

## NESTING BEHAVIOR AND NEST STRUCTURE OF *APIS FLOREA* (FABRICIUS, 1787) FROM ALEL-THAUNG AND THA-HTAY-KONE VILLAGES IN YESAGYO ENVIRONS

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### Abstract

Nesting behavior and nest structure of *Apis florea* (Fabricius, 1787) was conducted from Alel-Thaung and Tha-Htay-Kone Villages in Yesagyo environs from December, 2018 to August, 2019. A total of 150 colonies was used for nesting by *Apis florea*. They used 31 different plant species which belong to 20 families and the man-made structures. *Tamaridus indica*, *Mangifera indica* and *Ziziphus jujuba* were most preferred nesting plants. The *Apis florea* nest occupied on the different height of the plants, the highest number of colonies was found in 3-6m height (57 colonies), followed by 0-3m (40 colonies), 6-9m (29 colonies), 9-12m (16 colonies), and 12m above (eight colonies). The measurement of comb length  $18.95 \pm 7.5$ cm, ranging from 4 to 30 cm; comb width  $16.85 \pm 5.74$  cm, ranging from 2 to 26 cm and comb thickness  $1.95 \pm 0.22$  cm, ranging from 1 to 2 cm (n=20) were recorded. The number of honey storage cells,  $36.3 \pm 6.64$  (n=20), worker cells,  $63.1 \pm 7.61$  cells (n=20), drone cells,  $27.75 \pm 4.58$  (n=8) and queen cells  $5.71 \pm 3.69$  cells (n=7) recorded in two centimeter square were observed in the study area.

**Keywords:** Nesting behavior, nest structure, *Apis florea*, Yesagyo environs

### Introduction

Honeybees play an important ecological role as pollinators of many plant species, and their products are the basis for a multi-million dollar commercial industry around the world. They are major agricultural pollinators around the world and are keystone pollinators in tropical ecosystems. Pollination has been considered a keystone process to ecosystem function through the facilitation of both plant and animal diversity (Suwannapong. *et.al*, 2014).

The dwarf honeybee, *Apis florea* (Hymenoptera: Apidae) is a single-combed, open- nesting small bees. It is a wild species, not readily managed by man but is highly important as a pollinator of crops. It builds small sized single comb that attached to a twig of small trees or dense bushes in tropical forests, scrubby/bushy vegetation as also in farming areas, especially orchards (Basavarajappa, 2008).

The little bee *A. florea* builds a single vertical comb nest, which is constructed around the stem of a bush, branches of bushes, hedges, trees or a dried thick stick in the shaded places. The nesting location of *A. florea* is unique, not easily accessible to animals including mankind that could help avoid animals including human interferences and vehicular traffic. Accordingly, *A. florea* builds its colony at interior side away from the road. *A. florea* avails various plant species including human-built structures for nesting under shady places on the twigs/branches. Shady places help protect the colony members from bright light, strong winds and inclement weather conditions (Vaudo, *et. al.*, 2012).

The single comb of the *Apis florea* nest contains cells of four sizes. The large storage cells for the honey are very deep and constructed in such a manner that the comb bulges out on either side and at the top. The small worker cells are located below the honey storage cells. The considerably larger drone cells are mostly found in the lower part of the comb. The pear shape queen cells, which are the largest of the cells, are located near the bottom. These can be observed when a colony loses its queen, and are emergency queen-cells (Ruttner, 1988).

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*Apis florea* choose different elevations in trees and shrubby plants were found suitable for the construction of colonies. The combs were found at the peripheral and middle regions of thickly interspersed canopy in trees and shrubs. Bee flora or bee plant, are the plants from which bees collect pollen and nectar. Honeybees forage on a variety of plant species to collect nectar and pollen, including agricultural crops and native plants. Yesagyoo environs are the largest areas on a variety of agricultural crops and native plants for preferring by *Apis florea*. So, the present study was conducted with the following objectives;

- to investigate the nesting behavior and nest height above the ground of *Apis florea*
- to observe different type of cells in the combs by *Apis florea* in this study areas

## Materials and Methods

### Study area and period

The study area was conducted the Alel-Thaung Village (Site I) is situated 21° 29' 46" N, 95° 14' 29" E. This area is about 4.8km. Tha-Htay-Kone Village (Site II) is situated 21° 30' 13" N, 95° 14' 34" E, and the areas is about 3.2km. The two study areas are situated on the west of the Chindwin River in Yesagyoo environs. The study period lasted from December, 2018 to August, 2019.

### Data collection

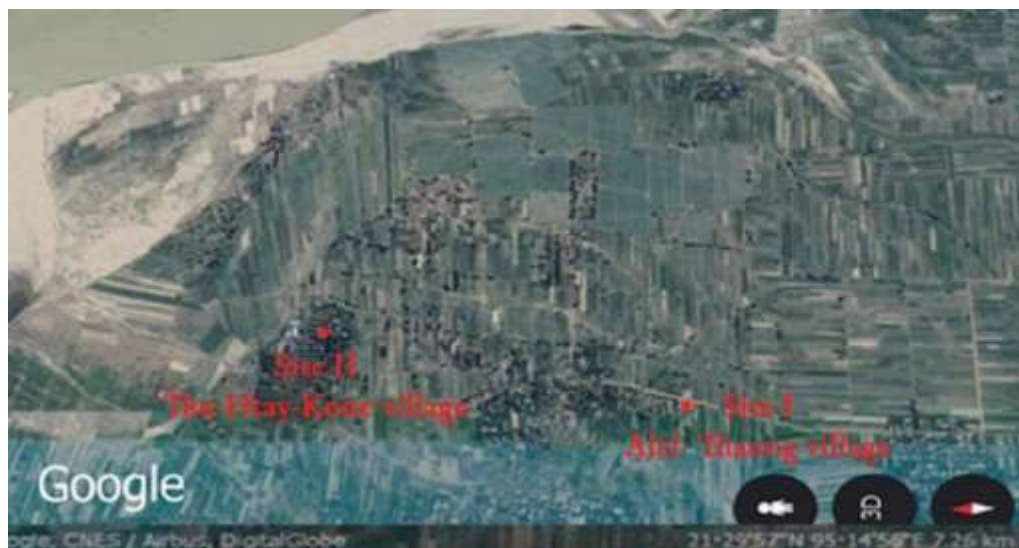
All the wild colonies were observed self-observation with the help of native people. The observations were made twice a month. The number of wild colonies was recorded in large trees, small trees, shrubs, man-made structures, grasses and ornamental plants. The collected combs from the fields were put into the plastic bags.

### Measurements of comb

The height of the nests above the ground was measured to the nearest meter by using a bamboo pole. The length, width and thickness of honey combs were measured with Vernier caliper. The number of worker cells, drone cells, honey storage cell and queen cells in two centimeter square of each comb were counted and recorded.

### Identification

The honeybees were identified according to Bingham (1897), Suwannapong (2011) and Noah Wilson-Rich (2014). The name of plants was identified by Kress *et.al*, (2003).



**Figure 1** Location map of study area (Source: Google Earth)

## Results

### Descriptive account on the species studied

Phylum	- Arthropoda
Class	- Insecta
Order	- Hymenoptera
Family	- Apidae
Genus	- <i>Apis</i>
Species	- <i>A. florea</i> (Fabricius, 1787)
Common name	- Dwarf honey bee
Local name	- Yin-pya

There are three kinds of bees in a colony: the worker, drone and queen. Workers do not lay eggs, but they carry on all the other duties in the colony, including comb building, brood care, and colony protection. The worker brood cells are made on the flat surface in the middle of the comb (Plate 1 A & Plate 2 C). Drones have no pollen baskets or specialized glands. Drone cells were found on the lower part of the comb (Plate 1B & Plate 2 D). Queen is the largest bee in the colony, and has a long, pointed abdomen. Queen cells are found at the bottom edge of the comb and are quite large (Plate 1 C & Plate 2 E).

### Nesting habit of the *Apis florea*

*Apis florea* colonies built a small comb nest, and the comb is constructed around the stem of a bush, branches of bushes, hedges, trees or a dried thick stick in the shaded places. *A. florea* avails various plant species including human-built structures for nesting under shady places on the twigs (Table 1). A variety of 31 plants belonging to 20 families utilized as nesting plants and two human built structures for nest construction were recorded in the study area. The highest number of 26 nesting plants in Site I, followed by 16 nesting plants in Site II was observed. Human built structure as yard and pagoda were observed in both study sites during the study period (Table 2, Fig. 1).

### Nest height above the ground of the *Apis florea*

*Apis florea* constructed their nests at height ranging from 0-3m to 12m above the ground. The plant height with the highest number of colonies was found in 3-6m (30 colonies), followed by 0-3m (27 colonies), 6-9m (20 colonies), 9-12m (nine colonies) and 12m above (seven colonies) in Site I (Table 3, Fig. 2). In Site II, plant height with the highest number of colonies was found in 3-6m (27 colonies), followed by 0-3m (13 colonies), 6-9m (nine colonies) and 9-12m (seven colonies), and 12m above (one colonies) (Table 4, Fig. 2).

### Nest structure of the *Apis florea*

The top the nest encircles the strong stem is thick, but as the comb is built further down, it becomes thin in depth, although as broad as the upper portion. In the same comb, brood is present in the lower section and the honey is found in the upper section. The honeycomb forms the interior structure of the hive, is made up of six-sided cells, and is made of beeswax. The comb cells of honeybee found in hexagonal in shape except the honey storage cells, these cells are asymmetrical hexagonal shape (Plate 2 A).

### Comb measurements of the *Apis florea*

The highest colonies were 32, colonies in December and lowest six, colonies in July during in months (Table 5). The measurement of comb length  $18.95 \pm 7.5$ cm, ranging from 4 to 30 cm; comb width  $16.85 \pm 5.74$  cm, ranging from 2 to 26 cm; comb thickness  $1.95 \pm 0.22$  cm, ranging from 1 to 2 cm (n=20) (Table 6). The number of honey storage cells,  $36.3 \pm 6.64$  (n=20), worker cells,

63.1±7.61cells (n=20), drone cells, 27.75±4.58 (n=8) was recorded in two centimeter square. The number of queen cells was 5.71±3.69 cells (n=7) were recorded in the study areas (Table 7, Fig 3, Plate 2).

**Table 1 Nesting host plants of *Apis florea* in study areas**

No	Family	Scientific Name	Common Name	Local Name	Plant type	No,of colonies
1	Rhamnaceae	<i>Ziziphus jujuba</i>	Jujube	Zee	Tree	30
2	Meliaceae	<i>Azadirachta indica</i>	Neem	Tama	Tree	10
3	Caesalpiniaceae	<i>Tamarindus indica</i>	Tamarind	Magyi	Tree	6
4		<i>Cassia siamea</i>	Siamese cassia	Mezali	Tree	10
5		<i>Bauhinia purpurea</i>	Swedaw-ni	Swe-daw	Tree	1
6		<i>Acrocarpus fraxinifolius</i>	Pink cedar	Ye-tama	Tree	5
7	Anacardiaceae	<i>Mangifera indica</i>	Mango	Thayet	Tree	18
8	Annonaceae	<i>Annona squamosa</i>	Custard apple	Awzar	Small Tree	2
9		<i>Annona muricata</i>	Sour-Sop	Duyin-awza	Small Tree	1
10	Arecaceae	<i>Borassus flabellifer</i>	Plamyra palm	Htan	Tree	2
11	Gramineae	<i>Bambusa sp.</i>	Bamboo	Nil	Grass	3
12	Mimosaceae	<i>Albizia lebbek</i>	Zo-fek	Kokko	Tree	15
13		<i>Leucaena leucocephala</i>	Aweya	Baw-zagaing	Tree	9
14		<i>Pithecellobium dulce</i>	Tayok-magyi	Thinbaw-magyi	Tree	2
15		<i>Acacia concinna</i>	Kin-mon-gyin	Kin-mon-gyin	Climber	1
16	Myrtaceae	<i>Psidium guajava</i>	Guava	Malaka	Small Tree	2
17		<i>Eugenia jambolana</i>	Malay Apple	Thabye	Tree	1
18	Rutaceae	<i>Citrus medica</i>	Lemon	Shauk	Shrub	2
19		<i>Feronia elephantum</i>	Wood Apple	Thee	Tree	2
20	Hypericaceae	<i>Garcinia mangostana</i>	Mangosteen	Mingut	Small tree	1
21		<i>Calophyllum inophyllum</i>	Pannay Tree	Pon-nyet	Tree	1
22	Rubiaceae	<i>Ixora coccinea</i>	Flame Tree	Pon-na-yeik	Shrub	2
23	Moraceae	<i>Morus indica</i>	Indian Mulberry	Posa	Small Tree	1
24	Boraginaceae	<i>Cordia myxa</i>	Taung-thanut	Thanat	Tree	2
25	Euphorbiaceae	<i>Embllica officinalis</i>	India Gooseberry	Zeebyu	Tree	1
26	Amaranthaceae	<i>Amaranthus blitoides</i>	Hin-nu-nwe	Hin-nu-nwe	Herb	1
27	Meliasnaceae	<i>Swietenia macrophylla</i>	Mahogany	Mahogany	Tree	2
28	Musaceae	<i>Musa sapientum</i>	Banana	Hnget-pyaw	Herb	5
29	Papilionaceae	<i>Dolichos lablab</i>	Lablab Bean	Pe-pazun	Climber	5
30	Solanaceae	<i>Solanum melongena</i>	Egg-Plant	Khayan	Shrub	1
31		<i>Capsicum frutescens</i>	Chilli	Nga-yok	Shrub	4

**Table 2 The nesting plants used by *Apis florea* in each study sites**

Sr no	Scientific name	Common name	Site I	Site II
1	<i>Azadirachta indica</i>	Neem	√	√
2	<i>Acrocarpus fraxinifolius</i>	Pink cedar	-	√
3	<i>Annona squamosa</i>	Custard apple	√	-
4	<i>Albizia lebbek</i>	Zo-fek	√	√
5	<i>Acacia concinna</i>	Kin-mon-gyin	√	-
6	<i>Amaranthus blitoides</i>	Hin-nu-nwe	√	-
7	<i>Annona muricata</i>	Sour-Sop	-	√
8	<i>Bauhinia purpurea</i>	Swedaw-ni	-	√
9	<i>Borassus flabellifer</i>	Plamyra palm	√	√
10	<i>Bambusa sp.</i>	Bamboo	√	√
11	<i>Cassia siamea</i>	Siamese cassia	√	√
12	<i>Citrus medica</i>	Lemon	√	-

Sr no	Scientific name	Common name	Site I	Site II
13	<i>Calophyllum inophyllum</i>	Pannay Tree	√	-
14	<i>Cordia myxa</i>	Taung-thanut	√	√
15	<i>Capsicum frutescens</i>	Chilli	√	-
16	<i>Dolichos lablab</i>	Lablab Bean	√	-
17	<i>Embllica officinalis</i>	India Gooseberry	-	√
18	<i>Eugenia jambolana</i>	Malay Apple	√	-
19	<i>Feronia elephantum</i>	Wood Apple	√	-
20	<i>Garcinia mangostana</i>	Mangosteen	√	-
21	<i>Ixora eoccinea</i>	Flame Tree	√	√
22	<i>Leucaena leucocephala</i>	Aweya	√	√
23	<i>Mangifera indica</i>	Mango	√	√
24	<i>Morus indica</i>	Indian Mulberry	√	-
25	<i>Musa sapientum</i>	Banana	√	-
26	<i>Pithecellobium dulce</i>	Tayok-magyi	√	-
27	<i>Psidium guajava</i>	Guava	√	-
28	<i>Swietenia macrophylla</i>	Mahogany	-	√
29	<i>Solanum melongena</i>	Egg-Plant	√	-
30	<i>Tamarindus indica</i>	Tamarind	√	√
31	<i>Ziziphus jujuba</i>	Jujube	√	√
	Human-built Structure	-	√	√
<b>Total</b>			<b>26</b>	<b>16</b>

**Table 3 Occurrence of *Apis florea* colonies in different plant height in study Site I**

Sr no.	Scientific name	Common name	Plant height					Total
			0-3m	3-6m	6-9m	9-12m	12m above	
1	<i>Azadirachta indica</i>	Neem	2	3	1	-	-	6
2	<i>Annona squamosa</i>	Custard apple	-	2	-	-	-	2
3	<i>Albizia lebbek</i>	Zo-fek	-	-	3	2	5	10
4	<i>Acacia concinna</i>	Kin-mon-chin	1	-	-	-	-	1
5	<i>Amaranthus blitoides</i>	Hin-nu-nwe	1	-	-	-	-	1
6	<i>Borassus flabellifer</i>	Plamya palm	-	-	1	-	-	1
7	<i>Bambusa sp.</i>	Bamboo	-	-	2	-	-	2
8	<i>Cassia siamea</i>	Siamese cassia	1	-	2	2	-	5
9	<i>Citrus medica</i>	Lemon	2	-	-	-	-	2
10	<i>Calophyllum inophyllum</i>	Pannay Tree	-	1	-	-	-	1
11	<i>Capsicum frutescens</i>	Chilli	4	-	-	-	-	4
12	<i>Cordia myxa</i>	Taung-thanut	-	-	1	-	-	1
13	<i>Dolichos lablab</i>	Lablab Bean	5	-	-	-	-	5
14	<i>Eugenia jambolana</i>	Malay Apple	1	-	-	-	-	1
15	<i>Feronia elephantum</i>	Wood Apple	-	2	-	-	-	2
16	<i>Garcinia mangostana</i>	Mangosteen	-	1	-	-	-	1
17	<i>Ixora eoccinea</i>	Flame Tree	1	-	-	-	-	1
18	<i>Leucaena leucocephala</i>	Aweya	-	3	2	-	-	5
19	<i>Mangifera indica</i>	Mango	3	5	2	3	-	13
20	<i>Morus indica</i>	Indian Mulberry	1	-	-	-	-	1
21	<i>Musa sapientum</i>	Banana	3	2	-	-	-	5
22	<i>Pithecellobium dulce</i>	Tayok-magyi	-	2	-	-	-	2
23	<i>Psidium guajava</i>	Guava	-	2	-	-	-	2
24	<i>Solanum melongena</i>	Egg-Plant	1	-	-	-	-	1
25	<i>Tamarindus indica</i>	Tamarind	-	1	2	-	-	3
26	<i>Ziziphus jujuba</i>	Jujube	-	6	4	2	2	14
	Human-built Structure		1	-	-	-	-	1
<b>Total</b>			<b>27</b>	<b>30</b>	<b>20</b>	<b>9</b>	<b>7</b>	<b>93</b>

**Table 4 Occurrence of *Apis florea* colonies in different plant height in study Site II**

Sr no.	Scientific name	Common name	Plant height					Total
			0-3m	3-6m	6-9m	9-12m	12m above	
1	<i>Azadirachta indica</i>	Neem	1	2	1	-	-	4
2	<i>Acrocarpus fraxinifolius</i>	Pink cedar	2	3	-	-	-	5
3	<i>Albizia lebbek</i>	Zo-fek	-	-	2	2	1	5
4	<i>Annona muricata</i>	Sour-Sop	1	-	-	-	-	1
5	<i>Bauhinia purpurea</i>	Swedaw-ni	-	-	1	-	-	1
6	<i>Borassus flabellifer</i>	Plamyra palm	-	-	-	1	-	1
7	<i>Bambusa sp.</i>	Bamboo	-	-	1	-	-	1
8	<i>Cassia siamea</i>	Siamese cassia	-	2	1	1	-	4
9	<i>Cordia myxa</i>	Taung-thanut	-	-	1	-	-	1
10	<i>Emblica officinalis</i>	India Gooseberry	-	1	-	-	-	1
11	<i>Ixora eoccinea</i>	Flame Tree	1	-	-	-	-	1
12	<i>Leucaena leucocephala</i>	Aweya	2	2	-	-	-	4
13	<i>Mangifera indica</i>	Mango	2	3	-	3	-	8
14	<i>Swietenia macrophylla</i>	Mahogany	-	2	-	-	-	2
15	<i>Tamarindus indica</i>	Tamarind	-	3	-	-	-	3
16	<i>Ziziphus jujuba</i>	Jujube	3	9	2	-	-	14
	Human-built Structure		1	-	-	-	-	1
<b>Total</b>			<b>13</b>	<b>27</b>	<b>9</b>	<b>7</b>	<b>1</b>	<b>57</b>

**Table 5 Occurrence of *Apis florea* colonies on different nesting plants during various months**

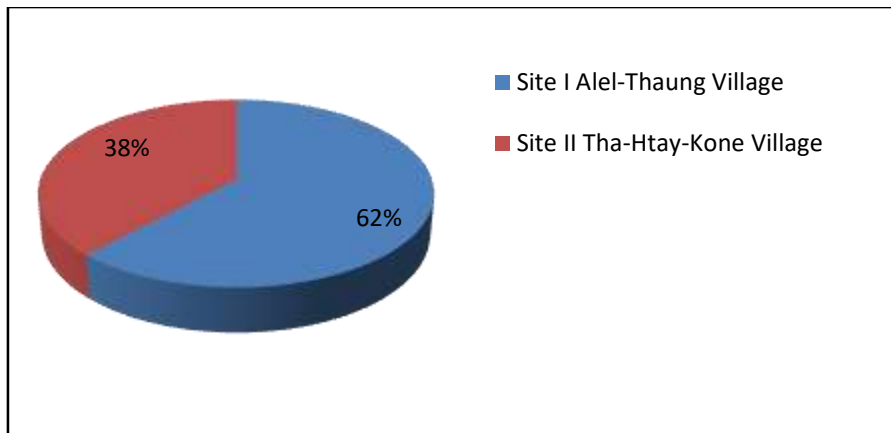
Sr no.	Scientific name	Dec	Jan	Feb	March	April	May	June	July	Aug	Total colonies (%)	
1	<i>Ziziphus jujuba</i>	6	5	5	6	1	2	1	1	3	30	20.0
2	<i>Azadirachta indica</i>	2	1	2	2	1	1	1	-	-	10	6.7
3	<i>Tamarindus indica</i>	-	1	1	-	1	-	1	1	1	6	4.0
4	<i>Cassia siamea</i>	2	2	1	-	-	1	2	1	1	10	6.7
5	<i>Bauhinia purpurea</i>	-	1	-	-	-	-	-	-	-	1	0.7
6	<i>Acrocarpus fraxinifolius</i>	2	1	2	-	-	-	-	-	-	5	3.3
7	<i>Mangifera indica</i>	5	3	2	3	2	1	-	-	2	18	12.0
8	<i>Annona squamosa</i>	-	-	1	-	1	-	-	-	-	2	1.3
9	<i>Annona muricata</i>	-	-	-	1	-	-	-	-	-	1	0.7
10	<i>Borassus flabellifer</i>	-	1	-	1	-	-	-	-	-	2	1.3
11	<i>Bambusa sp.</i>	1	-	1	1	-	-	-	-	-	3	2.0
12	<i>Albizia lebbek</i>	4	1	1	2	2	2	1	1	1	15	10.0
13	<i>Leucaena leucocephala</i>	1	1	2	2	2	1	-	1	-	9	6.0
14	<i>Pithecellobium dulce</i>	-	-	1	-	1	-	-	-	-	2	1.3
15	<i>Acacia concinna</i>	-	-	1	-	-	-	-	-	-	1	0.7
16	<i>Psidium guajava</i>	-	1	-	1	-	-	-	-	-	2	1.3
17	<i>Eugenia jambolana</i>	-	-	-	1	-	-	-	-	-	1	0.7
18	<i>Citrus medica</i>	1	-	1	-	-	-	-	-	-	2	1.3
19	<i>Feronia elephantum</i>	-	-	1	-	1	-	-	-	-	2	1.3
20	<i>Garcinia mangostana</i>	-	1	-	-	-	-	-	-	-	1	0.7
21	<i>Calophyllum inophyllum</i>	-	1	-	-	-	-	-	-	-	1	0.7
22	<i>Ixora eoccinea</i>	1	-	-	1	-	-	-	-	-	2	1.3
23	<i>Morus indica</i>	-	-	-1	-	-	-	-	-	-	1	0.7
24	<i>Cordia myxa</i>	1	-	-	-	-	1	-	-	-	2	1.3
25	<i>Emblica officinalis</i>	-	-	-	-	-	1	-	-	-	1	0.7
26	<i>Amaranthus blitoides</i>	1	-	-	-	-	-	-	-	-	1	0.7
27	<i>Swietenia macrophylla</i>	-	-	-	-	-	-	2	-	-	2	1.3
28	<i>Musa sapientum</i>	1	-	-	1	1	-	-	1	1	5	3.3
29	<i>Dolichos lablab</i>	1	2	1	1	-	-	-	-	2	5	3.3
30	<i>Solanum melongena</i>	-	-	-	1	-	-	-	-	-	1	0.7
31	<i>Capsicum frutescens</i>	2	-	1	1	-	-	-	-	-	4	2.7
	Human-built Structure	1	-	-	-	-	-	1	-	-	2	1.3
<b>Total</b>		<b>32</b>	<b>21</b>	<b>23</b>	<b>25</b>	<b>13</b>	<b>10</b>	<b>9</b>	<b>6</b>	<b>11</b>	<b>150</b>	

**Table 6 Measurements of some honey combs of *Apis florea* in the study areas**

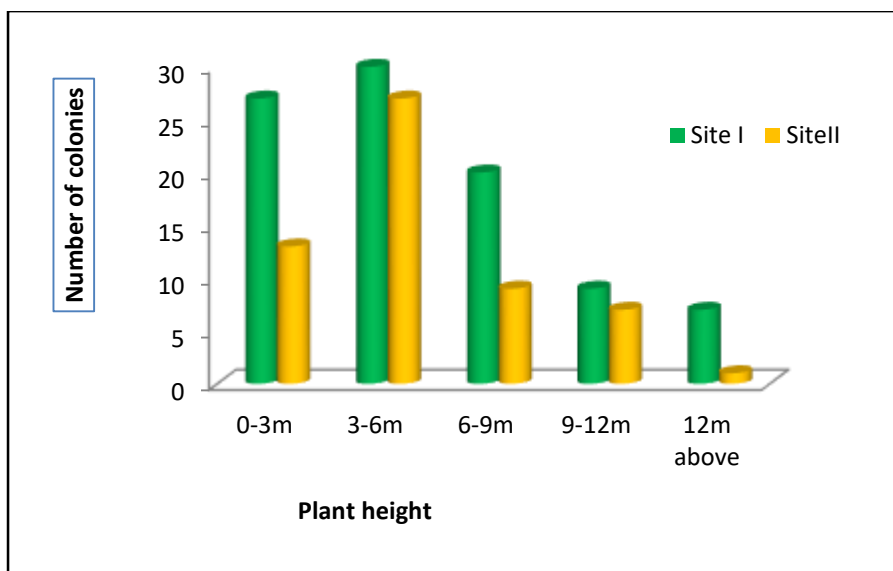
Sr no.	Measurement of honey comb (cm) (n=20)		
	Length	Width	Thickness
1	26.00	19.00	2.00
2	25.00	23.00	2.00
3	17.00	26.00	2.00
4	25.00	17.00	2.00
5	14.00	12.00	2.00
6	9.00	7.00	2.00
7	10.00	12.00	2.00
8	17.00	18.00	2.00
9	16.00	18.00	2.00
10	4.00	2.00	1.00
11	22.00	20.00	2.00
12	14.00	13.00	2.00
13	22.00	20.00	2.00
14	30.00	24.00	2.00
15	20.00	18.00	2.00
16	16.00	18.00	2.00
17	30.00	20.00	2.00
18	14.00	12.00	2.00
19	22.00	20.00	2.00
20	26.00	18.00	2.00
Mean ± SD	18.95 ± 7.5	16.85 ± 5.74	1.95 ± 0.22

**Table 7 Numbers of honey storage cells, worker cell, drone cell, and queen cells of *Apis florea***

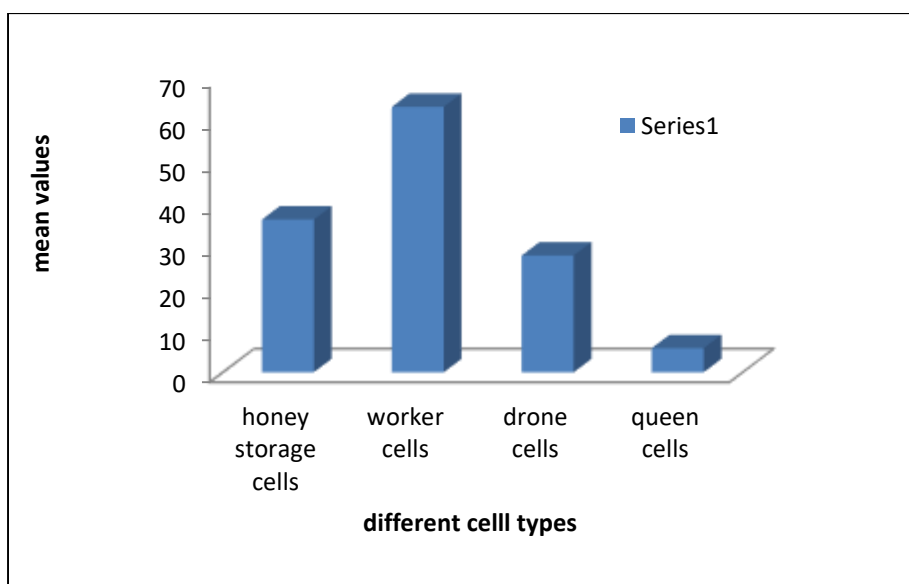
Sr no.	No; of honey storage cells (2cm <sup>2</sup> ) (n=20)	No; of worker cells (2 cm <sup>2</sup> ) (n=20)	No; of drone cells (2 cm <sup>2</sup> ) (n=8)	No; of queen cells (n=7)
1	29.00	58.00	22.00	0.00
2	33.00	66.00	25.00	0.00
3	39.00	61.00	0.00	0.00
4	42.00	59.00	0.00	0.00
5	36.00	67.00	0.00	0.00
6	27.00	57.00	0.00	0.00
7	38.00	66.00	0.00	0.00
8	42.00	61.00	0.00	0.00
9	37.00	62.00	0.00	5.00
10	29.00	51.00	0.00	0.00
11	30.00	70.00	30.00	1.00
12	38.00	56.00	0.00	0.00
13	48.00	60.00	24.00	12.00
14	54.00	82.00	33.00	7.00
15	30.00	58.00	32.00	8.00
16	32.00	56.00	0.00	0.00
17	34.00	67.00	26.00	2.00
18	38.00	66.00	0.00	0.00
19	34.00	80.00	30.00	5.00
20	36.00	59.00	0.00	0.00
Mean ± SD	36.3 ± 6.64	63.10 ± 7.61	27.75 ± 4.58	5.71 ± 3.69



**Figure 1** Percentage composition of nesting host plants by *Apis florea* in the study sites

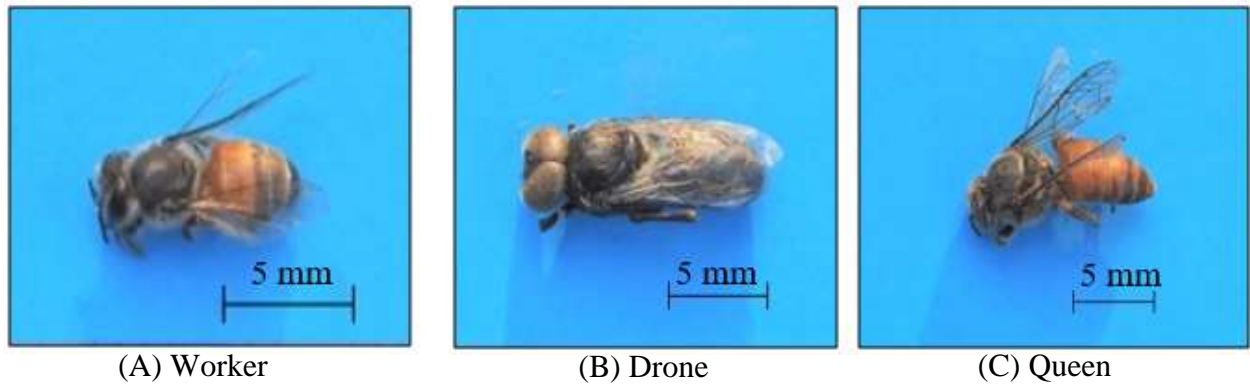


**Figure 2** Comparison of *Apis florea* colonies in different plant height in the study areas

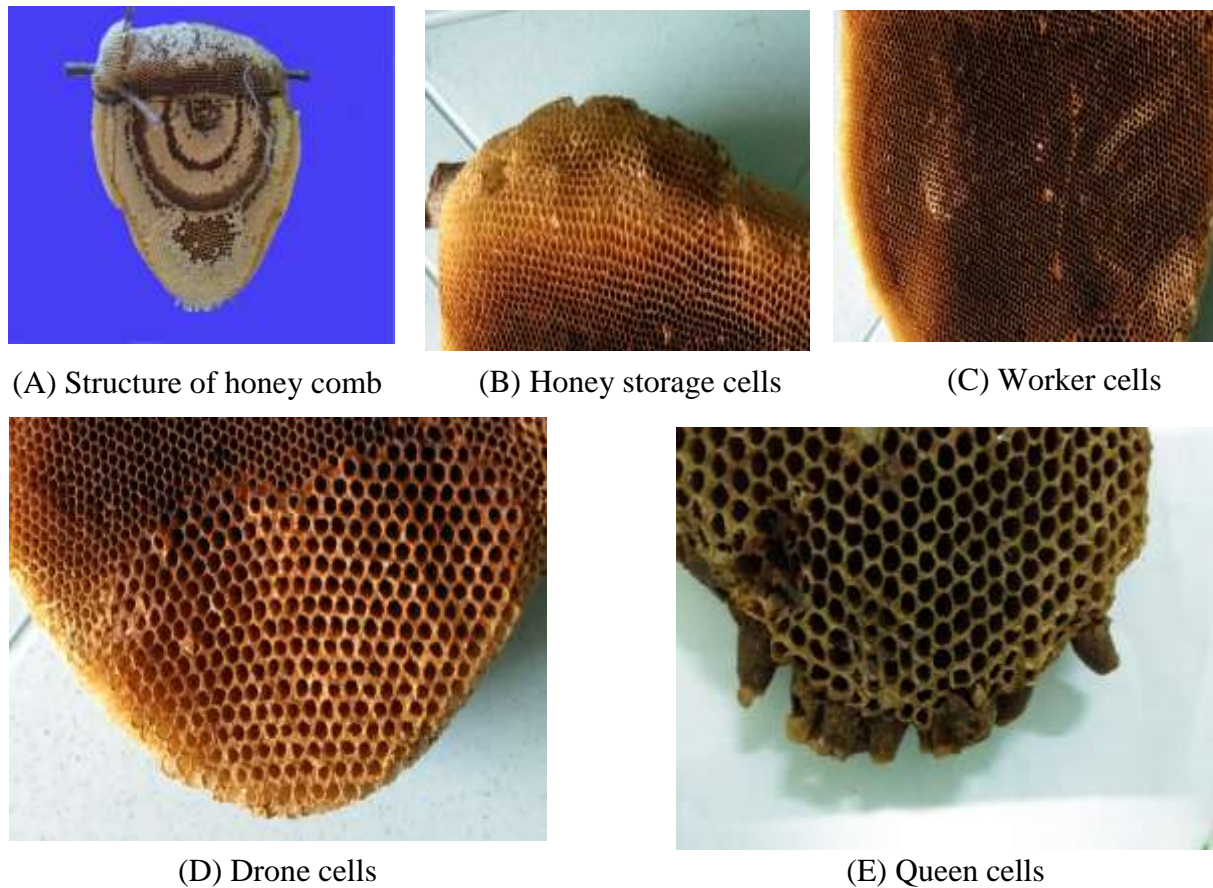


**Figure 3** Mean value of different cell types in *Apis florea*





**Plate 1** Three castes of *Apis florea*



**Plate 2** Different cell types of *Apis florea*

### Discussion

*A. florea* prefers to live under wild conditions, not readily managed by man. It builds small sized single comb surrounded the plant twig/branch from which the comb was suspended. A total of 150 colonies and 31 plant species belonging to 20 families and two human built structures at different place for nesting were recorded from Yesagyo environs.

*A. florea* nests are attached to a wide variety of plants. Nests of *A. florea* occur in wooded areas, urban settings, areas with intensive agricultural activity as well as in the savanna stated by Franssen (1932). In the study, *Apis florea* preferred to nest on various plants of Caesalpinaceae, Mimosaceae families with the highest (four species, 12.90% in each), followed by Annonaceae,

Myrtaceae, Rutaceae, Hypericaceae and Solanaceae (two species, 6.45% in each). The remaining families with one species each, (3.23%) were recorded.

Zewdu *et al.* (2017) stated that concerning preference of plant species to the nest were found on dried and alive *Ziziphus* spp. *A. florea* in the assessed localities prefers small branches of *Ziziphus* for their nesting. In the present study, the highest colonies on *Ziziphus jujube* (Zee) (30 colonies, 20.00%), followed by *Mangifera indica* (Thayet) (18 colonies, 12.00%), *Albizia lebbek* (Kokko) (15 colonies, 10.00%), *Azadirachta indica* (Tama), *Cassia siamea* (Mezali) (ten colonies, 6.67% in each), *Leucaena leucocephala* (Baw-zagaing) (nine colonies, 6.00%) and *Musa sapientum* (Hngget-pyaw) (five colonies, 3.33%) were observed.

The present data showed the highest number of 26 nesting plants (61.90%) in Site I. It can be assumed that Site I including agricultural crops and native plants are pollinated by honeybee. Of these, several plant species are visited by honeybees such as corn, sunflower, mango, cucurbit plants and jujube. While the lower number of 16 varieties of nesting plants (38.10%) was occurred in Site II. It can be assumed that this area is less suitable habitats as foraging nesting plants preferring for the honeybee.

According to Narayanaswamy and Basavarajappa (2013), *A. florea* preferred more in lower elevations (i.e., ground level to upto 15ft height) compared to higher elevations. However, *A. florea* didn't prefer much higher elevations (i.e., 15.1ft onwards) for nesting. In the present study, the highest number of colonies was found in 3-6m (30 colonies, 20.00%), followed by 0-3m (27colonies, 18.00%), 6-9m (20 colonies, 13.33%), 9-12m (nine colonies, 6.00%) and 12m above (seven colonies, 4.66%) in Site I. In Site II the highest number of colonies was found in 3-6m (27 colonies, 18.00%), followed by 0-3m (13 colonies, 8.67%), 6-9m (nine colonies, 6.00%), 9-12m (seven colonies, 4.66%) and 12m above (one colonies, 0.67%).

Khin Su Myat (2015) observed that the mean value of length and width of honey comb were  $18.33\pm 4.36$ cm and  $19.43\pm 4.68$ cm respectively. In the present data, the mean value of length, width and thickness of honey comb were  $18.95\pm 7.5$ cm,  $16.58\pm 5.74$ cm and  $1.95\pm 0.22$ cm respectively. May Yu Maw (2016) observed that the mean value of number of honey storage cells, worker cells, drone cells and queen cells were  $68.20\pm 9.14$ cm,  $114.05\pm 4.55$ cm,  $45.44\pm 2.99$ cm and  $6.33\pm 1.15$ cm respectively per three centimeter square. In the present data the mean value of number of honey storage cells, worker cells, drone cells and queen cells were  $36.3\pm 6.64$ cm,  $63.10\pm 7.61$ cm,  $27.75\pm 4.58$ cm and  $5.71\pm 3.69$ cm cells respectively per two centimeter square. Worker and drone brood are reared in a hexagonal cells, queen development takes place in cells shaped somewhat like peanuts. Swarm queen cells are built along the lower edge of the comb, often in large numbers: as many as 20 cells of various ages may be seen in a colony stated by (Michener, 2000). In the present study, queen cells of 1- 12 range in each colony were observed.

Narayanaswamy and Basavarajappa (2013), stated that total 139 normal colonies were recorded from January to June and the highest (36) normal colonies were recorded during February, followed by March (31) and April (29 colonies). However, in May and June the normal colonies were less (10 each) were occurred during different months at Manasagangotri campus. In the present study, total 150 colonies were recorded from December to August and highest (32, colonies) were recorded during December, followed by March (25, colonies), February (23, colonies), January (21, colonies), April (13, colonies), August (11, colonies), May (ten, colonies), June (nine, colonies), and July (six, colonies). Thus, the colonies mostly depended on the proportion of floral abundance and favorable weather condition.

It can be concluded that honey bees produce honey. Without the work of honey bees our agricultural crops would suffer huge losses, as the plants would produce considerably less fruit and seed. Honey bees are the farmer's favorite insects. Therefore, the honey bee's commercial value

comes from the role it plays in the pollination of crops as well as when enough bees are present in a forest, they provide a better pollination that leads to improved regeneration of trees and conservation of the forest's biodiversity. At present, conservation of native honeybee species and preserve natural bee habitat is of primary importance in Yesagyoo environs.

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