

New species, new synonymies and a new record of the genus *Cryptogonus* Mulsant, 1850 (Coleoptera, Coccinellidae) from China

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Abstract

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Three new species of the genus *Cryptogonus* Mulsant, 1850 from China are described and illustrated: *C. dulongjiangensis*, *C. fusiformis* and *C. reniformis* Huo and Ren. *Cryptogonus octoguttatus* Mader, 1954 and *C. kurosawai* Sasaji, 1968 are recognized as synonymous with *C. schraiki* Mader, 1933. *Cryptogonus hingstoni* Kapur, 1948 is newly recorded from China. A species list of the genus *Cryptogonus* is presented.

Key Words

Cryptogonus
new species
new synonymy
new record
China

Introduction

The genus *Cryptogonus* belongs to Aspidimerini (Coleoptera, Coccinellidae). The Aspidimerini species are widely distributed in South and Southeast Asia. They are natural enemies of coccidae, aphidae, aleyrodidae and have important application value in the control of insect pests.

The genus *Cryptogonus* was erected by Mulsant (1850) with *C. orbiculus* (Gyllenhal, 1808) as the type species by monotypy. Weise (1900) separated the genera *Cryptogonus* and *Aspidimerus* Mulsant, 1850 from Scymnini based on the structure of male genitalia and erected the tribe Aspidimerini with *Aspidimerus* Mulsant, 1850 as the type genus. Kapur (1948) revised the tribe Aspidimerini and proposed two new genera: *Pseudaspidimerus* Kapur and *Acarinus* Kapur, and subdivided the genus *Cryptogonus* into six species groups based on the shape of prosternal carinae. In Kapur's revision, 19 *Cryptogonus* species were included, and then during the past several decades

30 new species were attributed to this genus (Mader 1954, Sasaji 1968, Bielawski 1972, 1979, Ghorpade 1974, Pang and Mao 1979, Hoàng 1982, 1985, Cao and Xiao 1984, Canepari 1986, Kuznotsov and Pang Hong 1991, Xiao and Li 1992, Yu 1995, Pang 1998). Among those 30 new species, *C. nigrinus* Pang & Mao, 1979 and *C. montanus* Hoàng, 1985 were transferred to *Aspidimerus* Mulsant, 1850 and *Trigonocarinus* Huo & Ren, 2015, respectively (Kovář 2007, Huo et al. 2015).

During studies on Aspidimerini from the Oriental Region, the genus *Aspidimerus* from China and *Pseudaspidimerus* from Laos have been reviewed (Huo et al. 2013, 2014). In the present paper, three new species of the genus *Cryptogonus* Kapur, 1948 from China are described and illustrated. *Cryptogonus octoguttatus* Mader, 1954 and *C. kurosawai* Sasaji, 1968 are recognized as synonymous with *C. schraiki* Mader, 1933. *Cryptogonus hingstoni* Kapur, 1948 is newly recorded from China. A species list of the genus *Cryptogonus* is also presented.

Material and methods

All studied materials were deposited in the Department of Entomology, South China Agricultural University (SCAU). Type specimens designated in the current article were deposited in SCAU and the Institute of Zoology (IOZ), Chinese Academy of Science, Beijing.

Measurements were made using an ocular micrometer attached to a stereomicroscope (SteREO Discovery V20, Zeiss) as follows: (TL) total length, from apical margin of clypeus to apex of elytra; (TW) total width, across both elytra at widest part; (TH) total height, through the highest point of elytra to elytral outer margins; (HW) head width, including eyes; (PL) pronotal length, from middle of anterior margin to base of pronotum; (PW) pronotal width at widest part; (EL) elytral length, along suture, from apex to base including scutellum; (EW) elytral width, across both elytra at widest part; (ID) interocular distance, nearest distance between two eyes. Morphological terms follow Ślipiński (2007) and Ślipiński and Tomaszewska (2010) and are applied as in our previous studies on Chinese species of former Scymninae (e.g. Chen et al. 2013, Chen et al. 2014).

External morphology was observed with a stereomicroscope (SteREO Discovery V20, Zeiss). Male and female genitalia were dissected, cleared in 10% NaOH solution by boiling for several minutes and observed under a compound microscope, Olympus BX51. Images were photographed with digital cameras (AxioCam HRC and Coolsnap-Procf & CRI Micro*Color). The software AXIOVISION REL. 4.8 and IMAGE-PRO PLUS 5.1 were used to capture images from both cameras. Images were cleaned up and arranged in plates with ADOBE PHOTOSHOP CS5.

Taxonomy

Description of new species

Cryptogonus dulongjiangensis Huo & Ren, sp. n.

<http://zoobank.org/451E691D-0181-454D-AC81-58830AA25652>

Figure 1

Diagnosis. This species can be distinguished from other *Cryptogonus* species by its long penis, regularly narrowing to pointed apex, penis capsule with both branches very short (Fig. 1e).

Description. TL: 2.37–2.60 mm, TW: 1.86–2.11 mm, TH: 1.21–1.32 mm, TL/TW: 1.23–1.27; PL/PW: 0.51–0.53; EL/EW: 0.99–1.00, HW/PW: 0.61–0.63; PW/EW: 0.71–0.73. ID/HW: 0.49–0.53.

Body rounded, densely covered with short pubescence, golden on head and pronotum and silver white on elytra (Fig. 1a–c). Head yellow in male and black in female, clypeus dark brown. Pronotum black except a triangular yellow spot at anterior corner in male. Scutellum and elytra black. Ventral side black except legs and abdomen partially yellow to dark brown.

Punctures on frons coarse and dense, 0.3–0.5 diameters apart. Punctures on pronotum and elytra fine and sparse, 1–3 diameters apart. Punctures on metaventricle fine and sparse at middle, 5 diameters apart, coarse and dense on both sides, 0.2 diameters apart.

Male genitalia. Penis long, regularly narrowing to pointed apex (Fig. 1f), penis capsule with both branches very short (Fig. 1e). Tegminal strut as long as tegmen (Fig. 1h). Parameres 2 times length of phallobase with apices sparsely setose. Penis guide, in lateral view, gradually narrowing to pointed apex. In ventral view, subparallel at basal 2/3, narrowing to pointed apex (Fig. 1g).

Female genitalia. Coxites subtriangular (Fig. 1i), with dense, long terminal setae. Spermatheca missing.

Types. Holotype: 1 male, **CHINA: Yunnan Prov.:** Qinglandan, Maku Village, Dulongjiang, Gongshan County, 27°41.12'N, 98°16.35'E, ca 1260 m, 4–7.VIII.2010, Wang XM et al. leg. (SCAU). **Paratypes (2): CHINA: Yunnan Prov.:** 1 male, Maku Village, Dulongjiang, Gongshan County, 27°40.57'N, 98°18.15'E, ca 1600 m, 1.VIII.2010, Wang XM et al. leg.; 1 female, Bapo Village, Dulongjiang, Gongshan County, 27°44.08'N, 98°20.59'E, ca 1400 m, 28.VII.2010, Wang XM et al. leg. (SCAU).

Distribution. China (Yunnan).

Etymology. The specific epithet refers to the type locality, Dulongjiang, Yunnan.

Cryptogonus fusiformis Huo & Ren, sp. n.

<http://zoobank.org/BAD66DB0-5B95-4DF4-949E-EEA46932F585>

Figure 2

Diagnosis. This species can be distinguished from other *Cryptogonus* species by its fusiform penis guide in ventral view (Fig. 2f).

Description. TL: 2.68 mm, TW: 2.14 mm, TH: 1.36 mm, TL/TW: 1.25; PL/PW: 0.51; EL/EW: 1.00, HW/PW: 0.58; PW/EW: 0.72. ID/HW: 0.50.

Body rounded, densely covered with short, silver white pubescence (Fig. 2a–b). Base of head yellow, anterior part black and clypeus dark brown. Dorsum entirely black. Ventral side black except legs and abdomen partially reddish brown.

Punctures on frons dense and coarse, 0.5–1.0 diameters apart. Punctures on pronotum and elytra fine and sparse, 2–4 diameters apart. Punctures on metaventricle fine and sparse at middle, 5 diameters apart, coarse and dense on both sides, 0.3 diameters apart.

Male genitalia. Penis long with apex pointed. Penis capsule with longer outer branch and short inner one. Tegminal strut slightly longer than tegmen. Parameres 2 times length of phallobase with apex densely setose (Fig. 2g). Penis guide, in lateral view strongly curved as S-shape, equivalent to parameres, in ventral view gradually broadening toward midlength, narrowing to pointed apex (Fig. 2f).

Female genitalia. Unknown.

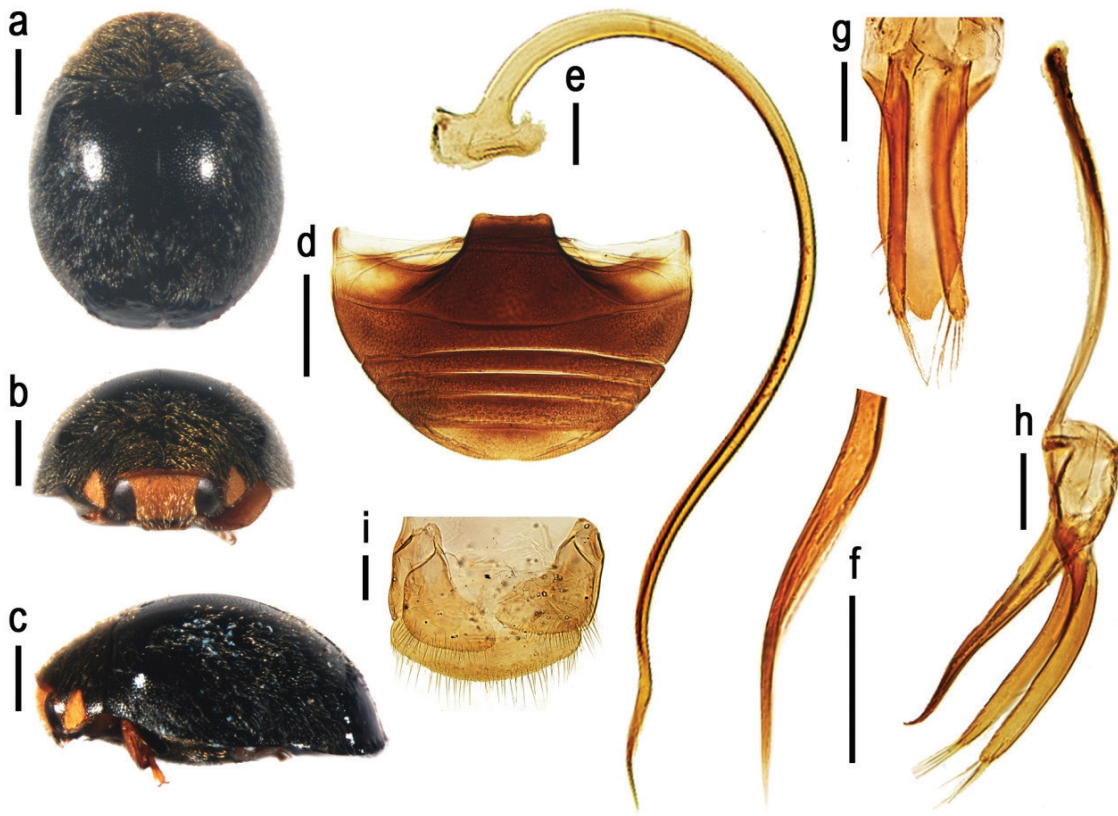


Figure 1. *Cryptogonus dulongjiangensis* Huo et Ren, sp. n. (a) dorsal view; (b) frontal view; (c) lateral view; (d) abdomen, male; (e) penis; (f) apex of penis; (g) ventral view of tegmen; (h) lateral view of tegmen; (i) coxites. Scale bars: a–d, 0.5 mm; e–h, 0.1 mm.

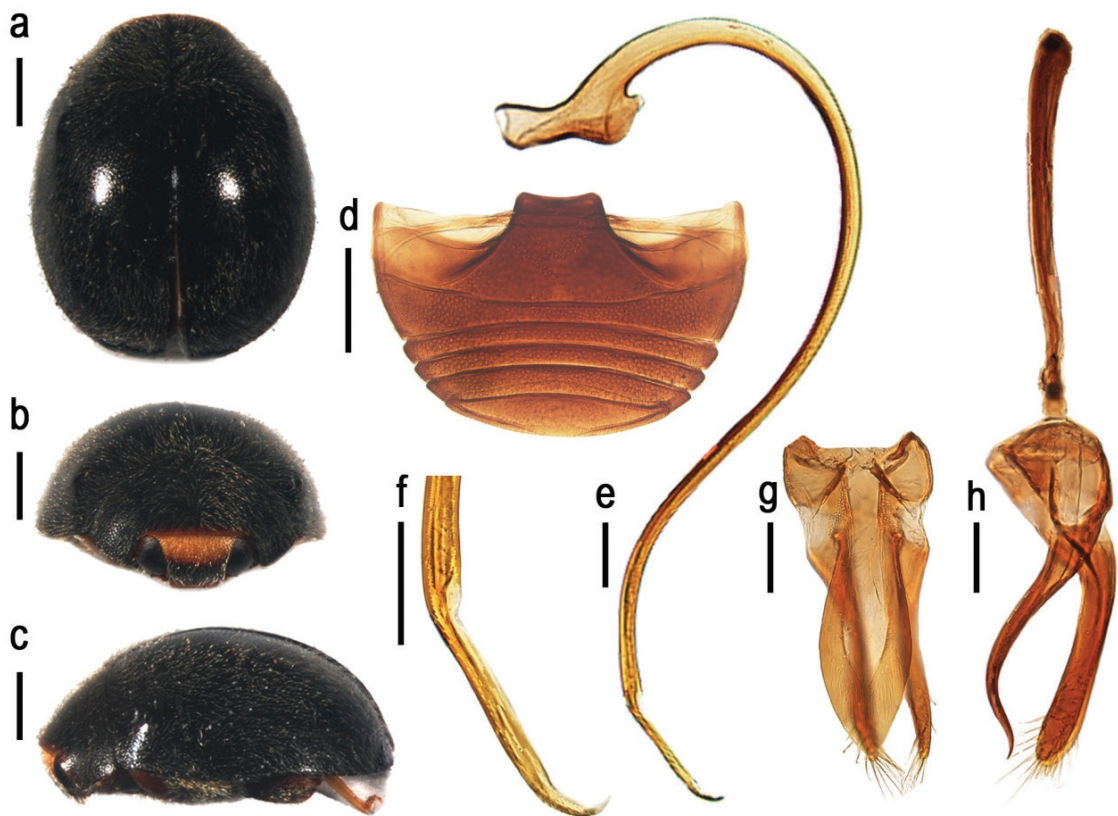


Figure 2. *Cryptogonus fusiformis* Huo et Ren, sp. n. (a) dorsal view; (b) frontal view; (c) lateral view; (d) abdomen, male; (e) penis; (f) apex of penis; (g) ventral view of tegmen; (h) lateral view of tegmen. Scale bars: a–d, 0.5 mm; e–g, 0.1 mm.

Types. Holotype: 1 male, **CHINA: Yunnan Prov.:** Mengdai Town, Zhenkang County, 23°54.16'N, 98°54.02'E, ca 1400 m, 18.V.2008, Wang XM et al. leg. (SCAU).

Distribution. China (Yunnan).

Etymology. The specific epithet is a Latin adjective referring to its fusiform penis guide in ventral view.

Cryptogonus reniformis Huo & Ren, sp. n.

<http://zoobank.org/DE7458AF-F2EE-4020-88E0-37465A5B1E96>

Figure 3

Diagnosis. This species can be easily identified by its reniform spot on elytra and trifurcate penis apex (Fig. 3a, h).

Description. TL: 1.90–2.40 mm, TW: 1.52–1.94 mm, TH: 1.00–1.27 mm, TL/TW: 1.24–1.25; PL/PW: 0.53–0.55; EL/EW: 0.96–1.01, HW/PW: 0.61–0.64; PW/EW: 0.71–0.72. ID/HW: 0.49–0.52.

Body rounded, densely covered with short, silver white pubescence (Fig. 3a–c). Head yellowish in male and black in female, clypeus dark brown. Pronotum black except a triangular yellowish spot at anterior corner in male. Scutellum black. Elytra black with a reniform spot at middle (Fig. 3a). Underside black except legs partially yellowish.

Punctures on frons coarse and dense, 0.5–1.5 diameters apart. Punctures on pronotum and elytra fine and sparse, 2–4 diameters apart. Punctures on metaventrite fine and sparse at middle, 8 diameters apart, coarse and dense on both sides, 0.5 diameters apart.

Male genitalia. Penis long with apex trifurcate (Fig. 3h). Penis capsule with outer branch bigger than inner one, anterior margin deeply concave (Fig. 3g). Tegminal strut as long as tegmen. Parameres 2 times length of phallobase with apex sparsely setose (Fig. 3j). Penis guide, in lateral view gradually narrowing to pointed apex, a little longer than parameres, in ventral view 3 times as long as wide, slightly broadening to apical 1/3, gradually narrowing to rounded apex (Fig. 3i).

Female genitalia. Coxites reniform with a small projection on the apical end (Fig. 3e). Spermatheca short and strongly arcuate without ramus (Fig. 3f).

Types. Holotype: 1 male, **CHINA: Yunnan Prov.:** Qinglandan, Maku Village, Dulongjiang, Gongshan County, 27°41.12'N, 98°16.35'E, ca 1260 m, 4–7.VIII.2010, Wang XM et al. leg. (SCAU). **Paratypes (38): CHINA: Yunnan Prov.:** 6 males, 14 females (2 males and 2 females in IOZ, 4 males and 12 females in SCAU), with the same data as holotype; 1 male, Kongdang Village, Dulongjiang, Gongshan County, 27°52.18'N, 98°20.24'E, ca 1600 m, 27.VII.2010, Wang XM et al. leg. (SCAU); 4 males, Bapo Village, Dulongjiang, Gongshan County, 27°44.09'N, 98°21.02'E, ca 1400 m, 28.VII.2010, Wang XM et al. leg. (SCAU); 3 males, 3 females, Bapo Village–Maku Village, Dulongjiang, Gongshan County, 27°42.49'N, 98°20.18'E, ca 1450 m, 29.VII.2010, Wang XM et al. leg. (SCAU); 4 males, 1

female, Maku Village, Dulongjiang, Gongshan County, 27°40.57'N, 98°18.15'E, ca 1600 m, 1.VIII.2010, Wang XM et al. leg. (SCAU); **Tibet:** 2 females, Beibeng Village, Motuo County, ca 850 m, 4.X.2011, Huo LZ et al. leg. (SCAU).

Distribution. China (Tibet, Yunnan).

Etymology. The specific epithet is a Latin adjective referring to its reniform spot on elytra.

New synonymies and new record

Cryptogonus schraiki Mader, 1933

Figures 4, 5

Cryptogonus schraiki Mader, 1933: 80; Kapur 1948: 101; Pang and Mao 1979: 69; Kovář 2007: 576; Ren et al. 2009: 120.

Cryptogonus octoguttatus Mader, 1954: 129; Pang and Mao 1979: 68; Kovář 2007: 576; Ren et al. 2009: 118.

Syn. n.

Cryptogonus kurosawai Sasaji, 1968: 11; Yu 1995: 140, 2011: 161; Kovář 2007: 576. **Syn. n.**

Remarks. Leopold Mader described *C. schraiki* Mader, 1933 from Sichuan, China with a brief description of elytral coloration (Fig. 4a–i). Kapur (1948) reviewed this species and illustrated its appearance. Later, Mader described *C. octoguttatus* Mader, 1954 also from Sichuan, China, only with description of elytral coloration. Sasaji (1968) described *C. kurosawai* Sasaji, 1968 from Taiwan, China. Photographs of the holotype were available on the website of The Digital Museum of Natural & Science. Pang and Mao (1979) reviewed *C. schraiki* and *C. octoguttatus* and illustrated their appearance and male genitalia, but didn't notice the similarities of these two species. We examined these three species from China and found that they are just the same species with different elytral coloration. The elytral coloration is variable, from entirely black to entirely yellowish (Fig. 5a–l). Besides, we found the male genitalia of specimens are slightly different, even in the same coloration. Sometimes penis guide equal to, slightly longer or shorter than parameres. They are considered as individual differences.

Material examined. 205 specimens from China were examined (see the details in supplementary material).

Distribution. China (Anhui, Fujian, Gansu, Guangdong, Guizhou, Hubei, Hunan, Sichuan, Taiwan, Yunnan).

Cryptogonus hingstoni Kapur, 1948

Figure 6

Cryptogonus hingstoni Kapur, 1948: 103; Kapur 1963: 24; Kovář 2007: 575.

Remarks. Kapur (1948) described this species from Sikkim, India. Two specimens from Tibet, China match the description except coloration variation on elytra. In the



Figure 3. *Cryptogonus reniformis* Huo & Ren, sp. n. (a) dorsal view; (b) frontal view; (c) lateral view; (d) abdomen, male; (e) coxites; (f) spermatheca; (g) penis; (h) apex of penis; (i) ventral view of tegmen; (j) lateral view of tegmen. Scale bars: a–d, 0.5 mm; e, g–j, 0.1 mm; f, 0.05 mm.

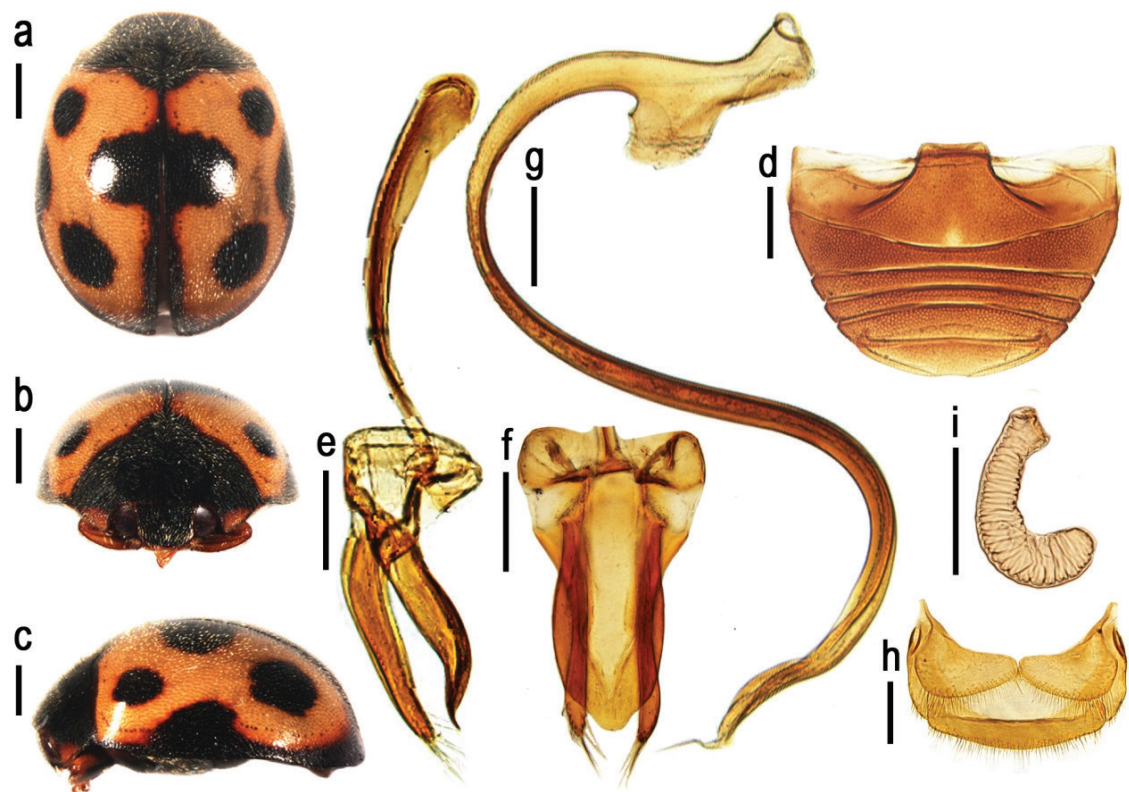


Figure 4. *Cryptogonus schraiki* Mader, 1933. (a) dorsal view; (b) frontal view; (c) lateral view; (d) abdomen, male; (e) lateral view of tegmen; (f) ventral view of tegmen; (g) penis; (h) coxites; (i) spermatheca. Scale bars: a–d, 0.5 mm; e–h, 0.2 mm; i, 0.1 mm.

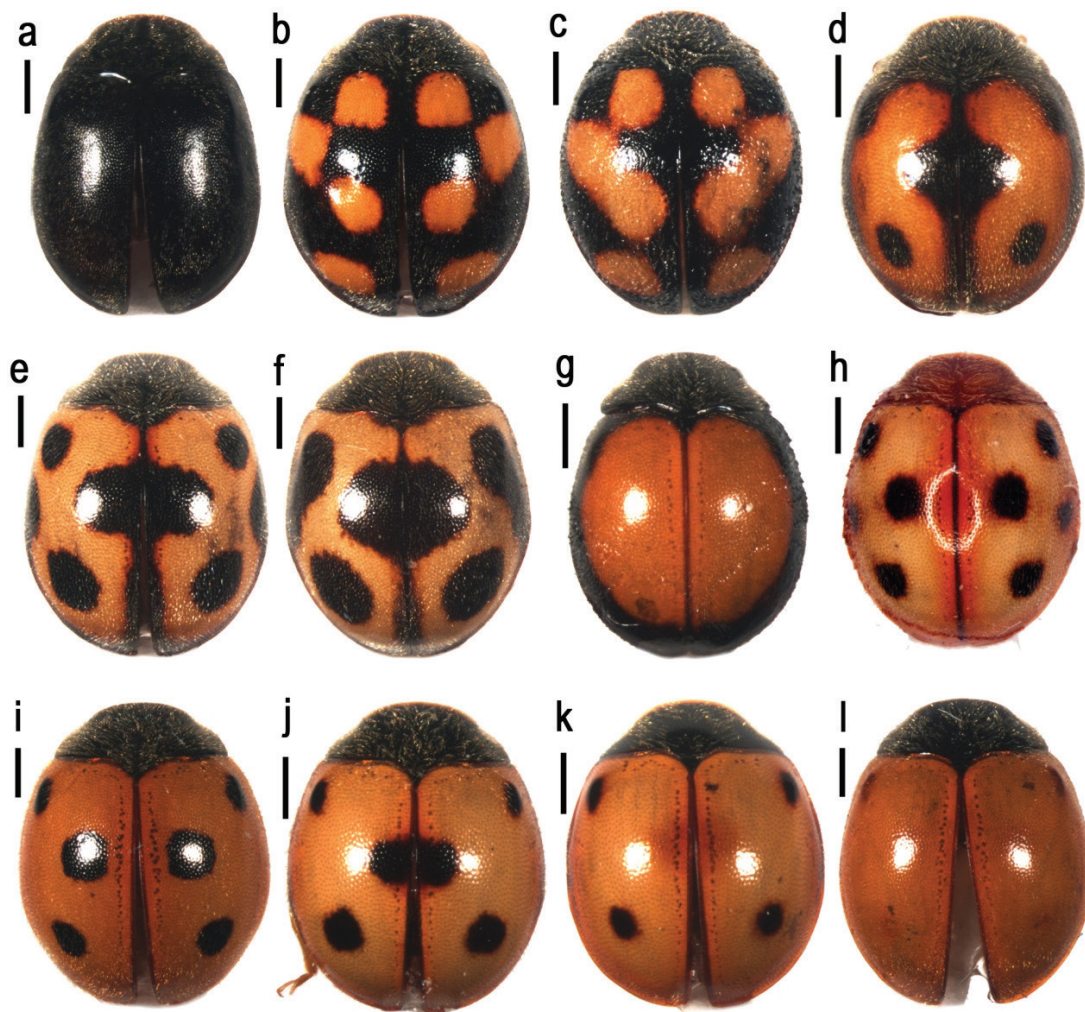


Figure 5. Different elytral coloration of *Cryptogonus schraiki* Mader, 1933. Scale bars: a–l, 0.5 mm.

original description, the spots on sutural and middle part of the elytron distinctly larger than that on humeral callus, the spot on pronotum is oval. However, in the present specimens we examined, the spots on sutural and middle part are as large as that on humeral callus, the spot on pronotum is triangular (Fig. 6a–c).

Material examined. CHINA: Tibet: 1 male, Bangxin Village, Motuo County, 29°34.58'N, 95°23.60'E, ca 1840 m, 12.X.2011, Huo LZ et al. leg; 1 female, Beibeng Village–Hanmi Village, Motuo County, 29°14.31'N, 95°10.58'E, ca 800–2100 m, 5–8.X.2011, Huo LZ et al. leg.

Distribution. China (Tibet) **new distribution**, India (Sikkim).

List of the genus *Cryptogonus* Mulsant

1. *Cryptogonus angusticarinatus* Sasaji, 1968
2. *Cryptogonus ariasi* (Mulsant, 1853)
3. *Cryptogonus bilineatus* Kapur, 1948
4. *Cryptogonus bimaculatus* Kapur, 1948
5. *Cryptogonus brachylobius* Pang, 1998
6. *Cryptogonus bryanti* Kapur, 1948
7. *Cryptogonus complexus* Kapur, 1948
8. *Cryptogonus deltodirus* Kapur, 1948
9. *Cryptogonus deltooides* Kapur, 1948
10. *Cryptogonus downingi* Kapur, 1948
11. *Cryptogonus dulongjiangensis* Huo & Ren, **sp. n.**
12. *Cryptogonus forficulae* Cao & Xiao, 1984
13. *Cryptogonus fractemaculatus* Pang, 1998
14. *Cryptogonus fulvoterminatus* Boheman, 1858
15. *Cryptogonus fusiformis* Huo & Ren, **sp. n.**
16. *Cryptogonus guangdongensis* Pang & Mao, 1979
17. *Cryptogonus hainanensis* Pang & Mao, 1979
18. *Cryptogonus hanoiensi* Hoàng, 1982
19. *Cryptogonus himalayensis* Kapur, 1948
20. *Cryptogonus hingstoni* Kapur, 1948
21. *Cryptogonus horishanus* (Ohta, 1929)
22. *Cryptogonus kapuri* Ghorpade, 1974: 55
23. *Cryptogonus laetus* (Weise, 1885)
24. *Cryptogonus langchanhensis* Hoàng, 1982
25. *Cryptogonus lepidus* (Weise, 1885)
26. *Cryptogonus lijiangensis* Pang & Mao, 1979
27. *Cryptogonus linguilatus* Pang, 1998
28. *Cryptogonus lobulus* Xiao, 1992
29. *Cryptogonus loebli* Canepari, 1986: 27
30. *Cryptogonus nepalensis* Bielawski, 1972

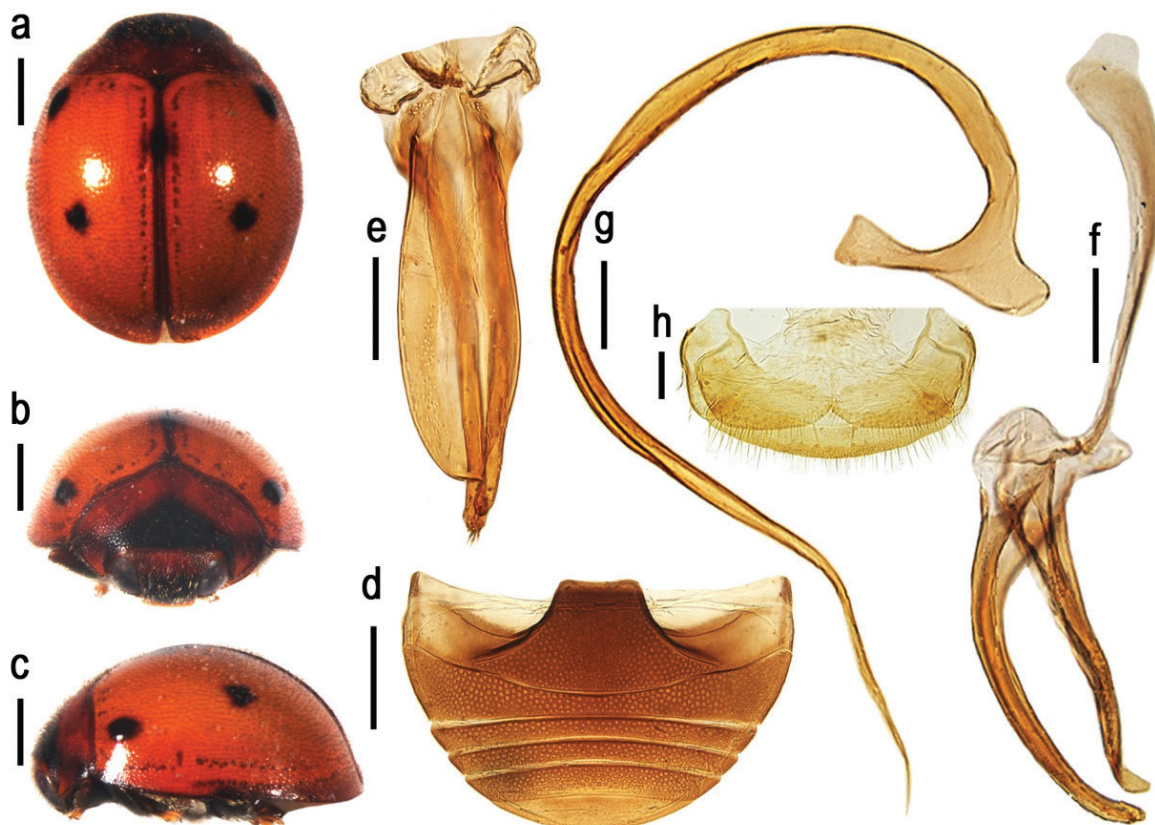


Figure 6. *Cryptogonus hingstoni* Kapur, 1948. (a) dorsal view; (b) frontal view; (c) lateral view; (d) abdomen, male; (e) ventral view of tegmen; (f) lateral view of tegmen; (g) penis; (h) coxites. Scale bars: a–d, 0.5 mm; e–h, 0.1 mm.

- Cryptogonus nepalensis bhutanensis* Bielawski, 1979
 31. *Cryptogonus nitidus* Kapur, 1948
 32. *Cryptogonus ocellatus* Hoàng, 1985
 33. *Cryptogonus ohtai* Sasaji, 1968
 34. *Cryptogonus orbiculus* (Gyllenhal, 1808)
 35. *Cryptogonus parorbiculus* Kuznotsov & Pang Hong, 1991
 36. *Cryptogonus polytrichus* Kuznotsov & Pang Hong, 1991
 37. *Cryptogonus postmedialis* Kapur, 1948: 95
 38. *Cryptogonus qianjiangensis* Xiao, 1992
 39. *Cryptogonus quadriguttatus* (Weise, 1895)
 40. *Cryptogonus reniformis* Huo & Ren, **sp. n.**
 41. *Cryptogonus robustus* Yu, 1995
 42. *Cryptogonus sagittiformis* Pang & Mao, 1979
 43. *Cryptogonus schraiki* Mader, 1933
 44. *Cryptogonus trifurcatus* Pang & Mao, 1979
 45. *Cryptogonus trioblitus* (Gorham, 1895)
 46. *Cryptogonus tristis* (Weise, 1910)
 47. *Cryptogonus wuzhishanus* Pang & Mao, 1979
 48. *Cryptogonus xiushanensis* Xiao, 1993
 49. *Cryptogonus yunnanensis* Cao & Xiao, 1984

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Supplementary material 1

Specimens examined of *Cryptogonus schraiki* Mader, 1933

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Data type: Specimens examined.

Explanation note: 205 specimens of *Cryptogonus schraiki* Mader, 1933 were examined in the present study.

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