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**Taxonomical Revision of The Tribe Coccinellini (Coleoptera: Coccinellidae)  
In Egypt**

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**ABSTRACT**

The study aims to investigate the reliable identification members of the tribe Coccinellini, because of their potential as biological control agents, as predators of aphid insect pests, and other soft-bodied insects which, threatened the major crops. The surveys were conducted in twelve governorates represent the most geographical regions within, Egypt. Specimens were collected regularly during the years of 2017- 2019, and some species have dispersed widely, and others are presented in one site. Totally, 9 species, subspecies, and more than 29 aberrations, belonging to two species *Coccinella undecimpunctata*, and *Hippodamia variegata*, classified into four genera within the tribe Coccinellini. Morphological characters especially the genitalia were studied with the morphometric measurements. Key to genera and species were constructed, and the illustration to the most effective characters were provided, with the local and world distributions for each species.

**INTRODUCTION**

Coccinellidae, commonly known as ladybugs or ladybird beetles, are a worldwide Cucujoid beetle family comprising approximately 6000 species (Kovář, 1996; Vandenberg, 2002, and Hunt *et al.* 2007). This family contains some of the larger, more conspicuously colored members of lady beetle fauna, and can be easily recognized by glabrous dorsal surface body length 1.75 to 10.5 mm; terminal maxillary palpomere securiform, and antenna two-thirds head width or longer. The subfamily Coccinellinae including two tribes Coccinellini and Tytthaspidini. The species of the tribe Coccinellini contains the species referred to as "ladybeetles" in the classic sense. These are the commonly collected "aphid" predators, includes many beneficial species that are voracious predators of pestiferous aphids and scale insects, and mass-reared for these purposes for controlling many crop pests in Egypt (Afifi *et al.* 2010; Mandour *et al.* 2011). Much of the color variation (number of spots, spot position, spot size, and shape) in ladybird beetles is genetic (Majerus, 1994). Honěk in (1996) provided a review of temporal and geographic variability in lady beetles. The morphological polymorphisms are well studied and provide evidence of natural variation and microevolutionary processes occurring in nature (Ford, 1964). The elytral patterns varying in terms of the base color and number, size, and shape of spots. The few species that are the classical subjects of these studies have a small number of morphs in which the base color of the elytra differs and is determined by major genes.

Many authors were studied and conducted this family, or some species, such as; Boehm his list of the Egyptian Coccinellidae in 1908; Ibrahim in 1953; Alfieri, 1976 in his list of "Coleoptera of Egypt"; (El-Akkad, 1979; Badrawy, 2009; Atif, 2016, and Bedewy, 2016). This subfamily is represented in the Egyptian fauna by two tribes Coccinellini and Tyttaspidini= Bulaeaini (Bedewy, 2016).

## MATERIALS AND METHODS

The fresh materials of tribe Coccinellini used in this study were obtained and collected during over two years (May 2017 to September 2019), from cultivated vegetation, citrus, fruit trees, and herbal plants with two collecting methods, depending on the type of habitats.

The collected specimens were killed by ethyl acetate, then pinned, labeled, and identified with information about host plants, locality and collecting date, and/or preserved in vials or Eppendorf contain 70% ethyl alcohol, for easily dissection and study the genitalia with other taxonomic characters.

The initial systematic assignment and identification of the included species and subspecies groups are based on a compromise between several compatible views on the systematics of Coccinellinae, Mulsant (1866), Beffa (1913), Mader (1930-1931), Iablokoff-Khinzorian (1979), Al-Akkad (1979), Gordon & Vandenberg (1991), Raimundo *et al.* (2000), Badrawy (2009), and Bedewy (2016), and the terminology of genitalia was based on Gordon (1985). The identified specimens were deposited in the side Collection of Plant Protection Department, Faculty of Agriculture, Al- Azhar University.

Measurements were made using an ocular micrometer attached to a dissecting microscope Olympus SZ61 Stereomicroscope, from at least six specimens (Kovář, 2005), or 10 replicates usually from each species, as follows:

Body length from apical margin of clypeus to apex of elytra (BL), and body width across both elytra at widest part (BW). Head length from anterior margin of clypeus to base of head (HL), head width including eyes (HW). Antennal length (AL), and mouthparts length (labrum, mandible, maxilla, labium). Pronotal length from the middle of anterior margin to base of pronotum (PL), pronotal width at widest part (PW), Elytral length along suture including scutellum (EL), elytral width (EW). Abdominal length (AL), abdominal width (AW), male genitalia (siphon from siphonal capsule to apex, and tegmen length from the apical margin of median lobe to apex of trabe), and female genitalia (spermathecal length) (Giorgi and Vandenberg, 2012).

The entire beetles were soaked in 10% solution of KOH to dissolve excess tissue and placed in glycerine on slides for further study. All drawings were made by a square eyepiece, and/ or Camera Lucida attached to Olympus SZ61 Stereomicroscope.

## RESULTS AND DISCUSSION

### Tribe Coccinellini, Latreille

Coccinellini Latreille, 1807

**Synonyms:** Halyziaires Mulsant, 1846: 29; Hippodamiini Costa, 1849: 10; Cydoniaires Mulsant, 1850: 429; Tyttaspides Crotch, 1874: 181; Synonychinae Della Beffa, 1913: 167; Anisostictini Jacobson, 1916: 969.

**Diagnosis:** Body length usually 1.75 to 1.5 mm, moderately to strongly convex; dorsum glabrous, smooth, and shiny, usually with contrasting markings. Head with clypeus straight or rarely arcuate anteriorly between distinct lateral projections, ventral side usually without antennal groove. Eyes large, finely faceted, weakly emarginate. Mandible large, triangular

with double apical tooth; terminal maxillary palpomere securiform. Antennae, 11-segmented with a distinct 1-3 segmented club. Pronotum almost simple, prosternal process usually with carinae. Scutellum large. Elytral punctures absent or faint and irregular. Tarsi 4-segmented; claws appendiculate. Abdomen with 6 ventrites. Postcoxal line variable, sometimes with an associated oblique dividing line. Tegmen symmetrical, parameres well developed multi setose apically. Coxites club-handle like; spermatheca large and well-differentiated with cornu and ramus.

#### Key to genera of the tribe Coccinellini

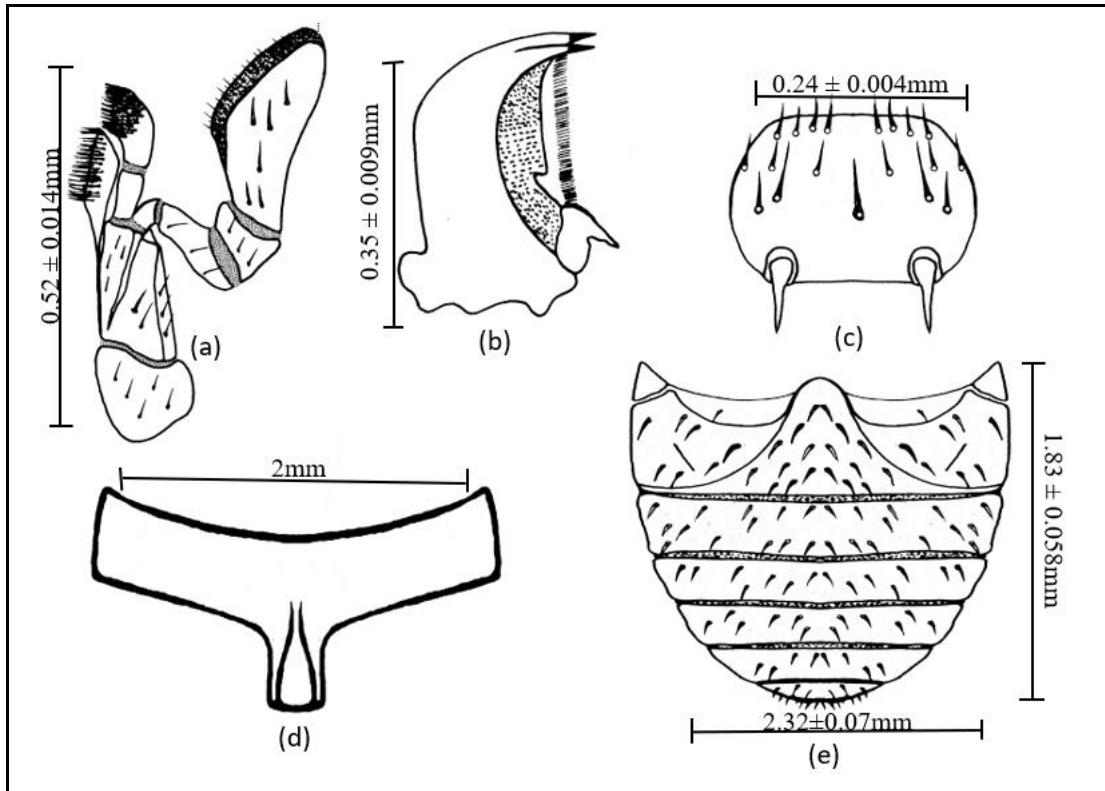
- 1- Antennae with scape asymmetrical; pronotum whitish-yellow, decorated by black spot, cup-shaped in the middle of its anterior edge, connected posteriorly by a pedicle has basilar edge, black.....*Cheilomenes* Chevrolat
  - Antennae with scape symmetrical; pronotum whitish-yellow with black spots or black with triangular or quadriangular markings at its antero-lateral angles.....2
  - 2- Epimeron of meso and metathorax whitish-yellow; postcoxal line complete or incomplete .....3
  - Epimeron of mesothorax yellowish-white or whitish-yellow; postcoxal line incomplete, recurved or not .....4
  - 3- Posterior margin of pronotum with distinct ridge; postcoxal line recurved and complete .....*Hippodamia* Chevrolat
  - Posterior margin of pronotum without distinct ridge; postcoxal line merging with posterior margin of the same sternum with an oblique dividing line.....*Coccinella* Linnaeus
  - 4- Pronotum whitish-yellow with five black spots connected to form M-shaped, or not connected; prosternum without carinae; postcoxal line semicircular but incomplete .....*Adalia* Mulsant
  - Pronotum black with two subquadriangular markings whitish-yellow at its antero-lateral angles; prosternum with two longitudinal carinae; postcoxal line on the first abdominal sternum merging with posterior margin with an oblique dividing line .....*Oenopia* Mulsant
- Notice:** Five genera are included in the key, but only four genera are mentioned with diagnosis.

#### Genus *Cheilomenes* Chevrolat, 1836

*Cheilomenes* Chevrolat, 1836: 435: type species: *Coccinella lunata* Fabricius, 1775.

**Synonyms:** *Cheilomenes* Mulsant, 1866: 288; *Chilomenes* Weise, 1879: 135: type species: *Chilomenes nilotica* Mulsant, 1850 (= *Cydonia vicina* Mulsant, 1850); *Cydonia* Mulsant, 1850: 430: type species: *Cydonia quadrilineata* Mulsant, 1850 (= *Cydonia propinqua* Mulsant, 1850).

**Diagnosis:** Body rounded or broadly oval; moderately convex; clypeus semicircular, emarginated; antenna short 11-segmented; terminal maxillary palpomere securiform (Fig. 1a); mandible with apical subapical, and basal teeth (Fig. 1b); labrum transverse (Fig. 1c); pronotum ornamented; scutellum not extremely minute or punctiform; prosternal process with two longitudinal carinae (Fig. 1d); elytra translucent, elytral epipleuron broad; tarsus 4-segmented, tarsal claws with a large subquadrate internal tooth at base, large and conspicuous; abdominal postcoxal line incomplete parallel to posterior margin of the first abdominal sternum with an oblique line (Fig. 1e).



**Fig. 1.** *Cheilomenes* ssp., (a) maxilla; (b) mandible; (c) labrum; (d) prosternum; (e) abdominal sternites with postcoxal line.

#### Key to the Egyptian species and subspecies of genus *Cheilomenes*

- 1- Pronotum yellow, decorated by triangular advanced tooth-shaped in the middle of its anterior edge, connected posteriorly by a pedicle has a basilar edge, reaches to near lateral margins, up to two-thirds of the posterior margin, black; elytra reddish-yellow or black.....**2**
- Pronotum yellow, decorated by triangular advanced tooth-shaped in the middle of its anterior edge, connected posteriorly by a pedicle has a basilar edge, covering two-thirds of the intermediate base, black; elytra foxy red, elytral suture black.....*vicina nilotica* Mulsant
- 2- Epimeron of meso and metasternum whitish-yellow; elytra reddish yellow.....*vicina* Mulsant
- Epimeron of mesosternum whitish-yellow; elytra black.....**3**
- 3- Elytra entirely black; elytral epipleuron infuscated.....*vicina isis* Crotch
- Elytra black with two infuscated markings at their apex; elytral epipleuron whitish yellow  
.....*vicina subsignata* Pic

*Cheilomenes vicina* (Mulsant, 1866) (Figs. 5& 6 for sp. and ssp.)

**Synonyms:** *Cydonia vicina* Mulsant, 1850: 441.

**Morphometrics:** BL  $4.18 \pm 0.13$ mm, BW  $3.35 \pm 0.098$ mm; HL  $0.72 \pm 0.02$ mm, HW  $1.07 \pm 0.03$ mm; AL  $0.56 \pm 0.012$ mm; Labrum  $0.24 \pm 0.004$ mm, Mandibles  $0.35 \pm 0.009$ mm, Maxillae  $0.52 \pm 0.014$ mm, Labium  $0.38 \pm 0.007$ mm; PL  $1.02 \pm 0.04$ mm, PW  $1.99 \pm 0.053$ mm; EL  $3.28 \pm 0.09$ mm, EW  $3.35 \pm 0.098$ mm; AL  $1.83 \pm 0.058$ mm, AW  $2.32 \pm 0.07$ mm; Tegmen  $1.29 \pm 0.018$ mm, Siphon  $1.34 \pm 0.026$ mm, Spermatheca  $0.27 \pm 0.017$ mm.

#### Diagnostic characters:

**Head** yellowish, slightly hidden into the prothorax; antenna short, 11-segmented, or so appears with 3-segmented compact club-shaped, and asymmetrical scape. Terminal maxillary

palpomere securiform.

**Thorax:** **pronotum** yellowish, finely punctured, convex, anterior margin sinuate recurved from the middle, lateral margins and posterior margin nearly rounded, lateral margins finely upturned, decorated by black spot cup-shaped or almost triangular advanced tooth-shaped in the middle of its anterior edge, connected posteriorly by a pedicle has a basilar edge, reaches to near lateral margins up two-thirds of the posterior margin; **prosternum** dark brown; prosternal process broad with two longitudinal carinae; epimeron of **meso** and **metasternum** whitish-yellow; mesosternum emarginated at the middle. **Elytra** reddish yellow, outer margins with trimmed edge from the middle of the base, extended passing on the callus up to five-tenths or even eight-ninths of their length, elytral apex rounded with reddish-yellow markings; **elytral epipleuron** reddish yellow, broad and concave, strongly inclined with an inner carinae reaches to elytral apex. **Legs** reddish yellow, tibiae of middle and hind legs with two apical spurs, tarsi 4-segments with subquadrate basal tooth.

**Abdomen:** six visible abdominal sternites in both sexes. Sixth abdominal sternite moderately convex in the female, while blunt in the male.

**Male genitalia:** **Apodeme** of male sternum 9 not chitinized, rod-like; **tegmen** slightly chitinized, with asymmetrical trabes; **basal piece** (bp), short, nearly parallel-sided; **basal lobe** (bl) elongated, slightly v-shaped, the middle portion broader than the base and apex, apical portion recurved toward parameres; **parameres** (pa) finger-like, longer than basal lobe, bears at its apex numerous long and short setae; **sipho** slightly chitinized, tube-like, nearly pointed at its siphonal apex (sa) and recurved before; **siphonal capsule** (sc) distinctly T-shaped.

**Female genitalia:** **coxites** elongated, slightly chitinized, apical half bears numerous short and long setae, broader than basal half, stylus, distinct, bears two long setae; **infundibulum** and **sperm duct** not chitinized. **Spermatheca** worm-like, distinctly chitinized with indistinct **nodulus** (n), **ramus** (r) distinctly separated from basal quarter of cornu, two-thirds of **cornu** (c) forming U-shaped, distal portion broader than the middle.

**Specimens examined:** Zoharieh Garden 4.VI.2018; 17.XII.2018 and El-Tahady 17.V.2018  
.....**Author coll.**

*Cheilomenes vicina nilotica* (Mulsant, 1850)

**Synonyms:** *Cydonia nilotica* Mulsant, 1850: 443; *Cydonia vicina nilotica* Mulsant, 1866: 288.

**Diagnostic characters:**

**Head** yellow, except the posterior margin, behind the eyes black; antenna short.

**Thorax:** **pronotum** yellowish decorated by black spot cup-shaped or almost triangular advanced tooth-shaped in the middle of its anterior edge, connected posteriorly by a pedicle has a basilar edge covering two-thirds of the intermediate base; ventral side brown except epimeron of mesosternum whitish-yellow; **mesosternum** emarginated at middle. **Elytra** finely punctured, yellowish red or foxy red, elytral suture black, lateral margins with fine ridge, that emerging from the middle of the base, extended, passing on the callus, up to five-tenths or even eight-ninths of their length not reach to apical margin of elytron, **elytral epipleuron** strongly declined with foveate to receive the femoral tips of middle and hind legs at rest. **Legs** reddish-yellow.

**Specimens examined:** Zoharieh Garden 4.VI.2018; 17.XII.2018 and El-Tahady 17. V.2018  
.....**Author coll.**

*Cheilomenes vicina subsignata* (Pic, 1911)

**Synonym:** *Cydonia subsignata* Pic, 1911: 11.

**Diagnostic characters:**

**Head** black, except the frons and clypeus pale yellow; **mandible** dark-brown; **maxillary cardo** black.

**Thorax:** **pronotum** yellowish, finely punctured, adorned by black spot cup-shaped, almost

triangular, advanced tooth-shaped, in the middle of its anterior edge, connected posteriorly by a pedicle has a basilar edge covering two-thirds of the intermediate base; **prosternum** dark brown or black; **hypomeron** yellowish, except that parts adjacent the prosternum; mesosternum with emargination in the middle; **epimeron of mesosternum** whitish-yellow. **Elytra** black with two infuscated (smoky gray-brown with blackish tinge) markings at their apex, **elytral epipleuron** whitish-yellow, with an inner carina reaches to the elytral apex. **Legs** reddish-yellow.

**Specimens examined:** Gabel Asfar 18.VIII.2017; El-Tahady 17.V.2018 ..... **Author coll.**

*Cheilomenes vicina isis* (Crotch, 1874)

This subspecies is distinguished by the following Characters:

**Elytra** entirely black, **elytral epipleuron** infuscated or dark brown.

**Specimens examined:** El-Tahady 17. V.2018.....**Author coll.**

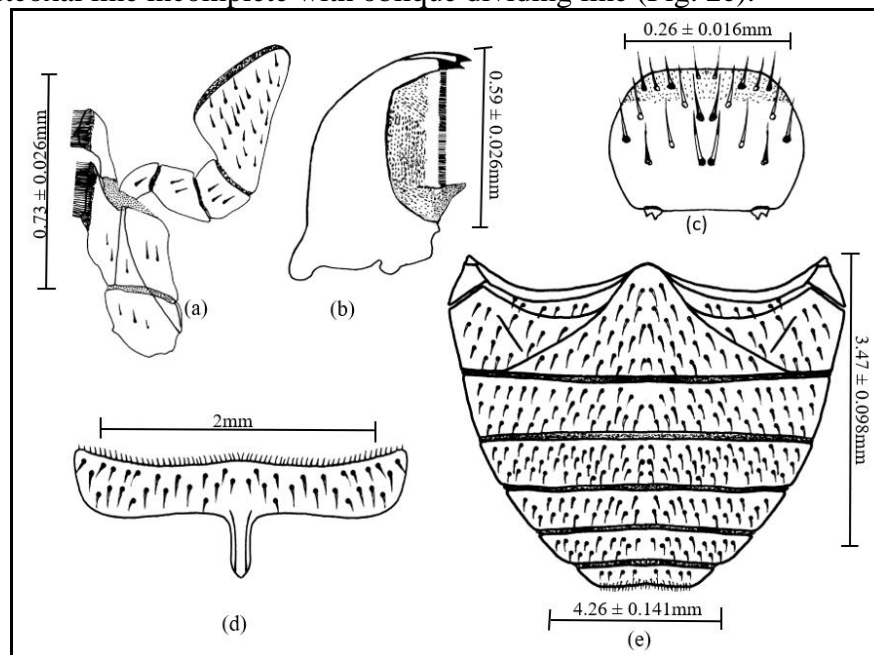
**Local distribution of species and subspecies of genus *Cheilomenes*:** Alexandria, Cairo, Giza, Qaluobiya, and Beheira.

**World distribution of species and subspecies of genus *Cheilomenes*:** Egypt, Algeria, Libya, Iraq, Lebanon, Saudi Arabia, Yemen and

**Genus *Coccinella* Linnaeus, 1758**

*Coccinella* Linnaeus 1758: 364: Type species; *Coccinella septempunctata* Linnaeus, 1758: 365.

**Diagnosis:** Body broadly oval; moderately to strongly convex; length 4-8.5mm. Head entirely black, or with 2 pale spots or pale band; terminal maxillary palpomere securiform (Fig. 2a); mandible with apical, subapical, and basal teeth (Fig. 2b); labrum transverse (Fig. 2c). Pronotum black with anterolateral angle with white spot varying in size, these spots sometimes joined by pale band along the anterior margin, ventral margin of anterolateral angle with pale spot of varying size; elytron yellow or red; maculate or not. Apex of clypeus nearly truncate, anterolateral angle produced forward. Lateral margin of elytron narrow, abruptly reflexed; epipleuron nearly flat. Intercoxal process of prosternum narrow, flat with 2 convergent or parallel lateral carinae (Fig. 2d). Apical margin of mesosternum truncate. Apex of middle and hind tibia each with 2 spurs. Tarsal claw with large tooth, either basal or median. Postcoxal line incomplete with oblique dividing line (Fig. 2e).



**Fig. 2,** *Coccinella* ssp., (a) maxilla; (b) mandible; (c) labrum; (d) prosternum; (e) abdominal sternites with postcoxal line

**Key to species and subspecies of genus *Coccinella***

- 1- Pronotum black with two quadrangular or triangular whitish-yellow markings at the anterior angles extending posteriorly to the posterior angles; basal piece slightly shorter than parameres; ramus distinctly separated from nodulus and long; siphonal capsule distinct but not T-shaped ..... *undecimpunctata* L.
- Pronotum black with two quadrangular whitish-yellow markings at the anterior angles; basal piece distinctly shorter than parameres; ramus distinctly separated from nodulus but short; siphonal capsule distinctly T-shaped..... *septempunctata* L.

*Coccinella septempunctata* L., 1758 (Figs. 7 & 8)

**Synonyms:** *Coccinella 7-punctata* Linnaeus, 8 (1758): 365; *Coccinella 7-punctata* Mulsant, 3 (1846): 79.

**Morphometrics:** BL  $7.84 \pm 0.39$ mm, BW  $5.35 \pm 0.29$ mm; HL  $0.96 \pm 0.037$ mm, HW  $1.61 \pm 0.042$ mm; AL  $1.16 \pm 0.022$ mm; Labrum  $0.26 \pm 0.016$ mm, Mandibles  $0.59 \pm 0.026$ mm, Maxillae  $0.73 \pm 0.026$ mm, Labium  $0.45 \pm 0.011$ mm; PL  $1.76 \pm 0.05$ mm, PW  $3.47 \pm 0.10$ mm; EL  $6.02 \pm 0.23$ mm, EW  $5.35 \pm 0.29$ mm; AL  $3.47 \pm 0.098$ mm, AW  $4.26 \pm 0.141$ mm; Tegmen  $2.27 \pm 0.026$ mm, Siphon  $2.65 \pm 0.037$ mm, Spermatheca  $0.54 \pm 0.015$ mm.

**Diagnostic characters:**

**Head** black; **antenna** dark brown, 11-segmented with 3 –segmented compact club-shaped; **labrum** dark brown or black; **mandible** bifid apically with whitish spot at lateral margin, near the base.

**Thorax:** **pronotum** black with two quadrangular whitish-yellow markings at its anterior angles; **prosternal process** with two obvious longitudinal carinae; **hypomeron** black, **meso**, and **metasternum** black, except the epimeron of mesothorax whitish-yellow, anterior margin of mesothorax with fine ridge, not emarginated at middle. **Elytra** reddish yellow with two yellowish patches at its base on both sides of scutellar black spot, lateral margins with obvious ridge at its anterior half and fine ridge at posterior one, elytra normally with seven black spots, three per elytron arranged as follows: (1/2, 1, 1, 1), the scutellar and three spots per each elytron, the lateral spot, **elytral epipleura** well developed with an inner carinae not reach the elytral apex. **Legs** black, tibiae of middle and hind legs with two spurs; tarsal claws with subquadrate basal tooth.

**Abdomen:** six visible abdominal sternites in both sexes; posterior margin of the six abdominal sternum, convex in the female, blunt in the male, posterior margin of the six abdominal tergite arched in the female, strongly convex in the male.

**Male genitalia:** **Apodeme** of male sternum 9 rod-like, and chitinized; **tegmen** with asymmetrical trabes, basal lobe (bl) slightly longer than lateral lobes, cone-shaped with obvious triangular orifice, terminal edge of basal lobe V-shaped; **parameres** (pa) finger-like, bears at its anterior third densely long setae, toward the basal lobe especially at lateral edges; **siphon** (s) chitinized, tube-like, **siphonal capsule** (sc) T-shaped, **siphonal apex** (sa) with a club at inner edge.

**Female genitalia:** **coxites** handle-like with distinctly short stylus, bears at its outer edge numerous short setae; stylus chitinized, length twice as width, bears two apical setae; **spermatheca** nearly semicircular, **cornu** (c) blunt at end, **ramus** (r) visible and shorter than the nodulus, which is tubular in shaped chitinous, rings covered all the well, except the apical region of **cornu** (c) forming finger-like at tip.

**Specimens examined:** Saint Katherine 9-11. V.2018; Baharieh Oases 27-28.IX.2017; Siwa Oasis 16-18.IX.2014; Kom Oshem 6.VII.2019; Gabel Asfar 15.IX.2018 & 20. V.2019 and Sikem (Belbies) 22.VIII.2015 ..... **Author coll.**

**Local distribution:** Giza, Cairo, Qaluobiya, Sharqiya, Fayoum, Aswan, New Valley, Matrouh, and South Sinai.

**World distribution:** widely distributed throughout **Europe, Asia, AFR, NAR, and ORR.**



*Coccinella (Spilota) undecimpunctata undecimpunctata* L., 1758 (Fig. 9& 10)

*C. (Spilota) undecimpunctata menetriesi* Muls., 1850) with synonyms: *C. menetriesi* Mulsant, 1850: 104; *C. undecimpunctata aegyptiaca* Reiche, 1861: 212.

**Morphometrics:** BL  $5.05 \pm 0.18$ mm, BW  $3.37 \pm 0.14$ mm; HL  $0.76 \pm 0.03$ mm, HW  $1.15 \pm 0.04$ mm; AL  $0.85 \pm 0.02$ mm; Labrum  $0.25 \pm 0.004$ mm, Mandibles  $0.42 \pm 0.01$ mm, Maxillae  $0.59 \pm 0.02$ mm, Labium  $0.46 \pm 0.01$ mm; PL  $1.12 \pm 0.05$ mm; PW  $2.18 \pm 0.12$ mm; EL  $4.05 \pm 0.19$ mm, EW  $3.29 \pm 0.15$ mm; AL  $2.17 \pm 0.12$ mm, AW  $2.45 \pm 0.13$ mm; Tegmen  $1.28 \pm 0.021$ mm, Siphon  $1.70 \pm 0.029$ mm, Spermatheca  $0.45 \pm 0.02$ mm.

**Diagnosis:** **Head** black; antenna dark brown, 11-segmented with compact 3-segmented, club-shaped, **mandible** with two light spots on its base.

**Thorax:** **pronotum** black with two quadrangular or triangular whitish-yellow markings at the anterior angles extending posteriorly to the posterior angles, and ventrally to the anterior angles of ventral part of the pronotum in the subspecies of *C. undecimpunctata menetriesi*, while in the typical species these anterolateral markings not reach to the posterior margins of pronotum, these markings attached to each other with narrow whitish-yellow stripe along the anterior margin; **prosternum** with two longitudinal carinae; **meso** and **metasternum** black, except **epimeron** of **meso** and **metasternum** whitish-yellow, anterior margin of mesosternum emarginated medially. **Elytra** yellowish red, or orange with 11-black spots, scutellar, and five spots per elytron, sometimes of these spots absent or fused with other spots forming the subspecies. **Legs** dark brown, tibiae of middle and hind legs with two apical obvious spurs, tarsi 4-segmented, tarsal claws with subquadrate basal tooth.

**Abdomen:** six visible abdominal sternites in both sexes, entirely black; apical margin of the sixth abdominal sternum in the female convex, blunt in the male, the apical end of the last tergite in the female, strongly convex, while in the male regularly convex.

**Male genitalia:** **Apodeme** of male sternum 9 rod-like, slightly chitinized at two-thirds of base and heavily chitinized at apical third; **tegmen** with asymmetrical trabes, **basal piece** (bp) much longer than wide, extended posteriorly into two divergent protuberance; **basal lobe** (bl) cone-shaped, strongly dilated from the middle; **parameres** (pa) finger-like, distinctly shorter than basal lobe, bears at its apex numerous long setae; **siphon** (s) strongly recurved before siphonal capsule and dilated leaving a wide concave from inner margin, siphonal capsule (sc) not T-shaped with protuberance at outer margin.

**Female genitalia:** **coxites** strongly dilated from two thirds apically, bears numerous short setae and narrow from basal third, **stylus** slightly chitinized and setose, **infundibulum** heavily chitinized, sperm duct not chitinized; **spermatheca;** C-shaped with distinct ramus (r), cornu (c) with apical half strongly chitinized and pointed apically, narrower than ramus, nodulus (n) shorter and narrower than ramus.

**Specimens examined:** Assiut 23.VII.2019; Saint Katherine 9-11.V.2018; El-Marg 13.IX.2018; Mostroud 14.IX.2019; Siwa 16-18.IX.2014; Helwan 10.VII.2019; Gabel Asfar 15.IX.2018, and 20.VII.2019 ; Beni Suief 22.VII.2019; Baharieh Oases 27-28.IX.2017; Belbies 22.VIII.2015; Kom Oshem 6.VII.2019; El-Nahda (Amrieh) 18.VI.2018, and 1.VI.2019 (49); Gaber Ibn Haian 2.V.2019 (16), and El-Bagor 18.III.2016 (5)....**Author coll.**

**Local distribution:** Cairo, Giza, Qaluobiya, Beheira, Minufiya, Sharqiya, Fayoum, Beni Suief, Assiut, Kharga Oasis, Matrouh and Alexandria, South Sinai, Aswan.

**World distribution:** Egypt, Algeria, Libya, Tunisia, South European Territory, Turkey, Greece, East Siberia, Gansu, Guizhou, Hebei, Iran, Iraq, Palestine, Jordan, Kuwait, and Syria.

**The species of *Coccinella undecimpunctata* L., has numerous aberrations in the Egyptian fauna and can be listed as follows:**

1- *Coccinella undecimpunctata brevifasciata* Weise

The lateral and discal spots are fused, the marginal and apical spots are also fused.

2- *Coccinella undecimpunctata confluens* Haworth

The lateral and discal spots are fused.

3- *Coccinella undecimpunctata maculata* Walter

This subspecies is distinguished by the following characters, elytra with 9 black spots, the humeral spot or the first spot absent, marginal and apical spots are fused.

4- *Coccinella undecimpunctata novempunctata* Linnaeus

The humeral spot absent.

5- *Coccinella undecimpunctata ocellata* Churchville

All spots surrounding with yellowish circles.

6- *Coccinella undecimpunctata oculata* Thunberg

Apical spot absent.

7- *Coccinella undecimpunctata tamaricis* Weise

The marginal and apical spots are fused.

8- *Coccinella undecimpunctata variegata* Weise

This species is distinguished by the following characters: scutellum black, elytron with lateral, discal and marginal spots. The humeral and apical spots are absent.

9- *Coccinella undecimpunctata vicina* Weise

The humeral and lateral spots are absent.

10- *Coccinella undecimpunctata lemani* Marriner

Each elytron with discal and apical spots only.

**Genus *Hippodamia* Chevrolat, 1836**

*Hippodamia* Chevrolat, 1836: 456: Type species: *Coccinella tredecimpunctata* Linnaeus, 1758

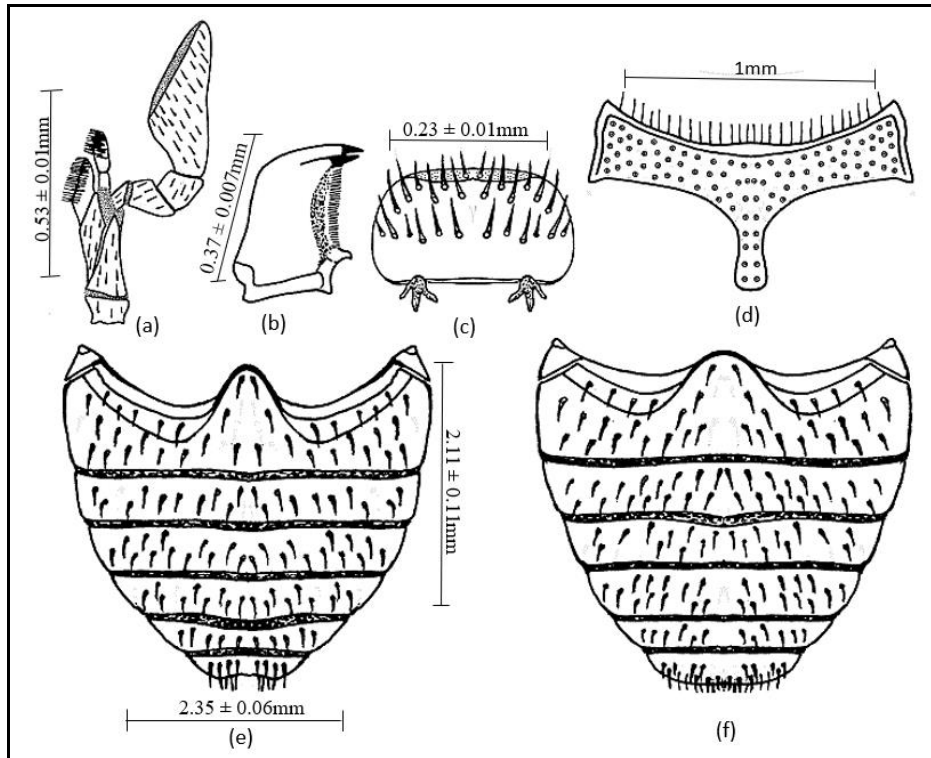
**Synonyms:** *Adonia* Mulsant, 1846: 39 and 1850: 36; Type species: *Coccinella mutabilis* Scriba (1790), a synonym of *Adonia variegata* (Goeze, 1777).

**Diagnosis:** Body elongate oval, from 3.0 to 8.0mm. in length; femur visible beyond lateral margin of elytra. Elytral colour orange with black variable patterns. Head with anterior clypeal border straight between lateral projections. Antenna 11-segmented; slightly shorter than head capsule with moderately compact 3-segmented club. Terminal maxillary palpomere strongly securiform (fig. 3a); mandible with apical subapical and basal teeth (fig. 3b), labrum transverse (fig. 3c). Pronotal disc is evenly convex transversely to narrowly upturned external borders; pronotal base with entire margin. Prosternal process very narrow without distinct carinae (fig. 3d). Tibial spurs formula 0-2-2; claw split apically. Abdominal postcoxal line present (fig. 3e & f), or absent. Male fore and mid tarsi with first tarsomeres enlarged. Male genitalia symmetrical; Female genitalia with coxal plate club-handle like, stylus distinct; infundibulum absent. Spermatheca, distinctly curved with cornu and basal ramus and nodulus.

*Hippodamia variegata* (Goeze, 1777) (fig. 11, 12 and 13)

**Synonyms:** *Adonia variegata* Goeze, 1(1777): 247; *Coccinella mutabilis* Scriba, 1(1790): 183; *A. mutabilis* Mulsant, 4(1846): 39.

**Morphometrics:** BL  $4.84 \pm 0.20$ mm, BW  $2.87 \pm 0.16$ mm; HL  $0.88 \pm 0.03$ mm, HW  $1.18 \pm 0.04$ mm; AL  $0.93 \pm 0.02$ mm; Labrum  $0.23 \pm 0.01$ mm, Mandibles  $0.37 \pm 0.007$ mm, Maxillae  $0.53 \pm 0.01$ mm, Labium  $0.42 \pm 0.007$ mm; PL  $1.12 \pm 0.05$ mm; PW  $2.17 \pm 0.10$ mm; EL  $3.58 \pm 0.09$ mm, EW  $2.87 \pm 0.16$ mm; AL  $2.11 \pm 0.11$ mm, AW  $2.35 \pm 0.06$ mm; Tegmen  $1.33 \pm 0.023$ mm, Siphon  $1.47 \pm 0.018$ mm, Spermatheca  $0.29 \pm 0.012$ mm.



**Fig. 3.** *Hippodamia* ssp., (a) maxilla; (b) mandible; (c) labrum; (d) prosternum; (e) abdominal sternites of male with postcoxal line, and (f) abdominal sternites of female

**Diagnosis:** **Head** whitish-yellow with posterior margin black sinuate between the eyes; **epistoma** whitish-yellow in the male, while in the female whitish-yellow with two black bands between inner margins of the eyes sometimes these bands become fused; anterior clypeal border straight between lateral projections; **antenna** brownish-yellow, 11-segmented with compact 3-segmented club-shaped.

**Thorax:** **pronotum** black with antero-lateral borders, two small spots on each side, and one invagination in the middle whitish-yellow in the female, while pronotum black with three invaginations connected with anter-lateral borders whitish-yellow in the male; Prothoracic hypomeron without fovea near anterior angles; prosternal process very narrow with two indistinct carinae; **epimeron** of **meso** and **metarhorax** whitish-yellow. **Elytral** colour orange to orange-yellow with black variable patterns; the typical pattern with 13-black spots, 6 per elytron and scutellar spot common, these spots arranged as follows (1/2, 1,2,1,1, and 1 or 1/2, 1,2,2,1), sometimes these spots reduced to 5, 4 or 3 spots per elytron; Elytral margin with narrow raised margins; elytral epipleuron whitish-yellow, not foveate. Coxae of fore-legs black to dark brown with two whitish spots in female, and brownish yellow in male; femora extended beyond, seen from above, black in the female while black except femora of fore and mid legs dark brown to brownish-yellow in the male, tibiae of mid and hind legs with two terminal spurs, the first tarsomere in the male fore and mid tarsi dilated, tarsal claws split apically.

**Abdomen:** abdomen dark brown or black with six visible abdominal sternites in both sexes; the sixth abdominal sternum in the female convex, while truncate in the male.

**Male genitalia:** **Apodeme** of male sternum 9 absent; **parameres** and **phallobase** symmetrical; penis guide asymmetrical; basal lobe (bl) protuberances from base and overlapped, apical portion V-shaped; **parameres** (pa) articulated with phallobase, distinctly shorter than basal lobe, bears at its apex numerous short setae; **sipho** (s) stout, consisting of single sclerite, **siphonal capsule** (sc) distinct and T-shaped.

**Female genitalia:** **coxities** club-handle like; **styli** terminal, well developed with apical setae; **infundibulum** absent; **sperm duct** simple, uniform in diameter; **spermatheca** distinctly curved with **cornu** (c) and basal **ramus** (r) and **nodulus** (n); spermathecal accessory gland distinctly separated from sperm duct.

**Specimens examined:** Assiut 23.VII.2019; Saint Katherine 9-11.V.2018; El-Marg 13.IX.2018; Mostroud 14.IX.2019; Siwa 16-18.IX.2014; Helwan 10.VII.2019; Gabel Asfar 15.IX.2018, and 20.VII.2019; Beni Suief 22.VII.2019; Baharieh Oases 27-28.IX.2017; Belbies 22.VIII.2015; Kom Oshem 6.VII.2019; El-Nahda (Amrieh) 18.VI.2018, and 1.VI.2019; Gaber Ibn Haian 2.V.2019, and El-Bagor 18.III.2016.....**Author coll.**

**Notice:** This species is widely distributed all over the country and collected from the governorates which are visited through study period from April 2017 to November 2019

**Local distribution:** This species is distributed all over the country and collected from different governorates, previously was considered rare.

**World distribution:** North Africa including Egypt; Europe; Asia, **AFR**, **NAR**, and **ORR**.

As mentioned by many authors such as; **Mulsant** (1866), **Beffa** (1913), **Mader** (1930- 31), and **Alfieri** (1976) within their contributions, this species have an aberrations or subspecies, and can be identified by the presence or missing of spots into to the following groups:

**a-Elytra with 13 spots**

1- *Hippodamia variegata* (Goeze, 1777)

The typical species with thirteen black spots.

2- *Hippodamia variegata similis* Schrank

This aberration is a synonym of *H. variegata* Goeze.

3- *Hippodamia variegata ustulata* Weise

The second spot connected with the scutellar spot, fourth, and fifth spots are fused.

4- *Hippodamia variegata transylvanica* Penecke

The fourth and fifth spots are fused and connected with the first spot.

5- *Hippodamia variegata orientalis* Weise

The second and third spots fused, fourth and fifth spots are fused also, the first, second, and third spots are fused, and so on.

6- *Hippodamia variegata maculigera* Weise

The fourth, fifth, and sixth spots are fused.

7- *Hippodamia variegata italica* Walter

The second spot is connected with the scutellar spot.

8- *Hippodamia variegata confluens* Sajo

The fourth, and fifth spots are fused.

**b-Elytra with 11 spots**

1- *Hippodamia variegata undecimpunctata* Schrank

The humeral or the first spot is absent.

2- *Hippodamia variegata neglecta* Weise

The second spot is absent.

3- *Hippodamia variegata moraviaca* Walter

The sixth spot is absent.

4- *Hippodamia variegata litigiosa* Weise

The first spot is absent, fourth, and fifth spots are fused.

5- *Hippodamia variegata abbreviata* Weise

The second spot is absent, fourth, and fifth spots are fused.

6- *Hippodamia variegata bellieri* Walter

The third spot is absent, fourth, and fifth spots are fused.

**c- Elytra with 9 spots**

1- *Hippodamia variegata angulosa* Weise

The second and third spots are absent, fourth and fifth spots are fused.

2- *Hippodamia variegata biconstellata* Sajo

The first and second spots are absent.

3- *Hippodamia variegata carpini* Geoffroy

The second and third spots are absent.

**d- Elytra with 7 spots**

1- *Hippodamia variegata constellata* Laicharting

The first, second, and third spots are absent.

**e- Elytra with 6 spots**

1- *Hippodamia variegata sexpunctata* Fabricius

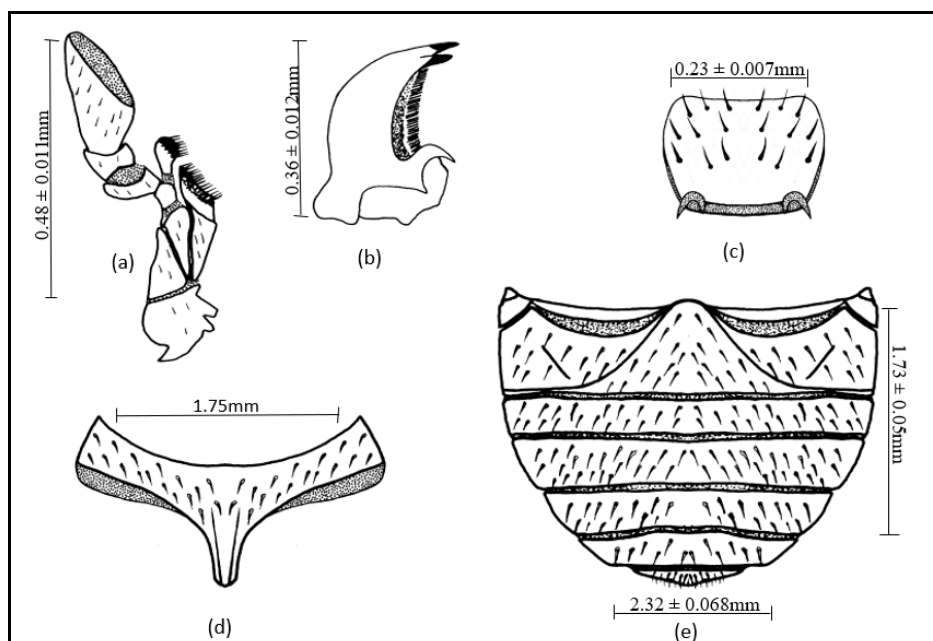
The first, second, and third spots are absent, the scutellar spot is absent also.

**Genus *Oenopia* Mulsant, 1850**

*Oenopia* Mulsant, 1850: 426: Type species: *Oenopia cinctella* Mulsant, 1850.

**Synonym:** *Synharmonia* Ganglbauer, 1899: 994: Type species: *Coccinella conglobata* Linnaeus 1758.

**Diagnosis:** Length 3-6 mm. Body strongly convex, glabrous. Head with anterior clypeal border straight between lateral projections. Elytra black with yellowish colour pattern of 4 spots. Antenna 11- segmented, slightly shorter than head capsule with moderately compact 3- segmented club. Terminal maxillary palpomere weakly securiform (fig. 4a). Mandible with apical, subapical, and basal teeth (fig. 4b). Labrum transverse (fig. 4 c). Pronotal disc evenly convex transversely to narrowly upturned external borders. Lateral margins of pronotum weakly arched, narrowly bordered, scutellum triangular, broader than long. Elytra basally wider than pronotum, lateral margins narrowly explanate and bordered. Anterior inner corners of pronotal hypomera shallowly foveate or not. Prothoracic hypomeron with fovea near anterior angles; prosternal process with distinct carinae extending anteriorly (fig. 4d). Anterior margin of mesoventrite deeply emarginate medially. Elytral margin with narrow raised and externally thickened margins; epipleuron not foveate. Tibial spurs formula 0-2-2. Abdominal postcoxal line not recurved and incomplete laterally with short and hardly visible oblique additional line (fig. 4e). Male genitalia symmetrical; Female genitalia with coxal plate club-handle like; styli distinct; infundibulum tube-like; spermatheca complex; spermathecal accessory gland distinctly separated from sperm duct.



**Fig. 4.** *Oenopia* spp., & ssp., (a) maxilla; (b) mandible; (c) labrum; (d) prosternum; (e) abdominal sternites with postcoxal line.

***Oenopia oncina addicta* (Mulsant, 1850) (Figs. 14 and 15)**

**Synonyms:** *Coccinella oncina* Olivier, 1808: 1048; *Oenopia addicta* Mulsant, 1850: 422; *Synharmonia uncina* ab. *sinaita* Weise, 53(1903): 583.

**Morphometrics:** BL  $4.12 \pm 0.11$ mm, BW  $2.81 \pm 0.086$ mm; HL  $0.74 \pm 0.017$ mm, HW  $1.07 \pm 0.02$ mm; AL  $0.69 \pm 0.015$ mm; Labrum  $0.23 \pm 0.007$ mm, Mandibles  $0.36 \pm 0.012$ mm, Maxillae  $0.48 \pm 0.011$ mm, Labium  $0.37 \pm 0.006$ mm; PL  $1.03 \pm 0.03$ mm; PW  $2.10 \pm 0.038$ mm; EL  $3.13 \pm 0.07$ mm, EW  $2.81 \pm 0.086$ mm; AL  $1.73 \pm 0.05$ mm, AW  $2.32 \pm 0.068$ mm; Tegmen  $1.35 \pm 0.026$ mm, Siphon  $1.39 \pm 0.026$ mm, Spermatheca  $0.38 \pm 0.021$ mm.

**Diagnostic characters:**

**Head** entirely black in female, except the mouthparts, dark brown, while black except the epistoma, whitish-yellow in male; antenna yellowish in male brownish in female, slightly shorter than the head width, and longer than the head length, 11-segmented with moderately compact, 3-segmented, club-shaped; labrum transverse, brownish-yellow in male, brown in female; mandible, bifid apically; maxilla with cardo and stipes dark brown or black in male, terminal maxillary palpomere weakly securiform.

**Thorax:** Pronotum, evenly convex, finely punctured, black with two quadrangular whitish-yellow markings connected by a band at its anterior margin in the male, or two triangular whitish-yellow markings connected with each other by narrow stripe at the anterior margin in female, lateral margins narrowly upturned; prosternum black, prosternal process with two distinct longitudinal carinae, extending anteriorly; prothoracic hypomeron with fovea near anterior angles; anterior margin of mesoventrite, deeply emarginated medially; ventral surface dark brown or black except the epimeron of mesoventrite whitish-yellow in male, black in female. **Elytra** black, finely punctured with six yellow-red spots per elytron, arranged as follows; 2, 1, 1, 1, 1, elytral margin with narrow raised and externally thickened margins; elytral epipleuron strongly inclined with an inner carinae, not reach the elytral apex. **Legs** with coxae of forelegs whitish-yellow in male, while dark brown in female, femora of

fore and mid legs brown, while the femur of hind leg dark brown in the male, as the femora of fore, mid and hind legs in the female which are dark brown; tibiae of mid and hind legs with two obvious spurs, tarsi, 4-segmented, tarsal claws with subquadrate basal tooth.

**Abdomen:** six visible abdominal sternites in both sexes, sternite one as long as sternite two and three combined; abdominal postcoxal line on the first abdominal sternum not recurved and incomplete, laterally and runs parallel to the posterior margin of the same sternite with short and hardly visible oblique additional line, the sixth sternite truncate in male, convex in the female.

**Male genitalia:** **Apodeme** of male sternum 9 rod-like, chitinized, slightly clubbed at apex; **tegmen** chitinized with asymmetrical trabes, **basal piece** (bp) parallel-sided, **basal lobe** (bl) flattened strongly recurved toward parameres, orifice triangular; **parameres** (pa) slightly longer than basal lobe, obliquely truncate apically with densely short and long hairs; **sipho** (s) sclerotized, **siphonal capsule** (sc) T-shaped, heavily chitinized, siphonal tube with construction before apex.

**Female genitalia:** **coxites** club handle-shaped, apical margin strongly chitinized, bears at apex numerous long and short setae, **stylus** indistinct, setose, **bursa copulatrix** not chitinized, infundibulum heavily chitinized cylindrical, **sperm duct** not chitinized and short; **spermatheca** sclerotized, nearly L-letter, angulated from two-thirds of apical **cornu** (c), **ramus** (r) long, slightly shorter than cornu distinctly separated from small **nodulus** (n).

**Specimens examined:**

Saint Katherine 9-11. V.2018 (25) .....**Author coll.**

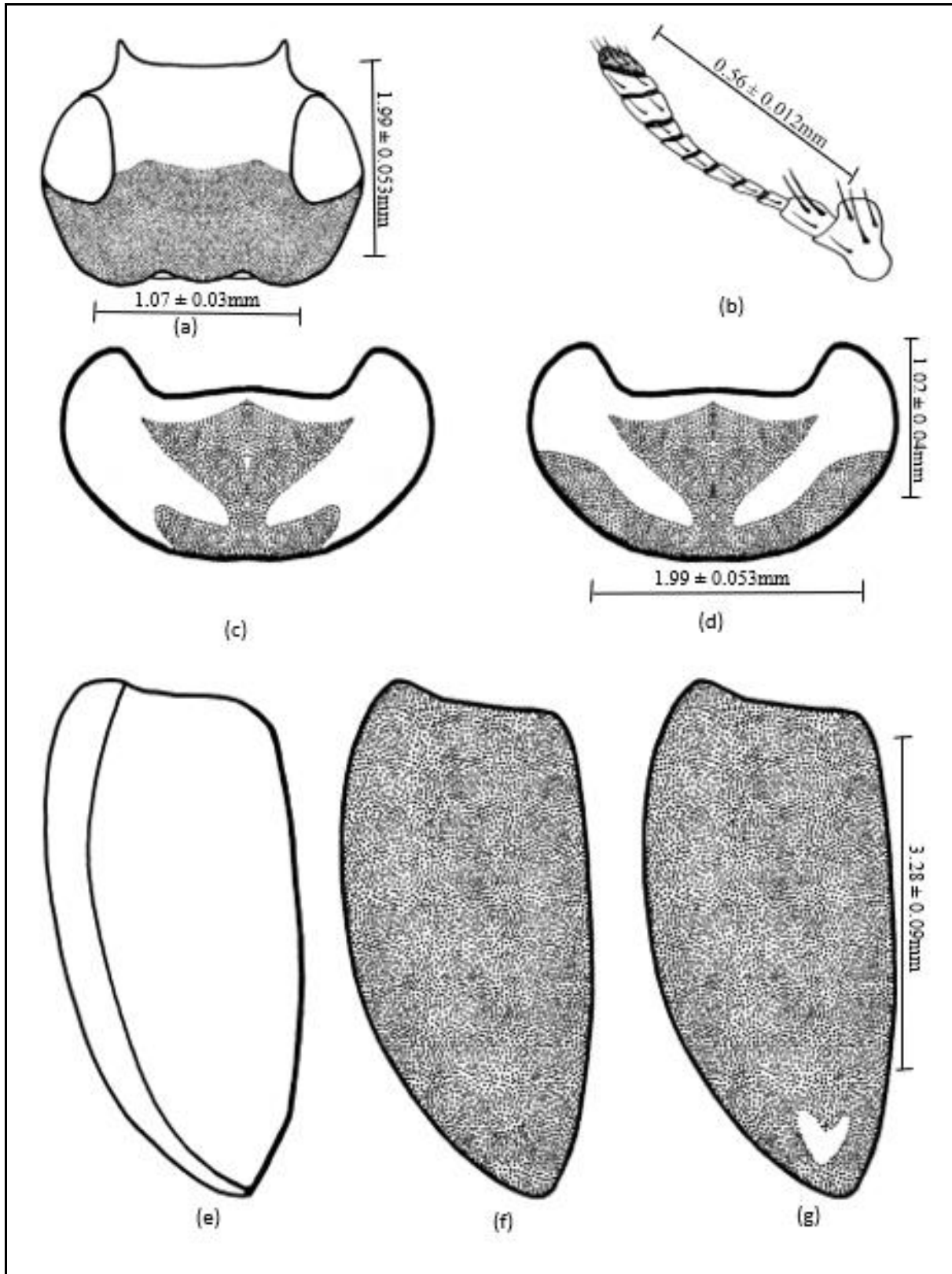
**Local distribution:** South Sinai.

**World distribution:** Egypt, Azerbaijan, Turkey, Greece, Armenia, Afghanistan, Arab Emirate, Saudi Arabia, Jordan, Syria, Iran, Iraq, and Lebanon.

*Oenopia oncina sinaita* (Weise, 1903) this subspecies as mentioned by Mader is equal to *addicta* Mulsant which distinguished by the first three spots are united, as follows: 1+2+3, 4, 5, and 6, while the arrangement of spots on the elytra of the next subspecies *Oenopia oncina peyrinhoffi* Sicard, are arranged as follows: 1+2, 3, 4, 5, and 6.

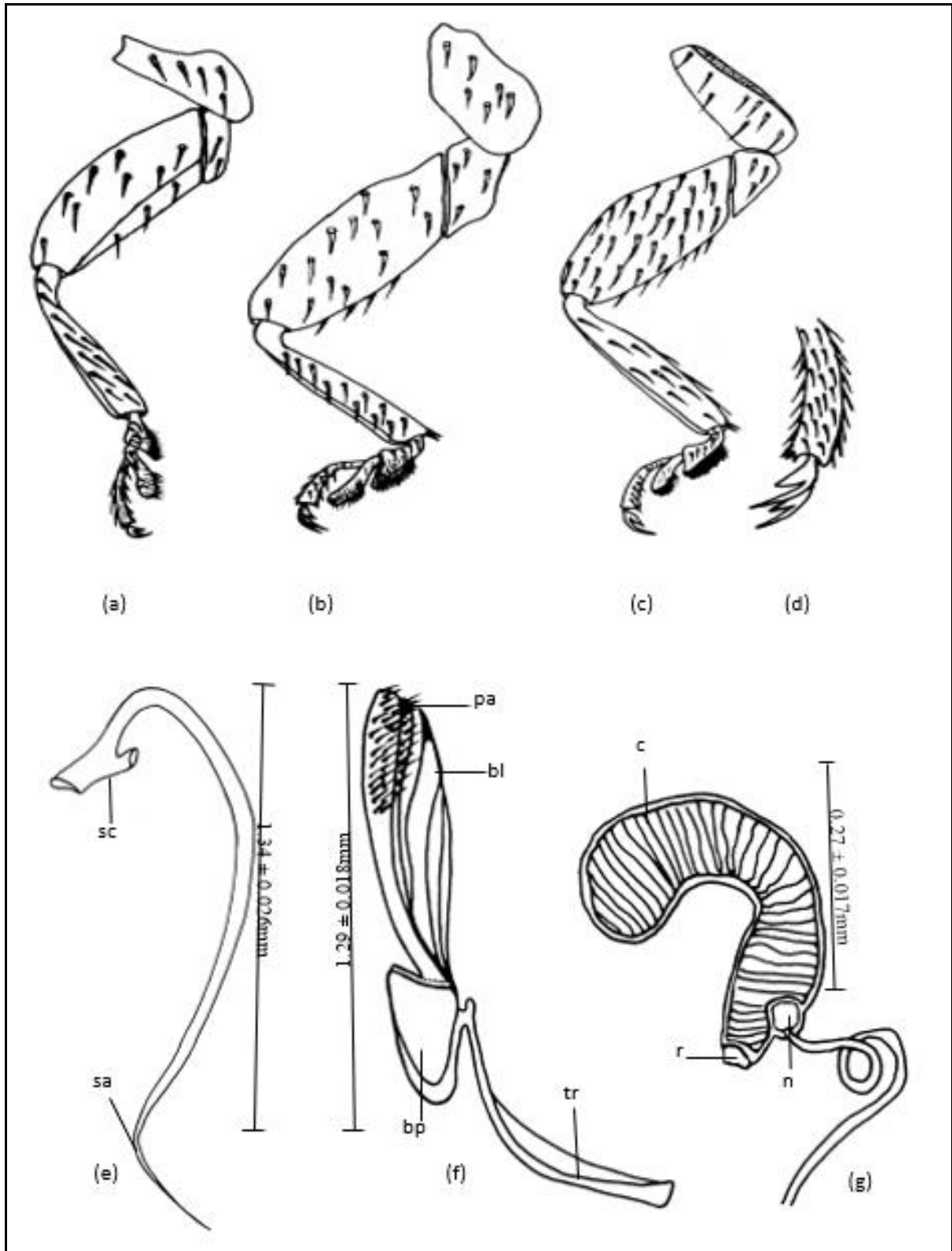
This subspecies differ from the previous subspecies by the following character: the first two spots are united, the third spot is isolated, the elytral pattern; 1+2, 3, 4, 5, and 6.

**Specimens examined:** Saint Katherine 9-11. V.2018 (20) .....**Author coll.**

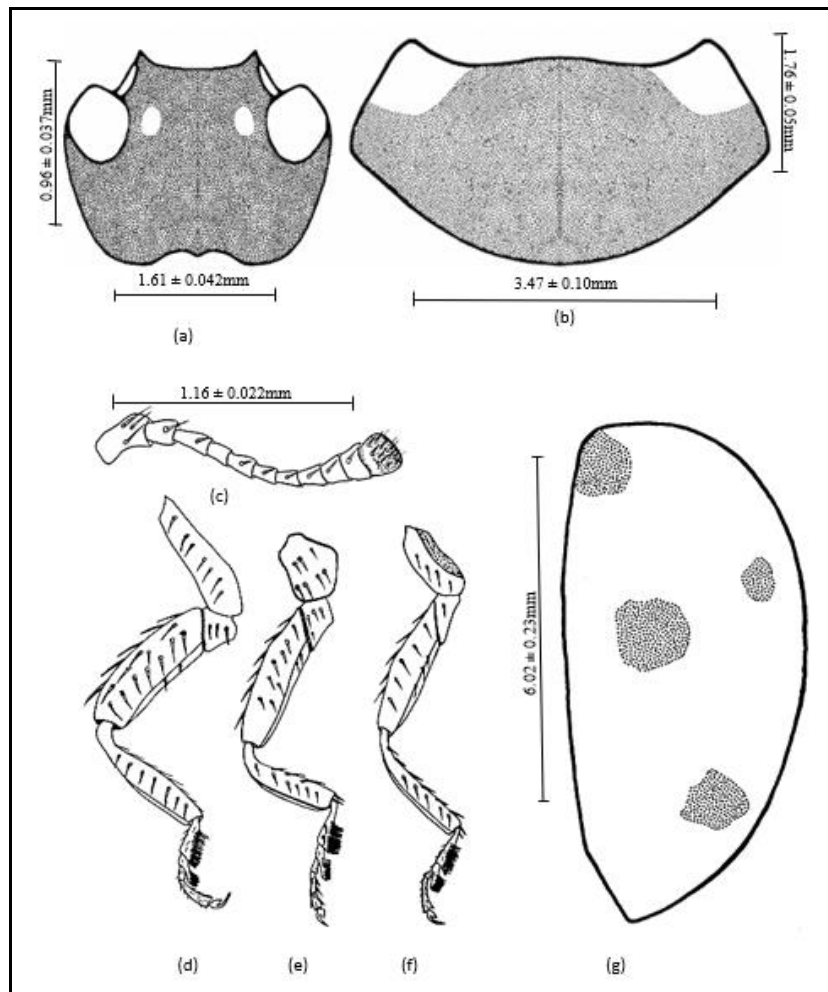


**Fig. 5, *Cheilomenes vicina* (Mulsant), and ssp.:** (a) head, (b) antenna, (c) pronotum of *nilotica*, (d) pronotum of *vicina, isis* and *subsignata*, (e) left elytron of *nilotica*; (f) left elytron of *isis*, and (g) left elytron of *subsignata*.

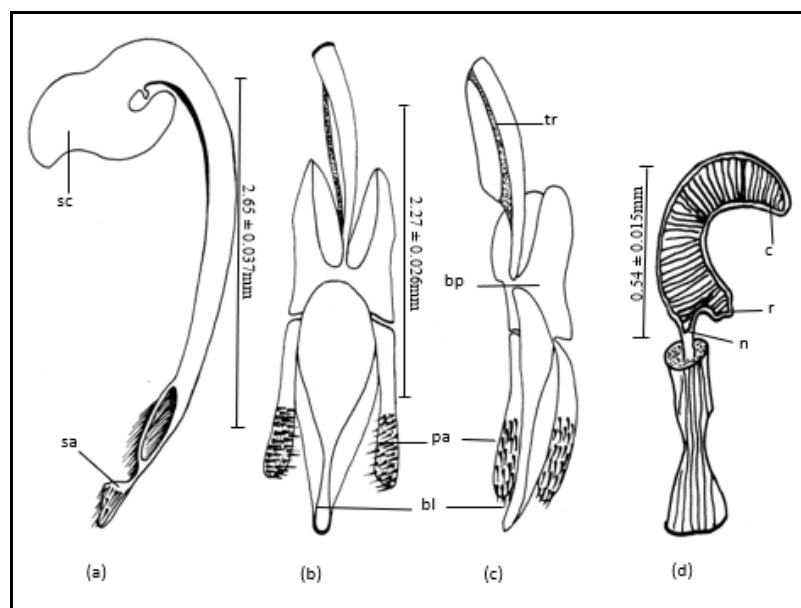




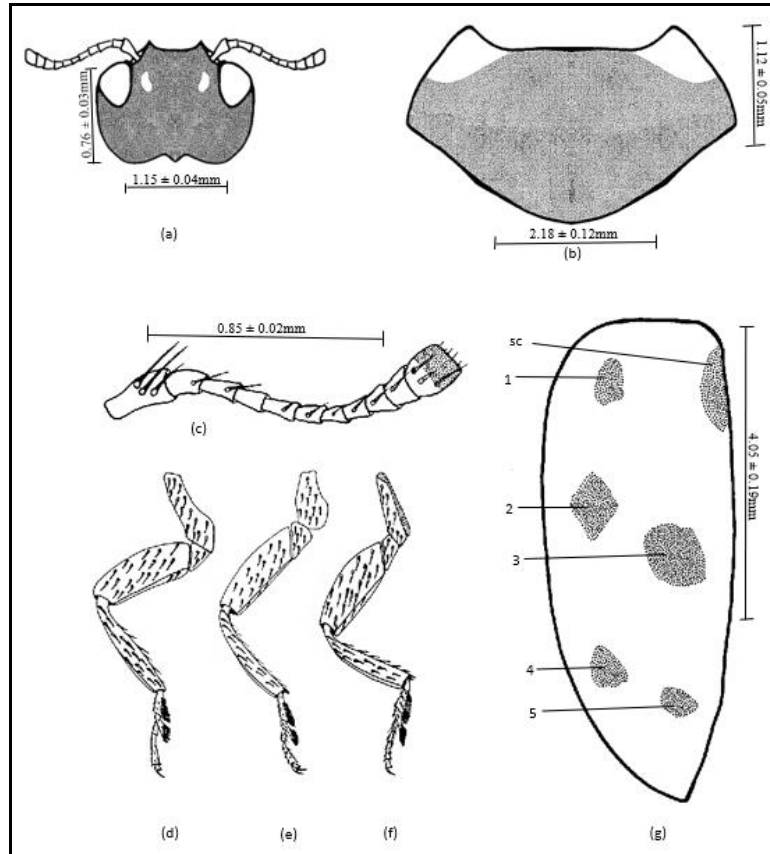
**Fig. 6, *Cheilomenes vicina*** (Mulsant), and *ssp.*; (a, b, & c) fore, mid, and hind-legs respectively; (d) tarsal claws; (e) siphon with siphonal capsule (sc), and siphonal apex (sa); (f) tegmen with paramera (pa), basal lobe (bl), basal base (bp), and trabes (tr); (g) spermatheca with sperm duct with nodulus (n), ramus (r), and cornu (c).



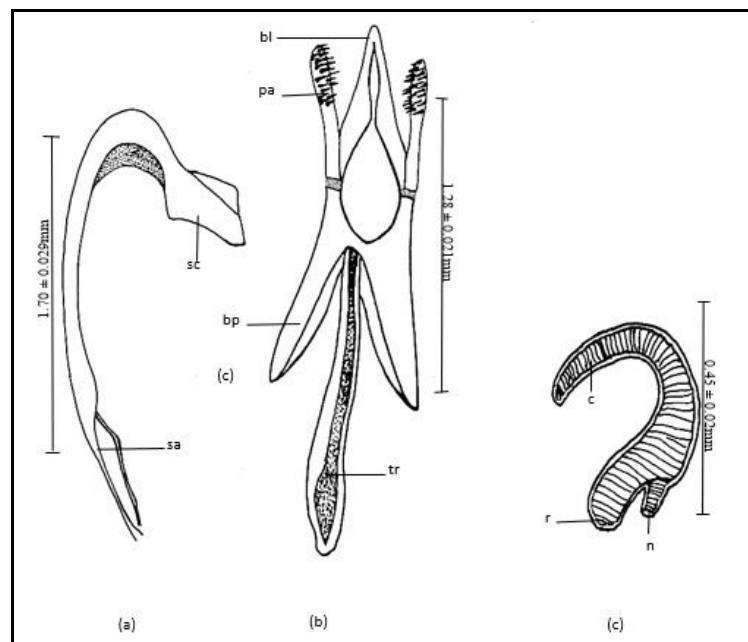
**Fig. 7,** *Coccinella septempunctata* Linnaeus, (a) head; (b) pronotum; (c) antenna; (d, e & f) fore, mid, and hind-legs respectively; (g) right elytron.



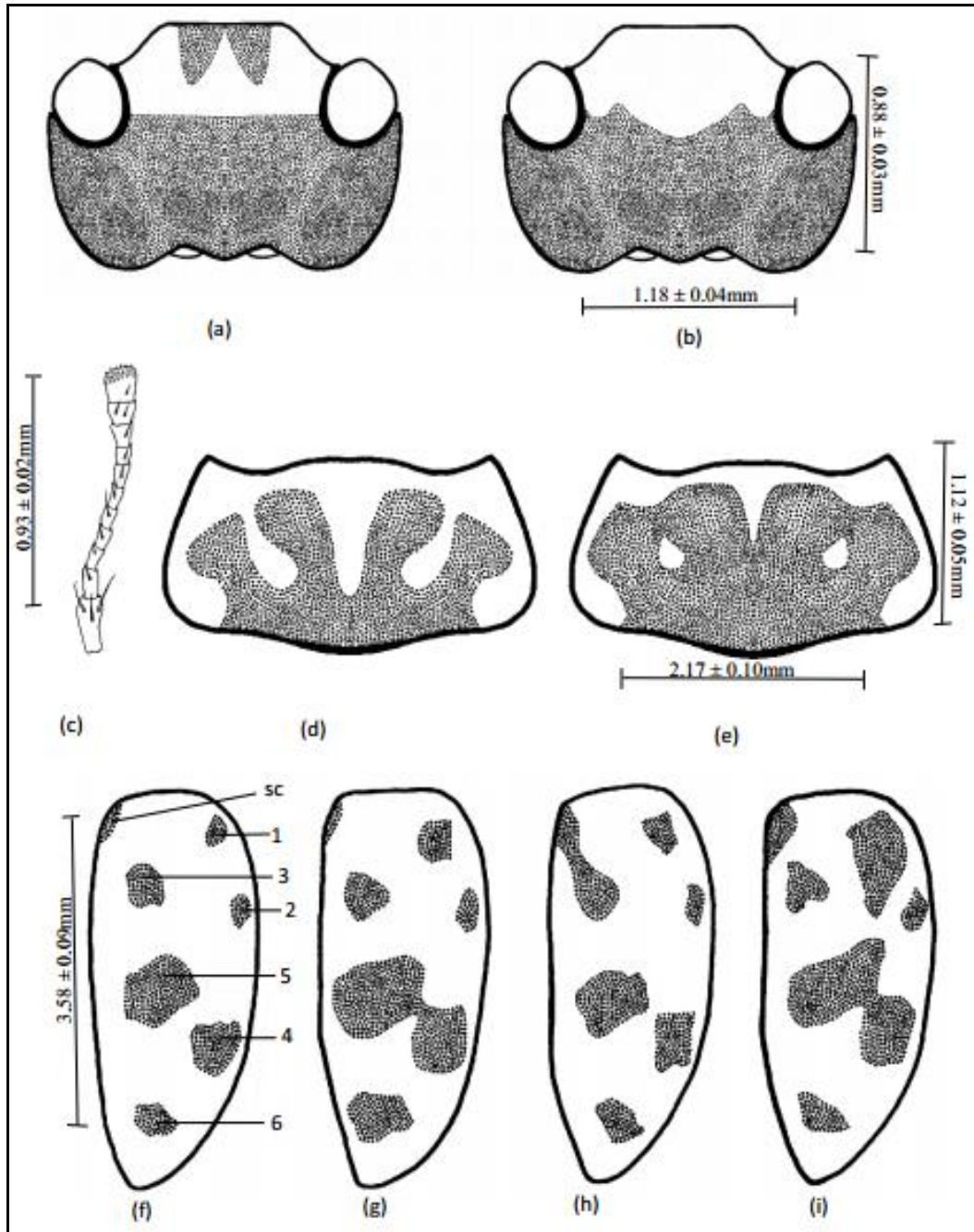
**Fig. 8,** *Coccinella septempunctata* Linnaeus, (a) siphon with siphonal capsule (sc), and siphonal apex (sa); (b) anterior view of tegmen with paramera (pa), basal lobe (bl), basal base (bp), and trabes (tr), (c) lateral view of tegmen; (d) spermatheca with sperm duct with infundibulum and sperm duct, nodulus (n), ramus (r), and cornu (c).



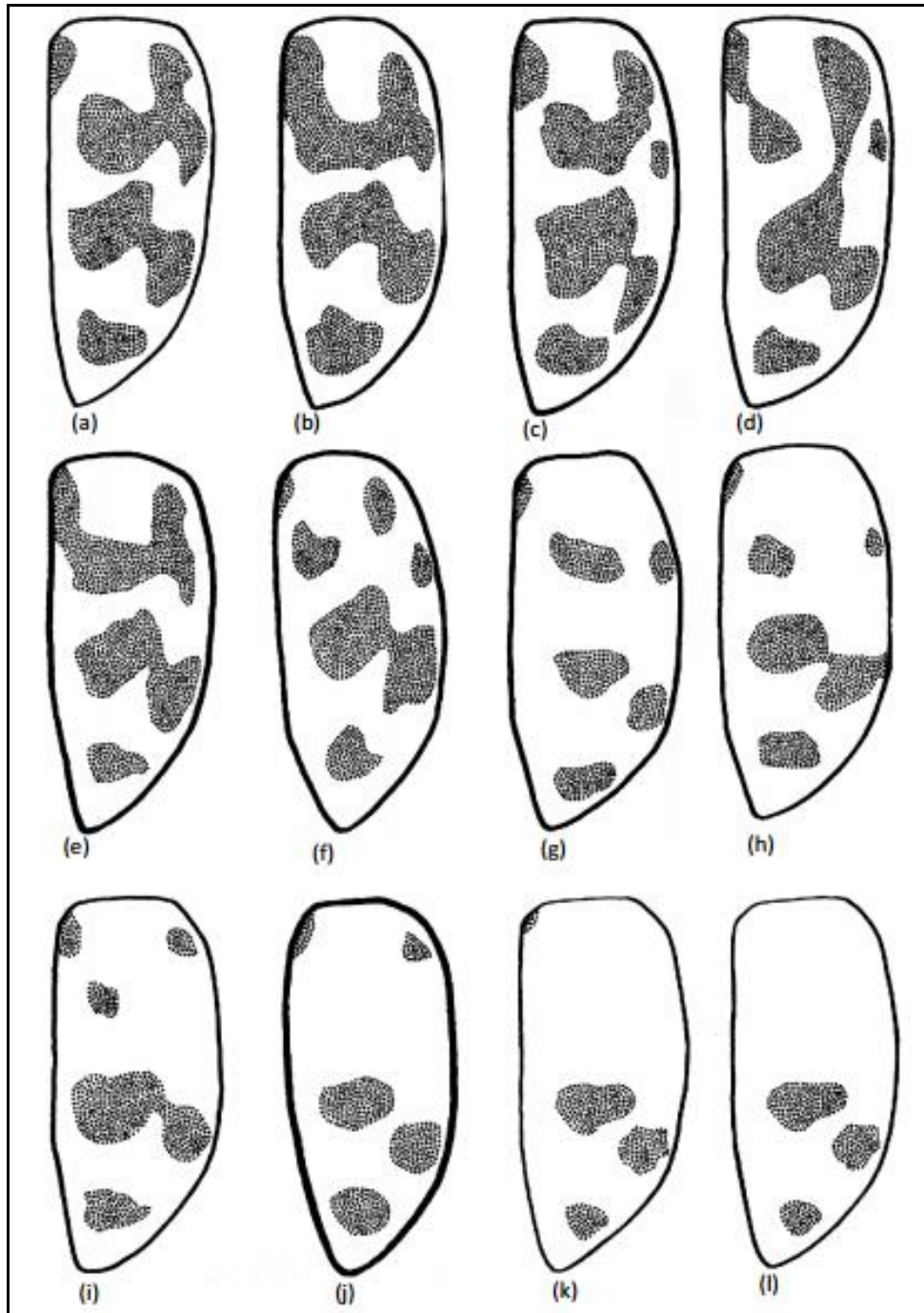
**Fig. 9,** *Coccinella undecimpunctata* L., (a) head; (b) pronotum; (c) antenna; (d, e & f) fore, mid, and hind-legs respectively; (g) left elytron with spot patterns of *C. undecimpunctata*; sc, scutellar spot; 1, humeral spot; 2, lateral spot; 3, discal spot; 4, marginal spot, and 5, apical spot.



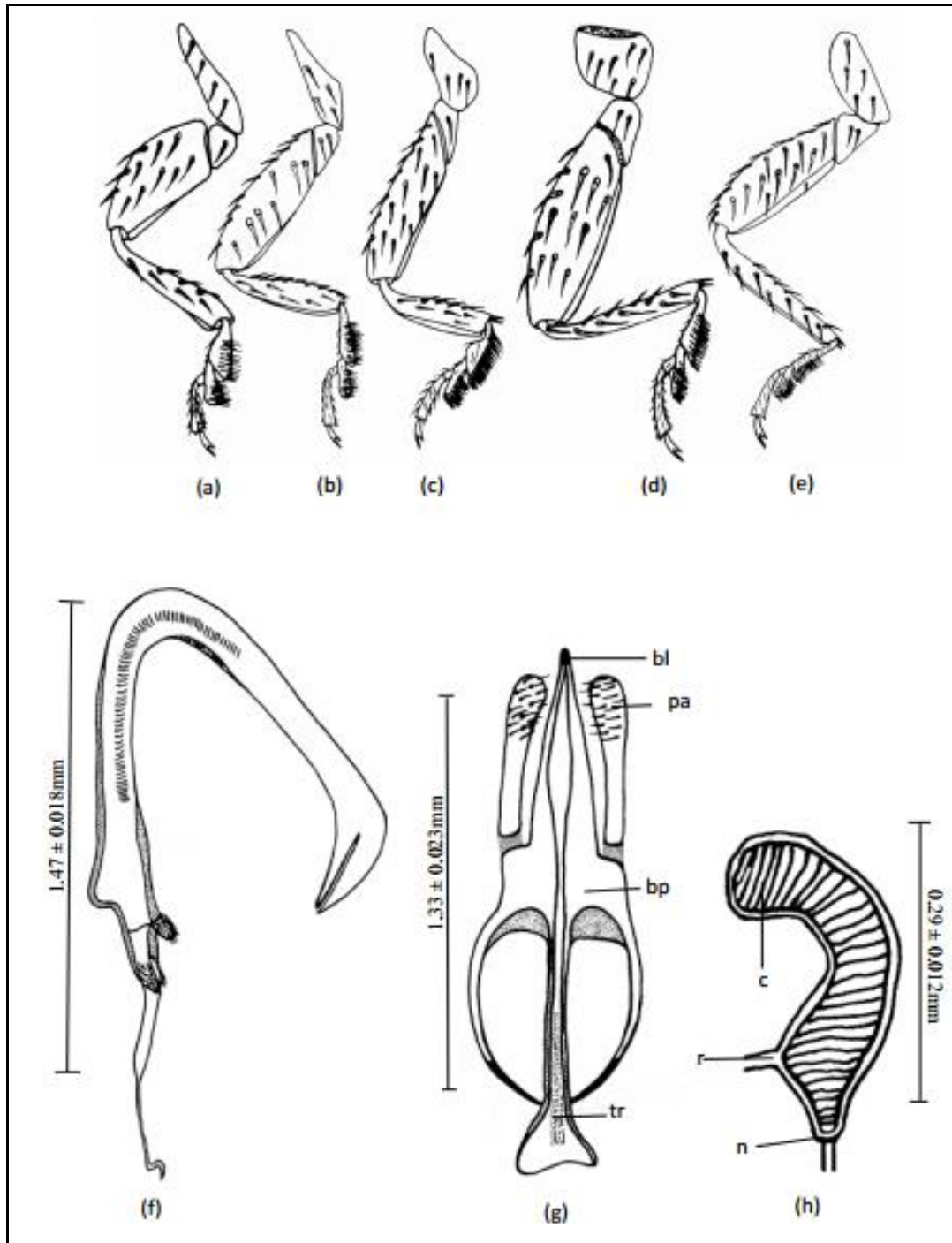
**Fig. 10,** *Coccinella undecimpunctata* L., (a) siphon with siphonal capsule (sc), and siphonal apex (sa); (b) tegmen with paramera (pa), basal lobe (bl), basal base (bp), and trabes (tr); (c) spermatheca, nodulus (n), ramus (r), and cornu (c).



**Fig. 11,** *Hippodamia variegata* (Goeze), (a and b) head in female and male respectively; (c) antenna; (d & e) pronotum of male and female respectively; (f, g, h, & i) right elytron of *variegata*, *confluens*, *italica*, and *transylvanica* respectively. Spot patterns of *H. variegata* fig. (f): sc, scutellar spot; 1, the first spot; 2, the second spot; 3, the third spot; 4, the fourth spot; 5, the fifth spot, and 6, the sixth spot.

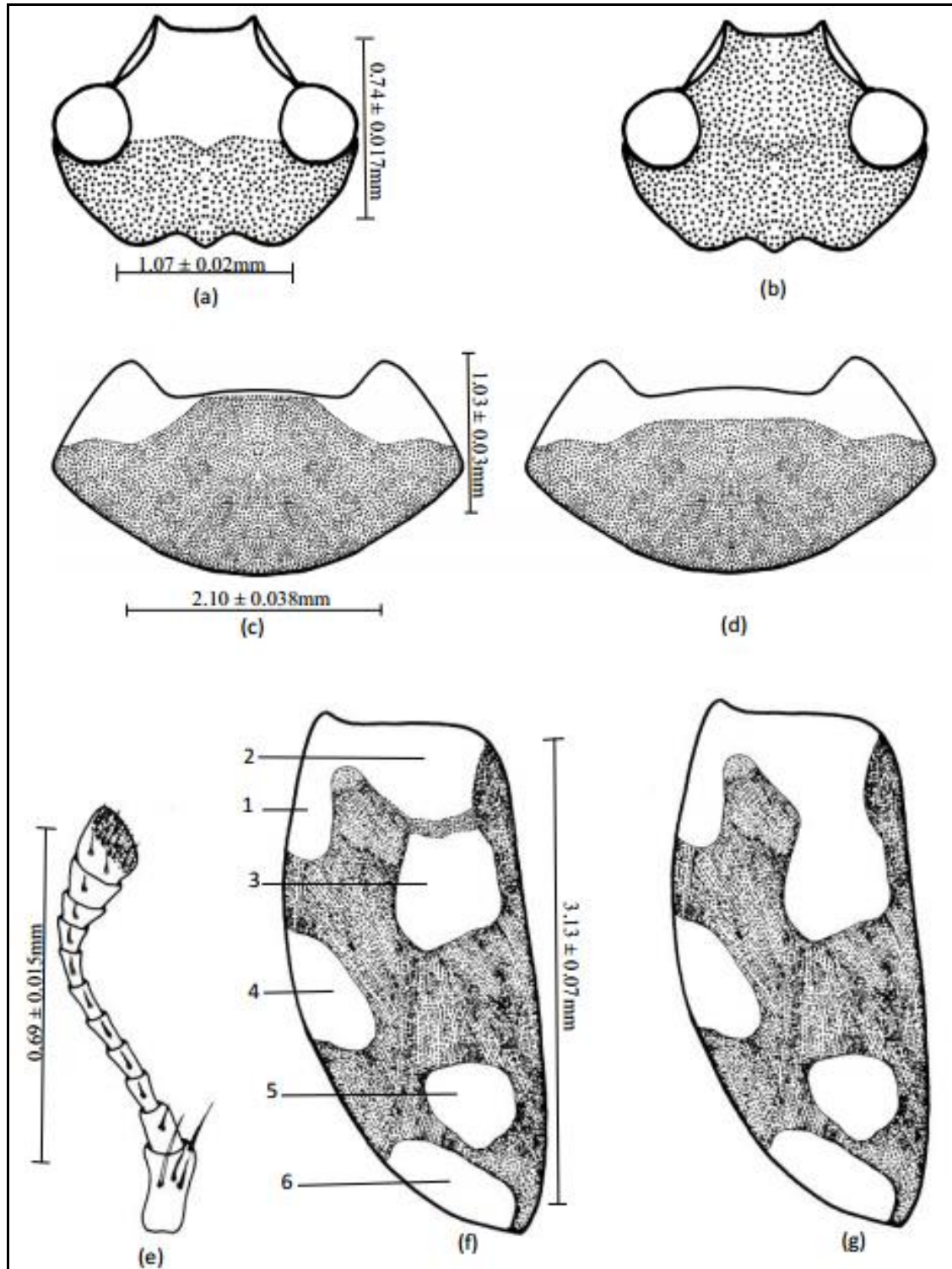


**Fig. 12,** *Hippodamia variegata* (Goeze), (a, b, c, d, & e) right elytron of *orientalis*, (f) right elytron of *confluens*, (g) right elytron of *undecimpunctata*, (h) right elytron of *litigiosa*, (i) right elytron of *abbreviata*, (j) right elytron of *carpini*, (k) right elytron of *constellata*, and (l) right elytron of *sexpunctata*.

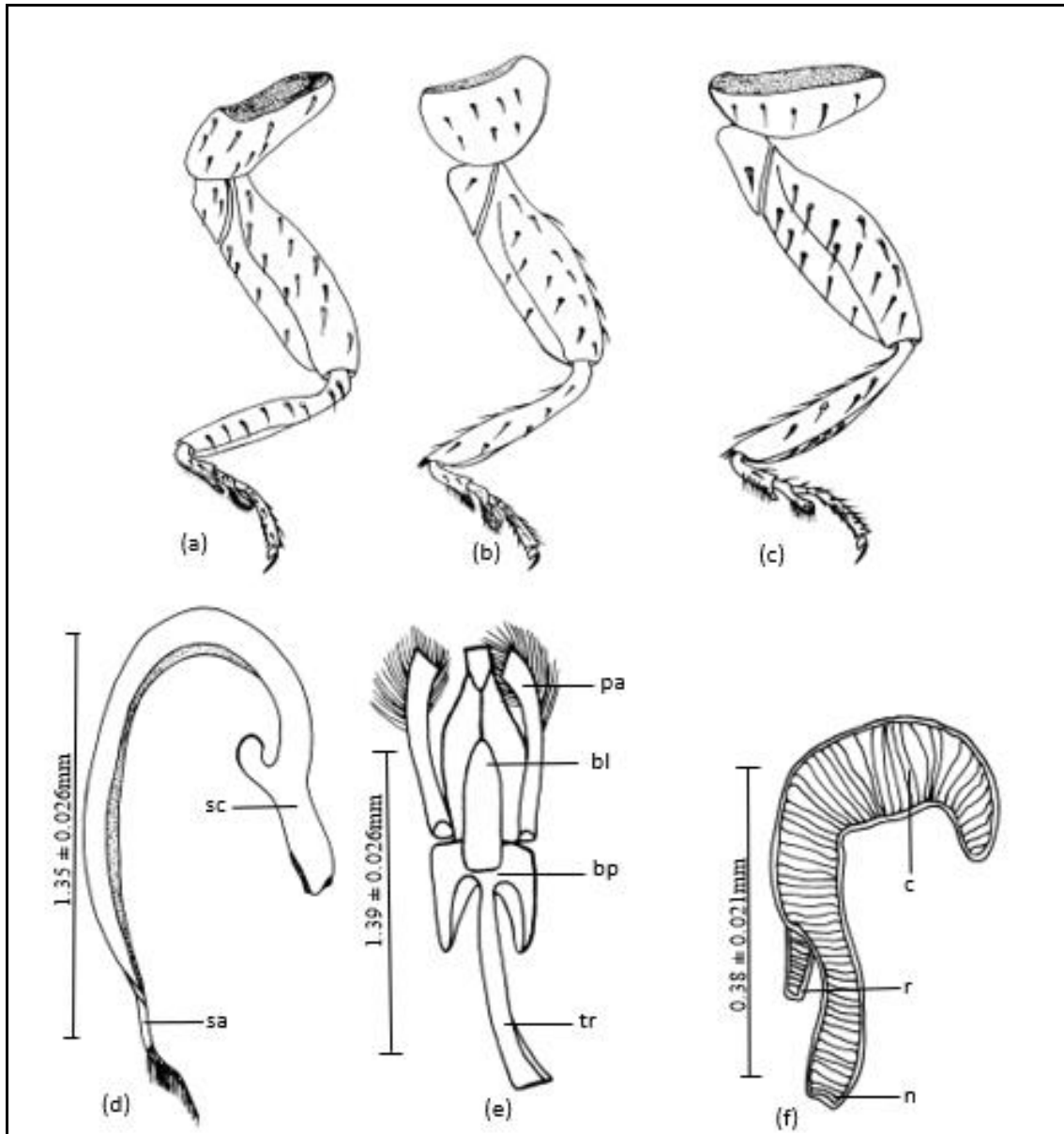


**Fig. 13:** *Hippodamia variegata* (Goeze), (a) fore-leg of male, (b) fore-leg of female, (c) mid-leg of male, (d) mid-leg of female, (e) hind-leg of both sexes; (f) siphon with siphonal capsule (sc), and siphonal apex (sa); (g) tegmen with paramera (pa), basal lobe (bl), basal base (bp), and traves (tr); (h) spermatheca, nodulus (n), ramus (r), and cornu (c).





**Fig. 14,** *Oenopia oncina* (Olivier), (a) head in male, (b) head in female; (c) pronotum of female, (d) pronotum of male; (e) antenna; (f) left elytron of ssp. *sinaita* ; (g) left elytron of ssp. *Oncina*; Spot patterns of *O. oncina* fig. (f): 1, the first spot; 2, the second spot; 3, the third spot; 4, the fourth spot; 5, the fifth spot, and 6, the sixth spot.



**Fig. 15.** *Oenopia oncina*, (a, b & c) fore, mid, and hind-legs respectively; (d) siphon with siphonal capsule (sc), and siphonal apex (sa); (e) tegmen with paramera (pa), basal lobe (bl), basal base (bp), and trapes (tr); (f) spermatheca with nodulus (n), ramus (r), and cornu (c).

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### ARABIC SUMMARY

مراجعة تقسيمية لقبيلة كوكسينيليني (عمدية الأجنحة: كوكسينيليني) في مصر

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تهدف الدراسة الحالية إلى إجراء التمييز التصنيفي لأفراد قبيلة كوكسينيليني، نظراً لدورها الهام والفعال كعنصر من عناصر المقاومة البيولوجية، كمفترسات للآفات الحشرية التي تهدد المحاصيل الزراعية كالمن والحشرات الرهيفة. تم إجراء الحصر الحالي خلال اثنا عشر محافظة ممثلة لأهم المناطق الجغرافية الموجودة في مصر في الفترة من 2017 وحتى 2019م، وقد وجد من خلال الحصر أن هناك أنواعاً واسعة الانتشار وأنواعاً أخرى تنتشر في منطقة واحدة. وأسفرت النتائج عن جمع عينات تابعة لتسعة أنواع ونويعات و29 اختلاف فردي تقع تحت النوعين كوكسينيلا انديسمبكتاتا وهيودميا فاريجاتا، وقد صنفت تلك الأنواع والنويعات وكذلك الاختلافات الفردية ضمن أربعة أجناس تابعة لقبيلة كوكسينيليني. تم دراسة الشكل الظاهري للأنواع موضع الدراسة وبخاصة الأعضاء التناسلية الذكرية والأنثوية كما تم عمل القياسات المورفومترية لمعرفة مدي التباين داخل الأنواع موضع الدراسة. ثم تم عمل المفاتيح التصنيفية لتمييز الأجناس والأنواع والنويعات التابعة لتلك الأجناس وزود البحث بالرسوم الإيضاحية والتوزيع الجغرافي لكل نوع داخل مصر وفي العالم.