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New additions to Indian fauna of Coccinellidae (Coleoptera)

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ABSTRACT

Fourteen species of Coccinellidae [*Henosepilachna kathmanduensis* Miyatake, *Henosepilachna verriculata* Pang and Mao, *Afissa ampliata* (Pang and Mao), *Afissa craspedotricha* (Yu), *Afissa nielamuensis* (Pang and Mao), *Diekeana glochinosa* (Pang and Mao), *Halyzia nepalensis* Canepari, *Oenopia chinensis* (Weise), *Prototheа decemguttata* (Hoàng), *Cryptogonus hainanensis* Pang and Mao, *Serangium clauseni* (Chapin), *Stethorus (Allostethorus) gangliiformis* Li et al., *Scymnus (Pullus) utilis* Hoàng and *Renius cornutus* Li and Wang] are added to the known fauna of lady beetles (Coleoptera: Coccinellidae) of India. *Afissa. craspedotricha* Yu and *Epilachna nielamuensis* Pang & Mao are combined with *Afissa* Dieke (**New combinations**) following the latest revised generic classification of Epilachnini. These new records are mainly based on material received for identification in the form of specimens and photographs from students and amateur naturalists. Notes on the diagnosis and distribution of these species are provided with illustrations to facilitate identification.

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Coccinelloidea; lady beetles; Indian subcontinent; faunal records; new combinations

Introduction

Lady beetles of the Indian region remain poorly documented due to the lack of collections from the entire geographic spread of India, particularly its biodiversity hotspots like the north-eastern region, eastern Himalayas, Western Ghats etc. Many large genera have not been revised in the light of the new system of classification proposed for the subfamilies and tribes of the family by Ślipiński (2007) and Seago et al. (2011). Primary revisions of major tribes like Scymnini, Sticholotidini and Epilachnini of the Indian Subcontinent based on examination of type material have been long overdue but hampered by various problems. Existing institutional collections in India are not easily accessible to even bona fide researchers and inter-institutional collaboration in

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India is virtually non-existent due to protectionism, which is an almost insurmountable problem for Indian taxonomists.

In the absence of networking among taxonomists and lack of funds for collection surveys, specimens received for identification from students and researchers are one of the major sources of study material to many insect taxonomists in India. Material received for identification by the first author often contains new species and new distribution records for the region. Many identification requests are often received for single female specimens in difficult tribes like Sticholotidini, Scymnini and Epilachnini, which are impossible to identify in the absence of associated males. Besides this, photographs of coccinellids are frequently submitted for identification. Increasing use of smartphones equipped with high-quality digital cameras and internet and social media mobile apps such as WhatsApp, Facebook and Flickr for sharing photographs, videos etc. by amateur naturalists and citizen scientists has made it easier to document the biodiversity of remote localities not easily accessible to taxonomists (Osawa et al. 2017; Suprayitno et al. 2017). Photographs shared/sent for identification by such 'citizen scientists' have been useful in updating the known distribution of many species within India. Such information gleaned from specimens examined and photographs received for identification is presented in this paper and 14 species of Coccinellidae are added to the known coccinellid fauna of India and illustrated with notes on their diagnosis and distribution. *Afissula craspedotricha* Yu 2004 and *Epilachna nielamuensis* Pang and Mao 1977 are transferred to *Afissa* Dieke (**new comb**.) following the latest revised generic classification of Epilachnini given by Tomaszewska and Szawaryn (2016).

Materials and methods

The information presented in this paper is mainly based on studies carried out on the specimens and photographs of coccinellids received for identification by the first author in recent times. Coccinellid collections housed at the Zoological Survey of India, Kolkata, were also examined in some cases. Only those species with definite spots and patterns that can be identified conclusively from photos have been included here. Most of the species examined here were received without any accompanying labels except for very scanty or basic information on their provenance such as name of the state/province of collection and are indicated as such. Images of whole specimens and genitalia were taken using a Leica M205A stereo microscope and image stacks generated were processed into composite images for enhanced depth using Combine ZP and touched up in Photoshop CS. The specimens studied are deposited in the following collections:

ZSIK: Zoological Survey of India, Kolkata

NBAIR: National Bureau of Agricultural Insect Resources, Bangalore
NRCB: National Research Centre for Banana, Trichy

Taxonomic accounts

Brief notes are given below on 14 species newly recorded from India with notes on distribution and illustrations to facilitate identification. Detailed diagnostic accounts are not given, but references to recent publications by other authors on these taxa are provided.

Subfamily Coccinellinae: Tribe Coccinellini
Halyzia nepalensis Canepari (Fig. 1A–D)

Halyzia nepalensis Canepari 2003, 261.

Specimens examined
'Burma Kambaiti', without other data, 2 ex. (ZSIK).

Notes. This species was originally described from Nepal Himalayas by Canepari (2003) and it has not been recorded from anywhere else in the Indian Subcontinent until now. This species is recorded for the first time from Myanmar ('Burma') based on specimens from 'Burma Kambaiti' (Fig. 1A–B) examined by JP in the collections at ZSI, Kolkata. Photographs of this species taken from the north-eastern Indian state of Arunachal Pradesh were also received for identification (Fig. 1C–D). This species is apparently attracted to light as the photos were of specimens taken along with moths during an expedition for documentation of Lepidoptera in Arunachal Pradesh by Geetha Iyer, an amateur naturalist. Suprayitno et al.

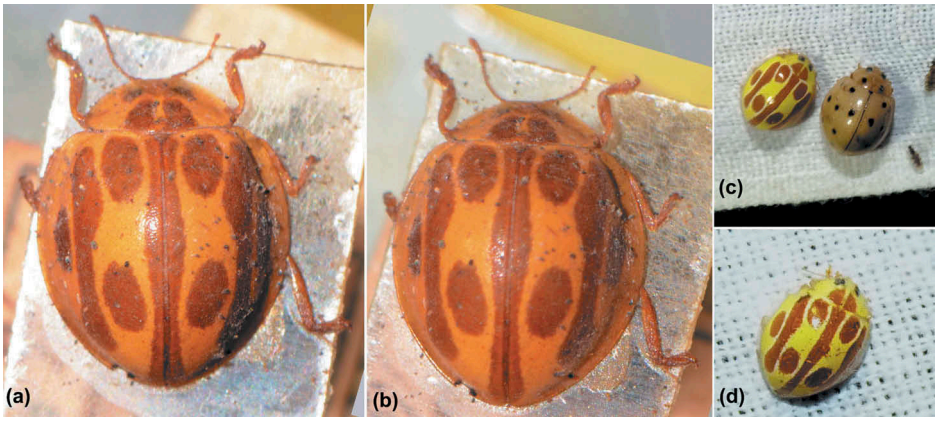

Figure 1A–D. *Halyzia nepalensis* Canepari: A–B, adult, dorsal view; C–D, adult attracted to light (C, specimen on the right is *Harmonia sedecimnotata* (F.)).

(2017) discussed the vital role played by amateur naturalists in documenting flora and fauna from remote areas in developing countries through social media. This is a typical example of what 'Citizen Science' can contribute in fauna-rich tropical countries where taxonomists often work without the resources or permits to collect from remote areas.

Distribution

India: Arunachal Pradesh; Myanmar ('Burma'); Nepal.

Oenopia chinensis (Weise) (Fig. 2A–C)

Coelophora chinensis Weise 1912, 113; Mader 1934, 325.
Gyrocaria chinensis: Miyatake 1965, 65.
Oenopia chinensis: Hoàng 1983a, 91.

Specimen examined

India: Meghalaya; without other data, 1 ex (NBAIR).

Notes. A single female (Fig. 2A) collected from the north-eastern state of Meghalaya was examined. The larvae (Fig. 2B–C) were collected during field surveys in Pasighat, Arunachal Pradesh but could not be reared to adults.

Figure 2A–C. *Oenopia chinensis* (Weise): A, adult, dorsal view; B–C, larva.

Distribution

India: north-eastern region (Arunachal Pradesh; Meghalaya); China.

Prototheа decemguttata (Hoàng) (Fig. 3A–C)

Nedina decemguttata Hoàng 1983b, 151, 1983a, 83.
Prototheа decemguttata: Poorani and Ślipiński 2006, 331.

Specimen examined

India: Pynursla, 21.3.59, A.P. Kapur/in forest east of Pynursla/on bamboo/coverslip with genitalia (ZSIK).

Notes. This species was originally described as *Nedina decemguttata* by Hoàng (1983b) from Vietnam and later transferred to *Prototheа* by Poorani and Ślipiński 2006 when *Nedina* was synonymised with *Prototheа*. The sole Indian specimen (Fig. 3A–C) examined in the collections at ZSI, Kolkata, is yellow-orange with 10 black elytral spots arranged in a characteristic 2-2-1 pattern on each elytron and fully matches Hoàng's description. The ventral side is yellow except prosternal process, meso- and metaventrites are black. It bears the label '*Coelophora ?decemguttata* Ws. 1912' by A.P. Kapur, but *Coelophora decemguttata* is much larger and does not have the raised prosternal process characteristic of *Prototheа*. The male genitalia were illustrated and described by Hoàng (1983b).

Distribution

India: Meghalaya (Pynursla); Vietnam.

Subfamily Coccinellinae: Tribe Epilachnini

Afissa ampliata (Pang and Mao) (Fig. 4A–F)

Epilachna ampliata Pang and Mao 1979, 152; Ren et al. 2009, 262, 263.
Afissa ampliata: Tomaszewska and Szawaryn 2016, 1, 52.

Figure 3A–C. *Prototheа decemguttata* (Hoàng), adult: A, dorsal view; B, lateral view; C, ventral view.

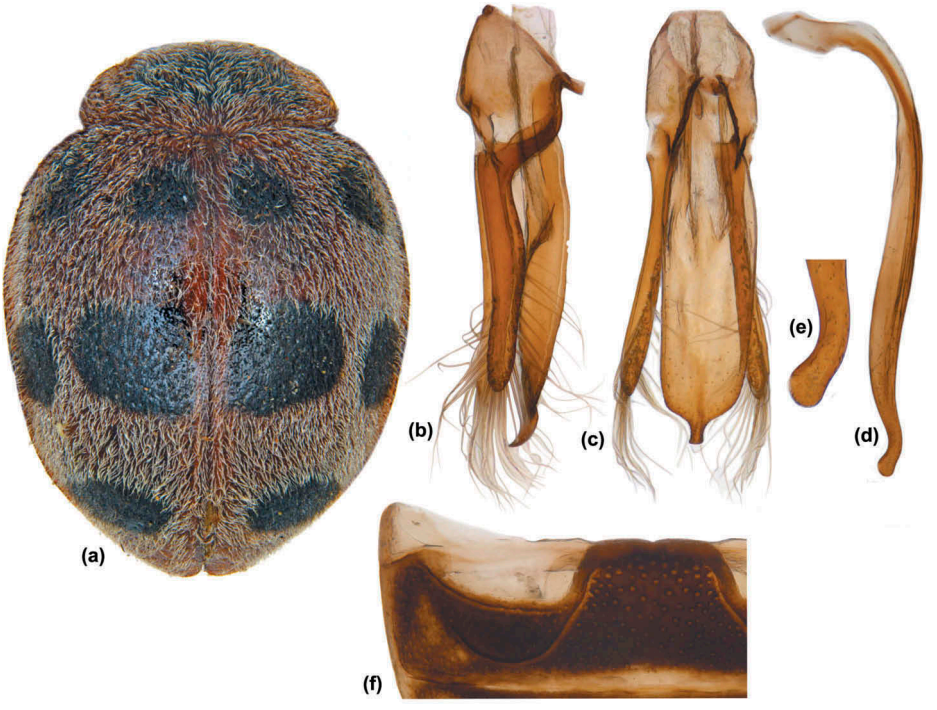

Figure 4A–F. *Afissa ampliata* (Pang and Mao): A, adult, dorsal view; B–E, male genitalia: B, tegmen, lateral view; C, tegmen, ventral view; D, penis; E, penis apex; F, abdominal postcoxal line.

Specimen examined

India: West Bengal; one male, without label data (NBAIR).

Notes. It was originally described from China by Pang and Mao (1979). This species has been adequately treated and illustrated by Ren et al. (2009), Pang and Mao (1979) and Pang et al. (2012).

Distribution

China. India: West Bengal.

Afissa. craspedotricha (Yu) (new comb.) (Fig. 5A–D)

Afissula craspedotricha Yu 2004, 60; Ren et al. 2009, 254, 255.

Specimen examined

India: Sikkim: Rumtek, 1999, S. Ramani, one male (NBAIR).

Notes. This species is recorded from India for the first time based on a single male specimen examined from Sikkim in the collections of NBAIR,

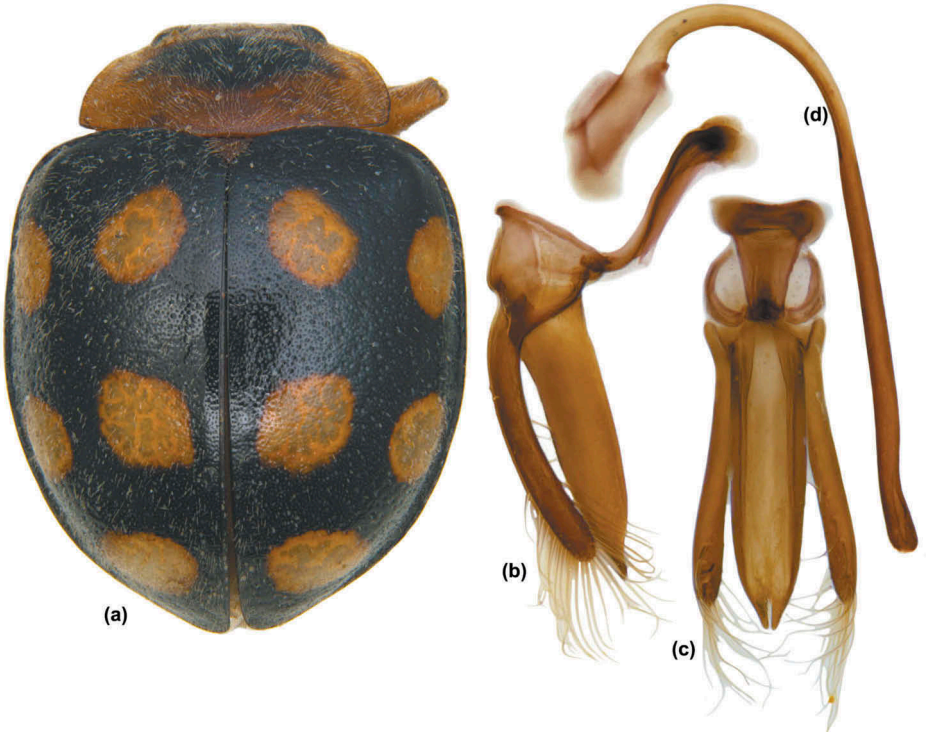

Figure 5A–D. *Afissa craspedotricha* (Yu): A, adult, dorsal view; B–D, male genitalia: B, tegmen, lateral view; C, tegmen, ventral view; D, penis.

Bangalore. As per the latest generic classification given for Epilachnini by Tomaszewska and Szawaryn (2016), *Afissula* is a synonym of *Afissa*, and accordingly, this species is combined here with *Afissa* (**new comb.**). The black macula on the anterior margin of pronotum in the specimen from Sikkim (Fig. 5A) does not extend to the lateral sides as in Yu's (2004) illustration, but the male genitalia (Fig. 5B–D) are identical. Externally, it is similar to another common species, *Afissa parvula* (Crotch), but the male genitalia are different. Yu (2004) and Ren et al. (2009) illustrated the habitus and male genitalia of this species.

Distribution

India: Sikkim; China.

Afissa nielamuensis (Pang and Mao) (new comb.) (Fig. 6A–B)

Epilachna nielamuensis Pang and Mao 1977, 323, 327.
Epilachna nielamuensis: Miyatake 1985, 30; Jadwiszczak and Węgrzynowicz 2003, 94; Ren et al. 2009, 291.

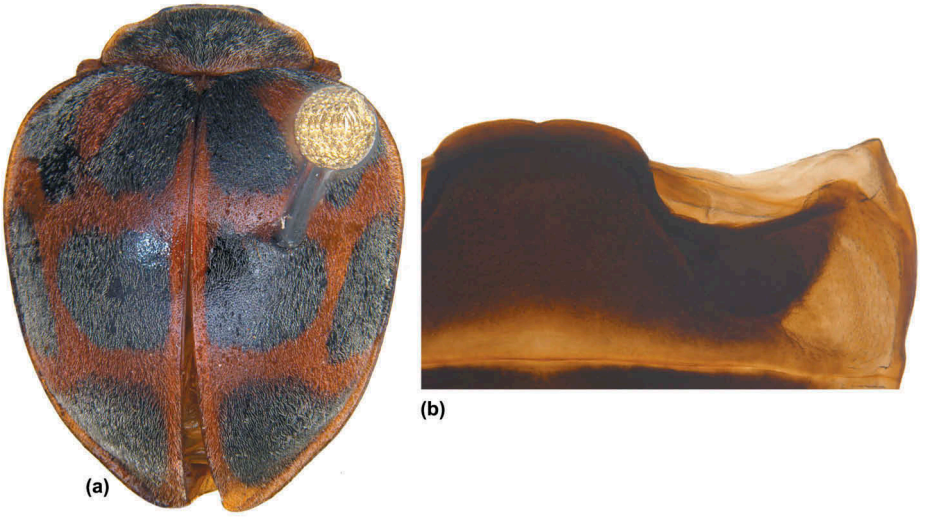

Figure 6A–B. *Afissa nielamuensis* (Pang and Mao): A, adult, dorsal view; B, abdominal postcoxal line.

Specimen examined

India: Arunachal Pradesh: two females (NRCB).

Notes. This species is recorded from India based on two females examined from the north-eastern Indian state of Arunachal Pradesh (Fig. 6A) that fully match Miyatake's (1985) description. Pang and Mao (1977) originally described this species from Tibet. Miyatake (1985) recorded it from Nepal Himalayas and described it in detail with excellent illustrations. The genus *Epilachna* does not occur in the Old World as per the latest generic classification of Epilachnini by Tomaszewska and Szawaryn (2016) and this species falls within the concept of the genus *Afissa* as defined by them. Hence, it is transferred here to *Afissa* (**new comb**.).

Distribution

India: Arunachal Pradesh; Nepal; China.

Diekeana glochinosa (Pang and Mao) (Fig. 7A–B)

Epilachna glochinosa Pang and Mao 1979, 138; Ren et al. 2009, 278; Pang et al. 2012, 12.
Diekeana glochinosa: Tomaszewska and Szawaryn 2016, 74.

Specimen examined

India: Nagaland: without other data (NBAIR).

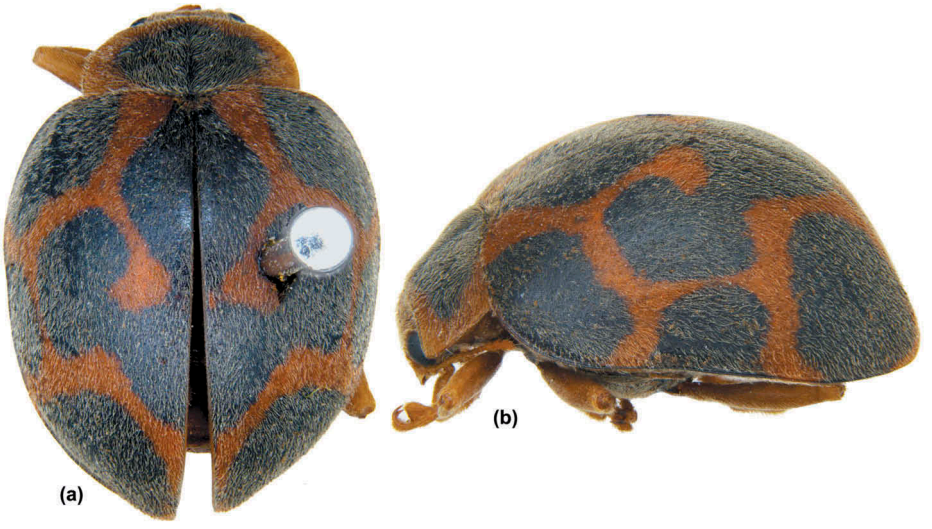

Figure 7A–B. *Afissa glochinosa* (Pang and Mao), adult: A, dorsal view; B, lateral view.

Notes. This record is based on a single female (Fig. 7A–B) received from Nagaland without any accompanying labels. This species was originally described under *Epilachna* and included by Pang et al. (2012) in their account of rare species of Chinese Epilachninae with illustrations of the habitus and male genitalia.

Distribution

India: Nagaland; China (Yunnan).

Henosepilachna kathmanduensis Miyatake (Fig. 8A–G)

Henosepilachna kathmanduensis Miyatake 1985, 23–24; Jadwiszczak and Węgrzynowicz 2003, 156.
Epilachna kathmanduensis: Jadwiszczak 1989, 734.

Specimen examined

India: Assam: Jorhat, ix.2016, Feeding on *Abelmoschus esculentus*, Rojeet Thangjam, two males; xii.2018, Reared from larva feeding on *Coccinia* sp., one male (NRCB).

Notes. Miyatake (1985) described this species from Nepal and mentioned that it was closely related to *Henosepilachna tamdaoensis* Hoàng (1977). Jadwiszczak (1989) transferred both to *Epilachna* for unspecified reasons, but both were later restored to *Henosepilachna* in the world catalogue of Epilachnini (Jadwiszczak and Węgrzynowicz 2003). Jadwiszczak (1989)

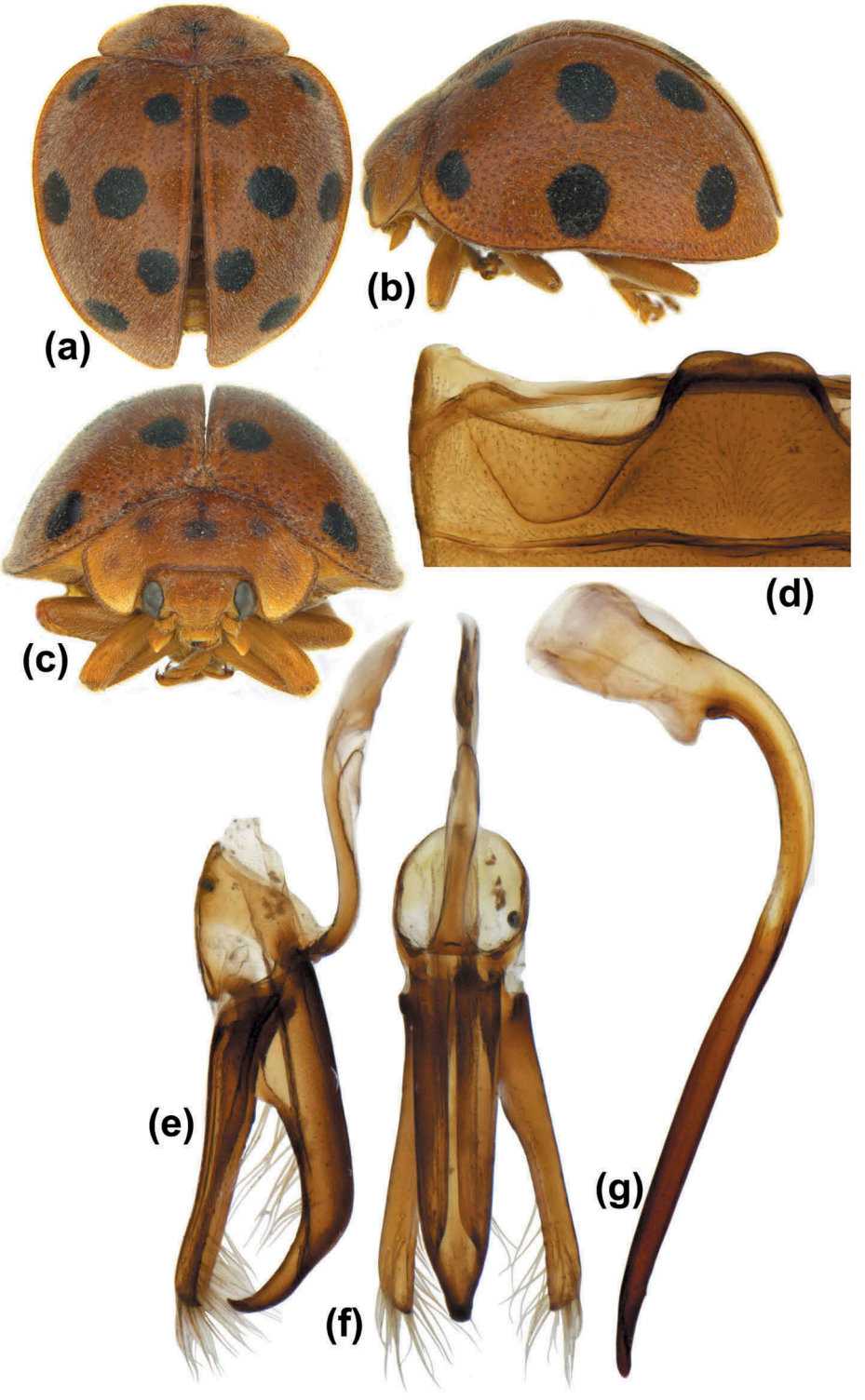

Figure 8A–G. *Henosepilachna kathmanduensis* Miyatake: A, adult, dorsal view; B, adult, lateral view; C, adult, frontal view; D, abdominal postcoxal line; E–G, male genitalia: E, tegmen, lateral view; F, tegmen, ventral view; G, penis.

opined that 'the differences between *E. kathmanduensis* Miyatake and *Epilachna tamdaoensis* were indistinct' and they were likely to be geographic races of one species. He observed that *E. tamdoensis* was 'stouter with an almost circular outline while *E. kathmanduensis* is narrower and short-oval; apart from spots 1–6 occurring in *E. kathmanduensis*, spots a-h were present in *E. tamdoensis*, but not as distinct as in the type specimen'. The specimens examined by us (Fig. 8A–C) are somewhat intermediate between *E. tamdaoensis* and *E. kathmanduensis*, but the male genitalia (Fig. 8D–E) are similar to Miyatake's species. The specimens examined by us were collected from Jorhat, Assam (north-eastern India), and found feeding on okra (*Abelmoschus esculentus* Moench, Malvaceae) and *Coccinia* sp. (Cucurbitaceae). Miyatake's (1985) paratype label data for *E. kathmanduensis* indicate potato as its host.

Distribution

India: Assam; Nepal.

Host plants. Okra (*Abelmoschus esculentus* Moench, Malvaceae); *Coccinia* sp. (Cucurbitaceae).

Henosepilachna verriculata Pang and Mao (Fig. 9A–D)

Henosepilachna verriculata Pang and Mao 1979, 117; Ren et al. 2009, 310, 311.

Specimen examined

India: Manipur, without other data, one male (NBAIR).

Notes. A single unlabelled specimen received for identification from the north-eastern Indian state of Manipur was examined. The habitus (Fig. 9A–B) and male genitalia (Fig. 9C–D) match the illustrations of *H. verriculata* given by Pang and Mao (1979) and Ren et al. (2009).

Distribution

India: Manipur; China.

Subfamily Coccinellinae: Tribe Aspidimerini

Cryptogonus hainanensis Pang and Mao (Fig. 10A–D)

Cryptogonus hainanensis Pang and Mao 1979, 65; Ren et al. 2009, 115.

Specimen examined

India: Tripura: without other data, one male (NBAIR).

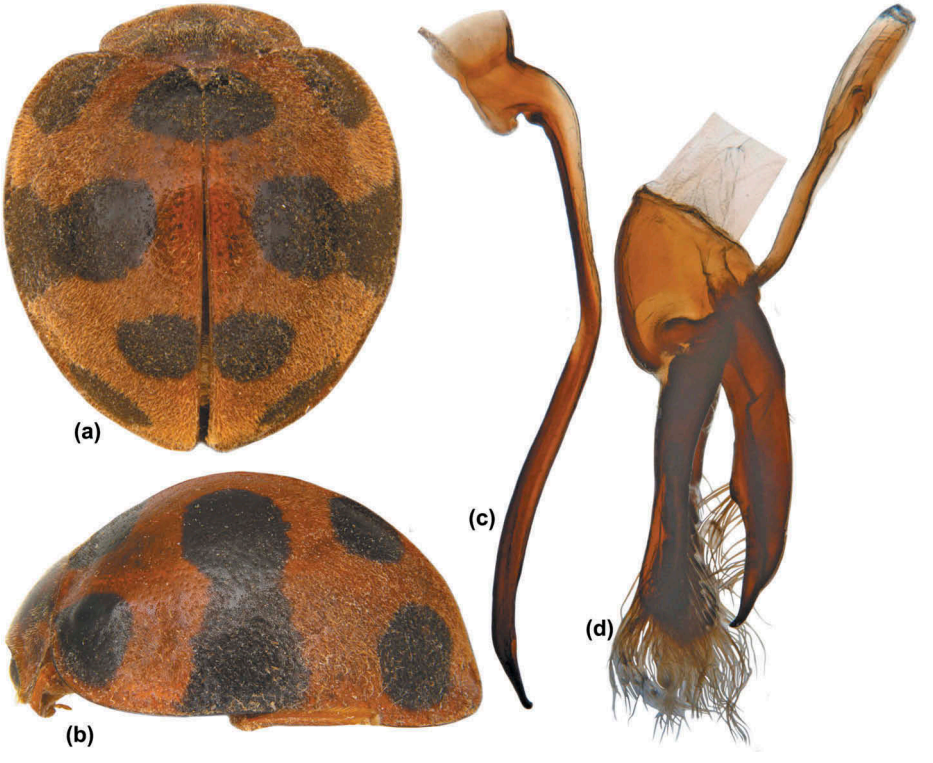

Figure 9A–D. *Henosepilachna verriculata* Pang and Mao: A–B, adult: A, dorsal view; B, lateral view; C–D, male genitalia: C, penis; D, tegmen, lateral view.

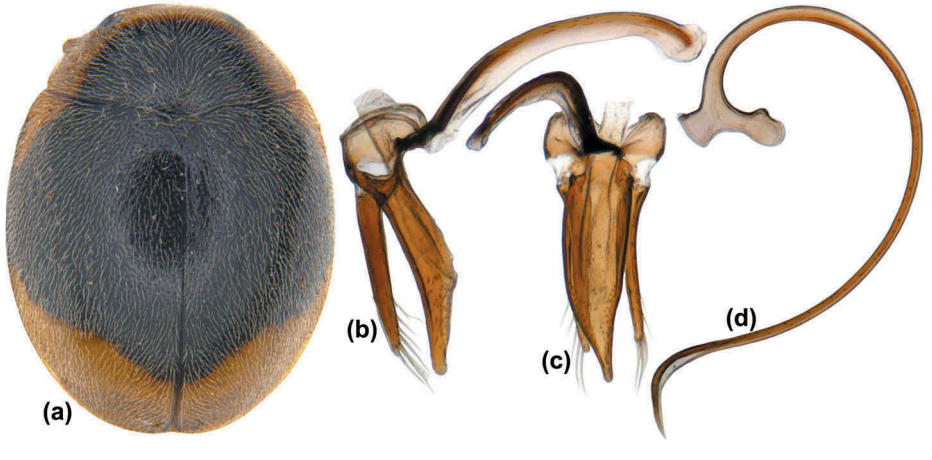

Figure 10A–D. *Cryptogonus hainanensis* Pang and Mao: A, adult, dorsal view; B–D, male genitalia: B, tegmen, lateral view; C, tegmen, ventral view; D, penis.

Notes. *Cryptogonus* Mulsant is a highly speciose genus and the species are difficult to identify without studying the male genitalia due to a great degree of variation in external appearance which overlaps across species.

Kapur (1948) revised the Indian species of *Cryptogonus*, but provided only truncated illustrations of the male genitalia for many species, which are inadequate to identify many species. The external appearance (Fig. 10A) and male genitalia (Fig. 10B–D) of the specimen studied here from the north-eastern Indian state of Tripura match the illustrations of *C. hainanensis* given by Ren et al. (2009).

Distribution

India: Tripura; China.

Subfamily Coccinellinae: Tribe Coccidulini (=Scymnini)

Scymnus (Pullus) utilis Hoàng (Fig. 11A–Q)

Scymnus (Pullus) utilis Hoàng 1982, 154–155.

Notes. This species is uniform yellow-orange on both sides and externally similar to the immaculate form of *Scymnus (Pullus) coccivora* Ayyar or yellowish with a large black macula occupying most of elytra except the lateral sides (Fig. 11A). The Indian specimens possess all the major diagnostic characters of *S. utilis* illustrated by Hoàng (1982), including male genitalia, prosternal process, abdominal postcoxal lines and the terminal ventrite in male. The abdominal postcoxal line (Fig. 11I–J) and male genitalia (Fig. 11K–P) of three specimens collected from different localities in South India were found to show minor variations and more specimens need to be studied to determine if these are only intraspecific. The male genitalia of two specimens in the collections of the erstwhile Commonwealth Institute of Biological Control-Indian Station (now NBAIR, Bangalore) identified at Commonwealth Institute of Entomology, London, as *Scymnus (Pullus) xerampelinus* and *S.* (*P.*) *o-nigrum* were also found to be identical to those of *S. utilis*. The types of these two species could not be examined and it is quite probable that *S. utilis* may prove to be a junior synonym of either or both older names.

Distribution

India (Karnataka); Vietnam.

Subfamily Coccinellinae: Tribe Coccidulini (=Stethorini)

Stethorus gangliiformis Li, Chen and Ren (Fig. 12A–D)

Stethorus (Allostethorus) gangliiformis Li et al. 2013, 324.

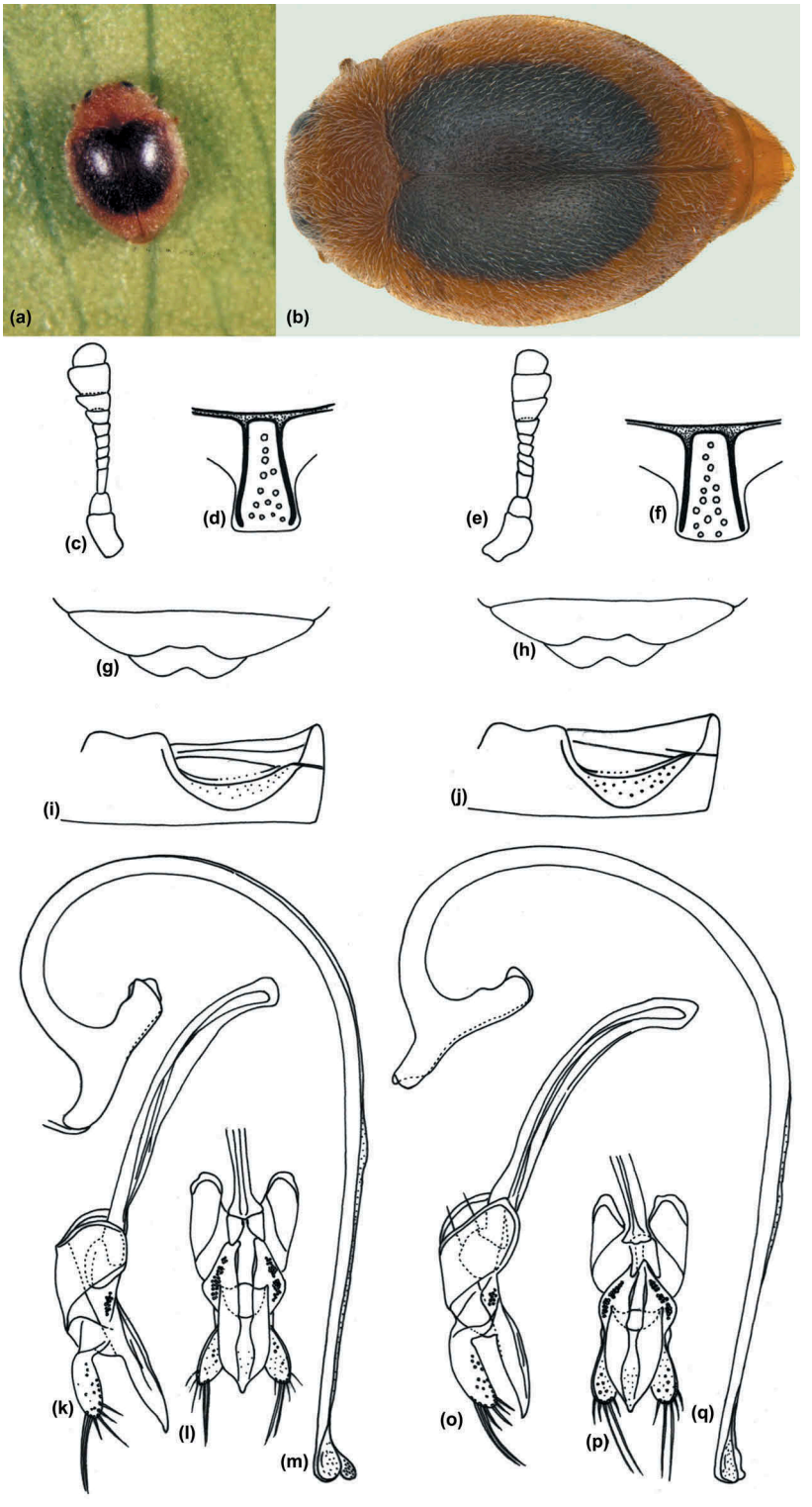

Figure 11A–P. *Scymnus (Pullus) utilis* Hoàng: A–B, adult, dorsal habitus; C, E, antenna; D, F, prosternal process; G–H, last abdominal ventrites in male; I–J, abdominal postcoxal lines; K–P, male genitalia: K, N, tegmen, lateral view; L, O, tegmen, ventral view; M, P, penis.

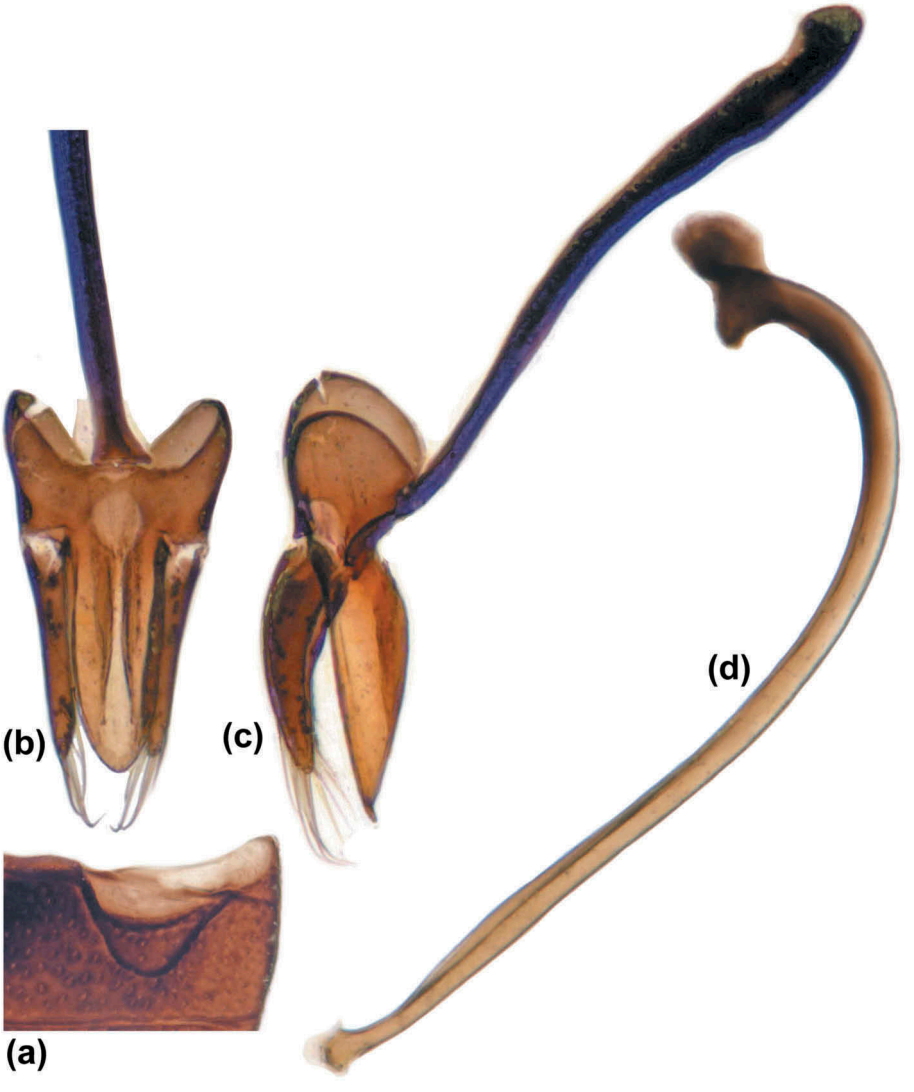

Figure 12A–D. *Stethorus gangliiformis* Li, Chen and Ren: A, abdominal postcoxal line; B–D, male genitalia: B, tegmen, lateral view; C, tegmen, ventral view; D, penis.

Specimen examined

India: Jammu and Kashmir: Srinagar, feeding on mites on apple, one male (NBAIR).

Notes. This species, originally described from China by Li et al. (2013), was recently recorded from Pakistan (Gilgit-Baltistan) by Iqbal et al. (2018). It is reported here for the first time from the Indian state of Jammu and Kashmir based on a single male specimen received for identification.

Externally, it is similar to scores of other *Stethorus* spp. and the male genitalia (Fig. 12B–D) are diagnostic.

Distribution

India: Jammu and Kashmir; Pakistan; China.

Subfamily Coccinellinae: Tribe Chilocorini

Renius cornutus Li and Wang (Fig. 13A–C)

Renius cornutus Li and Wang, 2017: 122, 124.

Specimen examined

India: Arunachal Pradesh: Tiwarigaow, 1085 mts, 28°13′12.9″N 095° 47′38.5″E, 13.ix.2014, Sweep net, Yeshwanth, HM.

Notes. *Renius* Li and Wang is a monotypic genus recently described from Tibet by Li et al. (2017) with *R. cornutus* as the type. It is added to the

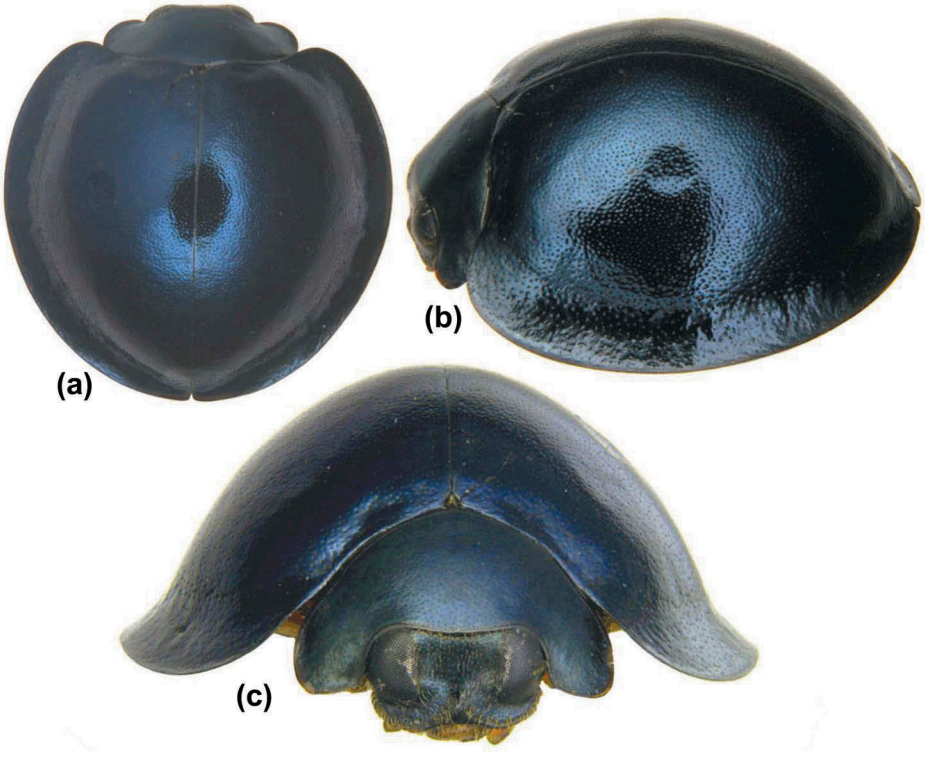

Figure 13A–C. *Renius cornutus* Li and Wang, adult female: A, dorsal view; B, lateral view; C, frontal view.

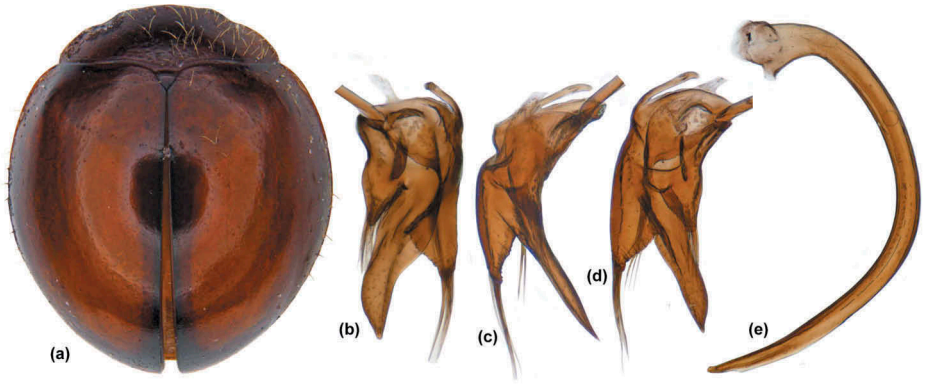

Figure 14A–E. *Serangium clauseni* (Chapin): A, adult, dorsal view; B–E, male genitalia: B, tegmen, ventral view; C, tegmen, lateral view; D, tegmen, dorsal view; E, penis.

Indian fauna based on a single female (Fig. 13A–C) examined from the north-eastern Indian state of Arunachal Pradesh (on the Indo-Tibetan border).

Distribution

India: Arunachal Pradesh, Assam; China.

Subfamily Microweiseinae: Tribe Serangiini

Serangium clauseni (Chapin) (Fig. 14A–E)

Catana clauseni Chapin 1940, 267; Miyatake 1961, 139; Ren et al. 2009, 36. *Serangium clauseni:* Ślipiński and Burckhardt 2006, 50; Wang et al. 2011, 40.

Specimens examined

India: Assam: Jorhat, feeding on mulberry whiteflies, without other data, two males (NBAIR).

Notes. This species was collected as a predator of mulberry whiteflies, *Dialeuropora decempuncta* (Quaintance and Baker) and *Aleuroclava pentatuberculata* (Sundararaj and David) (Hemiptera: Aleyrodidae) from Assam. The general appearance (Fig. 14A) and male genitalia (Fig. 14B–E) of the specimens examined fully match the description and illustrations of *S. clauseni* by Wang et al. (2011).

Distribution

India: Assam; China

Hosts. : *Dialeuropora decempuncta* (Quaintance and Baker) and *Aleuroclava pentatuberculata* (Sundararaj and David) (Hemiptera: Aleyrodidae).

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Disclosure statement

No potential conflict of interest was reported by the authors.

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