Research Article

Taxonomic study on potter wasps (Hymenoptera: Vespidae: Eumeninae) of Malakand, Pakistan

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Abstract
The present study was done in district Malakand, Khyber Pakhtunkhwa, Pakistan. This study was conducted to record the biodiversity of subfamily Eumeninae indistrict Malakand. The specimens were collected from diverse localities of Malakand through active search with the use of hand net. The captured specimens were then killed by spraying insecticides in the hand nets. The killed specimens were transferred to bottles having 95% ethanol, cyanide and ethyl acetate. The specimens were then placed in freezer for 1 or 2 days to prevent any fungal contamination. The entomological pins were used for the pining of dead specimens. The dried wasps were labeled and transferred to insect boxes having naphthalene balls as a preservative. The dried wasps were then observed and identified up to species and subspecies level with the help of pervious published literature. A total of 7species (Delta dimidiatipenne, Antodynerus limbatus, Rhynchium carnaticum, Allorhynchium argentatum, Katamenes dimidiatus, Antepipona sibilans and Antepipona deflenda), 3 subspecies (Delta pyriformepyriforme, Delta esuriensesuriens and Antodynerousflavesens flavesens) under 6 genera (Delta, Antodynerus, Rhynchium, Allorhynchium, Katamene and Antepipona) of the subfamily Eumeninae are reported. These taxa are recorded for the first time from district Malakand, Khyber Pakhtunkhwa, Pakistan.

Keywords: Antepipona; Antodynerus; Allorhynchium; Delta; Katamene; Rhynchium Eumeninae

Introduction
The subfamily Eumeninae is the largest and diverse subfamily of the family Vespidae. It contains 3,773 species under 205 genera. The wasps belonging to this subfamily are present throughout the world [1]. The
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The common predators in most ecosystems [2]. They are called potter wasps because members of genus *Eumenes* and other similar genera made their nest from mud [3]. Eumeninae wasps are classified in 3 tribes which are Zethini, Odynerini, and Eumenini [4]. Potter wasps are solitary wasps some species show primitive social behavior. Larvae of Eumeninae wasps are predators of many insect larvae while the adult of this subfamily feed on nectar. Eumeninae is economically very important because they are the predators of many pests. These wasps are also called mason wasps [5]. Size of the adult is about 2mm to 28mm. Some species have *Petiolate metasoma* but most wasps are not Petiolate. Parategula present on mesoscutum, tarsal claws are bifid, hind coxa has longitudinal carina on dorsal side and three sub marginal cells present in forewing [6]. They cannot form colony and have no labour division. The female of solitary wasps capture the insect, paralyze their prey (insect) by stinging and bring it into their nests. Each cell in the nests of potter wasps is filled by one insect (single). The wasps lay eggs in these prey filled cells and seal them. Solitary wasps construct their nest from clay and mud. Spider wasps are the largest wasps among Potter wasps [7]. Some solitary wasps are burrowers in soil or wood while some species of the genera *Calligaster* and *Zethus* construct nests from plant materials [8]. The wasps of this subfamily used different methods for nest construction. One female (single female) starts the nest construction from different materials used mud or clay sometimes used vegetable and plant materials. On the basis of nests locations (habitats) Eumeninae wasps are of three types, i.e. renters, excavators and builders. Most species of this group are provisioners [9].

**Materials and Methods**

**Study area**

District Malakand is located among 34-22’ to 34-41’ north latitudes and 71-37’ to 72-14’ east longitudes. It is attached to district Swat by a series of hills on the east-north. It is connected to Mohmand Agency and Bajawar Agency through a range of mountains on the west and to district Dir Lower on north. It is also linked to district Bunir on east, district Charsada on south to west and district Mardan on south to east. Total area of the district is about 952 km² (District Census Report, 1998).

**Specimens’ collection**

The specimens were collected from diverse localities of Malakand through active search with the use of the hand net. The specimens were caught from both plan area (public parks, old and new buildings, flowering plants, agronomic crops, gardens, fruit markets, vegetable markets, fields, and other vegetation) and mountains (grasses, springs, water, damp area, water stream, small, and large trees) of the Malakand. The captured specimens were then killed by spraying insecticides (Black Cobra) in the hand nets.

**Preservation of the specimens**

The killed specimens were transferred to bottles having 95% ethanol, cyanide and ethyl acetate. The specimens were then placed in freezer for 1 or 2 days to prevent any fungal contamination. The entomological pins were used for the pining of dead specimens. The dried wasps (specimens) were labeled and transferred to insect boxes. Naphthalene balls were present in each insect box as a preservative.

**Microscopy**

Specimens were observed through Stereomicroscope (Nikon Japan) to record taxonomically important structures.

**Photography**

Pictures of the specimens were captured through Canon camera.

**Specimens’ identifications**
The collected wasps were observed and identified up to species and subspecies level with the help of pervious published latest literature [5, 9-21].

Measurements
The measurements of the complete body (body length), and body parts of the specimens were done through Digital Calliper.

Results and Discussion
The present study was conducted in district Malakand, Khyber Pakhtunkhwa, Pakistan. Total of 7 species Delta dimidiatipenne (de Saussure, 1852), Antodynerus limbatus (de Saussure, 1852), Rhynchium carnaticum (Fabricius, 1798), Allorhynchium argentatum (Fabricius, 1804), Katamenes dimidiatus (Brulle 1832), Antepipona sibilans (Cameron, 1903), Antepipona deflenda (Saunders, 1853) and 3 subspecies Delta pyriformepyriforme (Fabricius, 1775), Delta esuriensesuriens (Fabricius, 1775), Antodynerousflavesens flavesens (Fabricius, 1775) under 6 genera Delta, Antodynerus, Rhynchium, Allorhynchium, Katamene and Antepipona of the subfamily Eumeninae were reported. All the reported species and subspecies were not previously recorded in district Malakand.

Systematic List
Order Hymenoptera
Family Vespidae
Subfamily Eumeninae
Genus: Delta de Saussure, 1885
1. Delta pyriformepyriforme (Fabricius, 1775)
2. Delta esuriensesuriens (Fabricius, 1787)
3. Delta dimidiatipenne (de Saussure, 1852)

Genus: Antodynerus de Saussure, 1855
4. Antodynerous flavesens flavesens (Fabricius, 1775)
5. Antodyneruslimbatus (de Saussure, 1852)

Genus: Rhynchium Spinola, 1806
6. Rhynchium carnaticum (Fabricius, 1798)
Genus: Allorhynchium van der Vecht, 1963
7. Allorhynchium argentatum (Fabricius, 1804)
Genus: Katamenes Meade-Waldo, 1910
8. Katamenes dimidiatus (Brulle 1832)
Genus: Antepipona de Saussure, 1855
9. Antepipona sibilans (Cameron, 1903)
10. Antepipona deflenda (Saunders, 1853)
Genus: Delta de Saussure, 1885
1. Delta pyriformepyriforme (Fabricius, 1775)

Material examined

Body measurement
The length of the female is 23-28.4 mm and the length of the fore wing of female is about 22.1-22.3 mm. The body length of male is 21.5 mm and the length of fore wing of male is 18 mm.

Distribution
Pakistan, India, Nepal, Vietnam, Thailand, China, Sri Lanka, Bhutan and Myanmar (Fig. 1) [22].

Remarks
In Pakistan Delta pyriformepyriforme was earlier reported from Khyber Pakhtunkhwa: Lower Dir: Talash [23] and from Punjab: Rawalpindi [24], Bahawalpur, Rawalpindi, Rajanpur, Jhelum, D.G. Khan, Attock, Sargodha, Bahra, Khushab, Layyah, Jhang and Muzafargarh Mianwali [6]. Gusenleitner recorded it from Islamabad [25]. Khan et al reported it from Azad Jammu and Kashmir: Poonch: Rawalakot [26]. In the current study it is first time reported from Malakand.
Figure 1. *Delta pyriformepyforme* (Fabricius, 1775)

2. *Delta esuriensesuriens* (Fabricius, 1787)

**Material examined**


**Body measurements**

The length of the female is 17.1-18 mm and the fore wing length of female is 13-14.3 mm. The length of the male is 14-15.5 mm and the length of the fore wing of male is 10.9-11.2 mm.

**Distribution**

Pakistan, India, Iran, Mauritius, Israel, Iraq, Qatar, UAE, Indonesia, Oman, Sri Lanka, Laos, Myanmar, New Caledonia, Philippines, Vietnam, Saudia Arabia, and Thailand (Fig. 2) [22].

**Remarks**

It is newly reported from Malakand. *Delta esuriensesuriens* was earlier recorded from Pakistan: Sindh: Qambar, Ubauro, PanoAqil, Nagarpakar and Gorakh Hills [27], Khyber Pakhtunkhwa: Lower Dir: Rabat and Upper Dir: Sheringal [23], Islamabad and Punjab: Chakwal, Rawalpindi and Attock [24] and Baluchistan: Quetta [28].

Figure 2. *Delta esuriensesuriens* (Fabricius, 1787)

3. *Delta dimidiatipenne* (de Saussure, 1852)

**Material Examined**

Body measurements
The length of the female is 25-26.2 mm and its fore wing is 21.5-22 mm while the length of male is 22.8 mm and the length of the fore wing of male is 21 mm.

Distribution
India, Pakistan, Mauritania, South Africa, Oman, Egypt, Afghanistan, Sudan, Algeria, Saudi Arabia, Chad, Nepal, Djibouti, Ethiopia, Morocco, Syria, UAE, Eritrea, Uganda, Yemen, Qatar, Turkmenistan, Jordan, Iran, Niger, Turkey, Tajikistan, Spain, and Somalia [22]. UAE, North Africa, Yemen and Nepal (Fig. 3) [29].

Remarks
During this study it is first time reported from Malakand. In Pakistan, *Delta dimidiatipenne* was previously reported from Sindh: Larkana, Dadu city, Sukkur, Kotri, Hyderabad, Umarkot, Nagarparkar, and Korangi [27]. It was recorded from Khyber Pakhtunkhwa: Swat: Takhtaband Mingora and Kabal [30] and from Khyber Pakhtunkhwa: Lower Dir: Chakdara [23]. It was described from Gilgit-Baltistan: Hunza and Ghizer [31]. In Punjab it was reported from Jhelum, Rawalpindi, Murree, Chakwal, and Attock [24]. Gusenleitner recorded from Baluchistan: Quetta [28]. Khan et al. identified from Azad Jammu and Kashmir: Poonch and Banjosa [26].

Figure 3. *Delta dimidiatipenne* (de Saussure, 1852)

Genus: *Antodynerus* de Saussure, 1855
4. *Antodynerousflavesens flavesens* (Fabricius, 1775)

Material examined

Body measurements
The female body length is 10.5-12.2 mm and the length of female fore wing is 9-9.5mm while the length of male is 11 mm and the fore wing length of male is 8.8 mm.

Distribution
Pakistan, Bangladesh and India (Fig. 4) [22].

Remarks
*Antodynerousflavesens flavesens* was reported from Islamabad [22].

Figure 4. *Antodynerousflavesens flavesens* (Fabricius, 1775)
5. *Antodynerus limbatus* (de Saussure, 1852)

**Material examined**

**Body measurements**
Length of the female is 15-15.8 mm and the length of the fore wing of female is 10.2-11 mm. The length of the male body is 12 mm and the fore wing length is 9.7 mm.

![Image of Antodynerus limbatus](image)

**Distribution**
Pakistan, India, China, Nepal, Myanmar, Thailand and Laos (Fig. 5) [22].

**Remarks**
Earlier from Pakistan *Antodynerus limbatus* was described from Sindh: Dokri, Mehrabpur and ThariMirwa [27]. It was reported from Khyber Pakhtunkhwa: Abbottabad and Kashmir: Muzafarabad [22]. It was also recorded from Punjab Taxila [25].

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6. *Rhynchium carnaticum* (Fabricius, 1798)

**Material examined**
Haryankot, 1 ♀ 20.vii 2018

**Body measurements**
The length of the body is 16.8 mm and the length of the fore wing is 13 mm.

![Image of Rhynchium carnaticum](image)

**Distribution**
Sri Lanka, Indonesia, India and Pakistan (Fig. 6) [22].

**Remarks**
*Rhynchium carnaticum* was earlier reported from Khyber Pakhtunkwa Swat: Takhtaband [30]. This species was also previously recorded from Sindh: Karachi [16, 31].

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7. *Allorhynchium argentatum* (Fabricius, 1804)

**Material examined**
Agra 1 ♂ 21.vii 2018

**Body measurements**
The length of male is 13 mm and the length of fore wing of the male is 11.1 mm.

**Distribution**
Malaysia, Thailand, Laos, India, Bhutan, Myanmar, Philippines, Pakistan, Nepal, Indonesia, Laos and Singapore (Fig. 7) [22].

**Remarks**
Previously in Pakistan *Allorhynchium argentatum* was recorded from Sindh: Halaji Lake, Malir and Mirpur Khas [27], Khyber Pakhtunkhwa: Lower Dir: Timergara [23], Khyber Pakhtunkhwa: Chitral: Bronze and Kalash, From Punjab: Lahore: Changa Manga and from Gilgit-Baltistan: Skardu: City Road [22]. It was reported from Islamabad and Punjab: Chakwal Rawalpindi, Jhelum and Attock [24]. This species was also recorded from Gilgit-Baltistan: Skardu and Ghizer [32]. In the present study, it is a newly recorded species in Malakand.

**Figure 7. Allorhynchium argentatum** (Fabricius, 1804)

**Genus: Katamenes Meade-Waldo, 1910**

8. Katamenes dimidiatus (Brulle 1832)

**Material examined**
Chenar gar 1 ♀, 6.iv 2018, Agra 1♀ 24.iv 2018, Bosaq 1♀ 24.v 2018

**Body measurements**
Body length is 18.3-18.8 mm and the length of fore wing is 15-16 mm.

**Distribution**
Iran, India, Pakistan, Afganistan, Central Asia, Kazakhstan, Turkey, Mongolia, Syria, Israel, Russia, Europe, Caucasus and Cyprus (Fig. 8) [29].

**Remarks**
In Malakand it is newly reported. Previously in Pakistan it was reported by Gusenleitner from Baluchistan: Quetta: Chiltan National Park and Hazarganji [28].

**Figure 8. Katamenes dimidiatus** (Brulle, 1832)

**Genus: Antepipona de Saussure, 1855**

9. Antepipona sibilans (Cameron, 1903)

**Material examined**
Toti 1 ♀ 31.vii 2018, Bosaq 1♂ 4.viii. 2018

**Body measurements**
The length of the female is 7.5 mm and fore wing is 6 mm. The length of the male is 7 mm and fore wing length is 5.8 mm.
Distribution
West Bangal, Pakistan, Nepal and India (Fig. 9) [22].
Remarks
In Pakistan Antepipona sibilans was previously recorded from Sindh: Larkana, Ratodero, Ghotki and Sukkur [27]. It was recorded from Khyber Pakhtunkhwa: Swat: Kabal [30]. Rafi et al. [22] described it from Punjab: Multan. From Islamabad it was reported by Siddiqui et al. [24].

Figure 9. Antepipona sibilans (Cameron, 1903)

10. Antepipona deflenda (Saunders, 1853)
Material examined
Body measurements
The length of the body is 7-8 mm while the fore wing length is 5.2-6 mm.
Distribution
Pakistan, Tajikistan, France, Uzbekistan, Algeria, China, Iran, Israel, Kazakhstan, Montenegro, Portugal, Switzerland, Turkey, Albania, Austria, Croatia, Germany, Iraq, Italy, Jordan, Lebanon, Morocco, Russia, Spain, Slowkia, Ukraine and Czech Republic [22].
Remarks
This Species is first time recorded from Malakand. Antepiponadeflenda was earlier reported from Khyber Pakhtunkhwa: Swat: Kabal by Rasool et al. [30].

Figure 10. Antepipona deflenda (Saunders, 1853)

Conclusion
The current study reported a detail formal taxonomic description Eumeninae fauna collected from district Malakand, Khyber Pakhtunkhwa, Pakistan. A total of 7 species and 3 subspecies under 6 genera of subfamily Eumeninae are reported. The recorded subspecies and species are Delta pyriformepyriforme, Delta esuriensesuriens, Delta dimidiatipenne, Antodynerousflavesens flavesens, Antodynerus limbatus, Rhynchiumparnaicum, Allorhynchium argentatum, Katamenes dimidiatus, Antepipona sibilans
and Antepipona deflenda. All the reported species and subspecies are first time recorded from district Malakand.

Authors’ contributions
Collected specimens: Riaz Ahmad, Identified the specimens: M Zahid, R Ahmad & M Rasool, Helped in the preparation of manuscript: M Sajid, M Shah, MT Khan & P Habibullah.

References


