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## Short Notes

# Fruit flies of Batu Timbang Forest Within Imbak Canyon Conservation Area, Sabah, Malaysia (Diptera: Tephritidae)

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## Abstract

A survey of fruit fly fauna was carried out at Batu Timbang Research Station, (Imbak Canyon Conservation Area - ICCA), Telupid, Sabah from 17<sup>th</sup> to 20<sup>th</sup> of August 2017. Fruit flies were collected using aerial net and bottle traps containing an attractant (Methyl Eugenol (ME) and Cue-lure (CUE)) at Lanap Trail, Rafflesia Trail and base camp. A total of 77 fruit flies belonging to *Bactrocera* were collected. This includes six species and three morphospecies, of which *Bactrocera tau* was the dominant species (56 individuals). This is the first study on fruit fly species at Imbak Canyon Conservation Area.

**Keywords:** Fruit fly, Diversity, Batu Timbang, ICCA, Sabah

## Introduction

The family Tephritidae, is an important group of insects as it contains many pests of agricultural fruits and vegetables, such as *Bactrocera dorsalis*, *B. papayae*, *B. carambolae*, *B. oleae*, *Rhagoletis pomonella* and *Anastrepha ludens*. There are also many beautiful bamboo shoot flies classified under Tephritidae which are susceptible to environmental and habitat destruction. Morphologically, Tephritids, except for *Bactrocera* spp., possess attractive, colourful markings and spotted or banded wings (Chua, 2010) with body length varying from 2 mm to over 20 mm. Worldwide there are about 4,550 described tephritid species from 500 genera (Jackson et al., 2011), of which about 200 species are recorded as pests.

Larvae of tephritids feed on phyto-materials and can be classified into two categories, frugivorous and non-frugivorous. Frugivorous larvae feed on fleshy

fruits while non-frugivorous larvae feed on plant parts other than fruit (Christenson & Foote, 1960). Mature female oviposits eggs on ripening host fruit. The larva hatches and feeds on the fleshy fruit which eventually causes direct damage to the fruit. The fruit is further damaged by penetration of microorganisms and decomposers through the opening holes leading to the early fall of fruit (Uchôa, 2012), causing economic losses to farmer.

Information on the presence of fruit fly species and diversity is useful in implementing integrated pest management (IPM) on pests. The diversity of fruit flies would also indicate roughly the extent of forest tree destruction in an area, especially trees that bear fruits for the fruit flies, and thus indirectly the loss of plant diversity. Studies on forest fruit flies also give an idea of potential agricultural pests found in such an area. This paper presents a preliminary list of fruit fly species collected from Batu Timbang Forest, Imbak Canyon Conservation Area (ICCA).

## Methodology

A fruit fly survey was carried out at Batu Timbang Research Station, (Imbak Canyon Conservation Area - ICCA), Telupid, Sabah from 17<sup>th</sup> to 20<sup>th</sup> of August 2017. These flies were collected individually using aerial net or trapped by baited bottle traps at three sites namely Lanap Trail, Rafflesia Trail and base camp. The bait was prepared with cotton roll, attractants and insecticide (Malathion). Two kinds of parapheromones: Methyl Eugenol (ME), 1,2-dimethoxy-4-(2-propenyl) and Cue-lure (CUE), 4-(p-hydroxyphenyl)-2-butanone acetate, were used as attractants.

A total of 10 baited bottle traps were hung on trees above 2m and left overnight, to trap the fruit flies. As for manual collection, a small amount of attractant lure, ME or CUE were smeared on top of leaves randomly along the trails to attract fruit flies. The attracted flies were collected manually using aerial net or with the aid of transparent plastic bottles. All specimens were sorted, dry mounted and identified on the basis of morphological characters, detailed in Drew & Hancock (1994) and specimens were housed at BORNEENSIS at the Institute for Tropical Biology and Conservation (ITBC), Universiti Malaysia Sabah.

## Results and Discussion

A total of nine species of fruit flies belonging to a single genus *Bactrocera* were recorded (Table 1) in this survey. The most abundant species is the *Bactrocera*

*tau* with 56 individuals (73%), followed by *Bactrocera* sp 15 (9%) and *Bactrocera nigrotibialis* (6%). The rest of the species were caught in relatively smaller numbers. *Bactrocera* sp A is a newly recorded species in comparison to previous studies conducted within Tunku Abdul Rahman Park and islands of Tun Mustapha Park (Banggi, Balambangan and Malawali islands).

Table 1. Fruit fly species recorded from Batu Timbang Forest

Family	Species	Number of Individuals
Tephritidae	<i>Bactrocera carambolae</i>	1
	<i>Bactrocera fuscitibia</i>	1
	<i>Bactrocera nigrotibialis</i>	5
	<i>Bactrocera papayae</i>	3
	<i>Bactrocera</i> sp.7	1
	<i>Bactrocera tau</i>	56
	<i>Bactrocera</i> sp.15	7
	<i>Bactrocera merapiensis</i>	1
	<i>Bactrocera</i> sp A	2
<b>Total</b>		<b>77</b>

Overall this result is similar to that of previous studies, where the genus *Bactrocera* is dominant and well presented, due to the endemic distribution (Drew 2004). Almost all of the fruit fly species collected from this site have been recorded from Tunku Abdul Rahman National Park and Banggi, Balambangan and Malawali islands. This study includes fruit flies species recorded for the first time from Imbak Canyon Conservation Area. Most of the species recorded here are common species in South East Asia. *Bactrocera papayae*, *B. tau* and *B. carambolae* are known as common species. The less common species recorded are *B. fuscitibia*, *B. nigrotibialis*, and *B. merapiensi*.

*Bactrocera papayae*, and *B. carambolae*, are highly polyphagous pests that share similar host plants (Allwood et al., 1999). They are among the major economic pests (Plant Health Australia, 2011) and recorded as the most abundant species in Sarawak and Peninsular Malaysia (Kuei et al., 2013; Yong et al., 2010a, 2010b). These two species have economic importance and are also found in abundance in agro-forested locations of southern Thailand (Danjuma et al., 2013).

Considering the small number of species and the relatively small number of individuals caught, it would appear either that the Tephritid fauna of Batu Timbang Forest is rather poor or the period of trapping (three days) is not long

enough to get a good representative catch. The disturbed habitat within the survey area might have also contributed to the low diversity of fruit flies. A more intensive study would enable to determine the right answer.

## Conclusion

This study includes fruit flies species recorded for the first time from Imbak Canyon Conservation Area. The fruitflies of Batu Timbang Forest is dominated by the genus *Bactrocera* and represented by common species such as *Bactrocera papayae*, *B. tau* and *B. carambolae* which are known to be agricultural pests. Future research should be emphasized for fruit fly diversity and its relative natural enemies to provide more information on agricultural pest species for better pest management.

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## References

- Allwood AJ, Chinajariyawong A, Kritsaneepaiboon S, Drew RAI, Hamacek EL, Hancock DL, Hengsawad C, Jipanin JC, Jirasurat M, Krong CK, Leong CTS, Vijaysegaran S. 1999. Host Plant Records for Fruit Flies (Diptera: Tephritidae) in Southeast Asia. *The Raffles Bulletin of Zoology, Supplement* (7):1-92.
- Chung AYC, Momin B, Yukang JL, Saudi B, Ahmsari. 2017. Insect Diversity of Imbak Canyon: Batu Timbang Sabah. *Batu Timbang Scientific Expedition Report*
- Chua TH. 2010. Fruit Flies (Diptera: Tephritidae) From Malaysia and Brunei Darussalam: New Species and Records. *The Florida Entomologist* 93 (4):482-488.
- Christenson LD, Foote RH. 1960. Biology of Fruit Flies. *Annual Review of Entomology* 5:171-192.
- Drew RAI, Hancock DL. 1994. The *Bactrocera dorsalis* Complex of Fruit Flies (Diptera: Tephritidae: Dacinae) in Asia. *Bulletin of Entomological Research: Supplement Series Number 2*. CAB International.
- Danjuma S, Boonrotpong S, Thaochan N, Permkam S, Satasook C. 2013. Biodiversity of the Genus *Bactrocera* (Diptera: Tephritidae) in Guava *Psidium Guajava* L. Orchards in Different Agro-forested Locations of Southern Thailand. *International Journal of Chemical, Environmental & Biological Sciences* 1(3): 538-544.

- Jackson MD, Marshall SA, Hanner R, Norrbom AL. 2011.** The Fruit Flies (Tephritidae) of Ontario. *Canadian Journal of Arthropod Identification* **(15)**: 1-251.
- Kuei TFF, Gumbek M, Hanapi S. 2013.** Status and Geographical Distribution of Indigenous and Quarantine Fruit Fly Species (Diptera:Tephritidae) in Sarawak. *Borneo Journal Resource, Science & Technology* **2(2)**:28-41.
- Uchôa MA. 2012.** Fruit Flies (Diptera: Tephritoidea): Biology, Host Plants, Natural Enemies, and the Implications to Their Natural Control. In Larramendy ML, Soloneski S (eds) *Integrated Pest Management and Pest Control - Current and Future Tactics*.
- Yong HS, Ng YF, Lim PE. 2010a.** Diversity and Abundance of Dacinae Fruit Flies (Insecta: Diptera: Tephritidae) in Chini 2, Runchang and Sungai Bebar, Pahang, Peninsular Malaysia. *Journal of Science and Technology in the Tropics* **6**: 17-21.
- Yong HS, Hashim R, Azirun MS, Diah SZM. 2010b.** Diversity and Abundance of Dacinae Fruit Flies (Insecta: Diptera: Tephritidae) in Pantai Melawi and Selising, Kelantan, Peninsular Malaysia. *Malaysia Journal of Science* **29 (Special Issue)**: 63-66.