

## PRELIMINARY STUDIES ON BEES AT PULAU BIDONG AND PULAU PERHENTIAN, TERENGGANU

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**Abstract:** Studies on bees, Apoidea were conducted in Pulau Bidong from 2 June until 6 June 2015 and Pulau Perhentian from 14 September until 18 September 2015 to identify the bees species present in both islands. Bees were collected by active method using aerial net along 1 km - 2 km sampling transect, and passive methods using two Modified Pennsylvanian light traps and 20 baited traps for four trapping nights. A total of 61 individuals of bees from five species were collected from Pulau Bidong and 20 individuals of bees from five species were collected from Pulau Perhentian. In order to get the actual species list at both islands, more samplings need to be conducted to cover the whole islands.

Keywords: Hymenoptera, Apoidea, species, South China Sea, islands.

### Introduction

According to Hill and Abang (2010), Hymenoptera is one of the largest group of insects and a diverse group both in form and habits and the most highly evolved insects. The order Hymenoptera comprises of wasps, bees and ants. Bees are one of the important pollinators that can help human to restore and regenerate again the disappearing forest in this country (Lee *et al.*, 2001). The main food sources of bees are nectar and pollen (Wilson & Carril, 2015). However, they are also known to feed on sap, honeydew and other sugar sources in the absence of flowers (Trelease, 1881; Burton, 1891; Ulyshen *et al.*, 2010). According to Jalil and Shuib (2014), about 15,000 species of bees had been described from all over the world and most of the described species were solitary bees.

Tropical rainforest is one of the greatest species richness and extremely threatened terrestrial habitats (Stork & Grimbacher, 2007). It is structurally complex and showed a significant stratification with a various resources (Stork & Grimbacher, 2007). In Peninsular Malaysia, the islands are greatly forested and expected to have important ecological role to the

ecosystem (Cronk, 2001; Tamblyn *et al.*, 2005). Those forests might provide various habitats for endemic, endangered and the migratory animals (Turner *et al.*, 2002; Tamblyn *et al.*, 2005).

The bee and plant relationship are very significant in the ecosystem in a way that benefited both of them and enabling them to survive. Other than providing honey and wax, bees are also important in pollination of plants including some economic crops. For instance, according to Lee *et al.* (2001) and Inoue *et al.* (1990), about 74% of insects visited the flowers in Sumatra are commonly Apid bees. According to Corlett (2004), in India, *Apis dorsata*, one of the nocturnal foraging bees, was the main pollinator of endangered dry forest trees, *Pterocarpus santalinus* (Fabaceae). In Lambir, Sarawak, about 15 species of canopy and emergent trees were pollinated by this species (Corlett, 2004). Other than honeybee, stingless bees such as *Heterotrigona itama*, *Geniotrigona thoracica* and *Lepidotrigona terminata* are the common pollinator in agriculture. In Malaysia, stingless bees help to pollinate flowers of agricultural crops such as, mango, guava, starfruits, watermelon, durian and coconut (Slaa *et al.*, 2006).

Some research on bees in Malaysia had been studied by Lee *et al.* (2001), Eltz *et al.* (2003), Salim *et al.* (2012), Kelly *et al.* (2014), Azmi *et al.* (2012, 2015). However, most of the studies were focusing on stingless bees and were conducted in the mainland. The bee fauna in the island are poorly described due to the limited studies conducted in that area. To fill this gap of knowledge, studies on bees were conducted in Pulau Bidong and Pulau Perhentian.

## Materials and Methods

### Study Area

Bees were sampled from 2 June until 6 June 2015 in Pulau Bidong (05°37.139"N, 103°03.494"E) and from 14 September until 18 September 2015 in Pulau Perhentian (05°53.243"N, 102°44.505"E). Both islands located at the coast of Terengganu, Malaysia in the South China Sea (Figure 1).

Pulau Bidong is a small historic island located at 35 km northeast of Kuala Terengganu.

It consists of Dipterocarp forest in part of the rocky and hills area where trees from family Dipterocarpacea (e.g. *Vatica cinerea*, *Shorea materialis*) and family Rosaceae, *Licania splendens* were mostly found in the study area.

Pulau Perhentian in Terengganu is one of the famous tourism islands in Malaysia which is located 21km from the mainland. Bees were sampled near the Teluk Keke forest where the sampling areas were part of the old secondary forest and rocky area which consists of trees from families, Dipterocarpaceae (e.g. *Vatica cinerea*), Myrtaceae (e.g. *Syzygium* sp.) and Anacardiaceae (e.g. *Buchanania arborescens*).

### Methods

There were three methods used to collect the bees which were active searching using aerial net, baited traps and Modified Pennsylvanian light traps. At both islands, bees were sampled by using aerial net through 1 km - 2 km sampling transects for five sampling days. In addition, a total of 20 baited traps and two light

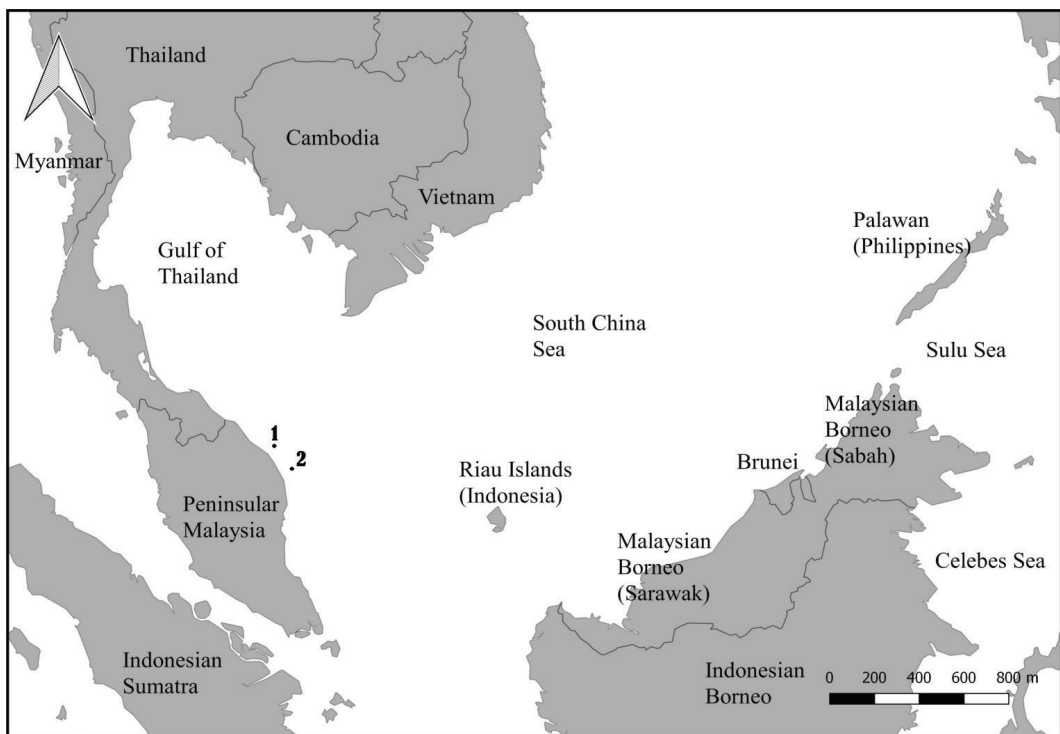


Figure 1: Location of Pulau Perhentian (1) and Pulau Bidong (2).

traps were set up to sample the bees during the four trapping nights at both Pulau Bidong and Pulau Perhentian. The baited traps were set up randomly in the forested area and ripen pineapples were used as bait to attract the bees. Light traps were set up at 1900 hours and the specimens were collected early in the morning on the next day. A killing jar consists of Ethyl acetate was used as killing agent to kill all the insects trapped in the light traps. All the specimens collected were preserved as dry specimens and deposited in Centre for Kenyir Ecosystems Research museum. The bees were identified based on Michener (2007), Inoka et al. (2008), Hill and Abang (2010) and Jalil and Shuib (2014).

## Results and Discussion

A total of five species represented by 61 individuals of bees were collected in Pulau Bidong (Table 1). All of the species were from the same family, Apidae. The five recorded species were identified as *Apis dorsata* (honeybee); *Tetragonula laeviceps* and *T. fuscobalteata* (stingless bees); and *Xylocopa aestuans* and *X. varipuncta* (carpenter bees). *Tetragonula laeviceps* has the highest number of individuals collected in Pulau Bidong with 49.18%, followed by *Apis dorsata* (37.70%).

In Pulau Perhentian, about five species of bees were recorded from a total of 20 individuals collected. The species recorded were *Apis cerana*, *Amegilla zonata* (Blue banded bee), *T. fuscobalteata*, *T. laeviceps* and *Xylocopa varipuncta*. Same as Pulau Bidong, all the species recorded were from one family, Apidae. The stingless bee species, *T. laeviceps* has the highest number of individuals collected with 50% (10 individuals), followed by *T. fuscobalteata* with 25% (5 individuals). *T. laeviceps* and *X. varipuncta* were collected in both islands.

In Pulau Bidong, the two stingless bees species *T. laeviceps* and *T. fuscobalteata* were observed foraging at Indian Beech tree (*Pongamia pinnata*) and oil palm (*Elaeis*

*guineensis*). Both the oil palm and Indian beech trees were undergoing flowering during the data collection which attract the bees to forage at the trees. According to Jalil and Shuib (2014), palm flowers are one of the selective floral for bee to forage because of the high number of flowers in a bloom. This type of flower reduces the foraging time and less energy spends by the bees to hoping from one flower to the next.

In Pulau Perhentian, most of the bees' species were observed to forage at shrubs and small trees. Carpenter bee was observed collecting the pollen from *M. malabathricum* and *Vitex pinnata* while stingless bees and blue banded bee were collected from *Asystasia gangetica*, *Ixora javanica*, *Melastoma malabathricum* and *Scaevola taccada* at the forest edges. According to Sydenham et al. (2016), higher sun exposure at the forest edges is part of the determinants of the species richness of solitary bees. The direct sun exposure might increase the number of flowering plants and their flower density which will increase the foraging resources in that area (Sydenham et al., 2016).

There were two colonies of *T. laeviceps* found in Pulau Bidong. The colonies were found nesting in *Pongamia pinnata* (Indian beech trees) and *Ficus superba* (Sea Fig) tree trunk. Stingless bees species were likely to build nest in the large hollow tree trunks and in some cases the nest sites are the limiting factors for the abundance of stingless bees in an area (Inoue et al., 1990; Lee et al., 2001). In Pulau Bidong, there was abundance of Dipterocarp trees near the sampling area. According to Jalil and Shuib (2014), most of the Dipterocarpaceae species consist resin where stingless bees regularly use for their nest mainly for building pollen pots, honey pots, nest entrance tubes and also nest lining walls.

This study is still in its infancy since the data obtained so far did not cover the whole area of both islands. The sampling periods were conducted at different times in both islands where the areas were undergoing different temporal variations during the sampling which may affect the recorded species at the islands.

Table 1: Taxonomic list on the bee species recorded at Pulau Bidong and Pulau Perhentian

Family Subfamily	Tribe	Species	Number of individuals, n (%)	
			Pulau Bidong	Pulau Perhentian
<b>Apidae</b>				
Xylocopinae	Xylocopini	<i>Xylocopa aestuans</i>	1 (1.64)	0
		<i>Xylocopa varipuncta</i>	1 (1.64)	1 (5)
Apinae	Anthophorini	<i>Amegilla zonata</i>	0	1 (5)
	Meliponini	<i>Tetragonula fuscobalteata</i>	6 (9.84)	5 (25)
Apini		<i>Tetragonula laeviceps</i>	30 (49.18)	10 (50)
	<i>Apis cerana</i>	0	3 (15)	
	<i>Apis dorsata</i>	23 (37.70)	0	
<b>TOTAL</b>			61 (100)	20 (100)

Thus, more samplings should be conducted at different times and locations in order to record all the bees' species present in both islands.

### Conclusion

From the study, five species of bees were sampled from both islands, Pulau Bidong and Pulau Perhentian. The species recorded in Pulau Bidong were *A. dorsata*, *T. fuscobalteata*, *T. laeviceps*, *X. aestuans* and *X. varipuncta*. In Pulau Perhentian, the species recorded were *Amegilla zonata*, *A. cerana*, *T. laeviceps*, *T. fuscobalteata*, and *X. varipuncta*. In order to get the actual species list at both islands, more samplings need to be done at different times and location to cover the whole islands.

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