

A new record of stingless bee, *Tetragonula gressitti* Sakagami (Hymenoptera: Apidae: Meliponini) from Nagaland, India

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Received: 07.10.2020/Accepted: 22.10.2020

ABSTRACT

The stingless bee, *Tetragonula gressitti* Sakagami was first recorded from Veitnam in 1978 followed by India in 2013 and from China in 2019. This is first report of the discovery of this species of stingless bee from Nagaland after Arunachal Pradesh in India. A survey was conducted in different parts of Nagaland in 2019. The feral colonies of stingless bees were marked, the specimens were collected and brought to the laboratory at Medziphema, Dimapur, Nagaland. The morphology and morphometrics were described. The bees were black in colour with total body length 6.11 mm with head width of 1.90 mm. Data on different taxonomical parameters revealed this stingless bee as new species, *Tetragonula gressitti* Sakagami and it was later confirmed by taxonomy section of Division of Entomology, Indian Agricultural Research Institute, New Delhi, India.

Keywords: Stingless bee; *Tetragonula gressitti* Sakagami; morphology; morphometry

INTRODUCTION

Stingless bees are a large group of bees having about 500 described species (Michener 2013) comprising the tribe Meliponini and sub-tribe Meliponina. They belong to the family Apidae and are closely related to common honeybees. Stingless bees are reported to be found throughout most of the tropical and subtropical regions of the world such as Australia, Africa, Southeast Asia, and tropical America (Silveira et al 2002). Approximate numbers of species so far identified were 50 in Africa, 300 in the Americas, 60 in Asia, 10 in Australia and 4 in Madagascar (Bradbeer 2009). According to Roubik (1989) local and regional diversities are high in the Neotropics where up to 60 meliponine species can be found locally in a single forest. Nests of stingless bees are mostly found on cavities of tree trunk, old walls, inside the termite mounds and subterranean cavities (Nogueira-Neto 1997, Eltz et al 2003, Roubik 2006).

Bingham (1897) described most of the Indian species under Melipona almost a century ago. There is sporadic information on stingless bees and only recent

account was given by Sakagami (1978) and Rasmussen (2013) for continental Asia and Indian subcontinent. Only the two genera, *Trigona* Jurine and *Lisotrigona* Moure have long been found in Indian subcontinent (Michener 2007). Rasmussen (2013) studied the distribution of stingless bees throughout the Indian subcontinent and concluded that stingless bees are available in most parts of the Indian subcontinent except at higher elevations or the drier interior regions. The author found different species of stingless bees like *Lepidotrigona arcifera* (Cockerell), *Lisotrigona cacciae* (Nurse), *L. mohandasi* Jobiraj and Narendran, *Tetragonula* aff *laeviceps* (Smith), *T. bengalensis* (Cameron), *T. iridipennis* (Smith), *T. praeterita* (Walker) and *T. ruficornis* (Smith) in Indian subcontinent.

The distribution pattern of stingless bees in India was studied by Rahman et al (2015). They have reported different species of stingless bees prevalent in south India viz *Tetragonula. iridipennis* *T. laeviceps* and *Lepidotrigona arcifera*. Whereas *T. iridipennis* and *T. laeviceps* were present in the northwestern India. Likewise from Kerela, two stingless bees are

mainly reported viz *T irridipennis* by Mohan and Devanesan (2000) and *Lisotrigona mohandasi* by Jobiraj and Narendran (2004). In northeastern India, five species were reported by Rahman et al (2015) viz *Tetragonula bengalensis*, *T irridipennis*, *T ruficornis*, *T laeviceps* and *Lepidotrigona arcifera*. From Arunachal Pradesh *Lepidotrigona arcifera* Cockrell was recorded. However in 2013, *T gressitti* was also observed in Arunachal Pradesh but the sample size was very small (Rathor et al 2013). In Nagaland, Singh (2016) has observed three species viz *Tetragonula irridipennis*, *T laviceps* and *Lophotrigona canifrons*. However later on five stingless bee species were reported viz *Tetragonula irridipennis*, *L ventralis*, *T laeviceps*, *L arcifera* and *Lophotrigona canifrons* (Chauhan et al 2019). Since Nagaland is a biodiversity hotspot so the present studies were conducted to explore more stingless bee fauna in Nagaland.

MATERIAL and METHODS

The study was carried out at Nagaland in northeastern India having an elevation range between 110 to 3,826 m amsl with geographical location of 25°45'43" N latitude and 93°33'04" E longitude. A survey was undertaken in different parts under Phek district of Nagaland during November-December 2019. Nests of the stingless bees were located and the samples were collected with the help of insect net during the day time (1100-1300 h).

The specimens of stingless bees were preserved as dry and wet in 70 and 100 per cent ethyl alcohol for the systematic study. The preserved specimens were treated with relaxing fluid (75% alcohol 106 ml, distilled water 98 ml, benzene 14 ml and ethyl acetate 38 ml) for 2-4 hours. Various body parts like wings, legs, sterna, mouth parts (mandibles) and metasoma were dissected after water bath boiling in 10 per cent KOH (potassium hydroxide) solution for 2 to 3 minutes. Then the parts were rinsed in water and placed in glacial acetic acid to neutralize the KOH and preserved in glycerine.

The measurements of different species along with body parts like head length and width, mesosoma length and width, metasoma length and width and the total length were taken as per Rahman et al (2015). The samples were also sent to Division of Entomology, IARI, New Delhi, India for confirmation of identification.

RESULTS

This species was previously known from three places in southern Vietnam and later on from Arunachal Pradesh in India followed by southwest China in 2019. The species recorded from Arunachal Pradesh was of very small sample size (4 bees only) but in the present study the bees were recorded from their natural habitat and nests were also located.

A total of 50 bees were taken for morphological and morphometrical studies and the same sample size was sent to IARI, New Delhi for confirmation of identification. The worker bees were black in colour with body clearly divided into head, thorax and abdomen (Fig 1). The total body length varied between 6.10-6.11 mm (Table 1). The length of head was 1.65 mm. The compound eyes were big with length of 1.31-1.33 mm. The width of compound eyes was 0.47-0.48 mm and the maximum interorbital distance was 1.28-1.29 mm while the lower and upper interorbital distance was 1.00-1.01 and 1.09-1.11 mm respectively. The diameter of median ocellus was 0.21-0.22 mm. The length of clypeus was found as 0.40-0.41 mm and width ranged between 0.68-0.69 mm. The oculo-malar space was 0.11 mm.

The total length of antennae was 3.09 mm with length and diameter of scape 0.76-0.78 and 0.10-0.11 mm respectively. The flagellomeres were black in colour and 10 in number with width of 0.88-0.90 mm. The distance between M-Cu and basal tip of marginal cell ranged between 1.32-1.33 mm. The length of forewing ranged between 4.80-4.89 mm however the hind wing was smaller with length of 3.96-4.01 mm having seven hamuli with arrangement like 4 + 1 + 2. In hind leg, the length of femur and tibia ranged between 1.04-1.07 and 1.96-1.98 mm respectively while the tarsus was 0.66-0.69 mm. The pretarsus was having 4 tarsomeres with 0.89-0.96 mm length. The tibia was bearing more black hair as compared to femur and tarsus. The last tarsomere terminated into claws. The abdomen was black in colour with inconspicuous divisions.

DISCUSSION

A new species of stingless bee, *Tetragonula gressitti* Sakagami was recorded from Nagaland which increased the total number of stingless bee fauna to six in the state. The body colour of the workers of *T gressitti* was black and total length ranged between

Table 1. Measurements (mm) of different parameters of *T gressitti* Sakagami

Character	Mean $\pm$ SE
Total body length (mm)	6.10 $\pm$ 0.11
Tongue (mm)	
Length of glossa	1.37 $\pm$ 0.14
Total length of tongue	2.07 $\pm$ 0.10
Head (mm)	
Length	1.65 $\pm$ 0.09
Compound eyes (mm)	
Length	1.31 $\pm$ 0.05
Width	0.47 $\pm$ 0.03
Maximum interorbital distance	1.28 $\pm$ 0.04
Lower interorbital distance	1.00 $\pm$ 0.03
Upper interorbital distance	1.10 $\pm$ 0.03
Median ocellus diameter	0.22 $\pm$ 0.02
Clypeus length	0.40 $\pm$ 0.03
Clypeus width	0.69 $\pm$ 0.03
Mandible (mm)	
Length	0.67 $\pm$ 0.04
Breadth	0.44 $\pm$ 0.03
Antenna (mm)	
Length of scape	0.77 $\pm$ 0.03
Diameter of scape	0.10 $\pm$ 0.02
Length of pedicel	0.14 $\pm$ 0.01
Length of flagella	1.97 $\pm$ 0.08
Total length of antenna	3.09 $\pm$ 0.04
Forewing (mm)	
Length	4.80 $\pm$ 0.08
Distance between M-Cu and basal tip of marginal cells	1.32 $\pm$ 0.04
Hindwing (mm)	
Length	4.05 $\pm$ 0.06
Number of hamuli	7.00
Hind leg (mm)	
Length of coxa	0.40 $\pm$ 0.02
Length of femur	1.03 $\pm$ 0.04
Length of tibia	1.98 $\pm$ 0.06
Length of basitarsus	0.48 $\pm$ 0.03

6.10-6.11 mm. The different body parameters revealed similarity with the description of *T gressitti* by Sakagami (1978). Rathor et al (2013) while sampling found 4-7 samples of *T gressitti* in the jungles of lower Dibang valley, Arunachal Pradesh which later they reported to have black coloured body with total length of 6.10 mm.

Earlier Sakagami (1978) reported this species from southern Vietnam and described different characters which confirm the results of

the present study. Pan et al (2019) reported this stingless bee species from southwestern China with characters similar to the reported species.

In India this species was reported earlier from Anurachal Pradesh (Rathor et al 2013) but the sample size was very small and further studies were suggested by the authors as whereabouts of samples were not known. Since very less literature is available on this species, the present research will add more scientific approach in the identification of this species



a. Dorsal view



b. Lateral view



c. Ventral view



d. Hind leg ventral view



e. Hind leg dorsal view



f. Antenna



g. Forewing



h. Hind wing



i. Hamuli

Fig 1. Different parameters of *T. gressitti* Sakagami

from different parts of the globe. In India with the discovery of this species only Nagaland state is harbouring six different species of stingless bees. This first report of *T gressitti* from Nagaland revealed the fauna diversity of stingless bees in this region. More studies are required in stingless bee diversity for realizing the full potential of this region for taxonomy and identification.

ACKNOWLEDGEMENT

The authors are indebted to Project Coordinator, All India Coordinated Research Project on Honey Bees and Pollinators for providing financial support. Thanks are due to Dr Debjani Dey, Prof and Head, Division of Entomology, IARI, New Delhi, India for identification of samples.

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