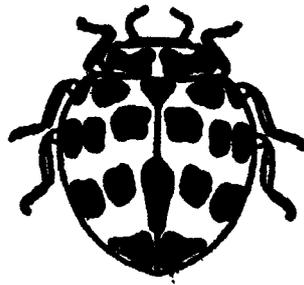




**TAXONOMY OF INDIAN COCCINELLIDAE WITH
OBSERVATIONS ON THE ROLE OF SOME
SPECIES IN AGROECOSYSTEM**



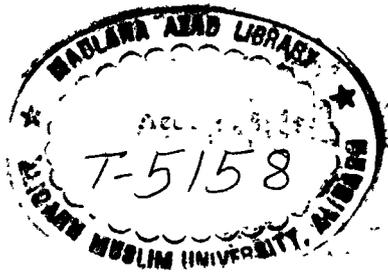
ABSTRACT

**THESIS SUBMITTED FOR THE DEGREE OF
Doctor of Philosophy
IN
ZOOLOGY
OF
*The Aligarh Muslim University, Aligarh***

**BY
SHAMA AFROZE**

**DEPARTMENT OF ZOOLOGY
ALIGARH MUSLIM UNIVERSITY
ALIGARH (INDIA)**

1997



ABSTRACT

The present work incorporates studies on the taxonomy of an economically important family (Coccinellidae : Coleoptera) with observations on the role of some species in agro-ecosystem. The work was carried out under the supervision of Dr. Shujauddin, Reader, Department of Zoology, Aligarh Muslim University.

In the present work Sasaji (1968a) system of dividing the family Coccinellidae into subfamilies and tribes is adopted with addition of few more tribes viz., Singhikalini Miyatake, Hippodamiini Costa and Microweisini Leng under Coccidulinae, Coccinellinae and Sticholotinae respectively.

Expanded or unexpanded condition of clypeus; insertion of antennae dorsally or ventrally on head; narrow or broad junction between mentum and submentum of labium; broad or narrow articulation between meso and metasternum; broad or narrow separation of middle coxal cavities; presence or absence of emargination on inner margin of female genital plates are considered as subfamily characters.

Pubescent or glabrous condition of body; presence or absence of antero-lateral projections on anterior margin of clypeus; condition of mandibular apices, presence or absence of basal tooth; shape of terminal segment of

maxillary palp; angulate or normal condition of tibiae on outer margin, number of tarsal segments of legs; number of visible abdominal sternites in both sexes; strongly or weakly curved siphon, poorly or well developed siphonal capsule of male genitalia, condition of female genital plates etc. are considered for tribal separation.

Number of antennal segments; presence or absence of prosternal carinae; presence or absence of tibial spurs, tarsal claws simple or bifid, with or without basal tooth; complete or incomplete femoral line on first abdominal sternite; condition of basal lobe, parameres, hypomere, proximal and distal end of siphon of male genitalia; shape of spermatheca, condition of ramus and nodulus, shape of genital plates and condition of styli etc. are regarded characters of generic significance.

Body size, shape, convexity, colour, spots or bands and condition of punctures and pubescence on pronotum and elytra; variable shape, size and length of various components of male genitalia viz., basal lobe, parameres, hypomere and siphon, shape and size of styli and setae on apices etc. are considered as characters of specific significance.

Taxonomic contributions made by earlier workers from India are given. Figure 1 (A-J) is provided for better understanding of the morphological characters. Brief diagnosis and key to subfamilies, tribes and genera of Indian Coccinellidae is proposed. Separate keys to Indian species wherever necessary are also added. Forty seven species belonging to twenty six genera have been included. The characters included in generic diagnosis, specific keys and illustrations are sufficient for the identification of the species, therefore, the

known species have not been redescribed. The new species are described and illustrated.

Three new species viz., *Serangium haleemae* sp.n., *Jauravia hanifi* sp.n., and *Micraspis shafeei* sp.n., are proposed.

One genus *Serangium* Blackburn and three species viz., *Micraspis allardi* (Mulsant), *Nephus ryuguus* Kamiya and *Scymnus (Neopullus) hoffmanni* (Weise) are reported for the first time from India. The species *Illeis beilawskii* Ghorpade is revalidated.

In addition to taxonomic study the bioecology of two species viz., *Synia melanaria* Mulsant and *Anegleis cardoni* (Fabricius) has also been carried out to determine their effectiveness against their respective pests. The bioecology of *Anegleis cardoni* (Fabricius) has been done for the first time.

The present work is supported by 463 illustrations (including two graphs) arranged in 51-plates. The plates are inserted in the text at appropriate places. For the sake of convenience the legends are typed below the figures. The entire study is based on the specimens collected by the author, from different parts of India. Holotypes, paratypes and other material examined by the author have been deposited in the Zoological Museum, Aligarh Muslim University, Aligarh, India.



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DEPARTMENT OF ZOOLOGY
ALIGARH MUSLIM UNIVERSITY
ALIGARH (INDIA)

1997





Coccinella transversalis Fabricius
feeding on aphids



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Certificate

This is to certify that Miss Shama Afroze has completed her Ph. D work under my supervision on a problem entitled "Taxonomy of Indian Coccinellidae with observations on the role of some species in Agro-ecosystem". This is an original contribution and distinct addition to the existing knowledge on the subject. Being satisfied with the quality and quantity of the work, she is permitted to submit it for the award of Ph. D. degree in Zoology of the Aligarh Muslim University, Aligarh.

Shuja uddin
36/5/97

(Dr. Shuja uddin)

Reader

Deptt. of Zoology
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Shama Afroz
(Shama Afroz)

INTRODUCTION

The members of the family Coccinellidae are commonly known as lady bird beetles. They are extremely diverse in their feeding habits. Majority of them constitute species which are effective natural enemies of aphids, coccids, pseudococcids, psyllids, jassids, aleyrodids, nymphs of pentatomoid bugs, tingids, delphacids, phytophagous mites and red spider. The eggs of spiders and sometimes eggs and young larvae of Lepidoptera are also consumed. Some are mycophagous and others are phytophagous causing considerable damage to Cucurbitaceae and Solanaceae in India. First spectacular success was achieved in 1889 for the control of *Icerya purchasi* Mask. in California by employing the coccinellid beetle *Rodolia cardinalis* Mulsant which was imported from Australia. It was later in 1929 introduced in India to combat the same species at the Nilgiris where the *Icerya purchasi* Mask. had become a serious pest of *Acacia decurrens* Willd., *Acacia dealbata* Link and other plants. (Beeson, 1941 & Kapur, 1942). Subsequently, *Cryptolaemus montrousieri* Mulsant, another coccinellid predator was introduced in California by Albert Koebele (1893) from Australia to control *Planococcus citri* (Risso) a serious pest of citrus with considerable success. It was imported in India in 1898 from U.S.A. and subsequently reported in India from Coimbatore feeding on *Pulvinaria psidii* Mask. and *Centrocooccus insolitus* (Gr.) infesting *Psidium guajava* Linnaeus and *Solanum melongena* Linnaeus respectively (Puttarudriah *et al.*, 1952; Nayar *et al.*, 1989).

Keeping in view the economic importance of these predators in biological control, it was decided to carry out a comprehensive plan of collecting, rearing and identification of the coccinellid predators found in India. This scheme necessitated extensive survey of different parts of India. The survey yielded a good number of genera and species of Coccinellidae. The Coccinellidae is fairly a large family

distributed throughout the temperate, tropical and subtropical regions of the world. Taxonomic studies on Coccinellidae remained neglected in India except the valuable contributions by Kapur (1942, 1944, 1946, 1948a, 1948b, 1948c, 1949, 1950a, 1950b, 1950c, 1952, 1954a, 1954b, 1954c, 1954d, 1955, 1959, 1961a, 1961b, 1963a, 1963b, 1963c, 1966, 1967, 1970, 1972, 1973). Later Ghorpade (1974, 1976, 1977, 1979a, 1979b, 1981); Lal & Kanakavalli (1960); Pajni & Singh (1982), Pajni & Verma (1985) and Anand et al., (1988, 1989, 1990); have also added new informations on the Coccinellidae.

In the present work Sasaji (1968a) system of dividing the family Coccinellidae into subfamilies and tribes is adopted with addition of few more tribes viz., Singhikalini Miyatake, Hippodamiini Costa and Microweisini Leng under Coccidulinae, Coccinellinae and Sticholotinae respectively. Four tribes viz., Chilacorini, Platynaspini, Shirozullini and Telsimiini under Chilacorinae; five tribes viz., Coccidulini, Exoplectrini, Lithophilini, Noviini and Singhikalini under Coccidulinae; three tribes viz., Coccinellini, Hippodamiini and Psylloborini under Coccinellinae; five tribes viz., Aspidimerini, Hyperaspini, Ortaliini, Scymnini and Stethorini under Scymninae; four tribes viz., Microweisini, Serangiini, Sticholotini and Sukunahikonini under Sticholotinae and a single tribe Epilachnini under Epilachninae is included.

Brief diagnosis and key to subfamilies, tribes and genera of Indian Coccinellidae are given, separate keys to Indian species wherever necessary are also added. Forty seven species belonging to twenty six genera have been included. The characters included in the generic diagnosis, specific keys and illustrations are sufficient for the identification of the species, therefore the known species have not been redescribed. The new species are fully described and illustrated. Figure 1 (A -J) is provided for better understanding of the morphological characters.

Three new species viz., *Serangium haleemae* sp.n., *Jauravia hanifi* sp.n., and *Micraspis shafeei* sp.n. are proposed. One genus *Serangium* Blackburn and three species viz., *Micraspis allardi* (Mulsant), *Nephus ryuguus* Kamiya and *Scymnus (Neopullus) hoffmanni* (Weise) are reported for the first time from India. The species *Illeis beilawskii* Ghorpade is revalidated. Khnzorian (1979) synonymised *Illeis bielawskii* Ghorpade with *Illeis bistigmosa* Mulsant without any remark. In the present work Kapur (1970) has been followed in recognizing the Hippodamiini, a valid tribe.

In addition to taxonomic study, the bioecology of two species viz., *Synia melanaria* Mulsant and *Anegleis cardoni* (Fabricius) has been carried out. The bioecology of *Anegleis cardoni* (Fabricius) has been done for the first time.

The present work is supported by 463 illustrations (including two graphs) arranged in 51 plates. The plates are inserted in the text at appropriate places. The entire study is based on the specimens collected from different parts of India. Holotypes, paratypes and other material examined by the author have been deposited in Zoological Museum, Aligarh Muslim University, Aligarh, India.

HISTORICAL REVIEW

Linnaeus (1758) described 36 species belonging the genus *Coccinella* under Coleoptera, without any provision of family or suprageneric categories. Subsequent additions of a large number of species by Linnaeus himself (1767) and many other workers with different genera stimulated the later taxonomists to lay hands on this interesting group. Bergstrasser (1874) proposed the family Coccinellidae

Mulsant (1846-1850) in his historical monograph (1850) entitled "Species des Coleopteres Trimeres Securipalpes" published a comprehensive work on the world coccinellid genera and proposed a phylogenetic classification of the family for the first time. He (1846) proposed the term "Securipalpes", comparable probably to an order. He divided it into two major groups viz., "Gymnosomides" and "Trichosomides" on the basis of presence or absence of hairs and assigned various categories under each group, recognizing them as families. His classification corresponding to present day categories is as follows:

Securipalpes (= Coccinellidae)

(A) Gymnosomides

- (i) Cariens (= Synonychini)
- (ii) Chilocoriens (= Chilacorini)
- (iii) Coccinelliens (= Coccinellini + Discotomini + Psylloborini)
- (iv) Hyperaspiens (= Hyperaspini + Oeneini + Pentilini + Pharini part)

(B) Trichosomides

- (v) Chnoodiens (= Exoplectrini)
- (vi) Cocciduliens (= Coccidulini part + Lithophilinae)
- (vii) Epilachniens (= Epilachninae)
- (viii) Ortaliens (= Azyini + Coccidulini part + Exoplectrini + Noviini part + Ortaliini part)
- (ix) Poriens (= Ortaliini part)
- (x) Scymniens (= Aspidimerini + Clanini + Cranophorini, + Pharini + Scymnini + Parts Noviini, Pharini and Coccidulini)

Further he grouped all the small sized glabrous genera under "Hyperaspiens" and all pubescent forms under "Scymniens". Mulsant's classification however is not recognized because of his unstable package of characters.

Crotch (1874) accepted **Bergstrasser (1874)** and made an excellent revision of the family Coccinellidae treating 1341 species under 37 genera after critical examination of **Mulsant's** collection. He regarded characters like mandibles, clypeus, eyes, antennae, elytral epipleurae and abdominal sternites much stable and used extensively in his classification. Further he grouped "Epilachnides" as absolutely phytophagous form and "Coccinellides" strictly as carnivorous. He established his own system as follows:

Family Coccinellidae

Subfamily Chilocorides	(= Aspidimerini + Chilocorini = Oeneini + Pentiliini + Pharini + Platynaspini)
Subfamily Coccinellidae	(= Coccinellinae)
Tribe Coccinellides	(= Coccinellini + Psylloborini + Synonychini etc.)
Tribe Epilachnides	(= Epilachninae)
Subfamily Exoplectrides	
Group Azyae	(= Azyini)
Group Exoplectrae	(= Exoplectrini + Noviini)
Group Ortaliae	(= Ortaliini part)
Subfamily Hyperaspides	(= Hyperaspini)
Subfamily Rhizobiides	(= Coccidulini part + Cranophorini + Lithophilinae + Ortaliini part)
Tribe Discotomides	(= Discotomini)
Subfamily Scymnides	(= Clanini + Scymnini)
Subfamily Tythaspides	(= Coccinellini part)

He discarded the use of dorsal pubescence in his classification of major subdivisions. He further merged *Platynaspis* Redtenbacher with *Chilocorus* Leach and its allies. He treated both the phytophagous "Epilachnides" and the carnivorous group "Coccinellides" under a single subfamily Coccinellidae.

"Genera des Coleopteres" of **Lacordaire (1854-76)** still holds popularity for its approach to classification of many coleopterous families. Its system of classification for Coccinellidae given by **Chapuis (1876)** is as follows:

Coccinellidae

(A) Coccinellides aphidiphages (= Coccinellinae)

Groups:

- | | |
|--------------------|-----------------------|
| i. Bucolites | (= Scymnini part) |
| ii. Cariites | (= Synonychini) |
| iii. Chilacorites | (= Chilacorini) |
| iv. Coccidulites | (= Coccidulini) |
| v. Coccinellites | (= Coccinellini part) |
| vi. Cranophorites | (= Cranophorini) |
| vii. Discotomites | (= Discotomini) |
| viii. Hippodamites | (= Coccinellini part) |
| ix. Hyperaspites | (= Hyperaspini) |
| x. Ortaliites | (= Ortaliini part) |
| xi. Poriites | (= Ortaliini part) |
| xii. Scymnites | (= Scymnini part) |

(B) Coccinellides phytophages (= Epilachninae)

Group:

Epilachnites (= Epilachninae)

Chapuis largely followed Mulsant's system of classification. Further he divided Coccinellidae into "Aphidiphages" and "Phytophages", comparable to Ganglbauer (1899) subfamily Coccinellinae and Epilachninae respectively.

Ganglbauer (1899) in his book "Die Kafer Von Mitteleuropa" divided the family into three subfamilies viz., Coccinellinae, Epilachninae and Lithophilinae and proposed seven tribes under the Coccinellinae viz., Chilacorini, Coccidulini, Coccinellini, Hyperaspini, Noviini, Pharini and Scymnini, and elevated *Lithophilus* Frolich to the rank of subfamily Lithophilinae on the basis of distinctive tetramerous tarsi. In the same year Casey made an excellent revision of American Coleoptera discarding the idea of classifying coccinellids on the basis of their feeding behaviour. He divided the family straight away into 16 tribes, with some newly proposed as follows:

Tribes: Chilacorini, Coccidulini, Coccinellini, Cranophorini, Epilachnini, Hippodamiini, Hyperaspini, Oeneini, Pentiliini, Pharini, Platynaspini, Psylloborini, Rhizobiini, Scymnillini, Scymnini and Telsimiini.

Casey's study was not only based on the North American species but also on the material of the world available to him. His study related to small sized Coccinellidae was specially appropriate and his system has been accepted by many of the present day taxonomists but Casey's opinion that the "Epilachnini" is not quite separable from the aphidophagous groups, has not been followed by the later authorities.

Weise (1879) divided aphidophagous Coccinellidae into seven tribes viz., Chilocorini, Coccinellini, Hippodamiini, Hyperaspini, Rhizobiini, Scymnini and Synonychini. Later (1887) he used the term "Pseudococcinellidae" for the genera *Coelopterus* Mulsant, *Pharus* Mulsant, and *Sticholotis* Crotch, and in 1900 proposed three tribes viz., Aspidimerini, Clanini, and Sticholotini.

Sicard (1909) arranged a long series of Madagascan Coccinellidae in the following system.

Coccinellidae

(A) Coccinellidae aphidiphagae

Tribes:

- | | | |
|-------------------|---|--|
| i. Chilocorini | : | <i>Brumus</i> Mulsant, <i>Chilocorus</i> Leach, <i>Exochomus</i> Redtenbacher, <i>Platynaspis</i> Redtenbacher |
| ii. Chnoodini | : | <i>Ambrocharis</i> Sicard, <i>Cyrtaulis</i> Crotch, <i>Discoceras</i> Sicard, <i>Hovaulis</i> Sicard, <i>Peralda</i> Sicard. |
| iii. Coccinellini | : | <i>Adalia</i> Mulsant, <i>Alesia</i> Mulsant, <i>Autotela</i> Weise, <i>Coelophora</i> Mulsant, <i>Cydonia</i> Mulsant, <i>Cyrtocaria</i> Crotch, <i>Dysis</i> Mulsant, <i>Elpis</i> Mulsant, <i>Leis</i> Mulsant, <i>Omalocaria</i> Sicard, <i>Thea</i> Mulsant, <i>Verania</i> Mulsant |
| iv. Hyperaspini | : | <i>Hyperaspis</i> Redtenbacher |
| v. Ortaliini | : | <i>Ortalia</i> Mulsant, <i>Rodolia</i> Mulsant |
| vi. Rhizobiini | : | <i>Microrhizobius</i> Sicard, <i>Rhizobius</i> Stephens |
| vii. Scymnini | : | <i>Nephus</i> Mulsant, <i>Paramida</i> Sicard, <i>Pullus</i> Mulsant, <i>Scymnhova</i> Sicard, <i>Scymnus</i> Kugelann, <i>Stethorus</i> Weise |

(B) Coccinellidae phytophagae: *Epilachna* Chevrolat, *Solanophila* Weise

Pseudococcinellidae: *Habrolotis* Weise, *Pharoscymnus* Bedel, *Serangium* Blackburn, *Sticholotis* Crotch. Both Weise (1887) and Sicard (1909) however used the term "Pseudococcinellidae" for the group of genera such as *Habrolotis* Weise,

Pharoscymnus Bedel, *Pharus* Mulsant, *Serangium* Blackburn, *Sticholotis* Crotch etc. which are characterised by the terminal segment of maxillary palp conical as distinct from the hatchet shaped palpus ("Securipalpes" of Mulsant) present in other coccinellids but the name, "Pseudococcinellidae" used by Sicard (1909) was not based on the available genus name perhaps meant "false Coccinellidae". His Ortaliini includes the tribe Noviini of the recent authors.

Dobzhansky (1924) has separated the tribe Stethorini from the Scymnini for the reception of single genus *Stethorus* Weise on the basis of female genital organs only. Chapin (1926) redefined the tribe Telsimiini Casey.

The "Junk's Coleopterorum Catalogus" of **Korschiesky (1931-1932)** had a great landmark towards the knowledge and classification of Coccinellidae. He followed Ganglbauer's and Casey's system of classification relating all the taxa proposed by former but dropped three tribes viz., Hippodamiini, Rhizobiini and Telsimiini from Casey's system and proposed various new tribes which had not been treated by the two authors in the tribal rank such as Azyini, Discotomini, Exoplectrini, Ortaliini (mainly distributed in the tropical region) and the later designated tribes, Aspidimerini and Clanini. He arranged the Coccinellidae into following 3 subfamilies and 20 tribes.

Subfamily Coccinellinae

Tribes: Aspidimerini, Azyini, Chilacorini, Clanini, Coccidulini, Coccinellini, Cranophorini, Discotomini, Exoplectrini, Hyperaspini, Noviini, Oeneini, Ortaliini, Pentiliini, Pharini, Platynaspini, Psylloborini, Scymnillini, Scymnini and Synonychini

Subfamily Epilachninae

Subfamily Lithophilinae

He synonymised Telsimiini created by Casey (1899) with Pharini and Hippodamiini with Coccinellini without recognizing the Dobzhansky's tribe Stethorini.

Since then no remarkable change has been seen regarding the subdivision

of the coccinellid classification except few minor changes by various workers from time to time (Sasaji, 1968a, Kapur, 1970 etc.).

Kapur (1946) gave a revision of the genus *Jauravia* Motschulsky (= *Clanis* Mulsant). As the generic name *Clanis* Mulsant, was preoccupied in Lepidoptera and it was the only genus in the tribe, Clanini whence the tribe was suppressed. Since *Jauravia* Motschulsky, is close to *Sticholotis* Crotch, as suggested by Kapur is placed under the tribe Sticholotini. He (1948a) also revised the genus *Lithophilus* Frolich which is preoccupied in Carabidae (Coleoptera) vide Schneider (1791) and proposed the generic name *Tetrabrachys*, consequently, the subfamily name was also changed to Tetrabrachinae.

Mader has published two series on the classification of Coccinellidae viz., Palaearctic (1926-37, 1955) and Ethiopian (1941, 1950, 1954). His classification is almost similar to the Korschefsky's system except recognizing the tribe Telsimiini and some subtribes within the tribe Synonychini.

Watson (1956) discussed the phylogeny of the tribe Coccinellini (sens. Korschefsky) examining the external structures of adult in detail and further divided it into three tribes viz., Anisostictini, Coccinellini and Hippodamiini, without mentioning any relationship between the other tribes.

Korschefsky's Classification (1931-32) has been followed by later workers Bielawski (1959), Fursch (1960, 1963) Arnett (1963) and Kapur (1963b) etc. though they slightly modified it. Thus the Korschefsky's system appears to be the time natural classification of the Coccinellidae but many tribes belonging to Coccinellinae are not at all homogeneous and little attention has been paid in establishing a natural classification of the higher categories of the family by means of morphological characters of larvae and adults together as pointed out by Crowson (1955), Kamiya (1960) and Arnett (1963). However few attempts were made by Boving (1917), Boving and Craighead (1931), Emden (1949) and Kapur (1950b) to study the larval

characters which may throw some light on the phylogenetic studies of the family

Kamiya (1960) proposed a new tribe Sukunahikonini, later she (1965b, 1966) and Sasaji (1967, 1968a) have studied detailed morphological characters of larvae and adults mainly using the materials from Japan and Ryukyus and proposed taxonomic revision of larvae and adults of the Coccinellidae and tried to show the phylogenetic relationship of the subfamilies and tribes based mainly on the comparative morphology of both larvae and adults together. Sasaji (1968a) presented following classification of the family.

Subfamily Chilocorinae

Tribes:

- | | |
|---------------------|------------------|
| i. Chilocorini | (= Chilocorini) |
| ii. Platynaspini | (= Platynaspini) |
| iii. Shirozuellini* | (Sasaji, 1968) |
| iv. Telsimiini | (= Pharini) |

Subfamily Coccidulinae

Tribes:

- | | |
|-------------------|--------------------------------|
| i. Coccidulini | (= Coccidulini) |
| ii. Exoplectrini | (= Coccidulini + Exoplectrini) |
| iii. Lithophilini | (= Lithophilinae) |
| iv. Noviini | (= Noviini) |

Subfamily Coccinellinae

Tribes:

- | | |
|------------------|--------------------------------|
| i. Coccinellini | (= Coccinellini + Synonychini) |
| ii. Psylloborini | (= Psylloborini) |

Subfamily Epilachninae

Tribe:

- | |
|----------------|
| i. Epilachnini |
|----------------|

Subfamily Scymninae

Tribes:

- | | |
|-----------------|-------------------|
| i. Aspidimerini | (= Aspidimerini) |
| ii. Hyperaspini | (= Hyperaspini) |
| iii. Ortaliini | (= Ortaliini) |
| iv. Scymnini | (= Scymnini part) |
| V. Stethorini | (= Scymnini part) |

Subfamily Sticholotinae

Tribes:

- i. Serangiini (= Pharini part)
- ii. Sticholotini (= Pharini part)
- iii. Sukunahikonini (Kamiya, 1960)

Sasaji demoted Lithophilinae established by Ganglbauer (1899) to the tribal level and recognized the tribal name Epilachnini under Epilachninae. He did not include tribes viz., Azyini, Cranophorini, Discotomini, Pentiliini and Scymnillini from Africa or New world in his classification and synonymised Pharini created by Casey (1899) with Sticholotini Weise (1900).

Recently Kapur (1970) preferred the system of Korschefsky (1931-32) and used only the Tetrabrachinae (for the Lithophilinae which is preoccupied), Coccinellinae (with most species of the family in 24 tribes) and the phytophagous Epilachninae in that order that first is more primitive than the other two and as the last one is specialized both by way of larval and adult structures, as well as in feeding habits. According to him Hippodamiini, Serangiini, Shirozuellini, Stethorini, Sticholotini, Sukunahikonini and Telsimiini may be added to the list of tribes by Korschefsky. In spite of this the tribe Clanini be synonymised with Sticholotini for the reason given earlier and Synonychini with Coccinellini, as these two tribes viz., Coccinellini and Synonychini contain a number of genera and species which could be placed in one or the other tribe only arbitrarily. According to him (1970) the relative position of the subfamilies and tribes may be modified as follows;

Subfamily Tetrabrachinae (=Lithophilinae)

Subfamily Coccinellinae

Tribes: Aspidimerini, Azyini, Chilacorini, Coccidulini, Coccinellini, Cranophorini, Discotomini, Exoplectrini, Hippodamiini, Hyperaspini, Noviini, Oeneini, Ortaliini, Pentiliini, Platynaspini, Psylloborini, Scymnillini, Scymnini, Serangiini, Shirozuellini, Stethorini, Sticholotini, Sukunahikonini and Telsimiini

Subfamily Epilachninae

A few additions have been made in the classification of Coccinellidae after Kapur (1970). Gordon (1971) proposed a new tribe Cryptoganathini to accommodate the genera viz., *Cryptognathis* Mulsant, *Curticornis* Mulsant, *Delphastopsis* Casey and *Pentilia* Mulsant later Miyatake (1972) proposed a new tribe Singhikalini to accommodate the genus *Singhikalia* Kapur. Ahmad (1973) proposed the tribe Ghaniini to accommodate the genus *Ghanius* Ahmad. Gordon (1977) recognized four tribes viz., Microweisini, Serangiini, Sticholotidini and Sukunahikonini under the subfamily Sticholotidinae. Further (1985) he erected two tribes viz., Cephaloscymnini and Selvadiini for the genera *Cephaloscymnus* Crotch and *Selvadius* Casey respectively and in 1987 proposed a new tribe Eremochilini for Neotropical subfamily Epilachninae.

MATERIALS AND METHODS

The material under study was largely collected by the author from different areas of various states (Assam, Haryana, Himachal Pradesh, Jammu, Karnataka, Madhya Pradesh, Maharashtra, Punjab, Bihar, Uttar Pradesh and Andaman Islands) as well as from Aligarh.

The collected material was preserved in 70% alcohol in glass vials 3 x 1 cm. A complete record of the survey regarding locality, date, prey and host plant was duly maintained. Identification was carried out in the laboratory under stereoscopic binocular microscope before and after dissecting various parts. Clove oil was used as clearing agent after dehydration of the material in ascending grades of alcohol.

Dissection was done under stereoscopic binocular microscope with the help of fine needles and removed appendages including mouth parts, male and female genitalia etc. The dissected parts were placed on a microslide in a drop of Canada balsam and oriented to the required position, and mounted. The slides were dried in thermostat maintained at $37 \pm 2^{\circ}\text{C}$ for about a week.

Diagrams of important structures were drawn with the help of camera lucida. Measurements were taken with the help of ocular micrometer.

An attempt was also made to rear the predators in laboratory on various agricultural pests like coccids, aphids and nymphs of Hemiptera. For this purpose beetles along with their suitable prey spp. were kept in rearing jars with their open ends covered with muslin cloth. Daily observations were taken to obtain detail information of various important aspects viz., longevity, oviposition period, fecundity, developmental stages and voracity of both larvae and adults.

FAMILY COCCINELLIDAE

The family Coccinellidae was proposed by Bergstrasser (1874). It belongs to the coleopterous superfamily Cucujoidea (section Clavicornia). Some important family characters are given as below:

Body usually oval to rounded, more or less strongly convex, ranging from minute (0.8 mm) to large (18mm) size; head small without distinct neck region, tentorium consist of only parallel longitudinal arms without any transverse bridge; antennae short more or less clavate, usually 11-segmented, often reduced to ten, nine, eight or seven segments; mandibles with mono, bi or multidentate apices; terminal segment of maxillary palp usually distinctly divergent apically, triangular (securiform), but often parallel sided or conical; legs with fore coxae distinctly separated by prosternal process, hind coxae strongly transverse, tarsal formula usually cryptotetramerous (pseudotrimerous) but often trimerous or rarely tetramerous, tarsal claws simple or apendiculate; elytra and hind wings fully developed; abdomen with 5-6 visible sternites, first abdominal sternite with arcuate femoral line.

Male genitalia consist of two main components viz., phallobase (fig. 1H) and siphon (fig. 1I).

Siphon: It is usually long and strongly curved structure with proximal end usually dilated forming bilobed siphonal capsule, distal end may be narrow or dilated.

Phallobase: It consists of a basal piece, a hypomere, a basal lobe and a pair of parameres.

Female genitalia (fig. 1J) consists of undifferentiated ovipositor, the genital opening is bounded by an unpaired dorsal plate, a pair of lateral plates and a pair of genital plates, the genital opening leads without any intervening tube into two

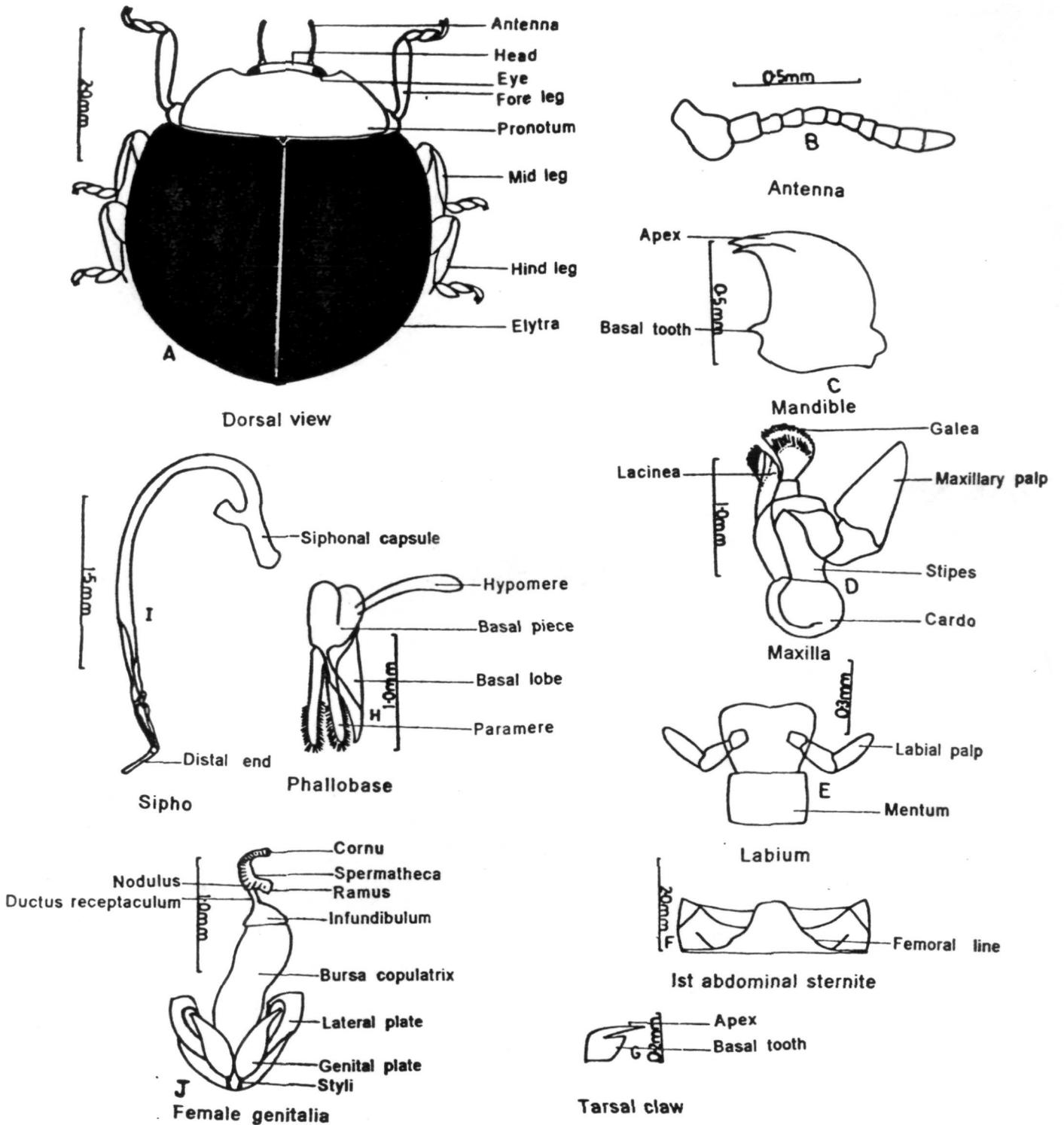


Fig. 1A-J: *Synia melanaria* Mulsant

different organs, prominent bursa copulatrix and other blunt and tapering sac like vagina lying ventral to the bursa copulatrix, the bursa copulatrix receives the short spermatheca close to its anterior extremity, which is usually differentiated into nodulus and ramus distally and proximal end is known as cornu.

Key to subfamilies, tribes and genera of Indian Coccinellidae*

1. Antennae inserted dorsally on head; clypeus unexpanded laterally ----- 2
 - Antennae inserted ventrally on head; clypeus expanded or unexpanded laterally ----- 4
2. Mentum and submentum of labium narrowly or broadly articulated; middle coxal cavities narrowly separated; meso and metasternum narrowly articulated ----- 3
 - Mentum and submentum of labium narrowly articulated; middle coxal cavities broadly separated; meso and metasternum broadly articulated. -----
----- **STICHOLOTIDINAE Weise, 1900**----- 6
3. Antennae inserted in front of eyes; inner margin of female genital plates without emargination; body dorsally glabrous; mandibles bidentate, basal tooth distinct; mentum and submentum of labium narrowly articulated -----
----- **COCCINELLINAE Ganglbauer, 1899**----- **13**
 - Antennae inserted usually between the eyes; inner margin of female genital plates with small emargination; body dorsally pubescent; mandibles multidentate, basal tooth indistinct; mentum and submentum of labium broadly articulated --
----- **EPILOCHNINAE Ganglbauer, 1899**
Epilachnini Costa, 1849 ----- **41**
4. Clypeus unexpanded laterally; mandibles bidentate, basal tooth distinct ----- **5**
 - Clypeus strongly expanded laterally; mandibles monodentate, basal tooth distinct ----- **CHILOCORINAE Della Beffa, 1912**----- **46**

* *Hysia* Mulsant (1850), *Palaeoneda* Crotch (1874), *Pania* Mulsant (1850) and *Protothea* Weise (1898) are not included in the key due to inadequate original description.

5. Meso and metasternum narrowly articulated; middle coxal cavities narrowly separated; terminal segment of maxillary palp securiform -----
----- **COCCIDULINAE Costa, 1849** ----- **52**
- Meso and metasternum broadly articulated; middle coxal cavities broadly separated; terminal segment of maxillary palp never securiform but with nearly parallel sides ----- **SCYMNINAE Della, Beffa, 1912, 1968** ----- **56**
6. **STICHOLOTIDINAE**: Prosternum not strongly lobed anteriorly, not concealing mouth parts ; legs with femora not broad and flat; antennae with terminal segment not knife shaped -----7
- Prosternum strongly lobed anteriorly, concealing mouth parts; legs with femora broad and flat; antennae with terminal segment elongated, knife shaped-----
----- **Serangiini Blackwelder, 1945** ----- **9**
7. Pronotum with oblique line separating the anterior angle from remaining part; abdomen with six visible sternites in both sexes; male genitalia asymmetrical, parameres reduced ----- **8**
- Pronotum without oblique line; abdomen with five visible sternites in both sexes; male genitalia symmetrical, parameres long and slender-----
----- **Sticholotidini Weise, 1900** ----- **10**
8. Body dorsally glabrous; prosternum lobed anteriorly-----
----- **Microweisini Leng, 1920** ----- **12**
- Body dorsally pubescent; prosternum not lobed anteriorly -----
----- **Sukunahikonini Kamiya, 1960**
Scotoscymnus Weise, 1900
9. **Serangiini**: Antennae 8-segmented; body 2.0 - 2.5 mm long-----
----- **Catana Chapin, 1940**
- Antennae 9-segmented; body at the most 2.0 mm long-----
----- **Serangium Blackburn, 1889**

10. **Sticholotidini**: Prosternum with a pair of carinae; antennae 11-segmented-- 11
- Prosternum without carinae; antennae 10-segmented -----
----- **Pharoscymnus Bedel, 1906**
11. Body dorsally pubescent; terminal segment of maxillary palp obliquely truncate and pointed, nevertheless securiform-----**Jauravia Motschulsky, 1858**
- Body dorsally glabrous; terminal segment of maxillary palp conical-----
----- **Sticholotis Crotch, 1874**
12. **Microweisini**: Apical segment of maxillary palp strongly dilated apically; propleural foveae distinct ----- **Buprestodera Sicard, 1910**
- Apical segment of maxillary palp slightly dilated apically; propleural foveae indistinct ----- **Paraplotina Miyatake, 1969**
13. **COCCINELLINAE**: Anterior margin of clypeus with antero-lateral projections on each side; mandibular apices with inner margin never serrate ----- 14
- Anterior margin of clypeus without antero-lateral projections; mandibular apices with inner margin always serrate ----- **Psylloborini Casey, 1899** ----- 15
14. Male genitalia with siphonal capsule distinctly bilobed, simply curved; first abdominal sternite with femoral line incomplete (except in *Adalia* Mulsant and *Bulaea* Mulsant)----- **Coccinellini Weise, 1885**-----17
- Male genitalia with siphonal capsule flattened and spatulate, lobes indistinct and bend at right angle to the siphonal tube in the form of inverted 'U' shaped; first abdominal sternite with femoral line complete, arc like-----
-----**Hippodamiini Costa, 1849**-----38
15. **Psylloborini**: Elytra usually with black spots or bands; distal end of siphon with distinct flagellum-----16
- Elytra usually without any black spots or bands; distal end of siphon without any flagellum----- **Illeis Mulsant, 1850**
Illeis s. str.

16. Anterior margin of mesosternum slightly emarginate, female genitalia with spermatheca short and thick, infundibulum absent-----***Halysia* Mulsant, 1846**
- Anterior margin of mesosternum entire; female genitalia with spermatheca considerably long, 'C' shaped, annulated (spring like), infundibulum present-----
-----***Psyllobora* Chevrolat, 1837**
17. Coccinellini: First abdominal sternite with femoral line complete-----18
- First abdominal sternite with femoral line incomplete -----19
18. Pronotum and prosternum elongated anteriorly to form distinct tube within which head may be drawn; tarsal claws simple without basal tooth -----
-----***Bulaea* Mulsant, 1850**
- Pronotum and prosternum not elongated anteriorly to form distinct tube tarsal claws with well developed basal tooth-----***Adalia* Mulsant, 1850**
19. Tarsal claws bifid, inner one slightly shorter than outer, basal tooth indistinct; antero-lateral projections of clypeus considerably long -----
-----***Synonycha* Mulsant, 1850**
- Tarsal claws not bifid, basal tooth distinct; antero-lateral projections on clypeus normal in size----- 20
20. Prosternum with a pair of carinae; legs with mid and hind tibial spurs -----21
- Prosternum without carinae; legs with or without mid and hind tibial spurs---36
21. Last abdominal sternite of male entire medially at apex; spermatheca with ramus and nodulus not fused----- 22
- Last abdominal sternite of male notched medially at apex; spermatheca with ramus and nodulus fused-----***Coelophora* Mulsant, 1850**
22. First abdominal sternite with an oblique line at each lateral part----- 23
- First abdominal sternite without an oblique line at each lateral part----- 28
23. Anterior margin of clypeus emarginate----- 24
- Anterior margin of clypeus straight-----***Oenopia* Mulsant, 1850**

24. Pronotum with anterior margin weakly convex medially; nodulus and cornu of spermatheca not very long and tube like----- 25
- Pronotum with anterior margin trapezoidally concave; nodulus and cornu of spermatheca considerably long and tube like-----***Aiolocaria* Crotch, 1874**
25. Elytral epipleurae with indistinct foveae; body moderately convex, elytra not expanded laterally; pronotum and elytra usually with black spots or bands ----- 26
- Elytral epipleurae deeply foveolate for the reception of femoral apices; body strongly convex; elytra expanded laterally; pronotum and elytra with out any spot or band----- ***Synia* Mulsant, 1850**
26. Anterior margin of clypeus roundly excavated antennae about half of the width of head; siphon with distal end considerably narrow, with long flagellum-----
----- ***Menochilus* Timberlake, 1943**
- Anterior margin of clypeus slightly convex medially; antennae slightly shorter than the width of head; siphon with distal end usually dilated without any flagellum-----
-----***Coccinella* Linnaeus, 1758 ----- 27**
27. ***Coccinella***: Siphon with siphonal capsule broad and distinctly bilobed; infundibulum in female genitalia with basal ring -----**s.gen. *Coccinella* s. str.**
- Siphon with siphonal capsule narrow, flat without distinct lobes; infundibulum in female genitalia without basal ring ---- **s.gen. *Neococcinella* Savoskaja, 1969**
28. Elytral epipleurae with inner carinae reaching the apex----- 29
- Elytral epipleurae with inner carinae not reaching the apex----- 34
29. Body moderate in size usually less than 8.0 mm in length; pronotum not grooved along the lateral margins----- 30
- Body considerably large more than 9.0 mm in length; pronotum grooved along the lateral margins-----***Callicaria* Crotch, 1874**
30. Eyes moderate in size, inner ocular distance half as wide as head including eyes; surface of mesosternum without distinct longitudinal elevations----- 31

- Eyes considerably big, inner ocular distance about one third as wide as head including eyes; surface of mesosternum with three distinct longitudinal elevations----- ***Phrynocaria* Timberlake, 1943**
- 31. Anterior margin of clypeus straight; antennae normal; anterior margin of mesosternum triangularly emarginated medially, lateral part of its margin sinuate; female genital plates with styli not conspicuous-----
----- ***Propylea* Mulsant, 1846**
- Anterior margin of clypeus incurvate; antennae considerably thin; anterior margin of mesosternum triangularly emarginated medially, lateral part of its margin straight; female genital plates with styli prominent-----***Lemnia* Mulsant, 1850-----32**
- 32. ***Lemnia***: Pronotum with anterior margin not projecting anteriorly and lobe like; hind trochanter of male with or without basal tooth----- **33**
- Pronotum with anterior margin projecting anteriorly, lobe like; hind trochanter of male with basal tooth -----**s. gen. *Artemis* Mulsant, 1850**
- 33. Male genitalia with ventral wall of siphon strongly swollen between the middle and beginning of the apical third or (in middle); basal lobe elongated, tapering triangularly to acute apex, parameres serrate at apices and on outer margin to the middle or little beyond, fringed with long dense setae --**s. gen. *Lemnia* s. str.**
- Male genitalia with ventral wall of siphon without any swelling between the middle and beginning of the apical third; basal lobe more than three times longer than wide with a short slender upturned process at apex, parameres with apices not serrate, fringed with medium sized setae----- **s.gen. *Spilocaria* Timberlake, 1943**
- 34. Antennae with terminal segment distinctly wider than long; anterior margin of mesosternum bisinuate, shallowly emarginated medially-----
----- ***Micraspis* Chevrolat, 1837**
- Antennae with terminal segment distinctly longer than wide; anterior margin of mesosternum roundly and deeply emarginated---***Calvia* Mulsant, 1846-----35**

35. ***Calvia***: Antennae considerably longer than the width of head with ninth segment considerably longer than wide; elytral epipleurae with inner carinae ending near the apex----- **s.gen. *Calvia* s. str.**
- Antennae slightly longer than the width of head with ninth segment not longer than wide; elytral epipleurae with inner carinae ending before the apical margin of the fifth abdominal sternite-----**s.gen. *Anisocalvia* Crotch, 1873**
36. Legs without mid and hind tibial spurs; anterior margin of mesosternum shallowly emarginate medially; elytra not alutaceous dorsally, elytral epipleurae not very broad, attenuate at the apex----- **37**
- Legs with mid and hind tibial spurs; anterior margin of mesosternum deeply emarginate medially; elytra alutaceous dorsally, elytral epipleurae considerably broad not attenuate at the apex-----***Megalocaria* Crotch, 1874**
37. First abdominal sternite with an oblique line at each lateral part; body oval, weakly convex; male genitalia with basal lobe never emarginate medially at apex-----***Harmonia* Mulsant, 1850**
- First abdominal sternite without an oblique line at each lateral part; body orbicular, moderately convex, male genitalia with basal lobe triangularly emarginate medially at apex-----***Anegleis* Khnz., 1979**
38. **Hippodamiini**: Tarsal claws with broad basal tooth, claw and tooth not combined----- **40**
- Tarsal claws and tooth combined giving bifid appearance-----
-----***Hippodamia* Chevrolat, 1837-----39**
39. ***Hippodamia***: First abdominal sternite with femoral line complete; male genitalia with siphon bifurcated distally-----**s.gen *Adonia* Mulsant, 1846**
- First abdominal sternite with femoral line indistinct; male genitalia with siphon not bifurcated distally-----**s. gen. *Hippodamia* s. str.**

40. Antennae with third segment distinctly triangular, bears four or five spines on the projecting angle----- **s.gen. *Semiadalla* Crotch, 1874**
- Antennae with third segment not triangular, without any spines on the projecting
41. **Epilachnini**: Last abdominal sternite in female entire; tarsal claws with or without basal tooth----- **42**
- Last abdominal sternite in female split longitudinally; tarsal claws with distinct basal tooth-----***Henosepilachna* Li & cook, 1961**
42. Tarsal claws bifid, with well developed basal tooth ----- **43**
- Tarsal claws bifid without basal tooth----- **45**
43. Female genital plates oval; mandibles with three apical teeth, median tooth present or absent----- **44**
- Female genital plates elongate and tapering towards apex; mandibles with three apical and one median tooth ----- ***Afissula* Kapur, 1955**
44. Mandible with median tooth, subapical and median tooth serrate; antennae equal to the width of head-----***Afidenta* Dieke, 1947**
- Mandible without median tooth, none of the tooth serrate; antennae shorter than the width of head-----***Afidentula* Kapur, 1955**
- 45 Mandibles multidentate, usually each tooth serrate (dentulate); female genital plates broad and oval----- ***Epilachna* Chevrolat, 1837**
- Mandibles multidentate, none of the tooth serrate (dentulate); female genital plates distinctly long and tubular ----- ***Afissa* Dieke, 1947**
46. **CHILOCORINAE**: Legs with tarsi cryptotetramerous; body dorsally pubescent or glabrous; siphon of male genitalia strongly curved, siphonal capsule well developed; abdomen with five or six visible sternites----- **47**
- Legs with tarsi trimerous; body dorsally pubescent; siphon of male genitalia weakly curved, siphonal capsule indistinct; abdomen with five visible sternites in both sexes-----**Telsimiini Casey, 1899**
***Telsimla* Casey, 1899**

47. Body dorsally glabrous; cardo of maxillae unexpanded laterally: abdomen with six visible sternites in male and five in female-----
-----**Chilocorini Costa, 1849**-----**48**
- Body dorsally pubescent; cardo of maxillae distinctly expanded laterally; abdomen with six visible sternites in both sexes-----**Platynaspini Casey, 1899**
Platynaspis Redtenbacher, 1843
48. **Chilocorini**: Legs with mid and hind tibial spurs, tibiae without triangular tooth on outer margin, tarsal claws with or without basal tooth; antennae 8 to 10-segmented-----**49**
- Legs without mid and hind tibial spurs, tibiae with a triangular tooth on outer margin, tarsal claws with well developed basal tooth; antennae 8-segmented--
-----**Chilocorus Leach, 1815**
49. Tarsal claws with well developed basal tooth, antennae 10-segmented-----**50**
- Tarsal claws simply thickened at base without basal tooth; antennae 8 or 10-segmented-----**51**
50. First abdominal sternite with femoral line complete; elytral epipleurae not foveolate for the reception of the femoral tips; legs with tibiae not excavated near apices-----**Exochomus Redtenbacher, 1843**
- First abdominal sternite with femoral line incomplete; elytral epipleurae foveolate for the reception of femoral tips; legs with tibiae shallowly excavate near apices--
-----**Curinus Mulsant, 1850**
51. Antennae 8-segmented; male genitalia with parameres nearly twice as long as basal lobe-----**Brumoides Chapin, 1965**
- Antennae 10-segmented; male genitalia with parameres slightly longer than the basal lobe-----**Brumus Mulsant, 1850**
52. **COCCIDULINAE**: Legs with tarsi cryptotetramerous or tetramerous, tibiae without angulation at outer margin; antennae 10 to 11-segmented-----**53**

- Legs with tarsi trimerous, tibiae angulate at outer margin; antennae 8-segmented-----**Noviini Ganglbauer, 1899**
----- **Rodolia Mulsant, 1850**
- 53. Legs with tarsi cryptotetramerous, abdomen with five or six visible sternites; antennae 10 or 11-segmented-----**54**
- Legs with tarsi tetramerous; abdomen with five visible sternites in both sexes; antennae 10-segmented-----**Lithophilini Weise, 1889**
----- **Tetrabrachys Kapur, 1948**
- 54. Antennae 11-segmented; abdomen with five visible sternites in both sexes; eyes finely or less coarsely faceted-----**55**
- Antennae 10-segmented; abdomen with six visible sternites in both sexes; eyes coarsely faceted-----**Coccidulini Costa, 1849**
-----**Sumnius Weise, 1892**
- 55. Body dorsally with short and dense pubescence; pronotum with antero-lateral angles considerably narrow; eyes less coarsely faceted -----**Singhikalini Miyatake, 1972**
-----**Singhikalia Kapur 1963**
- Body dorsally with relatively long and sparse pubescence; pronotum with antero-lateral angles not narrow; eyes coarsely faceted-----
-----**Exoplectrini Casey, 1908**
-----**Aulis Mulsant, 1850**
- 56. **SCYMNINAE:** Body dorsally pubescent: male genitalia with phallobase symmetrical; legs with tibiae not angulate on outer margin ----- **57**
- Body dorsally glabrous; male genitalia with phallobase always distinctly asymmetrical; legs with tibiae angulate on outer margin----- **Hyperaspini Costa, 1849**
-----**Hyperaspis Redtenbacher, 1843**
- 57. Eyes exposed anteriorly; antennae 9 to 11-segmented; first abdominal sternite not dilated posteriorly in an arch-----**58**

- Eyes covered anteriorly by the expanded head capsule; antennae 9-segmented, geniculate; first abdominal sternite dilated posteriorly in an arch medially-----
-----**Aspidimerini Weise, 1900**-----**60**
- 58. Prosternum not convex medially and not produced arch like anteriorly; female genital plates elongate or transverse-----**59**
- Prosternum convex medially and produced arch like anteriorly partly covering the mouth parts; female genital plates always considerably elongated -----
-----**Stethorini Dobzhansky, 1924**
-----**Stethorus Weise, 1885**
- 59. Eyes extremely large reaching the posterior margin of the head; female genital plates strongly transverse, without styli -----**Ortaliini Sicard, 1909**
-----**Ortalia Mulsant, 1850**
- Eyes moderate in size, never reaching the posterior margin of head; female genital plates usually elongate, rarely transverse with styli-----
-----**Scymnini Costa, 1849**-----**62**
- 60. **Aspidimerini:** Prosternum flat at least on the sides external to the carinae, which always meet anteriorly and enclose a flat area; body small to moderate in size (2.0 - 4.5 mm)----- **61**
- Prosternum evenly convex, carinae widely separated and not meeting each other anteriorly; body moderate in size (4.0 - 6.0 mm)-----
-----**Aspidimerus Mulsant, 1850**
- 61. Carinae as wide apart as the base of prosternal process, parallel, extending from the base to the anterior margin of the segment, meeting each other in a transverse ridge to enclose a rectangular area, the part external to the carinae subquadrate in outline-----**Pseudaspidimerus Kapur, 1948**
- Carinae subparallel in the basal half, either subparallel, wider or narrower in the apical half and meet each other in an arch a little before or at the anterior margin,

- the part external to the carinae, triangular in out line-----
----- ***Cryptogonus* Mulsant, 1850**
62. **Scymnini**: Prosternum not extended forward; antennae 9 to 11-segmented-- **63**
- Prosternum greatly extended forward, concealing the mouth parts completely;
antennae 10-segmented-----***Cryptolaemus* Mulsant, 1853**
63. Antennae 10 or 11-segmented; legs with tarsi cryptotetramerous; eyes not very
big-----**64**
- Antennae 9-segmented; legs with tarsi trimerous; eyes considerably big reaching three
fourth of the posterior margin of head----- ***Pseudoscymnus* Chapin, 1962**
64. Antennae 10-segmented; prosternum without carinae-----***Nephus* Mulsant, 1846**
- Antennae 10 or 11-segmented; prosternum with a pair of carinae-----
-----***Scymnus* Kugelann, 1794 -----65**
65. ***Scymnus***: Antennae 11-segmented -----**66**
- Antennae 10-segmented-----**s.gen. *Neopullus* Sasaji, 1971**
66. First abdominal sternite with femoral line complete----- **s.gen. *Pullus* Mulsant, 1846**
- First abdominal sternite with femoral line incomplete----**s. gen. *Scymnus* s.str.**

Subfamily STICHOLOTIDINAE Weise

Sticholotinae Weise, 1900:430.

Sticholotinae Weise; Sasaji, 1968a:19.

Sticholotidinae: Gordon, 1977:186.

Body dorsally pubescent or glabrous; clypeus unexpanded laterally with antero-lateral projections on each side; antennae inserted dorsally on head in front of the eyes, 7 to 11-segmented, antennal insertion exposed; mandibles mono or bidentate, basal tooth may or may not be distinct; terminal segment of maxillary palp more or less tapered, conical, barrel shaped or elongate-oval; mentum and submentum of labium narrowly articulated; mid coxal cavities broadly separated; meso and metasternum broadly articulated; legs with tarsi trimerous or cryptotetramerous; abdomen with five to six visible sternites; inner margin of female genital plates without an emargination.

Four tribes are included under Sticholotidinae Weise.

Tribe Serangiini Blackwelder

Serangiini Blackwelder, 1945; 450.

Serangiini Blackwelder; Pope, 1962:627.

Serangiini Blackwelder; Sasaji, 1967:2.

Serangiini Blackwelder; Sasaji, 1968a:20.

Serangiini Blackwelder; Gordon, 1970:356.

Serangiini Blackwelder; Gordon, 1977:208.

Body dorsally pubescent; antennae 8 to 9-segmented; mandibles monodentate, basal tooth indistinct; terminal segment of maxillary palp elongate-oval; prosternum distinctly lobed anteriorly, concealing mouth parts; legs with tarsi trimerous or cryptotetramerous; abdomen with five visible sternites in both sexes, elytral epipleurae deeply foveolate for the reception of femoral tips; male genitalia asymmetrical, siphon strongly curved, parameres reduced; female genital plates triangularly elongated.

The tribe Serangiini Blackwelder is represented by two genera from India. Their separation is given in the key to genera.

Genus *Serangium* Blackburn

Serangium Blackburn, 1889:187.

Type species: *Serangium mysticum* Blackburn, 1889:210.

Serangium Blackburn; Sicard, 1909:151.

Serangium Blackburn; Chapin, 1940:268.

Serangium Blackburn; Gordon, 1970:357.

Serangium Blackburn; Chu et al 1978:132.

Diagnosis: Body subhemispherical, strongly convex; antennae (fig.2B) 9-segmented, terminal segment more than two times longer than fourth to eighth segments combined; prosternum with a pair of carinae, strongly divergent anteriorly; first abdominal sternite with femoral line incomplete (fig.2F); legs with fore femora (fig. 2G) much broader than mid and hind femora, without mid and hind tibial spurs, tarsal claws narrow, weakly curved with small and blunt basal tooth; male genitalia (figs.2K-L) with basal lobe asymmetrical, parameres unequally developed, hypomere slender and considerably longer than basal lobe (fig.2K); siphon (fig.2L) proximally broad, without distinct lobes, distal end narrow at apex; female genitalia with spermatheca (fig. 2N) relatively broad proximally, narrowed and curved distally, genital plates (fig.2 O) triangularly elongated, styli small, narrow and papilliform.

The genus is a first report from India and is represented by single species.

Serangium haleemae sp.n. from India.

*Serangium haleemae** sp.n.

(Fig. 2A- O)

Body subhemispherical (fig. 2A), strongly convex and shiny dorsally; head reddish brown, anterior half with short, sparse setae; pronotum reddish brown with short and sparse setae, lateral regions with comparatively dense setae, punctures big and shallow, separated by three to four times their diameter; elytra reddish brown with short and sparse setae on basal and lateral margins and few on humeral callus, apical one-third, basal and lateral margins with big and deep punctures, separated by two to three times their diameter, remaining part with mixed puncta-

* The new species is named after my mother.

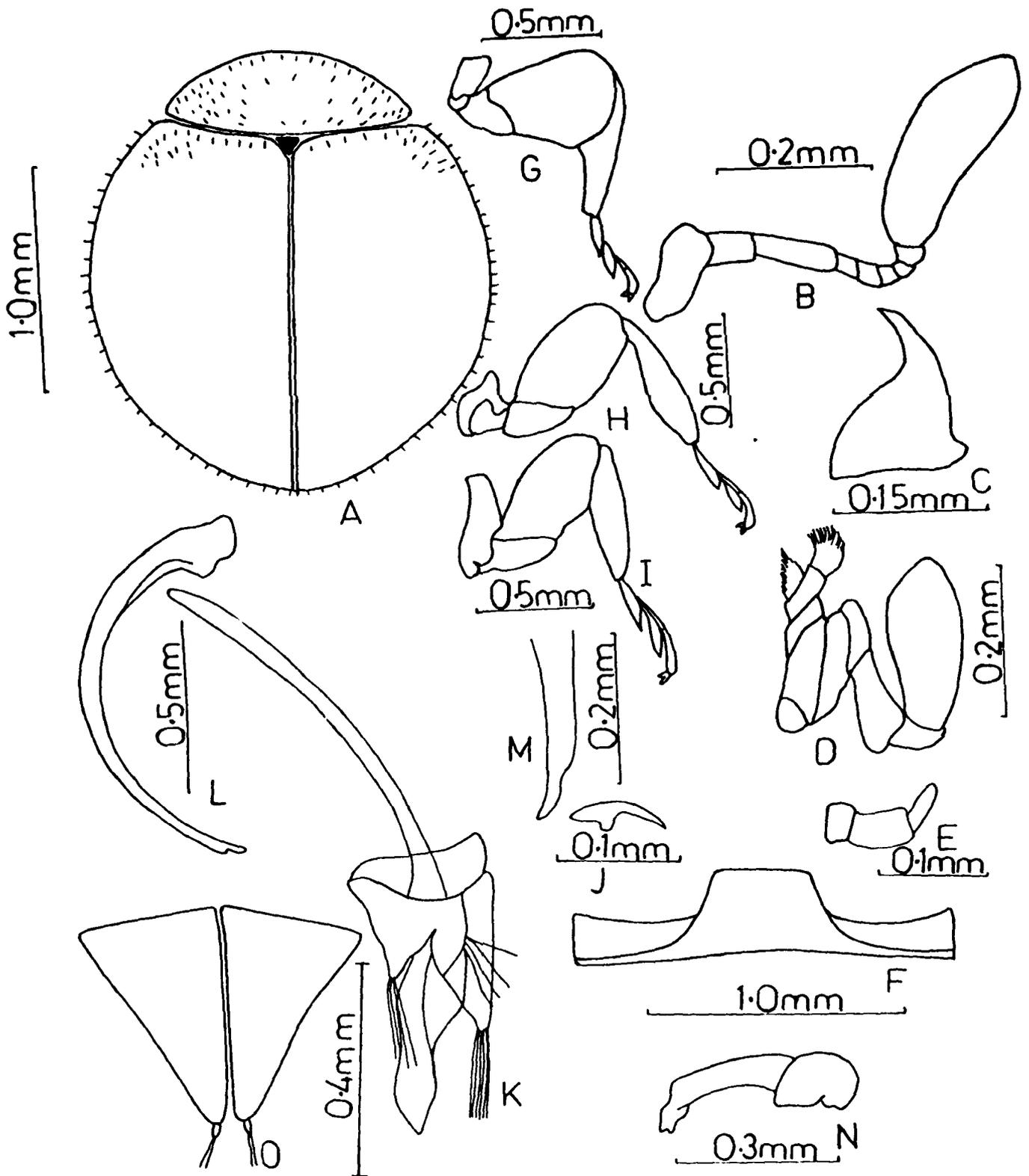


Fig. 2A-0

Serangium haleemae sp. n.

A=Dorsal view, B=Antenna, C=Mandible, D=Maxilla,
 E=Labial palp, F=1st abdominal sternite, G= Foreleg,
 H=Mid leg, I=Hind leg, J=Tarsal claw, K=Phallobase,
 L= Sipho, M=Distal end of Sipho (enlarged view),
 N=Spermatheca, O=Genital plates

tion, bigger one separated by three to four times and smaller one seven to eight times their diameter; male genitalia with basal lobe asymmetrical, distinctly longer than parameres, parameres unequally developed, one is considerably reduced, just half the length of other, apices fringed with few long setae, hypomere slender, more than one and half times longer than basal lobe (fig. 2K); siphon (fig. 2L) strongly curved, proximally broad, without distinct lobes, distal end narrow at apex; female genitalia with spermatheca (fig. 2N) relatively broad proximally, narrowed and curved distally, genital plates (fig. 2O) triangularly elongated, styli small, narrow and papilliform with two setae at apices.

Length : 2.0 mm
Width : 1.75 mm

Holotype: ♂ INDIA: Hadgaum, Fatehpur (Uttar Pradesh), predaceous on aleyrodids on *Solanum tuberosum* Linnaeus, 20-viii-1994 (Shama Afroze).

Allotype ♀ (Same data as for holotype).

Paratype 2♂♂, 3♂♂ (Same data as for holotype).

Tribe Sticholotidini Weise

Sticholotini Weise, 1900:430.

Pseudococcinellidae Weise, 1887:185.

Pharini Casey, 1899:110.

Coelopterini Della Beffa, 1912:171.

Coelopterina Jacobson, 1916:969.

Sticholotini Weise; Sasaji, 1967:11.

Sticholotini Weise; Sasaji, 1968a:19.

Sticholotidini: Gordon, 1977:210.

Body dorsally pubescent or glabrous; antennae 7 to 11-segmented; mandibles bidentate, basal tooth distinct; terminal segment of maxillary palp conical; legs with tarsi cryptotetramerous; abdomen with five visible sternites in both sexes; siphon of male genitalia weakly curved, siphonal capsule poorly developed; female genital plates elongated.

The tribe Sticholotidini Weise is represented by three genera from India. Their separation is given in the key to genera.

Genus *Pharoscymnus* Bedel

Pharoscymnus Bedel, 1906:93.

Type species: *Pharus sexguttatus* Gyllenhal, 1808: 206.

Pharoscymnus Bedel; Sicard, 1909:155.

Diagnosis: Body oval to subhemispherical, strongly convex; antennae (fig. 3B) 10-segmented; prosternum with a pair of poorly developed, subparallel carinae, may or may not be reaching the anterior margin; first abdominal sternite with femoral line incomplete (fig.3F); legs without mid and hind tibial spurs, tarsal claws with small triangular basal tooth; male genitalia with basal lobe elongated, parameres considerably long and slender, hypomere considerably shorter than parameres (fig.3H); siphon (fig.3I) distinctly broad proximally, with a blunt projection on inner side, distal end usually narrow and pointed; female genital plates elongated, gradually narrowed towards apex, styli small.

The genus is represented by two species from India. A key for their separation is given below.

Key to Indian species of *Pharoscymnus* Bedel

1. Siphon proximally with a blunt projection on inner side, distal end without any transparent tip ----- ***flexibilis* (Mulsant)**
- Siphon proximally without any projection on inner side, distal end with a short, pointed transparent tip ----- ***horni* (Weise)**

i. *Pharoscymnus flexibilis* (Mulsant) (Fig.3A-I)

Scymnus flexibilis Mulsant, 1853b:271.

Scymnus flexibilis Mulsant; Crotch, 1874:252.

Scymnus flexibilis Mulsant; Korschefsky, 1931:120.

Pharus flexibilis (Mulsant); Weise, 1900:435.

Pharoscymnus flexibilis (Mulsant); Korschefsky, 1931:215.

Pharoscymnus flexibilis (Mulsant); Kapur, 1954c:264.

Pharoscymnus flexibilis (Mulsant); Puttarudriah and Channabasavanna, 1955:4.

Material Examined : 2♂♂, 3♂♂, INDIA: Aligarh (Uttar Pradesh), predaceous on mealy bugs on *Butea monosperma* O.Ktz., 20-X-1995 (Shama Afroze).

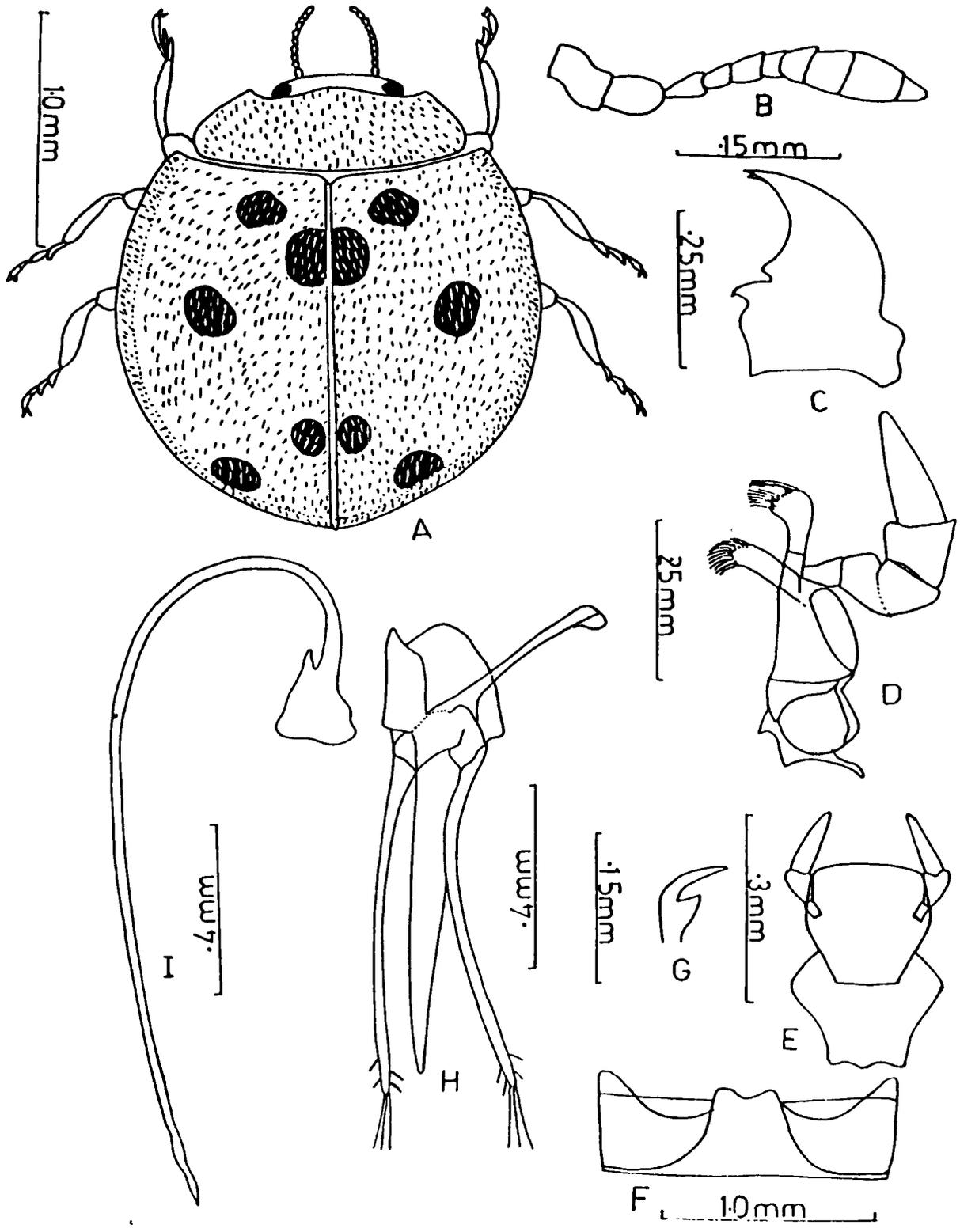


Fig. 3A-I *Pharoscymnus flexibilis* (Mulsant)
 A=Dorsal view, B=Antenna, C=Mandible, D=Maxilla,
 E=Labium, F= 1st abdominal sternite, G=Tarsal claw,
 H=Phallobase, I=Sipho

Prey: Mealy bugs

Distribution: INDIA: Aligarh, Bangalore, Gandhara Forest, Kundri.

ii. *Pharoscymnus horni* (Weise)

Scymnus horni Weise, 1900 : 434.

Pharoscymnus horni (Weise); Puttarudriah & Channabasavanna, 1956:158.

Pharoscymnus horni (Weise); Puttarudriah & Channabasavanna, 1957:10.

Pharoscymnus horni (Weise); Chelliah, 1965:166.

Prey: *Diaspis echinocacti* Bouche, *Saccharum officinarum* Ckll.

Distribution: INDIA: Coimbatore, Mandya.

Genus *Jauravia* Motschulsky

Jauravia Motschulsky, 1858a:117.

Type species: *Jauravia pallidula* Motschulsky, 1858a:117.

Clanis Mulsant, 1850:949, 999.

Type species: *Clanis pubescens* Mulsant, 1850:999.

Jauravia Motschulsky; Crotch, 1874:273, 274.

Jauravia Motschulsky; Chapuis, 1876:258.

Jauravia Motschulsky; Weise, 1892a:24.

Jauravia Motschulsky; Weise, 1900:431.

Jauravia Motschulsky; Korschefsky, 1931:222.

Jauravia Motschulsky; Kapur, 1946:64.

Diagnosis: Body rounded oval to hemispherical, strongly convex; antennae 11-segmented; prosternum with a pair of carinae, diverging anteriorly in straight or curved line, reach or stop short before the anterior margin; first abdominal sternite with femoral line incomplete (fig. 5E); legs without mid and hind tibial spurs, tarsal claws with small quadrate basal tooth; male genitalia with basal lobe elongated, usually expanded and flattened towards apex, in some species narrower than the base, parameres considerably long and slender, hypomere considerably shorter than parameres (figs. 4F,5G,6F); siphon (figs.4G,5H,6G) distinctly broad proximally with pointed or blunt projection on inner side, distal end usually narrow and pointed.

The genus is represented by eleven species from India. A key proposed by Kapur (1946) is revised to accommodate the new species.

Revised Key to Indian species of *Jauravia* Motschulsky

1. Body rounded oval, lateral borders of elytra moderately to narrowly expanded----- 2
 - Body hemispherical, lateral borders of elytra broadly expanded -----8
2. Elytra yellowish brown to brown, without black spots -----3
 - Elytra brown, with black spots ----- 5
3. Elytral pubescence short and whitish -----4
 - Elytral pubescence moderately long, golden, suberect and sparse, punctures shallow, separated by their diameter; male genitalia with basal lobe broad towards the apex----- *pubescens* (Fabricius)
4. Elytra with punctures and pubescence dense; male genitalia with basal lobe narrow towards the apex ----- *pallidula* Motschulsky
 - Elytra with punctures and pubescence sparse; male genitalia with basal lobe slightly wide towards the apex ----- *indica* Kapur
5. Each elytron with one or two black spots----- 6
 - Each elytron black except broad testaceous lateral and apical borders-----
-----*limbata* Motschulsky
6. Each elytron with a black spot, near the base -----7
 - Each elytron with two black spots, one near the base, the other postmedian --
----- *quadrinotata* Kapur
7. Elytral spot nearly one-third as long as elytron ----- *kanaraensis* Kapur
 - Elytral spot three-fourth as long as elytron-----*hanifi* sp.n.
8. Elytral pubescence long and sparse ----- 9
 - Elytral pubescence short and dense, punctures dense-----*simplex* (Walker)
9. Elytral punctures fine and dense, pubescence whitish -----10
 - Elytral punctures coarse and sparse, pubescence golden-----*pilosula* (Weise)
10. Prosternal carinae reaching the anterior margin ----- *soror* (Weise)
 - Prosternal carinae not reaching the anterior margin ----- *dorsalis* (Weise)

**i. *Jauravia pubescens* (Fabricius)
(Fig. 4A-G)**

Coccinella pubescens Fabricius, 1798:77.
Clanis pubescens (Fabricius); Mulsant, 1850:99
Jauravia pubescens (Fabricius); Korschefsky, 1931:222.
Jauravia pubescens (Fabricius); Kapur, 1946:79.

Material Examined: 3 ♂♂, INDIA: Nasik (Maharashtra), predaceous on
Pulvinaria maxima Green on *Vitis vinifera* Linnaeus, 28-VIII-1993 (Shama Afroze).

Prey: *Pulvinaria maxima* Green

Distribution: INDIA: Balasore, Belgaum, Guntur, Madurai, Nasik, Nilgiri hills.

ii. *Jauravia pallidula* Motschulsky

Jauravia pallidula Motschulsky, 1858a:117.
Jauravia pallidula Motschulsky; Crotch, 187:274.
Jauravia pallidula Motschulsky; Chapuis, 1876:258.
Clanis pallidula (Motschulsky); Weise, 1892a:25.
Clanis pallidula (Motschulsky); Weise, 1900:431,433.
Clanis pallidula (Motschulsky); Sicard, 1910:385.
Jauravia pallidula Motschulsky; Korschefsky, 1931:122.
Jauravia pallidula Motschulsky; Kapur, 1946:80.
Jauravia pallidula Motschulsky; Puttarudriah & Channabasavanna, 1955:4.
Jauravia pallidula Motschulsky; Puttarudriah & Channabasavanna, 1956:158.

Prey: Diaspids.

Distribution: INDIA: Bangalore, Bengal, Belgaum, Calcutta, Cuddalore.

iii. *Jauravia indica* Kapur

Jauravia indica Kapur, 1946:83.

Prey: Unknown

Distribution: INDIA: Nilgiri hills.

iv. *Jauravia limbata* Motschulsky

Jauravia limbata Motschulsky, 1858b:188.
Jauravia limbata Motschulsky; Motschulsky, 1866:424.
Jauravia limbata Motschulsky; Crotch, 1874:274.
Jauravia limbata Motschulsky; Gorham, 1894a:206.
Clanis limbata (Motschulsky); Weise, 1900:432,433.

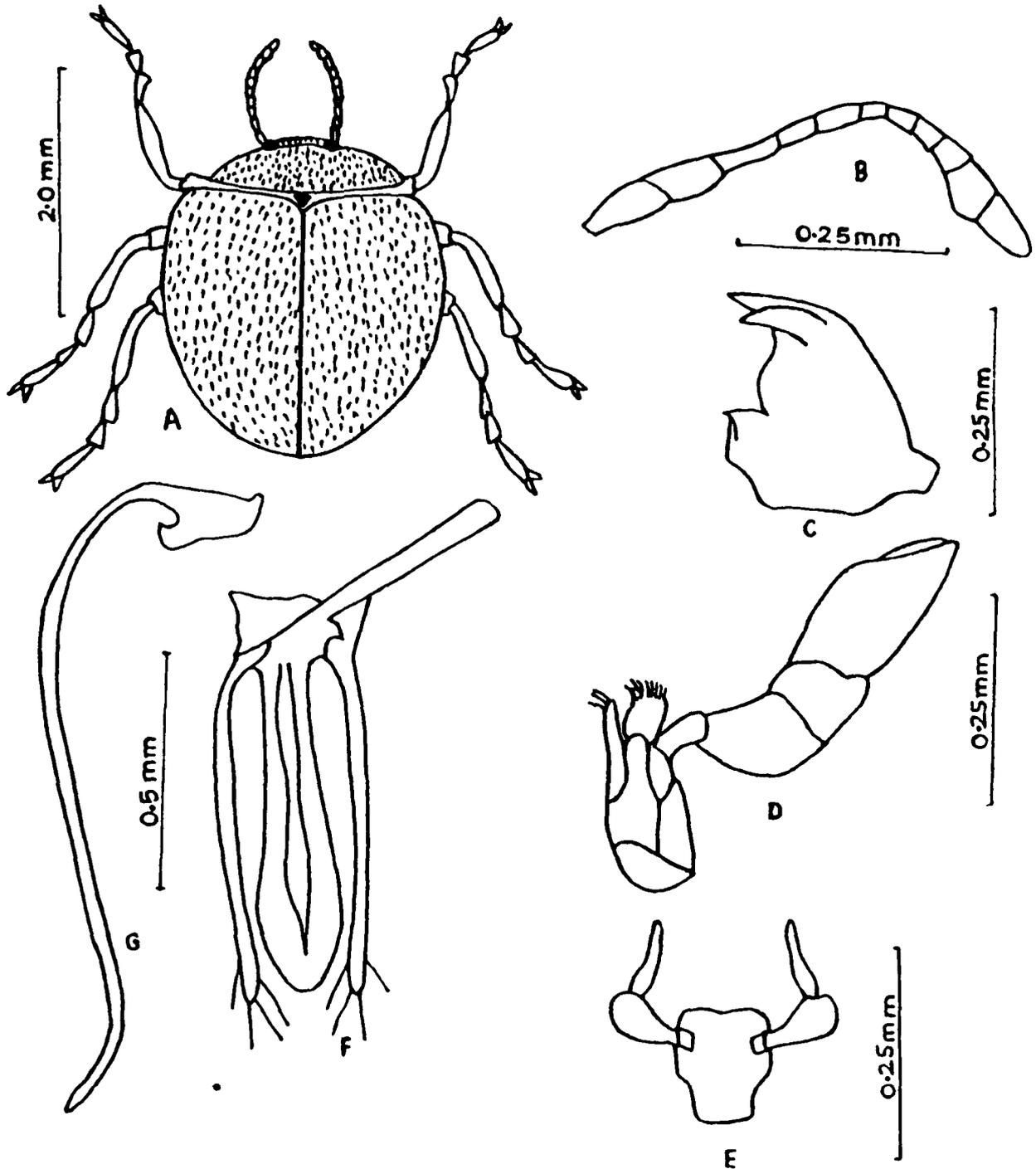


Fig. 4A-G: *Jauravia pubescens* (Fabricius)
 A=Dorsal view, B=Antenna, C=Mandible, D=Maxilla,
 E=Labium, F=Phallobase, G=Siphon

Sticholotis limbata (Motschulsky); Weise, 1908:227.
Jauravia limbata (Motschulsky); Kapur, 1946:82.
Jauravia limbata (Motschulsky); Kapur, 1972:312.
Jauravia limbata (Motschulsky); Canepari, 1986:27.

Prey: Unknown

Distribution: INDIA: Belgaum, Goa, Kanara, Malabar.

**v. *Jauravia quadrinotata* Kapur
(Fig. 5A-H)**

Jauravia quadrinotata Kapur, 1946:85.

Material Examined: 2♂♂, INDIA: Jorhat (Assam), predaceous on mealy bugs on *Camillia sinensis* O.Ktz., 5-IX-1995 (Sudhir Singh).

Prey: Mealy bugs.

Distribution: INDIA: Bangalore, Jorhat, Patkai mountains.

vi. *Jauravia kanaraensis* Kapur

Jauravia kanaraensis Kapur, 1946:84.

Prey: Unknown

Distribution: INDIA: Kanara.

vii. *Jauravia hanifi sp.n.
(Fig. 6A-G)**

Body rounded oval (fig. 6A), strongly convex; head brown, uniformly pubescent, punctures, deep separated by one to one and half times their diameter; pronotum brown, pubescence short and sparse, lateral regions comparatively densely pubescent, punctures small, shallow, separated by two to two and half times their diameter; elytra brown, each elytron with one black spot nearly three-fourth as long as elytron, nearer to the base than apex, slightly curved towards the suture, pubescence short and sparse except one-sixth external border, comparatively densely pubescent, punctures bigger than pronotum, deep, separated by one

* The new species is named after my father

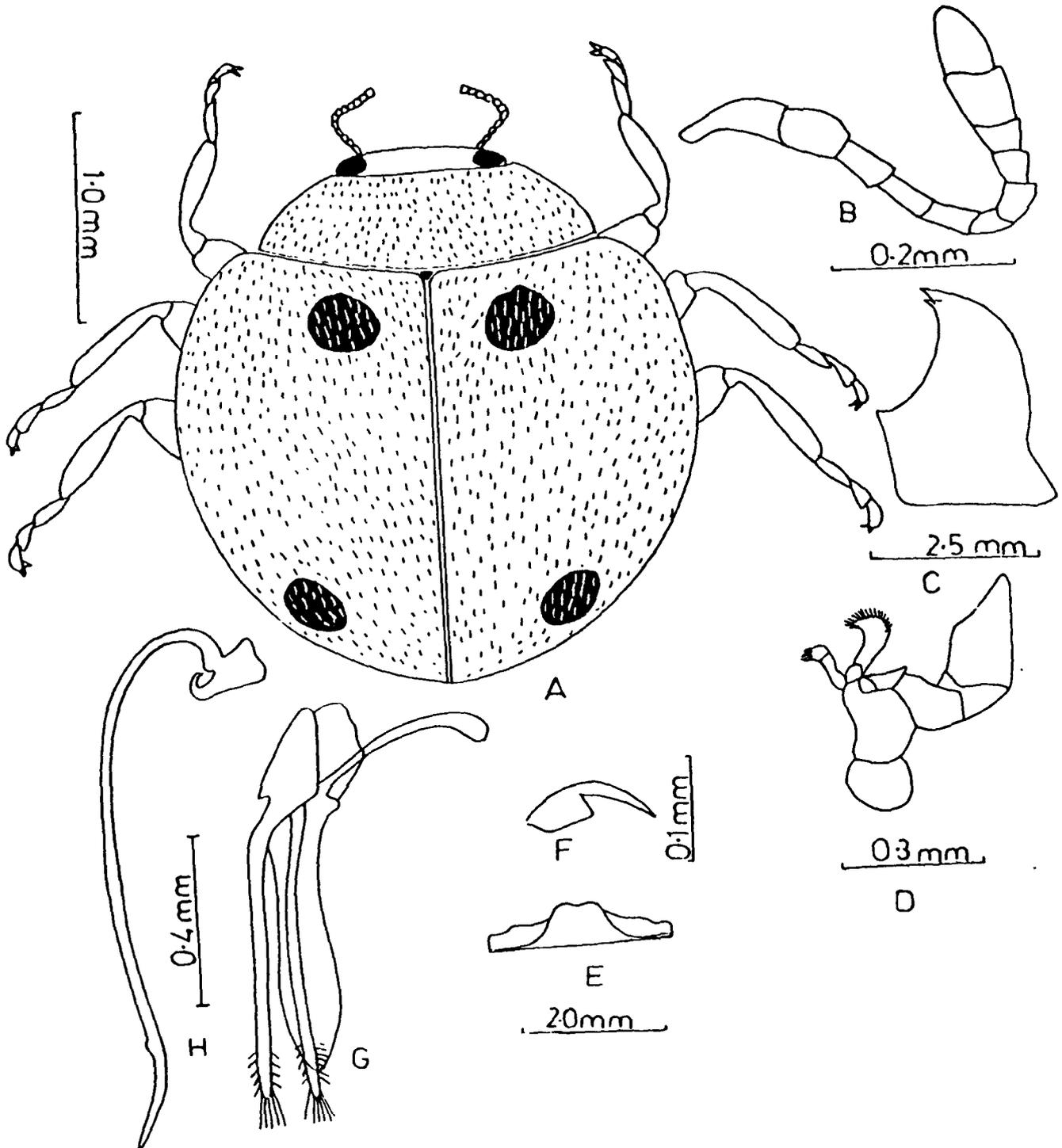


Fig. 5A-H:

Jauravia quadrinotata Kapur

A=Dorsal view, B=Antenna, C=Mandible, D=Maxilla,
 E=1st abdominal sternite, F=Tarsal claw, G=Phallobase
 H=Siphon

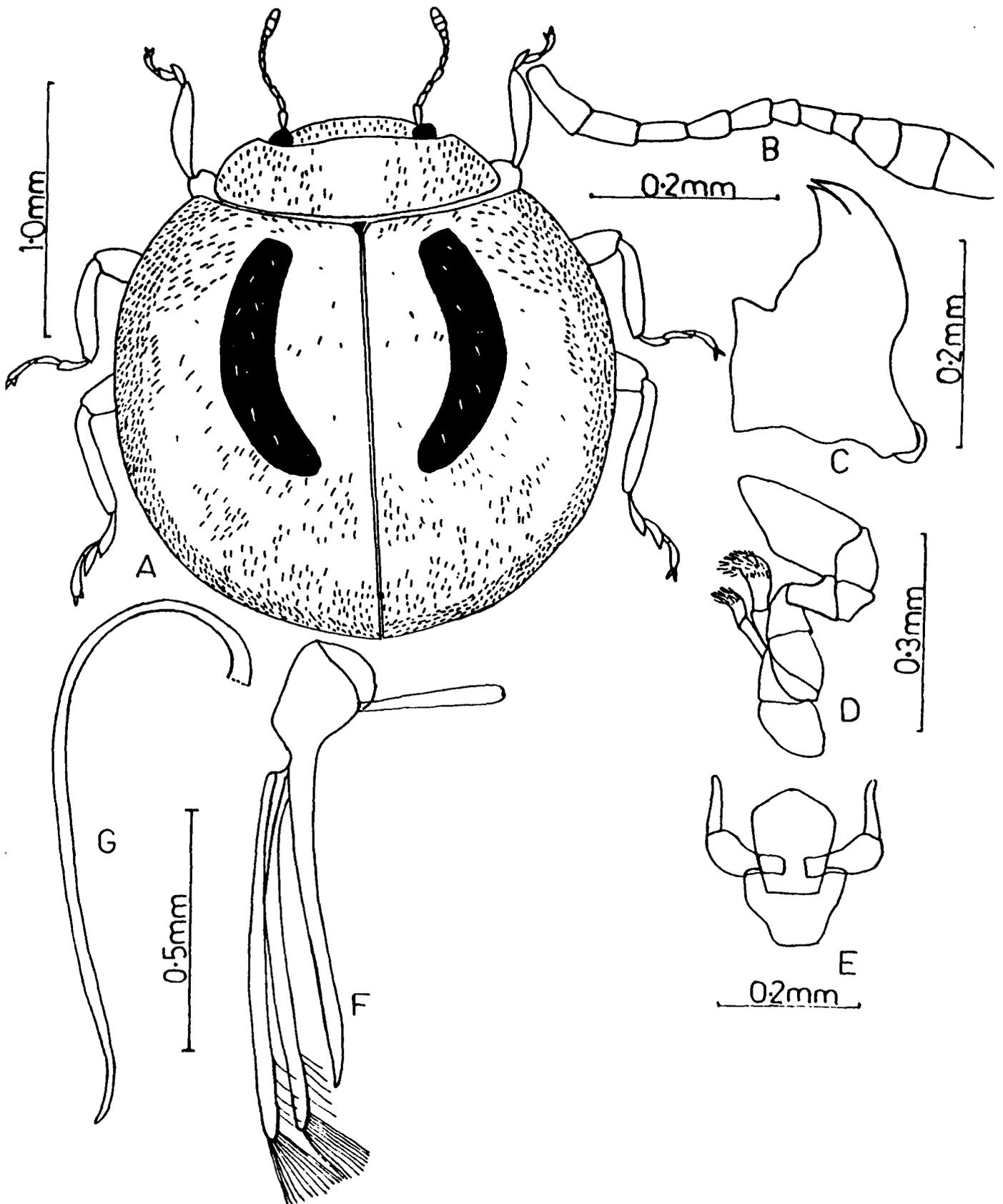


Fig. 6A-G: *Jauravia hanifi* sp.n.
 A=Dorsal view, B=Antenna, C=Mandible, D=Maxilla,
 E=Labium, F=Phallobase, G=Sipho.

to two times their diameter; male genitalia (figs.6F-G) with basal lobe (in lateral view) narrow, slender, slightly curved and pointed apically, parameres distinctly longer and slightly narrower than basal lobe with rounded apices fringed with long dense setae, few medium sized setae also present on apical one-fourth of inner margin, hypomere less than half the length of parameres, gradually thickened apically (fig.6 F); siphon (fig.6 G) long and narrow, slightly curved at distal end.

Length : 2.0 mm.
Width : 1.75 mm.

Holotype: ♂, INDIA: Aligarh (Uttar Pradesh), predaceous on aleyrodids on *Syzgium jambolanum* Dc, 1-IV-1995 (Shama Afroze).

Paratype: 1 ♂ (Same data as for holotype).

Remarks: The new species *J. hanifi* similar to *J. kanaraensis* Kapur in coloration, punctation and pubescence but differ in having elytral spot, nearly three-fourth as long as elytron, in *J. kanaraensis* Kapur elytral spot is nearly one-third as long as elytron.

viii. *Jauravia simplex* (Walker)

Coccinella simplex Walker, 1859: 219.
Clanis opaca (Weise), 1900:430,433.
Clanis simplex (Walker); Sicard, 1912:505.
Jauravia simplex (Walker); Korschefsky, 1932:588.
Jauravia simplex (Weise); Kapur, 1946: 86.

Prey: Cecidomyid larvae.

Distribution: INDIA: Belgaum.

ix. *Jauravia pilosula* (Weise)

Clanis pilosula Weise, 1900:429,433.
Jauravia pilosula (Weise); Korschefsky, 1931:222.
Jauravia pilosula (Weise); Kapur, 1946: 89.

Prey: Unknown

Distribution: INDIA: Nilgiri hills.

x. *Jauravia soror* (Weise)

Clanis soror Weise, 1892a:25.

Clanis soror Weise; Gorham, 1894a:204.

Clanis soror Weise; Weise, 1895a:155.

Jauravia soror (Weise); Korschefsky, 1931:222.

Jauravia soror (Weise); Kapur, 1946 : 89.

Jauravia soror (Weise); Puttarudriah and Channabasavanna, 1956:158.

Jauravia soror (Weise); Puttarudriah and Channabasavanna, 1957:10.

Prey: *Dialeurodes citri* Ashmead, *Hemaspidopectus cinereus* (Green),
Monophelbus sp., *Orthezia* sp. *Pulvinaria* sp., *Saissetia nigra* (Nietner), *Saissetia*
hemispherica (Targ.), *Tetranychus bioculatus* Wood Mason

Distribution: INDIA: Bangalore, Malabar, Nilgiri hills, Tharikere.

xi. *Jauravia dorsalis* (Weise)

Clanis dorsalis Weise, 1908: 227.

Clanis dorsalis Weise; Sicard, 1912:505.

Jauravia dorsalis (Weise); Korschefsky, 1931:222.

Jauravia dorsalis (Weise); Kapur, 1946:90.

Prey: *Fiorinia plana* Green.

Distribution: INDIA: Chandragiri, Coimbatore, Nilgiri hills.

Subfamily COCCINELLINAE Ganglbauer

Coccinellinae Ganglbauer, 1899: 955, 966.

Coccinellinae Ganglbauer; Kapur, 1966: 18.

Coccinellinae Ganglbauer; Sasaji, 1968a: 2.

Body dorsally glabrous; clypeus unexpanded laterally with or without antero-lateral projections on each side; antennae inserted dorsally on head and in front of the eyes, 11-segmented, antennal insertion exposed; mandibles bidentate with inner margin serrate or not, basal tooth distinct; terminal segment of maxillary palp strongly divergent apically (securiform) or expanded; mentum and submentum of labium narrowly articulated; mid coxal cavities narrowly separated; meso and metasternum narrowly articulated; legs with tarsi cryptotetramerous; abdomen usually with six visible sternites in both sexes; female genital plates transverse or oval, inner margin without any emargination.

Three tribes are included under Coccinellinae Ganglbauer.

Tribe Psylloborini Casey

Psylloborini Casey, 1899: 100.

Psylloborini Casey; Kapur, 1966:86.

Psylloborini Casey; Sasaji, 1968a:21.

Anterior margin of clypeus without antro-lateral projections; mandibles bidentate with inner margin always serrate; terminal segment of maxillary palp expanded in wing shaped; abdomen with six visible sternites in both sexes; siphon of male genitalia nearly as in Coccinellini; female genital plates usually oval rarely transverse.

The tribe Psylloborini Casey is represented by four genera from India. Their separation is given in the key to genera.

Genus *Illeis* Mulsant

Illeis Mulsant, 1850:1026.

Type species: *Coccinella cincta* Fabricius, 1801:158.

Illeis Mulsant; Khnz., 1979:63.

Diagnosis: Body oval to subrounded weakly to moderately convex; prosternum without carinae; first abdominal sternite with femoral line incomplete

(figs. 7F,8F); legs without mid and hind tibial spurs, tarsal claws with subquadrate basal tooth; male genitalia with basal lobe elongated (in lateral view), broad at base, abruptly narrowed to a curve or straight apex, parameres narrow and slender, hypomere shorter than parameres (figs. 7H,8H-I); siphon (figs. 7I,8J) distinctly broad proximally, siphonal capsule with poorly distinct lobes, distal end may be bulbous, spatulate or abruptly narrowed; female genitalia with spermatheca (fig. 8K) small, comma shaped, nodulus and ramus indistinct.

The genus is represented by single subgenus from India. A key to species proposed by Anand *et al.*, (1990) is revised to accommodate the revalidated species, *Illeis (Illeis) bielawskii* Ghorpade.

s.gen. *Illeis* s.str.

Illeis s.str.; Khnz., 1979:63.

The subgenus is represented by five species from India.

Revised key to Indian species of *Illeis* s.str. Mulsant

1. Pronotum unmarked ----- 2
- Pronotum with two black spots ----- 3
2. Each elytron with a dusky grey discal patch; male genitalia with basal lobe slightly longer than parameres ----- *bielawskii* Ghorpade sp.rev.
- Each elytron with a light orange discal patch; male genitalia with basal lobe distinctly shorter than parameres ----- *kapuri* Anand *et al.*
3. Body relatively small, not distinctly narrowed towards apex; apex of siphon not bifid ----- 4
- Body relatively large, distinctly narrowed towards apex; apex of siphon bifid -----
----- *indica* Timberlake
4. Underside black; apex of siphon abruptly narrowed, basal lobe with apex blunt, almost straight, very slightly emarginate in middle ----- *bistigmosa* Mulsant
- Underside pale in colour; apex of siphon broadly spatulate, basal lobe with apex not strongly curved upward, tapering into a slender arcuate apex ----- *cincta* Fabricius

**i. *Illeis (Illeis) bielawskii* Ghorpade sp. rev.
(Fig.7A-J)**

Illeis (Illeis) bielawskii Ghorpade, 1976:579.

Illeis (Illeis) bielawskii Ghorpade; Khnz., 1979:64.

Material Examined: 2 ♂♂ INDIA: Chikmagalur (Karnataka), feeding on fungi on *Capsicum annuum* Linnaeus, 14-V-1995 (M. Dhanam).

Remarks: Khnz. (1979) synonymised *Illeis (Illeis) bielawskii* Ghorpade with *Illeis (Illeis) bistigmosa* (Mulsant). *Illeis (Illeis) bielawskii* Ghorpade is treated here as valid on the basis of characters as given in the key.

Prey: Fungi

Distribution: INDIA: Bangalore, Chikmagalur, Dharwar, Doddagubbi, Hebbal, Puratgeri.

ii. *Illeis (Illeis) kapuri* Anand et al.

Illeis (Illeis) kapuri Anand et al., 1990:131.

Prey: Fungi

Distribution: INDIA: Solan.

**iii. *Illeis (Illeis) indica* Timberlake
(Fig. 8A-K)**

Illeis (Illeis) indica Timberlake, 1943:61.

Illeis (Illeis) indica Timberlake; Bielawski, 1961:364.

Illeis (Illeis) indica Timberlake; Kapur, 1966:180.

Illeis (Illeis) indica Timberlake; Ghorpade, 1976:583.

Illeis (Illeis) indica Timberlake; Khnz., 1979:63.

Illeis (Illeis) indica Timberlake; Anand et al., 1990:133.

Material Examined: 20 ♀♀, 17 ♂♂, INDIA: Port Blair (South Andaman), feeding on fungi on ornamental plant, 19-XI-1993 (M. Yousuf).

Prey: Fungi

Distribution: INDIA: Calcutta, Delhi, Port Blair.

iv. *Illeis (Illeis) bistigmosa* (Mulsant)

Psyllobora bistigmosa Mulsant, 1850:168.

Psyllobora simplex Mulsant, 1866:128.

Thea bistigmosa (Mulsant); Crotch, 1874:135.

Illeis (Illeis) bistigmosa (Mulsant); Korschefsky, 1932:558.

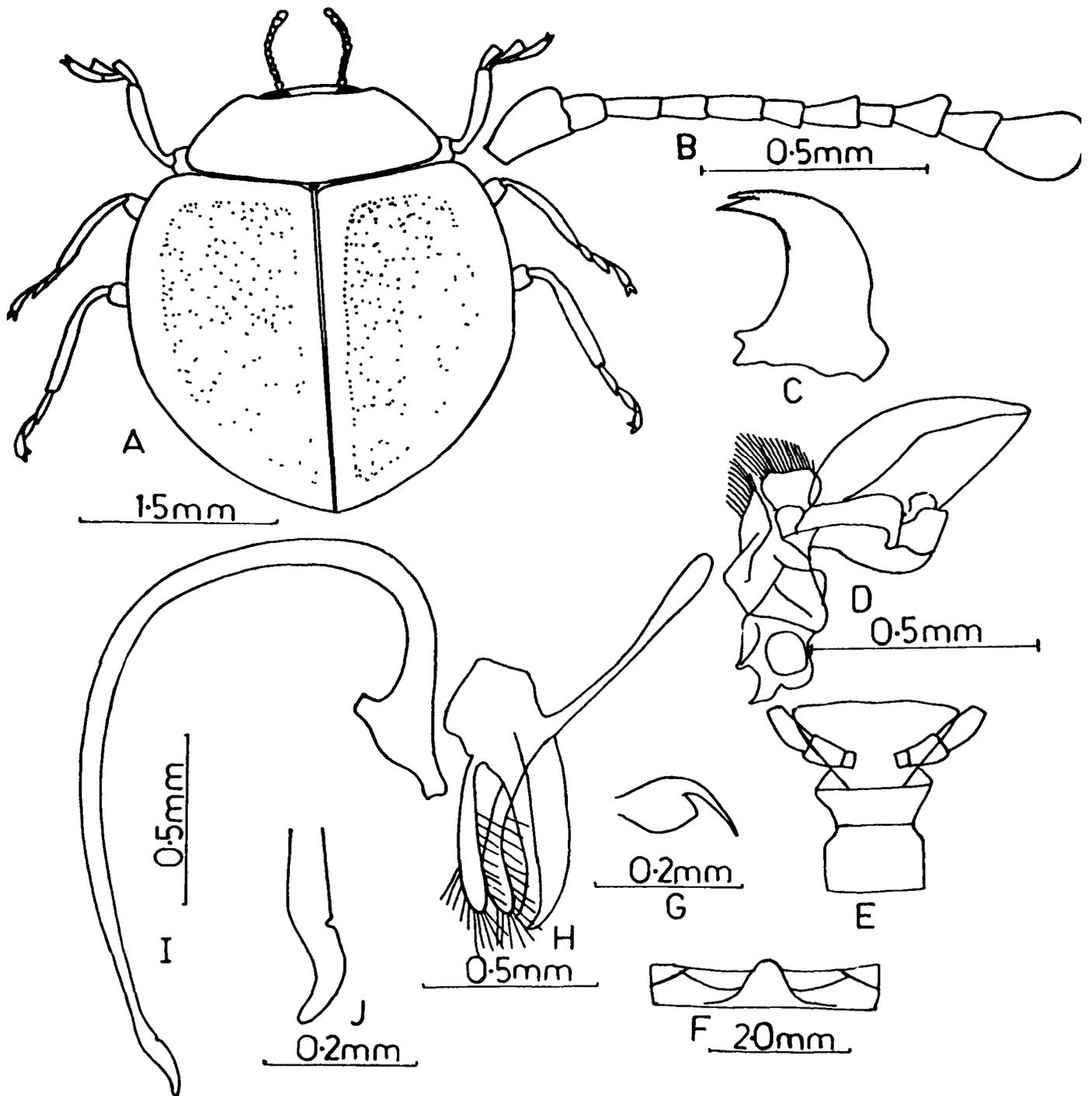


Fig.7A-J:

Illeis (Illeis) bielawskii Ghorpade

A=Dorsal view, B=Antenna, C=Mandible, D=Maxilla,
 E=Labium, F=1st abdominal sternite, G=Tarsal claw,
 H=Phallobase, I= Siphon, J=Distal end of siphon (enlarged view)

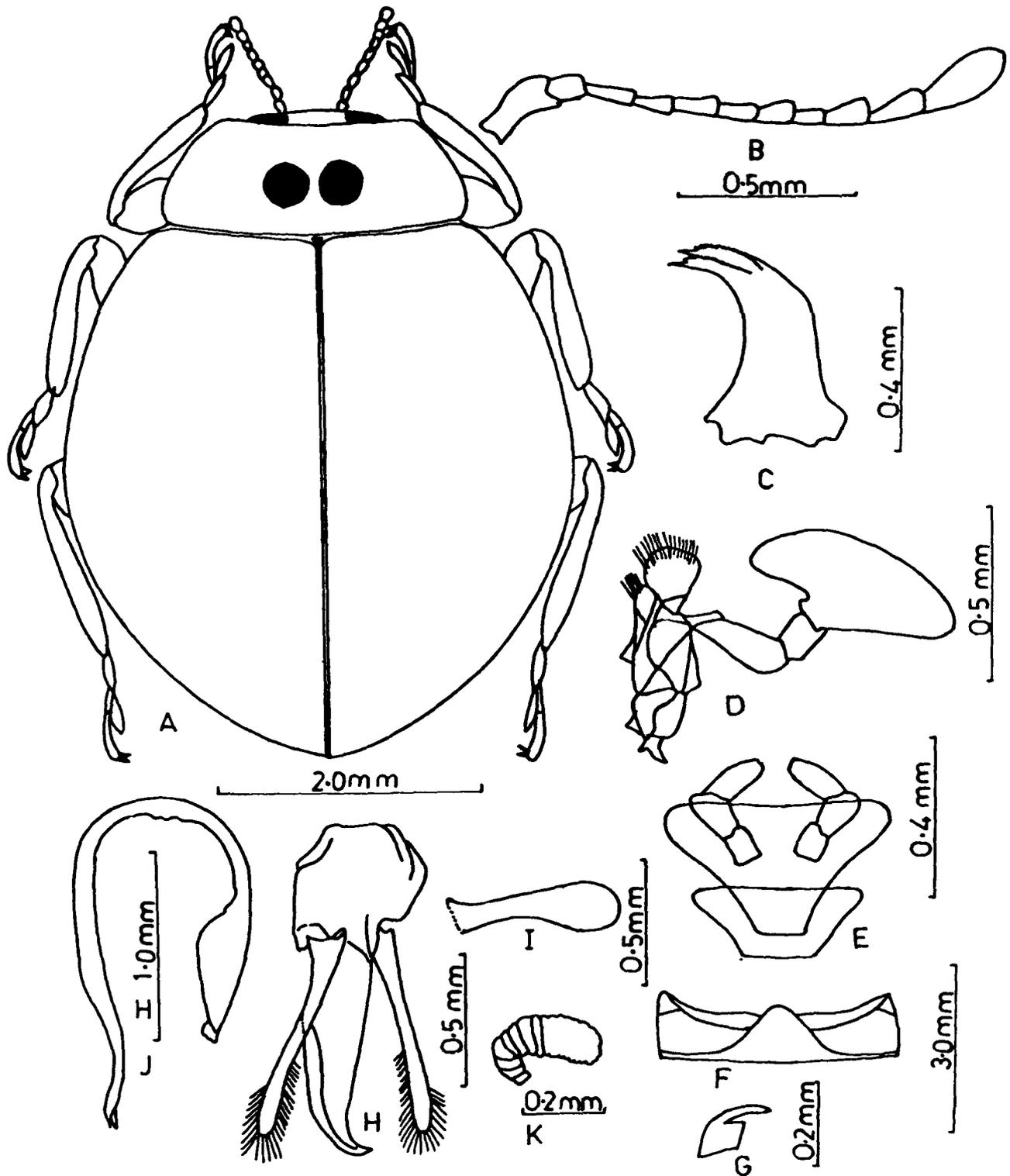


Fig. 8A-K:

Illeis (Illeis) indica Timberlake

A=Dorsal view, B=Antenna, C=Mandible, D=Maxilla,

E=Labium, F=1st abdominal sternite, G=Tarsal claw,

H=Phallobase, without hypomere, I=Hypomere, J=Siphon, K=Spermatheca

Illeis (Illeis) bistigmosa (Mulsant); Timberlake, 1943:60.
Illeis (Illeis) bistigmosa (Mulsant); Bielawski, 1961:366.
Illeis (Illeis) bistigmosa (Mulsant); Kapur, 1966:179.
Illeis (Illeis) bistigmosa (Mulsant); Ghorpade, 1976:583.
Illeis (Illeis) bistigmosa (Mulsant); Khnz., 1979:64.
Illeis (Illeis) bistigmosa (Mulsant); Anand *et al.*, 1990:133.

Prey: Mildew and other fungi

Distribution: INDIA: Port Blair

v. *Illeis (Illeis) cincta* (Fabricius)

Coccinella cincta Fabricius, 1801:158.
Thea cincta (Fabricius); Bagal & Trehan, 1945:569.
Illeis (Illeis) cincta (Fabricius); Ghorpade, 1976:583.
Illeis (Illeis) cincta (Fabricius); Khnz., 1979:63.
Illeis (Illeis) cincta (Fabricius); Anand *et al.*, 1990:133.

Prey: Fungi

Distribution: INDIA: Belgaum, Kanara, Poona.

Genus *Psyllobora* Chevrolat

Psyllobora Chevrolat, 1837:458.
 Type species: *Coccinella lineola* Fabricius, 1775:79.
Thea Mulsant, 1846:159.
 Type species: *Thea vigintiduopunctata* Linnaeus, 1758:366.
Psyllobora Chevrolat; Khnz., 1979:64.

Diagnosis: Body oval, weakly convex; prosternum without carinae; first abdominal sternite with femoral line incomplete (fig. 9F); legs without mid and hind tibial spurs, tarsal claws with triangular basal tooth; male genitalia with basal lobe elongated, gradually narrowed towards apex, parameres shorter than basal lobe, finger shaped, hypomere longer than parameres (fig.9H); siphon (fig.9I) proximally with unequal bilobed siphonal capsule, distal end irregular; female genitalia (fig.9J) with spermatheca considerably long, strongly curved in 'C' shaped, annulated (spring like) ramus more developed than nodulus, genital plates small, oval, styli small.

The genus is represented by single species from India.

***Psyllobora bisoconotata* (Mulsant)
(Fig.9A-J)**

Vibidia bisoconotata Mulsant, 1850:204.

Thea artemisiae Wollaston, 1867:158.

Thea bisoconotata (Mulsant); Kapur, 1944:165.

Psyllobora bisoconotata (Mulsant); Khnz., 1979:64.

Material Examined: 30 ♀♀, 35 ♂♂ **INDIA:** Aligarh (Uttar Pradesh), feeding on fungi on *Acalypha* sp. 6-vi-1992 (Shama Afroze); 10 ♀♀, 12 ♂♂, Rohtak (Haryana), feeding on fungi on *Chrysanthemum indicum* Linnaeus, 10-vii-1992 (Jamal Ahmad).

Prey: Fungi

Distribution: **INDIA:** Aligarh, Delhi, Poona, Rohtak.

Tribe Coccinellini Weise

Coccinellini Weise, 1885b: 7.

Synonychini Weise, 1885b: 7.

Coccinellini Weise; Kapur, 1966: 186.

Coccinellini Weise; Sasaji, 1968a:21.

Anterior margin of clypeus with antero-lateral projections; mandibles with inner margin never serrate; terminal segment of maxillary palp strongly divergent apically (securiform); first abdominal sternite with femoral line incomplete (except *Adalia* Mulsant, *Bulaea* Mulsant); siphonal capsule well developed, distinctly bilobed; female genital plates transverse or oval.

The tribe Coccinellini Weise is represented by twenty one genera from India. Their separation is given in the key to genera.

Genus *Synonycha* Mulsant

Synonycha Mulsant, 1850:229.

Type species: *Coccinella grandis* Thunberg, 1781:12.

Synonycha Mulsant; Kamiya, 1965a:66.

Synonycha Mulsant; Khnz., 1979:74.

Diagnosis: Body nearly rounded strongly convex; prosternum without carinae; first abdominal sternite with femoral line incomplete; legs with mid and hind tibial spurs, tarsal claws bifid, inner one slightly shorter than outer basal tooth

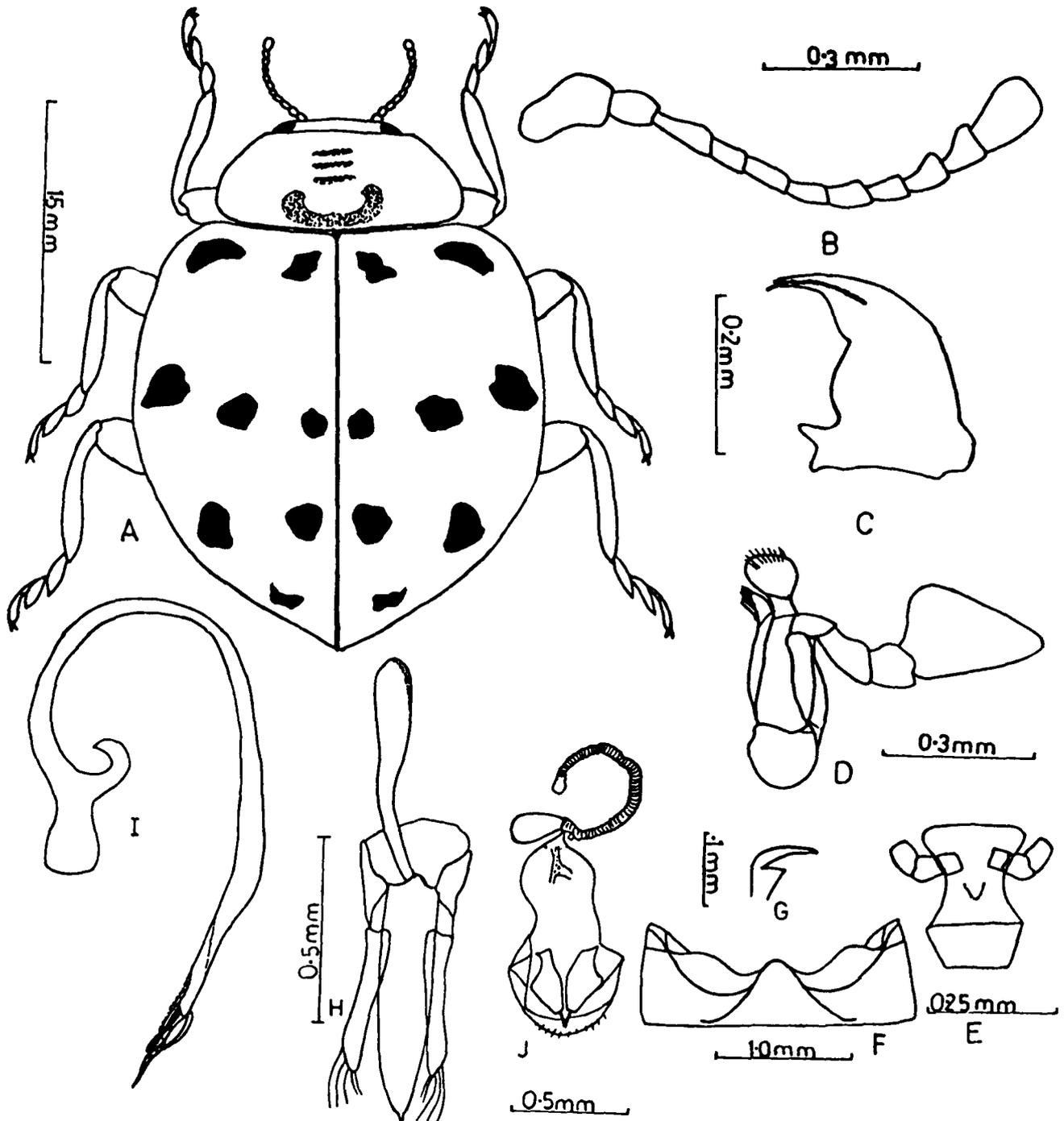


Fig. 9A-J:

Psyllobora bisoctonotata (Mulsant)

A=Dorsal view, B=Antenna, C=Mandible, D=Maxilla,
 E=labium, F=1st abdominal sternite, G=Tarsal claw,
 H=Phallobase, I=Siphon, J=Female genitalia

indistinct; male genitalia with basal lobe broad (in lateral view) for half of its length, then abruptly tapering, parameres arched and longer than basal lobe, hypomere longer than parameres (fig. 10G); siphon (fig. 10H) proximally with, unequal bilobed siphonal capsule, distal end with a pair of tongs; female genitalia with spermatheca 'C' shaped, ramus and nodulus well developed, genital plates small flask shaped.

The genus is represented by single species.

***Synonycha grandis* (Thunberg)
(Fig. 10A-H)**

Coccinella grandis Thunberg, 1781:12.

Synonycha grandis (Thunberg); Chevrolat, 1837:460.

Synonycha grandis (Thunberg); Mulsant, 1850:230.

Synonycha grandis (Thunberg); Crotch, 1874:171.

Synonycha grandis (Thunberg); Korschefsky, 1932:268.

Synonycha grandis (Thunberg); Lal & Kankavalli, 1960:85.

Synonycha grandis (Thunberg); Bielawski & Chujo, 1961:33.

Synonycha grandis (Thunberg); Kamiya, 1965a:67.

Synonycha grandis (Thunberg); Kapur, 1966:174.

Synonycha grandis (Thunberg); Chunram & Sasaji, 1980:489.

Material Examined: 2 ♂♂, INDIA: Jorhat (Assam), predaceous on aphids on *Brassica campestris* Linnaeus, 22-ix-1995 (Sudhir Singh)

Prey: Aphids

Distribution: INDIA: Andaman Islands, Bangalore, Belgaum, Coimbatore, Darjeeling, Jorhat, Kanara, Sikkim.

Genus *Oenopia* Mulsant

Oenopia Mulsant, 1850:374.

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

Aza Mulsant, 1850:425.

Type species: *Aza kirbi* Khnz., 1979:69.

Synharmonia Ganglbauer, 1899:994.

Type species: *Synharmonia conglobata* Linnaeus, 1758:366.

Gyrocaria Timberlake, 1943:39.

Type species: *Gyrocaria guttata* Blackburn, 1889:1-1275.

Pseudoharmonia Savojskaja, 1969:37.

Type species: *Pseudoharmonia montana* Savojskaja, 1969:37.

Oenopia Mulsant; Crotch, 1874:158.

Oenopia Mulsant; Khnz., 1979:69.

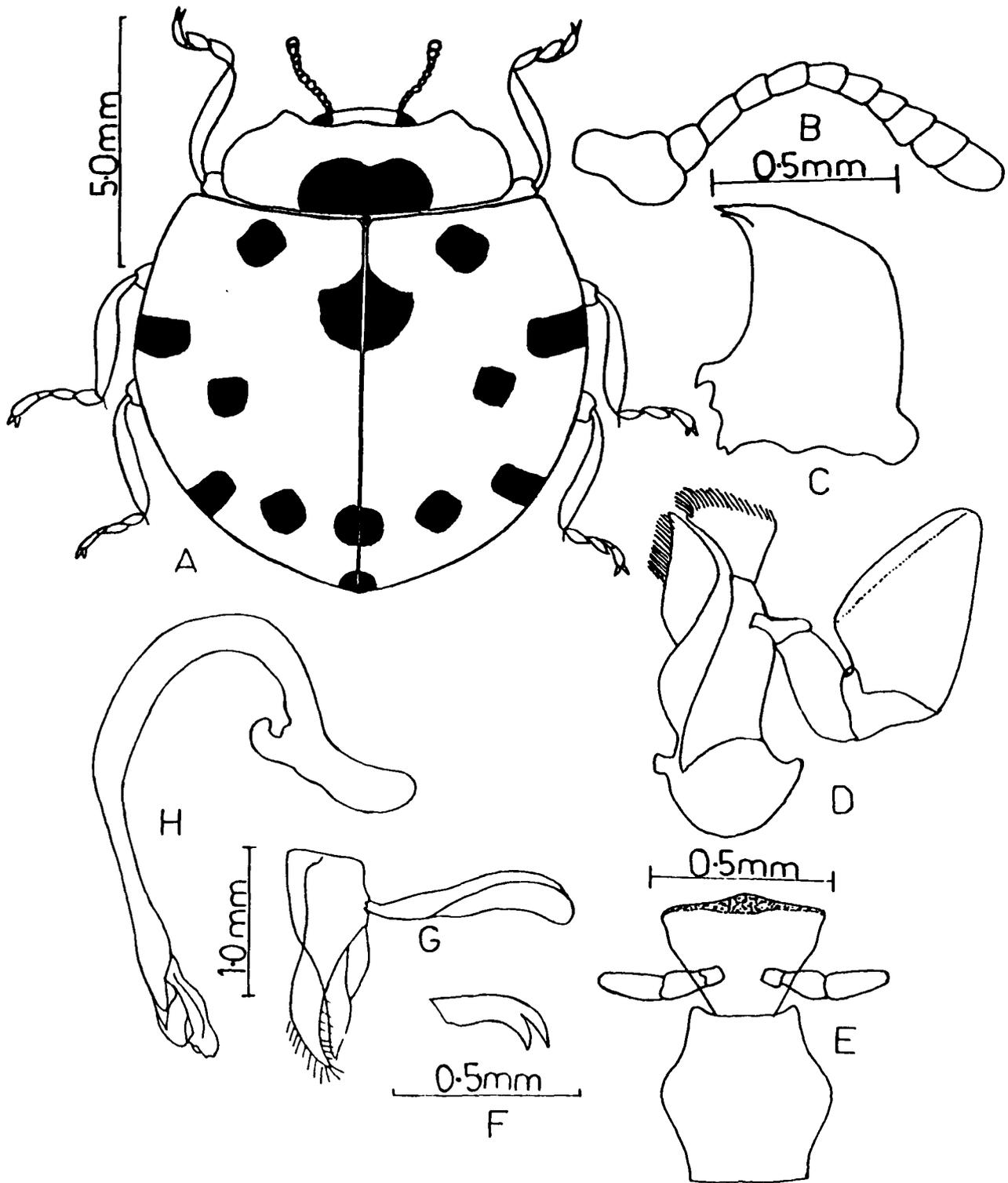


Fig. 10A-H: *Synonycha grandis* (Thunberg)
 A=Dorsal view, B=Antenna C=Mandible, D=Maxilla,
 E=Labium, F=Tarsal claw, G=Phallobase, H=Siphon.

Diagnosis: Body oval moderately convex; prosternum with a pair of carinae; first abdominal sternite with femoral line incomplete, with an oblique line at each lateral part (figs. 11F, 12F); legs with mid and hind tibial spurs, tarsal claws with triangular or quadrate basal tooth; male genitalia with basal lobe broad at base, apex deeply emarginate medially appearing bilobed (except in *billieti* (Mulsant)), parameres longer than basal lobe, apices thickened and fringed, with long, dense setae, hypomere narrow, longer than parameres (figs. 11H, 12H); siphon (figs. 11I, 12I) proximally with more or less equal bilobed siphonal capsule, distal end considerably narrower than remaining part; female genitalia with spermatheca (fig. 12J) weakly curved, ramus and nodulus well developed, genital plates oval, styli small.

The genus is represented by five species from India. A key for their separation is given below.

Key to Indian species of *Oenopia* Mulsant*

1. Pronotum black, except yellowish antero-lateral regions; male genitalia with basal lobe deeply emarginate medially at apex, appearing bilobed -----2
- Pronotum testaceous, with large black spot covering major part; male genitalia with basal lobe narrow, curved and pointed at apex -----*billieti* (Mulsant)
2. Each lobe of basal lobe divergent apically, hypomere slightly thickened apically -----3
- Each lobe of basal lobe straight apically, hypomere comparatively more thickened apically ----- *sexaerata* (Mulsant)
3. Elytra yellowish, each elytron with four black spots, including two common sutural spot-----*sauzeti* Mulsant
- Elytra black except four spots and lateral borders yellowish -----
-----*quadripunctata* Kapur

i. *Oenopia billieti* (Mulsant)

Harmonia billieti Mulsant, 1853a:144.

Oenopia indica Weise, 1903:582.

Harmonia billieti Mulsant; Mulsant, 1866:71.

* *Oenopia kirbi* Mulsant is not included in the key due to inadequate original description.

Coccinella billieti (Mulsant); Korschefsky, 1932:447.

Synharmonia billieti (Mulsant); Kapur, 1963b:33.

Oenopia billieti (Mulsant); Khnz., 1979:69.

Prey: Unknown

Distribution: INDIA: Assam, Kashmir, Garhwal, Kumaon

**ii. *Oenopia sexaerata* (Mulsant)
(Fig.11A-J)**

Coelophora sexaerata (Mulsant), 1853a:181.

Coelophora sexaerata Mulsant; Gorham, 1894b:209.

Coelophora sexaerata Mulsant; Korschefsky, 1932:296.

Coelophora sexaerata Mulsant; Kapur, 1955:333.

Coelophora sexaerata Mulsant; Kapur, 1963b:29.

Oenopia sexaerata (Mulsant); Khnz., 1979:70.

Material Examined: 2♂♂, INDIA: Gulmarg (Jammu), predaceous on aphids on *Prunus persica* Batsch., 28-XII-1993 (M.Yousuf).

Prey: Aphids

Distribution: INDIA: Assam, Gangtok, Garhwal, Gulmarg, Kalimpong, Manipur, North Bengal.

**iii. *Oenopia sauzeti* Mulsant
(Fig.12A-J)**

Oenopia sauzeti Mulsant, 1866:281.

Oenopia mimica Weise, 1902:505.

Oenopia sauzeti Mulsant; Kapur, 1955:331.

Oenopia sauzeti Mulsant; Kapur, 1973:458.

Oenopia sauzeti Mulsant; Khnz., 1979:69.

Material Examined: 5♀♀, 7♂♂, INDIA: Solan (Himachal Pradesh) predaceous on aphids on *Prunus persica* Batsch., 24-XII-1993 (M. Yousuf).

Prey: Aphids, psyllids

Distribution: INDIA: Chhota Nagpur, Darjeeling, Kausuni, Punjab, Singhik, Solan, W. Bhutan.

iv. *Oenopia quadripunctata* Kapur

Oenopia quadripunctata Kapur, 1963b:27.

Oenopia quadripunctata Kapur; Khnz., 1979:70.

Prey: Unknown

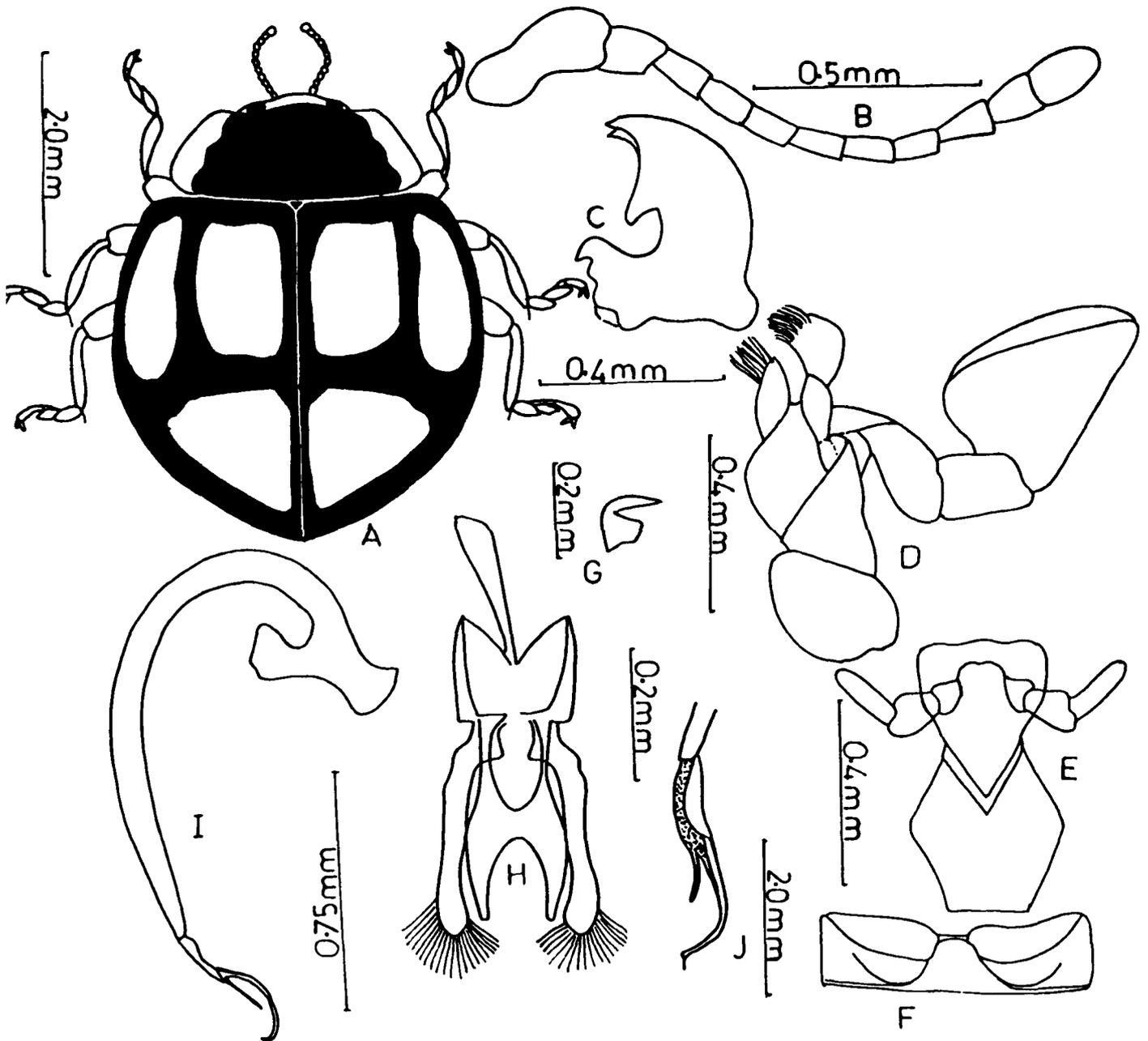


Fig. 11A-J: *Oenopia sexaerata* (Mulsant)
 A=Dorsal view, B=Antenna, C=Mandible, D=Maxilla,
 E=Labium, F=1st abdominal sternite, G=Tarsal claw,
 H=Phallobase, I=Siphon, J=Distal end of Siphon (enlarged view)

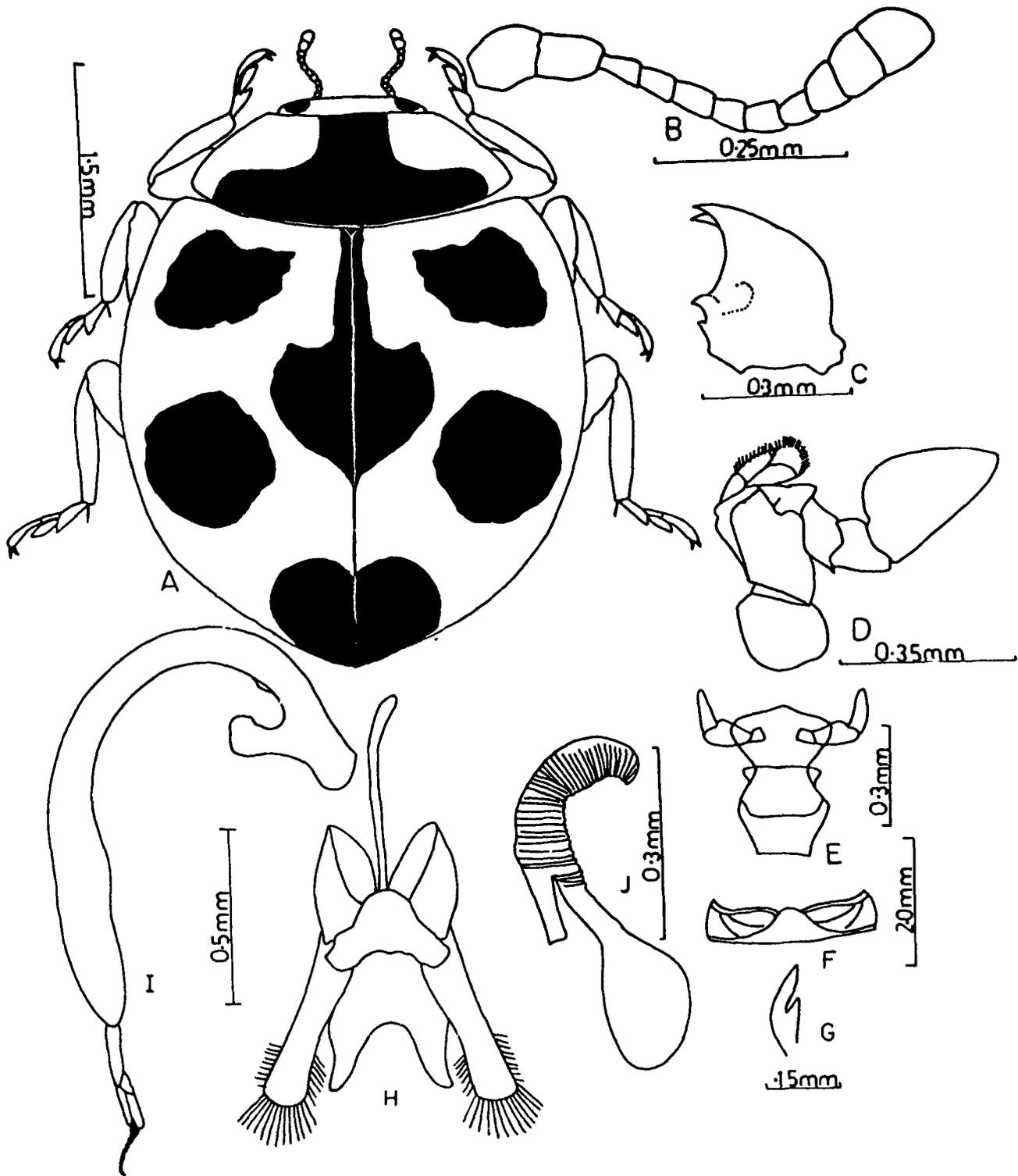


Fig. 12A-J:

Oenopia sauzeti Mulsant

A=Dorsal view, B=Antenna, C=Mandible, D=Maxilla,
 E=Labium, F=1st abdominal sternite, G=Tarsal claw,
 H=Phallobase, I=Siphon, J=Spermatheca

Distribution: INDIA: Assam, Kalimpong, Shillong, Sikkim.

v. *Oenopia kirbi* Mulsant

Oenopia kirbi Mulsant, 1850: 425.

Oenopia kirbi Mulsant; Mulsant, 1866:281.

Oenopia kirbi Mulsant; Korschefsky, 1932: 288.

Oenopia kirbi Mulsant; Khnz., 1979:70.

Prey: Aphids

Distribution: INDIA: Almora, Garhwal, Kalimpong, Kausuni, Phakuri, Ranikhet.

Genus *Synia* Mulsant

Synia Mulsant, 1850: 375.

Type species: *Synia melanaria* Mulsant, 1850: 375.

Synia Mulsant; Khnz., 1979: 73.

Diagnosis: Body nearly rounded, strongly convex (fig. 13A) prosternum with a pair of parallel carinae; first abdominal sternite with femoral line incomplete, with an oblique line at each lateral part (fig. 13F); legs with mid and hind tibial spurs, tarsal claw with quadrate basal tooth; male genitalia with basal lobe elongated, parameres spatulate, hypomere nearly as long as parameres (fig. 13H); siphon (fig. 13I) proximally with unequal bilobed siphonal capsule, distal end narrow before the tip; female genitalia (fig. 13K) with spermatheca 'C' shaped, nodulus and ramus well developed, genital plates oval, styli prominent.

The genus is represented by single species from India.

***Synia melanaria* Mulsant
(Fig. 13A-K)**

Synia melanaria Mulsant, 1850: 375.

Synia melanopepla Mulsant, 1850: 375.

Leis rougeti Mulsant, 1866: 248.

Synia melanaria Mulsant; Subramaniam, 1925: 924.

Synia melanaria Mulsant; Pradhan, 1938: 354, 356.

Synia melanaria Mulsant; Lal & Kanakavalli, 1960: 92.

Synia melanaria Mulsant; Chu *et al.*, 1978: 148.

Material Examined: 30 ♀♀ , 20 ♂♂ , INDIA: Aligarh (Uttar Pradesh),

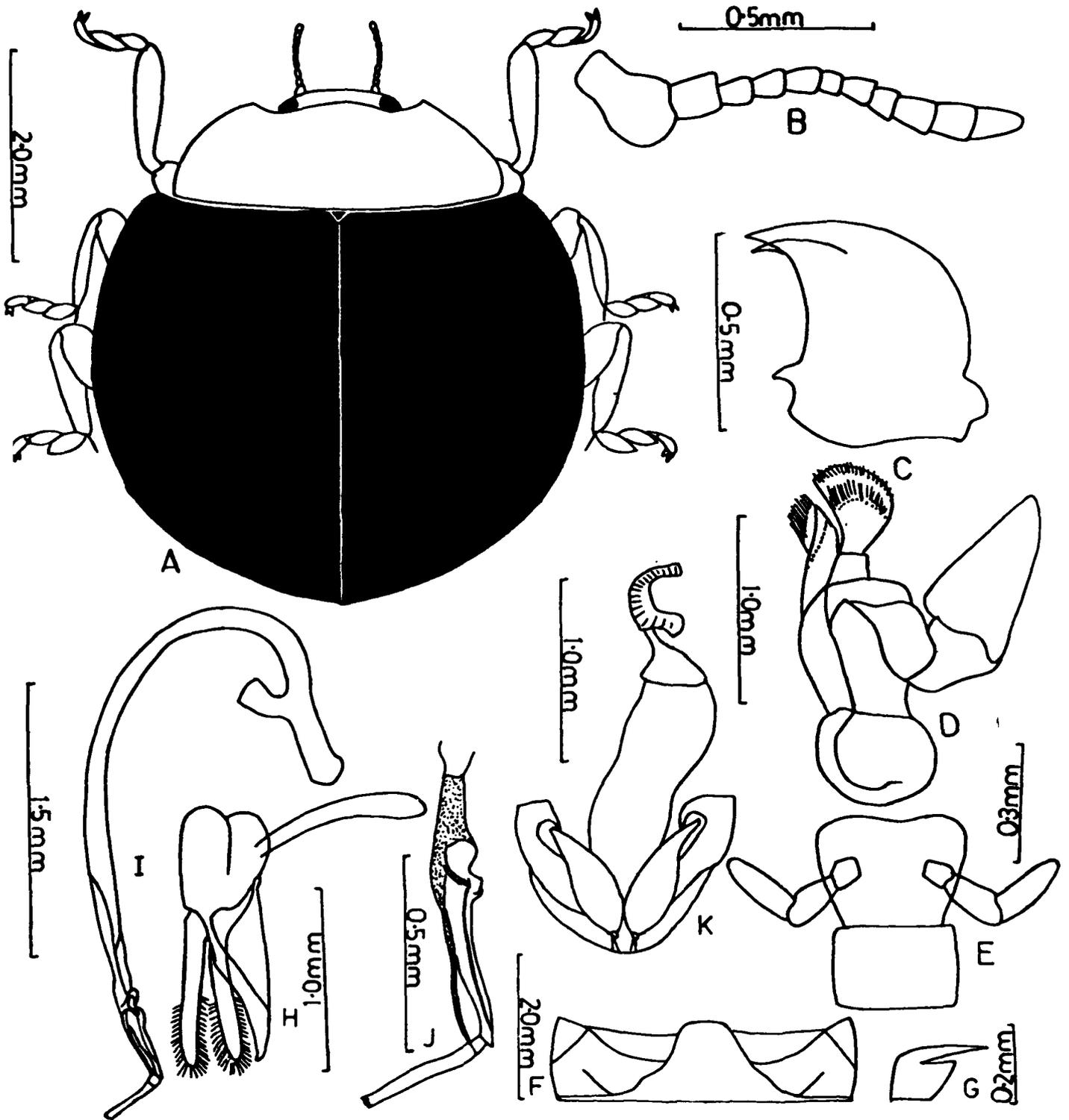


Fig.13A-K:

Synia melanaria Mulsant

A=Dorsal view, B=Antenna, C=Mandible, D=Maxilla,

E=Labium, F=1st abdominal sternite, G=Tarsal claw,

H=Phallobase, I=Sipho, J=Distal end of sipho. (enlarged view), K=Female genitalia.

predaceous on nymphs of *Coptosoma ostensum* Dist. on *Butea monosperma* O.Ktz. 23-X-1994 (Shama Afroze).

Prey: Nymphs of *Coptosoma ostensum* Dist.

Distribution: INDIA: Aligarh, Bangalore, Delhi, Kanpur, Mysore.

Genus *Menochilus* Timberlake

Menochilus Timberlake, 1943:40.

Type species: *Coccinella sexmaculatus* Fabricius, 1781: 91.

Menochilus Timberlake; Kamiya, 1965a: 61.

Menochilus Timberlake; Kapur, 1966: 176.

Menochilus Timberlake; Khnz., 1979: 58.

Diagnosis: Body oval, moderately convex (fig. 14a); prosternum with a pair of carinae; first abdominal sternite with femoral line incomplete, with an oblique line at each lateral part (fig. 14F); legs with mid and hind tibial spurs, tarsal claws with quadrate basal tooth; male genitalia with basal lobe long, parameres slightly longer than basal lobe, spatulate, hypomere longer than parameres considerably narrow and slender (fig. 14H); siphon (fig. 14I) proximally with unequal bilobed siphonal capsule, distal end considerably narrow with long flagellum; female genitalia with spermatheca (fig. 14J) 'C' shaped, ramus prominent, nodulus poorly developed, genital plates (fig. 14K) elongate-oval, styli prominent.

The genus is represented by single species from India.

***Menochilus sexmaculatus* (Fabricius) (Fig. 14A-K)**

Coccinella sexmaculatus Fabricius, 1781: 91.

Coccinella quadriplagiata Swartz, 1808: 195.

Coccinella hingaensis Takizawa, 1917: 221.

Menochilus sexmaculatus (Fabricius); Kapur, 1955: 333.

Menochilus sexmaculatus (Fabricius); Kamiya, 1965a: 62.

Menochilus sexmaculatus (Fabricius); Kapur, 1966: 176.

Menochilus sexmaculatus (Fabricius); Kapur, 1973: 460.

Menochilus sexmaculatus (Fabricius); Chunram & Sasaji, 1980: 487.

Material Examined: 20 ♀♀, 35 ♂♂, INDIA: Aligarh (Uttar Pradesh), predaceous on aphids on *Solanum melongena* Linnaeus, 30-III-1994 (Shama

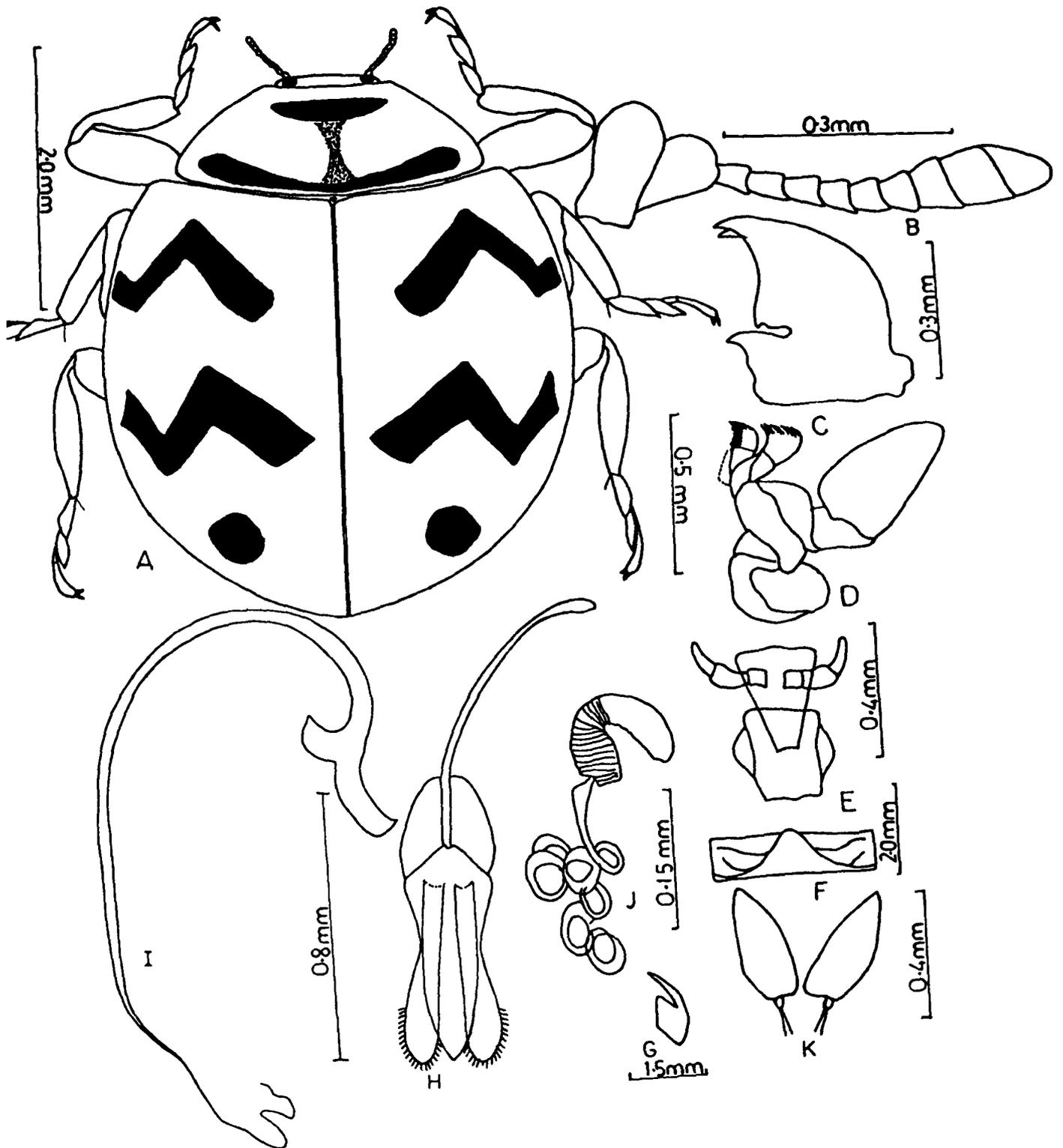


Fig. 14A-K: *Menochilus sexmaculatus* (Fabricius)
 A=Dorsal view, B=Antenna, C=Mandible, D=Maxilla,
 E=Labium, F=1st abdominal sternite, G=Tarsal claw,
 H=Phallobase, I=Sipho, J=Spermatheca, K=Genital plates.

Afroze); 15 ♀♀, 25 ♂♂, Kanpur (Uttar Pradesh), predaceous on mealy bugs on *Mangifera indica* Linnaeus, 20-IV-1994 (Shama Afroze); 15 ♀♀, 17 ♂♂, Fatehpur (Uttar Pradesh), predaceous on mealy bugs on *Mangifera indica* Linnaeus, 12-V-1994 (Shama Afroze); 10 ♀♀, 7 ♂♂, Chandrapura (Bihar), predaceous on aphids on *Zea mays* Linnaeus, 16-VII-1995 (Arshad Ali Haider).

Prey: Aleyrodids, aphids, coccids, jassids, psyllids, sometimes eggs and young larvae of certain Lepidoptera and nymphs of tingids and delphacids.

Distribution: INDIA: Widely distributed in India.

Genus *Coccinella* Linnaeus

Coccinella Linnaeus, 1758: 364.

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

Coccinella Linnaeus; Kamiya, 1965a: 35.

Coccinella Linnaeus; Kapur, 1966: 188.

Coccinella Linnaeus; Khnz., 1979: 66.

Diagnosis: Body oval, moderately convex; prosternum with a pair of carinae; first abdominal sternite with incomplete femoral line and an oblique line at each lateral part; (figs. 15F, 16F); legs with mid and hind tibial spurs, tarsal claws with small subquadrate basal tooth; male genitalia with basal lobe ovate or triangular, parameres slightly shorter than basal lobe, finger shaped, hypomere longer than parameres (figs. 15H, 16H, 17F); siphon (figs. 15I, 16I, 17G); proximally with unequal bilobed siphonal capsule (except in s. gen. *Neococcinella* Savojskaja (fig. 17G), distal end distinctly narrow and constricted before apex; female genitalia with spermatheca (figs. 15J, 16J, 17I) 'C' shaped, ramus and nodulus well developed, nodulus considerably narrower than ramus, genital plates (figs. 15K, 16K, 17H) oval, styli small.

The genus is represented by two subgenera from India. Their separation is given in the key to genera.

1. s.gen. *Coccinella* s. str.

Coccinella s.str.; Khnz., 1979: 67.

The subgenus is represented by four species from India. A key for their separation is given below.

Key to Indian species of *Coccinella* s. str.

1. Body dorsally never black and shining; pronotum with antero-lateral angles yellowish brown without any white spot-----2
- Body dorsally black very shining (as if varnished); pronotum black with a quadrate white spot at anterior region-----*luteopicta* (Mulsant)
2. Elytra only with black spots, without any black bands-----3
- Elytra with one sutural, two triangular subhumeral spots and four black transverse bands uniting with black sutural margin-----*transversalis* Fabricius
3. Elytra with seven black spots, including one common sutural spot-----
- septempunctata* Linnaeus
- Elytra with eleven black spots including one common sutural spot-----
- magnopunctata* Rybakov

i. *Coccinella (Coccinella) luteopicta* (Mulsant)

Adalia luteopicta Mulsant, 1866: 45.

Lioadalia luteopicta (Mulsant); Mader, 1930: 134.

Adalia luteopicta Mulsant; Korschefsky, 1931: 433.

Adalia luteopicta Mulsant; Kapur, 1955: 326.

Adalia luteopicta Mulsant; Kapur, 1963b: 32.

Coccinella (Coccinella) luteopicta (Mulsant); Khnz., 1979: 68.

Prey: Unknown

Distribution: INDIA: Assam, Dehradun, Sikkim.

**ii. *Coccinella (Coccinella) transversalis* Fabricius
(Fig.15A-K)**

Coccinella (Coccinella) transversalis Fabricius, 1781: 97.

Coccinella (Coccinella) repanda Thunberg, 1781: 18.

Coccinella (Coccinella) undulata Herbst, 1786: 7.

Coccinella (Coccinella) transversalis Fabricius; Timberlake, 1943: 14.

Coccinella (Coccinella) transversalis Fabricius; Kapur, 1972: 317.

Coccinella (Coccinella) transversalis Fabricius; Chunram & Sasaji, 1980: 485.

Material Examined: 25, ♀♀20 ♂♂ INDIA: Aligarh (Uttar Pradesh), predaceous

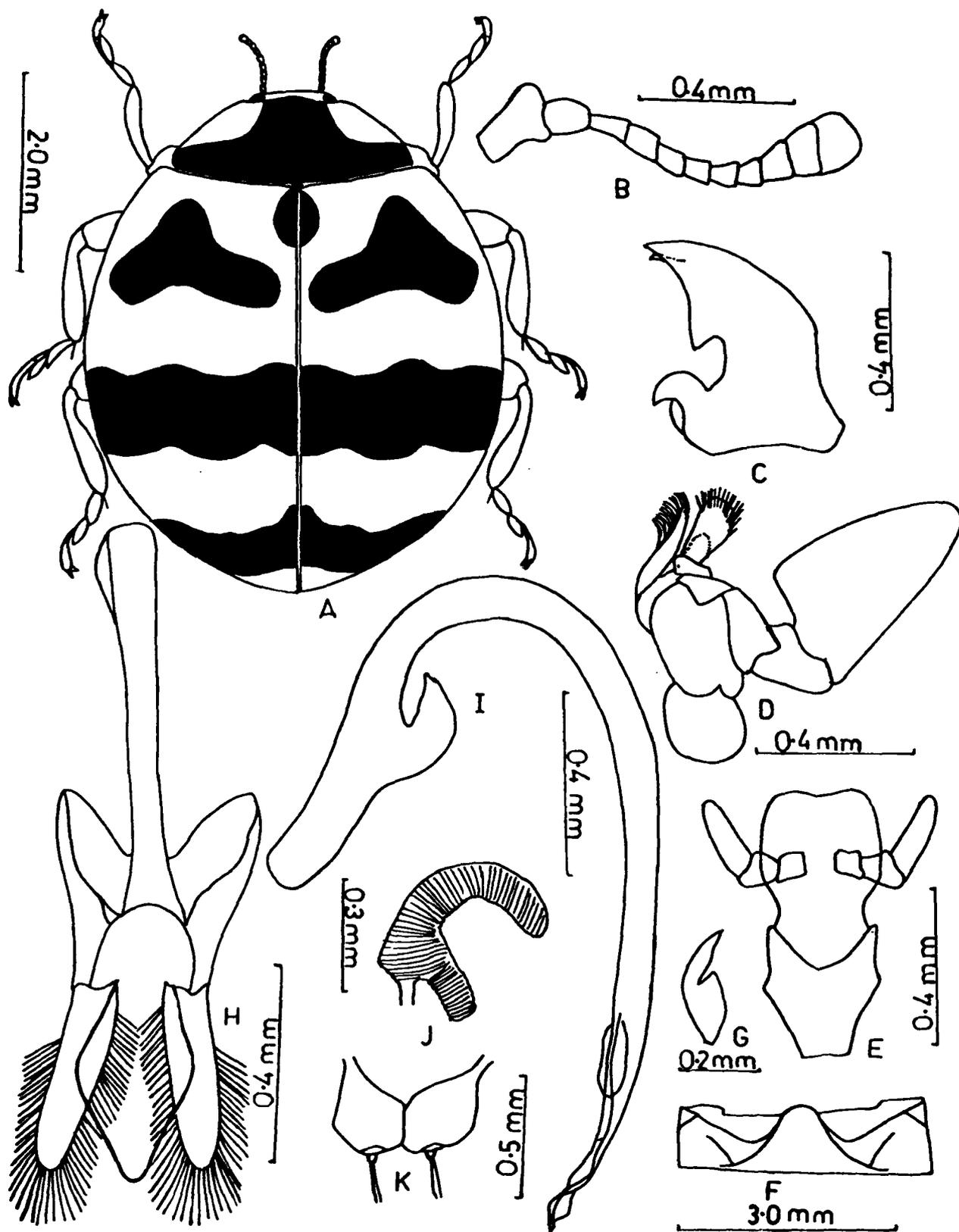


Fig. 15A-K: *Coccinella (Coccinella) transversalis* (Fabricius)
 A=Dorsal view, B=Antenna, C=Mandible, D=Maxilla,
 E=Labium, F=1st abdominal sternite, G=Tarsal claw,
 H=Phallobase, I=Siphon, J=Spermatheca, K=Genital plates.

on aphids on *Brassica oleracea* Linnaeus, 30-III-1994 (Shama Afroze); 20 ♀♀
 30 ♂♂ Kanpur (Uttar Pradesh), predaceous on aphids on *Pisum sativum* Linnaeus,
 20-IV-1994 (Shama Afroze); 20 ♀♀, Chandrapura (Bihar), predaceous on aphids
 on *Zea mays* Linnaeus, 16-VII-1995 (Arshad Ali Haidar).

Prey: Aphids

Distribution: INDIA: Widely distributed in India.

iii. *Coccinella (Coccinella) septempunctata* Linnaeus (Fig.16A-K)

Coccinella (Coccinella) septempunctata Linnaeus, 1758: 365.
Coccinella (Coccinella) divaricata Olivier, 1808: 1001.
Coccinella (Coccinella) confusa Wiedemann, 1823: 12.
Coccinella (Coccinella) brucki Mulsant, 1866: 90.
Coccinella (Coccinella) septempunctata Linnaeus; Lal & Kanakavalli, 1960: 98.
Coccinella (Coccinella) septempunctata Linnaeus; Kamiya, 1965a: 38.
Coccinella (Coccinella) septempunctata Linnaeus; Kapur, 1973: 460.
Coccinella (Coccinella) septempunctata Linnaeus; Chu *et al*, 1978: 155.
Coccinella (Coccinella) septempunctata Linnaeus; Khnz., 1979: 6.

Material Examined: 20 ♀♀ 30 ♂♂ INDIA: Aligarh (Uttar Pradesh) predaceous
 on aphids on *Brassica oleracea* Linnaeus, 30 - III - 1994 (Shama Afroze); 10 ♀♀
 50 ♂♂ Kanpur (Uttar Pradesh), predaceous on aphids on *Pisum sativum* Linnaeus,
 20 - IV - 1994 (Shama Afroze); 10 ♀♀ 7 ♂♂, Chandrapura (Bihar), predaceous on
 aphids on *Zea mays* Linnaeus, 16 - VII - 1995 (Arshad Ali Haider).

Prey: Aphids

Distribution: INDIA: Widely distributed in India.

iv. *Coccinella (Coccinella) magnopunctata* Rybakov

Coccinella (Coccinella) magnopunctata Rybakov, 1889: 289.
Coccinella (Coccinella) magnopunctata Rybakov; Dobzhansky, 1924: 22.
Coccinella (Coccinella) magnopunctata Rybakov; Korschefsky, 1932: 469.
Coccinella (Coccinella) magnopunctata Rybakov; Kapur, 1963b: 33.
Coccinella (Coccinella) magnopunctata Rybakov; Khnz., 1979: 67.

Prey: Unknown

Distribution: INDIA: Kashmir.

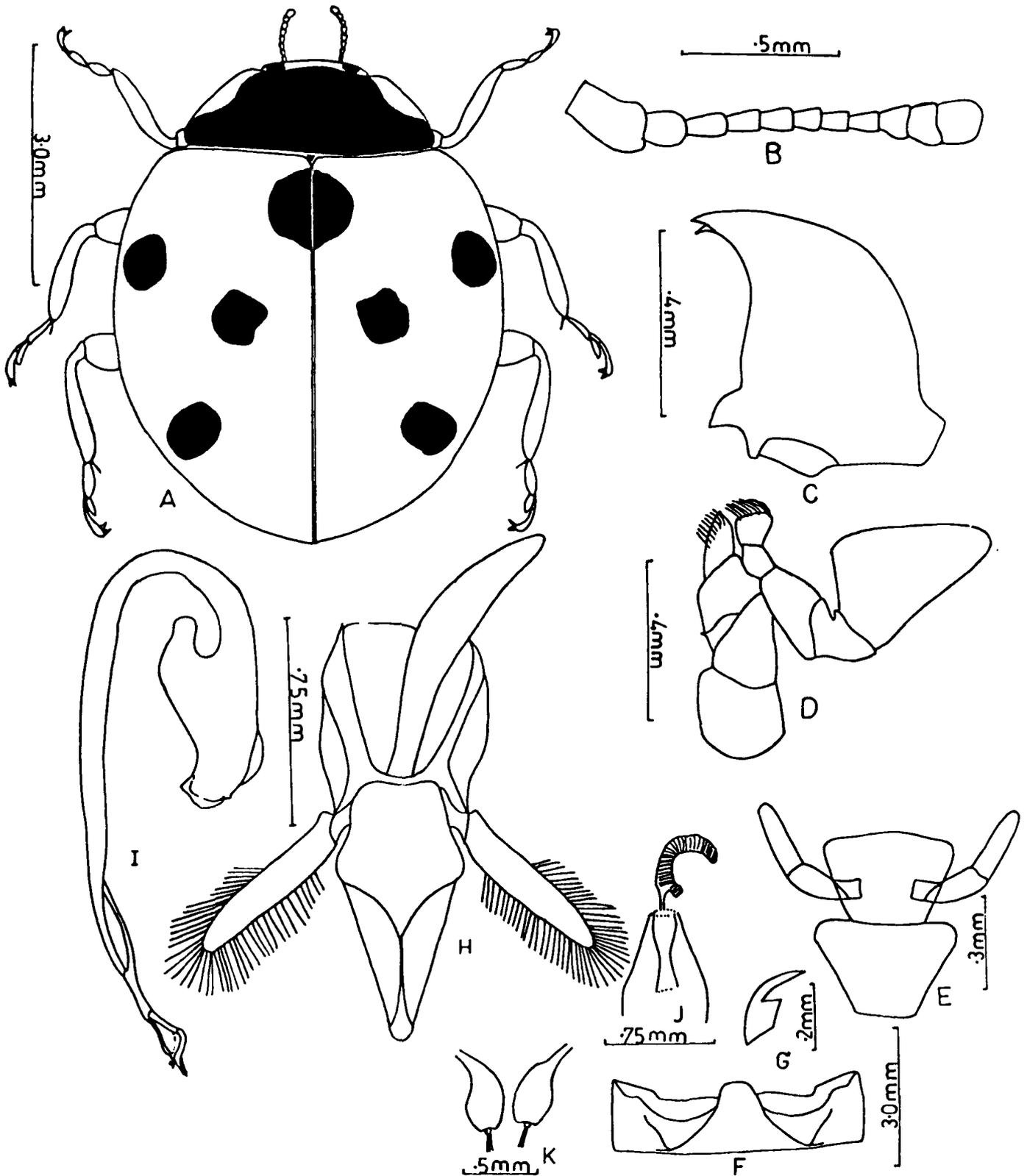


Fig.16A-K:

Coccinella (Coccinella) septempunctata Linnaeus
 A=Dorsal view, B=Antenna, C=Mandible, D=Maxilla,
 E=Labium, F=1st abdominal sternite, G=Tarsal claw,
 H=Phallobase, I=Siphon, J=Spermatheca, K=Genital plates.

2. s. gen. *Neococcinella* Savojskaja

Neococcinella Savojskaja, 1969: 104.

Type species: *Neococcinella undecimpunctata* Linnaeus, 1758: 361.

Dobzhanskia Khnz., 1970:70.

Dobzhanskia undecimpunctata Linnaeus, 1758:361.

Neococcinella Savojskaja; Khnz., 1979:66.

The subgenus is represented by single species from India.

Coccinella (*Neococcinella*) *undecimpunctata* Linnaeus (Fig.17A-I)

Coccinella (*Neococcinella*) *undecimpunctata* Linnaeus, 1758:361.

Coccinella (*Neococcinella*) *menetriesi* Mulsant, 1850: 104.

s.sp. *Coccinella* (*Neococcinella*) *tripunctata* Linnaeus, 1758: 365.

Coccinella (*Neococcinella*) *pontica* Dobzhansky, 1927: 212.

Coccinella (*Neococcinella*) *tripunctata* Nefedov! 1959: 161.

s.sp. *Coccinella* (*Neococcinella*) *boreolitoralis* Donisthorpe, 1913: 99.

s. sp. *Coccinella* (*Neococcinella*) *arabica* Mader, 1931b: 172.

Coccinella (*Neococcinella*) *undecimpunctata* Linnaeus; Ibrahim, 1955: 395.

Coccinella (*Neococcinella*) *undecimpunctata* Linnaeus; Chu *et al.*, 1978: 156.

Coccinella (*Neococcinella*) *undecimpunctata* Linnaeus; Khnz., 1979: 66.

Material Examined: 2 ♀♀ 3 ♂♂ INDIA: Fatehpur (Uttar Pradesh), predaceous on aphids on *Pisum sativum* Linnaeus, 30-IV-1992 (Shama Afroze).

Prey: Aphids

Distribution: INDIA: Delhi, Fatehpur.

Genus *Propylea* Mulsant

Propylea Mulsant, 1846:152.

Type species: *Propylea quatuordecimpunctata* Linnaeus, 1758:366.

Propylea Mulsant; Miyatake, 1959:152.

Propylea Mulsant; Kamiya, 1965a:43.

Propylea Mulsant; Khnz., 1979:59.

Diagnosis: Body oval, weakly convex; prosternum with a pair of parallel carinae; first abdominal sternite with femoral line incomplete, without an oblique line at each lateral part (fig. 18F); legs without mid and hind tibial spurs, tarsal claws with quadrate basal tooth; male genitalia with basal lobe elongated, broad at base gradually narrowed to sharp apex, parameres usually as long as basal lobe, long and slender, hypomere longer than parameres (fig. 18H); siphon (fig. 18I) proximally with nearly equal bilobed siphonal capsule, ventral wall of siphonal tube slightly

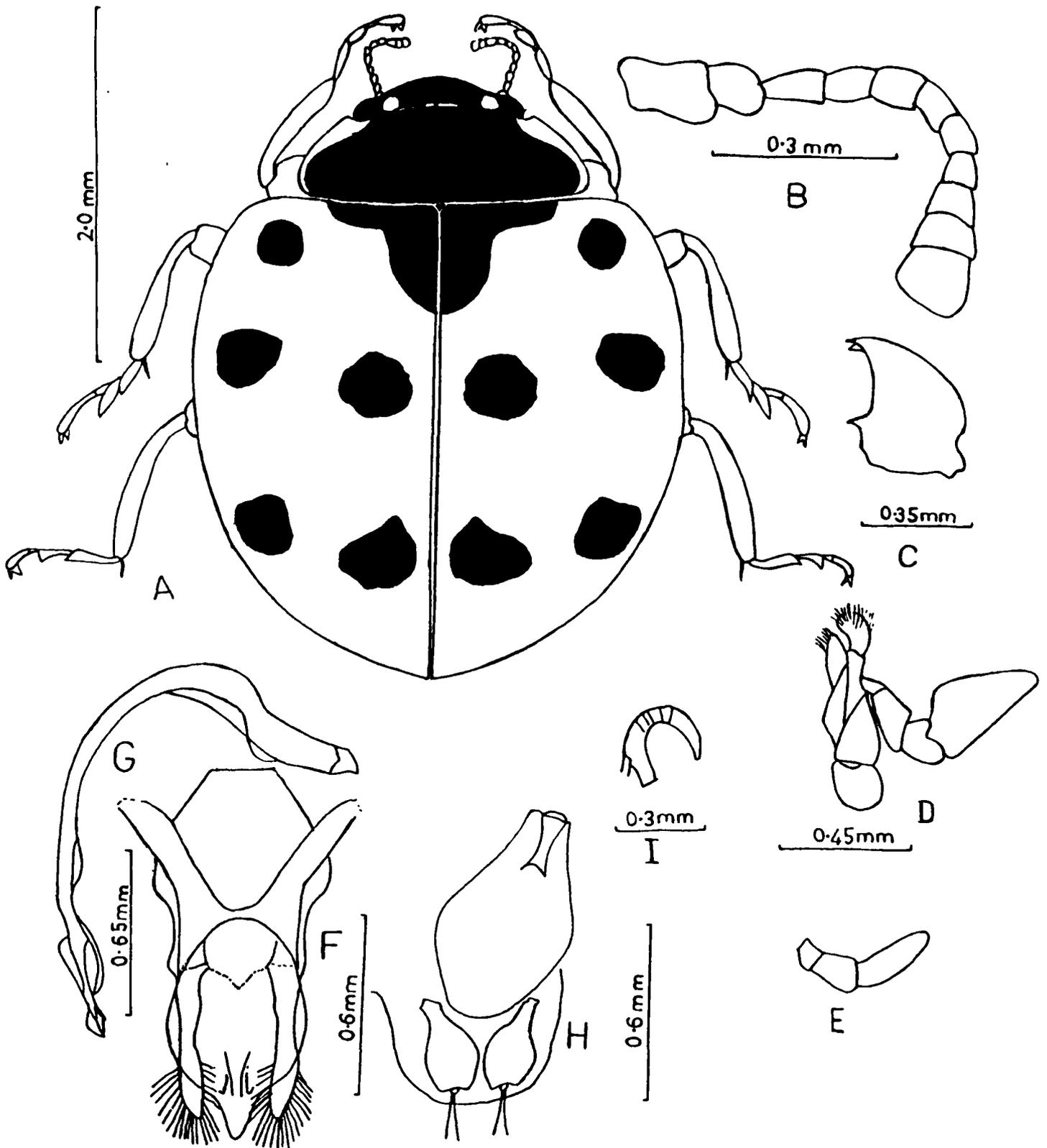


Fig.17A-I:

Coccinella (Neococcinella) undecimpunctata Linnaeus
 A=Dorsal view, B=Antenna, C=Mandible, D=Maxilla,
 E=Labial palp, F=Phallobase without hypomere, G=Siphon
 H=Female genitalia without spermatheca, I=Spermatheca.

swollen in middle and some extent to apically, distal end usually with two to three unequal claw like processes; female genitalia with spermatheca (fig. 18J) strongly curved, nodulus and ramus well developed, genital plates (fig. 18K) spatulate or oval, styli not conspicuous.

The genus is represented by two species from India. A key to species proposed by Kamiya (1965a) is consulted.

**i. *Propylea japonica* (Thunberg)
(Fig.18A-K)**

Coccinella japonica Thunberg, 1781:12.

Propylea conglobata Lewis, 1873:55.

Propylea japonica (Thunberg); Lewis, 1896:30.

Propylea japonica (Thunberg); Miyatake, 1959:152.

Propylea japonica (Thunberg); Kamiya, 1965a:44.

Propylea japonica (Thunberg); Chu *et al.*, 1978:157.

Propylea japonica (Thunberg); Khnz., 1979:58.

Material Examined: 2 ♀♀ 2 ♂♂ INDIA: Jind (Haryana) predaceous on aphids on *Sorghum vulgare* Pers., 10-X-1995 (M. Yousuf); 25 ♀♀ 20 ♂♂, Aligarh (Uttar Pradesh), predaceous on aphids on *Brassica oleracea* Linnaeus, 13-X-1995 (Shama Afroze).

Prey: Aphids

Distribution: INDIA: Aligarh, Jind.

ii. *Propylea quatuordecimpunctata* (Linnaeus)

Coccinella quatuordecimpunctata Linnaeus, 1758:366.

Propylea quatuordecimpunctata (Linnaeus); Mulsant, 1846:152.

Propylea quatuordecimpunctata (Linnaeus); Korschefsky, 1932:532.

Propylea quatuordecimpunctata (Linnaeus); Kamiya, 1965a:44.

Propylea quatuordecimpunctata (Linnaeus); Khnz., 1979:59.

Prey: Aphids

Distribution: INDIA: Raj shahi.

Genus *Lemnia* Mulsant

Lemnia Mulsant, 1850:376.

Type species: *Lemnia fraudulenta* Mulsant, 1866:254.

Osumia Kurisaki, 1923:101.

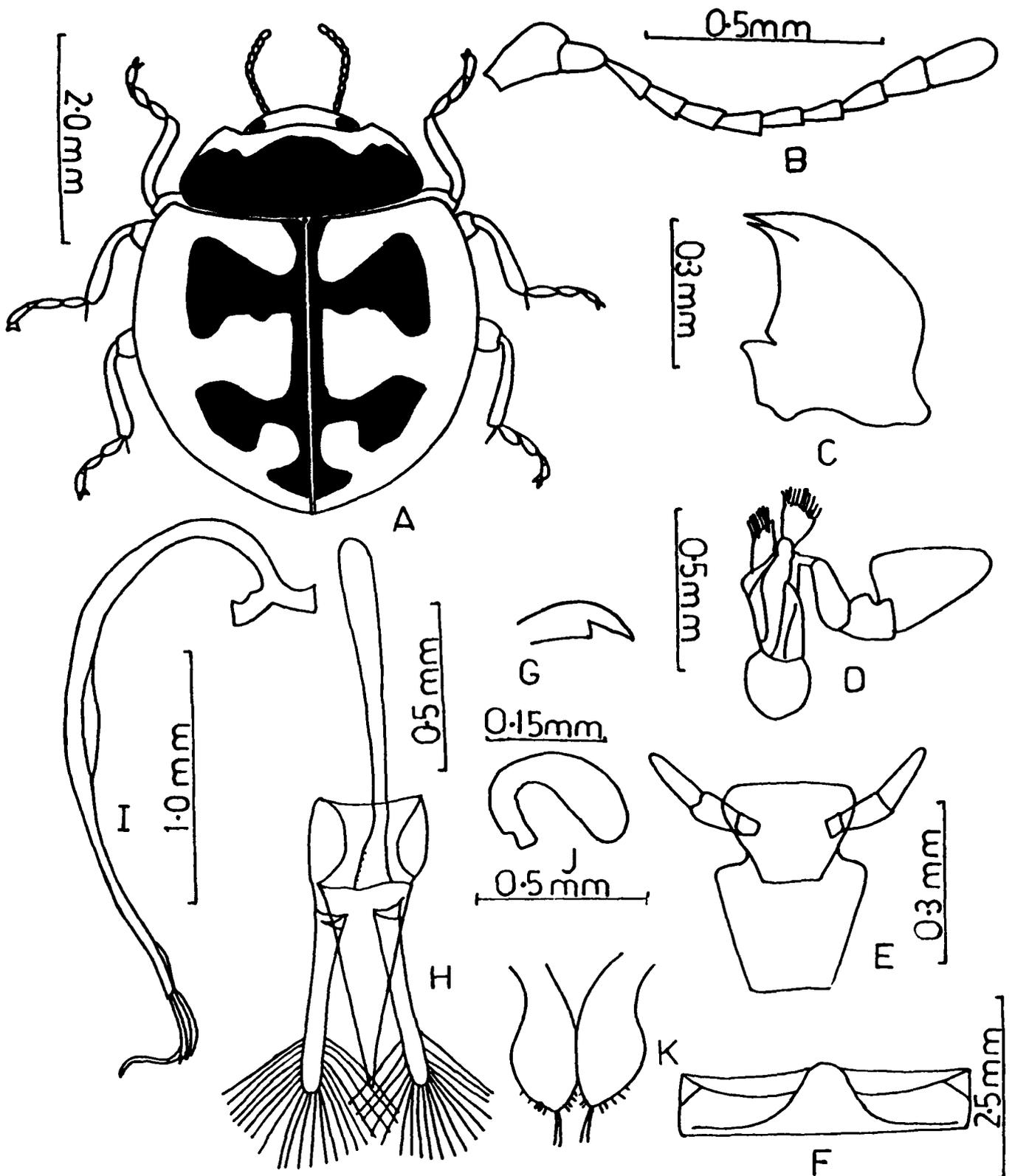


Fig.18A-K:

Propylea Japonica (Thunberg)

A=Dorsal view, B=Antenna, C=Mandible, D=Maxilla,
 E=Labium, F=1st abdominal sternite, G=Tarsal claw,
 H=Phallobase, I=Siphon, J=Spermatheca, K=Genital plates.

Type species: *Osumia bimaculata* Kurisaki, 1923:101.
Lemnia Mulsant; Kamiya, 1965a:63.
Lemnia Mulsant; Khnz., 1979:62.

Diagnosis: Body hemispherical, strongly convex; prosternum with a pair of parallel carinae; first abdominal sternite with femoral line incomplete, without an oblique line at each lateral part; legs with mid and hind tibial spurs, tarsal claws with quadrate basal tooth; male genitalia with basal lobe elongated, tapering triangularly to acute apex, parameres as long as basal lobe nearly straight, serrate at apices and on outer margin to the middle or a little beyond, apical half fringed with long, dense setae, hypomere slightly shorter than parameres; siphon proximally with bilobed siphonal capsule, outer lobe broader and longer than inner, ventral wall of siphon with membranous part, bulged out between the middle and beginning of the apical third, distal end with two claw like processes; female genitalia with spermatheca strongly curved and nearly 'U' shaped, ramus and nodulus well developed, genital plates broad, styli small.

The genus is represented by three subgenera from India. Their separation is given in the key to genera.

1. s.gen. *Artemis* Mulsant

Artemis Mulsant, 1850:388.

Type species: *Artemis circumusta* Mulsant, 1850:389.
Artemis Mulsant; khnz., 1979:62.

The subgenus is represented by single species.

***Lemnia (Artemis) circumusta* Mulsant**

Lemnia (Artemis) circumusta Mulsant, 1850:388.

Lemnia (Artemis) rufula Mulsant, 1850:389.

Lemnia (Artemis) mandarinae Mulsant, 1850:389.

Coelophora westermanni Mulsant, 1850:391.

Lemnia (Artemis) circumusta Mulsant; Khnz., 1979:62.

Prey: Aphids

Distribution: INDIA: Bengal, Nilgiri hills.

2. s.gen *Lemnia* s.str.

Lemnia s.str.; Khnz., 1979:62.

The subgenus is represented by two species from India. A key for their separation is given below.

Key to Indian species of *Lemnia* s.str.

1. Each elytron with narrow, oblique red spot; male genitalia with basal lobe narrow, elongated, tapering triangularly to a acute apex, parameres rather slender----- ***saucia* (Mulsant)**
- Each elytron with transverse red spot, with irregular edges; male genitalia with basal lobe wider than *saucia* (Mulsant) and rounded at apex, parameres thicker than *saucia* (Mulsant) ----- ***biplagiata* (Swartz)**

i. *Lemnia (Lemnia) saucia* Mulsant

Lemnia (Lemnia) saucia Mulsant, 1850:380.
Leis calypso Mulsant, 1856:145.
Coelophora mouhoti Crotch, 1874:149.
Coelophora swinhoei Crotch, 1874:149.
Chilomenses ishidae Ohta, 1931:135.
Lemnia (Lemnia) saucia Mulsant; Korschefsky, 1932:296.
Lemnia (Lemnia) saucia Mulsant; Timberlake, 1943:30.
Lemnia (Lemnia) saucia Mulsant; Kamiya, 1965a:65.
Lemnia (Lemnia) saucia Mulsant; Khnz., 1979:62.

Prey Unknown

Distribution: INDIA

ii. *Lemnia biplagiata* (Swartz)

Coccinella biplagiata Swartz, 1808:196.
Lemnia fradulenta Mulsant, 1850:379.
Leis melanota Mulsant. 1850:381.
Coelophora nepalensis Crotch, 1874:149.
Coelophora personata Weise, 1910b:141.
Osumia bimaculata Kurisaki, 1923:105, 107.
Lemnia (Lemnia) biplagiata (Swartz); Miyatake, 1959:150.
Lemnia (Lemnia) biplagiata (Swartz); Kamiya, 1965a:64.
Lemnia (Lemnia) biplagiata (Swartz); Khnz., 1979:63.
Lemnia (Lemnia) biplagiata (Swartz); Chunram & Sasaji, 1980:487.

Prey: Unknown

Distribution: INDIA

3. s.gen. *Spilocaria* Timberlake

Spilocaria Timberlake, 1943:57.

Type species: *Coelophora bisellata* Mulsant, 1850:400.
Spilocaria Timberlake; Khnz., 1979:62.

The subgenus is represented by single species,

***Lemnia (Spilocaria) bisellata* (Mulsant)
 (Fig.19A-I)**

Coelophora bisellata Mulsant, 1850:400.
Caria gracilicornis Weise, 1902:505.
Coelophora bisellata Mulsant; Kapur, 1954a:335.
Lemnia (Spilocaria) bisellata (Mulsant); Khnz., 1979:62.

Material Examined: 3♂♂ INDIA: Gulmarg (Jammu), predaceous on aphids
 on *Pyrus domestica* Linnaeus, 10-II-1992 (Sudhir Singh).

Prey: Aphids

Distribution: INDIA: Assam, Bangalore, Belgaum, Darjeeling,
 Himachal Pradesh, Gulmarg, Kumaon hills, Manipur, Shevroy hills, Sikkim.

Genus *Micraspis* Chevrolat

Micraspis Chevrolat, 1837:459.
 Type species: *Alesia striata* Fabricius, 1792:269.
Verania Mulsant, 1850:343.
 Type species: *Verania comma* Thunberg, 1781:20.
Alesia Mulsant, 1850:343.
 Type species: *Alesia striata* Fabricius, 1792:269.
Menevillidia Brethes, 1923:229.
 Type species: *Menevillidia furcifera* Guerin, 1842:318.
Micraspis (Chevrolat); Kamiya, 1965a:59.
Micraspis (Chevrolat); Khnz., 1979:72.

Diagnosis: Body oval, moderately convex, prosternum with a pair of parallel
 carinae; first abdominal sternite with femoral line incomplete, without an oblique line
 at each lateral part (figs.20F,21F,23F); legs with mid and hind tibial spurs, tarsal
 claws with quadrate basal tooth; male genitalia with basal lobe elongated (in lateral
 view), gradually narrowed to a curved, pointed apex, parameres shorter than basal
 lobe, uniformly broad, hypomere longer than parameres (figs.20H,21H,22F,23H);
 siphon (figs.20I, 21I,22G,23I) proximally with unequal bilobed siphonal capsule,
 distal end with two unequal claw like processes; female genitalia with spermatheca
 weakly curved, ramus and nodulus poorly developed, genital plates elongate-oval,

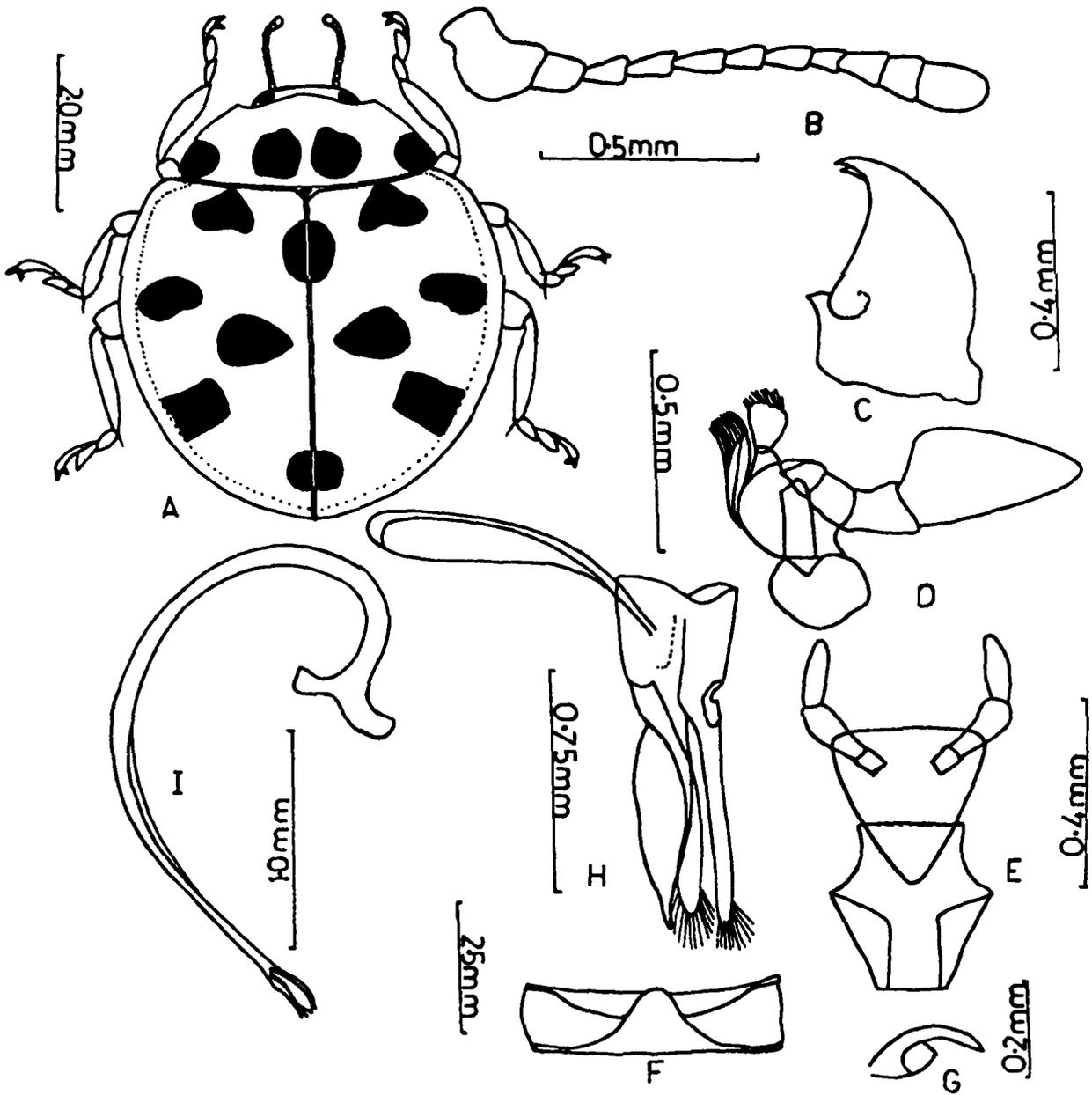


Fig. 19A-I: *Lemnia (Spilocaria) bissellata* (Mulsant)
 A=Dorsal view, B=Antenna, C=Mandible, D=Maxilla,
 E=Labium, F=1st abdominal sternite, G=Tarsal claw,
 H=Phallobase, I=Sipho,

styli small.

The genus is represented by seven species from India. A key for their separation is given below.

Key to Indian species of *Micraspis* Chevrolat

1. Pronotum and elytra with black spots and bands----- 2
 - Pronotum and elytra without any black spot or band----- *shafeei* sp.n.
2. Body not shiny dorsally; pronotum at the most with two black spots-----3
 - Body shiny dorsally; pronotum with seven black spots arranged in semicircle--
-----*crocea* (Mulsant)
3. Pronotum with two black spots; elytra with black spots or bands including
common black sutural band----- 4
 - Major part of pronotum black except yellowish brown one-fourth anterior and
narrow lateral regions; elytra with only common black sutural band -----
----- *discolor* Fabricius
4. Pronotum with black basal band; each elytron with a black longitudinal band or
spot ----- 5
 - Pronotum without black basal band; each elytron with two black spots -----
----- *allardi* (Mulsant)
5. Each elytron with a black longitudinal band ----- 6
 - Each elytron with a black spot -----*guerini* (Mulsant)
6. Elytra with black external border----- *univittata* (Hope)
 - Elytra without black external border ----- *inops* (Mulsant)

**i. *Micraspis shafeei* sp.n.
(Fig.20A-K)**

Body oval (fig.20A) moderately convex; head yellowish brown; pronotum yellowish brown without any spot or band, punctures deep, separated by two to two and half times their diameter; elytra yellowish brown without any spot or band, punctures shallower than pronotum, separated by three and half to four times their

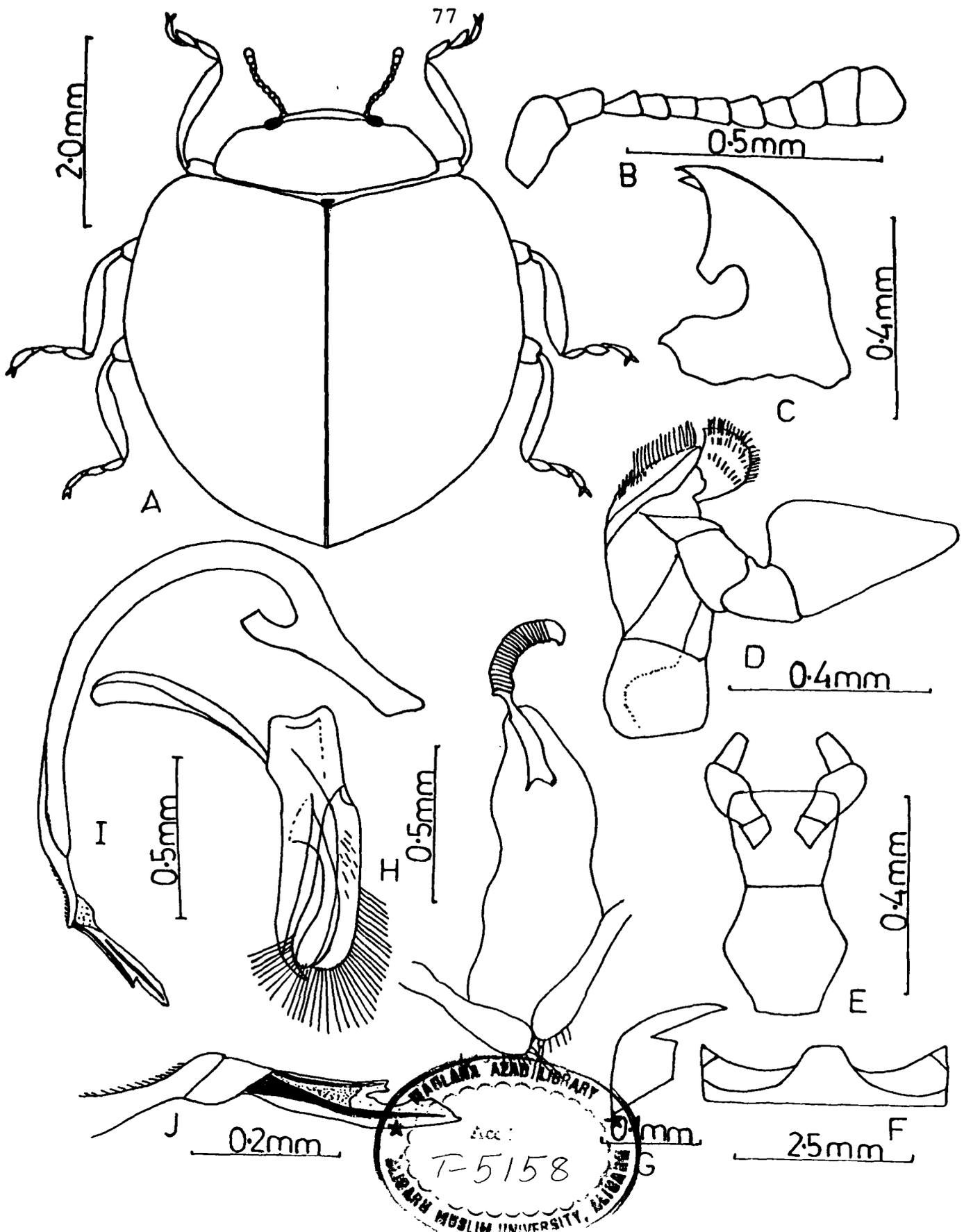


Fig.20A-K:

Micraspis shafeei sp. n.

A=Dorsal view, B=Antenna, C=Mandible, D=Maxilla,
 E=Labium, F=1st abdominal sternite, G=Tarsal claw,
 H=Phallobase, I=Siphon, J=Distal end of Siphon (enlarged view)
 K=Female genitalia.

diameter; male genitalia (figs.20H-J) with basal lobe (in lateral view) elongated, gradually narrowed to upturned and pointed apex, parameres slightly shorter than basal lobe, curved apically towards basal lobe with pointed apices, apical half of the outer margin and one fourth of the inner margin fringed with long, dense setae, hypomere slightly shorter than parameres (fig.20H); siphon (figs.20I-J) proximally with unequal bilobed siphonal capsule, outer lobe broader and three and half times longer than inner, distal end with two unequal claw like processes; female genitalia (fig.20K) with spermatheca slightly curved, ramus and nodulus poorly developed, genital plates spatulate, styli small, oval with two long setae at apices.

Length: 4.75mm

Width : 4.0mm

Holotype ♂ **INDIA**: Muzaffarnagar (Uttar Pradesh), predaceous on aphids on *Pisum sativum* Linnaeus, 17-XI-1994 (Shama Afroze).

Allotype ♀, (Same data as for holotype).

Paratype 15 ♀♀, 12 ♂♂, (Same data as for holotype).

The new species is named in honour of late Dr. Shekh Adam Shafee, Reader, Department of Zoology, A.M.U., Aligarh.

Remarks: The new species *M. shafeei* differs from other known species in absence of any band or spot on pronotum and elytra.

ii. *Micraspis crocea* (Mulsant)

Harmonia crocea Mulsant, 1866:58.

Micraspis crocea Mulsant; Korschefsky, 1932:308

Prey: Unknown

Distribution: INDIA

iii. *Micraspis discolor* (Fabricius) (Fig.21A-I)

Coccinella discolor Fabricius, 1798:77.

Verania discolor (Fabricius); Mulsant, 1850:369.

Verania discolor (Fabricius); Korschefsky, 1932:308.

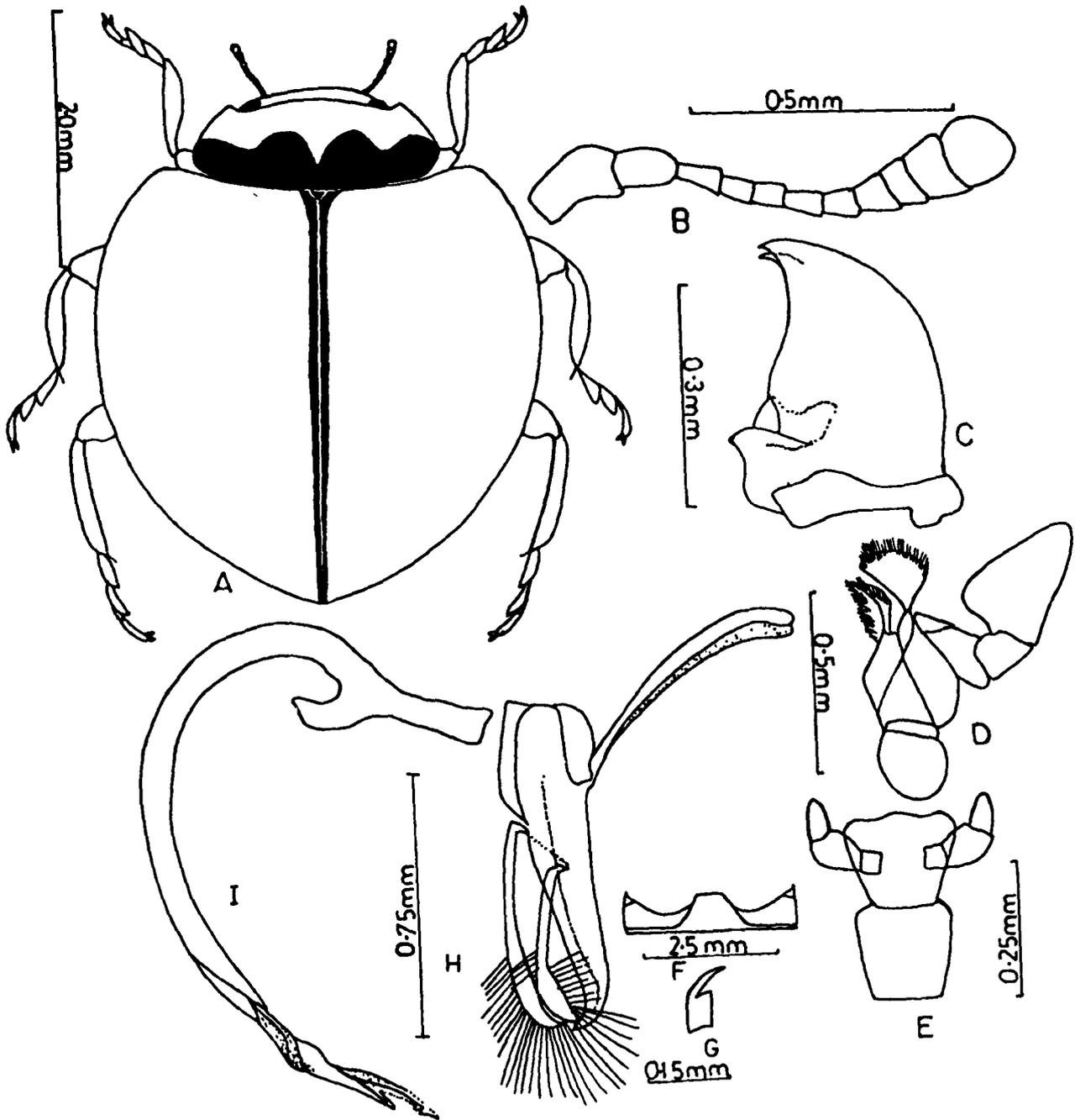


Fig. 21A-I: *Micraspis discolor* (Fabricius)
 A=Dorsal view, B=Antenna, C=Mandible, D=Maxilla,
 E=Labium, F=1st abdominal sternite, G=Tarsal claw,
 H=Phallobase, I=Sipho

Verania discolor (Fabricius); Lal & Kanakavalli, 1960:96.
Verania discolor (Fabricius); Bielawski & Chujo, 1961:333.
Verania discolor (Fabricius); Kapur, 1966:178.
Verania discolor (Fabricius); Kapur, 1972:316.
Micraspis discolor (Fabricius); khnz., 1979:73.
Micraspis discolor (Fabricius); Chunram & Sasaji, 1980:488.

Material Examined: 10 ♂♂, INDIA: Port Blair (S. Andaman), predaceous on aphids on ornamental plant, 9-XI-1993 (M. Yousuf).

Prey: Aleyrodids, aphids, psyllids, thrips

Distribution: INDIA: Garhwal, Goa, Port Blair.

iv. *Micraspis allardi* (Mulsant) (Fig. 22A-H)

Lemnia allardi Mulsant. 1866:249.
Verania allardi (Mulsant); Crotch, 1874:177.
Micraspis allardi (Mulsant); Khnz., 1979:73.

Material Examined: 4 ♀♀ 2 ♂♂, INDIA: Aligarh (Uttar Pradesh), predaceous on aphids on *Triticum aestivum* Linnaeus, 15-IV-1995 (Shama Afroze); 2 ♂♂, Chandrapura (Bihar), Predaceous on aphids on *Zea mays* Linnaeus, 7-VII-1996 (Arshad Ali Haider).

Prey: Aphids

Distribution: INDIA: Aligarh, Chandrapura.

v. *Micraspis guerini* (Mulsant)

Alesia guerini Mulsant, 1850:345.
Micraspis guerini (Mulsant); Crotch, 1874:171.
Micraspis guerini (Mulsant); Korschefsky, 1932:305.

Prey: Unknown

Distribution: INDIA: Nilgiri hills.

vi. *Micraspis univittata* (Hope)

Coccinella univittata Hope, 1831:31.
Alesia inconsiderata Mulsant; 1866:238.
Alesia univittata (Hope); Mulsant, 1866:239.
Micraspis univittata (Hope); Crotch, 1874:171.
Micraspis univittata (Hope); Khnz., 1979:73.

Prey: Unknown

Distribution: INDIA

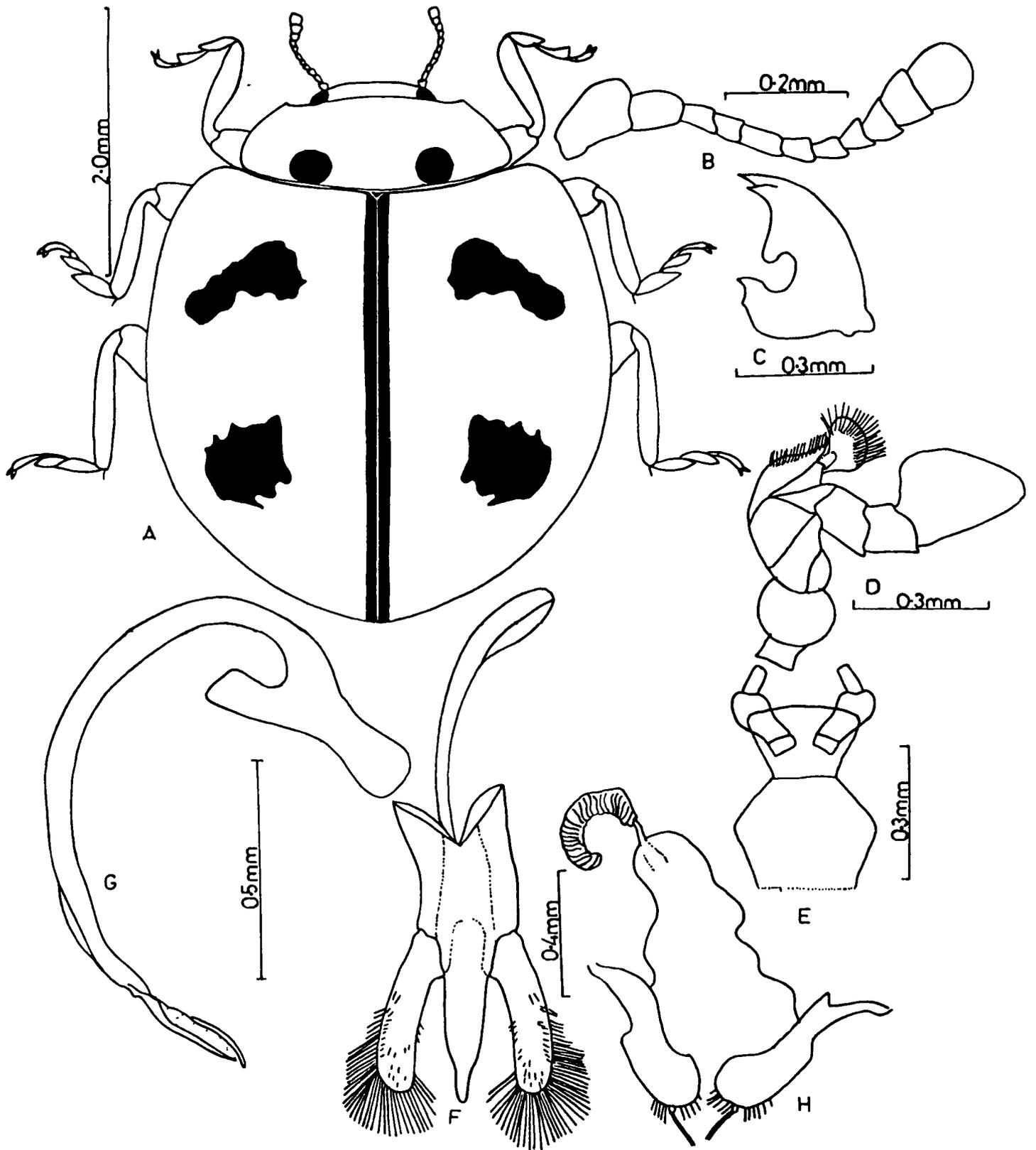


Fig. 22A-H: *Micraspis allardi* (Mulsant)
 A=Dorsal view, B=Antenna, C=Mandible, D=Maxilla,
 E=Labium, F=Phallobase, G=Siphus, H=Female genitalia.

**vii. *Micraspis inops* (Mulsant)
(Fig. 23A-I)**

- Cheilomenes inops* Mulsant, 1866:286.
Verania vincta Gorham, 1895b:686.
Verania kiotoensis Nakane & Araki, 1960:117.
Micraspis inops (Mulsant); Khnz., 1979:73.
Micraspis inops (Mulsant); Chunram & Sasaji, 1980:488.

Material Examined: 10 ♂♂, INDIA: Port Blair (S. Andaman), predaceous on aphids on ornamental plant, 9-XI-1993 (M. Yousuf) 2 ♂♂, Ranchi (Bihar), predaceous on aphids on *Solanum melongena* Linnaeus, 3-XI-1994 (Arshad Ali Haider).

Prey: Aphids

Distribution: INDIA: Assam, Bangalore, Bhutan, Manipur, Port Blair, Ranchi.

Genus *Harmonia* Mulsant

- Harmonia* Mulsant, 1850: 24.
 Type species: *Coccinella quadripunctata* Pontoppidan, 1763; 669
Leis Mulsant, 1850: 24.
 Type species: *Leis dimidiata* Fabricius, 1781: 94.
Ballia Mulsant, 1853a: 34.
 Type species: *Ballia eucharis*, 1853a: 167.
Callineda Crotch, 1874: 6.
 Type species: *Callineda sedecimnotata* Fabricius, 1801: 370.
Ptichanatis Crotch, 1874: 122.
 Type species: *Ptichanatis axyridis* Pallas, 1773: 726.
Stictoleis Crotch, 1874: 118.
 Type species: *Stictoleis coryphaea* Guerin, 1846: 320.
Harmonia Mulsant; Kapur, 1966: 186.
Harmonia Mulsant; Khnz, 1979: 71.

Diagnosis: Body oval or hemispherical, weakly to moderately convex; prosternum without carinae; first abdominal sternite with femoral line incomplete, with an oblique line at each lateral part (figs. 24F, 26F); legs without mid and hind tibial spurs, tarsal claws with triangular basal tooth; male genitalia with basal lobe, (in lateral view) usually elongated, broad at base, gradually narrowed to a sharp apex, parameres usually broad, as long as basal lobe, may be slightly shorter than basal lobe, apices broad, flat with nearly straight apical margin, fringed with medium to long dense setae, hypomere longer than parameres (figs. 24H, 25G, 26H); siphon (figs. 24I, 25H, 26I) proximally with unequal bilobed siphonal capsule, a dorsal crest

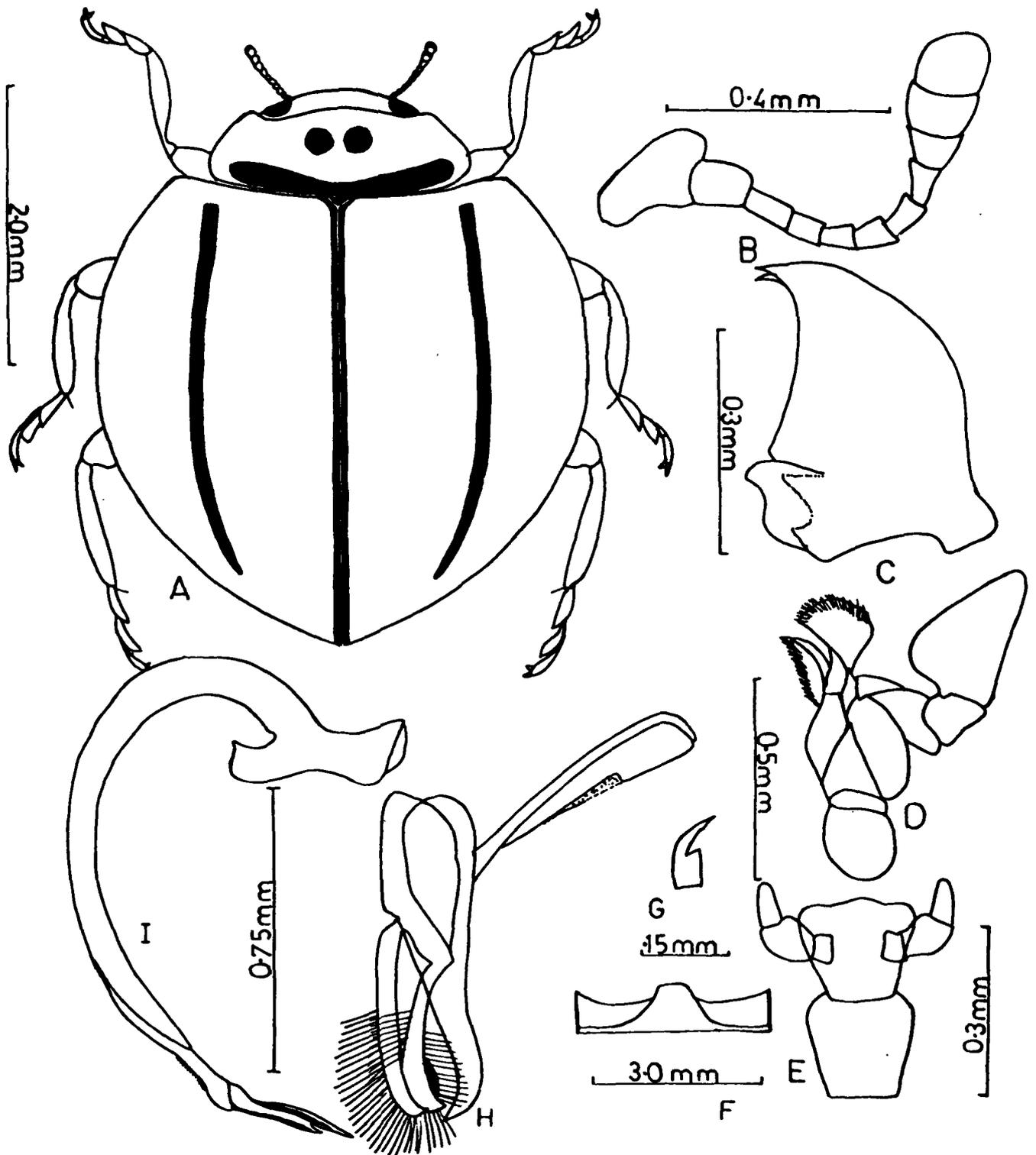


Fig.23A-I:

Micraspis inops (Mulsant)

A=Dorsal view, B=Antenna, C=Mandible, D=Maxilla,
 E=Labium, F=1st abdominal sternite, G=Tarsal claw,
 H=Phallobase, I=Sipho.

present in the mid third of the siphon, distal end usually dilated; female genitalia with spermatheca (fig. 24J) strongly curved, 'C' shaped, ramus and nodulus well developed, genital plates (fig. 24K) quadrangular, styli small.

The genus is represented by seven species from India. A key for their separation is given below.

Key to Indian species of *Harmonia* Mulsant

1. Pronotum more than one black spots ----- 2
- Pronotum with only one black spot -----6
2. Each elytron with eight black spots without any common sutural spot -----3
- Each elytron with four or ten black spots including common sutural spot -----4
3. Body distinctly narrowed and pointed posteriorly; pronotum with a pair of elongated and obliquely placed black spots; male genitalia with basal lobe in lateral view curved twice (once before the middle and secondly before the apex), siphon more or less straight in the distal half ----- ***breiti* Mader**
- Body rounded posteriorly; pronotum with nine black spots; male genitalia with basal lobe in lateral view curved once only, before the apex, siphon moderately curved in the distal half----- ***quadripunctata* (Pontoppidan)**
4. Each elytron with ten black spots including one or two common sutural spot; male genitalia with parameres long and narrow-----5
- Each elytron with four black spots, spots two, three and four uniting with black sutural margin forming common sutural spot; male genitalia with parameres stout and broad----- ***octomaculata* (Fabricius)**
5. Pronotal and elytral spots considerably big; pronotum with a pair of transversely placed black spots; elytra with two common sutural spots----- ***eucharis* (Mulsant)**
- Pronotal and elytral spots moderate in size; pronotum with two elongated, obliquely placed black spots forming 'M'; elytra with only one common sutural spot----- ***axyridis* (Pallas)**

6. Body oval; each elytron with five black spots, without any common sutural spot

----- *dunlopi* (Crotch)

- Body subhemispherical, each elytron with seven black spots including one apically placed common sutural spot-----*dimidiata* (Fabricius)

i. *Harmonia breiti* Mader

Harmonia breiti Mader, 1931a: 476.

Harmonia breiti Mader; Khnz., 1979: 72.

Prey: Unknown

Distribution: INDIA: N. India.

ii. *Harmonia quadripunctata* (Pontoppidan)

Coccinella quadripunctata Pontoppidan, 1763: 669.

Harmonia quadripunctata (Pontoppidan); Crotch, 1874:3.

Harmonia quadripunctata (Pontoppidan); Korschefsky, 1932: 471.

Harmonia quadripunctata (Pontoppidan); Khnz., 1979: 71.

Prey: Unknown

Distribution: INDIA

iii. *Harmonia octomaculata* (Fabricius) (Fig.24A-K)

Coccinella octomaculata Fabricius, 1781: 97.

Coccinella arcuata Fabricius, 1787: 94.

Coccinella arcuata Fabricius; Mulsant, 1850: 77.

Harmonia octomaculata (Fabricius); Miyatake, 1959: 155.

Harmonia octomaculata (Fabricius); Bielawski & Chujo, 1961: 334.

Harmonia arcuata (Fabricius); Kapur, 1966: 179.

Harmonia arcuata (Fabricius); Kapur, 1972: 318.

Harmonia octomaculata (Fabricius); Khnz., 1979: 71.

Harmonia octomaculata (Fabricius); Chunram & Sasaji, 1980: 487.

Material Examined: 10 ♀♀, 20 ♂♂, INDIA: Port Blair (South Andaman),
predaceous on aphids on *Cocos nucifera* Linnaeus, 25-IX-1993 (M. Yousuf).

Prey: Aphids, *Dialeurodes citri* (Ashmead)

Distribution: INDIA: Bangalore, Gudur, Manipur, Mizorum, Molem, Mysore,
Port Blair.

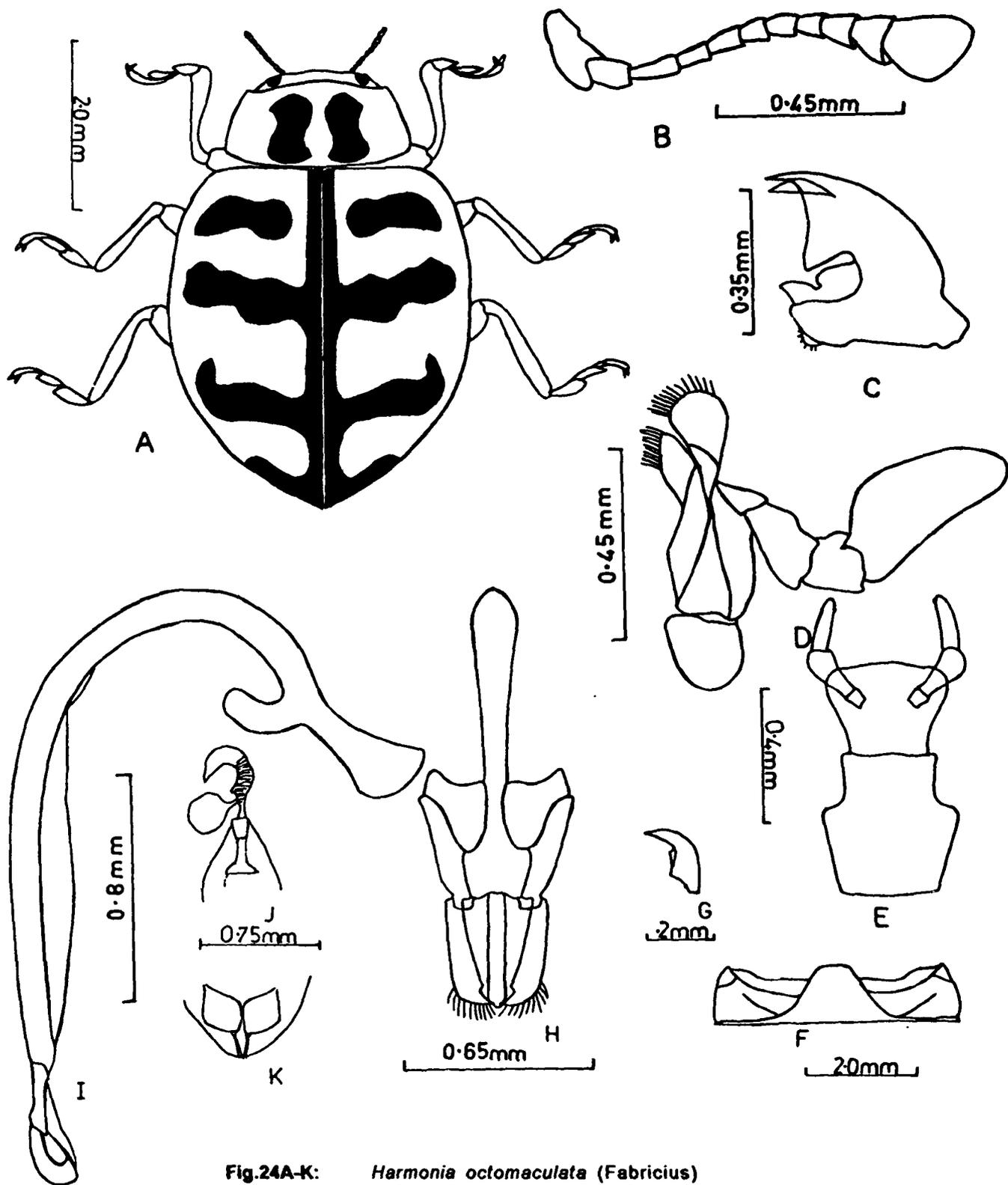


Fig.24A-K:

Harmonia octomaculata (Fabricius)

A=Dorsal view, B=Antenna, C=Mandible, D=Maxilla,
 E=Labium, F=1st abdominal sternite, G=Tarsal claw,
 H=Phallobase, I=Sipho, J=Spermatheca, K=Genital plates.

**iv. *Harmonia eucharis* (Mulsant)
(Fig.25A-H)**

Ballia eucharis Mulsant, 1853a: 167.
Ballia christophori Mulsant, 1853a: 165.
Ballia brahmae Mulsant, 1853a: 164.
Ballia diana Mulsant, 1853a: 164.
Ballia montivaga Mulsant, 1853a: 167.
Ballia testacea Mulsant, 1853a: 169.
Ballia mayeti Mulsant, 1866: 189.
Ballia zephirinae Mulsant, 1866: 190.
Neda bayaderae Mulsant, 1866: 200.
Ballia perplexa Crotch, 1874: 128.
Ballia saundersi Crotch, 1874: 128.
Halyzia roubali Mader, 1931a: 109.
Harmonia eucharis Mulsant; Khnz., 1979: 72.

Material Examined: 2 ♂♂, INDIA: Jorhat (Assam), predaceous on aphids on *Brassica campestris* Linnaeus, 22-x-1995 (Sudhir Singh).

Prey: Aphids

Distribution: INDIA: Garhwal, Jorhat, Mizorum, Shillong.

v. *Harmonia axyridis* (Pallas)

Coccinella axyridis Pallas, 1773:726.
Harmonia axyridis (Pallas); Korschefsky, 1932: 441.
Harmonia axyridis (Pallas); Khnz., 1979: 71.

Prey: Unknown

Distribution: INDIA: Nagahills.

vi. *Harmonia dunlopi* (Crotch)

Leis dunlopi Crotch, 1874: 121.
Harmonia dunlopi (Crotch); Korschefsky, 1932: 275.
Harmonia dunlopi (Crotch); Khnz., 1979: 71.

Prey: Unknown

Distribution: INDIA

**vii *Harmonia dimidiata* (Fabricius)
(Fig. 26A-I)**

Coccinella dimidiata Fabricius, 1781: 94.
Leis quindecimmaculata Weise, 1923: 184.
Synonycha kikuchii Ohta, 1929b: 70.
Leis dimidiata Fabricius; Kapur, 1955: 329.

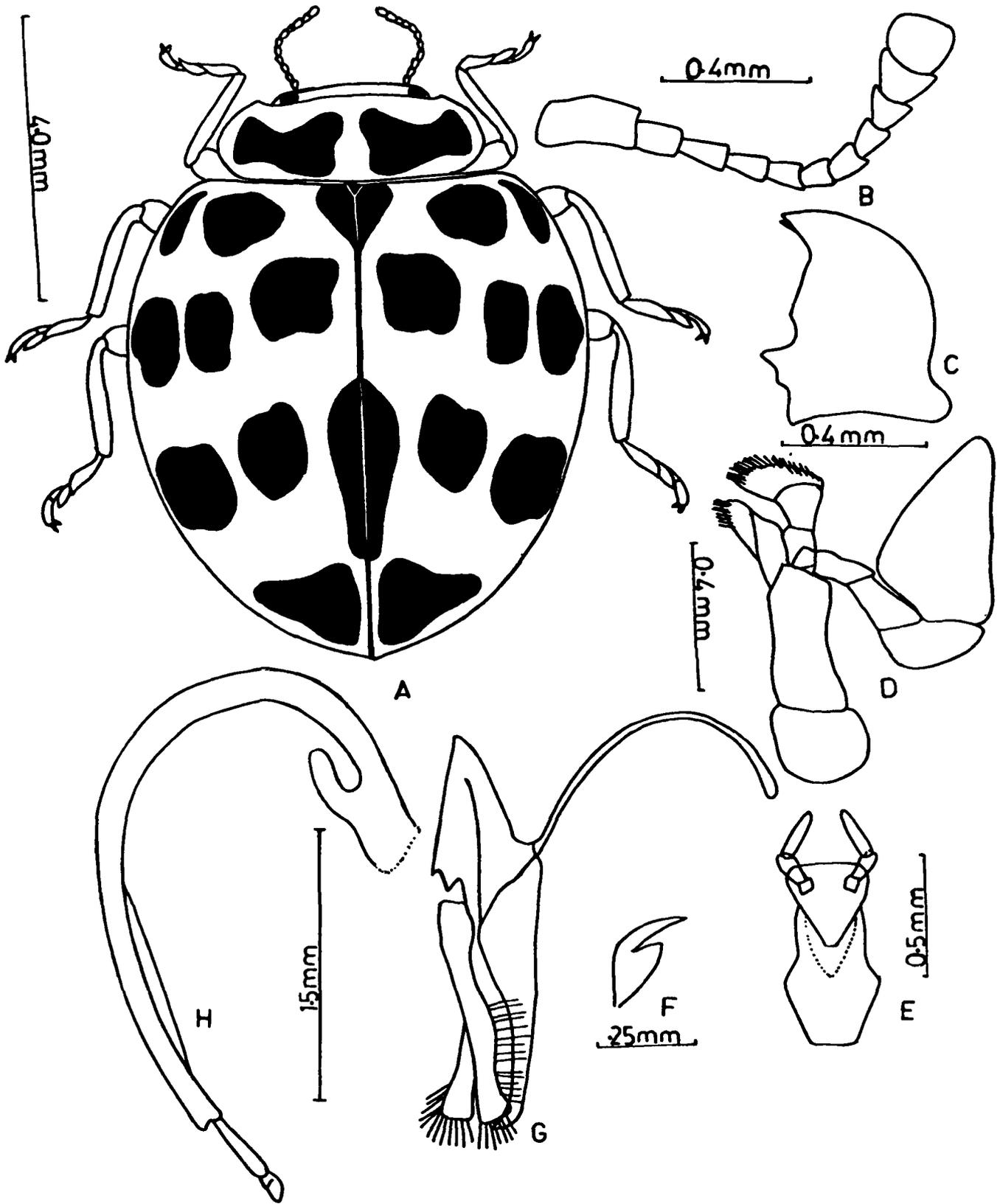


Fig.25A-H: *Harmonia eucharis* (Mulsant)
 A=Dorsal view, B=Antenna, C=Mandible, D=Maxilla,
 E=Labium, F=Tarsal claw, G=Phallobase, H=Sipho

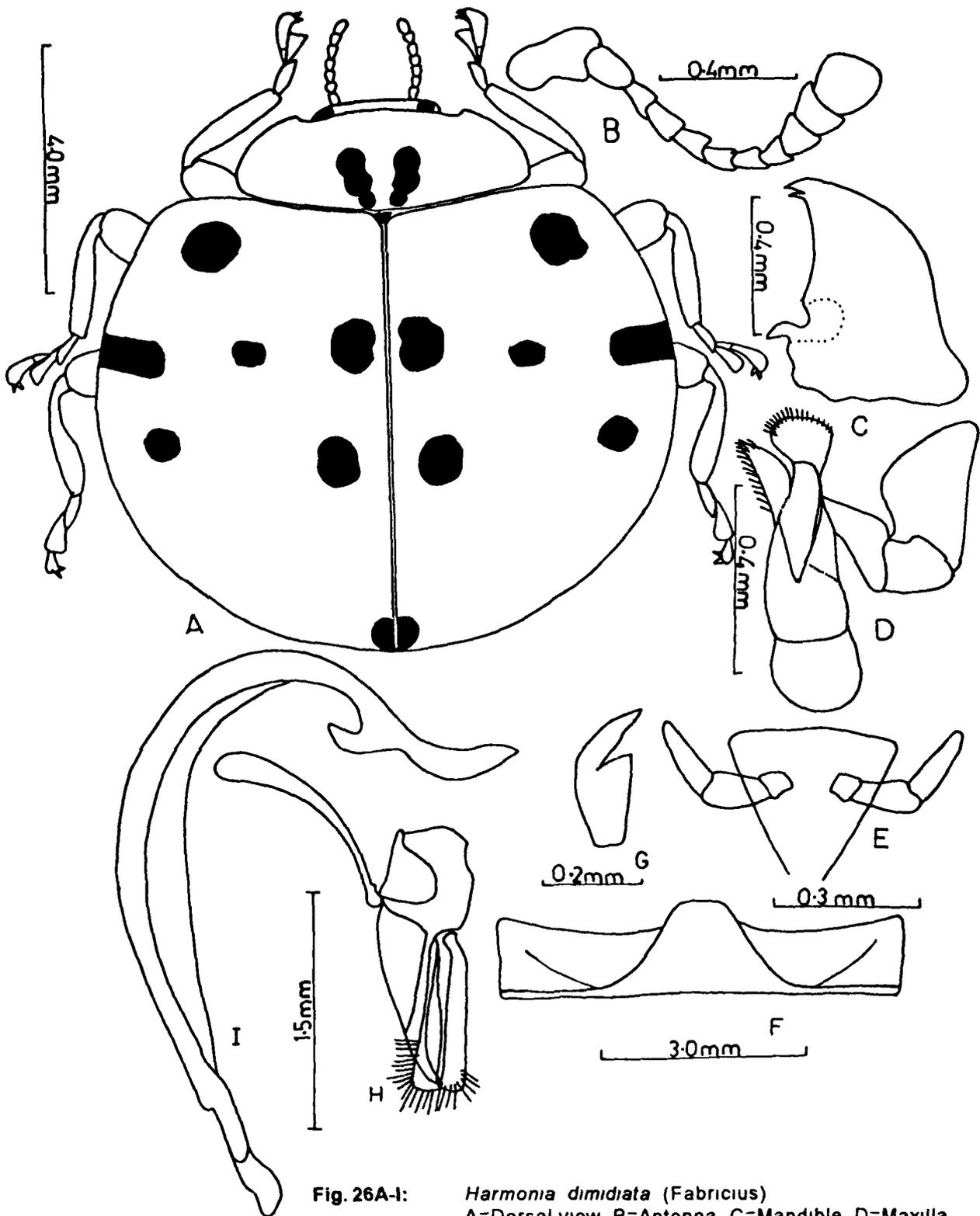


Fig. 26A-I:

Harmonia dimidiata (Fabricius)

A=Dorsal view, B=Antenna, C=Mandible, D=Maxilla,
 E=Labium, F=1st abdominal sternite, G=Tarsal claw,
 H=Phallobase, I=Sipho

Leis dimidiata Fabricius; Kapur, 1963b: 25.

Leis dimidiata Fabricius; Lal & Kanakavalli, 1960: 90.

Harmonia dimidiata Fabricius; Khnz., 1979: 71.

Material Examined: 2 ♂♂, INDIA: Dehradun, (Uttar Pradesh), predaceous on aphids on *Litchi chinensis* Sonn., 28-V-1996 (Jamal Ahmad).

Prey: Aphids

Distribution: INDIA: Assam, Dehradun, Kashmir, Sikkim.

Genus *Anegleis* Khnz.

Anegleis Khnz., 1979: 64.

Type species: *Verania cardoni* Weise, 1892a: 19.

Diagnosis: Body orbicular, moderately convex (fig.27A) prosternum without carinae; first abdominal sternite with femoral line incomplete, without an oblique line at each lateral part (fig. 27F); legs without mid and hind tibial spurs, tarsal claws with triangular basal tooth; male genitalia with basal lobe ovate, apex excavate medially, parameres slightly longer than basal lobe with considerably swollen apices, hypomere longer than parameres (fig.27H); siphon (fig.27I) proximally with unequal bilobed siphonal capsule, distal end dilated; female genital plates (fig. 27J) oval with narrow base, styli prominent.

The genus is represented by single species.

***Anegleis cardoni* (Weise) (Fig. 27A-J)**

Verania cardoni Weise, 1892a: 19.

Coelophora cardoni (Weise); Gorham, 1894a: 202.

Coelophora cardoni (Weise); Korschefsky, 1932: 588.

Micraspis cardoni (Weise); Timberlake, 1943: 28.

Micraspis cardoni (Weise); Kapur, 1972: 316.

Anegleis cardoni (Weise); Khnz., 1979: 64.

Material Examined: 45 ♀♀, 52 ♂♂, INDIA: Aligarh (Uttar Pradesh), predaceous on *Phaenacoccus insolitus* Green on *Plumeria obtusa* Bert. ex A.DC. *Solanum melongena* Linnaeus, and *Coccinia indica*, W.& A., 6-XI-1995 (Shama Afroze); 40 ♀♀, 35 ♂♂, Aligarh, predaceous on aphids on *Brevicoryne brassicae* Linnaeus, 30-XI-1995 (Shama Afroze).

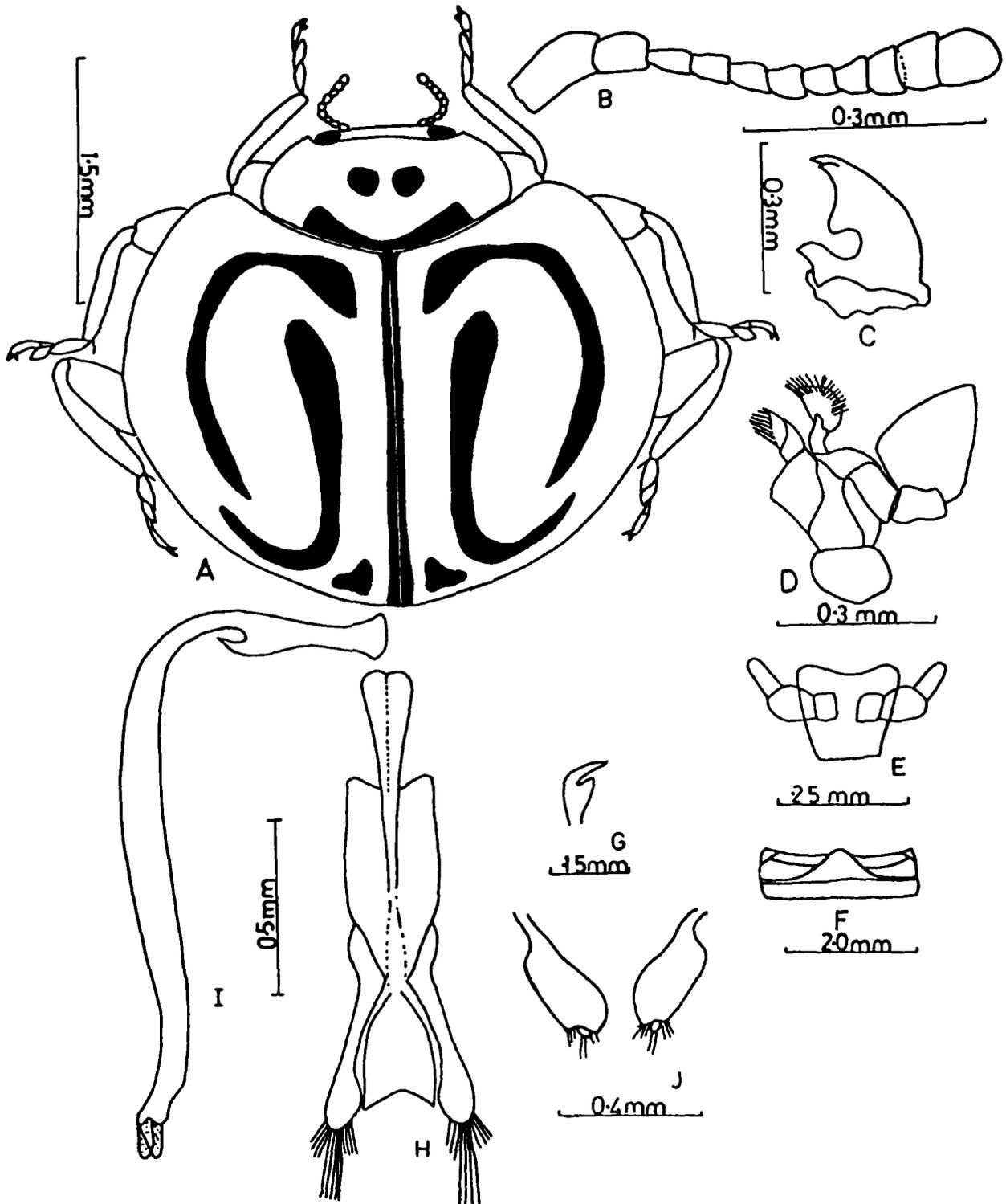


Fig. 27A-J: *Anegleis cardoni* (Weise)
 A=Dorsal view, B=Antenna, C=Mandible, D=Maxilla,
 E=Labium, F=1st abdominal sternite, G=Tarsal claw,
 H=Phallobase, I=Siphon, J=Genital plates.

Prey: Aphids, coccids and sometimes eggs of spider

Distribution: **INDIA:** Aligarh, Bangalore, Bicholim, Chotta Nagpur.

Tribe Hippodamiini Costa

Hippodamiini Costa, 1849:10.

Hippodamiini Costa; Sasaji, 1968a:4.

Hippodamiini Costa; Kapur, 1970:172,177.

Anterior margin of clypeus with antero-lateral projections; mandibles with inner margin never serrate; terminal segment of maxillary palp securiform; abdomen with six visible sternites in both sexes; siphon of male genitalia inverted 'U' shaped, siphonal capsule flattened, spatulate without distinct lobes.

The tribe Hippodamiini Costa is represented by single genus from India.

Genus *Hippodamia* Chevrolat

Hippodamia Chevrolat, 1837:256.

Type species: *Coccinella tredecimpunctata* Linnaeus, 1758:366.

Hippodamia Chevrolat; Mulsant, 1846:168.

Hippodamia Chevrolat; Crotch, 1874:173.

Hippodamia Chevrolat; Chapin, 1946:2.

Diagnosis: Body elongate-oval, weakly convex; prosternum without carinae; first abdominal sternite with femoral line complete (except in s.gen. *Hippodamia* s str.)(fig.28F); legs without mid and hind tibial spurs, tarsal claws and tooth nearly combined giving bifid appearance; male genitalia with basal lobe more or less triangular, parameres slightly shorter than basal lobe, finger shaped, apical one-third fringed with moderately long setae, hypomere longer than parameres, apex broad and emarginate medially (fig. 28H); siphon (fig.28I) inverted 'U' shaped, siphonal capsule flattened, spatulate without distinct lobes; female genitalia with spermatheca heavily sclerotized, sausage shaped.

The genus is represented by four subgenera from India. Their separation is given in the key to genera.

1. s.gen. *Adonia* Mulsant

Adonia Mulsant, 1846:39

Type species: *Coccinella variegata* Goeze, 1777:247.

Adonia Mulsant; Khnz., 1979:65.

The subgenus is represented by single species.

Hippodamia (Adonia) variegata (Goeze) (Fig. 28A-I)

Coccinella variegata Goeze, 1777:247.

Hippodamia (Adonia) variegata (Goeze); Mulsant, 1846:39.

Hippodamia (Adonia) variegata (Goeze); Korschefsky, 1932:346.

Hippodamia (Adonia) variegata (Goeze); Kapur, 1942:39.

Hippodamia (Adonia) variegata (Goeze); Kapur, 1955:325.

Hippodamia (Adonia) variegata (Goeze); Khnz., 1979:65.

Material Examined: 2 ♂♂, INDIA: Rohtak (Haryana), predaceous on aphids on *Triticum aestivum* Linnaeus, 10-III-1992 (Jamal Ahmad); 2 ♂♂, Hissar (Haryana), predaceous on aphids on *Triticum aestivum* Linnaeus, 12-III-1992 (Jamal Ahmad).

Prey: Aphids

Distribution: INDIA: Garhwal, Hissar, Rohtak.

2. s.gen. *Hippodamia* s.str.

Hippodamia s.str.; Khnz., 1979:64.

The subgenus is represented by single species from India.

Hippodamia (Hippodamia) tredecimpunctata (Linnaeus)

Coccinella tredecimpunctata Linnaeus, 1758:366.

Coccinella signata Faldermann, 1832:240.

Hippodamia (Hippodamia) xanthoptera Mulsant, 1850:10.

Hippodamia (Hippodamia) impictipennis Fairmaire ! 1876:50.

Hippodamia (Hippodamia) timberlakai Capra, 1931:17.

s.sp. *Coccinella tibialis* Say, 1824:94.

Prey: Aphids

Distribution: INDIA: Kashmir.

3. s.gen. *Semiadalia* Crotch

Semiadalia Crotch, 1874:98.

Type species: *Idalia inquinata* Mulsant, 1846:67.

Semiadalia Crotch; Khnz., 1979:66.

The subgenus is represented by single species from India.

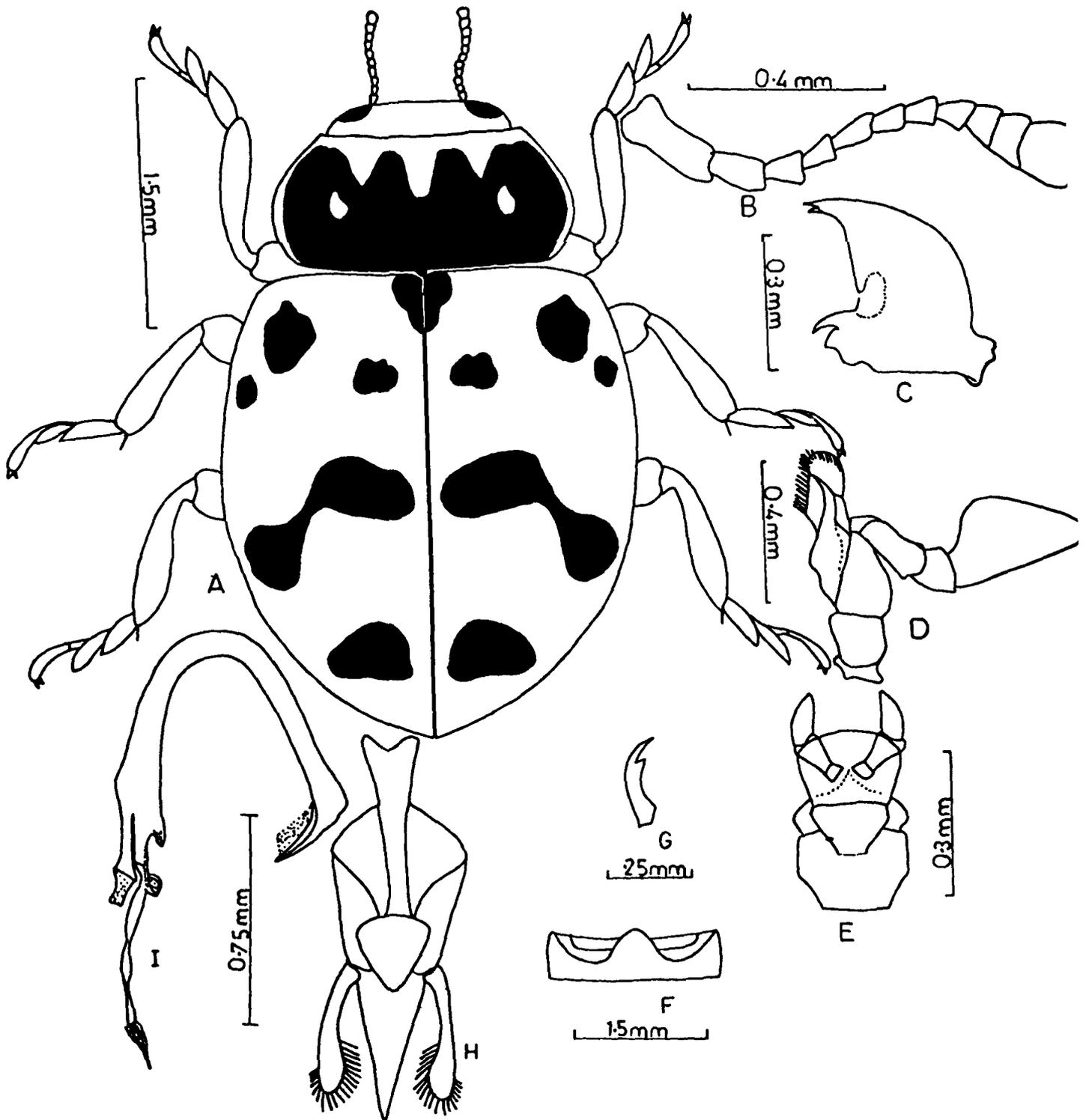


Fig. 28A-I: *Hippodamia (Adonia) variegata* (Goeze)
 A=Dorsal view, B=Antenna, C=Mandible, D=Maxilla,
 E=Labium, F=1st abdominal sternite, G=Tarsal claw,
 H=Phallobase, I=Sipho, J=Spermatheca, K=Genital plates.

***Hippodamia (Semiadalia) apicalis* Weise**

Hippodamia (Semiadalia) apicalis Weise, 1879b:104.

Hippodamia (Semiadalia) apicalis Weise; Khnz., 1979:66

Prey: Aphids

Distribution: INDIA: Kashmir.

4. s.gen. *Asemiadalia* Barovskij

Asemiadalia Barovskij, 1928:128.

Type species: *Semiadalia heydeni* Weise, 1892b:109.

Asemiadalia Barovskij; Khnz., 1979:65.

The subgenus is represented by single species from India

***Hippodamia (Asemiadalia) heydeni* (Weise)**

Hippodamia (Semiadalia) heydeni Weise, 1892b:109.

Hippodamia (Semiadalia) andrewesi Sicard ! 1913:398.

Hippodamia (Semiadalia) przewalskii Savojskaja ! 1962:316.

Hippodamia (Asemiadalia) heydeni (Weise); Khnz., 1979:66.

Prey: Aphids

Distribution: INDIA: Kashmir.

Subfamily EPILACHNINAE Ganglbauer

Epilachninae Ganglbauer, 1899:947.

Epilachninae Ganglbauer; Kapur, 1966:181.

Epilachninae Ganglbauer; Sasaji, 1968a:21.

Body dorsally pubescent; clypeus unexpanded laterally with antero-lateral projections on each side; antennae inserted dorsally on head and in between the eyes, 11-segmented, antennal insertion exposed; mandibles multidentate, basal tooth indistinct; terminal segment of maxillary palp strongly divergent apically (securiform); mentum and submentum of labium broadly articulated; middle coxal cavities narrowly separated; meso and metasternum narrowly articulated; legs with tarsi cryptotetramerous; abdomen with six visible sternites in both sexes; siphon of male genitalia weakly curved, siphonal capsule poorly developed; female genital plates usually transverse with emargination on its inner margin.

The subfamily Epilachninae Ganglbauer is represented by single tribe Epilachnini Costa, which is represented by five genera. Their separation is given in the key to genera.

Genus *Afidentula* Kapur

Afidentula Kapur, 1955:324.

Type species: *Epilachna manderstjernae* Mulsant, 1853b:256.

Diagnosis: Body oval, moderately convex; prosternum without carinae; first abdominal sternite with femoral line complete (fig. 29F), female with last abdominal sternite entire apically; legs without mid and hind tibial spurs, tarsal claws bifid with subtriangular basal tooth; male genitalia with basal lobe elongated, curved and pointed apically, parameres considerably narrow and slender, hypomere considerably shorter than parameres (fig. 29H); siphon (fig. 29I) proximally with poorly developed siphonal capsule, distal end truncated; female genital plates more or less round.

The genus is represented by three species from India. A key for their separation is given below.

Key to Indian species of *Afidentula* Kapur

1. Body more than 3.0 mm; pronotal spot present or absent; external elytral margin not bordered black ----- 2
- Body comparatively small; pronotal spot absent; external elytral margin bordered black----- *minima* (Gorham)
2. Pronotal spot absent; two subapical elytral spots united into one transversely elongated spot; male genitalia with siphon simply curved ----- *manderstjerna* (Mulsant)
- Pronotum with medially placed quadrangular black spot; two subapical elytral spots distinct; male genitalia with siphon more or less sigmoid ----- *himalayana* Kapur

i. *Afidentula minima* (Gorham)

Epilachna minima Gorham, 1894a:206.

Afidentula minima (Gorham); Dieke, 1947:111.

Afidentula minima (Gorham); Kapur, 1955:324.

Afidentula minima (Gorham); Kapur, 1963b:15.

Host Plant: Grass, also reported under bark

Distribution: INDIA: Baraway, Belgaum, Dehradun, Mangalore, Murmugao.

ii. *Afidentula manderstjerna* (Mulsant)

(Fig. 29A-J)

Epilachna manderstjerna Mulsant, 1853b:256.

Epilachna manderstjerna Mulsant; Crotch, 1874:83.

Epilachna manderstjerna Mulsant; Weise, 1885a:228.

Epilachna manderstjerna Mulsant; Korschefsky, 1931:24.

Afissa manderstjerna (Mulsant); Dieke, 1947:125.

Afidentula manderstjerna Mulsant; Kapur, 1955:325.

Material Examined: 5 ♂♂, INDIA: Barog (Himachal Pradesh), on *Zea mays* linnaeus, 10-VIII-1994 (M. Yousuf).

Host Plant: *Zea mays*

Distribution: INDIA: Barog, Kurseong, Mussoorie hills, Sikkim.

iii. *Afidentula himalayana* Kapur

Afidentula himalayana Kapur, 1963b:12.

Afidentula himalayana Kapur; Canepari, 1986:30.

Host Plant: Shrubs

Distribution: INDIA: Darjeeling, Sikkim.

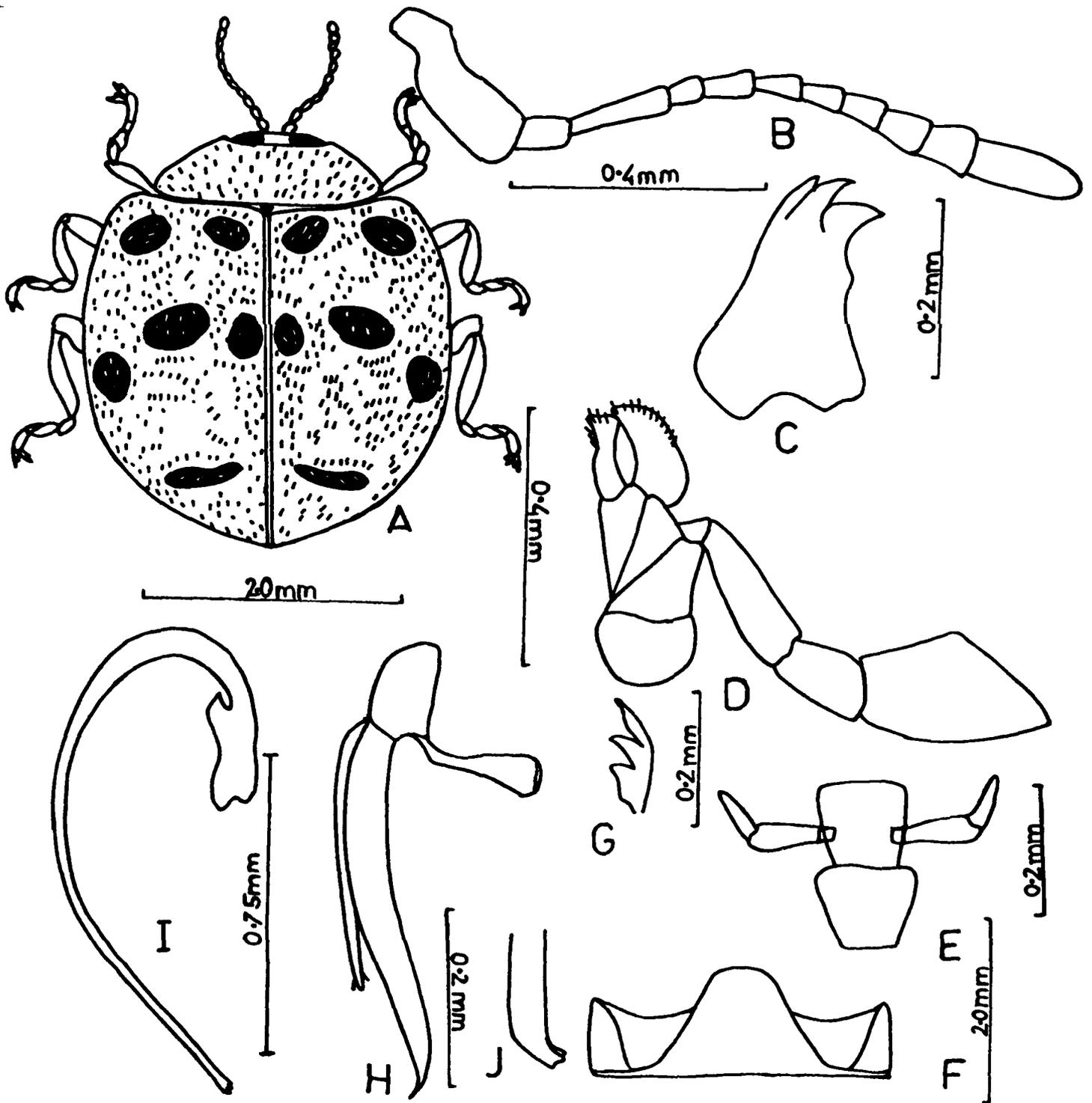


Fig.29A-J:

Afidentula manderstjernae (Mulsant)

A=Dorsal view, B=Antenna, C=Mandible, D=Maxilla,

E=Labium, F=1st abdominal sternite, G=Tarsal claw,

H=Phallobase, I=Siphus, J=Distal end of siphus (enlarged view)

Subfamily CHILOCORINAE Della Beffa

Chilocorinae Della Beffa, 1912:167.

Body dorsally pubescent or glabrous; clypeus strongly expanded laterally with antero-lateral projections on each side; antennae inserted ventrally on head, 7 to 11 -segmented, antennal insertion covered by expanded clypeus; mandibles monodentate, basal tooth distinct; terminal segment of maxillary palp with nearly parallel sides; mentum and submentum of labium broadly articulated; middle coxal cavities broadly separated, meso and metasternum broadly articulated; legs with tarsi trimerous or cryptotetramerous; abdomen with five to six visible sternites; inner margin of female genital plates without emargination.

Three tribes are included under Chilocorinae Della Beffa.

Tribe Chilocorini Costa

Chilocorini Costa, 1849: 9.

Chilocorini Costa; Chapin, 1965a:227.

Chilocorini Costa; Kapur, 1966:184.

Chilocorini Costa; Sasaji, 1968a:20.

Body dorsally glabrous; antennae 7 to 11- segmented; legs with tarsi cryptotetramerous; abdomen usually with six visible sternites in male and five in female; siphon of male genitalia moderately curved, siphonal capsule well developed, basal lobe slightly asymmetrical, female genital plates usually subtriangular.

The tribe Chilocorini Costa is represented by five genera from India. Their separation is given in the key to genera.

Genus *Chilocorus* Leach

Chilocorus Leach, 1815:116.

Type species: *Coccinella cacti* Linnaeus, 1767:584.

Chilocorus Leach; Redtenbacher, 1843:11.

Chilocorus Leach; Mulsant, 1850:452.

Chilocorus Leach; Crotch, 1874:183.

Chilocorus Leach; Gorham, 1892:175.

Chilocorus Leach; Korschefsky, 1932:257.

Chilocorus Leach; Chapin, 1965a:263.

Chilocorus Leach; Miyatake, 1970:315.

Diagnosis: Body glabrous except few setae on pronotal flanks and elytral borders, oval, strongly convex; antennae (figs. 30B, 32B), 8-segmented; prosternum without carinae; first abdominal sternite with femoral line incomplete in form of a quarter circle; tibiae with a triangular tooth at basal third of outer margin, mid and hind tibial spurs absent, tarsal claws with small quadrate basal tooth; male genitalia with basal lobe slightly asymmetrical, triangularly elongated, parameres usually as long as basal lobe, hypomere slender, longer than parameres (figs. 30G, 31F, 32F); siphon (figs. 30H, 31G, 32G) proximally with unequal bilobed siphonal capsule, distal end truncated; female genitalia with spermatheca stout, nodulus and ramus indistinct, cornu very short and bent, genital plates broadly triangular.

The genus is represented by eight species from India. A key for their separation is given below:

Key to Indian species of *Chilocorus* Leach

1. Body oval, black, reddish brown or testaceous dorsally-----2
 - Body outline typically cordate, shining black dorsally, without any spot on pronotum and elytra----- ***braeti* Weise**
2. Elytra black ----- 3
 - Elytra reddish brown or testaceous ----- 4
3. Each elytron with two red spots ----- ***bijugus* Mulsant**
 - Elytra without any spot----- ***nigritus* (Fabricius)**
4. External margin of elytra bordered black throughout ----- 5
 - External margin of elytra not bordered black throughout ----- 7
5. Siphonal capsule of male genitalia with outer lobe slightly shorter than inner; parameres slightly longer than basal lobe ----- 6
 - Siphonal capsule of male genitalia with outer lobe less than half the length of inner, parameres as long as basal lobe ----- ***hauseri* Weise**
6. Siphonal capsule with outer lobe slightly broader than inner; female genital plates almost triangular ----- ***circumdatius* Schonherr**

- Siphonal capsule with outer lobe nearly two times broader than inner, female genital plates narrow and elongated ----- ***rubidus* Hope**
- 7. Siphonal capsule with outer lobe shorter than inner; female genital plates elongated, styli indistinct ----- ***politus* Mulsant**
- Siphonal capsule with outer lobe longer than inner; female genital plates subtriangular, styli prominent ----- ***coelosimilis* Kapur**

i. *Chilocorus braeti* Weise

Chilocorus braeti Weise, 1895a:154.

Chilocorus braeti Weise; Kapur, 1963b:24.

Prey: Unknown

Distribution: INDIA: Darjeeling, Sikkim.

ii. *Chilocorus bijugus* Mulsant

Chilocorus bijugus Mulsant, 1853a:189.

Chilocorus bijugus Mulsant; Crotch, 1874:183

Chilocorus bijugus Mulsant; Korschefsky, 1932:242.

Chilocorus bijugus Mulsant; Kapur, 1954c:259.

Chilocorus bijugus Mulsant; Nagaraja & Hussainy, 1967:249.

Chilocorus bijugus Mulsant; Miyatake, 1970:324.

Prey: Diaspine scale, Sanjose scale

Distribution: INDIA: Almora, Assam, Kashmir, Shillong.

iii. *Chilocorus nigrinus* (Fabricius)

(Fig.30A-I)

Coccinella nigrinus Fabricius, 1798:79.

Chilocorus nigrinus Fabricius; Mulsant, 1850:463.

Chilocorus nigrinus Fabricius; Crotch, 1874:184.

Chilocorus nigrinus Fabricius; Korschefsky, 1932:240.

Chilocorus nigrinus Fabricius; Kapur, 1966:171.

Chilocorus nigrinus Fabricius; Nagaraja & Hussainy, 1967:252.

Chilocorus nigrinus Fabricius; Kapur, 1972:313.

Material Examined: 2♂♂, 3♂♂, INDIA: Panaji (Goa), predaceous on mealy bugs on *Anacardium occidentale* Linnaeus, 3.I.1992 (Shama Afroze); 3♂♂, Aligarh (Uttar Pradesh) predaceous on aleyrodids on *Syzgium jambolanum* Dc., 25-III-

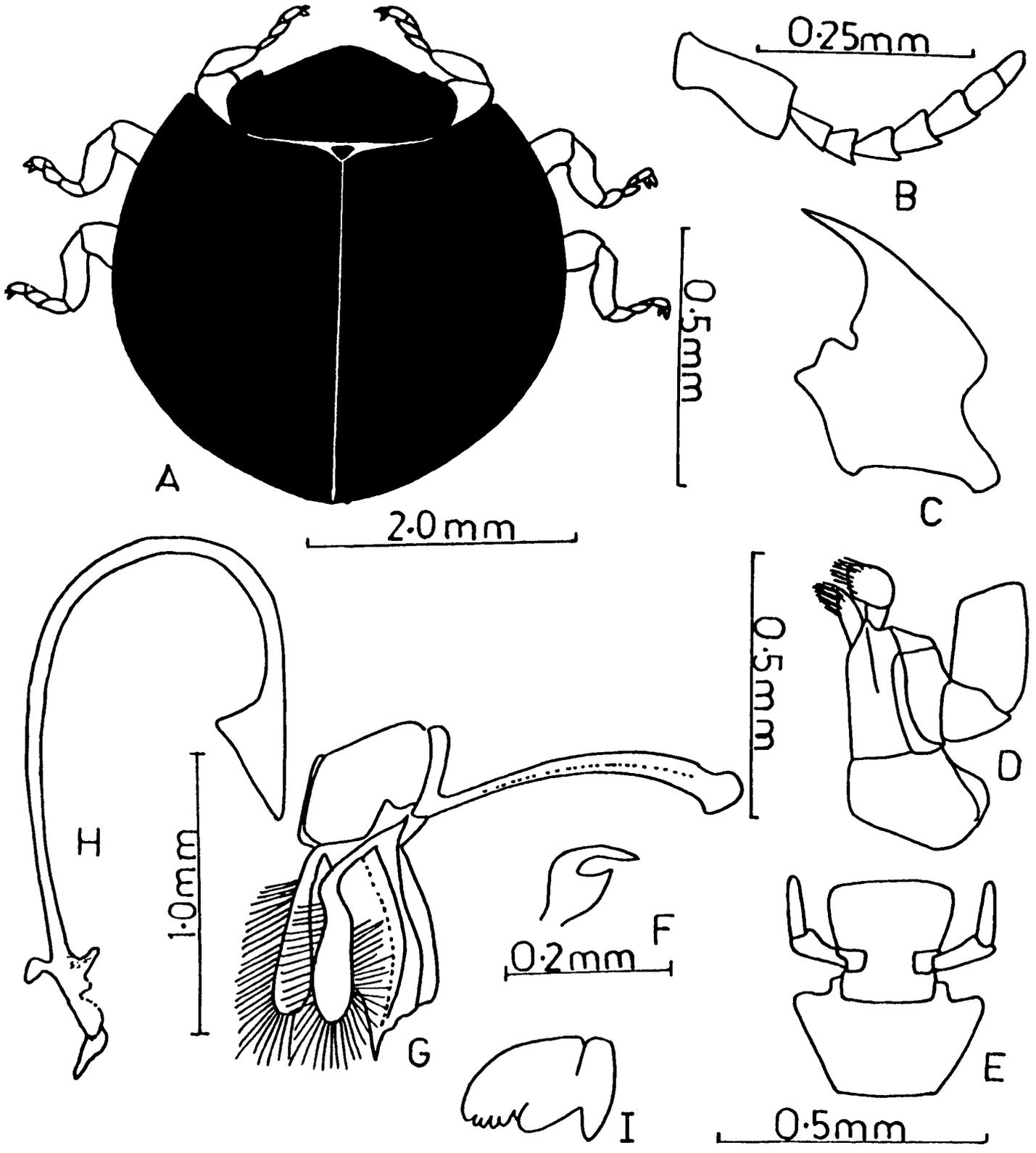


Fig.30A-I:

Chilocorus nigratus (Fabricius)

A=Dorsal view, B=Antenna, C=Mandible, D=Maxilla,
E=Labium, F=Tarsal claw, G=Phallobase, H=Sipho,
I=Spermatheca.

1996 (Shama Afroze).

Prey: Aleyrodids, mealy bugs

Distribution: INDIA: Aligarh, Bangalore, Belgaum, Kanara, Margao, Mysore, Panaji.

iv. *Chilocorus hauseri* Weise

Chilocorus hauseri Weise, 1895a:135.

Chilocorus hauseri Weise; Sicard, 1912:500.

Chilocorus hauseri Weise; Korschefsky, 1932:243.

Chilocorus hauseri Weise; Kapur, 1963b:24.

Chilocorus hauseri Weise; Nagaraja & Hussainy, 1967:250.

Prey: Unknown

Distribution: INDIA: Singhik.

v. *Chilocorus circumdatus* Schonherr

Chilocorus circumdatus Schonherr, 1808:152.

Chilocorus nigromarginatus Motschulsky, 1859:174.

Chilocorus circumdatus Schonherr; Mulsant, 1850:484.

Chilocorus circumdatus Schonherr; Crotch, 1874:186.

Chilocorus circumdatus Schonherr; Korschefsky, 1932:242.

Chilocorus circumdatus Schonherr; Nagaraja & Hussainy, 1967:250.

Chilocorus circumdatus Schonherr; Miyatake, 1970:323.

Prey: Unknown

Distribution: INDIA: Assam, Manas.

vi. *Chilocorus rubidus* Hope (Fig.31A-G)

Chilocorus rubidus Hope, 1831:31.

Coccinella tristis Faldermann, 1835:452.

Chilocorus rubidus Hope; Mulsant, 1850:452.

Chilocorus rubidus Hope; Weise, 1887:210.

Chilocorus rubidus Hope; Korschefsky, 1932:241.

Chilocorus rubidus Hope; Mader, 1955:775.

Chilocorus rubidus Hope; Kapur, 1954c:262.

Chilocorus rubidus Hope; Nagaraja & Hussainy, 1967:253.

Chilocorus rubidus Hope; Kapur, 1972:313.

Material Examined: 2 ♂♂, INDIA: Aligarh (Uttar Pradesh), predaceous on mealy bugs on *Mangifera indica* Linnaeus, 3-X-1993 (Shama Afroze).

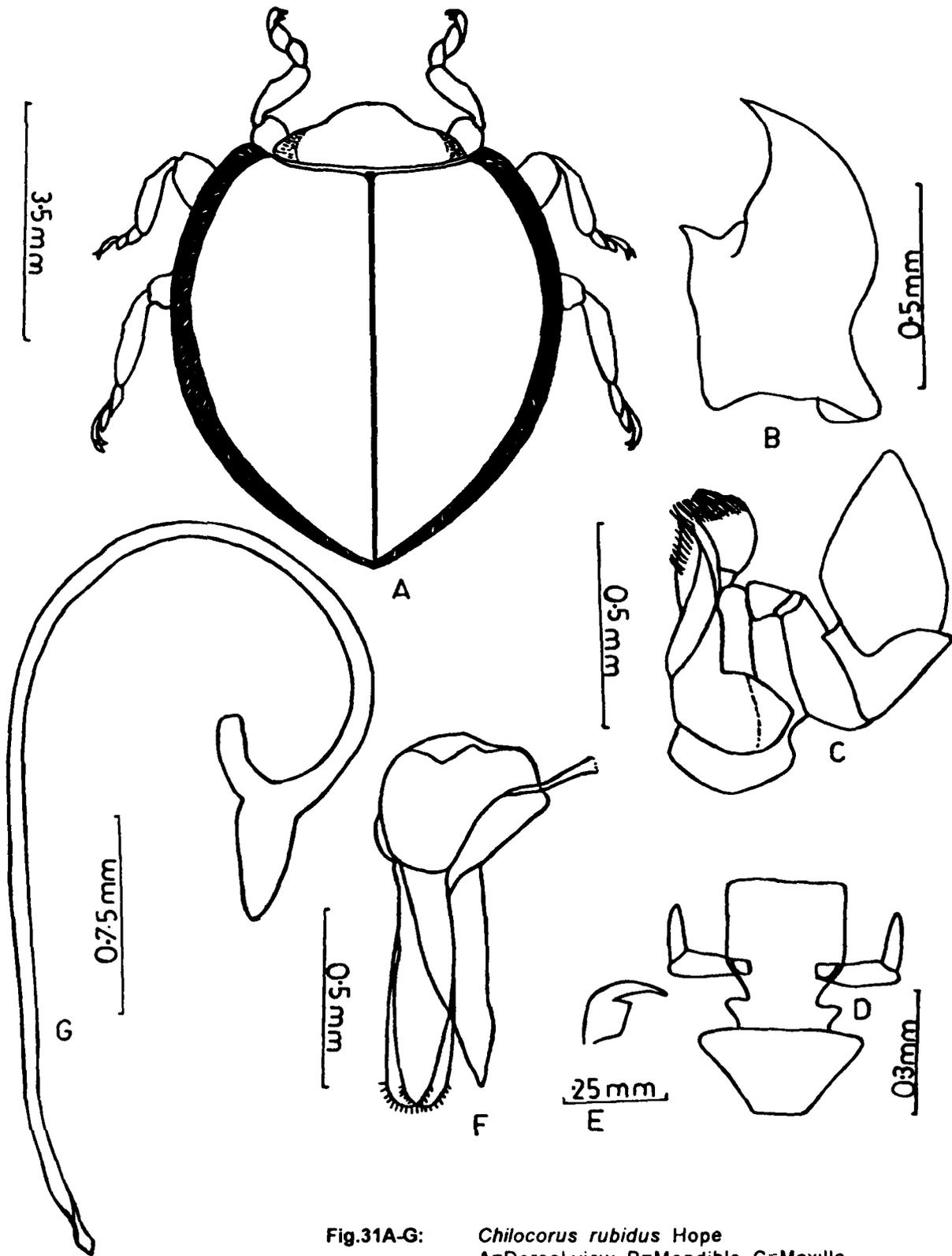


Fig.31A-G: *Chilocorus rubidus* Hope
 A=Dorsal view, B=Mandible, C=Maxilla,
 D=Labium, E=Tarsal claw, F=Phallobase,
 G=Siphon.

Prey: Mealy bugs

Distribution: INDIA: Aligarh, Garhwal, Kashmir, Kumaon hills, Margao.

vii. *Chilocorus politus* Mulsant

Chilocorus politus Mulsant, 1850:455.

Chilocorus politus Mulsant; Crotch, 1874:187.

Chilocorus politus Mulsant; Miyatake, 1970:316.

Chilocorus politus Mulsant; Chunram & Sasaji, 1980:481.

Prey : Unknown

Distribution: INDIA

viii. *Chilocorus coelosimilis* Kapur (Fig. 32A-G)

Chilocorus coelosimilis Kapur, 1966:171.

Material Examined: 2 ♂♂, INDIA: Panaji (Goa) predaceous on mealy bugs on *Anacardium occidentale* Linnaeus, 5-1-1992 (Shama Afroze).

Prey : Mealybugs

Distribution: INDIA: Panaji, Port Blair.

Genus *Brumoides* Chapin

Brumoides Chapin, 1965a:237.

Type species: *Coccinella suturalis* Fabricius, 1798:78.

Brumoides Chapin; Miyatake, 1970:304.

Diagnosis: Body oval, moderately convex; antennae (figs.33B,34B) 8-segmented; prosternum without carinae; first abdominal sternite with femoral line complete (figs. 33F, 34F); legs with mid and hind tibial spurs, tarsal claws narrow, slightly thickened at base; male genitalia with basal lobe triangular, parameres considerably longer than basal lobe, hypomere longer than parameres (figs.33H,34H); siphon (figs.33I, 34I) proximally with equal bilobed siphonal capsule, distal end ovate; female genitalia (fig.34J) with spermatheca stout, moderately curved, nodulus and ramus poorly developed, genital plates elongate - oval, styli small.

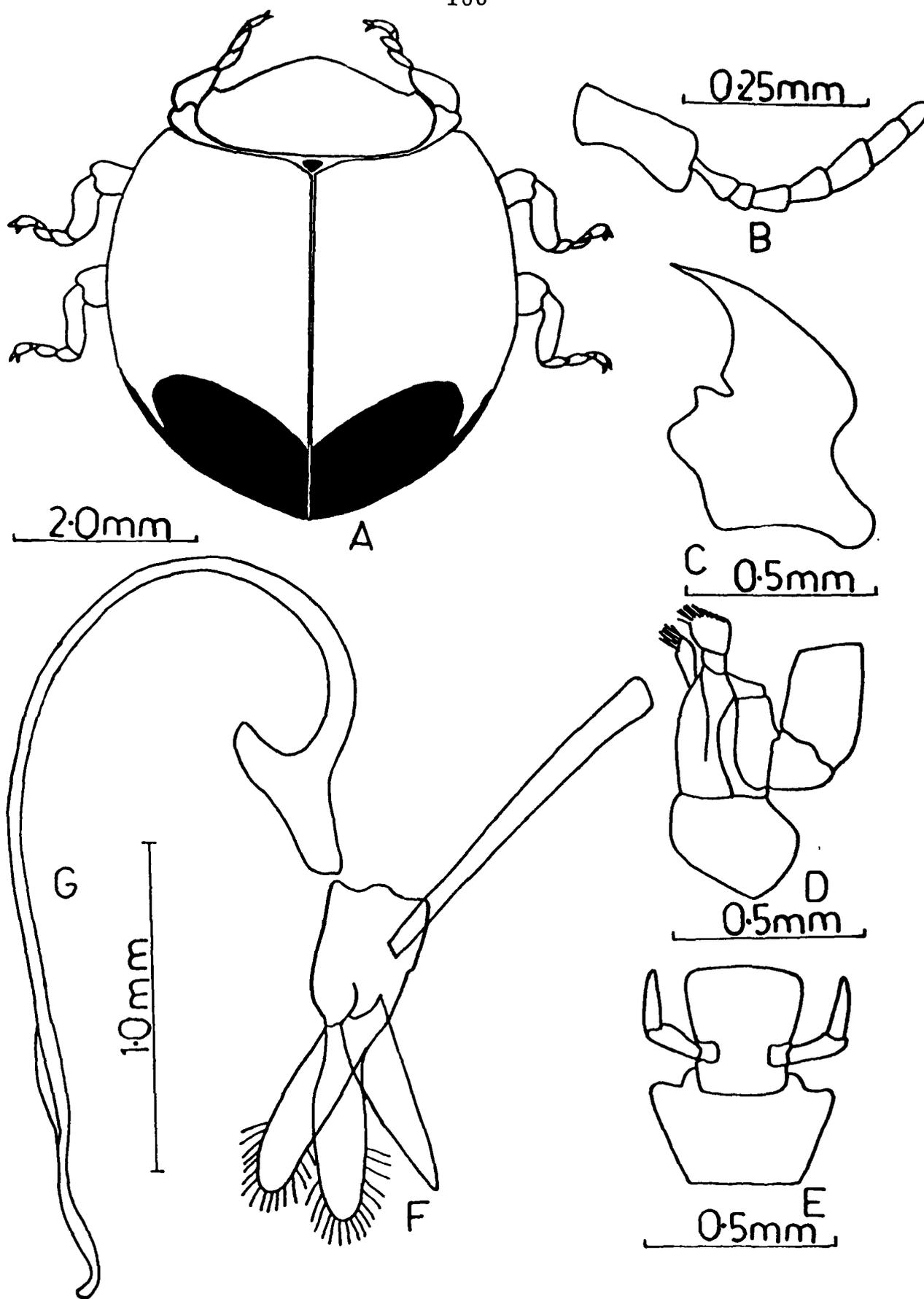


Fig.32A-G: *Chilocorus coelosimilis* Kapur
 A=Dorsal view, B=Antenna, C=Mandible,
 D=Maxilla, E=Labium, F=Phallobase, G=Siphon.

The genus is represented by two species from India. A key for their separation is given below.

Key to Indian species of *Brumoides* Chapin

1. Elytra with three broad black bands; male genitalia with parameres one and half times longer than basal lobe-----*lineatus* (Weise)
- Elytra with three narrow black bands; male genitalia with parameres nearly two times longer than basal lobe----- *suturalis* (Fabricius)

**i. *Brumoides lineatus* (Weise)
(Fig. 33A-I)**

Brumus lineatus Weise, 1885a:229.
Brumus lineatus Weise; Weise, 1900:422.
Brumus lineatus Weise; Korschefsky, 1932:265.
Brumus lineatus Weise; Beilawski, 1957:87,88.
Brumus lineatus Weise; Kapur, 1966:174.
Brumoides lineatus (Weise); Miyatake, 1970:305.

Material Examined: 2 ♂♂ INDIA: Hebbal (Bangalore), predaceous on aphids on *Psidium guajava* Linnaeus, 5-IX-1992 (M. Dhanam).

Prey: Aphids

Distribution: INDIA: Hebbal, South Andaman.

**ii. *Brumoides suturalis* Fabricius
(Fig.34A-J)**

Coccinella suturalis Fabricius, 1798:78.
Brumus suturalis (Fabricius); Mulsant, 1850:494.
Brumus suturalis (Fabricius); Kapur, 1942:8.
Brumoides suturalis (Fabricius); Chapin, 1965a:237.

Material Examined: 10 ♀♀, 12 ♂♂ INDIA: Hebbal (Bangalore), predaceous on *Phenacoccus insolitus* Green on *Solanum melongena* Linnaeus, 20-II-1993 (M. Dhanam); 25 ♀♀, 30 ♂♂ Aligarh (Uttar Pradesh), predaceous on *P. insolitus* Green on *Zizyphus jujuba* Linnaeus, 15-IX-1995 (Shama Afroze).

Prey: Aphids, *Phenacoccus insolitus* Green

Distribution: INDIA: Widely distributed in India.

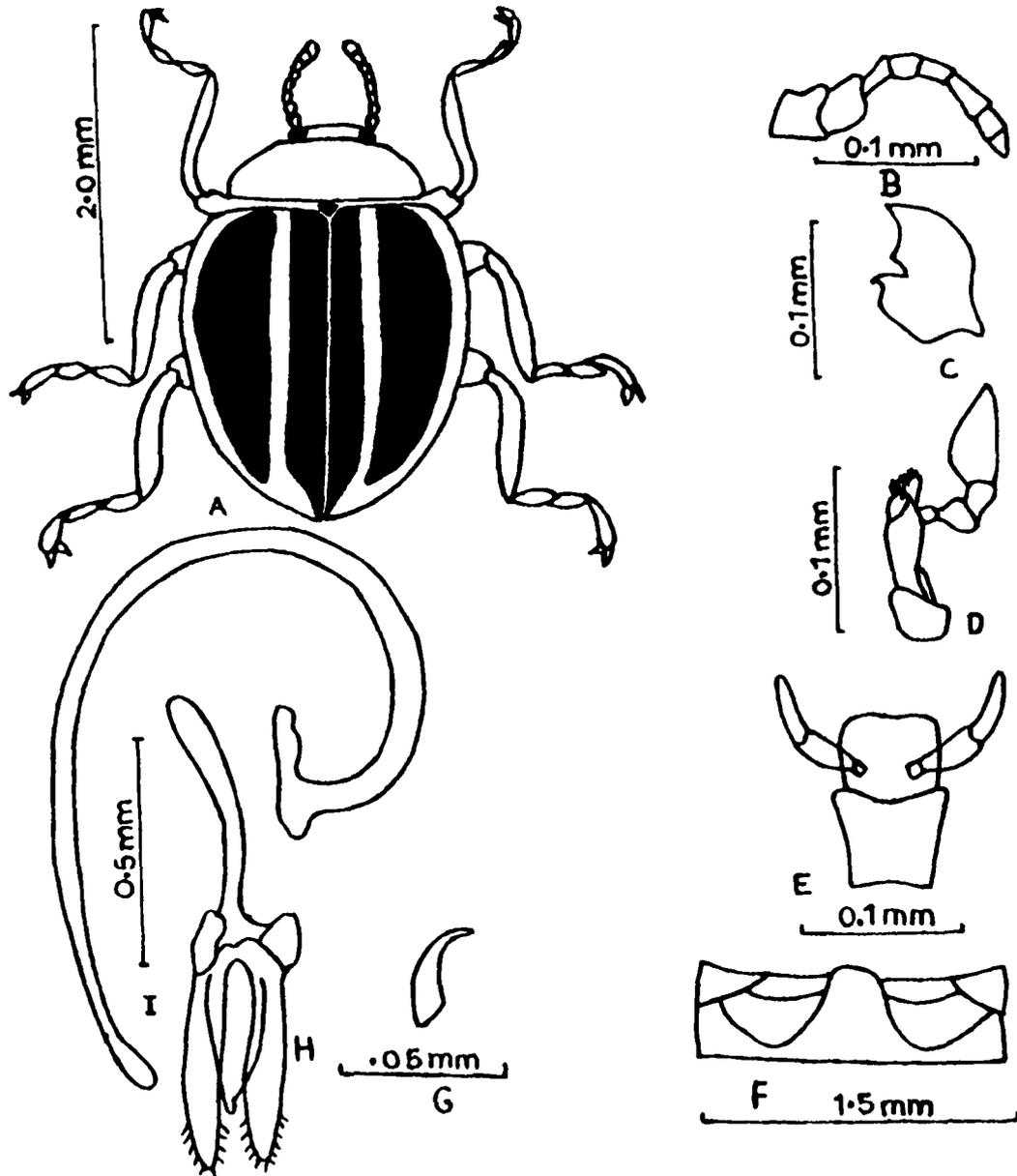


Fig.33A-I:

Brumoides lineatus (Weise)

A=Dorsal view, B=Antenna, C=Mandible,
 D=Maxilla, E=Labium, F=1st abdominal sternite,
 G=Tarsal claw, H=Phallobase, I=Sipho.

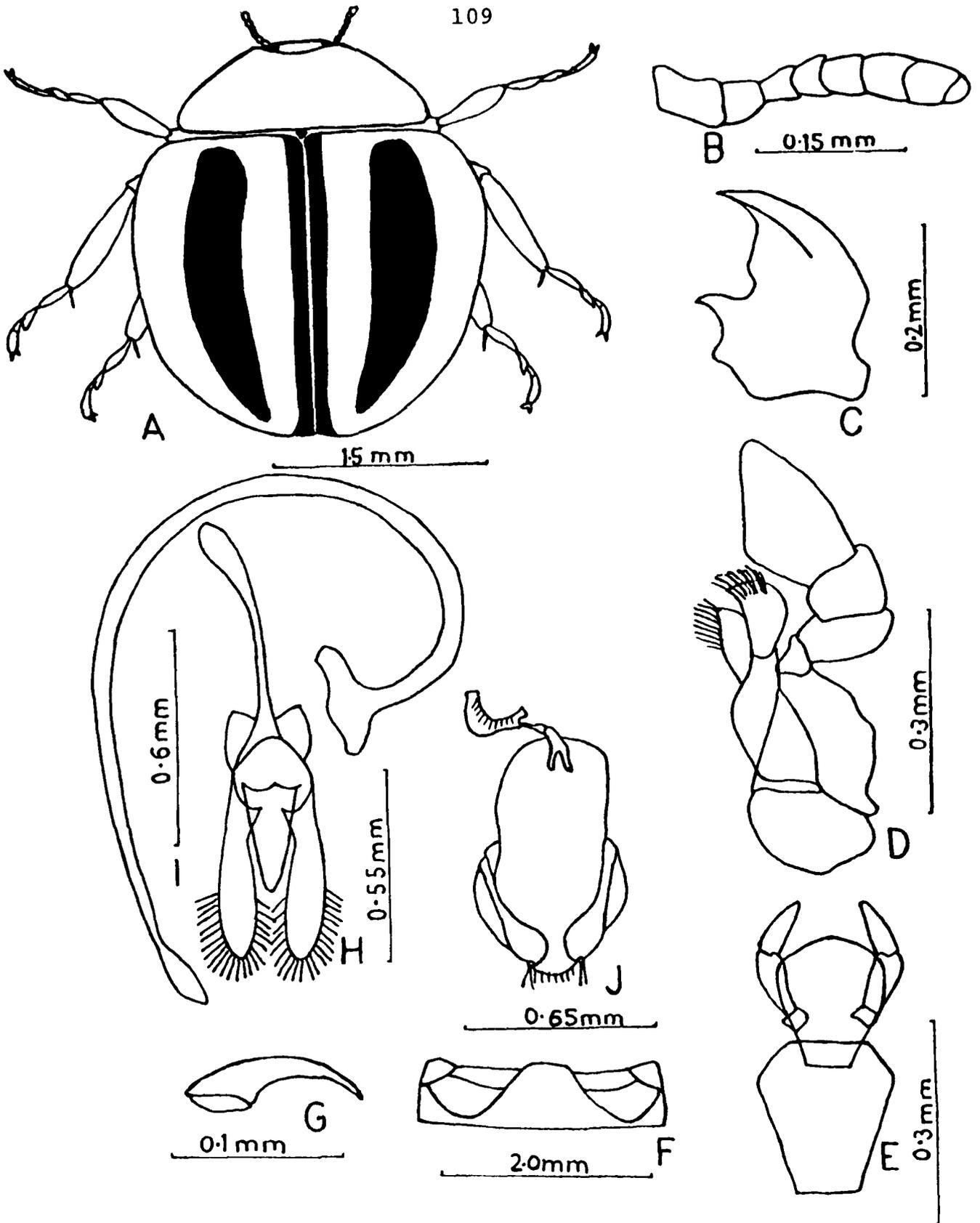


Fig.34A-J:

Brumoides suturalis (Fabricius)
 A=Dorsal view, B=Antenna, C=Mandible,
 D=Maxilla, E=Labium, F=1st abdominal sternite,
 G=Tarsal claw, H=Phallobase, I=Siphon,
 J=Female genitalia

Subfamily COCCIDULINAE Costa

Coccidulinae Costa, 1849:9,104.

Body dorsally pubescent; clypeus unexpanded laterally with antero-lateral projections on each side; antennae inserted ventrally on head and in front of the eyes, 8,10 or 11-segmented, antennal insertion exposed; mandibles bidentate, basal tooth distinct; terminal segment of maxillary palp strongly divergent apically (securiform); mentum and submentum of labium broadly articulated; middle coxal cavities narrowly separated; meso and metasternum narrowly articulated; legs with tibiae angulate or not externally, tarsi trimerous, cryptotetramerous or tetramerous; abdomen with five to six visible sternites; female genital plates considerably long with inner margin without emargination.

Five tribes are included under Coccidulinae Costa.

Tribe Noviini Ganglbauer

Noviini Ganglbauer, 1899: 954, 977.
Noviini Ganglbauer; Sasaji, 1968a:23.

Antennae 8-segmented; legs with tibiae angulate externally, tarsi trimerous; abdomen with six visible sternites in both sexes; siphon of male genitalia strongly curved, siphonal capsule well developed.

The tribe Noviini Ganglbauer is represented by single genus.

Genus *Rodolia* Mulsant

Rodolia Mulsant, 1850:902.

Type species: *Rodolia ruficollis* Mulsant, 1850:903.
Rodolia Mulsant; Kapur, 1949:531.

Diagnosis: Body oval to hemispherical, moderately convex, antennae (figs. 35B, 36B) 8-segmented; prosternum without carinae; first abdominal sternite with femoral line complete (fig.36F.); legs with tibiae angulate externally, without mid and hind tibial spurs, tarsal claws with small quadrate basal tooth; male genitalia with

basal lobe usually tubular, gradually narrowed to a sharp apex, parameres as long as basal lobe, spatulate, hypomere shorter than parameres (fig.36H); siphon (fig.36I) proximally with unequal bilobed siphonal capsule, distal end usually narrow, slender or whiplike.

The genus is represented by eleven species from India. A key to species proposed by Kapur (1950) is consulted.

**i. *Rodolia amabilis* Kapur
(Fig.35A-C)**

Rodolia amabilis Kapur, 1949:536.

Rodolia amabilis Kapur; Kapur, 1950a:4.

Material Examined: 1 ♀ INDIA: Hebbal (Bangalore), predaceous on *Icerya purchasi* Maskell on *Citrus* sp. 21-IV-1994 (M. Dhanam).

Prey: *Icerya aegyptiaca* (Douglas), *I. purchasi* Maskell

Distribution: INDIA: Coorg, Hebbal, Periakulam, Poshok, Talliar, Thavarekere.

**ii. *Rodolia fumida* Mulsant
(Fig.36A-I)**

Rodolia fumida Mulsant, 1850:904.

Rodolia roseipennis Mulsant, 1850:904.

Rodolia arethusa Mulsant, 1853b:254.

Rodolia testicolor Mulsant, 1853b:255.

Rodolia fumida Mulsant; Kapur, 1949:534.

Rodolia fumida Mulsant; Kapur, 1950a:1.

Material Examined: 2 ♂♂, INDIA: Gulmarg (Jammu), predaceous on aphids on *Prunus persica* Batsch., 6-III-1992 (Sudhir Singh).

Prey: *Dialeurodes citri* (Ashmead), *Icerya purchasi* Maskell, *Monophelbus* sp.

Distribution: INDIA: Almora, Bandra, Belgaum, Cherrapunji, Darjeeling, Dehradun, Delhi, Ganohala Reserve forest, Jabulpur, Kangra Valley, Manipur, Muree hills, Nagpur, Nilgiri hills, Pusa, Ranikhet, Sitapur.

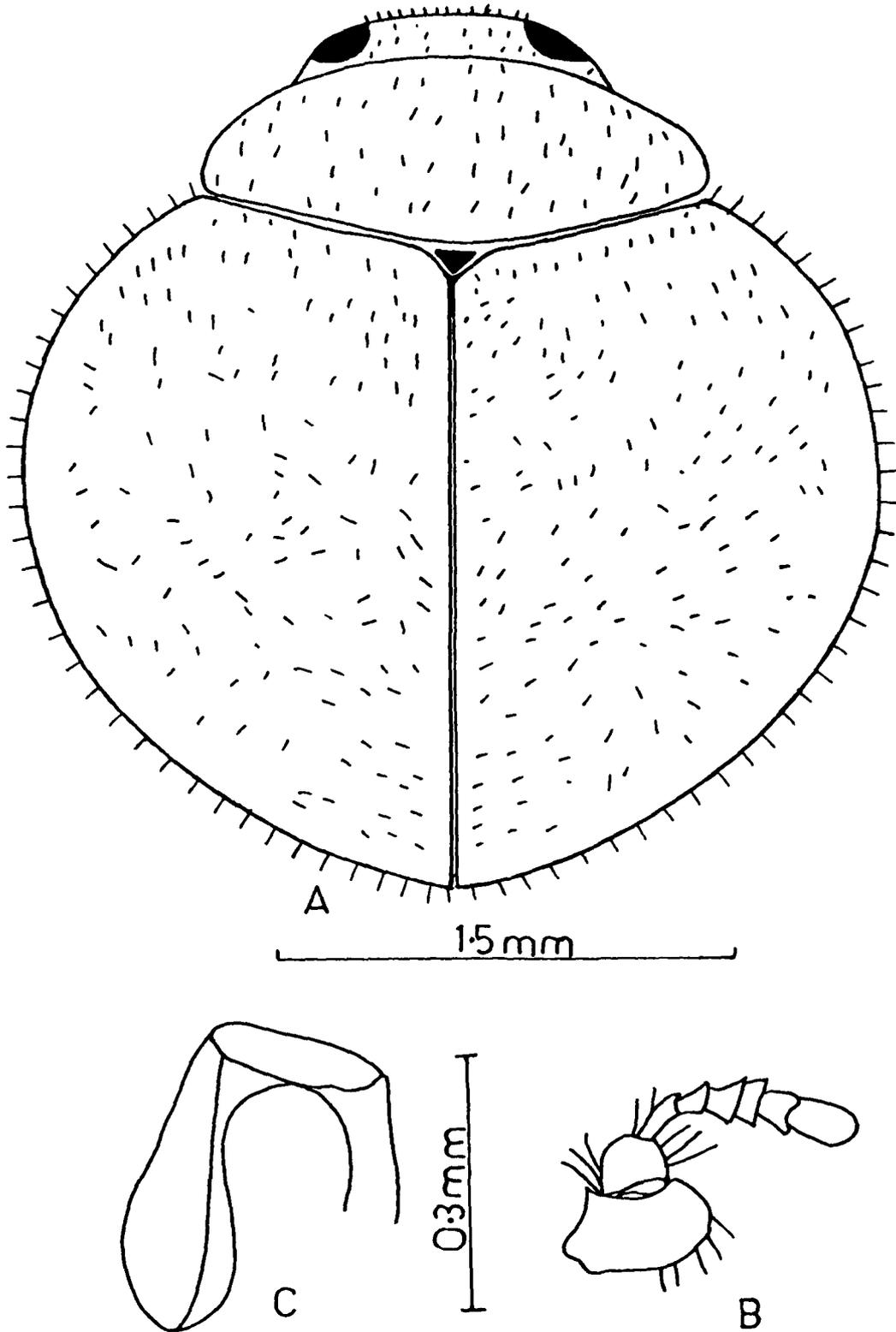


Fig.35A-C: *Rodolia amabilis* Kapur
 A=Dorsal view, B=Antenna, C=Spermatheca

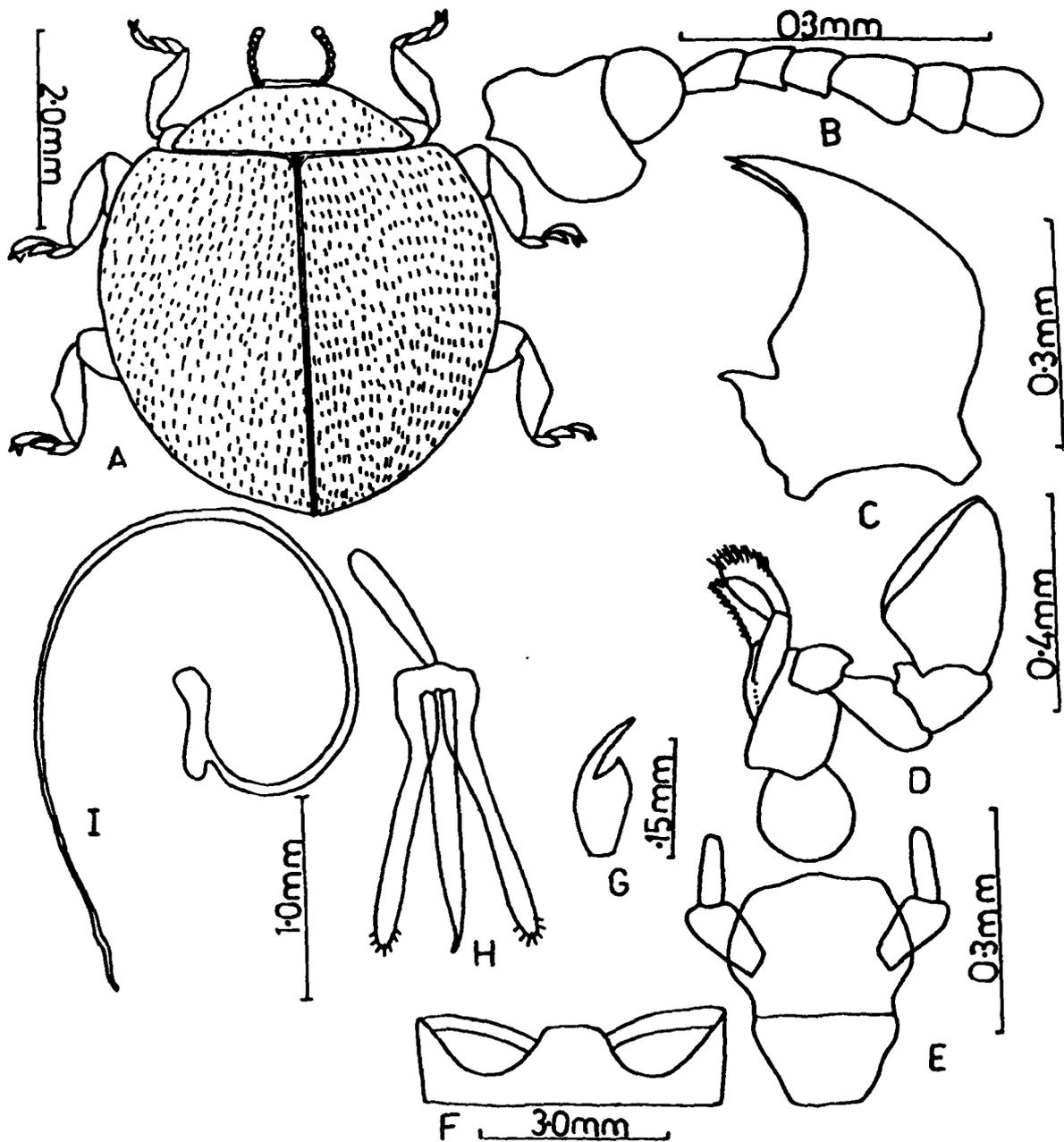


Fig.36A-I:

Rodolia fumida Mulsant

A=Dorsal view, B=Antenna, C=Mandible,

D=Maxilla, E=Labium, F=1st abdominal sternite, G=Tarsal claw,

H=Phallobase, I=Sipho.

iii. *Rodolia andamanica* Weise

Rodolia andamanica Weise, 1901:93.

Rodolia andamanica Weise; Korschefsky, 1931:38.

Rodolia andamanica Weise; Kapur, 1949:535.

Rodolia andamanica Weise; Kapur, 1966:160.

Prey: Unknown

Distribution: INDIA: Andaman Islands, Bhimku, Talkumaon hills.

iv. *Rodolia breviuscula* Weise

Rodolia breviuscula Weise, 1892a:26

Rodolia breviuscula Weise; Kapur, 1949:536.

Rodolia breviuscula Weise; Kapur, 1950a:4.

Rodolia breviuscula Weise; Puttarudriah & Channabasavanna, 1957:7.

Rodolia breviuscula Weise; Bielawski & Chujo, 1961:332.

Rodolia breviuscula Weise; Chunram & Sasaji, 1980:481.

Prey: *Drosichiella* sp., *Icerya aegyptiaca* (Douglas), *I. purchasi* Maskell, *I. seychellarum* Westwood.

Distribution: INDIA: Anakapulle, Bangalore, Chittamannar, Coorg, Devarshola, Kukul valley, Nelliampathy, Poshok, Sarapanemane, Shimoga, Travandrum.

v. *Rodolia cardinalis* (Mulsant)

Vedalia cardinalis Mulsant, 1850:906.

Novius cardinalis (Mulsant); Crotch, 1874:283.

Rodolia cardinalis (Mulsant); Kapur, 1950a:6.

Rodolia cardinalis (Mulsant); Puttarudriah & Channabasavanna, 1957:6.

Prey: *Icerya purchasi* Maskell

Distribution: INDIA: Bangalore, Mysore.

vi. *Rodolia guerini* (Crotch)

Vedalia guerini Crotch, 1874:282.

Rodolia immsi Weise, 1912:120.

Rodolia 6-maculata Korschefsky, 1940:2.

Rodolia guerini (Crotch); Kapur, 1949:535.

Rodolia guerini (Crotch); Kapur, 1950a:2.

Prey: *Icerya pilosa* Green, *Monophelbus stebbingi* Green

Distribution: INDIA: Cape comorin, Dehradun, Haldwani, Pondicherry, Singhik.

vii. *Rodolia minima* Kapur

Rodolia minima Kapur, 1949:537.

Rodolia minima Kapur; Kapur, 1950a:6.

Prey: *Icerya purchasi* Maskell

Distribution: INDIA: Ooty.

viii. *Rodolia netara* Kapur

Rodolia netara Kapur, 1949:537.

Prey: *Icerya purchasi* Maskell

Distribution: INDIA: Munnar.

ix . *Rodolia nigrofrontalis* Kapur

Rodolia nigrofrontalis Kapur, 1950a:5.

Prey: Unknown

Distribution: INDIA: Travancore.

x. *Rodolia octoguttata* Weise

Rodolia octoguttata Weise, 1910a:51.

Rodolia octoguttata Weise; Kapur, 1950a:2.

Prey: Unknown

Distribution: INDIA: Bhimku, Khasi hills, Shillong, Talkumaon hills.

xi. *Rodolia ruficollis* Mulsant

Rodolia ruficollis Mulsant, 1850:903.

Vedalia ruficollis (Mulsant); Crotch, 1874:281.

Rodolia ruficollis Mulsant; Kapur, 1949:535.

Rodolia ruficollis Mulsant; Kapur, 1950a:6.

Rodolia ruficollis Mulsant; Puttarudriah & Channabasavanna 1957:7.

Rodolia ruficollis Mulsant; Chunram & Sasaji, 1980:402.

Prey: Mealy bugs

Distribution: INDIA: Bengal, Nilgiri hills, Patkai mountains.

Subfamily SCYMNINAE Della Beffa

Scymninae Della Beffa, 1912: 168.

Body dorsally pubescent or glabrous; clypeus unexpanded laterally with antero-lateral projections on each side; antennae inserted ventrally on head, 9-11 segmented, antennal insertion exposed; mandibles bidentate, basal tooth distinct; terminal segment of maxillary palp nearly with parallel sides or slightly divergent apically or strongly transverse; mentum and submentum of labium broadly articulated; middle coxal cavities broadly separated; meso and metasternum broadly articulated; legs with tarsi trimerous or cryptotetramerous; abdomen with six visible sternites in both sexes; female genital plates transverse or elongated, without emargination on inner margin.

Five tribes are included under Scymninae Della Beffa.

Tribe Hyperaspini Costa

Hyperaspini Costa, 1849: 9,64.

Hyperaspini Costa; Casey, 1899:72.

Hyperaspini Costa; Sasaji, 1968a:24.

Body dorsally glabrous; antennae 11-segmented; terminal segment of maxillary palp nearly with parallel sides; legs with tarsi cryptotetramerous; siphon of male genitalia strongly curved, siphonal capsule well developed, basal lobe distinctly asymmetrical; female genital plates transverse.

The tribe Hyperaspini Costa is represented by single genus.

Genus *Hyperaspis* Redtenbacher

Hyperaspis Redtenbacher, 1843:8.

Type species: *Coccinella reppensis* Herbst, 1783:48.

Hyperaspis Redtenbacher; Crotch, 1874:213.

Hyperaspis Redtenbacher; Chu *et al.*, 1978:143.

Diagnosis: Body glabrous, oval and moderately convex; antennae (fig. 37B) 11-segmented with segment eighth considerably long; prosternum with a pair of

carinae; first abdominal sternite with femoral line complete (fig. 37F); legs with tibiae angulate at three-fourth of the outer margin, without mid and hind tibial spurs, tarsal claws narrow with small, blunt basal tooth; male genitalia with basal lobe asymmetrical, parameres unequally developed, hypomere slightly longer than parameres, narrow and slender (fig.37H); siphon (fig.37I) proximally with unequal bilobed siphonal capsule, distal end ovate; female genitalia (fig.37J) with spermatheca poorly developed, ramus and nodulus poorly developed, female genital plates quadrangular, styli indistinct.

The genus is represented by single species from India.

***Hyperaspis maindroni* Sicard
(Fig.37A-J)**

Hyperaspis maindroni Sicard, 1929:179.

Hyperaspis maindroni Sicard; Puttarudriah & Channabasavanna, 1956:156.

Material Examined: 20 ♀♀, 30 ♂♂, INDIA: Aligarh (Uttar Pradesh), predaceous on *Phenacoccus insolitus* Green on *Zizyphus jujuba* Linnaeus, 10-VIII-1995 (Shama Afroze); 30 ♀♀, 20 ♂♂, Aligarh, predaceous on *Phenacoccus insolitus* Green on *Coccinia indica* W. & A., 20-x-1996 (Shama Afroze).

Prey: Coccids, pseudococcids

Distribution: INDIA: Aligarh, Bangalore, Mysore.

Tribe Stethorini Dobzhansky

Stethorini Dobzhansky, 1924:20.

Stethorini Dobzhansky; Sasaji, 1968a:24.

Body dorsally pubescent; antennae 11-segmented; terminal segment of maxillary palp slightly convergent apically; legs with tarsi trimerous; siphon of male genitalia strongly curved, siphonal capsule usually poorly developed; female genital plates always elongated.

The tribe Stethorini Dobzhansky is represented by single genus.

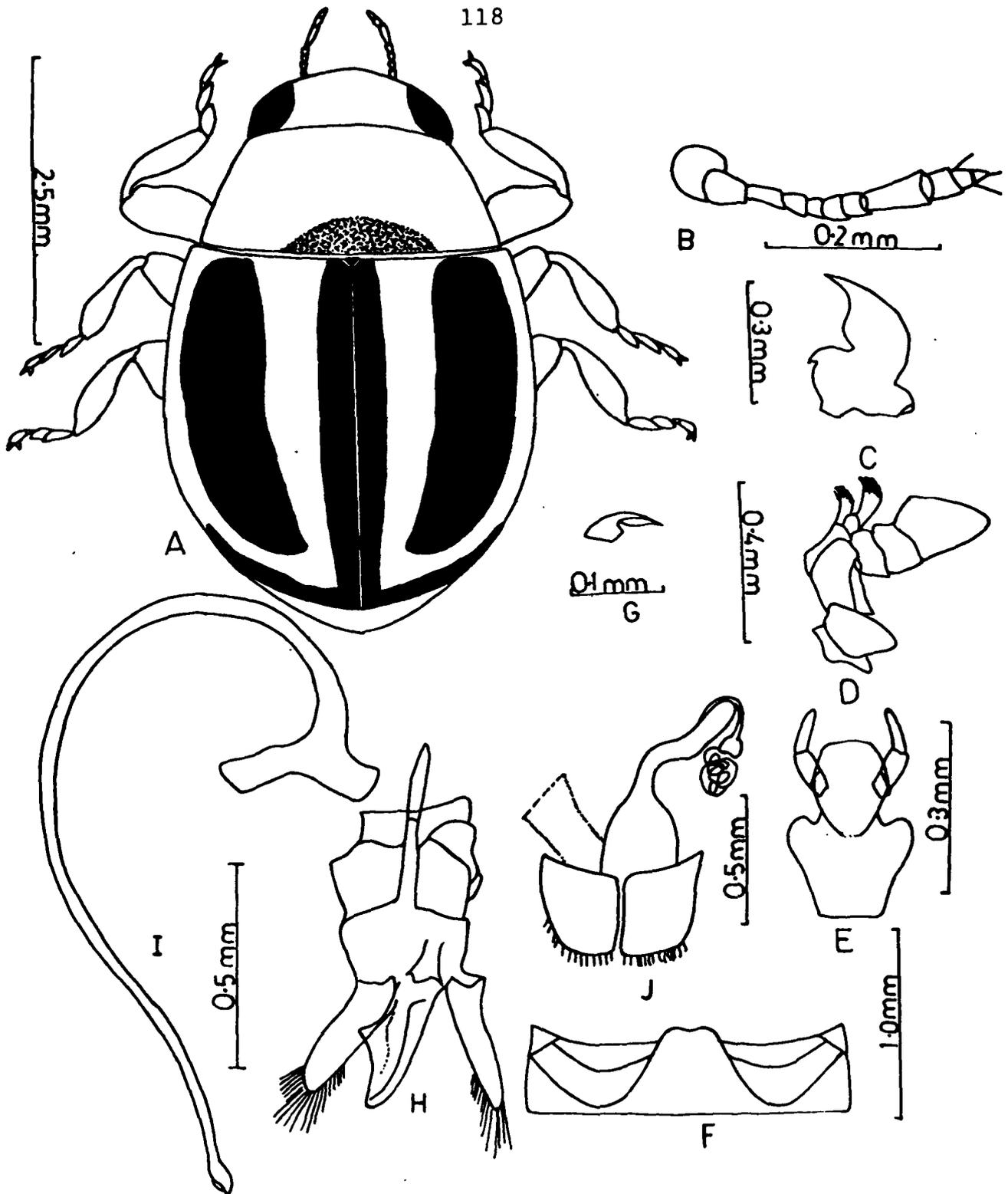


Fig.37A-J:

Hyperaspis maindroni Sicard
 A=Dorsal view, B=Antenna, C=Mandible,
 D=Maxilla, E=Labium, F=1st abdominal sternite,
 G=Tarsal claw, H=Phallobase, I=Sipho
 J=Female genitalia.

Genus *Stethorus* Weise

Stethorus Weise, 1885b:65.

Type species: *Stethorus punctillum* Weise, 1891:781.

Nephopullus Brethes, 1924:167.

Type species: *Nephopullus darwini* Brethes, 1924:167.

Stethorus Weise; Kapur, 1948b:300.

Diagnosis: Body considerably small (less than 2.0 mm), oblong, oval or rounded, moderately to strongly convex; antennae (figs.38B,39B) 10-segmented; prosternum convex medially, produced forward in the form of broad arch, partly covering the mouth parts; first abdominal sternite with femoral line complete (figs.38F,39F); legs without mid and hind tibial spurs, tarsal claws bifid, basal tooth indistinct; male genitalia much variable in shape and size.

The genus is represented by six species from India. A key for their separation is given below.

Key to Indian species of *Stethorus* Weise

1. Body subhemispherical to oval, sparsely pubescent; male genitalia with basal lobe not bifurcated apically, parameres shorter than basal lobe-----2
 - Body oval, densely pubescent; male genitalia with basal lobe distinctly bifurcated apically into two subtriangular pieces, parameres slightly longer than basal lobe----- ***tetranychii* Kapur**
2. Body shortly oval, moderately convex; male genitalia with parameres nearly two-third the length of basal lobe, with more than one setae at apices----- 3
 - Body subhemispherical, strongly convex; male genitalia with parameres considerably short, just half the length of basal lobe, with a long seta at apices-----
----- ***parcepunctatus* Kapur**
3. Last abdominal sternite in male weakly emarginate or entire at apex; male genitalia with hypomere longer than basal lobe, siphon not forming loop-----4
 - Last abdominal sternite in male with distinct and wide emargination in the middle at apex; male genitalia with hypomere shorter than basal lobe, siphon forming a loop----- ***gilvifrons* Mulsant**

4. Last abdominal sternite in male entire, rounded or straight apically; male genitalia with siphon long and slender or short and stout-----5
- Last abdominal sternite in male weakly emarginate; male genitalia with siphon considerably long and narrow, tapering towards the apex, irregularly curved-----
----- **rani Kapur**
5. Last abdominal sternite in male straight apically; male genitalia with siphon long and slender, gradually narrowed to the curved and pointed apex, basal lobe oblong, apical part slightly produced and notched medially, parameres also oblong-----**Indira Kapur**
- Last abdominal sternite in male rounded apically; male genitalia with siphon short and stout, narrowing gradually towards the apex, obtusely bend in an opposite direction of the apical one-sixth, basal lobe triangular, parameres long, filiform--
-----**pauperculus Weise**

i. *Stethorus tetranych* Kapur

Stethorus tetranych Kapur, 1948b:311.

Stethorus tetranych Kapur; Puttarudriah & Channabasavanna, 1955:3.

Stethorus tetranych Kapur; Puttarudriah & Channabasavanna, 1956:157.

Stethorus tetranych Kapur; Chunram & Sasaji, 1980:476.

Prey: *Tetranychus telarius* Linnaeus

Distribution: INDIA: Hebbal, Tharikere.

ii. *Stethorus parcepunctatus* Kapur

Stethorus parcepunctatus Kapur, 1948b:312.

Stethorus parcepunctatus Kapur; Puttarudriah & Channabasavanna, 1956:157.

Prey: *Raviella macfarlanes*

Distribution: INDIA: Kanara, Tharikere.

iii. *Stethorus gilvifrons* (Mulsant) (Fig.38A-H)

Scymnus (Pullus) gilvifrons Mulsant, 1850:995.

Stethorus gilvifrons (Mulsant); Weise, 1885b:74.

Stethorus gilvifrons (Mulsant); Kapur, 1948b:303.

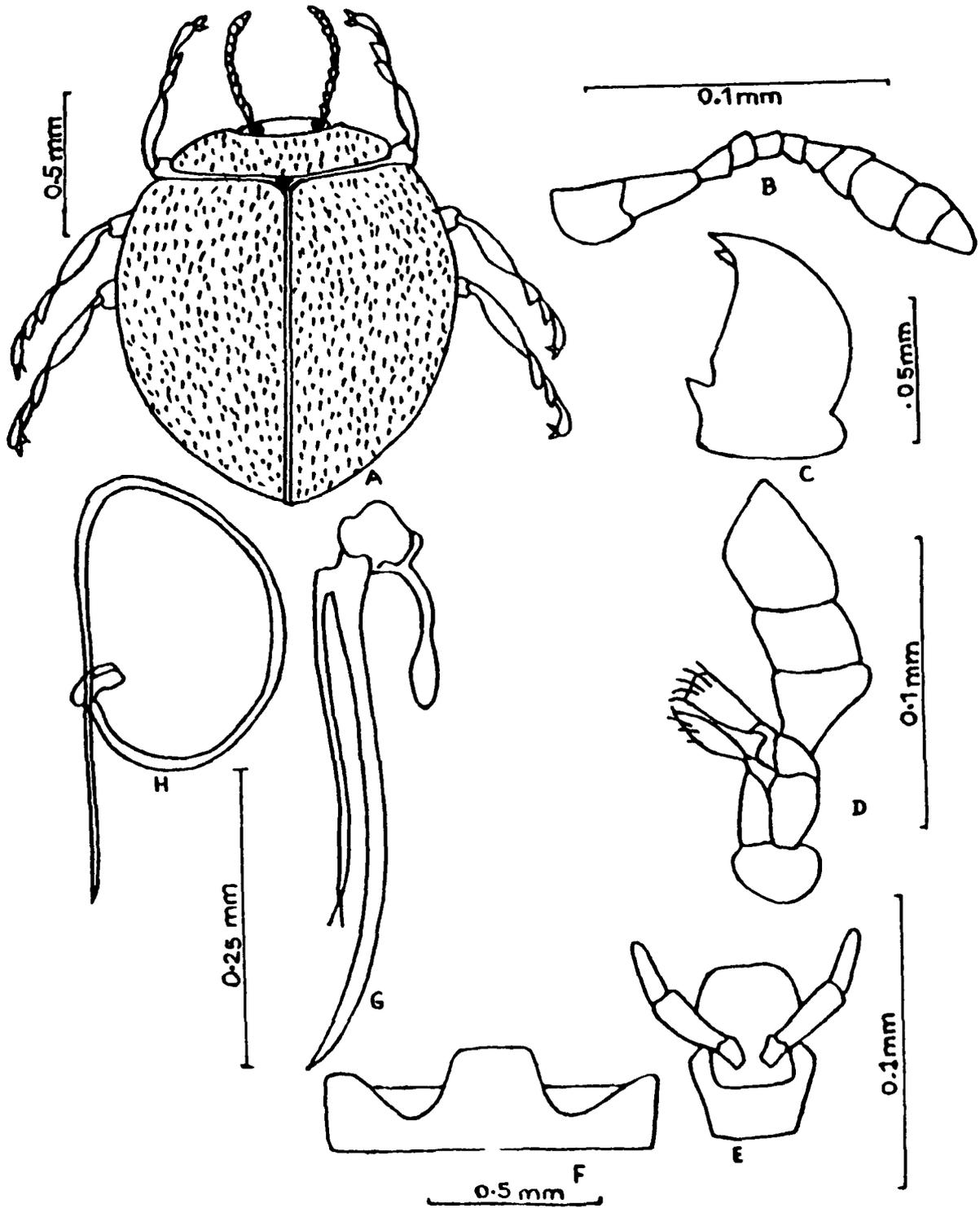


Fig.38A-H: *Stethorus gilvifrons* Mulsant
 A=Dorsal view, B=Antenna, C=Mandible,
 D=Maxilla, E=Labium, F=1st abdominal sternite,
 G=Phallobase, H=Sipho.

Material Examined: 2 ♂♂, INDIA: Bhatinda(Punjab), predaceous on mites on *Ricinus communis* Linnaeus, 28-II-1996 (Arshad Ali Haider).

Prey: Mites

Distribution: INDIA: Bangalore, Bhatinda.

iv. *Stethorus rani* Kapur

Stethorus rani Kapur, 1948b:313.

Stethorus rani Kapur; Chunram & Sasaji, 1980:475.

Prey: Unknown

Distribution: INDIA: Kumaon hills, Ranikhet.

v. *Stethorus indira* Kapur (Fig.39A-I)

Stethorus indira Kapur, 1950c:148.

Material Examined: 2 ♂♂ INDIA: Pusa (Bihar), predaceous on *Tetranychus telarius* Linnaeus on *Ricinus communis* Linnaeus, 20-IV-1996 (Arshad Ali Haider).

Prey: *Tetranychus telarius* Linnaeus

Distribution: INDIA: Calcutta, Pusa.

vi. *Stethorus pauperculus* (Weise)

Scymnus pauperculus Weise, 1895a:155.

Stethorus pauperculus (Weise); Weise, 1900:440.

Stethorus pauperculus (Weise); Kapur, 1948b: 309.

Stethorus pauperculus (Weise); Puttarudriah & Channabasavanna, 1956: 157.

Stethorus pauperculus (Weise); Chunram & Sasaji, 1980:475.

Prey: *Tetranychus telarius* Linnaeus

Distribution: INDIA: Bangalore, Coimbatore, Delhi, Lyallpur, Nadiah, Pusa.

Tribe Aspidimerini Weise

Aspidimerini Weise, 1900: 426.

Aspidimerini Weise; Kapur, 1948c:77.

Aspidimerini Weise; Sasaji, 1968a:24.

Body dorsally pubescent; antennae 9-segmented, geniculate; terminal segment of maxillary palp strongly transverse with rounded lateral sides; legs with

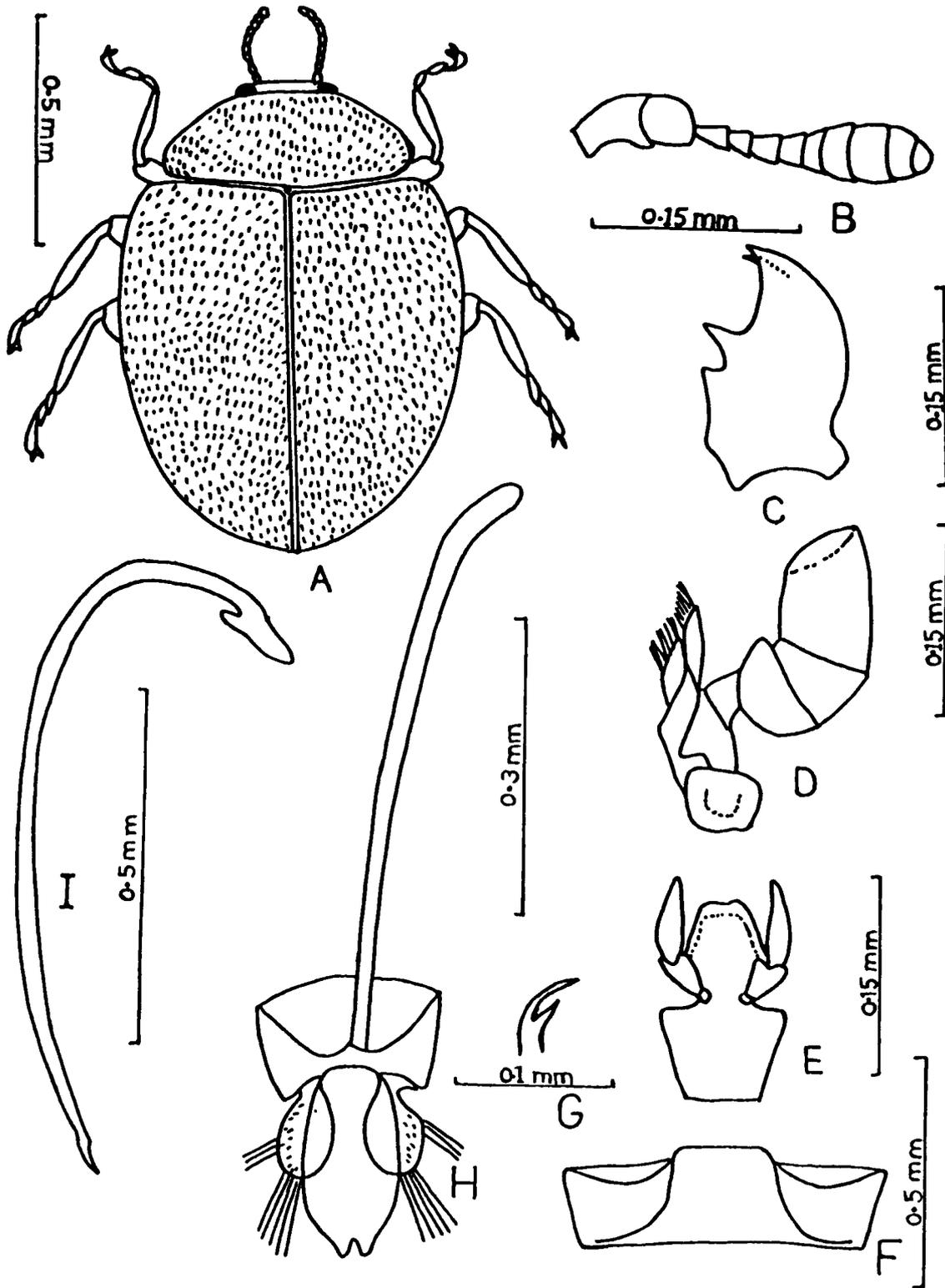


Fig.39A-I: *Stethorus indira* Kapur
 A=Dorsal view, B=Antenna, C=Mandible,
 D=Maxilla, E=Labium, F=1st abdominal sternite,
 G=Tarsal claw, H=Phallobase, I=Sipho

tarsi trimerous; abdomen with first sternite dilated posteriorly in an arc medially; siphon of male genitalia moderately to strongly curved, siphonal capsule well developed; female genital plates transverse.

The tribe *Aspidimerini* Weise is represented by three genera from India. Their separation is given in the key to genera.

Genus *Cryptogonus* Mulsant

Cryptogonus Mulsant, 1850:944.

Type species: *Coccinella orbiculus* Gyllenhal, 1808: 205.

Cryptogonus Mulsant; Crotch, 1874:203.

Cryptogonus Mulsant; Chapuis, 1876:238.

Cryptogonus Mulsant; Weise, 1885a: 232

Cryptogonus Mulsant; Weise, 1900: 426.

Cryptogonus Mulsant; Mader, 1926: 16.

Cryptogonus Mulsant; Korschefsky, 1931:173.

Cryptogonus Mulsant; Kapur, 1948c: 86.

Diagnosis: Body small, oval to subrounded, strongly convex; antennae (fig.41B) 9-segmented, geniculate; prosternum with a pair of subparallel carinae in basal half and either subparallel, wider or narrower in the apical half and always meet each other in an arch little before or at the anterior margin; first abdominal sternite dilated posteriorly in an arc in the middle femoral line incomplete; legs with femora usually broad and expanded, without mid and hind tibial spurs, tarsal claws narrow, pointed with subquadrate basal tooth; male genitalia with basal lobe usually two to three times as long as wide, parameres usually filiform, rarely spatulate (fig.41F); siphon (fig.41G); considerably narrow; female genitalia with spermatheca usually semicircular.

The genus is represented by seventeen species from India. A key for their separation is given below.

Key to Indian species of *Cryptogonus* Mulsant

1. Body oblong to subrounded, dorsal surface not shiny, less coarse to finely punctate, pubescence not suberect-----2

- Body elongate-oval, dorsal surface shiny, much coarsely punctate, pubescence suberect-----***nitidus* Kapur**
- 2. Carinae as long as the prosternum, always reaching the anterior margin-----**3**
- Carinae nearly two-third the length of prosternum, subparallel, slightly narrowing anteriorly to meet each other in a rounded arch away from the anterior margin-----**6**
- 3. Carinae meeting each other at the anterior margin, the enclosed area coarsely punctate as the other part of prosternum-----**4**
- Carinae meeting each other at the anterior margin and proceeding forward as a single carina which joins the anterior margin, the area enclosed by them more finely and sparsely punctate than the rest of the prosternum----- **5**
- 4. Carinae nearly as wide apart at the base as the basal width of prosternal process, subparallel in the basal half and narrow in the apical half-----**13**
- Carinae much narrower than the base of prosternal process, subparallel in the basal half and widening in the anterior half before meeting each other in an arch at the apical margin of prosternum----- ***complexus* Kapur**
- 5. Carinae forming a triangle----- **14**
- Carinae running subparallel for two-third their length and acutely arched for the remaining one-third----- **15**
- 6. Elytra black with brownish borders, markings or spots -----**7**
- Elytra brownish with or without black borders, markings or spots-----**9**
- 7. Each elytron with a discal, brownish or yellowish testaceous spot-----**8**
- Each elytron with two yellowish testaceous spots-----***qudriguttatus* (Weise)**
- 8. Elytral spot oval, usually one-third as long as elytron, situated in the middle. more towards the suture -----***orbiculus* (Gyllenhal)**
- Elytral spot rounded, small, situated in the apical half and at two-third the length of elytron----- ***postmedialis* Kapur**

- 9 Elytra with black spots, margins with or without black borders-----10
- Elytra without black spots, margins all around narrowly bordered black -----
-----*laetus* (Weise)
10. Each elytron with more than one black spot ----- 11
- Each elytron with a large, oval, discal black spot ----- *bimaculatus* Kapur
11. Elytra without any black border along the margins, each elytron with three black spots----- 12
- Elytra with broad black border along the basal and apical margins, each elytron with two black spots----- *trioblitus* (Gorham)
12. Pronotum with antero-medially placed black spot; elytra without humeral spot--
----- *ariasi* (Mulsant)
- Pronotum with postero-medially placed black spot; elytra with humeral spot----
----- *hingstoni* Kapur
13. Pronotum with anterior margin black; elytra black, with a testaceous rounded spot on each elytron ----- *lepidus* (Weise)
- Pronotum with anterior margin testaceous; elytra black, with out any testaceous rounded spot-----*himalayensis* Kapur
14. Body dorsally with deep and close punctation; the apical testaceous area on each elytron, together forming a broadly convex arc towards the base -----
-----*deltoides* Kapur
- Body dorsally with shallow and sparse punctation; the apical testaceous area on each elytron, forming separately a semicircular arc towards the scutellum -----
-----*deltodirus* Kapur
15. External margin of elytra not completely black; male genitalia with basal lobe shorter than parameres ----- 16
- External margin of elytra completely black; male genitalia with basal lobe longer than parameres----- *bilineatus* Kapur

16. External margin of each elytron, with an oblong testaceous spot at the humeral angle and a longitudinal reddish testaceous stripe on the disc, well separated from the base and apex ----- ***bryanti* Kapur**
- External margin of each elytron with an irregular yellow stripe, terminating a little before the apex and two elongated yellow spots on the disc, situated one behind the other ----- ***kapuri* Ghorpade**

i. *Cryptogonus nitidus* Kapur

Cryptogonus nitidus Kapur, 1948c:104.

Prey : Unknown

Distribution : INDIA : Manipur.

ii. *Cryptogonus complexus* Kapur

Cryptogonus complexus Kapur, 1948c:110.

Cryptogonus complexus Kapur; Kapur, 1963b:24.

Prey: Unknown

Distribution: INDIA: Patkai mountains, Singhik.

iii. *Cryptogonus quadriguttatus* (Weise) (Fig.40A)

Aspidiphorus quadriguttatus Weise, 1895b:326.

Cryptogonus quadriguttatus (Weise); Weise, 1900:428.

Cryptogonus quadriguttatus (Weise); Kapur, 1948c:97.

Cryptogonus quadriguttatus (Weise); Kapur, 1963b:23.

Cryptogonus quadriguttatus (Weise); Kapur 1972:312.

Material Examined: 1 ♂, INDIA: Aligarh (Uttar Pradesh), predaceous on coccids on *Mangifera indica* Linnaeus, 29-VIII-1995 (Shama Afroze).

Prey: Aphids, coccids

Distribution: INDIA: Aligarh, Bengal, Haldwani, Goa, Kumaon hills, Patkai mountains, Sikkim.

iv. *Cryptogonus orbiculus* (Gyllenhal)

Coccinella orbiculus Gyllenhal, 1808:205.

Cryptogonus orbiculus(Gyllenhal); Mulsant, 1850:945.
Platynaspis oculata Motschulsky, 1858a:118.
Cryptogonus centroguttatus Boheman, 1859:206.
Cryptogonus malasiae Crotch, 1874:203.
Cryptogonus orbiculus(Gyllenhal); Crotch, 1874:203.
Cryptogonus orbiculus(Gyllenhal); Weise, 1885b:63.
Cryptogonus orbiculus(Gyllenhal); Weise, 1900:424.
Cryptogonus orbiculus(Gyllenhal); Korschefsky, 1931:173.
Cryptogonus orbiculus(Gyllenhal); Kapur, 1948c:90.
Cryptogonus orbiculus(Gyllenhal); Sasaji, 1971:195.
Cryptogonus orbiculus(Gyllenhal); Canepari, 1986:27.

Prey : Coccids

Distribution : INDIA : Assam Valley , Belgaum,Doherty,Nilgiri hills, Patkai mountains, Ramgarh, Sudiya.

v. *Cryptogonus postmedialis* Kapur

Cryptogonus postmedialis Kapur, 1948c:95.
Cryptogonus postmedialis Kapur; Kapur, 1963b:23.

Prey :Unknown

Distribution :INDIA: Assam,Darjeeling hills, Khaula,Singhik, Upper Gumti Valley.

vi. *Cryptogonus laetus* (Weise)

Aspidimerus laetus Weise, 1885a: 233.
Cryptogonus laetus (Weise);Weise,1900 : 427.
Cryptogonus laetus (Weise);Korschefsky, 1931:178.
Cryptogonus laetus (Weise);Kapur, 1948c:97.

Prey : Unknown.

Distribution: INDIA

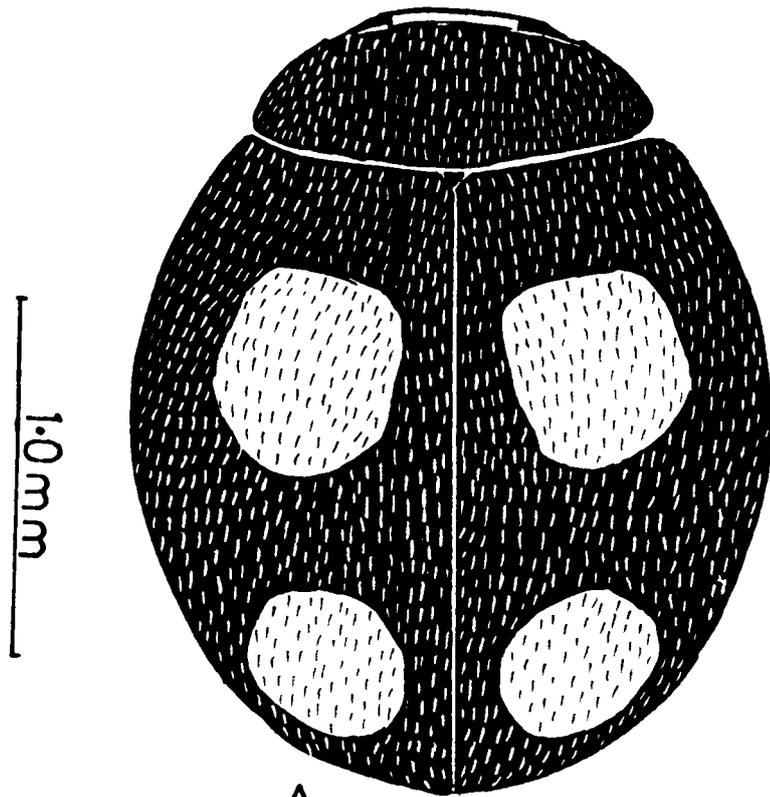
vii. *Cryptogonus bimaculatus* Kapur (Fig.40B)

Cryptogonus bimaculatus Kapur, 1948c:100

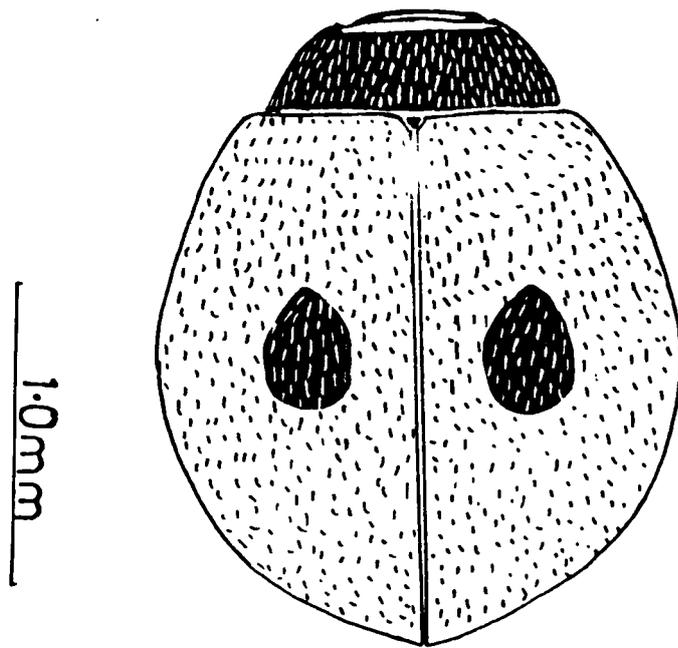
Material Examined: 1 ♂, INDIA: Jorhat (Assam),predaceous on aphids on *Solanum melongena* Linnaeus, 18-X - 1995 (Sudhir Singh).

Prey: Aphids

Distribution: INDIA: Jorhat, Nagahills, Patkai mountains.



A



B

Fig.40A: *Cryptogonus quadriguttatus* (Weise)
Dorsal view

Fig.40B: *Cryptogonus bimaculatus* Kapur
Dorsal view

viii. *Cryptogonus trioblitus*(Gorham)

- Aspidimerus trioblitus* Gorham, 1895a:690.
Aspidimerus trioblitus Gorham; Korschefsky, 1931:173.
Cryptogonus trioblitus (Gorham); Kapur, 1948c:101.
Cryptogonus trioblitus (Gorham); Kapur, 1955:335.
Cryptogonus trioblitus (Gorham); Canepari, 1986:27.

Prey :Unknown

Distribution: INDIA: Gori Valley, Khasi hills, Patkai mountains.

ix. *Cryptogonus ariasi* (Mulsant)

- Aspidimerus ariasi* Mulsant, 1853b:265.
Aspidimerus ariasi Mulsant; Crotch, 1874 : 202.
Aspidimerus ariasi Mulsant; Weise, 1900 : 427.
Aspidimerus ariasi Mulsant; Korschefsky, 1931: 172.
Cryptogonus ariasi (Mulsant); Kapur, 1948c : 102.
Cryptogonus ariasi (Mulsant); Kapur, 1963b : 24.

Prey: Aphids

Distribution: INDIA: Haldwani, Khaula, Mizorum, Ranikhet, Singhik.

x. *Cryptogonus hingstoni* Kapur

- Cryptogonus hingstoni* Kapur, 1948c:103.
Cryptogonus hingstoni Kapur; Kapur, 1963b:24.

Prey :Unknown

Distribution: INDIA: Singhik.

xi. *Cryptogonus lepidus*(Weise)

- Aspidimerus lepidus* Weise, 1885a:233.
Cryptogonus lepidus (Weise); Weise, 1900:428.
Cryptogonus lepidus (Weise); Korschefsky, 1931:173.
Cryptogonus lepidus (Weise); Kapur, 1948c:107.

Prey : Unknown

Distribution: INDIA : Assam.

xii. *Cryptogonus himalayensis* Kapur

- Cryptogonus himalayensis* Kapur, 1948c:108.
Cryptogonus himalayensis Kapur; Kapur, 1963b:24.

Prey :Unknown

Distribution: INDIA: Singhik.

xiii. *Cryptogonus deltoides* Kapur

Cryptogonus deltoides Kapur, 1948c:112.

Prey: Unknown

Distribution: INDIA: Merong, Perak.

xiv. *Cryptogonus deltodirus* Kapur

Cryptogonus deltodirus Kapur, 1948c:113.

Prey: Unknown

Distribution : INDIA : Martapura.

xv. *Cryptogonus bilineatus* Kapur

Cryptogonus bilineatus Kapur, 1948c:115.

Prey: Unknown

Distribution : INDIA: Mysore.

xvi. *Cryptogonus bryanti* Kapur

Cryptogonus bryanti Kapur, 1948c:116.

Prey: Unknown

Distribution: INDIA: Mysore.

**xvii. *Cryptogonus kapuri* Ghorpade
(Fig.41 A-G)**

Cryptogonus kapuri Ghorpade, 1974:55.

Material Examined: 2 ♂♂ INDIA: Chikmagalur (Karnataka), predaceous on aphids on *Cocos nucifera* Linnaeus, 20-V-1995 (M. Dhanam).

Prey: Aphids

Distribution: INDIA: Bangalore, Chikmagalur.

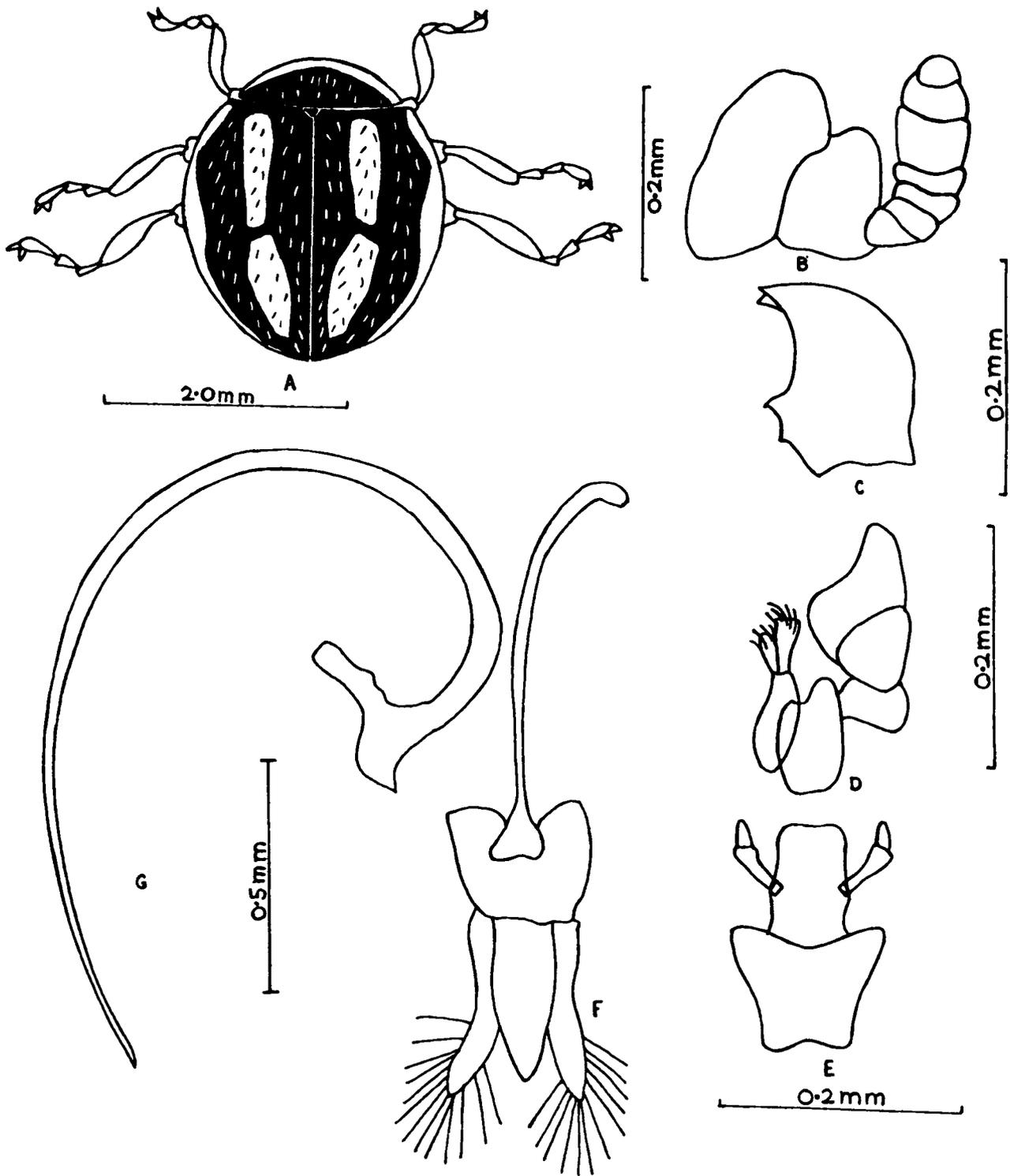


Fig.41A-G: *Cryptogonus Kapuri* Ghorpade
 A=Dorsal view, B=Antenna, C=Mandible,
 D=Maxilla, E=Labium, F=Phallobase
 G=Siphus

Tribe Scymnini Costa

Scymnini Costa; 1849: 9,78.

Scymnini Costa; Kapur, 1966:183.

Scymnini Costa; Sasaji, 1968a:24.

Body dorsally pubescent; Antennae 9 to 11-segmented; terminal segment of maxillary palp nearly with parallel sides; legs with tarsi trimerous or cryptotetramerous; siphon of male genitalia moderately to strongly curved, siphonal capsule well developed, female genital plates usually elongated rarely transverse.

The tribe Scymnini Costa is represented by four genera from India. Their separation is given in the key to genera. The representatives of the genus *Cryptolaemus* Mulsant are comparatively large sized.

Genus *Cryptolaemus* Mulsant

Cryptolaemus Mulsant, 1853b:268.

Type species: *Cryptolaemus montrousieri* Mulsant, 1853b:268.

Cryptolaemus Mulsant; Korschefsky, 1931:169.

Cryptolaemus Mulsant; Chapin, 1965b:193,198.

Cryptolaemus Mulsant; Sasaji, 1971:91,93.

Cryptolaemus Mulsant; Gordon, 1985:100.

Cryptolaemus Mulsant; Booth & Pope, 1986:704.

Diagnosis: Body relatively large sized (3.5-4.6 mm), oval, strongly convex; antennae (fig. 42B) 10-segmented; prosternum extended forwardly, concealing the mouth parts, without carinae; first abdominal sternite with femoral line complete (fig. 42F); legs without mid and hind tibial spurs, tarsi trimerous, claws with quadrate basal tooth; male genitalia with basal lobe almost triangular, parameres broad, spatulate, hypomere considerably longer than parameres, narrow and slender (fig. 42H); siphon (fig. 42I) proximally with unequal bilobed siphonal capsule, distal end truncated.

The genus is represented by single species from India.

Cryptolaemus montrousieri Mulsant (Fig. 42A-I)

Cryptolaemus montrousieri Mulsant, 1853b:268.

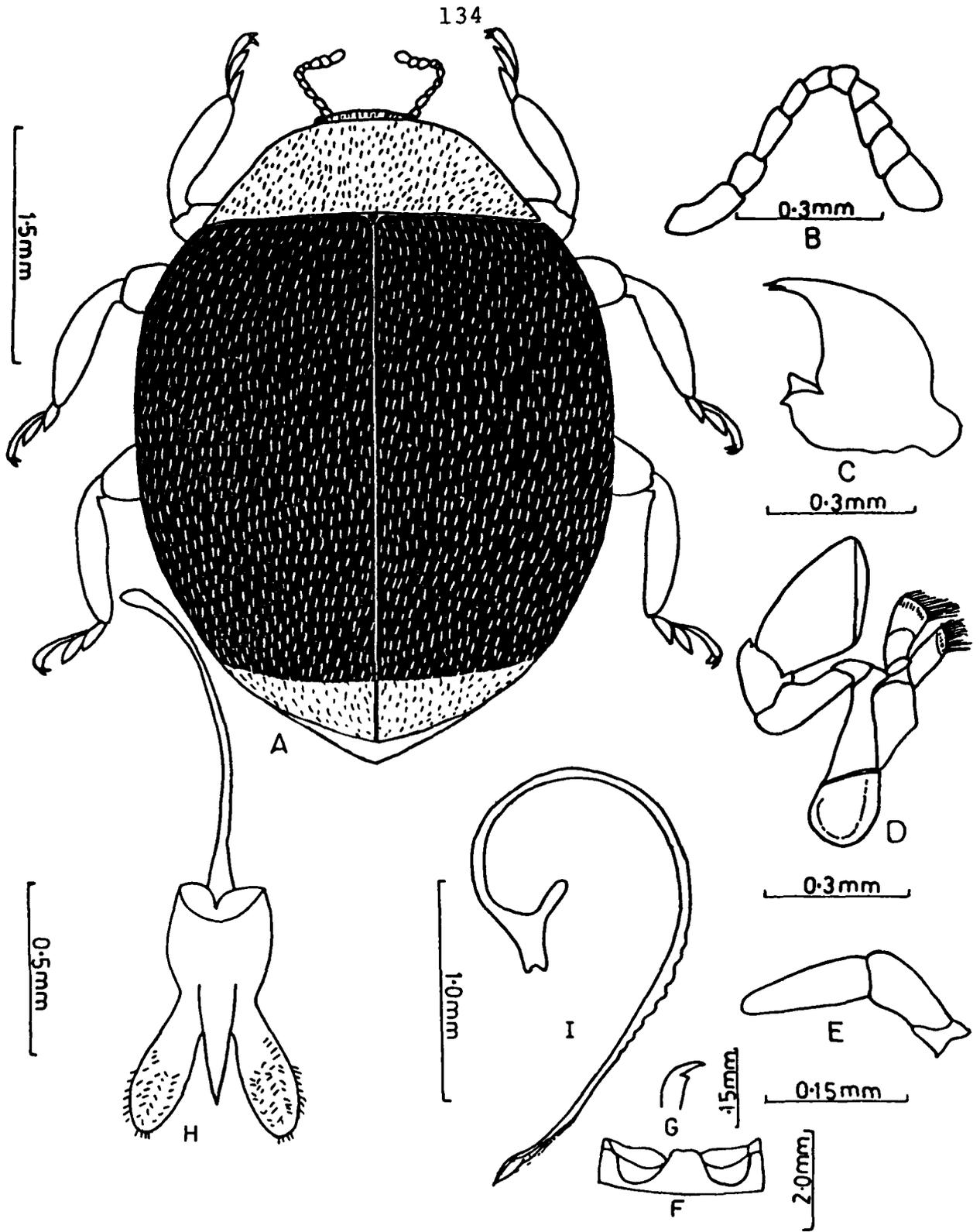


Fig. 42A-I: *Cryptolaemus montrouzieri* Mulsant
 A=Dorsal view, B=Antenna, C=Mandible,
 D=Maxilla, E=Labial palp, F=1st abdominal sternite,
 G=Tarsal claw, H=Phallobase, I=Sipho

Cryptolaemus montrousieri Mulsant; Crotch, 1874:204.
Cryptolaemus montrousieri Mulsant; Cockerell, 1929:271.
Cryptolaemus montrousieri Mulsant; Korschefsky, 1931:169.
Cryptolaemus montrousieri Mulsant; Rao & David, 1958:545.
Cryptolaemus montrousieri Mulsant; Wilson, 1960:102.
Cryptolaemus montrousieri Mulsant; Chapin, 1965b:199.
Cryptolaemus montrousieri Mulsant; Gordon, 1985:105.
Cryptolaemus montrousieri Mulsant; Booth and Pope, 1986:706.

Material Examined: 3 ♂♂, INDIA: Hebbal (Bangalore), predaceous on *Pulyinaria psidii* Maskell on *Mangifera indica* Linnaeus, 20-V- 1995(Arshad Ali Haider).

Prey: Aphids, mealy bugs

Distribution: INDIA: Hebbal, Mysore.

Genus *Nephus* Mulsant

Nephus Mulsant, 1846 : 237.

Type species: *Sphaeridium quadrimaculatus* Herbst, 1783:30.

Nephus Mulsant; Sicard, 1909:134.

Nephus Mulsant; Chu *et al.*, 1978:136.

Diagnosis: Body small usually oblong, moderately convex; antennae (fig.43B) 10-segmented; prosternum without carinae; first abdominal sternite with femoral line incomplete (fig.43F); legs without mid and hind tibial spurs, tarsal claws with small triangular basal tooth; male genitalia with basal lobe elongated in lateral view, gradually narrowed towards apex, parameres usually shorter than basal lobe, hypomere considerably long (fig.43H);sipho (fig.43I) proximally with unequal bilobed siphonal capsule, inner lobe longer than outer, distal end truncated.

The genus is represented by five species from India. A key for their separation is given below.

Key to Indian species of *Nephus* Mulsant

1. Body dorsally with simple coloration -----2
- Body dorsally with distinct ornamental coloration-----**severini (Weise)**
- 2 Body relatively rounded----- 3
- Body oblong ----- 4

3. Pronotum and elytra pale testaceous; each elytron with an obtriangular black spot nearly two-third the length of the elytron ----- *bistillatus* (Mulsant)
- Pronotum and elytra light brown; each elytron with a roundish, dark brown and rather large median spot-----*regularis* (Sicard)
4. Pronotum and elytra yellowish brown; each elytron with a oval, yellowish subapical spot-----*ryuguus* (Kamiya)
- Pronotum light castaneous; elytra testaceous except piceous at the base and three-fourth along the suture----- *tagiapatus* (Kamiya)

i. *Nephus severini* (Weise)

Eurodolia severini Weise, 1895a:150.

Nephus severini (Weise); Kapur, 1966:165.

Prey: Unknown

Distribution: INDIA

ii. *Nephus bistillatus* (Mulsant)

Scymnus bistillatus Mulsant, 1853a:145.

Scymnus bistillatus Mulsant; Crotch, 1874:252.

Nephus bistillatus (Mulsant); Kapur, 1966:165.

Prey: Unknown

Distribution: INDIA

iii. *Nephus regularis* (Sicard)

Scymnus regularis Sicard, 1929:183.

Nephus regularis (Sicard); Puttarudriah & Channabasavanna, 1955:2.

Nephus regularis (Sicard); Puttarudriah & Channabasavanna, 1956:157.

Nephus regularis (Sicard); Puttarudriah & Channabasavanna, 1957:9.

Nephus regularis (Sicard); Chelliah, 1965: 166.

Nephus regularis (Sicard); Kapur, 1966:165.

Prey: *Aphis gossypii* Glov., *Pseudococcus* sp.

Distribution: INDIA: Bangalore, Coimbatore, Mysore.

**iv. *Nephus ryuguus* (Kamiya)
(Fig.43A-I)**

Scymnus ryuguus Kamiya, 1966: 65-93.
Nephus ryuguus (Kamiya); Chu *et al.*, 1978: 137.

Material Examined: 2 ♂♂ INDIA: Aligarh (Uttar Pradesh) predaceous on aphids on *Psidium guajava* Linnaeus, 30-IV-1994 (Shama Afroze).

Prey: Aphids

Distribution: INDIA: Aligarh.

v. *Nephus tagiapatus* (Kamiya)

Scymnus tagiapatus Kamiya, 1965c:104.
Nephus roonwali Kapur, 1966:163.
Nephus tagiapatus (Kamiya); Sasaji, 1968b:122.
Nephus tagiapatus (Kamiya); Chunram & Sasaji, 1980:476.

Prey: Unknown

Distribution: INDIA: Andaman Islands.

Genus *Scymnus* Kugelann

Scymnus Kugelann, 1794a : 545.
Type species: *Scymnus nigrinus* Kugelann, 1794:548.
Scymnus Kugelann; Mulsant, 1846:219.
Scymnus Kugelann; Crotch, 1874 : 239
Scymnus Kugelann; Sicard, 1909 : 134.
Scymnus Kugelann; Chu *et al.*, 1978: 136.

Diagnosis: Body small, oval to oblong, moderately convex; antennae 10 to 11- segmented; prosternum with or without carinae; first abdominal sternite with femoral line complete (except in subgenus *Scymnus* s.str. (figs.44F, 45F, 46F,47F,); legs without mid and hind tibial spurs, tarsal claws narrow to broad with triangular or subquadrate basal tooth; male genitalia with basal lobe usually stout, rarely elongated, parameres long spatulate, hypomere usually longer than parameres (figs.44G, 45G, 46H, 47G); siphon (figs.44H,45H, 46I,47H)proximally with unequal bilobed siphonal capsule, inner lobe usually longer than outer, distal end usually dilated; female genitalia with spermatheca weakly to moderately curved, posterior

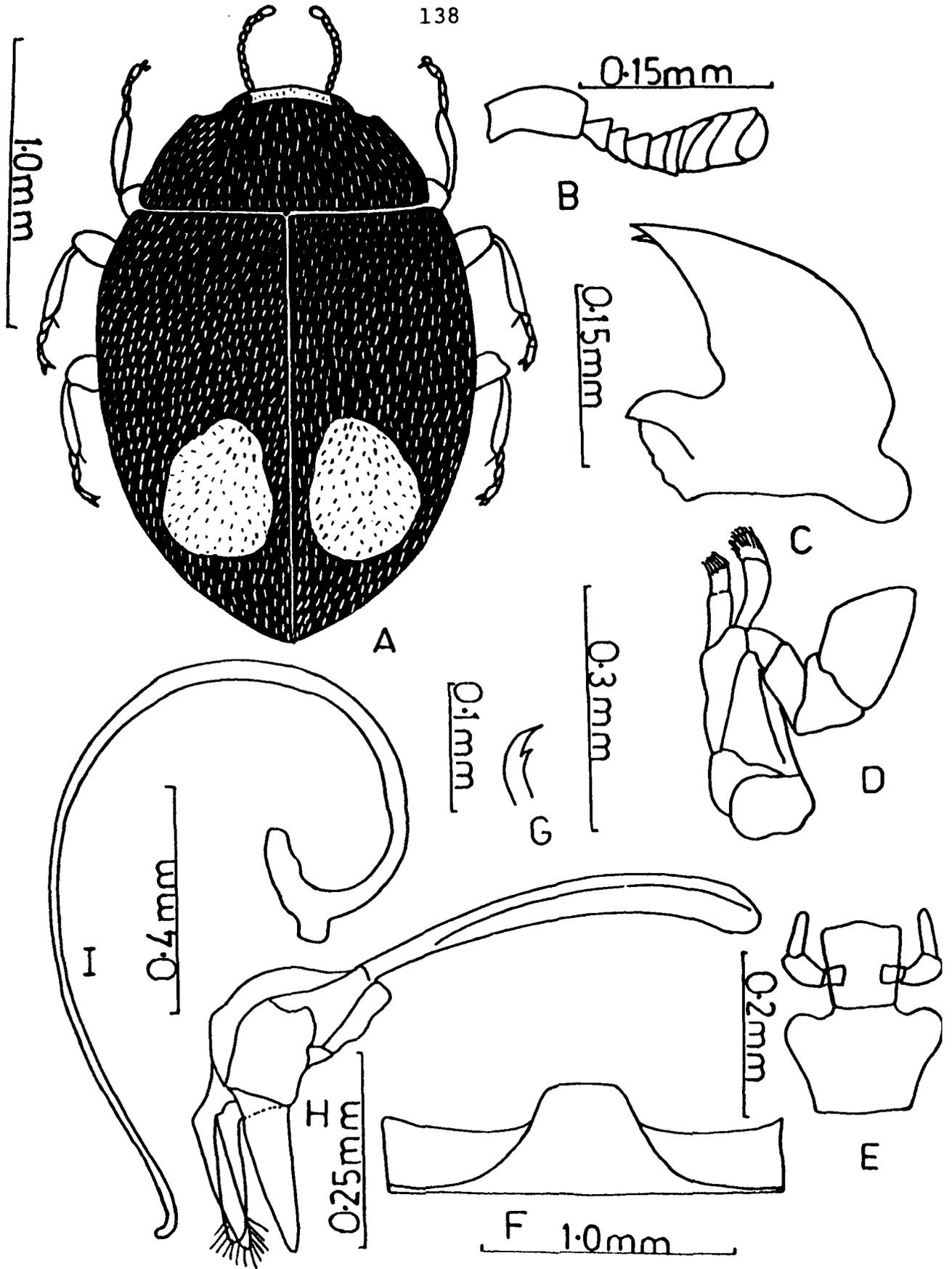


Fig.43A-I:

Nephus ryuguus Kamiya
 A=Dorsal view, B=Antenna, C=Mandible,
 D=Maxilla, E=Labium, F=1st abdominal sternite,
 G=Phallobase, H=Sipho.

half thickened, nodulus and ramus poorly developed, genital plates always elongated, styli small.

The genus is represented by three subgenera. Their separation is given in the key to genera.

1. s. gen. *Neopullus* Sasaji

Neopullus Sasaji, 1971: 328.

Typespecies: *Coccinella fuscatus* Boheman, 1859: 208.

Neopullus Sasaji; Chu *et al.*, 1978: 136.

The subgenus is represented by two species from India. A key for their separation is given below.

Key to Indian species of *Neopullus* Sasaji

1. Elytra with blackish sutural, basal and lateral margins; male genitalia with parameres shorter than basal lobe ----- ***hoffmanni* (Weise)**
- Elytra without blackish sutural, basal and lateral margins; male genitalia with parameres longer than basal lobe----- ***loebli* Canepari**

i. *Scymnus* (*Neopullus*) *hoffmanni* Weise (Fig.44A-H)

Scymnus (*Pullus*) *hoffmanni* Weise, 1879b : 147.

Scymnus (*Pullus*) *hoffmanni* Weise; Miyatake, 1959 : 132.

Scymnus (*Neopullus*) *hoffmanni* (Weise); Chu *et al.*, 1978 : 139.

Material Examined: 2 ♂♂ INDIA: Aligarh (Uttar Pradesh), on light, 30-VIII-1995 (Shama Afroze).

Prey: Unknown

Distribution: INDIA: Aligarh.

ii. *Scymnus* (*Neopullus*) *loebli* Canepari

Scymnus (*Neopullus*) *loebli* Canepari, 1986:26.

Prey: Unknown

Distribution: INDIA: Ranikhet.

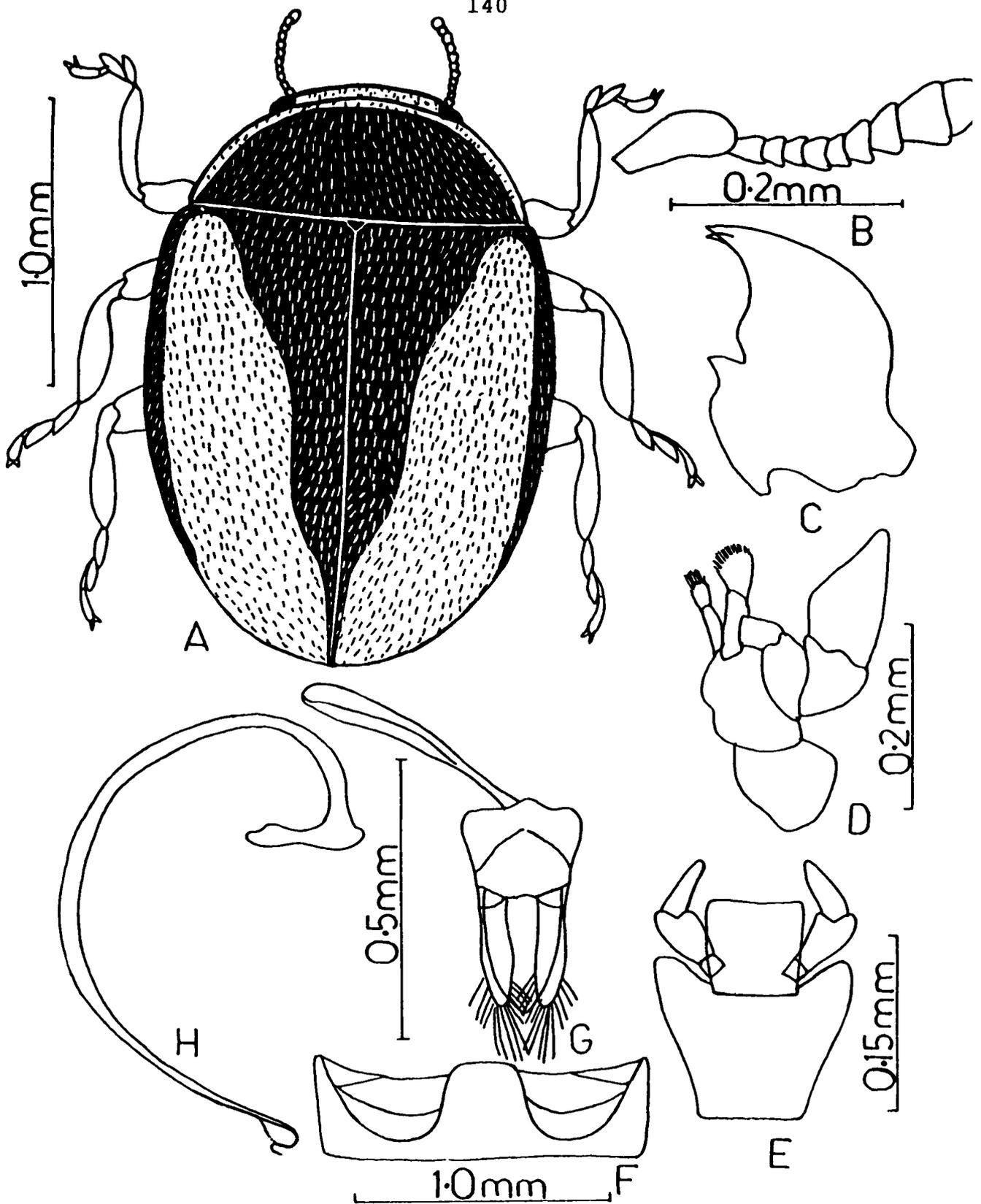


Fig.44A-H:

Scymnus (Neopullus) hoffmanni Weise
 A=Dorsal view, B=Antenna, C=Mandible,
 D=Maxilla, E=Labium, F=1st abdominal sternite,
 G=Phallobase, H=Siphon.

2. s.gen *Pullus* Mulsant

Pullus Mulsant, 1850: 1021.

Type species: *Coccinella subvillosus* Goeze 1777:247.

Pullus Mulsant; Sicard, 1909: 139.

Pullus Mulsant; Chu *et al.*, 1978: 136.

The subgenus is represented by twenty two species from India. A key for their separation is not given due to insufficient key characters of some species.

i. *Scymnus (Pullus) coccivora* Ayyar (Fig.45A-I)

Scymnus (Pullus) coccivora Ayyar, 1925 : 491.

Scymnus (Pullus) coccivora Ayyar; Ayyar, 1929 : 6.

Scymnus (Pullus) coccivora Ayyar; Kapur, 1972 : 311.

Material Examined: 40 ♀♀, 50 ♂♂, INDIA: Aligarh (Uttar Pradesh), predaceous on *Phenacoccus insolitus* Green on *Zizyphus jujuba* Linnaeus, 15-x-1995 (Shama Afroze); 35 ♀♀, 20 ♂♂, Aligarh, predaceous on *P. insolitus* Green on *Solanum melongena* Linnaeus, and *Coccinia indica*, W.A., 11-xi-1996 (Shama Afroze).

Prey: *Phenacoccus insolitus* Green, *Pulvinaria maxima* Green

Distribution: INDIA: Aligarh, Coimbatore, Margao.

ii. *Scymnus (Pullus) kawamurai* (Ohta) (Fig.46A-J)

Scymnus kawamurai Ohta, 1929: 8.

Scymnus (Pullus) kawamurai (Ohta); Sasaji, 1971:171.

Scymnus (Pullus) kawamurai (Ohta); Chu *et al.*, 1978 : 137.

Scymnus (Pullus) kawamurai (Ohta); Canepari, 1986 : 25.

Material Examined : 2 ♀♀, 2 ♂♂ INDIA: Aligarh (Uttar Pradesh), predaceous on aphids on *Brassica oleracea* Linnaeus, 23-XI-1995 (Shama Afroze).

Prey : Aphids

Distribution : INDIA: Aligarh, Garhwal.

iii. *Scymnus (Pullus) quadrillum* (Motschulsky) (Fig. 47A-J)

Scymnus quadrillum Motschulsky, 1858a:120.

Scymnus (Pullus) quadrillum (Motschulsky); Weise, 1900 : 436.

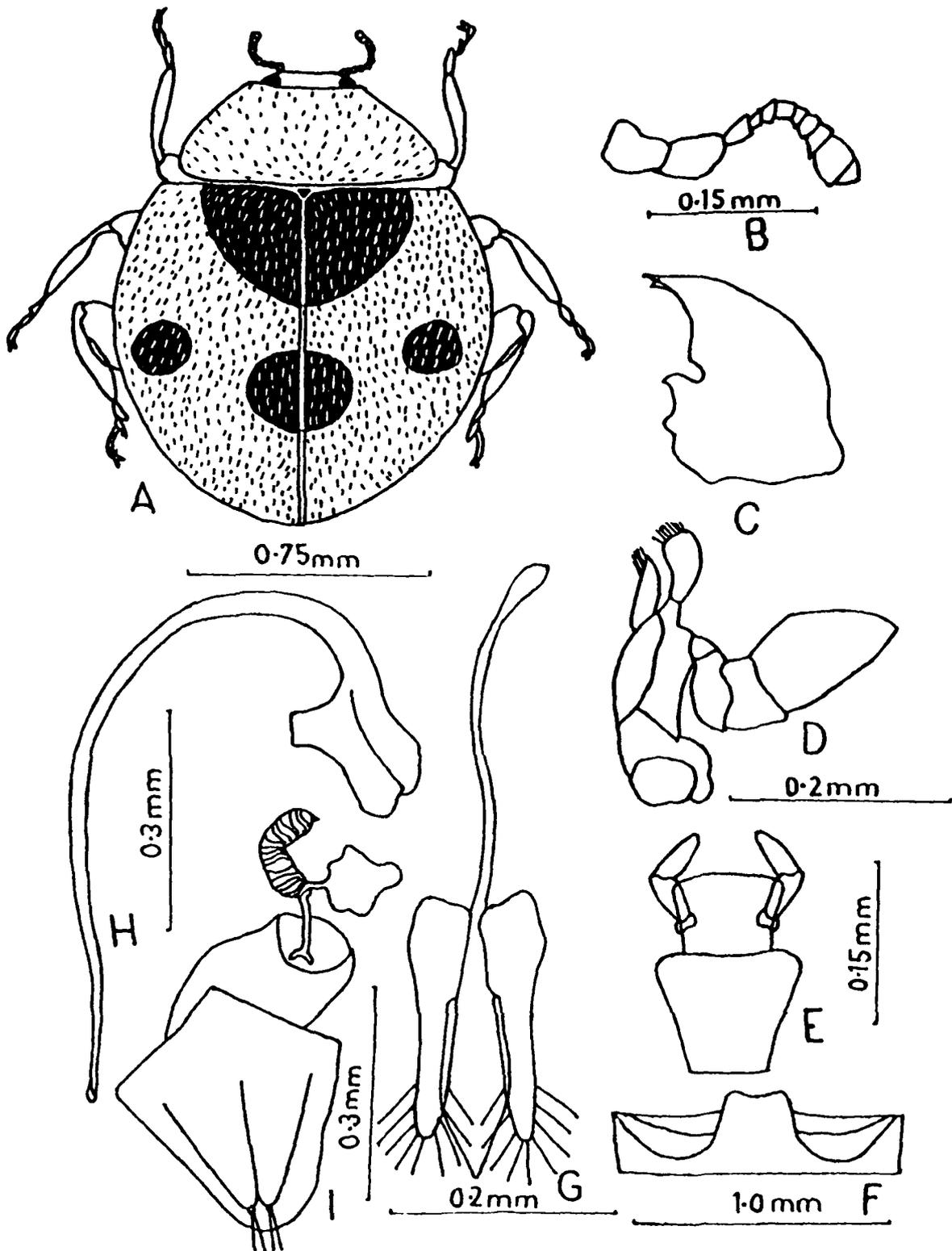


Fig.45A-I:

Scymnus (Pullus) coccivora Ayyar
 A=Dorsal view, B=Antenna, C=Mandible,
 D=Maxilla, E=Labium, F=1st abdominal sternite,
 G=Phallobase, H=Sipho, I=Female genitalia.

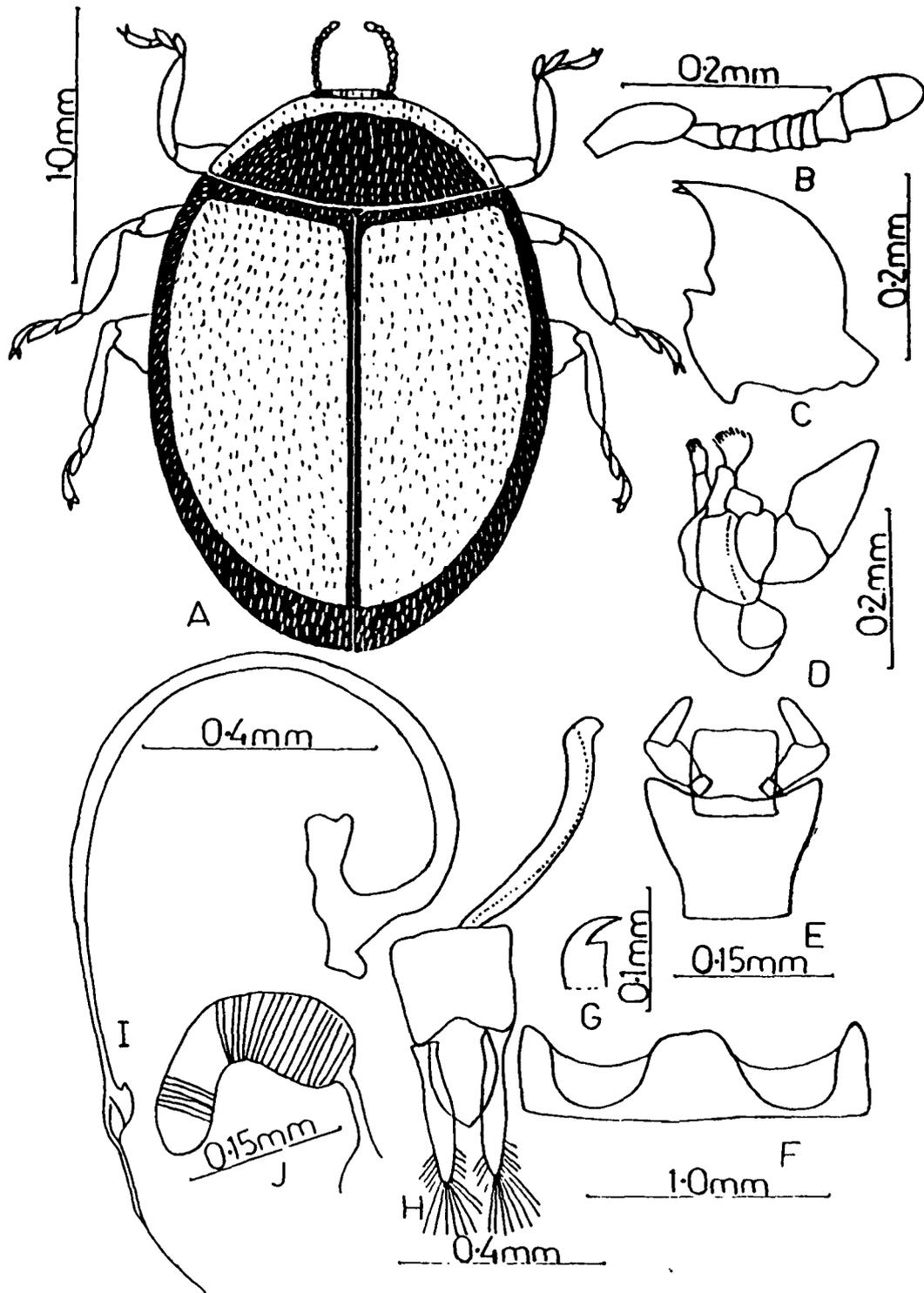


Fig.46A-J: *Scymnus (Pullus) kawamurai* (Ohta)
 A=Dorsal view, B=Antenna, C=Mandible,
 D=Maxilla, E=Labium, F=1st abdominal sternite,
 G=Tarsal claw, H= Phallobase, I=Siphon, J=Spermatheca.

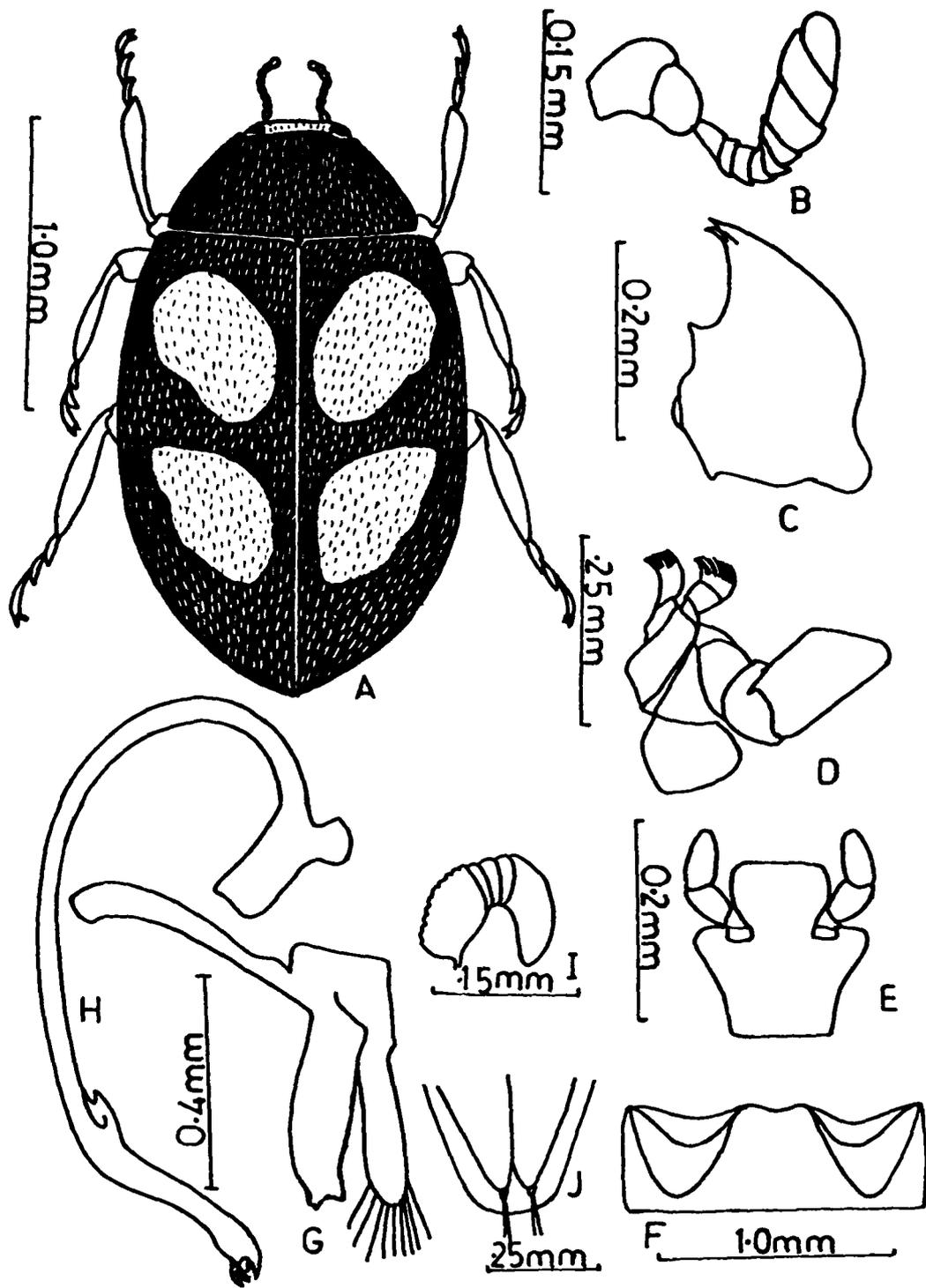


Fig.47A-J: *Scymnus (Pullus) quadrillum* (Motschulsky)
 A=Dorsal view, B=Antenna, C=Mandible,
 D=Maxilla, E=Labium, F=1st abdominal sternite,
 G=Phallobase, H=Sipho, I=Spermatheca, J=Genital plates.

Scymnus (Pullus) quadrillum (Motschulsky); Korschevsky, 1931:144.
Scymnus (Pullus) quadrillum (Motschulsky); Kapur, 1942 : 60.
Scymnus (Pullus) quadrillum (Motschulsky); Kapur, 1972:31.

Material Examined 2 ♀♀, 3 ♂♂ INDIA: Aligarh (Uttar Pradesh), predaceous on aphids on *Capsicum annuum* Linnaeus, 24-IV-1994 (Shama Afroze).

Prey: Aphids

Distribution: INDIA: Aligarh, Bangalore, Bihar, Delhi, Kanpur, Mysore, Ponda.

iv. *Scymnus (Pullus) apiciflavus* Motschulsky

Scymnus (Pullus) apiciflavus Motschulsky; 1858a: 119.
Scymnus (Pullus) apiciflavus Motschulsky; Crotch, 1874:254.

Prey: Unknown

Distribution: INDIA

v. *Scymnus (Pullus) assamensis* Canepari

Scymnus (Pullus) assamensis Canepari, 1986 : 23.

Prey: Unknown

Distribution: INDIA: Assam.

vi. *Scymnus (Pullus) besucheti* Canepari

Scymnus (Pullus) besucheti Canepari, 1986:29.

Prey: Unknown

Distribution: INDIA: Darjeeling, West Bengal.

vii. *Scymnus (Pullus) bourdilloni* Kapur

Scymnus (Pullus) bourdilloni Kapur, 1955 : 335.
Scymnus (Pullus) bourdilloni Kapur; Kapur, 1963b: 20.

Prey: Unknown

Distribution: INDIA: Singhik.

viii. *Scymnus (Pullus) brunnescens* Motschulsky

Scymnus (Pullus) brunnescens Motschulsky, 1866: 425.
Scymnus (Pullus) brunnescens Motschulsky; Crotch, 1874:256.
Scymnus (Pullus) brunnescens Motschulsky; Weise, 1900:437.

Scymnus (Pullus) brunnescens Motschulsky; Korschefsky, 1931:122.
Scymnus (Pullus) brunnescens Motschulsky; Kapur, 1966: 160.

Prey: Unknown

Distribution: INDIA: Andaman Islands.

ix. *Scymnus (Pullus) castaneus* Sicard

Scymnus (Pullus) castaneus Sicard, 1929:180.
Scymnus (Pullus) castaneus Sicard; Puttarudriah & Channabasavanna, 1956:156.

Prey: Mealybugs.

Distribution: INDIA: Bangalore, Mysore.

x. *Scymnus (Pullus) facetus* Canepari

Scymnus (Pullus) facetus Canepari, 1986 : 24.

Prey: Unknown

Distribution: INDIA: Garhwal.

xi. *Scymnus (Pullus) gratiosus* Weise

Scymnus (Pullus) gratiosus Weise, 1900:439.
Scymnus (Pullus) gratiosus Weise; Puttarudriah & Channabasavanna, 1955:2.
Scymnus (Pullus) gratiosus Weise; Puttarudriah & Channabasavanna, 1956:156.

Prey: *Icerya purchasi* Maskell

Distribution: INDIA: Mandya.

xii. *Scymnus (Pullus) hingstoni* Kapur

Scymnus (Pullus) hingstoni Kapur, 1963b:22.
Scymnus (Pullus) hingstoni Kapur; Canepari, 1986:26.

Prey : Unknown

Distribution: INDIA: Khasi hills, Orissa.

xiii *Scymnus (Pullus) meghalayae* Canepari

Scymnus (Pullus) meghalayae Canepari, 1986:24.

Prey: Unknown

Distribution: INDIA: Khasi hills.

xiv. *Scymnus (Pullus) nepalensis* Bielawski

Scymnus (Pullus) nepalensis Bielawski, 1971:3

Scymnus (Pullus) nepalensis Bielawski; Canepari, 1986:25.

Prey: Unknown

Distribution: INDIA: Darjeeling.

xv. *Scymnus (Pullus) pallidicollis* Mulsant

Scymnus (Pullus) pallidicollis Mulsant, 1853a:152.

Scymnus (Pullus) pallidicollis Mulsant; Crotch, 1874:256.

Scymnus (Pullus) pallidicollis Mulsant; Puttarudriah & Channabasavanna, 1955:2.

Scymnus (Pullus) pallidicollis Mulsant; Puttarudriah & Channabasavanna, 1957:8.

Prey: *Pseudococcus* sp.

Distribution: INDIA: Chitaldrug, Coorg.

xvi. *Scymnus (Pullus) picescens* Gorham

Scymnus (Pullus) picescens Gorham, 1894a:207.

Scymnus (Pullus) picescens Gorham; Puttarudriah & Channabasavanna, 1956:156.

Prey: Aphids

Distribution: INDIA: Mysore.

xvii. *Scymnus (Pullus) posticallis* Sicard

Scymnus (Pullus) posticallis Sicard, 1912:503.

Scymnus (Pullus) posticallis Sicard; Korschefsky, 1931:144.

Scymnus (Pullus) posticallis Sicard; Kapur, 1973:458.

Scymnus (Pullus) posticallis Sicard; Canepari, 1986:25.

Prey: Unknown

Distribution: INDIA: Gauhati.

xviii. *Scymnus (Pullus) pyrocheilus* Mulsant

Scymnus (Pullus) pyrocheilus Mulsant, 1853b:281.

Scymnus (Pullus) pyrocheilus Mulsant; Crotch, 1874:256.

Scymnus (Pullus) pyrocheilus Mulsant; Korschefsky, 1931:144.

Scymnus (Pullus) pyrocheilus Mulsant; Kapur, 1955:338.

Scymnus (Pullus) pyrocheilus Mulsant; Kapur, 1963b:22.

Scymnus (Pullus) pyrocheilus Mulsant; Kapur, 1966:160.

Prey: Unknown

Distribution: INDIA: Andaman Islands, Calcutta.

xix. *Scymnus (Pullus) sodalis* Weise

Scymnus (Pullus) sodalis Weise, 1923:186.
Scymnus (Pullus) sodalis Weise; Miyatake, 1959:134.
Scymnus (Pullus) sodalis Weise; Chu *et al.*, 1978:138.

Prey: Unknown

Distribution: INDIA: Sikkim.

xx. *Scymnus (Pullus) testacecollis* Kapur

Scymnus (Pullus) testacecollis Kapur, 1963b:21.

Prey: Unknown

Distribution: INDIA: Sikkim.

xxi. *Scymnus (Pullus) victoris* Motschulsky

Scymnus (Pullus) victoris Motschulsky, 1858a:118.
Scymnus (Pullus) victoris Motschulsky; Crotch, 1874:253.
Scymnus (Pullus) victoris Motschulsky; Puttarudriah & Channabasavanna, 1956:156.

Prey: Aphids, pseudococcids

Distribution: INDIA : Bangalore, Mysore.

xxii. *Scymnus (Pullus) xerampelinus* Mulsant

Scymnus (Pullus) xerampelinus Mulsant, 1853a:149.
Scymnus (Pullus) xerampelinus Mulsant; Crotch, 1874:256.
Scymnus (Pullus) xerampelinus Mulsant; Puttarudriah & Channabasavanna, 1955:2.

Prey: Aphids

Distribution: INDIA: Bangalore, Belgaum.

3. s.gen. *Scymnus* s.str.

Scymnus s.str.; Chu *et al.*, 1978:136.

The subgenus is represented by six species from India. A key for their separation is not given due to insufficient key characters of some species.

i. *Scymnus (Scymnus) andamanensis* Kapur

Scymnus (Scymnus) andamanensis Kapur, 1966:161.

Prey: Unknown

Distribution: INDIA: Andaman Islands.

ii. *Scymnus (Scymnus) gracilis* Motschulsky

Scymnus (Scymnus) gracilis Motschulsky, 1866:426.

Scymnus (Scymnus) gracilis Motschulsky; Crotch, 1874:257.

Prey: Mites

Distribution: INDIA: Kashmir.

iii. *Scymnus (Scymnus) hilaris* Motschulsky

Scymnus (Scymnus) hilaris Motschulsky, 1858a: 119.

Scymnus (Scymnus) hilaris Motschulsky; Crotch, 1874:254.

Prey: Aphids, *Aleurolobus barodensis* Maskell

Distribution: INDIA: Mizorum, Orissa.

iv. *Scymnus (Scymnus) levaillantii* Mulsant

Scymnus (Scymnus) levaillantii Mulsant, 1850:964.

Scymnus (Scymnus) levaillantii Mulsant; Crotch, 1874:241.

Scymnus (Scymnus) levaillantii Mulsant; Canepari, 1986:26.

Prey: Unknown

Distribution: INDIA: Garhwal

v. *Scymnus (Scymnus) nubilus* Mulsant

Scymnus (Scymnus) nubilus Mulsant, 1850:972.

Scymnus (Scymnus) nubilus Mulsant; Crotch, 1874:253.

Scymnus (Scymnus) nubilus Mulsant; Puttarudriah & Channabasavanna, 1956:156.

Scymnus (Scymnus) nubilus Mulsant; Puttarudriah & Channabasavanna, 1957:8.

Scymnus (Scymnus) nubilus Mulsant; Kapur, 1972:311.

Prey: *Aleurolobus barodensis* Maskell, *Phenacoccus hirsutus* Green

Distribution: INDIA: Belgaum, Majorda, Merces, Mysore, Orissa, Panaji.

vi. *Scymnus (Scymnus) tristigmaticus* Gorham

Scymnus (Scymnus) tristigmaticus Gorham, 1894c:692.

Prey: Unknown

Distribution: INDIA: Khasi hills.

Bioecology of *Synia melanaria* Mulsant

Distribution, Seasonal occurrence and Hosts: The *Synia melanaria* Mulsant is widely distributed in Southern India (Subramaniam, 1923, 1925; Puttarudriah & Channabasavanna, 1953). It has also been reported from Northern India (Pradhan, 1938; Sharga, 1948). It is commonly found in Aligarh on *Butea monosperma* O. Ktz. from October to March which coincides with the severe infestation of *Coptosoma ostensum* Dist. on *B. monosperma*. O.Ktz Both larvae and adults are strong predator of the nymphs of *Coptosoma ostensum* Dist.

Materials and Methods: Adult beetles were collected from the leaves of *B. monosperma* O.Ktz. and confined in glass jars 8"x5" size with open end closed by muslin cloth, and reared on the nymphs of *C. ostensum* Dist. (fig. 48-V-X) for maintaining laboratory stock to evaluate their effectiveness against pest. The life cycle under laboratory conditions during October-November ($25^{\circ} \pm 5.0^{\circ}$ temperature with $80 \pm 5\%$ R.H.) was completed in 19 days (Table I).

Survival: The average hatchability of eggs was found to be 97% at $25 \pm 5^{\circ}\text{C}$ temperature and $80 \pm 5\%$ R.H., which is higher than *Coccinella septempunctata* Linnaeus (88%) (Singh & Malhotra, 1979) and *Harmonia eucharis* (Mulsant) ($73.6 \pm 4.5\%$) (Chakrabarti *et al.*, 1995). The average rates of survival of larvae and pupae were 92% and 96% respectively on the nymphs of *Coptosoma ostensum* Dist. which are higher than *H. eucharis* (Mulsant) Chakrabarti *et al.*, 1995). Significant larval mortality occurred only in the first instar (7%).

Longevity: Average longevity of adult beetles was recorded five months for female and four months for male (Table I) similar to *C. septempunctata* Linnaeus and *Menochilus sexmaculatus* (Fabricius) (Bagal & Trehan, 1945) but is considerably higher than *Brumoides suturalis* (Fabricius) and *Scymnus (Pullus) quadrillum* (Motschulsky)(Kapur, 1942); *Psyllobora bisoctonotata* (Mulsant) (Kapur, 1944):

Table - I

Duration (Days) of different life stages and longevity of adults in *Synla melanaria*
Mulsant at 25 ±5°C and 80 ±5% R.H.

Incubation Period (Days)	First Instar		Second Instar		Third Instar		Fourth Instar		Prepupa		Pupa		Egg to adult		Adult longevity	
	(Days)	(Days)	(Days)	(Days)	(Days)	(Days)	(Days)	(Days)	(Days)	(Days)	(Days)	(Days)	(Days)	(Days)	Male	Female
Max	4	2.5	2.5	2.5	3.0	3.0	5.5	5.5	2.5	2.5	3.5	3.5	23.5	145	192	
Min	2	1.5	1.5	1.5	2.0	2.0	3.5	3.5	1.5	1.5	2.5	2.5	14.5	95	108	
Average	3	2.0	2.0	2.0	2.5	2.5	4.5	4.5	2.0	2.0	3.0	3.0	19.0	120	150	

Illeis cincta (Fabricius) (Bagal & Trehan, 1945); *Chilocorus nigritus* (Fabricius) and *Simmondsius pakistanensis* Ahmad & Ghani (Ahmad, 1970) and *H. eucharis* (Mulsant) (Chakrabarti *et al.*, 1995).

The higher longevity of female has also been reported in *C. nigritus* Fabricius and *S. pakistanensis* Ahmad & Ghani (Ahmad, 1970) and *M. sexmaculatus* (Fabricius) (Saha, 1987).

Adult beetles can withstand starvation for over two months. The duration is more than *Adonia variegata* (Goeze) (Kapur, 1942), *M. sexmaculatus* (Fabricius), *I. cincta* (Fabricius) and *C. septempunctata* Linnaeus (Bagal & Trehan, 1945) and *C. nigritus* (Fabricius) (Rao *et al.*, 1954).

General habits: The larvae and adults avoid sunlight and confine themselves on the ventral side of the leaves. Reflex bleeding a defensive behaviour is characteristic of many coccinellids, the phenomenon is known for long time in adult coccinellids. Adults of *S. melanaria* Mulsant when disturbed exude an orange colour fluid with unpleasant odour. This phenomenon has also been observed in fourth instar larvae of *Hyperaspis binotata* (Say) (Boving, 1917); larvae and pupae of *Cryptognatha nodiceps* Marshall (Taylor, 1935); larvae and adults of *A. variegata* (Goeze) (Kapur, 1942); adults of *P. bisoctonotata* (Mulsant) (Kapur, 1944), adults of *I. cincta* (Fabricius), *C. septempunctata* Linnaeus and *M. sexmaculatus* (Fabricius) (Bagal & Trehan, 1945); larvae of *Scymnodes lividigaster* Mulsant (Richards, 1980) and larvae and adults of *Rhizobius ventralis* (Erichson) and *Rhizobius forestieri* (Mulsant) (Richards, 1981).

Copulation (Phot. I): Mating starts after 11-days of emergence mostly at day time and evening at different intervals. Mating time varies from 4 to 6 hours, considerably higher than previously reported 2-hours in other coccinellids viz., *M. sexmaculatus* (Fabricius), *C. septempunctata* Linnaeus and *I. cincta* (Fabricius) (Bagal & Trehan 1945) and *C. nigritus* (Fabricius) (Ahmad, 1970).

Oviposition (fig. 49, Table II): The female start egg laying after 6-days of mating and continued upto 70-days. A female deposited on an average 1401.2 eggs in 70 days with a range from 6-34 eggs/day. Eggs were laid vertically in batches of 2-10 usually on the dorsal surface of leaves.

Similar oviposition period has also been recorded in *M. sexmaculatus* (Fabricius) (Bagal & Trehan, 1945) but it is higher than *A. variegata* (Goeze) (Kapur, 1942); *C. septempunctata* Linnaeus (Bagal & Trehan, 1945; Singh & Malhotra, 1979); *S. pakistanensis* Ahmad & Ghani and *C. nigrinus* (Fabricius) (Ahmad, 1970); *Lioadalia flavomaculata* (De Geer) (Brown, 1972) and *H. eucharis* (Mulsant) Chakrabarti *et al.*, 1995).

The egg deposition was considerably higher from 1st to 40th day. During this period a female deposited on an average 1111 eggs with a range from 24-34 eggs/day having maximum oviposition on 3rd and 6th day and minimum oviposition on 25th, 32nd and 34th day.

The steep fall in egg deposition was observed from 41th to 47th day. During this period the egg deposition was considerably low and female deposited only 93 eggs with a range from 9-17 eggs/day having maximum and minimum oviposition on 42nd and 47th day respectively.

After 47th day steady rise and fall in egg deposition was maintained till the end. During this period a female deposited 197 eggs with a range from 6-12 eggs/day having maximum oviposition on 55th and minimum on 51th and 64th day.

The average fecundity of female is 1401.2 eggs. It is higher than *A. variegata* (Goeze) (Kapur, 1942); *S. pakistanensis* Ahmad & Ghani and *C. nigrinus* (Fabricius) (Ahmad, 1970); *L. flavomaculata* (De Geer) (Brown, 1972) and *H. eucharis* (Mulsant) (Chakrabarti *et al.*, 1995) but is lower in comparison to *M. sexmaculatus* (Fabricius) (Bagal & Trehan, 1945).

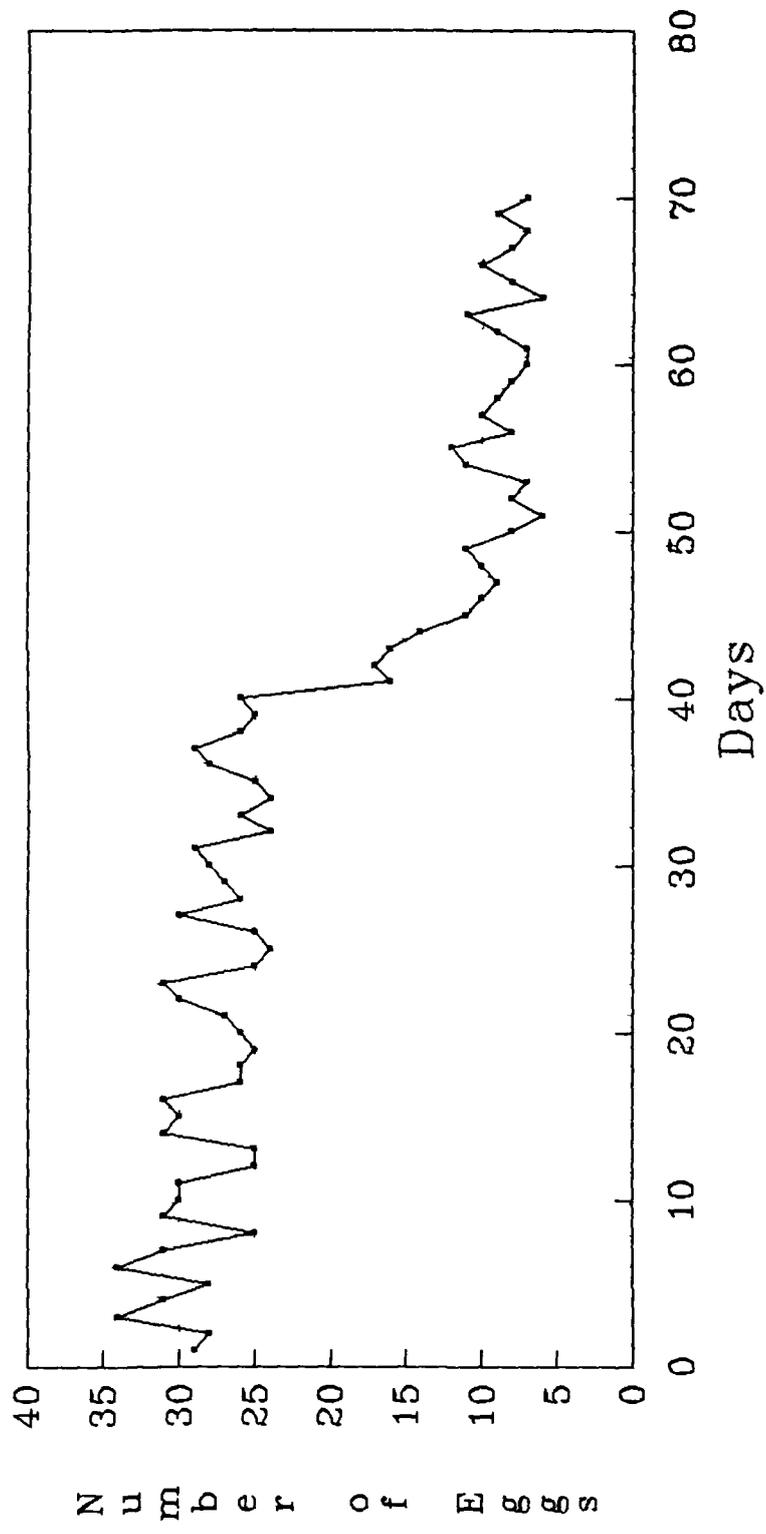


Fig. 49 : Average Oviposition rate (per day) in *Synia melanaria* Mulsant reared on *Coptosoma ostensum* Dist. nymphs

Table II

Pre-oviposition, oviposition period and total fecundity of *Synia melanaria* Mulsant at 25±5°C and 80±5% R.H.

Pre-oviposition period (Days)	Copulation period (Hours)	Preoviposition period (Days)	Total oviposition period (Days)	Number of eggs laid by a female / day		Total eggs laid by a female in total oviposition period
				Range	Average	
11	4.0	6.0	68	6-32	19	1292
10	6.0	5.0	74	5-39	22	1628
11	8.0	7.0	79	4-34	19	1501
13	3.0	7.0	62	8-30	19	1178
10	4.0	5.0	70	7-35	21	1407
Average 11	5.0	6.0	70	6-34	20	1401.2

Egg (fig.48,A-B, Phot. II): The freshly laid eggs are orange, oval with smooth and shiny surface, 1.45 mm long and 0.84 mm broad. After 1.5-2.0 days they become light yellow and at the time of hatching change to greyish brown. Average incubation period is 3.0 days (Table I).

First instar larva (fig.48C): Freshly emerged first instar larva is 1.95 mm long and 0.59 mm broad across the metathoracic region, greyish black with a white band across the abdomen posteriorly, ventral side yellowish brown; head dark greyish, antennae (fig.48D) 3-segmented; mandibles (fig.48E) monodentate, basal tooth indistinct; maxillae (fig.48F) represented by only 3-segmented maxillary palp; legs with tarsal segments indistinct, claws well developed with small triangular basal tooth; abdominal segments not clearly distinct. They stay at emerging site upto 24-hours. Later on start crawling in search of food. The average duration is 2.0 days (Table I).

Second instar larva (fig.48G): The second instar larva is 3.25 mm long and 0.87 mm broad, yellowish brown with prominent whitish bands on first and fourth abdominal segments; abdominal segments distinct. The average duration is 2.0 days (Table I).

Third instar larva (fig.48K): The third instar larva is 4.65 mm long and 1.1 mm broad, yellowish area on prothoracic segments turns into orange colour; meso and metathorax yellowish orange with considerably large greyish patches covering major part, intersegments dark greyish; abdomen orange yellow intersegmentally. The average duration is 2.5 days (Table I).

Fourth instar larva (fig.48O, Phot. III): The fourth instar larva is 5.5 mm long and 1.66 mm broad, colour almost same as in third instar except thorax and abdomen become dark orange with greyish patches. The average duration is 4.5 days (Table I).

Prepupa: The fourth instar larva attaches itself to the support by its caudal end and changes into prepupa, prepupal duration is 2.0 days (Table I).

Pupa (fig.48S-T; Phot. IV): The pupa is oval, 4.64 mm long and 3.03 mm broad, orange in colour; head with two blackish longitudinal streaks; thorax has two pairs of blackish spots on each side along the median line; abdomen also with two transversely placed blackish spots in the middle and three on each side of median line, touching the lateral wall of abdomen. The average duration is 3.0 days (Table I).

Adult (fig. 48U): Freshly emerged adult is entirely orange in colour with soft elytra (Phot. V) after 5-6 hours elytra become hard and colour changes from orange to blackish. Females are comparatively bigger in size than males (Phot. VI). Freshly emerged adult stay at emerging site upto 1-0 to 1.5 days.

Feeding habits: Adults are seen active at morning and evening but larvae are active throughout the day except at noon when the temperature is little higher. Both adults and larvae are voracious feeder of the nymphs of *Coptosoma ostensum* Dist. First instar larvae prefer first and second instar nymphs and second instar larvae feed on first to third instar nymphs, rarely feed on fourth and fifth instar nymphs but third and fourth instar larvae and adults feed on all stages, from first to fifth instar nymphs of *C. ostensum* Dist. Adults and larvae have never been found to feed on the adult bugs.

During feeding fore legs and mandibles play an important role, first they search prey and run fastly towards prey, hold the nymph with the help of fore legs and maxillary palp turn the nymph upside down so as the ventral side is exposed, suitable for eating abdominal contents leaving only chitinous part. All stages from first instar to adult take variable time to consume whole content of respective nymphs. First instar is slow feeder and takes 16-17 minutes but takes 52 minutes when feeding on second instar nymph. Second, third, fourth instars and adults take 33, 24, 11 and 1.5 minutes respectively.

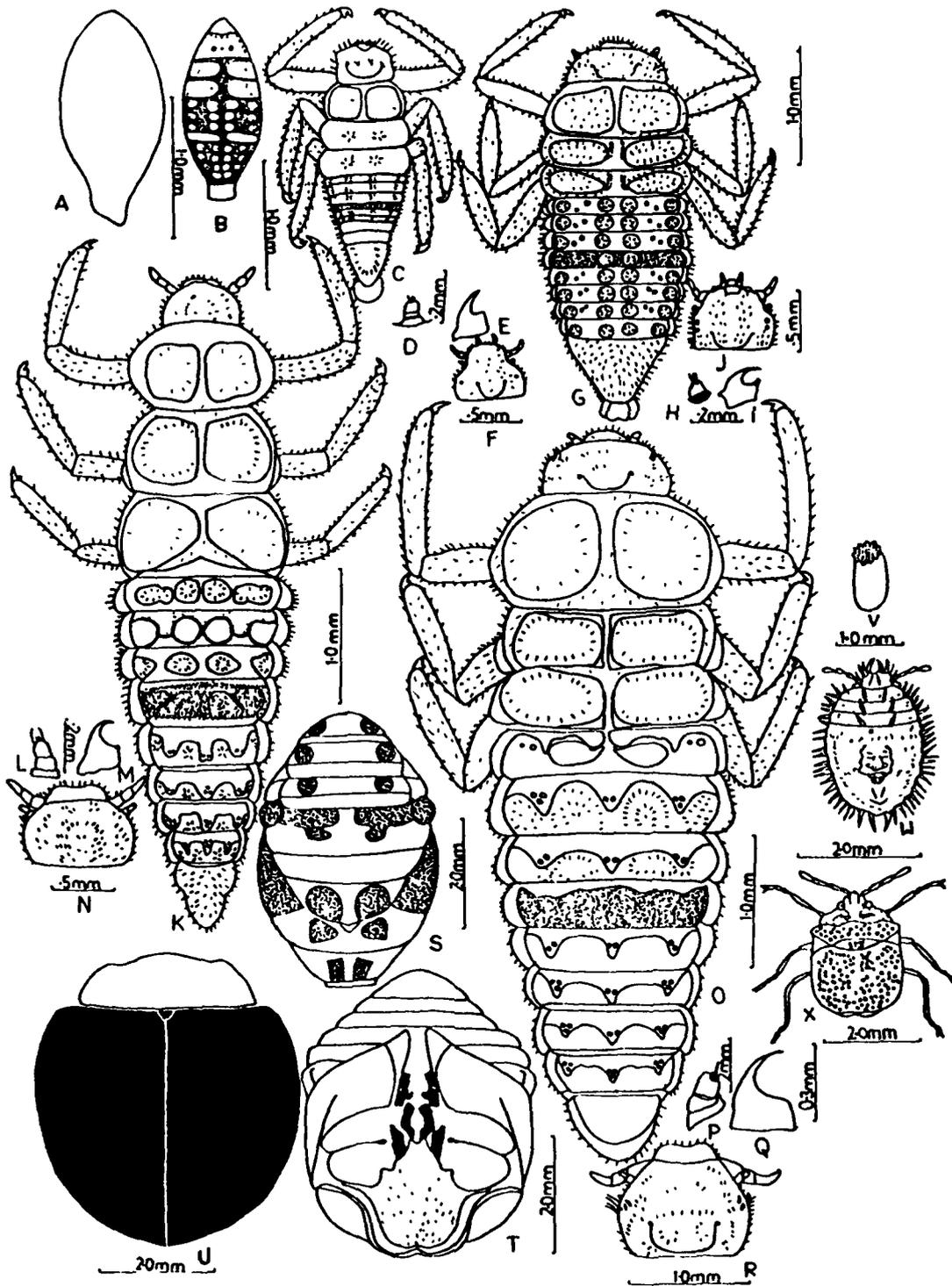


Fig.48A-U: *Synia melanaria* Mulsant
 A=Fresh egg, B=Mature egg, C=1st instar larva; D=Antenna, E=Mandible, F=Head,
 G=IInd instar, larva, H=Antenna, I=Mandible, J=Head, K=IIIrd instar larva; L=Antenna,
 M=Mandible, N=Head, O=IVth instar larva, P=Antenna, Q=Mandible, R=Head, S=Pupa
 (Dorsal view), T=Pupa (Ventral view), U=Adult,
 V-X *Coptosoma ostensum* Dist V=Egg, W=Nymph, X=Adult.

Larval and adult food consumption (Table III): A larva consumes an average, of 426 nymphs of *C. ostensum* Dist. to become pupa. The food consumption during larval period is higher than *C. nigritus* (Fabricius) (Beeson, 1941); *A. variegata* (Goeze), *B. suturalis* (Fabricius) and *S. (P.) quadrillum* (Motschulsky) (Kapur, 1942); *C. septempunctata* Linnaeus (Bagal & Trehan, 1945; Singh & Malhotra, 1979) and *M. sexmaculatus* Fabricius (Bagal & Trehan, 1945).

A female consumes an average, of 44 nymphs per day and 6600 during total life span. Male consumes an average, of 40 nymphs per day and 4800 during total life span. Female is more voracious than male.

The daily feeding rates and food consumption during total life span of a female and male are considerably higher than *A. variegata* (Goeze), *B. suturalis* (Fabricius) and *S. (P.) quadrillum* (Motschulsky) (Kapur, 1942); *S. pakistanensis* Ahmad & Ghani *C. nigritus* (Fabricius) (Ahmad, 1970) but are lower than *M. sexmaculatus* (Fabricius) (Bagal & Trehan, 1945) and *C. septempunctata* Linnaeus (Bagal & Trehan, 1945; Singh & Malhotra, 1979).

Cannibalism: The larvae and adults exhibited cannibalism in rearing jars when there was over crowding and shortage of food supply. The adults (male or female) were observed attacking the egg batches (usually fresh ones) and freshly emerged first instar. An adult male takes one to two minutes to consume the content of one egg, or one first instar nymph. Females consume the content of eggs very quickly taking 40-45 seconds only. It is interesting that females were never observed feeding on first instar nymphs.

Mature first instar and second instar take 52 and 32 minutes respectively to suck one egg. Cannibalism is common among coccinellids as reported in *A. variegata* (Goeze) (Kapur, 1942); *C. septempunctata* Linnaeus and *M. sexmaculatus* (Fabricius) (Puttarudriah & Channabasavanna, 1953) and *H. eucharis* (Mulsant) (Bos & Ray 1967 ; Dimetry and Mansovr, 1976 and Agarwala & Dixon, 1991).

Table III

Larval and adult food consumption in *Synia melanaria* Mulsant.

Number of nymphs consumed	First instar	Second instar	Third instar	Fourth instar	Total larval period	Adult beetle/Day		Feeding record during total life span	
						Male	Female	Male	Female
Max	44	62	106	230	442	42	46	5040	6900
Min.	36	58	98	218	410	38	42	4560	6300
Average	40	60	102	224	426	40	44	4800	6600

Discussion: The life cycle of *S. melanaria* Mulsant is short and is completed in 19 days. Nine to ten generations are completed annually. Both larvae and adults are voracious feeder of nymphs of *C. ostensum* Dist. and can be easily reared on mass scale. The *S. melanaria* Mulsant is more effective predator because of its prey specificity and high fecundity, hence, playing an important role in the natural control and keep the population of the nymphs of *C. ostensum* Dist. under check in nature.

Bioecology of *Anegleis cardoni* (Fabricius)

Distribution, Seasonal occurrence and Hosts: *Anegleis cardoni* (Fabricius) is distributed in southern, northern parts of India (Puttarudriah & Channabasavanna, 1953; Kapur, 1973; Ghorpade, 1979b). In Aligarh, it is commonly found from mid of September to April. Both larvae and adults are strong predator of various species of aphids viz., *Aphis gossypii* Glover (on *Solanum melongena* Linnaeus), *Brevicoryne brassicae* Linnaeus (on *Brassica oleracea* Linnaeus, *B. juncea* Linnaeus), *Macrosiphum miscanthi* (Takahashi) (on *Triticum aestivum* Linnaeus) and *Macrosiphum pisi* Kaltenbach (on *Pisum sativum* Linnaeus) and mealybugs viz., *Phenacoccus insolitus* Green and *Pulvinaria maxima* Green (on *Solanum melongena* Linnaeus, *Coccinia indica* W.&A. and *Zizyphus jujuba* Linnaeus) in Aligarh.

Materials and Methods: Adult beetles were collected from the leaves of *Plumeria obtusa* Bert. ex A.Dc. infested by mealy bugs and were confined in glass jars 8"x5" with open end closed by muslin cloth. Rearing was done on *B. brassicae* Linnaeus and *P. insolitus* Green.

The life cycle under laboratory conditions during October-November (25°C ± 5°C temperature with 80% ± 5% R.H.) was completed in 25 days and 22 days on *B. brassicae* Linnaeus and *P. insolitus* Green respectively (Table. IV, V).

Survival: The average hatchabilities of eggs were found to be 86% and 95% on *B. brassicae* Linnaeus and *P. insolitus* Green respectively. The hatchability is higher than *Coccinella septempunctata* Linnaeus (Bagal & Trehan, 1945; Singh & Malhotra, 1979); *Propylea japonica* (Thunberg), (Kawauchi 1985); *Menochilus sexmaculatus* (Fabricius) (Saha, 1987); *Micraspis discolor* (Fabricius) (Agarwala et al., 1988) and *Harmonia eucharis* (Mulsant) (Chakrabarti et al., 1995). The average rates of survival of larvae and pupae were 85% and 93% respectively on *B.*

Table IV

Duration (Days) of different life stages and longevity of adults in *Anegleis cardoni* (Fabricius) reared on *Brevicoryne brassicae* Linnaeus at 25±5°C and 80±5% R.H.

Incubation Period (Days)	First Instar (Days)	Second Instar (Days)	Third Instar (Days)	Fourth Instar (Days)	Pupa (Days)	Egg to adult (Days)	Adult longevity (Days)	
							Male Female	
Max.	3.5	4.5	3.8	3.6	7.0	6.5	28.9	53 74
Min.	2.5	2.5	2.2	2.4	6.0	5.5	21.1	31 52
Average	3.0	3.5	3.0	3.0	6.5	6.0	25	42 63

Table V

Duration (Days) of different life stages and longevity of adults in *Anegleis cardoni* (Fabricius) reared on *Phenacoccus insolitus* Green at 25±5°C and 80±5% R.H.

Incubation Period (Days)	First Instar (Days)	Second Instar (Days)	Third Instar (Days)	Fourth Instar (Days)	Pupa (Days)	Egg to adult (Days)	Adult longevity (Days)		
							Male	Female	
Max.	4.5	4.2	3.0	3.8	4.6	4.5	24.6	82	104
Min.	3.5	3.8	2.0	3.2	3.4	3.5	19.4	60	78
Average	4.0	4.0	2.5	3.5	4.0	4.0	22.0	71	91

brassicae Linnaeus, and 91% and 97% on *P. insolitus* Green. Significant larval mortality was recorded only in the first instar (8-9%) on both the pests.

Longevity: Average longevity of adult beetles was recorded 42 days for male and 63 days for female on *B. brassicae* Linnaeus but it was considerably higher, 71 days for male and 91 days for female on *P. insolitus* Green (Table IV, V).

Average longevities of adult male and female are higher than *Adonia variegata* (Goeze), *Brumoides suturalis* (Fabricius) (Kapur, 1942); *Psyllobora bisoctonotata* (Mulsant) (Kapur, 1944); and *H. eucharis* (Mulsant) (Chakrabarti et al., 1995) but lower than *M. sexmaculatus* (Fabricius), *C. septempunctata* Linnaeus and *Illeis cincta* (Fabricius), (Bagal & Trehan, 1945); *Scymnus (Pullus) quadrillum* (Motschulsky) (Kapur, 1942); *Chilocorus nigritus* (Fabricius) (Ahmad, 1970) and *Lioadalia flavomaculata* (De Geer) (Brown, 1972).

Adult beetles can withstand starvation for 15-20 days, the duration is more than earlier recorded in *M. sexmaculatus* (Fabricius) and *I. cincta* (Fabricius) (Bagal & Trehan, 1945) and *C. nigritus* (Fabricius) (Rao et al., 1954), but less than *A. variegata* (Goeze) (Kapur, 1942) and *C. septempunctata* Linnaeus (Bagal & Trehan, 1945).

Oviposition (fig.51): The females which reared on *P. insolitus* Green start egg laying after six days of mating and continued upto 44 days and during this period a female deposited on an average 1099.9 eggs (Table VI), but those reared on *B. brassicae* Linnaeus start egg laying after eight days of mating and continued upto 37 days only and during this period a female deposited on an average 821.2 eggs (Table VII). Eggs were laid vertically in batches of 2-12 usually on the ventral surface of leaves.

The maximum egg deposition was recorded from first to 31st day on *P. insolitus* Green and during this period a female deposited on an average 893 eggs with a range from 25-40 eggs/day having maximum and minimum deposition on 4th

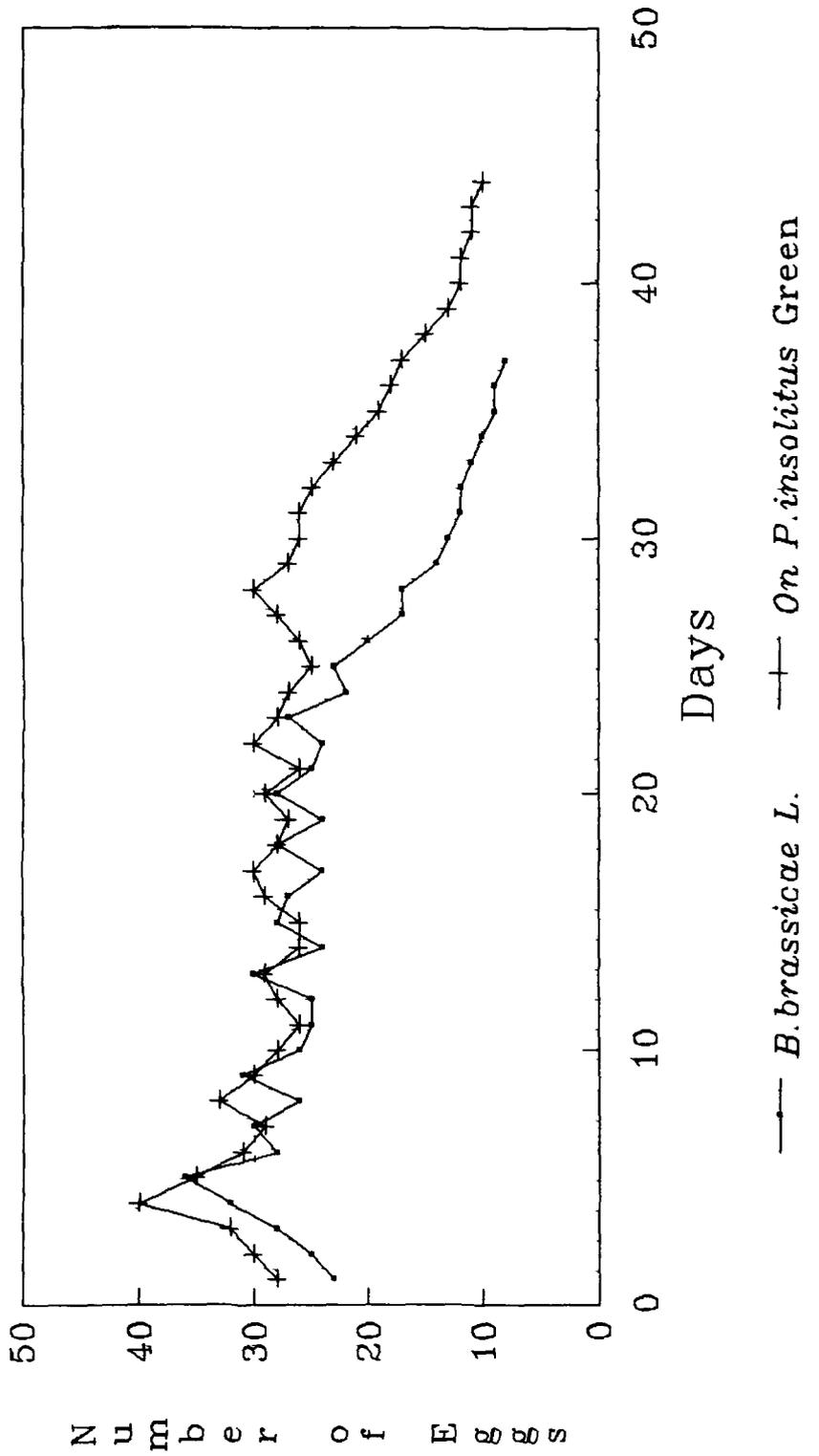


Fig 51: Average Oviposition rate(per day) in *Anegleis cardoni* (Fabricius) reared on *P. insolitus* Green and *B. brassicae* L.

Table VI

Pre-oviposition, oviposition period and total fecundity of *Anegleis cardoni* (Fabricius) reared on *Phenacoccus insosifus* Green at 25±5°C and 80±5% R.H.

Precopulation period (Days)	Copulation period (Hours)	Preoviposition period (Days)	Total oviposition Period (Days)	Number of eggs laid by a female / day Range	Average	Total eggs laid by a female in total oviposition period
11	1.5	6.0	48	10-42	26	1248
9	2.0	5.0	50	9-40	24.5	1225
10	2.5	7.0	39	12-41	26.5	1033.5
11	2.0	5.0	42	11-39	25	1050
10	2.0	7.0	41	8-38	23	943
Average 10	2.0	6.0	44	10-40	25	1099.9

Table VII

Pre-oviposition, oviposition period and total fecundity of *Anegeleis cardoni* (Fabricius) reared on *Brevicoryne brassicae* Linnaeus at 25±5°C and 80±5% R.H.

Precopulation period (Days)	Copulation period (Hours)	Preoviposition period (Days)	Total oviposition period (Days)	Number of eggs laid by a female / day		Total eggs laid by a female in total oviposition period
				Range	Average	
10	2.0	7.0	38	7-39	23	874
12	0.50	8.0	40	9-40	24.5	980
13	1.5	7	34	6-30	18	612
16	2.5	9	41	10-38	24	984
14	1.0	9	32	8-33	20.5	656
Average	1.5	8	37	8-36	22	821.2

and 25th day respectively. After 31st day steep fall in egg deposition was observed till the end and during this period a female deposited only 207 eggs with a range from 10-25 eggs/day having maximum and minimum deposition on 32th and 44th day respectively.

When *B. brassicae* Linnaeus were served as food, maximum egg deposition was observed from first to 25th day and during this period a female deposited on an average 669 eggs with a range from 22-36 eggs/day having maximum and minimum deposition on 5th and 24th day of oviposition. Steep fall in egg deposition was observed from 26th to the end and a female deposited only 152 eggs with a range from 8-20 eggs/day having maximum and minimum deposition on 26th and 37th day respectively. Average oviposition period and fecundity both are higher on *P. insolitus* Green than *B. brassicae* Linnaeus. Average oviposition period is higher than *A. variegata* (Goeze) and *B. suturalis* (Fabricius) (Kapur, 1942) but is lower than *M. sexmaculatus* (Fabricius) and *C. septempunctata* Linnaeus (Bagal & Trehan, 1945); *Simmondsius pakistanensis* Ahmad & Ghani and *C. nigrinus* (Fabricius) (Ahmad, 1970) and *H. eucharis* (Mulsant) (Chakrabarti *et al.*, 1995).

Average fecundity of female is 1010.5 eggs. It is higher than *S. (P.) quadrillum* (Motschulsky) *A. variegata* (Goeze) and *B. suturalis* (Fabricius) (Kapur, 1942); *S. pakistanensis* Ahmad and Ghani and *C. nigrinus* (Fabricius) (Ahmad, 1970) and *H. eucharis* (Mulsant) (Chakrabarti *et al.*, 1995) but is lower than *M. sexmaculatus* (Fabricius) and *C. septempunctata* Linnaeus (Bagal & Trehan, 1945).

Egg (fig.50A, Phot. IX): The freshly laid eggs are oval, light yellow with smooth and shiny surface, 1.36 mm long and 0.60 mm broad, after 31 hours colour changes to greyish. Average incubation periods are 3.0 and 4.0 days on *B. brassicae* Linnaeus and *P. insolitus* Green respectively (Table IV, V).

First instar larva (fig. 50B): Freshly hatched first instar larva is 1.9 mm long and 0.51 mm broad across the metathoracic segment, greyish in colour. Body

poorly chitinized and setaceous dorsally. Legs setaceous, tarsal claws with well developed basal tooth. The average durations are 3.5 and 4.0 days on *B. brassicae* Linnaeus and *P. insolitus* Green respectively (Table IV,V).

Second instar larva (fig. 50C): The second instar larva is 2.0 mm long and 0.80 mm broad; head dark brown; pro, meso and metathorax dark brown surrounded by whitish border; first abdominal segment nearly whitish, second and third dark brown except narrow lateral borders and median patch whitish, fourth in the form of whitish band, remaining segments similar to second and third. The average durations are 3.0 and 2.5 days *B. brassicae* Linnaeus on *B. brassicae* Linnaeus and *P. insolitus* Green respectively (Table IV,V).

Third instar larva (fig. 50D): The third instar larva is 3.5 mm long and 0.90 mm broad; head dark brown; prothorax whitish with two big dark brown patches on each side of median line; meso and meta thorax dark brown except whitish median patch; first to third abdominal segments dark brown except a pair of patches on each lateral side and one median patch whitish, fourth segment in the form of whitish band, remaining segments dark brown except a patch on each lateral side and a median patch whitish. The average durations are 3.0 and 3.5 days on *B. brassicae* Linnaeus and *P. insolitus* Green respectively (Table IV, V).

Fourth instar larva (fig. 50E, Phot. X): The fourth instar larva is 8.0 mm long and 1.2 mm broad, nearly similar to third instar in general appearance except size. The average durations are 6.5 and 4.0 days on *B. brassicae* Linnaeus and *P. insolitus* Green respectively (Table IV,V).

Prepupa: Fourth instar larva stops feeding and attaches itself to the dorsal side of the leaf through caudal end and within 6-8 hours changes into prepupa. The average prepupal durations are 23 and 21 hours on *B. brassicae* Linnaeus and *P. insolitus* Green respectively (Table IV,V).

Pupa (fig.50F, Phot. XI): The pupa is elongated, 4.8mm long and 1.9mm broad with a number of symmetrically arranged yellow, reddish and brown areas. The average pupal durations are 6.0 and 4.0 days on *B. brassicae* Linnaeus and *P. insolitus* Green respectively (Table IV, V).

Adult (fig.50G, Phot.XII): Adult takes 30 to 45 minutes to come out from pupal case, freshly emerged adult is creamish, without any spots on pronotum and elytra. After two and half hours pronotal spot become visible. Later after one or two hours pronotal and elytral spots become blackish. Freshly emerged adult remains inactive for one day and stay at emerging site.

Larval and adult food consumption (Table VIII, IX): A larva consumes an average, of 440 *P. insolitus* Green and 410 *B. brassicae* Linnaeus to become pupa.

Average food consumption during larval period is higher than *C.nigritus* (Fabricius) (Beeson, 1941); *A. variegata* (Goeze), *B. suturalis* (Fabricius) and *S. (P.) quadrillum* (Motschulsky) (Kapur, 1942); *M. sexmaculatus* (Fabricius) (Bagal & Trehan, 1945); *C. septempunctata* Linnaeus (Bagal & Trehan, 1945 and Singh & Malhotra, 1979).

A female consumes an average, of 43 *P. insolitus* Green and 32 *B. brassicae* Linnaeus per day and 3913 *P. insolitus* Green and 2016 *B. brassicae* Linnaeus during total life span.

A male consumes an average of 40 *P. insolitus* Green and 28 *B. brassicae* Linnaeus per day and 2848 *P. insolitus* Green and 1176 *B. brassicae* Linnaeus during total life span.

The daily feeding rates and food consumption during total life span of adult female and male are considerably higher than *A.variegata* (Goeze), *B. suturalis* (Fabricius) and *S. (P.) quadrillum* (Motschulsky) (Kapur, 1942) but are lower than *M. sexmaculatus* (Fabricius) and *C. septempunctata* Linnaeus (Bagal & Trehan, 1945).

Table VIII

Larval and adult food consumption in *Anegleis cardoni* (Fabricius).

Number of <i>Phenacoccus</i> <i>insolitus</i> Green Consumed	First	Second	Third	Fourth	Total	Adult beetle/Day		Feeding record	
	Instar	Instar	Instar	Instar	larval period	Male	Female	Male	Female
Max.	60	52	150	222	484	42	46	2982	4186
Min.	52	42	122	180	396	38	40	2698	3640
Average	56	45	135	200	440	40	43	2840	3913

Table IX
Larval and adult food consumption in *Anegeleis cardoni* (Fabricius).

Number of <i>Brevicoryne brassicae</i> Linnaeus consumed	First instar	Second instar	Third instar	Fourth instar	Total larval period	Adult beetle/Day		Feeding record during total life span	
						Male	Female	Male	Female
Max.	42	62	98	230	432	30	35	1260	2205
Min.	34	56	84	214	388	26	29	1092	1827
Average	38	59	91	222	410	28	32	1176	2016

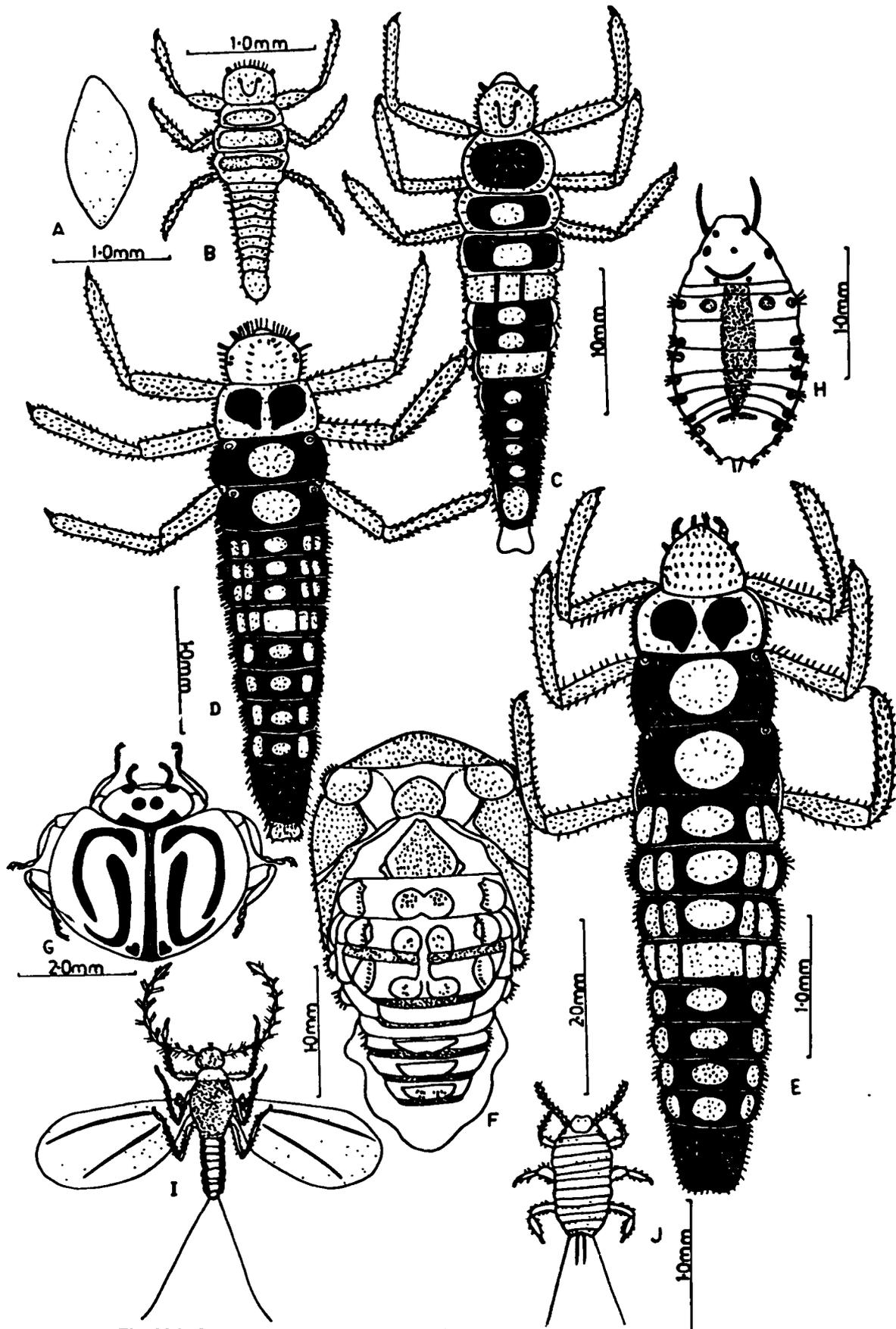


Fig.50A-G: *Anegleis cardoni* (Fabricius)
 A=Egg, B=1st instar larva, C=2nd instar larva, D=3rd instar larva,
 E=4th instar larva F=Pupa, G=Adult
 H-J: *Phenacoccus insolitus* Green
 H=Female, I=Male, J=Young nymph.

migrate on various crops infested by aphids which serve as alternate hosts. Chakrabarti *et al.*, (1995) has also reared *H. eucharis* (Mulsant) on three different species of aphids viz., *Brachycaudus helichrysi* (Kaltenbach), *Eriosoma lanigerum* (Hausman) and *Macrosiphoniella pseudoartemisiae* (Shinji) and recorded short life cycle, higher adult longevity and higher fecundity on *M. pseudoartemisiae* (Shinji) than remaining two species. The food consumption of the larvae of *H. eucharis* (Mulsant) was also higher on *M. pseudoartemisiae* (Shinji).

Therefore it is clear that the prey plays an important role on the development, longevity, oviposition period and fecundity of a predator.



Nymphs of *Coptosoma ostensum* Dist and adults of *Synia melanaria* Mulsant on leaf of *Butea monosperma* O.Ktz.



Adults of *Coptosoma ostensum* Dist. on leaf of *Butea monosperma* O.Ktz.



(i) Mating



(ii) Eggs

Synia melanaria Mulsant



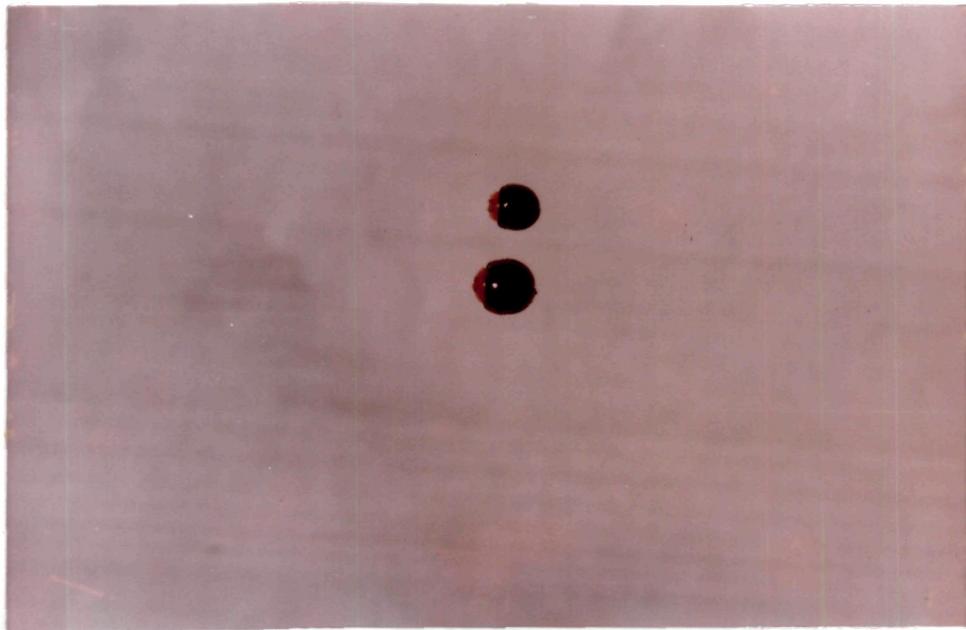
(iii) Larva



(iv) Pupae
Synia melanaria Mulsant



(v) Freshly emerged adult



(vi) Mature adults (Male & Female)

Synia melanaria Mulsant



(vii)

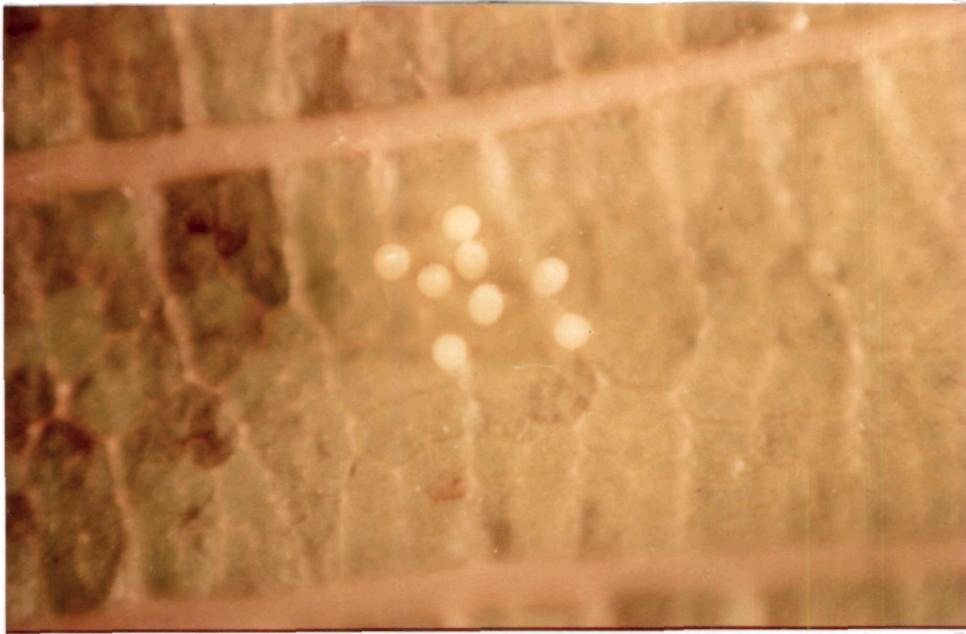
Adults feeding on nymphs of *Coptosoma ostensum* Dist.



(viii)

Larva feeding on nymphs of *Coptosoma ostensum* Dist

Synia melanaria Mulsant



(ix) Eggs

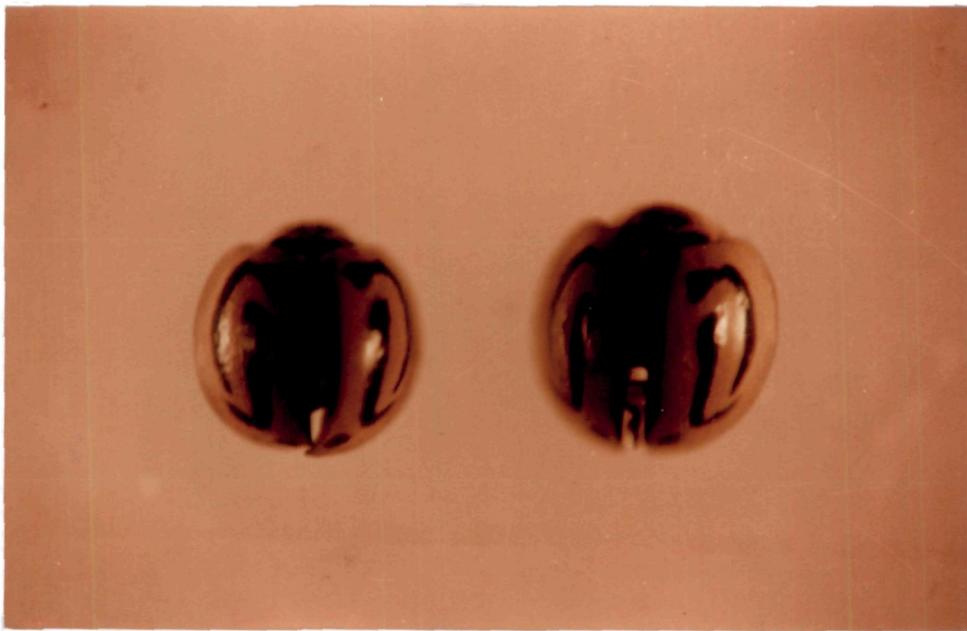


(x) Larvae

Anegleis cardoni (Fabricius)



(xi) Pupae



(xii) Adults

Anegleis cardoni (Fabricius)



Phenacoccus insolitus Green on *Coccinia indica* W. & A.



Creeper with *P. insolitus* Green, Adult and larva of *Anegleis cardoni* (Fabricius)

DISCUSSION

Considerable work has been done on the taxonomy of the family Coccinellidae Linnaeus (1758) in his "Systema Naturae" described 36-species under the genus *Coccinella*. Kugelann (1794a) added the genus *Scymnus*. Thereafter a number of genera were added to the family viz., *Chilocorus* (Leach, 1815), *Coccidula* (Gyllenhal, 1827), *Epilachna*, (Chevrolat, 1837) and *Hyperaspis* (Redtenbacher, 1843) etc.

Mulsant (1846) for the first time proposed phylogenetic classification of Coccinellidae and gave group-name "Securipalpes" to it. Later (1850) his monographic work proved a land mark in the subdivision of the family, followed by Crotch (1874), Ganglbauer (1899), Casey (1899), Weise (1879a, 1879b, 1887, 1900) and Sicard (1909) with some modifications.

Korschefsky (1931-32) in his Coleopterorum Catalogue adopted mainly the Ganglbauer's and Casey's system of classification and placed the world Coccinellidae under three subfamilies viz., Coccinellinae, Epilachninae and Lithophilinae. Korschefsky's system was followed by recent workers viz., Bielawski (1959), Fursch (1960, 1963), (Arnett 1963) and Kapur (1948a, 1948c, 1963b, 1966) in their keys or revision of local fauna with few modifications.

Though the Korschefsky system of classification has long been a standard classification but many tribes belonging to the Coccinellinae are not homogeneous and little attention has been paid in establishing the natural classification of the higher categories of the family (Crowson, 1955; Kamiya, 1960; Arnett, 1963).

Kamiya (1965b, 1966) and Sasaji (1967, 1968a) have attempted a natural classification of the higher categories of the family, mainly based on the comparative morphology of both adults and larvae together and divided the family into six

subfamilies viz., Chilocorinae, Coccidulinae, Coccinellinae, Epilachninae, Scymninae and Sticholotinae and later (1968a) in his expanded classification of subfamilies and tribes has taken many characters, some of which intergrade even at generic level. Some important characters at subfamily level are as follows: expanded or unexpanded condition of clypeus; insertion of antennae dorsally or ventrally on head; condition of mandibular apices, presence or absence of basal tooth; narrow or broad junction between mentum and submentum; broad or narrow articulation between meso and metasternum; broad or narrow separation of middle coxal cavities, coarsely or finely faceted condition of eyes; narrow or broad condition of elytral epipleurae, length of epipleural carinae; condition of siphon of male genitalia; presence or absence of emargination on inner margin of female genital plates etc. The characters considered by Sasaji for the separation of tribes are as follows: pubescent or glabrous condition of body; presence or absence of antero-lateral projections on anterior margin of clypeus; number of antennal segments; exposed or concealed condition of eyes by expanded head capsule; shape of terminal segment of maxillary palp; condition and structure of prosternum; number of visible abdominal sternites in both sexes; foveolate or non foveolate condition of elytral epipleurae; condition of femora, angulate or normal condition of tibiae on outer margin, number of tarsal segments of legs, strongly or weakly curved siphon, poorly or well developed siphonal capsule in male genitalia, presence or absence of styli on female genital plates etc.

Kapur (1948a, 1948c, 1963b, 1966, 1970) has also followed Ganglbauer classification (1899) and recognised three subfamilies viz., Coccinellinae, Epilachninae and Tetrabrachinae (=Lithophilinae) and considered following characters for the separation of three subfamilies: insertion of antennae between or in front of the eyes; condition of mandibular apices and presence or absence of basal tooth; obliquely or transversely truncated condition of episterna of metathorax; number of

tarsal segments of legs etc. The set of characters considered for tribal separation by Kapur are as follows: pubescent or glabrous condition of body; exposed or concealed condition of the base of antennae, number of segments and modification of antennae; serrate or entire mandibular apices; shape of terminal segment of maxillary palp; expanded or unexpanded condition of femora; number of visible abdominal sternites in both sexes with modification or normal condition of first sternite etc. The combination of characters used for generic separation as evident from the literature are as follows: presence or absence of prosternal carinae; presence or absence of tibial spurs, tarsal claws with or without basal tooth; complete or incomplete femoral line on first abdominal sternite; conditions of proximal and distal end of siphon, basal lobe and parameres of male genitalia etc. For specific separation Kapur has mainly stressed the body size, convexity, colour, spots or bands and condition of punctures and pubescence on pronotum and elytra; variable shape, size and length of various components of male genitalia viz., basal lobe, parameres, hypomere and siphon; condition of genital plates and spermatheca of female genitalia etc.

The characters considered by Kapur for the separation of higher taxa, though stable but seem too little to cover the present elaborated size of the family, so far as correct and unconfused placement is concerned. The package of characters considered by Sasaji for subfamily and tribal separation, though are logical and valid but quite enormous and intergrading and applicable to even lower taxa, sometimes create confusion during identification.

The present work therefore though largely after Sasaji (1968a) but is an attempt regarding selection and use of a set of characters though stable but different at different level of hierarchy in order to present the undue intergradation of characters for the sake of maintaining clarity of classification and easy understanding. The following characters were considered suitable for subfamilies,

tribal, generic and specific separation. Expanded or unexpanded condition of clypeus; insertion of antennae dorsally or ventrally on head; narrow or broad junction between mentum and submentum of labium; broad or narrow articulation between meso and metasternum; broad or narrow separation of middle coxal cavities; presence or absence of emargination on inner margin of female genital plates are considered as subfamily characters.

Pubescent or glabrous condition of body; presence or absence of antero-lateral projections on anterior margin of clypeus; condition of mandibular apices, presence or absence of basal tooth; shape of terminal segment of maxillary palp; angulate or normal condition of tibiae on outer margin, number of tarsal segments of legs; number of visible abdominal sternites in both sexes; strongly or weakly curved siphon, poorly or well developed siphonal capsule of male genitalia, condition of female genital plates etc. are considered for tribal separation.

Number of antennal segments; presence or absence of prosternal carinae; presence or absence of tibial spurs, tarsal claws simple or bifid, with or without basal tooth; complete or incomplete femoral line on first abdominal sternite; condition of basal lobe, parameres, hypomere, proximal and distal end of siphon of male genitalia; shape of spermatheca, condition of ramus and nodulus, shape of genital plates and condition of styli etc. are regarded characters of generic significance.

Body size, shape, convexity, colour, spots or bands and condition of punctures and pubescence on pronotum and elytra; variable shape, size and length of various components of male genitalia viz., basal lobe, parameres, hypomere and siphon; shape and size of styli and setae on apices etc. are considered as characters of specific significance.

Sasaji (1968a) classification has been mainly followed during present work because of its more elaborate form, logical approach and studies being based on both adult as well as larval characters.

In addition to taxonomic study, rearing of two predator species viz., *Synia melanaria* Mulsant and *Anegleis cardoni* (Fabricius) has been done in laboratory on their natural preys viz., nymphs of *Coptosoma ostensum* Dist. and *Phenacoccus insolitus* Green, *Brevicoryne brassicae* Linnaeus respectively. Adult longevity, oviposition period, fecundity, developmental period, life stages, adult and larval voracity are studied to assess the potentials of predators as biological control agent of respective pests. Both larvae and adults are strong predator and play an important role in agro-ecosystem to keep the pest population below economic injury level.

Brief account about life history of *S. melanaria* Mulsant has been given by Subramaniam (1925). He has not taken into consideration the various important aspects viz., longevity, oviposition period, fecundity and adult and larval voracity etc. The present study is carried out to obtain detailed informations on the above aspects which would be helpful in mass culture of the predator under laboratory conditions.

Taking into considerations the short life cycle, high reproductive potential, higher longevity and survival of adults for over two months without food shows that they can easily be reared on mass scale under laboratory conditions. They are effective biological control agents because of high voracity and may be successfully utilized for the control of *Coptosoma ostensum* Dist.

Rearing of *A. cardoni* (Fabricius) has been carried out for the first time. Both larvae and adults are predator of different species of aphids and coccids. Rearing was done on *Phenacoccus insolitus* Green and *Brevicoryne brassicae* Linnaeus to evaluate their effectiveness against both the pests. Detailed information on various aspects viz., adult longevity, reproductive potential, developmental period and adult and larval voracity on two different pests were obtained in order to determine their effectiveness. Higher adult longevity, reproductive potential and voracity are record-

ed on *P. insolitus* Green rather than *B. brassicae* Linnaeus. Their production on mass scale is possible on both the pests under laboratory conditions and the other natural pests viz., *Aphis gossypii* Glover *Macrosiphum miscanthi* Takahashi, *Macrosiphum pisi* Kaltenbach, and *Pulvinaria maxima* Green etc. facilitate the continuity of predator in the field throughout the year.

REFERENCES

- Agarwala B.K., Das, S. & Senchowdhuri, M. 1988. Biology and food relations of *Micraspis discolor* (Fabricius) an aphidophagous coccinellid in India. *J. Aphidology* **2**:7-17.
- Agarwala, B.K. & Dixon, A.F.G. 1991. Cannibalism and interspecific predation in lady birds. *In Behaviour and impact of Aphidophaga*: 95-102 (Eds. Polgar. L. et al., SPB Publications. Hague. The Netherlands).
- Ahmad, R. 1970. Studies in West Pakistan on the biology of one nitidulid species and two coccinellid species (Coleoptera) that attack scale insects. (Homoptera: Coccoidea) *Bull. ent. Res.* **60**: 5-16.
- Ahmad, R. 1973. A new tribe of the family Coccinellidae (Coleoptera). *Bull ent. Res.* **63**: 449-452.
- Anand, R.K., Gupta, A.K. & Ghai, S. 1988. A check list of Indian Epilachninae (Coleoptera: Coccinellidae) with recorded host plants. *Bull.ent.* **29**(1):121-137.
- Anand, R.K., Gupta, A.K. & Ghai, S. 1990. A new species of *Illeis* Mulsant from North India (Coleoptera: Coccinellidae). *Reichenbachia Staatliches Museum Fur Tierkunde Dresden* **27**(23): 131-134.
- Arnett, R.H. Jr. 1963. The beetles of the United States: 1-1112. Washington
- Ayyar, T.V.R. 1925. Un described coccinellid beetle of economic importance *Scymnus coccivora* Ayyar. *J. Bombay. nat. Hist. Soc.* **30**:491-499.
- Ayyar, T.V.R. 1929. Contribution to our knowledge of South Indian Coccidae. *Imperial institute of Agricultural Research Pusa* (Bulletin No.197):1-72.
- Bagal, S.R. & Trehan, K.N. 1945. Life history and bionomics of two predaceous and one mycophagous species of Coccinellidae: *J.Bombay. nat. His. Soc.* **45**: 566-575.
- *Barovskij, J. 1928. Abh. Ergebnisse Pamir Ex.P. 1927:128.
- *Bedel, R. 1906. *Bull. Soc. ent. France*: 93.
- Beeson, C.F.C. 1941. The ecology and control of the forest insects of India and the neighbouring countries. Forest Research Institute, Dehradun, India and Imperial forestry Institute, Oxford, England: 1-990.
- Bergstrasser, J.A. 1874. *Bol. Acad. Univ. Cordova* III:287.
- Bielawski, R. 1957. Coccinellidae (Coleoptera) von Srilanka, *Vesh. naturff. Ges. Basel.* **68**: 72-96.
- Bielawski, R. 1959. Klucze do Oznaczania owadów Polski xix. Coleoptera, 76. Coccinellidae: 1-92. Warszawa

- Bielawski, R. 1961. Bemerkungen Über die männlichen Genitalien Von Arten der Gattung *Illeis* Mulsant nebst Beschreibung einer neuen Art und einer untern Art (Coleoptera: Coccinellidae). *Annls. zool. Warszawa* 19: 353-368.
- Bielawski, R. 1971. Über Coccinellidae (Coleoptera) aus Nepal, *Khumbu Himal Innsbruck Munchen* 4(1):1-9.
- Bielawski, R. & Chujo, M. 1961. Coleoptera from South East Asia 16. Family Coccinellidae. *Nature & Life in South East Asia* 1:331-334.
- *Blackburn, T. 1889. *Proc. Linn. Soc. N.S.W.* 4(2):1-1275.
- Blackwelder, R. 1945. Checklist of the Coleopterous insects of Mexico Central America, the West Indies and South America. Part-III *U.S. Natl. Mus. Bull.* 183:343-550.
- *Boheman, 1859. *Freg. Eugen. Resa*:1-223.
- Booth, R.G. & Pope, R.D. 1986. A review of the genus *Cryptolaemus* (Coleoptera: Coccinellidae) with particular reference to the species resembling *Cryptolaemus montrouzieri* Mulsant. *Bull. ent. Res.* 76:701-717.
- Bose, K.C. & Ray, S.K. 1967. A comparative study on the consumption of aphids by the common predator, *Chilomenes sexmaculata* (Coleoptera: Coccinellidae) *Indian J. Sci. and Ind.* 1(1):56-59.
- Boving, A. 1917. A generic synopsis of the coccinellid larvae in the United States National Museum with a description of the larva of *Hyperaspis binotata* Say. *Proc. U.S. Nat. Mus.* 51: 621-650.
- Boving, A.G. & Craighead, F.C. 1931. An illustrated synopsis of the principal larval forms of the order Coleoptera. *Ent. Amer.* 11:1-86.
- *Brethes, J. 1923. *Bull. Soc. ent. Fr.*: 229.
- Brethes, J. 1924. Sur une collection de coccinellides (et un Phalacridae) du British Museum. *Ann. Mus. Nac. Hist. Nat. Buenos Aires* 33:145-175.
- Brown, H.D. 1972. On the biology of *Lioadalia flavomaculata* (Deg.) (Coleoptera: Coccinellidae) predator of the wheat aphid *Schizaphis graminum* (Rond). in South Africa. *Bull. ent. Res.* 62:673-679.
- Canepari, C. 1986. Su alcuni Coccinellidi dell' India e Nepal Settentrionale del Museo di Storia Naturale di Ginevra (Coleoptera: Coccinellidae). *Rev. Suisse Zool.* 93(1):21-36.
- *Capra, 1931. *Boll. Soc. ent. ital.* 63 (1-2):17.

- Casey, T.L. 1899. A revision of the American Coccinellidae. *J.N.Y. ent. Soc.* 7: 71-169.
- Chakrabarti, S., Debnath, N. & Ghosh, D. 1995. Bioecology of *Harmonia eucharis* (Mulsant) (Coleoptera: Coccinellidae). An aphidophagous predator in Western Himalayas. *Entomon* 20 (3-4):191-196.
- Chapin, E.A. 1926. On some Coccinellidae of the tribe Telsimiini with descriptions of new species. *Proc. biol. Soc. Washington* 39: 129-134.
- Chapin, E.A. 1940. New genera and species of lady beetles related to *Serangium* Blackburn (Coleoptera: Coccinellidae). *J. Wash. Acad. Sci.* 30: 263-272.
- Chapin, E.A. 1946. Review of the new world species of *Hippodamia* Chevrolat (Coleoptera: Coccinellidae). *Smithson. Misc. coll.* 106(10): 1-39.
- Chapin, E.A. 1965a. The genera of the Chilocorini (Coleoptera: Coccinellidae). *Bull. Mus. Comp. Zool. Harvard Univ.* 133(4) 227-271.
- Chapin, E. A. 1965b. Insects of Micronesia:Coccinellidae. *Bernice P. Bishop Museum Publ.* 16(5):189-254.
- Chapuis, F. 1876. In Lacordaire, Histoire naturelle des Insects et Genera des Coleopteres Famililles des Erotyliens, des Entomychides, et des Coccinellides. Paris 12:231, 238,258.
- Chelliah, S. 1965. The male genitalia of few predaceous coccinellid (Coleoptera:Coccinellidae) of South India. *Indian J. Ent.* 27: 165-167.
- Chevrolat, A. 1837. In Dejean's Catalogue des Coleopteres de la collection de M. le comte Dejean, Paris, troisieme edition, livr. 5: 256, 365-503.
- Chu, J., He, J. & Wu, Y. 1978. Atlas of natural enemies of economic insects:1-300.
- Chunram S. & Sasaji, H. 1980. A contribution of the Coccinellidae (Coleoptera) of Thailand. *Orient. Insects* 14(4):473-491.
- Cockerell, T.D.A. 1929. *Cryptolaemus montrousieri* Mulsant and its allies. *J. Econ. Ent.* 22:271.
- *Costa, A. 1849. *Fauna Regno di Napoli*, 1:9,10,64,7 8,104.
- *Crotch, R. 1871. *Catal. Coccinell.*:6.
- Crotch, R. 1874. A review of the Coleopterous family Coccinellidae: 1-311.
- Crowson, R A. 1955. The natural classification of the families of Coleoptera: 1-187. London
- Della Beffa, G. 1912. Revisione dei Coccinellidi italiani. *Riv. Coleotter Italiana* 10: 145-192.

- Dieke, G. H. 1947. Lady beetles of the genus *Epilachna* (Sens. lat.) in Asia Europe and Australia. *Smithson. Misc. coll.* **106**(15):1-183.
- Dimetry, N.Z. & Mansovr, M.H. 1976. The choice of oviposition sites by the lady bird beetle *Adalia bipunctata* (Linnaeus). *Experientia* **32**(2): 181-182.
- Dobzhansky, Th. 1924. Die Weiblichen Generationsorgane der Coccinelliden als Artmerkmal betrachtet (Coleoptera). *Ent. Mitt.* **13**:18-27.
- Dobzhansky, Th. 1927. Neue und wenig bekannte Coccinelliden. *Rev. Russ. Ent.* **21**:212-217.
- *Donisthorpe, 1913. *Ent. Rec.* **14**:99.
- Emden, F.I. Van. 1949. Larvae of British beetle VII. (Coccinellidae). *Ent. mon. Mag.* **85**:265-283.
- *Fabricius, J.C. 1775. *Syst. Ent.*:79.
- *Fabricius, J.C. 1781. *Spec. Ins.*: 91, 94, 97.
- *Fabricius, J.C. 1787. *Mantissa Insectorum*: 94.
- *Fabricius, J.C. 1792. *Ent. Syst. Emendata*:269.
- *Fabricius, J.C. 1798. *Suppl. Ent. Syst.* **7**:77, 79.
- *Fabricius, J.C. 1801. *Syst. Eleut.* **1**:158,370.
- *Fairmaire, J. 1876. *Petites Nouv. Ent.* **2**:50.
- *Faldermann, F. 1832. *Menetries Catal. rais.*:240.
- *Faldermann, F. 1835. *Mem. Peters. Div. Sav.* **2**:452.
- Fursch, H. 1960. Mission zoologique de l' I.R.S.A. C. en Afrique orientale xvi (Coleoptera: Coccinellidae). *Ann. Mus. Congo Tervuren Zool.* **81**: 251-312.
- Fursch, H. 1963. La reserve naturelle integrale du mont Nimba X(Coleoptera: Coccinellidae). *Mem. Inst. Fr. Afriq. Noire* **66**: 285-309.
- Ganglbauer, L. 1899. Die Kafer Von Mitteleuropa. Band **3**: 1-1046.
- Ghorpade, K.D. 1974. Description of a new *Cryptogonus* Mulsant from Bangalore, Southern India (Coleoptera: Coccinellidae). *Orient. Insects* **8**(1): 55-60.
- Ghorpade, K.D. 1976. An undescribed species of *Illeis* Mulsant from South India (Coleoptera: Coccinellidae). *Orient. Insects* **10**(4):579-585.

- Ghorpade, K.D. 1977. A new species of *Pseudoscymnus* (Coleoptera: Coccinellidae) predaceous on coconut scale in peninsular India. *J. nat. Hist.* 11(4): 465-469.
- Ghorpade, K.D. 1979a. *Ballia eucharis* Mulsant (Coleoptera: Coccinellidae) breeding on Cicadellidae (Homoptera) at Shillong. *Curr. Res.* 8: 113.
- Ghorpade, K.D. 1979b. On the association of some Coccinellidae (Coleoptera) with spider nest. *Curr. Res.* 8:105-106.
- Ghorpade, K.D. 1981. *Cryptolaemus montrousieri* Mulsant (Coleoptera: Coccinellidae) breeding on aphids. *Colemania* 1(1):59.
- Ghosh, D., Debnath, N. & Chakrabarti, S. 1991. Predators and parasites of aphids from North West and Western Himalaya III. Twenty five species of Coccinellidae (Coleoptera: Insecta) from Garhwal and Kumaon ranges. *Rec. Zool. Sur. India* 88(2): 177-188.
- *Goeze, J. A. E. 1777. *Entom. Beytr.* 1:1-736.
- Gordon, R.D. 1970. A review of the genus *Delphastus* Casey. *Proc. ent. Soc. Washington* 72(3):356-369.
- Gordon, R.D. 1971. A generic review of the Cryptognathini new tribe with a description of a new genus. *Acta zool. litt.* 26: 181-196.
- Gordon, R.D. 1977. Classification and phylogeny of new world Sticholotidinae (Coleoptera: Coccinellidae). *Coleopts. Bull.* 31(3): 185-228.
- Gordon, R.D. 1985. The Coccinellidae (Coleoptera) of America north of Mexico. *J.N.Y. ent. Soc.* 93: 1-912.
- Gordon, R.D. 1987. Eremochilini a new tribe of neotropical Epilachninae (Coleoptera: Coccinellidae). *J.N.Y. ent. Soc.* 95(1):5-9.
- *Gorham, H.S. 1891. *Annls. Soc. ent. Belg.* 35: 206.
- *Gorham, H.S. 1892. *Annls. Soc. ent. Belg.* 36:175.
- Gorham, H.S. 1894a. On the Coccinellidae from India in the collection of Mr. H.E. Andrews of the Indian Forest Service. *Annls. Soc. ent. Belg.* 38:200-208.
- Gorham, H.S. 1894b. Observations on some species of the family Coccinellidae collected from Konbir and Mandari, Bengal (India) By R. Gordon. *Annls. Soc. ent. Belg.* 38: 209-211.
- Gorham, H.S. 1894c. On the Coccinellidae collected by Mr. L. Fea in Burma. *Annali. Mus. civ. Stor. nat. Genova* 25(2):683-695.
- *Gorham, H.S. 1895a. *Annali. Mus. civ. Stor. nat. Genova* 26(2):690-693.

- *Gorham, H.S. 1895b. *Annali. Mus. civ. Stor. nat. Genova* **26**(2):686.
- *Guerin F.E. 1842. *Icones Regne Anim.*: 318.
- *Guerin, F.E. 1846. *Icones Regne Anim.*: 320.
- *Gyllenhal, L. 1808. *In Schonherr Synonymia Insectorum* **2**(2): 205,206.
- *Gyllenhal, L. 1827. *Insecta Suecica* **4**:193.
- *Herbst, J.F.W. 1783. *Arch. d. Ins. Gesch.* IV-V:48.30.
- *Herbst, J.F.W. 1786. *Arch. d. Ins.* VI:7.
- Hope, J. F.W. 1831. Synopsis of the new species of Nepaul insects in the collection of Major General Hadwicke. *Gray's Zool. Misc.*:21-32.
- Ibrahim, M.M. 1955. Studies on *Coccinella undecimpunctata* Linnaeus II. Biology and life history. *Bull. Soc. ent. Egypte* **39**:395-423.
- Jacobson, G.G. 1904-1916 (1916). Die Käfer Russlands und Westeuropas. *Einhandbuch zum Bestimmen der Käfer Petrograd.* 865-1024.
- Kamiya, H. 1960. A new tribe of Coccinellidae (Coleoptera). *Kontyu* **28**:22-26.
- Kamiya, H. 1965a. A revision of the tribe Coccinellini of Japan and the Ryukyus (Coleoptera: Coccinellidae). *Mem. Fac. Lib. Arts Fukui Univ.* **15**(2):27-71.
- Kamiya, H. 1965b. Comparative morphology of larvae of the Japanese Coccinellidae, with special reference to the tribal phylogeny of the family (Coleoptera). *Mem. Fac. Lib. Arts Fukui Univ.* **14**(2):83-100.
- *Kamiya, H. 1965c. *Kontyu* **33**:104.
- Kamiya, H. 1966. On the Coccinellidae attacking the scale insects and mites in Japan and the Ryukyus. *Mushi* **39**:65-93.
- Kapur, A.P. 1942. Bionomics of some Coccinellidae predaceous on aphids and coccids in North India. *Indian J. Ent.* **4**:49-66.
- Kapur, A.P. 1944. On the biology and the structures of the coccinellid *Thea bisoctonotata* Mulsant in North India. *Indian J. Ent.* **6**:165-171
- Kapur, A.P. 1946. A revision of Genus *Jauravia* Motschulsky (Coleoptera: Coccinellidae). *Ann. mag. nat. hist. Ser. II* **13**:75-92.

- Kapur, A.P. 1948a. The genus *Tetrabrachys* (*Lithophilus*) with notes on its biology and a key to the species (Coleoptera: Coccinellidae). *Trans. R. ent. Soc. London* **99**:319-339.
- Kapur, A.P. 1948b. On the old world species of the genus *Stethorus* Weise (Coleoptera: Coccinellidae). *Bull. ent. Res.* **38**:297-320.
- Kapur, A.P. 1948c. A revision of the tribe Aspidimerini Weise (Coleoptera: Coccinellidae). *Trans. R. ent. Soc. London* **99**:77-128.
- Kapur, A.P. 1949. On the Indian species of *Rodolia* Mulsant (Coleoptera: Coccinellidae). *Bull. ent. Res.* **39**: 531-538.
- Kapur, A.P. 1950a. Further notes on the Indian species of *Rodolia* Mulsant (Coleoptera: Coccinellidae). *Rec. Indian Mus.* **48**:1-7.
- Kapur, A.P. 1950b. The biology and external morphology of the larvae of Epilachninae. *Bull. ent. Res.* **40**: 161-208.
- Kapur, A.P. 1950c. A new species of *Stethorus* Weise from India (Coleoptera: Coccinellidae). *Proc. R. ent. Soc.* **19**:148-149.
- Kapur, A.P. 1952. A note on *Epilachna ocellata* Redt. (Coleoptera: Coccinellidae) with description of three species hitherto confused with it. *Rec. Indian Mus.* **50**:17-29.
- Kapur, A.P. 1954a. Contribution to a knowledge of the fauna of Manipur State, Assam. *Rec. Indian Mus.* **52**:313-336.
- Kapur, A.P. 1954b. A new species of Coccinellidae (Coleoptera) predaceous on the citrus white fly in India. *Rec. Indian Mus. Calcutta* **52**:189-193.
- Kapur, A.P. 1954c. Systematic and biological notes on the lady bird beetles predaceous on the sanjose scale in Kashmir with description of a new species (Coleoptera:Coccinellidae). *Rec. Indian Mus. Calcutta* **52**: 257-274.
- Kapur, A.P. 1954d. Mass assemblage of the coccinellid beetle *Epilachna bisquadripunctata* (Gyllenhal) in Chhota Nagpur. *Curr. Sci.* **23**:230-231.
- Kapur, A.P. 1955. Coccinellidae of Nepal. *Rec. Indian Mus*: **53**: 309-338.
- Kapur, A.P. 1959. Identification of the lady beetles, *Epilachna implicata* Mulsant from India (Coleoptera: Coccinellidae). *J. Bombay nat. Hist. Soc.* **56**(3):652-660.
- Kapur, A.P. 1961a. Taxonomic notes on *Epilachna indica* Mulsant and description of a new species related to it (Coleoptera: Coccinellidae). *Proc. R. ent. Soc. London* **30**: 133-140.

- Kapur, A.P. 1961b. Some new or a little known species of Coccinellidae (Insecta: Coleoptera). *Rec. Indian Mus.* **59**: 131-141.
- Kapur, A.P. 1963a. Some new or little known species of Coccinellidae (Insecta: Coleoptera) Part I. four new species of Epilachninae from India and Burma. *Rec. Indian Mus.* **61**: 131-141.
- Kapur, A.P. 1963b. The Coccinellidae of the third mount Everest Expedition, 1924 (Coleoptera). *Bull. Br. Mus. (nat. Hist.) Ent.* **14**:1-48.
- Kapur, A.P. 1963c. The taxonomic status and further description of *Harmonia expallida* Weise (Coleoptera:Coccinellidae) feeding on *Adelges* species (Hemiptera:Adelgidae). *Entomophaga* **8**:199-203.
- Kapur, A.P.1966. The Coccinellidae (Coleoptera) of the Andamans. *Proc. nat. Ins. Sci. India* **32 B(3-4)**:148-189.
- Kapur, A.P. 1967. On some Coccinellidae of the tribe Telsimiini with descriptions of new species from India. *Bull. Syst. Zool.* **1(2)**: 45-56.
- Kapur, A.P. 1970. Phylogeny of lady beetles. *Proc. 57th Indian Sci. Congr. Part II*: 167-180.
- Kapur, A.P. 1972. The Coccinellidae (Coleoptera) of Goa. *Rec. Zool. Surv. India* **66** (1-4): 309-320.
- Kapur, A.P. 1973. On a collection of lady bird beetles (Coleoptera: Coccinellidae) from Bhutan. *Orient. Insects* **7(3)**: 457-460.
- Kawauchi, S. 1985. Comparative studies on the facundity of three aphidophagous coccinellids (Coleoptera: Coccinellidae). P.36. In Proc. meeting IOBC: "Ecology of Aphidophaga 4" Budapest.
- Khnzorian, S.M.I. 1970. *Zool. papers* (Erevan) **15**:70.
- Khnzorian, S.M.I. 1979. Genera der Palaearktischen Coccinellini (Coleoptera: Coccinellidae). *Entomol. Blatter* **75** (1-2): 37-75.
- Koebele, A. 1893. Studies of parasitic and predaceous insects in New Zealand, Australia and Adjacent Islands U.S. Dept. of Agriculture: 1-39.
- Korschevsky, R. 1931. Coccinellidae 1. In Junk *Coleoptm Cat.* Berlin Pars (118): 1-224.
- Korschevsky, R. 1932. Coccinellidae II. In junk *Coleoptm. Cat.* Berlin Pars (120):225-659.
- *Korschevsky, R. 1940. *Ent. Blatt.* **36**:2.
- *Kugelann, J.G. 1794 . *N. Mag. Lieb. Ent.* (Schneiders) **5**:545-548.

- *Kurisaki, 1923. *Month. Mag. Zool. Tokyo*: **35** (413):101,105,107.
- Lal, R. & Kanakavalli, S. 1960. The genitalia of some Indian Coccinellidae. *Annls. zool.* **3**(6): 69-110.
- *Leach, J.G. 1815. *In Brewster, Edinburgh Encycl.* **9**:116.
- *Lewis, G. 1873. *Ent. Mon. Mag.* **10**: 55.
- *Lewis, G. 1896. On the Coccinellidae of Japan. *Ann. Mag. nat. hist.* London **17**(6):22-41.
- Linnaeus, C. 1758. *Systema naturae per regna tria naturae, secumdem classes, ordines genera, species cum characteribus differendiis, synonymis, locis, Editio decima, reformata, Tom. I laurentii Salvii, Holmiae* **1**:1-824.
- *Linnaeus, C. 1767. *Systema Naturae* **10**: 364-368,533-1364.
- Liu, C.L. 1965. Economic Insects of China, Fasc. 5, Coleoptera Coccinellidae :1-101.
- Mader, L. 1926. *Z. Ver. Nat. Beob. Sammler Wien.* **1**:16.
- Mader, L. 1926-1937. Evidenz der Palaarktischen Coccinelliden und ihrer Abberationen in Wort und Bild, 1, Teil. 412 + 12 PP. 62 Col. Pls.
- Mader, L. 1930. Die Evidenz der Palaarktischen Coccinelliden und ihrer Abberationen (Contd.). *Z. Ver. Naturbeobach Vienna* **5**: 125-168.
- *Mader, L. 1931a. *Ent. Anz.* **11**: 109,476.
- *Mader, L. 1931b. *Evidenz.*: 172.
- *Mader, L. 1941. Coccinellidae, I Teil. Explor. Parc nat. Albert, Miss. de Witte (1933-35), fasc. 43. 208pp
- *Mader, L. 1950. Coccinellidae, II Teil. Explor. Parc. nat. Albert, Miss. de Witte (1933-35), fasc. 34.136pp
- *Mader, L. 1954. Coccinellidae, III Teil. Explor. Parc. nat. Albert, Miss. de Witte (1933-35), fasc. 80.206pp.
- *Mader, L. 1955. Evidenz der Paläarktischen Coccinelliden und ihrer Abberationen in wort und Bild, II. Teil *Ent. Arb. Mus. Georg. Frey* **6**(3): 764-1035.

- Miyatake, M. 1959. A contribution to the Coccinellid fauna of the Ryukyu Islands (Coleoptera). *Mem. Ehime. Univ.* 4:125-161.
- Miyatake, M. 1970. The East Asian Coccinellid beetles preserved in the California academy of sciences (Tribe:Chilocorini). *Mem. Coll. Agri. Ehime Uni.* 14(3); 304-338.
- Miyatake, M. 1972. A new Formosan species belonging to the genus *Singhikalia* Kapur with proposal of a new tribe (Coleoptera: Coccinellidae). *Trans. Shikoku ent. Soc.* 11(3):92-98.
- Motschulsky, V. 1858a. Entomologiae speciale. Insectes des Indes Orientales. *Etud. Ent.* 7:20-122.
- *Motschulsky, V. 1858b. *Etud. Ent. Pt.* 7:188.
- Motschulsky, V. 1859. Entomologie appliquee. Insectes utiles et nuisibles. *Etud. Ent.* 8:169-174.
- Motschulsky, V. 1866. Essai d'un Catalogue des insectes de l'ile ceylan. *Bull. Soc. Hist. Nat. Moscow* 39:422-426.
- Mulsant, M.E. 1846. Securipalpes. *Histoire Naturelle des Coleopteres de France* 4:1-280.
- Mulsant, M.E. 1850. Species des Coleopteres trimeres securipalpes. *Ann. Soc. Agric. Lyon* 2(2):1-1104.
- Mulsant, M.E. 1853a. Supplement a la Monographie des Coleopteres trimeres Securipalpes. *Opus. Ent.* 3:1-205.
- Mulsant, M.E. 1853b. Supplement a la Monographie des Coleopteres trimeres Securipalpes. *Ann. Soc. Linn. Lyon* 1:129-333.
- Mulsant, M.E. 1856. Species des Coleopteres trimeres Securipalpes. *Ann. Soc. Agric. Lyon* III:135-156.
- Mulsant, M.E. 1866. Monographie des Coccinellides, Paris: 1-292.
- Nagaraja, H. Hussainy, S.U. 1967. A study of six species of *Chilocorus* (Coleoptera: Coccinellidae) predaceous on san jose and other scale insects. *Orient. Insects* 1(3-4):249-256.
- *Nakane & Araki 1960. *Sci Rep. Kyot pref. univ.*(A) 3:117.
- Nayar, K.K., Ananthakrishnan, T.N. & David, B.V. 1989. General and applied Entomology. Tata Mc Graw-Hill Publishing Company Limited New Delhi: 1-587.

- *Nefedov, 1959. *Kabadino Balkar Univ. Mem. Sci.* 5:161.
- Ohta, Y. 1929a. Scymninen Japans. *Ins. Mats.* 4(1-2):1-16.
- Ohta, Y. 1929b. *Ins. Matsum.* 4(1/2):70.
- Ohta, Y. 1931. Ueber einige Coeloptoren-und Helotiden-Arten aus Formosa, mit Beschreibung von. 2 neuen Arten. *Ins. Mats.* 6(3):134-136.
- *Olivier, G.A. 1808. *Entom.* 6(98):985-1061.
- Pajni, H.R. & Singh, T. 1982. A report on the family Coccinellidae of Chandigarh and its surrounding areas. *Res. Bull. of the Punjab University Science* 33(3-4):79-86.
- Pajni, H.R. & Verma, S. 1985. Studies on the structure of male genitalia in some Indian Coccinellidae (Coleoptera). *Res. Bull. of the Punjab University Science.* 36(3-4):195-201.
- *Pallas, P.S. 1773. *Reise:*726.
- *Pontopiddan, E. 1763. *Danska Atlas* 1:669.
- Pope, R.D. 1962. A revision of the Pharini (Coleoptera: Coccinellidae). *Ann. mag. nat. hist.* 13(4):627-640.
- Pradhan, S. 1938. Neuromuscular study of the mouth parts of *Coccinella septempunctata* Linnaeus with a comparison of the mouth parts in carnivorous and herbivorous coccinellids. *Rec. Indian Mus.* 15:341-358.
- Puttarudriah, M., Channabasavanna, G.P. & Krishna Murti B. 1952. Discovery of *Cryptolaemus montrousieri* Mulsant (Coleoptera: Coccinellidae) in Bangalore, South India. *Nature* 169:377.
- Puttarudriah, M. & Channabasavanna, G.P. 1953. Beneficial coccinellids of Mysore. *Indian J. Ent.* 15:87-96.
- Puttarudriah, M. & Channabasavanna, G.P. 1955. Beneficial Coccinellids of Mysore II. *Indian J. Ent.* 17:1-5.
- Puttarudriah, M. & Channabasavanna, G.P. 1956. Some beneficial coccinellids of Mysore. *J. Bombay nat. Hist. Soc.* 54(1):156-159.
- Puttarudriah, M. & Channabasavanna, G.P. 1957. Notes on some predators of mealy bugs (Coccidae, Hemiptera). *The Mysore Agricultural Journal* 32:4-19.

- Rao, V.T., David, A.L. & Rao, K.R.M. 1954. Attempts at the utilization of *Chilocorus nigrinus* (Fabricius) (Coleoptera: Coccinellidae) in the Madras State. *Indian J. Ent.* **16**: 205-209.
- Rao, V.T., & David, A.L. 1958. *Indian Journal of Agricultural Sciences* **28**:545-552.
- *Redtenbacher, L. 1843. Tentamen dispositionis generum et specierum coleopterorum pseudotrimerorum Archiducatus Austriae. **8**,11,16.
- Richards, A.M. 1980. Defensive adaptations and behaviour in *Scymnodes lividigaster* (Mulsant) (Coleoptera: Coccinellidae). *J. Zool.* **192**: 157-168.
- Richards, A.M. 1981. *Rhyzobius ventralis* (Erichson) and *R. forestieri* (Mulsant) (Coleoptera: Coccinellidae) their biology and value for scale insects control. *Bull. ent. Res.* **71**:33-46.
- *Rybakov, 1889. *Horae, Soc. ent. ross.* **23**:289.
- Saha, J.L. 1987. Studies on the, fecundity, hatchability, mortality and longevity of *Menochilus sexmaculatus* (Fabricius) (Coleoptera: Coccinellidae). *J. Aphidology* **1**: 47-50.
- Sasaji, H. 1967. A revision of the formosan Coccinellidae (I) the subfamily Sticholotinae with an establishment of a new tribe (Coleoptera). *Etizenia* **25**:1-28.
- Sasaji, H. 1968a. Phylogeny of the family Coccinellidae (Coleoptera). *Etizenia* **35**:1-37.
- Sasaji, H. 1968b. Coccinellidae collected in the paddy fields of the orient, with discriptions of new species (Coleoptera). *Mushi* **42**:119-132.
- Sasaji, H. 1971. Fauna Japonica Coccinellidae (Insecta: Coleoptera). *Acad. Press. Japan* IX: 1-340.
- *Savojskaja, G.I. 1962. *Trans. Inst. Zash. Rast. Kazakhst.* **7**:316.
- *Savojskaja, G.I. 1969. *Vestnik Sel. Khoz. nauk.* **9**:37,104.
- *Say, Th. 1824. *J. Acad. Philadelphia* **4**: 94.
- *Schneider, D.H. 1791. *N. Mag. Lieb. Ent.* **1**(1):23.
- *Schonherr, C.J. 1808. *Synonymia Insectorum* **1**:1-424.
- *Sharga, U.S. 1948. *Curr. Sci.* **17** (10):302-303.
- Sicard, A. 1909. Revision des Coccinellides de la fauna malgache (II). *Ann. Soc. ent. Fr.* **78**: 68-165.

- Sicard, A. 1910. Coccinellides de l'Inde. *Ann. Soc. ent. Fr.* **79**:377-389.
- Sicard, A. 1912. Notes sur quelque Coccinellidae de l'Inde et de Birmanie appartenant a la collection de M. Andrews, de-Londres, et description d' especes et de varietes nouvelles. *Ann. Soc. ent. Fr.* **81**: 495-506.
- *Sicard, A. 1913. *Ann. Soc. ent. Fr.* **81**:398.
- Sicard, A. 1929. Espèces nouvelles de coccinellides *Ann. mag. nat. hist.* **3**(10):179-184.
- Singh, R. & Malhotra, R.K. 1979. Bionomics of *Coccinella septempunctata* Linnaeus. *Indian J. Ent.* **41**:244-249.
- *Subramaniam, T.V. 1923. *Rep. Proc. 5th Ent. Meeting Pusa*: 108- 118.
- Subramaniam, T.V. 1925. *Coptosoma ostensum* Dist. and its enemy *Synia melanaria* Mulsant. *J. Bombay nat. Hist. Soc.* **30**(25); 924-925.
- *Swartz, 1808. *Syst. Ins.* **2**:195.
- Takizawa, M. 1917. Some new species of Coccinellidae in Japan. *Trans. Sapporo Nat. Hist. Soc.* **6**:220-224.
- Taylor, T.H.C. 1935. The campaign against *Aspidiotus destructor* sign in Fizi. *Bull. ent. Res.* **26**:1-102.
- Thunberg, C.P. 1781. *Dissertatio entomologica:Novas Insectorum species, Sistens. J. Edman upsaliae* **1**:1-28.
- Timberlake, P.H. 1943. The Coccinellidae or ladybeetles of the Koebele collection part I. *Hawaii. Plant Rec.* **47**:1-67.
- Walker, F. 1859. Characters of some apparently undescribed Ceylon Insects. *Ann. & mag. nat. hist.* **4**:217-224.
- Watson, W.Y. 1956. A Study of the phylogeny of the genera of the tribe Coccinellini (Coleoptera): *Contr. Roy. Ontario Mus. Zool. Palaeont* **42**:1-52.
- Weise, J. 1879a. Beitrage Zur Kafer Fauna Von Japan. *Dt. ent. Z.* **23**:147-154.
- *Weise, J. 1879b. Bestimmungstabellen der europäischen Coleoptera. II: Coccinelliden. *Z. ent. Breslau.* **7**:88-156.
- Weise, J. 1885a. Beschreibung einiger Coccinelliden. *Stettin ent. Ztg* **46**: 227-241.
- Weise, J. 1885b. *Bestimm. Tab. eur. Coleopt* **2**:1-83.
- Weise, J. 1887. Neue Sibirische chrysomeliden und coccinelliden nebst Bemerkungenuber fuher beschriebene Arten. *Arch. Naturgesch* **53**(1):164-214.

- *Weise, J. 1891. *Cat. Col. Europ.* 781.
- Weise, J. 1892a. Les Coccinellides du Chhota Nagpare. *Ann. Soc. ent. Belg.* 36:16-30.
- Weise, J. 1892b. *Dez.* 36:109.
- Weise, J. 1895a. Neue Coccinelliden, sowie Bemerkungen Zu bakannten Arten. *Ann. Soc. ent. Belg.* 39:120-157.
- *Weise, J. 1895b. *Dtsch. Ent. Z.*:326.
- Weise, J. 1900. Coccinelliden aus Ceylon gesammelt-Von Dr.Horn. *Dtsch. Ent. Z.* 28:417-445.
- Weise, J. 1901. Contributions a l et ude de la faune entomologique de Sumatra, coccinellides. *Ann. Soc. ent. Belg.* 45:91-96.
- Weise, J. 1902. Coccinelliden aus der sammlung des ungarischen National Museums. *Termès. Fuz.* 25:489-520.
- Weise, J. 1903. *Verh. zool. bot. Ges. Wien.* 53:582.
- Weise, J. 1908. Coleopetren aus Ostindien. *Stettin. ent. Ztg* 69: 214-230.
- *Wiese, J. 1910a. *Verh. Naturf. Ver. Brunn.* XLVIII:51.
- *Weise, J. 1910b. verzeichniss von Coleopteren aus den Philippinen, nebst zwei neuen Arten aus Niederlandisch Ostindien. *Philippine. Journ. Sci.* 5D:139-149.
- *Weise, J. 1912. Uber Hispinen und Coccinelliden. *Arch. Naturgesch.* 78A(12)100-120.
- *Weise, J. 1913 *Arch. Naturgesch.* 79A(2):184.
- *Weise, J. 1923. H. Sauter's Formosa-Ausbeute: Coccinellidae. *Arch. Naturgesch.* 89A:182-188.
- Wiedemann, C.R.W. 1823. Lweine, ndert nene Kafer Von Java, Bengalen und demrorgebide de guten Hoffuung. *Zool. Mag.* 2: 1-333.
- Wilson, F. 1960. A review of the biological Control of insects and weeds in Australia and Australian New Guinea. *Tech. Commun. Inst. biol. Control* No.1: 1-102.
- *Wolloston, 1867. *Col. Hesp.* :158.

* References not consulted in original.