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Wasps of sphecidae and vespidae of Tando Jam

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Abstract

The study was conducted on Sphecidae and Vespidae families from various localities of Tandojam and the specimens were brought into the laboratory of Insect Systematic, Department of Entomology, Sindh Agriculture University Tandojam for further identification and examination. Collection was made through traditional hand net from various localities of Tandojam. For habitus (adult) images the high pixel camera was used, and for the images of genitalia was captured through a USB camera fitted on microscopes. In the present study total 39 members of the family vespidae and sphecidae, were collected and studied. During the course of identification 8 species were identified; family vespidae revealed 6 species under 3 subfamilies; Polistinae, tribe polistini with 3 species *Polistes indicus*, *Polistes wattii* and *Ropalidia brevita*. Vespinae with only one species *Vespa orientalis*. Eumeninae with 2 species *Delta pyriforme pyriforme* and *Delta dimidiatipenne*. Family Sphecidae, revealed 2 species under subfamily Sphecinae, tribe Sphecini; *Sphex pruinosis* and *Sphex argentatus*.

Keywords: Wasps, Sphecidae, Vespidae mud wasps, eusocial, Tando Jam

1. Introduction

The Sphecidae wasps family (cosmopolitan) recently diversified with 9660 described species worldwide (Pulawski, 2009) [1]. Their Adult population relies on pollen, nectar, juice with greater portion of sugar; while, larvae population relies on adult/larvae of Araneida order (Murray, 1940 and Gillott, 2005) [2, 3]. The most probably, Sceliphronini are diversified group of sphecid tribe, such as, *Chalybion* Dahlbom and *Chlorion* Latreille, and *Sceliphron* Klug, are recognized by tarsi with plantulae and/or claws of some legs with one mesal tooth on inner margin and are best known genera of this group (Bohart and Menke, 1976) [4]. The proper diversification of such wasps has probably long been assisted by human activity (Hensen, 1988) [5].

The family Sphecidae has been sub divided into 04 sub-families viz., Ampulicidae, Sphecidae, Heterogynaide and Crabronidae. It is treated as paraphyletic entity with phylogenetic analysis (Bohart and Menke, 1976; Brothers, 1999; Melo, 1999) [4, 6, 7]. Sphecidae is a cosmopolitan family in three subfamilies: Ammophilinae, Sceliphroninae and Sphecinae (Yildirim, 2012) [8], and Crabronidae is the largest of the sphecid families in two subfamilies: Crabroninae and Larrinae (Yildirim, 2012; Pulawski, 2012) [8, 9]. Crabronidae is represented by about 9000 species in the world (Cubuk and Gulmez, 2013) [10]. Sphecid Wasps are powerful predators of insects. Prey consists of an exceptionally wide range of insects and spiders (Araneae): about 12 orders of insects are known to be preyed upon (Bohart and Menke, 1976, Goulet and Huber, 1993) [4, 11].

The Vespidae (cosmopolitan) family is divided into 06 subfamilies viz., Eumeninae, Stenogastrinae, Polistinae, Mesarinae and Vespinae with 5000 described species. Adult vespids are brown/black in color with yellow/white markings (Guler *et al.*, 2011) [12]. Polistinae and Vespinae composed of eusocial solely, Eumeninae, Euparagiinae and Mesarinae composed of solitary; Stenogastrinae composed of eusocial wasps. Social vespids contains 36 genera throughout the world and well distributed in tropical areas via Dolichovespula and Vespa (Mahmood *et al.*, 2012) [13].

In Pakistan, total 08 species has been reported by (Dvorak, 2007) [14]. On the other hand (Gusenleitner, 2006) [15] described Eumeninae family, which comprised of 23 species found in

Quetta (Balouchistan) and Karachi (Sindh). (Dvorak, 2007) [14] described 21 species in KPK and Balouchistan. (Siddiqui et al., 2015) [16] described a number of species and added vespidae of pothwar region of Pakistan. Overall, Pakistan listed very limited work on sphecidae, however, some sort of research is reported on vespidae and other related families published in research journals.

From Tandojam no comprehensive work on wasps of families Sphecidae and Vespidae has been done, and it is the first proposal to carry out study on this fauna, and it will help to understand the present sphecid fauna active in Tandojam.

2. Materials and Methods

2.1. Place of work: The study was conducted in the Post Graduate Lab of the Department of Entomology, Sindh Agriculture University Tandojam, Sindh-Pakistan. Sphecidae and Vespidae specimens were collected from Tandojam and its surroundings and brought to the Lab for their proper identification and detailed examinations.

2.2. Method of collection: Hand net traditional method was applied for capturing the Sphecidae and Vespidae wasps.

2.3. Methods of Killing and preserving: Wasps were killed by using Potassium cyanide in a jar and mounted with entomological pins. Samples were labeled for place, date, collector name, host plant and pinned at the beneath of the specimen.

2.4. Method of imaging: Images were captured by using a high pixel camera. Microscopic examination was done with the help of USB camera (350 k pixel) **a)** Labomed CSM2 (20X and 40X), **b)** Kyowa Medilux 20 were used.

2.5 Methods of identification: Specimens were identified using identification keys printed on the Lab Manual as well as publications.

3. Results

The study was conducted on wasps of sphecidae and vespidae families from various localities of Tandojam and specimens at insect museum of the Department of Entomology, Sindh Agriculture University Tandojam. Further examination and identification was carried out at Insect Systematic Laboratory, Department of Entomology, Sindh Agriculture University Tandojam. Collection was made through traditional hand net from various localities of Tandojam. For habitus (adult)

images the high pixel camera was used, and for genitalia images were captured through USB camera fitted on microscopes (Fig.1). In present study total 39 members of the family vespidae and sphecidae, were collected and studied. Further results were provided separately in plates with their taxonomic hierarchy and distributional map, total hierarchy chart of species studied during present work is presented in (Fig.2). During the course of identification 8 species were identified; family vespidae revealed 6 species under 3 subfamilies; Polistinae, tribe polistini with 3 species *Polistes indicus*; Stolfa, 1934, *Polistes wattii*; Cameron, 1900 and *Ropalidia brevita*; Das & Gupta, 1989. Vespinae with only one specie *Vespa orientalis*; Linnaeus, 1771. Eumeninae with two species *Delta pyriforme pyriforme*; Fabricius, 1775 and *Delta dimidiatipenne*; de Saussure 1852. Family Sphecidae, revealed 2 species under subfamily Sphecinae, tribe Sphecini; *Sphex pruinosus*; Germar, 1817 and *Sphex argentatus*; Fabricius 1787.

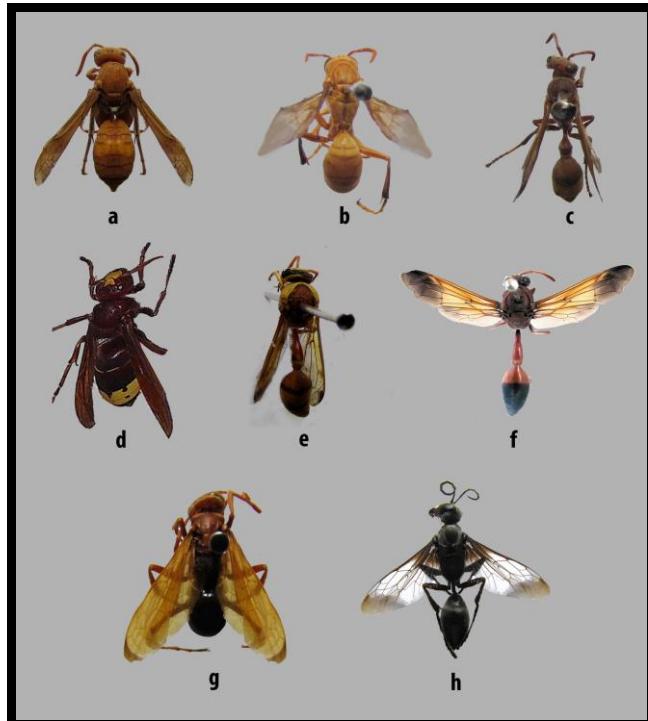


Fig 1: (a) *Polistes indicus* (b) *Polistes wattii* (c) *Ropalidia brevita* (d) *Vespa orientalis* (e) *Delta pyriforme pyriforme* (f) *Delta dimidiatipenne* (g) *Sphex pruinosus* (h) *Sphex argentatus*

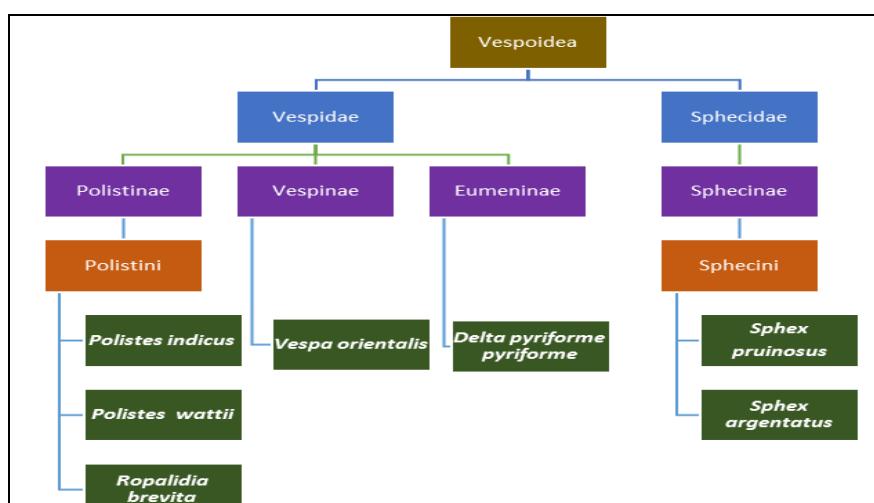


Fig 2: Records of vespidae and sphecidae families from Tandojam.

Taxonomic Hierarchy

VESPOIDEA Latreille, 1802

VESPIDAE leach, 1815

POLISTINAE Lepeletier, 1836

POLISTINI Lepeletier 1836

***Polistes indicus* Stolfa, 1934**

Description: Body generally brownish yellow, vertex with reddish tone, deep punctures at lower half of clypeus and punctate, yellow lines missing at mesoscutum. Antennae with orange tone proximal 2 articles black.

Material examined. Pakistan: 1♂, Sindh Prov., Tandojam, 27.vi.2016.

***Polistes wattii* Cameron, 1900**

Description: General body colour yellowish, powerful mandibles with dark brown margin ring like structure at the base of antennal flagellum, eyes prominent and white in colour, pronotum with semicircular thin ridge, thin brown band at the first abdominal segment, big light brown patches and transverse bands on abdominal segments.

Material examined. Pakistan: 5♀, Sindh Prov., Tandojam, 04.iii.2016.

Ropalidiini***Ropalidia brevita* Das & Gupta, 1989**

Description: General body appearance with reddish brown, apical half of forewing and hindwing dark grayish, abdomen with thin black band following by the thick yellow band. Petiole thin at proximal portion and thick and transverse distally, thin white band at the base of petiole. Last segment of the abdomen small and depressed, rounded then pointed. Antennae broader proximally.

Material examined. Pakistan: 10♀, Sindh Prov., Tandojam, 15.iv.2016.

Vespinae***Vespa orientalis* Linnaeus, 1771**

Description: General appearance of body reddish brown, front of head with thick transverse band between eyes, last abdominal segment with thick yellow band. Moderate punctures on elongated clypeus.

Material examined. Pakistan: 11♀, Sindh Prov., Tandojam, 29.ii.2016.

Eumeninae leach, 1815

***Delta pyriforme pyriforme* (Fabricius 1775)**

Description: General appearance is brown, thorax with yellow concave band, tip of the forewing blackish, black and yellow band on the abdomen, petiole with small brown and black band, pronotum with peculiar pretegular carina, petiole very smooth in appearance. Frons and vertex of the head and thorax with close shallow punctures. Antennae reddish brown with black occiput, the last article of the antennae long and hooked, mid of the antennae swollen.

Material examined. Pakistan: 3♀, Sindh Prov., Tandojam, 19.vi.2016.

***Delta dimidiatipenne* (de Saussure 1852)**

Description: Body colour reddish brown in general appearance, half of the abdomen prominently black, apical portion of forewing and hindwing light black shade and basal half of forewing and hindwing reddish brown. Last article of the antennae hooked and yellow with black margin.

Material examined. Pakistan: 6♀, Sindh Prov., Tandojam,

14.vii.2016.

Sphecidae Latreille, 1802

Sphecinae Latreille, 1802

Spheciini Latreille, 1802

***Sphex pruinosus* Germar, 1817**

Description: General body black and brown, forewing yellowish with light brown shade at the outer margin, hindwing with a clear pattern of veins and without markings. Pronotum with semicircular ridge, eyes yellowish brown, flagellum of antennae curved inside, wide placoids having 3-6 flagellomeres, femur of foreleg, mid-leg and hind leg is dark brown.

Material examined. Pakistan: 1♂, Sindh Prov., Tandojam, 02.iii.2016.

***Sphex argentatus* Fabricius 1787**

Description: Commonly known as black digger wasp. Abdomen with about six band of bluish grey coloured. Forewings darker at fore margin and at base, whereas, hindwings darker at base only, thorax with grayish pubescence at base.

Material examined. Pakistan: 2♀, Sindh Prov., Tandojam, 16.iii.2016.

4. Discussion

Wasps of the sphecidae and vespidae families are very common visitors of home gardens and buildings. The former consists of very common yellow jackets and the later are famous with digger wasps. Family vespidae is a cosmopolitan, adult brown or black with white and yellow markings, consists of six subfamilies: polistinae, vespinae, stenogastrinae, eumeninae, eupragiinae and masariniae. Members of families eumeninae, masariniae and eupragiinae are solitary, whereas, vespinae and polistinae are highly eusocial wasps. Our knowledge on wasp from Pakistan is very poor, pre Pakistan records within present boundaries of Pakistan in fauna of British India included only 4 species; *Icaria aberrans*; Gribodo, 1892 *Polistes hebraeus*; Fabricius, 1787 *Polistes Sagittarius*; Saussure, 1853 *Vespa cincta*; Drury, 1770. Later few authors' added fauna including (Dvorak, 2007; Gusenleitner, 2006; Mahmood *et al.*, 2012; Bodlah *et al.*, 2012)^[14, 15, 13, 17].

Genus *Delta* represented by two species; *Delta pyriforme pyriforme* and *D. dimidiatipenne* de Saussure, 1852 can be separated from each other by the presence of Posterior third of second metasomal tergum and visible part of remaining metasomal tergumterga yellow in *D. Pyriforme pyriforme* whereas, Posterior third of second metasomal tergum and visible part of remaining metasomal tergumterga black or red in *D. dimidiatipenne*. Mahmood *et al.*, 2012^[13] examined similar material from Peshawar and IslamabadBodlah *et al.*, 2012^[17] presented treatment of *Delta dimidiatipenne* and collected specimens from Chakwal, Jhelum, Jhang, Faisalabad, Multan, Gujrat and Gujranwala. Mahmood *et al.*, 2012^[13] presented localities of *D. dimidiatipenne* from Azad Kashmir, Mansehra, Balakot, Noshkey, Peshawar and Islamabad. Members of vespidae represented here with *Vespa orientalis*, these are social wasps, but the males and females are similar in size. They possess powerful jaws and bite in case of teasing. Females are queens and sterile workers, both possess ovipositor, it is visible externally and is also used for stinging as a defense behavior. The drones can be differentiated from sterile workers by the number of segments in antennae; drones have thirteen segments while the sterile

workers have twelve segments. *Vespa orientalis* is closely related to *Vespa crabro*; Linnaeus, 1758 and *V. mandarinia* Smith 1792. They make their colonies in every spring as it is usually observed in our locality, usually drones die after mating, nests are usually seen in the ground, and in general observation hundreds of individuals can be seen in a single nest. Type specimen is deposited in British Museum Natural History London. *Polistes wattii*; Cameron, 1900, is closely related to *Polistes hebraeus*; Fabricius, 1787, Mahmood *et al.*, 2012 [13] reported this species from various localities of Pakistan including; Gilgit-Baltistan, Hunza, Chillas, Peshawar, Bahawalpur, from Sindh they collected this species from Ghotki and Sukkur. Mahmood *et al.*, 2012 [13] collected *Ropalidia brevita*; Das & Gupta, 1989 from various localities including; Mansehra, Ghari Habibullah, Abbottabad and Islamabad. Members of family sphecidae are very commonly seen in our faculty making mud houses mostly in cool places, and are commonly called as digger wasps after their behavior, it build the nest mostly with clay and mixed with saliva of female. Its female lays eggs inside, it hunts caterpillars, they sting, paralyze and bring in nest, and finally in closing the nest, before closing it ensures that the food is enough for young ones till their adult hood. This is a very good example of tiny creature with tiniest mind that is thinking for their future brood's life. The Potter, its common name is after its nest building behavior. The adult feed on pollen and nectar. *Sphex argentatus* and *S. pruinosus* is represented in the present work, under this several species are synonymized including; *S. unicolor*; Fabricius, 1787, *S. umbrosus*. The species presented here are very basic and preliminary knowledge, though some of the work could be seen on pollinators of Tandojam, much work is needed to understand their diversity, behavior, role as a biological control agent. Hope present work will provide understanding to craft some new titles and approaches to study the biodiversity of this important group of insects.

5. Conclusion

The overall results concluded that total 39 members of the family vespidae and sphecidae, were collected and studied. Moreover, in total, 8 species were identified; family vespidae revealed 6 species and Family Sphecidae, revealed 2 species.

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