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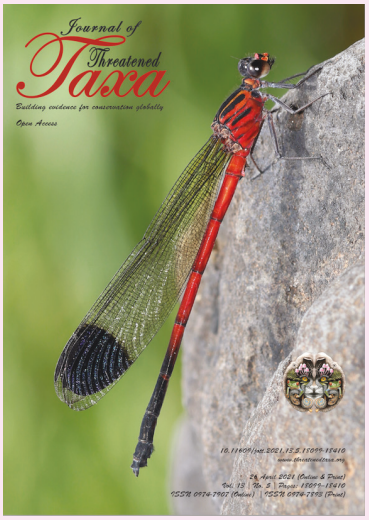

Short Communication

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SHORT COMMUNICATION

Report on the stingless bees of Bhutan (Hymenoptera: Apidae: Meliponini)

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Abstract: Two species of stingless bees, *Tetragonula gressitti* (Sakagami) and *Lepidotrigona arcifera* (Cockerell), are reported from Bhutan for the first time. The nest description and meliponiculture are described. This is the gross underestimation of Meliponini diversity in Bhutan and summons more study on the diversity, biology, and meliponiculture.

Keywords: Diversity, meliponiculture, *Lepidotrigona arcifera*, *Tetragonula gressitti*

Abbreviation: NBCB—National Biodiversity Center, Bhutan.

Stingless bee keeping is known as meliponiculture (Cortopassi-Laurino et al. 2006) and is a rare activity in Bhutan, where it is considered a sin to taste even a tiny drop of honey, from a Buddhist perspective. Perhaps this explains its uncommonness in the country. Although a very few people in southern Bhutan rear stingless bees for domestic consumption nevertheless there is no published record of stingless bee species in Bhutan. Stingless bee honey and propolis are known to have high medicinal value (Choudhari et al. 2012; Vit et al. 2004). Stingless bees not only produce high-priced honey, but also help in pollination of crops, though they are facing various threats at present (Slaa et al. 2006). Therefore, a huge opportunity for meliponiculture exists in Bhutan, with 72% of the country under forest cover with rich and diverse flora, and chemical use in agriculture almost nonexistent, making the country attractive for large-scale organic meliponiculture (Gupta et al. 2014).

There are about 600 species of Meliponini in global tropical and subtropical areas (Cortopassi-Laurino et al. 2006). The Indo-Malayan region has 89 recognized stingless bee species, 43 in Asia and eight in the Indian subcontinent (Michener 2007; Rasmussen 2008; Rasmussen 2013). Two local types (white and black) of stingless bees were collected from different localities of Bhutan. They are locally known as “Putkha” in Nepali (Rasmussen 2013) but they are unambiguously named as “Kalo putka” (=black putka) and Shayto putka (=white putka) in Bhutan. Locally it is said that the honey of the black species has a higher medicinal value than the white (Deo K. Rai pers. comm. 10.xi.2017) though it is yet to be proven.

Materials and methods

Specimens were collected with a sweep net. Collected specimens were pinned, dried and stored. Identifications were based on Sakagami (1978), Smith (unpublished), Rasmussen (2013), and Rathor et al. (2013). Measurements were made with digital Vernier

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Competing interests: The author declares no competing interests.

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caliper under a stereo microscope. The specimens were deposited in the National Biodiversity Centre, Serbithang, Thimphu, Bhutan and a registered reference number is provided for each specimen as provided in the materials examined. Identifications were based on worker specimens collected during the invertebrate inventory project field work in 2014–2017 that focused on Hymenoptera (bees and wasps), Lepidoptera (moths and butterflies), Coleoptera (beetles), Odonata (dragonflies and damselflies), and Mollusca (snails and slugs). The project was funded by the Bhutan Trust Fund for Environmental Conservation (BTFEC) and coordinated by National Biodiversity Center, Bhutan. The surveys were conducted by the experts from Sherubtse College and College of Natural Resources, Royal University of Bhutan, Ugyen Wangchuck Institute for Conservation and Environmental Research (UWICER), National Plant Protection Centre (NPPC) and Naturalis Biodiversity Center, The Netherlands. Distribution within Bhutan is provided with Districts followed by localities in parenthesis.

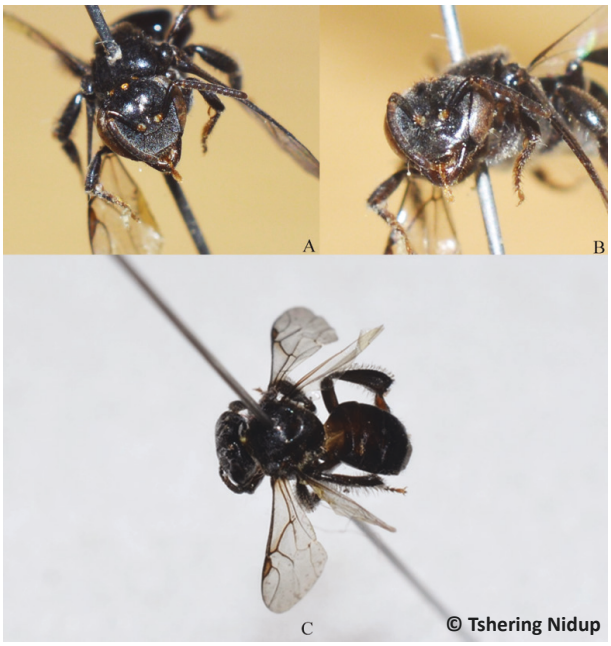

Image 1. *Tetragonula gressitti*: A—facial view | B—malar space | C—body color.

Results and discussion

Genus Tetragonula Moure, 1961

The genus *Tetragonula* Moure is differentiated by the combination of the following characters: small size, body smooth, shiny with minute punctation; scutellum projecting backward, over-arching almost the whole propodeum; basal area of propodeum smooth, shiny and hairless; five hammuli per hind wing, hind basitarsus narrower than tibia with large sericeous patch; metasoma narrower than thorax; mesopleural hairs silvery white; clypeus with microscopic appressed silvery-white hairs; malar space not well developed; mandible with 2 teeth; wings uniformly clear.

Tetragonula gressitti (Sakagami, 1978) (Image 1A,B,C, 2, 3)

Trigona (*Tetragonula*) *gressitti* Sakagami 1978: 214–216; Holotype: worker; Type locality: Vietnam, Lâm Đồng province in the central Highlands. Diagnosis: highly melanic; body, scape, alveolus, flagella, hairs, corbicular bristles clypeus, tegula, legs and metasoma black; scape long; mesoscutal hairs do not form distinct bands; mesosoma and metasoma glossy. In Nepali it is known as "*kalo putka*" corresponding to its melanic body.

Measurements: Seven workers; total body length: 4.39–5.59 mm (mean 5.14mm); Forewing length excluding tegula: 4.31–4.89 mm (mean 4.62mm); Hind tibia length: 1.67–1.78 mm (mean: 1.73mm).

Image 2. Nest entrance of *Tetragonula gressitti*.

Materials examined: NBCB00282, NBCB00283, NBCB00284, NBCB00285, NBCB00286, NBCB00287, NBCB00288, 29.vii.2016, 7 females, Khengpagang, Sarpang (26.848N & 89.396E, 461m), coll. Deo Kumar Rai & Bishal Rai from a reared colony.

Remark: This species is reported for the first time from Bhutan and known only from a reared colony in

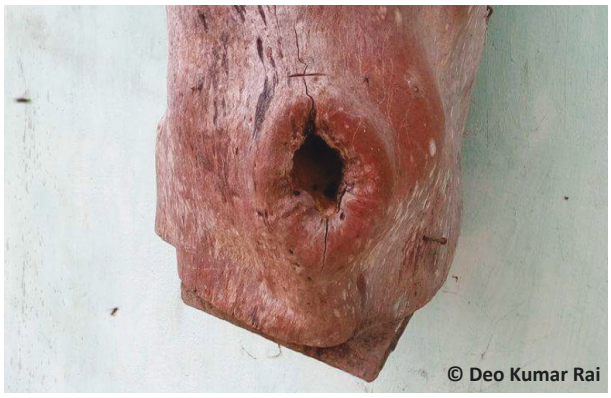

Image 3. Log with the nest of *Tetragonula gressitti* for rearing.

Sarpang District and warrants further exploration.

Distribution: Vietnam (Sakagami 1978), India (Rathor et al. 2013), Bhutan.

Genus *Lepidotrigona* Schwarz, 1939

This genus is distinguished by having six hamuli and dense tesselation on head and thorax; mesonotum with a border of thick, scale-like yellow or whitish hairs. Basitarsis is without sericeous patch on inner face of basitarsus which is rather uniformly setose.

***Lepidotrigona arcifera* (Cockerell, 1929) (Image 4, A & B; Image 5, 6 & 7)**

Trigona arcifera Cockerell 1929: 591–592: Holotype: worker (BMNH 17b.1081); Type locality: India, Sikkim, Teesta bridge.

Diagnosis: Generally black; complete semicircular dark band on the pale first metasomal tergum partly enclosing the basal depression; yellowish apical metasomal terga; densely plumose ("scale-like") hairs on margin of mesoscutum; body and wing each more than or equal to 4mm in length.

Measurements: 12 workers; total body length: 4–4.60 mm (mean: 4.14mm); forewing length excluding tegula: 3.99–4.91 mm (mean: 4.49mm).

Materials examined: NBCB00268, NBCB00269, NBCB00270, 29.vii.2016, 3 females, Rinchending, Chhukha, (26.848N & 89.396E, 461m), coll. Tshering Nidup; NBCB00271, NBCB00272, NBCB00273, 23.x.2015, 3 females Yongkola, Monggar (27.306N & 91.164E, 1,553m), coll. Phurpa Dorji & Wim Klein; NBCB00274, NBCB00275, NBCB00276, NBCB00277, NBCB00278, NBCB00279, NBCB00280, NBCB00281, 29.vii.2016, 8 females, Khengpagang, Sarpang (26.848N & 89.396E, 461m), coll. Deo Kumar Rai & Bishal Rai.

Remark: This species seems to be widely distributed

Image 4. *Lepidotrigona arcifera* (Cockerell): A—tessellation on thorax | B—hind leg showing tibia and the basitarsus | C—showing semi-circular dark band on first metasomal segment.

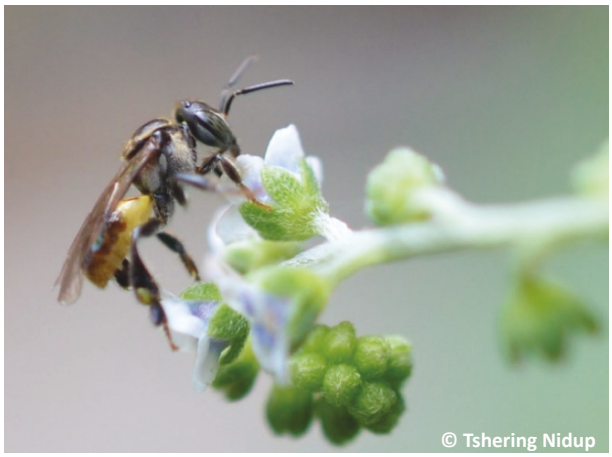

Image 5. *Lepidotrigona arcifera* feeding on flower of *Cynoglossum furcatum*.

and recorded at the altitude range of 461–1,553m. It is reported from the seven districts of Chhukha, Dagana, Mongar, Zhemgang, Samdrup Jongkhar, Trashigang, Tsirang and Sarpang however, the nest entrance were examined only in Serzhong (Mongar), Dorona (Dagana), Shumar & Nganglam (Pemagatshel), Mantar & Pemathang (Samdrup Jongkhar), Dovan & Goang (Sarpang), Tsholingkhar (Tsirang), and Panbang (Zhemgang).

Distribution: India (Rasmussen 2008, 2013) Bhutan.

Image 6. Nest entrance of *Lepidotrigona arcifera* on the tree *Quercus griffithii.*

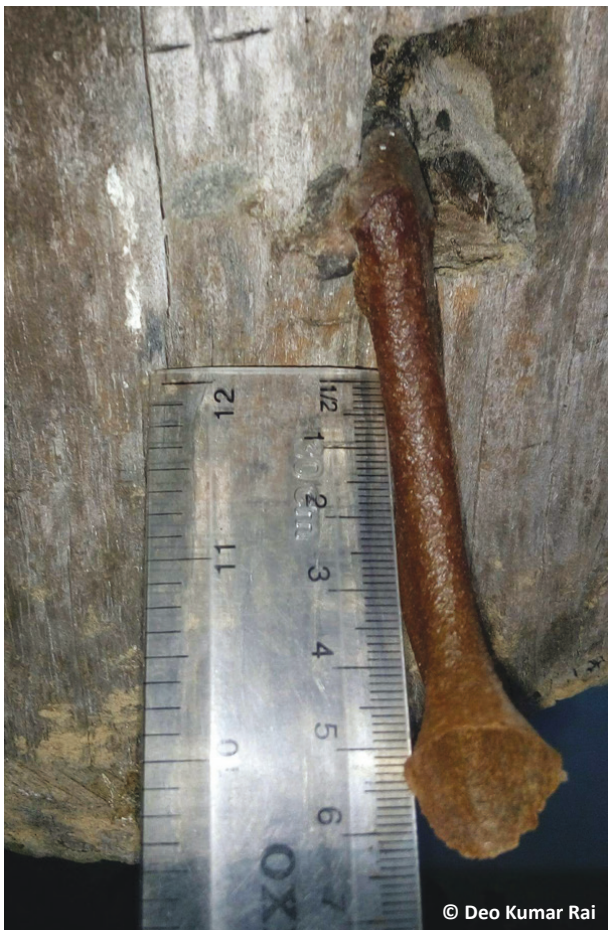

Image 7. Nest entrance of reared *Lepidotrigona arcifera*.

Nest description and meliponiculture

A nest of *L. arcifera* was observed under natural conditions in the oak forest in Pemagatshel (Image 6). It was nesting in the trunk of an oak tree, ca. 4m above ground on the bulging side of the trunk. The area was sloping and the ground was clear without much undergrowth. The nest entrance varies from broadly funnel-like to round and little narrow at the base but in some the base can be bulging. The color of the entrance is lighter at the tip and darker to reddish-brown at the base. The entrance is bit angled downward and the rim appears as though sliced angularly. It is guarded by 5–12 adults based on a series of the nest photographs. The nest entrance measures about 1.6cm in width (opening), 2cm in length (opening), 7.5cm dorsally from tip to base and 6.5cm ventrally. *T. gressitti* do not make any nest entrance like *L. arcifera*; however, it coats the nest tunnel with yellowish substances (likely resin or resin mixed with wax) (Image 2).

According to one informant, honey is extracted in winter and each *L. arcifera* colony provides approximately 750 ml/year. *T. gressitti* is thought to produce slightly more than 750 ml/year. Honey of *T. gressitti* is sold at Nu. 6000 (=100 US Dollars) and honey of *L. arcifera* at Nu. 3000 (=50 US Dollars), per 750 ml. Currently 20 households rear *L. arcifera* in Khengpagang village in Sarpang District but only one household rears *T. gressitti*. The first author also saw one household

rearing *L. arcifera* at Tsholingkhar Village in Tsirang.

These bees are brought to the village from the forest with an undisturbed nest after cutting the trunk of the tree they were nesting in. They are then placed around the house in any position in case of *L. arcifera*, but in upright position in case of *T. gressitti* (Image 3). It is said that *T. gressitti* colony leaves the nest if kept in other positions. They are reared in a natural way and it was never observed that the bees were kept in rational hives or that the keepers knew how to perform divisions of the colonies or artificial feeding.

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