

Key to the Chinese species of the subgenus *Sphodromimus* Casale, 1984 (Carabidae, Chlaeniini, *Chlaenius*) with descriptions of two new species

Yuyao Qin^{1,2}, Christoph Germann³, Hongbin Liang²

1 College of Life Sciences, Hebei University, Baoding 071002, China **2** Key Laboratory of Zoological Systematics and Evolution, Institute of Zoology, Chinese Academy of Sciences, Beijing 100101, China **3** Naturhistorisches Museum Basel, Augustinergasse 2, CH-4051 Basel, Switzerland

Corresponding author: Hongbin Liang (lianghb@ioz.ac.cn)

Academic editor: B. Guéorguiev | Received 23 August 2022 | Accepted 18 November 2022 | Published 12 December 2022

<https://zoobank.org/7E562C71-BD10-446E-9E10-2AA52A9888FB>

Citation: Qin Y, Germann C, Liang H (2022) Key to the Chinese species of the subgenus *Sphodromimus* Casale, 1984 (Carabidae, Chlaeniini, *Chlaenius*) with descriptions of two new species. ZooKeys 1135: 61–91. <https://doi.org/10.3897/zookeys.1135.93843>

Abstract

The subgenus *Sphodromimus* Casale, 1984 in China has been studied, revealing two new species: *Chlaenius* (*Sphodromimus*) *caperatus* **sp. nov.** from Hunan Province and *Chlaenius* (*Sphodromimus*) *yinggelingensis* **sp. nov.** from Hainan Province. A new replacement name is proposed for *C. (Sphodromimus) wrasei* (Kirschenhofer, 2003) [nec *Chlaenius (Lithochlaenius) wrasei* Kirschenhofer, 1997]: *Chlaenius (Sphodromimus) davidi* **nom. nov.** The status of *Chlaenius (Sphodromimus) enleensis* Mandl, 1992 is upgraded from subspecies to full species, and *Chlaenius (Sphodromimus) tamdaoensis* Kirschenhofer, 2003 is proposed as its new synonym. *Chlaenius (Sphodromimus) pilosus* (Casale, 1984) is reported as a new record from China. A key to all known species of the subgenus *Sphodromimus* from China is provided.

Keywords

Coleoptera, distribution, genitalia, ground beetles, taxonomy

Introduction

Vachinius Casale, 1984 was erected as a genus for *Pristonychus subglaber* Andrewes, 1937, and *Sphodromimus* Casale, 1984 was erected as a subgenus of *Vachinius* at the same time (Casale, 1984). Recently, both *Vachinius* and *Sphodromimus* were considered sub-

genera of the genus *Chlaenius* Bonelli, 1810 (Azadbakhsh and Kirschenhofer 2019). *Chlaenius peterseni* (Louwerens, 1967), *C. flavofemoratus* Laporte, 1834, and *C. tamdaoensis* Kirschenhofer, 2003 were transferred from the subgenus *Haplochlaenius* to the subgenus *Sphodromimus* by Azadbakhsh and Kirschenhofer (2019). To date, in total 14 species are recognized in the subgenus *Sphodromimus*, distributed in the Oriental Region, e.g., China, Indonesia, Laos, Myanmar, Nepal, Philippines, Thailand, Vietnam (Morvan 1991, 1997; Lassalle 2001; Kirschenhofer 2003, 2012; Brunk 2015; Zettel 2020).

The subgenus differs from other subgenera of genus *Chlaenius* mainly by its large size (length 19.0–26.0 mm), elytral intervals densely punctate and pubescent, slightly convex, not costulate, and the apical lamella of the aedeagus is denticulate on the dorsal side (Casale 1984). Before the present study, four species of this subgenus had been recorded from China: *Chlaenius (Sphodromimus) deuvei* (Morvan, 1997), *Chlaenius (Sphodromimus) flavofemoratus* Laporte, 1834, *Chlaenius (Sphodromimus) hunanus* (Morvan, 1997), and *Chlaenius (Sphodromimus) wrasei* (Kirschenhofer, 2003). When examining specimens from south China, we found two new species and a new country record based on comparison with types and/or original descriptions. In this paper, we describe the new species and report the newly found one, upgrade one subspecies to full species, propose a new replacement name, and provide a revised key to all known species of subgenus *Sphodromimus* in China.

Materials and methods

Specimens examined during our study are deposited in the following collections:

- CAS** California Academy of Science, San Francisco, USA;
DWC working collection David W. Wrase, Gusow-Platkow, Germany (part of Zoologische Staatssammlung, München);
IZAS Institute of Zoology, Chinese Academy of Sciences, Beijing, China;
MNHN Muséum National d'Histoire Naturelle, Paris, France;
NHMB Naturhistorisches Museum Basel, Switzerland;
SCAU South China Agriculture University, Guangzhou, China.

Abbreviations for measurements used in the paper are as follows:

- BL** length of body, measured from the apical margin of the labrum to the elytral apex;
BW width of body, measured across the elytral greatest width;
EL length of elytra, measured from the base of the scutellum to the elytra apex;
ML length of metepisternum, measured along its outer side;
MW width of metepisternum, measured along its anterior side;
PAW width of apical pronotum, measured between the apices of the anterior angle;

- PBW** width of basal pronotum, measured along its basal margin;
PL length of pronotum, measured along its median line;
PW width of pronotum, measured across its greatest width.

The methods of dissection, illustrations, and measurements mainly follow our previous work (Shi et al. 2013a, b). Terminology of female genitalia follows Deuve (1993) and Liebherr and Will (1998).

Taxonomic account

Subgenus *Sphodromimus* Casale, 1984

Sphodromimus Casale, 1984: 372; Morvan 1991: 60 (described new species); Morvan 1997: 16 (described new species); Lorenz 1998: 320 (catalogue); Lassalle 2001: 240 (described new species); Kirschenhofer 2003: 32 (described new species); Lorenz 2005: 341 (catalogue); Kirschenhofer 2012: 84 (described new species); Kirschenhofer 2013: 9 (new combination from *Haplochlaenius*); Brunk 2015: 5 (described new species); Kirschenhofer 2017: 497 (catalogue); Azadbakhsh and Kirschenhofer 2019: 1 (*Sphodromimus* considered subgenus of *Chlaenius*); Zettl 2020: 29 (described new species).

Type species. *Vachinius holzschuhi* (Casale, 1984) (type locality: East Nepal, Tashigaon 2100 m; holotype in NHMB), by original designation.

Diagnosis. *Sphodromimus* can be distinguished from other subgenera in *Chlaenius* by the following character combinations: body large, BL 19–26 mm; body black or metallic colored, luster matt or strongly shiny, antennae, mandibles usually dark brown, elytra black, ventral side black; head finely punctate; penultimate labial palpomere with 5–7 setae, apex truncate; antennae long, antennomere 3 longer than 4; mentum tooth stout, bifid; pronotum long, with sides usually sinuate before posterior angles, posterior lateral seta situated before posterior angles, anterior lateral seta absent; proepisterna sparsely punctate and pubescent; elytral intervals flat or convex, not ribbed, densely punctate and pubescent, basal margin reaching the scutellum; hind wings reduced in all species except *Chlaenius flavofemoratus* Laporte, 1834 and *Chlaenius peterseni* (Louwrens, 1967); prosternal process unbordered at apex; metepisterna wider than long in all species except *C. flavofemoratus* and *C. peterseni*, coarsely punctate, pubescent; legs sparsely pubescent, tarsi nearly smooth dorsally, claws simple, protibiae sulcate on dorsal side; abdominal sternites finely punctate laterally; apical lamella of aedeagus denticulate on dorsal side; apical gonocoxite without ensiform setae; receptaculum very short to absent.

Comparisons. This subgenus is most similar to subgenera *Haplochlaenius* Lutshnik and *Vachinius* Casale, but differs in having elytra with intervals flat or slightly convex, densely punctate and pubescent, and with basal margin complete, connected with

scutellum (intervals strongly ribbed in *Haplochlaenius*, basal margin obsolete near scutellum; intervals smooth in *Vachinius*; cfr. Azadbakhsh and Kirschenhofer 2019).

Species and distribution. Subgenus is composed of 16 species distributed in the Oriental Region (China, Indonesia, Laos, Myanmar, Nepal, Philippines, Thailand, Vietnam), including the two new species described below.

Key to species of subgenus *Sphodromimus* Casale, 1984 from China

- 1 Pronotum copper-green to violet, shining, with metallic luster **2**
- Pronotum black and matt **4**
- 2 Pronotum cordate, widest at apical third, anterior angles projected forward, strongly sinuate before posterior angles (Figs 21, 23); hind wings reduced; metepisterna short, MW/ML = 1.03–1.17 (Figs 12, 15) **3**
- Pronotum subquadrate, widest at middle, anterior angles not projected forward, lateral margins rounded or straight before posterior angles (Fig. 22); hind wings developed; metepisterna long, MW/ML = 0.75–0.92 (Fig. 14) ***C. flavofemoratus* Laporte, 1834**
- 3 Legs entirely black (Fig. 9A, B). Guangdong, Xinyi; Guangxi, Daming Shan ..
..... ***C. davidi* nom. nov.**
- Distal half of femora red-brown (Fig. 4A–D). Hainan, Yinggeling.....
..... ***C. yinggelingensis* sp. nov.**
- 4 Posterior angles of pronotum slightly projected backward (Fig. 19); apex of apical lamella of aedeagus concaved in the middle, both sides thickened, each with a denticulation (Fig. 27A); receptaculum tiny, seminal canal short (Fig. 36A). Guangxi, Mao'er Shan; Guangxi, Huaping ***C. deuwei* (Morvan, 1997)**
- Posterior angles of pronotum not projected (Figs 17, 18, 20); apex of apical lamella of aedeagus truncated or rounded **5**
- 5 Pronotum subquadrate, nearly as long as wide (PW/PL = 1.02–1.07), lateral margins straight before posterior angles (Fig. 20); apex of apical lamella of aedeagus truncated; right side of median lobe with a large denticulation, left side with a small denticulation (Fig. 28A). Yunnan, Dawei Shan; Vietnam, the Black River ***C. pilosus* (Casale, 1984)**
- Pronotum cordate, much wider than long (PW/PL = 1.18–1.26), lateral margins faintly sinuate before posterior angles (Fig. 17, 18); apex of apical lamella of aedeagus untruncated **6**
- 6 Pronotum with apical width equal to or slightly shorter than basal width (PAW/PBW = 0.99–1.00) (Fig. 17); apex of apical lamella of aedeagus rounded (Fig. 25A); receptaculum long, seminal canal short (Fig. 34A). Hunan, Guidong ***C. caperatus* sp. nov.**
- Pronotum apical width clearly shorter than basal width of pronotum (PAW/PBW = 0.87–0.97) (Fig. 18); apical lamella of aedeagus triangular (Fig. 26A); receptaculum short, seminal canal long (Fig. 35A). Hunan Jiuyi Shan; Guangdong, Nanling..... ***C. hunanus* (Morvan, 1997)**

***Chlaenius (Sphodromimus) caperatus* sp. nov.**

<https://zoobank.org/DC3445D1-970D-43DE-B622-8EA561F22632>

Figs 1A–D, 11, 17, 25A–E, 34A–C, 40

Type locality. China, Hunan, Guidong: Qiyun Shan (25.9010°N, 114.0068°E), altitude 1299.12 m.

Type material. *Holotype*. Male (IZAS) [genitalia dissected and glued on plastic film pinned under specimen], Hunan, Guidong, Qiyun Shan, 25.9010°N, 114.0068°E, 1299.12 m, 2017.XI.12–14, S.P. Yu, Y.Z. Liu leg., Institute of Zoology, IZAS/Holotype *Chlaenius (Sphodromimus) caperatus* sp. nov. des. by Y.Y. Qin, 2022 [red label].

Paratypes. Total 8 specimens: 2 ♂♂ and 3 ♀♀ (IZAS), same data as holotype; 1 ♀ (IZAS), Hunan, Guidong, Qiyun Shan, 25.9007°N, 114.01318°E, 1487.17 m, 2017.XI.12–14, S.P. Yu, Y.Z. Liu leg., Institute of Zoology, IZAS; 1 ♂ and 1 ♀ (SCAU) “Hunan, Guidong, Dongluo, Chishuixian, 1350–1450 m, 2011.XII.1, M.Y. Tian, Q. Gao, F.F. Sun leg., SCAU. All paratypes also bear the following label: Paratype. *Chlaenius (Sphodromimus) caperatus* sp. nov. des. by Y.Y. Qin, 2022 [red label].

Diagnosis. Dorsum black. PW/PL = 1.18–1.21; PAW/PBW = 0.99–1.00 (Fig. 17); pronotum with anterior angles rounded, moderately projected forward; disc sparsely punctate and pubescent with deep transverse rugosities, but with a glabrous area in the middle. Elytral intervals flat, densely punctate and pubescent. Hind wings reduced. Metepisterna short, MW/ML = 1.1–1.3 (Fig. 11). Apex of apical lamella rounded (Fig. 25A–E).

Comparisons. This new species is most similar to *Chlaenius (Sphodromimus) hunanus* (Morvan, 1997) (Fig. 2A, B), sharing the large size, shape of pronotum, black elytra, and reduced hind wings, but can be distinguished from the latter by: (1) PAW/PBW = 0.99–1.00 (Fig. 17), (0.87–0.97 in *C. hunanus*, Fig. 18); (2) apex of lamella of median lobe rounded (apex of lamella triangular in *C. hunanus*, Fig. 26A–E); (3) in female genitalia, receptaculum longer (shorter in *C. hunanus*, Fig. 35A–C), and seminal canal shorter (longer in *C. hunanus*, Fig. 35A–C).

Description. BL = 20.3–22.0 mm, BW = 7.6–8.9 mm [BL = 21.0 mm, BW = 7.0 mm in holotype], PAW = 3.6–3.9 mm, PBW = 3.6–3.9 mm, PW = 5.0–5.5 mm, PL = 4.3–4.5 mm, MW = 1.9–2.0 mm, ML = 1.5–1.8 mm. Head, pronotum, elytra, legs, and venter black; antennae, labial and maxillary palpi, apex of mouthparts, and tarsomeres dark brown.

Head. Vertex punctate and pubescent with a glabrous and rugose area in the middle; antennae long, reaching middle of elytra; antennomere 3 ~ 1.5× longer than antennomere 4.

Pronotum cordiform, PW/PL = 1.18–1.21 (Fig. 17), widest at apical third; anterior margin slightly concave, its width equal to its basal width, PAW/PBW = 0.99–1.00; lateral margins rounded before middle, then distinctly narrowed to base, faintly sinuate before posterior angles; anterior angles rounded, moderately projected forward; posterior angles obtuse, slightly sharp at tips; disc gently convex, sparsely punctate and pubescent, with deep transverse rugosities, with a small glabrous area in the middle; median line distinct, not reaching anterior margin and base; basal foveae deep and long, punctate, pubescent.

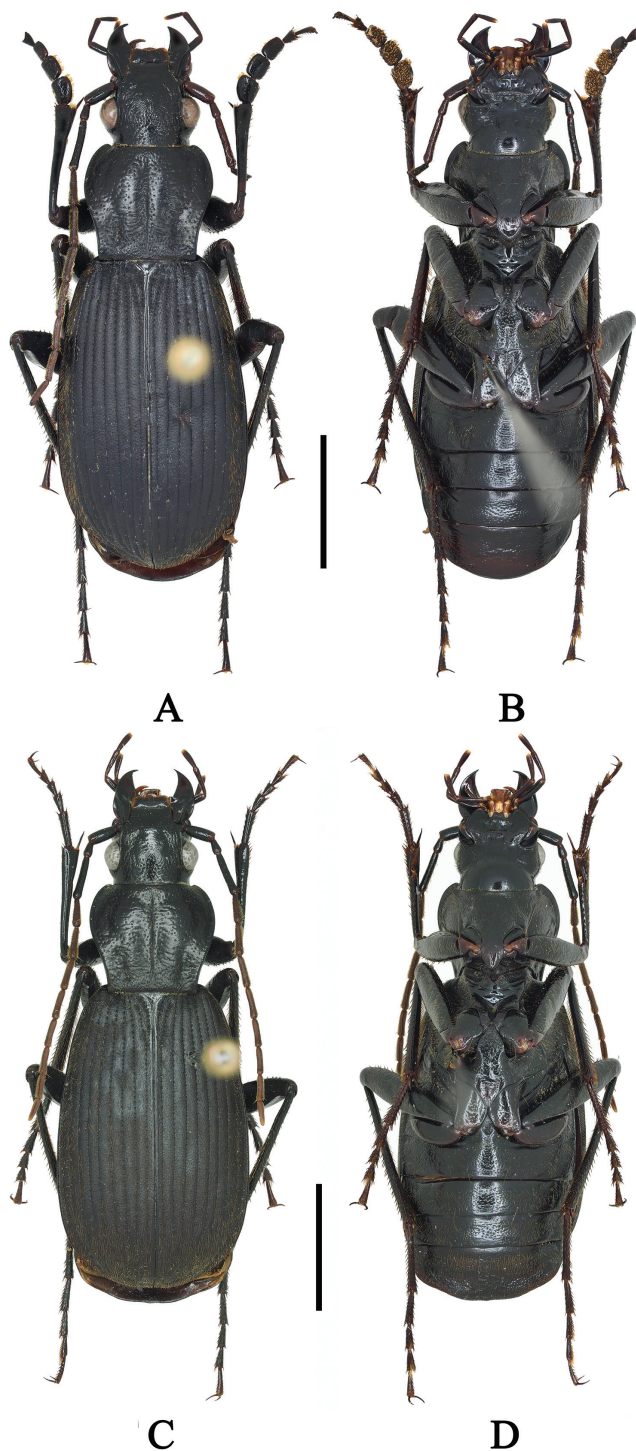
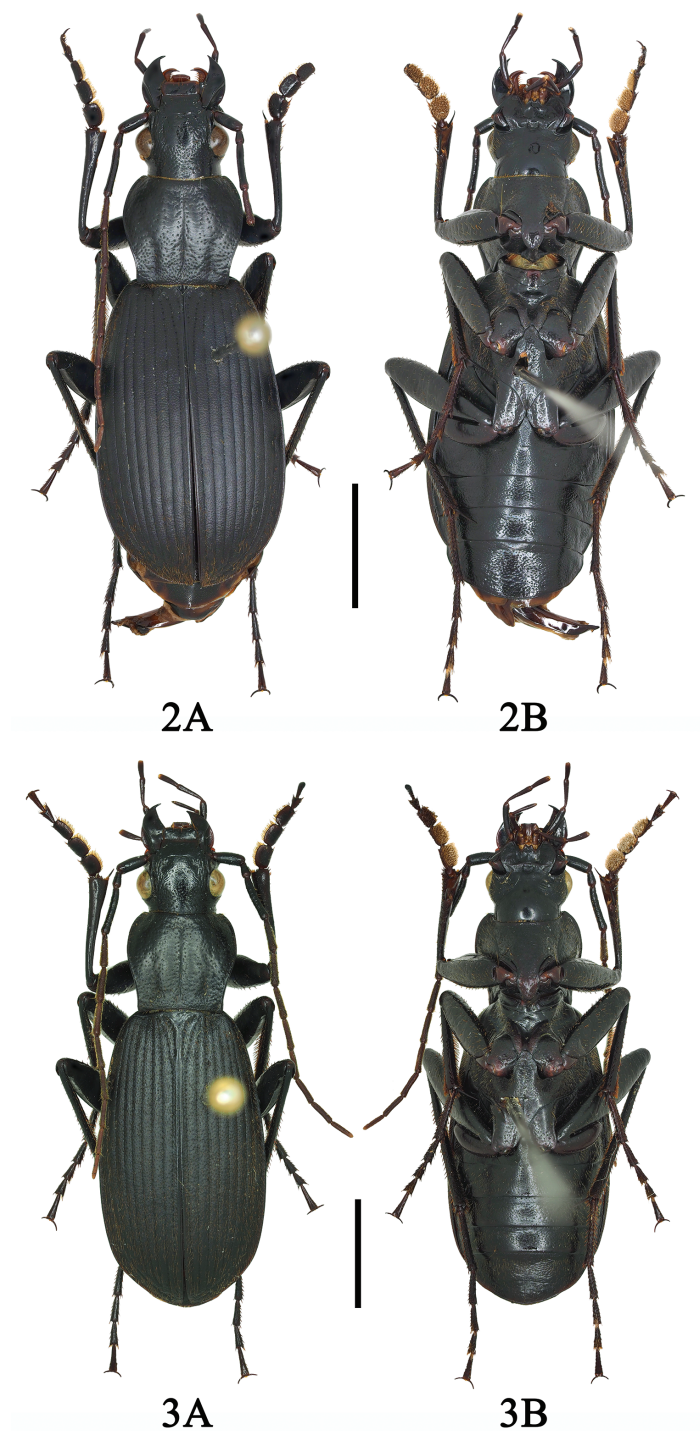


Figure 1. A, B *Chlaenius* (*Sphodromimus*) *caperatus* sp. nov. (holotype, Hunan, Guidong)
C, D *C. (Sphodromimus) caperatus* sp. nov. (female paratype, Hunan, Guidong). Scale bars: 5.0 mm.



Figures 2, 3. **2A, B** *Chlaenius* (*Sphodromimus*) *hunanus* (Morvan, 1997) (male, Guangdong, Nanling)
3A, B *C. (Sphodromimus) deuvei* (Morvan, 1997) (male, Guangxi, Huaping). Scale bars: 5.0 mm.

Elytra elongate, EL/BW = 1.45–1.61; gently convex, widest near posterior third, rounded at apex in males, subtruncate in females; striae with fine punctures; parascutellar striae well developed; parascutellar pores present; intervals flat, densely punctate and pubescent; sutural angles sharp; hind wings reduced.

Venter densely punctate, pubescent, metepisterna (Fig. 11) short, MW/ML = 1.25–1.33; abdominal sternites III–VI with one setiferous puncture each side, sternite VII with one pair of setiferous punctures in males, two pairs in females; all abdominal sternites with distinct impressions laterally.

Legs long and slender; tarsi nearly smooth dorsally.

Male genitalia. Median lobe (Fig. 25B–E) long, strongly bent to ventral side; apical orifice opened dorsally, long and wide, not reaching basal bulb, slightly turned to left side; in dorsal view, apical lamella (Fig. 25A) slightly bent to left side, length nearly equal to its basal width, apex rounded; in left lateral view, apical portion distinctly bent into a hook ventrally (Fig. 25B, E), basal orifice ~ 90 ° relative to preapical shaft; left paramere large and round; right paramere helical carved; endophallus with coiled flagellum; basal part of flagellum strongly bent with an oval sclerite facing the right; apical part of flagellum distinctly bent with a triangular bursa.

Female genitalia. Spermatheca (Fig. 34A–C) with seminal canal ~ 15× as long as receptaculum; receptaculum short linear; seminal canal inserted at base of common oviduct; spermathecal gland rounded and inserted near apex of seminal canal; villous canal long, tortuously contorted, adhered to common oviduct.

Distribution. (Fig. 40) This species is known only from Guidong, Hunan. Its distribution seems isolated by a mountain barrier from *C. hunanus*.

Etymology. The new species *caperatus* is named for its rugosity on the vertex, pronotal disc, and abdominal sternites.

Remarks. We have not examined the types of *C. (S.) hunanus*, but Dr. Deuve (MNHN) kindly helped us to compare types and sent us illustrations of the apical lamella of holotype. More than 60 specimens collected from Nanling, Guangdong fit Morvan's descriptions and illustration (1997: 17, fig. 13), and we determined them as *C. (S.) hunanus*. Nanling is located ~ 100 km north of the type locality of *C. (S.) hunanus* Jiuyi Shan, Hunan (Fig. 40).

***Chlaenius (Sphodromimus) yinggelingensis* sp. nov.**

<https://zoobank.org/95948EBD-4279-457D-BB06-0A501D8198D9>

Figs 4A–D, 12, 21, 29A–E, 37A–C, 40

Type locality. China, Hainan, Yinggeling.

Type material. Holotype. Male (IZAS) [genitalia dissected and glued on plastic film pinned under specimen], Hainan, Yinggeling, 2009.V.11, Xinlei Huang leg., Institute of Zoology, IZAS/Holotype *Chlaenius (Sphodromimus) yinggelingensis* sp. nov. des. by Y.Y. Qin, 2022 [red label].

Paratypes. Total 4 specimens: 1 ♂ (IZAS), same data as holotype; 2 ♀♀ (IZAS), Hainan, Jianfengling, Mingfenggu, 947 m, 2015.I.23, Deyao Zhou leg., Institute of

Zoology, IZAS; 1♀ (IZAS), Hainan, Wuzhishan, 18°54'N, 109°41'E, 1000–1600 m, 2012.IV.18, PAN & LI leg. All paratypes also bear the following label: Paratype. *Chlaenius* (*Sphodromimus*) *yinggelingensis* sp. nov. des. by Y.Y. Qin, 2022 [red label].

Diagnosis. Pronotum metallic coppery to green. $PW/PL = 1.12\text{--}1.21$; $PAW/PBW = 0.84\text{--}0.91$ (Fig. 21); pronotum cordate with posterior angles right angled, rounded at tips; disc sparsely punctate and pubescent with shallow, transverse rugosities. Elytral intervals distinctly convex, with a row of setae laterally and sparse setae centrally. Hind wings reduced. Metepisterna short or width nearly equal to length; $MW/ML = 1.03\text{--}1.17$ (Fig. 12). Distal half of femora red-brown, the rest of legs black.

Comparisons. This new species is similar to *Chlaenius* (*Sphodromimus*) *flavofemoratus* (Figs 7A–C), in having a large size, coloration of the pronotum and femora, and the absence of a spermatheca, but can be distinguished from the latter by: (1) pronotum cordate (subquadrate in *C. flavofemoratus*); (2) metepisterna wider than or nearly equal to long (longer than wide in *C. flavofemoratus* as in Fig. 14); (3) hind wings reduced (developed in *C. flavofemoratus*); (4) interval convex throughout (convex basally, flat apically in *C. flavofemoratus*).

It is also similar to *Chlaenius* (*Sphodromimus*) *peterseni* (Louwerens, 1967) from the Philippines in having pronotum with green metallic luster and elytral intervals slightly convex, but differs in having meso- and metafemora with yellow coloration in the middle, pronotum with lateral margins sinuate before posterior angles, hind wings reduced (femoral black, pronotum with lateral margins straight, and hind wings developed in *C. peterseni*, Fig. 5A, B)

Description. BL = 20.9–21.6 mm, BW = 7.5–7.9 mm [BL = 21.3 mm, BW = 7.7 mm in holotype], PAW = 3.4–3.6 mm, PBW = 3.7–4.0 mm, PW = 4.8–5.3 mm, PL = 4.1–4.5 mm, MW = 1.7–1.8 mm, ML = 1.5–1.6 mm. Head, elytra, and venter black; pronotum metallic green to metallic coppery; antennae, labial and maxillary palpi, apex of mouthparts, and tarsomeres dark brown; distal half of femora red-brown, the rest of legs black.

Head. Vertex sparsely, finely punctate and pubescent; antennae long, reaching middle of elytra; antennomere 3 ~ 1.5× longer than antennomere 4.

Pronotum cordiform, $PW/PL = 1.12\text{--}1.21$ (Fig. 21), widest at apical third; anterior margin slightly concave, $PAW/PBW = 0.84\text{--}0.91$; lateral margins rounded before middle, then distinctly narrowed to base, straight before posterior angles; anterior angles rounded, moderately projected forward; posterior angles almost right angled, slightly sharp at tips; disc sparsely punctate and pubescent, with shallow transverse rugosities, without glabrous area in the middle; median line distinct, not reaching anterior margin and base; basal foveae deep and long, punctate, pubescent.

Elytra elongate, $EL/BW = 1.67\text{--}1.73$, gently convex, widest near posterior third, rounded at apex in males, subtruncate in females; basal margin sinuate, reaching the scutellum (but slightly obsolete on one side in a female); striae with deep punctures; parascutellar striae well developed; parascutellar pores present; intervals distinctly convex, with a row of setae laterally and sparse setae centrally; sutural angles obtuse; hind wings reduced.

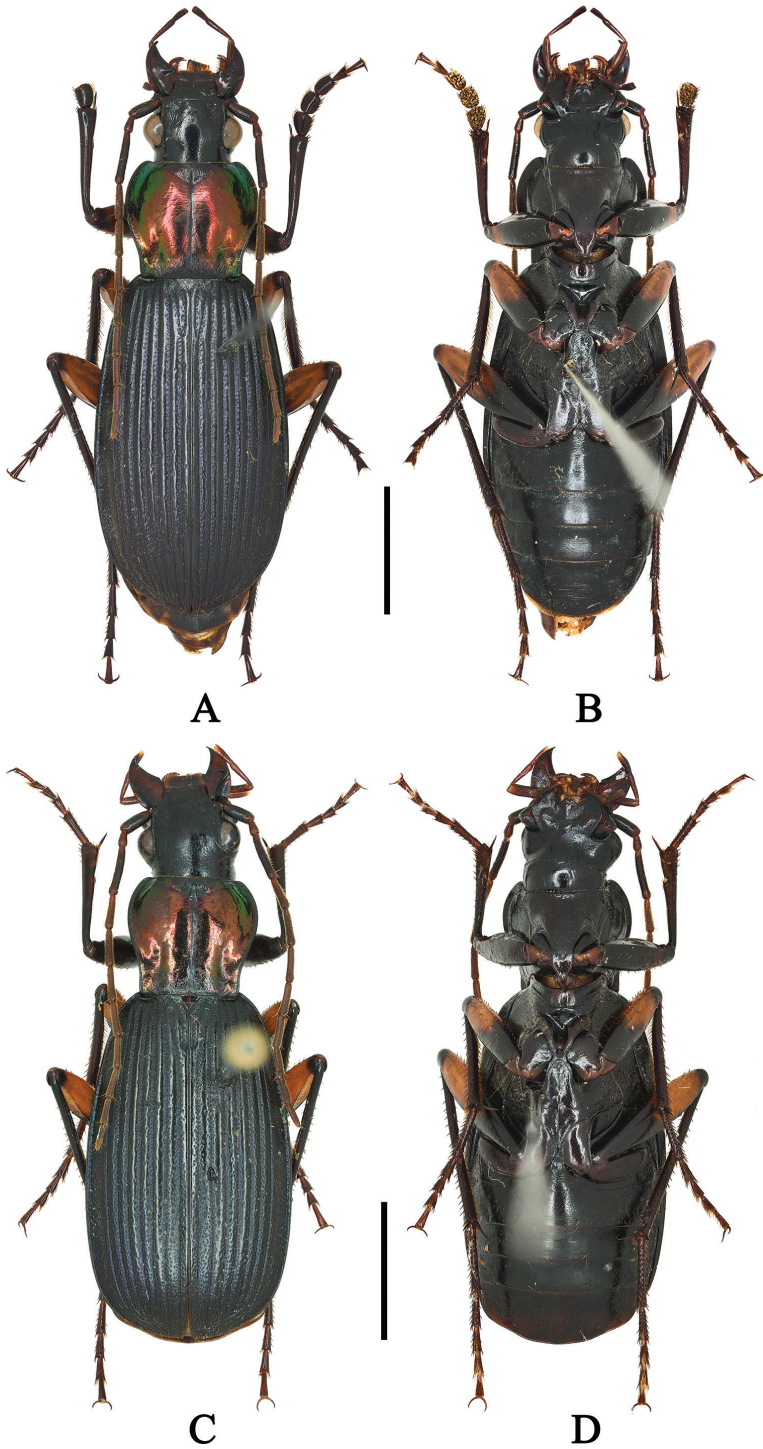
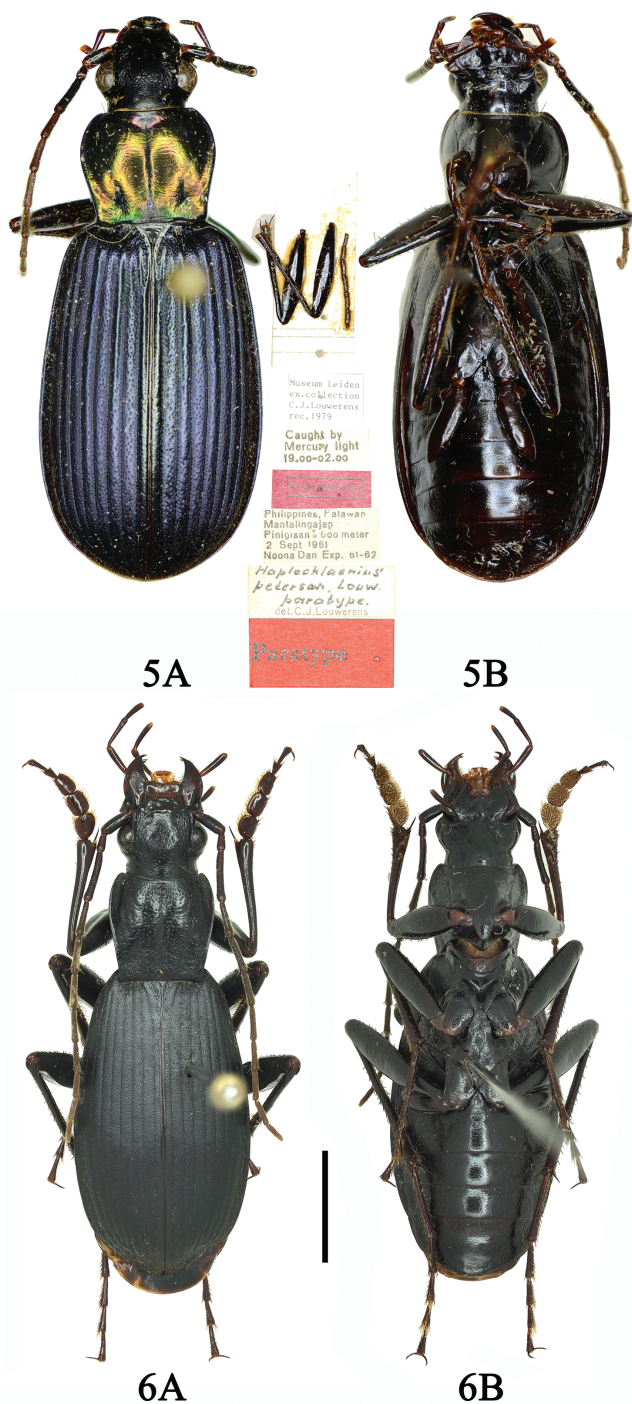


Figure 4. A, B *Chlaenius* (*Sphodromimus*) *yinggelingensis* sp. nov. (holotype, Hainan, Yinggeling) C, D *C. (S.) yinggelingensis* sp. nov. (female paratype, Hainan, Jianfengling). Scale bars: 5.0 mm.



Figures 5, 6. 5A, B *Chlaenius* (*Sphodromimus*) *peterseni* (Louwerens, 1967) (female paratype, Philippine, photos by Shi Hongliang) 6A, B *C. (Sphodromimus) pilosus* (Casale, 1984) (male, Yunnan, Pingbian). Scale bar: 5.0 mm.

Venter sparsely pubescent, punctate; metepisterna (Fig. 12) short or width nearly equal to length, $MW/ML = 1.03–1.17$; abdominal sternites III–VI with one setiferous puncture each side, sternite VII with one pair of setiferous punctures in males, two pairs in females; all abdominal sternites with a few impressions laterally.

Legs long and slender; tarsi nearly smooth dorsally.

Male genitalia. Median lobe (Fig. 29B–E) long, strongly bent to ventral side; apical orifice opened dorsally, long and wide, not reaching basal bulb; in dorsal view, apical lamella (Fig. 29A) wide and short, wider than long, apex subtruncate, each side distinctly widened and thickened; in left lateral view, apex with a denticulation bent to back; in right lateral view, each side convex into a denticulation, right side smaller than left side, basal orifice $\sim 90^\circ$ relative to preapical shaft; left paramere large and oval; right paramere helically curved; endophallus with flagellum thick and straight; basal part of flagellum with a disciform sclerite facing the left.

Female genitalia. Bursa copulatrix (Fig. 37A–C) asymmetric, base with a bifid irregular protrusion; villous canal long, tortuously contorted, adhered to common oviduct; spermatheca and spermathecal gland absent.

Distribution. (Fig. 40) China (Hainan).

Etymology. The new species *yinggelingensis* is named for the type locality Yinggeling, Hainan.

Remarks. We dissected two females in *C. yinggelingensis*, four in *C. davidi* and nine in *C. flavofemoratus*. As a result, we could not find either spermatheca or spermathecal gland. The absence of spermatheca is uncommon in Carabidae and only occasionally found in Trechini (Deuve 1993: fig. 250). They are also absent at least in other two species of the subgenus, *C. (Sphodromimus) davidi* and *C. (Sphodromimus) flavofemoratus* (see female genitalia descriptions below).

***Chlaenius (Sphodromimus) pilosus* (Casale, 1984), new record from China**

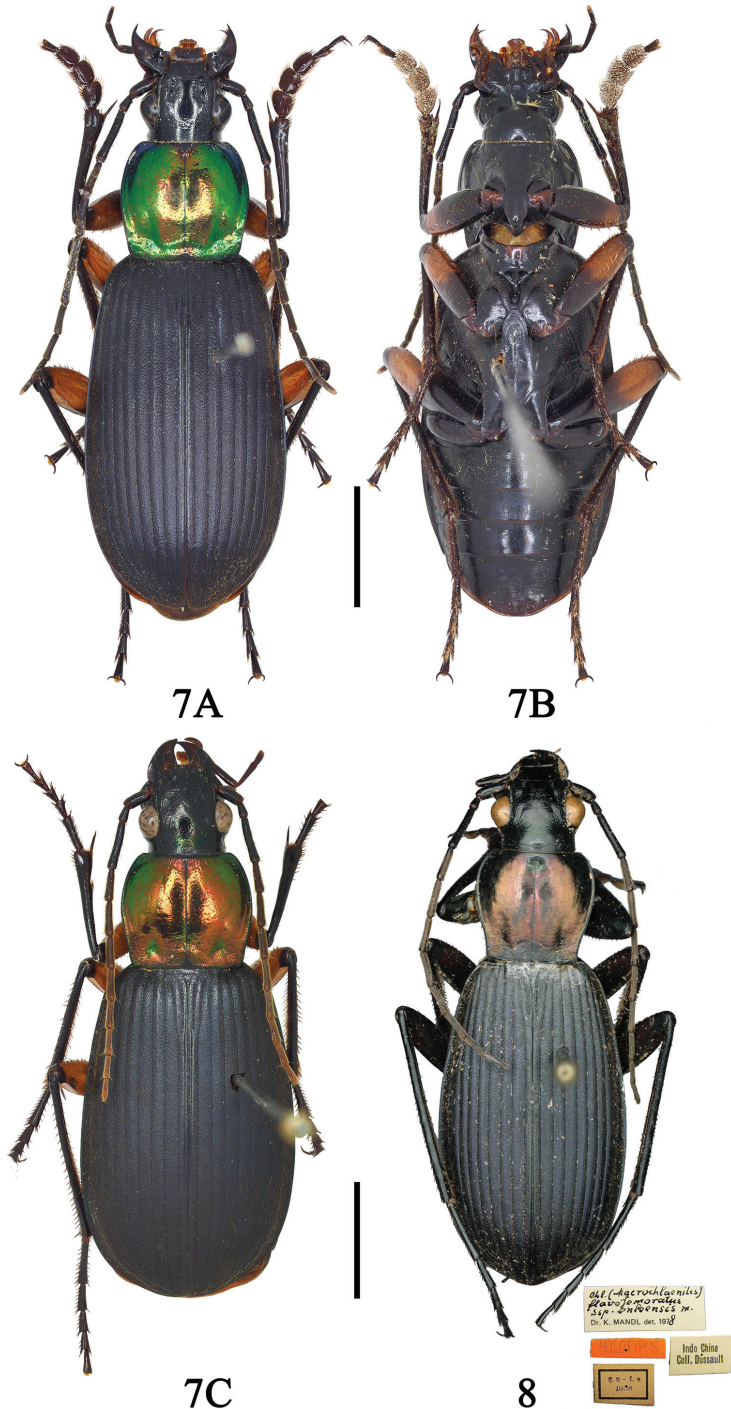
Figs 6A, B, 13, 20, 28A–E, 40

Vachinius (Sphodromimus) pilosus Casale, 1984: 379; Lorenz 1998: 320 (catalogue); Lorenz 2005: 341 (catalogue); Brunk and Kirschenhofer 2016: 54 (record); Azadbakhsh and Kirschenhofer 2019: 1 (transferred from genus *Vachinius*).

Type locality. Vietnam, Chapa, Tonkin, Coll. J. Clermont.

Material examined. CHINA – Yunnan Prov.: 4 ♂♂ (IZAS), Pingbian, Dawei Shan, 2100 m, 2010.V.23, X.D. Yang, X.Y. Zhu leg.

Diagnosis. Dorsum black. $PW/PL = 1.02–1.07$; $PAW/PBW = 0.98–1.00$ (Fig. 20); pronotum subquadrate with anterior angles rounded, slightly projected forward; disc densely and completely rugose, punctate. Elytral intervals flat and densely punctate and pubescent. Hind wings reduced. Metepisterna short, $MW/ML = 1.3–1.4$ (Fig. 13). Apical lamella of median lobe truncated, right side with a large denticulation, left side with a small denticulation (Fig. 28A–E), sometimes, such denticulation absent.



Figures 7, 8. 7A, B *Chlaenius* (*Sphodromimus*) *flavofemoratus* Laporte, 1834 (male, Yunnan, Menglun) **C** *C. (Sphodromimus) flavofemoratus* Laporte, 1834 (female, Yunnan, Menglun) **8** *C. (Sphodromimus) enleensis* Mandl, 1992 (holotype, Indo China) Scale bars: 5.0 mm.

Description. BL = 19.6–21.9 mm, BW = 7.3–7.6 mm, PAW = 3.33–3.55 mm, PBW = 3.40–3.55 mm, PW = 4.35–4.55 mm, PL = 4.05–4.45 mm, MW = 1.65–1.80 mm, ML = 1.20–1.35 mm. Head, pronotum, elytra, legs, and venter black; antennae, labial and maxillary palpi, apex of mouthparts and tarsomeres dark brown.

Head. Vertex punctate and pubescent with a rugose area; antennae long, reaching middle of elytra; antennomere 3 ~ 1.5× longer than antennomere 4.

Pronotum subquadrate, PW/PL = 1.02–1.07 (Fig. 20), widest at apical third; anterior margin slightly concave, its width equal to width of basal margin, PAW/PBW = 0.98–1.00; lateral margins slightly bent before middle, then gently narrowed to base, straight before posterior angles; anterior angles rounded, slightly projected forward; posterior angles right angled, slightly rounded at tips; disc gently convex, sparsely punctate, pubescent, with a few transverse rugosities, without glabrous area in the middle; median line distinct, deep, reaching anterior margin and base; basal foveae deep, short, broad, punctate, and pubescent.

Elytra elongate, EL/BW = 1.64–1.77; gently convex near anterior third, widest near posterior third, rounded at apex in males; striae with deep punctures; parascutellar striae well developed; parascutellar pores present; intervals flat, densely punctate and pubescent; sutural angles sharp; hind wings reduced.

Venter densely punctate, pubescent, metepisterna (Fig. 13) short, MW/ML = 1.30–1.38; abdominal sternites III–VI with one setiferous puncture each side, sternite VII with one pair of setiferous punctures in males, two pairs in females; all abdominal sternites with distinct impressions laterally.

Legs long and slender; tarsi nearly smooth dorsally.

Male genitalia. Median lobe (Fig. 28B–E) stout, strongly bent to ventral side; apical orifice opening dorsally, long and wide, not reaching basal bulb; in dorsal view, apical lamella (Fig. 28A) wide and short, wider than long, apex truncated; in left lateral view, apical right side with a large denticulation towards the base and outside, basal left side only thickened and convex or convex into a small denticulation, basal orifice ~ 90 ° relative to preapical shaft; left paramere large and round; right paramere helically curved; endophallus with flagellum coiled; basal part of flagellum with a disciform sclerite facing the right; apical part of flagellum with strip of sclerite.

Female genitalia unknown.

Distribution. China (Yunnan), Vietnam.

Remarks. The type locality is situated in the mountains of the Black River, northern Vietnam, not far from the Chinese frontier. Our identification is based on the original description and illustration of the male genitalia of the holotype by Casale (1984: 379, figs 11, 13).

***Chlaenius (Sphodromimus) davidi* nom. nov.**

Figs 9A, B, 15, 23, 31A–E, 39A–C, 40

Vachinius (Sphodromimus) wrasei Kirschenhofer, 2003: 37 (type locality: China, Guangdong); Lorenz 2005: 342 (catalogue); Brunk and Kirschenhofer 2016:

54 (record); Azadbakhsh and Kirschenhofer 2019: 1 (genus *Chlaenius*, subgenus *Sphodromimus*) [nec *C. (Lithochlaenius) wrasei* (Kirschenhofer, 1997)]

Type locality. Guangdong, Xinyi, Datianding.

Material examined. Total 10 specimens. CHINA – **Guangdong:** Holotype female (DWC, photo), China, Guangdong, 1500 m, Xinyi: Datianding (22.16/111.15) -VIII-1997 – leg. Li/Holotypus, *Chlaenius (Sphodromimus) wrasei* sp. nov. det. Kirschenhofer, 2001 [red label]/COLL WRASE, BERLIN; 1 ♂ and 4 ♀♀ (IZAS), Guangdong, Xinyi, Yunkai Shan, 1508.21m/22.291317°N, 111.209888°E, 2017.V.30, Y.Z. Liu, S.P. Yu leg., Inst. of Zoology; 2 ♀♀ (IZAS), Guangdong, Xinyi, Yunkai Shan, 1250.55 m/22.292692°N, 111.203833°E, 2017.V.31, Y.Z. Liu, S.P. Yu leg., Inst. of Zoology; **Guangxi:** 2 ♂♂ (IZAS), Guangxi Prov, Daming Shan, Tianping Protect Station, N 23.49811, E 108.43715/1230 m, 2011.V.27 N, Xinlei Huang Coll., Inst. of Zoology.

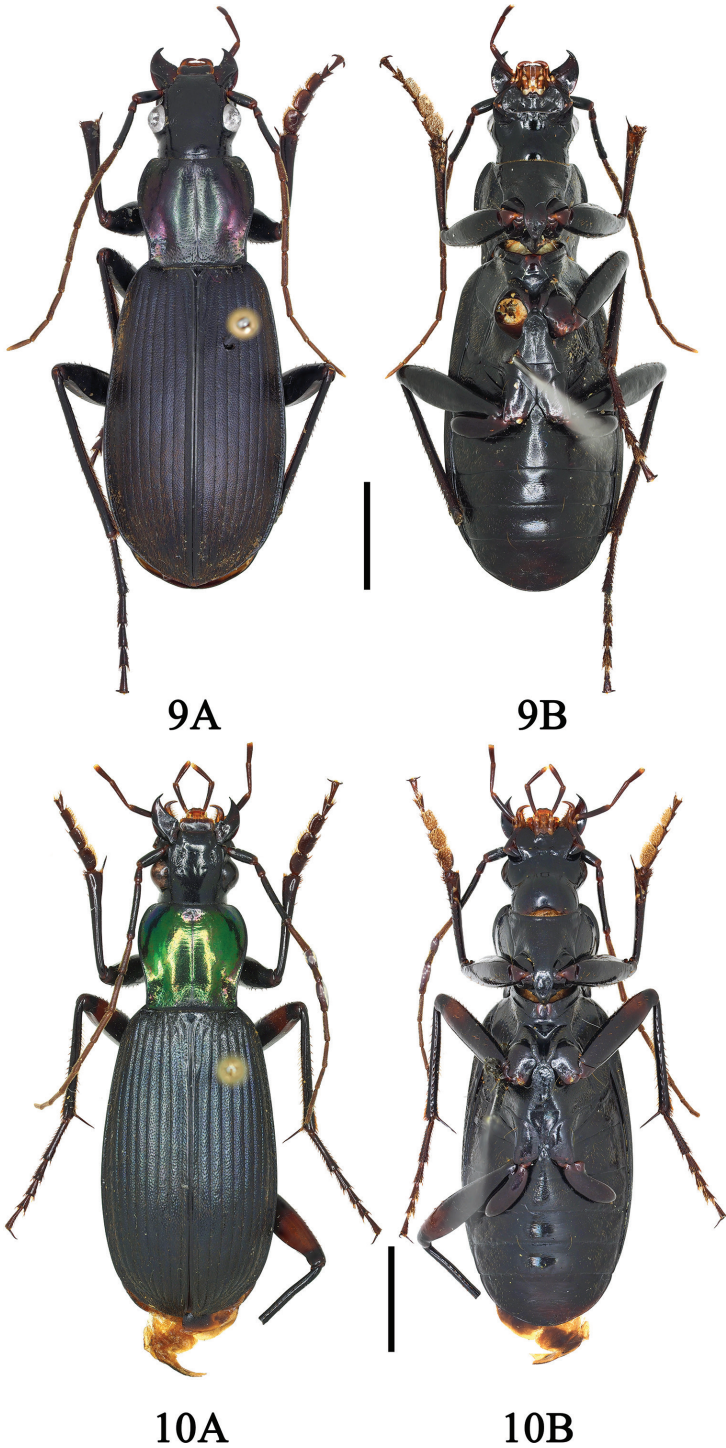
Diagnosis. Pronotum fully metallic purple, or greenish purple. PW/PL = 1.09–1.11; PAW/PBW = 0.83–0.93 (Fig. 23); pronotum cordate with posterior angles nearly right angled, rounded at tips; disc sparsely punctate and pubescent, with dense, shallow, transverse rugosities, without glabrous area in the middle. Elytral intervals convex basally, flat apically, densely punctate and pubescent. Hind wings reduced. Metepisterna short, MW/ML = 1.11–1.15 (Fig. 15). Legs totally black.

Comparisons. This species is most similar to *Chlaenius (Sphodromimus) enleensis* Mandl, 1992 (Figs 8, 10A, B), sharing the large size, general shape of apical lamella, metepisterna short (Figs 15, 16), and reduced hind wings, but can be distinguished from the latter by: (1) pronotum purple or greenish purple (Fig. 23) (green to coppery, but not purple in *C. enleensis*, Fig. 24); (2) femora black (middle of mesofemora and metafemora brown in *C. enleensis*); (3) elytral intervals convex basally, flat apically (interval convex throughout in *C. enleensis*); (4) apical lamella wider at base (narrower in *C. enleensis*, Figs 32A, C, D, 33A, C, D)

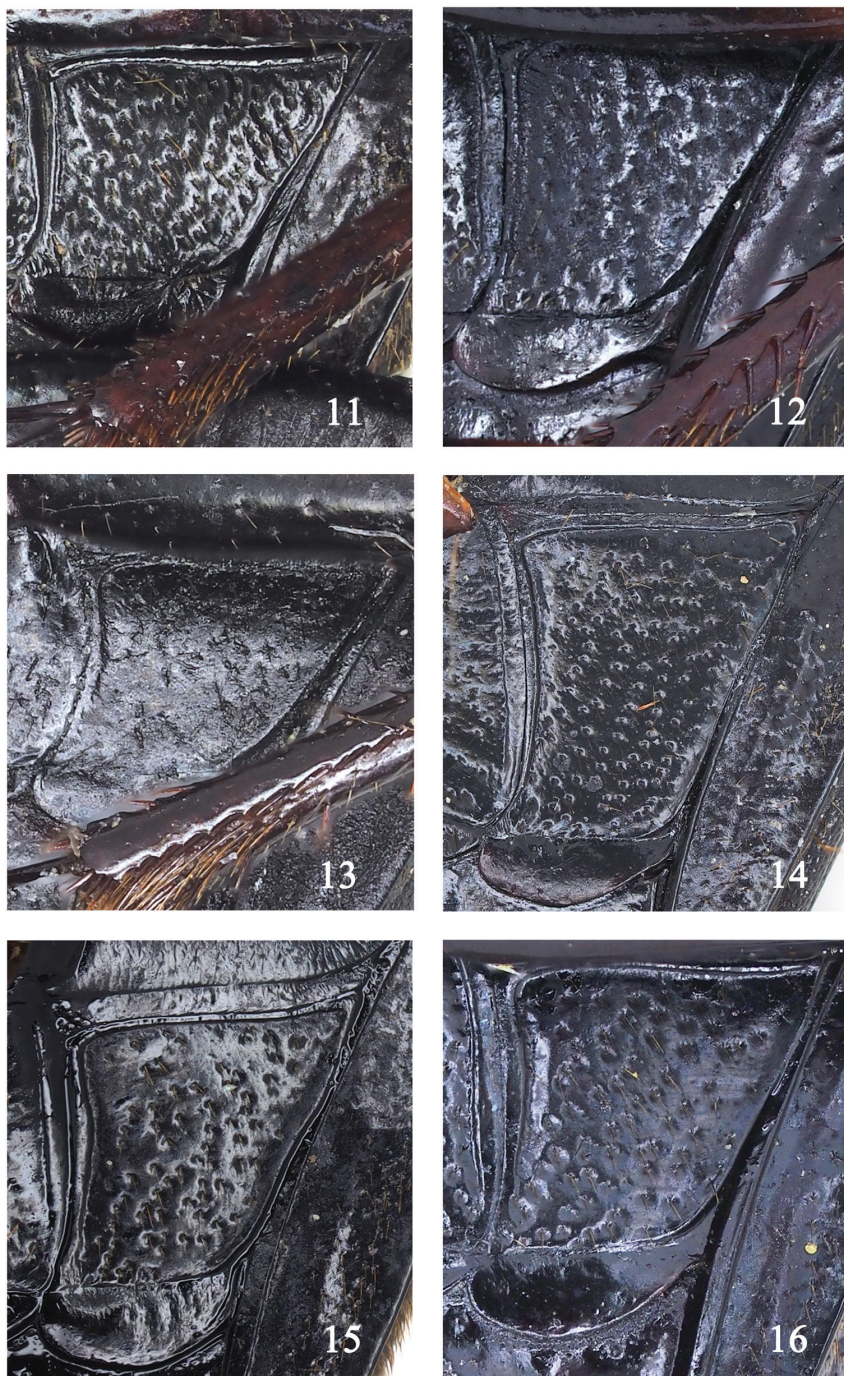
Description. BL = 21.3–24.4 mm, BW = 8.0–8.7 mm. PL = 4.5–5.0 mm, PW = 5.0–5.5 mm, MW = 2.0–2.1 mm, ML = 1.7–1.9 mm. Head, elytra, venter, and legs dark and black; pronotum fully purple or greenish purple; antennae, labial and maxillary palpi, apex of mouthparts and tarsomeres dark brown.

Head. Vertex finely punctate, pubescent, without a distinct glabrous area; antennae long, reaching middle of elytra; antennomere 3 ~ 1.5× longer than antennomere 4.

Pronotum cordiform, PW/PL = 1.09–1.11 (Fig. 23), widest at apical third; anterior margin slightly concave, PAW/PBW = 0.83–0.93; lateral margins distinctly narrowed from middle to base, distinctly sinuate before posterior angles; anterior angles rounded, slightly projected forward; posterior angles nearly right angled, rounded at tips; disc gently convex, sparsely punctate and pubescent, with dense shallow transverse rugosities, without glabrous area in the middle; median line distinct, fine, not reaching anterior margin and base; basal foveae deeply arcuate, punctate and pubescent.



Figures 9, 10. 9A, B *Chlaenius (Sphodromimus) davidi* nom. nov. (male, Guangdong, Xinyi) **10A, B** *C. (Sphodromimus) enleensis* (male, Vietnam, Tam Dao). Scale bars: 5.0 mm.



Figures 11–16. Metepisternum features of *Sphodromimus* spp. **11** *Chlaenius (Sphodromimus) caperatus* sp. nov., holotype **12** *C. (S.) yinggelingensis* sp. nov., holotype **13** *C. (S.) pilosus* (Casale, 1984), male **14** *C. (S.) flavofemoratus* Laporte, 1834, male **15** *C. (S.) davidi* nom. nov.; male **16** *C. (S.) enleensis* Mandl, 1992, male.

Elytra elongate, EL/BW = 1.61–1.75, gently convex near anterior third, widest near posterior third, rounded at apex in males, subtruncate in females; striae with deep punctures; parascutellar striae well developed; parascutellar pores present; intervals convex at base, flat from middle to apex, densely punctate and pubescent; sutural angles obtuse and right; hind wings reduced.

Venter densely punctate, pubescent, metepisterna (Fig. 15) short, MW/ML = 1.11–1.15; abdominal sternites III–VI with one setiferous puncture each side, sternite VII with one pair of setiferous punctures in males, two pairs in females; all abdominal sternites with distinct impressions laterally.

Legs long and slender; tarsi nearly smooth dorsally.

Male genitalia. Median lobe (Fig. 31B–E) long, strongly bent to ventral side; apical orifice opened dorsally, long and wide, not reaching basal bulb; in dorsal view, apical lamella triangular (Fig. 31A), distinctly bent to right side, longer than basal width, each side of middle apical lamella with a denticulation or absent on right side; in left lateral view, apical portion slightly bent dorsally at apex, basal orifice ~ 90° relative to preapical shaft; left paramere larger than right paramere, both helically curved; endophallus with flagellum thick and straight; basal part of flagellum with irregular bursa; apical part of flagellum with drop-shaped sclerite.

Female genitalia. Bursa copulatrix (Fig. 39A–C) round, base with a distinct long digitiform protrusion; villous canal long, tortuously contorted, adhered to common oviduct; spermatheca and spermathecal gland absent.

Distribution. (Fig. 40) China (Guangdong; Guangxi).

Remarks. *Chlaenius* (*Sphodromimus*) *wrasei* was originally described as a member of the genus *Vachinius*. Azadbakhsh and Kirschenhofer (2019) moved it to the genus *Chlaenius*. However, in a result of this treatment, it became a junior homonym of *Chlaenius* (*Lithochlaenius*) *wrasei* (Kirschenhofer, 1997). Herein, we propose a new replacement name for the former – *Chlaenius* (*Sphodromimus*) *davidi* nom. nov., based on the first name of the well-known specialist on the ground beetles, David W. Wrase.

This species was described based on a single female from Datianding, Xinyi, Guangdong, China. Recently, one male and six females were collected from the type locality, and those specimens fit well with the original description and illustration of *C. davidi* nom. nov. Two more males were collected in Guangxi, which are identical to the holotype.

***Chlaenius* (*Sphodromimus*) *flavofemoratus* Laporte, 1834**

Figs 7A–C, 14, 22, 30A–E, 38A–C, 40

Chlaenius flavofemoratus Laporte, 1834: 81; Chaudoir 1856: 244 (synonymized with *Chlaenius femoratus* Dejean, 1826); Chaudoir 1876: 93 (mention); Andrewes 1941: 308 (key to species; distinguished from *Chlaenius femoratus* Dejean, 1826); Andrewes 1947: 6 (Burma, Indo-China, The Malay Island, Hong Kong); Mandl 1992: 99 (*Macrochlaenites*; Java, Burma); Lorenz 1998: 318 (catalogue); Lorenz 2005: 338 (catalogue); Kirschenhofer 2017: 491 (catalogue); Azadbakhsh and Kir-

schenhofer 2019: 1 (transferred to subgenus *Sphodromimus* from subgenus *Haplochlaenius*)

nigricoxis Motschulsky, 1865: 339 (type locality: Hong Kong); Chaudoir 1876: 94 (redescription); Bates 1892: 312 (Bhamò, Palon, Karin Chebà, Laos, Java); Mandl 1992: 99 (synonymized with *C. flavofemoratus* Laporte, 1834); Lorenz 1998: 318 (catalogue); Lorenz 2005: 338 (catalogue). *Synonymy*.

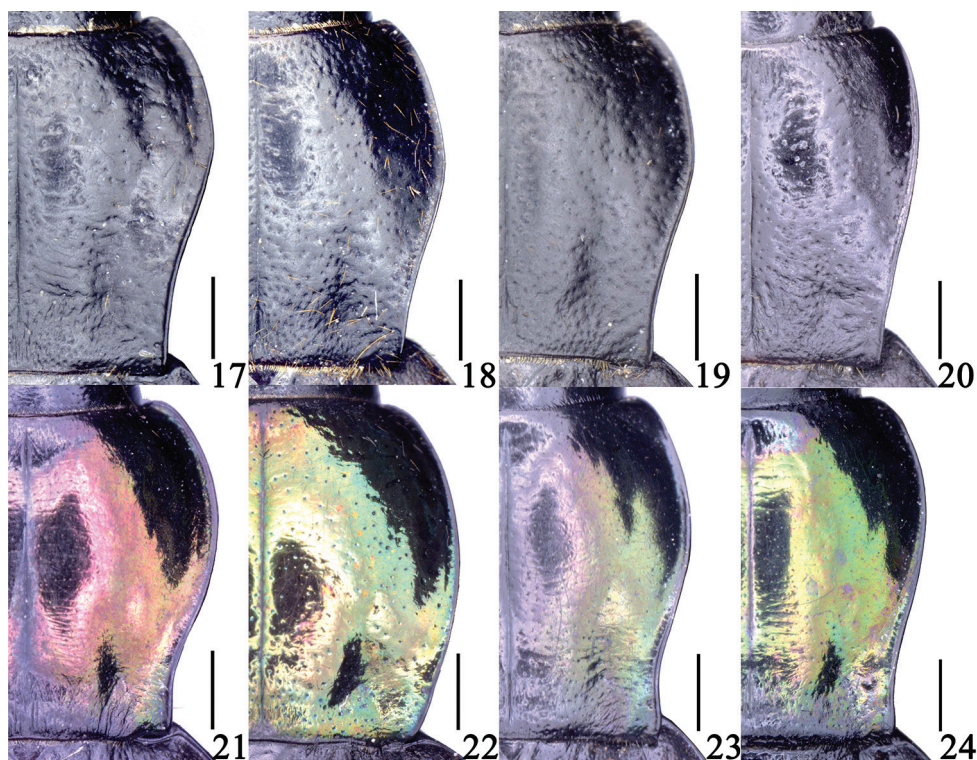
Type locality. Indonesia, Java.

Material examined. Total 83 specimens. **CHINA – Fujian:** 1 ♀ (IZAS), Fujian, Nanping, 1985.VI.7; 1 ♀ (IZAS), Fujian, Nanjing, 1991.V.15; **Guangdong:** 3 ♂♂ (IZAS), Guangdong, Haifeng, Jimingsi, 23.037605°N, 115.25343°E, 178.09m/2017.V.22, Y.Z. Liu, S.P. Yu leg., Inst. of Zoology; **Guangxi:** 1 ♂ (IZAS), Guangxi, Longsheng, Liliu, 1985. IV Jun Li leg.; 1 ♂ (IZAS), Guangxi, Guilin, Longsheng, 2003.VII.7 Jianxin Cui leg.; 1 ♀ (IZAS), Guangxi, Nanning, 1980.IV.21, Rongquan Cai leg.; 1 ♂ (IZAS), Guangxi, Jingxi, 840 m, 1998.IV.1 Chunsheng Wu leg.; **Guizhou:** 1 ♂ and 1 ♀ (IZAS), Guizhou, Luodian, 420 m, 1979.IV.16, Qingqiang Li leg.; 1 ♀ (IZAS), Guizhou, Luodian, 1979.V.1; **Hainan:** 1 ♂ (IZAS), Hainan, Baisha, Yinggeling, 2011.V.1, 600 m, light trap, Wenxin Lin leg., Inst. of Zoology; **Yunnan:** 4 ♂♂ and 1 ♀ (IZAS), Yunnan, Jinghong, Virgin Forest Park, Peacock Villa, 22.0304°N, 100.8763°E, 682 m/2021.VIII.6 N, along road Pingzhou Zhu leg., Inst. of Zoology; 1 ♂ (IZAS), Yunnan, Xishuangbanna, Botanical Garden, Chao Wu leg.; 1 ♀ (IZAS), Yunnan, Hekou, Qiaotou, Bajiaotian village/ 22.85348°N, 104.14211°E, 886 m, 2021.IV.21 N, Y. Xu, Z.Q. Yan coll., Inst. of Zoology; 1 ♂ (CAS), China, Yunnan Province, Tengchong, Shangying, Longwenqiao, field, beach, 25°01'19.9"N, 98°40'40.4"E/1290 m, 2003.X.20 D., H.B. Liang, X.C. Shi Coll., Institute of Zool., CAS & California Acad. Sciences; 1 ♂ and 3 ♀♀ (IZAS), Yunnan, Xishuangbanna, Menglun, Botanical Garden, 549 m, 21°56.035'N, 101°15.154'E /2005.V.25, Guo Zheng leg, Inst. of Zoology, CAS; 4 ♂♂ and 6 ♀♀ (CAS), Yunnan, Xishuangbanna, Menglun, Botanical Garden, 558 m, 21°55.035'N, 101°16.500'E /2007.V.20, Guo Zheng leg, Inst. of Zoology, CAS; 3 ♂♂ and 8 ♀♀ (IZAS), Yunnan, Xishuangbanna, Menglun, Botanical Garden, 558 m, 21°55.035'N, 101°16.500'E /2007.VII.10, Guo Zheng leg, Inst. of Zoology, CAS; 1 ♂ and 4 ♀♀ (CAS), Yunnan, Xishuangbanna, Menglun, Botanical Garden, 572 m, 21°54.646'N, 101°16.257'E /2007.I.10, Guo Zheng leg, Inst. of Zoology, CAS; 2 ♀♀ (IZAS), Yunnan, Xishuangbanna, Menglun, Botanical Garden, 2009.XII.1, Guo Tang leg, Inst. of Zoology; 2 ♀♀ (IZAS), China, Yunnan Prov., Nabanhe N.R. Guomenshan, alt.1150 m, 2009.V.6, Jiayao Hu, Ziwei Yin leg.; 1 ♂ (IZAS), Yunnan, Jinghong, Menghai, Nabanhe N.R. Guomenshan, Forest, 2009.VI.26, 1114 m/22.24644°N, 100.60610°E, pitfall, L.Z. Meng leg., Inst. of Zoology; 1 ♂ (IZAS), China, Yunnan, Hekou, Longpu, 240 m, 2011.IV.13D, 22.65404°N, 103.98193°E/Xinlei Huang leg., Inst. of Zoology, CAS; 1 ♂ (IZAS), Yunnan, Xishuangbanna, Menglun, Botanical Garden, 540 m, 21.92987°N, 101.24820°E, 2011.IV.21N/Hongbin Liang, Kaiqing Li leg., Institute of Zool., CAS; 1 ♂ (CAS), Yunnan, Xishuangbanna, Menglun, Botanical Garden, 540 m, 21.92987°N, 101.24820°E, 2011.IV.22/Yan Li leg., Institute of Zool.,

CAS; 1 ♂ (IZAS), Yunnan Prov. Menglun, Botanical Garden, vegetation, 21.91175°N, 101.28163°E /650 m, 2009.XI.15, Guo Tang Coll., Inst. of Zoology; 1 ♀ (IZAS), Yunnan, Xishuangbanna, Menglun, Botanical Garden, 2011.V.04, 560 m/ 21°55'39.66"N, 101°15'18.09"E, Jingxin Liu leg., Inst. of Zoology; 1 ♀ (IZAS), Yunnan, Xishuangbanna, 29 km NW, Jinghong, vic. Da Nuo You/ 22°12.41'N, 100°38.29'E, 790 m, 2009.V.16 leg. L. Meng, rice follow; 1 ♀ (IZAS), Yunnan, Xishuangbanna, 20km NW, Jinghong, vic. Man Dian (NNNR)/22°07.80'N, 100°40.05'E, 740 m, 2008.V.13 leg. A. Weigei rubb. plant; 1 ♂ and 1 ♀ (CAS), Yunnan, Lushui, Pianma, Gangfang, Xuetang 26.12218°N, 98.57546°E/1625 m, 2005.V.16N, D. Kavanaugh, D.Z. Dong leg., Inst. of Zoology, CAS; 1 ♂ (CAS), China, Yunnan, Mengla, Biodiversity Corridor, 660 m, 2011.IV.25D, 21.40482°N, 101.63035°E /Xinlei Huang leg., G213 1999 km, Inst. of Zoology, CAS; 1 ♂ (IZAS), Yunnan, Yangbi, Pingpo, 1422 m, 25°35'33"N, 100°2'56"E/2002.VI.27, Min Wu leg.; 1 ♀ (CAS), China, Yunnan Province, Tengchong, Qushi Town, Xiaojiangqiao, riverside, 25°14'22.2"N, 98°37'38.0"E/1445 m, 2003.X.21, night, H.B. Liang, X.C. Shi Coll., Institute of Zool., CAS & California Acad. Science; 1 ♀ (CAS), Yunnan, Gaoligongshan, Nujiang Prefecture, 1500 m, 26°07.3'N, 98°34.5'E, 1998.X.14, D.H. Kavanaugh leg.; 2 ♂♂ (IZAS), Yunnan, Xishuangbanna, Menglun Town NO.55, 2009.V.04, Hu Li leg.; 4 ♀♀ (IZAS), Yunnan, Xishuangbanna, Menglun, Botanical Garden, 2012.V.16, L.Z. Meng leg., Inst. of Zoology; 1 ♂ (IZAS), Yunnan, Xishuangbanna, Menglun, 1982.IV.26, Linyao Wang leg.; 1 ♂ (IZAS), Yunnan, 1980.VI.5, Fen Liu leg.; 1 ♀ (IZAS), Yunnan, Gaoligong, Cikai Town, Pulahe joint of Nujiang, 27.74843°N, 98.66498°E/1530 m 2004.X.23, night, D. Kavanaugh, D.Z. Dong leg. Inst. of Zoology, CAS; 1 ♂ (IZAS), Yunnan, Lancang, Mafang By pitfall traps, 22.57925°N, 99.99849°E/1723 m, 2004.VI.16, W.B. Gu coll, Inst. of Zoology, CAS; 1 ♀ (CAS), Yunnan, Lushui, Liuku, Gaoligong Shan, 25°51'20"N, 98°50'58"E/800 m, 2002.IX.19, H.B. Liang, night, Sino-American Exped., Inst. of Zoology, CAS; 1 ♂ (CAS), China, Yunnan, Gaoligongshan, Nujiang Prefecture, Gangfang, Sancha Lukou/26 07.3'N, 98 34.5'E, 1500 m, 1998.X.12, D.H. Kavanaugh collector.; **MYANMAR:** 1 ♂ (NHML), Carin Cheba, 900–1100 m, L. Fea/ Fry Coll., 1905.100./ *Chlaenius flavofemoratus* Cast. = *nigricoxis* Mots., comp with type, H.E. Andrewes det.; **VIETNAM:** 1 ♀ (IZAS), Tonkin, Hoa Binh, leg: A. de Cooman.

Diagnosis. Pronotum metallic green to metallic coppery. PW/PL = 1.14–1.26; PAW/PBW = 0.76–0.92 (Fig. 22); pronotum subquadrate with anterior angles rounded, not projected forward; disc gently convex, sparsely punctate. Elytral intervals convex basally, flat apically, densely punctate and pubescent. Hind wings developed. Metepisterna long, MW/ML = 0.75–0.92 (Fig. 14). Distal half of femora red-brown, the rest of legs black. This species is similar to *Chlaenius* (*Haplochlaenius*) *costiger* Chaudoir, 1856, but intervals interval convex basally and flat apically, not costulate.

Description. BL = 22.3–25.3 mm, BW = 8.5–10.4 mm, PAW = 3.5–4.0 mm, PBW = 4.3–4.6 mm, PW = 5.5–5.8 mm, PL = 4.5–4.9 mm, MW = 1.9–2.5 mm, ML = 2.4–3.0 mm. Head, elytra, and venter black; pronotum metallic green to metallic coppery; antennae, labial and maxillary palpi, apex of mouthparts and tarsomeres dark brown; distal half of femora red-brown, the rest of legs black.



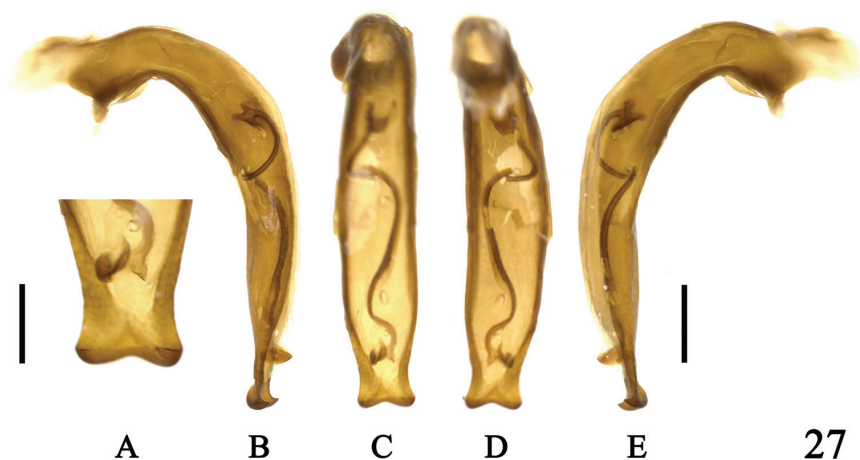
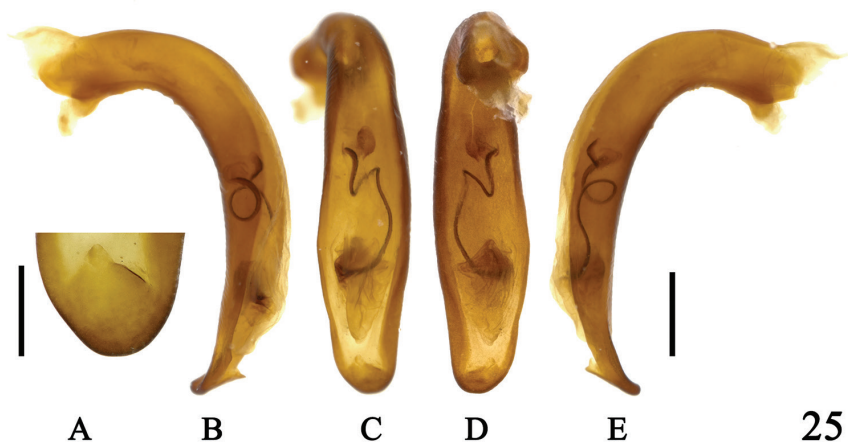
Figures 17–24. Pronotum features of *Sphodromimus* spp. **17** *Chlaenius (Sphodromimus) caperatus* sp. nov.; holotype **18** *C. (S.) hunanus* (Morvan, 1997) male **19** *C. (S.) deuwei* (Morvan, 1997); male **20** *C. (S.) pilosus* (Casale, 1984), male **21** *C. (S.) yinggelingsensis* sp. nov.; holotype **22** *C. (S.) flavofemoratus* Laporte, 1834, male **23** *C. (S.) davidi* nom. nov., male **24** *C. (S.) enleensis* Mandl, 1992, male. Scale bars: 1.0 mm.

Head. Vertex finely punctate and pubescent, with a glabrous area in the middle; antennae long, reaching middle of elytra; antennomere 3 ~ 1.7× longer than antennomere 4.

Pronotum subquadrate, $PW/PL = 1.14–1.26$ (Fig. 22), widest at apical four-ninth; anterior margin slightly concave, $PAW/PBW = 0.76–0.92$; lateral margins rounded or straight before posterior angles; anterior angles rounded, not projected forward; posterior angles obtuse; disc gently convex, sparsely punctate, without glabrous area in the middle; median line distinct, fine, reaching anterior margin and base; basal foveae deep, punctate and pubescent.

Elytra elongate, $EL/BW = 1.47–1.83$; slightly convex, widest near posterior third, rounded at apex in males, subtruncate in females; parascutellar striae well developed; parascutellar pores present; striae with deep punctures; interval convex basally, flat apically, densely punctate and pubescent; sutural angles obtuse; hind wings developed.

Venter densely punctate, pubescent; metepisterna (Fig. 14) long, $MW/ML = 0.75–0.92$; abdominal sternites III–VI with one setiferous puncture each side, sternite VII with one pair of setiferous punctures in males, two pairs in females.



Figures 25–27. Aedeagus of *Sphodromimus* spp. **25** *Chlaenius (Sphodromimus) caperatus* sp. nov., holotype **26** *C. (Sphodromimus) hunanus* (Morvan, 1997) (Guangdong, Nanling) **27** *C. (Sphodromimus) deuvei* (Morvan, 1997) (Guangxi, Huaping) **A** apical lamella **B** left lateral view **C** dorsal view **D** ventral view **E** right lateral view. Left scale bars: 0.5 mm (**A**); right scale bars: 1.0 mm (**B–E**).

Legs long and slender; tarsi nearly smooth dorsally.

Male genitalia. Median lobe (Fig. 30B–E) large, long, strongly bent to ventral side; apical orifice opened dorsally, long and wide, not reaching basal bulb; in dorsal view, apical lamella (Fig. 30A) slightly bent to left side, width slightly longer than length, apex rounded; in left lateral view, apical portion slightly bent ventrally at apex, left side near apical lamella with a large denticulation; internal sac with flagellum slender, apex with a helical sclerite, not reaching to apical orifice; left paramere larger than right paramere, both rounded; endophallus with flagellum fine and slightly bent; basal part of flagellum without a sclerite; apical part of flagellum with a drop-shaped bursa.

Female genitalia. Bursa copulatrix (Fig. 38A–C) very long, base with trapeziform protrusion; villous canal long, tortuously contorted, adhered to common oviduct; spermatheca and spermathecal gland absent.

Distribution. (Fig. 40) China (Fujian; Guangdong; Guangxi; Guizhou; Hainan; Hong Kong; Yunnan), Indonesia, Laos, Myanmar, Vietnam.

Remarks. Due to the fully developed hind wings and the shape of pronotum, this species is very special among species of *Sphodromimus*. It also has a wider distribution than other species. But the morphological characteristic of the apical lamella of the aedeagus, denticulate on the dorsal side, and the mentum with a bifid tooth show that the species belongs to *Sphodromimus*. The subspecies *C. (Sphodromimus) flavofemoratus enleensis* Mandl, 1992 was upgraded as a valid species (see below).

***Chlaenius (Sphodromimus) enleensis* Mandl, 1992, stat. nov.**

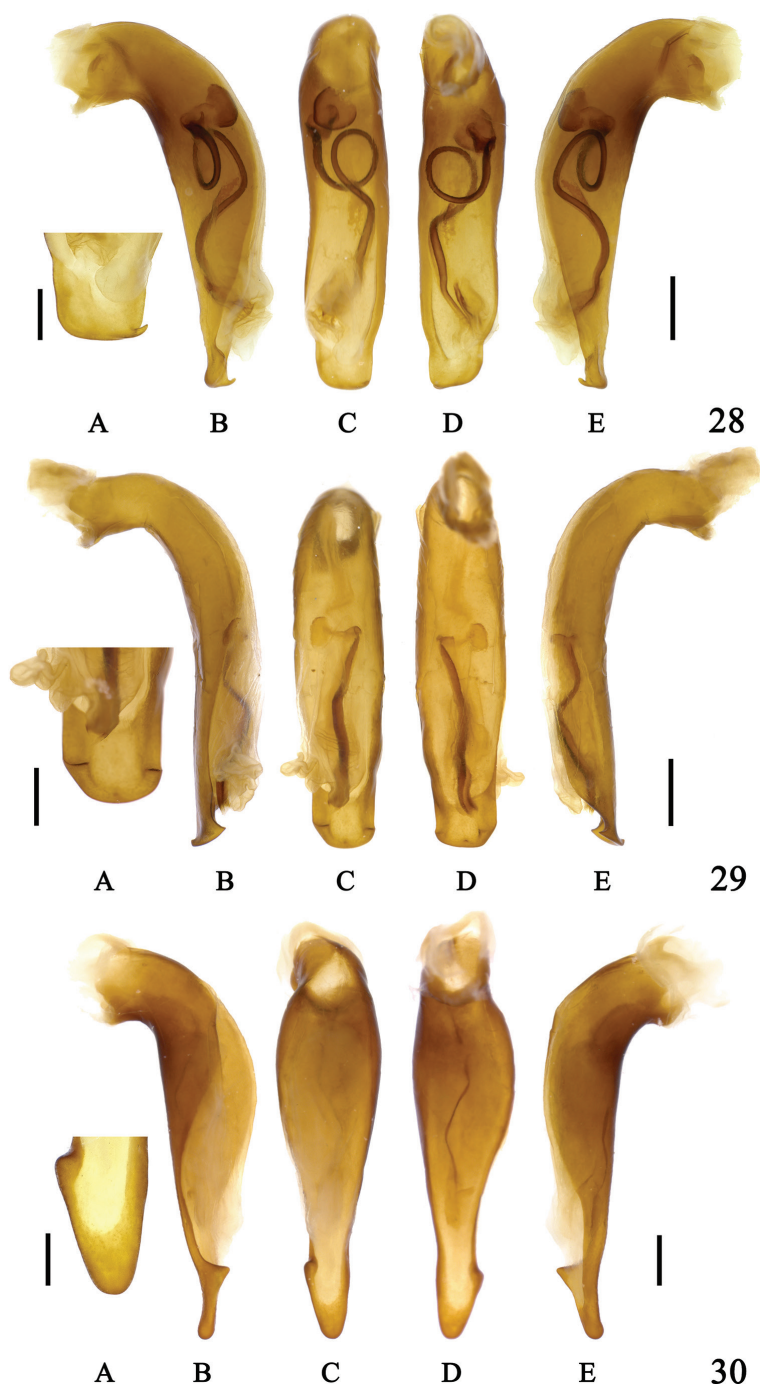
Figs 8, 10A, B, 16, 24, 32A–F, 33A–E, 40

Chlaenius flavofemoratus enleensis Mandl, 1992: 100; Lorenz 1998: 318 (synonymized with *C. flavofemoratus* Laporte, 1834, catalogue); Lorenz 2005: 338 (catalogue); Kirschenhofer 2017: 491 (as a subspecies of *C. flavofemoratus*; catalogue); Azadbakhsh and Kirschenhofer 2019: 1 (transferred to subgenus *Sphodromimus* from subgenus *Haplochlaenius*).

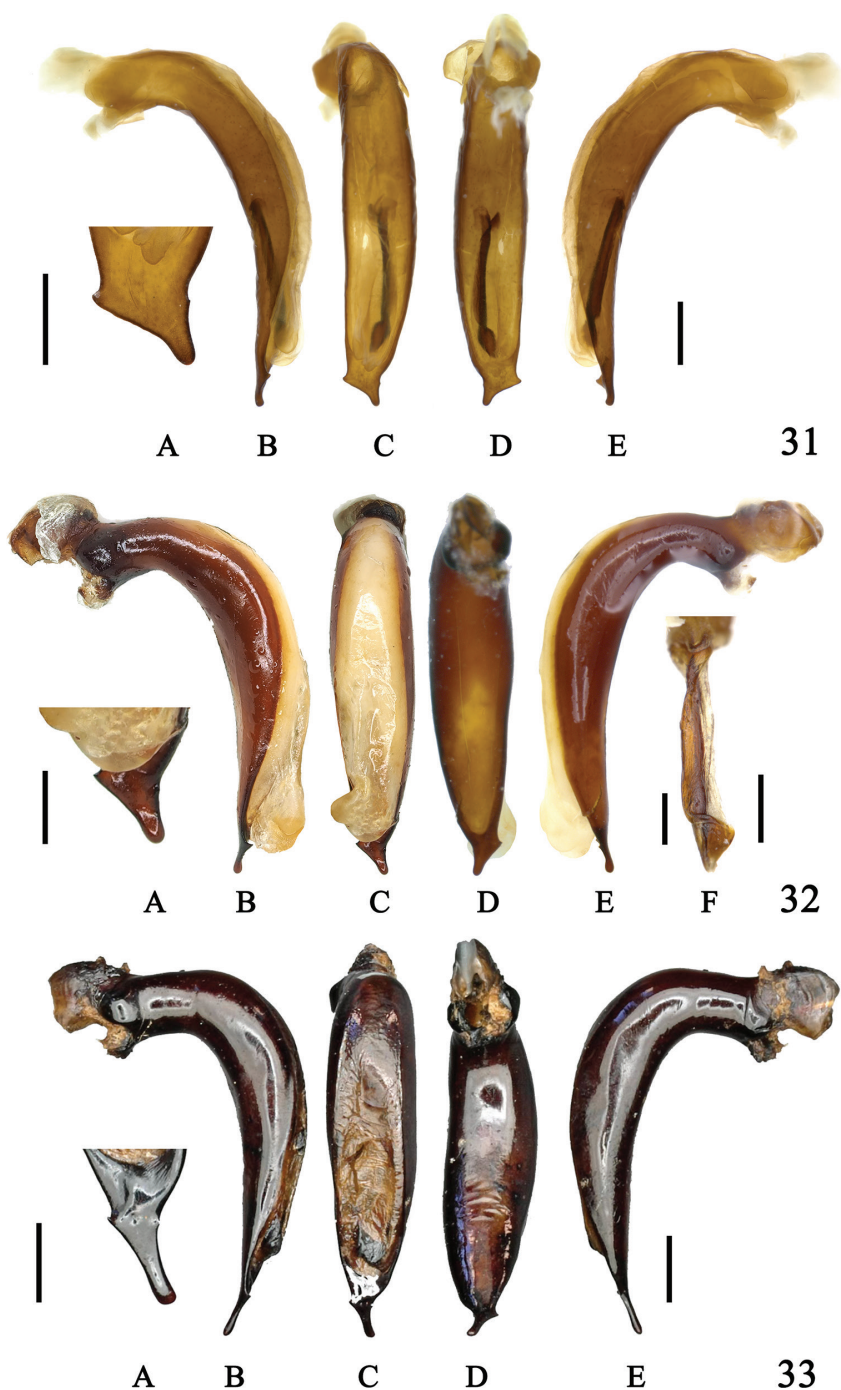
tamdaoensis Kirschenhofer, 2003: 32 (type locality: Vietnam, Tam Dao; genus *Chlaenius*, subgenus *Haplochlaenius*); Lorenz 2005: 342 (catalogue); Azadbakhsh and Kirschenhofer 2019: 1 (genus *Chlaenius*, subgenus *Sphodromimus*) syn. nov.

Type locality. Indo China.

Material examined. Total 5 specimens. **VIETNAM:** **Holotype**, Male (NHMB), Indo China coll. Dussault/ En-Le 1908/*Chl (Macrochlaeniles) flavofemoratus* ssp. *enleensis* Dr. K. MANDL det. 1978/Holotype [red label]. **Paratype** (DWC, photo), 1 ♂ (IZAS), VIETNAM, Tam Dao, 20–28.VI.1990, Dr. Blazicek lgt./Paratypus, *Chlaenius (Haplochlaenius) tamdaoensis* mihi det. Kirschenhofer 2001 [red label]/COLL WRASE, BERLIN; 1 ♂ (IZAS), Vietnam, Tam Dao, 60 km NW Hanoi, 900 m, 1997 May–June, S. Ryabov [internal sac fully everted]; 1 ♂ (IZAS), Vietnam, Cao Bang, Nguen Binh, 800 m, 2003.V.13, S. Ryabov [internal sac partially everted]; 1 ♂ (IZAS), Tonkin, Hoa-Binh, leg. A. de Cooman [genitalia damaged by dermestid beetle].



Figures 28–30. Aedeagus of *Sphodromimus* spp. **28** *Chlaenius* (*Sphodromimus*) *pilosus* (Casale, 1984) (Yunnan, Pingbian) **29** *C. (Sphodromimus) yinggelingensis* sp. nov, holotype **30** *C. (Sphodromimus) flavofemoratus* Laporte, 1834 (Yunnan, Menglun) **A** apical lamella **B** left lateral view **C** dorsal view **D** ventral view **E** right lateral view. Left scale bars: 0.5 mm (**A**); right scale bars: 1.0 mm (**B–E**).



Figures 31–33. Aedeagus of *Sphodromimus* spp. **31** *Chlaenius (Sphodromimus) davidi* nom. nov. (Guangdong, Xinyi) **32** *C. (Sphodromimus) enleensis* Mandl, 1992 (Vietnam, Tam Dao) **33** *C. (Sphodromimus) enleensis* Mandl, 1992 (holotype, “Indo Chine”) **A** apical lamella **B** left lateral view **C** dorsal view **D** ventral view **E** right lateral view **F** endophallus. Left scale bars: 0.5 mm (**A**); right scale bars: 1.0 mm (**B–F**).

Diagnosis. Pronotum green to coppery. $PW/PL = 1.06\text{--}1.12$; $PAW/PBW = 0.82\text{--}0.95$ (Fig. 24); pronotum cordate with anterior angles rounded, not projected forward; disc sparsely punctate and pubescent, with shallow transverse rugosities. Elytral intervals gently convex throughout; densely punctate and pubescent. Hind wings reduced. Metepisterna short; $MW/ML = 1.11\text{--}1.17$ (Fig. 16). Apex of femora dark brown or yellow-brown, the rest of legs black.

Description. $BL = 21.7\text{--}24.1$ mm, $BW = 8.2\text{--}8.7$ mm. $PL = 4.5\text{--}4.9$ mm, $PW = 5.0\text{--}5.3$ mm, $MW = 2.0\text{--}2.1$ mm, $ML = 1.7\text{--}1.8$ mm. Head, elytra, venter dark and black; pronotum green to coppery; antennae, labial and maxillary palpi, apex of mouthparts and tarsomeres dark brown; apex of femora dark brown or yellow-brown, the rest of legs black.

Head. Vertex finely punctate, pubescent, without a distinct glabrous area; antennae long, reaching middle of elytra; antennomere 3 $\sim 1.5\times$ longer than antennomere 4.

Pronotum cordiform, $PW/PL = 1.06\text{--}1.12$ (Fig. 24), widest at apical third; anterior margin slightly concave, $PAW/PBW = 0.82\text{--}0.95$; lateral margins distinctly narrowed from middle to base, slightly sinuate before posterior angles; anterior angles rounded, not projected forward; posterior angles nearly right angled, rounded at tips; disc gently convex, sparsely punctate and pubescent, with shallow, transverse rugosities, without glabrous area; median line distinct, fine, not reaching anterior margin and base; basal foveae deeply arcuate, punctate and pubescent.

Elytra elongate, $EL/BW = 1.58\text{--}2.22$, gently convex near anterior third, widest near posterior third, rounded at apex in males; striae with deep punctures; parascutellar striae well developed; parascutellar pores present; intervals gently convex throughout, densely punctate and pubescent; sutural angles sharp at tips; hind wings reduced.

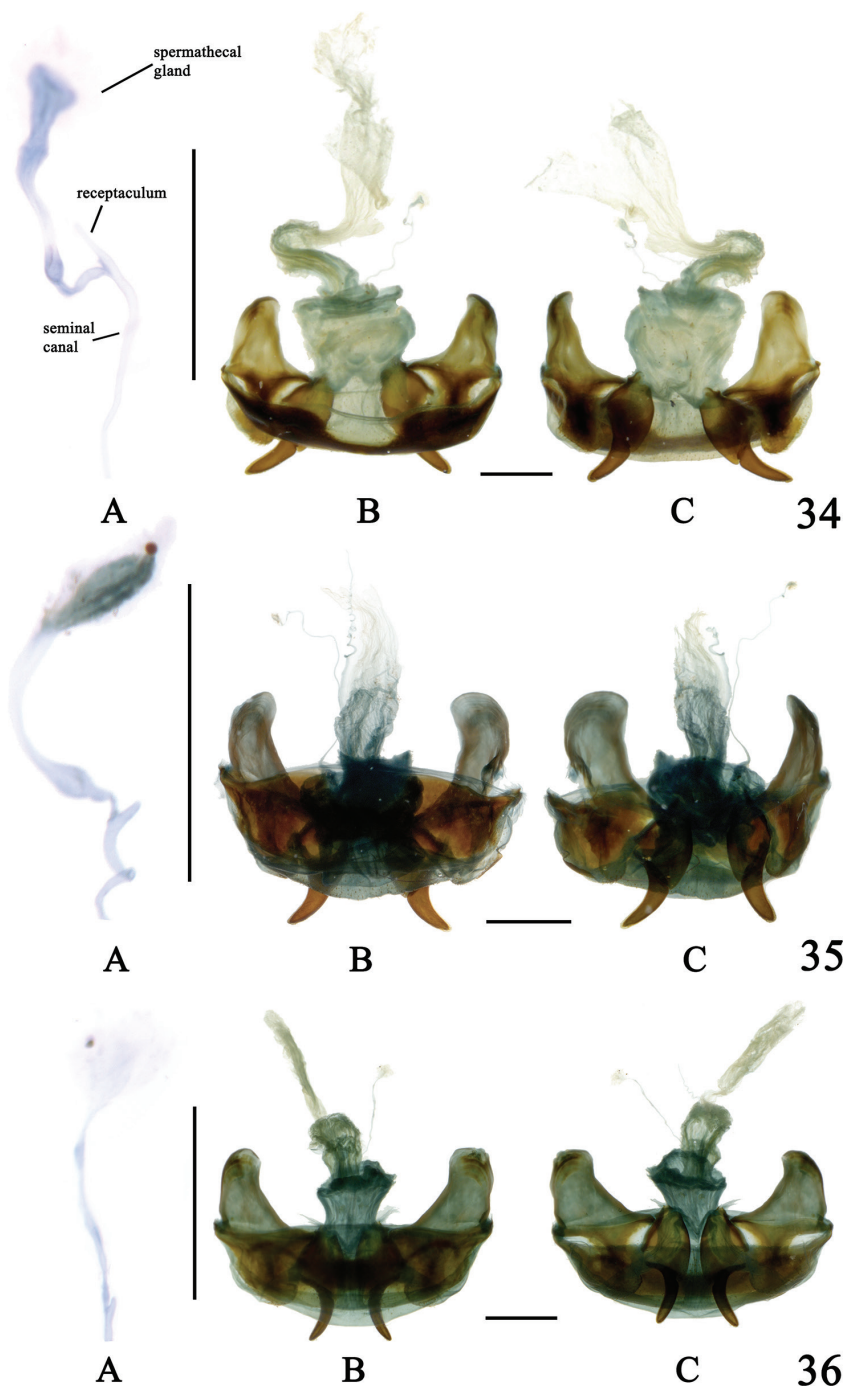
Venter densely punctate, pubescent, metepisterna (Fig. 16) short, $MW/ML = 1.11\text{--}1.17$; abdominal sternites III–VI with one setiferous puncture each side, sternite VII with one pair of setiferous punctures in males; all abdominal sternites with distinct impressions laterally.

Legs long and slender; tarsi nearly smooth dorsally.

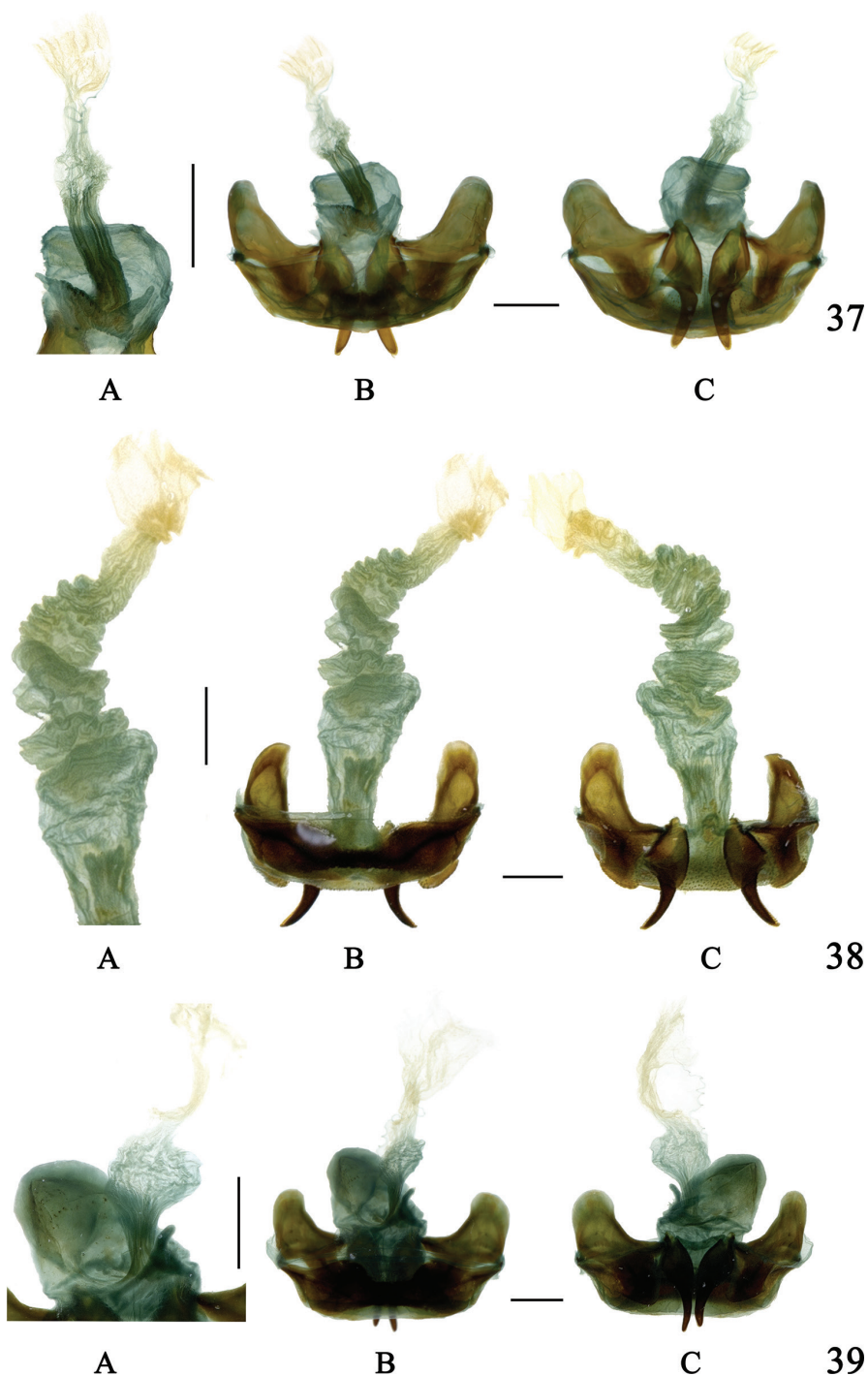
Male genitalia. Median lobe (Figs 32B–E, 33B–E) long, strongly bent to ventral side; apical orifice opened dorsally, long and wide, not reaching basal bulb; in dorsal view, apical lamella linear, longer than basal width (Figs 32A, 33A), distinctly bent to right side, with a denticulation laterally in the middle, left denticulation distinctly larger than the right one; in left lateral view, apical portion slightly bent dorsally at apex, basal orifice $\sim 90^\circ$ relative to preapical shaft; left paramere larger than right paramere, both helically curved; endophallus (Fig. 32F) with flagellum helically thick and straight; basal part of flagellum with irregular bursa; apical part of flagellum with triangular sclerite.

Female genitalia unknown.

Distribution. (Fig. 40) Vietnam (Indo Chine). We mark En-le, Yunnan on the map with a question mark ‘?’.



Figures 34–36. Internal reproductive system of females **34A–C** *Chlaenius* (*Sphodromimus*) *caperatus* sp. nov., paratype **35A–C** *C. (Sphodromimus) hunanus* (Morvan, 1997) **36A–C** *C. (Sphodromimus) deuvei* (Morvan, 1997) **A** spermatheca **B** dorsal view **C** ventral view. Vertical scale bars: 0.5 mm (**A**); horizontal scale bars: 1.0 mm (**B, C**)



Figures 37–39. Internal reproductive system of females **37** *Chlaenius (Sphodromimus) yinggelingensis* sp. nov., paratype **38** *C. (Sphodromimus) flavofemoratus* Laporte, 1834 **39** *C. (Sphodromimus) davidi* nom. nov. **A** bursa copulatrix **B** dorsal view **C** ventral view. Scale bars: 1.0 mm.

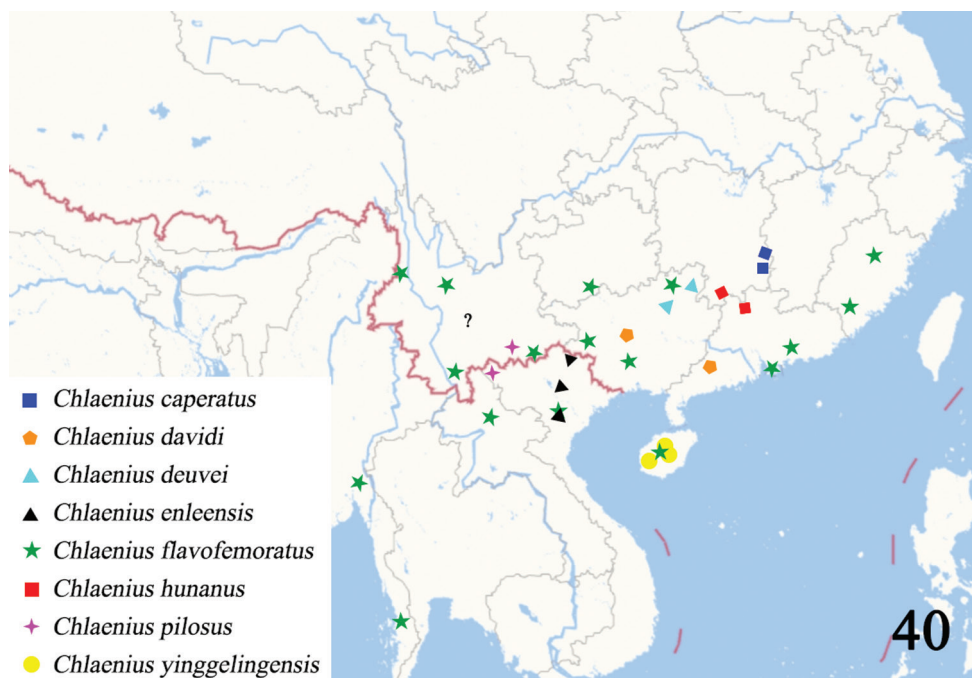


Figure 40. Distribution of *Chlaenius* (*Sphodromimus*) species in China and adjacent areas (a possible distribution of *C. enleensis*, En-le, Yunnan, represented by a question mark).

Remarks. Lorenz (1998) and Lorenz (2005) proposed *C. flavofemoratus enleensis* Mandl, 1992 as a synonym of *C. flavofemoratus*, but Kirschenhofer (2017) treated it as a distinct subspecies. Based on its original description, its pronotum longer than *C. flavofemoratus*, and black femora indicated it probably represented a different species. After the examination of the holotype and its dissected genitalia, we find that it has the same apical lamella as *C. tamdaoensis*. As a consequence of this surprising discovery, the locality should also be critically revised. The labels of the holotype contain two localities (“En-le” and “Indo Chine”), the latter including today’s Vietnam. Based on the type locality of *C. tamdaoensis*, it is very unlikely that *C. flavofemoratus enleensis* also occurs in Yunnan’s En-le. Hence, we think that the label of En-le is likely to be the wrong one and may have been erroneously added, as it rarely happened in the historical collections of the NHMB (e.g., Caldara et al. 2022). We upgrade *C. enleensis* as a valid species and consequently treat *C. tamdaoensis* as synonym of *C. enleensis*.

Acknowledgements

We thank Dr. Beulah Garner for hosting the second author (LHB) at NHML, David W. Wrase (Berlin, Germany), for providing images of type specimens, Dr Mingyi Tian (SCAU), Dr. Lizhen Li (Shanghai Normal University) for loan of specimens,

Dr. Herbert Zettel (Wien, Austria) for providing literature, and Dr. Thierry Deuve (MNHN) for checking types of *C. hunanus* and for discussions on female genitalia structure. This work was supported by National Natural Science Foundation of China (Grant No. 31970400), and National Science & Technology Fundamental Resources Investigation Program of China (Grant No. 2019FY101800).

References

- Andrewes HE (1941) XVIII. Papers on Oriental Carabidae. XXXVII. Annals & Magazine of Natural History 7(39): 307–317. <https://doi.org/10.1080/03745481.1941.9727934>
- Andrewes HE (1947) Entomological results from the Swedish expedition 1934 to Burma and British India. Arkiv för Zoologi 38A: 1–55.
- Azadbakhsh S, Kirschenhofer E (2019) A new species and subspecies of genus *Chlaenius* Bonelli, 1810 with remark on the taxonomic position of *Haplochlaenius* Lutshnik, 1933 and *Vachinius* Casale, 1984 and a new synonym of subgenus *Macrochlaenites* Kuntzen, 1919 (Coleoptera: Carabidae: Chlaeniini). Oriental Insects 53(4): 566–587. <https://doi.org/10.1080/00305316.2018.1561539>
- Bates HW (1892) Viaggio di Leonardo Fea in Birmania e regioni vicine. XLIV. List of the Carabidae. Annali del Museo Civico di Storia Naturale di Genova 32: 267–428.
- Brunk I (2015) A new species of the genus *Vachinius* Casale, 1984 from the Philippines (Coleoptera, Carabidae, Chlaeniini). Entomologische Blätter für Biologie und Systematik der Käfer 111: 5–10.
- Brunk I, Kirschenhofer E (2016) *Vachinius* (*Vachinius*) *arakanensis* sp.n. (Coleoptera: Carabidae: Chlaeniini) from Myanmar. Zeitschrift der Arbeitsgemeinschaft Oesterreichischer Entomologen 68: 51–55.
- Caldara R, Toševski I, Mendel H, Germann C (2022) In search of some type-specimens of *Rhampfus* [Clairville], 1798 (Coleoptera: Curculionidae). Zootaxa 5169(4): 371–380. <https://doi.org/10.11646/zootaxa.5169.4.6>
- Casale A (1984) The new Asiatic genus *Vachinius* (Carabidae: Callistinae), with three new species. Bollettino del Museo Regionale di Scienze Naturali, Torino 2: 371–382.
- Chaudoir M (1856) Mémoire sur la famille des carabiques. 6–e partie. Bulletin de la Société Impériale des Naturalistes de Moscou 29(3): 187–291.
- Chaudoir M (1876) Monographie des chlénien. Annali del Museo Civico di Storia Naturale di Genova 8: 3–315.
- Deuve T (1993) L'abdomen et les genitala des femelles de Coléoptères Adephaga. Mémoires du Muséum National d'Histoire Naturelle 15: 1–184.
- Kirschenhofer E (2003) Über neue und wenig bekannte Carabidae aus der äthiopischen und orientalischen Region (Coleoptera: Carabidae, Chlaeniinae, Pterostichinae). Entomofauna 24: 29–60.
- Kirschenhofer E (2012) Neue Arten der Gattung *Vachinius* Casale, 1984 von Laos. Mitteilungen des Internationalen Entomologischen Vereins Frankfurt a.M. 1–2: 83–90.

- Kirschenhofer E (2013) Ein Beitrag zur Kenntnis der Tribus Chlaeniini (= Callistini sensu auct.) der palaearktischen, afrotropischen und orientalischen Region (Coleoptera: Carabidae). Zeitschrift der Arbeitsgemeinschaft Österreichischer Entomologen 65: 23–36.
- Kirschenhofer E (2017) Tribe Chlaeniini Brullé, 1834. In: Löbl I, Löbl D (Eds) Catalogue of Palaearctic Coleoptera (Vol. 1. 2nd Edn.). Brill, Leiden, Boston, 491–497.
- Laporte FLN (1834) Études entomologiques, ou description d'insectes nouveaux: et observations sur leur synonymie. Méquignon–Marvis Paris, vol. 13, 159 pp.
- Lassalle B (2001) Chasses en Birmanie. Entomologiste 57: 239–243.
- Liebherr JK, Will KW (1998) Inferring phylogenetic relationships within Carabidae (Insecta, Coleoptera) from characters of the female reproductive tract. In: Ball GE, Casale A, Vigna Taglianti A (Eds) Phylogeny and classification of Caraboidea (Coleoptera: Adephaga), Proceedings of a Symposium (28 August 1996, Florence, Italy), 20 International Congress of Entomology. Torino, Museo Regionale di Scienze Naturali. Atti Museo Regionale di Scienze Naturali 5: 107–170.
- Lorenz W (1998) Systematic List of Extant Ground Beetles of the World. Wolfgang Lorenz, Tutzing, 502 pp.
- Lorenz W (2005) Systematic List of Extant Ground Beetles of the World (Insecta Coleoptera Geadephaga: Trachypachidae and Carabidae incl. Paussinae, Cicindelinae, Rhysodinae), second edition. Wolfgang Lorenz, Tutzing, 530 pp.
- Mandl K (1992) Ein Beitrag zur Kenntnis einiger Chlaeniinae–(Callistinae–) Formen aus der paläarktischen und der orientalischen Region. (Zugleich zweite Auswertung der vom Naturhistorischen Museum in Wien erworbenen Chlaeniinae–Spezielsammlung Ernst Grundmanns) (Carabidae: Coleoptera) 2. Teil. Annalen der Naturhistorischen Museums in Wien 93 B: 59–103.
- Morvan DM (1991) Contribution à la Connaissance des Coleopteres Carabidae de Thailand. Elytron 5: 55–62.
- Morvan DM (1997) Étude faunistique des coléoptères du Népal avec extension aux provinces chinoises du Yunnan et du Sichuan. Genre *Andrewesius* Jedlicka et *Vacinius* Casale. Loened Aziad Amprevaned Feureskalleged C'wiledig 2: 1–23.
- Shi H, Sciaky R, Liang H, Zhou H (2013a) A new subgenus *Wraseellus* of the genus *Pterostichus* Bonelli (Coleoptera, Carabidae, Pterostichini) and new species descriptions. Zootaxa 3664(2): 101–135. <https://doi.org/10.11646/zootaxa.3664.2.1>
- Shi H, Zhou H, Liang H (2013b) Taxonomic synopsis of the subtribe Physoderina (Coleoptera, Carabidae, Lebiini), with species revisions of eight genera. ZooKeys 284: 1–129. <https://doi.org/10.3897/zookeys.309.5499>
- Zettel H (2020) A new species of *Chlaenius* subgen. *Sphodromimus* Casale, 1984 (Coleoptera: Carabidae) from the Philippines. Zeitschrift der Arbeitsgemeinschaft Österreichischer Entomologen 72: 29–35.