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A review of Chinese Scymnomorphus Weise (Coleoptera: Coccinellidae) with description of five new species

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A review of Chinese *Scymnomorphus* Weise (Coleoptera: Coccinellidae) with description of five new species

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The genus *Scymnomorphus* Weise from China is reviewed and five new species, *Scymnomorphus isolateralis* sp. nov., *Scymnomorphus magnopunctatus* sp. nov., *Scymnomorphus cuspidatus* sp. nov., *Scymnomorphus xiaomengyangus* sp. nov. and *Scymnomorphus yadongensis* sp. nov. are described. A distribution map and a key to the Chinese species are provided.

Keywords: Coleoptera; Coccinellidae; Scymnomorphus; new species; China

Introduction

Weise (1897) described three minute pubescent coccinellids from East Africa under a new genus *Scymnomorphus*, but subsequently (Weise 1901) proposed *Scotoscymnus* as an unjustified replacement name in the mistaken belief that his *Scymnomorphus* was a junior homonym of *Scymnomorpha* (Blackburn 1892; Ślipiński and Tomaszewska, 2005). Pope (1962) in his revision of the tribe Pharini (= Sticholotidinae) designated the type species of *Scymnomorphus* and gave revised diagnostic notes for the genus. Kamiya (1960) established a new genus, *Sukunahikona* (= *Scymnomorphus*), from Japan and erected a new tribe, Sukunahikonini, for the new genus.

Sasaji (1968) classified Sukunahikonini in the subfamily Sticholotidinae along with the tribes Sticholotidini, Serangiini and Schirozuellini. This has been followed by most coccinellid workers (Gordon 1977; Hoàng 1982; Fürsch 1985; Kovář 2007; Pang et al. 2004; Ren et al. 2009). Gordon (1977) reviewed New World Sticholotidinae and described nine new species of *Scotoscymnus* from Mexico, Central America and South America. Ślipiński and Tomaszewska (2005) in their review of the Australian Sukunahikonini noticed that there was a two-letter difference between the supposed homonymous names *Scymnomorpha* and *Scymnomorphus*; they used the name *Scymnomorphus* and described five new species in their paper. The tribe Sukunahikonini was classified in the subfamily Microweiseinae (Ślipiński 2007; Seago et al. 2011) and synonymized with Microweiseini Leng, 1920 by Escalona and Ślipiński (2012).

Scymnomorphus is a moderately large genus of Sukunahikonini Kamiya, with 33 species known from all over the world (Pope 1962; Gordon 1977; Hoàng 1982;

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Fürsch 1985; Ślipiński and Tomaszewska 2005; Escalona and Ślipiński 2012). Up to the present, three species are known from China, *Scymnomorphus bicolor* (Kamiya, 1965) and *Scymnomorphus japonica* (Reitter, 1889) (Sasaji 1967; Pang et al. 2004; Ren et al. 2009). In the present paper, *Scymnomorphus* from China is reviewed and five new species are added to the genus.

Materials and methods

The specimens examined were collected from China. All fresh materials were preserved in 85% ethanol. External morphology was observed with a dissecting stereomicroscope (Zeiss Stemi 2000-cs). The following measurements were made using an ocular micrometer: length from apical margin of clypeus to apex of elytra (TL); width across both elytra at widest part (TW = EW); height at highest elytral part (TH); head width at widest part (HW); pronotal length at longest part (PL); pronotal width at widest part (PW); elytral length at longest part (EL). Male and female genitalia were dissected, cleared in 10% NaOH solution by boiling for several minutes, and examined with an Olympus BX51 compound microscope.

Images were photographed with digital cameras (Qimagin 5.0 RTV and Coolsnap– Pro*cf* & CRI Micro*Color), connected to the dissecting microscope. The software IMAGE-PRO PLUS 5.1 was used to capture images from both cameras, and photographs were cleaned up and laid out in plates with ADOBE PHOTOSHOP CS 8.0.

Terminology follows Ślipiński (2007). Type specimens designated in the present paper are deposited in the Insect collections of the Department of Entomology, South China Agriculture University (SCAU), Guangzhou, China.

Taxonomy

Genus Scymnomorphus Weise

- *Scymnomorphus* Weise 1897: 303. Type species, designated by Pope (1962: 628): *Scymnomorphus rotundatus* Weise 1897 (Africa); Ślipiński and Tomaszewska, 2005: 380; Kovář, 2007: 572; Escalona and Ślipiński, 2012: 152.
- *Scotoscymnus* Weise, 1901: 458 (unnecessary replacement name); Gordon, 1977: 189; Fürsch, 1985: 283; Miyatake, 1994: 235; Ren *et al.*, 2009: 44.
- Sukunahikona Kamiya, 1960: 22. Type species by original designation: Sukunahikona japonica Kamiya 1960. Synonymized by Fürsch (1985: 283).
- *Hikonasukuna* Sasaji, 1967: 4. Type species *Hikonasukuna monticola* Sasaji, 1967. Fürsch, 1985: 287. Synonymized by Escalona and Ślipiński, 2012: 152.
- *Orculus* Sicard, 1931: 233. Type species *Orculus castaneus* Sicard, 1931 (monotypy). Fürsch, 1985: 289. Synonymized by Escalona and Ślipiński, 2012: 152.

Diagnosis description

Body minute and oval, distinctly convex; dorsum pubescent (Figure 2). Head transverse; small; clypeal and frontal regions usually prominent, sometimes rostrate (Figure 1A). Eyes small and convex, coarsely faceted. Antenna 10-segmented, with a distinct two-segmented club (Figure 1C). Terminal palpomere elongate-conical

(Figure 1D). Pronotum always with distinct line or ridge separating anterior corners from pronotal disc, sometimes extending along lateral edge. Elytra with lateral margin slightly flared or with distinct flat ridge. Elytral punctures at least along suture in apparent rows; epipleuron narrow, incomplete apically, without cavities. Prosternum strongly reduced and narrow, prosternal process reduced to a narrow carina (Figure 1E). Mesoventrite small and transverse between middle coxae; about three times as wide as long. Metaventrite broad and elevated, always strongly and densely punctured. Abdomen with six visible ventrites. Abdominal postcoxal line incomplete or reaching lateral margin, divided into two lines, usually with associated pits and pores (Figure 1F). Tarsi four-segmented (Figures 1G, H). Male genitalia asymmetrical; parameres reduced or absent (Figure 3B–E). Female genitalia: ovipositor triangular elongate, lightly sclerotized bearing short styli; spermatheca composed of two or more than two round areas (Figure 1I).

Distribution

China, Oriental region, Africa, Australia, Central America, Madagascar.

Key to the species of Scymnomorphus from China

1.	Body uniformly yellowish brown, or brown, or dark brown
2.	Body elongate oval; abdominal postcoxal line incomplete, reaching lateral margin and bulging out in middle, divided into two lines. TL: 1.25 mm, TW: 0.83 mm
3.	Elytron with large punctures4Elytron with fine punctures5
4.	Hind wing absent; Abdominal ventrite 3–5 without large punctures. TL: 0.94 mm, TW: 0.73 mm
5.	Penis guide quadrate and elongate in lateral view, more than three times as long as wide
6.	Penis guide in lateral view elongate, flattened and quadrate, six times as long as wide. TL: 1.38–1.46 mm, TW: 1.04–1.09 mm <i>S. isolateralis</i> sp. nov. Penis guide in lateral view flattened and quadrate, three times as long as wide. TL: 1.00–1.08 mm, TW: 0.75–0.80 mm <i>S. japonicus</i> (Reitter)
7.	Body yellowish brown, with sutural area reddish brown. TL: 1.02 mm, TW: 0.78 mm



Figure 1. *Scymnomorphus isolateralis* sp. nov. (A) head frontal view, (B) mandible, (C) antenna, (D) maxilla, (E) prothorax, (F) abdomen, (G) hind leg, (H) tarsi, (I) female genitalia. Scale bars: 0.1 mm.



Figure 2. (A) Scymnomorphus isolateralis sp. nov., (B) Scymnomorphus japonicus (Kamiya),
(C) Scymnomorphus magnopunctatus sp. nov., (D) Scymnomorphus cuspidatus sp. nov.,
(E) Scymnomorphus yadongensis sp. nov., (F) Scymnomorphus xiaomengyangus sp. nov. Scale bars: 0.5 mm.



Figure 3. *Scymnomorphus isolateralis* sp. nov., (A) abdomen; (B–E) male genitalia: (B) penis, (C) apex of penis, (D) tegmen, lateral view, (E) tegmen, ventral view; (F–J) *Scymnomorphus japonicus* (Reitter), (F) abdomen; (G–J) male genitalia: (G) penis; (H) apex of penis; (I) tegmen, lateral view; (J) tegmen, ventral view. Scale bars: 0.1 mm.

Scymnomorphus isolateralis sp. nov. (Figures 1A–I, 2A, 3A–E, 6)

Diagnosis

This species is similar to *S. bicolor* in male genitalia, but it can be distinguished from the latter as follows: body uniformly brown, without other external spots (Figure 2A), penis guide in lateral view slender, flattened and quadrate, with apex truncated(Figure 3D), penis guide in ventral view elongate (Figure 3E). In *S. bicolor*, head and pronotum are dark brown and elytra black, penis guide in lateral view is elongate with apex pointed, and penis guide in ventral view is stout.

Description

TL: 1.38–1.46 mm, TW: 1.04–1.09 mm, TH: 0.60–0.62 mm, TL/TW: 1.32–1.33; PL/PW: 0.58–0.61; EL/EW: 1.10–1.11.

Body uniformly brown, without other external spots (Figure 2A). Head yellowish brown. Underside brown, except mesoventrite and metaventrite dark brown. Legs yellowish brown.

Body minute, short oval, distinctly convex; dorsum pubescent. Head small, 0.45 times elytral width (HW/EW = 1 : 2.21); punctures on frons fine, separated by 0.8–3.0 times their diameter, with short setae in punctures; eyes small and coarsely faceted, widest interocular distance 0.63 times width of head. Pronotum 0.74 times elytral width (PW/EW = 1 : 1.35), pronotal punctures fine, slightly smaller than those on head, separated by 0.5-1.0 times their diameter. Surface of proventrite and mesoventrite shagreened. Punctures on metaventrite larger in middle, separated by 0.2-0.5 times their diameter, with short setae in punctures; becoming smaller towards lateral parts. Abdominal postcoxal line incomplete or reaching lateral margin smoothly, divided into two lines, with associated pits and pores (Figure 3A).

Male genitalia. Penis simple and slender, curved and narrowing toward apex; penis capsule with a short and stout outer process and a small inner one (Figure 3B,C); penis guide in lateral view long, flattened and quadrate, six times as long as wide, with apex truncated; parameres very short and indistinct, with rather long setae (Figure 3D); penis guide in ventral view elongate, widest near base and strongly narrowed at base, apex pointed and strongly bent (Figure 3E).

Type material

Holotype: 1°, China, Yunnan: Dajianshan, Pingbian, 2100 m, 20 April 2008, Wang XM leg. Paratypes: China, Yunnan:, 1°, 1°, same data as holotype; 4°, °, Dajianshan, Pingbian, 2100 m, 22 May 2009, Wang XM leg; 3°, Gaoligongshan, Baoshan, 19 September 2006, Wang XM leg.

Distribution

China (Yunnan).

1912 X. Wang and S. Ren

Etymology

The specific epithet refers to the flattened and quadrate penis guide in lateral view.

Scymnomorphus japonicus (Reitter, 1889) (Figures 2B, 3F–J, 6)

Alexia japonica Reitter, 1889: 277.

Sukunahikona japonica: Kamiya, 1960: 24; Sasaji, 1971: 49; Pang et al., 2004: 66 Scotoscymnus japonica: Miyatake, 1994: 235; Ren et al., 2009: 44. Scymnomorphus japonicus: Kovář, 2007: 572.

Diagnosis

This species can be distinguished from other *Scymnomorphus* by the extremely small body (Figure 2B), and the unique male genitalia (Figure 3F–J).

Description

For detailed description see Kamiya (1960: 24).

Specimens examined China. Sichuan. 2♂♂1♀, Wangjiang Park, Chengdu, 3 November 1983, Pang XF leg.

Distribution China (Sichuan; Taiwan), Japan.

Scymnomorphus monticola (Sasaji, 1967)

Hikonasukuna monticola: Sasaji, 1967: 5. Scymnomorphus monticola: Escalona and Ślipiński, 2012: 152.

Specimens examined

China. Taiwan. 19, Kuraru, Hengchun Park, Taiwan, 250 m, 2 April 1965, Yoshimoto CM Leg.

Distribution China (Taiwan).

Scymnomorphus magnopunctatus sp. nov. (Figures 2C, 4A–E, 6)

Diagnosis

This species is similar to *S. japonicus* in general appearance, but it can be distinguished from the latter by the elytron with large punctures and the unique male genitalia (Figures 2C, 4A–E).

Description

TL: 1.04 mm, TW: 0.76 mm, TH: 0.47 mm, TL/TW: 1.38; PL/PW: 0.56; EL/EW: 1.09.

Body yellowish brown, without other spots (Figure 2C). Head yellowish brown. Underside yellowish brown, except mesoventrite and metaventrite reddish brown. Legs yellow.

Body very small, short oval, distinctly convex; dorsum pubescent. Head small, 0.52 times elytral width (HW/EW = 1 : 1.93); frons smooth, convex, with fine punctures, separated by 1.0–3.0 times their diameter, with short sparse hairs on the apical half; eyes small and coarsely faceted, widest interocular distance 0.60 times width of head. Pronotum 0.74 times elytral width (PW/EW = 1 : 1.35), pronotal punctures fine, similar to those on head, separated by 1.0–4.0 times their diameter. Punctures on elytra large, separated by 0.2–0.5 times their diameter. Surface of proventrite and mesoventrite slightly shagreened. Punctures on metaventrite moderately large, separated by 0.2–0.5 times their diameter, with short and sparse setae in punctures. Abdominal postcoxal line incomplete or reaching lateral margin smoothly, divided into two lines, with associated indistinctly pits and pores (Figure 4A).

Male genitalia. Penis simple and slender, curved and narrowing toward apex; penis capsule indistinct (Figure 4B,C); penis guide in lateral view short and stout, nearly quadrate, apex slightly bent; parameres short and indistinct, with rather long setae (Figure 4D); penis guide in ventral view short, widest at base, narrowing apically, apex truncated; parameres in ventral view flattened and quadrate (Figure 4E).

Type material

Holotype: 1°, China, Tibet: Yarang Village, Motuo, 1030 m, 24 October 2007, Wang XM leg. Paratypes: 1°, same data as holotype.

Distribution China (Tibet).

Etymology

The specific epithet refers to the elytron with large punctures.

Scymnomorphus cuspidatus sp. nov. (Figures 2D, 4F–J, 6)



Figure 4. (A–E) *Scymnomorphus magnopunctatus* sp. nov., (A) abdomen, (B–E) male genitalia, (B) penis, (C) apex of penis, (D) tegmen, lateral view, (E) tegmen, ventral view; (F–J) *Scymnomorphus cuspidatus* sp. nov., (F) abdomen, (G–J) male genitalia: (G) penis, (H) apex of penis, (I) tegmen, lateral view, (J) tegmen, ventral view. Scale bars: 0.1 mm.

Diagnosis

This species is similar to *S. magnopunctatus* sp. nov. in male genitalia, but can be distinguished from the latter as follows: body distinctly larger, brown, punctures on elytra fine and apex of penis guide in ventral view pointed (Figures 2D, 4J). In *S. magnopunctatus*, body is yellow brown, punctures on elytra are large and apex of penis guide in ventral view is truncated (Figures 2C, 4E).

Description

TL: 1.28–1.38 mm, TW: 0.8–0.96 mm, TH: 0.60–0.65 mm, TL/TW: 1.43–1.44; PL/PW: 0.52–0.54; EL/EW: 1.18–1.22.

Body brown, except mesoventrite and metaventrite dark brown (Figure 2D). Body minute, short oval, distinctly convex; dorsum pubescent. Head small, 0.43 times elytral width (HW/EW = 1 : 2.31); frons convex, with fine punctures, separated by 0.8-2.0 times their diameter, with short and sparse hairs; eyes small and coarsely faceted, widest interocular distance 0.66 times width of head. Pronotum 0.76 times elytral width (PW/EW = 1 : 1.32), pronotal punctures very fine, smaller than those on head, separated by 2.0-4.0 times their diameter. Punctures on elytra moderately large, separated by 0.3-1.0 times their diameter. Surface of proventrite and mesoventrite slightly shagreened. Punctures on metaventrite fine, separated by 0.3-1.5 times their diameter, with short and sparse setae in punctures. Abdominal incomplete or reaching lateral margin smoothly, divided into two lines, with many associated pits and pores (Figure 4F).

Male genitalia. Penis simple and slender, curved and narrowing toward apex; penis capsule indistinct (Figure 4G,H); penis guide in lateral view short and stout, apex pointed; parameres short and indistinct, with four or five long setae (Figure 4I); penis guide in ventral view short and cuspate, widest at base (Figure 4J).

Type material

Holotype: 1♂, China, Tibet: Xiayadong Town, Yadong, 2800 m, 29 September 2009, Wang XM leg. Paratypes: China, Tibet:, 1♂1♀, same data as holotype; 1♂, Hanmi Village, Motuo, 2100 m, 13 October 2009, Wang XM leg.

Distribution

China (Tibet).

Etymology

The specific epithet refers to the cuspate penis guide in ventral view.

Scymnomorphus yadongensis sp. nov. (Figures 2E, 5A–E, 6)

Figure 5. (A–E) *Scymnomorphus yadongensis* sp. nov., (A) abdomen, (B–E) male genitalia: (B) penis, (C) apex of penis, (D) tegmen, lateral view, (E) tegmen, ventral view; (F–J) *Scymnomorphus xiaomengyangus* sp. nov., (F) abdomen, (G–J) male genitalia: (G) penis, (H) apex of penis, (I) tegmen, lateral view, (J) tegmen, ventral view. Scale bars: 0.1 mm.

Diagnosis

This species can be identified by its elongate oval body, fine punctures on elytron (Figure 2E), incomplete abdominal postcoxal line, reaching lateral margin and bulging out in middle (Figure 5A). The male genitalia are also diagnostic (Figure 5B–E).

Figure 6. Distribution map. (▲) Scymnomorphus isolateralis sp. nov.; (△)Scymnomorphus japonicus (Kamiya); (○) Scymnomorphus magnopunctatus sp. nov.; (●) Scymnomorphus cuspidatus sp. nov.; (◊) Scymnomorphus yadongensis sp. nov.; (♦) Scymnomorphus xiaomengyangus sp. nov.; (★) Scymnomorphus bicolor (Kamiya).

Description

TL: 1.25 mm, TW: 0.83 mm, TH: 0.42 mm, TL/TW: 1.50; PL/PW: 0.60; EL/EW: 1.16.

Body uniformly reddish brown, minute, elongate oval, distinctly convex; dorsum pubescent (Figure 2E). Head small, 0.50 times elytral width (HW/EW = 1 : 2.0); frons convex, with fine punctures, separated by 2.0–4.0 times their diameter, with short and sparse hairs, eyes small and coarsely faceted, widest interocular distance 0.69 times width of head. Pronotum 0.78 times elytral width (PW/EW = 1 : 1.28), pronotal punctures fine, slightly smaller than those on head, separated by 1.0–3.0 times their diameter. Surface of proventrite and mesoventrite slightly shagreened, with several setae. Punctures on metaventrite moderately large, separated by 0.8–3.0 times their diameter, with short and dense setae in punctures. Abdominal postcoxal line incomplete, reaching lateral margin and bulging out in middle, divided into two lines, with associated large pits and pores (Figure 5A).

Male genitalia. Penis simple and slender, curved and narrowing toward apex; penis capsule with a short and stout outer process and a small inner one (Figure 5B,C); penis guide in lateral view flattened and nearly quadrate, six times as long as wide, inner margin bulging out at apical third (Figure 5D); parameres short and indistinct,

with five or six long setae; penis guide in ventral view slender, narrowing apical, apex pointed (Figure 5E).

Type material

Holotype: 1°, China, Tibet: Xiayadong Town, Yadong, 2800m, 29 September 2009, Wang XM leg.

Distribution China (Tibet).

Etymology The specific epithet refers to the type locality.

Scymnomorphus xiaomengyangus sp. nov. (Figures 2F, 5F–J, 6)

Diagnosis

This species is similar to *S. bicolor* in general appearance and male genitalia, but based on Kamiya's detailed descriptions and illustrations, it can be distinguished from the latter by the elytra with a red brown area (Figure 2F). In *S. bicolor*, elytron is uniformly black. Their male genitalia are also distinctly diagnostic (Figures 5F–J).

Description

TL: 1.02 mm, TW: 0.78 mm, TH: 0.47 mm, TL/TW: 1.30; PL/PW: 0.52; EL/EW: 0.90.

Head yellow, with eyes black. Pronotum yellowish brown. Ground colour of elytra yellowish brown, with sutural area reddish brown (Figure 2F). Underside yellowish brown, except mesoventrite and metaventrite dark brown. Legs yellow.

Body minute, short oval, distinctly convex; dorsum pubescent. Head small, 0.47 times elytral width (HW/EW = 1 : 2.14); frons convex, with fine punctures, separated by 1.5-3.0 times their diameter, with short and sparse hairs; eyes small and coarsely faceted, widest interocular distance 0.66 times width of head. Pronotum 0.77 times elytral width (PW/EW = 1 : 1.30), pronotal punctures fine, similar to those on head, separated by 2.0-4.0 times their diameter. Punctures on elytra large, separated by 0.5-1.5 times their diameter. Surface of proventrite and mesoventrite slightly shagreened, with several setae. Punctures on metaventrite moderately large, separated by 1.0-3.0 times their diameter, with short and dense setae in punctures. Abdominal postcoxal line incomplete, reaching lateral margin smoothly, divided into two lines, with associated small pits and pores (Figure 5F).

Male genitalia. Penis simple and slender, curved and narrowing toward apex; penis capsule indistinct (Figure 5G,H); penis guide in lateral view slender and almost

straight, almost subparallel at basal five-sixths, somewhat bulging at apical one-sixth, apex pointed and strongly bent; parameres short and indistinct, with several setae (Figure 5I); penis guide in ventral view stout and straight, narrowed at base, tapering apical, apex pointed and slightly bent (Figure 5J).

Type material

Holotype: 1°, China, Yunnan: Xiaomengyang Town, Xishuangbanna, 29 September 2009, Wang XM leg; Paratype: China, Yunnan: 1°, Jiluo Town, Jinghong, 6 May 2009, Ren SX leg.

Distribution

China (Yunnan).

Etymology

The specific epithet refers to the type locality.

Scymnomorphus bicolor (Kamiya, 1965)

Sukunahikona bicolor Kamiya, 1965: 113; Sasaji, 1967: 4; 1971: 50; Pang et al., 2004: 66.

Scotoscymnus bicolor: Miyatake, 1994: 235.

Scymnomorphus bicolor: Kovář, 2007: 572.

Distribution

China (Taiwan), Japan.

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