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A new species of the genus *Trichonotulus* Bedel, 1911 from Malaysia (Coleoptera: Scarabaeidae: Aphodiinae)

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Abstract. *Trichonotulus cechovskyi* sp. nov., a new species of the genus *Trichonotulus* Bedel, 1911 from Malaysia is described and illustrated. Photos of the holotype of *Trichonotulus dzamosanicus* Stebnicka, 1973, a paratype of *Trichonotulus khonensis* Stebnicka, 1981, and a specimen of *Trichonotulus castetsi* Paulian, 1936 are given. A short comment on the holotype of *T. dzamosanicus* Stebnicka, 1973 is given. A key to species from Palaearctic and Oriental Regions is given.

INTRODUCTION

In the course of examination of specimens from our collections we found a new undescribed *Trichonotulus* Bedel, 1911. One of authors examined, extracted the epipharynx and made photos of the holotype of *T. dzamosanicus* Stebnicka, 1973 (female), examined and made photos of a paratype of *T. khonensis* Stebnicka, 1982 (male), examined, extracted the epipharynx and made photos of a specimen of *T. castetsi* Paulian, 1936 (male) deposited in collection of the Institute of Systematics and Evolution of Animals. The newly described species is in our opinion most closely related to *T. vultuosus* Balthasar, 1971, and its photos were shown in Král, Rakovič & Mencl (2015). In 2015 Král, Rakovič & Mencl described *T. amdoensis*, which is most closely related to *T. dzamosanicus* Stebnicka, 1973, but its photos were never shown in literature. We decided to make a key to all species from Palaearctic and Oriental Region, and because of it photos of *T. khonensis* Stebnicka, 1982, and *T. castetsi* Paulian, 1936 are added.

While examining the holotype of *T. dzamosanicus* Stebnicka, 1973 one of authors found a mistake on the label in name of the described species ("*T. dzamosanus*"), and because of it add a new label with true name.

MATERIAL AND METHODS

The specimens was observed by using the Nikon SMZ-U stereoscopic microscopes. The photos of new species published here were taken using the Meopta laboratory microscope, CMOS5 digital camera with the Helicon Focus programme.

The photos of other specimens were taken using Canon EOS 5D Mark III, combined with Canon MP-E 65mm macro lens, and by use of the Helicon Focus programme.

The aedeagus and epipharynx were treated by boiling with a 10% sodium hydroxide solution.

Morphological terms used in the description of epipharyngeal structures are in agreement with Dellacasa G., Bordat, Dellacasa M. (2001).

Each specimen of the new species is indicated by a red, printed label added to the same pin and bearing the status of the specimen (holotype or paratype), sex, its name, name of the author, month and year of the designation.

Holotype (male) is deposited in private collection of Ladislav Mencl, paratype (female) is deposited in private collection of Łukasz Minkina, deposited in Institute of Systematics and Evolution of Animals in Krakow.

Abbreviation ISEA - Institute of Systematics and Evolution of Animals in Kraków.

Addenda and remarks are found in brackets, separate label lines are indicated by slash (/), separate labels by double slash (//).

RESULTS

Trichonotulus cechovskyi sp. nov.
(Figs. 1-6, 23)

Type material. Holotype (♂): Malaysia West Pahang / 70 km SW of Kuala Rompin / Endau Rompin N.P. 600 m. / G. Beremban (Kg. Tebu Hitam) / 13.iv.-3.v.2009, P. Čechovský lgt. [white printed label] // HOLOTYPE (♂) / *Trichonotulus* / *cechovskyi* sp. nov. / det. Ł. Minkina & L. Mencl (2017) [red printed label]. Paratype (♀): W Malaysia Kelantan / 90 km N of Gua Musang / Mt. Basor, 1700 m. / Kampong Kubur Datu / 01.iii.-21.i.2015 / Petr Čechovský lgt. // PARATYPE (♀) / *Trichonotulus* / *cechovskyi* sp. nov. / det. Ł. Minkina & L. Mencl (2017) [red printed label].

Description. Dorsum (Fig. 1). Total body length 3.2 mm. Body oblong oval, moderately convex, moderately shiny, head nearly glabrous, pronotum and elytra macrosetaceous, brownish.

Head moderately convex, moderately shiny; with quite dense, slightly irregular in size, rather regularly located punctures; on genae punctures with quite long setae; clypeus with rather strongly bristled, gently upturned edges; epistome slightly gibbous; clypeus anteriorly distinctly sinuate, rounded on sides, with nearly straight sides, clearly differentiated from genae; genae small, rounded, slightly more protruding beyond the quite large eyes; frontal suture distinctly impressed, not tuberculate; slightly microreticulate.

Pronotum transverse, convex, moderately shiny, with double, rather dense, rather irregular punctures; punctures on sides with short setae, larger punctures with diameter about three times larger than small punctures; anterior and lateral angles rounded, sides rounded, bordered, bristled; anterior margin not bordered; basal margin distinctly bordered; slightly microreticulate.

Scutellum small, triangular, elongate, with moderately arcuate sides; with few punctures; moderately microreticulate.

Elytra slightly elongate, regularly rounded nearby apex, convex, moderately shiny, not denticulate at shoulders; striae distinctly, rather sparsely punctured, feebly crenulate, only

Figs. 1-3. *Trichonotulus cechovskyi* sp. nov., ♂, holotype: 1- dorsal view; 2- dorso-lateral view; 3- ventral view. Figs. 1-3: scale line: 1.0 mm.

Figs. 4-6. *Trichonotulus cechovskyi* sp. nov., ♂, holotype: 4- aedeagus, lateral view; 5- aedeagus, dorsal view; 6- epipharynx. Figs. 4-6: scale line: 0.1 mm.

first and tenth not shortened, both joined before apex; first striae apically become much deeper and wider - about three times wider than others; sixth to ninth striae shortened in basal part, eighth quite significantly; intervals slightly convex, with two rows of punctures on sides, and occasionally with few additional punctures between them; all punctures with macrosetae; moderately microreticulate.

Profemora with rather sparse, fine, irregular, macrosetose punctation; middle and hind femora only with few fine punctures, and only a few of them with short macrosetae. Protibiae very distinctly tridentate, and proximately not serrulate at outer margin; apical spur of fore tibiae thick, slightly bent outward and downward; meso- and metatibiae moderately widened apically, with distinct transverse carinae on outer face; apically fimbriate irregularly with spinules of unequal length; metatibiae with the superior apical spur slightly longer than

basal metatarsomere, the latter slightly shorter than next two combined; claws moderately fine, regularly arcuate.

Macropterous.

Venter (Fig. 3). Meso- metaventral plate moderately shiny with indistinct median impression, with thick, shallow longitudinal groove in the middle, with sparse, irregular punctation; slightly microreticulate. Sternites with rather sparse, irregular, punctation; punctures with long macrosetae. Pygidium dull, with irregular, rather sparse, punctures; punctures with setae; moderately microreticulate.

Aedeagus (Figs. 4-5) with parameres distinctly shorter than phallobase, with indistinctly bent downward acute apex, when observed from the side. Parameres, when observed from above with nearly acute apex.

Epipharynx (Fig. 6), transverse, with anterior margin straight, gently rounded anterolateraly, corypha not exceeding anterior margin, with six longitudinal celtes. Tormae short.

Sexual dimorphism. Males with epistome slightly gibbous; females with epistome very slightly gibbous. Meso- metaventral plate slightly more convex in a female.

Variability. Holotype length is 3.2 mm, paratype length 3.3 mm. Punctation of pronotum is of variable density.

Differential diagnosis. Body oblong oval, intervals with two rows of setigerous punctures, rarely three punctures on the width of interval, clypeus anteriorly distinctly sinuate at middle, punctation of pronotum double, larger punctures with diameter about three times larger than small punctures, punctures here distinctly rounded.

Name derivation. The name of the new species is dedicated to its collector - Petr Čechovský (Brno, Czech Republic).

ADDITIONAL MATERIAL STUDIED AND PRESENTED ON PHOTOS

Trichonotulus dzamosanicus (Stebnicka, 1973)

(Figs. 10, 20-22, 26)

Material studied. Holotype (♀): Korea Dzamosan / distr. Sunćhôn lg. / Pawłowski, 8.1971 [white printed label] // ♀[white printed label] // HOLOTYPUS [white printed label] // Aphodius (Tricho- / notulus) / dzamosanus / det. Z. Stebnicka / 1972 [white written label] // HOLOTYPE (♀) Trichonotulus / dzamosanicus / Stebnicka, 1973 [red printed label].

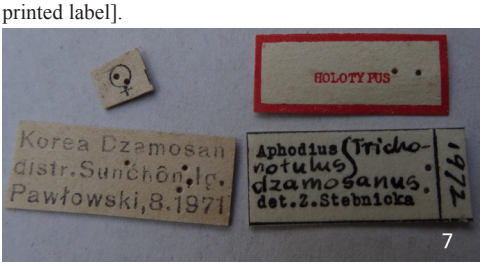


Fig. 7. Labels added to holotype of *Trichonotulus dzamosanicus* Stebnicka, 1973.

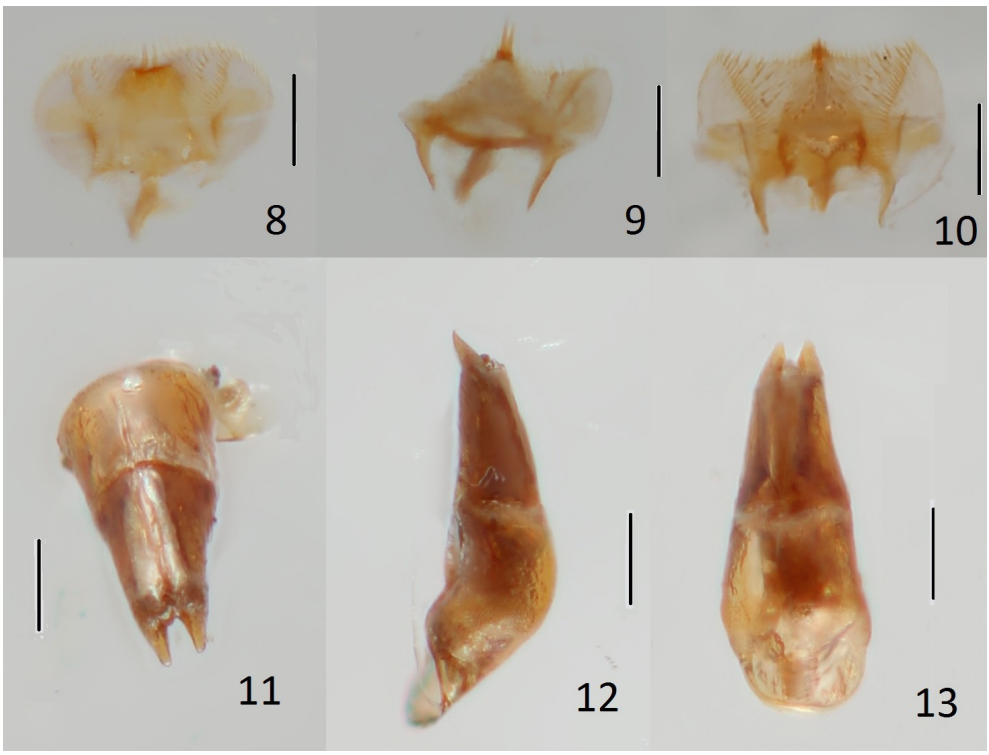
This species has not been illustrated until now. The epipharynx is here examined for the first time. Specimen length 4.2 mm. The specimen is deposited in ISEA, Kraków.

Trichonotulus castetsi (Paulian, 1936)

(Figs. 8, 14-16, 24)

Material studied. 1 specimen (♀): Nepal nr. Simra / Adhabhar 690 ft. / 27 Aug. 1967 / Can. Nepal. Exp. [white printed label] // Trichonotulus / castetsi / (Paulian, 1936) / det. Ł. Minkina (05.2017) [white printed label].

Photos of this species have not been published until now. The shape of the epipharynx is here shown for the first time. Specimen length 2.5 mm. The specimen is deposited in ISEA, Kraków.



Figs. 8-13. Fig. 8. *Trichonotulus castetsi* (Paulian, 1936), ♀. Figs. 9, 11-13. *Trichonotulus khonensis* (Stebnicka, 1982), paratype ♂. Fig. 10. *Trichonotulus dzamosanicus* (Stebnicka, 1973), holotype, ♀. Figs. 8-10: epipharynx. Fig. 11. Apex of aedeagus. Fig. 12. Aedeagus in lateral view. Fig.13. Aedeagus in dorsal view. Figs 8-13: scale line: 0.1 mm.

Trichonotulus khonensis (Stebnicka, 1982)
(Figs. 9, 11-13, 17-19, 25)

Material studied. Paratypes (1 ♂ and 1 ♀): Nordest- Thailand / Khon Kaen / ad lucem / Dr. Sastri / Saowakontha leg. / 18.6.1980 [white printed label] // ♂ or 1 ♀ [white printed label] // PARATYPUS [yellow printed label] // *Aphodius (Trich.)* / *khonensis* / det. Z. Stebnicka [white partely written, partely printed label].

Photos of this species have not been published until now. Photos of epipharynx, and aedeagus examined by Stebnicka are here presented at first time. Specimen length 1.9 mm. The specimen is deposited in ISEA, Kraków.

Figs. 14-16. *Trichonotulus castetsi* (Paulian, 1936), ♀; 14- dorsal view; 15- lateral view; 16- ventral view. Figs. 14-16: scale lines: 1.0 mm.

DISCUSSION

The newly described species seems to be most closely related to *Trichonotulus vultuosus* Balthasar, 1971 because it has two rows of setigerous punctures on each interval of elytra, double punctation on the pronotum, with the punctures here rounded, and its similar colour of body. However by the features given in key below it can be easily distinguished from it. Additionaly *T. vultuosus* Balthasar, 1971 is known from Nepal, Pakistan and India.

Figs. 17-19. *Trichonotulus khonensis* (Stebnicka, 1982), paratype, ♂; 17- dorsal view; 18- lateral view; 19- ventral view. Figs. 17-19: scale lines: 1.0 mm.

Figs. 20-22. *Trichonotulus dzamosanicus* (Stebnicka, 1973), holotype, ♀; 20- dorsal view; 21- lateral view; 22- ventral view. Figs. 20-22: scale lines: 1.0 mm.

Fig. 23. *Trichonotulus cechovskyi* sp. nov., holotype, ♂. Fig. 24. *Trichonotulus castetsi* (Paulian, 1936), ♀. Fig. 25. *Trichonotulus khonensis* (Stebnicka, 1982), paratype, ♂. Fig. 26. *Trichonotulus dzamosanicus* (Stebnicka, 1973), holotype, ♀. Figs. 23-26: heads. Figs. 23-26: scale line: 0.5 mm.

We propose here an "easy" key to genus *Trichonotulus* Bedel, 1911 from the Palaearctic and Oriental Regions:

1. Elytral intervals, on disc, with only one row of setigerous punctures. Macrosetae very thick. .... *castetsi* (Paulian, 1936)
- Elytral intervals, on disc, with more than one row of setigerous punctures. Macrosetae rather thin. 2
2. Intervals, with two rows of setigerous punctures, rarely three setigerous punctures present per intervals width, in some species first interval with two rows of setigerous punctures in basal part, but with one row of punctures behind the disc. 3
- Intervals, with four to five setigerous punctures present per interval width. 8
3. Scutellum in the shape of an equilateral triangle. ..... *osetinus* (Medvedev & Dzhambazish, 1977)
- Scutellum in the shape of an elongate triangle. 4
4. Pronotum with simple punctation. 5
- Pronotum with double punctation. 7
5. Punctures of pronotum rounded. Body length less than 2.5 mm. Colour of body orange-brownish .... *khonensis* (Stebnicka, 1982)
- Punctures of pronotum not rounded, rather slightly transverse (especially on disc). Body length more than 3.0 mm. Pronotum and head dark-brownish to blackish, elytra orange-brownish to blackish. 6
6. Usually larger. Body length 3.0 - 4.0 mm. Elytra darker, usually dark brownish to blackish, rarely light brownish. ..... *scrofa* (Fabricius, 1787)

- Usually smaller. Body length 2.6 - 3.5 mm. Elytra lighter, always orange-brownish. .... *mongolicus* (Mannerheim, 1852)

7. Larger. Body length more than 3.5 mm. Body rather elongate. Size difference between the larger and smaller punctures of pronotum smaller. Punctation of clypeus less coarse. Clypeus anteriorly less distinctly sinuate at middle. Tibia and femora less thickened. ..... *vultuosus* Balthasar, 1971
- Smaller. Body length less than 3.5 mm. Body oblong ovate. Size difference between the larger and smaller punctures of pronotum larger. Punctation of clypeus coarser. Clypeus anteriorly more distinctly sinuate at middle. Tibia and femora more thickened. ..... *cechovskyi* sp. nov.

8. Punctation of head, and meso- metaventral plate less dense in female (like in male of *T. amdoensis* Král, Rakovič et Mencl, 2015) ..... *dzamosanicus* (Stebnicka, 1973)
- Punctation of head, and meso- metaventral plate denser in female. *amdoensis* Král, Rakovič et Mencl, 2015

Despite proposing key to species authors still see here some problems in meaning of some species from genus *Trichonotulus* Bedel, 1911.

No specimen of T. *osetinus* (Medvedev et Dzhambazish, 1977) was examined or available to study. The authors have seen about 20 specimens of *T. scrofa* (Fabricius, 1787) from various localities, from Georgia. It is necessary to see the holotype of *T. osetinus* (Medvedev et Dzhambazish, 1977) to confirm distinction of both species.

It is possible that *T. mongolicus* (Mannerheim, 1852) is only a subspecies or other lower rank of *T. scrofa* (Fabricius, 1787), because authors didn`t find any other differences between them except for those given in the key. It is necessary to examine specimens of *T. scrofa* (Fabricius, 1787), from different localities and define its variability. For example specimens of *T. scrofa* (Fabricius, 1787) from Afghanistan, deposited in collection of one of authors have part of intervals with three distinct rows of setigerous punctures.

Despite the examination of holotype of *T. dzamosanicus* (Stebnicka, 1973) authors did not find any significant features between it and *T. amdoensis* Král, Rakovič et Mencl, 2015. We agree that species are distinct, but it is necessary to examine more amount of specimens from both species.

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