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The Honey Bees (Hymenoptera: Apidae) of Bhutan with a key to the *Apis* species

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ABSTRACT: Two each of giant, cavity nesting and dwarf honey bee species are reported from Bhutan with the keys to the identification. *Apis mellifera* was imported from India in 1986 for apiculture. The distribution of species within Bhutan is provided.

Key Words: Honey bee, *Apis*, Bhutan.

INTRODUCTION

Among 20,000 bee species globally, honey bees are the well-known taxa because of their apicultural use and effective pollinating agents (Engel, 2001, 2012). Ten extant species, the dwarf, the giant and the cavity nesting honey bees including the imported European honey bee, *Apis mellifera*, are found in Asia (Lo *et al.* 2010). Four species each in India and Thailand, five species each in China and Indonesia, are reported besides *A. mellifera* (Engel, 2001, 2002 & 2012; Cao *et al.* 2012). Only recently, *Apis indica* (Fabriciuos, 1798), the Plains Honey Bee of south India and *A. breviligula* (Maa, 1953), the Giant Philippine Honey Bee, are recognized as valid species (Lo *et al.* 2010). Many works had been done on the honey bees nevertheless, there is no report on the indigenous honey bee species of Bhutan although *Apis laboriosa*, *A. dorsata* and *A. florae* are regarded as native to Bhutan without any authentic study. This paper reports five indigenous species and *A. mellifera*, which is imported from India in 1986 (National Biodiversity Strategies and Action Plan, 2014).

MATERIALS AND METHODS

Specimens were collected with swift net and killed with Ethyl Acetate. Photographs were taken with Nikon D5100 with attached AF-S Micro Nikkor 40 mm macro lens. Measurements were taken with digital Vernier caliper nearest to 0.01 mm. Measurement refers to the total length (TL = Head + Mesosoma + Metasoma) unless mentioned. Identifications were based on the keys and descriptions provided by Engel (2001, 2002 & 2012) and Lo *et al* (2010). The pinned and dried specimens were deposited in Zoology Museum, Sherubtse College, Royal University of Bhutan. Altitude (Alt.) is provided in meters (m). Latitudes and longitudes were provided in decimal degrees.

SPECIES ACCOUNT

***Apis dorsata* Fabricius, 1793** (The Giant Honey Bee; Fig. 1)
This species is common in lower altitude of Bhutan.

It is very similar to *A. laboriosa* in size however differs in its lower altitudinal distribution and in having tergum I-III/IV wholly bright orange yellow. As the altitude increases, very less *A. dorsata* is found with clear indication of altitudinal separation of the two species though their feeding ground overlaps. This species nests on rocks, buildings and the tree branch like *A. laboriosa*. Measurements: 4♀: 16-18.12 mm.

Materials examined: Ranjung, Trashigang (91.61E, 27.4N, Alt. 893 m): 1♀ collected by Tshering Nidup, Phurpa Dorji & Thinley Gyeltsen on 17.vi.2015 from Lungten Zampa; Pekashing, Chhukha (89.45E, 26.8333N, Alt. 293 m): 1♀ collected by Tshering Nidup & Wim Klein on 08.x.2015 along the road to Pasakha; Toribari, Sarpang (26.91E, 90.21N, Alt. 995 m): 1♀ collected by Mr. Tshering Nidup and Wim Klein on 13.x.2015 from the Gelephu-Sarpang Highway; Doksum, Trashi Yangtse (91.5816E, 27.4395N, Alt. 864 m): 1♀ collected by Tshering Nidup & Phurpa Dorji on 8.vi.2015 from above the highway to Trashi Yangtse.

Fig. 1. *Apis dorsata* feeding on the flower, from Pasakha, Chhukha.

Distribution: Zhemgang, Chhukha, Toribari, Trashigang.

***Apis laboriosa* Smith, 1871**(The Giant Mountain Honey Bee; Fig. 2)

This species is common in higher altitudes of Bhutan. It is similar to *A. dorsata* however, differs in its higher altitudinal distribution and in having all abdominal tergites black, long body hairs and unraised ocelli. Measurements: 2♀: 17.96-19.33 mm.

Materials examined: Chapcha, Chhukha (27.15E, 89.54N, Alt. 2264 m): 1♀ collected by Mr. Tshering Nidup & Wim Klein on 06.x.2015 from the desolated house surrounded by forest; Tangchen, Phobjikha, Wangdi Phodrang (27.43E, 90.22N, Alt. 2984 m): 1♀ collected by Mr. Phurpa Dorji & wim Klein on 25.x.2015 from the river bank.

Distribution: Chhukha, Wangdi Phodrang, Zhemgang, Trashigang, Thimphu.

Fig. 2. *Apis laboriosa* feeding on flower, from Wangsisina, Thimphu.

***Apis mellifera* Linnaeus, 1758** (The Western or European Honey Bee; Fig. 3)

This species is similar in size to *A. cerana* however, it is imported from India for apiculture purpose and is introduced to Bumthang. This species was collected and found only in Bumthang District. This is also a good sign that it is not adapted to wild in Bhutan. Measurement: 2♀: 11.49-13.22 mm.

Materials examined: Lamai Gonpa, Bumthang (27.54N, 90.72E, Alt. 2929 m): 1♀ collected by Phurpa Dorji & Wim Klein on 24.x.2015 from the campus of Ugyen Wangchuck Institute of Conservation and Environment (UWICE); Gaytsa, Bumthang (27.49N, 90.69E, Alt. 2877 m): 1♀ collected by Tshering Nidup, Phurpa Dorji & Thinley Gyeltshen on 16.v.2015 from the highway to Chumey Town; Dechen Pelrithang, Bumthang (27.51N, 90.80E, Alt. 2483 m): 1♀ collected by Tshering Nidup & Wim Klein on 17.x.2015 from the highway to Chumey town.

Distribution: Bumthang.

***Apis cerana* Fabricius, 1793** (The Eastern Honey Bee; Fig. 4)

The Eastern Honey Bee is the most common species among the cavity nesting honey bee in Bhutan distributed from 113 m to 2000 m. It is similar to *A. mellifera* however, differs in having distal abscissa of vein-M in hind wing. It also has abdominal tergum I-III partly or completely black. Measurement: 14♀: 9.52-12.67 mm.

Materials examined: Gaytsa, Bumthang (27.49N, 90.69E, Alt. 2877 m): 1♀ collected by Tshering Nidup, Phurpa Dorji & Thinley Gyeltshen on 15.v.2015 from the highway to Chumey Town; Nganglam, Pema Gatshel (26.8355N, 91.2494E, Alt. 133 m): 1♀ collected by Tshering Nidup, Phurpa Dorji & Thinley Gyeltshen on 11.v.2015 from Bhutan Police gate; Nganglam, Pema

Fig. 3. Habitus of *Apis mellifera* from Lamai Gonpa, Bumthang.

Gatshel (26.8355N, 91.2494E, Alt. 133 m): 1♀ collected by Tshering Nidup, Phurpa Dorji & Thinley Gyeltshen on 11.v.2015 from Nganglam Lake; Nganglam, Pema Gatshel (26.82N, 91.23E, Alt. 720 m): 1♀ collected by Tshering Nidup, Phurpa Dorji & Thinley Gyeltshen on 14.iv.2016 from Deezama village; Nganglam, Pema Gatshel (26.82N, 91.24E, Alt. 349 m): 1♀ collected by Tshering Nidup, Phurpa Dorji & Thinley Gyeltshen on 18.iv.2016 from Alabari village; Panbang, Zhemgang (26.84N, 90.94E, Alt. 113 m): 2♀ collected by Tshering Nidup, Phurpa Dorji & Thinley Gyeltshen on 17.iv.2016 from Andhalathang; Panbang, Zhemgang (26.84N, 90.99E, Alt. 390 m): 1♀ collected by Phurpa Dorji, Thinley Gyeltshen & Tshering Nidup on 15.iv.2016 from Klawagang stream; Bumdeling Lower Secondary School, Trashi Yangtse (27.65N, 91.45E, Alt. 390 m): 2♀ & 1♂ collected by Tshering Nidup on 01.v.2016 from School campus; Khaling, Trashigang (91.6033E, 27.2058N, Alt. 2073 m): 2♀ collected by Tshering Nidup & Phurpa Dorji on 01.i.2015 from Khaling village; Ganglakha, Chhukha (26.91N, 89.47E, Alt. 1924 m): 1♀ collected by Tshering Nidup & Wim Klein on 07.x.2015 from the highway to Phuntsholing; Pekashing, Chhukha (89.45E, 26.8333N, Alt. 293 m): 1♀ collected by Tshering Nidup & Wim Klein on 08.x.2015 from the highway to Pasakha.

Distribution: Trashigang, Trashi Yangtse, Zhemgang, Chhukha, Bumthang, Mongar, Samdrup Jongkhar, Sarpang & Tsirang.

***Apis florea* Fribicius, 1787** (Red Dwarf Honey Bee; Fig. 5)

The Red Dwart Honey Bee is native to mainland Asia where it is introduced in Southeast Asian countries (Engel, 2012). This species is similar to *A. andreniformis* however, differs in having metatibia and dorsolateral margin of metabasitarsus with white sitae, metasomal terga I-II reddish orange. This species is found in southern humid subtropical forest of Bhutan with a unique heart shaped single open comb hanging on the twig or branches of trees. Measurement: 10♀: 7.71-8.23 mm.

Fig. 4. Temporary swarm of *Apis cerana* resting on the tree trunk, Ganglakha, Chhukha.

Fig. 5. Hive of *Apis florea* from Sonamthang, Zhemgang.

Materials examined: Panbang, Zhemgang (26.85N, 90.97E, Alt. 222 m): 9♀ collected by Tshering Nidup, Phurpa Dorji & Thinley Gyeltshen from Sonamthang village on 17.iv.2016; Nganglam, Pema Gatshel (91.2494E, 26.8355N, Alt. 133 m): 1♀ collected by Tshering Nidup, Phurpa Dorji & Thinley Gyeltshen on 11.v.2015 from Nganglam Primary School.
Distribution: Zhemgang & Pema Gatshel.

***Apis andreniformis* Smith, 1858 (**The Black Dwarf Honey Bee)
The Black Dwarf Honey Bee is very uncommon honey bee in Bhutan. It is similar to Red Dwarf Honey Bee but differs in having metatibia and dorsolateral margin of metabasitarsus with black sitae, metasomal terga I-II black. This also makes single open comb like *A. florea*. Measurement: 1♀: 7.39 mm (Thorax + Abdomen).
Materials examined: Nganglam, Pema Gatshel (91.2494E, 26.8355N, Alt. 133 m): 2♀ collected by Tshering Nidup, Phurpa Dorji & Thinley Gyeltshen from Bhutan Police gate area on 11.v.2015.
Distribution: Pema Gatshel.

Key to the Species of *Apis* in Bhutan
1a. Distal abscissa of vein-M in hind wing present (Fig. 6, A). ----------2
1b. Distal abscissa of vein-M in hind wing absent (Fig. 6, B). ----------4
2a. All abdominal tergites black; 17-19.5 mm (Fig. 7, B). ----------*A. laboriosa*
2b. Abdominal terga not as above. ----------3
3a. Abdominal terga I-III/IV wholly orange yellow; 17.8-18.5 mm (Fig. 7, A). ----------*A. dorsata*
3b. Moderate size; abdominal terga I-III partly or completely black (Fig. 7, C). ----------*A. cerana*
4a. Mesoscutum black; forewing 6-7 mm; mean worker small size 8.1 mm; open nesting. ----------5
4b. Mesoscutum light to dark brown; worker moderate size; forewing 7.5-10 mm; cavity nesting (Fig. 7, D). ---------- *A. mellifera*
5a. Metatibia and dorsolateral margin of metabasitarsus with black sitae; metasomal terga I & II black (Fig. 7, F). ----------*A. andreniformis*
5b. Metatibia and dorsolateral margin of metabasitarsus with white sitae; metasomal terga I-II reddish orange (Fig. 7, E). ---------- *A. florea*.

Fig. 6. Hind wings of representative *Apis* species depicting presence or absence of abscissa of vein-M (arrow): A – *A. cerana*, B – *A. mellifera*.

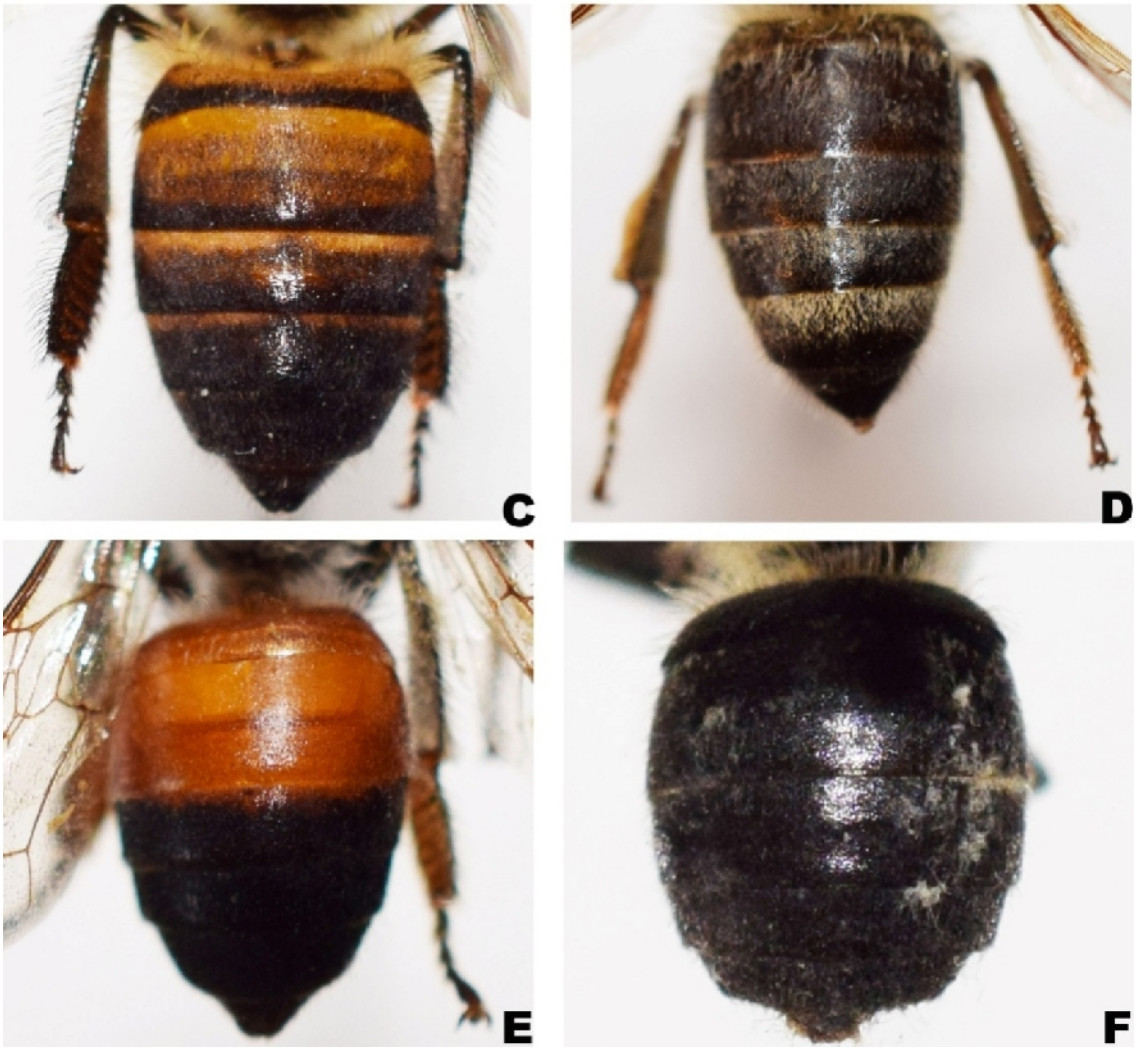

Fig. 7. *Apis* species found in Bhutan depicting the abdominal coloration: A – *A. dorsata*, B - *A. laboriosa*, C - *A. cerana*, D - *A. mellifera*, E – *A. florea*, F – *A. andreniformis*.

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