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First record of two genera of Anthophorini and one genus of Melectini (Apinae: Apidae: Hymenoptera) from Pothwar Punjab, Pakistan

Imran Bodlah, Muhammad Amjad, Muhammad Adnan Bodlah and Abdul Qayyum

Abstract

Four species of wild bees (Apidae: Hymenoptera) belonging to two tribes viz. Anthophorini and Melectini have been recorded for the first time from the Pothwar tract of Punjab, Pakistan. *Amegilla* (*Zonamegilla*) *cingulata* (Fabricius, 1775) and *Anthophora confusa* (Smith, 1854) of tribe Anthophorini while two cleptoparasitic bee, *Thyreus himalayensis* (Radoszkowski, 1893) and *Thyreus ramosus* (Lepeletier, 1841) of tribe Melectini have been illustrated with the help of micro- photographs, floral host plants and their distribution range. These baseline studies will help the future research to manage these bees in these areas for the uplift of crop yield and future pollination studies.

Keywords: Anthophorini, *Amegilla*, *Anthophora*, Melectini, *Thyreus*, Apinae, Apidae

1. Introduction

1.1 Background

The subfamily Apinae (Apidae: Hymenoptera) consists of 19 highly important genera in terms of their role in honey production and pollination. According to [8], the distinctive features of Apinae are: submarginal veins particularly 2nd recurrent vein weakly developed as compared to others, marginal cell open apically or closed by weak veins (Meliponini); arolia present, hind tibial spur absent (Apini); wings hairless apically, tibial spur of meso leg unmodified (Melectini); second submarginal cell smaller than first, female scopa with largely simple pubescence, sometimes upper part of tibia with plumose hairs (Anthophorini). Tribe Anthophorini is characterized by medium to large-sized nest building bees, constitutes 710 reported species in 7 genera [5]. Bees of *Anthophora* Latreille 1803, *Amegilla* Friese, 1897 and *Thyreus* have been reported for the first time from Pothwar (Punjab) region of Pakistan.

Bees of genus *Anthophora* Latreille 1803 (Anthophorini: Apinae) are highly robust, fast flying and are capable of travelling across the significant water bodies. Primarily these are well known for nesting in vertical soil banks while sometimes in preexisting wood cavities [4]. There are about 350 reported species including 14 subgenera of *Anthophora* bees throughout the World [3].

The bees of genus *Amegilla* Friese, 1897 are commonly known as blue banded bees due to metallic blue/green color pattern of their metasoma. These are similar to *Anthophora* bees but lacking arolia [8]. It comprises of more than 250 recognized species within 11 subgenera and hence known as 2nd largest group within Anthophorini [1]. It is restricted to Old World in distribution ranging from Africa to Palearctic region, Australia and Oriental region but absent in America.

The bees of genus *Thyreus* (Melectini: Apinae) are cleptoparasitic in nature on *Amegilla* Friese [2, 9, 7] and possibly on *Anthophora* and *Eucera* Scopoli bees species [1, 12, 11, 13]. The striking features of these bees are; body less robust with unique pattern of pale to bright blue or whitish appressed plumose hairs, 8-14mm in size, secutellum flat or produced over metanotum posteriorly, arolia absent, maxillary palpus small or absent [8]. Lieftinck [6] revised the Old World species of genus *Thyreus* from East Asia and Australian regions. He reported 40 species distributed within different parts of the regions including India, Burma, Sri Lanka, China, Korea, Japan, Thailand, Australia, New Guinea etc. Similarly he also documented the distribution of these species in Palearctic region (Europe, Egypt, West Asia, Mongolia, Africa and Arabia) during his revision of Old World *Thyreus* fauna in 1968.

In Pothwar tract of Pakistan no taxonomic has been done on these bees, so we made an effort to explore bee's fauna of this area in continuation of our previous and current work [14, 15, 16] on various other bees.

2. Materials and Methods

To explore the bee fauna of Pothwar tract of Punjab, Pakistan, a survey for the collection of bees was carried out during 2013-14. The various bee species were collected from different localities and host plants including ornamental flowers, crops, weeds and houses with the help of aerial net. The collected specimens were killed in a killing bottle (containing potassium cyanide) and tagged after pinning by using common pins. After tagging the identification procedure was carried out under Kruss microscope. The specimens were identified up to species level by using identification keys of [1, 8, 9]. Micrometry and measuring scale were used for the measurements of different parts (body length, forewing length and width) of bees. The Labomed CZM6 microscope (10X / 22 W.F) was used for the illustration of identified species and then preserved in wooden boxes (containing naphthalene balls and Coopex® powder to prevent ant's damage) for future studies. All the research was carried out in the laboratory of Biosystematics, Department of Entomology, PMAS-Arid Agriculture University Rawalpindi, Pakistan.

3. Results and Discussion

3.1 Tribe Anthophorini

It includes the most active fast flying, robust, pollen collecting bees closely resembling with Centridini bees. Wings clear and papillate apically beyond the veins, stigma short mainly up to the base of r vein. The 2nd and 3rd submarginal cells long as compared to 1st i.e. much shorter. In hind wings the jugal lobe is one half of the length as that of anal lobe. These bees usually build their nests into the soil [8].

3.1.1 Genus *Amegilla* (Friese, 1897)

These are the bees with blue and metallic green coloration, separated from the genus *Anthophora* on the basis of arolia. The widely distributed genus *Amegilla* does not possess arolia as that of *Anthophora* which are characterized by well developed arolia. Both male and female have yellowish and white markings on their face. In males pygidial plate is absent. The hind tibial scopa is characterized by a band of plumose hairs on its upper margin [8].

3.1.1.1 *Amegilla* (*Zonamegilla*) *cingulata* (Fabricius, 1775)

Andrena cingulata, Fabr. Syst. Ent. p. 378; *Podalirius cingulatus*, Dall. Torr. Cat. x, p. 263.

Diagnostic characters

Male with 13 antennal segments and female 12 antennal segments. Both male and female have dense pubescence on head and thorax (Fig. 1; A-B) while it is thinner on clypeus, basal portion of metasomal segments and face below the antennae. Moreover head and thorax beneath pubescence are finely punctured. Clypeus, labrum and base of mandibles are yellowish. Clypeus is characterized by a sub-apical line and a small triangular area above its base (Fig. 1; C). Pale grayish pubescence on head and thorax with mixture of black hairs, legs with bluish- white hairs dorsally while black ventrally, hind tibiae covered with long white hairs on upper side and black beneath (Fig. 1 D), metasoma covered with thin black hairs and transverse bands of metallic blue pubescence [1]. Wings fusco-hyaline and tegulae dark brown.



Fig 1 (A-D): External morphology of *Amegilla* (*Zonamegilla*) *cingulata*, A. Dorsal view (female); B. Male; C, Face (Clypeus with rectangular area); D, Hind tibia with mixture of white and black hairs.

Material examined

Islamabad, 2♀ and 1♂; Chakwal, 3♀ and 1♂; Jehlum, 2♀ and 1♂.

Measurement (mm)

Body length 10-11; Forewing length 8; Forewing width 4 (Male).

Body length 12; Forewing length 10; Forewing width 4.5 (female).

Distribution

Pegu Hills, Burma, Sri Lanka, the Malayan region to Australia [1]; Africa (including Madagascar) and the Mediterranean basin and from the Canary Islands east across southern Europe to Japan, Korea and northeast China, south to Yemen, Sri Lanka, Indonesia, New Guinea, and the whole of Australia (including Tasmania), and east to the Solomon Islands [8].

Floral Host plants

White bean: *Phaseolus vulgaris* (Fabaceae); Taramira: *Eruca sativa*, (Brassicaceae); Gul-e-neelam: *Jacaranda mimosifolia* (Bignoniaceae); *Chrysanthemu*, (Asteraceae); Khabal grass: *Cynodon dactylon* (Poaceae).

Comments

The species was collected from Punjab, Pakistan and compared with published data of [1, 8] and was found to be similar. It is first time reported from the Punjab province of Pakistan. The specimens collected from Islamabad have bright and shiny in colors as compared to other localities.

3.1.2 Genus *Anthophora* (Latreille, 1803)

These are fast flying and robust bees closely related to genus *Amegilla*. But unlike *Amegilla* these possess arolia on their tarsi. These are bees with black and white tergal bands. Submedian tooth of mentum is absent [8].

3.1.2.1 *Anthophora confusa* (Smith, 1854)

Anthophora vigilans, Smith, 2nd Yark. Miss., Hym. p. 6, (nec Smith, Jour. Linn. Soc. 1861, p. 92).

Podalirius confusus, Dall. Torr. Cat. x, p. 264.

Diagnostic Characters

The entire body closely and finely punctured, thorax and upper part of head thickly pubescent. The basal part of the mandibles and the labrum pale yellowish except the spots on the base. Clypeus with black color characterized by a spot on sides and an upper triangular spot (Fig. 2; C). Clypeus of the male has broader yellowish markings as compared to female. Vertex and thorax with ash grey color sometime intermixed with black pubescence. Hind femora and cheeks with white pubescence, metasoma covered with thin black hairs. Additionally the abdominal segments with transverse white faciae dorsally (usually basal four segments or five like in males) (Fig. 2; A-B). Wings fusco-hyaline.

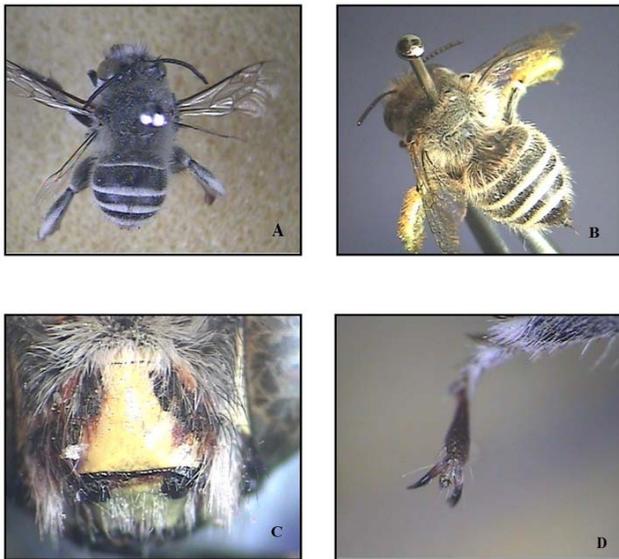


Fig 2 (A-D): External morphology of *Anthophora confusa*, A. Dorsal view (Male); B. female; C, Face (Clypeus with dark and yellow coloration); D, Leg with arolia.

Material examined

Rawalpindi, 4♀ and 3♂; Chakwal, 7♀ and 3♂; Attock, 1♀ and 2♂.

Measurement (mm)

Body length 10; Forewing length 7; Forewing width 4 (Male).
Body length 12; Forewing length 9; Forewing width 4 (Female).

Distribution

Bombay, Burma and Ladak^[1]; abundant in the holarctic and African regions, scarce in the neotropics and Southeast Asia^[8].

Floral Host plants

White bean: *Phaseolus vulgaris* (Fabaceae); Taramira: *Eruca sativa* (Brassicaceae); Brassica: *Brassica campestris* (Brassicaceae); *Chrysanthemum* (Asteraceae); Khabal grass: *Cynodon dactylon* (Poaceae).

Comments

The collected specimens were compared with the description of^[1, 8]. This species is first time reported from Punjab, Pakistan.

3.2 Tribe Melectini

It mainly includes cleptoparasitic bees having parasitic nature. The scope in these bees is absent and the in hind wing M+ Cu

vein is shorter as compared to Cu-v or sometime absent. The forewings with marginal cell apically round and middle tibial spur without modifications. The sixth sternum of the female is tapered^[8].

Scutellum flat or nearly so, produced posteriorly over metanotum, propodeum, and, in some positions, base of T1, as sharply margined plate, bidentate with broad Vor U-shaped emargination between teeth, and posterior part of scutellar surface on underside of plate, facing downward^[1]; body with areas of appressed plumose hairs forming white, blue, or green spots or broken bands (arolia absent; maxillary palpus absent or minute, zero- to four-segmented)^[8].

3.2.1 Genus *Thyreus* Panzer

Crocisa Jurine, 1801: 164. Type species: *Nomada scutellata* Jurine, 1801 *Melecta histrionica* Illiger, 1806, by designation of Morice and Durrant, 1915: 423. Suppressed by Commission Opinion 135 (1939).

Diagnostic characters

Head smaller than thorax not so broad, eyes very narrowed, face underside the antennae bases and clypeus somehow elongated and stretched forward. Mandibles simple and acute apically, mentum and labrum equal in length. Labial palpi five jointed while maxillary palpi with two joints. Scutellum elongate and modified into a plate emerging posteriorly. Wings broad with three sub-marginal cells, 2nd sub-marginal cell strongly contracted from above. Metasoma with conical shape, sharply tapering toward the apex^[1].

In the palearctic and Indo-Australian areas a total of 83 species are recognized. It occurs from the Canary Islands and Portugal to China and Japan, north as far as the Netherlands, Germany, Mongolia, and Manchuria, thence south throughout Africa, including Madagascar and through southern Asia, including the islands of Taiwan, the Philippines, and Indonesia, eastward to the Solomon Islands and southward in Australia as far as the state of Victoria and central Western Australia^[8].

3.2.1.1 *Thyreus himalayensis* (Radoszkowski, 1893)

Thyreus amata (Cockerell, 1911)

Thyreus emarginata (Lepeletier)

Crocisa decora, Smith, Trans. Ent. Soc. n.s. ii, 1852, p. 41, ♀.

Crocisa elegans, Smith (nec Mocsary), New Sp.Hym. B. M. p. 107, ♀.

Crocisa himalayensis, Rad. Bull. Soc. Nat. Mosc. n. s. vii, 1894, p. 171.

Diagnostic characters

All body segments with fine and close punctures except the lower side of vertex, clypeus with slightly convex shape and sometime with well-developed antennal ridge (Fig. 3; B), the scutellum with median bracket (}) shape posteriorly (may be deep or shallow) but never with inverted V shape (^) (Fig. 3; C), clypeus and basal segments of antennae black, a spot on the pronotum spreading up to mesonotum and a posterior longitudinal streak, tegulae characterized by a bent line apically or a spot, lateral sides of the basal metasomal segments with two large spots extending interiorly forming L shaped structure, abdominal segments with blue transverse apical bands (Fig. 3; D), fore wings with dark brown color and hyaline spots above cubital cells while hind wings sometime hyaline entirely^[1].

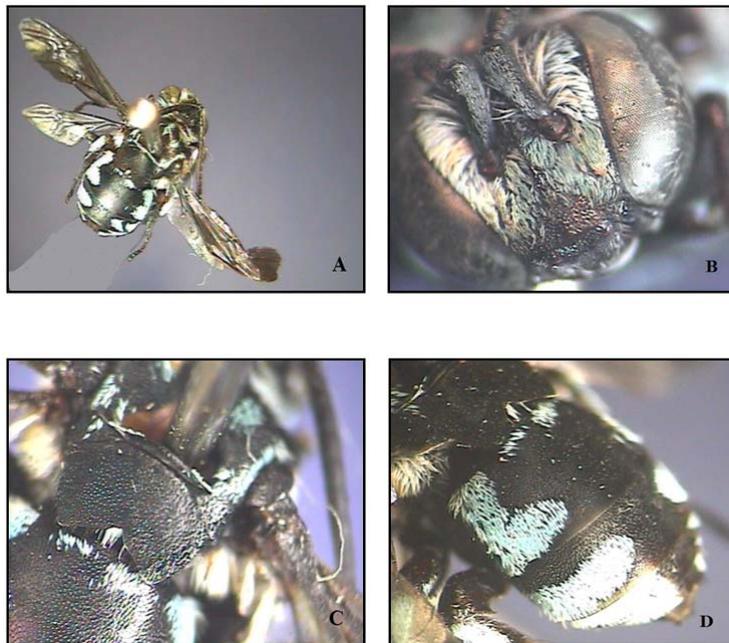


Fig 3 (A-D): External morphology of *Thyreus himalayensis*, A. Dorsal view (female); B. clypeus (slightly convex); C, Scutellum (Bracket shape); D, Metasoma (1st segment forming L shape).

Material examined

Rawalpindi, 1 ♀ and 1 ♂.

Measurement (mm)

Body length 10; forewing length 7; forewing width 3 (Male).
 Body length 9-10; forewing length 7; forewing width 3 (Female).

Distribution

Calcutta, Bombay, Malabar, Sri Lanka, Burma, on the west extending to South Africa, on the east to China and the Malay Archipelago [1].

Floral Host plants

Bidens (Asteraceae); *Premna foetida* (Verbenaceae).

Comments

The collected specimens were compared with the description of [1, 8]. This species is reported for the first time from Punjab, Pakistan.

3.2.1.2 *Thyreus ramosus* (Lepeletier, 1841)

Crocisa ramosa, Lepel Hym. ii, p. 451; Dall. Torr. Cat. x, p.321.

Diagnostic characters

It is closely related to *Thyreus himalayensis* but with white apical bands on abdomen Fig. 4; A-B). This species is short and bear a broad incision on the scutellum posteriorly (Fig. 4; D), face and clypeus with dense pubescence, lateral sides of the basal metasomal segments with two large spots always extending interiorly forming L shaped structure (Fig. 4; C). Wings slightly pale [1].



Fig 4 (A-D): External morphology of *Thyreus ramosus*, A. Dorsal view of female; B. Dorsal view of male; C. Metasomal segments (1st segment with L shape structure); D. Scutellum with broad incision

Material examined

Rawalpindi, 1♀ and 2♂; Jehlum, 2♂ and 1♀; Chakwal, 2♀.

Measurement (mm)

Body length 11; forewing length 9; forewing width 4 (male).

Body length 9; forewing length 7; forewing width 3 (Female).

Distribution

Bombay, Madras, Sri Lanka, Burma ^[1]. This is also well distributed in Europe, Egypt, Arabia, and South Africa ^[8].

Floral Host plants

Bidens (Asteraceae); *Premna foetida* (Verbenaceae); Niazbo: *Ocimum basilicum* (Lamiaceae) and other ornamental plants.

Comments

The collected specimens were compared with the description of ^[1, 8] and found to be similar. This species is reported for the first time from Punjab, Pakistan.

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