

New Record of Stingless Bees (Meliponini: *Trigona*) in Thailand

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ABSTRACT.—Stingless bees, of which over 500 species are recorded, are found mostly in tropical countries. Species are classified into five genera: *Melipona*, *Trigona*, *Meliponula*, *Dectylurina* and *Lestrimelitta*. *Trigona* is an extensive genus of the Meliponini tribe found in tropical regions of all continents. Stingless bees in this study were collected from the western, eastern and northern regions of Thailand between 2002 and 2003. Ten species of *Trigona* were identified and two species, *Trigona binghami* and *Trigona minor*, are new records to the list of 30 species recorded by Schwarz (1939), Sakagami et al. (1985) and Michener and Boongird (2004) making a total of 32 stingless bees in *Trigona* that are currently recorded from Thailand. The newly recorded species were found in HM Queen Sirikit Botanical Garden in Maerim, Chiang Mai, Chanthaburi and Mae Hong Son Provinces, Thailand.

KEY WORDS: New record, Stingless bees, Meliponini, *Trigona*,
Trigona binghami, *Trigona minor*

INTRODUCTION

Stingless bees are a group of eusocial insects which play an important role in the pollination process of plant life, particularly wild flowers in most tropical countries (Heard, 1999). They constitute the Meliponini tribe of the family Apidae. Their nests are made from wax mixed with resin and gum and some species add mud collected by worker bees. In Southeast Asia, three tribes were found of which four were corbiculate Apinae: Apini (honey bees), Meliponini (stingless bees) and Bombini (bumble bees) (Salmah et al. 1990). The stingless bees species are classified into five genera: *Melipona*, *Trigona*, *Meliponula*,

Dectylurina and *Lestrimelitta*. *Trigona* is a genus of the Meliponini tribe which is found extensively in tropical regions. It ranges from the Neotropics, from Mexico to Argentina. In the Indo-Australian region it extends from India and Sri Lanka to Taiwan, the Solomon Islands, South Indonesia and New Guinea; in Australia it reaches 34° S (Michener, 2000). In Thailand, 30 species of *Trigona* have been recorded (Schwarz, 1939; Sakagami et al., 1985 and Michener and Boongird, 2004). The objective of this study is to investigate the diversity of stingless bees in Thailand and to identify species.

MATERIALS AND METHODS

The diversity and descriptive morphometric study of stingless bee species in Thailand were investigated with specimens collected from the eastern (Chanthaburi Province), western (Kanchanaburi Province) and northern (Chiang

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Mai, Nan and Mae Hong Son Provinces) regions of Thailand (Fig. 1). Data were collected on the number of colonies, location of host trees, the species of tree which stingless bees use as a nest habitat. The position of all stingless bee colonies was located by a Global Positioning System (GPS). Specimens were preserved in 70% ethyl alcohol. Identification procedures used in this study were based primarily on those of Schwarz (1939) and Sakagami et al. (1985). Identification of host plant species followed the procedures used by Smitinand (1980).

RESULTS

Ten species of *Trigona* were found in a total of 56 colonies (Table 1). The majority of colonies (35) were were of *T. collina*. *Trigona*



Figure 1. Map of Thailand is showing the locations of specimens collected.

binghami and *T. minor* were found for the first time in Thailand, which can be added to the 30 species previously recorded. Descriptions of *T. binghami* and *T. minor* are given in Table 2.

Trigona binghami Schwarz, 1939

(Fig. 2)

Trigona binghami specimens were collected from Mae Hong Son province. This species is similar to *T. apicalis* but is distinguished by the size of its body and more extensively testaceous yellow appearance.

Worker- Body length (BL) 6.340 ± 0.0152 mm., body color is melanic. Mandible with two strong teeth (Fig. 2B), Clypeus with erect black bristles mainly on apical area, malar space as long as width of the second segment of flagellomere (Fig. 2A). Fore wing length (FWL) 7.080 ± 0.084 mm. Fore wing width (FWW) 2.980 ± 0.027 mm. fore wing is bicolorous, basally brown with dark brown veins, contrasting to milky white apical part with pale orange veins (Fig. 2C). Hind wing length (HWL) 5.46 ± 0.089 mm. Hind wing width (HWW) 1.540 ± 0.055 mm. Hind femur length (HFL) 2.040 ± 0.042 mm. Hind tibia length (HTL) 2.970 ± 0.027 mm. Hind tibia width (HTW) 1.020 ± 0.027 mm. Posterior fringe of hind tibia mostly consisting of plumose hairs (Fig. 2D). Hind basitarsus length (HBL) 1.200 ± 0.035 mm. Hind basitarsus width (HBW) 0.548 ± 0.004 mm. Hind basitarsus below consisted with disc mentioned above (Fig. 2D₂).

Trigona minor Sakagami, 1978

(Fig. 3)

Trigona minor is similar to *T. laeviceps* but is distinguished by its larger size, mesoscutal hairs mixed with more dark hairs and darker coloration.

Worker- BL 3.936 ± 0.033 mm. Mandible with two teeth (Fig. 3B), malar space linear or at most shorter than width of second segment of

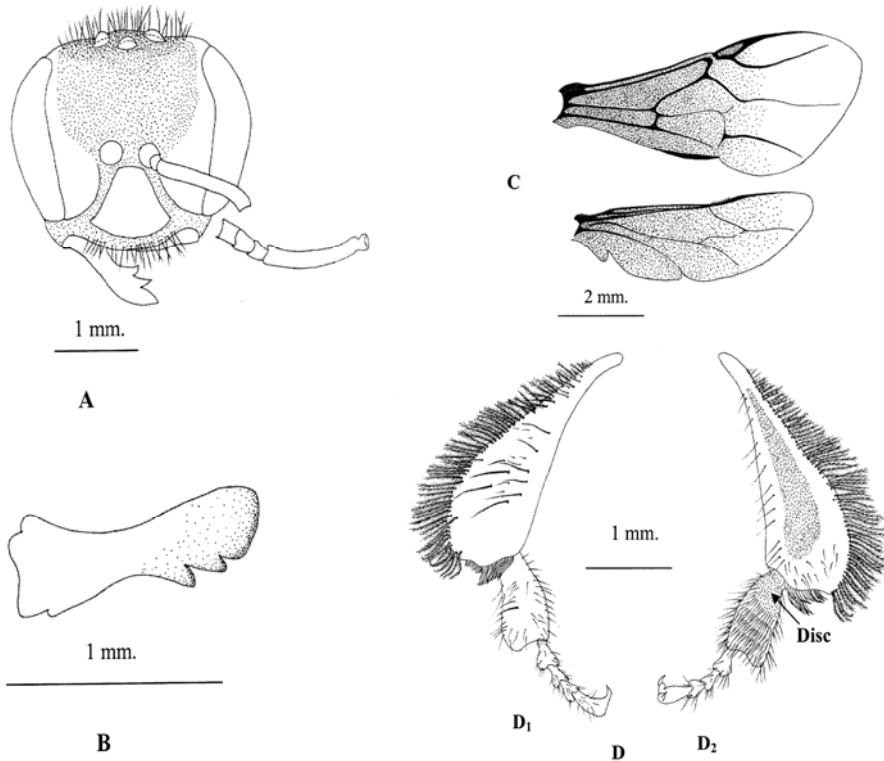


FIGURE 2. *Trigona binghami*. A. Head, frontal view, B. Mandible, C. Forewing and hindwing, D. Right hind legs (D₁ = above view, D₂ = below view).

TABLE 1. Host trees of *Trigona* in the eastern, western and northern regions of Thailand

<i>Trigona</i> spp.	No. of Colony	Locality	Host Plant
<i>T. collina</i>	35	Chanthaburi, Kanchanaburi, Chiang Mai, Mae Hong Son, Nan	<i>Ficus religiosa</i> , <i>Diospyros rhodocalyx</i> , <i>Irvingia malayana</i> , <i>Dipterocarpus alatus</i>
<i>T. terminata</i>	5	Chanthaburi, Chiang Mai	<i>Irvingia malayana</i> , <i>Ficus religiosa</i>
<i>T. apicalis</i>	3	Chiangmai, Mae Hong Son	<i>Tectona grandis</i> , <i>Dipterocarpus alatus</i>
<i>T. doipaensis</i>	3	Chanthaburi, Chiang Mai	<i>Homalium grandiflorum</i> , <i>Ficus religiosa</i>
<i>T. laeviceps</i>	3	Chanthaburi, Chiang Mai, Nan	<i>Hevea brasiliensis</i> , In domestic building
<i>T. minor</i>	2	Chanthaburi, Chiang Mai	<i>Tectona grandis</i> , <i>Homalium grandiflorum</i>
<i>T. thoracica</i>	2	Kanchanaburi	<i>Hopea</i> sp., <i>Dipterocarpus alatus</i>
<i>T. binghami</i>	1	Mae Hong Son	<i>Tectona grandis</i>
<i>T. fimbriata</i>	1	Mae Hong Son	<i>Tectona grandis</i>
<i>T. fuscobalteata</i>	1	Chiang Mai	In domestic building

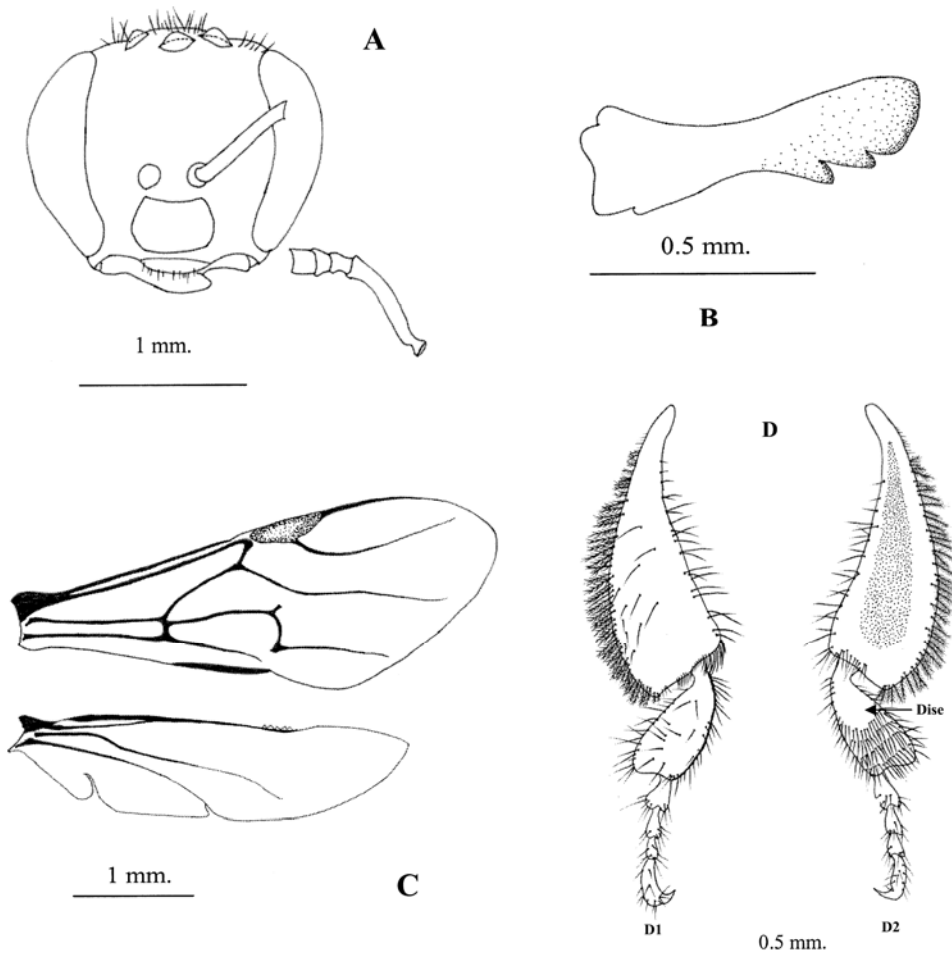


FIGURE 3. *Trigona minor*. A. Head, frontal view, B. Mandible, C. Forewing and hindwing, D. Right hind legs (D₁ = above view, D₂ = below view)

antenna (Fig. 3A). FWL 3.746 ± 0.022 mm. FWW 1.5 mm. HWL 2.724 ± 0.033 mm. HWW 0.720 mm, fore and hind wing rather uniformly transparent or slightly in fuscate (fig. 3C). HFL 1.176 ± 0.033 mm. HTL 1.752 ± 0.016 mm. HTW 0.582 ± 0.016 mm. Posterior fringe of hind tibia consists of plumose hairs (Fig. 3D). HBL 0.792 ± 0.016 mm. HBW 0.342 ± 0.016 mm. Hind basitarsus consist disc mentioned above (Fig. 3D₂). Mesoscutum with glabrous area.

DISCUSSION AND CONCLUSION

Table 3 shows a list of stingless bee species reported in Thailand. Schwarz (1939) collected extensively in the Indo-Malayan region and recorded 20 species of *Trigona* from Thailand. Sakagami et al. (1985) recorded 41 species of *Trigona* in the Indo-Pacific area, including 22 species from Thailand. Rajitparinya et al. (2000) reported 8 species of *Trigona* in Thailand's northern province of Chiang Mai. In this study (2003) we report 10 species from eastern, western and northern regions of Thailand. Michener and Boongird (2004) reported *T.*

TABLE 2. Description of *T. binghami* Schwarz, 1939 and *T. minor* Sakagami, 1978

Character	<i>Trigona binghami</i>		<i>Trigona minor</i>	
	Mean±SD (mm.)	Min/Max (mm.)	Mean±SD (mm.)	Min/Max (mm.)
Body length (BL)	6.340±0.152	6.10 / 6.50	3.936±0.033	3.90 / 3.96
Fore wing length (FWL)	7.080±0.084	7.00 / 7.20	3.746±0.022	3.72 / 3.78
Fore wing width (FWW)	2.980±0.027	2.95 / 3.00	1.500±0.000	1.50 / 1.50
Hind wing length (HWL)	5.460±0.089	5.40 / 5.60	2.724±0.033	2.70 / 2.76
Hind wing width (HWW)	1.540±0.055	1.50 / 1.60	0.720±0.000	0.72 / 0.72
Hamuli number	8		5	
Mesoscutum length (ML)	1.810±0.065	1.70 / 1.85	1.320±0.000	1.32 / 1.32
Mesoscutum width (MW)	1.620±0.045	1.60 / 1.70	1.056±0.033	1.02 / 1.08
Tergite III length (T ₃ L)	4.160±0.114	4.00 / 4.30	2.388±0.050	2.34 / 2.46
Tergite III width (T ₃ W)	0.980±0.045	0.90 / 1.00	0.552±0.016	0.54 / 0.57
Tergite IV length (T ₄ L)	3.950±0.141	3.80 / 4.10	2.208±0.016	2.19 / 2.22
Tergite IV width (T ₄ W)	0.940±0.022	0.90 / 0.95	0.492±0.016	0.48 / 0.51
Sternite III length (ST ₃ L)	3.000±0.100	2.90 / 3.10	1.800±0.042	1.74 / 1.86
Sternite III width (ST ₃ W)	0.860±0.042	0.80 / 0.90	0.480±0.021	0.45 / 0.51
Stergite IV length (ST ₄ L)	2.910±0.065	2.85 / 3.00	1.812±0.027	1.80 / 1.86
Stergite IV width (ST ₄ W)	0.760±0.042	0.70 / 0.80	0.426±0.013	0.42 / 0.45
Hind femur length (HFL)	2.040±0.042	2.00 / 2.10	1.176±0.033	1.14 / 1.20
Hind tibia length (HTL)	2.970±0.027	2.95 / 3.00	1.752±0.016	1.74 / 1.77
Hind tibia width (HTW)	1.020±0.027	1.00 / 1.05	0.582±0.016	0.57 / 0.60
Hind basitarsus length (HBL)	1.200±0.035	1.15 / 1.20	0.792±0.016	0.78 / 0.81
Hind basitarsus width (HBW)	0.548±0.004	0.54 / 0.55	0.342±0.016	0.33 / 0.36

(*Tetragonula*) *sirindhornae*, a new species from the Isthmus of Kra in southern Thailand. Thus, a total of 32 species of *Trigona* have been recorded from Thailand.

Stingless bees (*Meliponini*) are from a diverse group of the Apidae that has rarely been reported from Thailand. Specimens collected for this paper from the western, eastern and

northern regions of Thailand do not provide full geographical coverage for Thailand and further studies are needed. All stingless bee species in this study, except *T. laeviceps* and *T. fuscobalteata*, were found in forests. *T. laeviceps* was most commonly found in suburban areas and most of the provinces in Thailand. *T. fuscobalteata* also occurred in suburban areas, but was less common than *T. laeviceps*.

TABLE 3. List of *Trigona* species found in Thailand

<i>Trigona</i> species	Michener and Boongird (2004)	This study (2003)	Rajitparinya et al. (2000)	Sakagami et al. (1985)	Schwarz, (1939)
<i>T. sirindhornae</i> Michener and Boongird, 2004	*				
<i>T. collina</i> Smith, 1857		*	*	*	*
<i>T. terminata</i> Smith, 1878		*	*	*	*
<i>T. apicalis</i> Smith, 1857		*	*	*	*
<i>T. doipaensis</i> Schwarz, 1939		*			*
<i>T. laeviceps</i> Smith, 1857		*	*	*	
<i>T. minor</i> Sakagami, 1978		*			
<i>T. thoracica</i> Smith, 1857		*		*	*
<i>T. binghami</i> Schwarz, 1939		*			
<i>T. fimbriata</i> Smith, 1857		*	*	*	
<i>T. fuscobalteata</i> Cameron, 1908		*		*	*
<i>T. itama</i> Cockerell, 1918				*	*
<i>T. melanoleuca</i> Cockerell, 1929			*	*	*
<i>T. peninsularis</i> Cockerell, 1927				*	*
<i>T. canifrons</i> Smith, 1857				*	*
<i>T. aliciae</i> Cockerell, 1929					*
<i>T. ferrea</i> Cockerell, 1929					*
<i>T. pagdeni</i> Schwarz, 1939				*	*
<i>T. geissleri</i> Cockerell, 1918				*	*
<i>T. iridipennis</i> Smith, 1854					*
<i>T. valdezi</i> Cockerell, 1918					*
<i>T. melina</i> Gribodo, 1893				*	*
<i>T. sarawakensis</i> Schwarz, 1937					*
<i>T. flavibasis</i> Cockerell, 1929					*
<i>T. ventalis</i> Smith, 1857			*	*	*
<i>T. scintillans</i> Cockerell, 1920			*	*	*
<i>T. nitidiventris</i> Smith, 1857				*	
<i>T. atripes</i> Smith, 1857				*	
<i>T. fuscibasis</i> Cockerell, 1920				*	
<i>T. hirashimai</i> Schwarz, 1939				*	
<i>T. pagdeniformis</i> Sakagami, 1978				*	
<i>T. latigenalis</i> Cockerell, 1969				*	
Total	1	10	8	22	20

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LITERATURE CITED

- Crane, E. 1999. The World History of Beekeeping and Honey Hunting. Gerald Duckworth & Co. Ltd, London.
- Heard, T. A. 1999. The role of stingless bees in crop pollination. Annual Review of Entomology, 44: 183-206.
- Michener, C. D. 1990. Classification of Apidae. University of Kansas Science Bulletin, 54: 75-153.
- Michener, C. D. 2000. The Bees of the World. The Johns Hopkins University Press, Maryland.
- Michener, C. D. and Boongird, S. 2004. A new species of *Trigona* from Peninsular Thailand (Hymenoptera: Apidae: Meliponini). Journal of the Kansas Entomological Society, 77: 143-146.
- Rajitparinya, T., Titayavan, M. and Burgett, M. 2000. The Ecology and Diversity of Stingless bees (Hymenoptera: Apidae) in Northern Thailand. Proceedings of the Seventh International Conference on Tropical bees: Management and Diversity & Fifth Asian Apicultural Association Conference, 19-25 March 2000, Chiang Mai, Thailand, pp. 91-95.
- Sakagami, S. F. 1975. Stingless bees (excl. *Tetragonula*) from the Continental Southeast Asia in the collection of Bernice P. Bishop Museum, Honolulu (Hymenoptera, Apidae). Journal of the Faculty of Sciences of Hokkaido University, Series VI, Zoology, 20: 49-76.
- Sakagami, S. F., Inoue, T. and Salmah, S. 1985. Key to the stinglessbee species found or expected from Sumatra. In: R.-i. Ohgushi (Ed.). Evolutionary Ecology of Insect in Humid Tropics, Especially in Central Sumatra. Kanasawa University, Japan. Sumatra Nature study (Entomology), pp. 37-43
- Salmah, S., Inoue, T. and Sakagami, S. F. 1990. Apid bee richness in Sumatra. In: S. F. Sakagami, R. Ohgushi and D. W. Roubik, (Eds). Natural History of Social Wasps and Bees in Equatorial Sumatra. Hokkaido University Press, Sapporo, pp. 139-163.
- Schwarz, H. F. 1939. The Indo-Malayan Species of *Trigona*. Bulletin of the American Museum of Natural History, 76: 83-141.
- Smitinand, T. 1980. Thai plant names (Botanical name-Vernacular name). Royal Forest Department, Bangkok, Bangkok.

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