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## ADDITIONS TO THE FAUNA OF PARASITIC WASPS (HYMENOPTERA: CHALCIDOIDEA) AND COCCOIDS (HEMIPTERA: COCCOIDEA) FROM THE ANDAMAN AND NICOBAR ISLANDS, INDIA, WITH ILLUSTRATIONS AND DIAGNOSIS

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**Abstract:** An illustrated account with diagnostic details of the reared and collected species of insect parasitoids along with scale insects and mealybugs from the Andaman and Nicobar Islands is presented. Twenty eight species of insect pests and parasitoids under two major orders Hemiptera and Hymenoptera are documented, of which 16 species are reported for the first time from these islands specifically from South and Middle Andamans. The parasitic wasps reared and collected belong to six families—Encyrtidae, Eulophidae, Chalcididae, Eucharitidae, Aphelinidae, and Pteromalidae, including 16 species under 12 genera. The majority of the species are primary or secondary parasitoids attacking many insect groups. The scale insects and mealybugs documented belong to four families—Coccidae, Pseudococcidae, Diaspididae, and Cerococcidae, including 12 species under 11 genera. Information on the species distribution, host association, and brief taxonomical description of each species along with illustrations is provided for easy identification. Illustrations include habitus photographs of 16 species of parasitic wasps and 12 species of scales and mealybugs.

**Keywords:** Andamans, host record, mealybugs, parasitoids, scale insects.

The Andaman and Nicobar Islands consist of 349 islands situated in the Bay of Bengal in the northern Indian Ocean between 60–140°N and 920–940°E. The insect fauna of the Andamans and Nicobar Islands is relatively less known in comparison with the explored and documented diverse fauna from the Indian mainland.

A compilation of abstracts covering 320 research publications dealing with agricultural research during the period 1978–1990 from the bay islands and a list of natural enemies of insect pests was documented (Bhumannavar et al. 1991a,b). A total of 41 species of parasitic wasps from the superfamily Chalcidoidea of the order Hymenoptera were listed from the Andaman and Nicobar Islands (Noyes 2012). Insect herbivores and the natural enemies associated with mangroves of the Andaman and Nicobar Islands were also documented (Veenakumari et al. 1997).

Parasitic wasps play a key role in targeting insect pests of economic importance. To document parasitoids associated with scales and mealybugs, recent surveys

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were undertaken in two batches from the National Bureau of Agriculturally Important Insects, Bengaluru, India, to the Andaman and Nicobar Islands during the months of February and March, 2012. The islands surveyed were South and Middle Andamans covering Port Blair, Sipighat, Blooms Dale, Wandoor, Havelock Island, Neil Island, Lakshmanpur, Rangat, Jirkatang, Baratong, Mount Harriet, Kadamtala and Yerata.

We documented 28 species of insects and parasitoids under the two major orders Hemiptera and Hymenoptera. Out of these, 16 species of parasitic wasps belong to the order Hymenoptera under the super family Chalcidoidea, of which many are associated with mealybugs and scale insects and amongst them nine species of wasps are reported for the first time from these islands and two species are documented with new host records. Of the total 12 species of scales and mealybugs from the order Hemiptera, seven species are reported for the first time. The insects collected were reared to adult stage on the associated hosts. The parasitoids that emerged during the rearings were collected and documented.

#### Material and Methods

**Sampling:** This work is based on studies of nearly 160 specimens collected from South and Middle Andamans. The wasp specimens were collected using sweep nets, yellow pan traps, malaise traps, and the collection of parasitized hosts was followed by subsequent laboratory rearing. Malaise traps and yellow pan traps were set in 20 different locations. Parasitized hosts were collected and kept in the laboratory for parasitoid emergence. Wasp specimens were processed using Hexamethyldisilazane (Brown 1993) and card mounted and identified consulting (Hayat 1986, 1998, 2006; Mani 1989; Narendran 1989; Noyes & Hayat 1994; Narendran & Mini 2000; Xiao & Huang 2001; Verma et al. 2002). The scale insects and mealybugs were collected from the infested host plants and preserved in 70% alcohol. Specimens were later mounted on slides following standard devised techniques (Sandlant 1978). Scale insects were identified following identification manual of family Coccidae (Hodgson 1994) and mealybugs were identified based on the keys for South Asia (Williams 2004). The wasp and coccid images were taken using Leica M 205 A stereozoom microscope with Leica DC 420 inbuilt camera using automontage software (version 3.8). All the specimens are deposited in the National Bureau of Agriculturally Important Insects, Bengaluru, India.

**Sampling sites:** South Andamans collection sites: Port Blair, CARI campus, Sipighat, Blooms Dale Farm, Neil

Island, Lakshmanpur, Mount Harriet, Havelock island, Kalapattar, and Jirkatang/Jirkatang. Middle Andamans include: Kadamtala and Rangat. For Baratong/Baratang: Middle Andamans is at its north and South Andamans at its south.

The GPS readings of all the surveyed sites are as follows: Sipighat 11.3656°N & 92.40°E; Blooms Dale Farm 11.798°N & 92.26°E; Neil Island 11.4994°N & 93.93°E; Lakshmanpur 11.3798°N & 92.39°E; Kadamtala 11.5029°N & 92.39°E; Mount Harriet 11.5029°N & 92.25°E; Havelock island, Kalapattar 13.0162°N & 77.05°E; Port Blair, CARI campus 11.3656°N & 92.67°E; Jirkatang/Jirkatang 11.3662°N & 92.85°E; Rangat 12.2113°N & 92.41°E; Baratong/Baratang 12.2113°N & 92.46°E; Yerata 12.2113°N & 92.46°E

#### Order Hymenoptera

##### (Images 1–16)

Phylum: Arthropoda

Class: Insecta

Order: Hymenoptera

Super family: Chalcidoidea

Family Encyrtidae (Images 1–6)

##### *Leptomastix nigrocincta* Risbec (Image 1)

*Leptomastix nigrocincta* Risbec, 1959: 27, F. Lectotype F (designated by Noyes & Prinsloo, 1998): Madagascar (MNHN).

**Material studied:** NBAII/2012/Enc/Ana/dact/2, 10.iii.2012, one male and one female, Mount Harriet, sweep net, coll. Ankita Gupta.

**Brief diagnosis:** Female. Head yellowish, mandible orange with base yellowish; pedicel and flagellum brown; scape yellowish with dorsal margin brown; mesosoma orange; mid coxae brown, rest legs yellow; metasoma orange; F1 shorter than clava, 0.7x clava; F6 almost 2x as long as wide; fore wing with linea clava interrupted not more than two lines of setae; marginal vein 0.8x post marginal vein and 1.16x stigma vein.

**Distribution:** Throughout India including Andaman and Nicobar Islands (Hayat 2006).

**Hosts:** *Coccidohystrix insolita* (Sankaran) and *Phenacoccus* sp. (Noyes & Hayat 1994).

##### *Anagyrus diversicornis* (Howard) Noyes, 2000: 34, 71-72, F, M, tax., des., distrib. (Image 2)

*Copidosoma diversicornis* Howard in Riley, Ashmead & Howard, 1894: 92, F. Lectotype F (designated by Noyes, 1979: 147): West Indies, St Vincent (BMNH).

**Brief diagnosis:** Scape yellowish with a brown patch in middle; pedicel, F1, F3-F6 and first segment of clava dark

brown; F2 and rest of clava white. Head and mesosoma dark brown; metasoma completely dark brown. Legs pale yellow with femora and tibia with brown infuscation dorsally; wings hyaline. Ovipositor exerted.

Material studied: NBAll/2012/Enc/Apo/bicol/1, 10.iii.2012, one female, Mount Harriet, sweep net, coll. Ankita Gupta.

Distribution: Andaman Islands (new record) and Tamil Nadu.

Hosts: Indet. coccids on *Annona squamosa* and pseudococcid on *Solanum nigrum* (Manickavasagam et al. 2001).

### ***Callipteroma sexguttata* Motschulsky (Image 3)**

*Callipteroma quinqueguttata* Motschulsky, 1863: 36–37, F. Syntypes F: Sri Lanka, Mt. Patannas (ZMMU). Synonymy by Boucek, 1977:70.

Material studied: NBAll/2012/Enc/Call/sexg/1, 10.iii.2012, one female, Mount Harriet, sweep net, coll. Ankita Gupta.

Brief diagnosis: Female blackish-brown; forewings mostly dark brown with hyaline areas, normally hyaline at base, two hyaline spots below submarginal vein, one on anterior wing margin at apex of venation and one opposite on posterior wing margin, one distad of this in disc of wing and apex narrowly hyaline.

Distribution: India: Andaman Islands (new record), almost widely distributed throughout India (Hayat 2006).

Hosts: *Birendracoccus saccharifolii* on sugarcane from Pakistan (Noyes & Hayat 2004).

### ***Lakshaphagus fusiscapus* (Agarwal) (Image 4)**

*Cheiloneurus fusiscapus* Agarwal, 1965: 62, 63–65, F. Holotype F: India, Aligarh (ZDAMU).

*Lakshaphagus fusiscapus* (Agarwal): Hayat, 1981: 22–23, tax.

Material studied: NBAll/2012/Enc/Lak/fus/5, 10.iii.2012, five females, ex. *Cerococcus indicus* (Maskell), Yerata, middle Andaman, coll. Ankita Gupta.

Brief diagnosis: Head and mesosoma dark orange; mid and hind tibia without brownish bands; funicle segments quadrate to slightly longer than broad, F1–F3 brownish, broader than long; F4–F6 whitish, clava dark brown; metasoma dark brown and metallic. Scutellum in apical third with scale like dark brown setae, the apical pair much longer.

Distribution: India: Andaman Islands (new record), Karnataka, Madhya Pradesh, Uttar Pradesh, Rajasthan, Maharashtra and Tamil Nadu (Hayat 2006).

Hosts: *Cerococcus* sp., *Ceroplastodes* sp. and

*Planococcus citri*. Full details given in Hayat 2006

Remarks: *Lakshaphagus fusiscapus* (Agarwal) is a new record from *Hibiscus* sp. scale - *Cerococcus indicus* (Maskell) from Yerata in Middle Andamans.

Family Eulophidae

### ***Elasmus noyesi* Verma & Hayat (Image 5)**

*Elasmus noyesi* Verma & Hayat in Verma et al., 2002: 36, 249, 258–259, F: BMNH.

Material studied: NBAll/2012/Eul/Elas/nov/1, 10.iii.2012, one female, Rangat, Malaise trap, coll. Ankita Gupta.

Brief diagnosis: Body black with greenish-blue shine, intense on fronto vertex, pronotum, mesosoma, propodeum, dorsal sides of hind coxae. Scape pale brown with dark brown infuscations dorsally, flagellum dark brown. Scutellum with a yellowish longitudinal narrow band on each side. Coxae almost black. Wings hyaline. Hind tibia with diamond shaped patterns. Metasoma reddish-brown basally, reddish-brown colouration more conspicuous laterally; apex black. Fore femora yellowish except brown infuscation at base on dorsal margin. Mid and hind femora dark brown, yellowish at apex and base.

Distribution: Andaman Islands (new record), Karnataka and Kerala (Noyes 2012).

### ***Elasmus flavescens* Verma & Hayat (Image 6)**

*Elasmus flavescens* Verma & Hayat in Verma et al., 2002: 36, 251, 284–285, F: BMNH.

Material studied: NBAll/2012/Eul/Elas/flav/1, 10.iii.2012, one female, Mount Harriet, sweep net, coll. Ankita Gupta.

Brief diagnosis: Body yellow with following brown to black parts: large portion of frontovertex surrounding ocelli extending in front of anterior ocellus; pronotum largely black (except sides and apex yellow); axillae and tegulae brown; metanotum dark brown; propodeum metallic blue. Metasoma yellow with basal half of T1 black with metallic green shine; tergite T3 with a brown spot medially; T6 largely blackish, T7 yellow; scape 3.5X as long as broad.

Distribution: Andaman Islands (new record), Karnataka and Kerala (Hayat 2006).

Hosts: Unknown.

Family Chalcididae (Images 7–11)

### ***Antrocephalus mitys* (Walker) Boucek, 1976: 345–346. (Image 7)**

*Halticella mitys* Walker, 1846: 81, F, Mauritius (BMNH).



Images 1–6. 1 - *Leptomastix nigrocincta* Risbec; 2 - *Anagyrus diversicornis* (Howard); 3 - *Callipteroma sexguttata* Motschulsky; 4 - *Lakshaphagus fusiscapus* (Agarwal); 5 - *Elasmus noyesi* Verma & Hayat; 6 - *Elasmus flavescens* Verma & Hayat. © Ankita Gupta

**Material studied:** NBAll/2012/Chal/Ant/mit/4, 05.iii.2012, four females, Sippighat, Malaise trap, coll. Ankita Gupta.

**Brief diagnosis:** Female black; legs rufous. Antennae largely black (except F1 and F2 dark brown). Hind femur reddish; metasoma longer than mesosoma; post marginal vein subequal to marginal. Propodeum with distinct lateral teeth. First tergite of metasoma smooth and shiny. Hind femur with inner basal tooth; scutellum with two teeth at apical margin and median fovea.

**Distribution:** India: Andaman Islands (new record), Kerala, Tripura and Uttar Pradesh (Noyes 2012)

**Hosts:** Mostly from the family Pyralidae- *Chilo partellus* Swinhoe, *Corcyra cephalonica* (Stainton), *Lamida moncusalis* Walker and *Apomyelois (Ectomyelois) ceratoniae* (Zeller) (Noyes 2012).

#### ***Brachymeria ryukyuensis* Habu (Image 8)**

*Brachymeria ryukyuensis* Habu, 1963: 115, Japan

**Material studied:** NBAll/2012/Chal/Bra/ryuk/3, 10.iii.2012, three females and males, Kadamtala, sweep net collection, coll. Ankita Gupta.

**Brief diagnosis:** Body black. Antennae black. Tegulae pale yellow; coxae and trochanters black; hind femora with apical yellow patch; fore and mid tibiae pale yellow with incomplete black patch in the middle; hind tibia black with sub basal and apical yellowish-white patch. All tarsi pale yellow. Pre orbital carinae not prominent and post orbital carinae present; apex of scutellum slightly pointed and round in shape.

**Distribution:** India: Andaman and Nicobar Islands, Tripura and Kerala (Noyes 2012).

**Hosts:** Unknown.

#### ***Dirhinus anthracia* Walker (Image 9)**

*Dirhinus anthracia* Walker, 1846: 85, BMNH, Philippines.

**Material studied:** NBAll/2012/Chal/Dir/anth/1, 10.iii.2012, one female, malaise trap, Kadamtala. coll. Ankita Gupta.

**Brief diagnosis:** Black. Antenna rufous. Fore and mid leg rufous, hind legs black. Striae on first metasomal tergite reaching 1/3<sup>rd</sup> of length, remaining tergite smooth and shiny. Head and mesosoma prominently setose, setae pale white. Fore wings slightly fuscous. Propodeum rugose with submedian and sublateral carinae.

**Distribution:** India: Andaman Islands (new record), Madhya Pradesh, Punjab, Tripura, Uttar Pradesh and Manipur (Noyes 2012).

**Hosts:** *Calliphora villosa*, *Dacus cucurbitae*, *Dacus*

*ferrugineus*, *Musca domestica*, *Sarcophaga aurifrons*, *Placoptera reflexa*, *Brachartona catoxantha*, *Pyrausta machaeralis* (Narendran 1989). *Hapalia machaeralis*, *Chortoicetes terminifera* and *Bombyx mori* (Noyes, 2012).

#### ***Hockeria polycarinata* Narendran (Image 10)**

*Hockeria polycarinata* Narendran, 1989: 89-90, F, USNM, Java.

**Material studied:** NBAll/2012/Chal/Hock/poly/1, 10.iii.2012, 1 female, Malaise trap, Rangat, coll. Ankita Gupta.

**Brief diagnosis:** Scape and first three funicular segments yellowish brown; tegulae yellowish-brown; Hind coxa black; hind femur black with apex and base reddish-brown hind tibia reddish-brown with middle ventral margin black also extending to dorsal region. Hind tarsi reddish-brown. First metasomal tergite with small basal carinae, inclined laterally on both sides; present in basal 1/3<sup>rd</sup> of first tergite.

**Distribution:** Andaman Islands (new record) and Indonesia (Java) (Noyes, 2012).

**Hosts:** Unknown.

#### ***Hockeria bifasciata* Walker (Image 11)**

*Hockeria bifasciata* Walker, 1834: Lectotype F, designated by Boucek, 1992: 53, 61, BMNH, France

**Material studied:** NBAll/2012/Chal/Hock/bifa/2, 08.iii.2012, two males, Malaise trap, Sippighat, coll. Ankita Gupta.

**Brief diagnosis:** Body black, antennae dark brown. Legs including coxae black except for faint brown apices of tibiae. Head and mesosoma distinctly punctate and setose. Scutellum entire. Propodeum with distinctly carinae, faint transverse carinae present inside the areola of propodeum. Metasoma sessile, smooth and shiny. Basal 1/3<sup>rd</sup> of first tergum rugose with small carinae; lateral sides of second tergum with fine punctures. Marginal vein longest; post marginal vein rudimentary; stigma vein short and curved, 0.3x marginal vein.

**Distribution:** India: Andaman Islands (new record) and Kerala (Noyes 2012).

**Hosts:** Unknown from India.

Family Eucharitidae (Images 12–16)

#### ***Schizaspidia andamanensis* (Mani) (Image 12)**

*Kapaloides andamanensis* Mani, 1942: 156, M, ZSIC, India-Andaman and Nicobar islands.

*Schizaspidia andamanensis* (Mani): Narendran, 1986: 53.

**Material studied:** NBAll/2012/Euch/Schi/and/3,



Images 7–11. 7 - *Antrocephalus mitys* (Walker); 8 - *Brachymeria ryukyuensis* Habu; 9 - *Dirhinus anthracia* Walker; 10 - *Hockeria polycarinata* Narendran; 11 - *Hockeria bifasciata* Walker. © Ankita Gupta

11.iii.2012, three males, Mount Harriet, yellow pan trap, coll. Ankita Gupta.

**Brief diagnosis:** Body dark metallic green; scape and pedicel yellowish-brown; coxae concolorous with mesosoma. Scutellum with a median furrow. Legs light brown. Scape 2.7x as long as wide; head 1.4 x as wide as long. First flagellar segment with a branch; branches of flagellar segments only slightly flattened and cylindrical. Petiole longer than coxa in male. Scutellar processes

1.17x longer in male than in female; almost of same width throughout except at extreme apex. Tines of the scutellar fork slightly convergent; bending in curve towards each other; carinae clearer in male than in female.

**Distribution:** Andamans (Mount Harriet - new record) and Port Blair (Noyes 2012).

**Hosts:** Unknown.

Family Aphelinidae (Images 12–16)

***Marietta leopardina* Motschulsky (Image 13)**

*Marietta leopardina* Motschulsky, 1863: 52, F, M, ZMMU, Sri Lanka.

Material studied: NBAll/2012/Aph/Mar/leop/14, 06.iii.2012, two females, ex. indet. scales on ornamental plant from Rangat, middle Andaman, coll. Ankita Gupta.

Brief diagnosis: Body 0.8–0.9 mm, pale coloured, with a beautiful pattern of dark bands or spots on head, mesosoma, metasoma and legs. Antenna six-segmented in female and five-segmented in male. Fore wing conspicuously maculated with a dark and light pattern of setae; marginal vein about 1.25x as long as submarginal vein, postmarginal absent, stigmal vein punctiform.

Distribution: Throughout India including Andaman and Nicobar Islands and the Oriental region (Noyes 2012).

Hosts: Commonly recorded as a hyperparasitoid associated with mealybugs and scales. Complete host details mentioned in Hayat 1998.

***Coccophagus ceroplastae* (Howard, 1895) (Image 14)**

*Aneristus ceroplastae* Howard, 1895: 351, F, ?USNM, Jamaica.

*Coccophagus ceroplastae* (Howard): Hayat, 1998: 162.

Material studied: NBAll/2012/Aph/Cocc/cero/11, 06.iii.2012, eight females mounted on card and several preserved in 70% alcohol, ex. *Parasaissetia nigra* (Nietner) on *Hibiscus* sp. from Rangat, middle Andaman, coll. Ankita Gupta.

Brief diagnosis: Body dark brown to black, mesosoma including scutellum, dark with a distinct metallic violet tinge, metasoma dark; antenna brown to dark brown. Flagellum somewhat flattened. Fore wing hyaline, strongly infuscate behind marginal and stigmal veins, infuscation distally convex; basal cell with few setae; hind wing hyaline.

Distribution: India: Well distributed throughout India.

Host: Reported from scales (Hemiptera: Coccoidea) viz., *Coccus viridis*, *C. hesperidum*, *Saissetia coffeae*, *Ceroplastes* spp., *Pulvinaria psidii*, *P. polygonata* (Coccidae), etc. Scales and mealybugs from the families Diaspididae and Pseudococcidae have also been recorded as hosts (Hayat, 1998).

Remarks: In our study the parasitoid *Coccophagus ceroplastae* (Howard) and *Coccophagus* sp. was bred from *Coccus hesperidum* L. scale from Jirkatang, Middle Andamans and from *Parasaissetia nigra* (Nietner) from Rangat.

***Coccophagus longipedicellus* Shafee (Image 15)**

*Coccophagus longipedicellus* Shafee, 1972: 25, F, ZAMU, India - Tumkur.

Material studied: NBAll/2012/Aph/Cocc/long/2, 06.iii.2012, two females, ex. *Parasaissetia nigra* (Nietner) on *Hibiscus* sp. from Rangat, Middle Andaman, coll. Ankita Gupta.

Brief diagnosis: Body orange yellow with metasoma having a dark brown cross band in about middle of dorsum, wings hyaline. First funicle segment short, about 1.5x as broad as long.

Distribution: India: Andaman and Nicobar Islands and Karnataka (Noyes 2012).

Hosts: *Parasaissetia nigra* (Nietner) on *Hibiscus* sp. is new host record from Andamans. Earlier recorded from *Coccus* sp. on *Mangifera indica* L.

Family Pteromalidae (Images 12–16)

***Cephaleta australiensis* (Howard) (Image 16)**

*Anysis australiensis* Howard, 1896: 167, USNM.

*Cephaleta australiensis* (Howard): Boucek et al. 1979: 438.

Material studied: NBAll/2012/Ptr/Ceph/aust/2, four females and three males, 06.iii.2012, ex. *Cerococcus indicus* (Cerococcidae) on *Hibiscus* sp. from Yerata, Middle Andaman, coll. Ankita Gupta.

Brief diagnosis: Body with shiny metallic shine, antenna dark brown except scape (yellowish-brown), legs yellowish-brown except all coxae black, tarsi dark brown, first pair of legs slightly darker brown. Head much wider than mesosoma. Male antenna nine-segmented with all funicular segments longer than broad, first one curved and longer than scape. Scutellum with silvery white hairs in apical third.

Distribution: Widely distributed throughout India (Andaman and Nicobar Islands, Andhra Pradesh, Bihar, Delhi, Kerala, Tamil Nadu, Karnataka, Orissa, Assam, Maharashtra, Uttar Pradesh, West Bengal). Oriental region. Nearctic (Noyes 2012).

Host: Commonly collected in association with several species of Coccoidea (Sternorrhyncha) including *Coccus* spp., *Ceroplastes* spp., *Saissetia* spp., *Drepanococcus chiton*, *Pulvinaria psidii* (Coccidae); *Cerococcus indicus* (Cerococcidae); *Ferrisia virgata* (Pseudococcidae) and Asterolecaniidae (Noyes 2012).

Remarks: So far only two species of the family Pteromalidae are reported from the Andaman and Nicobar Islands - *C. australiensis* and *C. brunniventris* Motschulsky, the latter one is mentioned as recorded from Andamans in the recent checklist by Sureshan,



Images 12–16. 12 - *Schizaspidia andamanensis* (Mani); 13 - *Marietta leopardina* Motschulsky; 14 - *Coccophagus ceroplastae* (Howard); 15 - *Coccophagus longipedicellus* Shafee; 16 - *Cephaleta australiensis* (Howard). © Ankita Gupta



2012.

### Order Hemiptera

(Images 17–28)

Phylum: Arthropoda

Class: Insecta

Order: Hemiptera

Super family: Coccoidea

Family Coccidae

#### ***Coccus hesperidum* Linnaeus (Image 17)**

*Coccus hesperidum* Linnaeus, 1758: 455. F, Europe: Syntypes, F.

Material studied: NBAll/2012/Coc/Cocc/hesp/12, 21.ii.2012, five females, Havelock Island, indet. climber (Cucurbitaceae), coll. Sunil Joshi.

Brief diagnosis: Body broadly oval to round; flat to slightly convex in lateral view; body yellowish-green to yellowish-brown, usually with small brown flecks scattered on dorsum. Mounted specimen with enlarged dorsal setae having acute or slightly rounded apices; ventral tubular ducts between middle legs, with a few (2–3) near base of hind legs; dorsal submarginal tubular ducts present around body margin.

Distribution: Andaman (new record), Bihar, Goa, Gujarat, Jammu and Kashmir, Kerala, Karnataka, Tamil Nadu, Tripura, Uttar Pradesh and West Bengal (Varshney, 1992).

#### ***Parasaissetia nigra* (Nietner) (Image 18)**

*Lecanium nigrum* Nietner, 1861: 9. F, Sri Lanka [=Ceylon]: on coffee. Syntypes, F.

*Parasaissetia nigra* Takahashi, 1955d: 26.

Material studied: NBAll/2012/Coc/Par/nig/13, 06.iii.2012, two females, Rangat, middle Andaman, coll. Ankita Gupta.

Brief diagnosis: Mature females with reticulate pattern on dorsum; marginal setae enlarged, fimbriate; without subdiscal or discal setae on anal plates; dorsal setae often capitate.

Distribution: Andaman (recorded earlier), Bihar, Tamil Nadu and West Bengal (Varshney 1992).

#### ***Drepanococcus* sp. (Image 19)**

Brief diagnosis: Marginal setae spinose; single long seta laterad of each spiracle; without dorsal setae; tubular ducts present over entire venter; without elongate prevulvar setae.

Material studies: NBAll/2012/Coc/Dre/sp/15, 21.ii.2012, eight females, Havelock Island, *Annona* sp., coll. Sunil Joshi

Distribution: Different species under this genus have been recorded throughout India (Ben-Dov et al. 2012).

Family Pseudococcidae

#### ***Antonina graminis* (Maskell) (Image 20)**

*Sphaerococcus graminis* Maskell, 1897: 244. F, Hong Kong: on grass. Lectotype F, by subsequent designation Williams, 1985: 45. Type depository: Auckland: New Zealand Arthropod Collection, Landcare Research, New Zealand.

*Antonina graminis* Fernald, 1903b: 121.

Material studied: NBAll/2012/Pse/Ant/gram/16, 21.ii.2012, several females, Havelock island, indet. grass (Poaceae), coll. Sunil Joshi.

Brief diagnosis: Legs absent or represented by sclerotized pockets; antennae reduced to 2 or 3 segments; spiracles with trilocular pores present in sclerotized band surrounding spiracular atrium. Clusters of discoidal pores in ventrosubmarginal areas of abdominal segments II or III to VII or VIII; without dorsal and dorsomarginal band of multilocular pores; abdominal segments not forming sclerotized plate-like structures on segments III or IV to VIII; anal ring at apex of internal tube.

Distribution: Andaman (new record), Bihar, Karnataka, Maharashtra, Odisha, Tamil Nadu, Uttar Pradesh and West Bengal (Varshney 1992).

#### ***Saccharicoccus sacchari* (Cockerell) (Image 21)**

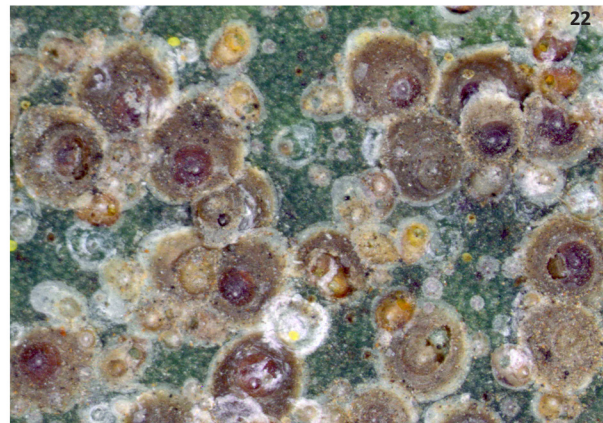
*Dactylopius sacchari* Cockerell, 1895: 195. F, Trinidad: St Ann's, on sugar-cane. Syntypes, F. Type depository: Washington: United States National Entomological Collection, U.S. National Museum of Natural History, District of Columbia, USA.

*Saccharicoccus sacchari* Ferris, 1950: 217. Change of combination.

Material studied: NBAll/2012/Pse/Sac/sac/14, 23.ii.2012, two females, Neil island, *Saccharum officinarum* L., coll. Sunil Joshi.

Brief diagnosis: Circulus hour-glass shaped; small discoidal pores surrounding hind coxae; cerarii restricted to anal lobes; multilocular pores present on dorsum and venter. Antennae usually seven segmented. Anterior and posterior pairs of ostiole present. Anal ring located at the apex of abdomen bearing six setae. Multilocular disc pores present mainly on the anterior and posterior margins of all the abdominal segments. Oral collar tubular ducts minute and are present in transverse rows on the abdomen.

Distribution: Andaman (new record), Arunachal Pradesh, Bihar, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Punjab, Tamil Nadu, Uttar Pradesh,



Images 17–22. 17 - *Coccus hesperidum* Linnaeus; 18 - *Parasaissetia nigra* (Nietner); 19 - *Drepanococcus* sp., Fig.20. *Antonina graminis* (Maskell); 21 - *Saccharicoccus sacchari* (Cockerell); 22 - *Hemiberlesia lataniae* (Signoret). © Sunil Joshi

West Bengal (Varshney 1992).

Family Diaspididae

***Hemiberlesia lataniae* (Signoret) (Image 22)**

*Aspidiotus lataniae* Signoret, 1869: 124. France, Syntypes, F. Type depository: Vienna: Naturhistorisches Museum Wien, Austria. Described: female and first instar.

*Hemiberlesia crawii*; Cockerell, 1899: 396.

*Hemiberlesia lataniae*; Borchsenius, 1966: 306.

Material studied: NBAII/2012/Dia/Hem/lat/17, 23.ii.2012, 12 females, Neil island, *Pisidium guajava* L., coll. Sunil Joshi.

Brief diagnosis: slide-mounted adult female membranous, and broadly pyriform. Pygidium with large median lobes close together, almost touching;

second and third lobes reduced, unsclerotized, anal opening very large and its diameter about equal to length of median lobes, situated near posterior margin, of pygidium; paraphyses shorter than the lobes, present only on the margin between the third lobes, Perivulvar pores present.

**Distribution:** Andaman (Recorded earlier), Assam, Karnataka, Maharashtra, Odisha, Tamil Nadu and West Bengal (Varshney 1992).

***Abgrallaspis cyanophylli* (Signoret) (Image 23)**

*Aspidiotus cyanophylli* Signoret, 1869: 119. F, France: Paris, Luxembourg Garden, on *Cyanophyllum magnificum*, Syntypes, F. Type depository: Vienna: Naturhistorisches Museum Wien, Austria.

*Abgrallaspis cyanophylli*; Balachowsky, 1948: 308.

**Brief diagnosis:** Body of slide-mounted adult female membranous and pyriform, with a well-developed eye spine present on each side, pygidium with large median lobes, quite small but well-developed, rounded second lobes and small (often pointed) third lobes; anal opening-large, situated near the posterior margin of the pygidium; paraphyses shorter than the lobes.

**Material studied:** NBAll/2012/Dia/Abg/cya/17, 23.ii.2012, two females, Neil island, *Pisidium guajava* L., coll. Sunil Joshi.

**Distribution:** Andaman (new record), all other states of India (Varshney 1992).

***Aonidiella aurantii* (Maskell) (Image 24)**

*Aspidiotus aurantii* Maskell, 1879: 199. F, New Zealand: Governors Bay, on oranges and lemons imported to New Zealand from Sydney. Syntypes, F. Type depository: Auckland: New Zealand Arthropod Collection, Landcare Research, New Zealand.

*Aonidiella aurantii*; Berlese, 1895a: 125.

**Brief diagnosis:** Prosoma becoming highly sclerotised and expanded with maturity; eventually the lateral lobes may project further posteriorly than the apex of the pygidium. Abdominal segment lacking any prepygidial macroducts. Pygidium with paraphyses present, most of them not longer than median lobes.

**Material studied:** NBAll/2012/Dia/Aon/aur/18, 21.ii.2012, eight females, Havelock island, *Citrus* sp., coll. Sunil Joshi.

**Distribution:** Andaman (new record), Bihar, Punjab, West Bengal (Varshney 1992).

***Pinnaspis aspidistrae* (Signoret) (Image 25)**

*Chionaspis aspidistrae* Signoret, 1869: 443. F, France: Paris, on *Aspidistra* sp. Holotype female. Type depository:

Vienna: Naturhistorisches Museum Wien, Austria.

*Pinnaspis aspidistrae*; Lindinger, 1912: 79.

**Brief diagnosis:** Body of slide-mounted adult female narrow and elongate, membranous, without lateral tubercles. Pygidium with well-developed median lobes without setae or gland spines between them; second lobes usually smaller than median lobes. Abdominal segment 5 with 1-3 submarginal macroducts on each side. Median lobes protrude as long as second lobes.

**Material studied:** NBAll/2012/Dia/Pin/asp/20, 22.ii.2012, eight females, Andaman Island, *Areca* sp., coll. Sunil Joshi

**Distribution:** Andaman (new record), Karnataka, Kerala, Madhya Pradesh, Maharashtra, Tamil Nadu and Tripura (Varshney 1992).

***Pinnaspis strachani* (Cooley) (Image 26)**

*Hemichionaspis minor strachani* Cooley, 1899: 54-55. F, Nigeria: Abeokuta, Type depository: Washington: United States National Entomological Collection, U.S. National Museum of Natural History, District of Columbia, USA.

*Pinnaspis minor strachani*; Kuwana, 1926: 40.

*Pinnaspis strachani*; Ferris & Rao, 1947: 39.

**Material studied:** NBAll/2012/Dia/Pin/str/22, 21.ii.2012, three females, Havelock Island, *Citrus* sp., coll. Sunil Joshi.

**Brief diagnosis:** Body of slide-mounted adult female narrow and elongate, membranous, without lateral tubercles, pygidium with well developed median lobes without spines between them, abdominal segment 5 with 1-3 marginal macroducts. Median lobe protrude beyond second lobes.

**Distribution:** Andaman (recorded earlier), Andhra Pradesh, Jammu and Kashmir, Karnataka, Kerala, Tamil Nadu, Tripura and West Bengal (Varshney 1992).

Family Cerococcidae

***Cerococcus indicus* (Maskell) (Image 27)**

*Eriococcus paradoxus indica* Maskell, 1897: 318. F, India: Uttar Pradesh, Saharanpur, on *Helicteres isora*. Syntypes, F. Type depositories: Auckland: New Zealand Arthropod Collection, Landcare Research, New Zealand, and London: The Natural History Museum, England, UK.

**Notes:** Lambdin & Kosztarab (1977) state that topotype material was examined.

*Cerococcus indicus* Green, 1910: 5.

**Material examined:** NBAll/2012/Cer/Cer/ind/19, 21.ii.2012, six females, Havelock island, *Hibiscus* sp., coll. Sunil Joshi.

**Brief diagnosis:** Cribriform plates and 8-shaped



Images 23–28. 23 - *Abgrallaspis cyanophylli* (Signoret); 24 - *Aonidiella aurantii* (Maskell); 25 - *Pinnaspis aspidistrae* (Signoret); 26 - *Pinnaspis strachani* (Cooley); 27 - *Cerococcus indicus* (Maskell); 28 - *Paralecanium* sp. © Sunil Joshi

pores present; spiracular furrows usually present, posterior furrow usually divided; single anal plate; antennae 1-segmented; legs absent or represented by unsegmented sclerotized spine; anal lobes usually protruding; labium 3-segmented.

**Distribution:** Andaman (recorded earlier), Andhra Pradesh, Bihar, Kerala, Karnataka, Madhya Pradesh, Maharashtra, Odisha, Tamil Nadu, Tripura, Uttar Pradesh and West Bengal (Varshney 1992).

Family Coccidae

***Paralecanium* sp. (Image 28)**

**Material examined:** NBAII/2012/Coc/Par/sp/21, 22.ii.2012, three females, Andaman Island, coll. Sunil Joshi

**Brief diagnosis:** Adult female flat, broadly rounded, margin indented at stigmatic areas. Colour dark castaneous, with a narrow hyaline boarder and with hyaline canals extending inwards from each stigmatic

cleft. Both antenna and legs wanting. Mounted female with fan shaped flabellae.

**Distribution:** Andaman (new record), the species of *Paralecanium* have been recorded from south-east Asia.

**Remarks:** The species that resembles to the species collected in present study is *Paralecanium mancum* Green. Diagnostic characters of this species are as follows. Colour dark castaneous, with a narrow hyaline border and with hyaline canals extending inwards from each stigmatic cleft. Dorsum with more or less well defined, thin, colourless, polygonal, waxy plates. Eye spots conscious; at some distance from the margin. Antennae relatively short, articulation obscure. Limbs entirely wanting. Anal operculum sub-quadrate, the base of each valve slightly shorter than its outer edge. Stigmatic spines three, blunt, the median spine usually shorter than the other two. Marginal flabellae sub-triangular in form, the outer edge flatly curved, the converging slides approximately straight.

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