Taxonomy of Bees of Bangladesh Forest Research Institute Campus, Chittagong, Bangladesh

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Abstract

A total of 19 species under four families belonging to Apiformes were identified from sweep net collections from Bangladesh Forest Research Institute (BFRI) Campus, Chittagong, Bangladesh. The identified species and families are: *Hylaeus mixta* Smith under Colletidae; *Nomia iridescens* Smith and *Lasioglossum albescens* Smith under Halictidae; *Megachile disjucta* Fabricius, *M. umbripennis* Smith, *Coelioxys cuneatus* Smith and *Euaspis carbonaria* Smith under Megachilidae; *Xylocopa aestuans* Linnaeus, *X. iridipennis* Lepeletier, *X. latipes* Drury, *Ceratina hieroglyphica* Smith, C. *binghami* Cockerell, *Nomada adusta* Smith, *Amegilla andrewsi* Cockerell, *A. fimbriata* Smith, *Thyreus histrio* Fabricius, *Trigona iridipennis* Smith, *Apis cerana* Fabricius and *A. dorsata* Fabricius under Apidae. The seven species namely *H. mixta, N. iridescens, M. umbripennis, C. cuneatus, E. carbonaria, A. andrewsi* and *T. iridipennis* are new records from Bangladesh.

সারসংক্ষেপ

বাংলাদেশ বন গবেষণা ইনস্টিটিউট ক্যাম্পাস হতে হাত জালের সাহায্যে সংগৃহীত সিরিজ Apiformes-এর চারটি পরিবারভূক্ত মোট ১৯ প্রজাতির মক্ষিকা শণাক্ত করা হয়েছে। শনাক্তকৃত প্রজাতি ও পরিবারগুলো হ'ল: Colletidae পরিবারভূক্ত *Hylaeus mixta* Smith; Halictidae পরিবারভূক্ত *Nomia iridescens* Smith ও *Lasioglossum albescens* Smith; Megachilidae পরিবারভূক্ত *Megachile disjucta* Fabricius, *M. umbripennis* Smith, *Coelioxys cuneatus* Smith ও *Euaspis carbonaria* Smith; Apidae পরিবারভূক্ত *Xylocopa aestuans* Linnaeus, *X. iridipennis* Lepeletier, *X. latipes* Drury, *Ceratina hieroglyphica* Smith, *C. binghami* Cockerell, *Nomada adusta* Smith, *Amegilla andrewsi* Cockerell, *A. fimbriata* Smith, *Thyreus histrio* Fabricius, *Trigona iridipennis* Smith, *Apis cerana* Fabricius এবং *A. dorsata* Fabricius। এর মধ্যে সাতটি প্রজাতি বাংলাদেশে নতুন রেকর্ড হিসেবে শণাক্ত করা হয়েছে। এগুলো হ'ল *H. mixta, N. iridescens, M. umbripennis, C. cuneatus, E. carbonaria, A. andrewsi* এবং *T. iridipennis*।

Keywords : Apoidea, Apidae, Colletidae, Halicidae, Megachilidae

Introduction

Bangladesh Forest Research Institute (BFRI) situated in the Chittagong Metropolitan City campus falls under tropical evergreen forest. The total area is 28 ha with very rich floral diversity. The arboretum of BFRI has 60 indigenous and 20 exotic timber species, 34 bamboo species and seven rattan species along with a good number of herbs, shrubs and undergrowths (Anon. 1999). The total floral population is

approximately 18,534, excepting bamboo and rattan. This area is inhabited by various animals including the diversified insect fauna due to presence of the various plant species.

The superfamily Apoidea of Hymenoptera, includes two series namely, Spheciformes (sphecoid wasps) and Apiformes (bees). The most important activity of bees is the pollination of natural vegetations (Michaner, 2007). In addition to this they provide honey, wax and other bee products. In Pakistan, mustard production was increased by 20% by the use of honey bee as pollinator (Alam *et al.* 1964, Verma 1990). Many workers worked on bees in different countries of the world (Michener 1990, 2000, 2007, O'Toole 1993, 1996, Wille 1979). O'Toole and Raw (1991) and Roig-Alsina and Michener (1993) gave an excellent review of phylogeny and classification of the long-tongued bees including an account of their taxonomic history and biology. O'Toole and Raw (1991) gave synoptic taxonomic information along with some sorts of biology and ecology of the bees of the world. Michener (2000, 2007) provided detailed taxonomic records on bees of the world.

In Bangladesh, Alam (1962) initially recorded 41 apidid, one megachilid and three xylocopid species. Chowdhury and Zethner (1971) recorded four carpenter bees from the forests of Bangladesh. Bhuiya and Miah (1990) reported four apidid, seven xylocopid, four megachilid, two anthophorid and one halictid bees from Chittagong. Tadauchi and Alam (1993) recorded one megachilid, two anthophorid, seven halictid bees from mustard fields in Bangladesh. Baksha (2000) gave a brief description, host record, nature of damage, biology and management of *Xylocopa aestuans* as a common timber pest. Baksha (2004) recorded three species of honey bees, *Apis dorsata, A. cerana*, and *A. florea*, available in the forests of Bangladesh. Baksha (2008) reported the foraging plants of *Apis dorsata* and its honey hunting in the Sundarbans of Bangladesh.

In Bangladesh taxonomic works on bees are fragmentary and insufficient, and area based work is not available. Keeping this in view, an area base work on taxonomy of bees was undertaken.

Materials and Methods

BFRI campus was selected as a study area, because it is an important forest area from conservation point of view and it is enriched with floral diversity. The area is interspersed with small hill ranging from 60-90 m high. Collection of the bee specimens was made randomly with the help of sweep net from different spots of BFRI campus during the period of June 2006 to March 2007. The specimens were brought to the insect laboratory of the Department of Zoology, University of Chittagong, Chittagong, Bangladesh. They were sorted out, preserved and identified with the help of Bingham (1975), Borror and Delong (1964), Goulet and Huber (1993), Michener (2000, 2007) and O'Toole and Raw (1991).

Results and Discussion

A total of 19 bee species of the series Apiformes under four families namely, Colletidae, Halictidae, Megachilidae and Apidae were identified. List of the identified species under respective higher taxa is shown in Table 1.

Diagnostic characters and short remarks of the identified species of bees are given below.

1. **SPECIES *HYLAEUS MIXTA*** Smith (Fig. 1A)

Diagnosis: Body length 5 mm; head, thorax, and abdomen smooth, a few scattered punctures on the apical margins of the second and following segments; face slightly elongate; clypeus flat, produced anteriorly,

Table 1. List of bee species found in Bangladesh Forest Research Institute Campus, Chittagong.

Family	Subfamily	Tribe	Species
Colletidae	Hylaeinae	No tribe	*Hylaeus mixta* Smith*
Halictidae	Nomiinae	No tribe	*Nomia iridescens* Smith*
	Halictinae	Halictini	*Lasioglossum albescens* Smith
Megachilidae	Megachilinae	Anthidiini	*Euaspis carbonaria* Smith*
		Megachilini	*Megachile disjuncta* Fabricius
			M. umbripennis Smith*
			Coelioxys cuneatus Smith*
Apidae	Xylocopinae	Xylocopini	*Xylocopa aestuans* Linnaeus
			X. latipes Drury
			X. iridipennis Lepeletier
		Ceratinini	*Ceratina hieroglyphica* Smith
			C. binghami Cockerell
	Nomadinae	Nomadini	*Nomada adusta* Smith
	Apinae	Anthophorini	*Amegilla andrewsi* Cockerell*
			A. fimbriata Smith
		Melectini	*Thyreus histrio* Fabricius
		Meliponini	*Trigona iridipennis* Smith*
		Apini	*Apis cerana* Fabricius
			Apis dorsata Fabricius

* New records from Bangladesh.

front above it carinate, the carina forking below the anterior ocellus, the lateral branches running one on each side up to the posterior ocelli; a deep hollow round the base of each antenna; median segment roundly steep at the sides and posteriorly, the enclosed space at base above slightly concave, finely rugose; black, shining; the clypeus, the face just above it, and the tubercles yellow; the apical four joints of the tarsi and the apical margins of abdominal segments 2-5 rufo-testaceous; the tibiae and tarsi, the apical half of the second, and the whole of the following abdominal segments clothed thinly with pale glittering hairs; wings hyaline and iridescent, veins and tegulae very pale testaceous.

Remarks: Distributed in India (Bingham 1975). In the present study it was found to foraging on flowers of different beans and Marigold. It is a new record from Bangladesh.

2. **SPECIES *NOMIA IRIDESCENS*** Smith (Fig. 1B)

Diagnosis: Body length 8-10 mm; head, thorax, and abdomen very minutely and densely punctured; clypeus convex, with coarser punctures, and a medial sharp vertical carina, its anterior margin transverse;

mesonotum broad, slightly convex, and in certain lights showing several fine abbreviated longitudinally-impressed parallel lines on the disc; enclosed space at base of median segment longitudinally rugose; black; head and thorax opaque; abdomen shining, iridescent in certain lights, segments 2-4/5 with transverse bright green or blue fasciae on their apical margins, pubescence on the head and thorax and legs griseous with a fulvous tint, most dense on sides of face, cheeks, and sides of median segment; wings hyaline and iridescent, veins and tegulae testaceous.

Remarks: This species is distributed in Tenasserim of Myanmar and Singapore (Bingham 1975). It is a new record from Bangladesh.

3. **SPECIES *LASIOGLOSSUM ALBESCENS*** Smith (Fig. 1C)

Diagnosis: Body length 7-11 mm; head closely and finely, thorax more sparsely punctured; median segment at the sides and apex and the abdomen smooth, shining; front flattish, not carinate, elongate; eyes distinctly convergent below; median segment with sides compressed, apex concavo-truncate, with a medial vertical carina; lunate space at base restricted, with outwardly divergent striae; 1st and 2nd abdominal segments with a distinct transverse groove across the middle; black, abdomen obscurely chalybeous; face, sides of thorax, and median segment with thin white pubescence; postscutellum, a broadly interrupted band at base of 1st abdominal segment, and entire regular transverse bands at base of segments 2-5 covered with snow-white pubescence; legs with pale glittering pubescence, tarsi and anal rima fulvous; wings hyaline and iridescent, wing veins ferruginous.

Remarks: It is distributed in Punjab, Nepal, Malaya (Bingham 1975) and Bangladesh (Tadauchi and Alam 1993). This species was found to forage flowers of beans and Marigold.

4. **SPECIES *EUASPIS CARBONARIA*** Smith (Fig. 1D)

Diagnosis: Body length 8-12mm; head, thorax, and abdomen black and closely, evenly and not so coarsely punctured; clypeus boldly convex, the front and space between bases of antennae slightly raised, with a medial carina beneath running on to base of clypeus; apical margins of abdominal segments narrowly smooth, impunctate; sides and apex of clypeus, sides of face and occiput with white pubescence; wing fuscous, with a rich purple effulgence, hyaline towards the base.

Remarks: This species is distributed in Asia (Iwata and Sakagami 1966). It was recorded from different plant species (Gupta 1992).

5. **SPECIES *MEGACHILE DISJUNCTA*** Fabricius (Fig. 1E)

Diagnosis: Body length 12-17 mm; head, thorax, and abdomen densely and somewhat coarsely punctured, margins of abdominal segments 1-5 broadly depressed, middle of the 4th just before the depressed portion always, and of the 2nd, 3rd, and 5th segments very often smooth, shining, impunctate; clypeus from front subtriangular, its apical margin transverse; mandibles broad at apex, outer tooth acute; vertex broad, flatish, produced back; back of head roundly emarginated; face and front, prothorax at sides and beneath, and legs on the outside with black pubescence; the pubescence on the inside of the tibiae and tarsi fuscous; median segment and basal segment of abdomen covered with thick long white to rusty-yellow pubescence; pollen-brush jet-black; wings hyaline fuscous, for their apical three-fourths with a brilliant purple effulgence.

Remarks: This species is distributed in India, Tenasserim (Myanmar), and France (Bingham 1975). . Bhuiya and Miah (1990) recorded it from Chittagong, Bangladesh. In the present study it was found to visit flower of beans and Marigold.

6. **SPECIES *MEGACHILE UMBRIPENNIS*** Smith (Fig. 1F)

Diagnosis: Body length nearly 13 mm; head, thorax, and abdomen closely punctured and pubescent; disc of the clypeus, vertex except round the ocelli, and apical two-thirds of 2nd and following abdominal segments bare; clypeus convex, transverse anteriorly; black; front, thorax, basal abdominal segment, and the base narrowly of the 2nd with dense fulvous pubescence; 3rd segment with a narrow fringe of the same generally much obliterated, 4th and 5th segments with a narrow white lateral fascia; legs black, tarsi beneath of the posterior legs with fulvous pubescence; pollen-brush white, with apical portion black; wings hyaline at base, fuscous for the apical four-fifths of their length.

Remarks: This species is distributed in Nepal, Sikhim, Tenasserim of Myanmar (Bingham 1975). Chourykaew *et al.* (2004) reported the species as a pollinator of *Afgelia sericea*, an endemic leguminous plant of Thailand. It is a new record from Bangladesh.

7. **SPECIES *COELIOXYS CUNEATUS*** Smith (Fig. 2A)

Diagnosis: Body length 11 mm; head, thorax densely and not very coarsely, abdomen more densely and finely punctured; punctures on apical segment above very close and minute, giving it an opaque appearance; clypeus slightly convex and densely pubescent; scutellum short, narrow, very slightly arched posteriorly, nearly transverse; basal three segments narrow but deep transverse grooves, apical margins of segments 1-5 narrowly recurved, apical segment deeply grooved at apex and armed with four teeth, and a lateral tooth on fifth ventral segment.

Remarks: This species is distributed in India and Tenasserim of Myanmar (Bingham 1975) and it is a new record from Bangladesh.

8. ***SPECIES XYLOCOPA AESTUANS*** Linnaeus (Fig. 2B)

Diagnosis: Body length 21-23 mm; head, thorax and abdomen finely punctured, thorax above densely pubescent, disc of mesonotum smooth and impunctate under the pubescence; clypeus flat, transverse in middle anteriorly; clypeus and front not carinate; black; pubescence on head and face, on sides of thorax and beneath, and on abdomen black, on the thorax above it bright yellow; wings dark fuscous with a purple effulgence.

Remarks: It occurs throughout India, Myanmar and Sri Lanka, extending to Africa on the west and Malayan region on the east (Bingham 1975). The tunnels are bored by both sexes in dead wood or in timber used in building. The larval cell contains an egg and a ball of bee-bread about half inch in diameter (Beeson 1941). Chowdhury and Zethner (1971), Bhuiya and Miah (1990) and Baksha (2002) recorded this species from Chittagong.

9. **SPECIES *XYLOCOPA LATIPES*** Drury (Fig. 2C)

Diagnosis: Body length 32-35mm; head, thorax and abdomen punctured; clypeus, mesonotum anteriorly, and abdomen most densely so; front with two deep sulcations from below the base of antennae to beyond the posterior ocelli,; eyes very large, meeting or nearly meeting on vertex; anterior tibiae and tarsi flattened and yellow, tibiae twisted, tibiae and tarsi fringed anteriorly and posteriorly with long, thick, curled hairs; intermediate and posterior legs longer in proportion; colour black, with black

pubescence thick and velvety on mesonotum anteriorly and long and tufted on lateral margins of abdominal segments, the pubescence on posterior tibiae long, dense and stiff; wings much narrower, the apex of anterior wing acute; wings dark fuscous, with vivid coppery, green and purple effulgence.

Remarks: This species is distributed in India, Sri Lanka and Tenasserim (Myanmar), extending to China and Malayan Region (Bingham 1975). Beeson (1941) reported that in timber the bee bores a tunnel which is nearly cylindrical being slightly constricted at interval to form separate cells; at the end of each tunnel a single egg is laid and a store of bee-bread or pollen is added. Chowdhury and Zethner (1971) and Alam (1962) recorded it from Bangladesh.

10. **SPECIES *XYLOCOPA IRIDIPENNIS*** Lepeletier (Fig. 2D)

Diagnosis: Body length 25-27 mm; punctures on head, thorax and abdomen, on the last, finer, closer and deeper; pubescence on sides of abdomen longer and dense; black with black pubescence; wings very different, being deep metallic blue at base, turning to greenish and deep rosy coppery red towards apex of fore wing.

Remarks: It is regarded as wood pest and sometimes completely damaging the wood, bamboo, etc. used in construction of houses. Beeson (1941) reported that the bee bores energetically into dead branches and trunks of trees and posts and rafters of houses and hollow bamboos and reeds. The species occurs in Bangladesh, India, Myanmar, Sumatra and China (Alam 1967, Bingham 1975).

11. **SPECIES *CERATINA HIEROGLYPHICA*** Smith (Fig. 2E)

Diagnosis: Body length 9-11mm; head above and the hollow on the front below the ocelli somewhat coarsely, thorax and abdomen more finely punctured, punctures on abdomen emitting short decumbent hairs; clypeus, disc of the mesonotum, and basal abdominal segments smooth and shining, clypeus having a few scattered fine punctures; median segment narrowed at apex and rounded posteriorly; colour black; a -shaped mark on clypeus, a lunate spot above it, a stripe on each side broadened below, a spot above each antenna, a broad stripe on each cheek, another on pronotum, two parallel longitudinal lines on the mesonotum, another short one on each side over tegulae, a broad squarish mark on middle of scutellum, tubercles, legs except the coxae, trochanters, and femora above, and transverse subapical fasciae on segments of abdomen, yellow; fascia on the 1st abdominal segment broadened in middle and roundly incised anteriorly on each side, that on the 2nd broad, laterally attenuated on each side of middle, facia on the 3rd segment broadly interrupted in middle and widest laterally, on 4th broadest in middle where it is narrowly interrupted, 5th segment with a broad truncate cone-shaped spot in the middle, 6th segment black; legs slightly pubescent; wings hyaline, more or less fuscescent; vein and tegulae testaceous.

Remarks: This species is distributed in India, Myanmar, China and Malayan region (Bingham 1975). In the present study nest of this species was found in dead stem of Mussunda, and found to visit bean and Marigold flower for collecting pollen. Alam (1967) recorded this species from Sylhet of Bangladesh.

12. **SPECIES *CERATINA BINGHAMI*** Cockerell (Fig. 2 F)

Diagnosis: Body length 8-10 mm; head, thorax, and abdomen finely and closely punctured, granular; clypeus elongate triangular, margined all round, and with a

medial longitudinal carina; mesonotum convex, with two medial parallel impressed lines, and an abbreviated impressed line on each side of and parallel to them; abdomen with segments 1-5 marked with short obscure impressed line on each side above, just before the apical margin; bright green, sometimes blue, metallic and shining; clypeus and a line on all the tibiae above yellow; mandibles, labrum, antennae, legs, and the impressed lines on the thorax and abdomen black, the legs sometimes with a greenish or bluish tint and covered with hoary white pubescence; wings hyaline and iridescent, veins and tegulae testaceous brown.

Remarks: This species is distributed throughout India, Myanmar, Sri Lanka, China and Malacca; the specimens from the Punjab and Western India have a golden-bronzy tint and those from Sri Lanka and Myanmar are darker (Bingham 1975). In the present study a swarm of this species was found to visit flower of beans. Alam (1967) recorded this species as *C. viridissima* from Sylhet.

13. **SPECIES *NOMADA ADUSTA*** Smith (Fig. 3A)

Diagnosis: Body length 6-8 mm; head and thorax densely punctured, giving them a granular appearance; basal abdominal segment smooth and polished, 2nd and following segments minutely and densely punctured, broadly along their base; clypeus flat, transverse anteriorly, sides mounded; and obscure short medial vertical carina between bases of antennae; median segment rounded posteriorly and steep, space at base densely and somewhat coarsely punctured; punctures running into oblique striae; large spot on each side at base of 2nd abdominal segment, sometimes forming a subinterupted broad fascia, a fascia at base of 3rd, and two contiguous spots at base of 4th segment, yellow; basal abdominal segment w ith a black spot on each side; face, sides of thorax and of median segment and 6th abdominal segment with a thin silvery white pubescence; wings hyaline, fuscous at their apical margins.

Remarks: Bingham (1975) reported its distribution in Bangladesh, India, Sri Lanka, Nepal and Myanmar. In the present study it was found to visit flowers of beans, gourd, sweet gourd, ribbed gourd and Marigold for collecting pollen. Alam (1962, 1967) recorded this species from Chittagong Hill Tracts of Bangladesh.

14. **SPECIES *AMEGILLA ANDREWSI*** Cockerell (Fig. 3B)

Diagnosis: Body length 11-13 mm; clypeus and bases of abdominal segments thinly pubescent; head and thorax finely and closely punctured under the pubescence, bases broadly of abdominal segments finely aciculate; colour black; labrum, base of mandibles, sides and apical margin of clypeus, with a narrow medial line on the same, yellowish white; labrum with a lateral spot and a line along its base black; a small transverse triangular spot above base of clypeus and front of scape of antenna pale yellowish white; front and vertex above base of antenna, and thorax above clothed with dull rufo-fulvous pubescence mixed with black hairs; legs covered with a thin cinereous pubescence; cheeks behind eyes, head and thorax beneath, and posterior tibiae above with snow white pubescence, last with a short line of black hairs at base dividing the white; pubescence on the abdomen black, apical margins of segment 1-4 with transverse bands of metallic blue scale-like hairs; wings nearly clear hyaline, sometimes with a fulvous tint, veins and tegulae testaceous.

Remarks: The species is distributed in Bangladesh, India, Myanmar and Sri Lanka through the Malay regions to Australia

(Bingham 1975). It usually forages at the forest edges and open habitats. In the present study it was found to visit flowers of gourd, sweet gourd for collecting pollen. This is a new record from Bangladesh.

15. **SPECIES *AMEGILLA FIMBRIATA*** Smith (Fig. 3C)

Diagnosis: Body length 16-20 mm; head and thorax pubescent, closely and finely punctured under the pubescence, which on the clypeus and front below the antennae is thin and sparse, and on the vertex of the head and on the thorax dense but not very long; abdomen smooth, dull, the surface minutely aciculate; clypeus strongly convex, transverse anteriorly and margined; black; a spot at each lateral angle of the clypeus jointed by a transverse line, an elongate cone-shaped median spot, and a transverse triangular spot above the base of the clypeus white; the front, vertex of the head, and thorax above with grey, the cheeks, the sides of the thorax in front, the anterior legs, and the median segment with white pubescence, thin and sparse on the legs, dense and long on the median segment; abdomen with a little black pubescence along the sides; intermediate and posterior legs with black pubescence, very dense and long on the outside of the posterior tibiae and tarsi; wings dark fuscous, with a slight purple effulgence.

Remarks: Bingham (1975) reported its distribution in Bangladesh and Myanmar. Alam (1962) recorded this species as *Anthophora fimbriata* from Sylhet of Bangladesh.

16. **SPECIES *THYREUS HISTRIO Fabricius*** (Fig. 3D)

Diagnosis: Body length 15-17 mm; head above the antennae finely and closely punctured; thorax and abdomen finely and closely aciculate; antennal carina prominent; scutellum with a Ë-shaped incision at apex; black; the clypeus thinly, sides of face, the cheeks, and a spot on each side on the occiput covered with dense white pubescence; a spot on each side of the pronotum spreading to mesonotum, a medial short longitudinal line on latter anteriorly, a spot on each side of it, a spot over each tegula, a spot on it posteriorly, a spot on each side of mesonotumat apex, a spot beneath Ë-shaped incision, a broad line under base of wings reaching posteriorly to median segment, a broader patch anteriorly on the mesoplurae, a broad line on the tibiae and the basal joint of tarsi above, and lateral spots on abdominal segments 1-5 above, covered with dense pubescence; spot on 1st segment elongate and produced perpendicularly at its posterior margin; fore wing dark fuscous, with some hyalne spots on discs; hind wing hyaline, fuscescent at apex.

Remarks: This species is distributed in Bengal and Southern India (Bingham 1975). Raju and Rao (2003) recorded 13 bee species including *T. histrio* associated with approximately 100 plant species. Alam (1962, 1967) recorded this species as *Crocisa histrio* from Bangladesh.

17. **SPECIES *TRIGONA IRIDIPENNIS*** Smith (Fig. 3E)

Diagnosis: Body length 3-4 mm; head, thorax, and abdomen smooth and shining and black, pile silvery; face in front, sides of thorax and of median segment with a thick silky pile; labrum, mandibles, palpi, antennae, and apical joints of tarsi testatecous, sides of mesonotum and scutellum fringed with fuscous pubescence.

Remarks: This species is distributed in India, Myanmar and Sri Lanka (Bingham 1975). It was found to construct very small nest in the holes of trees, crevices of rocks, in the holes of walls and also in branches and leaves of small trees. It is found to live in a small colony (Michener 2000). In the present

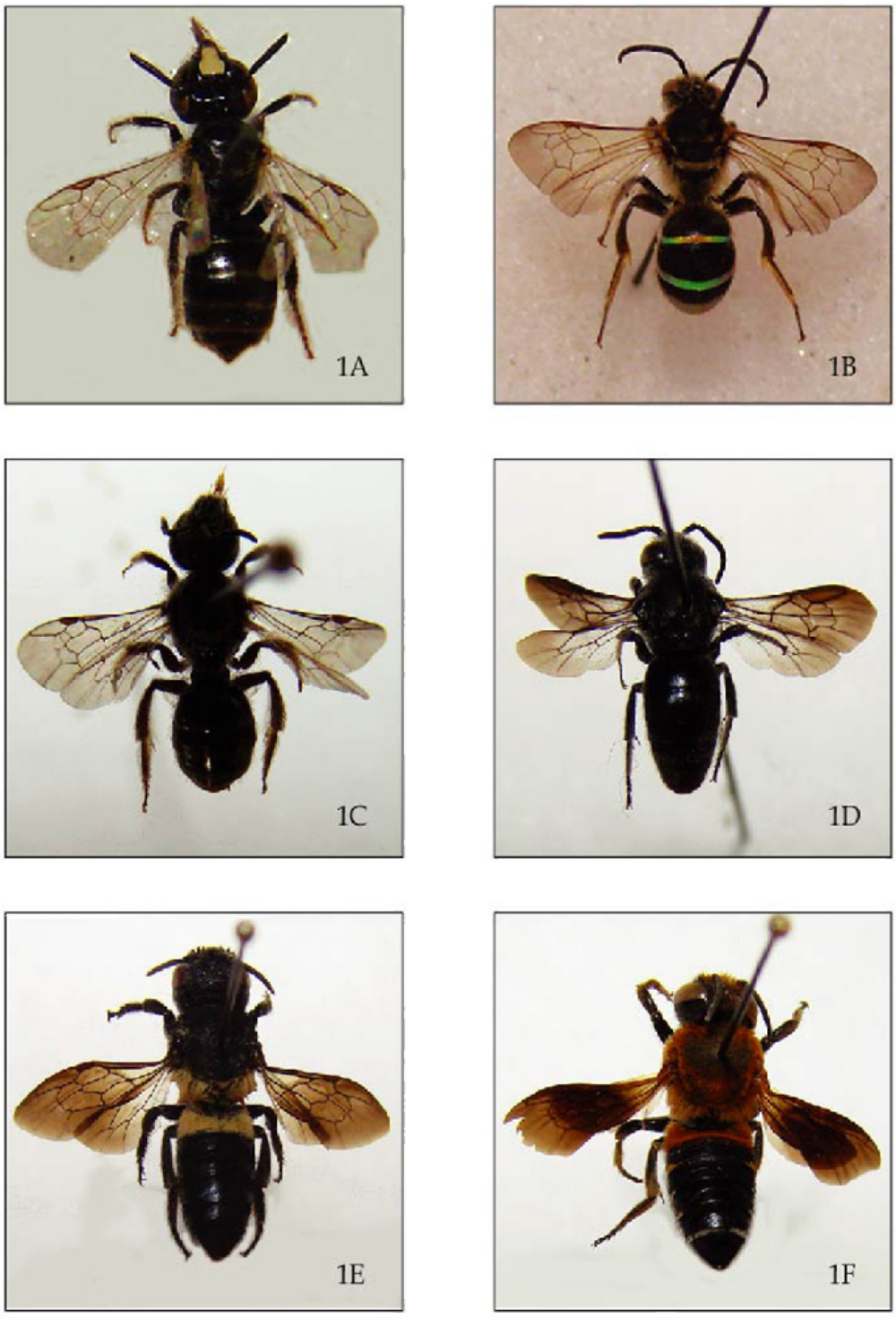

Figure. 1A. ***Hylaeus mixta*****, 1B.** ***Nomia iridescens*****, 1C.** ***Lasioglossum albescens*****, 1D.** ***Euaspis carbonaria*****, 1E.** ***Megachile disjuncta*** **and 1F.** ***Megachile umbripennis***

Note: All insects are not of same scale.

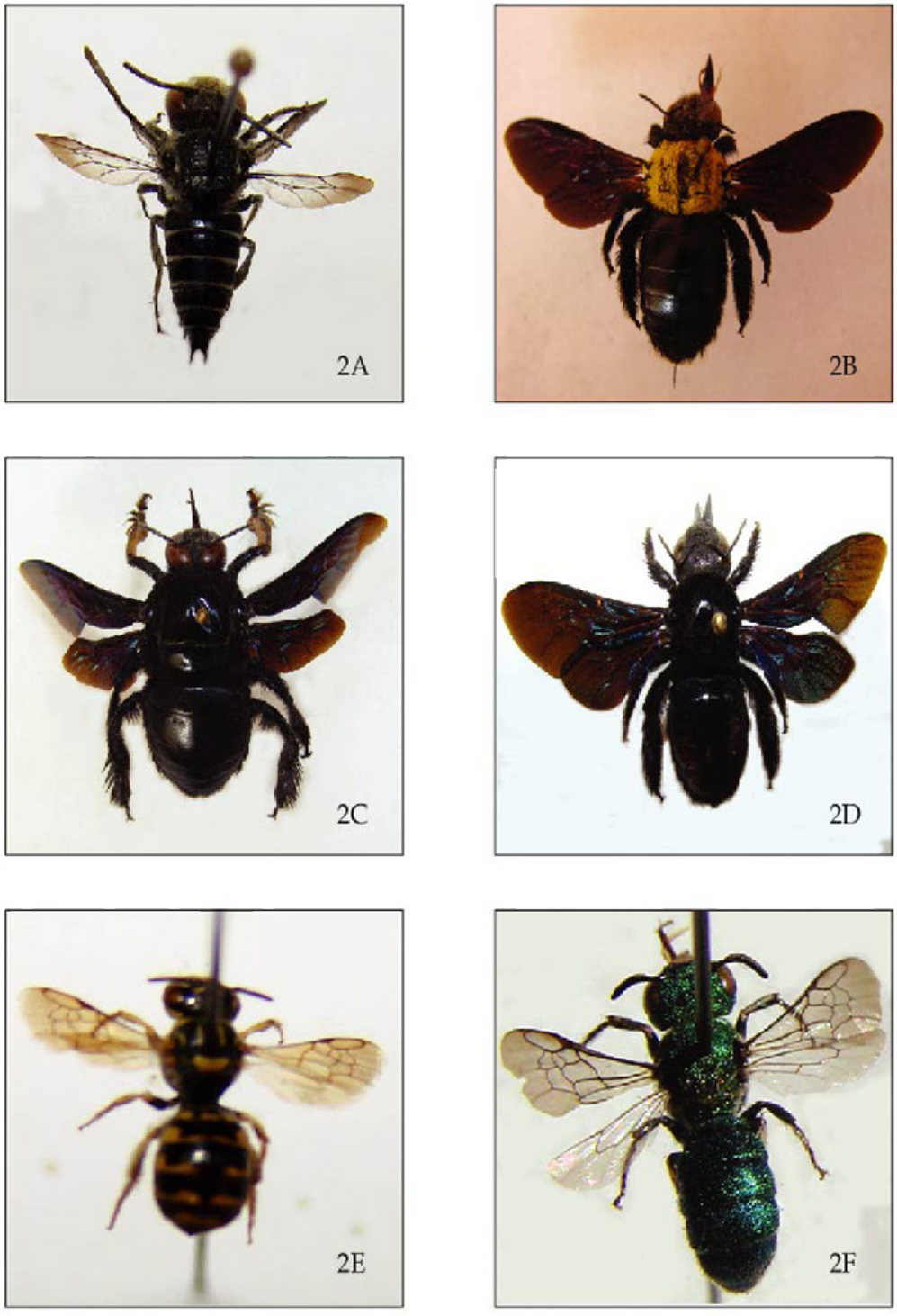

Figure. 2A. *Coelioxys cuneatus*, **2B.** *Xylocopa aestuans*, **2C.** *Xylocopa latipes*, **2D.** *Xylocopa iridipennis*, **2E.** *Ceratina hieroglyphica* **and 2F.** *Ceratina binghami*

Note: All insects are not of same scale.

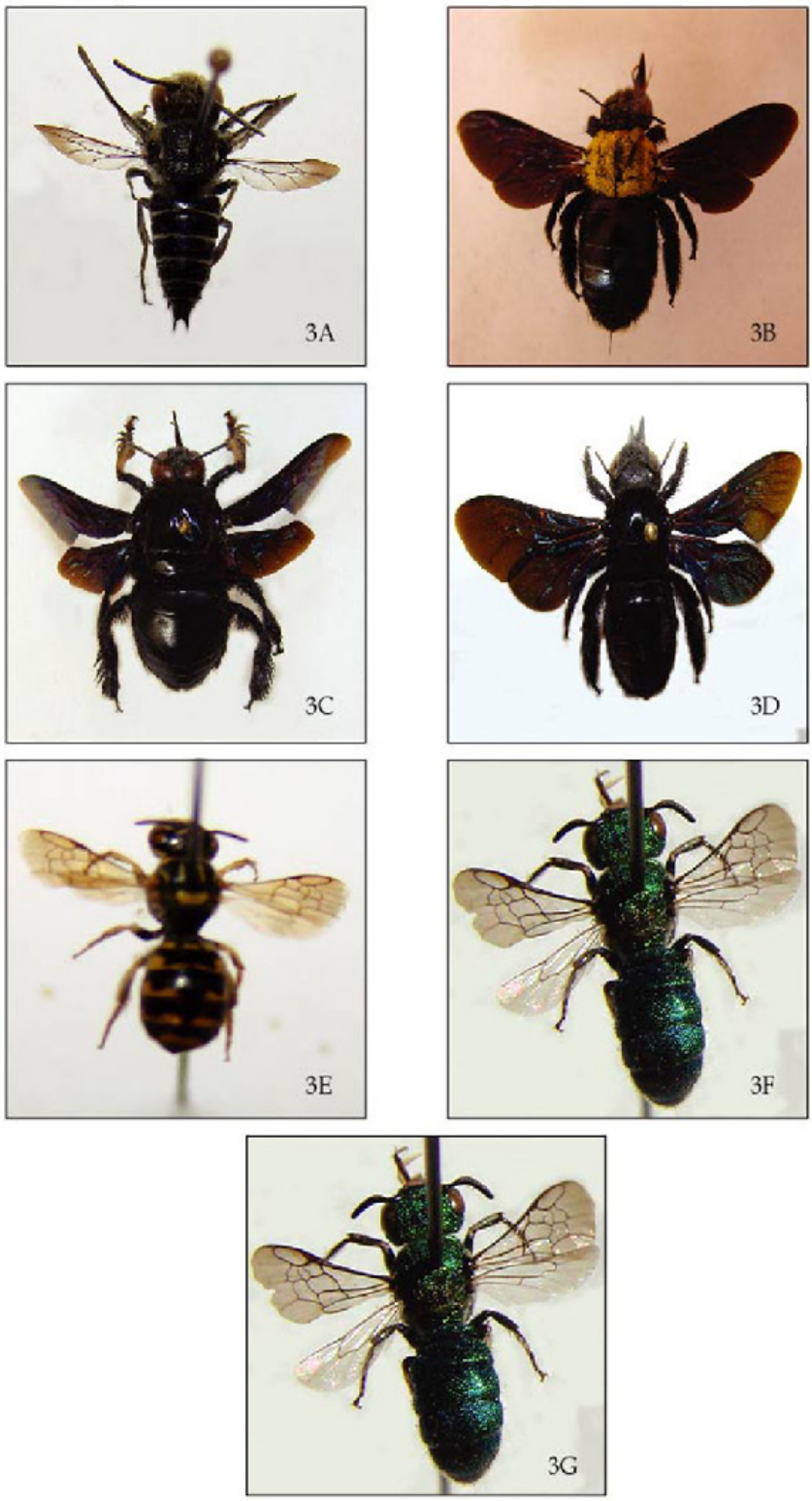

Figure. 3A. ***Nomada adusta*****, 3B.** ***Amegilla andrewsi*****, 3C.** ***Amegilla fimbriata*****, 3D.** ***Thyreus histrio*****, 3E.** ***Trigona iridipennis*****, 3F.** ***Apis cerana*** **and 3G.** ***Apis dorsata***

Note: All insects are not of same scale.

study a large number of this species was found to visit flower of bean, Marigold for collecting pollen.

18. **SPECIES *APIS CERANA*** Fabricius (Fig. 3F)

Diagnosis: Body length 11-12 mm; head, thorax and abdomen smooth and shining, sparsely pubescent, sometimes densely; head, thorax and apical abdominal segment black; scutellum and basal five segments of abdomen testaceous yellow; legs rufo-fuscous, pubescence cinereous; wings hyaline and iridescent.

Remarks: This species is found in southern and southeastern Asia, including all the countries of the Himalayan region (Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, Pakistan) as well as Indonesia, Japan, Malaysia, Papua New Guinea, Thailand, Vietnam, and probably other countries. The subspecies of *A. cerana are: Apis cerana cerana Fabricius* (= "sinensis")- Afghanistan, Pakistan, north India, China and north Vietnam; *Apis cerana heimifeng* Engel; *Apis cerana indica* Fabricius- South India, Sri Lanka, Bangladesh, Burma, Malaysia, Indonesia and the Philippines; *Apis cerana japonica* Fabricius - Japan; *Apis cerana javana* Enderlein; *Apis cerana johni* Skorikov; *Apis cerana nuluensis* Tingek, Koeniger and Koeniger; *Apis cerana skorikovi* Engel (="himalaya")- Central and east Himalayan mountains (Ruttner 1987). Alam (1962), Bhuiya and Miah (1990), Baksha (2002) recorded it from Bangladesh. In the present study *A. cerana* was found to visit flowers including those of jujube, mango, coconut, jamrul, guava, bean, sunflower and flowering vegetables.

19. **SPECIES *APIS DORSATA*** Fabricius (Fig. 3G)

Diagnosis: Body length 16-18 mm; head, thorax and abdomen with short pubescence; head and mesonotum finely punctured under pubescence; a short, medial vertical groove below anterior ocellus; head, thorax, legs and three apical abdominal segments and also basal three segments black; three basal abdomen segments honey-yellow; pubescence fuscous on head, thorax in front, legs above, and apical segments of abdomen; posterior tibiae and tarsi with short ferruginuous pubescence; wings pale fuscous or fusco-hyaline.

Remarks: *Apis dorsata,* the Giant honey bee, is a honey bee of southern and southeastern Asia mainly in forested areas. It is recorded from all over India, Myanmar and Sri Lanka, extending into China and Malayan region to Java. Engel (1999) recognized the following subspecies: *Apis dorsata dorsata-* India; *Apis dorsata binghami* Cockerell- Malaysia and Indonesia; *Apis dorsata breviligula* Maa- Philippines; *Apis dorsata laboriosa* Fabricius- Myanmar, Laos, and southern China. Bhuiya and Miah (1990) reported that it usually constructs more or less regular shaped hive on the branches of large mango, banyan, jujube, mandar and chalta trees. Alam (1962) and Baksha (2002, 2008) also recorded this species from Bangladesh.

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