



Research Article

Parasitic wasps of the family Encyrtidae Walker (Hymenoptera: Chalcidoidea) from Dadra and Nagar Haveli, India

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ABSTRACT: Twenty-one encyrtid species under 15 genera belonging to the family Encyrtidae (Hymenoptera: Chalcidoidea) are reported for the first time from Dadra and Nagar Haveli (Union Territory), India along with their hosts and distribution details.

KEY WORDS: Encyrtidae, parasitoids, biocontrol, new distributional records, Union Territory

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INTRODUCTION

The family Encyrtidae Walker is one of the largest families of the superfamily Chalcidoidea and easiest to recognize by the enlarged mesopleuron (Hayat 2006; Noyes 2004). The members of the family are the primary internal parasitoids of insects as well as arachnids and hyperparasitoids through other hymenopterous parasitoids (Noyes et al. 1997). Most of the encyrtid parasitoids attack hemipterans viz., Coccidae, Pseudococcidae, Diaspididae, Aphidoidea, Psylloidea, Kerridae, Eriococcidae etc. (Hayat 2006). They also parasitize eggs or larvae of beetles (Coleoptera), lacewings (Neuroptera), bugs (Hemiptera), butterflies and moths (Lepidoptera), flies (Diptera), grasshoppers (Orthoptera), ootheca of cockroaches (Blattodea), nymphs of ticks, spider eggs and mites (Arachnida). On the other hand, some species are polyembryonic in nature while some species are hyperparasitoids (secondary parasitoids) via other Encyrtidae, Pteromalidae, Aphelinidae, Braconidae, Dryinidae etc. (Hayat 2006). The family Encyrtidae is represented by 742 species from India whereas 1111 species are reported from the Oriental region (Noyes 2019). The keys to Indian genera and species with associated data like synonymy, host, distribution etc., were provided by Hayat (2006).

Dadra and Nagar Haveli is a Union Territory (occupying about 491 km²) in India, lying between 20° 0' to 20° 25' N

and 72° 50' to 73° 15'E. Only less than 500 insect species were reported earlier by Chandra (2011). Kazmi *et al.* (2003) recorded eight species of butterflies, Ghosh *et al.* (2018) studied the aquatic beetle fauna and Chandra *et al.* (2018) studied the diversity of hemipteran fauna. No comprehensive studies on the encyrtid fauna from Dadra & Nagar Haveli have so far been made to estimate the possible number of taxa inhabiting the area. Although, the present study provides a list of the encyrtid fauna from collections, thorough surveys are required to chalk out strategies to collect more information.

MATERIAL AND METHODS

Encyrtid parasitoids were collected through net sweeping and yellow pan trap methods from different areas of Dadra and Nagar Haveli. Specimens were processed and mounted as per standard protocol (Noyes 1982) and identified up to species level through appropriate keys. Voucher specimens are deposited in National Zoological Collection, Zoological Survey of India, Kolkata (NZSI), India.

RESULTS AND DISCUSSION

Twenty-one species under 15 genera of the family Encyrtidae were identified and are reported for the first time from Dadra and Nagar Haveli Union territory, India. Specimens of the genus *Metaphycus* Mercet (new to Dadra and Nagar Haveli) were also collected, but are not yet determined to species.

1. *Acerophagus papayae* Noyes and Schauff

Acerophagus papayae Noyes and Schauff 2003, 105 (1): 184-185, ♀, ♂, figs. Mexico.

Specimen examined: India, Dadra and Nagar Haveli, Dudhni garden (20.18123°N, 073.15342°E), 01 male, yellow pan trap, 25.i.2018 (A. Rameshkumar).

Host: *Paracoccus marginatus* (Noyes and Schauff, 2003)

Distribution: India: Andhra Pradesh, Karnataka, Tamil Nadu, Puducherry, Dadra and Nagar Haveli (**New record**).

2. *Agarwalencyrtus citri* (Agarwal)

Coccidencyrtus citri Agarwal 1965: 75, 76-77, ♀, Holotype: India, Aligarh.

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

Specimen examined: India, Dadra and Nagar Haveli, Dudhni garden (20.18123°N, 073.15342°E), 01 female, yellow pan trap, 25.i.2018 (A. Rameshkumar).

Hosts: *Planococcus citri* (Agarwal 1965); *Tomosvaryella* sp. (Diptera) (Hayat 1986).

Distribution: India: Andhra Pradesh, Assam, Bihar, Delhi, Jharkhand, Kerala, Meghalaya, Rajasthan, Tamil Nadu, Uttar Pradesh, Dadra and Nagar Haveli (**New record**)

3. *Anagyrus aquilonaris* (Noyes and Hayat)

Cremesina aquilonaris Noyes and Hayat 1984: 261-262, ♀, ♂, India, Aligarh.

Anagyrus aquilonaris (Noyes and Hayat): Shamim and Shafee, 1989: 45.

Specimen examined: India, Dadra and Nagar Haveli, Dudhni garden (20.18123°N, 073.15342°E), 01 female, yellow pan trap, 25.i.2018 (A. Rameshkumar).

Hosts: Unknown.

Distribution: India: Andhra Pradesh, Assam, Bihar, Delhi, Jammu & Kashmir, Jharkhand, Karnataka, Kerala, Tamil Nadu, Uttarakhand, Uttar Pradesh, Dadra and Nagar Haveli (**New record**).

4. *Anagyrus dactylopii* (Howard)

Aphyucus dactylopii Howard 1898: 242, ♀, China, Hong Kong.

Anagyrus dactylopii (Howard): Timberlake, 1924: 224.

Specimen examined: India, Dadra and Nagar Haveli, Khanvel (20.13060°N, 073.06226°E), 01 female, yellow pan trap, 20.i.2018 (A. Rameshkumar).

Hosts: *Ferrisia virgata* on *Acacia* sp. (Subba Rao and Rai 1970), same host on pomelo (Noyes and Hayat 1994); *Maconellicoccus hirsutus* on *Anona squamosa* and grape (Mani and Krishnamurthy 1989); *Nipaeococcus viridis* (Shafee and Avasthi 1983), same host on *Citrus vines*, *Euphorbia hirta* and *Dalbergia sisso* (Subba Rao et al. 1965); *Casuarina* sp., *Tephrosia purourea* (Noyes and Hayat 1994) *Planococcus citri* on *Cirtus medca* (Agarwal 1965); *Rastrococcus capparidae* (Shafee and Avasthi 1983).

Distribution: India: Andaman & Nicobar Islands, Andhra Pradesh, Assam, Bihar, Delhi, Goa, Himachal Pradesh, Jammu & Kashmir, Jharkhand, Karnataka, Kerala, Maharashtra, Odisha, Punjab, Tamil Nadu, Uttar Pradesh, Uttarakhand, Dadra and Nagar Haveli (**New record**).

5. *Anagyrus gracilis* (Hayat)

Doliphoceras gracilis Hayat 1970: 114-115, ♀. India, Bannerghatta N. P.

Anagyrus gracilis (Hayat): Noyes and Hayat, 1994: 75, 95-96, ♀, ♂, des., key, recorded from several localities in India: also Madagascar and Nepal.

Specimen examined: India, Dadra and Nagar Haveli, Dudhni garden (20.18123°N, 073.15342°E), 01 female, yellow pan trap, 25.i.2018 (A. Rameshkumar).

Hosts: *Brevennia rehi* (Nalini and Manickavasagam 2011), *Coccidohystrix insolita* (Noyes and Hayat 1994), *Antigastra catalaunalis* (Hayat 2006).

Distribution: India: Andaman and Nicobar Islands, Andhra Pradesh, Assam, Bihar, Delhi, Himachal Pradesh, Jammu & Kashmir, Jharkhand, Karnataka, Kerala, Maharashtra, Odisha, Rajasthan, Tamil Nadu, Uttar Pradesh, West Bengal, Dadra and Nagar Haveli (**New record**).

6. *Anagyrus thailandicus* (Myartseva)

Anathrix thailandicus Myartseva 1979: 1746-1747, ♀, Thailand, Muang

Anagyrus thalilandicus (Myartseva): Noyes, 2000: 29.

Specimen examined: India, Dadra and Nagar Haveli, Khanvel (20.13060°N, 073.06226°E), 01 female, yellow pan trap, 20.i.2018 (A. Rameshkumar).

Hosts: Unknown.

Distribution: India: Assam, Kerala, Tamil Nadu, West Bengal, Dadra and Nagar Haveli (**New record**).

7. *Anicetus angustus* Hayat, Alam and Agarwal

Anicetus angustus Hayat, Alam and Agarwal 1975: 31, 35, ♀, India, Goa, Madgao.

Specimens examined: India, Dadra and Nagar Haveli, Dudhni garden (20.18123°N, 073.15342°E), 02 females, yellow pan trap, 25.i.2018 (A. Rameshkumar).

Hosts: *Ceroplastes actiniformis* (Hayat 1986).

Distribution: India: Goa, Dadra and Nagar Haveli (**New record**).

8. *Apoleptomastix bicoloricornis* (Girault)

Leptomastix bicoloricornis Girault 1915: 152-153, ♀, Australia, Cairns, Gordonvale.

Apoleptomastix bicoloricornis (Girault): Kerrich, 1982: 427

Specimen examined: India, Dadra and Nagar Haveli, Dudhni garden (20.18123°N, 073.15342°E), 01 female, yellow pan trap, 25.i.2018 (A. Rameshkumar).

Hosts: *Coccidohystrix insolita* (Shamim and Shafee 1984), *Brevennia rehi*, *Heterococcus nigeriensis* (Noyes and Hayat 1994).

Distribution: India: Andhra Pradesh, Bihar, Delhi, Jammu & Kashmir, Jharkhand, Karnataka, Kerala, Maharashtra, Puducherry, Rajasthan, Tamil Nadu, Uttar Pradesh, West Bengal, Dadra and Nagar Haveli (**New record**).

9. *Callipteroma sexguttata* Motschulsky

Callipteroma sexguttata Motschulsky 1863: 37, ♂, Sri Lanka, Mt. Patannas.

Specimens examined: India, Dadra and Nagar Haveli, Madhuban Dam (20.17879°N, 073.06289°E), 01 female,

Sweep Net, 22.1.2018; Khanvel (20.13060°N, 073.06226°E), 02 females, yellow pan trap, 20.i.2018 (A. Rameshkumar).

Hosts: *Heliococcus summervillei* (Gupta and Joshi 2013).

Distribution: India: Andaman & Nicobar Islands, Delhi, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Rajasthan, Tamil Nadu, Uttar Pradesh, Dadra and Nagar Haveli (**New record**).

10. *Cheiloneurus bangalorensis* (Subba Rao)

Chrysopophagus bangalorensis Subba Rao 1957: 382-383, ♀, ♂, India, Bangalore.

Cheiloneurus bangalorensis (Subba Rao): Hayat, 1972: 212, ♀, ♂, tax., Aligarh rec.

Specimen examined: India, Dadra and Nagar Haveli, Dudhni garden (20.18123°N, 073.15342°E) 01 female, yellow pan trap, 25.i.2018 (A. Rameshkumar).

Hosts: *Antonina* sp. on grass (Hayat 1972); *A. graminis* (Anis and Hayat 2002).

Distribution: India: Andaman & Nicobar Islands, Andhra Pradesh, Assam, Karnataka, Kerala, Rajasthan, Tamil Nadu, Uttarakhand, Uttar Pradesh, West Bengal, Dadra and Nagar Haveli (**New record**).

11. *Cheiloneurus exitiosus* (Perkins)

Echthronatopus exitiosus Perkins 1906: 256. .

Cheiloneurus exitiosus (Perkins): Guerrieri and Viggiani, 2005: 314, hosts, distrib., tax., rec.

Specimen examined: India, Dadra and Nagar Haveli, Khanvel (20.13060°N, 073.06226°E), 01 female, yellow pan trap, 20.i.2018 (A. Rameshkumar).

Hosts: *Cnaphalocrocis medinalis* and *Marasmia exigua* (Behera et al. 2002).

Distribution: India: Andhra Pradesh, Assam, Bihar, Karnataka, Kerala, Maharashtra, Meghalaya, Mizoram, Odisha, Puducherry, Tamil Nadu, Uttarakhand, Uttar Pradesh, West Bengal, Dadra and Nagar Haveli (**New record**).

12. *Cheiloneurus latifrons* Hayat, Alam and Agarwal

Cheiloneurus latifrons Hayat, Alam and Agarwal 1975: 46-48, ♀, India, Karnataka, Hebbal.

Specimen examined: India, Dadra and Nagar Haveli, Dudhni garden (20.18123°N, 073.15342°E), 01 female, yellow pan trap, 25.i.2018 (A. Rameshkumar).

Hosts: *Phenacoccus indicus* (Noyes and Hayat 1994), *Peliococcus indicus* (Hayat 1986).

Distribution: India: Delhi, Himachal Pradesh, Karnataka, Kerala, Tamil Nadu, Uttarakhand, Uttar Pradesh, Dadra and Nagar Haveli (**New record**).

13. *Copidosoma floridanum* (Ashmead)

Berecyntus floridanus Ashmead 1900: 365, ♀, USA, Florida, Biscayne Bay.

Specimens examined: India, Dadra and Nagar Haveli, Dudhni garden (20.18123°N, 073.15342°E), 04 females, yellow pan trap, 25.i.2018 (A. Rameshkumar).

Hosts: *Plusia signata* (Hayat 1986), *Argyrogramma signatum*, *Helicoverpa armigera* (Kazmi and Hayat 2012), *Cosmophila sabulifera* (Hayat 2006), *Chrysodeixis eriosoma*, *C. chalcites* (Noyes and Hayat 1994).

Distribution: India, Bihar, Jammu & Kashmir, Jharkhand, Karnataka, Kerala, Odisha, Tamil Nadu, Uttar Pradesh, West Bengal, Dadra and Nagar Haveli (**New record**).

14. *Encyrtus infelix* (Embleton)

Comys infelix Embleton 1902: 223 (foot note). Lectotype ♀ [designated by Graham, 1969:308]

Encyrtus infelix (Embleton): Peck, 1963: 356-357.

Specimens examined: India, Dadra and Nagar Haveli, Vasona (20.20292°N, 073.02486°E) 02 females and 04 males, yellow pan trap, 23.i.2018 (A. Rameshkumar).

Hosts: *Saissetia* sp. (Gupta and Poorani 2009), *Coccus hesperidum* (Konar and Saha 2002).

Distribution: India, Assam, Karnataka, Tamil Nadu, West Bengal, Dadra and Nagar Haveli (**New record**).

15. *Homalotylus albiclavatus* (Agarwal)

Neoaenasioidea albiclavatus Agarwal 1970: 27, ♀, India, Aligarh.

Homalotylus albiclavatus (Agarwal): Hayat, Alam and Agarwal, 1975: 69, ♀, ♂, key, hosts, distrib., Shencottah,

Shoranur, Joginder Nagar and Lakhimpur Kheri rec.

Specimen examined: India, Dadra and Nagar Haveli, Khanvel (20.13060°N, 073.06226°E), 01 female, yellow pan trap, 20.i.2018 (A. Rameshkumar).

Hosts: *Nipaecoccus viridis*, *Pseudococcus* sp., *Pullus* sp. (Kazmi and Hayat 2009).

Distribution: India, Himachal Pradesh, Jharkhand, Karnataka, Kerala, Rajasthan, Tamil Nadu, Uttar Pradesh, West Bengal, Dadra and Nagar Haveli (**New record**).

16. *Leptomastix nigrocincta* Risbec

Leptomastix nigrocincta Risbec 1959 (1958): 27, ♀, Madagascar.

Specimen examined: India, Dadra and Nagar Haveli, Khanvel (20.13060°N, 073.06226°E), 01 female, yellow pan trap, 20.i.2018 (A. Rameshkumar).

Hosts: *Coccidohystrix insolita* (Sankaran 1959), *Phenacoccus* sp. (Gupta and Joshi 2013).

Distribution: India: Andaman and Nicobar Islands, Andhra Pradesh, Delhi, Karnataka, Kerala, Madhya Pradesh, Puducherry, Tamil Nadu, Uttar Pradesh, Dadra and Nagar Haveli (**New record**).

17. *Microterys nietneri* (Motschulsky)

Encyrtus nietneri Motschulsky 1863: 55, ♀. Sri Lanka, Mt. Patanna.

Microterys nietneri (Motschulsky): Trjapitzin and Sugonjaev, 1972: 617.

Specimens examined: India, Dadra and Nagar Haveli, Khanvel (20.13060°N, 073.06226°E), 05 females, yellow pan trap, 20.i.2018 (A. Rameshkumar).

Hosts: *Coccus hesperidum* (Pruthi and Mani 1945), *Parasaissetia nigra* (Ayyar and Margabandhu 1934), *Saissetia coffeae*, *Crossandra infundibuliformis* (Sankaran and Pattar 1977).

Distribution: India: Karnataka, Kerala, Tamil Nadu, Uttar Pradesh, Dadra and Nagar Haveli (**New record**).

18. *Neodusmetia sangwani* (Subba Rao)

Dusmetia sangwani Subba Rao 1957: 385-386, ♀, ♂, India, Bangalore.

Neodusmetia sangwani (Subba Rao): Kerrich, 1964: 76.

Specimen examined: India, Dadra and Nagar Haveli, Vasona (20.20292°N, 073.02486°E), 01 male, yellow pan trap, 23.i.2018 (A. Rameshkumar).

Hosts: *Antonina* sp. on grass (Hayat 1981), same sp. on *Cynodon* sp. (Shafee et al. 1975), same sp. on *Eragrostes ciliaris* (Hayat 1977); *A. indica* (=graminis) (Subba Rao 1957; Burks 1957).

Distribution: Probably throughout India. India: Andaman & Nicobar Islands, Andhra Pradesh, Assam, Delhi, Karnataka, Kerala, Puducherry, Rajasthan, Tamil Nadu, Uttar Pradesh, Dadra and Nagar Haveli (**New record**).

19. *Ooencyrtus segestes* Trjapitzin

Ooencyrtus segestes Trjapitzin 1965: 320-321, ♀, Indonesia, Komodo Island.

Specimen examined: India, Dadra and Nagar Haveli, Khanvel (20.13060°N, 073.06226°E), 01 female, yellow pan trap, 20.i.2018 (A. Rameshkumar).

Hosts: Unknown.

Distribution: India: Andhra Pradesh, Assam, Bihar, Delhi, Himachal Pradesh, Karnataka, Odisha, Puducherry, Punjab, Tamil Nadu, Uttar Pradesh, Uttarakhand, West Bengal, Dadra and Nagar Haveli (**New record**).

20. *Tassonia amaaura* Hayat

Tassonia amaaura Hayat 2003: 233-234, ♀, India, Mysore, Brindavan Garden

Specimen examined: India, Dadra and Nagar Haveli, Khanvel (20.13060°N, 073.06226°E), 01 female, yellow pan trap, 20.i.2018 (A. Rameshkumar).

Hosts: Unknown.

Distribution: India: Arunachal Pradesh, Karnataka, Odisha, Uttarakhand, Dadra and Nagar Haveli (**New record**).

21. *Tassonia glorieae* Girault

Tassonia glorieae Girault 1921: 2, ♀, Australia, Wynnum.

Specimens examined: India, Dadra and Nagar Haveli, Dudhni garden (20.18123°N, 073.15342°E), 01 female, sweep net, 25.i.2018; Khanvel (20.13060°N 073.06226°E),

02 females, yellow pan trap, 25.i.2018; Khanvel, 01 female, yellow pan trap, 20.i.2018 (A. Rameshkumar).

Hosts: *Hysteroneura setariae* on *Cynodon dactylon* (Hayat 1979; Kazmi and Hayat 2009), *Longiunguis sacchari* on *Saccharum officinarum* (Kazmi and Hayat 2009; Shafee et al. 1975), same host on *Sorghum vulgare* (Kazmi and Hayat 2009; Hayat 1979); *Myzus persicae* (Hayat 2006 and Hayat 1979).

Distribution: India: Andhra Pradesh, Arunachal Pradesh, Bihar, Goa, Daman & Diu, Himachal Pradesh, Jharkhand, Karnataka, Kerala, Odisha, Punjab, Rajasthan, Tamil Nadu, Uttarakhand, Uttar Pradesh, West Bengal, Dadra and Nagar Haveli (**New record**).

Encyrtids are extremely important parasitoids because most of the species are involved in biological control of many agricultural as well as horticultural pests. Even though the family is studied well throughout India, Dadra and Nagar Haveli are not explored. In the present paper, 21 species under 15 genera of encyrtids were recorded for the first time from Dadra and Nagar Haveli. However, further more surveys are required in the agricultural and horticultural belts in these regions which may likely to yield a large number of known and undescribed species.

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