Two new species of Chrysomelobia (Acari: Heterostigmata: Podapolipidae) parasitic on Gonioctena rubripennis Baly (Coleoptera: Chrysomelidae; Chrysomelinae) in Japan

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Two new species of *Chrysomelobia* (Acari: Heterostigmata: Podapolipidae) parasitic on *Gonioctena rubripennis* Baly (Coleoptera: Chrysomelidae; Chrysomelinae) in Japan

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**Abstract**

*Chrysomelobia matsuzawai* sp. nov. and *Chrysomelobia nipponica* sp. nov. (Acari: Podapolipidae) are described from *Gonioctena rubripennis* Baly (Coleoptera: Chrysomelidae) collected in Japan. This is the first record of the genus *Chrysomelobia* Regenfuss, 1968 in Asia. Adult females of the type species for *Chrysomelobia*, *Chrysomelobia mahunkai* Regenfuss, 1968, were recollected from female specimens infesting a *Gonioctena* sp. in Germany. An updated key to all species of *Chrysomelobia* is provided.

**Key words:** insect parasites, *Chrysomelobia*, key, Acari, Japan, Podapolipidae

**Introduction**

Mites in the family Podapolipidae are common parasites of a number of families of Coleoptera, and less commonly on Blattodea and Orthoptera (e.g., Regenfuss 1968; Husband 1990; Husband & O'Connor 2003). The family Podapolipidae is represented by one species each on Heteroptera (Kurosa & Husband 1994) and Hymenoptera (Husband & Sinha 1970) and has not been found on Diptera, Lepidoptera, Odonata or any aquatic insects. In most instances, each family of parasitized Coleoptera will have genera of Podapolipidae that are associated with that family only. A conspicuous exception is the genus *Podapolipus* Rovelli & Grassi, 1888 which is found on beetles in four families as well as on insects in the orders Blattodea and Orthoptera (e.g., Husband 1986). Previous reports of Podapolipidae on Chrysomelidae have been recorded as species in the genus *Chrysomelobia* Regenfuss, 1968 (*Parobia* Seeman & Nahrung, 2003) (Regenfuss 1968; Eickwort 1975; Drummond et al. 1984; Fain 1987; Haitlinger 1989; Houck 1992; Moraes et al. 1999; Husband & Moraes 1999; Seeman & Nahrung 2003, 2005, 2013; Husband & O'Connor 2004; Seeman 2008). The single record of a podapolipid mite that is not a *Chrysomelobia* but is a parasite of a chrysomelid beetle is *Cassidopohpus physonotae* Husband & O'Connor, 2014, a parasite of *Physyonota alutacea* Beheman (Husband & O'Connor 2014). Twenty-one species of *Chrysomelobia* have been reported from Australia (14), Africa (2), Europe (1), and the Americas (4) on leaf beetles belonging to the subfamily Chrysomelinae (Seeman & Nahrung 2013). The record of a single female specimen of *C. donati* Haitlinger, 1989 from a cercopid hemipteran is considered accidental. *Chrysomelobia nipponica* sp. nov. and *Chrysomelobia matsuzawai* sp. nov. are the first *Chrysomelobia* species described from Asia.

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Materials and methods

Examination of chrysomelid beetles representing primarily the subfamily Chrysomelinae, by Kazuyoshi Kurosa over a number of years, yielded mites belonging to the genus *Chrysomelobia* (Podapolipidae). Mites were removed from the abdominal tergites and under the elytra. Mites mounted on slides in Hoyer's mounting medium were placed on a heated drying tray for five days and ringed with red insulating varnish.

Measurements were taken with a Zeiss compound phase contrast microscope with a stage micrometer. Measurements are given in micrometers (µm). Alveolar vestiges of setae are designated as v. Microsetae, designated as m, are no longer than the diameter of their setal alveoli. Other terminology is based on Lindquist (1986).

The holotypes are deposited in the National Museum of Nature and Science, Tsukuba, 306-0005, Japan (NSMT). Paratypes of males, larvae and females are housed with the holotypes excepting some female, male and larval paratypes that are placed in the following museums: the A.J. Cook Arthropod Research Collection, Michigan State University, East Lansing, Michigan (CARC); The Acarology Laboratory, Museum of Biodiversity, The Ohio State University, Columbus, Ohio (OSAL); United States National Museum of Natural History, Washington, D.C. (NMNH) (mite collection housed in the USDA Systematic Entomology Laboratory, Beltsville, Maryland); Queensland Museum, South Brisbane, Australia (Q MBA); Tarbiat Modares University, Tehran, Iran (TMUI); University of Michigan Museum of Zoology, Ann Arbor, Michigan (UMMZ); Tyumen State University, Tyumen, Russia (TSUR) and Zoological Museum, University of Hamburg, Hamburg, Germany (ZMH).

Description of new species

*Chrysomelobia matsuzawai* Husband, Kurosa & Seeman sp. nov. (Figs. 1–5)

**Diagnosis.** All life stages. Tibia I with seta k, tarsus I with seven setae and one solenidion, setae tc' and tc" with blunt tips. Adult female: trachea shorter than setae v1, setae v1 slender, setae sc2 bulbous, setae c1 bulbous, setae c1 long, slender, setae e shorter than v1. Coxal setae la, 2a and 3b bulbous, apodemes I, II meeting sternal apodeme. Leg I with one claw. Femur II with minute setae d and conspicuous l'. Tibia IV with a pair of long setae, tarsus IV with a single long seta. Adult male: shield C, D, EF with 4 pairs of setae, c1, d, e minute, c1 developed, 5 long; setae c1 posterior to plane of setae c2. Plate C, D, EF with row of setae d slightly anterior to row of setae e. Genital capsule posterodorsal, shield C, D, EF with broadly concave posterior margin, setae ps, not evident; tibiae I, II, III with spine-like setae, femur II with minute setae d and longer l'; leg IV enlarged basally, convex lateral margin, about 2/3 length of leg III, tibia III setae v nearly 1/2 width of idiosoma, tibia IV setae v', v" shorter than seta d. Legs I, II, III with two claws. Three tarsus IV setae plus a curved claw. Larva: dorsal gnathosomal setae nearly 1/2 length of dorsal gnathosomal setae in adult females.

**Description.**

**Female** (Figs. 1, 2, n=18)


*Idiosoma.* Length 258–319, width 208–240, setae v1 24–30, positioned on narrowed anterolateral margin of prodorsal shield and immediately posterior to stigmata, v1 v. Setae sc2 bulbous, length 10–
Idiosomal plate lengths: PD 98, C 70, D 50–58, EF 45–52; widths PD 208, C 210–220, D 190, EF 103–123, setae c, bulbous, length 8–9, width 4–6, c₁ 90–127, d 7–8 (one 12), e 7–10, h₁ 15–25, h₁–h₁ 53–56. Cupule ia anterolateral to setae d, cupule im anterolateral to setae e. Stigmata at anterolateral margin of prodorsal shield. Trachea length 25–28, width 5, branching not evident. Distance between setae v₁–v₁ 70–82, sc₂–sc₂ 43–54, c₁–c₁ 86–93, c₁–c₂ 31–37, v₁–sc₁ 38–55, v₂–sc₁ 8–10. Venter with apodemes II meeting sternal apodeme. Coxal setae la bulbous 12 long, 7 wide; 2a bulbous, 10 long, 8 wide, 2b v, 3a 5–8, 3b bulbous, 10 long, 6 wide; 4b 6. Distance between setae la–la 41, 2a–2a 72, 3a–3a 82, 3b–3b 129.

FIGURES 1–2. *Chrysomelobia matsuzawai* Husband, Kurosa & Seeman sp. nov., adult female. 1. dorsal, 2. ventral.


*Male* (Figs. 3, 4, n=1)

*Gnathosoma.* Length 50, width 51. Cheliceral stylets 33, pharynx width 10, setae ch 9, su 6, su–su 19, palp length 15.

*Idiosoma.* Length 250, width 207, setae v₁ 2, v₂ m, setae sc₂ 3, c₁ m, c₂ 5, d m, distance between setae v₁–v₂ 32, v₂–v₃ 30, sc₂–sc₂ 66, c₁–c₁ 60, c₁–c₂ 41, d–d 32, e–e 78. Genital capsule posterodorsal, length 35, width 50, two internal lobes interpreted as setae ps₂ length10, aedeagus small. Venter with apodemes II almost reaching sternal apodeme. Coxal setae minute.
TABLE 1. Maximum measurements in micrometers (µm) for Chrysomelobia mahunkai (mah), C. nipponica sp. nov. (nip), C. matsuzawai sp. nov. (mat), C. gimlii (gim), C. pagurus (pag), C. orthagoriscus (ort), C. captivus (cap), C. alleni (all), C. lipsettae (lip). Males and larvae of C. mahunkai have not been reported.

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</table>
Chrysomelobia matsuzawai Husband, Kurosa & Seeman sp. nov., male. 3. dorsal, 4. ventral.

**Legs.** Femur I setae \(l' \ 6, \ v'' \ 8, \ d \) m, femur II setae \(l' \ 10, \ d \) m, no femora III, IV setae. No genua I, II, III, IV setae. Tibia I solenidion \(\phi \ 11\), slender adjacent seta \(k \ 10\). Tibia I setae \(v'\) spine-like, tibiae II, III setae \(l'\) spine-like \(10\), tibia I, II, III setae \(d \ 22, 18, 15\). Tarsi I setae \(pl' \ 15, \ tc' \ 23, \ tc'' \ 30, \ solenidion \(\omega \ 10\), setae \(pl'' \ 22, s \ 12, \ pv' \ 3, \ pv'' \ 8\). Tibia III setae \(v'' \ 140\). Ambulacra I, II, III with two stout claws. Setation for femur, genu, tibia, tarsus of legs I, II, III, IV: \(3-0-6(+1)-7(+1)\), \(2-0-4-5\), \(0-0-4-5\), \(0-0-3-3\). Thickness of fused femur and genu IV 33.

**Larval female** (Fig. 5, \(n=5\) exoskeletons containing adult females)

*Gnathosoma.* Length 43–52, width 37–48. Cheliceral stylets 45–53, pharynx width 8–10. Setae: \(ch \ 9, \ su \ 9, \ su-su \ 15\).

*Idiosoma.* Length 270–370, width 195–265, setae \(v_1 \ m, v_2 \ v, s_c \ 3, c_1 \ m, c_2 \ 3, h_1 \ 55\), distance setae \(v_1-v_2 \ 30, v_1-v_2 \ 40, s_c-s_c \ 63, v_1-s_c \ 20\). Distance between setae \(c_1-c_2 \ 32, h_1-h_1 \ 8\).

*Legs.* Femur I setae \(l' \ 5, \ v'' \ 6, \ d \) m, no genua I, II, III, IV setae. Tibia I solenidion \(\phi \ 6, \ k \ 2, \ v' \ 5, \ v'' \ 5, \ d \ 5\). Tarsus I setae \(tc' \ 12, \ tc'' \ 14, \ solenidion \(\omega \ 5, \ setae \(pl'' \ 6\). Femur II setae \(l' \ 6, \ d \ 3\). Tibia II setae \(v'' \ 26\), tibia III setae \(v'' \ 70\). Ambulacra I, II, III with two stout claws.

**Etymology.** The species is named for Dr. Haruo Matsuzawa, specialist in Chrysomelidae, who provided many potential host beetles that yielded *Chrysomelobia* mites for this study. The species name is a noun in the genitive case.

**Type material.** All specimens from *Gonioctena rubripennis* Baly (Coleoptera: Chrysomelidae). *Holotype:* adult female (Kurosa Collection No. 3321–3(3/7), Shiromana, Okutama, Tokyo, Japan, 3 May 1980, coll. K. Kurosa, deposited with the type host in the National Museum of Nature and Science, Tsukuba, Japan (NSMT). *Paratypes:* 5 females, 1 male, same data as holotype (KCN 3321-1 to 3321-8); 3 females, Mineoka, Kamagawa City, Chiba Pref., Japan, 4 June 1978, coll. J. Okuma; 2 females (1 slide), Mt. Odamiyama, Oda-cho, Ehime Pref., Japan, coll. E. Yamamoto; 5 females inside of exoskeletons of larval females, Kamafuga Dam, Miyaga Pref., Japan, 27 April 1995, coll. unknown; 2 females, Bizen-shi, Okayama Pref., Japan, 7–9 1989, coll. unknown. One female paratype each is deposited at CARC, OSAL, NMNH, QMBA, TMUI, TNAU, UMMZ.
and ZMH. The balance of paratypes is deposited with the holotype (NSMT). The balance of type hosts is deposited in UMMZ.

FIGURE 5. Chrysomelobia matsuzawai Husband, Kurosa & Seeman sp. nov., larval female, dorsal, proterosoma.

Differential diagnosis. The new species appears closely related to C. gimlii (Seeman & Nahrung, 2005), but differs by having females with the alveolar vestige of seta v₂ situated close to seta sc₂ and setae tc’–tc” on tarsus I eupathidial (alveolar vestige of seta v₁ midway between setae v₁ and sc₁ and setae tc’–tc” with tapering tips in C. gimlii); and by having males without alveolar vestiges of setae sc₁ and lacking extremely long setae on tibia III (alveolar vestiges of setae sc₁ present and tarsus III with a very long attenuate seta in C. gimlii).

Remarks. The six species of Chrysomelobia from the Western Hemisphere (4 spp.) and Africa (2 spp.) all have setae on genua I–II, and of those six species, only C. donati lacks setae on genu III. These setal losses place C. matsuzawai sp. nov. within the radiation of 14 Australian species, plus the European species C. mahunkai Regenfuss 1968, that all lack setae on genua I–III. The distinctive bulbous setae present in several species of Chrysomelobia are expressed variously and help define species groups, as indicated in Seeman (2008). The bulbous setae in C. matsuzawai sp. nov. are sc₂, c₁, la, 2a and 3b, which is the same as mites in the gimlii species group (C. gimlii, C. orthagoriscus Seeman, 2008, C. pagurus Seeman, 2008). Thus, C. matsuzawai sp. nov. is similar to these species, but differs from the other species of the gimlii species group in the following features. In female C. matsuzawai sp. nov., the vestige of seta v₁ is situated close to seta sc₂ and setae tc’–tc” on tarsus I are eupathidial, i.e., blunt-tipped. In species of the gimlii species group, seta v₂ is in a more typical position midway between setae v₁ and sc₂ and setae tc’–tc” are not eupathidial, having tapering tips. Chrysomelobia matsuzawai sp. nov. also differs from all other Australian species, excepting C. lipsettae Seeman, 2008, by having broad tracheae (width 5). The thin trachea that do not anastomose may be a synapomorphy for species of Chrysomelobia that infest eucalypt-feeding Paropsini; the host of C. lipsettae feeds on Acacia (Fabaceae), and C. lipsettae was hypothesized by Seeman (2008) to be a species intermediate between the Australian (+C. mahunkai) and the American and African species of Chrysomelobia.
Chrysomelobia nipponica Husband, Kurosa & Seeman sp. nov.
(Figs. 6–10)

Diagnosis. All life stages. Tibia I with seta k, tarsus I with seven setae and one solenidion, setae tc’ and tc” with slender tips. Adult female: tracheae broad and long, Anastomosing distally, setae c1, c2, long, setae e as long as setae v1. Coxal setae la, 4a slender, 2a and 3b bulbous, femora I, II with seta l’ and minute setae d. Tibia IV with a pair of long setae, tarsus IV with a single long seta. Adult male: setae v2, d, e minute, setae sc2, c1, c2 short, two times diameter of setal acetabulum. Genital capsule posterodorsal, wider than long, setae h1, h2 minute, setae ps1 minute, setae ps2 internal, lobular. Femur I setae l’ 10, d m, v’ 10, femur II setae l’ 4, d m. Tibiae I, II, III without spine-like setae. Tibia III setae l’ shorter than tibia III setae d. Legs I, II, III with two claws. Larva: gnathosomal setae su near 1/2 length setae ch. Setae v1, v2, c1 minute, setae c2, sc2 short, two times diameter of setal acetabulum.

Description

Female (Figs. 6, 7, n=16)


Male (Figs. 8, 9, n=1)

Gnathosoma. Length 50, width 60. Cheliceral styles 41, pharynx width 10, setae ch 19, su 7, distance su–su 21, palp length 12.

Idiosoma. Length 300, width 60, setae v1 m, v2 m, sc2 4, c1 3, c2 10, d, e, f. Distance between setae v1–v2 32, v1–sc2 49, sc2–sc2 75, c1–c1 33, c2–c2 114, c1–c2 114 d–d 18, e–e 63. Genital capsule posterodorsal, length 35, width 50.


Larval female (Figure 10, n=1, exoskeleton very pale)

**Idiosoma.** Length 300, width 230. Setae v1 m, v2 m, sc2 4, c1 m, c2 4, h1 m. Distance v1–v1 29, v2–v2 34, v2–sc2 25, sc2–sc2 58, c1–c2 20.

**FIGURES 6–7.** Chrysomelobia nipponica Husband, Kurosa & Seeman sp. nov., adult female, 6. dorsal, 7. ventral.

**Legs.** Femur I seta l' 4, d m, v'' 10. Tibia I l' m, d 28, φ 10, k 8, v' 12, l'' m. Tarsus I tc'' 22, tc' 16, pl' 9, pv' 4, s 5, pv'' 5, pl'' 8. Femur II seta l' 5, d m, Tibia II l' 3, d 7, v' 8, v'' 14. Tarsus II tc'' 23, pl'' 8, pv'' 4. Tibia III l' 2, v' 12, v'' 17. Tarsus III pl' 10, pl'' 20, tc' 12, u' 5, pv'' 3. Setation for femur, genu, tibia, tarsus I, II, III: 3-0-6(+1)-7(+1), 2-0-4-5, 0-0-4-5.

**Etymology.** The specific name nipponica is an adjective derived from the country of origin, Japan (Nippon).

**Type material.** All specimens from Gonioctena rubripennis Baly (Coleoptera: Chrysomelidae).


**Paratypes:** 1 male, 12 females, 1 larva, same data as holotype; 2 females, Hongo-Cho, Aizu-Wakamatsu, Fukushima Pref., Japan, 26–27 V 1999, coll. unknown; 1 male, Minakami-machi, Gunma Pref., Japan, 1 IV 1999, coll. unknown; 1 female, Fujikawachi, Umemachi, Saiki-shi, Oita Pref., Japan, 3 VI 2012, coll. S. Sasaki; 1 female, Nano-shi, Yamagata Pref. Japan, 23 VI 1999, coll. unknown. 1 female paratype is deposited at each of the following CARC, OSAL, NMNH, QMBA, TMUI, TNAU, TSUR, UMMZ, ZMH. Balance of paratypes is deposited with the holotype (NSMT). Balance of type hosts deposited in UMMZ.

**Differential diagnosis.** The new species appears closely related to *C. mahunkai*, but differs by having females with one ambulacr al claw (two in all other *Chrysomelobia*) and seta d on femur II (absent in *C. nipponica* sp. nov.).

Remarks. The host genus for both new species, *Gonioctena* (Coleoptera: Chrysomelidae), is also a host for the type species of *Chrysomelobia*. *C. mahunkai*. New adult female specimens of *C. mahunkai* were collected from an unspecified locality in Germany from *Gonioctena* sp. and the holotype female was also examined. An illustration of the holotype female loaned by Dr. Hieronymus Dastych of the University of Hamburg, Germany is provided (Fig. 11). Previously, the species was recorded from a single female collected from Tansey beetle *Chrysolina graminis* (L., 1758) (= *Chrysomela graminis*). Of the two new species, *C. matsuzawai* sp. nov. is not closely related to *C. mahunkai*, but in contrast, *C. nipponica* sp. nov. shares several similar character states with *C. mahunkai*. These similarities are the bulbous coxal setae *2b* and *3b*, dorsal setae and seta *la* unmodified, the female tibia IV with two setae and tarsus IV with one terminal seta, and the broad trachea that Anastomose distally. With the exception of the last character state, these states are also shared with some Australian species, particularly the *husbandi* species group. Female *C. mahunkai* and *C. nipponica* sp. nov. are distinct from the *husbandi* species group by having well-developed setae *la* (they are minute in the *husbandi* species group). Male *C. nipponica* sp. nov. differ from the *husbandi* species group by their large leg IV that bears a terminal claw (leg IV is diminutive and lacks a claw in the *husbandi* species group). Female *C. nipponica* sp. nov. are distinguished from *C. mahunkai* by the presence of two ambulacral claws on leg I in *C. mahunkai* (one in all other *Chrysomelobia*) and the presence of seta *d* on femur II in *C. nipponica* sp. nov. (absent in *C. mahunkai*). The male and larval stages for *C. mahunkai* remain unknown, so cannot be compared with *C. nipponica* sp. nov., but we anticipate males and larvae of *C. matsuzawai* sp. nov. and *C. nipponica* to be similar. The divided plate C in the larva is absent in all Australian species but is present in *C. eickworti* Husband & O'Connor, 2004, *C. labidomerae* Eickwort, 1975 and *C. peraviensis* Husband and Moraes, 1999 and may be present in *C. nipponica* sp. nov.

Key to species of *Chrysomelobia*

1. Female & male: at least 1 seta on genua I, II and IV and femur IV ........................................ 2
   – Female & male: setae absent on genua I–IV and femur IV ............................................. 7
2(1). Female: genu I with 3 setae; femur II with 1 seta; femur III without setae … *C. donati* Haytlinger
   – Female & male: genu I with 4 setae; femur II with 3 setae; femur III with 2 setae ……… 3
3(2). Female: coxal seta *4b* absent. Male: tarsus I without setae *f*’ and *f”* …………… *C. elytrosopherae* Fain
   – Female: coxal seta *4b* present. Male: tarsus I with at least 1 *f*’ seta ………………… 4
4(3). Female: genu IV with 2 setae (*v”* present). Male: with 4 prodorsal setae or vestiges of setae (*sc* absent); post-genital shield posterior to genital capsule expansive; fused telofemur-genu IV with 2 setae …………………………………………………………………………………. *C. eickworti* Husband & O’Connor
   – Female: genu IV with 1 seta (*v”* absent). Male: with 3 prodorsal setae or vestiges of setae (*sc* absent); post-genital shield posterior to genital shield elongate; fused telofemur-genu IV with 1 seta ………………… 5
   – Female: Cheliceral styles > 50. Male: idiosomal plates smooth; tibia III, seta *v”* long (> 70) ……… 6
6(5). Female: seta *h* 30–40. Male: ventral gnathosomal setae 18–23; seta *sc* close to margin of prodorsal shield; genu IV with 1 seta (*v”* present). …………………….. *C. peraviensis* Husband & Moraes
   – Female: seta *h* 17–19. Male: ventral gnathosomal setae 10–13; seta *sc* well within margin of prodorsal shield; genu IV without setae (*v”* absent) …………………….. *C. labidomerae* Eickwort
7(1). Female: tarsus IV with 2 or 3 long terminal setae. Male: seta *c* 1 minute …………………… 8
   – Female: tarsus IV with 1 long terminal seta. Male: seta *c* 1 developed; > 3 long …………… 14
8(7). Female: seta *sc* 1, *la* 2a and *3b* slender …………………………………………………………… 9
   – Female: seta *sc* 2, *la* 2a and *3b* bulbous …………………………………………………………… 10
9(8). Female & male: seta 3a absent ……………………………………………………………………….. *C. vafer* Seeman
   – Female & male: seta 3a present ……………………………………………………………………….. *C. verecundus* Seeman
10(8). Female & male: tibia II lacking seta 'l'. Female: tibia and tarsus IV partially or completely fused. Male: dorsal shield C-D-E divided or with folds marking a weak division; tarsus IV, setae u' and pv" absent.  

- Female & male: tibia II with seta 'l'. Female: tibia and tarsus IV separate. Male: dorsal shield C-D-E entire; tarsus IV, setae u' and pv" present.  

C. armstrongi Seeman  

11(10). Female & male: tibia IV with 1 seta (v" present) C. alilipus (Seeman & Nahrung)  

- Female & male: tibia IV without setae (v" absent).  

C. nahrungae Seeman  

12(11). Female: tarsus IV with 3 terminal setae; setae d and e < 40. C. mahunkai Regenfuss  

- Female: tarsus IV with 2 terminal setae; setae d and e > 45. C. nipponica sp. nov.  


- Female: intercoxal setae closer together (la-la 26–31, 2a 47–51). Male: tarsus IV with claw, u', and 4 setae (minute seta pv" present). Larva: setae sc1 13–18 and c1 13–18 long. C. aquarius us Seeman  

14(7). Female: coxal setae 2a and 3b slender… C. lipsettiae Seeman  

- Female: coxal setae 3a and 3b bulbous or minute.  

15(14). Female: seta la slender; tracheae broad, anastomosing distally. C. armstrongi sp. nov.  

- Female: seta la minute or bulbous; tracheae narrow, not anastomosing distally.  

16(15). Female: ambulacra with 2 claws; femur II without seta d. C. mahunkai Regenfuss  

- Female: ambulacra with 1 claw; femur II with seta d. C. nipponica sp. nov.  

17(15). Female: setae sc1, c1, and la bulbous. Male: tarsus IV with terminal claw, with 3–4 setae. C. cap tivus Seeman  

- Female: setae sc1, c1, and la slender; seta la minute. Male: tarsus IV lacking terminal claw, with 1–2 setae.  

18(17). Female: vestigial seta v either closely associated with seta sc2; tarsus I setae tc'–tc" eupathidial (blunt-tipped). Male: plate C-D-EF with 5 pairs of setae; post-sternal apodeme well-developed. C. matsuizawai sp. nov.  

- Female: vestigial seta v either closely associated with seta sc2 about half way between setae v' and sc2; tarsus I setae tc'–tc" not eupathidial (tips tapered). Male: plate C-D-EF with 4 pairs of setae; post-sternal apodeme not associated with setae. C. matsuizawai sp. nov.  

19(18). Female: seta sc1 and c1 5–7 long, 4–5 wide, with mediolateral projection 4–5 long (if broken then obvious stub present). Male: tibia II, seta v' 54–58, tarsus III, seta tc' 43–47. C. orthogorius Seeman  

- Female: seta sc1 8–12 long, 5–6 wide; seta c1 7–10 long, 5.5–7 wide, mediolateral projection absent or a minute stub. Male: tibia II, seta v' either < 40 or > 80 long, tarsus III, seta tc' either < 35 or > 50 long. C. matsuizawai sp. nov.  


21(17). Female: setae 2a and 3b bulbous.  

- Female: no coxal setae bulbous.  

22(21). Female: setae 2a and 3b 5–6 long, 3–4 wide; distance between h1–h1 31–41. Male: tarsus II, seta tc" < 50. C. husbandi (Seeman & Nahrung)  

- Female: setae 2a and 3b 6–7.5 long, 4.5–5 wide; distance between h1–h1 22–29. Male: tarsus II, seta tc" > 80. C. captivus (Seeman & Nahrung)  

23(21). Female & male: femur II without setae. C. cubile Seeman  

- Female & male: femur II with minute seta. C. cubile Seeman  

24(23). Female: seta v1 vestigial but distinct; setae h1 length 33–43. C. intrusus Seeman & Nahrung  

- Female: seta v1 absent; setae h1 length 15–19. C. lawsonii (Seeman & Nahrung)
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