A Revision of the Genus *Lycoperdina* (Coleoptera: Endomychidae) from Japan

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**Abstract** The Japanese species of the genus *Lycoperdina* is revised. Three previously known species are redescribed: *Lycoperdina castaneipennis* Gorham, 1873, *Lycoperdina dux* Gorham, 1873 and *Lycoperdina mandarinea* Gerstaecker, 1858, and one new species is described: *Lycoperdina hiranoi* sp. nov. from Honshu and Hokkaido. The distributional pattern of Japanese species is briefly discussed.

**Introduction**

The genus *Lycoperdina* Latreille, 1807 belongs to the subfamily Lycoperdininae Redtenbacher, 1844 (Tomaszewska, 2005), and contains 28 species: 18 from the Palearctic, 9 from the Ethiopian, and 1 from the Nearctic Regions (Shockley et al., 2009).

From Japan, three species have been recorded. First report of the genus from Japan was Gorham (1873), he described *Lycoperdina dux* from Hyogo, and recorded *L. mandarinea* from Nagasaki. Subsequently Gorham (1874) described *L. castaneipennis* from Hyogo. In addition Gorham (1887) and Hirano (2011) recognized the presence of an undescribed species from Hokkaido and Honshu.

In this paper, we review the Japanese species of the genus *Lycoperdina*.

This paper is based on the Sogoh’s undergraduate dissertation for Faculty of Agriculture, Ehime University (February 2017).

**Materials and Methods**

**Materials.** The specimens used in this paper were preserved in Ehime University Museum, Matsuyama (EUMJ); Kyushu University Museum, Fukuoka (KUMJ); Tochigi Prefectual Museum, Utsunomiya (TPMJ) and private collection of Mr. Y. Hirano (HI).

**Methods.** Dissected parts are cleared in 10% solution of KOH, and placed in glycerine on slides. Measurements, general observations, and dissections were made under a microscope (Leica MZ95). Photographs were taken under a Leica MZ95 using a microscopy camera system (Nikon DS-Fi1-L2), and combined with automontage software Combine ZM (Alan Hadley, UK). The figures were prepared using Adobe Photoshop CS. After examination, dissected parts and genitalia were placed in genitalia tube with glycerine.

Technical terms refer to Tomaszewska (2005). Morphological abbreviations used in this study are as follows: AI: aedeagal index (length/basal width); EL: elytral length from anterior margin to elytral apex; EW: maximum elytral width; IOI: interocular index (interocular distance/compound eye width); PML: pronotum length in median line; PSL: pronotum length in lateral from right anterior angle to posterior margin; PW: maximum width of pronotum; TL: total length (PML + EL). The average is given in parenthesis after the range.

**Systematics**

**Genus *Lycoperdina* Latreille, 1807**

*Lycoperdina* Latreille, 1807: 73 (Type species: *Galleruca bovistae* Fabricius, 1792); Tomaszewska, 2005: 47.

*Golgia* Mulsant, 1846: 20 (Type species: *Silpha succincta* Linnaeus, 1767).

*Lycoperdinodes* Arrow, 1923: 485 [replacement name for *Lycoperdinella* Arrow, 1920].


*Falsoylaia* Pic, 1945: 10 (Type species: *Falsoylaia obscurusnaturalis* Pic, 1945).

**Diagnosis** (modified Tomaszewska, 2005). Body (Fig. 1) elongate to ovate, convex dorsally, glossy. Coloration of body light to dark reddish-brown, having vague black marking on middle of pronotum and elytra in some species; legs black to reddish brown. Antennae (Fig. 3) shorter than a half of body length; antennal club 2 segmented, loose. Pronotum (Fig. 4A–D) with stridulatory membrane in anterior margin; basal sulcus distinct; lateral sulci deep and subparallel; anterior angles acute or narrowly rounded; posterior angles right angle or acute. Mesoventrite (Fig. 4E–H) with intercoxal process short, narrowly separated mesoxoae. Elytra elongate, convex, widest at basal 1/3 or 1/2, gently tapering apically, blunt at apex, densely and irregularly covered with fine punctures. Femur (Fig. 2A, C, E, G) widest at 1/3 from edge. Abdomen (Fig. 6A–H) with five freely articulated ventrites; anterior margin of intercoxal process straight; ventrite 1 as long as ventrites 2–4 combined; ventrites 2–4 subequal in length. Male genital segment (= tergite and sternite 9; Fig. 4A–D) with paired apophyses fused near base or mid length. Aedeagus (Fig. 5) moderately long, strongly sclerotized and stout; median lobe with short thumb-like apical branch; tegmen placed at base of median lobe, ring-like shaped, fused parameres.

**Key to the species of *Lycoperdina* from Japan**

1. Elytra (Fig. 1C, F) with large black marking at center; legs fully reddish brown. ........................................... *L. mandarinea* -
   - Elytra (Fig. 1A, B, D, E, G, H) uniformly reddish-brown or infuscate at center; legs black or partially red................... 2
2. Elytra oval, strongly convex, widest at middle (Fig. 1A, ...
D); EL/EW 1.29–1.42 (1.34). Distributed in Honshu to Kyushu.................................................L. castaneipennis
- Elytra oblong, rather flattened, widest at basal 1/3 (Fig. 1B, E, G, H); EL/EW 1.38–1.56 (1.46).................................3
3. Pronotum (Fig. 4B) transverse, widest at base; lateral margin subparallel-sided; male fore tibia (Fig. 2D) slightly projecting in inner margin; ventrite 5 rounded at apex in male, triangle and slightly pointed at apex in female. Median lobe (Fig. 5D) slightly curved ventrally, convex in ventral 1/3; apex expanded and emarginated at

Fig. 1. Habitus of Lycoperdina spp. from Japan. —Male (A, B, C, G, I) and female (D, E, F, H) and ventral habitus in male (I). — A, D, Lycoperdina castaneipennis Gorham, 1874; B, E, L. dux Gorham, 1873; C, F, L. mandarinea Gerstaecker, 1858; G–I, L. hiranoi sp. nov. (G, I, holotype; H, paratype). Scale bars = 3.0 mm.
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...middle; apical branch moderately long, curved ventrally. TL 4.75–6.48 (5.72) mm. Distributed in Hokkaido to Kyushu. ...

...Pronotum (Fig. 4D) weakly transverse, widest at apical 1/3; lateral margins slightly tapered in basal 1/3; male fore tibia (Fig. 2H) with distinct tooth-like projection in inner margin; ventrite 5 moderately flattened at apex in male, triangle and slightly pointed at apex in female. Median lobe (Fig. 5J) straight; apex uneven, expanded and slanted; apical branch very short, strongly curved ventrally. TL 4.35–5.69 (5.16) mm. Distributed in Hokkaido and Honshu...

*Lycoperdina castaneipennis* Gorham, 1874

(Figs. 1A, D, 2A, B, 3A, 4A, E, 5A–C, 6A, B, I, 7B, E, F)

[Japanese name: Kuribane-tsuya-tentoudamashi]


Specimens examined. [HONSHU] <Tochigi Pref.> 2♂1♀ (EUMJ), Yumoto, Nasu-onsen (alt. 850 m), 16. x. 1967, S. Hisamatsu leg.; 6♂6♀ (EUMJ), Nasu (alt. 850 m), 7. x. 1948, S. Hisamatsu leg.; 2♂4♀ (TPMJ), Kuriyama-mura, Tashiro-rindô (alt. 1,000 m), 4. x. 1981, T. Miyamoto leg.; 2♂1♀ (TPMJ), Himuro-yama, Kuzuu-machi (alt. 1,100 m), 1. iii. 1986, K. Kusano leg.; 1♀ (TPMJ), Kuroiso-shi (alt. 330 m), 25. x. 1983, M. Takaoka leg. <Yamanashi Pref.> 1♀ (KUMJ),

Redescription. Male (Fig. 1A). Body oval, strongly convex, glossy. Coloration of body reddish-brown and becoming lighter or darker in variation, but having vague black marking on middle of pronotum and elytra in some

Fig. 5. Male genitalia of Lycoperdina spp. in dorsal (A, D, G, J), lateral (B, E, H, K) and ventral (C, F, I, L) views. — A–C, Lycoperdina castaneipennis Gorham, 1874; D–F, L. dux Gorham, 1873; G–I, L. mandarinea Gerstaecker, 1858; J–L, L. hiranoi sp. nov. Scale bar = 1.0 mm.
specimens; legs black or partially red. EL/PL 2.55–2.86 (2.69), EW/PW 1.29–1.59 (1.47), TL/EW 1.74–1.93 (1.83).

Head densely and irregularly covered with small punctures; IOI 2.13. Antennae (Fig. 2A) shorter than half of TL; antennomere 11 fan-shaped; approximate ratio of each antennomere (n = 1) as 2.4 : 1.1 : 1.6 : 1.0 : 1.0 : 1.0 : 1.0 : 1.0 : 1.1 : 1.2 : 1.6. Pronotum (Fig. 4A) transverse, glossy; definite punctures distributed densely and irregularly; anterior and posterior angles acute; lateral margins rounded in front and curved near base. PW/PML 1.27–1.63 (1.37), PW/PSL 1.18–1.44 (1.26), PML/PSL 0.88–0.94 (0.92). Elytra glossy, oval, strongly convex, widest at middle, densely and irregularly covered with definite punctures; EL/EW 1.24–1.39 (1.34). Intercoxal process of mesosternum moderately short, wide and carinate. Metasternum distinctly transverse, punctate, pubescent, 1.53 times as long as metacoxal cavity. Fore trochanter (Fig. 2A) flattened, having a hairy tuft in male; fore femur widest at basal 2/3; fore tibia (Fig. 2B) setose at

Fig. 6. Abdominal ventrites (A–H) and male genital segment (I–L) of *Lycoperdina* spp. — Male (A, C, E, G) and female (B, D, F, H). — A, B, *Lycoperdina castaneipennis* Gorham, 1874; C, D, J, *L. dux* Gorham, 1873; E, F, K, *L. mandarinea* Gerstaecker, 1858; G, H, L, *L. hiranoi* sp. nov. Scale bars = 1.0 mm.
apical 1/3, strongly rounded. Ventrite 5 (Fig. 6A) emarginate at apex. Male genital segment (Fig. 6I) formed by segment 9 (tergite and sternite 9) with paired apophyses fused near base; right apophyse with trapezoidal plate at base.

Aedeagus (Fig. 5A–C) strongly sclerotized and stout; AI 2.25. Median lobe slightly curved ventrally, strongly convex in ventral 1/3; apex expanded and flattened; apical branch moderately long.

Female (Fig. 1D). Sexual dimorphism distinct in the following characteristics: fore legs slender and without projection; ventrite 5 (Fig. 6B) triangular, pointed at apex. PW/PML 1.36–1.50 (1.41), PW/PWL 1.22–1.37 (1.27), PML/PWL 0.87–0.94 (0.90), EL/EW 1.24–1.39 (1.34), EL/PL 2.52–2.89 (2.73), EW/PW 1.34–1.60 (1.45), TL/EW 1.70–1.90 (1.83).

Measurements. Male (n = 20). TL 5.01–6.43 (5.85) mm, PW 1.93–2.48 (2.18) mm, PML 1.41–1.78 (1.59) mm, PSL 1.50–2.00 (1.73) mm, EL 3.60–4.70 (4.26) mm, EW 2.75–3.50 (3.19) mm. Female (n = 20). TL 4.15–6.14 (5.61) mm, PW 1.68–2.30 (2.12) mm, PL 1.12–1.68 (1.50) mm, PL 1.23–1.83 (1.67) mm, EL 3.03–4.49 (4.10) mm, EW 2.30–3.40 (3.07) mm.

Distribution. Japan (Hokkaido, Honshu, Sado-ga-shima, Awaji-shima, Shikoku, Kyushu), Korea, Russia.

Biological notes. This is common species in Japan, and is collected from Lycoperdina gemmatum (Agaricaeae). This species is mainly distributed in mountain zone (ca. 800–1,150 m in altitude). Taniguchi (1942) noted that this species was collected from Calvatia craniformis (Agaricaeae) in Kobe, Japan. Hibernation is occurred in both larvae and adults stages.

Remarks. The larva of this species (Fig. 7B, E, F) is similar to that of L. dux (Hayashi et al., 1959 and Fig. 7C, D), but differs from it by the tubercles on abdominal segments relatively small and covered with short setae.

Lycoperdina dux Gorham, 1873
(Figs. 1B, 2C, D, 3B, 4B, F, 5D–F, 6C, D, 7A, C, D)

[Japanese name: Fuchitori-tsuya-tentoudamashi]


Specimens examined. [HOKKAIDO] 2♂5♀♀ (EUMJ), Eniwa-dake, lake side of Shikotsu-ko (alt. 1,200 m), 4. x. 1968, S. Hisamatsu leg.; 1♂ (EUMJ), Kawayu (alt. 150 m), 4. x. 1954, S. Hisamatsu leg.; 1♂ (EUMJ), Narabarasan-san (alt. 1,050 m), 3. xi. 1968, M. Takagi leg.; 1♂ (EUMJ), Shiratsue-san (alt. 1,150 m), 20. x. 1968, M. Sakai leg.; 1♂ (EUMJ), Matsuyama (alt. 50 m), 4. vi. 1954, S. Hisamatsu leg.; 1♂ (EUMJ), Awaji-shima, Shikoku, Kyushu), Korea, Russia.

Measurements. Male (n = 14). TL 4.75–6.48 (5.58) mm, PW 1.69–2.30 (1.98) mm, PML 1.15–1.75 (1.35) mm, PSL 1.18–1.95 (1.43) mm, EL 3.60–4.73 (4.23) mm, EW 2.58–3.43 (2.91) mm. Female (n = 18). TL 4.96–6.34 (5.83) mm, PW 1.80–2.20 (2.04) mm, PML 1.18–1.49 (1.36) mm, PSL 1.28–1.55 (1.47) mm, EL 3.78–4.85 (4.47) mm, EW 2.55–3.35

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Lycoperdina mandarinea Gerstaecker, 1858
(Figs. 1C, F, 2E, F, 3C, 4G, 5G–I, 6E, F, K)
[Japanese name: Seguro-tsuya-tenoudamashi]

Lycoperdina mandarinea Gerstaecker, 1858, 212.
Gorham, 1887, 642 [note]; Strohecker, 1953, 72 [list];

Lycoperdina (Golgia) mandarinea: Csiki, 1910, 35,
catalogued; Ohba, 1931, 225 [noted]; Strohecker, 1970, 245 [male genitalia]; Sasaji, 1985, 241 [note, photo].


Measurements. Male (n = 4). TL 4.01–5.18 (4.60) mm,
PW 1.50–1.84 (1.67) mm, PML 1.10–1.33 (1.21) mm, PSL 1.41–1.39 (1.26) mm, EL 2.91–3.85 (3.39) mm, EW 2.08–2.56 (2.28) mm. Female (n = 9). TL 3.98–5.08 (4.56) mm, PW 1.48–1.88 (1.67) mm, PML 1.00–1.25 (1.13) mm, PSL 1.10–1.38 (1.23) mm, EL 2.98–3.83 (3.43) mm, EW 2.05–2.50 (2.24) mm.

Distribution. Japan (Hokkaido, Honshu, Izu Isls. (Hachijô-jima), Shikoku, Kyushu, Tokara Isls., Amami-Ôshima, Ishigaki-jima, Iriomote-jima), Korea, China, Hong Kong, Taiwan, Cambodia, Laos, Mongolia, Russia, Vietnam.

Biological notes. This species is mainly distributed in low altitude area (ca 50–150 m in altitude) in Japan, and frequently collected by light trap. Taniguchi (1942) noted that this species was collected from Lycoperdon gemmatum (Agaricaceae) in Kobe, Japan. Hashimoto & Hayashi (2014) reported biological notes. This is common species in Japan, and biological notes


Lycoperdina hiranoi sp. nov.
[Japanese name: Hosomune-tsuya-tenoudamashi]

Lycoperdina sp.: Hirano, 2011, 19 [note].


Lycoperdina hiranoi sp. nov.
[Japanese name: Hosomune-tsuya-tenoudamashi]

Lycoperdina sp.: Hirano, 2011, 19 [note].


Lycoperdina hiranoi sp. nov.
[Japanese name: Hosomune-tsuya-tenoudamashi]
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**Description.** Male (Fig. 1G). Body oblong, glossy. Coloration of body reddish-brown and becoming lighter or darker in variation, but having vague black marking on middle of pronotum and elytra in some specimens; legs black or partially red. EL/PML 3.04–3.26 (3.11), EW/PW 1.43–1.53 (1.46), TL/EW 1.88–1.94 (1.91).

Head densely and irregularly covered with small punctures; IOI 1.35. Antennae (Fig. 3D) shorter than 1/2 TL; antennomere 11 fan-shaped; approximate ratio of each antennomere (n = 1) as 2.0 : 1.0 : 1.4 : 1.0 : 1.0 : 1.0 : 1.0 : 1.0 : 1.0 : 1.0 : 1.5. Pronotum (Fig. 4D) transverse, glossy, widest at apical 1/3; densely and irregularly covered with definite punctures; anterior and posterior angles acute; lateral margins rounded in front and strongly curved near base. PW/PML 1.44–1.51 (1.47), PW/PSL 1.28–1.34 (1.31); PML/PSL 0.88–0.90 (0.89). Elytra glossy, oblong, widest at basal 1/3, densely and irregularly covered with definite punctures; EL/EW 1.44–1.46 (1.45). Intercoxal process of mesosternum (Fig. 4H) moderately long, narrow and carinate. Metasternum transverse, punctate, pubescent, 2.09 times as long as metacoxal cavity. Fore trochanter (Fig. 2G) quadrate; fore femur widest at basal 2/3, 2.00 times as wide as tibiae; fore tibia (Fig. 2H) setose at apical 1/3, with tooth in inner margin. Ventrite 5 (Fig. 6G) moderately flattened at apex. Male genital segment (Fig. 6L) formed by segment 9 (tergite and sternite 9) with paired apophyses fused near base; right apophyse slightly curved at base.

Aedeagus (Fig. 5J–L) strongly sclerotized and stout; AI 1.94. Median lobe straight; apex uneven, expanded and slanted; apical branch very short, strongly curved ventrally.

Female (Fig. 1H). Sexual dimorphism distinct in the following characteristics: fore legs slender, without tooth in inner margin; ventrite 5 (Fig. 6H) triangular and slightly pointed at apex. PW/PML 1.37–1.58 (1.47), PW/PSL 1.28–1.48 (1.35), PML/PSL 0.89–0.95 (0.92), EL/EW 1.39–1.56 (1.47), EL/PML 2.84–3.28 (3.09), EW/PW 1.37–1.55 (1.43), TL/EW 1.88–2.05 (1.95).

**Measurements.** Male (n = 8). TL 5.00–5.65 (5.25) mm, PW 1.76–2.00 (1.88) mm, PML 1.21–1.45 (1.29) mm, PSL 1.30–1.55 (1.43) mm EL 3.75–4.20 (3.96) mm, EW 2.57–2.99 (2.74) mm. Female (n = 17). TL 4.35–5.69 (5.13) mm, PW 1.58–2.03 (1.84) mm, PML 1.10–1.38 (1.26) mm, PSL 1.19–1.50 (1.37) mm, EL 3.25–4.36 (3.87) mm, EW 2.24–2.88 (2.64) mm.

**Distribution.** Japan (Hokkaido, Honshu: Tohoku, Kanto, and Chubu districts).

**Biological notes.** This is rare species in Japan, and is collected from *Lycoperdon gemmatum* (Agaricaceae) (Hirano, 2011). This species is mainly distributed in low to mountainous altitude area (ca. 300–750 m in altitude) in northern part of Japan.

**Etymology.** The species name is dedicated for Mr. Yukihiko Hirano, who recognized this species firstly.

**Remarks.** This species is similar to *L. koltzei* and *L. ferruginea* in the shapes of male genitalia (Strohecker, 1970).

**Discussion**

In the present paper, we recognized four species of the genus *Lycoperdina* from Japan. Based on the label data,
awaits further sampling and investigation in the field.

Thus, is weakly associated with the altitude. However, we cannot find

in "Kami-Hinawa"). On

Acknowledgements

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