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Comparative study on average body weight and morphometric studies on honeybees *Apis Florea* and *Apis Cerana Indica*. (Fabricius, 1787)

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Abstract
In this study were compared average body weight and morphometrics characters of the honeybees *A. florae* and *A. cerana indica* were studied in Mailadhuthrai, Tamil Nadu, India. The studies on selected characters of the two different species were studied. A total of 125 bees including 75 *A. florae* and 50 *A. cerana indica* were collected and measurements were observed, body length, tongue length, forewing length, forewing width, number of wings hooks width of hind metatarsus and length of leg were studied. The average weight of the *A. florae*18.08 mg and *A. cerana indica* as 54.9 mg. the morphometrics measurements indicated a higher value for the Indian hive bee *A. cerana indica.*

Keywords: *Apis florae, Cerana indica,* Morphometrics, Tongue length, Forewing length

1. Introduction
Honeybees belong to the family Apidae in which other types of social bees are also included. The sub family Apidae comprises single genus, *Apis*. The genus *Apis* comprises *A. florae* (the little bee), *Apis dorsata* (the gaint bee), *Apis cerana* (the eastern bee) and *Apis mellifera* (the western bee).The bees are ability to regulate high temperature they are able to survive in temperate as well as tropical countries resulting in many geographic subspecies in each type. The bees originally evolved from hunting wasps during cretaceous period, 146 million years ago. At the time of evolution of honeybees, flowering plants also evolved. Nowadays, several sub species of the honeybees have been recognized and only in recent years, a comprehensive classification has been attempted based on differences in physical characters and their distribution between sub species [1, 2, 3].

The dwarf bee or the little bee *A. florae* has been distinguished from *Apis cerana* and reniforms be morphometric studied (Radloff *et al.*, 2005) [4]. It is important to identify and insect of locality up to subspecies level for a better understanding of its biology. Morphometric studies involving characters of wings and legs of honeybees provided comparison of allied species as suggested by Verma (1998) [5]. The well being of a honeybee colony is possible only if annual biological cycle is well adjusted to ecological parameters influencing it. Besides geographic variability, seasonal variations also influence the different morphological features of honeybee [1, 6].

Bees are important pollinators and are widely known throughout the globe for pollination services they deliver. Bess is a dominant family found mainly under subtropical and sub-temperate regions in India [7]. Morphometrics has been used widely for identifying honey bees populations, is simple and much more effective than standard morphometrics in discrimination or identification of honey bee populations in the world [6, 8]. Hence, the present study was undertaken the morphological features of the co-existing honeybees species viz., *A. florae* and *A. cerana indica* in Mannampandal, Nagapattinam District, Tamil Nadu, India.

2. Materials and Methods
2.1 Collection of the insects
The test species were collected from the field, while foraging for nectar and pollen. Once a bee was located, it was capture using a sweep net and carefully transferred into a glass container, without any damage to their body parts. After transferring 10-15 bees, the container was kept in freezer for 5 minutes to immobilize the bees. Each bee was observed using a hand lens for any damage on the parts that were measured and each bee was weighted. Seventy-five individuals of *A. florae* and fifty *A. cerana indica* were measured respectively.

2.2 Methods of measurements
All the parts to be measured were carefully taken out and placed on a clean slide for measurement. All measurements were recorded under stereomicroscope equipped with an ocular micrometer. Total measurements recorded on seven characters were pertaining to body length, tongue length, forewing length, forewing width, number of wings hooks, width of hind metatarsus and length of leg. These measurements were recorded as per the methods followed by Mattu and Verma (1984) and Dayal and Rana (2007) [9, 10] with some modifications.

3. Result and Discussion
The comparative body weights of the selected species were given in the Table.1, Fig.1 and Fig.2.The mean body weight of *A. florae is* 18.08±2.34 and comparatively three times smaller than the body weight of *A. cerana indica* with a body weight of 54.96±9.8 there was a wide variation in the weight of the species measured in each species since the minimum and maximum body weight were 12 and 24 mg for *A. florae* and 38 and 75 mg for *A. cerana indica* respectively. Wells and Wells (1985) [11] proved that the honeybees could carry a nectar load almost equal to its body weight. Since the bees were collected in the foraging area, there is possibility that the weight recorded for individual bees could also be due to the nectar load in their honey stomach. Higher body weight as well as the wide variations observed in

the body weight of bees was also due to varied state of feeding among the bees.

The length of both species was in accordance to their body weight with the mean body length of *A. florae* being smaller with 8.53±0.55 than *A. cerana indica* with a mean body length of 10.84±0.41. The body length of *A. florae* observed in the present study was similar to the observations [12, 13] in Thailand and they reported that this specie was slightly different from *A.anderiformes*. The body length of *A. cerana indica* was within the size range reported for the plain variety of *A. cerana indica* [14] and was lesser than the body length of hill variety.

The tongue length of both species indicated their adaptations to feed nectar of specific plants suitable to their proboscis length. The tongue of *A. florae of* 1.84±0.06 that is suitable for feeding on flowers with smaller corolla tube as reported by Kalpana and Ramanujam (1990) [15]. It has been identified that the little bee preferred flowers of several herbs like *Justica simplex* and *Oldenlandia umbellate* [16]. The tongue length of *A. florae* was longer than *A. cerana indica* the tongue length of 2.67±0.41, accordingly their flower preference also varied. The nectar sources of *A. cerana indica* has been identified as many Shrubs and trees, e.g, Datura with flowers of long corolla tube. Average body weight and morph metric measurements of *A. florae* and *A. cerana indica* are given in the Table.1, Fig.1 and Fig.2

Table 1: Average body weight and morphometric measurements of selected parts of *A. florae* and *A. cerana indica.*

Species	Body weight (mg)	Body length (mm)	Tongue length (mm)	Fore wing length (mm)	Fore wing width (mm)	Number of wing hooks (mm)	Width of hind metatarsus (mm)	Length of hind leg (mm)
A. florae (N=75)	18.08±2.34	8.53±0.55	1.84±0.06	6.94±0.22	2.20±0.06	11.96±1.05	0.58±0.04	7.17±0.38
A. cerana indica (N=50)	54.96±9.8	10.84±0.41	2.67±0.41	8.00±0.00	2.79±0.11	17.44±1.17	0.93±0.27	9.00±0.00

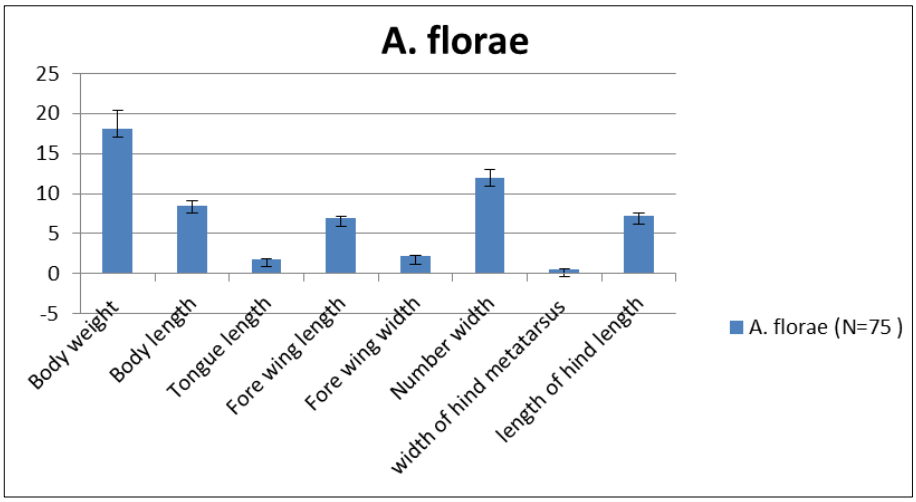

Fig 1: Average body weight and morphometric measurements of selected parts of *A. florae*

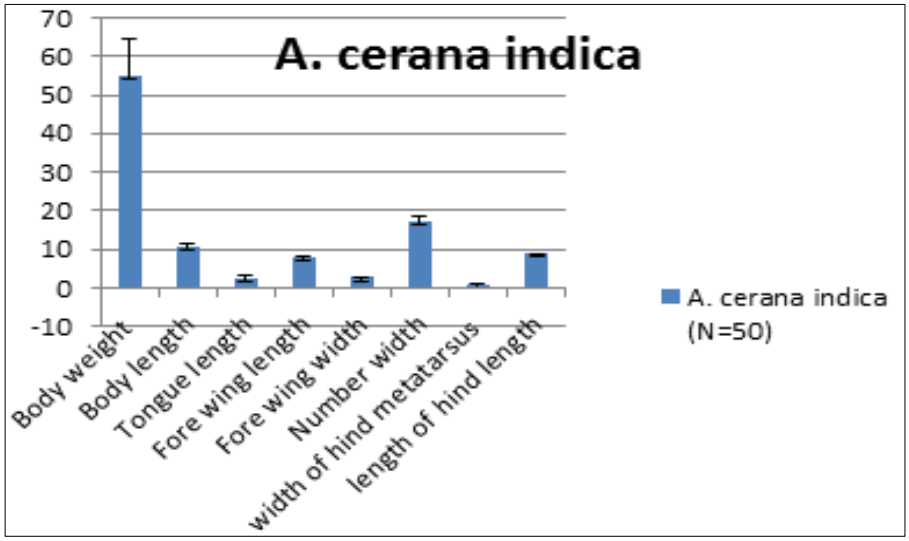

Fig 2: Average body weight and morphometric measurements of selected parts of *A. cerana indica.*

The wing characteristics also showed variations between the species. The forewing length and width were smaller in *A. florae* than in *A. cerana indica.* The length of forewing A. *florae* and *A. cerana indica* were 6.94±0.22 and 8.00±0.00 respectively. The little bees being smaller in size has a flying range of few meters for foraging whereas the maximum foraging range of *A. cerana indica* was few kilometers. Accordingly, the wing size was also adapted in both species.

One of the features measured for subspecies identification is the number of wing hooks [9, 2]. The number of hooks in *A. florae* has been11.96±1.05. In the present result was also In accordance with the findings with the findings [12]. The number of wing hooks in *A. cerana indica was* 17.44±1.17, which resembled the description given for the plain type as presented by Verma (1994) [5]. The wing hooks were more in *A. cerana indica* than *A. florae.*

The hind leg characters such as width of metatarsus and the length of the leg play a vital role in pollen carrying capacity of the honeybees. The width of the metatarsus has been studied in the identification of species. The width of metatarsus decides the quantity of pollen to be brushed from the body parts before packing into the pollen press. The width of metatarsus of *A. florae* being smaller (0.58±0.04) could collect a pollen pellet of 6 mg whereas, the metatarsus of *A. cerana indica* could make a pollen pellet of 12 mg the length of hind leg in both species varied according to the differences in other morphomeric features studied. The length of hind leg of *A. florae* 7.17±0.38, whereas that *A. cerana indica* was 9.00±0.00, indicating the ability of the latter species to crawl over the petals of larger flowers while feeding on the nectar.

The results of this study clearly showed that measurements of size and angle characters can be sufficient to identify or discriminate honey bee populations Wing shape likely driven by: (1) environmental pressures such as latitude [17], altitude [5, 18] and climate [4, 19, 20]; (2) sexual selection [21] and (3) abiotic factors such as temperature [22] and season [9]. Farshineh *et al.*, (2007) [24] compared *A. mellifera meda* populations of Iran (Orumieh, Tbriz, and Tehran) with populations in different zones of Turkey (Kiseher and Beypazari) and *A. mellifera carnica* of northern Turkey. They found that honeybee populations in Iran were smaller than honeybee populations in Turkey. Morphometrics has been used widely for identifying honey bees populations. Morphometric identification techniques have improved considerably due to new computational techniques [25]. The results of this study clearly showed that measurements of size and angle characters can be sufficient to identify or discriminate honey bee populations and adaptation of characters.

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