

New Species of *Aphelinoidea* Girault (Hymenoptera: Chalcidoidea: Trichogrammatidae) along with Key from India

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ABSTRACT

Two new species of *Aphelinoidea* Girault (Hymenoptera: Trichogrammatidae), *A. almoraensis* Ikram & Khan sp. nov and *A. rudrapurensis* Ikram & Khan sp. nov. are being described from India . A key to the Indian species of *Aphelinoidea* Girault and re-description of *Aphelinoidea gwaliorensis* Yousuf & Shafee are also provided. *Aphelinoidea gwaliorensis* Yousuf & Shafee is being revalidated.

Key words: *Aphelinoidea*, Chalcidoidea, new species, India.

INTRODUCTION

Aphelinoidea a cosmopolitan genus of the family Trichogrammatidae. Some members of which are known as egg parasitoids of various leafhoppers (Hemiptera: Cicadellidae) and thus they can be important for biological control (Trjapitzin 1995; Walker, Zareh, Bayoun, & Triapitsyn, (1997); Walker, Bayoun, Triapitsyn, & Honda, (2005); Bayoun, Walker, & Triapitsyn, (2008). Walker, Bayoun, Triapitsyn & Honda (2005) reviewed the species of egg parasitoids attacking *N. tenellus* in California. Triapitsyn (2018) synonymized *A. gwalioensis* Yousuf & Shafee under *A. (Lathromeroides) neomexicana* (Girault), and *A. retiruga* Lin, was synonymized under *A. (Aphelinoidea) longiclavata* Yousuf & Shafee. So, presently the genus *Aphelinoidea* Girault includes 39 described (including three Indian species: *A. gwalioensis* Yousuf & Shafee (revalidated), *A. yousufi* Khan & Anis, *A. longiclavata* Yousuf, & Shafee) valid species in the world (Noyes, 2019). Here we have described two new species *A. almoraensis* Ikram, & Yousuf sp. nov and *A. rudrapurensis* Ikram & Yousuf sp. nov. of the genus *Aphelinoidea* Girault collected from Uttarakhand region in India. An updated key to the Indian species of *Aphelinoidea* Girault and re-description of *Aphelinoidea gwalioensis* Yousuf & Shafee are also provided. *Aphelinoidea gwalioensis* Yousuf & Shafee is being revalidated, which was synonymized with *Aphelinoidea (Lathromeroides) neomexicana* (Girault, 1915) by Triapitsyn (2018).

MATERIAL AND METHODS

All specimens were collected from the forestry and adjoining agro-forestry areas of Haryana, Uttarakhand and Punjab (India) by sweep net. Screened out specimens from insect samples were preserved in 70% alcohol. Later specimens were dissected and kept in a drop of euparal under coverslips. Only body lengths of specimens were measured in millimeters, rest parts of measurements were taken from the divisions of a linear scale micrometer placed in the eye piece of a Nikon Digital Sight attached with Optiphot Microscope, at 10X, 20X and 40X (objective lens) for slide-mounted parts. Scales are placed on photographs of slide mounted parts and measurement was taken with the help of NIS-ELEMENT software in micrometer (μm). Photographs of slide-mounted specimens were taken with digital camera "Nikon Digital Sight attached with Optiphot Microscope (Japan)" fitted over a compound microscope (Leica's Leitz Labor Lux S). All the specimens including types are deposited at NFIC (National Forest Insect Collection), Forest Protection Division, Forest Research Institute, Dehradun, Uttarakhand (India).

The following abbreviations are used: OOL= Ocello-ocellar length; POL= Post-ocellar; C1 & C2= Club segments 1 & 2; FWW= Fore wing width; STV= Stigmal vein; MV= Marginal vein; PM= Pre marginal vein.

RESULTS

Taxonomy

Key to Indian species of *Aphelinoidea* Girault, based on females

1. Fore wings less than 2.5X as long as wide2
 - Fore wings 2.5X as long as wide; marginal fringe about one fifth of wing width; antennae with scape more than 3X as long as wide, pedicel about 2X as long as wide1. *A. gwaliorensis* Yousuf & Shafee
2. Antennae with club about 4X as long as wide3
 - Antennae with club always less than 4X as long as wide4
3. Fore wings with discal setae restricted to apical half of disc; antennae with scape more than four times as long as2. *A. yousufi* Khan & Anis
 - Fore wings with disc densely setose after venation, covering two third of disc3. *A. longiclavata* Yousuf & Shafee
4. Antennae with club less than 3X as long as wide, scape more than 3.5 times as long as wide; fore wings with marginal fringe about one-sixth of wing width4. *A. almoraensis* sp. n.
 - Antennae with club more than 3X as long as wide; scape less than 3.5X as long as wide; fore wings with marginal fringe about than one-tenth of wing width5. *A. rudrapurensis* sp. n.

Aphelinoidea gwaliorensis Yousuf & Shafee (Figs. 1-5)

Aphelinoidea gwaliorensis Yousuf & Shafee, 1985: 303.

Aphelinoidea gwaliorensis Yousuf & Shafee, 1988: 105.

Aphelinoidea (*Lathromeroides*) *neomexicana* (Girault): Trjapitzin 1995: 301. Syn. quoted by Triapitsyn, 2018: 61.

Female. Length. 0.50 mm. Head with fronto-vertex light yellow; facial area from ventral margin of toruli to mouth margin of the eye gena light brown; eyes and ocelli red; Mandibles golden yellow with tip brown. Antennae with scape and pedicel light brown except club with brownish. Mid-lobe of mesoscutum light golden yellow except light dorsellum and propodeum parts with light yellow. Fore and hind wings hyaline except infuscation beneath marginal vein.

Head: (facial view) (Fig. 1) 1.14X as broad as long (176: 154). Eyes 1.4X as long as malar space; mandibles with tri-denticles. Antennae (Fig. 2) with scape 3.52X as long as broad (67: 19); pedicel 2X as long as broad (44: 22); one anellus present; funicle absent; club three-segmented (C1, C2 and C3), about 2.3X as long as broad (90: 40).

Mesosoma: (Fig. 4) Midlobe of mesoscutum about 1.2X wider than long (92: 78) with 2 pairs of setae present on dorsal surface; midlobe of scutellum 1.5X wider than long (92: 61) with 2 pairs of setae, dorsellum 0.61X as long as propodeum (13: 21). Fore wings (Fig. 3), 2.6X as long as broad (501: 194); disc densely setose; STV rudimentary.

Metasoma: (Fig. 5) longer than mesosoma; ovipositor very long, arising from base of 2nd tergite of mesothorax and cover the entire length of gaster slightly exserted, 2.8X as long as hind tibia (230: 82).

Male. Unknown.

Host. Unknown.

Material examined: INDIA: Haryana: Karnal, 1♀ (on slide), 03.09.2014; Yamunanagar, Kamain chowk, 1♀ (on slide), 16.02.2015, by sweeping, S. Khan; Yamunanagar, Bhelpur, 1♀ (on slide), 09.iii.2016, R.B. Singh, by sweeping; Hisar, Alipur, 1♀ (on slide), 30.12.2015; Bhiwani, Raigarh, 1♀ (on slide), 30.12.2015, by sweeping, S. Khan. PUNJAB: Taran Tarn, Aladdinpur, 1♀ (on slide), 11.09.2013; Jalandhar, Jandusingha, 1♀ (on slide), 11.09.2013, S. Khan, by sweeping.

Distribution: India: Andhra Pradesh, Arunachal Pradesh, Haryana (New record), Himachal Pradesh, Jammu & Kashmir, Madhya Pradesh, Odisha, Punjab (New record), Uttar Pradesh, West Bengal.

Discussion: *Aphelinoidea gwaliorensis* was described by Yousuf & Shafee (1985), based on female characters. During present study additional morphometric characters (Midlobe of mesoscutum about 1.2X wider than long (92: 78) with 2 pairs of setae present on dorsal surface; midlobe of scutellum 1.5X wider than long (92: 61) with 2 pairs of setae, dorsellum 0.61X as long as propodeum (13: 21) have been studied.

Aphelinoidea gwaliorensis Yousuf & Shafee was synonymized with *Aphelinoidea* (*Lathromeroides*) *neomexicana* (Girault, 1915) by Triapitsyn (2018) but several specimens of *A. gwaliorensis* collected during the present study, have been studied in detail and following key characters make it distinct from *A. (Lathromeroides) neomexicana*. Therefore *A. gwaliorensis* being treated as valid distinct species and hence, it is being revalidated as *Aphelinoidea gwaliorensis* Yousuf & Shafee, 1985.

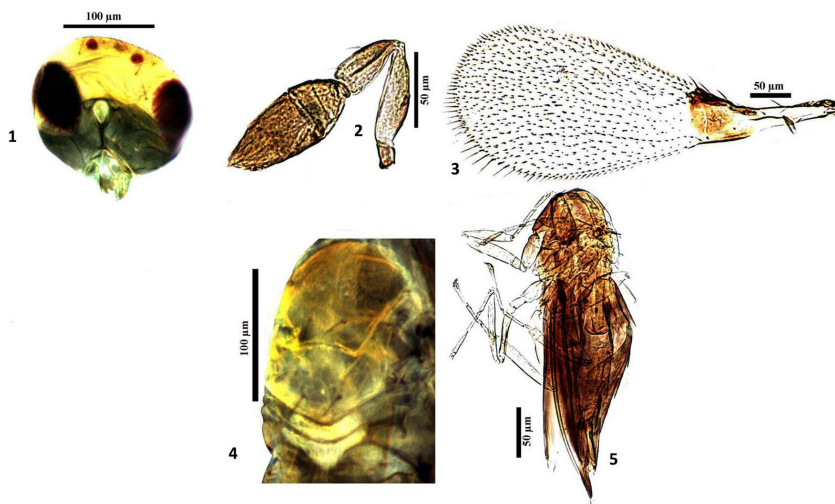


Fig. 1-5. *Aphelinoidea gwaliorensis* Yousuf & Shafee (Female). 1. Head, 2. Antenna, 3. Fore wing, 4. Mesosoma, 5. Ovipositor & hind tibia.

New Species of *Aphelinoidea* Girault

Table 1. Comparative characters of *A. (Lathromeroides) neomaxicana* Girault and *A. gwaliorensis* Yousuf & Shafee.

Key characters	<i>A. (Lathromeroides) neomaxicana</i> (Girault, 1915)	<i>A. gwaliorensis</i> Yousuf & Shafee (1985) (n=5)
Body size	0.60-1.10 mm	0.50-0.56 mm
Body colour	Face brown, Mesoscutum mostly orange; gaster generally dark brown or sometimes with several pale or orange transverse strips.	Face dark yellow with pale yellow vertex; gaster dark yellow with brown transverse strips.
Antennae (Length/ width)	Club: 2.2-3.1×	2.1-2.6×
	Pedicel: 3×	2.0-2.5×
	Scape: About 4×	3.7-4.4×
Fore wings (Length/ width)	2.3-2.4× as long as wide	2.5-2.7× as long as wide
Ovipositor: Hind tibia	About 4×	2.5-3.0×
Ovipositor: Meta tibia	3.0-3.9×	2.8-3.0×
Genitalia arising from	2 nd tergite of mesothorax	3 rd tergite of mesothorax

Aphelinoidea almoraensis sp. nov. (Figs. 6-11)

Holotype, 1♀ (on slide), INDIA: Uttarakhand, Almora, 06.02.2018, R. B. Singh, by sweeping.

Paratype: 1♀ (on slide) same data as holotype.

Description

Female. Length 0.85 mm. Head with vertex pale yellow; gena brownish; eyes and ocelli red. Mandibles dark brown. Antennae with scape, pedicel and club light brown. Mesosoma with pronotum, mesoscutum and scutellum brown; metanotum and propodeum pale brown. Gaster uniformly dark brown with several pale transverse stripes.

Head: (facial view) (Fig.6) 1.14X as broad as high (153: 134); front-vertex with prominent setae; vertex with rugose sculpture. Eyes reddish, about 1.55X as long as malar space (70: 45); mandible with three denticles (Fig. 10). Antennae (Fig. 7) with scape broad at the base, 3.8X as long as broad (65: 17); pedicel 2X as long as broad (44: 22); one anellus present; club three-segmented (C1, C2 and C3), 2.7X as long as broad (92: 34), C3 longest, more than 2X longer than pedicel.

Mesosoma: Fore wings (Fig. 11), hyaline except infuscation beneath venation, 2.4X as long as broad (484: 201), fore wings disc with dens setose not arranged in rows, STV rudimentary and marginal fringe short. Hind wings about 11X as long as wide (396: 37) with 3 rows of discal setae, marginal fringe long, about 1/5th of wing width.

Metasoma: Gaster longer than mesosoma; ovipositor 1.3X as long as hind tibia (175: 131) (Figs. 8, 9).

Host: Unknown

Distribution: INDIA: Uttarakhand.

Etymology: The name of the species is derived from collection site 'Almora' district in Uttarakhand.

Remarks: *Aphelinoidea almoraensis* sp. nov. is very close to *Aphelinoidea longiclavata* Yousuf & Shafee (1988a) but can be separated by having antennae with scape 3.8X as long as broad; pedicel 2X as long as broad; club 2.7X as long as broad. Fore wings, 2.4X as long as broad.

In *Aphelinoidea longiclavata*, antennae with scape 4X as long as broad; pedicel 2.5X as long as broad; club long, about 4X as long as broad. Fore wings, slightly more than 2X as long as broad.

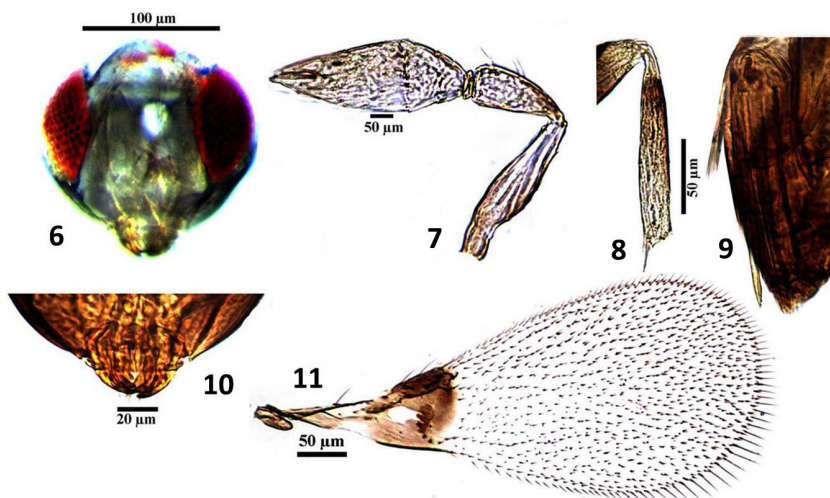


Fig. 6-11. *Aphelinoidea almoraensis* sp. nov. (Female) 6. Head, 7. Antenna, 8. Hind tibia, 9. Ovipositor, 10. Mandibles, 11. Fore wing.

***Aphelinoidea rudrapurensis* sp. nov. (Figs. 12-19)**

Holotype, 1♀ (on slide), INDIA: Uttarakhand, Udham Singh Nagar. Rudrapur, 06.02.2018, R. B. Singh, by sweeping.

Description

Female. Length. 0.79 mm. Head with fronto-vertex bright yellow; facial area from ventral margin of toruli upto mouth margin of the eye gena light brown; eyes and ocelli red; Mandibles golden yellow with tip brown. Antennae with scape, pedicel and club brown. Midlobe of mesoscutum light golden yellow, except dorsellum and propodeum parts with light yellow. Fore and hind wings hyaline except light infuscation beneath venation.

Head: (facial view) (Fig. 12) 1.2X as broad as high (191: 162). Eyes 2.3X as long as malar space; mandibles with tri-denticles (Fig. 14). Antennae (Fig. 13) with scape broad at the base, 3.25X as long as broad (78: 24); pedicel 2.4X as long as broad (53: 22); one anellus present; funicle absent, club three-segmented (C1, C2 and C3), 3.3X as long as broad (119: 36), C3 longest.

New Species of Aphelinoidea Girault

Mesosoma: (Fig. 15) Midlobe of mesoscutum 1.14X wider than long (124: 108) with 2 pairs of setae present on dorsal surface; midlobe of scutellum 1.52X wider than long (116: 76), having 2 pairs of setae, dorsellum as long as propodeum. Fore wings (Fig. 16), 2.30X as long as broad (578: 251); disc densely setose, STV rudimentary; marginal fringe about 1/10th of FWW. Hind wings (Fig. 17) 11X as long as wide (452: 41), 2 rows of setae present. Metasoma: Gaster longer than mesosoma; ovipositor very long, arising from base of and cover the entire length of gaster and slightly exserted, 2.3X as long as hind tibia (421: 181) (Figs. 18-19).

Host: Unknown

Distribution: Uttarakhand.

Etymology: The name of the species is derived from collection site 'Rudrapur' district in Uttarakhand.

Remarks: *Aphelinoidea rudrapurensis* sp. nov. is very similar to *Aphelinoidea yousufi* Khan & Anis (2016) but can be separated by having antennae with scape 3.25X as long as broad; club 3.3X as long as broad. Midlobe of mesoscutum 1.14X wider than long; midlobe of scutellum 1.5X wider than long. Fore wings, 2.30X as long as broad; disc densely setose upto the margin of stigmal vein. Ovipositor very long, arising from base, and cover the entire length of gaster and slightly exserted, 2.3X as long as hind tibia.

In *Aphelinoidea yousufi* antennae with scape broad at the base, 4.44X as long as broad, club about 4X as long as broad. Midlobe of mesoscutum 1.23X wider than long; midlobe of scutellum 2.25X wider than long. Fore wings, 2.2X as long as broad; discal setae restricted to apical half. Ovipositor short, arising from IIIrd of the gaster, about 1.47X as long as hind tibia.

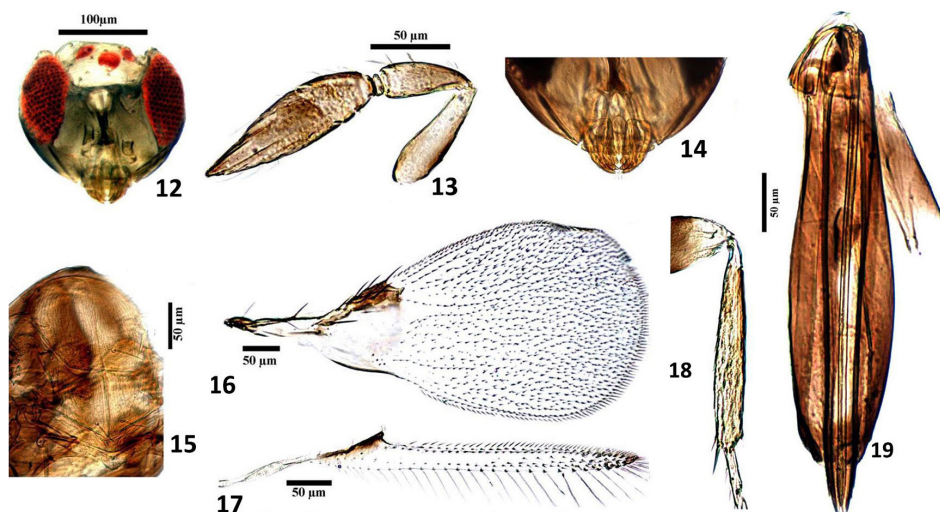


Fig. 12-17. *Aphelinoidea rudrapurensis* sp. nov. (Female) 12. Head, 13. Antenna, 14. Mandibles, 15. Mesosoma, 16. Fore wing, 17. Hing wing, 18. Hind tibia, 19. Ovipositor.

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