



RECORDS OF ENCYRTIDAE FROM UTTARAKHAND WITH REDESCRIPTION OF *RHYTIDOTHORAX AERISCUTELLUM* (GIRAULT)

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ABSTRACT

Thirteen known species of Encyrtidae (Hymenoptera: Chalcidoidea) are recorded, including seven new records from Uttarakhand, India. *Rhytidothorax aeriscutellum* (Girault) is redescribed along with its morphometrics based on specimens from Uttarakhand.

Key words: Hymenoptera, Chalcidoidea, Encyrtidae, distribution, new records, host, redescription, biological control, Uttarakhand, India

Encyrtidae are important controlling agents of other insects belonging to the orders Hemiptera, Lepidoptera, Neuroptera and the eggs of ticks (Acarina) and spiders (Hayat, 2006b). Since the encyrtids are economically very important hence, it is essential to identify the different species of Encyrtidae accurately in order to ensure their proper and effective utilization as biological control agents. It is the largest and most abundant family with over 4896 valid species distributed in 506 genera (Noyes, 2022). In India, a total of 157 genera and 1410 species of encyrtids are known and only 99 species in 46 genera are reported so far from Uttarakhand state (Kazmi and Kumar, 2014; Nautiyal and Singh, 2017; Noyes, 2022). Girault (1915) erected the genus *Anusomyia* with *Anusomyia auratiscutum* as its type species and included two species in this genus, namely *A. auratiscutum* and *A. aerscutellum* based on female specimens from Queensland, Australia. The original descriptions of the species *A. aerscutellum* and *A. auratiscutum* were limited. Noyes and Hayat (1984) reviewed the genera of Indo-Pacific Encyrtidae and placed *Anusomyia* as a junior synonym of *Rhytidothorax*. In 1997, Dahms and Gordh reviewed the genera of Australian Encyrtidae described by Girault and accepted *Rhytidothorax* as broadly defined by Noyes and Hayat (1984). Dahms (1997) examined the material determined by Girault along with ten additional specimens but did not give a detailed description of the species. Therefore, in the present paper, a detailed morphometrics and description of *R. aeriscutellum* is given and new distribution records for seven species of Encyrtidae have been documented.

MATERIALS AND METHODS

Encyrtidae were collected from different locations of Doon Valley by host rearing and sweep net methods. The specimens were processed and mounted according to Noyes (1982) and identified using the keys given by Noyes and Hayat (1984; 1994) and Hayat (2006b). Observation and description of *Rhytidothorax aeriscutellum* were done using Olympus SZx16 (Japan) stereozoom microscope. For imaging of dried specimen Olympus SZx16 (Japan) stereozoom microscope with attached AutoMontage Digital Micropublisher Q-Imaging 5.0 RTV camera was used. Automontaged photographs of slide mounted parts were taken with Nikon Digital Sight DS-Fi1 using the EDF module of NIS-Br software (Nikon) mounted on Nikon Optiphot compound microscope. Abbreviations and measurements used are according to Noyes and Hayat (1984) and Singh and Agarwal (1993). Body length is given in millimeters (mm), and all other measurements are in micro meter (μ m). The specimens are deposited with the National Forest Insect Collection, Entomology Division, Forest Research Institute, Dehradun, India (NFIC-FRI). Following abbreviations are used in the text: M: Male. F: Female. NPCI: National Pusa Collection, Division of Entomology, Indian Agricultural Research Institute, New Delhi, India. USNM: United States National Museum of Natural History, Washington DC, U.S.A. ZSI: Zoological Survey of India, Kolkata, India. BMNH: The Natural History Museum, London. ZDAMU: Department of Zoology, Aligarh Muslim University, Aligarh, India. QMB: Queensland Museum, Brisbane, Australia. NMV: Naturhistorisches Museum,

Vienna, Austria. NFIC-FRI: National Forest Insect Collection, Entomology Division, Forest Research Institute.

RESULTS AND DISCUSSION

A total of 13 species are included, of which seven species are new records from Uttarakhand state and *Rhytidothorax aeriscutellum* is redescribed since its earlier description was inadequate.

1. *Aenasius arizonensis* (Girault)

Chalcaspis arizonensis Girault, 1915: 280, F. USNM, USA- Arizona; *Aenasius arizonensis* (Girault, 1915): Noyes and Woolley, 1994: 1330; *Aenasius bambawalei* Hayat, 2009: 21-25, Holotype, NPC-IARI.

Specimen examined. India: Uttarakhand, Dehradun, Muni ke Reti, 1 Female, 16. vi. 2018, coll. Sudhir Singh (collected by sweeping in nursery).

Distribution. India: Delhi, Haryana, Maharashtra (Hayat, 2006b), Tamil Nadu (Nalini and Manickavasagam, 2011), Andhra Pradesh (Rameshkumar et al., 2011), Puducherry (Manickavasagam and Ramesh Kumar, 2012) and Uttarakhand (**new record**); Elsewhere: China, Pakistan, Turkey, USA.

2. *Anagyrus alami* Hayat

Anagyrus alami Hayat, 1970: 112, F. Holotype F: India, Nasik (ZSI).

Specimens examined. India: Uttarakhand, Dehradun, New Forest (*bambusetum*), 9 females, 3 males, 6.vii.2018, ex. indet. Scale on *Bamboo tulda*, coll. R. Nautiyal.

Distribution. India: Karnataka, Maharashtra (Hayat, 2006b) and Uttarakhand (**new record**).

3. *Adelencyrtus coxalis* Hayat, Alam and Agarwal

Adelencyrtus coxalis Hayat, Alam and Agarwal, 1975: 77, 78-80, F, M. Holotype F: India, Guntur (BMNH)

Specimens examined. India: Uttarakhand, Dehradun, New Forest, 26 females, 1 male, 06. iii. 2018, ex. inted. Scale on *Toona ciliata*, coll. R. Nautiyal.

Distribution. India: Andhra Pradesh (Hayat, 2006b), Delhi, Puducherry, Tamil Nadu (Manickavasagam and Rameshkumar, 2012) and Uttarakhand (**new record**); Elsewhere: China.

4. *Adelencyrtus mayurai* (Subba Rao)

Anabrolepis mayurai Subba Rao, 1957: 380-382, F, M. Holotype, F: India, New Delhi (NPCI); *Adelencyrtus mayurai* (Subba Rao): Noyes and Hayat, 1984: 224, tax.

Specimens examined. India: Uttarakhand, Dehradun, New Forest (*bambusetum*), 3 females, 1 male, 06.vii.2018, ex. indet. Scale on *Bamboo tulda*, coll. R. Nautiyal; New Forest (near Trevor gate), 4 females, 20.iv.2018, ex. indet. pseudococcid sp on *Alstonia scholaris*, coll. R. Nautiyal.

Distribution. India: Delhi, Gujarat, Karnataka, Tamil Nadu, Uttar Pradesh (Hayat, 2006b), Puducherry (Manickavasagam and Rameshkumar, 2012) and Uttarakhand (Nautiyal and Singh, 2017); Elsewhere: Mauritania.

5. *Homalotylus albiclavatus* (Agarwal)

Neoaenasioidea albiclavatus Agarwal, 1970: 27, F. Holotype F: India, Aligarh (ZDAMU); *Neoaenasioidea albiscutellaris* Khan, 1976: 180, F. Holotype F: India, Aligarh (ZDAMU); synonymy by Hayat, 1981: 21, F, tax.; *Homalotylus albiclavatus* (Agarwal): Hayat, Alam and Agarwal, 1975: 69, F, M, key, hosts, distrib.; *Echthroplexis albiclavatus* (Agarwal): Shafee and Fatma, 1984: 371, tax., hosts; *Echthroplexis albiscutellaris* (Khan): Shafee and Fatma, 1984: 373.

Specimen examined. India: Uttarakhand, Dehradun, New Forest (near Trevor gate), 1 female, 11.v.2018, ex. indet. pseudococcid sp. on *Alstonia scholaris*, coll. R. Nautiyal.

Distribution. India: Himachal Pradesh, Jharkhand, Karnataka, Kerala, Rajasthan, Tamil Nadu, Uttar Pradesh, West Bengal (Hayat, 2006b) and Uttarakhand (Nautiyal and Singh, 2017); Elsewhere: Iran.

6. *Microterys kerrichi* Shafee, Alam and Agarwal

Microterys kerrichi Shafee, Alam and Agarwal, 1975: 66, 69-71, F, M. Holotype F: India, T. Nadu, Arkonam (ZDAMU; lost?)

Specimens examined. India: Uttarakhand, Dehradun, Panditwari, 1 female, 1 male, 31.iii.2018, ex indet. pseudococcids on *Psidium guajava*, coll. R. Nautiyal.

Distribution. India: Tamil Nadu (Hayat, 2006b) and Uttarakhand (**new record**).

7. *Microterys newcombi* (Girault)

Microterys newcombi Girault, 1915: 91, F. Australia, N.S.W., Sydney (QMB)

Microterys newcombi (Girault): Rosen, 1973: 250.

Specimens examined. India: Uttarakhand, Dehradun, Gorakhpur, 6 females, 10 males, 6. iii. 2018, ex. indet. Coccidson *Citrus maxima* leaves, coll. R. Nautiyal.

Distribution. India: Assam (Hayat, 2006b) and Uttarakhand (**new record**); Elsewhere: Australia, Malaysia.

8. *Ooencyrtus aethes* Hayat

Ooencyrtus aethes Hayat, 2006a: 307-308, F. Holotype F: India, Aligarh (NPCI).

Specimen examined. India: Uttarakhand, Dehradun, Phondoowala ramgarh range, 1 female, 31. iii. 2018, ex. unidentified eggs on *Murraya koenigii*, coll. R. Nautiyal.

Distribution. India: Uttar Pradesh (Hayat, 2006b) and Uttarakhand (Nautiyal and Singh, 2017).

9. *Prochiloneurus testaceus* (Agarwal)

Achrysopophagus testaceus Agarwal, 1965: 66, 68-69, F. Holotype F: India, Aligarh (ZDAMU); *Prochiloneurus hayati* Shafee, Alam and Agarwal, 1975: 49, 53-55, F. Holotype F: India, Nabha (ZDAMU), synonymy by Hayat, 1999: 391; *Prochiloneurus testaceus* (Agarwal): Shafee, Alam and Agarwal, 1975: 49, 53-55, F, key.

Specimen examined. India: Uttarakhand, Dehradun, Gorakhpur, 1 female, 4.iii.2018, ex. indet pseudococcid on *Psidium guajava*, coll. R. Nautiyal.

Distribution. India: Andaman and Nicobar Island, Andhra Pradesh, Maharashtra, Punjab, Tamil Nadu, Uttar Pradesh (Hayat, 2006b) and Uttarakhand (**new record**).

10. *Psyllaephagus macrohomotomae* Singh and Agarwal

Psyllaephagus macrohomotomae Singh and Agarwal, 1993: 73, 81-84, F, M. Holotype F: India, North Lakhimpur (FRI, examined).

Specimens examined. India: Uttarakhand, Dehradun, Kalsi, 4 female, 8 males, 17.iii.2018, ex. indet. psyllid on *Ficus ramphii*, coll. R. Nautiyal.

Distribution. India: Assam, Mizoram (Hayat, 2006b) and Uttarakhand (Nautiyal & Singh, 2017).

11. *Trechnite manaliensis* Hayat, Alam and Agarwal

Trechnite manaliensis Hayat, Alam and Agarwal, 1975: 87-88, 90-92, F, M. Holotype F: India, Aligarh (BMNH).

Specimens examined. India: Uttarakhand, Dehradun, New Forest, 8 female, 4 males, 15. vii. 2018, ex. indet. psyllid on *Terminalia tomentosa*, coll. R. Nautiyal.

Distribution. India: Himachal Pradesh, Karnataka (Rameshkumar et al., 2016) and Uttarakhand (**new record**); Elsewhere: China, Africa.

12. *Zaomma lambinus* (Walker)

Encyrtus lambinus Walker, 1838: 422, F. Lectotype F [designated by Graham, 1969: 271]: England. (BMNH). [As synonym of *Apterencyrtus microphagus* by Graham, 1969: 270];

Chiloneurus microphagus Mayr, 1876: 745, 746, F. syntypes (NMV), synonymy with *lambinus*, implied by Gordh and Trjapitzin, 1979: 37; *Chiloneurus microphagus* (Mayr): Mercet, 1921: 646. *Apterencyrtus microphagus* (Mayr): Hayat, Agarwal and Alam, 1975: 57-60, F, M.; *Zaomma lambinus* (Walker): Gordh and Trjapitzin, 1979: 35, 37, tax.

Specimens examined. India: Uttarakhand, Dehradun, New Forest, 3 females, 1 male, 7. ii. 2018, ex indet. Scaleon *Toona ciliata*, coll. R. Nautiyal.

Distribution. India: Andaman and Nicobar Island, Kerala, Uttar Pradesh (Hayat, 2006b) Odisha, West Bengal (Hayat and Khan 2008) and Uttarakhand (Nautiyal & Singh, 2017); Elsewhere: Algeria, Argentina, Armenia, Austria, Azerbaijan, Brazil, Bulgaria, Canada, Croatia, Czech Republic, Czechoslovakia, Denmark, Finland, France, Georgia, Germany, Hawaii, Hungary, Indonesia, Iran, Italy, Japan, Korea, Mauritius, Moldova, Montenegro, Netherlands, New Zealand, Norway, China, Peru, Philippines, Poland, Romania, Russia, Spain, Sweden, Switzerland, United Kingdom, United States of America, USSR.

13. *Rhytidothorax aeriscutellum* (Girault) (Figs. 1-9)

Anusomyia aeriscutellum Girault, 1915: 164 (original description)

Rhytidothorax aeriscutellum (Girault): Noyes and Hayat, 1984: 333 (generic transfer).



Fig. 1-4. *Rhytidothorax aeriscutellum*. female: 1. body in dorsal view; 2. body in lateral view; 3. head in frontal view; 4. head in lateral view

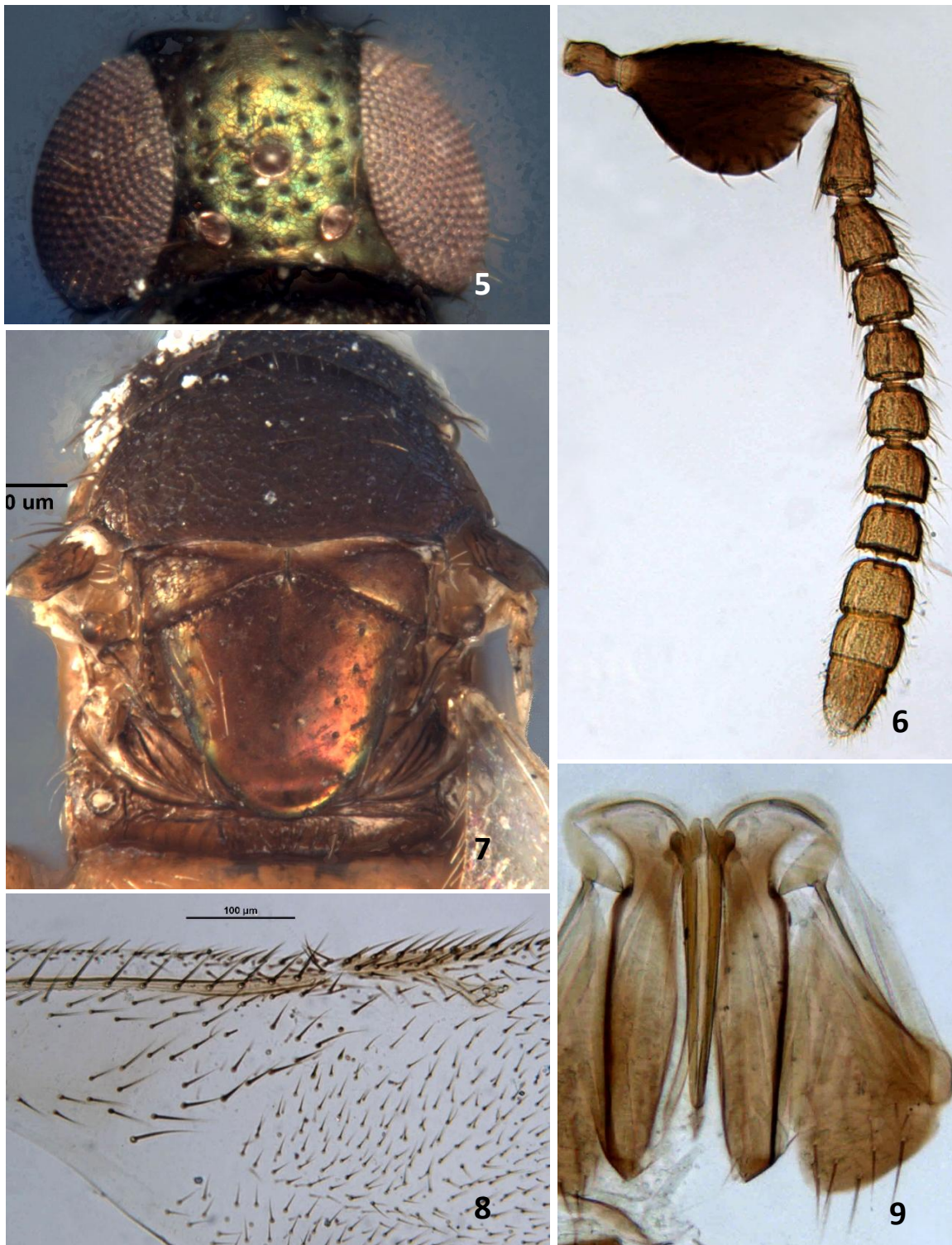


Fig. 5-9. *Rhytidothorax aeriscutellum*. female: 5. head in dorsal view; 6. antenna; 7. mesosoma in dorsal view; 8. part of fore wing showing venation; 9. ovipositor

Redescription

Female length 1.48 mm. Body with head and mesosoma dark brown to black. Head in frontal view with mild blue-green reflection; frontovertex with metallic green reflection; ocelli reddish brown; eyes bronzy reaching sharp occipital margin with gray setae; mandibles with teeth brown, palpi pale; antenna brown, scape flattened dark brown, funicle segments and clava with light brown. Mesosoma dark brown. Wings hyaline. All legs testaceous yellow except mid coxa basal half dark brown. Metasoma light brown with alternate white line at each tergite.

Head, in frontal view (Fig. 3) 1.16x wider than long; inner eye margins smoothly curved; eye 1.84x as long as wide; antennal toruli located much above the mouth margin; inter antennal prominence convex, with long dark setae and raised reticulation; toruli 1.34x as long as wide; distance between toruli 1.23x, distance between torulus and eye margin 1.1x, torulo-mouth margin distance 0.58x shorter than torular length (78: 70: 37: 63); scrobes broadly U-shaped with margins rounded, reaching 0.55x between torulus and median ocellus. Head, in dorsal view (Fig. 5) with anterior and posterior margins slightly concave and convex respectively; 1.62x as wide as long, 2.34x as wide as frontovertex width at level of median ocellus; frontovertex with reticulate sculpture, becoming elongate towards margin of scrobal area; ocellar area with small setigerous punctures, about half diameter of median ocellus; ocelli in right angle triangle; POL 2.29x, OCL 0.58x and OOL about 0.51x the diameter of middle ocellus (94: 24: 21: 41); eye about 1.91x as long as wide. Head, in profile (Fig. 4) 4.5x as high as malar space length; eye 1.27x as long as wide; malar sulcus present. Antenna (Fig. 6) with scape expanded ventrally, 1.67x as long as wide; pedicle long conical, 2.08x as long as broad; all funicle segments with fine and long setae; clava three segmented with rounded apex; except F1, quadrate to broader than long; F1 0.6x smaller than pedicel, 1.22x as long as wide, F2 0.94x, F3 0.96x, F4 0.9x, F5 0.94x, F6 0.83x, clava 2.54x as long as broad. Mandible with two acute teeth, ventral tooth shorter than dorsal.

Mesosoma slightly narrow than head, 0.9x head width. Pronotum visible in dorsal view with around 12 long strong setae along collar; mesoscutum squamiform reticulate sculpture with long brown setae, anterior margin convex, axillae meeting at the middle, axillae 3.26x wider than long; rounded on sides; scutellum mild sculpture with long brown setae, narrow distally, 1.08x as long as wide; propodeum narrow medially,

distad of spiracles with light setae, 10x as wide as long. Fore wing proximad of lineacalva with a row of long setae, 2.42x as long as wide; marginal 1.28x and stigmal vein 0.8x longer than postmarginal (103: 64: 80). Midtibial spur 1.2x longer than basitarsus. Metasoma. Metasoma 1.18x longer than mesosoma, 1.35x as long as wide, cercal plates situated almost at anterior half of metasoma; hypopygium extending 0.83x along metasoma length; ovipositor 0.69x smaller than the mid tibia length. Third valvula distinctly articulated with second valvifer (Fig. 9).

Male. Unknown.

Host. Unknown.

Specimens examined. 2f (1f, on a card, with one antenna and one pair of wing, mounted on the slide; 1f completely dissected on a slide under 8 cover slips) India: Uttarakhand: Dehradun, Kalsi; 30. xi. 2018; Coll. R. Nautiyal (by sweeping bamboo bushes).

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