alpine meadow surrounded by coniferous forests and rhododendron thickets. The spot is situated on the southeastern ridge of Gosainkund and not so remote from the type-locality of T. tosioi. However, the genitalic differentiation is really striking between the two. It is beyond all doubt that many more species of the same group will be discovered in the future when the great massif of the Himalayas is extensively investigated.

It may be worthy of noticing that in the two known members of the group of *T. tosioi*, there are a pair of foveoles on the disk of their pronota (at least in males). Such foveoles also exist in the male of *T. hashimotoi* S. Uéno (1961, p. 337, fig. 1), an endogean *Epaphius* known from a high mountain in northern Japan. I do not know what function these foveoles have. It is, however, of interest that the structure has been known in the three trechines belonging to two different groups of *Epaphius*, which are widely separated from each other both taxonomically and geographically.

ACKNOWLEDGEMENT

I wish to express my hearty thanks to Dr. Tosio Kumata and Dr. Akinobu Habu for the privilege of studying the interesting materials, which are the very important additions to our knowledge of the trechine fauna of the Himalayas.

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