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European Journal of Taxonomy 469: 1–34
https://doi.org/10.5852/ejt.2018.469
ISSN 2118-9773
www.europeanjournaloftaxonomy.eu
2018 · Li *et al.*

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Research article

urn:lsid:zoobank.org:pub:09F625AD-D58F-4D26-98B7-832743127667

Contribution to the genus *Chilocorus* Leach, 1815 (Coleoptera: Coccinellidae: Chilocorini), with descriptions of two new species from China

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[5]urn:lsid:zoobank.org:author:51CDA9D0-12F3-4593-A887-BF8CB2E6AB16

Abstract. Twenty species of the genus *Chilocorus* Leach, 1815 currently known from China are recorded, including two new species described here: *C. nigricaeruleus* Li & Wang sp. nov. and *C. strenotubus* Li & Wang sp. nov. Diagnoses and detailed descriptions of the new species are given. Each species is illustrated in detail, including genitalia. Distribution maps, a key to the Chinese species and a world checklist of *Chilocorus* are given.

Keywords. Lady beetles, Chilocorini, new species, China, world checklist.

Li W., Huo L., Wang D., Ahrens D. & Wang X. 2018. Contribution to the genus *Chilocorus* Leach, 1815 (Coleoptera: Coccinellidae: Chilocorini), with descriptions of two new species from China. *European Journal of Taxonomy* 469: 1–34. https://doi.org/10.5852/ejt.2018.469

Introduction

The tribe Chilocorini Mulsant, 1846 belongs to the subfamily Chilocorinae along with the tribes Platynaspini Mulsant, 1846 and Telsimiini Casey, 1899 in the traditional classification, based on

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the fact that they share a characteristic head capsule with a strongly expanded clypeus and reduced antennae (Sasaji 1968b). However, recent studies on the molecular phylogeny of Coccinellidae indicate that this subfamily is not a monophyletic group (Giorgi *et al.* 2009; Seago *et al.* 2011). As per the classification proposed by Ślipiński (2007) and Seago *et al.* (2011), Chilocorinae and its three tribes are now included in the subfamily Coccinellinae. Chilocorini has been identified as a sister group of Coccinellini (Magro *et al.* 2010; Seago *et al.* 2011; Escalona *et al.* 2017; Chen *et al.* 2017). At present, Chilocorini contains 27 genera and more than 280 species (Łączyński & Tomaszewska 2012; Li *et al.* 2017).

Chilocorus, the largest genus of the tribe Chilocorini, contains 79 species distributed all over the world and mainly preying on coccoidea (Giorgi *et al.* 2009; Escalona *et al.* 2017). Many species of *Chilocorus* are economically important as they are widely used as biological control agents (Ślipiński & Giorgi 2006), such as *Chilocorus nigrita* (Fabricius, 1798), which is widely distributed due to its deliberate introduction for biological control (Booth 1998). Leach (1815) established the genus *Chilocorus* for *Coccinella cacti* Linnaeus, 1767. Sicard (1920) proposed a subgenus *C.* (*Trichocorus*) for two species, this was supported by Chapin (1965) who considered *Chilocorus* as a non-monophyletic genus. This concept was accepted by Miyatake (1970), who studied East-Asian species, and subdivided *Chilocorus* into seven groups depending on the characters of pronotal oblique line, prosternal process, prosternal hypomeral foveae, elytral epipleural foveae, elytral outer margin, etc. The phylogenetic relationships of *Chilocorus* are still unclear. There are no detailed phylogenetic analyses based on morphology and Chilocorini are poorly represented in the molecular studies dealing with Coccinellidae.

The species of *Chilocorus* are abundant in China and prior to the present study, 18 were known (Liu 1963; Pang & Mao 1979; Cao & Xiao 1984; Pang *et al.* 2004; Ren *et al.* 2009). However, no comprehensive revision of Chinese *Chilocorus* has been carried out over the last 40 years. Furthermore, the world checklist of *Chilocorus* has not been updated for several decades since Korschefsky (1932), who provided the world checklist of Coccinellidae. The present paper aims at updating the knowledge of Chinese *Chilocorus*, including two new species, and provides a checklist of the known species of the world.

Material and methods

Specimens examined in this study were collected from China and Nepal. Type specimens of the new species are deposited at the Department of Entomology, South China Agriculture University, Guangzhou. Other material examined is deposited in the following research institutions:

SCAU = South China Agriculture University, Guangzhou, China
FIQB = The Forest Inspection and Quarantine Bureau, Yunnan, China
NCHU = National Chung Hsing University, Taiwan, China

External morphology was observed with a dissecting stereo microscope (SteREO Discovery V20, Zeiss). Male and female genitalia were dissected, cleared in a 10% solution of NaOH by boiling for several minutes and examined with an Olympus BX51 microscope. The photographs of genitalia and other morphological characters were generated with digital cameras (AxioCam HRc and Coolsnap-Procf & CRI Micro*Color), attached to microscopes using AxioVision Rel. ver. 4.8 and Image-Pro Plus ver. 6.0 to capture images, and photographs were cleaned up and laid out in plates with Adobe Photoshop CS ver. 8.0. Terminology follows Ślipiński (2007) and Ślipiński & Tomaszewska (2010).

Abbreviations

TL = total length, length from apical margin of clypeus to apex of elytra
TW = total width, width across both elytra at widest part
TH = height measured across the highest point of the elytra

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HW = head width in a frontal view
PL = pronotal length, from middle of anterior margin to base of pronotum
PW = pronotal width at widest part
EL = elytral length, from apex to base including scutellum
EW = elytral width, equal to TW

Results

Superfamily Coccinelloidea Latreille, 1807
Family Coccinellidae Latreille, 1807
Subfamily Coccinellinae Latreille, 1807
Tribe Chilocorini Mulsant, 1846

Genus ***Chilocorus*** Leach, 1815

Chilocorus Leach, 1815: 116.

Type species

Coccinella cacti Linnaeus, 1767, by monotypy.

Diagnosis

The genus *Chilocorus* can be distinguished from the other genera of the tribe Chilocorini by the following characters: body with dorsum glabrous, rarely with pubescence; outer elytral margin slightly reflexed, without distinct bead; antenna stout, composed of 8 antennomeres (Fig. 3e); terminal maxillary palpomere elongate, from 1 to 2 times as long as basal width, with sides nearly parallel or moderately expanded to apex (Fig. 3f); prosternal process long, narrow and subparallel without carina; legs with stout femora, tibiae with a triangular tooth at basal ⅓, without tibial spurs (Fig. 3i–j); tarsal claws stout, with approximately rectangular basal tooth, about ½ length of claw (Fig. 3k).

Description

Body. Broadly oval or roundish, hemispherical and strongly convex. Dorsum glabrous, rarely pubescent. Head relatively large, 0.50–0.65 times pronotal width, covered with short, greyish pubescence; antenna composed of eight antennomeres, relatively stout, scape asymmetrical, scape and pedicel subequal in length and width, antennomeres 3–7 gradually broadening and elongated, antennomere 8 subconical, distinctly longer than antennomere 7 (Fig. 3e). Mandible unidentate, prostheca indistinct, lateral margin of mandible strongly curved (Fig. 3g). Terminal maxillary palpomere elongate with sides nearly parallel or expanded to apex, rarely subquadrate, apical margin obliquely truncate (Fig. 3f). Terminal labial palpomere subconical (Fig. 3h).

Prothorax. Descending anteriorly. Prosternum T-shaped, in front of coxae distinctly longer than basal width of prosternal process. Prosternal process moderately broad, subparallel or slightly expanded to apex, truncate at apex, without carinae (Fig. 3d). Mesoventrite approximately trapezoidal, anterior margin of mesoventrite straight. Meso-metaventral process narrow, junction straight, with visible suture. Scutellum small and triangular. Elytra distinctly wider than pronotum at base, surface finely or coarsely punctate. Elytral epipleura distinctly oblique, with or without grooves. Abdomen with five ventrites in female and six ventrites in male. Abdominal postcoxal lines incomplete, not curved, posteriorly reaching or very close to hind margin of ventrite. Legs with stout femora, tibiae with a triangular tooth at basal ⅓, without tibial spurs (Fig. 3i–j); tarsal claw with basal tooth (Fig. 3k).

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Key to species of the genus **Chilocorus** *from China*

1. Elytra without spots 2
– Elytra with spots 11

2. Elytra entirely black or outer margin black 3
– Elytra entirely red (Fig. 1a) ..... ***C. politus*** Mulsant, 1850

3. Elytra entirely black 4
– Only outer margin of elytra black 7

4. Body round 5
– Body heart-shaped (Fig. 2a) ..... ***C. yunlongensis*** Cao & Xiao, 1984

5. Dorsum without metallic lustre 6
– Dorsum with bluish lustre (Fig. 3a) ..... ***C. nigricaeruleus*** Li & Wang sp. nov.

6. Pronotum mostly black except lateral parts yellow (Fig. 4c) ..... ***C. nigrita*** (Fabricius, 1798)
– Pronotum black except anterior angles yellow (Fig. 5c) ..... ***C. melas*** Weise, 1898

7. Ground colour of elytra red 8
– Ground colour of elytra yellow 10

8. Body roundish 9
– Body heart-shaped (Fig. 6a ..... ***C. rubidus*** Hope, 1831

9. Scutellum black (Fig. 7a–c); abdominal postcoxal line not reaching posterior margin of abdominal ventrite 1 (Fig. 7d) ..... ***C. chinensis*** Miyatake, 1970
– Scutellum red (Fig. 8a–c); abdominal postcoxal line reaching posterior margin of abdominal ventrite 1 (Fig. 8d) ..... ***C. rufitarsis*** Motschulsky, 1853

10. Head black, pronotum and outer margin of elytra black with bluish lustre (Fig. 9a–c) ..... ***C. hauseri*** Weise, 1895
– Head and pronotum yellow, outer margin of elytra black without bluish lustre (Fig. 10a–c) ..... ***C. circumdatus*** (Gyllenhal, 1808)

11. Elytra with a pair of spots 12
– Elytra with two or three pairs of spots 17

12. Black areas of dorsum with bluish lustre 13
– Black areas of dorsum without any metallic lustre 14

13. Penis guide as long as parameres (Fig. 11h) ..... ***C. chalybeatus*** Gorham, 1892
– Penis guide distinctly shorter than parameres (Fig. 12g) ..... ***C. shirozui*** Sasaji, 1968

14. Elytral spots small, apex of penis blunt 15
– Elytral spots relatively larger, penis constricted to a pointed tip (Fig. 13a, e–f) ..... ***C. hupehanus*** Miyatake, 1970

15. Penis and tegmen moderately stout 16
– Penis and tegmen strongly stout, penis guide subtriangular, widest at base, gradually converging apically to blunted tip in ventral view (Fig. 14e, h) ..... ***C. strenotubus*** Li & Wang sp. nov.

16. Penis guide approximately ⅔ length of parameres in lateral view, distinctly expanded at basal ¼ in ventral view (Fig. 15g–h) ..... ***C. kuwanae*** Silvestri, 1909

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– Penis guide approximately ⅘ length of parameres in lateral view, approximately parallel from base to basal ½ (Fig. 16g–h) ..... ***C. esakii*** Kamiya, 1959

17. Ground colour of elytra black 18
– Ground colour of elytra brown 19

18. Body length: 3.40–3.70 mm, broadly oval, dorsum with bluish lustre (Fig. 17a) ..... ***C. alishanus*** Sasaji, 1968
– Body length: 4.30–5.30 mm, heart-shaped, dorsum without any metallic lustre (Fig. 18a) .... ***C. bijugus*** Mulsant, 1853

19. Body length: 3.33–3.67 mm, elytra dark brown, with three pairs of roundish yellow spots, arranged in a row before centre, penis guide as long as parameres (Fig. 19a, g) .... ***C. bipustulatus*** (Linnaeus, 1758)
– Body length: 3.80–4.67 mm, elytra dark brown, with a pair of transverse yellow strips, situated before centre, about ⅔ elytra width, penis guide slightly longer than parameres (Fig. 20a, g) ..... ***C. geminus*** Zaslavskij, 1962

Chilocorus politus Mulsant, 1850
Figs 1, 21

Chilocorus politus Mulsant, 1850: 455.

Chilocorus politus – Crotch 1874: 184. —Weise 1902: 507. — Miwa 1931: 87. — Korschefsky 1932: 240.— Nagaraja & Hussainy 1967: 252. — Sasaji 1968a: 20. — Chazeau *et al.* 1974: 280. — Hoáng 1983: 19.— Booth & Pope 1989: 360. — Cao *et al.* 1992: 153. — Poorani 2002: 312. — Kovář 2007: 593.

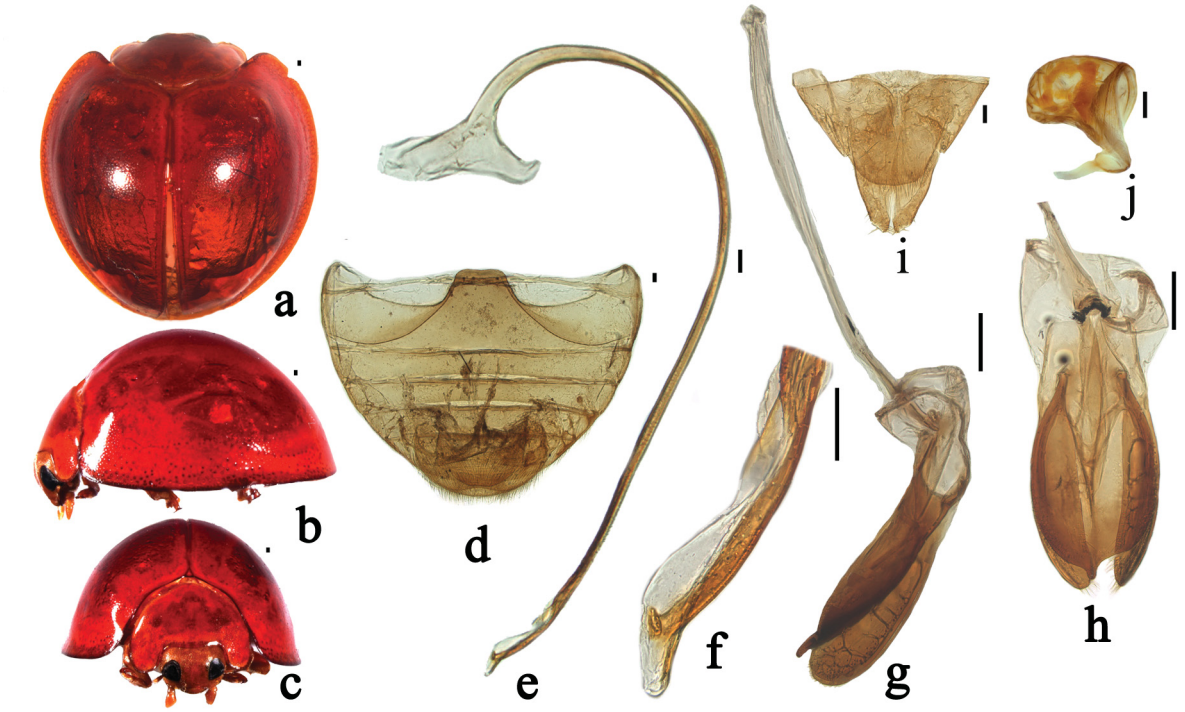

Fig. 1. *Chilocorus politus* Mulsant, 1850. **a**. Dorsal view. **b**. Lateral view. **c**. Frontal view. **d**. Abdomen. **e**. Penis. **f**. Apex of penis. **g**. Tegmen, lateral view. **h**. Tegmen, ventral view. **i–j**. Female genitalia. **i**. Ovipositor. **j**. Spermatheca. Scale bars: 0.1 mm. (SCAU)

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Material examined

CHINA: Guangxi Zhuang Autonomous Region: 1 ♂, Hongqilinchang, Shiwandashan, 9 Nov. 2004, X.M. Wang leg. (SCAU 20051206200).

NEPAL: 1 ♂, 1 ♀, Tansen, Palpa, Lumbini, 16 Oct. 2011, S.X. Ren leg. (SCAU).

Distribution

China (Guangxi, Yunnan, Tibet, Taiwan) (Fig. 21), Thailand, Laos, India, Nepal, Bhutan, Indonesia.

Chilocorus yunlongensis Cao & Xiao, 1984
Figs 2, 21

Chilocorus yunlongensis Cao & Xiao, 1984: 117

Chilocorus yunlongensis – Cao *et al.* 1992: 159. — Pang *et al.* 2004: 29. — Kovář 2007: 594.

Type material

Holotype

CHINA: ♂, Yunnan Prov., Yunlong, 2800 m a.s.l., 24 May 1980, collector unknown (FIQB 83010).

Paratypes

CHINA: 3 ♀♀, same collection data as for holotype (FIQB).

Distribution

China (Yunnan) (Fig. 21).

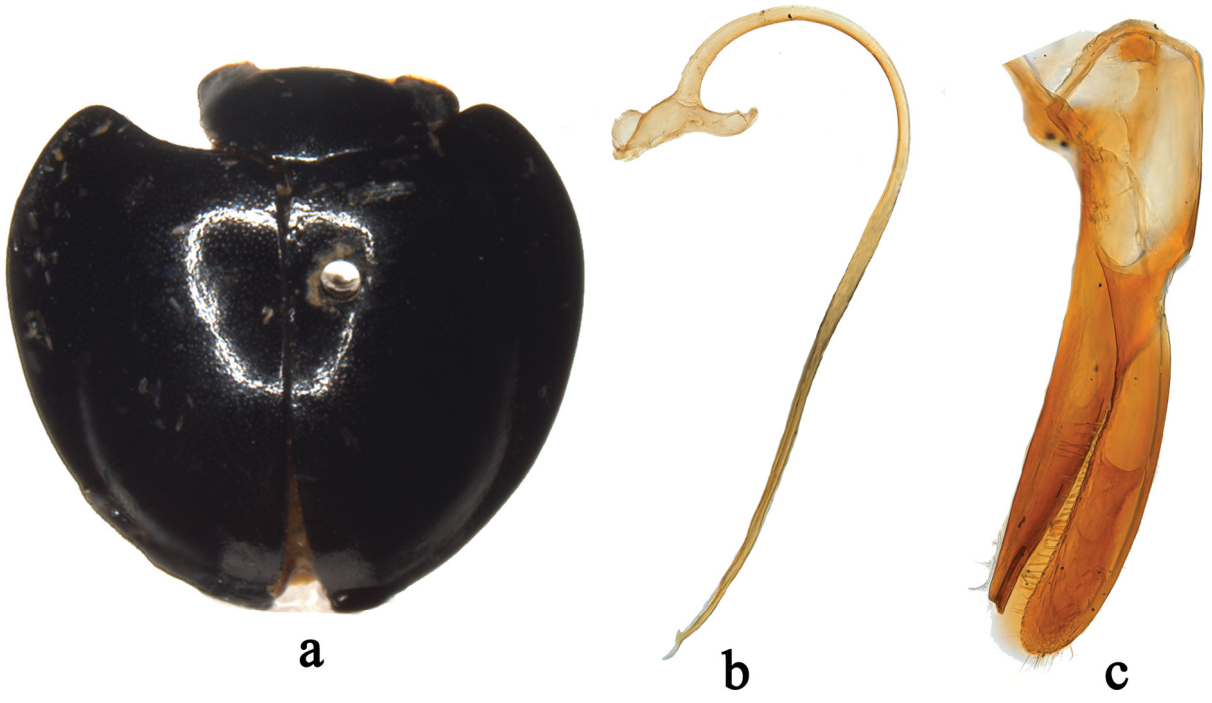

Fig. 2. *Chilocorus yunlongensis* Cao & Xiao, 1984. **a**. Dorsal view. **b**. Penis. **c**. Tegmen, lateral view. Scale bars: 0.1 mm. (FIQB)

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Chilocorus nigricaeruleus Li & Wang sp. nov.
urn:lsid:zoobank.org:act:AD963BB9-B700-4984-BE32-C9AFAFFE15D1
Figs 3, 21

Diagnosis

This species resembles *Chilocorus melas* Weise, 1898, but can be distinguished from it by having relatively large black body with dorsum with bluish lustre (Fig. 3a) and equal length of penis guide and parameres (Fig. 3o). In *C. melas*, the body is relatively small, dorsum black (Fig. 5a) and the penis guide distinctly longer than parameres (Fig. 5g).

Etymology

The specific epithet is derived from the Latin and refers to the colour of the elytra and pronotum, black with a bluish lustre.

Type material

Holotype

CHINA: ♂, Yunnan Prov., Longtan, Ximeng, 900 m a.s.l., 9–10 May 2008, X.M. Wang leg. (SCAU (E) 11287).

Paratypes

CHINA: 1 ♂, same collection data as for holotype (SCAU (E) 11288).

Description (male)

Measurements. TL: 4.40–4.67 mm, TW: 4.00–4.33 mm, TH: 2.33–2.40 mm, TL/TW: 1.08–1.10, PL/PW: 0.48–0.51, EL/EW: 0.98–0.99.

Body. Roundish, strongly convex. Head, antenna and mouthparts yellow, sparsely covered with short, greyish pubescence. Pronotum black with bluish lustre, except anterior angles yellow. Scutellum and elytra black with bluish lustre (Fig. 3a–c). Underside yellow except elytral epipleura black, metaventrite brownish yellow, sparsely covered with short, greyish pubescence. Head relatively large, 0.52 × as wide as pronotum, punctures on frons large and densely distributed, 1.0–2.0 diameters apart, surface polished between punctures. Eyes approximately oval, densely faceted, interocular distance 0.41 × as wide as head (Fig. 3c). Pronotum 0.51 × as wide as elytra, pronotal punctures moderately large and moderately densely distributed, smaller than those on head, 2.0–3.0 diameters apart, surface polished between punctures. Punctures on elytra moderately large and sparsely distributed, 2.0–4.0 diameters apart, similar to those on pronotum. Prosternal process moderate broad, slightly expanded to apex. Abdominal postcoxal lines incomplete, reaching posterior margin of abdominal ventrite 1 and running along posterior margin, then almost reaching lateral margin. Posterior margin of male abdominal ventrite 5 broadly rounded and ventrite 6 emarginate medially (Fig. 3l).

Male genitalia. Penis slender, penis capsule with long outer and inner arms, apex of penis slightly narrow with membranous appendage (Fig. 3m–n). Tegmen stout, penis guide widest at basal ⅓, then gradually converging to blunt apex, distinctly asymmetrical in ventral view and widest at base, gradually converging to blunt apex, bent outwardly from apical ⅙ to apex in lateral view. Parameres constricted from base to basal ½ than expanded toward apex, as long as penis guide, densely covered with short setae at the inner surfaces and distal end in lateral view (Fig. 3o–p).

Distribution

China (Yunnan) (Fig. 21).

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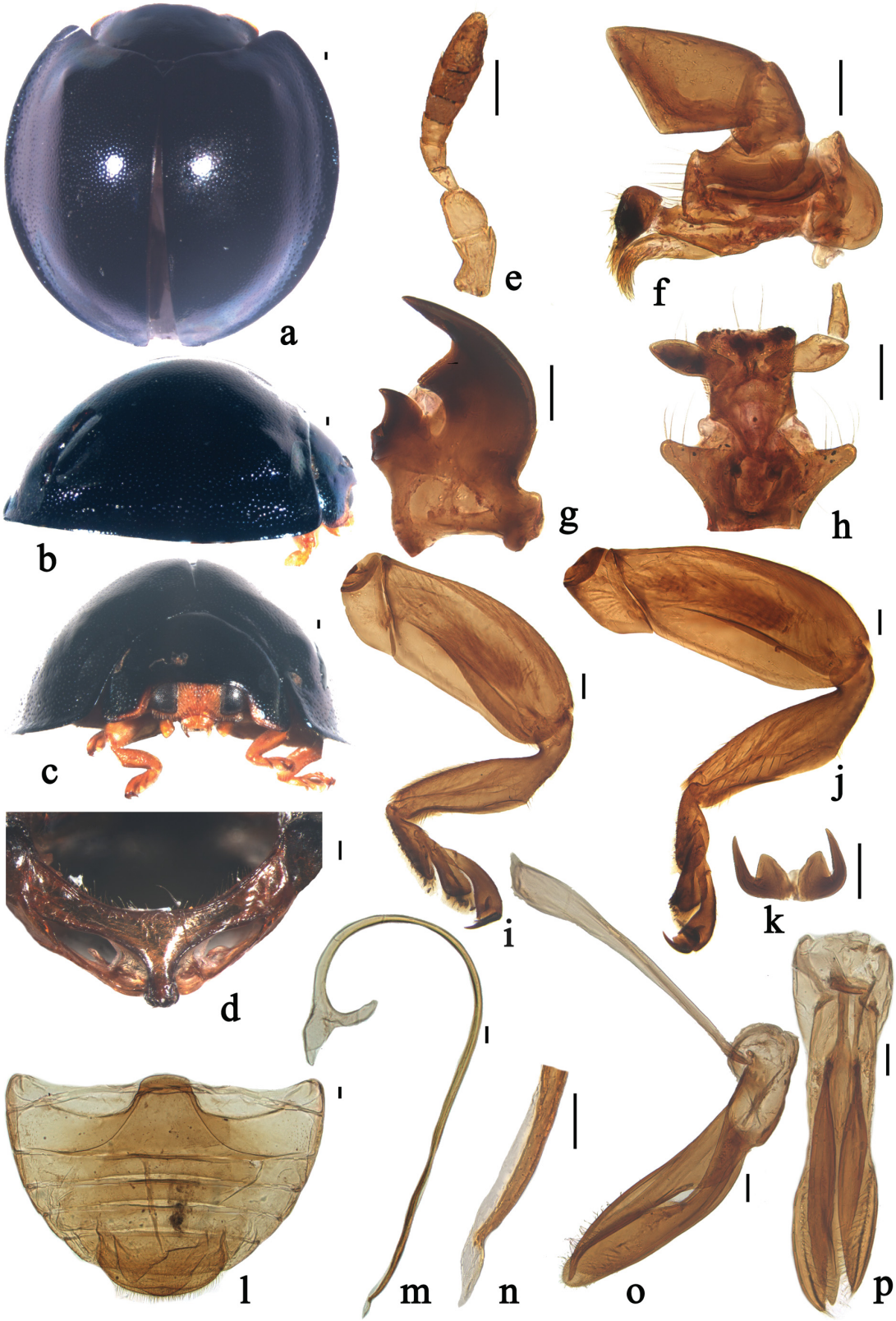

Fig. 3. *Chilocorus nigricaeruleus* Li & Wang sp. nov., holotype. **a**. Dorsal view. **b**. Lateral view. **c**. Frontal view. **d**. Prothorax. **e**. Antenna. **f**. Maxilla. **g**. Mandible. **h**. Labium. **i**. Front leg. **j**. Hind leg. **k**. Tarsal claw. **l**. Abdomen. **m**. Penis. **n**. Apex of penis. **o**. Tegmen, lateral view. **p**. Tegmen, ventral view. Scale bars: 0.1 mm. (SCAU (E) 11287)

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Chilocorus nigrita (Fabricius, 1798)
Figs 4, 21

Coccinella nigrita Fabricius, 1798: 79.

Chilocorus nigrita – Bielawski 1957: 86. — Booth 1998: 362. — Poorani 2002: 312.
Chilocorus nigritus – Mulsant 1850: 463. — Crotch 1874: 184. — Korschefsky 1932: 240. — Nagaraja & Hussainy 1967: 252. — Leeper 1976: 287. — Kovář 2007: 593.

non *Chilocorus nigritus* – Liu 1963: 78.

Material examined

CHINA: **Yunnan Prov.**: 2 ♂♂, 2 ♀♀, Jinghong, Xishuangbanna, 550 m a.s.l., 11 Aug. 2013, X.S. Chen leg. (SCAU); 2 ♀♀, Ruili, 20 Oct. 2000, Z.Q. Peng leg. (SCAU); 2 ♀♀, Dengshandao, Ruili, 22 Oct. 2000, Z.Q. Peng leg. (SCAU).

Distribution

China (Yunnan) (Fig. 21), Far East, Indian subcontinent, Oriental region, Australian region, USA, Brazil, Africa.

Chilocorus melas Weise, 1898
Figs 5, 21

Chilocorus melas Weise, 1898b: 229.
Chilocorus gressitti Miyatake, 1970: 330.

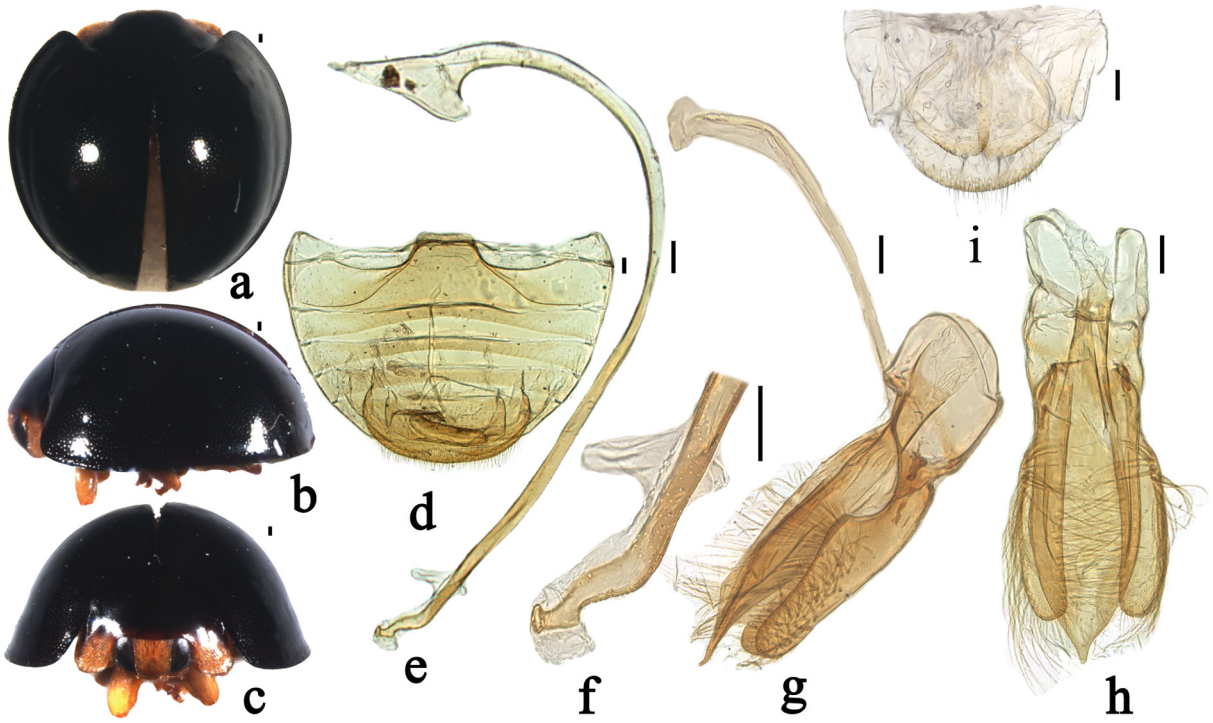

Fig. 4. *Chilocorus nigrita* (Fabricius, 1798). **a**. Dorsal view. **b**. Lateral view. **c**. Frontal view. **d**. Abdomen. **e**. Penis. **f**. Apex of penis. **g**. Tegmen, lateral view. **h**. Tegmen, ventral view. **i**. ovipositor. Scale bars: 0.1 mm. (SCAU)

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Chilocorus melas – Korschefsky 1932: 243. — Booth 1998: 364. — Poorani 2002: 311. — Pang *et al.* 2004: 28. — Kovář 2007: 593. — Ren *et al.* 2009: 132.
Chilocorus gressitti – Pang & Mao 1979: 84. — Hoáng 1983: 18. — Jing 1992: 567. — Cao *et al.* 1992: 159. — Pang *et al.* 2002: 317.
Chilocorus nigritus – Liu 1963: 78.

Material examined

CHINA: **Guangdong Prov.**: 1 ♀, Tianma, Xinhui, 24 Apr. 1956, Z.B. Zhou leg. (SCAU); 4 ♀♀, Xinhui, Nov. 1956, collector unknown (SCAU); 1 ♀, Nanhai, 14 Oct. 1955, L.B. Huo leg. (SCAU). – **Guangxi Prov.**: 1 ♂, Longsheng, 6 Apr. 1974, Y.L. Luo leg. (SCAU); 1 ♂, Nanning, 4 Aug. 1985, X.F. Pang leg. (SCAU). – **Fujian Prov.**: 1 ♂, Huaan, 26 Apr. 1982, Y.Q. Tang leg. (SCAU). – **Hainan Prov.**: 1 ♂; 3 ♀♀, Diaoluoshan, Jul. 1995, Z.Q. Peng leg. (SCAU); 1 ♂, Diaoluoshan, 8 May 2005, X.M. Wang leg. (SCAU); 1 ♂, Dongfang, 27 Nov. 1997, Z.Q. Peng leg. (SCAU).

Distribution

China (Fujian, Guangdong, Guangxi, Hainan, Sichuan, Yunnan, Hongkong) (Fig. 21), Burma, Thailand, Laos, India, Nepal, Bhutan, Indonesia.

Chilocorus rubidus Hope, 1831
Figs 6, 21

Chilocorus rubidus Hope, 1831: 31.
Coccinella tristis Faldermann, 1835: 452.

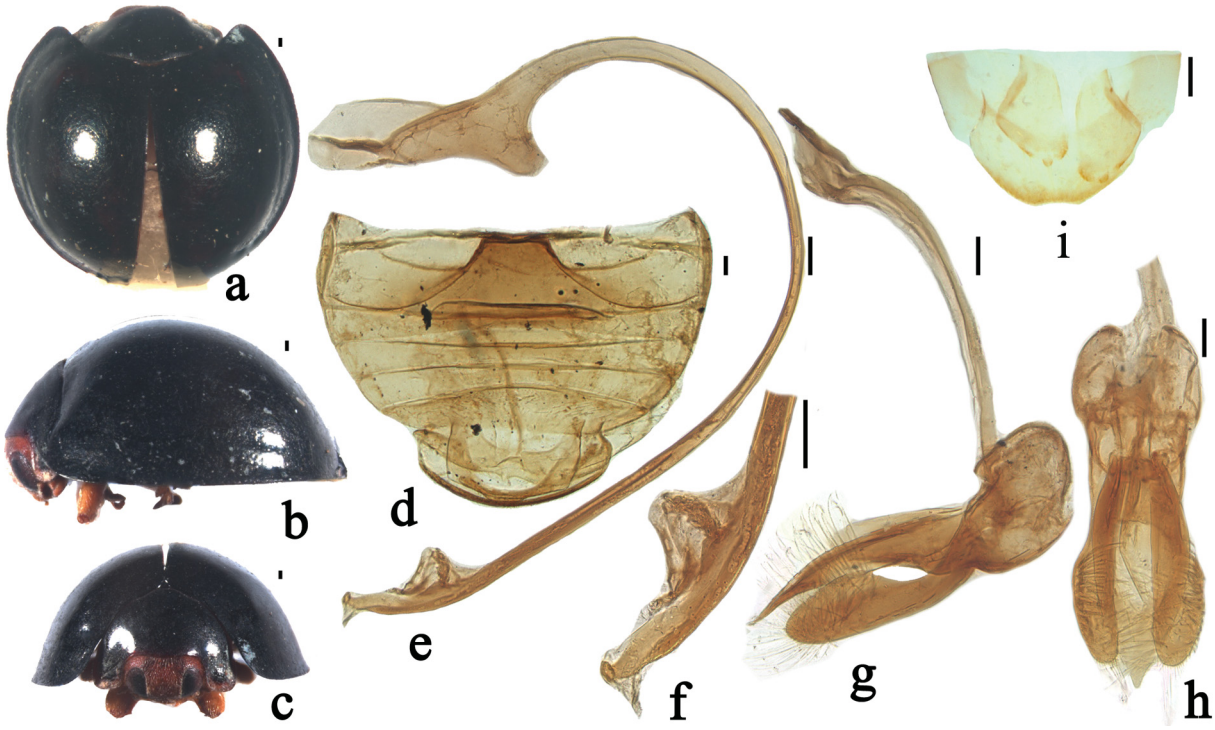

Fig. 5. *Chilocorus melas* Weise, 1898. **a**. Dorsal view. **b**. Lateral view. **c**. Frontal view. **d**. Abdomen. **e**. Penis. **f**. Apex of penis. **g**. Tegmen, lateral view. **h**. Tegmen, ventral view. **i**. ovipositor. Scale bars: 0.1 mm. (SCAU)

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Chilocorus rubidus – Mulsant 1850: 452. — Crotch 1874: 183. — Weise 1887: 210. — Blackburn 1889: 1275. — Lewis 1896: 31. — Korschefsky 1932: 241. — Hu 1937: 563. — Mader 1955b: 775. — Kapur 1956: 262; 1972: 313. — Kamiya 1959: 100. — Nakane 1963: 209. — Liu 1963: 75. — Nagaraja & Hussainy 1967: 253. — Miyatake 1970: 318. — Sasaji 1971: 224. — Pang & Mao 1979: 80. — Booth & Pope 1989: 362. — Jing 1992:567. — Cao *et al.* 1992:154. — Pang *et al.* 2002: 320; 2004: 29. — Poorani 2002: 311. — Kovář 2007: 593. — Ren *et al.* 2009: 134.
Chilocorus tristis – Mulsant 1850: 452. — Crotch 1874: 183. — Weise 1885: 51. — Lewis 1873: 56.
Chilocorus rubidus ab. *tristis* – Korschefsky 1932: 241. — Kapur 1956: 262.

Material examined

CHINA: **Inner Mongolia**: 1 ♂, 1 ♀, Xiangchizi, Gulaben, 1861–2283 m a.s.l., 7 Aug. 2010, C.W. Li leg. (SCAU). – **Ningxia Hui Autonomous Region**: 3 ♂♂, 1 ♀, Suyukou, Helanshan, Yinchuan 1950 m a.s.l., 12 Aug. 2009, X.M. Wang leg. (SCAU). – **Jiangsu Prov.**: 1 ♀, Nanjing University, 5 Sep. 1962, collector unknown (SCAU); 2 ♂♂, Nanjing Agricultural College, time of collection and collector unknown (SCAU). – **Zhejiang Prov.**: 1 ♂, Hangzhou, time of collection unknown, X. Cong leg. (SCAU). – **Shandong Prov.**: 1 ♀, Yuantoucun, Qingdao, 7 Jun. 1958, collector unknown (SCAU). – **Henan Prov.**: 1 ♂, 31 Jul. 1954, collector unknown (SCAU). – **Guizhou Prov.**: 1 ♂, Guizhou Forestry Institute, time of collection and collector unknown (SCAU). – **Yunnan Prov.**: 1 ♂, 4 ♀♀, Yuxi, Jul. 1981, collector unknown (SCAU); 1 ♂, Jilong, Tibet, 25 Jul. 1984, Z.X. Yan leg. (SCAU).

Distribution

China (Beijing, Tianjin, Hebei, Inner Mongolia, Liaoning, Jilin, Heinongjiang, Jiangsu, Zhejiang, Fujian, Shandong, Henan, Hunan, Hainan, Sichuan, Guizhou, Yunnan, Tibet, Shannxi, Gansu, Ningxia) (Fig. 21), Mongolia, Korea, Japan, India, Nepal, Indonesia, Siberia.

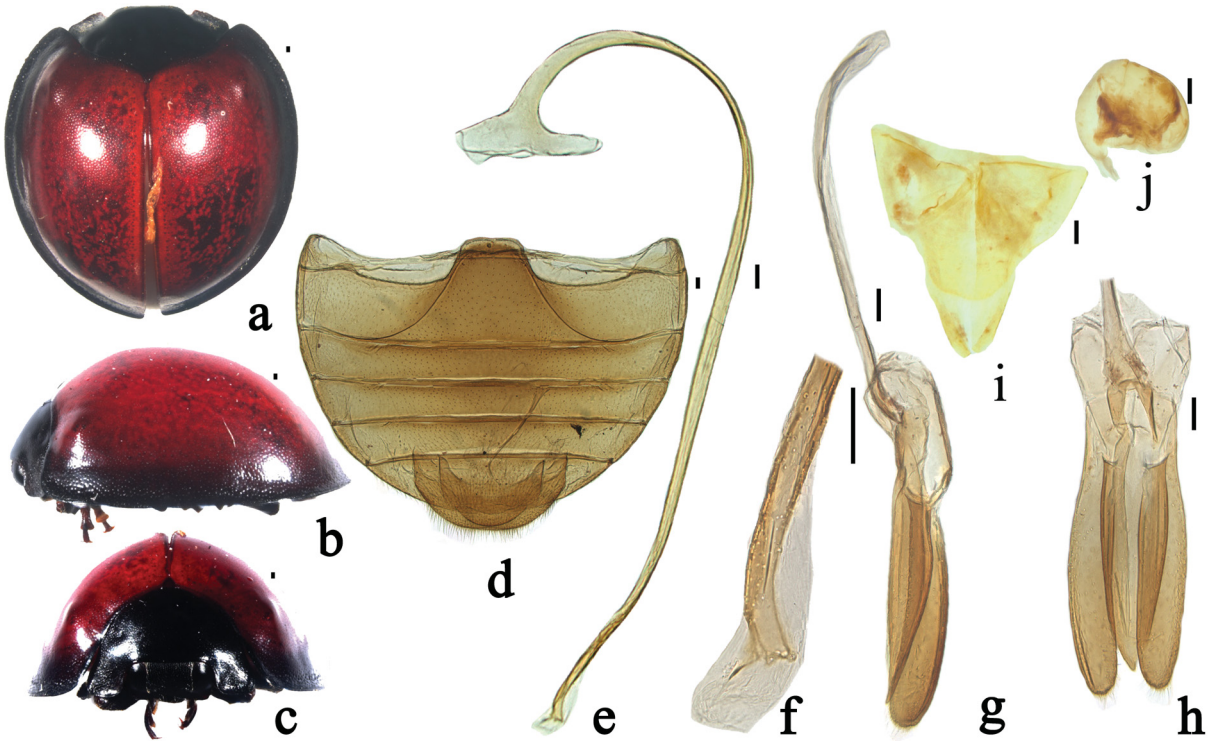

Fig. 6. *Chilocorus rubidus* Hope, 1831. **a**. Dorsal view. **b**. Lateral view. **c**. Frontal view. **d**. Abdomen. **e**. Penis. **f**. Apex of penis. **g**. Tegmen, lateral view. **h**. Tegmen, ventral view. **i–j**. Female genitalia: **i**. ovipositor. **j**. spermatheca. Scale bars: 0.1 mm. (SCAU)

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Chilocorus chinensis Miyatake, 1970
Figs 7, 21

Chilocorus chinensis Miyatake, 1970: 322.

Chilocorus chinensis – Pang & Mao 1979: 81. — Hoáng 1983: 22. — Cao *et al.* 1992: 156. — Pang *et al.* 2002: 317; 2004: 28. — Kovář 2007: 593. — Ren *et al.* 2009: 128.

Material examined

CHINA: **Henan Prov.**: 1 ♀, Longyuwan, Luoyang, 1390 m a.s.l., 11–12 Nov. 2009, X.M. Wang leg. (SCAU). – **Guangdong Prov.**: 2 ♂♂, Huangniping, Shimentai, 7 Oct. 2004, X.M. Wang leg. (SCAU). – **Anhui Prov.**: 1 ♂, Tangkouzhen, Huangshan, 12–13 Sep. 2010, X.M. Wang leg. (SCAU). – **Guizhou Prov.**: 1 ♂, Xianheping, Anlong, 14–15 Sep. 2006, X.M. Wang leg. (SCAU). – **Hainan Prov.**: 1 ♀, Bawangling, 21 Mar. 1996, Z.Q. Peng leg. (SCAU). – **Jiangsu Prov.**: 2 specimens, Agricultural college, Nanjing, the time of collection and collector unknown (SCAU). – **Jiangxi Prov.**: 2 ♂♂, 1 ♀, Maoping Jinggangshan, 20 Sep. 2004, X.M. Wang leg. (SCAU); 4 specimens, Lushan, Sep. 1978, Y.H. Wang leg. (SCAU).

Distribution

China (Anhui, Zhejiang, Fujian, Jiangxi, Henan, Guangdong, Guangxi, Hainan, Guizhou, Yunan, Jiangsu) (Fig. 21).

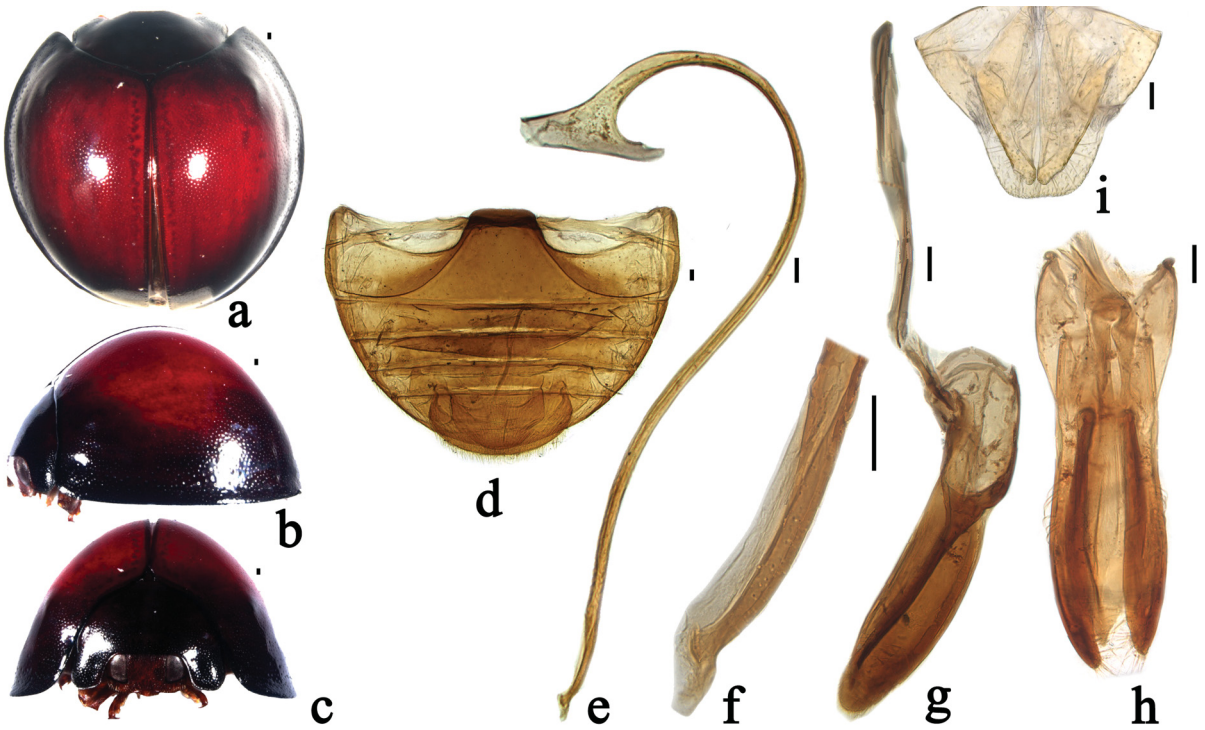

Fig. 7. *Chilocorus chinensis* Miyatake, 1970. **a**. Dorsal view. **b**. Lateral view. **c**. Frontal view. **d**. Abdomen. **e**. Penis. **f**. Apex of penis. **g**. Tegmen, lateral view. **h**. Tegmen, ventral view. **i**. Ovipositor. Scale bars: 0.1 mm. (SCAU)

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Chilocorus rufitarsis Motschulsky, 1853
Figs 8, 21

Chilocorus rufitarsis Motschulsky, 1853: 50.

Chilocorus rufitarsis – Crotch 1874: 183. — Korschefsky 1932: 243. — Hu 1937: 563. — Mader 1955b: 775. — Liu 1963: 79. — Miyatake 1970: 319. — Pang & Mao 1979: 80. — Hoáng 1983: 22. — Cao *et al.* 1992: 155. — Pang *et al.* 2002: 320; 2004: 29. — Kovář 2007: 594. — Ren *et al.* 2009: 134.

Material examined

CHINA: **Hunan Prov.**: 1 ♂, Shennonggu, Yanlin, 650–800 m a.s.l., 9 Oct. 2010, X.M. Wang leg. (SCAU). – **Shandong Prov.**: 1 ♀, Qishui, Jul. 1958, collector unknown (SCAU). – **Guizhou Prov.**: 2 ♂♂, 1 ♀, Guizhou Forestry Institute, time of collection and collector unknown (SCAU). – **Guangdong Prov.**: 1 ♂, Dadongshan, Liangzhou, 19 Jul. 2005, X.M. Wang leg. (SCAU); 1 specimen, Shipai, 7 Apr. 1954, J.X. Jiang leg. (SCAU); 1 specimen, Shipai, 16 Oct. 1960, Y.K. Wang leg. (SCAU); 1 specimen, Nanhai, Mar. 1960, collector unknown (SCAU); 2 specimens, Zhangdongshui, 26 Sep. 1989, J.C. Wu leg. (SCAU). – **Guangxi Prov.**: 3♂♂, 3 ♀♀, Xinguang, Yiyang, 18 Aug. 1981, G.M. Deng leg. (SCAU); 1 ♀, Jun. 1960, T.S. Pu leg.; 2 ♀♀, Quanzhou, 1980, collector unknown (SCAU).

Distribution

China (Jiangsu, Zhejiang, Fujian, Jiangxi, Hunan, Guangdong, Guangxi, Sichuan, Guizhou, Yunnan, Hongkong, Shandong) (Fig. 21), Vietnam.

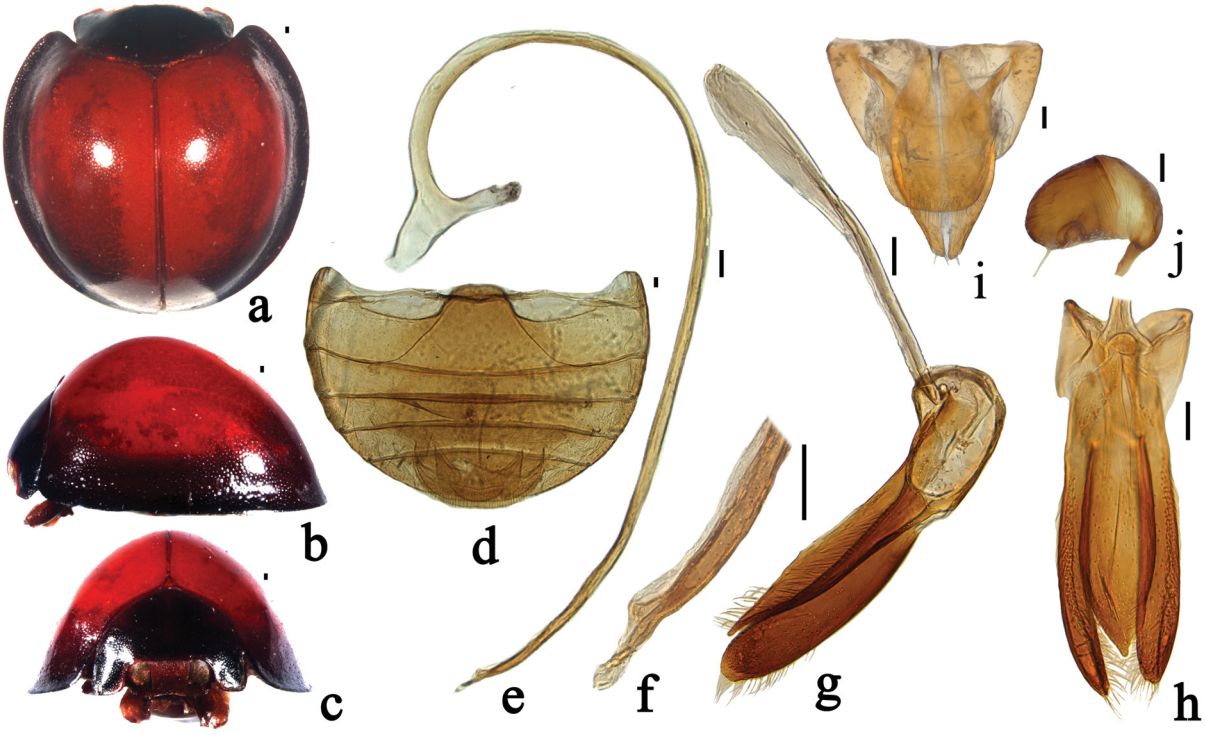

Fig. 8. *Chilocorus rufitarsis* Motschulsky, 1853. **a**. Dorsal view. **b**. Lateral view. **c**. Frontal view. **d**. Abdomen. **e**. Penis. **f**. Apex of penis. **g**. Tegmen, lateral view. **h**. Tegmen, ventral view. **i–j**. Female genitalia. **i**. Ovipositor. **j**. Spermatheca. Scale bars: 0.1 mm. (SCAU)

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Chilocorus hauseri Weise, 1895
Figs 9, 21

Chilocorus hauseri Weise, 1895a: 135.

Chilocorus hauseri – Sicard 1913: 500. — Korschefsky 1932: 243. — Liu 1963: 77. — Nagaraja & Hussainy 1967: 250. — Pang & Mao 1979: 82. — Cao *et al.* 1992: 156. — Pang *et al.* 2002: 318; 2004: 28. — Kovář 2007: 593. — Ren *et al.* 2009: 130.

Material examined

CHINA: **Hainan Prov.**: 1 ♂, 2 ♀♀, Jianfengling, 15 Jun. 1982, Y.F. Liu leg. (SCAU). – **Sichuan Prov.**: 3 ♂♂, Puge, 2000 m a.s.l., 15 Sep. 2007, X.M. Wang leg. (SCAU). – **Yunnan Prov.**: 1 ♂, 1 ♀, Funing, 16 Aug. 2005, X.M. Wang leg. (SCAU); 1 ♂, Tongbiguan, Nabang, Yingjiang, 1000 m a.s.l., 22–23 May 2008, X.M. Wang leg. (SCAU).

Distribution

China (Fujian, Guangdong, Hainan, Sichuan, Yunnan) (Fig. 21), Burma, India (Sikkim).

Chilocorus circumdatus (Gyllenhal, 1808)
Figs 10, 21

Coccinella circumdatus Gyllenhal in Schönherr, 1808: 152.

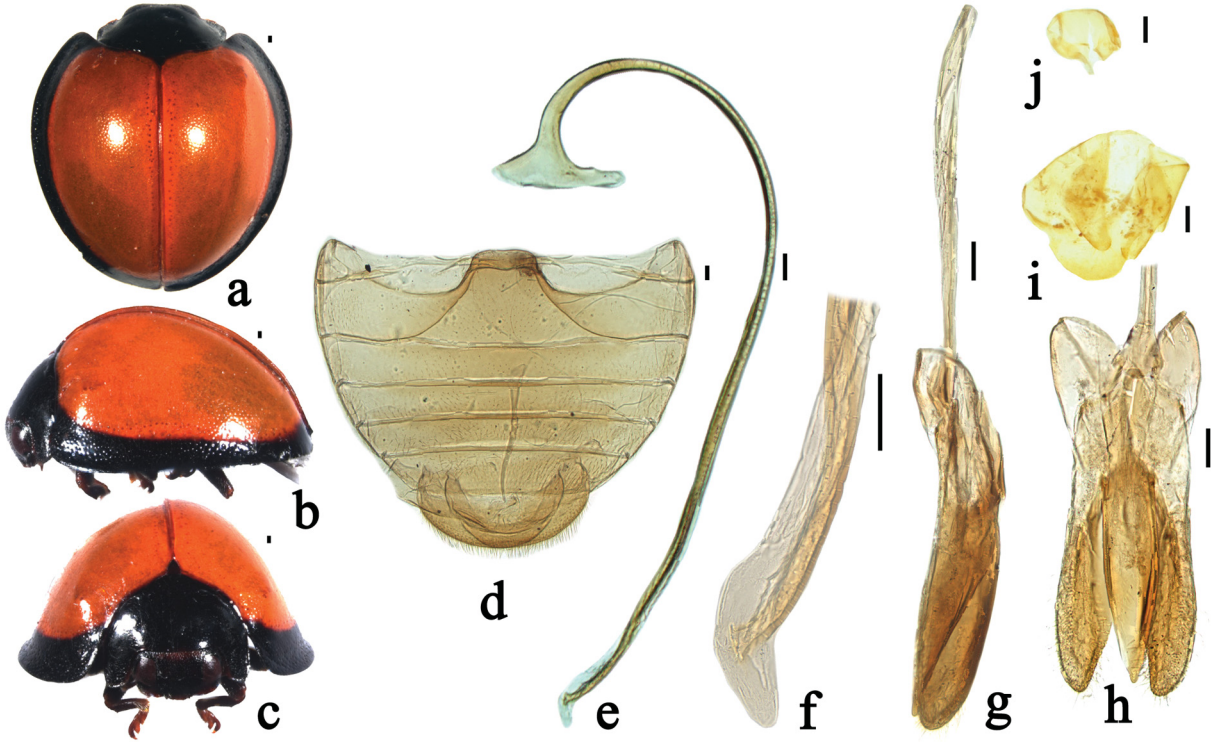

Fig. 9. *Chilocorus hauseri* Weise, 1895. **a**. Dorsal view. **b**. Lateral view. **c**. Frontal view. **d**. Abdomen. **e**. Penis. **f**. Apex of penis. **g**. Tegmen, lateral view. **h**. Tegmen, ventral view. **i–j**. Female genitalia. **i**. Ovipositor. **j**. Spermatheca. Scale bars: 0.1 mm. (SCAU)

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Chilocorus circumdatus – Mulsant 1850: 454. — Crotch 1874: 186. — Korschefsky 1932: 242. — Mader 1955b: 867. — Liu 1963: 77. — Nagaraja & Hussainy 1967: 250. — Miyatake 1970: 323. — Leeper 1976: 287. — Pang & Mao 1979: 83. — Hoáng 1983: 19. — Cao *et al.* 1992:158. — Pang *et al.* 2002: 317; 2004: 28. — Poorani 2002: 311.— Kovář 2007: 593. — Ren *et al.* 2009: 130.

Material examined

CHINA: **Guangdong Prov.**: 1 specimen, Huizhou, 11 May 1988, X.L. Tong leg. (SCAU); 1 specimen, Shenshan, Huidong, 5 May 1988, X.L. Tong leg. (SCAU); 3 specimens, Kuangbianyuan, Yangcun, Jun. 1979 (SCAU); 4 specimens, Shipai, Mar. 1961 (SCAU); 1 specimen, Shipai, Aug. 1956, N.C. Sun leg. (SCAU); 5 specimens, Shipai, Oct. 1956 (SCAU); 1 specimen, Zengcheng, 28 May 1951 (SCAU); 1 ♂, Huangniping, Shimentai, Guangzhou, 7 Oct. 2004, X.M. Wang leg. (SCAU). – **Hainan Prov.**: 8 ♂♂, 3 ♀♀, Diaoluoshan, Jul. 1995, Z.Q. Peng leg. (SCAU); 16 specimens, Diaoluoshan, Jul. 1995, Z.Q. Peng leg. (SCAU); 1 ♂, Diaoluoshan, 9 May 1995, Z.Q. Peng leg. (SCAU); 24 specimens, Nanfengzhen, Danzhou,Aug. 1995, Z.Q. Peng leg. (SCAU); 4 specimens, Liangyuan, Danzhou, Aug. 1995, Z.Q. Peng leg. (SCAU); 1 ♂, Yanglan, Sanya, 22 Sep. 1997, Z.Q. Peng leg. (SCAU); 1 ♂, Wushi, 14 Jul. 1999, Z.Q. Peng leg. (SCAU). – **Yunnan Prov.**: 1 ♂, Mengmao, 21 Oct. 2000, Z.Q. Peng leg. (SCAU).

Distribution

China (Zhejiang, Fujian, Guangdong, Guangxi, Hainan, Yunnan, Hong Kong) (Fig. 21), Indonesia, India, Sri Lanka. Introduced to Australia, America.

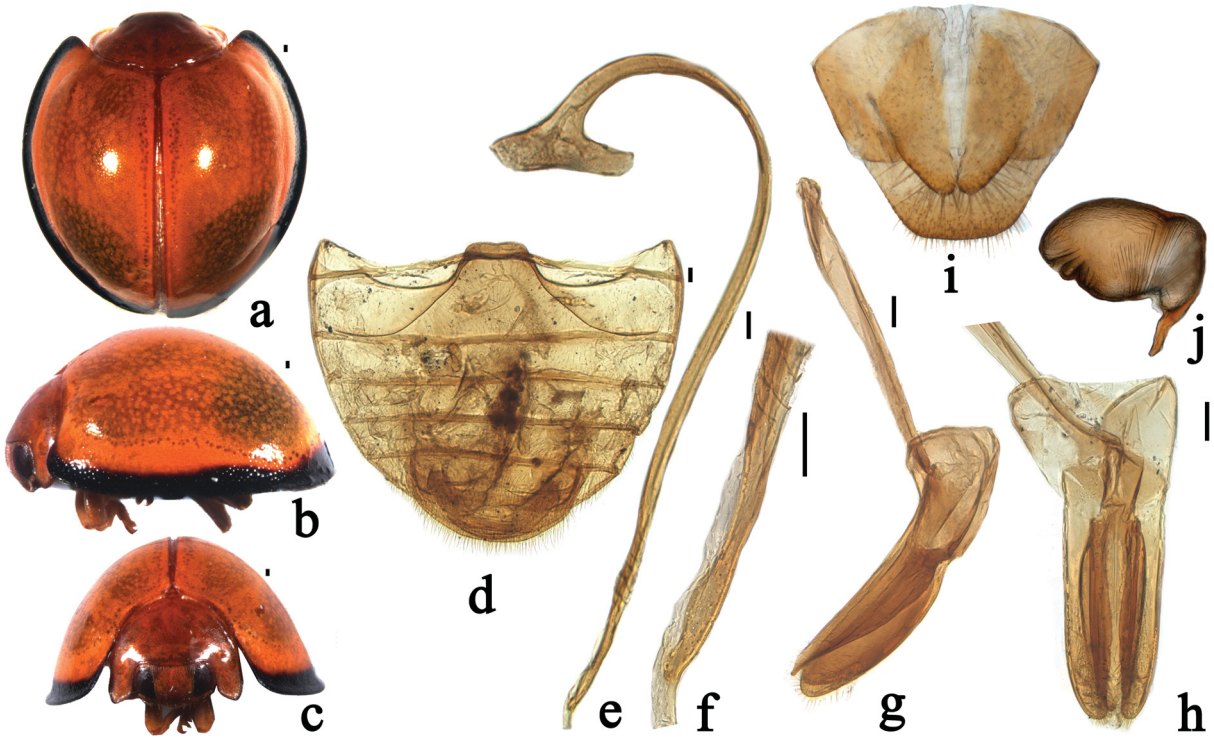

Fig. 10. *Chilocorus circumdatus* (Gyllenhal, 1808). **a**. Dorsal view. **b**. Lateral view. **c**. Frontal view. **d**. Abdomen. **e**. Penis. **f**. Apex of penis. **g**. Tegmen, lateral view. **h**. Tegmen, ventral view. **i–j**. Female genitalia. **i**. Ovipositor. **j**. Spermatheca. Scale bars: 0.1 mm. (SCAU)

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Chilocorus chalybeatus Gorham, 1892
Figs 11, 22

Chilocorus chalybeatus Gorham, 1892: 24.

Chilocorus chalybeatus – Miyatake 1970: 325. — Pang & Mao 1979: 84. — Hoáng 1983: 21. — Yu *et al.* 1993: 489. — Pang *et al.* 2002: 316; 2004: 27. — Kovář 2007: 593. — Ren *et al.* 2009: 128.

Material examined

CHINA: **Zhejiang Prov.**: 1 ♂, Tianmu Mountain, Linan, 450–1000 m a.s.l., 18 Sep. 2010, X.M. Wang leg. (SCAU). – **Hunan Prov.**: 16 ♂♂, 8 ♀♀, Shennonggu, Yanlin, 1100 m a.s.l., 7 Oct. 2010, X.M. Wang leg. (SCAU). – **Guangxi Prov.**: 1 ♂, Shilidaxiagu, Maoer Mountain, 19 Oct. 2004, X.M. Wang leg. (SCAU). – **Guizhou Prov.**: 1 ♀, Dongtang, Maolan, Libo, 730 m a.s.l., 15–18 Oct. 2008, J.B Liang leg. (SCAU). – **Anhui Prov.**: 1 ♂, Tianju Mountain, 29 Jul. 2005, X.M. Wang leg. (SCAU); 1 ♀, Tianma Jinzhai, 600 m a.s.l., 3–5 Oct. 2010, X.M. Wang leg. (SCAU). – **Gansu Prov.**: 1 ♂, Dangchuan, Tianshuimaiji, 1800 m a.s.l., 4 Aug. 2009, X.M. Wang leg. (SCAU); 1 ♂, Maiji Mountain, Tianshui, 1500 m a.s.l., 17 Oct. 2007, S.X. Ren leg. (SCAU). – **Shannxi Prov.**: 2 ♂♂, Fengyulinchang, Changan, 1600 m a.s.l., 27 Jul. 2007, X.M. Wang leg. (SCAU); 2 ♂♂, 1 ♀, Longtan village, Fenghuangguzhen, 785 m a.s.l., 26 Jun. 2014, W.J. Li leg. (SCAU); 2 ♂♂, Dabaigou, Caichuanzhen, 1200 m a.s.l., 1 Jul. 2014, W.J. Li leg. (SCAU).

Distribution

China (Anhui, Zhejiang, Fujian, Hunan, Guangdong, Hainan, Sichuan, Guizhou, Yunnan, Shannxi, Gansu, Guangxi) (Fig. 22).

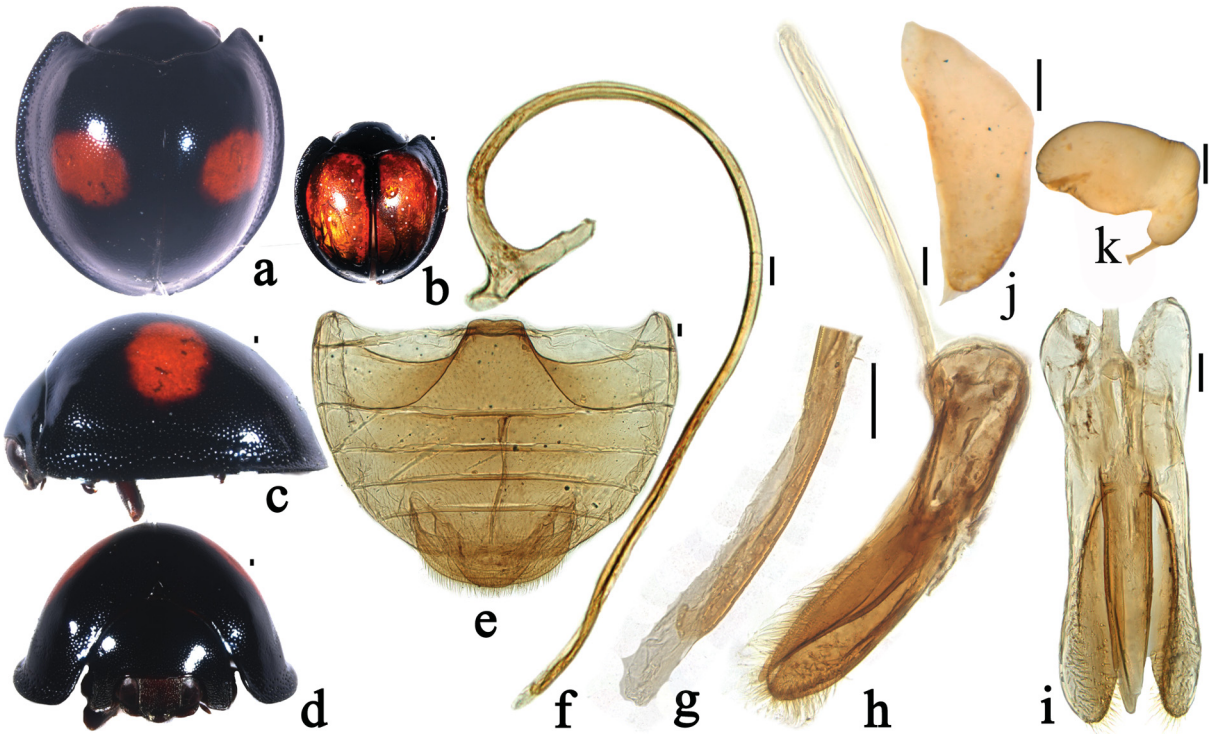

Fig. 11. *Chilocorus chalybeatus* Gorham, 1892. **a–b**. Dorsal view. **c**. Lateral view. **d**. Frontal view. **e**. Abdomen. **f**. Penis. **g**. Apex of penis. **h**. Tegmen, lateral view. **i**. Tegmen, ventral view. **j–k**. Female genitalia. **j**. Coxit. **k**. Spermatheca. Scale bars: 0.1 mm. (SCAU)

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Chilocorus shirozui Sasaji, 1968
Figs 12, 22

Chilocorus shirozui Sasaji, 1968a: 22.

Chilocorus shirozui – Miytake 1970: 327. — Pang *et al.* 2004: 29. — Kovář 2007: 594. — Yu 2011: 69.

Material examined

CHINA: **Taiwan Prov.**: 2 ♂♂, 4 ♀♀, Puli (NCHU).

Distribution

China (Taiwan) (Fig. 22).

Chilocorus hupehanus Miyatake, 1970
Figs 13, 22

Chilocorus hupehanus Miyatake, 1970: 329.

Chilocorus hupehanus – Pang & Mao 1979: 86. — Pang *et al.* 2002: 318; 2004: 28. — Kovář 2007: 593. — Ren *et al.* 2009: 132.

Material examined

CHINA: **Gansu Prov.**: 3 ♂♂, Dongliugou, Sunan, 2500 m a.s.l., 8 Aug. 2007, J.B. Liang leg. (SCAU). – **Zhejiang Prov.**: 2 ♂♂, 2 ♀♀, Cixi, 30 Jul. 1988, G.Y. Yu leg. (SCAU). – **Hunan Prov.**: 1 ♂, Zhubotang,

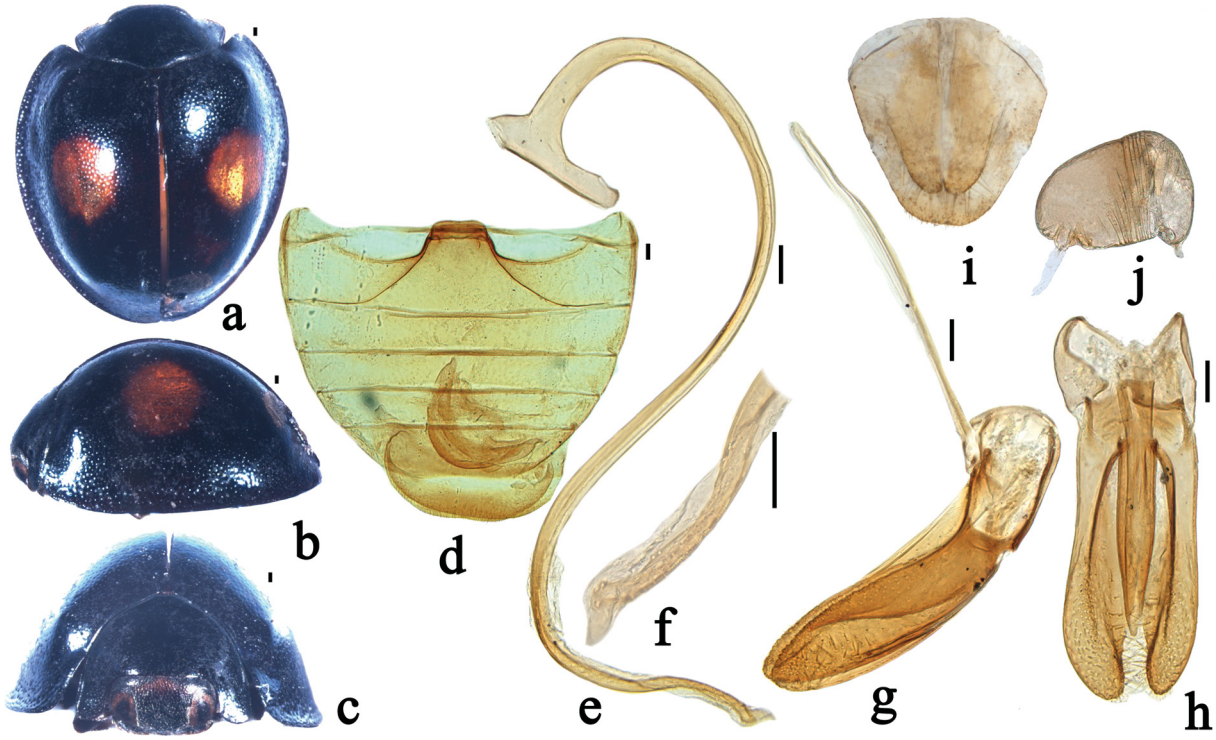

Fig. 12. *Chilocorus shirozui* Sasaji, 1968. **a**. Dorsal view. **b**. Lateral view. **c**. Frontal view. **d**. Abdomen. **e**. Penis. **f**. Apex of penis. **g**. Tegmen, lateral view. **h**. Tegmen, ventral view. **i–j**. Female genitalia. **i**. Ovipositor. **j**. Spermatheca. Scale bars: 0.1 mm. (NCHU)

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Yiyang, 18 Aug. 2001, Z.Q. Peng leg. (SCAU); 1 ♂, Horticultural institute, Changsha, 1984, collector unknown (SCAU). – **Guangdong Prov.**: 1 ♀, Huidong, 11 May 1987, X.F. Pang leg. (SCAU). – **Shandong Prov.**: 1 specimen, 1958, collector unknown (SCAU). – **Sichuan Prov.**: 2 specimens, Oct. 1978, collector unknown (SCAU); 3 specimens, Beita, Oct. 1978, collector unknown (SCAU). – **Guizhou Prov.**: 2 ♂♂, Leigongshan, 30 Jul. 1997, Z.Q. Peng leg. (SCAU); 6 specimens, Huaxi, 18 Aug. 1987, X.F. Pang leg. (SCAU).

Distribution

China (Zhejiang, Fujian, Shandong, Hubei, Hunan, Sichuan, Guizhou, Guangdong, Guangxi, Gansu) (Fig. 22).

Chilocorus strenotubus Li & Wang sp. nov.
urn:lsid:zoobank.org:act:9258A913-6BF6-419B-812E-C80707513E96
Figs 14, 22

Diagnosis

This species is similar to *C. kuwanae* Silvestri, 1909 in the shape of the body, but can be distinguished from it by the male genitalia: penis strongly stout (Fig. 14e); tegmen strongly stout with penis guide subtriangular, widest at base, gradually converging apically to blunted tip in ventral view (Fig. 14h).

Etymology

The specific epithet is derived from Latin and refers to the stout penis.

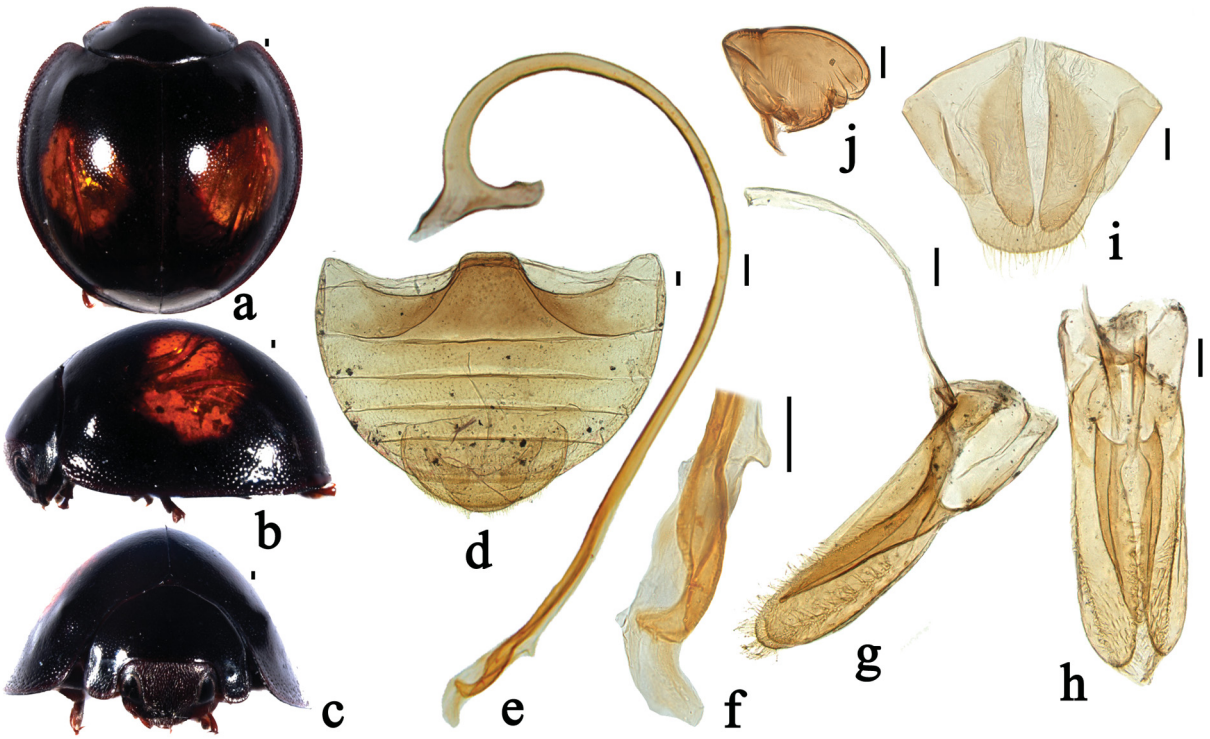

Fig. 13. *Chilocorus hupehanus* Miyatake, 1970. **a**. Dorsal view. **b**. Lateral view. **c**. Frontal view. **d**. Abdomen. **e**. Penis. **f**. Apex of penis. **g**. Tegmen, lateral view. **h**. Tegmen, ventral view. **i–j**. Female genitalia. **i**. Ovipositor. **j**. Spermatheca. Scale bars: 0.1 mm. (SCAU)

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Type material

Holotype

CHINA: ♂, Inner Mongolia, Youyizhongqi, Keerqin, 19 Aug. 2009, S.X. Ren leg. (SCAU (E) 11037).

Description (male)

Measurements. TL: 3.41 mm, TW: 2.93 mm, TH: 1.77 mm, TL/TW: 1.16, PL/PW: 0.51, EL/EW: 1.02.

Body. Roundish, strongly convex. Head, antenna and mouthparts brown-black, sparsely covered with short, greyish pubescence. Pronotum and scutellum black. Elytra black with a pair of oblong, orange spots, situated at centre, about ½ elytra width (Fig. 14a–c). Underside black except abdomen brown, sparsely covered with short, greyish pubescence. Head relatively large, 0.60 × as wide as pronotum, punctures on frons large and densely distributed, 1.0–2.0 diameters apart, surface polished between punctures. Eyes subtriangular, densely faceted, interocular distance 0.55 × as wide as head (Fig. 14c). Pronotum 0.59 × as wide as elytra, pronotal punctures moderately large and sparsely distributed, smaller than those on head, 2.0–3.5 diameters apart, surface polished between punctures. Punctures on elytra fine and sparsely distributed, 3.0–4.0 diameters apart, smaller than those on pronotum. Prosternal process moderate broad, slightly expanded to apex. Abdominal postcoxal lines incomplete, reaching posterior margin of abdominal ventrite 1 and running along posterior margin and almost reaching lateral margin. Posterior margin of male abdominal ventrite 5 truncate and 6 broadly rounded (Fig. 14d).

Male genitalia. Penis stout and simple, penis capsule with short outer arms and long inner arms, apex of penis truncate and membranous around at ⅓ to apex (Fig. 14e–f). Tegmen distinctly stout with penis guide subtriangular, widest at base, gradually converging to blunt apex in ventral view and widest at base, gradually converging to blunt apex in lateral view. Parameres distinctly longer than penis guide

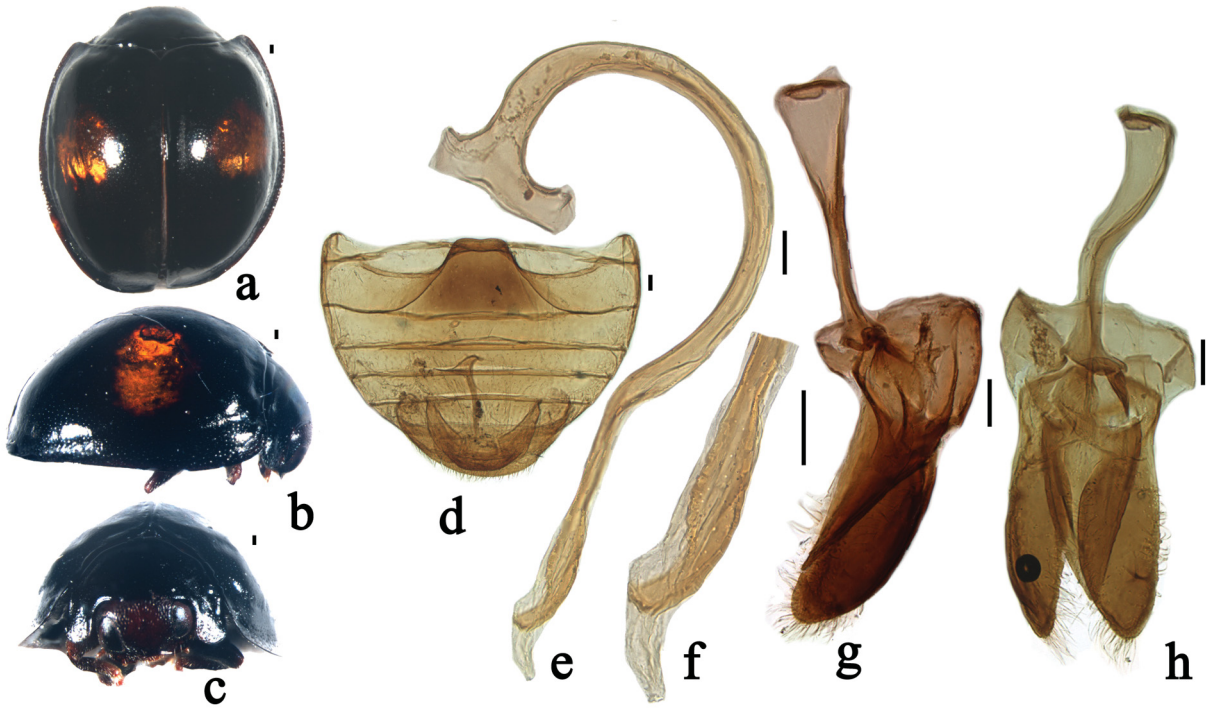

Fig. 14. *Chilocorus strenotubus* Li & Wang sp. nov., holotype **a**. Dorsal view. **b**. Lateral view. **c**. Frontal view. **d**. Abdomen. **e**. Penis. **f**. Apex of penis. **g**. Tegmen, lateral view. **h**. Tegmen, ventral view. Scale bars: 0.1 mm. (SCAU (E) 11037)

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with densely covered with long setae at the inner sides and distal end with a group of long setae in lateral view (Fig. 14g–h).

Distribution

China (Inner Mongolia) (Fig. 22).

Chilocorus kuwanae Silvestri, 1909
Figs 15, 22

Chilocorus kuwanae Silvestri, 1909: 126.
Chilocorus similis Lewis, 1896: 31.
Chilocorus similis var. *japonicus* Sicard, 1907a: 211.

Chilocorus renipustulatus Lewis, 1873: 56.
Chilocorus kuwanae – Korschefsky 1932: 563. — Mader 1955a: 78; 1955b: 776. — Kamiya 1959: 100. — Liu 1963: 77. — Nagaraja & Hussainy 1967: 251. — Miyatake 1970: 327. — Sasaji 1971: 226. — Pang & Mao 1979: 87. — Gordon 1985: 652. — Jing 1992: 567. — Cao *et al.* 1992: 160. — Pang *et al.* 2002: 319; 2004: 28. — Kovář 2007: 593. — Ren *et al.* 2009:132.

Material examined

CHINA: **Inner Mongolia**: 2 ♂♂, Xiangchizi, Gulaben, 1861–2283 m, 7 Aug. 2010, C.W. Li leg. (SCAU); 1 ♀, Honghuaerji, Ewenkeqi, 720 m a.s.l., 22 Aug. 2009, S.X. Ren leg. (SCAU); 1 ♀, Youyizhongqi, Keerqin, 19 Aug. 2009, S.X. Ren leg. (SCAU). – **Xinjiang Uygur Autonomous Region**: 1 ♀, Shanshan, 14 Aug. 2008, S.X. Ren leg. (SCAU); 1 ♀, Bole, 16 Aug. 2008, S.X. Ren leg. (SCAU). – **Ningxia**

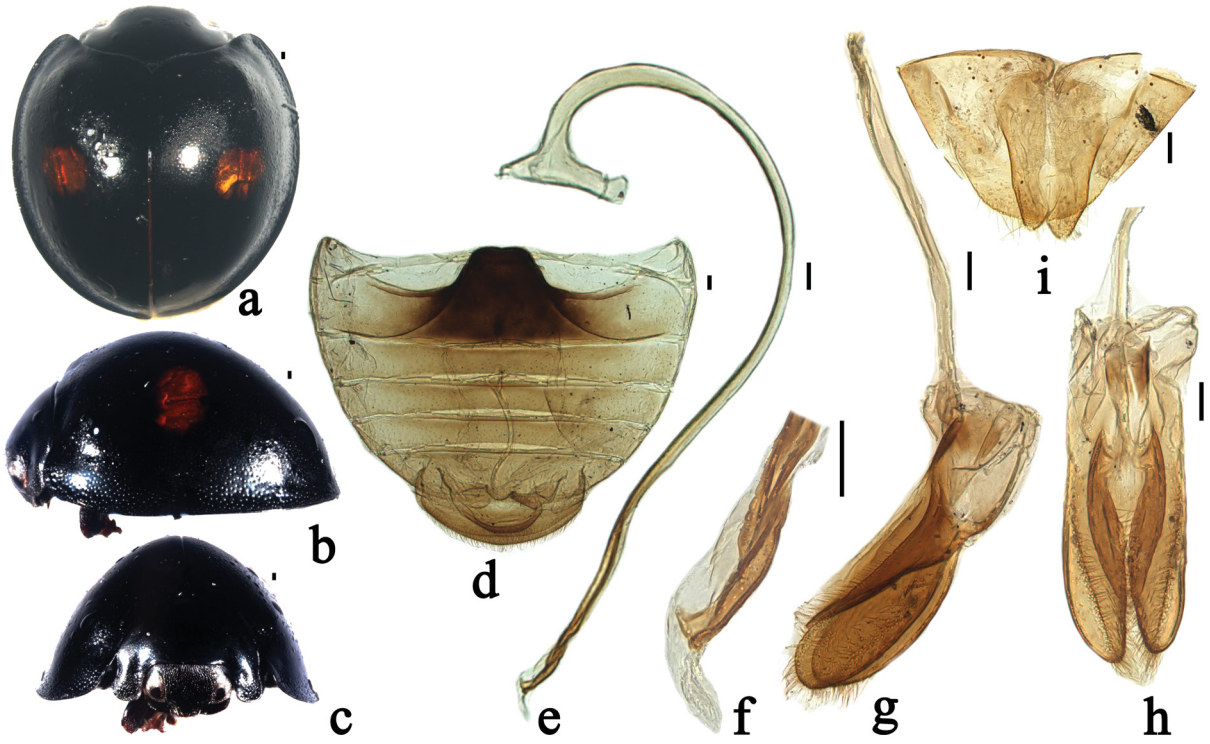

Fig. 15. *Chilocorus kuwanae* Silvestri, 1909. **a**. Dorsal view. **b**. Lateral view. **c**. Frontal view. **d**. Abdomen. **e**. Penis. **f**. Apex of penis. **g**. Tegmen, lateral view. **h**. Tegmen, ventral view. **i**. ovipositor. Scale bars: 0.1 mm. (SCAU)

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Hui Autonomous Region: 4 ♀♀, Suyukou, Yinchuan, 1950 m a.s.l., 12 Aug. 2009, X.M. Wang leg. (SCAU). – **Henan Prov.**: 1 ♀, Sanmenxia, 8 Aug. 2008, S.X. Ren leg. (SCAU). – **Hubei Prov.**: 1 ♂, Tiantangzhai, Yingshanxian, 30 Jun. 2014, L.Z. Huo leg. (SCAU); 1 ♂, Qiangtaiguan, Luoyangxian, 2 Jul. 2014, L.Z. Huo leg. (SCAU). – **Guangdong Prov.**: 1 ♂, Shenzhen, 19 May 1988, S.P. Shen leg. (SCAU); 6 ♀♀, Huidong, 11 May 1988, X.F. Pang leg. (SCAU). – **Hunan Prov.**: 1 ♂, Shaowu, 24 Aug. 1984, X.F. Pang leg. (SCAU); 1 ♀, Changsha, 1984, collector unknown (SCAU).

Distribution

China (Beijing, Hebei, Shanxi, Liaoning, Jilin, Heinongjiang, Shanghai, Jiangsu, Zhejiang, Anhui, Fujian, Jiangxi, Shandong, Henan, Hubei, Hunan, Guangdong, Guangxi, Sichuan, Guizhou, Yunnan, Shannxi, Gansu, Ningxia, Hong Kong, Inner Mongolia, Xinjiang) (Fig. 22), Japan, North Korea. Introduced to America.

Chilocorus esakii Kamiya, 1959

Figs 16, 22

Chilocorus esakii Kamiya, 1959: 102.

Chilocorus esakii – Sasaji 1971: 227. — Pang & Mao 1979: 85. — Pang *et al.* 2004: 28. — Kovář 2007: 593.

Material examined

CHINA: **Inner Mongolia**: 2 ♂♂, 2 ♀♀, Guyang, Baotou, 1300 m a.s.l., 16 Aug. 2009, S.X. Ren leg. (SCAU); 3 ♂♂, Dengkou, Bayannaoer, 14 Aug. 2009, S.X. Ren leg. (SCAU); 2 ♂♂, Helanshan,

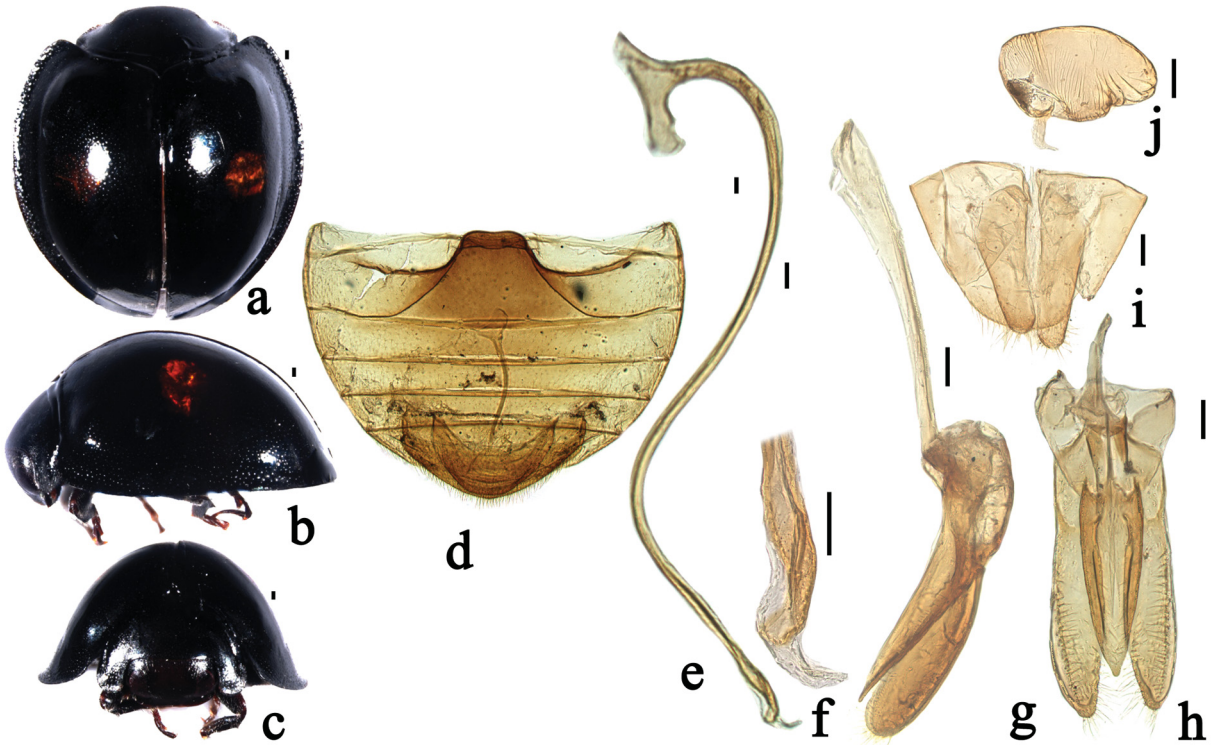

Fig. 16. *Chilocorus esakii* Kamiya, 1959. **a**. Dorsal view. **b**. Lateral view. **c**. Frontal view. **d**. Abdomen. **e**. Penis. **f**. Apex of penis. **g**. Tegmen, lateral view. **h**. Tegmen, ventral view. **i–j**. Female genitalia. **i**. Ovipositor. **j**. Spermatheca. Scale bars: 0.1 mm. (SCAU)

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Alashanzuoqi, 14 Aug. 2009, S.X. Ren leg. (SCAU); 1 ♂, Youyizhongqi, Keerqin, 19 Aug. 2009, S.X. Ren leg. (SCAU); 1 ♂, 2 ♀♀, Xiangchizi, Gulaben, 1861–2283m, 7 Aug. 2010, C.W. Li leg. (SCAU). – **Anhui Prov.**: 1 ♀, Hengdu, Shitai, 230 m a.s.l., 20 Sep. 2010, X.M. Wang leg. (SCAU). – **Zhejiang Prov.**: 1 ♂, 7 ♀♀, Cixi, 30 Jul. 1988, G.Y. Yu leg. (SCAU). – **Hunan Prov.**: 1 ♂ 2 ♀♀, Horticultural institute, 1984, collector unknown (SCAU); 1 ♀, Shaowu, 24 Aug. 1984, X.F. Pang leg. (SCAU). – **Guangdong Prov.**: 2 ♀♀, Huidong, 11 May 1988, X.F. Pang and X.L. Tong leg. (SCAU); 1 ♀, Huidong, 13 Jun. 1988, X.F. Pang leg. (SCAU). – **Henan Prov.**: 1 ♂, Jigong mountain, 10 Jul. 1997, Z.Q. Peng leg. (SCAU); 1 ♀, Boerdeng part, Xinyang, 216 m a.s.l., 5 Jul. 2009, X.M. Wang leg. (SCAU). – **Jiangxi Prov.**: 1 ♂, Taihe, 12 Aug. 2004, X.M. Wang leg. (SCAU). – **Guizhou Prov.**: 1 ♂, Qingzhen, 20 Jul. 1994, M.Y. Tian leg. (SCAU). – **Fujian Prov.**: 1 ♂, Tongmu, 3 Aug. 1983, K.C. Zhang leg. (SCAU). – **Guangxi Zhuang Autonomous Region**: 1 ♂, Nanning, 4 Aug. 1985, H. Pang leg. (SCAU). – **Hebei Prov.**: 1 ♂, Baoding, 24 Nov. 1960, collector unknown (SCAU).

Distribution

China (Inner Mongolia, Hebei, Henan, Shanxi, Shanghai, Liaoning, Shandong, Anhui, Jiangxi, Zhejiang, Hunan, Fujian, Guangdong, Sichuan, Guizhou, Guangxi) (Fig. 22), Japan.

Chilocorus alishanus Sasaji, 1968
Figs 17, 22

Chilocorus alishanus Sasaji, 1968a: 20.

Chilocorus alishanus – Pang & Mao 1979: 89. — Cao *et al.* 1992: 162. — Pang *et al.* 2004: 27. — Kovář 2007: 593. — Yu 2011: 67.

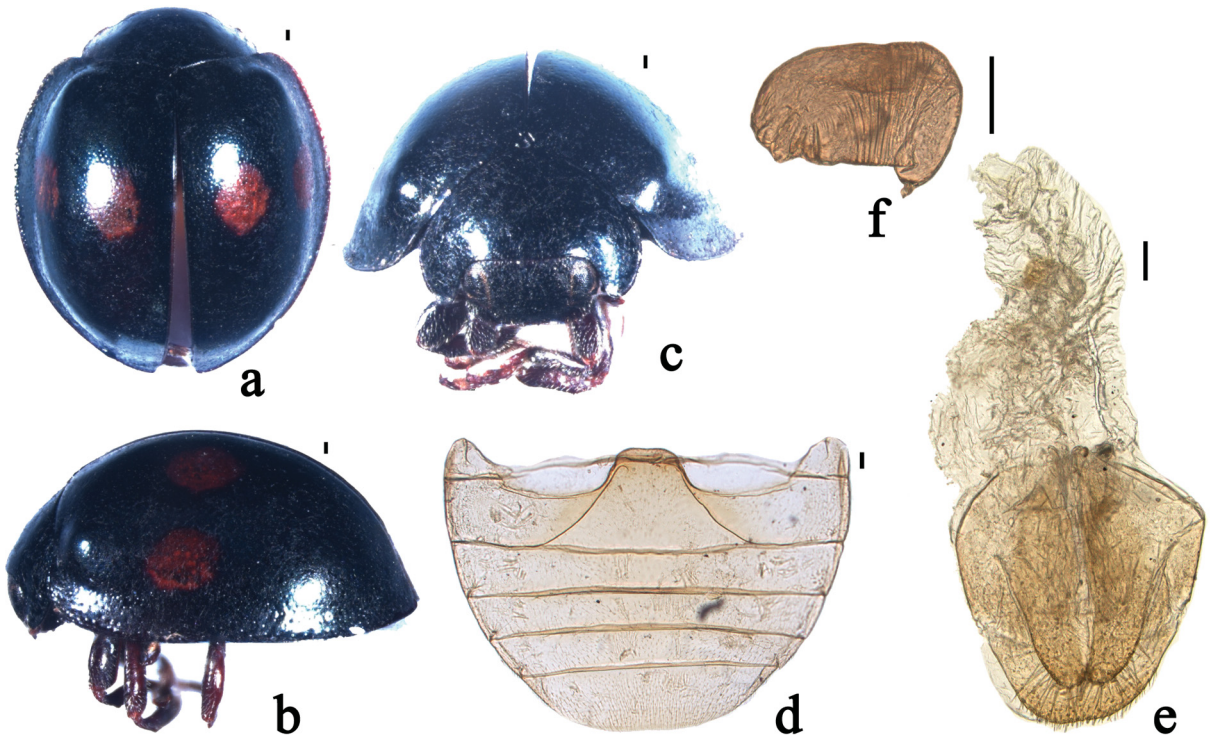

Fig. 17. *Chilocorus alishanus* Sasaji, 1968. **a**. Dorsal view. **b**. Lateral view. **c**. Frontal view. **d**. Abdomen. **e–f**. Female genitalia. **e**. Ovipositor. **f**. Spermatheca. Scale bars: 0.1 mm. (NCHU)

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Material examined

CHINA: **Taiwan Prov.**: 4 ♀♀, Ali Mountain, 1 Jun. 1972, collector unknown (NCHU).

Distribution

China (Yunnan, Taiwan) (Fig. 22).

Chilocorus bijugus Mulsant, 1853
Figs 18, 22

Chilocorus bijugus Mulsant, 1853: 61.
Chilocorus infernalis Mulsant, 1853: 189.
Chilocorus bijugus infernalis Korschefsky, 1932: 242.

Chilocorus bijugus – Crotch 1874: 183. — Korschefsky 1932: 242. — Kapur 1956: 259. — Nagaraja & Hussainy 1967: 249. — Miyatake 1970: 324; 1985: 12. — Pang & Mao 1979: 90. — Jing 1992: 566. — Cao *et al.* 1992: 162. — Pang *et al.* 2004: 27. — Kovář 2007: 593. — Ren *et al.* 2009: 126.
Chilocorus infernalis – Crotch 1874: 183.
Chilocorus renipustulatus – Liu 1963: 79.

Material examined

CHINA: **Yunnan Prov.**: 3 ♂♂, Shanggeri-La, 3000 m a.s.l., 3 Sep. 2005, X.M. Wang leg. (SCAU); 1 ♀, Fenshuiling, Jinping, 2000 m a.s.l., 18 May 2009, S.X. Ren leg. (SCAU); 1 ♀, Part of Xishan, Kunming, 2200 m a.s.l., 22 Aug. 2013, X.S. Chen leg. (SCAU). – **Sichuan Prov.**: 1 ♀, Panzhihua, 1400 m a.s.l., 16 Sep. 2007, X.M. Wang leg. (SCAU); 1 ♂, Fengyongzhai, Baoxing, 1560 m a.s.l.,

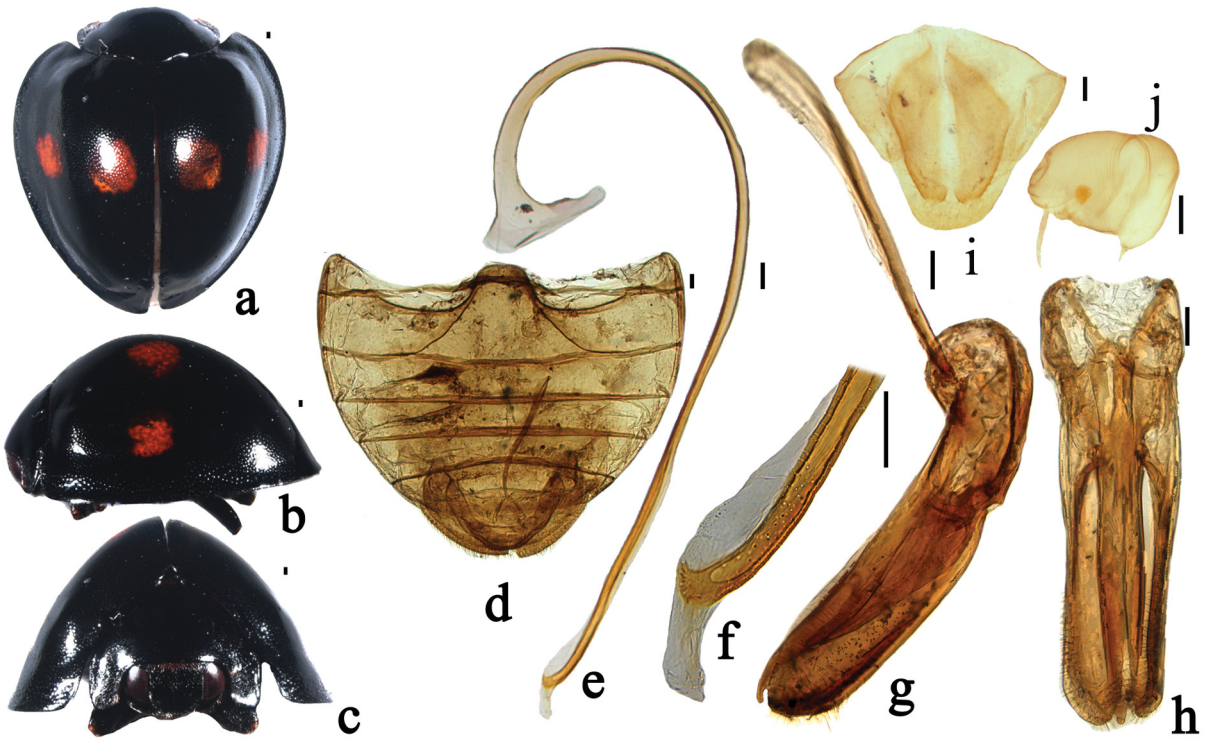

Fig. 18. *Chilocorus bijugus* Mulsant, 1853. **a**. Dorsal view. **b**. Lateral view. **c**. Frontal view. **d**. Abdomen. **e**. Penis. **f**. Apex of penis. **g**. Tegmen, lateral view. **h**. Tegmen, ventral view. **i–j**. Female genitalia. **i**. Ovipositor. **j**. Spermatheca. Scale bars: 0.1 mm. (SCAU)

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2–3 Oct. 2007, J.Y. Hao leg. (SCAU). – **Guizhou Prov.**: 6 specimens, Huaxi Guiyang, 12 Aug. 1987, X.F. Pang leg. (SCAU); 4 specimens, Guiyang arboretum, 17–19 Aug. 1987, X.F. Pang XF and B.C. Huang leg. (SCAU); 36 specimens, Qingzhen, 20 Jul. 1994, M.Y. Tian leg. (SCAU); 11 specimens, Ximu, Guiyang, 31 Jul. 1994, M.Y. Tian leg. (SCAU); 2 specimens, Huaxi Guiyang, 3 Aug. 1994, M.Y. Tian leg. (SCAU); 2 ♂♂, Xifeng, 1100 m a.s.l., 9 Aug. 1997, Z.Q. Peng leg. (SCAU). – **Hubei Prov.**: 1 ♀, Pingqian, Shennongjia, 1600 m a.s.l., 27 Jul. 2007, X.M. Wang leg. (SCAU); 1 ♀, Yinyu River, Shennongjia, 1700 m a.s.l., 31 Jul. 2007, X.M. Wang leg. (SCAU); 1 ♂, Laojun Mountain, Shennongjia, 1230 m a.s.l., 5 Aug. 2007, X.M. Wang leg. (SCAU). – **Tibet**: 1 ♂, Mangkang, 2300 m a.s.l., 10 Oct. 2007, X.M. Wang leg. (SCAU); 1 ♂, Mangkang, 3300 m a.s.l., 18 Sep. 2011, L.Z. Huo leg. (SCAU); 1 ♂, Yigong, Bomi, 2100 m a.s.l., 18 Oct. 2011, L.Z. Huo leg. (SCAU); 1 ♂, Milin, Paizhen, 2950 m a.s.l., 21 Oct. 2011, L.Z. Huo leg. (SCAU).

Distribution

China (Jiangsu, Hubei, Sichuan, Guizhou, Yunnan, Tibet, Gansu) (Fig. 22), Japan, India, Nepal, Pakistan, Palaearctic.

Chilocorus bipustulatus (Linnaeus, 1758)
Figs 19, 22

Coccinella bipustulata Linnaeus, 1758: 367.

Chilocorus bipustulatus – Crotch 1874: 185. — Jakobson 1916: 990. — Korschefsky 1932: 239. — Bielawski 1984: 369. — Pang & Mao 1979: 88. — Gordon 1985: 654. — Poorani 2002: 311. — Pang *et al.* 2004: 27. — Kovář 2007: 593. — Ren *et al.* 2009: 128.

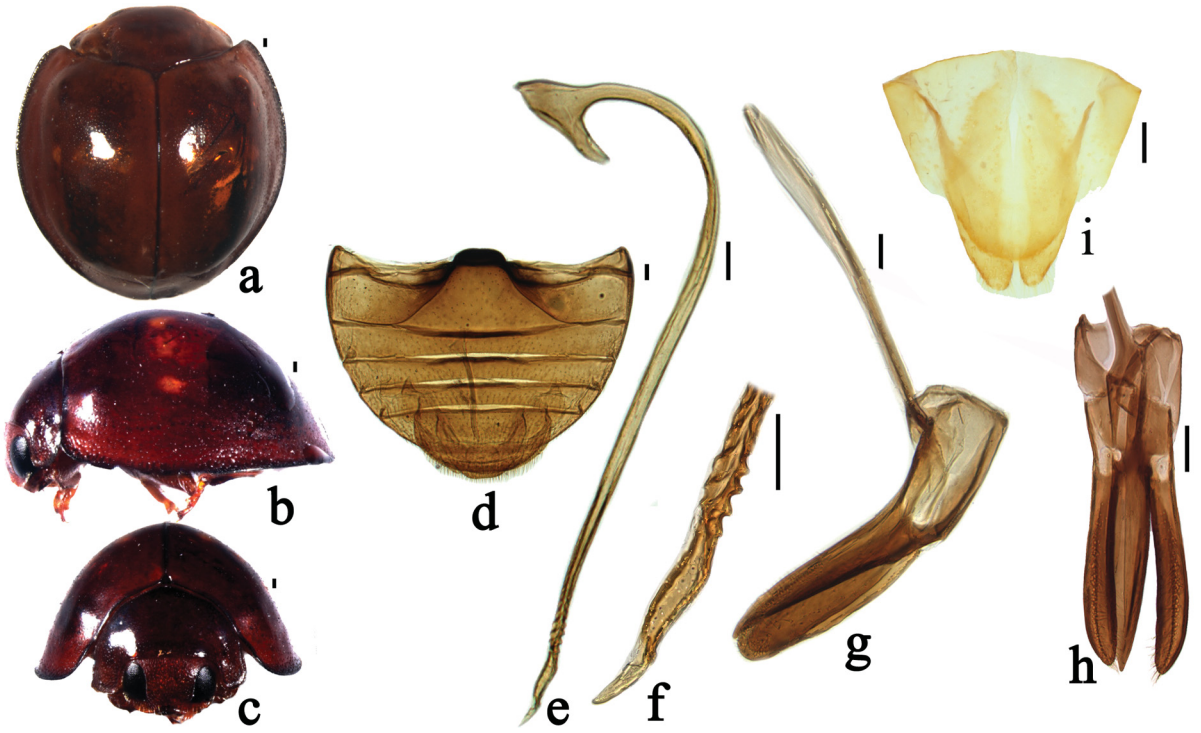

Fig. 19. *Chilocorus bipustulatus* (Linnaeus, 1758). **a**. Dorsal view. **b**. Lateral view. **c**. Frontal view. **d**. Abdomen. **e**. Penis. **f**. Apex of penis. **g**. Tegmen, lateral view. **h**. Tegmen, ventral view. **i**. ovipositor. Scale bars: 0.1 mm. (SCAU)

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Material examined

CHINA: **Xinjiang Uygur Autonomous Region:** 5 ♂♂, 2 ♀♀, Bole, 1000 m a.s.l., 16 Aug. 2008, S.X. Ren leg. (SCAU); 1 ♂, Tianchi, Fukang, 550 m a.s.l., 5 Sep. 2008, X.M. Wang leg. (SCAU); 1 ♀, Shanshan, 14 Aug. 2008, S.X. Ren leg. (SCAU); 1 ♂, Qiaxi, Gongliu, 1430 m a.s.l., 19 Aug. 2008, S.X. Ren leg. (SCAU); 1 ♂, Yining, 950 m a.s.l., 18 Aug. 2008, S.X. Ren leg. (SCAU).

Distribution

China (Xinjiang) (Fig. 22), Europe, Middle East, Central Asia, North Africa.

Chilocorus geminus Zaslavskij, 1962
Figs 20, 22

Chilocorus geminus Zaslavskij, 1962: 398.

Chilocorus geminus – Bielawski 1975: 254; 1984: 370. — Pang & Mao 1979: 88. — Pang *et al.* 2004: 28. — Kovář 2007: 593. — Ren *et al.* 2009: 130.

Material examined

CHINA: **Xinjiang Uygur Autonomous Region**: 1 ♂, Shanshan, 400 m a.s.l., 14 Aug. 2008, S.X. Ren leg. (SCAU); 1 ♂, 1 ♀, Bole, 1000 m a.s.l., 16 Aug. 2008, S.X. Ren leg. (SCAU); 1 ♂, 1 ♀, Qiaxi, Gongliu, 1430 m a.s.l., 19 Aug. 2008, X.M. Wang leg. (SCAU); 1 ♂, Hejing or Bohu, 1100 m a.s.l., 21 Aug. 2008, J.B. Liang leg. (SCAU); 8 ♂♂, 6 ♀♀, Kuche and Luntai, 930 m a.s.l., 23 Aug. 2008, S.X. Ren leg. (SCAU); 2 ♀♀, Xinhe and Wensu, 1160 m a.s.l., 24 Aug. 2008, S.X. Ren leg. (SCAU); 2 ♂♂,

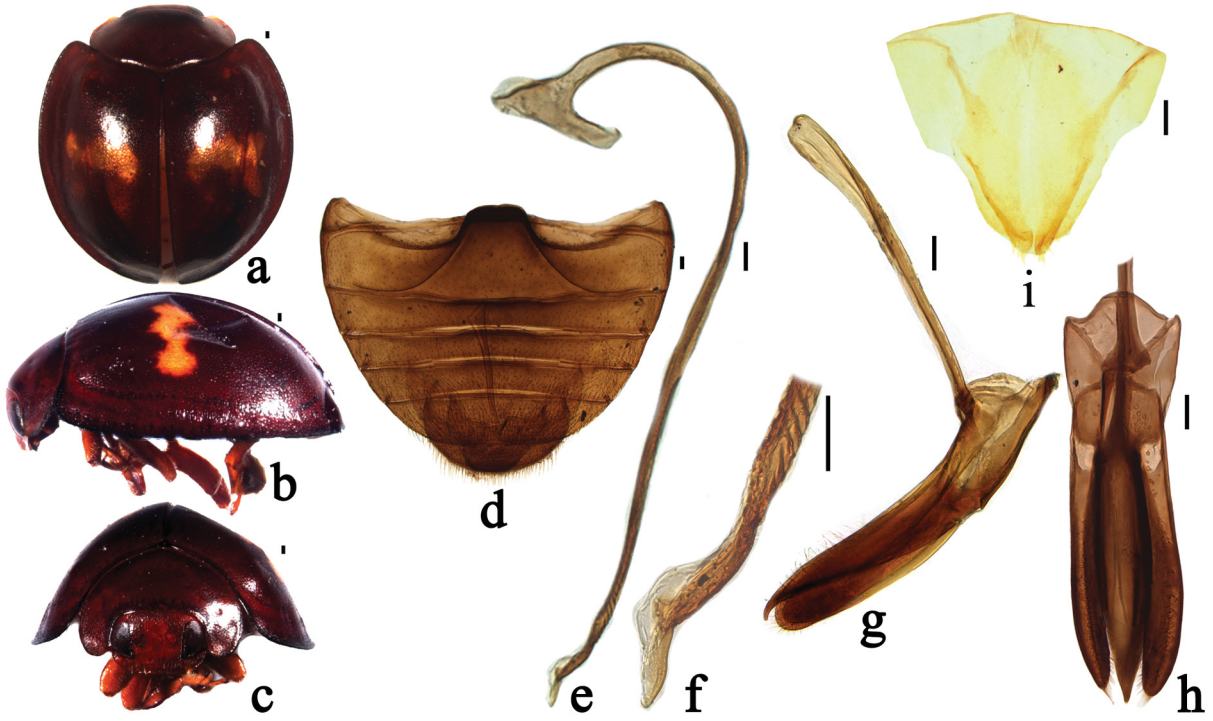

Fig. 20. *Chilocorus geminus* Zaslavskij, 1962. **a**. Dorsal view. **b**. Lateral view. **c**. Frontal view. **d**. Abdomen. **e**. Penis. **f**. Apex of penis. **g**. Tegmen, lateral view. **h**. Tegmen, ventral view. **i**. ovipositor. Scale bars: 0.1 mm. (SCAU)

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1 ♀, Awati, 1070 m a.s.l., 25 Aug. 2008, S.X. Ren leg. (SCAU); 1 ♀, Akesu, 1000 m a.s.l., 27 Aug. 2008, X.M. Wang leg. (SCAU).

Distribution

China (Gansu, Xinjiang) (Fig. 22), Mongolia, Uzbekistan, Turkey, Central Asia.

The world checklist of Chilocorus *Leach, 1815*

C. adustus Weise, 1898a: 119. Gabon, Cameroon, West Africa.
C. alishanus Sasaji, 1968a: 20. China.
C. amamensis Kamiya, 1959: 103. Japan.
C. angolensis Crotch, 1874: 186. Angola, Central & southern Africa.
C. bennigseni Weise, 1900: 128. Tanzania, Central East Africa.
C. bijugus Mulsant, 1853: 61. China, Japan, India, Nepal, Pakistan, Palaearctic.
C. bipustulatus (Linnaeus, 1758): 367. China, Europe, Middle East, Central Asia, North Africa.
C. braeti Weise, 1895b: 154. Himalaya, India.
C. cacti (Linnaeus, 1767): 584. America.
C. calvus Weise, 1898b: 228. Mozambique, South Africa.
C. canariensis Crotch, 1874: 185. Canary Islands.
C. cerberus Mulsant, 1853: 148. Malaysia, Indonesia, Philippines, Sumatra.
C. chalybeatus Gorham, 1892: 24. China.

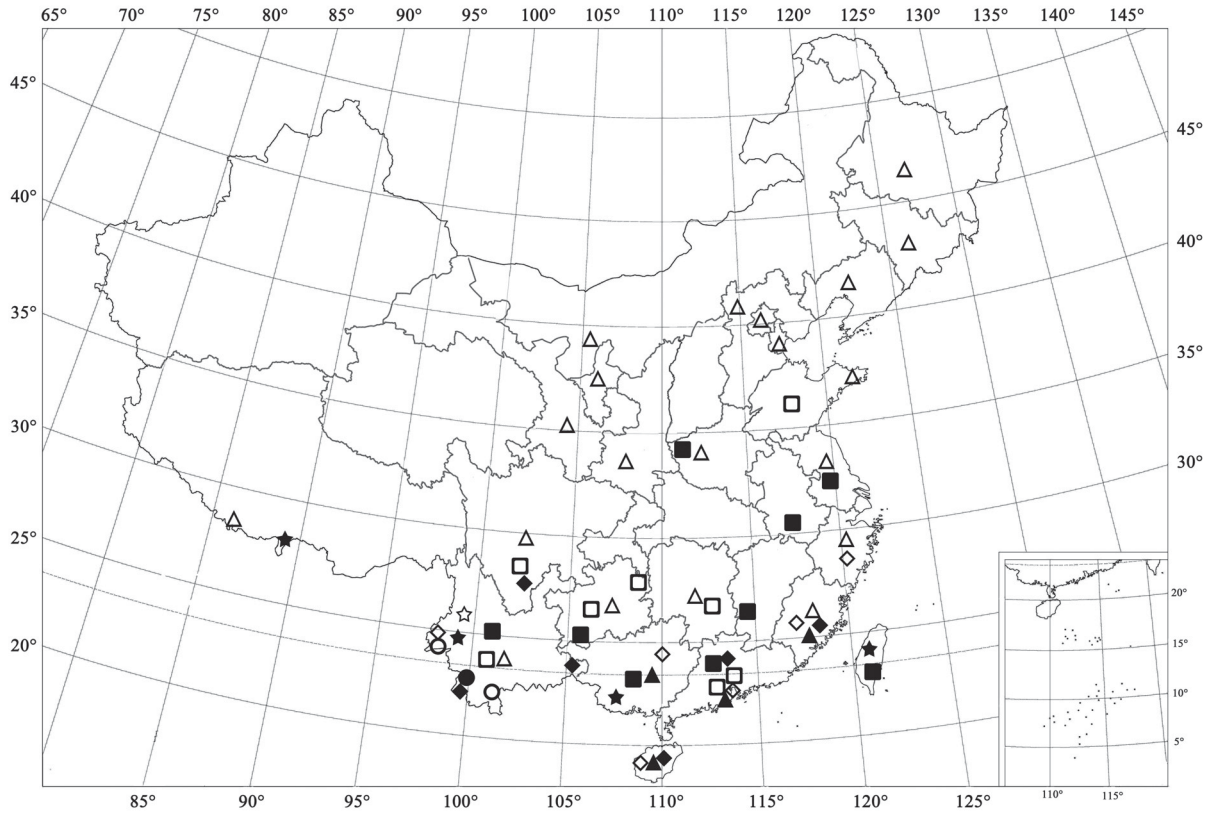

Fig. 21. Distribution map. (★) = *Chilocorus politus* Mulsant, 1850; (☆) = *C. yunlongensis* Cao & Xiao, 1984; (●) = *C. nigricaeruleus* Li & Wang sp. nov.; (○) = *C. nigrita* (Fabricius, 1798); (▲) = *C. melas* Weise, 1898; (△) = *C. rubidus* Hope, 1831; (■) = *C. chinensis* Miyatake, 1970; (□) = *C. rufitarsis* Motschulsky, 1853; (◆) = *C. hauseri* Weise, 1895; (◇) = *C. circumdatus* (Gyllenhal, 1808).

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C. chinensis Miyatake, 1970: 322. China.
C. circumdatus (Gyllenhal, 1808): 152. China, Indonesia, India, Sri Lanka. Introduced to Australia, America.
C. coelosimilis Kapur, 1967: 171. India.
C. cooki Casey, 1899: 165. Liberia.
C. crotchi Li & Ślipiński in Li *et al*., 2014: 598. Indonesia.
C. cruentatus Gorham, 1901: 413. Zimbabwe.
C. distigma (Klug, 1835): 49. Angola, Ethiopia.
C. dohrni Mulsant, 1850: 456. Guinea, Nigeria, Senegal, Zimbabwe.
C. elegans Mader, 1954: 75. Democratic Republic of the Congo.
C. esakii Kamiya, 1959: 102. Japan.
C. fraternus LeConte, 1860: 70. America.
C. geminus Zaslavskii, 1962: 398. China, Mongolia, Uzbekistan, Turkey, Central Asia.
C. gracilior Booth, 1998: 365. Indonesia.
C. haematocephalus Sicard, 1909: 92. Madagascar.
C. hauseri Weise, 1895a: 135. China, Burma, India, Myanmar.
C. hexacyclus Smith, 1959: 446. Canada.
C. hupehanus Miyatake, 1970: 329. China.
C. insularis Weise, 1906: 208. Madagascar.
C. ishigakensis Kamiya, 1959: 104. Japan.

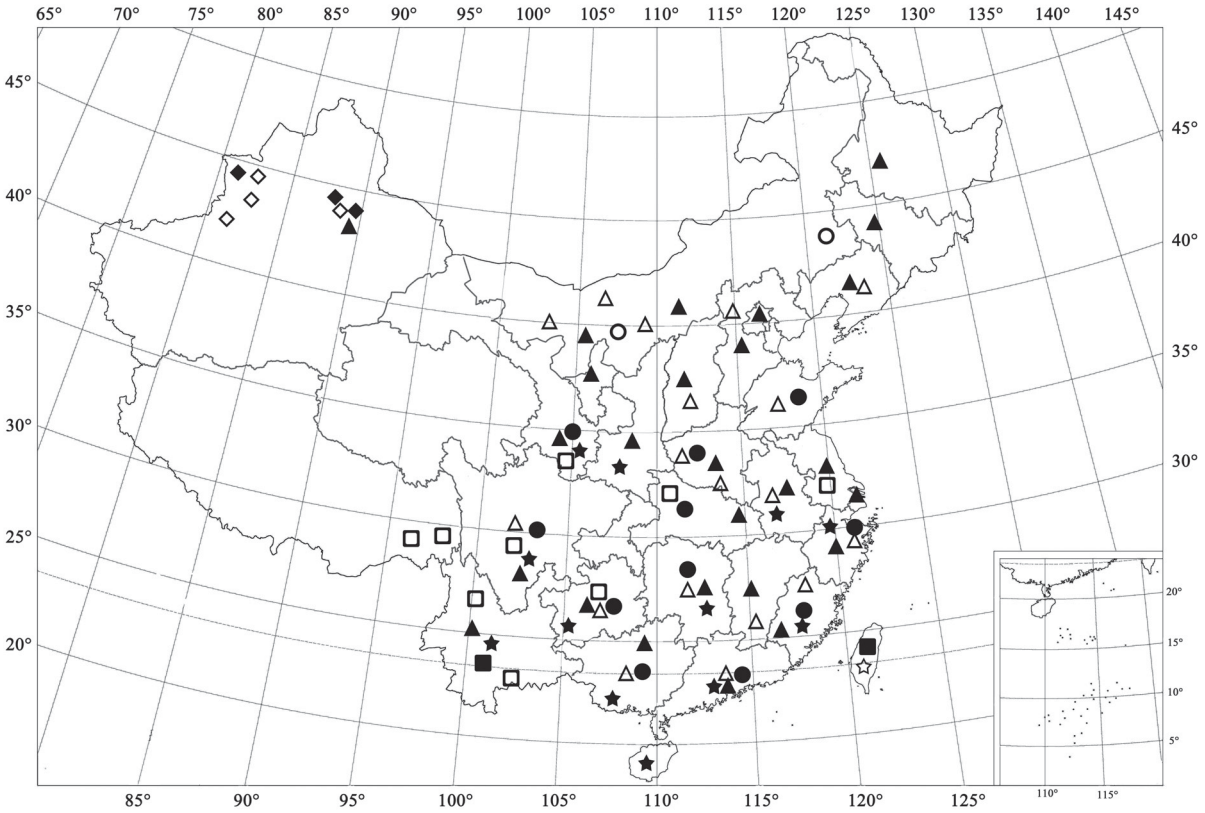

Fig. 22. Distribution map. (★) = *Chilocorus chalybeatus* Gorham, 1892; (☆) = *C. shirozui* Sasaji, 1968; (●) = *C. hupehanus* Miyatake, 1970; (○) = *C. strenotubus* Li & Wang sp. nov.; (▲) = *C. kuwanae* Silvestri, 1909; (△) = *C. esakii* Kamiya, 1959; (■) = *C. alishanus* Sasaji, 1968; (□) = *C. bijugus* Mulsant, 1853; (◆) = *C. bipustulatus* (Linnaeus, 1758); (◇) = *C. geminus* Zaslavskij, 1962.

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C. kirgisicus Iablokoff-Khnzorian, 1976: 305. Palaearctic.
C. kuwanae Silvestri, 1909: 126. China, Japan, North Korea, Italy. Introduced to America.
C. malasiae Crotch, 1874: 187. Australia, New Guinea.
C. maculatus Ślipiński & Giorgi, 2006: 270. Australia.
C. marshalli Gorham, 1901: 414. Angola, Zimbabwe.
C. matsumurai Miyatake, 1985: 13. Nepal.
C. melanophthalmus Mulsant, 1850: 455. Indonesia (Java).
C. melas Weise, 1898b: 229. China, Burma, Thailand, Laos, India, Nepal, Bhutan, Indonesia.
C. metallescens Sicard, 1909: 94. Madagascar.
C. micrus Ślipiński & Giorgi, 2006: 272. Melville Island (Australia).
C. midas Klug, 1833: 214. Madagascar.
C. nigricaeruleus Li & Wang sp. nov. China.
C. nigripes Mader, 1954: 73. Tanzania.
C. nigrita (Fabricius, 1798): 79. China, Far East, Indian subcontinent, Oriental region, Australian region, America, Brazil, Africa.
C. orbus Casey, 1899: 105. America.
C. pilosus Sicard, 1920: 212. São Tomé and Príncipe.
C. platycephalus Mulsant, 1850: 464. Cuba.
C. politus Mulsant, 1850: 455. China, Thailand, Laos, India, Nepal, Bhutan, Indonesia.
C. quadriguttatus Weise, 1888: 93. South Africa.
C. quadrimaculatus Weise, 1910: 45. East Africa.
C. reinecki Weise, 1905: 140. South Africa.
C. renipustulatus (Scriba, 1791): 105. Europe.
C. rubidus Hope, 1831: 31. China, Mongolia, Korea, Japan, India, Nepal, Indonesia, Siberia.
C. rubrocinctus Sicard, 1909: 93. Madagascar.
C. rufitarsis Motschulsky, 1853: 50. China, Vietnam.
C. rufithorax Mader, 1954: 78. Democratic Republic of the Congo.
C. schioedtei Mulsant, 1850: 456. Guinea, Sierra Leone, Uganda.
C. semiaeneus Weise, 1891: 284. Tsibodas ('Tzibodes' in Weise 1891, perhaps Cibodas in Indonesia)
C. seminulum Weise, 1910: 46. Kisar Island (Indonesia).
C. sexguttatus Weise, 1912: 115. Angola, Democratic Republic of the Congo, Tanzania.
C. shirozui Sasaji, 1968 a: 22. China.
C. silvestrii Weise, 1913: 221. Democratic Republic of the Congo, Guinea.
C. similis Rossi, 1790: 68. Italy.
C. simoni Sicard, 1907b: 413. South Africa.
C. solitus Wiese, 1899: 62. Mozambique.
C. stigma (Say, 1835): 202. America. Introduced to Hawaii, Australia, Chile, Italy, Mauritania.
C. stillatus Sicard, 1912: 411. Democratic Republic of the Congo.
C. strenotubus Li & Wang sp. nov. China.
C. subaenescens Weise, 1898b: 227. Tanzania.
C. subindicus Booth, 1998: 365. India, Maldives, Sri Lanka.
C. sublineatus Crotch, 1874: 187. Indonesia.
C. takara Nakane & Araki, 1959: 52. Japan.
C. tibialis Weise, 1897: 300. Tanzania.
C. tricyclus Smith, 1959: 446. America.
C. trimaculatus Crotch, 1874: 187. Indonesia.
C. tumidus Leng, 1908: 37. America.
C. wahlbergi Mulsant, 1850: 462. Democratic Republic of the Congo, South Africa, Tanzania, Zanzibar.
C. wallacii Crotch, 1874: 187. Indonesia.
C. yunlongensis Cao & Xiao, 1984: 117. China.

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Discussion

The morphological characters of the genus *Chilocorus* are relatively heterogeneous at species level. Chapin (1965) and Miyatake (1970) thought that it should be further subdivided. However, four genera in Chilocorini, *Phaenochilus* Weise, 1895 distributed in Oriental region, *Simmondsius* Ahmad & Ghani,1966 distributed in Pakistan, *Anisorcus* Crotch, 1874 distributed in Australian region and *Egius* Mulsant, 1850 distributed in Cuba, are very similar to *Chilocorus* in morphological characters. A more detailed analysis of the phylogeny of the genera of Chilocorini is needed to reveal the relationships between the five groups and determine whether *Chilocorus* is a natural group.

Acknowledgements

We are particularly grateful to Wioletta Tomaszewska (Museum and Institute of Zoology PAS, Warsaw, Poland) and Michael Geiser (Natural History Museum, London, UK) for their kind help during Wenjing Li's visit to the museums. We are grateful to Shaukat Ali (South China Agriculture University, Guangzhou, China) for checking a draft of this paper. This research was supported by the National Natural Science Foundation of China (31501884), Science and Technology Partnership Program, Ministry of Science and Technology of China (KY201402014) and Science and Technology Program of Guangzhou, China (201509010023).

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Manuscript received: 28 October 2017
Manuscript accepted: 11 June 2018
Published on: 23 October 2018
Topic editor: Gavin Broad
Section editor: Max Barclay
Desk editor: Kristiaan Hoedemakers

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Zeitschrift/Journal: European Journal of Taxonomy

Jahr/Year: 2018

Band/Volume: 0469

Autor(en)/Author(s): Li Wenjing, Huo Lizhi, Wang Di, Ahrens Dirk, Wang Xingmin

Artikel/Article: Contribution to the genus Chilocorus Leach, 1815 (Coleoptera: Coccinellidae: Chilocorini), with descriptions of two new species from China 1-34