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Research Article

New distributional records of twelve encyrtid parasitoids (Chalcidoidea: Encyrtidae) across various Indian states, including some new host associations

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ABSTRACT: Twelve encyrtid species viz. *Agarwalencyrtus citri* (Agarwal), *Alamella flava* Agarwal, *Anomalicornia tenuicornis* Mercet, *Cryptanusia ajmerensis* (Fatma & Shafee), *Yasumatsuiola orientalis* (Trjapitzin), *Ethoris dahmsi* Noyes and Hayat, *Hemileucoceras longicornis* Hayat, *Hesperencyrtus gordhi* (Fatma & Shafee), *Monstranusia antennata* (Narayanan), *Paratetracnemoidea malenotti,* (Mercet), *Pentelicus depunctatus* Manickavasagam & Chaitanya and *Pentelicus punctatus* Manickavasagam & Chaitanya are newly recorded from different states of India. From the present work, *Anaesius hayati* reared from an unidentified mealybug from an unknown weed, *Gentakola trifasciata* reared from *Maconellicoccus hirsutus, Ooencyrtus penchants* reared from an unidentified diaspidid scale on cotton and *O. segestes* reared from unidentified Heteroptera eggs from citrus and pomegranate were first host records and *Anaesius advena* reared from unidentified bug egg from cocoa, *Prochiloneurus pulchellus* and *P. aegyptiacus* reared from *Phenacoccus solenopsis*, *Metaphycus* sp. reared from mango galls and *Proleurocerus montanus* reared from unidentified mealybug on unknown weed were additional new host records.

KEYWORDS: Encyrtidae, host rearing, new record, parasitoids

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ABBREVIATIONS

F1, F2, etc. = funicle segments 1, 2, etc

YPT = Yellow pan trap

TI, TII, etc. = Tergites I, II, etc. of gaster

The following acronyms are used: ZDAMU = Department of Zoology, Aligarh Muslim University, Aligarh, India

EDAU = Entomology Department, Annamalai University

NEH = North East Hill Region

ICAR = Indian Council of Agricultural Research

MCNM = Instituto Espanol de Entomologia, Museo Nacional de Ciencias Naturales, Madrid, Spain

PPRI = Plant Protection Research Institute, Preteria, Republic of South Africa

RARS = Regional Agricultural Research Station

NPCI = National Pusa Collection, Division of Entomology, Indian Agricultural Research Institute, New Delhi, India

F = Female

M = Male

INTRODUCTION

Chalcidoidea is one of the largest superfamilies of Hymenoptera, with greater species diversity. One of the largest families of chalcidoid insects is Encyrtidae (Hymenoptera: Chalcidoidea). As of now, this family has about 4,000 described species spread across 497 genera worldwide, with 610 species in 142 genera reported from India (Hayat, 2006; Noyes, 2018). It is also recognised as one of the most effective family groups for biological control of agricultural pests globally (Noyes, 1985; Greathead, 1986), especially when it comes to mealybug biocontrol (Noyes & Hayat, 1994). Although other families such as Cercopidae and Aphididae may also act as hosts, members of this family usually target members of the Pseudococcidae, Coccidae, and Sternorryncha families. The egg stage of the hemipterous family Pentatomidae and its closely related forms is specifically targeted for attack. Numerous species of Lepidoptera are parasitized; certain species develop in the eggs, while others do so in the larvae. Several genera in the latter group are capable of polyembryonic reproduction, which produces thousands of

individuals from a single host. Coleoptera larvae and pupae of Chrysomelidae and Coccinellidae are common hosts. Dipterous pupae, specifically those of the Cecidomyiidae and Syrphidae, are frequently parasitized. Neuropterous cocoons have yielded several species, primarily from the genus Chrysopa. *Ooencyrtus submetallicus* Howard occasionally attacks chloropidae dipterans, including *Hippelates pusio* Loew. Some encyrtids are also internal parasitoids of tick nymphs (Ixodidae), specifically the genera *Ixodiphagus* and *Huntrellus* (Walker, 1846).

The taxonomy of this significant group of agricultural parasitoids remains unexplored in India except for published reports from a group of researchers at Aligarh Muslim University in Aligarh. Hence, efforts were initiated by the Department of Entomology, Annamalai University initially through a major research project sponsored by the University Grants Commission, New Delhi in 2009 and the work is still being continued even today and notable contributions from here are, Manickavasagam and Rameshkumar (2010, 2011, 2012, 2013a, 2013b, 2014, 2015). The current work is a continuation of the ongoing effort to document the Indian encyrtid fauna.

MATERIALS AND METHODS

The specimens were collected through four collection methods (yellow pan trapping (Noyes, 1982), Malaise trapping (Noyes, 2004), net sweeping Noyes (1982) and host rearing (Noyes & Hayat, 1994) from different ecosystems in India. The samples were examined and captured using a Leica M205C stereo zoom trinocular microscope and a DMC2900 camera. The observed specimens were appropriately documented and deposited at the Parasitoid Taxonomy and Biocontrol Laboratory, Department of Entomology, Faculty of Agriculture, Annamalai University, Chidambaram, Tamil Nadu.

RESULTS AND DISCUSSIONS

Encyrtid parasitoids collected through host rearing

Through host rearing, 393 encyrtids representing nine different genera were reared from different hosts (Table 1). From the present study, a total of 191 specimens of *Aenasius* Walker were reared representing three species, out of which, 116 represented *Aenasius arizonensis* (Girault) (=*Aenasius bambawalei* Hayat), followed by *A. advena* Compere (44) and *A. hayati* Manickavasagam (31). *Aenasius arizonensis* was reared from an unidentified mealybug from an unknown weed, *Phenacoccus solenopsis* Tinsley from *Abutilon indicum* (L.) and *Maconellicoccus hirsutus* (Green). Earlier mealy bug hosts known for this parasitoid are *P. solenopsis* and *Pseudococcus longispinus* (Pseudococcidae) (Noyes, 2016). *Anaesius advena* was reared from unidentified mealybug from weed and unidentified bug egg from Cocoa from the present study but earlier hosts known for this parasitoid are *Ferrisia virgata* Cockerell (Kerrich, 1967; Rawat & Modi, 1968; Hayat *et al.*, 1975) and *Planococcus citri* (Risso) and mealybug on croton and Citrus (Noyes & Ren, 1995). *Anaesius hayati* is reported here as reared from an unidentified mealybug from an unknown weed. This is the first host record for this species. Present host-parasitoid associations are by earlier works mentioned in this paragraph except *A. advena* was reared from an unidentified bug egg from Cocoa (these specimens were received for identification from a PG student of TNAU and the host details were orally recorded), and hence this host record might be new or erroneous that needs further confirmation.

Prochiloneurus sp. was reared from mealy bugs, out of which, 28 specimens represented *Prochiloneurus pulchellus* Silvestri, remaining 15 specimens *P. aegyptiacus* (Mercet). From the present study, *Prochiloneurus pulchellus* and *P. aegyptiacus* were reared from *P. solenopsis* on *Abutilon indicum* (L.). The former was already reported from *Coccidohystrix insolita* (Green), *Ferrisia virgata* (Hayat, 1981) and *Rastrococcus iceryoides* (Green) (Shafee *et al.*, 1975) and *P. aegyptiacus* from *Nipaecoccus viridis* (Newstead) (Shafee *et al.*, 1975; Avasthi & Shafee, 1977). From the present study, *Aenasius arizonensis* emerged from *P. solenopsis*, a few days later, *Prochiloneurus* spp. emerged via *A. arizonensis.* The members of the genus *Prochiloneurus* are all hyperparasitoids via other encyrtids parasitizing mealybugs (Hayat, 2006; Noyes, 2000) and the same is confirmed in the present study also. *P. solenopsis* was reported here as a host for *P. pulchellus* and *P. aegyptiacus* for the first time.

Out of the 74 *Ooencyrtus* Ashmead specimens reared, 27 represented *O. peechianus* Hayat followed by *O. segestes* Trjapitzin (25) and *O. phongi* Trjapitzin, Myartseva and Kostjukov (22). From the present study, *O. peechianus* was reared from an unidentified diaspidid scale on Cotton and this is the first report of host for *O. peechianus*. Another species, *O. segestes* was reared from unidentified Heteroptera eggs from Citrus and Pomegranate. Apart from mentioning that the type specimen was collected from sweeping on *Imperata arundinacea* in palm savanna (Borassus) and that Huang & Noyes (1994) suspected that it might be associated with Heteroptera in grasses, the collections were from the edges of paddy (Trjapitzin, 1965), there are no hosts recorded for this species from India (Hayat, 2006) or any other part of the world. Therefore, Heteroptera eggs are the first confirmed host record on citrus and pomegranate. Another species *O. phongi* was reared from unidentified Heteroptera eggs. Earlier this species was reared from eggs of *Tessaratoma javanica* (Hemiptera: Tessaratomidae) (Mehra, 1966; Huang & Noyes, 1994) and hence the present host findings are by earlier workers.

Table 1. Parasitoids recorded through host-rearing

Sl. No.	Locality (State/District)	Host plant/Insect	Name of the parasitoid	Total parasitoids emerged		Date of collection
				F	M	
1	Andhra Pradesh: Prakasam	Unidentified mealybug from unknown weed	*Aenasius arizonensis (Girault)*	26	7	28-12-2013
2	Andhra Pradesh: Prakasam	Unidentified Heteroptera eggs from citrus*	*Ooencyrtus segestes* Trjapitzin	9	1	15-06-1014
3	Kerala: Kollam	Mango galls**	*Metaphycus* sp.	3	1	13-02-2014
4	Kerala: Kollam	Unknown coccinellid grubs	*Homalotylus ferrierei* Hayat, Alam & Agarwal	2	0	13-02-2014
5	Maharastra: Kolhapur	*P. solenopsis* on *Abutilon indicum* (L.)	*Aenasius arizonensis (Girault)*	18	3	13-03-2016
6	Maharastra: Kolhapur	*P. solenopsis* on *Abutilon indicum* (L.)**	*Prochiloneurus pulchellus* Silvestri	8	1	15-03-2016
7	Maharastra: Kolhapur	*Paracoccus marginatus* from unknown weed	*Acerophagus papayae* Noyes & Schauff	29	3	18-03-2016
8	Tamil Nadu: *Cuddalore*	Cotton scale (Diaspidae)*	*Ooencyrtus peechianus* Hayat	22	5	20-03-0214
9	Tamil Nadu: *Cuddalore*	Unidentified scale from *Acasia* sp.	*Arrhenophagus chionaspidis* Aurivillius	11	2	15-05-2016
10	Tamil Nadu: *Cuddalore*	Unidentified Heteroptera eggs from unknown weed	*Ooencyrtus phongi* Trjapitzin, Myartseva & Kostyukov	17	5	25-10-2016
11	Tamil Nadu: Salem	Unidentified mealybug from unknown weed**	*Proleurocerus montanus* Manickavasagam & Chaitanya sp. nov.	1	0	15-03-2014
12	Tamil Nadu: Nagercoil	*Maconellicoccus hirsutus* (Green)	*Acerophagus serpentinus* Fatma & Shafee	12	3	20-03-2014
13	Tamil Nadu: Nagercoil	*Maconellicoccus hirsutus* (Green)*	*Gentakola trifasciata* (Saraswat)	2	0	20-03-2014
14	Tamil Nadu: Coimbatore	Unidentified Heteroptera eggs from Cocoa**	*Aenasius advena* Compere	19	8	14-08-2015
15	Tamil Nadu: Dindigul	Unidentified mealybug from weed	*Aenasius advena* Compere	15	2	12-04-2015
16	Tamil Nadu: Vellore	*P. solenopsis* on *Abutilon indicum* (L.)**	*Prochiloneurus aegyptiacus* (Mercet)	12	3	23-04-2016
17	Tamil Nadu: Vellore	*P. solenopsis* on *Abutilon indicum* (L.)**	*Prochiloneurus pulchellus* Silvestri	17	2	23-04-2016
18	Tamil Nadu: Vellore	*P. solenopsis* on *Abutilon indicum* (L.)	*Aenasius arizonensis (Girault)*	40	13	23-04-2016
19	Tamil Nadu: Salem	Unidentified mealybug from unknown weed*	*Aenasius hayati* Manickavasagam	23	8	7-02-2015
20	Tamil Nadu: Salem	*Paracoccus marginatus* from unknown weed	*Acerophagus papayae* Noyes & Schauff	4	2	15-03-2015

Sl. No.	Locality (State/District)	Host plant/Insect	Name of the parasitoid	Total parasitoids emerged		Date of collection
				F	M	
21	Tamil Nadu: Salem	Unidentified mealybug from unknown weed	*Proleurocerus fulgoridis* Ferriere	7	1	17-04-2015
22	Tamil Nadu: Salem	*Maconellicoccus hirsutus* (Green)	*Aenasius arizonensis (Girault)*	9	0	01-06-2015
23	Telangana: Ranga Reddy	Unidentified Lepidopteran egg from Pomegranate*	*Ooencyrtus segestes* Trjapitzin	10	5	26-04-2016
24	Tamil Nadu: Salem	Unidentified mealybug from unknown weed	*Eotopus elongare* Krishnachaitanya & Manickavasagam sp. nov.	2	0	26-03-2016
Total				318	75	-
Grand Total				**393**		

* Indicates first host record, ** Indicates additional host recordw

Out of the 53 *Acerophagus* specimens reared, 38 represented *A. papayae* Noyes and Schauff and the remaining 15 represented *A. serpentinus* Fatma and Shafee. From the present study *A. papayae* was reared from *Paracoccus marginatus* Williams and Granara de Willink on an unknown weed (Kolhapur: Maharastra & Salem: Tamil Nadu), earlier host known for this parasitoid was *Paracoccus marginatus* and *Naiacoccus serpentinus* Green (Pseudococcidae) (Noyes, 2016). *Acerophagus serpentines* was reared on *Maconellicoccus hirsutus* (Green) from Nagercoil, Tamil Nadu. The earlier host known for this parasitoid was *Naiacoccus serpentinus* Green (Pseudococcidae) (Fatma & Shafee, 1988).

Arrhenophagus chionaspidis was recovered from the unidentified scale on *Acasia* sp. from Chidambaram, Tamil Nadu (Table 1). This parasitoid was earlier reported from *Contigaspis* sp. and *Pinnaspis strachani* (Cooley) on *Murraya koenigii* (Hayat, 1979); indet. Coccids and *Diaspis* sp. on *Citrus medica* (Shafee *et al.*, 1975; Agarwal, 1963). Hence, the present host finding of recovering *Arrhenophagus chionaspidis* Aurivillius from the scale is by earlier findings. Four specimens of *Metaphycus* (Howard) were found in mango galls found in Kollam, Kerala. Thus far, Eriococcidae, Asterolecaniidae, Diaspididae, and Kerridae (Hayat, 2006), *Ceroplastodes cajani* Maskell on Ficus sp., *Aonidiella orientalis* (Newstead) on *Dalbergia sissoo* de Candolle, and *Nipaecoccus* sp. on Citrus sp. (Agarwal, 1965; Shafee *et al.*, 1975) and *Coccus viridis* (Srinivasa, 1987) are the known hosts for these parasitoids. The present finding of *Metaphycus* emergence from mango galls is a new host record.

Two specimens of *Gentakola trifasciata* (Saraswat) merged from *Maconellicoccus hirsutus* from Nagercoil, Tamil Nadu (Table 1). So far, there is no known host for this species (Hayat, 2006). The present finding of *Gentakola trifasciata* emergence from *Maconellicoccus hirsutus* is a new host record. Two females of *Homalotylus ferrierei* Hayat, Alam & Agarwal eared from unknown coccinellid grubs from Kollam, Kerala (Table 1). For this, the host is already known [Coccinellids predaceous on *Cerococcus* sp. on *Hibiscus* sp. (Hayat *et al.*, 1975)]. Hence, the present host findings are by earlier workers.

One specimen of *Proleurocerus montanus* Manicka vasagam & Chaitanya was reared from an unidentified mealybug on an unknown weed from Salem, Tamil Nadu (Table 1) and published as a new species from the present work. Earlier hosts known for this genus were eggs of Eurybrachydae, spiders (Araneida), and Lepidoptera (Hayat, 2006). The present finding of mealybug as a host is the parasitoid's new host record. From the present study, through host rearing, 14 species of encyrtids belonging to 10 genera were recovered, whereas, Nalini and Manickavasagam (2011) and Nalini (2012) recovered 31 species of encyrtids belonging to 16 genera. The earlier authors' work was purely based on host rearing of mealy bugs continuously for three years, but here host rearing was one of the recovery methods along with other collection methods and this might be the reason for a smaller number of genera and species recorded from the present work through host rearing.

Earlier authors (Noyes & Hayat, 1994; Noyes, 2000, 2004) reported that rearing was the most rewarding method to recover the chalcid parasitoids from their respective hosts. However, it was difficult, to locate, collect and rear hosts of encyrtids, especially honeydew-yielding bugs as plant hosts should be replaced fresh or carefully maintained to avoid drying. Despite doing this, there is no guarantee of recovery. Coccoids being more during summer, covering all places or states within this summer season, become a difficult task for host collection. In addition, the lack of specialists and time

involved; to identify the collected host insects of various stages as well as plant hosts is a major problem in this method.

New distributional records of twelve species of encyrtids from different states of India

***Agarwalencyrtus citri* (Agarwal) (Figure 1)**

Coccidencyrtus citri Agarwal, 1965: 75, 76-77, F. Holotype F: Aligarh, India (ZDAMU)

Agarwalencyrtus citri (Agarwal): Hayat, 1981: 15-16, F, tax., des., Aligarh, Kolyatji near Bikaner, Bikaner and Nagaur rec.

Agarwalencyrtus ajmerensis Fatima & Shafee, 1994: 50-51, F. Holotype F: India, Ajmer (ZDAMU), synonymy by Hayat, 1999:354.

Diagnosis: The legs, including the coxae, display a yellow hue with brownish patches at the tips of the front and middle femora, along the lower two-thirds of the middle tibia, at the end of the middle femur, and on the lower portion of the middle tibia. The mandible features a broad truncation with a single small tooth. The scutellum exhibits a striate-reticulate texture, while the propodeum measures approximately one-sixth the length of the scutellum and displays a faint reticulation at its centre. Furthermore, the antennal clava surpasses the combined length of the pedicel and funicle.

Length: 0.85-0.95 mm

Distribution: Assam, Andhra Pradesh, Bihar, Jharkhand, Delhi, Kerala, Rajasthan, Meghalaya, Tamil Nadu, Karnataka and Uttar Pradesh, are among the states where records of this species are already available. This has recently been reported from Nagaland and Maharashtra.

Material examined: India, Maharashtra, Kolhapur district, Shivaji University, 6 ♀, 16.iii.2016 (N19°22.787' E77°46.951'), coll. T. Krishna Chaitanya and S. Manickavasagam, via YPT. India, Nagaland, Dimapur, Medziphema, Jharnapani, ICAR RC-NEH Region, 3 ♀, 27.vi.2016 (N25o45.553' E093o50.450'), Coll. T. Krishnachaitanya, S. Manickavasagam, and S. Palanivel, through YPT, India, Tamil Nadu, Chidambaram, Annamalai University, EDAU.

***Alamella flava* Agarwal (Figure 2)**

Alamella flava Agarwal, 1966: 77-78, F, M. Holotype F: Aligarh, India.

Alamella kerrichi Annecke, 1969: 455-457, F, M. Holotype F: South Africa, (PPRI). Synonymy by Noyes & Hayat, 1994: 238.

Figure 1. Habitus of *Agarwalencyrtus citri* (Agarwal).

Material examined: India, Meghalaya, ICAR complex for NEH region, Umroi Road, Barapani, 2 ♀, 22.vii.2016, (N12°45' E17°15'), Coll. T. Krishnachaitanya, S. Manickavasagam, and S. Palanivel through YPT, India, Tamil Nadu, Chidambaram, Annamalai University, EDAU.

Length: 0.95-1.34 mm

Diagnosis: The head displays a yellowish hue, with the scape matching this colour, albeit slightly dusky along the dorsal margin. The pedicel and flagellum exhibit a pale testaceous brown shade. The thorax also appears yellowish, with the pronotum, anterior portion of the mesoscutum, and scutellum often displaying a distinct orange hue. Yellow legs support this structure. The forewing features a marginal vein not extending beyond half the length of the stigma vein, while the post-marginal vein measures approximately half to two-thirds the length of the stigma vein. Multiple lines of setae adorn the distal half of the wing dorsally.

Distribution: There are already records for this species from Tamil Nadu, Uttar Pradesh, Karnataka, Kerala, Maharashtra, Punjab, Andhra Pradesh, Haryana, and Himachal Pradesh. This is first record from Meghalaya.

***Anomalicornia tenuicornis* Mercet (Figure 3)**

Anomalicornia tenuicornis Mercet, 1921: 86-87, M=F. Holotype F: Spain, Madrid, El Pardo (MCNM)

Figure 2. Habitus of *Alamella flava* Agarwal.

Material examined: India, Meghalaya, ICAR complex for NEH region, Umroi Road, Barapani, 7 ♀ and 2 ♂22. vii.2016, (N12°45' E17°15'), Coll. T. Krishnachaitanya, S. Manickavasagam and S. Palanivel, through YPT. India, Maharashtra, Kolhapur district, Shivaji University, 6 ♀, 16.iii.2016, (N19°22.787' E77°46.951'), coll. T. Krishna Chaitanya and S. Manickavasagam, through YPT. India, Nagaland, Dimapur, Medziphema, Jharnapani, ICAR RC-NEH Region, 15 ♀ and 4 ♂, 27.vi.2016, (N25°45.553' E093°50.450'), Coll. T. Krishnachaitanya, S. Manickavasagam and S. Palanivel, through YPT. India, Manipur, Longole, ICAR, 04.vii.2016, (N24.24° E093.54°), Coll. T. Krishnachaitanya, S. Palanivel and S. Manickavasagam, through YPT. India, Assam, Guwahati, NRCP, Rani, 26 ♀ and 16 ♂, 13.vi.2016, (N26°20' E92°93'), Coll. T. Krishnachaitanya, S. Palanivel and S. Manickavasagam, through YPT, India, Tamil Nadu, Chidambaram, Annamalai University, EDAU.

Length: 0.56 – 1.14 mm

Diagnosis: The head and thorax exhibit hues spanning from orange to dark brown, accompanied by a scape ranging from yellowish to brown. The flagellum presents entirely in dark brown or yellowish tones, featuring a scape approximately four times as long as it is broad. Each funicle segment measures at least three times the length of its width. Fully winged forms boast forewings slightly less than three times as long as they are broad, while in brachypterus forms, they barely extend to the base of the gaster. The ovipositor measures about half the length of the mid tibia.

Male: length, 0.59-0.72 mm, Generally very similar to female apart from structure of antennae and genitalia; flagellar segments clothed in relatively sparse setae which are about as long as the diameter of a segment; three or four scale like sensilla on F6 and one or two on base of clava ventrally; funicle segments gradually diminishing in size distad with F1 about 4× as long as broad; clava subequal to F1.

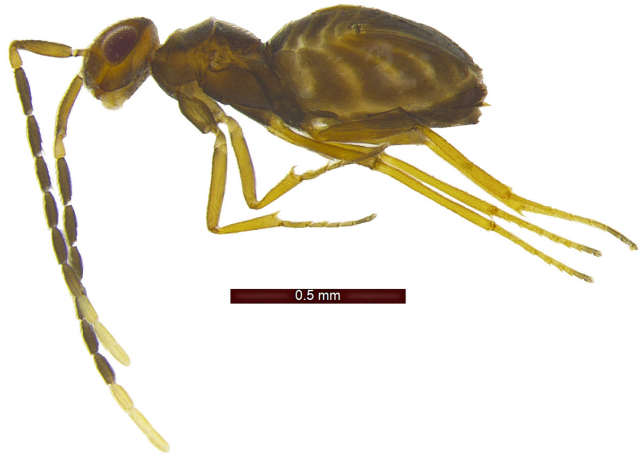

Figure 3. Habitus of *Anomalicornia tenuicornis* Mercet.

Distribution: This species is already recorded from Andhra Pradesh, Delhi, Karnataka, Kerala, Odisha, Uttar Pradesh, Tamil Nadu, Rajasthan and Puducherry. This is newly recorded from Meghalaya, Maharashtra, Nagaland, Assam and Manipur.

Cryptanusia ajmerensis (Fatma & Shafee) (Figure 4)

Mira ajmerensis Fatma & Shafee, 1988: 25-26, F. Holotype F: India, Raj., Ajmer (ZDAMU)

Cryptanusia ajmerensis (Fatma & Shafee): Noyes & Hayat, 1994: 49, 51, F, key, tax.

Material examined: India, Andhra Pradesh, Vishakapattanam, Chinthapalli, RARS, 3 ♀, (N18° 94″; E82° 61″), 06.vii.2015, Coll. T. Krishnachaitanya, through YPT. India, Tamil Nadu, Thadiyankudisai, TNAU, research station, 1 ♀, (N11.40°E76.69°), 03.iii.2016, Coll. T. Krishnachaitanya and M. Ayyamperumal, through YPT, India, Tamil Nadu, Chidambaram, Annamalai University, EDAU, 5 ♀, (N11 23; E079 43), 24.vii.2014, Coll. T. Krishnachaitanya and S. Manickavasagam, through YPT, India, Tamil Nadu, Vellore, 1 ♀, (N12.93° E79.13°), 14.vi.2014, Coll. T. Krishna Chaitanya and S. Manickavasagam, through YPT, India, Assam, Guwahati, NRCP, Rani, 1 ♀, 13.vi.2016, (N26°20' E92°93'), Coll. T. Krishnachaitanya, S. Manickavasagam, and S. Palanivel through YPT, India, Tamil Nadu, Chidambaram, Annamalai University, EDAU.

Length: 1.16 mm

Figure 4. Habitus of *Cryptanusia ajmerensis* (Fatma & Shafee).

Diagnosis: Body robust, head slightly longer than broad; funicle 6-segmented; head and thorax dark brown; second funicle segment about 0.75× as long as first, marginal vein of fore wing longer than stigma vein.

Distribution: This species has already been recorded in Rajasthan. This is newly recorded from Andhra Pradesh, Kerala, Tamil Nadu, and Assam.

***Yasumatsuiola orientalis* Trjapitzin (Figure 5)**

Yasumatsuiola orientalis Trjapitzin, 1977: 155, F. Holotype F: Thailand

Material examined: India, Andhra Pradesh, Vishakapattanam, Chinthapalli, RARS, 1 ♀, (N18° 94″; E82° 61″), 07.vii.2015, Coll. T. Krishnachaitany, through YPT. India, Nagaland, Dimapur, Medziphema, Jharnapani, ICAR RC-NEH Region, 15 ♀ and 2 ♂, 26.vi.2016, (N25°45' E093°50'), Coll. T. Krishnachaitanya, S. Palanivel and S. Manickavasagam, through YPT, India, Tamil Nadu, Chidambaram, Annamalai University, EDAU.

Length: 1.08-1.51 mm

Diagnosis: The body typically presents a vibrant red hue, occasionally appearing slightly dusky on the dorsal side of the thorax. The posterior edge of the pronotum often showcases an infuscated shade. The scape matches the color of the head, yet its ventral margin is white, and the apex shows a clear infuscation. Within the flagellum, segments F4-6 and the clava exhibit dark brown to blackish tones, while segments F1-F3 are predominantly white, with at least F1 showing reddish or brownish markings ventrally. A distinctive pattern adorns the forewing, and the mid tibial spur appears yellow. The mid and hind tarsi share the same coloration.

Figure 5. Habitus of *Yasumatsuiola orientalis* Trjapitzin.

Distribution: This species has already been recorded in Karnataka, Delhi, Tamil Nadu, Kerala, Uttarakhand, and Uttar Pradesh. This is a new record from Andhra Pradesh and Nagaland.

***Ethoris dahmsi* Noyes & Hayat (Figure 6)**

Ethoris dahmsi Noyes & Hayat, 1984: 275. Type species *Ethoris dahmsi* Noyes & Hayat, by monotype and original designation.

Material examined: India, Tamil Nadu, Chidambaram, Annamalai University, EDAU, 1 ♀, (N11° 23″; E079° 43″), 05.i.2014, Coll. T. Krishnachaitanya and S. Manickavasagam, through YPT. Tamil Nadu, Salem, Yercaud 1 ♀, (N11° 47″; E078° 12″), 09.iii.2015, Coll. T. Krishnachaitanya and S. Palanivel, through YPT, India, Tamil Nadu, Chidambaram, Annamalai University, EDAU.

Length: 1.05-1.14 mm

Diagnosis: The head displays a dark metallic green coloration, with a subtle coppery sheen observed between the anterior ocellus and antennal scrobes. The scape appears yellowish, while the pedicel, funicle, and basal segment of the clava exhibit a dark brown hue. The apical two segments of the clava are white. The medial area of the pronotum's face and the anterior margin of the mesoscutum appear dark brown. The scutellum, except for its sides, also presents a dark metallic green shade. The rest of the thorax, including the legs, appears pale orange, with the metanotum and dorsum of the propodeum displaying a darker brownish-orange tone. Dorsally, the gaster is brown, while ventrally it appears paler. The post-marginal and stigma veins form an unusually acute angle, and the mid-tibial spur is approximately the same length as the basal mid-tarsal segment.

Distribution: There are already records for this species in Andhra Pradesh. This is newly recorded from Tamil Nadu.

Figure 6. Habitus of *Ethoris dahmsi* Noyes & Hayat.

***Hemileucoceras longicornis* Hayat (Figure 7)**

Hemileucoceras longicornis Hayat, 2003: 218-219, F. Holotype, F: India, Aligarh (NPCI)

Material examined: India, Andhra Pradesh, Vishakapattanam, Chinthapalli, RARS, 3 ♀, (N18° 94″; E82° 61″), 05.vii.2015, Coll. T. Krishnachaitanya, through YPT. India, Tamil Nadu, Chidambaram, Annamalai University, EDAU, 2 ♀, (N11° 23″; E079° 43″), 07.vi.2015, Coll. T. Krishnachaitanya and S. Manickavasagam, through YPT. India, Tamil Nadu, Salem, Yercaud, 5 ♀, (N11° 47″; E078° 12″), 03.iv.2016, Coll. T. Krishnachaitanya and S. Palanivel, through YPT, India, Tamil Nadu, Chidambaram, Annamalai University, EDAU.

Length: 2.30 -2.45 mm.

Diagnosis: The body exhibits a dark brown hue, with the frontovertex, face, and scrobes displaying a bluish-green coloration. The pronotum appears predominantly bronzy, while the collar and anterior margin of the mesoscutum showcase a violet shade. Tegulae are brown, with the apical third or so appearing pale. The antenna features a scape in a testaceous yellow hue, with the radicle, pedicel, and flagellum, except for the narrow apex of the clava, displaying a dark brown color. Along each eye margin, the frontovertex displays distinct but small scattered setigerous punctures, while the mesoscutum exhibits a finely reticulate texture with dense, minute setigerous punctures.

Distribution: This species has already been recorded in West Bengal and Uttar Pradesh. This is a new record from Andhra Pradesh and Tamil Nadu.

Figure 7. Habitus of *Hemileucoceras longicornis* Hayat.

***Hesperencyrtus gordhi* (Fatma & Shafee) (Figure 8)**

Doddanusia gordhi (Fatma & Shafee), 1989: 19-20, F. Holotype F: India, Andhra Pradesh, mahboob Nagar (ZDAMU)

Hesperencyrtus gordhi (Fatma & Shafee): Hayat, 2003: 193-194, tax.

Material examined: India, Tamil Nadu, Salem, Yercaud, 1 ♀, (N11° 47″; E078° 12″), 08.vi.2016, Coll. T. Krishnachaitanya and S. Palanivel, through YPT, India, Tamil Nadu, Chidambaram, Annamalai University, EDAU.

Length: 0.95 mm

Diagnosis: The female body presents a testaceous yellow coloration. The clava appears flat and brown, with a medial section exhibiting a yellow hue. The pedicel and segments F1-F4 are brown, while the rest, including the clava, are yellow or white. The clava features a prominent oblique truncation, with the truncated part being at least as long as the remaining portion of the ventral surface. The stigma vein is well-developed, while the post-marginal vein is absent. The filum spinosum consists of 2-3 lines of spines. The scutellum is adorned with a thin apical flange, and the third valvula is fused with the second valvifer.

Distribution: This species has already been recorded in Andhra Pradesh. This is newly recorded from Tamil Nadu.

***Monstranusia antennata* (Narayanan) (Figure 9)**

Cerapterocerus antennatus Narayanan, 1960: 122-123, F. Holotype F: India, Delhi (NPCI)

Monstranusia antennata (Narayanan): Hayat, 1979: 315, 320, tax.

Figure 8. Habitus of *Hesperencyrtus gordhi* (Fatma & Shafee).

Material examined: India, Tamil Nadu, Chidambaram, Annamalai Nagar 1 ♀, (N11° 23″; E079° 43″), 16.vii.2016, Coll. T. Krishnachaitanya and S. Manickavasagam, through YPT. Tamil Nadu, Salem, Yercaud 2 ♀, (N11° 47″; E078° 12″), 03.ii.2016, Coll. T. Krishnachaitanya and S. Palanivel, through YPT. Maharashtra, Kolhapur district, Shivaji University, 1 ♀, 14.iii.2016, (N19°22' E77°46'), coll. T. Krishnachaitanya and S. Manickavasagam, through YPT, India, Tamil Nadu, Chidambaram, Annamalai University, EDAU.

Length: 1.35-1.83 cm

Diagnosis: The head is a dark brown shade with a matte yellow frontovertex, while the area below the lowest margins of the eyes is shiny and dark brown. The antennae are entirely dark brown, though the scape occasionally displays an orange hue. The thorax exhibits a brown coloration with subtle purplish reflections and a dorsal longitudinal stripe, varying from narrow to broad, in whitish or yellow tones. Legs are predominantly orange, with fore and mid coxae appearing yellow and hind coxae dark brown. Sometimes, the hind femora and tibia may also display a dark brown coloration. The head is approximately 1.25-1.35 times longer than its breadth, with the scape measuring about 0.85 times the length of the head and roughly 2.5 times its breadth. The ovipositor is approximately three-fifths the length of the mid-tibia.

Distribution: This species has already been recorded from Delhi, Odisha, and Uttar Pradesh. This is newly recorded from Tamil Nadu and Maharashtra.

***Paratetracnemoidea malenotti* (Mercet) (Figure 10)**

Rhinoencyrtus malenotti Mercet, 1918: 235-237; F, M, Lectotype M (Desegnated by Noyes, 1981:1982): Spain, Laguna penalara (MCNM)

Figure 9. Habitus of *Monstranusia antennata* (Narayanan).

Paratetracnemoidea malenotti (Mercet): Noyes & Hayat, 1984: 318.

Material examined: India, Tamil Nadu, Salem, Yercaud, 1 ♀, (N11° 47″; E078° 12″), 5.iii.2016, Coll. T. Krishnachaitanya and S. Palanivel, through YPT. India, Andhra Pradesh, Vishakapattanam, Chinthapalli, RARS, 2 ♀, (N18° 94″; E82° 61″), 18.vii.2015, Coll. T. Krishnachaitanya, through YPT, India, Tamil Nadu, Chidambaram, Annamalai University, EDAU.

Length: 0.75-0.85 mm

Diagnosis: The female's body displays a coppery hue with hints of bluish reflections, while the setae covering the body are silvery white. The antenna features a light testaceous yellow coloring at the base and tip of the scape, as well as on the pedicel, with the rest being dark brown. Legs are predominantly brown, except for the apical portion of the middle tibia and all yellow tarsi. On the frontovertex, there are setigerous punctures resembling thimbles, and the intertorular prominence extends into a spoon-shaped tooth above the mouth margin between the toruli. The mandible is pointed apically, featuring one long tooth and a shorter, receding one. The scape is slender and cylindrical, with all funicle segments longer than broad. The clava consists of three segments and is strongly obliquely truncated. There is no postmarginal vein, while the stigma vein is well developed, and the sensilla are arranged in a square pattern. The uncus is absent, and the third valvula is fused with the second valvifer.

Distribution: This species has already been recorded from Karnataka and Uttarakhand. This is newly recorded from Tamil Nadu and Andhra Pradesh.

***Pentelicus depunctatus* Manickavasagam & Chaitanya (Figure 11)**

Pentelicus depunctatus Manickavasagam & Chaitanya, 2015: 229-231, F. Holotype F: India, Tamil Nadu, Chidambaram (EDAU)

Material examined: India, Andhra Pradesh, Vishakapattanam, Chinthapalli, RARS, 2 ♀, (N18° 94″; E82° 61″), 18.vii.2015, Coll. T. Krishnachaitanya, through YPT. India, Andhra Pradesh, Vishakapattanam, Araku Valley, Near Coffee estate, 1 ♀, (N18° 32″; E82° 87″), 12.vii.2015, Coll. T. Krishnachaitanya, through YPT, India, Tamil Nadu, Chidambaram, Annamalai University, EDAU.

Length: 1.3-1.5 mm

Diagnosis: The female's body presents a dark blue to black hue. The scape exhibits a dark brown coloration with a yellow tip, appearing flat and measuring 2.9 times its width. The pedicel, also dark brown, has a lighter apex and is 2.3 times longer than its width. Most of the funicle is dark brown, except for F6 and the apex of F5. The clava is notably obliquely truncated. Silvery white setae adorn the frontovertex, arranged faintly imbricate between the posterior ocelli. The fore wing displays a distinct infuscation at the base behind the submarginal vein, becoming lighter beyond the stigma vein.

Figure 10. Habitus of *Paratetracnemoidea malenotti* (Mercet).

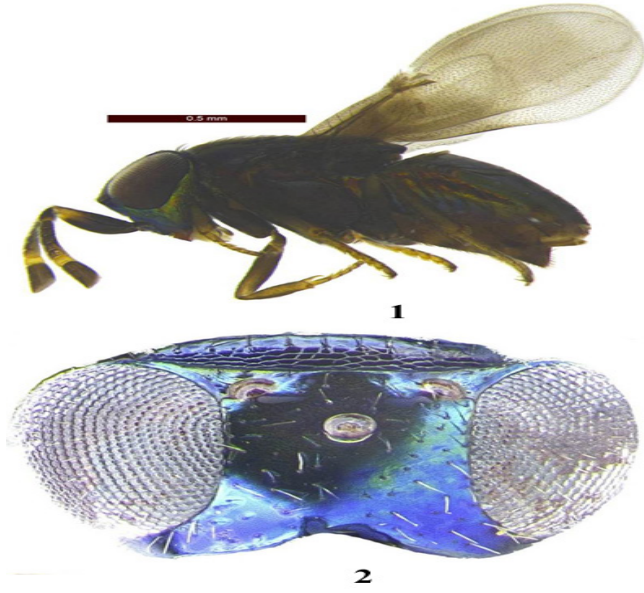

Figure 11. 1. Habitus of *Pentelicus depunctatus* Manickavasagam & Chaitanya.

Distribution: This species has already been recorded in Tamil Nadu. This is a new recording from Andhra Pradesh.

***Pentelicus punctatus* Manickavasagam & Chaitanya (Figure 12)**

Pentelicus depunctatus Manickavasagam & Chaitanya, 2015: 225-229, F. Holotype F: India, Tamil Nadu, Chidambaram (EDAU)

Material examined: India, Andhra Pradesh, Vishakapattanam, Chinthapalli, RARS, 2 ♀, (N18° 94″; E82° 61″), 19.vii.2015, Coll. T. Krishnachaitanya, through YPT. Andhra Pradesh, Vishakapattanam, Paderu, 3 ♀, (N18° 08″; E82° 66″), 10.vii.2015, Coll. T. Krishnachaitanya, through YPT, India, Tamil Nadu, Chidambaram, Annamalai University, EDAU.

Diagnosis: The female body displays a dark blue to black coloring. The scape, slightly flattened, measures 5.2 times its length and 2.5 times its width. The pedicel, dark brown in hue, is 2.5 times its length. Most of the funicles are dark brown, except for F6 and the apex of F5, which are yellow. The clava is notably obliquely truncated at the apex. On the frontovertex, which is broader than the distance between toruli, scattered deep setigerous punctures and an imbricate sculpture are observed, fading out from the occiput to the scrobal cavity. The fore wing exhibits clear infuscation in its basal half behind the submarginal vein, faintly along the leading margin beyond the venation, and at the centre of the

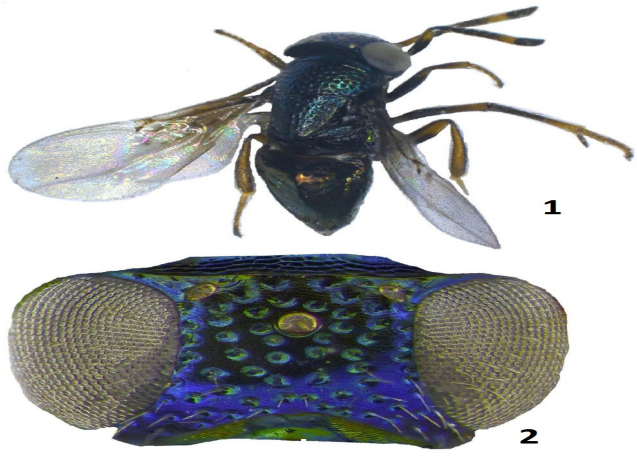

Figure 12. Habitus of *Pentelicus punctatus* Manickavasagam & Chaitanya.

disc. The stigma vein measures twice as long as the marginal vein.

Distribution: Tamil Nadu has previously recorded sightings of this species. This is a recent record from Andhra Pradesh.

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