

BIOMETRIC STUDIES OF THE STINGLESS BEE LEPIDOTRIGONA FLAVIBASIS COMPLEX (APIDAE: MELIPONINI) FROM NORTHERN THAILAND

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OBJECTIVE

The purpose of the work reported is to clarify *L. flavibasis* complex colony bionomics as observed in northern Thailand with managed colonies.

BACKGROUND

- There are 89 stingless bee species found in the Indo-Malayan/Australasian region, yet research on the colony bionomics of only a handful of these species has been conducted (Rasmussen, 2008).
- Stingless bees are a vital part of countless ecosystems and contribute significantly to biodiversity. There are 31 stingless bee species that are specifically found in Thailand (Chuttong et al. 2014).
- One of these species that has not been researched is *Lepidotrigona flavibasis*. *L. flavibasis* falls under the Meliponini tribe in the family Apidae (Michener, 2000).
- In Thailand, *L. flavibasis* is a popular choice for meliponiculture, which involves the cultivation of stingless bees.
- Meliponiculture is currently at an incipient stage but is starting to expand (Chuttong et al, 2014) and gain economic traction, with honey and cerumen collectively generating 5.76 million THB (\$177,500 USD) for the regional economy (Chuttong et al, 2014). This is in addition to the value of the primary function of meliponiculture, which is pollination.
- The demand for stingless bee honey has been rising (Basrawi et al, 2017). There are an estimated 700 stingless bee beekeepers in Thailand each with 20 to over 200 hives (Chuttong et al, 2014).
- The majority of commercial meliponiculture is found in southern Thailand, particularly prominent in the Chanthaburi and Trat provinces where there are approximately 5,000 hives (Chuttong et al, 2014)
- Thai stingless bee honey retails at a price 10 times the price of Thai *Apis mellifera* honey at 1,200-1,500 THB (\$37-\$47 USD) per kilogram (Chuttong et al, 2014).



Image 1: Log cavity colony #6 with brood nest on the lower left and honey and pollen pots surrounding it



Image 2: Bamboo cavity colony #12 with brood nest on the left and honey and pollen pots surrounding it

MATERIALS & METHODS

- Twelve colonies of *L. flavibasis* complex were obtained from local meliponiculturists in the northern Thai province of Chiang Mai in the Thepsadej and T. Suthep Subdistricts.
- The colonies ranged from 8 months to 3 years old. There was no standard unit size or volume in either the bamboo or log cavity colonies.
- Colonies were euthanized by freezing prior to the careful dissection of colony configuration.
- The following parameters were measured: number of adult workers, males, and queens were counted under microscope, number of brood cells, honey and pollen pots were counted individually, and their respective volumes were measured by digital caliper.
- Colony examinations took place during the wet season of 2017 (July), throughout the entire year of 2018, the dry season of 2019 (January-April), and the wet season of 2023 (August) at the Meliponini and Apini Research Laboratory, Department of Entomology and Plant Pathology, Faculty of Agriculture on the Chiang Mai University campus, Chiang Mai, Thailand.

Colony No.	Number of					
	Workers	Males	Queens	Brood cells	Pollen pots	Honey pots
1	3,893	1,288	1	6,288	155	328
2	3,833	381	1	7,225	7	372
3	7,406	45	1	7,502	248	350
4	3,227	0	1	2,329	32	90
5	3,608	15	1	9,846	51	12
6	1,089	0	1	2,297	88	591
Average	3,842.6 ±2036	288.2 ±511	1±0	5,914.5 ±3026	96.8 ±90	290.5 ±210

Table 1.1: Individual colony metrics of a log cavity colony

RESULTS & CONCLUSIONS

- From Tables 1.1 and 1.2 there is a broad variation of number of males present in *L. flavibasis* colonies. The highest number was colony one with 1,288 males and the lowest were colonies four and six with zero males. Besides the difference in males there are considerable variations in size between colonies living in log and bamboo cavities.
- The average bamboo cavity colony was larger than the average log cavity brood nest. Surprisingly, there is a comparable amount of pollen in both types of cavities, with the average bamboo cavity colony having 94.8 pots compared to the average 96.8 pots of the log cavity colonies. This suggests that *L. flavibasis* has a limit for how much pollen they will store no matter the size of the cavity. This is not true with honey storage amounts, with the average bamboo cavity colonies containing 127.3 honey pots compared to the 290.5 honey pot average of the log cavity brood nest. This suggests that *L. flavibasis* will only limit their honey production due to space confinements.
- In addition to separate pollen and honey pots, 'mixed' pots were observed containing both pollen and honey in the same storage container. The shape and size of storage pots vary across Meliponini, and Table 2 shows the average sizes of *L. flavibasis* honey and pollen pots as well as brood cells.
- Stingless bees like *L. flavibasis* create geopropolis, a specific type of propolis that includes plant resins, waxes, and earth debris. Geopropolis is used in the hive for defending the colony by reinforcing the hive structure. (Simone-Finstrom et al, 2010). Another name for geopropolis is batumen. Batumen was observed to be present on the exterior of some of the log cavity colonies. There was also involucrum, a thin cerumen layer that covers and protects the brood nest from the resource pots. Cerumen is a mixture of wax and plant resin, and is used to construct resource pots, brood cells and build other nest structures. The structure of the brood nest in all colonies were horizontal comb layers that were stacked on top of each other, and the layers were connected by small cerumen columns.

Colony No.	Number of					
	Workers	Males	Queens	Brood cells	Pollen pots	Honey pots
7	2,671	11	1	5,541	49	130
8	1,337	98	1	1,214	29	59
9	1,057	149	1	1,032	169	108
10	1,861	95	1	2,592	65	107
11	1,333	23	1	3,177	151	49
12	1,510	8	0	446	106	311
Average	1628.2 ±575	64±58	0.8±0.4	2,333.7 ±1875	94.8 ±57	127.3 ±95

Table 1.2: Individual colony metrics of a bamboo cavity colony



Image 3: *L. flavibasis* queen and worker



Image 4: Close up of a brood comb layer of *L. flavibasis*

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