



**Full Length Article**

## **Addition of Three New Species of Metopiinae (Ichneumonidae: Hymenoptera) for Pakistan Fauna from Pothwar Region (Punjab) of Pakistan**

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### **Abstract**

The subfamily Metopiinae (Hymenoptera: Ichneumonidae), an important group of family Ichneumonidae was studied from Pothwar region of Punjab, Pakistan during 2016–2018. A total of five species were recorded out of which *Triclistus aitkini* Cameron (1897), *Colpotrochia (Colpotrochia) cincta* Scopoli, 1763 and *Hypsicera intermedia* Momoi and Kusigemati (1970) are new records for Pakistan. All the identified species are reported for the first time from Pothwar region in present study. New distributional records of already reported species are added. An Identification key to the genera and their respective species of Metopiinae in Pothwar region of Pakistan has been given. Comparison of recorded species with closely related species, distribution ranges, and remarks on their host and discussion on conservation are provided. Main identification characters of all identified species have been illustrated using microphotography. Spatial distributions of the recorded species have been given using ArcGIS tools. © 2020 Friends Science Publishers

**Key words:** Ichneumonidae; Metopiinae; Pothwar; New country records

### **Introduction**

The members of subfamily Metopiinae Forster 1869 are small to medium sized and well known from all regions of the world (Fitton 1984). Members are recognized by their uniform convex surface face where clypeus not separated by groove, except for the genus *Metopius*, face flat or slightly concave with shielded borders and sharply carinate. The body is with stout legs, thick coxae and the cylindrical abdomen, division between trochantellus often obsolete except hind legs (Baltazar 1964; Townes 1971; Gauld 1984; Choi and Lee 2017). Metopiinae are koinobiont endoparasitoids of concealed larvae of family Tortricidae and Pyralidae of order Lepidoptera (Gupta 1987). Oviposition takes place in host larva and adult emerged from host pupa (Quicke 2015). Metopiinae comprises 26 genera and approximately 900 species in all geographical regions (Yu *et al.* 2012; Choi and Lee 2017). Earliest work done on this subfamily in various parts of the world include from Oriental region (Cameron 1897; Morley 1913), Palearctic region (Schmiedeknecht 1924; Clément 1930; Uchida 1934), Nearctic region (Townes and Townes 1959) and Afrotropical region (Scopoli, 1763; Panzer 1806). Different researchers have made significant faunal

contributions in different parts of the world on Metopiinae like Masnadi and Jussila (2009) from Iran, Kolarov and Ozbek (1998) from Turkey, Zhang *et al.* (2016) from China, Tolkanitz (1987) in Russian region, Gauld and Sithole (2002) from Costa Rica, Broad and Shaw (2005) from Britain, Berry (1990) from New Zealand, Araujo and Penteado (2011) from Brazil, Choi and Lee (2017) from South Korean region, Kusigemati (1971, 1983, 1984, 1985) from Japan, Taiwan, Mongolia and Nepal *etc.*

Prior to this study, only three species *Metopius (Metopius) rufus*, *Exochus appendiculatus* and *Colpotrochia (Colpotrochia) pilosa* were reported from Pakistan (Townes *et al.* 1961; CIBC 1981), whereas, from adjacent countries, like India 22 species (Townes *et al.* 1961) Iran 11 species (Amiri *et al.* 2015) and from China 156 species (Yu *et al.* 2012). Keeping in view this situation and day by day increasing the importance of these bio control agents, extensive surveys were conducted in Pothwar region during 2016–18 for the collection of Metopiinae.

### **Materials and Methods**

Collection was done using Malaise traps (Fig. 7A–B) (Malaise, 1937; Mason and Bordera 2008; Aguiar and

Santos 2010) supplemented with sweep net in different localities of Pothwar region, which includes Attock, Chakwal, Jhelum, Rawalpindi and Islamabad during 2016 to 2018. Study area occurred parallel to the outer himalyas and lies between the river Jehlum and Indus. It is located at 32.3° to 33.5°N and 71.3° to 74.0°E at elevation of around 200 to 2000 meters (Fatima and Khan, 2018). Different ecosystems including agro-ecosystems, forests and rangelands were surveyed in above five locations. Specimens were collected twice in month after 15 days from 04 Malaise traps installed in each district.

Achterberg (2009) dry method was used for extraction of specimens from malaise traps. Specimens of large size were pinned whereas small specimens were mounted on card and labeled. Morphological and Microsculpture terminologies of Townes (1969) and Eady (1968) were followed. Taxonomic literature (Morley 1913; Townes, 1971; Kusigemati 1983) was used for identification of species.

Labomed microscope (CZS6) was used to observe morphological characters of the specimens. LEICA MS 5 microscope attached with Amscope 18 megapixel camera was used for microphotography. Illustrations were processed in helicon focus 6 and adobe Photoshpe CS6. Abbreviations used in measurements include total body length (TBL) and fore wing length (FWL). Identified specimens were deposited in Department of Entomology, PMAS-Arid Agriculture University Rawalpindi.

## Results

Five species belonging to four genera under subfamily Metopiinae were collected and identified. Two genera *Triclistus* Cameron (1897) and *Hypsicera* Latreille (1829) with one species each and *Colpotrochia cincta* Scopoli (1763) are new records for the Pakistani fauna. All identified species in this study are briefed with their description, distribution and illustrations.

### Key to genera and species of Metopiinae from Pothwar region of Pakistan

1. Face in the form of flat or slightly concave shield bordered by the carina (Fig. 1D); tibia of midleg with one spur, mandibles unidentate.....*Metopius (Metopius) rufus browni* Ashmead
  - Face in the form of entirely convex and without shield shaped area; tibia of midleg with two spurs and bidentate mandibles .....2
2. Back of head vertical behind posterior ocelli to foramen magnum. Middle tibia with two spurs of equal length. Areolet absent (Fig. 5B). 2nd tergite with sublateral longitudinal carina sharp.....*Hypsicera intermedia* Momoi & Kusigemati
  - Back of head temple rather long and flat. Middle tibial spurs of unequal length. Areolet of fore wing present or

absent. 2<sup>nd</sup> tergite without sub lateral longitudinal carina.....3

3. Areolet in forewing present. Basal and areola areas confluent on propodeum. First abdominal segment weakly to quite strongly taper anteriorly, its spiracle located near its anterior, length of 1<sup>st</sup> tergite more or less three times length of 1<sup>st</sup> sternite. Upper tooth of mandible longer than lower tooth. (Fig. 2F).....*Triclistus aitkini* Cameron

- Areolet in forewing absent. Basal and areola areas absent on propodeum. First abdominal segment petiolate anteriorly, its spiracle is near, at or behind the center. Length of 1<sup>st</sup> tergite more or less double length of 1<sup>st</sup> sternite. Upper tooth of mandible subequal or shorter than lower tooth. Nervellus of hind wing vertical (Fig. 3B, 4B).....*Colpotrochia (Colpotrochia)* Holmgren.....4

4. Apical half apex of scutellum yellow. First tergite black dorsally and rest yellowish brown up to fourth tergite. All the femurs partially or wholly black, mid and hind tibiae yellow medially (Fig. 3A).....*C. (C.) cincta* Scopoli

- Apical apex of scutellum yellow. (Fig. 4F) First three tergite broadly yellow at their apices both above and below black. Fore femur yellow whereas rest partially black, mid tibia wholly yellow except apically black from one side (Fig. 4E).....*C. (C.) pilosa* Cameron

Taxonomic Account  
Family Ichneumonidae Latreille (1802)  
Subfamily Metopiinae Förster (1869)

### Genus *Metopius* panzer (1806)

**Diagnosis:** Face with a shield-shaped structure is the most prominent characteristics of this genus. Head medium sized, clypeus broad and densely punctures, separated by suture from face. Flavescent labrum with strong unidentate mandibles Mesopleuron characterized by the presence of sternulus and epicenimal carina. Forewing is with areolet and second recurrent vein with bulla. Absence of 2<sup>nd</sup> tooth on mandibles and compressed interantennal process with median carina distinguish the subgenus *Metopius* with other subgenera (Kusigemati 1971; Tolkanitz 2007).

*Metopius (Metopius) rufus browni* Ashmead (1905) (Fig. 1A–F; 6)

*Metopius browni* Ashmead (1905)

*Metopius kakogawanus* Matsumura (1912)

*Metopius formosanus* Clément (1930)

**Material Examined: Pakistan Punjab, Rawalpindi,** Kotli Sattian, Neela Sand (33°39'38.16"N, 73°23'03.37"E, 691 m) 1♂, 9.iv.2016, S. Ahmed, Taxila (33°44'20.61"N 72°51'18.22"E, 559 m) 1♂, 1♀, 02.ix.2016. Murree kuldana (33°55'22.50"N, 73°24'14.58"E, and 1929 m) 1♂ (Malaise Trap) 02.viii.2017, S. Ahmed. **Jhelum,** Dina (33°07'07.47"N, 73°37'38.59"E, 278m) 1♂, 1♀ 08. x. 2016. Lehri park (33°03'53.33"N 73°28'02.11"E, 399m) 1♂, 1♀, S. Ahmed, 09.i.2017. 3♂, 2♀ (Malaise trap), 15.ix.2017, S. Ahmed. 3♀ (Malaise trap) 03.x.2017, S. Ahmed. **Attock,** Hassanabdal, Por Miana (33°49'39.49"N, 72°47'14.42"E

500m) 2♂, 15♀, S. Ahmed, 25.05.2017. 2♂ 1♀, 24.x.2017, S. Ahmed. 1♀, 27.iv.2018. S. Ahmed. 5♂, 11♀, 26.v.2018, S. Ahmed. 6♂, 10♀ 20.x.2018, I. Bodlah. 3♂ 3♀ 13.x.2018, S. Ahmed. 4♀, 4♂ 26. x. 2018, I. Bodlah. 1♂ 02.xi.2018, S. Ahmed **Chakwal**, Kallar Khar (32°47'44.25"N 72°43'46.69"E, 721m) 2♂ (Malaise Trap) 07.ix.2017. 4 m, 28.ix.2017, I. Bodlah. 1♂ 2♀ (Malaise Trap) 16.x.2017, S. Ahmed. 1♂ 1♀ (Malaise Trap) 17.iv, 2018, I. Bodlah. 3♂ 1♀ (Malaise Trap) 15.v.2018, S. Ahmed. 1♂ (Malaise Trap) 03.x.2018, I. Bodlah. **Islamabad Capital Territory** Kachnar Park (33°40'32.99" N 73°04'39.15" E, 522 m), 4♀, 30.viii.2016, S. Ahmed. 3♂, 24.ix.17, I. Bodlah. 2♂, 2♀, 14. x. 2017, 1♂, 4.iv.2018, S. Ahmed. 3♀, 16.x.2018, S. Ahmed.

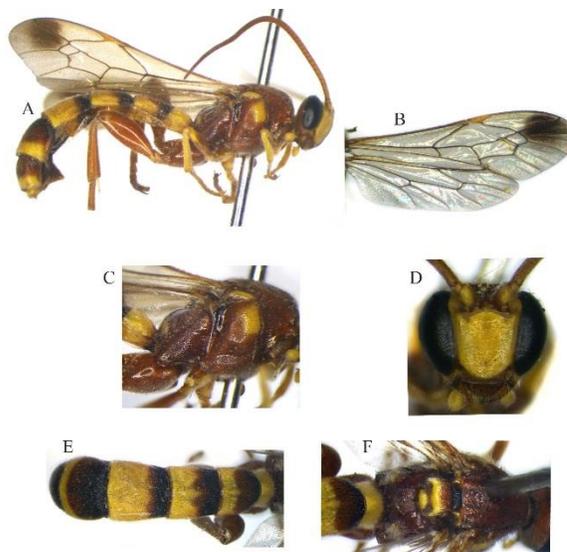
**Description:** ♀ Female: TBL: 10–12 mm, FWL: 8.5–9.5 mm. Female yellowish brown. Male dominantly black with yellow bands on metasomal tergites. Head and thorax yellowish brown to dark brown (Fig 1C). Mandibles unidentate. Antenna with short 55–60 flagellomeres. Pronotum polished, densely punctate and epomia distinct. Position of spiracles before middle on short and stout first tergite with median longitudinal carina. Wings hyaline with areolet, 1m-cu with two bullae, costa and stigma red, apex of wing with a large dark spot (Fig. 1B). Scutellum fully or partially flavescent and propodeum with longitudinal carina. Transverse carina absent on propodeum (Fig. 1F). Metasomal tergites brown to black basally, subcylindrical abdomen with 5<sup>th</sup> broadest segment and spiracles located at their brown base. First four basal segments coarsely and longitudinally punctuated (Fig. 1E). Legs of female mainly brown, fore and middle legs of male yellow. Hind leg reddish brown except apical area of tarsal claw reddish black and claws strongly curved (Fig. 1A). Ovipositor shorter than hind tibia without dorsal subapical notch.

**Distribution in Pakistan:** Haripur (CIBC, 1981), Chakwal, Attock, Jehlum, Rawalpindi, Islamabad during present study (Fig. 6).

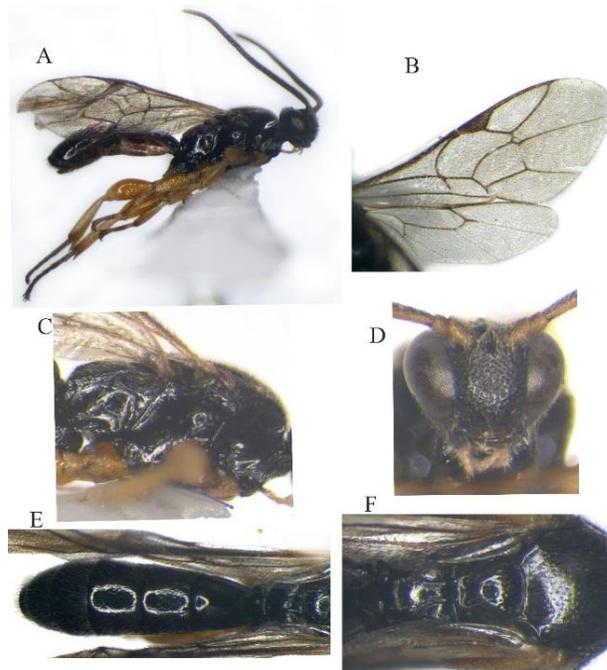
**General distribution:** China, India, Indonesia, Japan, Korea, Mongolia, Myanmar, Taiwan, Thailand, Philippines, Vietnam and Hong Kong (Yu *et al.* 2012)

**Biogeographical region:** Palearctic, Oriental and Oceanic regions.

**Remarks:** *Metopius (Metopius) rufus* contains three sub species in oriental region. However, it is differentiated from others two sub species mainly with characters of propodeal carination. Propodeum is devoid of transverse carinae and prominent longitudinal carinae present on propodeum. Yellow shield face sparsely punctate with densely punctate frons differentiate the subspecies from others. Morphological characters on metasomal tergites vary which are coarsely and longitudinally punctate as compared to other sub species (Nikam and Helbe 1976). In Vietnam, Khuat and Pham (2007) recorded this species as a parasitoid of *Parnara guttata* (Hesperiidae), and *Mythimna separata* (Noctuidae). In Pakistan this species have been reported as parasitoid of *Spotopdtera litura* and *Spodoptera exigua* (Lepidoptera: Noctuidae) which are serious pest of



**Fig. 1:** *Metopius (Metopius) rufus browni* (A-E): A. lateral view of body; B, fore wing; C, lateral view of mesosoma; D, frontal view of head; E, dorsal view of abdomen; F, dorsal view of scutellum and propodeum



**Fig. 2:** *Triclistus aitkini* (A-E): A. lateral view of body; B, fore wing; C, lateral view of mesosoma; D, frontal view of head; E, dorsal view of abdomen; F, dorsal view of scutellum and propodeum

vegetables and different field crops (CIBC, 1981). In present study, specimens of this species has been collected from agricultural crops in greater number as compared to other habitats because the host insects population was maximum in agricultural crops.

### Genus *Triclistus* Förster (1869)

**Diagnosis:** Face and clypeus evenly convex, dorsally face continued as an interantennal lamella forming a high arched shaped in front of the median ocellus. Temple, sloping weakly inward, giving the head a buccate appearance. Occipital carina complete, mesopleuron characterized by epicnemial carina and devoid of sternulus. Propodeal carination present with subcircular spiracle. Areoleted forewing with broad pterostigma. Femur of fore and mid leg thick, two spurs present on mid tibia (Sun *et al.* 2013; Mohamed *et al.* 2013).

***Triclistus aitkini* Cameron (1897)** Figs (2A–F; 6)

*Exochus aitkini* Cameron (1897)

*Triclistus aitkini* Morley (1913)

*Exochus curvicarinatus* Cameron (1902)

**Material Examined:** Pakistan, Punjab **Rawalpindi** Murree Kuldana (33°55'22.50"N, 73°24'14.58"E, 1929 m), 1♂, 09.ix.2017, S. Ahmed. (Malaise trap), 1♀ 24. ix.2017, I. Bodlah., Num Behr Mall (33°52'54.87"N 73°21'17.01"E, 1432m) 1♀, 16. ix.2018, S. Ahmed.

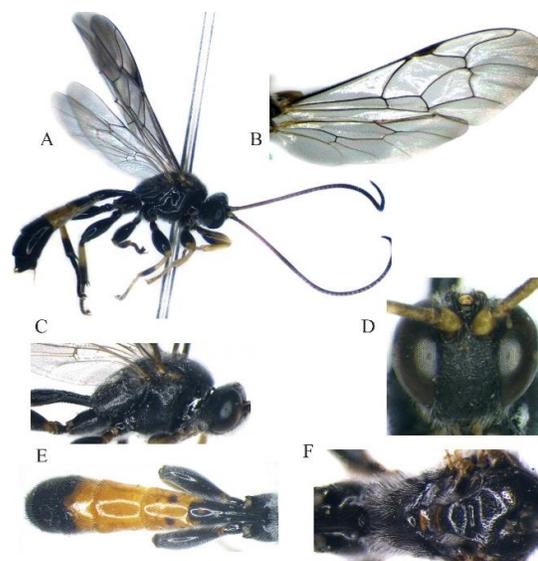
**Description:** Female: TBL: 6.0–6.8 mm, FWL 4.7–5.8 mm. Face with prominent compound eyes with dense punctuation and sparse hairs (Fig. 2D). Bidentate mandibles with prominent longer upper tooth. Basal mandibular width 1.5X length of malar space Position of spiracles on first tergite before middle near basal area, broader at apex with median longitudinal carina. Sec tergite without median longitudinal carina (Fig. 2E). Antennae dark brown with 22–25 flagellomeres with short pubescence; first segment longer than rest of flagellomeres. Wings hyaline with elongate petiolate areolet no longer than submarginal vein, pterostigma and veins dark brown (Fig. 2B). Propodeum with a broad confluent basal and areola areas, costulae and lateral longitudinal carina present (Fig. 2F). Head and thorax black (Fig. 2C). Metasomal segments black dorsally and short abdomen with yellowish brown legs with mid tibial spurs of subequal length (Fig. 2A). Ovipositor is projecting beyond hind margin of sub-genital plate sand tapering sharp at apex.

**Distribution in Pakistan:** Rawalpindi Murree (Kuldana, Num Behr Mall) - **New record for Pakistan (Fig. 6).**

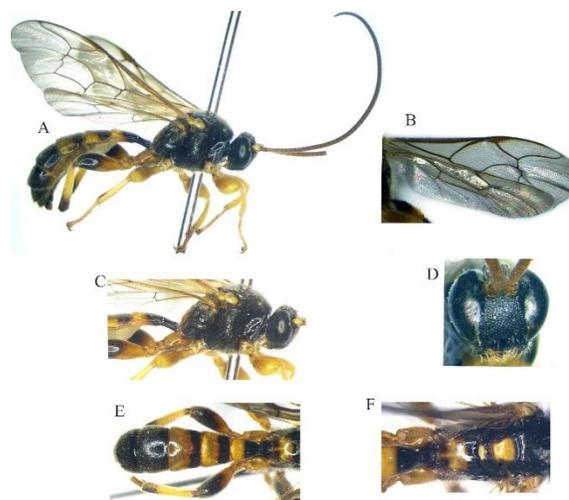
**General Distribution:** India, China, Japan, Korea, Philippines, Taiwan and Russia (Yu *et al.* 2012).

**Biogeographical Region:** Palearctic and Oriental regions.

**Remarks:** This species is recorded for the first time from Pakistan. He *et al.* (1984) reported this species as parasitoid of rice pest *Cnaphalocrocis medinalis* of the family Crambidae in the Oriental region. *Triclistus aitkeni* seems to be similar with *Triclistus crassus* (Townes and Townes 1959) another member of this genus by presence of costula on propodeum, wings characteristics and head profile. Presence of hairs on metapleuron, greater length and width of areola on propodeum and usually smaller body length of



**Fig. 3:** *Colpotrochia (Colpotrochia) cincta* (A–E): A. lateral view of body; B. fore wing; C. lateral view of head & mesosoma; D. frontal view of head; E. dorsal view of abdomen; F. dorsal view of scutellum and propodeum



**Fig. 4:** *Colpotrochia (Colpotrochia) pilosa* (A–E): A. lateral view of body; B. fore wing; C. lateral view of head & mesosoma; D. frontal view of head; E. dorsal view of abdomen; F. dorsal view of scutellum and propodeum

*Triclistus crassus* differentiate it from *Triclistus aitkeni* (Tolkanitz 1987). One of collection site of this species is adjacent to water stream having water loving shrubs.

### Genus *Colpotrochia* holmgren (1856)

**Diagnosis:** Genus is recognized by the narrow and sloppy temple. Head with rounded weakly convex clypeus. Mandibles broad at base and apically constricted with two teeth of equal length. Mesonotum finely and scarcely punctuated, postscutellum carinated. Propodeum

characterized by hairs with very weak or without carination. Elongate metanotum and first long and slender tergite constricted basally and dorsally bicarinate before or at its center. Forewing without areolet and stout legs with thickened femur with abdomen banded with yellow. Inclivous nervellus of hindwing and absence of areolet in forewing distinguish the subgenus *Colpotrochia* from others subgenera (Townes and Townes 1959).

***Colpotrochia (Colpotrochia) cincta* (Scopoli, 1763)** (Fig. 3A–F; 6)  
*Sphex cincta* Scopoli (1763)

*Ichneumon elegantulus* Schrank (1781)

*Ichneumon mundator* Thunberg (1822)

*Colpotrochia affinis* Vollenhoven (1875)

**Material examined:** Pakistan Punjab, **Rawalpindi**, Murree, Kuldana (33°55'22.50"N, 73°24'14.58"E, and 1929 m), 1♀, 1♂, 02.viii.2017, S. Ahmed. 1 m, 15.vii.2018. I. Bodlah. 1♀, 16. ix.18, S. Ahmed. Kahuta (33°35'59.30"N, 73°24'19.93"E, 610 m) 1♀ 1♂, 17. ix. 2017. I. Bodlah.

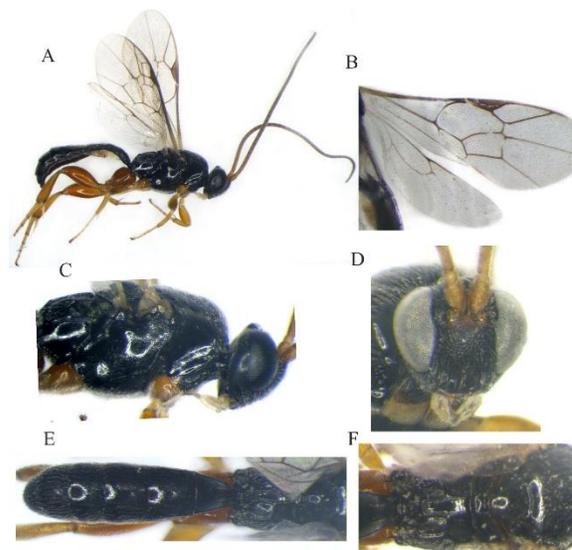
**Description:** Female: TBL: 8.4–9.0 mm FWL: 6.7–7.5 mm. Convex face, densely punctate and hairy, margin of clypeus not separated from the face, strong bidentate mandible and well developed vertical lamella present between the antennal sockets (Fig. 3D). Antenna with 58- flagellomeres and its length to body length or more. Black Propodeum with no carination and with oblique shaped propodeal spiracles (Fig. 3C). Mesonotum finely and scarcely punctuated, postscutellum carinated (Fig. 3F). Apical width of first tergite is equal to its length, with deep suture in the center, width of sec tergite is equal to its length (Fig. 3E). Wing without areolet radius vein arises from center of stigma, nervulus postfurcal, sec recurrent vein sinuated (Fig. 3B). Stout legs with strong thick, hind femur length equal to its width. Ovipositor very short not extending last abdominal segment. Male larger in size and about 9–11 mm in total body length.

**Distribution in Pakistan:** Rawalpindi, Murree (Kuldana) and Kahuta (**New record for Pakistan**) (Fig. 6).

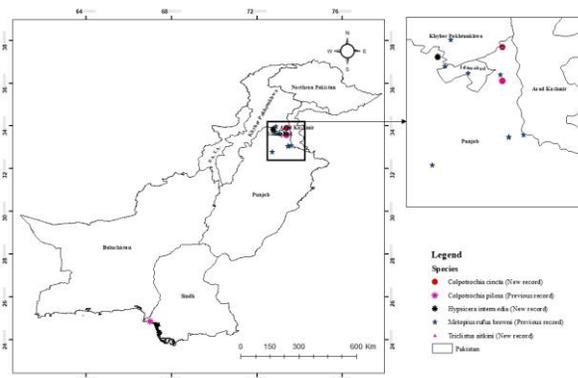
**General distribution:** Iran, Japan, Russia France, Germany, South Korea, Spain, Turkey and United Kingdom (Yu *et al.* 2012)

**Biogeographical Region:** Palearctic, Oriental, Oceanic and Nearctic regions.

**Remarks:** *Colpotrochia cincta* is new record from Pakistan collected from shaded forest areas of Murree as reported by Townes (1971) collected from tropical areas with shaded shrubbery. *Colpotrochia tricolor* (Aubert 1979) a species of same genus with similar characteristic of vertical lamella with deep median groove between antennal sockets and differentiate in presence of areolet in forewing and of red colour femur and tibia. Where as in *Colpotrochia cincta* areolet in forewing absent and colour of femur black and tibia yellow medially (Amiri *et al.* 2015). Biology of *Colpotrochia* species, is not completely explored yet however records showed family Noctuidae (Lepidoptera) as their hosts and are usually associated with shady environments (Yu and Horstmann 1997; Gauld and Sithole 2002).



**Fig. 5:** *Hypsicera intermedia* (A-E): A. lateral view of body; B, fore wing; C, lateral view of mesosoma; D, frontal view of head; E, dorsal view of abdomen; F, dorsal view of scutellum and propodeum



**Fig. 6:** Map of distributional records of Metopiinae species in Pakistan

***Colpotrochia (Colpotrochia) pilosa* Cameron (1909)** (Fig. 4A–F; 6)

*Inoresa pilosa* Cameron (1909)

*Coipotrochia pilosa* Morley (1913)

*Coipotrochia (Colpotrochia) pilosa* Townes and Townes (1959)

**Material examined:** Pakistan Punjab, **Rawalpindi**, Kahuta (33°35'59.30"N, 73°24'19.93"E, 610 m) 3♀, 2♂, 17.ix.2017, S. Ahmed.

**Description:** Female: TBL: 10–11.4 mm, FWL: 8.6–9.0 mm. Face almost evenly punctate with white hairs occiput and frons sparsely punctate and carinate between the antennal scrobe, mandibles strong and bidentate and clypeus truncate apically (Fig. 4D). Antennae, filiform and more or less equal with body length with very short flagellomere. First flagellomere about half long than sec flagellomere (Fig. 4A).

Mesosoma black and finely punctate with strongly elongate spiracles (Fig. 4C). Mesonotum characterized with hairs and devoid of notauli, mesopleuron distinctly punctate. Scutellum broader at base and narrow apically with postscutellum prominent with yellow colour. Propodeum yellow with no carination and with oblique shaped propodeal spiracles (Fig. 4F). Metasoma tergites closely punctate and pilose black and apically longitudinally tricarinate. First three tergites broadly yellow at their apices both above and below; apical margin of fourth segment completely yellow. While rest tergites black dorsally and light yellow in colour ventrally (Fig. 4E). Wing without areolet radius vein arises from center of stigma, nervulus postfurcal, sec recurrent vein sinuated (Fig. 4B). Stout legs with strong thicken, hind femur. Length of hind femur equal to its width. Ovipositor very short not extending last abdominal segment.

**Distribution in Pakistan:** Karachi (Morley, 1913), Rawalpindi; Kahuta during present study (Fig. 6).

**General Distribution:** China, India, Japan, Korea, Pakistan, Taiwan, Vietnam and Philippines (Yu et al. 2012).

**Biogeographical Region:** Palearctic, Oriental and Oceanic regions.

**Remarks:** *Colpotrochia pilosa* is reported earlier from Karachi by Morley (1913) from host *Eumenes campaniformis esuriens*. In this study it is reported from forest area of Tehsil Kahuta district Rawalpindi. Which showed it's enhance distribution in the area and host presence in the shady forest (Townes 1971; Gauld and Sithole 2002). *Colpotrochia (Colpotrochia) melanosome* Morley a species of same genus with similar characteristics of face strongly and evenly punctate, antennae more or less equal to the body length, and wing characteristics. Whereas red colour scutellum, closely punctate frons and the tergum differentiaiate it from *Colpotrochia pilosa* (Kusigemati 1971; Morley 1913).

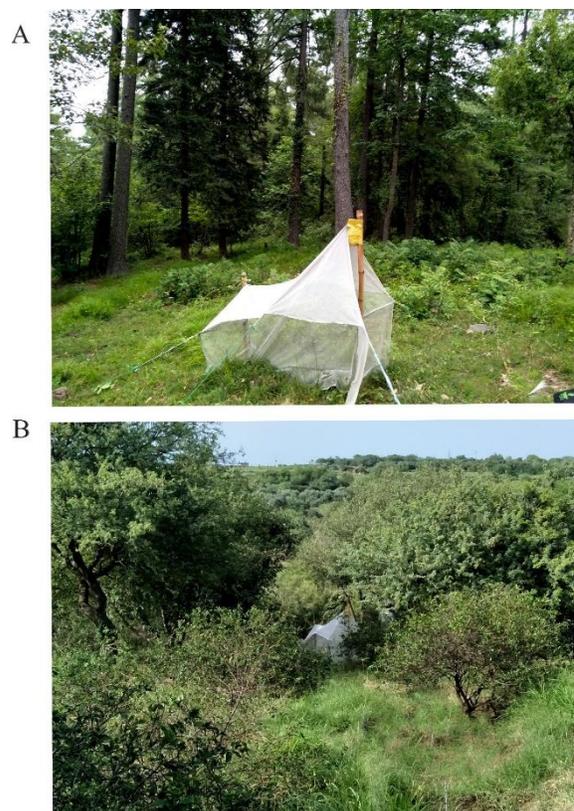
### *Hypsicera* Latreille (1829)

**Diagnosis:** Genus is recognized by forewing venation devoid of areolet, head characteristics back of head dropping vertically from the hind margin of the lateral ocelli to the foramen magnum and occipital carina weak or absent laterally. Face and clypeus weakly convex longitudinally and strongly convex transversely making a shape of face in lateral view strongly bulging. Mandibles with two teeth of unequal length. Antenna flagellomeres rather short to long and filiform. Convex scutellum devoid of lateral carinae. Mesopleuron characterized by epiceninal carina and sternulus. Propodeum characterized by carination and elongate propodeal spiracles. Legs strong and stout with mid tibial spurs of equal length.

***Hypsicera intermedia* Momoi and Kusigemati (1970)** (Fig. 5A–F; 6)

*Hypsicera intermedia* Momoi and Kusigemati (1970).

**Material Examined:** Pakistan Punjab, Attock, Hassanabdal, Pore Miana (33°49'39.49"N, 72°47'14.42"E,



**Fig. 7:** Maliase Traps A. (kuldana, Murree) B. (Kallar khar, Chakwal)

500 m) 2♂, 3♀, 11.v.2018, S. Ahmed.

**Description:** Female: TBL: 6.5–7.0 mm, FWL: 5.4–5.8 mm. Face sparsely punctate and convex longitudinally with closely punctate frons (Fig. 5D). Position of spiracles before middle on short and stout first tergite with median dorsal carina extending on basal 0.6 of the first tergite (Fig. 5E). Wings hyaline and without areolet (Fig. 5B). Filiform Antenna with 38–40 flagellomeres basely blackish brown to brown apically. First flagellomere 1.5 times as long as wide. Flagellum in male longer than female with 40–43 flagellomere. Mandibles short but wider basally with teeth of unequal length, upper tooth longer than lower tooth. Mandibles light brown in colour. Occipital carina absent. Basal mandibular width 0.3X length of malar space Metapleuron devoid of any hairs on its surface (Fig. 5C). Mesosoma black and mesonotum without noutli and scutellum weakly convex and pronotum with strong epomia. Propodeum characterized by continuous area of areola and basal area not separated by anterior transverse carina (Fig. 5F). Metasoma black and first tergite polished and without punctures. Tergite 1 narrow at base and wider from apex .2<sup>nd</sup> tergite characterized by presence of sublateral longitudinal carinae (Fig. 5E). Strong stout legs and hind femur 3 times as long as wide. Hind legs brownish yellow with brown tarsal claws (Fig. 5A). Tarsal claws pectinate whereas tarsal claw of hind legs simple. Ovipositor short,

barely visible not extending last abdominal segment.

**Distribution in Pakistan:** Attock, (Hassanabdal) (New Record) (Fig. 6).

**General distribution:** Japan and South Korea (Yu *et al.* 2012).

**Biogeographical Region:** Palearctic and Oriental regions.

**Remarks:** This species is newly recorded from Pakistan. *Hypsicera intermedia* is similar to the *Hypsicera harrelli* (Momi and Kusigemati 1970) by characters of confluent arola with basal area, 2<sup>nd</sup> lateral area on propodeum longer than wide and presence of sublateral longitudinal carinae upto 2<sup>nd</sup> tergite. Whereas, 2<sup>nd</sup> lateral area of propodeum sparsely hairy and light reddish brown flagellum with 34–35 flagellomere of *Hypsicera harrelli* differentiate it from *Hypsicera intermedia* where 2<sup>nd</sup> lateral area of propodeum almost hairless antenna with 38–40 flagellomeres basely blackish brown to brown apically (Kusigemati 1971; Morley 1913). Townes (1971) reported genus *Hypsicera* as endoparasitoids of lepidopteran larvae, such as Gelechiidae, Pyralidae and Tortricidae. Specimens of this species were collected from agricultural habitat containing the host. Members of lepidopterous insect are common pests of agricultural crops.

## Discussion

The results of this study recorded five species belonging to four genera in Pothwar region Punjab Pakistan, which is quite less in number as compared to most recently recorded species of Metopiinae from other countries of the world like Masnadi and Jussila (2009), Araujo and Penteadó (2011), Yu *et al.* (2012), Amiri *et al.* (2015), Zhang *et al.* (2016) and Choi and Lee (2017). Urbanization, deforestation and establishment of housing societies on agricultural land are a threat in Pakistan for habitat as well as host loss of these Metopiinae parasitoids. Exploration of these parasitoids, their awareness among local farmers and community via Government and non-government agencies and well planned policies are required for conservation Metopiinae species along with their habitat is a need of time for long term sustainability of the ecosystem.

Spatial and temporal distributions are significant for conservation of potential biological natural enemies of insect pest. The members of Metopiinae are parasitoids of lepidopterous pests such as tortricids and pyralids. In Pakistan *Metopius rufus* is reported as prominent parasitoid of *Spodoptera litura* and *Spodoptera exigua* (Lepidoptera: Noctuidae) which are polyphagous notorious pest of vegetables and major cereals crops (CIBC 1981). According to Gupta (1991) Ichneumonids can be used as biocontrol agents successfully. By exploring the undocumented fauna there is lot of potential for their use in integrated bio control programmes. Frequent biodiversity surveys are required for identification of parasitoids for utilization in controlled biological programs as well as base line for conservation activities.

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## References

- Achterberg CV (2009). Can Townes type Malaise traps be improved? Some recent developments. *Ent Berichten* 69:129–135
- Aguiar AP, BF Santos (2010). Discovery of potent, unsuspected sampling disparities for Malaise and Mörické traps, as shown for Neotropical Cryptini (Hymenoptera: Ichneumonidae). *J Ins Conserv* 14:199–206
- Amiri A, AA Talebi, M Riedel, E Rakhshani, H Hajiqanbar (2015). A survey of Metopiinae (Hymenoptera: Ichneumonidae) in southern Iran, with three new records. *J Crop Prot* 4:519–531
- Araujo CR, AD Penteadó (2011). New species of Metopiinae (Hymenoptera, Ichneumonidae) from Brazil. *Braz J Biol* 71:203–207
- Aubert JF (1979). Ichneumonides petiolees inedites avec quatre genres nouveaux (I). *Bull Soc Entomol Mulh Janv* 1–8
- Ashmead WH (1905). New Hymenoptera from the Philippines. In: *Proc. US Natl Museum* Vol 29, pp: 1–117
- Baltazar CR (1964). The genera of parasitic Hymenoptera in the Philippines, Part 2. *Pac Insects* 6:15–67
- Berry JA (1990). The New Zealand species of the subfamily Metopiinae (Hymenoptera: Ichneumonidae). *New Zeal J Zoo* 17:607–614
- Broad GR, MR Shaw (2005). The species of four genera of Metopiina (Hymenoptera: Ichneumonidae) in Britain, with new host records and descriptions of four new species. *J Nat His* 39:2389–2407
- Cameron P (1909). Descriptions of new genera and species of Indian Ichneumonidae. *J Bombay Nat His Soc* 19:722–730
- Cameron P (1902). Descriptions of new genera and species of Hymenoptera collected by Major C.S. Nurse at Deesa, Simla and Ferozepore. Part II. *J Bombay Nat His Soc* 14:419–449
- Cameron P (1897). Hymenoptera Orientalia, or contribution to a knowledge of the Hymenoptera of the Oriental Zoological Region. Part V. Mem. Proc. Manchester Lit. *Phil Soc* 41:1–144
- CIBC (1981). A review of biological control in Pakistan. In: *Proc. 2<sup>nd</sup> Pakistan Conger. Zool.*, pp: 31–79
- Choi JK, JW Lee (2017). Checklist of South Korean Metopiinae Förster, 1869 (Hymenoptera, Ichneumonidae) with new South Korean species and a note on *Seticornuta koreana*. *J Asia-Pacific Biodivers* 10:1–19
- Clément E (1930). Opuscula Hymenopterologica III. Die paläarktischen Metopius-Arten (Hym. Ichneumon.). *Konowia German* 8:325–437
- Eady RD (1968). Some illustrations of microsculpture in the hymenoptera. *Proc Royal Entomol Soc Lond* 43:66–72
- Fatima S, MS Khan (2018). Forecasting Rainfall in Potohar Region of Pakistan in the Perspective of Drought. *Punjab Univ J Math* 50:119–32
- Fitton MG (1984). Subfamily Metopiinae. In: *An Introduction to the Ichneumonidae of Australia*, pp: 413. Gauld, I.D. (Ed.). British Museum London
- Förster A (1869). Synopsis der Familien und Gattungen der Ichneumonien. In: *Verhandlungen des Naturhistorischen Vereins der Preussischen Rheinlande und Westfalens (German)*, Vol 25, pp: 135–221

- Gauld ID (1984). *An introduction to the Ichneumonidae of Australia*. British Museum London
- Gauld ID, R Sithole (2002). Subfamily Metopiinae. In: *Ichneumonidae of Costa Rica*, Vol. 66, pp: 11–262. Gauld ID., C. Godoy, R. Sithole and U. Gómez (Eds.). Memoirs of the American Entomological Institution
- Gupta VK (1991). The parasitic Hymenoptera and biological control of the African Ichneumonidae. *Insect Sci Appl* 12:9–18
- Gupta VK (1987): The Ichneumonidae of the IndoAustralian area (Hymenoptera), p: 1210. Mem. Amer. Ent. Inst.
- He JH, X.X Chen, Y Ma (1996). Hymenoptera: Ichneumonidae; Economic Insect Fauna of China. Science Press, Beijing, China
- Holmgren AE (1856). Entomologiska anteckningar under en resa i södra Sverige år 1854. *Kongl Vetenskapsak Handling (Swed)* 75:1–104
- Khuat DL, TN Pham (2007). An inventory of parasitic Ichneumonoid wasps (Hymenoptera: Ichneumonoidea) reared from agricultural pest insects in Vietnam. In: *Proceedings of the 2nd National Workshop on Ecology and Biological Resources*, pp: 153–162. Agric. Publishing House, Hanoi, Vietnam
- Kolarov J, H Ozbek (1998). New and little known Metopiinae (Hymenoptera, Ichneumonidae) from Turkey. *Linzer Biol Beitr* 30:127–130
- Kusigemati K (1985). Metopiinae collected by the Hokkaido University Expedition to Nepal Himalaya 1968 (Hymenoptera: Ichneumonidae). *Kontyu* 53:398–405
- Kusigemati K (1984). Metopiinae (Hymenoptera, Ichneumonidae) from Mongolia. *Annls Hist Nat Mus Natn Hung* 76:245–263
- Kusigemati K (1983). Some Metopiinae of Taiwan (Hymenoptera: Ichneumonidae). *Mem Kagoshima Univ Res Center South Pac* 3:123–138
- Kusigemati K (1971). Taxonomic studies on the subfamily Metopiinae of Japan (Hymenoptera: Ichneumonidae). *Mem Fac Agric Kagoshima Univ* 8:205–298
- Latreille PA (1829). Des Ichneumons (Ichneumon) de Linnaeus. In: *Le Règne Animal Tome, 5<sup>th</sup> Ed.* Cuvier, M.L.B. (Ed.). Deterville, Paris (French)
- Latreille PA (1802). *Histoire Naturelle, Generale Et Particuliere, Des Crustaces Et Des Insectes*, p: 468. Tome troisième, Paris French
- Malaise R (1937). A new insect trap. *Ent Tidsskr* 58:148–160
- Masnadi A, R Jussila (2009). A contribution to ichneumonid wasps of Iran (Hymenoptera: Ichneumonidae) Anomaloninae, Cremastinae, Ctenopelmatinae, Mesochorinae, Metopiinae and Orthopelmatinae. *Appl Entomol Phytopathol* 76:11–28
- Mason M, S Bordera (2008). Effectiveness of two sampling methods used for Collecting (Ichneumonidae: Hymenoptera) in Cabaneros national park (Spain). *Eur J Entomol* 105:879–888
- Matsumura S (1912). *Thousand insects of Japan*, p: 247. Supplement IV. Tokyo, Japan
- Momoi S, K Kusigemati (1970). Metopiinae (Hymenoptera: Ichneumonidae) of the Ryukyu Archipelago. *Pacific Insects* 12:401–415
- Morley C (1913). *The Fauna of British India Including Ceylon and Burma, Hymenoptera*, Vol. 3. Ichneumonidae. British Museum, London
- Mohamed N, SB Yaakop, IA Ghani (2013). A taxonomic review of the genus *Triclistus* Foerster, 1868 (Hymenoptera: Ichneumonidae: Metopiinae) from Malaysia. In: *AIP Conf Proceed* 1571:311–316
- Nikam PK, KS Helbe (1976). Studies on Indian parasitic hymenoptera (ichneumonidae) from Marathwada sub family Metopiinae. *Nat Sci J Marathw Univ Aurangabad* 8:259–262
- Panzer GWF (1806). Kritische Revision der Insektenfauna Deutschlands nach dem System bearbeitet II, p: 271. Nürnberg, Germany
- Quicke LJD (2015). *The Braconid and Ichneumonid Parasitoid Wasps. Biology, Systematic, Evolution and Ecology*. Metopiinae, Wiley Blackwell, Boston, Massachusetts, USA
- Schrank FVP (1781). *Enumeratio insectorum austriacae indigenorum*, p: 548. Augustae Vindelicorum (Latin)
- Scopoli JA (1763). *Entomologia carniolica*, p: 453. Vindobonae: J.T. Trattner (Portuguese)
- Schmiedeknecht O (1924). A short summary of the section Tryphonides prosopi Ichneumonidae). *Ent Mon Mag* 60:103–112
- Sun SP, QS Luan, ML Sheng (2013). A new species of *Triclistus* Förster (Hymenoptera, Ichneumonidae, Metopiinae) parasitizing cone-borers from the Eastern Palaearctic part of China. *J Hym Res* 30:75–82
- Thunberg CP (1822). Ichneumonidae, Insecta Hymenoptera illustrata. *Mém. del'Acad. Imperiale Sci. S. Petersbourg, Corsican* 8:249–281
- Tolkanitz VI (2007). Ichneumon flies of the genus *Exochus* Gravenhorst (Hymenoptera: Ichneumonidae: Metopiinae) of the fauna of Palaearctic region. *Russ Entomol J* 16:339–358
- Tolkanitz VI (1987). Parasitic Hymenoptera. Ichneumonidae – Metopiinae. (In Russian). *Fauna Ukraina* 11:1–212
- Townes HK (1971). The genera of Ichneumonidae, Part 4. In: *Memoirs of the American Entomological Institute* Vol 17, pp: 1–372
- Townes HK (1969). The genera of Ichneumonidae, part 1. In: *Memoirs of the American Entomological Institute* Vol 11, pp: 1–300
- Townes HK, M Townes (1959). Ichneumon-flies of American north of Mexico: 1 Subfamily Metopiinae. In: *United States Natural Museum Bulletin*, Vol. 216, pp: 1–318
- Townes HK, M Townes, VK Gupta (1961). A catalogue and reclassification of the Indo-Australian Ichneumonidae. In: *Memoirs of the American Entomological Institute*, Vol. 1, pp: 1–522
- Uchida T (1934). Eine neue Gattung und eine neue Art der Unterfamilie Metopiinae (Hymenoptera: ichneumonidae) (German). *Trans Sapporo Nat His Soc* 13:275–277
- Vollenhoven SCSV (1875). *Pinacographia. Illustrations of more than 1000 species of northwest European Ichneumonidae Senu Linnaeano*, p: 68. S'Gravenhage Plates 1–10
- Yu DS, K Horstmann (1997). A catalogue of World VI. Ichneumonidae Hymenoptera. Part I: Subfamilies Acaenitinae to Ophioninae. In: *Memoirs of the American Entomological Institute*, Vol 58, pp: 1–763
- Yu DS, K Van-Achterberg, K Horstmann (2012). World of Ichneumonoidea, 2011. Taxonomy, Biology, Morphology and Distribution. (CD-ROM) Taxapad. Available at <http://www.taxapad.com/> (Accessed: 23 February 2012)
- Zhang Y, ML Sheng, ZC Xiong (2016). A new species of Metopiinae (Hymenoptera: Ichneumonidae) parasitizing lepidopteran larvae in China. *ZooKeys* 572:71–79