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New record of subgenus *Chelostomoda* Michener of Genus *Megachile* Latreille (Hymenoptera; Megachilidae) from Sutlej basin of North western plains of India with descriptions of a new species

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Abstract
Two species *Megachile nana* and *Megachile saphira* of subgenus *Chelostomoda* Michener under the genus *Megachile* Latreille have been reported for the first time from plains of Sutlej basin in northwestern India in the states of Punjab and Haryana. *Megachile nigroluteus* sp. n. has been described as a new species. The important morphological taxonomic characters has been described and illustrated. In addition floral associations and morphological measurements have also been recorded in all the three species studied presently.

Keywords: megachilini, new record, new species, morphometrics

1. Introduction
Tribe Megachilini belongs to the long tongued bee family Megachilidae, known to carry pollen on the underside of metasoma on scopal hairs (scopae) in females. Megachilid bees mostly have robust bodies with wide and equal head and thorax (Banaszak and Romasenko, 1998) [1]. In India, tribe Megachilini is represented by two genera *(*out of the three present worldwide) i.e *Megachile* Latrielle and *Coelioxys* Latrielle (Michener, 2007) [8]. A total of 56 subgenera have been described worldwide (Michener, 2007) [8] with 17 subgenera reported from India under the genus *Megachile* (Gupta, 1999) [5]. This genus has 1528 species reported worldwide, with 101 species reported from India.
The genus *Megachile* includes an enormous diversity of bees both morphologically and behaviourally. *Megachile* bees have unique architectural abilities to construct nests. They have peculiar and outstanding ability to cut leaves with their sharp, sturdy and toothed mandibles. Hence they are called 'leaf cutting bees'. Subgenus *Chelostomoides* (Michener, 2007) [8] use mud and sand along with labial secretions to make cells hydrophobic i.e. water resistant. Females have penta-dentate mandibles with large incomplete cutting edge in second and third interspace thus helps in scraping and collecting mud for nest construction. The count of these wild solitary bees is decreasing in recent times due to over interference of humans in ecosystem like habitat degradation, agricultural intensification, over digging of soil, increased insecticide use, use of barbed wires instead of natural hedges.

2. Material and Methods
Specimens belonging to three different species of *Megachile (Chelostomoda)* have been studied. They were collected during day time when bees forage between 8 am to 5 pm during March to June and between 10am to 3 pm during September to December. The collections were done with the help of sweep nets. After collections, they were killed by transferring them to bottle charged with ethyl acetate.
Identification keys for oriental fauna by Bingham (1897) [2], Gupta (1999) [5] and Michener (2000, 2007) have been used for identification purpose. Adult specimens are photographed with Canon 60D digital camera. Morphometric measurements are taken with stereoscope microscope (RSM 9 fitted with Progress software and CT5 Jenoptik camera).

3. Results/ Observations
Genus *Megachile* Latreille
Megachile Latreille 1802, Histoire Naturelle des Fourmis, 2: 43.
Type species: *Apis centuncuralis* Linn.
*Anthophor*a Fabricius 1804, Mitt. der Deutsc. Entomol. Gesells, 10: 372.
Megachile Smith 1853, Cat. Hym, 1: 149.
Megachile Dalla Torre 1894a, Cat. Hym, 10: 417.
Megachile Bingham 1897, Fauna of British India, 1: 470.
Megachile Michener 1944, Bull. Amer. Mus. Nat. Hist., 82: 151-326.
Megachile Mitchell 1962, N.C.Agri. Exp. Sta. Tech. Bull., 152: 158.
Megchile Michener 1965, Bull. Amer. Mus. Nat. Hist., 130: 206.
Megachile Pasteels 1965, Ann. Mus. R. Afr. Centr., Terveuren Sci. Zool., 137: 58.

Diagnosis
Adults robust, non-metallic, black; variable size; tergal fasciae present either on apical or basal tergal margins; concave or incurved basal tergum; axillae not tapering and produced backwards; 4-5 dentate mandibles in females, small second interspace; broad, short and ovoid metasoma; flat and smooth tergal surface; scopal hairs present on sternum 6th ; males have well developed process on lower margin of mandible; metasoma more parallel sided; sterna visible four, rest (5-8) hidden under the fourth, simple fore legs but sometimes modified.

4. Remarks

The subgenus *Chelostomoda* bears superficial resemblance to subgenus *Chalicodoma*. Some differences do appear between the two like presence of apical hair bands beneath the scopa on sterna 2-4 and five toothed mandible in female with incomplete cutting edge in second interspace in *Cheostomoda* (Gupta, 1999) [5]. Bingham described *Megachile nana* in 1897 but it was later placed under genus *Chalicodoma* by Michener in 1965. Michener (2000, 2007) downgraded all genera to subgenus level under a single genus *Megachile* Latrielle. Niu (2012) [9] has synonymized *Megachile saphira* under *Megachile ulrica*.

Subgenus *Chelostomoda* Michener

Chalicodoma (Chelostomoda) Michener 1962, *Megachile* Jour. of the New York Entomol. Soc., 70: 17-29.
Type species: *Megachile spissula parvula* Strand 1913.
Ashmeadiella (Neoashmeadiella) Gupta 1990 [4], Reichen., 29(10): 55-59.

Diagnosis

6.5-10 mm long bees with cutting edge in second interspace of female mandible. Females with five dentate mandibles, the latter with a large incomplete cutting edge in second or sometimes in third interspace; first flagellar segment broader than long; mid and hind tarsi shorter than corresponding tibiae; parallel metasoma; sixth tergum concave in profile; sixth sternum with scopal hairs all over, no shining marginal areas; sterna 2-4 with apical hair bands at least laterally. In males mandibles tridentate; first coxae hairy on dorsal side, without apical spine or bristles; anterior tarsi broad; middle tibial spur present; carina of tergum 6th rounded; margin of 6th tergum with a tooth at each side; three exposed sterna.

Key to the species of subgenus *Chelostomoda* Michener

1. Female mandible with cutting edge at third interspace; shorter antennae; parallel sided abdomen; black…….*Megachile nana* (Bingham)
- Female mandible with cutting edge on either side of third tooth; antennae longer…….2
2. Apex of femora, tibiae and tarsi reddish, basal tarsal joints dilated in males……..*Megachile ulrica* Nurse
- Black integument with luteus scopal hairs and legs ventrally, tarsal joints not dilated in males……..*Megachile nigroluteus* sp.n.

***Megachile nana* (Bingham)**

Megachile nana Bingham 1897, Fauna of British India. 1: 487.
Chalicodoma nana Michener 1965, Bull. Amer. Mus. Nat. Hist., 130: 204.

Female (Plate 1, Figs. a-e)

Diagnosis

Integument black; base of claws, metatarsi apex, tibial spur with light yellow tinge on underside; face, posteroior sides of scutellum, legs dorsally, apical fasciae on abdominal segments, pollen scopa white.

Morphological descriptions

Head

Clypeus protuberant, apical margin medially tuberculate, subocellar surface flat; antennae long reaching upto middle of scutum; supraclypeus flattened, punctured coarsely, lightly pubescent; vertex flat, sculptured; mandibles short and broad with incomplete cutting edge in second interspace.

Mesosoma

Scutum dull black, punctured longitudinally, closely and deeply; pronotal lobe incarinate; scutellum raised, narrow, broadly curved posterior margin covered with light row of hairs; axillae depressed, punctured; wings hyaline; tegulae shining, smooth, punctured finely; mid legs simple; fore and hind coxae, trochanter simple, femur convex on dorsal side and concave below, short spine present on fore tibiae dorso-apically medially, simple claws, covered with white pubescence on upper side and pale yellow underside.

Metasoma

Abdomen conical in profile; pregradular area sparsely punctured; postgradular area finely and closely punctured; terga 2-5 graduli linear; tergum 6th depressed; apical margin slightly incurved medially; apical fasciae white; sterna convex in profile, elevated medially, white scopal hairs present on sterna 2-5

Specimen examined

2♀, 3.iv.2014, Ferozpur (30° 55' 24.3588" N, 74° 36' 36.7704" E) Collected by Kumari, P.; 1♀, 13.ix.2014, Sangrur (30.2458° N, 75.8421° E), Collected by Kumari, P; 2♀, 25.iii.2015 Faridkot (30.5932° N, 74.8273° E), Collected by Kumari, P.

Floral associations

Lythraceae: *Lagerstromia indica* L.; Asteraceae*: Silybum marianum* (L.)

Old distribution: Mussourie and Pegu Hills.

Remarks

This species has been recorded previously in hills of Mussourie (Uttarakhand) and Pegu (now in Myanmar). Hence the present record from plains of Punjab is new to its distribution.

Lagerstromia indica L.

Silybum marianum (L.)

Fig 1

***Megachile ulrica* Nurse, 1901**

Megachile ulrica Nurse, 1901. Jour. Asia. Soc. Beng., 151.
Megachile saphira Cameron 1907b, Jour. Bomb. Nat. Hist. Soc., 17: 106.

Female (Plate 2, Figs. a-e)

Diagnosis

Integument black, apex of femora, tibiae and tarsi reddish testaceous. Face, paraocular area, scutellum posteriorly, legs dorsally, apical fasciae on terga white; fore tarsi pale white; mid tarsi white dorsally, golden ventrally; hind tarsi golden.

Head

Clypeus flattened, punctured coarsely, dull, with two median smooth dents; supraclypeus slightly convex, sculptured finely; eyes convergent below, lateral ocelli nearer eyes than to the vertex; paraocular area are pubescent with white hairs; vertex shining, punctured sparsely and irregularly; mandible five dentate, cutting edge close to third.

Mesosoma

Scutum dull, punctures present fine, close; mesepisterna swollen slightly with punctures sparse, close; metanotal lateral extensions depressed, punctured; propodeal triangle feebly visible, lateral margins recurved, apex acute; wings hyaline, stigma fuscous; tegulae punctate minutely; fore and mid legs with very short spine ventrally, hind leg without spine; tarsi dilated, covered with thick hairs, claws curved.

Metasoma

Cordate, ovoid in profile; basal tergal concavity incarinate, pregradular area punctures sparse and fine; postgradular area uniformly punctured; terga 2-5 graduli linear, complete, apical fasciae white; terga punctured finely, shining, convex in profile, elevated medially, declivous at sides; apex of tergum 6th acute; 4 sterna exposed, basal fasciae present, white down, sternum 6th traingular without hairs.

Specimen examined: 2♀, 13.v.2013, Gurdaspur (32° 2' 30.9948" N, 75° 24' 19.2024" E) Collected by Kumari, P; 1♀, 27.iv. 2014, Rohtak (28° 53' 43.8540" N, 76° 36' 23.8068" E) Collected by Kumari, P; 1♀, 1.v.2014; 1♀, 18.v. 2015, Patiala (30° 20' 24.0000" N, 76° 22' 47.9892" E), Collected by Kumari, P.

Floral associations

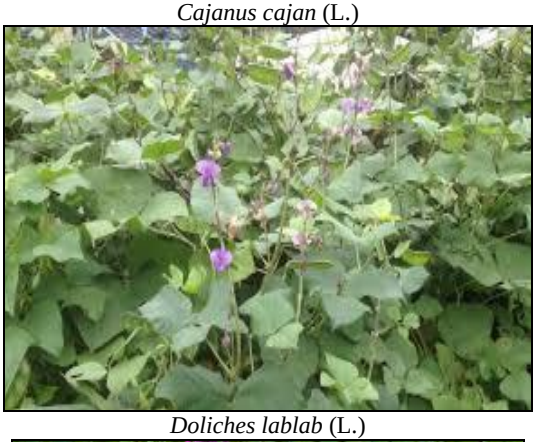
Fabaceae: *Cajanus cajan* (L.), *Doliches lablab* (L.), *Lathyrus odoratus* L., *Melilotus indica* (L.).

Old Distribution

Megachile ulrica was originally described by Cameron in 1907. Its distribution is reported from north eastern regions of India, Nepal and China.

Remarks: This species has been recorded earlier from North east India, Nepal and China. Hence the present record from plains of Punjab and Haryana is new to its distribution.

Cajanus cajan (L.)



Doliches lablab (L.)

Lathyrus odoratus L.

Melilotus indica (L.).

***Megachile nigroluteus* sp. n.**
Female (Plate 3, Figs. a-e)
Diagnosis
Integument black, entirely black except apex of claws; pubescence on supraclypeus, hind tibiae sparsely testaceous, pollen scopa orange.

Head
Eyes slightly convergent below; clypeal apical margin marginally incurved, clypeus flat, dull, punctured coarsely, deeply; supraclypeus pubescent testaceous very sparsely, raised lightly, sculptured; lateral ocelli nearer eyes than to vertex; vertex shining, punctured; paraocular area declivous, marginally pubescent, punctate; pubescence of entire head almost black, short and dense around antennae.

Mesosoma
Scutum and scutellum shining, convex, punctured, punctures less over midscutum becoming more concentrated at sides laterally; axillae depressed below level of hind wings, punctured finely; pleura densely punctured; pubescence on mesosoma black entirely; lateral faces of propodeum rugoso-punctate; basitarsi narrower than corresponding tibiae, fulvous; forecoxae with a short acute spine, mid and hind coxae without spines; claws brownish red; wings less hyaline, stigma black.

Metasoma
Tapering, convex in profile, abdominal terga depressed lightly basally, depressed more apically, fasciae absent; discal pubescence short, obscure, suberect, black, punctured finely, closely, shining terga; tergum 6 conical, concave in profile, no erect hairs; sterna elevated in middle, declivous at sides, scopal hairs dense, fulvous, tawny on sterna 2-5, apical side of sterna 5 bare, with no hairs, conical margin.

Etymology
It is named after combining names of the color of its integument and scopal hairs i.e. black integument with luteus scopal hairs. *Megachile nigroluteus* sp. n. has cutting edges on either sides of third tooth. Abdomen is conical, slowly tapering as compared to strongly ovoid abdomen of *Megachile saphira*. Abdimen has dense luteus scopal hairs. Legs are black dorsally with few luteus hairs ventrally. On the other hand *Megachile saphira* has reddish tibiae and tarsi. It is presently kept in Entomology laboratory, Zoology department, Panjab University, Chandigarh, India.

Specimen examined: Holotype: 1♀, 19.x.2014, Panchkula (30° 41' 42.7272" N, 76° 51' 15.0192" E), Collected by Kumari, P.
Paratype: 1♀, 19.x.2014, 2♀, 25.x.2014, 3♀, 7.x.2015, Panchkula (30° 41' 42.7272" N, 76° 51' 15.0192" E), Collected by Kumari, P.

Floral associations: Fabaceae: *Milletia pinnata*, *Crotolaria juncea*; Malvaceae: *Grewia asiatica* L.

Milletia pinnata

Crotolaria juncea

Grewia asiatica L.

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