

## Additions to the Knowledge of the Genus *Elaphrus* FABRICIUS, 1775 (Coleoptera, Carabidae)

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**Abstract** Taxonomic, faunistic and bionomic data on the species of the genus *Elaphrus*, particularly from the People's Republic of China, are given. *Elaphrus (Elaphrus) citharus* is described as new from specimens from the province of Gansu and adults are compared with those of other species of *Elaphrus* s. str. The available bionomic data are given and the pertinent couplets in the key by GOULET (1983) are modified to accommodate the new species.

The *E. trossulus* species-group is characterized and keyed out; within this group, *Elaphrus (Elaphrus) parviceps* VAN DYKE, 1925 is placed in synonymy with *E. (Elaphrus) trossulus* SEMENOV, 1904 (new synonymy), and a new key to separate *E. trossulus* from *E. (Elaphrus) tibetanus* SEMENOV, 1904 is presented. The variability in adults of *E. tibetanus* is discussed and available distributional and bionomic data for the species are given.

Two names used for colour forms of adults of *Elaphrus (Arctelaphrus) lapponicus* GYLLENHAL, 1810: v. *violaceus* LUTSHNIK, 1936 and a. *viridis* JEDLIČKA, 1956 are formally placed in synonymy with this species (new synonymies) and an updated formal synonymy of *E. lapponicus* is given. Information is given on the holotype of *E. (Elaphroterus) purpurans* HAUSEN, 1891.

A third instar larva of *Elaphrus viridis* HORN is described and the pertinent couplets in the key in GOULET (1983) are modified.

Adults of *Elaphrus (Neoelaphrus) sugai* NAKANE, 1987 and *Elaphrus (Elaphrus) weissi* DOSTAL, 1996 are characterized and the pertinent couplets in the key by GOULET (1983) are modified.

### Introduction

In systematic research, even upon completion of a revision, unsolved problems may remain, due to lack of specimens in difficult species complexes, or for numerous other reasons, such as newly acquired information on types, that have not been seen and/or located. Finally, new taxa or immatures of known species may be discovered.

GOULET (1983) revised the world fauna of the genus *Elaphrus* FABRICIUS, 1775. Since the publication of this revision, the author has been gathering new information. Following the significant recent discoveries of *Elaphrus* specimens by A. SMETANA and other coleopterists, it was felt a paper was due to make the new information on the

genus available.

Following the discovery of numerous specimens of *E. tibetanus* SEMENOV, 1904 in China in the past few years, it is now possible to characterize this species and those closely related to it. In addition, there is a new and rather distinct species from the People's Republic of China. The keys by GOULET (1983) have been modified to include this new species, and revised couplets for the treated taxa of the *tibetanus* complex are added. A third instar larva of *E. viridis* HORN is described. Adults of *Elaphrus* (*Ne-elaphrus*) *sugai* NAKANE, 1987 and *Elaphrus* (*Elaphrus*) *weissi* DOSTAL, 1996 are characterized, and brief nomenclatorial, synonymical and distribution notes are given.

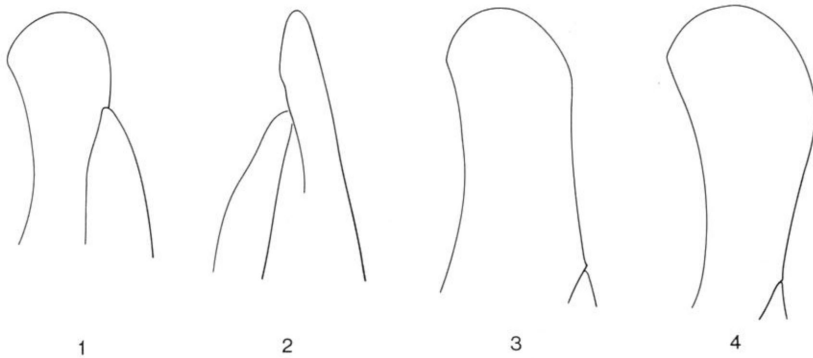
### The *Elaphrus tibetanus* Complex

Adults in this complex are characterized as follows: lateral beaded margin of pronotum lacking in situation, or reduced to a fold in situation, lateral margin not explanate near middle; lateral margin of elytron hardly sinuate in basal third; metafemur in dorsal view with a few short (25 to 80 microns) setae; accessory setae extended at least to edge of fifth visible abdominal sternum; lateral surface of third visible abdominal sternum with less than 40 punctures (Fig. 21); microsculpture on last three sterna, outside ambulatory setae and punctate lateral surface, without pointed and scale-like sculpticells but with flat, partly isodiametric and transversely fused sculpticells (Fig. 23). Two species are at present included in this complex: *E. tibetanus* and *E. trossulus* SEMENOV, 1904 (referred as to *E. parviceps* VAN DYKE, 1925 in GOULET, 1983; see synonymic discussion below).

Couplet 12 in GOULET (1983, 286) is modified as follows to allow easier separation of this complex of species.

- 12 (11') Third visible abdominal sternum with less than 40 punctures between ambulatory setae and lateral margin (Fig. 21). Microsculpture on last three sterna outside ambulatory setae and punctate lateral surface without pointed scale-like sculpticells, but with flat, isodiametric and transversely fused sculpticells (Fig. 23). Most specimens with one or more accessory setae on disc of pronotum (Fig. 8). Punctures in pits separated by two to four rows of sculpticells (Fig. 17–18). . . . . 14
- Third visible abdominal sternum with 40 to 80 punctures between ambulatory setae and lateral margin (Fig. 22). Microsculpture on last three sterna outside ambulatory setae and punctate lateral surface with pointed scale-like sculpticells in at least basal third, and with flat and convex isodiametric sculpticells, rarely with sculpticells transversely fused at apical margin of visible sternum 5 and 6 (Fig. 24). Almost all specimens without accessory setae on disc of pronotum (as in Fig. 9). Punctures in pits separated by one to three rows of sculpticells. . . . . 13

*Elaphrus trossulus* is known from northwestern Québec (Povungnituk in northwestern Québec, first mention east of Hudson Bay) westward across the continent to



Figs. 1-4. Apex of median lobe. — 1-2, *Elaphrus citharus*: 1, lateral view; 2, ventral view. — 3, *Elaphrus sugai*, lateral view. — 4, *E. japonicus*, lateral view.

northeastern Siberia in the southern tundra ecotone (GOULET, 1983, 320, and specimens correctly identified by KRYZHANOVSKIJ), and isolated in forested mountainous regions of northern Mongolia and neighbouring Russia west and south of Lake Baikal (SEMENOV, 1904, and specimens provided by KRYZHANOVSKIJ). *Elaphrus tibetanus* is known from several localities in Gansu, Qinghai and Sichuan provinces east of Tibet.

*Elaphrus trossulus*, was previously synonymized by GOULET (1983, 314) with *E. riparius* (LINNÉ, 1758) and by SHILENKOV (1995) with *E. tuberculatus* MÄKLIN, 1878. We have not seen the type of *E. trossulus*, studied by both KRYZHANOVSKIJ and SHILENKOV. However, four specimens, identified as *E. trossulus* and compared with the holotype by KRYZHANOVSKIJ, are distinct from *E. riparius* and *E. tuberculatus*. We are confident in KRYZHANOVSKIJ's interpretation based on correct identifications of specimens of species notoriously difficult to segregate (e.g. *E. riparius* from Kamchatka, *E. tuberculatus*, *E. parviceps*, *E. hypocrita* SEMENOV, 1926 and *E. comatus* GOULET, 1983).

*Elaphrus trossulus* is a problem species within the *tibetanus* complex. Based on only four available specimens, this species cannot be separated from *E. parviceps*. The distributional range of *E. trossulus* is widely isolated from that of the northeastern Siberian *E. parviceps*. SHILENKOV (1995), in his analysis of the southern Siberian ground beetle fauna, also mentions several species with ranges in the tundra ecotone. LAFONTAINE (pers. comm.), a lepidopterist, and SHILENKOV (pers. comm.), a ground beetle expert, are familiar with the region, and both confirm that several species with tundra ranges also occur in south Siberian mountains. The known localities of *E. trossulus* are not recorded from alpine sites, but from boreal sites. However, we believe that their tundra ancestors adapted to lower ecozone in similar habitats, following the last glacial retreat. Therefore, we believe that both species are synonymous. The proposed synonymy is as follows:

*Elaphrus (Elaphrus) trossulus* SEMENOV

*Elaphrus trossulus* SEMENOV, 1904, 21. Type area: Western Mongolia; type not seen.

*Elaphrus parviceps* VAN DYKE, 1925, 112. Type locality: Seward Peninsula, Alaska; type seen by GOULET (1983) in California Academy of Sciences, San Francisco. *New Synonymy*.

*Elaphrus riparius*: LINDROTH, 1961, 116 ( *ex parte*) (nec LINNÉ, 1758).

*Elaphrus americanus* JUDD, 1967, 51 (nec DEJEAN, 1831).

GOULET (1983, 320) attempted to separate *E. tibetanus* from *E. parviceps* (now *E. trossulus*). The only character mentioned, that still works, is the size of punctures in the first pit of elytral interval 3, other characters are unreliable. The following key is expanded to insure accuracy in identification, and to complement the description of *E. trossulus*, given by GOULET (1983, 286).

- 14 (12) Overall punctation of elytra fine (Figs. 11, 17, 19); largest diameters of most punctures in first elytral pit near suture between 20–25  $\mu\text{m}$  (Fig. 17). Most setae on last abdominal sternum less than 150  $\mu\text{m}$  long; setae on dorsal surface in apical fourth of metafemur 25–50  $\mu\text{m}$  long. First mirror near base of elytron anterior to first pit in interval 5 (second row of pits) quite clearly outlined, at most with a few small punctures (Fig. 11). Irregular striation on middle of frons prominent, interstitial punctures markedly reduced (Fig. 5). Interval 4 just outside largest mirror in interval 3 usually with elongate purple or green spot similar to nearby pit colour pattern. . . . . *E. tibetanus* SEMENOV
- Overall punctation of elytra distinctly coarser (Figs. 12, 18, 20); largest diameters of most punctures in first elytral pit near suture between 25–30  $\mu\text{m}$  (Fig. 18). Most setae on last abdominal sternum more than 150  $\mu\text{m}$  long; setae on dorsal surface in apical fourth of metafemur 50–80  $\mu\text{m}$  long. First mirror anterior to first pit in interval 5 (second row of pits) indistinctly outlined and covered with punctures of diameters of 25  $\mu\text{m}$  (Fig. 12). Irregular striation on middle of frons less prominent, interstitial punctures slightly reduced (Fig. 6). Interval 4 just outside largest mirror in interval 3 rarely with purple spot similar to nearby pit colour pattern. . . . . *E. trossulus* SEMENOV

**Notes on *Elaphrus (Elaphrus) tibetanus***

*Variation, measurements and proportions.* The colour variation in *E. tibetanus* is unusual, as three distinct colour forms were discovered. We know only two other species with 3 colour forms occurring together: *E. olivaceus* LECONTE, 1863 and *E. angusticollis angusticollis* R. F. SAHLBERG, 1844. Moreover, there seems to be a geographical difference in the distribution of the colour form with green body and green pits. This form is known to us only from southwestern Gansu and the neighbouring areas in Sichuan.

The three colours are characterized as follows. In the green form with purple pits



Table 1. Descriptive statistics for *E. tibetanus*, based on ten males and ten females from Lingke Riv., 5 km SSW Luqu, Gansu, China.

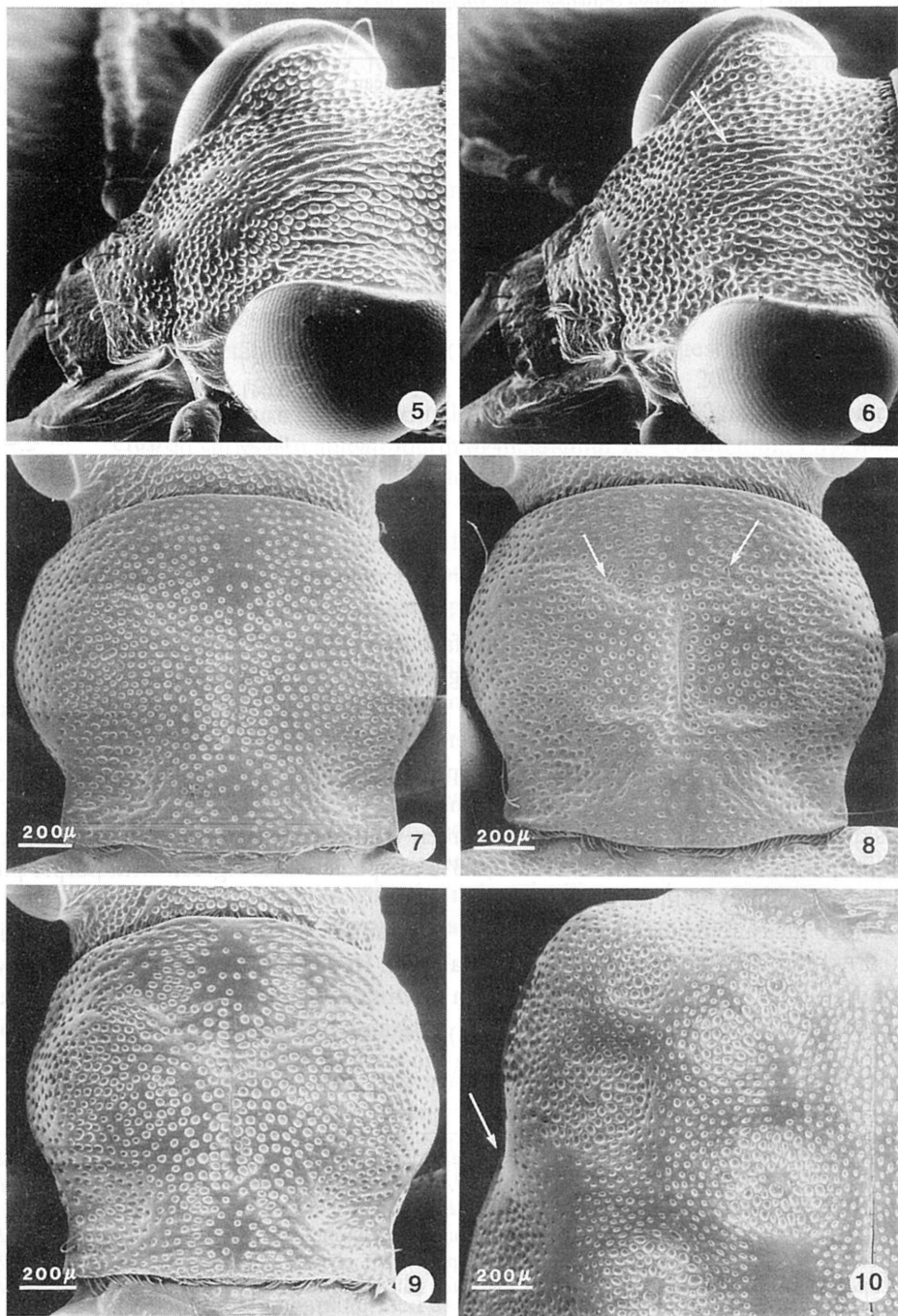
Character	Range	Mean	1.5 SD	2 SE	CV (%)
<b>A. Measurements in mm</b>					
Pronotum length=PL	1.20–1.48	1.31	0.093	0.031	4.3
Pronotum width=PW	1.37–1.67	1.52	0.121	0.036	5.3
Elytral length=EL	3.30–3.90	3.57	0.234	0.070	4.4
Elytral width=EW	1.17–1.40	1.32	0.102	0.030	5.2
Head width=HW	1.35–1.62	1.55	0.100	0.031	4.3
<b>B. Proportions</b>					
PL/PW	0.828–0.918	0.867	0.038	0.011	2.9
PL/EL	0.347–0.383	0.368	0.014	0.004	2.5
PL/EW	0.893–1.000	0.998	0.057	0.017	3.8
PL/HW	0.806–0.919	0.851	0.041	0.012	3.3
PW/EL	0.403–0.446	0.424	0.017	0.005	2.6
PW/EW	1.036–1.200	1.150	0.050	0.015	2.9
PW/HW	0.935–1.037	0.981	0.042	0.013	2.9
EL/EW	2.571–2.821	2.708	0.091	0.027	2.3
EL/HW	2.236–2.444	2.310	0.082	0.024	2.4
EW/HW	0.828–0.903	0.853	0.029	0.009	3.0

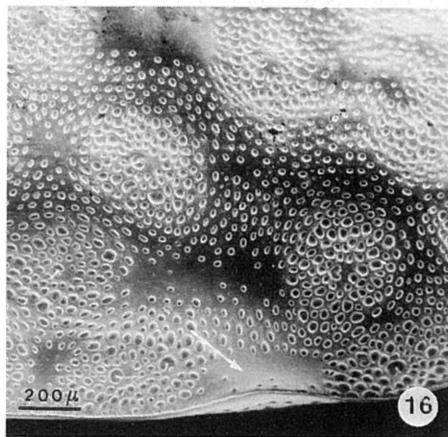
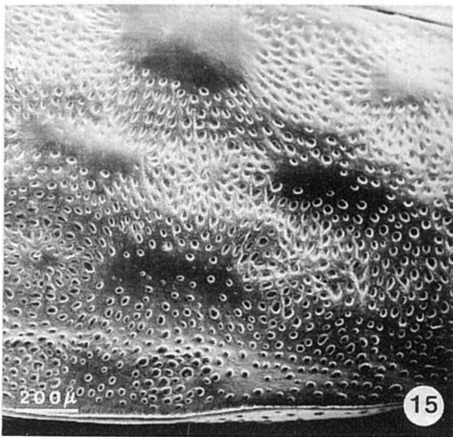
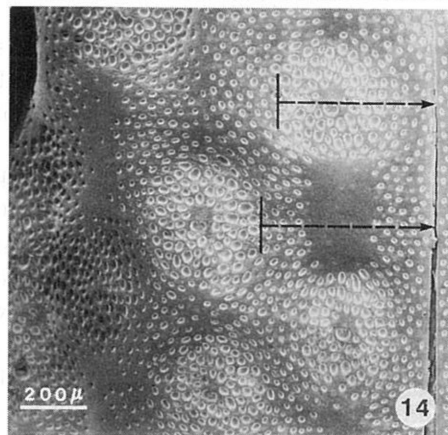
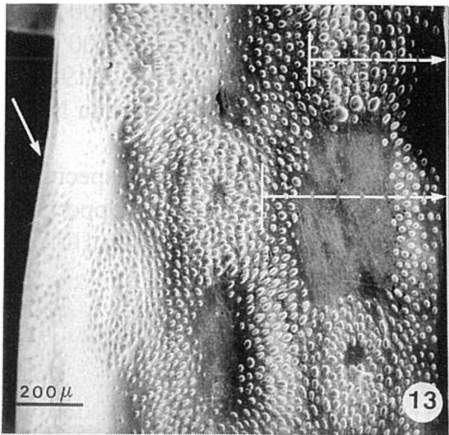
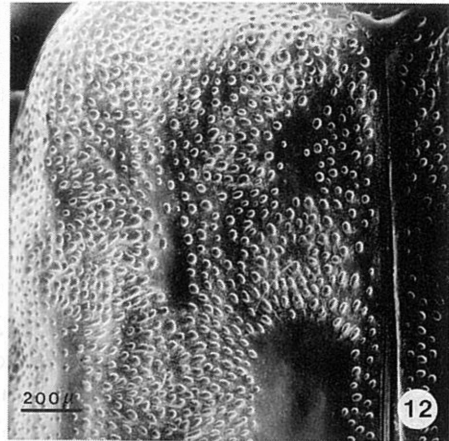
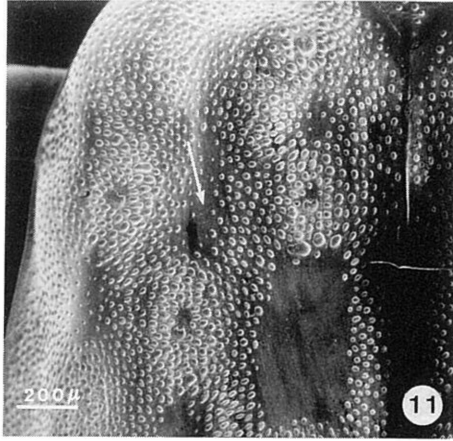
(68% of studied specimens), the dorsal surface (excluding the purple pit areas) is dark copper and the punctures are green. In the green form with green pits (16% of studied specimens), the surface is mainly coppery with some green (on pronotum and head) and the punctures are green. In the coppery form with purple pits (16% of studied specimens), the surface (excluding the purple pit areas) is dark copper and the punctures are coppery. In southwestern Gansu and adjacent areas of Sichuan, 37% of specimens are green with green pits, 39% are green with purple pits and 24% are coppery with purple pits. Farther north in Gansu, 93% of specimens are green with purple pits and 7% are coppery with purple pits.

Most measurements of *E. tibetanus* are similar to those of *E. trossulus* (in GOULET, 1983, 319, under *E. parviceps*) (Table 1). However, in the width (EW) of elytra and head (HW) they distinctly differ. In *E. trossulus* the measurements are longer than those of *E. tibetanus*: EW is between 1.42 and 1.60 mm and HW between 1.60 and 1.75 mm, and the ratio is smaller than those of *E. tibetanus*: PW/EL is between

Figs. 5–10 (on page 206).—5–6, Posterodorsal view of head: 5, *Elaphrus tibetanus*; 6, *E. trossulus*.—7–9, Dorsal view of pronotum: 7, *Elaphrus tibetanus*; 8, *E. trossulus*; 9, *E. citharus*.  
—10, Basal half of elytron of *Elaphrus citharus*.

Figs. 11–16 (on page 207).—11–12, Basal half of elytron: 11, *Elaphrus tibetanus*; 12, *E. trossulus*.—13–14, Dorsal view of central portion of elytron: 13, *Elaphrus tibetanus*; 14, *E. citharus*.—15–16, Dorso-lateral view of outer half of elytron: 15, *Elaphrus trossulus*; 16, *E. citharus*.





0.346 and 0.420. Most specimens of *E. tibetanus* have the value of PW/EL greater than 0.410, and in most specimens of *E. trossulus* this value is 0.410 or less.

*Material studied* (37 ♂♂, 50 ♀♀). China: [Gansu]: Labrang-Umg. (=Xiahe) VI. 92, 3000 m, RICHTER leg., 2 ♀♀, Canadian National Collection, collection HEINZ. —“Hua-er-Ge, Lingke Riv., 5 km SSW Luqu, 3400 m, 12. VII. 1994 A. SMETANA [C11]”, 5 ♂♂, 5 ♀♀, Canadian National Collection; or two different spellings of same locality: “ca. 5 km sw. Luqu (loc. Hua-er-Ge/Lin Ke river) — 3400 m 12/13. VII. 1994 HEINZ leg.”, 5 ♂♂, 8 ♀♀, Collection HEINZ; “Hua-er-Ge 5 km SSW Luqu 3400 m, 13. VII. 1994 A. SMETANA [C12]”, 6 ♂♂, 8 ♀♀, Canadian National Collection; “road Luqu–Waxu, km 5, 3300 m 12.–13. VII. 1994 leg. K.-W. ANTON”, 2 ♂♂, 1 ♀, Collection ANTON. —“Mts. 10 km S Xiahe, 3100–3200 m, 4. VIII. 1994 A. SMETANA [C29]”, 11 ♂♂, 16 ♀♀, Canadian National Collection; or different spelling of same locality: “road SW of Xiahe, valley, 3200–3450 m, 4. VIII. 1994, Leg. K.-W. ANTON”, 6 ♂♂, 8 ♀♀, Collection ANTON. [Sichuan]: “Hongyuan m 4200 21. VII. 1991 Málek”, 1 ♂, 1 ♀, Canadian National Collection. —“Bass. Golub. r.: r. Dza-chiu. 11.000’. Sred. IV. 1901. Exp. Kozlova” (label in Cyrillic=Dsa-tshu River 31°46’N 100°00’E), 1 ♀, Canadian National Collection. [Qinghai]: “Lv. prit. r. By-chiu. 14.000’. VII. 1900 Exp. Kozlova” (label in Cyrillic=left tributary of the river By-chiu, 1 ♂, Canadian National Collection.

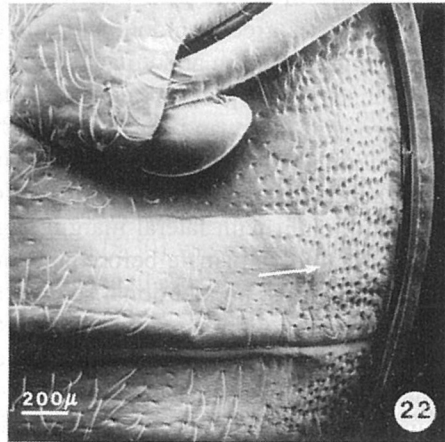
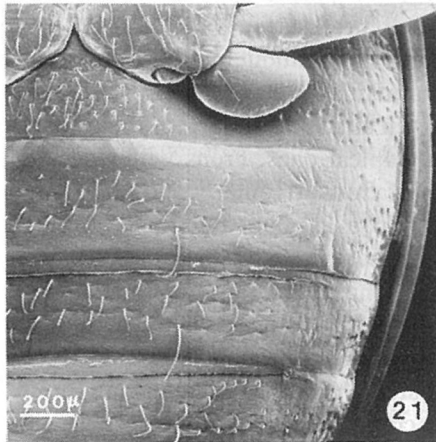
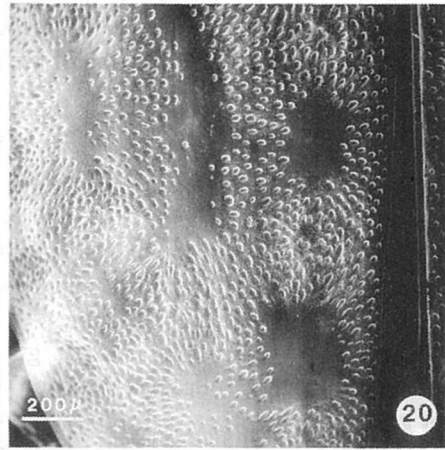
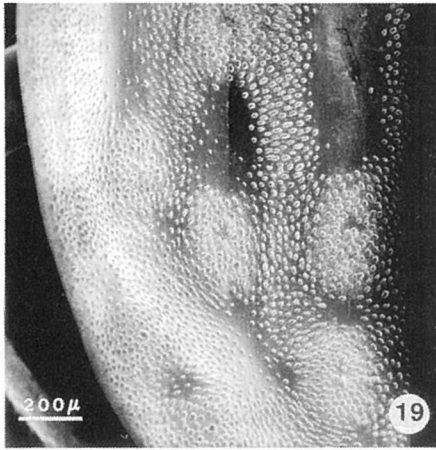
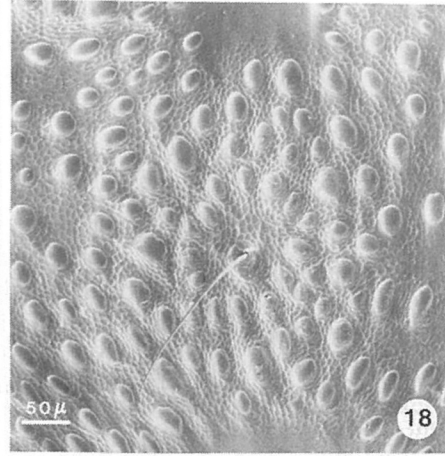
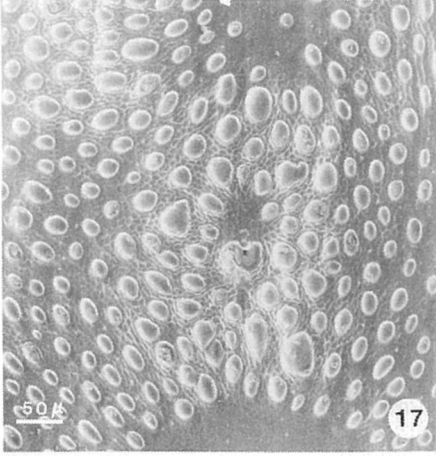
*Additional records.* SEMENOV (1904) reports 55 specimens of this species from the following localities in the province of Qinghai: Upper Huang-he [=Upper Yellow River]; Amnen-kor Mts. [=Anyêmaqên Shan]; Orin-nur Lake [=Ngoring Hu]; Serg-tshu Riv. [=one of the rivers feeding lake Ngoring Hu].

*Geographical distribution.* *Elaphrus tibetanus* is at present known from the provinces of Qinghai (mainly from the area around the sources of Huang-he [Yellow River], western Gansu and northern Sichuan (Fig. 27).

*Bionomics.* The specimens collected by SMETANA, HEINZ and ANTON at the locality 5 km SSW Luqu (C11, C12), were taken on moist, sun-exposed, loamy-sandy flats with sparse low vegetation, together with a species of the genus *Asaphidion*. Specimens collected by SMETANA and ANTON in the mountains 10 km S Xiahe (C29) were taken in a pasture formation on a sun-exposed wet seepage flat with very dense and thick, low grass (Figs. 25, 26). The specimens were difficult to spot among the dense blades of grass. It should be noted that these two habitats of *E. tibetanus* are drastically different.

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Figs. 17–22. — 17–18, Dorsal view of pit in first row in front of main mirror along mirror: 17, *Elaphrus tibetanus*; 18, *E. trossulus*. — 19–20, Apical half of elytron: 19, *Elaphrus tibetanus*; 20, *E. trossulus*. — 21–22, Ventral view of abdominal sterna 1 to 4: 21, *Elaphrus tibetanus*; 22, *E. tuberculatus*.





## A New Species of *Elaphrus* from China

### *Elaphrus (Elaphrus) citharus* sp. nov.

(Figs. 1–2, 9–10, 14, 16)

*Type material.* Holotype (male) labelled: "(CHINA: Gansu) Xinlongshan b. Yuzhong (loc. Yangzhai) 3000 m 7/9. VIII. 1994 HEINZ leg.". In the Canadian National Collection, Ottawa, Ontario, Canada. Condition: perfect, aedoeagus extracted, but still attached to apex of abdomen. Paratypes: China: [Gansu]: Xinlongshan b. Yuzhong (loc. Yangzhai), 3000 m, 7/9. VIII. 1994, HEINZ leg., 2 ♂♂, 2 ♀♀, Collection HEINZ and the National Science Museum (Natural History), Tokyo. — Dalijia Shan, 46 km W Linxia, 2980, 10. VII. 1994, A. SMETANA [C5], 1 ♀. — Mts. 25 km E Xiahe, 3000 m, 5. VIII. 1994, A. SMETANA, [C30], 1 ♀. both specimens in the Canadian National Collection, Ottawa.

*Etymology.* The specific epithet is an adjective, derived from the Latin noun *cithara*, -ae, f. (guitar). It refers to the shape of the elytra that to some extent resembles a guitar, due to the distinct sinuation of the lateral margins).

### Adults

*Diagnostic combination.* *Elaphrus citharus* differs from the adults of all other species of the subgenus with markedly constricted lateral margin of elytra in basal third, by the large punctures (diameters of 40–50 microns) in elytral pits, on the pronotum and proepisternum, by the accessory setae laterally on visible sterna 4 and 5, and by the lack of setae on metepisternum.

*Description.* One colour form: green with purple pits. Microsculptured and smooth surfaces dark coppery on elytron except in pits, bright coppery over half and bright green or blue green over remainder of head and pronotum, and red or blue purple near centre of elytral pits; punctures green but purple near centre of elytral pits. Ventral punctures green; smooth and microsculptured surfaces dark copper on pleura and green and copper on abdominal sterna. Interval 4 without purple spot (looking as a pit without setigerous puncture at middle) near main mirror; femora metallic green and reddish brown at base, and tibiae reddish brown and metallic green at base and apex. Antennomere 3 without accessory setae, only apical ones. Frons without medial impression and accessory setae; central portion of frons irregularly and not prominently striated. Pronotum with lateral margin slightly convex, obliterated and not beaded in sinuation, and not explanate before sinuation; disc with one pair of very shallow submedial impressions; no additional setae beside long seta at posterolateral angle; maximal width of pronotum narrower than maximal width of head with eyes (Fig. 9). Abdominal sterna with moderate number of setae in both sexes, mostly at side on last abdominal sternum; setae extended to edge of sterna 5 and 6. Setae lacking on metepisternum. Lateral margin of elytron markedly constricted in basal third (Fig. 10). Main

mirror of elytron rectangular and sharply outlined, mirror in second row indistinctly outlined (Fig. 10), those of third row quite clearly outlined, and mirror near lateral sinuation clearly outlined and bright copper (Fig. 16, compare with Fig. 15). Elytral pits wide: distance from suture to lateral margin of pit in front of main mirror in interval 3 subequal to distance from suture to medial margin of pit nearest to main mirror in interval 5; pits deeply impressed (Fig. 14). Dorso-subapical surface of metafemur with one to four short (40–60  $\mu\text{m}$  long) setae.

*Integument sculpture.* Punctures 30–40  $\mu\text{m}$  in diameter on head, along outer half of elytral pits, pronotum, proepisternum and metepisternum. Punctures 20–30  $\mu\text{m}$  apart on elytral intervals 4, 6 and 8 (Figs. 10, 14), 20–40  $\mu\text{m}$  apart on proepisternum and abdominal sterna 3–4, 30–50  $\mu\text{m}$  apart anterolaterally on pronotum (Fig. 9); mainly adjacent submedially on pronotum (Fig. 9), head, elytral pits, on mesopleuron and metapleuron. First sutural pit of elytron with 3 to 4 concentric rows of punctures (Fig. 14). Third visible abdominal sternum with less than 50 punctures (less than in Fig. 22).

Microsculpture convex over most of dorsal body surface and thoracic pleura, flat transverse and without points on visible abdominal sterna 4 to 6 between ambulatory setae and lateral punctate area (as in Fig. 23).

*Male genitalia.* Apex of median lobe in ventral view thin-edged and slightly twisted, in lateral view spatulate with clearly defined angle ventrally (Figs. 1, 2); base of lobe along ventral angular bend widely sclerotized, ventral membrane not visible in lateral view. Setae of parameres long.

*Measurements and proportions.* Based on six specimens. PL, 1.32–1.330–1.35 mm; PW, 1.47–1.508–1.52 mm; EL, 3.25–3.492–3.60 mm; EW, 1.22–1.273–1.32 mm; HW, 1.62–1.680–1.72 mm; PL/PW, 0.868–0.882–0.918; PL/EL, 0.367–0.381–0.406; PL/EW, 1.015–1.045–1.107; PL/HW, 0.767–0.792–0.815; PW/EL, 0.420–0.433–0.468; PW/EW, 1.152–1.185–1.216; PW/HW, 0.880–0.898–0.938; EL/EW, 2.600–2.734–2.869; EL/HW, 1.970–2.078–2.160; EW/HW, 0.731–0.758–0.772.

*Geographical distribution.* *Elaphrus citharus* is at present known from 3 localities in the province of Gansu (Fig. 27).

*Notes on bionomics.* The series of specimens, including the holotype collected by HEINZ in Xinlongshan, was taken near a creek in a pasture formation on a sun-exposed wet seepage area with low grassy vegetation and patches of exposed bare ground. The specimen from Dalijia Shan [C5] was taken near a small mountain river among low grass on a wet seepage area with lush vegetation at the base of a rock wall. The specimen from the mountains 25 km E Xiahe [C30] was taken among dense low grass on a small, sun-exposed, seepage area near a small creek.

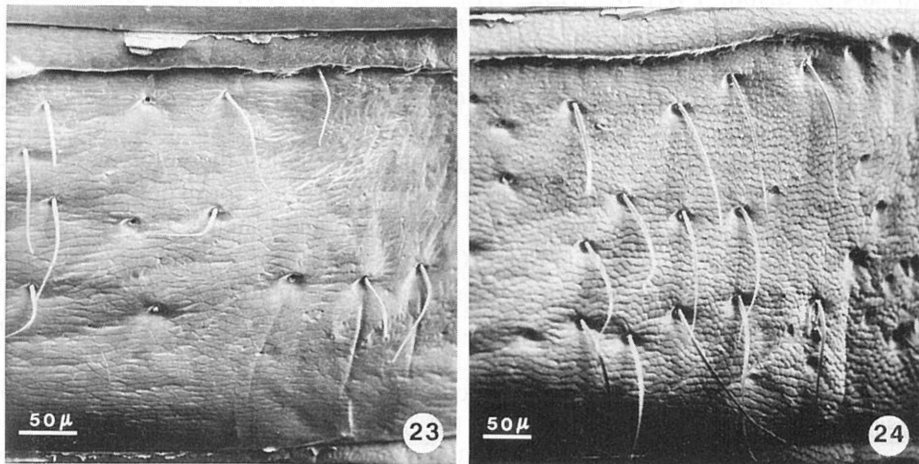
*Taxonomic notes.* Adults of this species are unusual in Eurasia because of the markedly constricted elytral margin (Fig. 10). *Elaphrus citharus* is quite similar to Nearctic *E. californicus* MANNERHEIM, 1843 and *E. ruscarius* SAY, 1830; however, we do not believe that it is related to either of these two species. In Eurasia, only adults of *E. smaragdiceps* SEMENOV, 1889 have such a constriction; however, in *E. smarag-*



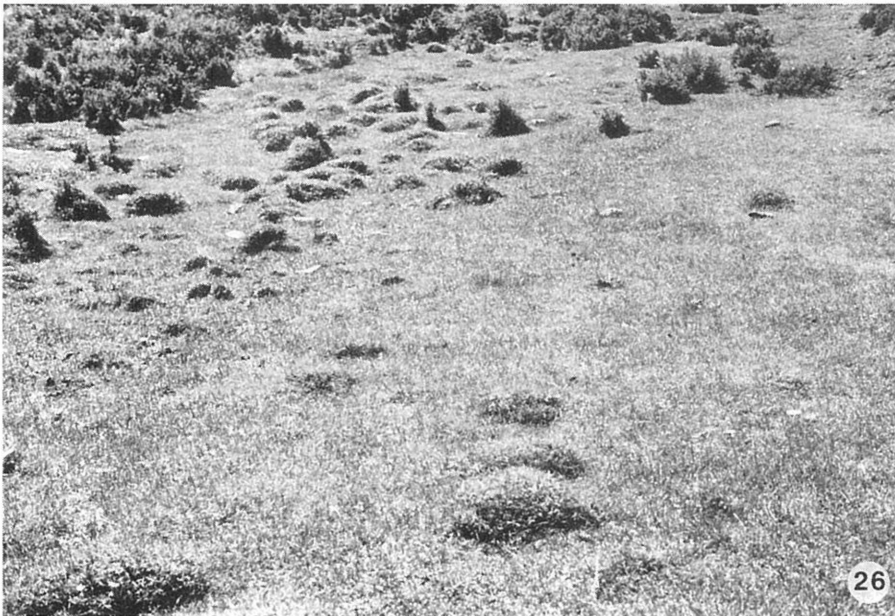
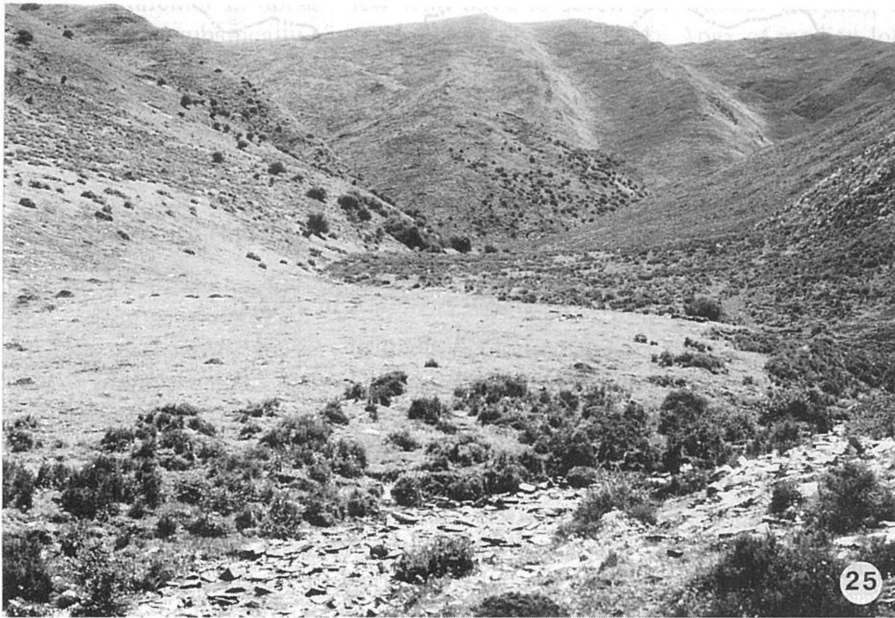
*diceps*, the head and elytra are very finely punctate (SEMENOV, 1889: “*Elytris...crebre tenuiter punctulatis*”), the head has no coppery patterns, only bright green patterns (SEMENOV, 1889: “*capite toto smaragdino*”), and the pronotum is longer than wide (SEMENOV, 1889: “*Thorace...nullo modo transverso*”). SEMENOV (1904) redescribed this species and added some new information, such as the development of the mirrors at the elytral sinuation and ventral punctation. GOULET (1983) studied the holotype of this species, but notes are not complete enough to key out SEMENOV’s species. The relationships of *E. citharus* with those of *Elaphrus* s. str. are not very clear. The setal distribution on last abdominal sterna to lateral edge would support relationships with the lineage comprising *E. comatus* GOULET, 1983, *E. riparius*, *E. tuberculatus*, *E. trossulus* and *E. tibetanus* (see GOULET, 1983). Within this group of species, adults of *E. citharus* are rather distinctive and relationships of this species remain unresolved. Both males of the original series were dissected.

*Geographical affinities.* The range of this species overlaps with those of *E. sibiricus* MOTSCHULSKY, 1844, *E. tibetanus* and *E. punctatus* MOTSCHULSKY, 1844. A specimen of *E. sibiricus*, or of a species similar to it, was found at the type locality of *E. citharus*. The following key is modified from GOULET (1983, 286) to include *E. citharus* and a geographical variant of *E. finitimus* CASEY, 1920, found recently in northeastern California and in adjacent Oregon:

- 11 (5) Frons and disc of pronotum with numerous setae. . . . . *E. finitimus* CASEY  
 — Frons and pronotum glabrous, or only pronotum with a few setae. . . . . A  
 A (11) Metepisternum without setae; punctures large (30–40  $\mu\text{m}$  in diameter). Lateral margin of elytron markedly sinuate in basal third; surface at sinuation with clearly outlined mirror (Fig. 10). Elytral pits large: distance from suture to outer margin of pit in front of main mirror in interval 3 subequal to



Figs. 23–24. Sublateral view of abdominal sternum 4 showing the microsculpture pattern: 23, *Elaphrus tibetanus*; 24, *E. tuberculatus*.



Figs. 25–26. Habitat of *Elaphrus tibetanus*: Gansu, Mts. 10 km S Xiahe, 3,200 m, 4–VIII–94: 25, general view; 26, close up of actual habitat showing a flat wet seepage area with dense and thick low grasses.



Fig. 27. Distribution of *Elaphrus tibetanus* (square) and *E. citharus* (triangle).

- distance from suture to inner margin of pit nearest to main mirror in interval 5 (Fig. 14). . . . . *E. citharus* sp. nov.
- Metepisternum with numerous setae; punctures small (20–30  $\mu\text{m}$  in diameter). Lateral margin of elytron little sinuate in basal third; surface at sinuation without mirror, or mirror no more than suggested (Fig. 15). Elytral pits small: distance from suture to outer margin of pit in front of main mirror in interval 3 clearly shorter than distance from suture to inner margin of pit nearest to main mirror in interval 5 (Fig. 13). . . . . B

- B (A') Metafemur in dorsal view with three to seven long (about 150  $\mu\text{m}$ ), white setae subapically (fig. 35 in GOULET, 1983, 344). Apex of median lobe of male truncate (fig. 63 b in GOULET, 1983, 348). [Specimen from northeastern China, Russian Far East (Primorskij Kraj) (KRYZHANOVSKIJ *et al.*, 1995), or Japan] ..... *E. comatus* GOULET
- Metafemur in dorsal view with one to three short (25–100  $\mu\text{m}$  long), white setae subapically (fig. 34 in GOULET, 1983). Apex of median lobe of male rounded (fig. 61 a in GOULET, 1983). . . . . 12

### Larva of *Elaphrus viridis* HORN, 1878

Adults of *E. viridis* are very brilliantly coloured and stand out from those of other species of *Elaphrus* s. str. A third instar larva, collected in California, Solano county, 19 km south of Dixon, on February 20, 1982 by J. K. LIEBHERR is keyed and described below. Unfortunately, the two first instar larvae sent on loan by Dr. D. H. KAVANAUGH (California Academy of Sciences, San Francisco, California) were accidentally lost upon arrival. The larva is typical of those associated with the species of the genus *Elaphrus*. The instar was determined based on the number of accessory setae found on the epipleuron, hypopleuron, the sternite and inner poststernite of terga 2 to 7.

The following is a modification of the key to third instar larvae in GOULET (1983, 288):

- A Terga 1 to 8 with 4 to 8 accessory setae. Mesonotum and metanotum smooth, without sculpticells; terga 1 to 8 smooth on disc, without pointed sculpticells. . . . . *E. viridis* HORN
- Terga 1 to 8 with 16 to 20 accessory setae. Mesonotum and metanotum with well developed meshes of microsculpture. Terga 1 to 8 with pointed sculpticells on disc. . . . . 1

A brief diagnostic description of the third instar larva of *E. viridis* follows (for setal code see fig. 76 in GOULET, 1983, 352):

Epicranial suture 0.6 as long as antennomere 1. Setae AIM and AII of nota long; seta PII–P of nota 40 to 80  $\mu\text{m}$  in length. Seta AIM on terga 1 to 8 long. Laterodorsal seta of abdominal epipleura 1 to 5 short, longer than those on terga 1 and 8.

### Notes on *Elaphrus sugai* NAKANE, 1987

NAKANE (1987, 171) described a new species *E. sugai* from Japan. This species, belonging to the subgenus *Neoelaphrus* HATCH, 1951, is similar to *E. japonicus* UÉNO, 1954. In his brief description of *E. sugai*, NAKANE emphasized the puncture size on elytral intervals and the darker colour pattern relative to *E. japonicus*. Dr. S.-I. UÉNO kindly gave us a pair of *E. sugai* and our comments are based on these two specimens. *Elaphrus sugai* is a clearly distinct species, probably related to *E. japonicus*. Unlike the latter species, *E. sugai* inhabits lowlands and is surviving only in two marshes of the Toné-gawa drainage on the Kwantô Plain, Central Japan. It is recorded in the offi-

Table 2. Summary of differences observed in character states between *E. sugai* and *E. japonicus*.

Species	<i>E. sugai</i>	<i>E. japonicus</i>
<b>Colour</b>		
Punctures		
a) Dorsal surface	dark green	copper
b) Abdominal sterna	black or very dark green	dark green
Surface between punctures		
a) Dorsal surface	very dark brown	brown
b) Pleura and elytral epipleuron	very dark copper	dark copper
c) Abdominal sterna	black	dark green
Dorsal surface of tibiae	blue	reddish brown
<b>Puncture size</b>		
Frons	40 to 50 $\mu\text{m}$	35 to 45 $\mu\text{m}$
Pronotal disc	40 to 50 $\mu\text{m}$	10 to 20 $\mu\text{m}$
Pronotal epipleuron	30 to 40 $\mu\text{m}$	10 to 15 $\mu\text{m}$
Proepisternum	70 to 90 $\mu\text{m}$ and very deeply impressed	20 to 25 $\mu\text{m}$ and flush with surface
Prosternum	30 to 50 $\mu\text{m}$	10 to 15 $\mu\text{m}$
Elytral intervals 4, 6 and 8	15 to 35 $\mu\text{m}$ (largest at edge of interval)	15 to 25 $\mu\text{m}$
Metepisternum	40 to 50 $\mu\text{m}$	20 to 25 $\mu\text{m}$
Abdominal sternum 1, laterally	40 to 50 $\mu\text{m}$	20 to 30 $\mu\text{m}$
<b>Puncture density</b>		
Proepisternum	adjacent	scattered: 1 to 5 puncture diameters apart.
<b>Setal development</b>		
Last abdominal sternum	20 to 30 setae	5 to 10 setae
<b>Median lobe</b>		
Apical region in lateral view	hardly narrowed down near ostium (Fig. 3)	clearly narrowed down near ostium (Fig. 4)

cial red data book of the Japanese Government.

The following is a modification of the key by GOULET (1983, 248):

- 3 (2') Punctures 50–150  $\mu\text{m}$  apart on elytral intervals 4, 6 and 8. Lateral ridges of elytral pits wide and convex (fig. 132 in GOULET, 1983, 363). [Known from Japan and adjacent regions of Russia]. . . . . A
- Punctures 30–40  $\mu\text{m}$  apart on elytral intervals 4, 6 and 8. Lateral ridges of elytral pits weakly convex, narrow or absent (figs. 119–120 in GOULET, 1983, 360). . . . . 4
- A (3) Pronotum with discal punctures large (40–50  $\mu\text{m}$  in diameter) and deeply impressed. Proepisternum with enormous (70–90  $\mu\text{m}$  in diameter), very deeply impressed, and closely packed punctures. Dorsal surface of tibiae dark blue. . . . . *E. sugai* NAKANE
- Pronotum with discal punctures small (10–20  $\mu\text{m}$  in diameter) and flush with surface. Proepisternum with small (20–25  $\mu\text{m}$  in diameter), flush, and scat-

tered (1 to 5 diameters apart) punctures. Tibiae, except base and apex, reddish brown. . . . . *E. japonicus* UÉNO

In Table 2, we give a summary of several character state differences between *E. japonicus* and *E. sugai*.

**Notes on *Elaphrus weissii* DOSTAL**

DOSTAL (1996) described a new species, *E. weissii*, from Greece, based on seven males and four females. Based on DOSTAL's description and illustration of an adult, he correctly associated this species with those of *Elaphrus* s. str. We did not see specimens of *E. weissii*, but based on his description, we agree with DOSTAL that adults key out to the *E. hypocrita*/*E. ruscarius* couplet in GOULET (1983, 285). *Elaphrus weissii* is most similar to *E. hypocrita* SEMENOV, 1926. We agree that it is a distinct species, as shown by the characterization given below.

Adults of this species are characterized as follows: lateral margin of pronotum not beaded in sinuation, not explanate near middle; punctures of pronotum twice as dense submedially as anterolaterally; disc of pronotum with deep and clearly defined impression submedially, in lateral view flattened, and with many white setae; abdominal sterna with setae not extended to lateral edge, setae numerous (more than 20, based on fig. 3 a in DOSTAL, 1996) on last abdominal sternum.

Adults of *Elaphrus weissii* are easily distinguished from those of *E. ruscarius* SAY, 1830 by the small proepisternal punctures (28–45  $\mu$ m) and the setose pronotum, and from those of *E. hypocrita* by the setose pronotum, and by the deep and clearly outlined submedial impression.

The pertinent couplets in the key by GOULET (1983, 285) are modified as follows to include *E. weissii*:

- 7 (6) Punctures on proepisternum large (50–60  $\mu$ m in diameter), surface around punctures widely depressed (fig. 109 in GOULET, 1986). Surface of proepisternum almost black: microsculptured surface dark coppery, punctures dark blue green. [Eastern Nearctic region]. . . . . *E. ruscarius* SAY
- Punctures on proepisternum small (30–45  $\mu$ m in diameter), surface around punctures hardly, or not depressed. Surface of proepisternum bright metallic blue-green or bronze-gold. [Palaeartic region]. . . . . A
- A (7) Pronotum with many white setae on disc; submedial impression deep and clearly outlined; pronotum wide: ratio pronotum length / pronotum width = 0.83–0.90. Last abdominal sternum with 20 or more setae (based on fig. 3 a in DOSTAL, 1996). . . . . *E. weissii* DOSTAL
- Pronotum without accessory white setae on disc; submedial impression shallow and obscurely outlined; pronotum narrow: ratio pronotum length / pronotum width = 0.92–0.93 (based on only six specimens – GOULET, 1986, 293). Last abdominal sternum with 15 or less setae. . . . . *E. hypocrita* SEMENOV



### Synonymic Notes

LUTSHNIK (1936) named a new variety of *Elaphrus* as *E. lapponicus* var. *violaceus*, informally described by SPARRE-SCHNEIDER as *E. lapponicus* var. *e*. JEDLIČKA (1956) added another variety as *E. lapponicus* ab. *viridis*. *Elaphrus lapponicus* is extremely variable in colour. Young adults are brightly coloured and older ones are mat. In general, the adults are green or coppery, dark bluish-purple specimens were also seen. Both names are considered here as junior synonyms of *E. lapponicus lapponicus* GYLLENHAL, 1810. The synonymy is as follows:

#### *Elaphrus lapponicus lapponicus* GYLLENHAL

*Elaphrus lapponicus* GYLLENHAL, 1810, 8. Type area: Lappland, subsequently restricted to Abisko, Sweden (LINDROTH, 1961); type in Göteborg Museum; type seen by LINDROTH (1961).

*Elaphrus elongatus* FISCHER VON WALDHEIM, 1828, 266. Type area: Kamchatka, Russia; type in Zoological Museum, University of Helsinki, Finland; type seen by LINDROTH (1961).

*Elaphrus obscurior* KIRBY, 1837, 63. Type area: Latitude 65°, according to LINDROTH (1961) near Great Bear Lake, N.W.T.; type in British Museum (Natural History), London; type seen by LINDROTH (1961). This name was attributed to J. SAHLBERG by SPARRE-SCHNEIDER (1888) as a variety. It is simply a change in status of KIRBY's name.

*Elaphrus lapponicus* var. *viridis* SPARRE-SCHNEIDER, 1888, 99. Name incorrectly established by SPARRE-SCHNEIDER due to improper reading of the name of a variety of *Elaphrus lapponicus* in C. R. SAHLBERG (1834, 188): "var. b. *Viridis*..." as "var. *viridis*".

*Elaphrus lapponicus* var. *elongatus*: JAKOBSON, 1906, 267.

*Elaphrus lapponicus* var. *violaceus* LUTSHNIK, 1936, 176. Name proposed for *E. lapponicus* var. *e* of SPARRE-SCHNEIDER (1888, 99).

*Elaphrus lapponicus* ab. *viridis* JEDLIČKA, 1956, 391. Type area: Saltdal (Norway); type in the Hungarian Natural History Museum, Budapest, Hungary; type not seen.

#### Holotype of *Elaphrus purpurans* HAUSEN

The holotype of *E. purpurans* HAUSEN, 1891 is deposited in the collection of MacDonald College, Ste Anne de Bellevue, Québec, Canada. The specimen is labelled as follows: "Br. Columbia Coll by Dr A.R.C. Selwyn /6/ Coll. Nat. Hist. Soc./207/ Type *Elaphrus purpurans* n. var. (?)". Condition of the specimen: abdomen and hind legs (excluding left metacoxa and metatrochanter), left antenna (excluding scape and pedicel) are missing.

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collected in China. Finally we appreciate the loan of important specimens of *E. finitimus* from northeastern California and larvae of *E. viridis* by Dr. D. H. KAVANAUGH, California Academy of Sciences, San Francisco, California.

Mr. Go SATO, Eastern Cereal and Oilseed Research Centre, Ottawa, carefully finished all line drawings and Mr. A. DAVIES, from the same institution, provided the SEM photomicrographs. Our colleagues, Mr. A. DAVIES, Drs. Y. BOUSQUET and D. E. BRIGHT read the original draft of the manuscript and their comments eventually led to its improvement.

### 要 約

H. GOULET・A. SMETANA : ハンミョウモドキ属に関する知見の追補。——ハンミョウモドキ属の種、とくに中国産の種について新しい知見を追加し、甘粛省から1新種 *Elaphrus citharus* GOULET et SMETANA を記載するとともに、*trossulus* 種群の種に関する改変ならびに記録の追補を行った。また、*E. lapponicus* の色彩変異にあたえられた名称を整理し、*E. sugai* および *E. weissii* の正確な標徴をまとめて、1983年に公表した第一著者による種の検索表を改変した。

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