

Research article

Submitted: February 16th, 2022 – Accepted: April 12th, 2022 – Published: May 15th, 2022
DOI: 10.13133/2284-4880/716

Notes on *Paratrichius* Janson, 1881 inhabiting Hainan Island, with description of a new species and the definition of two new junior synonyms (Coleoptera: Scarabaeidae, Cetoniinae)

Enrico RICCHIARDI^{1,*}, Yuanyuan LU², Sha LI², Bai MING^{2,3,4}

¹ Corso A. Tassoni 79/4, 10143 Torino Italy – alericor@fastwebnet.it

² Key Laboratory of Zoological Systematics and Evolution, Institute of Zoology, Chinese Academy of Sciences, Beichen West Road, Chaoyang District, Beijing, 100101, China.

³ University of Chinese Academy of Sciences, Yuquan Road, Shijingshan District, Beijing, 100049, China.

⁴ Hainan Yazhou Bay Seed Lab, Building 1, No.7 Yiju Road, Yazhou District, Sanya City, Hainan, 572025, China.

*Corresponding author

Abstract

Nearly three decades ago two new species belonging to the genus *Paratrichius* Janson, 1881 were described from Hainan Island (SW China): *Paratrichius papilionaceus* Ma, 1990 and *P. rufescens* Ma, 1990. The present paper increases the number of *Paratrichius* species known from Hainan Island to four, with the description of a new species (*P. pilosus* Ricchiardi and Lu, **n. sp.**), and a new regional record for *P. elegantulus* (Moser, 1902), thus far known from N Indochina and continental SW China only. Additionally, *Paratrichius papilionaceus* Ma, 1990 is here proposed as junior synonym of *Paratrichius marmoreus* (Moser, 1902), described from northern Vietnam (**n. syn.**), and *Paratrichius brevifolius* Kobayashi and Fujioka, 2013, described from northern Vietnam, is here proposed as junior synonym of the above cited *Paratrichius elegantulus* (Moser, 1902) (**n. syn.**). Among the four *Paratrichius* species now listed from Hainan, two (*P. pilosus* and *P. rufescens*) are very likely endemic to the island's highlands, while other two inhabit the highlands of northern Vietnam, too.

Key words: Scarabaeidae, Cetoniinae, *Paratrichius*, new species, new synonym, Oriental Region.

Introduction

Hainan Island is separated from the Chinese mainland (Guangdong) by the Qiongzhou Strait, which has a maximum width of about 19-20 km and a maximum depth of about 120 m below the current sea level and therefore, during the last glacial maximum, when in that area the sea level was about 100-120 m below the current one, the island was joined to Leizhou Peninsula and to northern-central Vietnam by lowlands with lower average temperatures, providing possible connections between the faunas of continental Asia and Hainan - see for example Chang et al. (2012). The study of the distribution of *Paratrichius* species in northern and central Vietnam, southern China and Hainan indicates a wider past distribution of species of this genus than today. Subsequently, the rising sea level separated Hainan from the mainland and a rising average temperature confined the *Paratrichius* inhabiting the Hainan Island to the highlands. The same thing happened to the *Paratrichius* inhabiting the mainland, which were all collected above 600-700 m a.s.l. One of the purposes of this article is also to analyze more in detail on a morphological basis the endemism level

reached by *Paratrichius* species isolated in Hainan from mainland Asia since last glacial maximum and thousands of generations.

Materials and methods

Specimen length was measured between the apex of the pygidium and the anterior margin of clypeus with the head in the normal position. Specimen width represents maximum width of elytra. Clypeal length was measured laterally, between the anterior margin and antennal insertion. For the description of surface sculpturing we found Harris (1979) very useful. Most terms used for descriptions came from Krikken (1984). The abdomen terminology is derived from Cristóvão & Vaz-de-Mello (2020).

Photographs were taken using a Canon 5D digital camera in conjunction with a Canon MP-E 65 mm f/2.8 1–5× Macro Lens and processed in Helicon Focus 5.3.10 software. Backgrounds were removed using GIMP 2.10.18 (www.gimp.org), in order to increase contrast. Individual photographs were finally merged to generate composite images using the same GIMP software.

The taxonomic acts (new species and synonymy) are attributed to E. Ricchiardi and Y. Lu. Unless elsewhere specified, all photographs were prepared by Yuanyuan Lu and Sha Li.

The following abbreviations are used to denote the depositories of the study material:

- ERPC** Enrico Ricchiardi personal collection, Torino, Italy.
- HKPC** Hirokazu Kobayashi personal collection, Tokyo, Japan.
- SJPC** Stanley Jakl personal collection, Prague, Czech Republic.
- IZAS** Institute of Zoology Chinese Academy of Science, Beijing, China.
- MNHUB** Museum fur Naturkunde Berlin, Germany.
- NHM** The Natural History Museum, London, Great Britain.
- ZFMK** Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn, Germany

The following abbreviations are used to denote the types:

- AT** "Allotype" (as indicated in original descriptions)
- HT** Holotype
- LT** Lectotype
- PLT** Paralectotype
- PT** Paratype.

Results

Ma (1990) described as new to science *Paratrichius rufescens* and *Paratrichius papilionaceus*, the only two species of *Paratrichius* at that time known from the island. Studying the specimens preserved in the IZAS collection, we concluded that:

the AT♀ of *P. rufescens*, as originally described by Ma (1990), a female that she thought was collected in Fujian (but, according to the labels, it should have been collected in Taiwan - see below) belongs to another species (to be further identified in the future); therefore, there are no known records of *P. rufescens* from continental China.

Carefully comparing the ♂ holotypes of *P. papilionaceus* and *Paratrichius marmoreus* (Moser, 1902) and other material (see below), we found that the parameres of the two species are identical, and subsequently *P. papilionaceus* is reduced to new junior synonym of *P. marmoreus* (**n. syn.**).

Studying several new specimens collected in the highlands of Hainan's, and comparing them with the morphologically closest species, *Paratrichius elegantulus* (Moser, 1902) and *Paratrichius brevifolius* Kobayashi & Fujioka, 2013 inhabiting northern Vietnam, we found that *P. brevifolius* and *P. elegantulus* have identical parameres to one another; thus, we propose *P. brevifolius* as a new junior synonym of *P. elegantulus* (**n. syn.**).

Several specimens (see the list below) collected in Hainan share their parameres shape and most morphological characters with *P. elegantulus* (Moser, 1902), so we identified them as belonging to the latter species (**new record**).

Both *P. marmoreus* and *P. elegantulus* inhabiting Hainan highlands show few morphological differences (see below) with vietnamese specimens and a future morphological analysis could lead to new subspecies.

We identified a further new endemic species and describe it *Paratrichius pilosus* Ricchiardi & Lu new species.

A key to Hainan's *Paratrichius* is given below.

Updated Hainan's Paratrichius species list

- Paratrichius elegantulus* (Moser, 1902) **new record**
= *brevifolius* Kobayashi and Fujioka, 2013 **new junior synonym**
- marmoreus* (Moser, 1902) **new record**
= *papilionaceus* Ma, 1990 **new junior synonym**
- pilosus* Ricchiardi & Lu **new species**
- rufescens* Ma, 1990

Key to Hainan's Paratrichius

Sex distinction

- Protibia with two sharp external teeth at apex and without spur. Profile of abdomen arched upwardsMales
- Protibia widened at apex with respect to that of the male. Apical spur present. Profile of abdomen not arched upward in lateral view. Sometimes, apex of pygidium more-or-less hollowed.....Females

Key to species

1. Larger species (length: 15-15.4 mm). Elytron black, decorated with a conspicuous chalky macula at juxtas-cutellar area continuing in two, transverse, relatively long chalky spots at one third of length and with one conspicuous chalky spot at two thirds ***P. marmoreus*** (Hainan's specimens)
- Smaller species (length: 11-14 mm). Elytral integuments completely black or completely reddish, or mixed, with disc decorated with six small chalky spots, three at one third, three at two thirds of length.....2
- Pygidium black, completely covered with chalky material (males) or with a pale yellow chalky wide band along anterior and first half of lateral margins (females) ***P. rufescens***
2. Pygidium black, with a different chalky material pattern3
- Metatarsi with short yellow-brown setae at apex of metatarsomeres I-V ***P. elegantulus***

3. Metatarsi with long, yellow-brown long setae becoming longer from third to fifth metatarsomeres
 *P. pilosus* Ricchiardi & Lu, new species

Taxonomy

Paratrichius elegantulus (Moser, 1902)

Studied material

Type series of *Paratrichius elegantulus* (Moser, 1902): LT♂ (here designated) MNHUB Tonkin, **Vietnam**: Lang Son, Montes Mauson, 2-3000", Apr-May, H. Fruhstorfer legit. 2 PLT♂, 3PLT♀ (here designated) MNHUB, same data as LT.

Other *Paratrichius elegantulus* material: 1♂ 2♀ ERPC, **China**: Guangxi, Mt. Dayaoshan, Jinxiu, 1100 m, May 2017, local collectors. 2♂ ERPC, **China**: Guangxi, Mt. Dayaoshan, Pingban, Jinxiu, 1200 m, 1/15 Jun 2014,

Zhaoijingshen legit. 1♂ ERPC, **China**: Guangxi, same data but 23 Apr-7 May 2014. 2♂ ERPC, **China**: Guangxi, Mt. Dayaoshan, Pingzhao, Jinxiu, 100 m, 5/13 Apr 2015, local collectors. 2♂ 1♀ NHMB, **Laos**: Hua Phan, Ban Saleui, Phou Pan Mt. (20°12'N, 104°01'E) 1340-1870 m, 10 May-16 Jun 2009, M. Brancucci & local collectors. 1♂ ZFMK, Same data but 1300-1900 m, 7 Apr-25 May 2010, C. Holzschuh legit. 14♂ 8♀ ZFMK, same data but 1/31 May 2011. 22♂ 6♀ ZFMK, same data but 11 Apr-15 May 2012. 2♂ 3♀ ERPC, same data but 1/31 May 2011. 8♂ ERPC, **Vietnam**: Ha Tinh, Huong Son Phou Pan, Jun 2017, Dang Ngoc Van legit. 1♂ SJPC, **Vietnam**: Ha Tinh, Jun 2017, local collectors. **Vietnam**: Vinh Phuc, Tam Dao, Jul 1995. 1♂ ERPC, same data but Jun 1990, Kuban legit. 1♀ ERPC, **Vietnam**: Lao Cai, Sa Pa (22°20'N, 103°50'E), 25 May-10 Jun 1991, E. Jendek legit.

Paratrichius elegantulus from Hainan: 1♂ IZAS, **China**: Hainan, Wuzhishan road to peak (18°89'N, 109°69'E), 1147 m, 10 Apr 2010, IOZ(E)1945732, Lin Meiyang

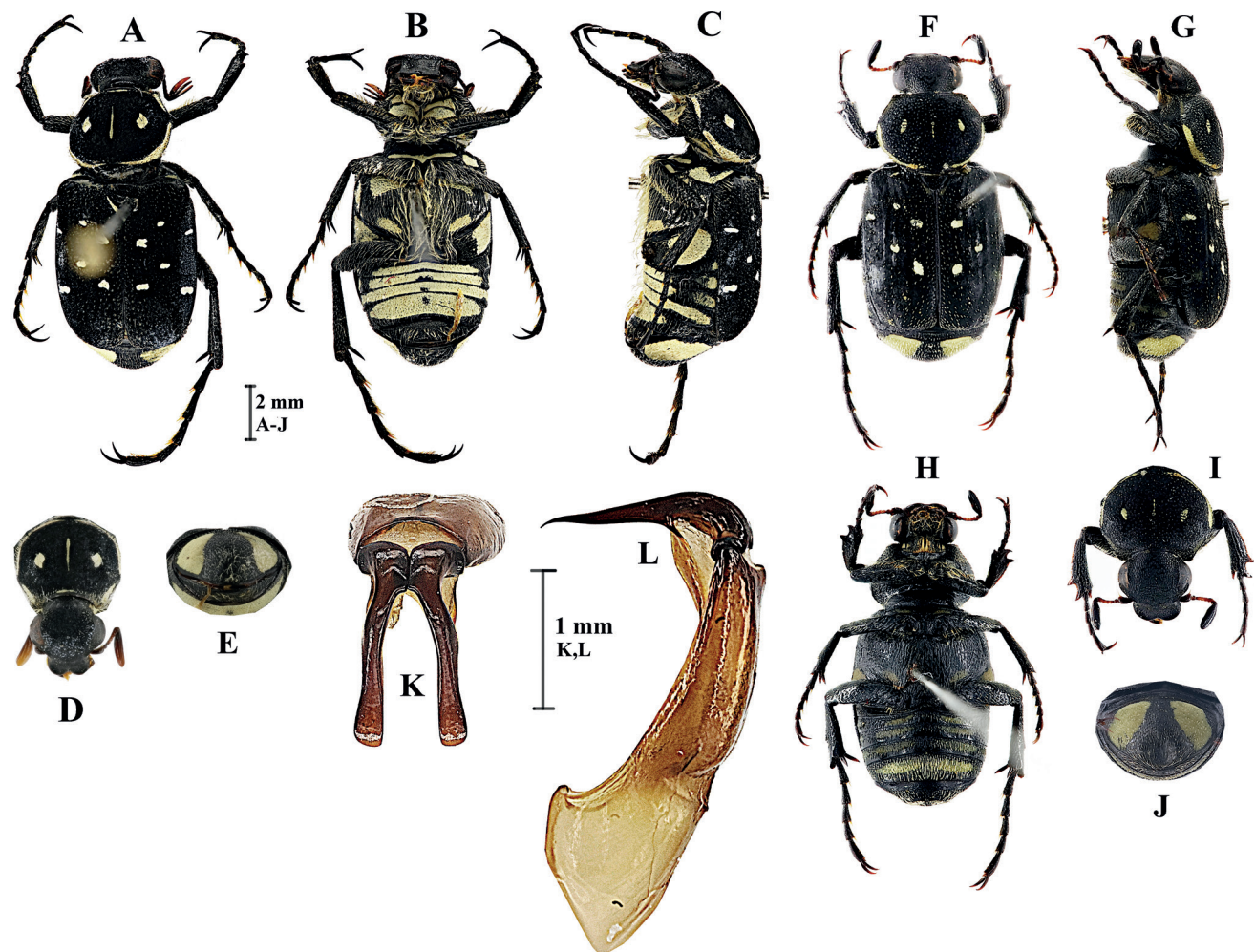


Fig. 1 – *Paratrichius elegantulus* (Moser, 1902), material collected in Hainan : ♂ IZAS: A, dorsal habitus; B, ventral habitus; C, lateral habitus; D, head; E, pygidium, K, parameres, frontal view; L, parameres, lateral view; ♀ IZAS: F, dorsal habitus; G, lateral habitus; H, ventral habitus; I, head; J, pygidium. Photographs by Yuanyuan Lu.

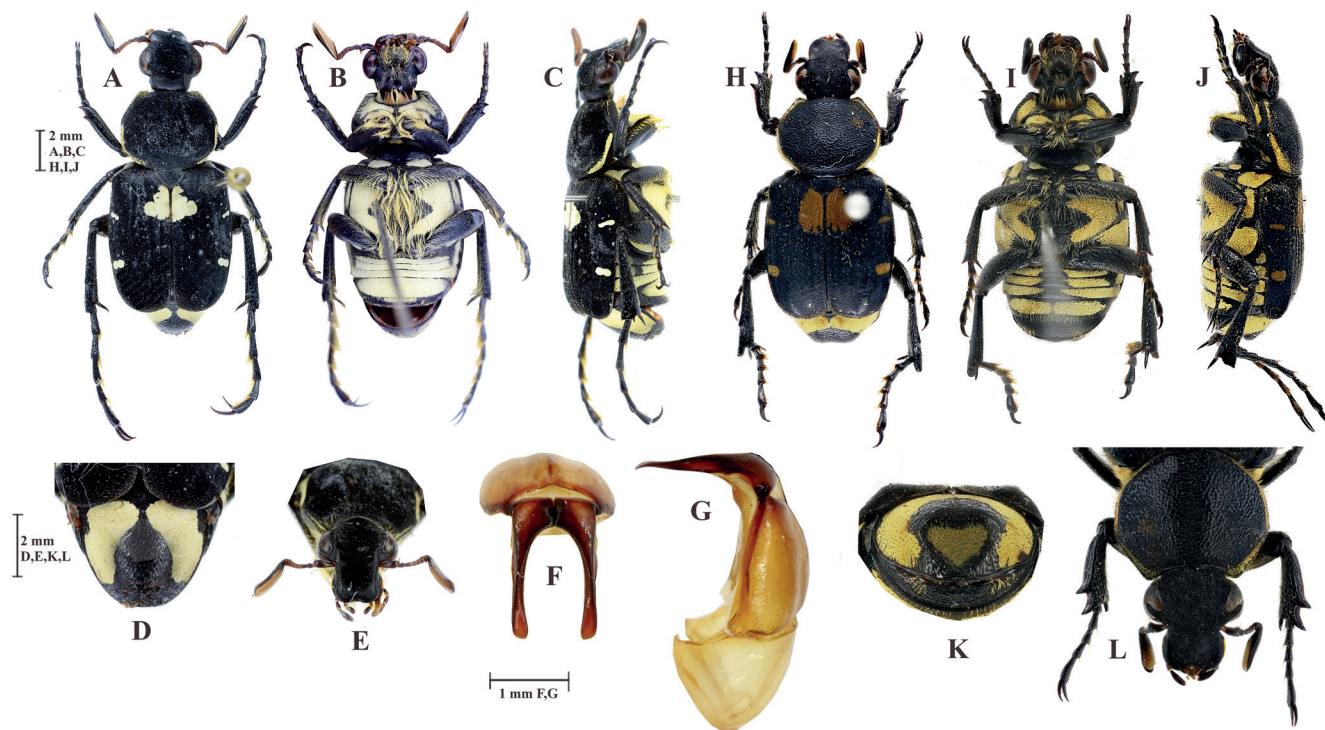


Fig. 2 – *Paratrichius marmoreus* (Moser, 1902), material collected in Hainan: ♂ ERPC: **A**, dorsal habitus; **B**, ventral habitus; **C**, lateral habitus; **D**, pygidium; **E**, head; **F**, parameres, frontal view; **G**, parameres lateral view. Photographs made by Sha Li. *P. marmoreus* (= *papilionaceus*): ♀ IZAS: **H**, dorsal habitus; **I**, ventral habitus; **J**, lateral habitus; **K**, pygidium; **L**, head. Photographs by Yuanyuan Lu.

legit. 1♂ ERPC (ex IOZ(E)1945741), same data as IOZ(E)1945732. 2♂ IZAS, 1♀ IZAS (IOZ 1945728/29/33) 1♀ ERPC (ex IZAS IOZ 1945730), China, Hainan, Mt. Wuzhishan, Diyifeng, 9/11 Jun 2010, Zhou Wenyi legit.

Paratrichius brevifolius Kobayashi & Fujioka, 2013. 2PT♂ HKPC, **Vietnam**: Vinh Phuc, Tam Dao, Local Collectors, June 1996.

Diagnosis

The specimens collected in Hainan show a difference from the *P. elegantulus* inhabiting the continent in the elytral striae shape: on continent *P. elegantulus* have scarcely noticeable striae composed of horseshoe points, sometimes joining to form rows; conversely, males inhabiting Hainan show more noticeable striae, composed of horseshoe points often joined to form rows but the parameres shape of the hainan's males are identical to those of the HT, therefore it is the same species.

Carefully studying *P. elegantulus* and the morphologically closed species, we found that *Paratrichius brevifolius* Kobayashi and Fujioka, 2013, described from northern Vietnam is a junior synonym of *Paratrichius elegantulus* (Moser, 1902) (**n. syn.**).

Distribution. *P. elegantulus* is now known from the highlands of the following Countries: Laos (Huaphan), Viet-

nam (Lao Cai, Vinh Phuc, Lang Son (locus typicus), Ha Tinh), China: Guangxi and Hainan (**new record**).

Remarks. Moser published several new species now belonging to the genus *Paratrichius* (*Trichius cruentus*, *Trichius elegantulus*, *Trichius flavipes*, *Trichius saucius*, *Trichius marmoreus*, *Trichius versicolor* and *Trichius bicolor*) in the Berliner Entomologische Zeitschrift, Sechshundvierzigster Band (1901), and this has misled many entomologists regarding the date of publication of the species. However, on the cover of the issue it is clearly printed: «Ausgeben Mitte Februar 1902» - issued in mid-February 1902, so the correct description year of those species is 1902.

Paratrichius marmoreus (Moser, 1902)

Studied material

Paratrichius marmoreus (Moser, 1902) type series. HT♂ MNHUB, Vietnam, Lang Son, Montes Mauson (Mau Son, Long San Prov, 21°51'N, 106°54'E).

Other taxon placed in synonymy with *P. marmoreus* by Krajcik (2008): *Trichius bicolor* Moser, 1902: HT♀ MNHUB, Montes Mauson (Mao Son, 21°51'N, 106°54'E), 2000-3000', Apr-May, H. Fruhstorfer legit.

Other studied material of *Paratrichius marmoreus* (Moser, 1902). **China**: Yunnan. S.E. Yunnan, Vietnam

border, Xichou vinc., BMNH(E)2015-37 (ex M. Krajcik collection), 29 May 1995. **Vietnam:** 3♂ 4♀ ERPC, Nghe An, May 2021, Dang Ngoc Van legit. 1♂ 1♀ ERPC, Vinh Phuc, Tam Dao, 26 May/3 June 1986, Jan Strnad legit. 1♂ NHM (ex M. Krajcik collection) Vinh Phuc, 70 Km NW of Hanoi, Tam Dao, 21°27'N 105°39'E, BMNH(E) 2015-37, 900-1200 m, 11/17 May 1996, P. Spáčil legit. 1♀ NHM (ex M. Krajcik collection) Vinh Phuc, Tonkin, Tam Dao, BMNH(E) 2015-37, 900-1200 m, 12/24 May 1989, Pacholatko legit.

Paratrichius papilionaceus Ma, 1990 type series. HT♂ IZAS, **China:** Hainan, Jianfeng (Jianfèng Ling): 18°43'16»N, 108°52'45»E), 900 m, 27 Apr 1982, (IOZ(E)109606), Gu Maobin legit.

Other studied material previously attributed to *P. papilionaceus*: 1♂1♀ IZAS, **China:** Hainan, Mt. Diaoluoshan, Lingshui, 6/7 May 2011, IOZ(E)1945054-55, Lin Wenxin legit. 1♂, ERPC, **China:** Hainan, Mt. Wuzhishan, Diyfeng, 9/11 Jun 2010, ex IOZ(E)1945742, Zhou Wenyi legit.

Diagnosis. *P. marmoreus* and *P. papilionaceus* belong to a conspicuous but rarely collected species of notable size.

The Hainan species was described by Ma (1990) as *Paratrichius papilionaceus*, based on a single holotype male. Subsequently two males and one female were collected (see list above) allowing a more accurate study of the taxon. Comparing these types and specimens with *Paratrichius marmoreus* (Moser, 1902) – see list above – we found that the parameres are of identical shape, thus *P. papilionaceus* Ma, 1990 must be considered a new junior synonym of *Paratrichius marmoreus* (Moser, 1902) (**n. syn.**), but it is remarkable that there are a few differences, mainly in the colour of the integument between the Vietnamese and Hainan's specimens:

- while the Vietnamese males exhibit a fulvous clypeus, sometimes this colour reduced to the anterior part, the males from Hainan have a completely black clypeus (Figs 2E and 3A)
- similarly, the males inhabiting Vietnam have a long narrow longitudinal fulvous spot in the posterior quarter of the fourth interstriae of the elytron and more-or-less conspicuous fulvous integument under the anterior chalky spots, while the males from Hainan have completely black elytra (Figs 2A and 3A).

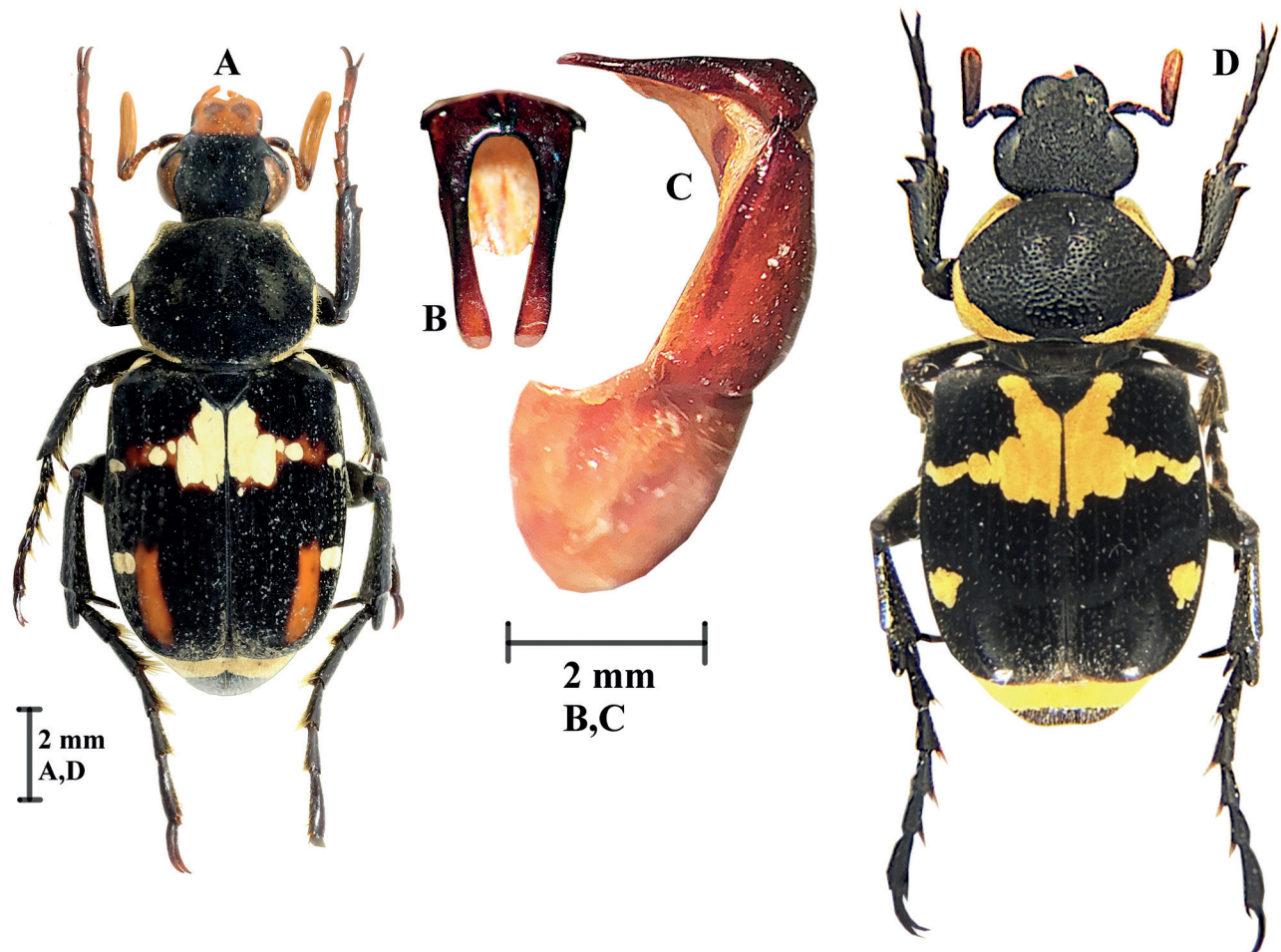


Fig. 3 – *Paratrichius marmoreus* (Moser, 1902). ♂ NHM (ex Krajcik collection) from southernmost Yunnan (Xichou, Vietnam border): **A**, dorsal habitus; **B**, parameres, frontal view; **C**, parameres, lateral view; **D**, ♀ NHM (ex Krajcik) from Tam Dao, northern Vietnam, dorsal habitus. Photographs by Sha Li.



Fig. 4 – *Paratrichius pilosus* Ricchiardi & Lu, new species. HT♂ IZAS: **A**, dorsal habitus; **B**, ventral habitus; **C**, lateral habitus; **H**, pronotum & head; **I**, pygidium; **L**, parameres, frontal view; **M**, parameres, lateral view; PT♂ IZAS: **D**, colour variation; PT♀ IZAS: **E**, dorsal habitus; **F**, ventral habitus; **G**, lateral habitus; **J**, pronotum & head; **K**, pygidium. Photographs by Yuanyuan Lu.

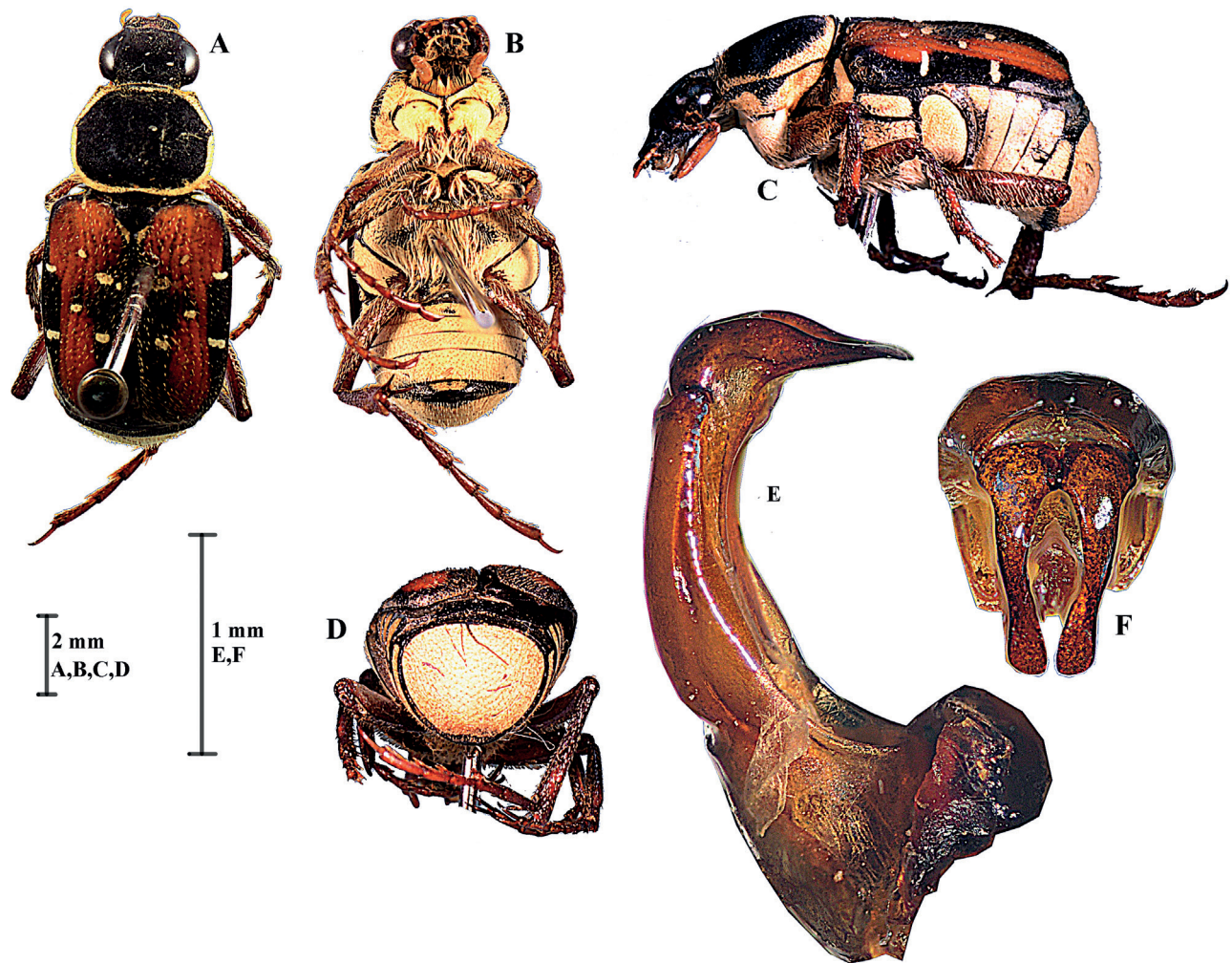


Fig. 5 – *Paratrichius rufescens* Ma, 1990. HT♂ IZAS: **A**, dorsal habitus; **B**, ventral habitus; **C**, lateral habitus; **D**, pygidium; **E**, parameres, lateral view; **F**, parameres frontal view. Photographs by Sha Li.

- the females are completely black but have different shaped chalky spots in the anterior third of the elytron (Figs 2H and 3D). The females inhabiting the continent show a constant chalky pattern on the elytron, but it may be yellowish or whitish.

The above reported morphological/chromatic differences among the insular (Hainan) and continental (N Vietnam) populations of *Paratrichius marmoreus* suggest that their level of genetic differentiation (if any) should be estimated by molecular methods as soon as possible.

Distribution

Paratrichius marmoreus, according to its updated taxonomic assessment tentatively proposed herein, is known to us from the highlands of Vietnam (Nghe An, Vin Phuc, Lang Son, Yen Bai) and SW China (southern Yunnan, Hainan).

Paratrichius pilosus Ricchiardi & Lu, new species

Type series. HT♂, 3PT♂, 3PT♀ IZAS, **China:** Hainan. HT♂ Lingshui, Diaoluoshan Waterfall, 580 m, 10 May 2011, (IOZ(E)1945059), Lin Wenxin legit. 1PT♂, Hilltop of Jianfengling, 25 Apr 1983, IOZ(E)901343, Gu Maobin legit. 1PT♂, Lingshui, Mt. Diaoluoshan, 960-970 m, 6/7 May 2011, IOZ(E)1945056, Lin Wenxin legit. 1PT♂, same data but 960 m, 8 May 2011, IOZ(E)1945058. 2 PT♀, Lingshui, Diaoluoshan road to waterfall, 580-960 m, 9/19 May 2011, IOZ(E)1945724 and IOZ(E)1945723, Lin Wenxin legit. 1PT♀, Jianfengling, 11 May 1981, IOZ(E)901354, Chen Zhiqing legit.

Description of holotype ♂

General. Length 12.1 mm, maximum elytral width 4.9 mm. Elongate, with slender legs. Black, except scapus, segments and the internal lamella which are dark-fulvous.

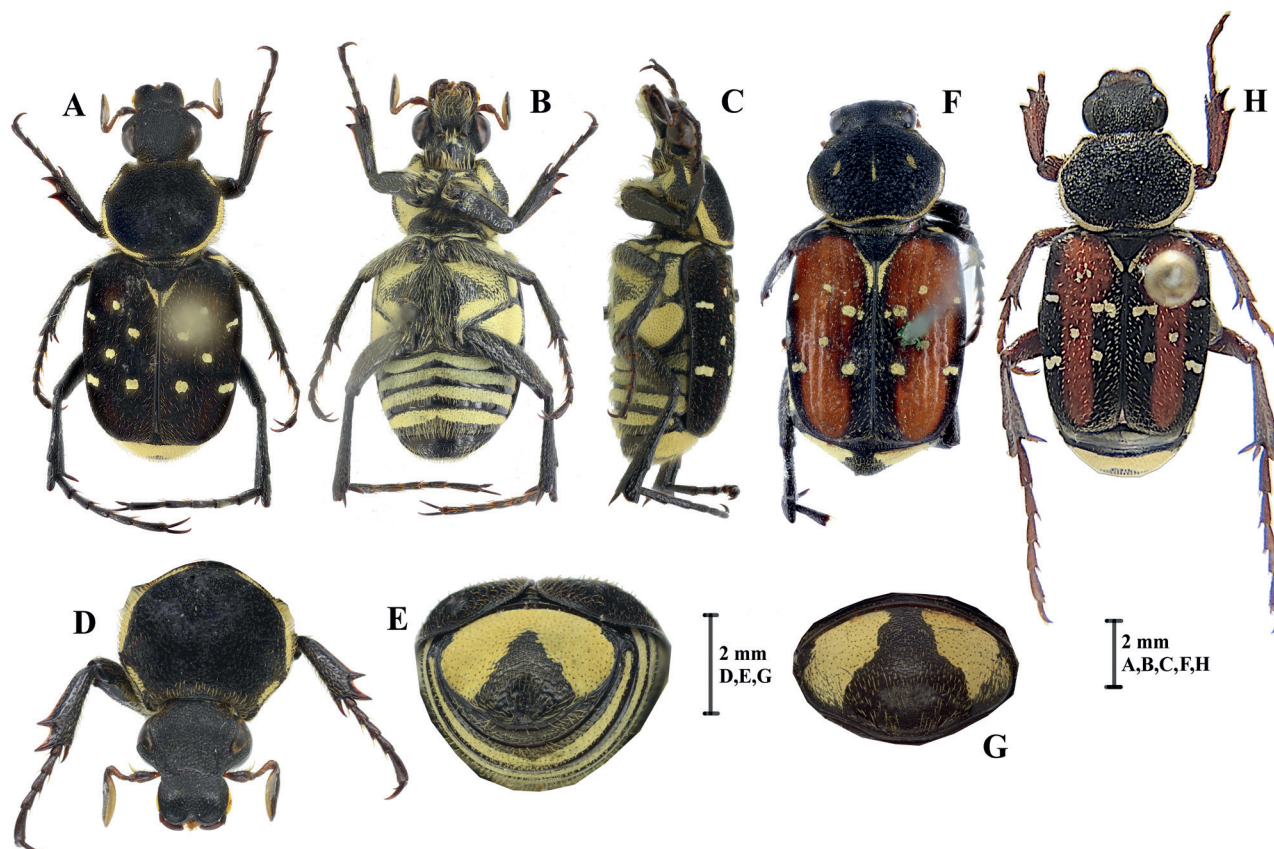


Fig. 6 – *Paratrichiulus rufescens* Ma, 1990. ♀ Not type IZAS IOZ(E)1945727: **A**, dorsal habitus; **B**, ventral habitus; **C**, lateral habitus; **D**, pronotum & head; **E**, pygidium. “*Paratrichiulus rufescens* Ma, 1990” (in fact, belonging to another species) AT♀ IZAS: **F**, dorsal habitus; **G**, pygidium. Photographs by Yuanyuan Lu. ♀ ERPC Not type: **H**, dorsal habitus, Photograph by E. Ricchiardi.

Body decorated with pale-yellow chalky markings as follows: pronotum with a chalky narrow band along margins, interrupted at around one-third of length at lateral ones and at central part of posterior margin. With a longitudinal narrow, short band at middle, two chalky spots on the sides. Elytron with chalky juxtascutellar margins and six prominent, chalky spots positioned in two angulate rows, at one-third and two-thirds of length. The two spots on declivity are elongated. Pygidium with a large comma-shaped patch at each side. Tergites side of ventrites 2-4 covered with chalky material, that of ventrite 5 without such material. Ventral side of ventrites 2-5 covered with chalky material. Ventrites 2-5 with lateral sides without chalky material. Ventrite 6 (anal one) with centre covered with chalky material.

Head. Clypeus shiny, glabrous, wider than long (width about 1.1 times length), widest at centre, sides regularly rounded outwards up to two third of length from anterior margin; horizontally arched, anterior corners rounded, anterior margin emarginate, not reflexed, sinuate. Surface of clypeus apex widely minutely punctulate. Disc of clypeus and frons reticulate. Antennal club long about 1.5 times the clypeus length.

Pronotum. Octagonal. Surface imbricate. Slightly wider than long (about 1.1 times wide than long), moderately

convex, with a short, shallow, central, longitudinal hollow of about one-thirds of length, with two large, shallow depressions at sides. Lateral margins broadly rounded laterally and posteriorly, anterior angles obtuse, posterior angles widely rounded, posterior margin broadly emarginated mesad. Covered with thick, fulvous, slightly long setae at anterior margin and corners.

Scutellum. Matt, with scattered punctures.

Elytron. Intervals covered with scattered, short, erect fulvous setae and scattered punctures. Striae prominent, with shallow horse-shoe punctures, and posterior portion of juxtascutellar interval reticulate.

Pygidium. Convex, slightly wider than long (maximum width about 1.15 times maximum length), with apex rounded. Surface imbricate. Covered with very scattered, short, recumbent, fulvous setae.

Ventrites. With noticeable, central, longitudinal hollow. Mostly covered with long, erect, fulvous setae.

Legs. Protibia bidentate, lacking terminal spur. Meso- and Metatibia posterior margin central tooth obsolete. Metatarsomeres 3-5 with long and thick yellowish setae, longer and longer from third to fifth. Metatibia long about 1.2 times the three first tarsomeres combined. First metatarsomere slightly longer than second.

Aedeagus. As in Figs 4 L-M.

Description of female (differences from male only).

General. Length about 12.5 mm, maximum elytral width about 4.7 mm. Body stockier than in male, with protibia larger.

Head. Clypeus black, dark fulvous at anterior corners, less arched than in male. Antennomeres mostly dark-fulvous. Antennal club about of same length of clypeus.

Pronotum. Dark fulvous, surface shagreened or reticulate by places. Posterior corners widely rounded, surface dark-fulvous, slightly shiny, reticulate. Pronotal central longitudinal hollow present. With thick, fulvous, moderately long setae on lateral margins and corners.

Elytron. Dark red-brown, matt.

Pygidium. Black, shiny, with large band of yellowish chalky material at sides, reaching anterior and posterior margins, covered with regularly scattered, short, fulvous setae, becoming longer at apex. Surface imbricate, punctate on apical hollow. Disc deeply hollowed just after mid-point to apex. **Ventrites.** Black. Superior part of ventrites 2-3 without chalky material, Ventrite 3 with a small chalky spot at sides. Ventrite 4 same chalky spots but much longer and wide. Ventrite 5, centrally completely covered. Anal ventrite (ventrite 6) not hollowed and without chalky material.

Legs. Tibiae dark-fulvous, femurs darker to black. Protibia largely bidentate, with spur. Posterior margin of metatibia with central tooth not very conspicuous, with apex rounded. Tarsi more robust than in male.

Type series variability. The HT♂ and one PT♂ are completely black, 2PT♂ have a completely red-brown pronotum, elytron, antennal club and legs. 3PT♀ have completely dark red-brown pronotum, elytron, antennal club, anterior margin of clypeus and legs.

Discussion. Among the species inhabiting Hainan, *Paratrichi* *pilosus* n. sp. is morphologically close to *P. elegantulus*. The latter taxon exhibits shorter yellow brown setae at the apex of metatarsomeres I-V in both sexes, while *P. pilosus* have longer, yellow brown setae, becoming longer from third to fifth metatarsomeres. In any case, the parameres of the two species are distinctive (Figs 1 K-L and 4 L-M).

Derivatio nominis. The name of the species comes from the long setae that adorn the last three metatarsomeres.

Paratrichi *rufescens* Ma, 1990

Studied material. Type series. HT♂ IZAS, **China:** Hainan, hilltop of Jianfengling, 700-1100 m, 27 Apr 1982, Gu Maobin legit. AT♀ IZAS, **Taiwan?**: Rimongan F, 22 June 1935.

Other studied material. 1♂1♀ ERPC, **China:** Hainan, Jianfeng, 2/25 Apr 1983, Gu Maobin legit. 2♂ 1♀ ERPC, **China:** Hainan, Wuzhishan, Diyifeng, 9/11 Jun 2010, Zhou Wenyi legit. 7♂3♀ IZAS, **China:** Hainan, Mt. Wuzhishan, Diyifeng,

9/11 Jun 2010, IOZ(E)1945712-13;15-16;19-21;25-27), Zhou Wenyi legit. 1♂1♀ IZAS, Wuzhishan road to peak (18°89'N, 109°69'E), 1147 m, 10 Apr 2010, Lin Meiyang legit.

Diagnosis. Ricchiardi (2020) compared this species with *Paratrichi* *bartolozzii* Ricchiardi, 2020 and *Paratrichi* *hajeki* Krajcik, 2010, establishing the morphological relationships between them. Ma (1990), proposed as AT♀ of *P. rufescens* a female apparently collected in Fujian (which was probably misinterpreted in the original description, since the original label seems to indicate that the specimen was collected in Taiwan), because of the red maculae on the elytron, a character present in the HT♂, but the chalky pattern on pronotum and pygidium does not support her diagnosis (see Fig. 6) and we found that this female belongs to another species, to be more precisely identified in the future. We identified several females collected in Hainan as belonging to *P. rufescens*, and selected one of them for the redescription of the species presented below.

Redescription of female (differences from the male). **General.** Length: about 12.5 mm, maximum width: about 5.1 mm. Body stockier than male, with protibia larger and abdomen not arched in lateral view.

Head. Black, reticulate, clypeus weakly shiny. Antennomeres mostly brown, with first club antennomere fulvous. Antennal club of about same length as clypeus.

Pronotum. With posterior corners rounded, surface black, without pruinosity, matt, coarsely punctate-reticulate. Pronotal central longitudinal hollow absent and with thick, fulvous, moderately long setae on lateral margins and posterior corners.

Elytron. Black, matt, posterior part of juxtastura scratched.

Pygidium. Black, with large band of pale-yellow chalky material along dorsal and lateral margins, but not reaching margins; covered with regularly scattered, medium-sized, fulvous setae, becoming longer at apex. Surface imbricate, scabrously imbricate into apical hollow. Deeply hollowed from about two-thirds of length to apex.

Ventrites. Black, ventrites 2-5 covered at centre with a continuous band of pale-yellow chalky material. Anal ventrite not hollowed and without chalky material.

Legs. External margin of metatibia with central tooth not very conspicuous. Tarsi more robust than in male.

Species variability. While the chalky patterns are constant in both sexes, the elytron integument colour varies. The males have elytron black, with a conspicuous orange-red spot on the first third and a second one at the posterior third, often joined centrally (Fig. 5A) sometimes expanding to form a large orange-red band. Females have elytral integument completely black (Fig. 6A) or a large orange-red band (Fig. 6H). The females with an orange-red band have a dark orange-red centre of the clypeus.

Acknowledgements – We are thankful to Maxwell Barclay (NHM), Bernd Jaeger (MNHUB), Dirk Ahrens (ZFMK) and Stan Jakl (SJPC) for the loan of types and other specimens. Special thanks to H. Kobayashi (HKPC) who sent us for study two PT♂ of *Paratrichius brevifolius* Kobayashi & Fujioka, 2013. Thanks to Zehao Tian (IZAS) who helped with photographs. This work was supported by the National Science & Technology Fundamental Resources Investigation Program of China (Grant No. 2019FY100400), the National Natural Science Foundation of China (Nos. 31961143002, 31900317), GDAS Special Project of Science and Technology Development (No. 2020GDASYL-20200102021, 2020GDASYL-20200301003). The research was funded by a project from Hainan Yazhou Bay Seed Lab (No. B21HJ0102).

References

- Chang J., Chen D., Ye X., Li S., Liang W., Zhang Z., Li M. 2012. Coupling Genetic and Species Distribution Models to Examine the Response of the Hainan Partridge (*Arborophila ardens*) to Late Quaternary Climate. *PLOS ONE*, 7 (11): 1-8. Doi: <https://doi.org/10.1371/journal.pone.0050286>
- Cristóvão J.P., Vaz-De-Mello F.Z. 2020. The terminalia of the superfamily Scarabaeoidea (Coleoptera): specific glossary, dissecting methodology, techniques and previously unrecorded sexual dimorphism in some difficult groups. *Zoological Journal of the Linnean Society*, XX: 1–43.
- Krajcik M. 2008. New species of *Paratrichius* with synonymical remarks on this genus (Coleoptera, Scarabaeidae, Trichiinae). *ANIMMA.X*: 11-14.
- Richter P.O. 1969. Spiracles of adult Scarabaeoidea (Coleoptera) and their phylogenetic significance. I. The abdominal spiracles. *Annals of the Entomological Society of America*, 61(4): 869–880.
- Ma W. 1990. Four new species of *Paratrichius* from China (Coleoptera; Trichiidae). *Acta Entomologica Sinica*: 457.
- Ricchiardi E. 2020. Description of eight new species of *Paratrichius* Janson, 1881 from Vietnam (Coleoptera: Scarabaeidae, Cetoniinae). *Fragmenta entomologica*, 52 (2): 321–339.