



## TAXONOMIC STUDIES OF THE TRIBE COCCINELLINI (COLEOPTERA: COCCINELLIDAE) OF KERALA

VISHNU MANOJ<sup>1</sup>, VIDYA C V<sup>2\*</sup>, B RAMESHA<sup>3</sup> AND K M SREEKUMAR<sup>1</sup>

<sup>1</sup>Department of Agricultural Entomology, College of Agriculture Padannakkad, Kerala Agricultural University, Kasaragod 671314, Kerala, India

<sup>2</sup>Department of Agricultural Entomology, College of Agriculture, Vellanikkara, Kerala Agricultural University, Thrissur 680656, Kerala, India

<sup>3</sup>Extension Training Centre, Kerala Agricultural University, Vorkady, Manjeshwar 671323, Kerala, India

\*Email: vidya.cv@kau.in (corresponding author): ORCID ID 0000-0003-0995-8517

### ABSTRACT

Ten species of coccinellid beetles belonging to the eight genera viz., *Anegleis* Iablokoff-Khuzorian, *Cheilomenes* Chevrolat, *Coccinella* Linnaeus, *Coelophora* Mulsant, *Harmonia* Mulsant, *Illeis* Mulsant, *Micraspis* Chevrolat and *Propylea* Mulsant were collected from various agroecosystems of Kerala. This paper illustrates the diagnostics including the descriptions of genitalia, their prey range and distribution in Kerala.

**Key words:** Coleoptera, Coccinellidae, Coccinellini, Kerala, *Anegleis*, *Cheilomenes*, *Coccinella*, *Coelophora*, *Harmonia*, *Illeis*, *Micraspis*, *Propylea*

Family Coccinellidae Latreille, commonly known as lady beetles or ladybugs, is classified in superfamily Coccinelloidea of order Coleoptera (Robertson et al., 2015), which was previously categorized under the superfamily Cucujoidea. There are approximately 6000 species worldwide, described under 360 genera and 30 tribes in Coccinellidae (Slipinski, 2007). Slipinski (2007) proposed two subfamilies viz., Coccinellinae and Microweiseinae Leng based on adult and larval morphology. Based on morphological and molecular evidences, Seago et al. (2011) revised the classification of Coccinellidae to comprise two subfamilies viz., Microweiseinae and Coccinellinae. Recently, Che et al. (2021) categorized Coccinellidae into 3 subfamilies, namely Coccinellinae, Monocoryninae Miyatake and Microweiseinae. Coccinellini, known as the true ladybeetles, constitute around 1000 species in 90 genera globally. These are commonly thought to predators of aphid, although their diet is diverse, including other hemipteran insects, beetle and moth larvae, pollen, fungal spores and even plant tissues (Escalona et al., 2017). Agarwala and Ghosh (1988) recorded 36 true aphidophagous coccinellids from India. An annotated checklist of the Coccinellidae of the Indian subcontinent (excluding the subfamily Epilachninae) with 400 species (including six subspecies) divided into 79 genera, 22 tribes and five subfamilies was provided by Poorani (2002). Poorani and Thangjam (2019) added three species of tribe Coccinellini viz., *Halyzia*

*nepalensis* Canepari, *Oenopia chinensis* (Weise) and *Protothea decemguttata* (Hoang) to the Indian fauna of Coccinellidae. An illustrated guide to the tribe Coccinellini covering 119 species of 30 genera in Indian subcontinent was detailed by Poorani (2023). They prefer to feed on Sternorrhynchan hemipterans viz., aphids, adelgids, scales, mealybugs, whiteflies, and psyllids (Hodek and Honek, 2009; Obrycki et al., 2009). Study on the diversity of Coccinellini is critical for their optimal use in integrated pest management. Being the biodiversity hotspot, Coccinellini fauna could be diverse in Kerala. The objective of the study was to elucidate the taxonomy of the tribe Coccinellini in different agroecosystems of Kerala.

### MATERIALS AND METHODS

The specimens which were utilized for the study were sourced from field collections and Departmental collections of Entomology, College of Agriculture Padannakkad. Field collections were made by carrying out the purposive surveys and field collection trips in all agroecological zones of Kerala viz., coastal plain, midland laterites, foothills, high hills and Palakkad plains representing vegetables, fruits, plantation crops and field crops during 2020-22. Visual exploration followed by hand picking and sweeping the vegetation using insect net were the methods of collecting the grubs, pupae and beetles. The grubs and pupae were

further reared to adults. Prey and host plant associations were also recorded during the survey. The collected specimens were preserved and labelled for further study.

The preserved specimens were grouped based on the colour and pattern of elytra and pronotum. The posterior margin of the last abdominal segment was studied to separate male and female specimens (Sasaji, 1971). The images of habitus and different body parts were captured using a Carl Zeiss Trinocular Axiocam 105 colour microscope equipped with Zen software. Multiple pictures of each body part were taken and then merged into a composite image using Combine ZM software. Measurements viz., TL (length from anterior to posterior end of body), TW (maximum width of body) or EW (maximum width of elytra), EL (length of elytra from tip to base along suture), PL (length of pronotum along median line) and PW (width of pronotum at widest point) were taken in Leica M80 stereomicroscope using ocular and stage micrometres. The specimens were further dissected following the standard procedure and taxonomic characters viz., habitus, antenna, labrum, mandible, maxilla, labium, prosternal carina, post coxal line, male genitalia and female genitalia were studied in detail. Based on the literature collected and taxonomic keys in Pope (1989), Chowdhury et al. (2015), Poorani and Lalitha (2018) and Poorani (2023), the specimens were identified up to species level. Present study identified and described ten species of Coccinellini viz., *Anegleis cardoni* (Weise), *Cheilomenes sexmaculata* (Fabricius), *Coccinella septempunctata* Linnaeus, *C. transversalis* Fabricius, *Coelophora bissellata* Mulsant, *C. saucia* (Mulsant), *Harmonia octomaculata* (Fabricius), *Illeis cincta* (Fabricius), *Micraspis discolor* (Fabricius) and *Propylea dissecta* (Mulsant). Further its prey associations and geographical distribution are also discussed.

## RESULTS AND DISCUSSION

### 1. *Anegleis cardoni* (Weise) (Fig. 1)

**Material examined:** 6♂, Padannakkad (12.2598°N, 75.1130°E), Kerala 03.ix.2020, Coll. Vishnu Manoj; 4♂, Pilicode (12.1997°N, 75.1633°E), Kerala, 12.iv.2021, Coll. Vishnu Manoj; 4♂, Karvachery (12.2471°N, 75.1341°E), Kerala, 25.v.2022, Coll. Sai Parvathy, C.

**Diagnosis:** TL: 3.8 mm, TW: 3.6 mm, TL/TW: 1.05, PL/ PW: 0.52, EL/ EW: 0.78, EW/ PW: 1.89. Body medium-sized, round, dorsum strongly convex, pale yellow, glabrous; ventrum yellowish. Head pale yellow or light brown; antenna brownish, hairy with 11

antennomeres and terminal segment rounded; mandible subtriangular with bifid apex, blunt mola, maxilla having securiform terminal palpomere; pronotum yellowish with two pyriform black spots at the centre and a transverse saucer-shaped black band along the posterior margin. Prosternal carina short, subparallel. Scutellum minute, black and triangular. Elytra sparsely punctate, yellow or pale yellow, each with a pair of narrow comma-shaped black stripes, outer one anteriorly bent inwards, inner one posteriorly bent outwards, small circular spot near apex, elytral commissural line with black band; hindleg pseudo trimerous or crypto tetramerous. Post coxal line of first visible abdominal ventrite straight and incomplete. Male genitalia having tegmen with parameres elongate and setose apically; penis guide shorter than parameres, broad at its apex with sharp and curved corners separated by inwardly compressed centre, penis long with slightly curved capsule, apex bilobed apically.

**Distribution:** Karuvachery (Kasaragod); Padannakkad (Kasaragod); Pilicode (Kasaragod).

### 2. *Cheilomenes sexmaculata* (Fabricius) (Fig. 2)

**Material examined:** 10♂ and 6♀, Vellayani (8.4453°N, 76.9925°E), Kerala, 3.iii.2021, Coll.

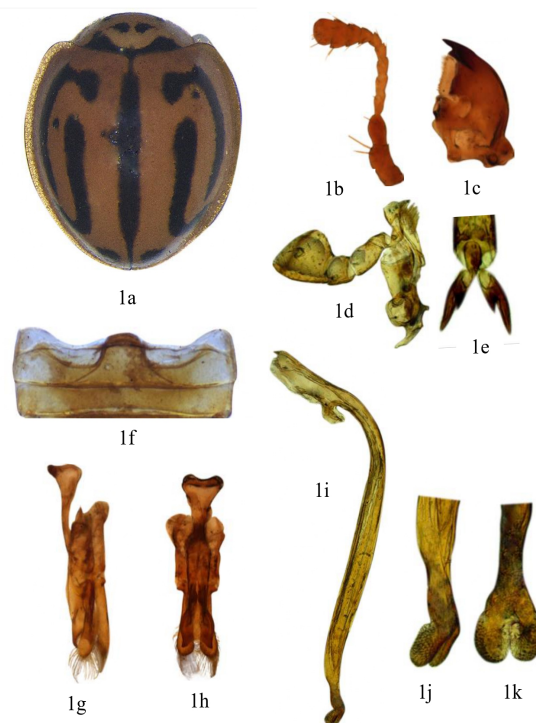


Fig. 1. *Anegleis cardoni* (Weise): 1a. habitus, 1b. antenna, 1c. mandible, 1d. maxilla, 1e. tarsal claw, 1f. abdominal postcoxal line, 1g. tegmen-lateral view, 1h. tegmen-ventral view, 1i. penis, 1j. penis apex-lateral view 1k. penis apex-ventral view

Vishnu Manoj; 4♂ and 2♀, Kumarakom (9.6229°N, 76.4292°E), Kerala, 12.iv.2021, Coll. Vishnu Manoj; 8♂ and 2♀, Ambalavayal (11.6197°N, 76.2103°E), Kerala, 14.vi.2021, Coll. Vishnu Manoj.

**Diagnosis:** TL: 4.5 mm, TW: 3.7 mm, TL/TW: 1.21, PL/PW: 0.30, EL/EW: 1.03, EW/PW: 1.61. Body medium sized, round, dorsum moderately convex, yellowish-orange to vivid orange coloured, glabrous; ventrum dark-brownish. Head pale yellowish or yellowish; antenna yellowish, hairy with 11 antennomeres with an enlarged scape; Mandible stout with bifid apex, basal mola; maxilla having securiform terminal palpomere. Pronotum pale yellow to yellowish with a half-moon shaped black marking attached to black band along margins; Prosternal carina short and subparallel. Scutellum black and triangular. Elytra sparsely punctate, yellow or pale yellow or orange coloured with three patches on each, first inverted V-shaped, second W-shaped, last almost round or sometimes proximal two zigzag patterns coalesce with each other forming patch and distal oval fused to form another patch or without any spots or patterns, elytral commissural line black; hindleg pseudo trimerous

or crypto tetramerous. Post coxal line of first visible abdominal ventrite incomplete with an oblique line. Male genitalia having tegmen with parameres stout, setose apically; penis guide shorter than parameres, capsule with rounded inner processes, pointed external processes; penis long, thin, long, filiform apically, highly coiled at the base. Coxites club-handle like; styli terminal having setae at its apex; sperm duct complex, highly coiled; spermatheca reniform, curved apically, infundibulum tubular.

**Distribution:** Padannakkad (Kasaragod); Pilicode (Kasaragod); Panniyur (Kannur); Amabalavayal (Wayanad); Meppadi (Wayanad); Karimbam (Kannur); Nilambur (Malappuram); Pattambi (Palakkad); Kavanattinkara (Kottayam); Kottayam (Kottayam); Kumarakom (Kottayam); Napier Museum (Thiruvananthapuram); Statue (Thiruvananthapuram); Vellayani (Thiruvananthapuram).

### 3. *Coccinella septempunctata* Linnaeus (Fig. 3)

**Material examined:** 4♂, Balaramapuram (8.4002°N, 77.0296°E), Kerala, 08.xi.2021, Coll. Vishnu Manoj; 2♀, Vellayani (8.4453°N, 76.9925°E),



Fig. 2. *Cheilomenes sexmaculata* (Fabricius): 2a, 2b, 2c. habitus-morphotypes, 2d. antenna, 2e. mandible, 2f. maxilla, 2g. tarsal claw, 2h. abdominal postcoxal line, 2i. tegmen-lateral view, 2j. tegmen-ventral view, 2k. penis, 2l. penis apex, 2m. female genitalia, 2n. spermatheca

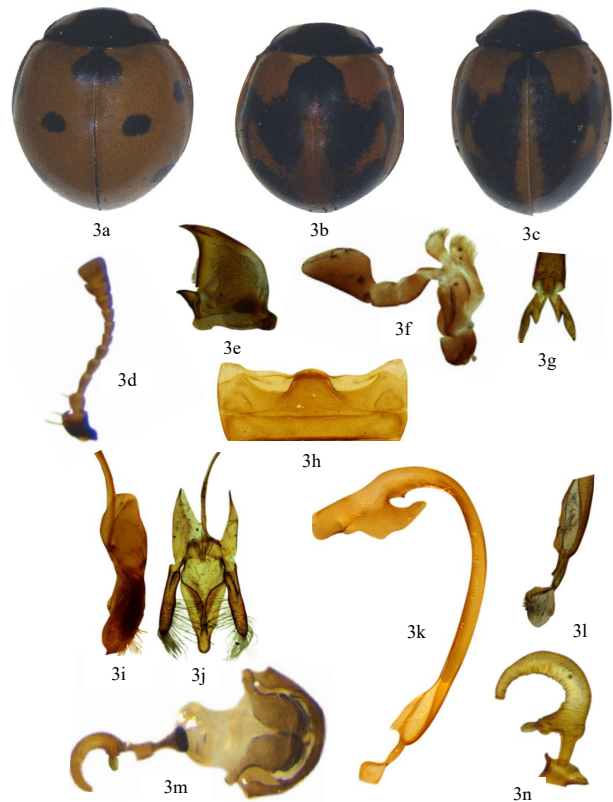


Fig. 3. *Coccinella septempunctata* Linnaeus: 3a, 3b, 3c. habitus-morphotypes, 3d. antenna, 3e. mandible, 3f. maxilla, 3g. tarsal claw, 3h. abdominal postcoxal line, 3i. tegmen-lateral view, 3j. tegmen-ventral view, 3k. penis, 3l. penis apex, 3m. female genitalia, 3n. Spermatheca

Kerala, 3.iii.2021, Coll. Vishnu Manoj; 2♂, Vellanikkara (10.5452°N, 76.2740°E), Kerala, 12.iv.2021 Coll. Vidya, C.V.

**Diagnosis:** TL: 6.7 mm, TW: 5.5 mm, TL/TW: 1.22, PL/PW: 0.45, EL/EW: 0.96, EW/PW: 1.77. Body medium to large-sized, orange or reddish-brown, short oval, dorsum strongly convex, glabrous; ventrum black. Head black; antenna brownish, hairy with 11 antennomeres, last three segments form a club; mandible stout, subtriangular with a bifid apex, a basal tooth; maxilla having securiform terminal palpomere. Pronotum blackish with quadrate yellow markings. Scutellum blackish, triangular. Elytra yellowish-orange or yellowish-brown having seven spots with three spots on each elytron, a common spot around scutellum, with two little whitish patches on either side of scutellum, elytral spots often join together to form a patch; hindleg pseudo trimerous or crypto tetramerous with a bifid claw. Post coxal line of first visible abdominal ventrite incomplete with an associated oblique line. Male genitalia having tegmen with parameres densely haired except at its base, shorter than penis guide; penis guide very broad, cone-shaped with a triangular orifice, capsule enlarged and T-shaped, penis with a strong curved base end in a hollow oval portion followed by a constricted region, apex broad towards the centre. Coxites club-handle-like each with short setae, stylus present; spermatheca semicircular, infundibulum funnel-like.

**Distribution:** Azhithala (Kasaragod); Pattambi (Palakkad); Vellanikkara (Thrissur); Kumarakom (Kottayam); Balaramapuram (Thiruvananthapuram); Vellayani (Thiruvananthapuram).

#### 4. *Coccinella transversalis* Fabricius (Fig. 4)

**Material examined:** 10♂, Padannakkad (12.2598°N, 75.1130°E), Kerala, 25.i.2021, Coll. Chavan T. S.; 2♀, Padannakkad (12.2598°N, 75.1130°E), Kerala, 5.ii.2021, Coll. Rajkumar K.; 6♂, Vellayani (8.4453°N, 76.9925°E), Kerala, 5.ii.2021, Coll. Vishnu Manoj; 4♂, Kumarakom (9.6229°N, 76.4292°E), Kerala, 2.iv.2021, Coll. Vishnu Manoj; 2♂, Balaramapuram (8.4002°N, 77.0296°E), Kerala, 5.vi. 2021, Coll. Vishnu Manoj.

**Diagnosis:** TL: 5.7 mm, TW: 4.3 mm, TL/TW: 1.32, PL/PW: 0.04, EL/EW: 1.12, EW/PW: 1.60. Body medium to large-sized, short oval; dorsum orange or reddish-brown, glabrous; ventrum black. Head black with a pair of pale yellow, subtriangular frontal spots; antenna brownish and hairy with 11 antennomeres and last three segments form a club; mandible stout, triangular with a bifid apex a basal tooth; maxilla

having securiform terminal palpomere. Pronotum black with pale yellow region towards anterolateral corners. Scutellum dark-brownish, triangular. Elytra yellowish orange with commissural spot, each with a large trilobed spot and transverse marking, elytral commissural line black; hindleg pseudo trimerous or crypto tetramerous. Post coxal line of first visible abdominal ventrite incomplete with an oblique line. Male genitalia with tegmen having parameres shorter than penis guide and setose apically, penis guide broad basally, pointed apically, capsule T-shaped and bulged, penis stout, elongate, strongly curved basally, apex tubular. Coxites subtriangular with fine setae, stylus present; spermatheca C-shaped, infundibulum funnel-like.

**Distribution:** Karuvachery (Kasaragod); Padannakkad (Kasaragod); Pilicode (Kasaragod); Thaikkadappuram (Kasaragod); Karimbam (Kannur); Panniyur (Kannur); Ambalavayal (Wayanad); Munderi (Malappuram); Nilambur (Malappuram); Pothukkal (Malappuram); Vazhikkadavu (Malappuram); Kavanattinkara (Kottayam); Kumarakom (Kottayam); Napier Museum (Thiruvananthapuram); Vellayani (Thiruvananthapuram).

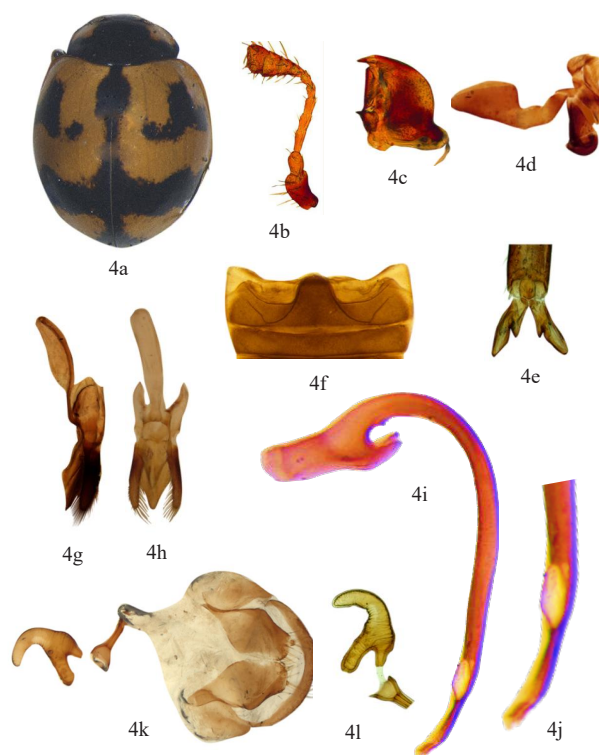


Fig. 4. *Coccinella transversalis* Fabricius: 4a. habitus, 4b. antenna, 4c. mandible, 4d. maxilla, 4e. tarsal claw, 4f. abdominal postcoxal line, 4g. tegmen-lateral view, 4h. tegmen-ventral view, 4i. penis, 4j. penis apex, 4k. female genitalia, 4l. spermatheca

**5. *Coelophora bissellata* Mulsant (Fig. 5)**

**Material examined:** 1♂, Kumarakom (9.6229°N, 76.4292°E), Kerala, 3.iii.2021, Coll. Vishnu Manoj.

**Diagnosis:** TL: 4.3 mm, TW: 3.4 mm; TL/ TW: 1.26, PL/ PW: 0.52, EL/ EW: 0.88, EW/ PW: 1.62. Body medium-sized, round; dorsum extremely convex, brownish yellow and glabrous; ventrum brown. Head orange-yellow; antenna eleven segmented with an elongate oval terminal antennomere; mandible subtriangular with bifid apex, sharp mola; maxilla having weakly securiform terminal palpomere. Pronotum slightly punctate and yellowish-orange with a pair of large black spots at the centre, a pair of small black spots along the corners. Scutellum dark-brown and triangular. Elytra sparsely punctate, yellowish-orange each with four black round spots, with two spots on commissural line, elytral commissural line dark brown.

**Distribution:** Kumarakom (Kottayam).

**6. *Coelophora saucia* (Mulsant) (Fig. 6)**

**Materials examined:** 2♀, Vellanikkara (10.5452°N, 76.2740°E), Kerala, 3. iv. 2022, Coll. Nimisha.

**Diagnosis:** TL: 4.0 mm, TW: 3.2 mm, TL/ TW: 1.25, PL/ PW: 0.65, EL/ EW: 0.94, EW/ PW: 1.39. Body medium-sized, round; dorsum strongly convex, black, glabrous; ventrum brown. Head black; antenna yellowish-brown, hairy with 11 antennomeres with 3-segmented club; mandible subtriangular, with bifid apex with sharp mola; maxilla with securiform terminal palpomere. Pronotum not punctate, black with a pair of reddish yellow spots along the lateral margins. Scutellum black, triangular. Elytra not punctate, smooth and black with yellow spots at centre, elytral commissural line black; hindleg sparsely hairy, pseudo trimerous or crypto tetramerous. Post coxal line of first visible abdominal ventrite incomplete without an oblique line. Coxites club handle shaped, stylus greatly

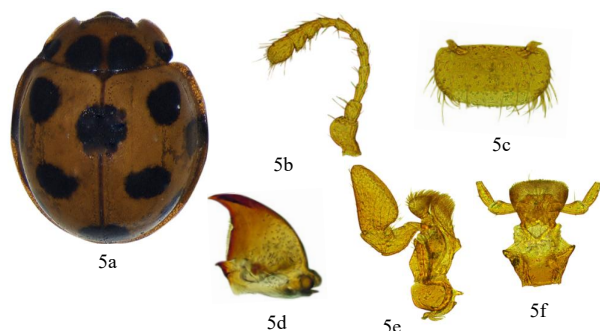


Fig. 5. *Coelophora bissellata* Mulsant: 5a. habitus, 5b. antenna, 5c. labrum, 5d. mandible, 5e. maxilla, 5f. labium

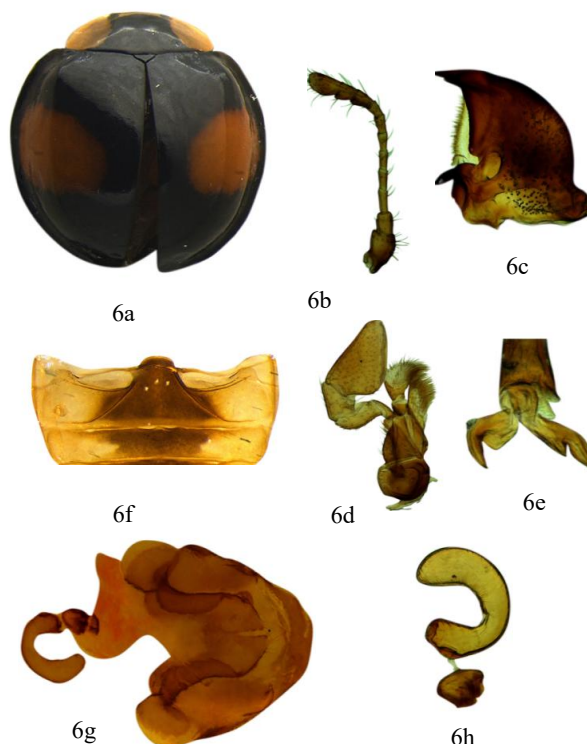


Fig. 6. *Coelophorasaucia* (Mulsant): 6a. habitus, 6b. antenna, 6c. mandible, 6d. maxilla, 6e. tarsal claw, 6f. abdominalpostcoxal line, 6g. female genitalia, 6h. spermatheca

reduced with apical setae; spermatheca C-shaped, distinctly curved apically.

**Distribution:** Vellanikkara (Thrissur)

**7. *Harmonia octomaculata* (Fabricius) (Fig. 7)**

**Material examined:** 1♂, Munderi (11.4414°N, 76.2537°E), Kerala, 15.vii.2021, Coll. Vishnu Manoj; 1♂, Kumarakom (9.6229°N, 76.4292°E), Kerala, 12.iv.2021, Coll. Vishnu Manoj; 1♂, Ranipuram (12.4280°N, 75.3616°E), Kerala, 4.iv.2022, Coll. Sai Parvathy, C.; 2♀, Padannakkad (12.2598°N, 75.1130°E), Kerala, 25.v.2020, Coll. Vishnu Manoj.

**Diagnosis:** TL: 6.1 mm, TW: 4.5 mm, TL/ TW: 1.35, PL/ PW: 0.31, EL/ EW: 1.13, EW/ PW: 1.28. Body medium to large sized, oval, convex; dorsum reddish-brown or brown; ventrum dark brown; glabrous. Head reddish brown; antenna brown, hairy with 11 antennomeres, last antennomere broad; mandible stout, subtriangular with a bifid apex, a basal tooth; maxilla having securiform terminal palpomere. Pronotum reddish-brown and trapezoidal. Scutellum dark-brownish and triangular. Elytra reddish-brown with black spots, arrangements of spots variable, elytral commissural line blackish; hindleg pseudo trimerous or crypto tetramerous. Post coxal line of first abdominal

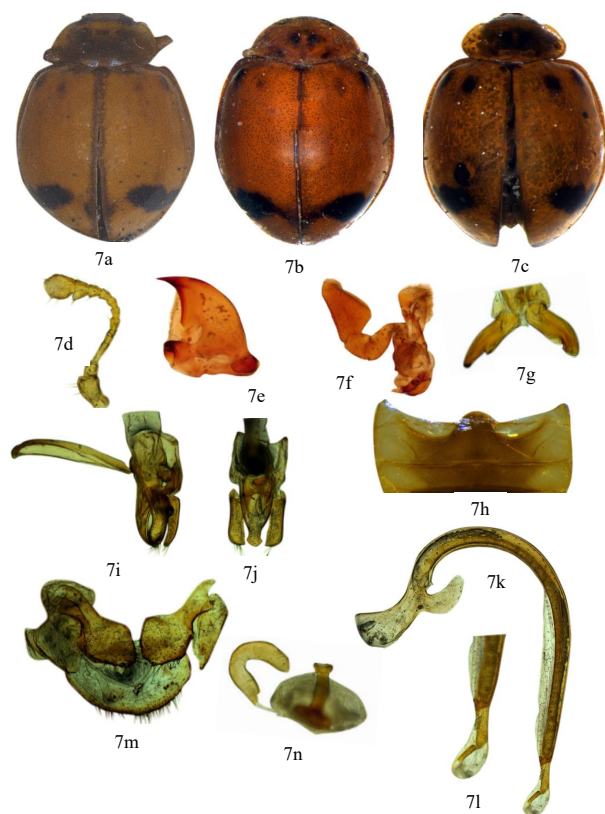


Fig. 7. *Harmonia octomaculata* (Fabricius): 7a, 7b, 7c. habitus-morphotypes, 7d. antenna, 7e. mandible, 7f. maxilla, 7g. tarsal claw, 7h. abdominal postcoxal line, 7i. tegmen-lateral view, 7j. tegmen-ventral view, 7k. penis, 7l. penis apex, 7m. female genitalia, 7n. spermatheca

ventrite incomplete with oblique associated line. Male genitalia having tegmen with short, thick parameres with hairs apically; penis guide inverted bell-shaped, as long as parameres, penis stout with curved base, capsule with hooked inner processes, blunt outer processes, apex with an elongated protuberance encircled by spoon-shaped layer. Coxites club handle-like, sparsely setose, stylus minute; spermatheca C-shaped, of same width, infundibulum present.

**Distribution:** Padannakkad (Kasaragod); Ranipuram (Kasaragod); Manjeri (Malappuram); Munderi (Malappuram); Kumarakom (Kottayam).

### 8. *Illeis cincta* (Fabricius) (Fig. 8)

**Material examined:** 2♂ and 1♀, Ambalavayal (11.6197°N, 76.2103°E), Kerala, 17.ii.2021, Coll. Vishnu Manoj; 5♂, Sultan Bathery (11.6629°N, 76.2570°E), Kerala, 12.ii.2021, Coll. Vishnu Manoj; 5♂, Mananthavady (11.8068°N, 76.0084°E), Kerala, 18.ii.2021, Coll. Vishnu Manoj.

**Diagnosis:** TL: 3.9 mm, TW: 3.2 mm, TL/ TW: 1.22, PL/ PW: 0.42, EL/ EW: 1.50, EW/ PW: 2.52.

Body medium-sized, short-oval; dorsum moderately convex, pale yellowish and glabrous; ventrum yellow or yellowish-brown. Head milky white; antenna yellowish-brown, hairy with 11 antennomeres, with a loosely attached 3-segmented club; mandible stout, sickle-shaped with multi-dentate apex, a basal mola; maxilla with strongly securiform terminal palpomere. Pronotum densely, finely punctate, milky white with a pair of black round spots at its posterior margin, anterior and lateral margins transparent. Scutellum pale yellowish, triangular. Elytra lesser densely punctate, light yellowish to yellowish-brown with transparent lateral margins, elytral commissural line yellowish-brown; hindleg densely hairy and pseudo trimerous or crypto tetramerous. Post coxal line of first abdominal ventrite very short, incomplete without oblique line. Male genitalia having tegmen with parameres elongated, densely hairy apically; penis guide longer than parameres, penis strongly curved basally, capsule with inner processes short, round, outer processes blunt, apex spatulate. Spermatheca C-shaped.

**Distribution:** Ambalavayal (Wayanad); Kalpetta (Wayanad); Mananthavady (Wayanad) Sultan bathery (Wayanad).

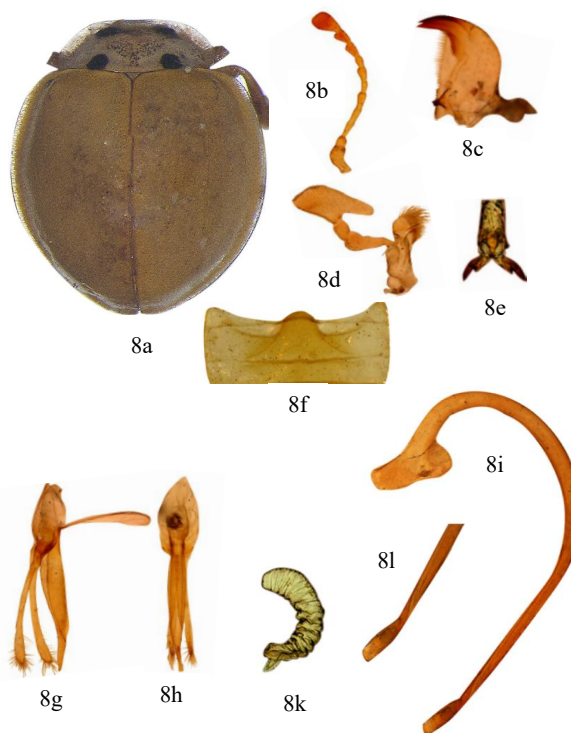


Fig. 8. *Illeis cincta* (Fabricius): 8a. habitus, 8b. antenna, 8c. mandible, 8d. maxilla, 8e. tarsal claw, 8f. abdominal postcoxal line, 8g. tegmen-lateral view, 8h. tegmen-ventral view, 8i. penis, 8j. penis apex, 8k. spermatheca

**9. *Micraspis discolor* (Fabricius) (Fig. 9)**

**Material examined:** 10♂ and 6♀, Vellayani (8.4453°N, 76.9925°E), Kerala, 3.iii.2021, Coll. Vishnu Manoj; 4♂ and 2♀, Kottayam (9.6229°N, 76.4292°E), Kerala, 12.iv.2021, Coll. Vishnu Manoj; 1♀, Kalpetta (11.6104°N, 76.1032°E), Kerala, 25.ii.2021, Coll. Vishnu Manoj; 1♀, Sultan Bathery (11.6629°N, 76.2570°E), Kerala, 21.ii.2021, Coll. Vishnu Manoj.

**Diagnosis:** TL: 3.7 mm, TW: 3.2 mm, TL/TW: 1.16, PL/ PW: 0.37, EL/ EW: 0.91, EW/ PW: 1.68. Body small-sized, short-oval; dorsum moderately convex, yellowish-orange or reddish-brown, glabrous; ventrum dark-brownish. Head yellowish rarely with black spot at centre of frons; antenna yellowish, hairy with 11 antennomeres, last three antennomeres forming club; mandible stout, subtriangular with a bifid apex, a basal tooth; maxilla with securiform terminal palpomere. Pronotum pale yellow to yellowish with a pair of black dots near the centre, with a black patch in the posterior margin, posterior marginal patch trilobed or variable. Scutellum minute, dark-brownish, triangular. Elytra orange or yellowish-brown with a black commissural line; hindleg pseudo trimerous or crypto tetramerous.



Fig. 9. *Micraspidiscolor* (Fabricius): 9a, 9b, 9c. habitus-morphotypes, 9d. antenna, 9e. mandible, 9f. maxilla, 9g. tarsal claw, 9h. abdominal postcoxal line, 9i. tegmen-lateral view, 9j. tegmen-ventral view, 9k. penis, 9l. penis apex, 9m. female genitalia, 9n. spermatheca

Post coxal line of first abdominal ventrite incomplete without an oblique line. Male genitalia with stout tegmen; parameres setose apically; penis guide broad, as long as parameres, capsule well developed, strongly curved at base, apex with forceps-shaped processes. Coxites club handle shaped, stylus present with apical setae; spermatheca C-shaped, curved apically, infundibulum duct-like, inverted Y-shaped.

**Distribution:** Kalpetta (Wayanad); Sultan bathery (Wayanad); Kottayam (Kottayam); Vellayani (Thiruvananthapuram).

**10. *Propylea dissecta* (Mulsant) (Fig. 10)**

**Material examined:** Kerala: 10♂, Vellayani (8.4453°N, 76.9925°E), Kerala, 3.iii.2021, Coll. Vishnu Manoj; 4♂, Kumarakom (9.6229°N, 76.4292°E), Kerala, 12.iv.2021, Coll. Vishnu Manoj.

**Diagnosis:** TL: 4.0 mm, TW: 3.3 mm, TL/ TW: 1.21, PL/ PW: 0.32, EL/ EW: 0.82, EW/ PW: 1.50.

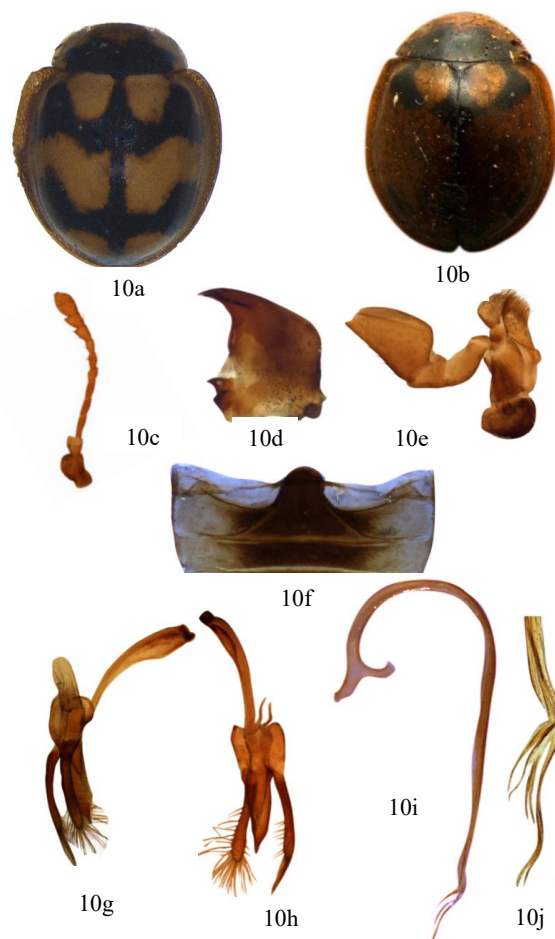


Fig. 10. *Propylea dissecta* (Mulsant): 10a, 10b. habitus-morphotypes, 10c. antenna, 10d. mandible, 10e. maxilla, 10f. abdominal postcoxal line, 10g. tegmen-lateral view, 10h. tegmen-ventral view, 10i. penis, 10j. penis apex

Body medium-sized, oval; dorsum slightly convex, yellowish-brown, glabrous; ventrum black. Antenna short, brownish, sparsely hairy with 11 antennomeres, last three segments form a club; mandible stout, triangular with a bifid apex, a basal tooth; maxilla having securiform terminal palpomere. Pronotum black with pale yellow anterolateral corners. Scutellum black, triangular. Elytra orange with a network of four black bands, two on each elytron, one on the anterior side, other on the posterior side, elytral commissural line black; hindleg pseudo trimerous or crypto tetramerous. Post coxal line of first abdominal ventrite incomplete without an oblique line. Male genitalia having tegmen with parameres narrow, hairy, longer than penis guide; penis long, capsule curved, T-shaped, apex thread-like and fringed.

**Distribution:** Kumarakom (Kottayam); Vellayani (Thiruvananthapuram).

### Prey range of Coccinellini

Among the ten species surveyed, *Coccinella transversalis* and *Cheilomenes sexmaculata* were the most frequently encountered in the study area. *Coccinella transversalis* was observed on cucumber, field bindweed, tapioca, cowpea and brinjal, where it fed on cowpea aphids (*Aphis craccivora* Koch). On the other hand, *C. sexmaculata* was associated with cowpea aphids (*A. craccivora*). According to Mayadunnage et al. (2007), *C. sexmaculata* was found to be associated with *Aphis gossypii* Glover, *A. craccivora*, *M. persicae*, *Amrasca* spp. and *Empoasca vitis* (Gothe). *Coccinella sexmaculata* and *H. octomaculata* were the most common predators of rice pests in the 'kole' lands of Thrissur (Lyla et al., 2010). Pervez et al. (2020) reported *C. sexmaculata* from *Camellia sinensis* (L.), *Helianthus annuus* L. and *Zea mays* L. *Micraspis discolor* was collected while consuming rice pollen (*Oryza sativa* L.). *Illeis cincta* was gathered from mulberry plants (*Morus* spp.) while feeding on powdery mildew spores. *Illeis cincta* was reported in the Dharwad region of Karnataka and found feeding on powdery mildew of mulberry, *Phyllactinia corylea* (Pers) (Megha et al., 2015). *Propylea dissecta* was found on rice (*Oryza sativa*), bhendi (*Abelmoschus esculentus* (L.)), and purple nutsedge (*Cyperus rotundus* L.), where it fed on cowpea aphids. *Coleophora saucia* was associated with a whitefly colony on coconut trees (*Cocos nucifera* (L.)), while *Coleophora bissellata* was collected from Canada thistle (*Cirsium arvense* (L.)). In Pakistan, custard apple, walnut and wheat were recorded as the host plants of *C. bissellata* (Hayat et al., 2017)

whereas in Nepal, *Bidens pilosa* was recorded as its host plant (Sajan et al., 2019). *Harmonia octomaculata* was observed on amaranthus (*Amaranthus viridis* L.), lamb's quarter (*Chenopodium album* L.) and crabgrass (*Digitaria* spp.). *Anegleis cardoni* was found to be connected with rice, cowpea, and sesamum. Chatterjee and Bose (1933) discussed that *A. cardoni* was often found associated with whitefly colony in *Cassia siamea* (Lam) and guava. Omkar et al. (2009) reported its association with *A. gossypii*, *A. craccivora* and *Lipaphis erysimi* Kalténbach. Moreover, it was also reported from scales (Sundararaj, 2008) and whiteflies (Ramani et al., 2002). *Coccinella septempunctata* was associated with field bindweed (*Convolvulus arvensis* L.) and was found feeding on cotton aphids (*A. gossypii*). In Kashmir, Khan et al. (2009) reported the prey range of *C. septempunctata* which include *Aphis pomi* De Geer, *Brevicoryne brassicae* (Linnaeus), *L. erysimi* and *M. persicae*. *Coccinella septempunctata* preferably devours on aphids, mealybugs, and psyllids as well as scale insects which are found across various crops, such as brassica, cabbage, wheat and cotton as well as fruit trees and wild vegetation (Ullah et al., 2012).

### FINANCIAL SUPPORT

The present study is a part of M Sc. thesis submitted to Kerala Agricultural University (KAU) by the senior author. The financial assistance provided by Indian Agricultural Research Institute (ICAR) and KAU for the conduct of research is greatly acknowledged.

### AUTHOR CONTRIBUTION STATEMENT

VCV designed the research and provided guidance. VM conducted surveys and field collection trips, dissected and illustrated the mentioned specimens and prepared the manuscript. BR and KMS corrected the manuscript.

### CONFLICT OF INTEREST

No conflict of interest.

### REFERENCES

- Agarwala B K, Ghosh A X. 1988. Prey records of aphidophagous Coccinellidae in India. A review and bibliography. Tropical Pest Management 34(1): 1-14.
- Chatterjee N C, Bose M. 1933. Entomological investigations on the spike disease of sandal Coccinellidae (Col.). Indian Forest Records 19(7): 1-10.
- Che L H, Zhang P, Deng S H, Escalona H E, Wang X, Li Y, Pang H, Vandenberg N, Slipinski A, Tomaszewska W, Liang D. 2021. New insights into the phylogeny and evolution of lady beetles

- (Coleoptera: Coccinellidae) by extensive sampling of genes and species. *Molecular Phylogenetics and Evolution* 156: 107045.
- Chowdhury S, Sontakke P P, Boopathi T, Bhattacharjee J, Bhattacharjee D, Malasawmzuali. 2015. Taxonomic studies on predatory coccinellid beetles and their species composition in rice ecosystem of Indo-Bangladesh border. *BioScan* 10(1): 229-242.
- Escalona H E, Zwick A, Li H S, Li J, Wang X, Pang H, Hartley D, Jermiin L S, Nedved O, Misof B, Niehuis O, Slipinski A, Tomaszewska W. 2017. Molecular phylogeny reveals food plasticity in the evolution of true ladybird beetles (Coleoptera: Coccinellidae: Coccinellini). *BMC Evolutionary Biology* 17: 151.
- Hayat A, Khan M R, Naz F. 2017. Subfamilies Coccinellinae and Coccidullinae (Coccinellidae: Coleoptera) with new records from AJK, Pakistan. *Journal of Applied Environmental and Biological Sciences* 7(4): 12-66.
- Hodek I, Honek A. 2009. Scale insects, mealybugs, whiteflies and psyllids (Hemiptera, Sternorrhyncha) as prey of ladybirds. *Biological Control* 51: 232-243.
- Khan AA, Zaki FA, Khan Z H, Mir RA. 2009. Biodiversity of predaceous ladybird beetles (Coleoptera: Coccinellidae) in Kashmir. *Journal of Biological Control* 23(1): 43-47.
- Lyla K R, Beevi S P, Philip B M, Jalali S K. 2010. Biological control of rice pests in 'Kole' lands of Kerala. *Journal of Biological Control* 24(3): 268-270.
- Mayadunnage S, Wijayagunasekara H N P, Hemachandra K S, Nugaliyadde L. 2007. Predatory Coccinellids (Coleoptera: Coccinellidae) of vegetable insect pests: A survey in mid country of Sri Lanka. *Tropical Agricultural Research* 19: 69-77.
- Megha R R, Vastrad A S, Kamanna B C, Kulkarni N S. 2015. Species complex of coccinellids in different crops at Dharwad region. *Journal of Experimental Zoology* 18(2): 931-935.
- Obrycki J J, Harwood J D, Kring T J, O'Neil R J. 2009. Aphidophagy by Coccinellidae: application of biological control in agroecosystems. *Biological Control* 51: 244-254.
- Omkar, Kumar G, Sahu J. 2009. Performance of a predatory ladybird beetle, *Anegleis cardoni* (Coleoptera: Coccinellidae) on three aphid species. *European Journal of Entomology* 106(4): 565-572.
- Pervez A, Yadav M, Khan M. 2020. Diversity of predaceous coccinellid beetles (Coleoptera: Coccinellidae) in Uttarakhand, North India. *Journal of Mountain Research* 15: 7-20.
- Poorani J. 2002 An annotated checklist of the Coccinellidae (Coleoptera) (excluding Epilachninae) of the Indian Subregion. *Oriental Insects* 36: 307-383.
- Poorani J. 2023. An illustrated guide to lady beetles (Coleoptera: Coccinellidae) of the Indian Subcontinent. Part 1. Tribe Coccinellini. *Zootaxa* 5332(1): 1-301.
- Poorani J, Lalitha M. 2018. Illustrated accounts of coccinellid predators of *Maconellicoccus hirsutus* (Green) (Hemiptera: Sternorrhyncha: Pseudococcidae) on mulberry in India, with description of a new species of *Scymnus* Kugelann (Coleoptera: Coccinellidae) from West Bengal. *Zootaxa* 4382(1): 93-120.
- Poorani J, Thangjam R. 2019. New additions to the Indian fauna of Coccinellidae (Coleoptera). *Oriental Insects* 53(4): 547-565.
- Pope R D. 1989. A revision of the Australian Coccinellidae (Coleoptera). Part 1. Subfamily Coccinellinae. *Invertebrate Taxonomy* 2: 633-735.
- Ramani S, Poorani J, Bhumannavar B S. 2002. Spiraling whitefly, *Aleurodicus dispersus* in India. *Biology News Information* 23(2): 55-62.
- Robertson J A, Slipinski A, Moulton M, Lord N P, Mckenna D D, Shockley F W, Giorgi A, Tomaszewska W, Forrester J, Miller K B, Whiting M F. 2015. Phylogeny and classification of Cucujoidea and the recognition of a new superfamily Coccinelloidea (Coleoptera: Cucujiformia). *Systemic Entomology* 40(4): 745-778.
- Sajan K C, Vetrovec J, Abbas M. 2019. Lady beetles of Nepal (Coleoptera: Coccinellidae: Coccinellinae) from the fields at Nepal Agricultural Research Council, Khumaltar, Lalitpur. *International Journal of Entomological Research* 3: 125-129.
- Sasaji H. 1971. *Fauna Japonica Coccinellidae* (Insecta: Coleoptera). Academic Press of Japan, Keigaku Publishing, Tokyo, 340 pp.
- Seago A E, Giorgi J A, Li J, Slipinski A. 2011. Phylogeny, classification and evolution of ladybird beetles (Coleoptera: Coccinellidae) based on simultaneous analysis of molecular and morphological data. *Molecular Phylogenetics and Evolution* 60: 137-151.
- Slipinski A. 2007. Australian ladybird beetles (Coleoptera: Coccinellidae): their biology and classification. *Australian Biological Resources Study*, Canberra. 286 pp.
- Sundararaj R. 2008. Distribution of predatory arthropod communities in selected sandal provenances of South India. *Journal of Biopesticides* 1(1): 86-91.
- Ullah R, Haq F, Ahmad H, Inayatullah M, Saeed K, Khan S. 2012. Morphological characteristics of ladybird beetles collected from District Dir Lower, Pakistan. *African Journal of Biotechnology* 11: 9149-9155.

(Manuscript Received: November, 2023; Revised: July, 2024;  
 Accepted: August, 2024; Online Published: November, 2024)  
 Online First in [www.entosocindia.org](http://www.entosocindia.org) and [indianentomology.org](http://indianentomology.org) Ref. No. e24773