

DISTRIBUTION AND IDENTIFICATION OF FRUIT FLIES (DIPTERA: TEPHRITIDAE) ATTRACTED ON METHYL EUGANOL AND CUE LURE IN CENTRAL BANGKA REGENCY, BANGKA BELITUNG

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ABSTRACT

Distribution and identification of fruit flies (Diptera: Tephritidae) attracted on methyl euganol and cue lure in Central Bangka Regency, Bangka Belitung. Not all fruit flies species of Dacini tribe were pests to fruit and fleshy vegetables. Central Bangka Regency is one of the citrus producer in the Bangka Belitung Islands Province. Information about this fruit flies in this area was limited. This study aimed to make inventory and identification of fruit flies species of the Dacini tribe in Central Bangka Regency, Bangka Belitung. The research was conducted in Nibung, Penyak, and Terentang Villages in Central Bangka Regency, Bangka Islands. Lynfield traps were installed in a citrus cultivation area about 1.5 m above ground level. Lynfield traps were treated with the attractant and deltamethrin (2: 1; v / v) on dental cotton. Methyl eugenol and cue lure were used to attract the male fruit flies. In Central Bangka Regency, 3 genera and 14 species of fruit flies were obtained from the tribe Dacini. The fruit fly species of *Bactrocera atrifemur*, *B. carambolae*, *B. dorsalis*, *B. occipitalis*, and *B. umbrosa* were caught in the methyl eugenol attractant trap. Meanwhile, the fruit fly species of *B. albistrigata*, *B. fuscitibia*, *B. melastomatos*, *B. neocognata*, *B. nigrotibialis*, *Dacus nanggala*, *Zeugodacus apicalis*, *Z. caudatus*, and *Z. cucurbitae* were caught in the cue lure attractant trap. The fruit flies obtained from the two different attractants were used to develop dichotomous keys.

Key words: citrus, cue lure, deltamethrin, lynfield trap, methyl eugenol

INTRODUCTION

Fruit flies (Diptera: Tephritidae) are important pest of commercial horticultural crops in tropical and subtropical countries. This pest attacks fruit and fleshy vegetables (Vargas *et al.*, 2015). Fruit flies disturbance in the horticultural sector would have impacts on the socio-economic sector of a country such as threats to food security, the food industry, jobs, farmers' income and foreign exchange (Vargas *et al.*, 2007; Kwasi, 2008; Vargas *et al.*, 2015). Affected fruits could reduced its economic value due to the quality damage and quantity decrease at harvest. Fruits that were infested with fruit flies would be rotten, less aesthetics, has lower nutritional content, change in taste and aroma, and susceptible to important post-harvest fungi such as *Penicillium digitatum* Sacc. or *P. notatum* (Omoloye *et al.*, 2016; Ni *et al.*, 2020). Fruit flies directly damages host fruits

and indirectly caused the loss of export opportunities for horticultural products due to quarantine regulation from importing countries to prevent the entry of fruit flies into the country (Vargas *et al.*, 2007).

Doorenweerd *et al.* (2018) reported that one of the fruit fly families reported to attack fruit and vegetable crops was Dacini tribe. The Dacini tribe was divided into 4 genera: *Bactrocera* Macquart, *Dacus* Fabricius, *Monacrostichus* Bezzi, and *Zeugodacus* Hendel. There were 932 species of Dacini fruit flies worldwide. In the Asia Pacific region there were 730 species, while in Africa there were 207 species. Only 10% from 932 species of Dacini tribe were reported as important pests of commercial fruit and vegetable crops. Vargas *et al.* (2015) classified the species of *Bactrocera* into 4 categories based on the level of threat of fruit flies, namely categories A, B, C, and D.

The diversity of fruit fly species could be different from one region to another. The presence of fruit fly species in an area could be detected by installing attractant traps. Some of the attractants used for Dacini fruit flies survey are methyl eugenol (ME) and cue lure (Drew & Romig, 2016). In Indonesia, there were more than 120 species of tribe Dacini fruit flies (Drew & Romig, 2012a). Fruit flies on the Bangka Island that have been known include *Bactrocera atrifemur*, *B. albistrigata*, *B. carambolae*, *B. dorsalis*, *B. limbifera*, *B. umbrosa*, *B. occipitalis*, *Dacus nanggala*, *Zeugodacus cucurbitae*, and *Z. caudatus* (Drew & Romig, 2013; Saputra *et al.*, 2019; Supratiwi *et al.*, 2020). In order to easily recognize the fruit flies, an identification key is required especially the site specific one (Larasati *et al.*, 2016). Identification of a species was needed to determine population control strategy and quarantine restrictions. The existence of a location-specific fruit flies identification key, especially in Central Bangka Regency, would be useful to accelerate the fruit flies identification process and find out information related to their taxonomy, particularly pest status and pest categories. Central Bangka Regency was one of the citrus producers in the Bangka Belitung Islands Province and the information about fruit flies in this area was still limited. This study aimed to determine the distribution and make dichotomous

identification keys of fruit flies in Central Bangka District, especially in citrus plantation.

MATERIALS AND METHODS

Research Site. The research was conducted from April to October 2020 in Central Bangka Regency, Bangka Belitung Islands. Fruit flies identification was carried in the Laboratory of Agrotechnology, Faculty of Agriculture, Fisheries and Biology, Universitas Bangka Belitung. The location of this research was a citrus plantation owned by farmers in three villages producing orange in Central Bangka Regency, that are Nibung, Penyak, and Terentang. Each village consists of four farmer plantation area, so there are 12 research locations (Figure 1; Table 1). The research was conducted at citrus plantation with minimum area of 500 m². Citrus plant in Central Bangka Regency were planted as an intercropping between pepper plants (*Piper nigrum*) and close to secondary forests, oil palm plantations, coconut plantations, and rubber plantations. Horticultural plants that located around the citrus plantation that were found in very limited numbers (1–5 plants) consist of different kind species such as watery rose apple var citra/cincalo (*Syzygium aqueum*), malay rose apple var jamaika (*S. malaccense*), mango (*Mangifera indica*), binjai (*M. caesia*), dragon fruit (*Hylocereus*

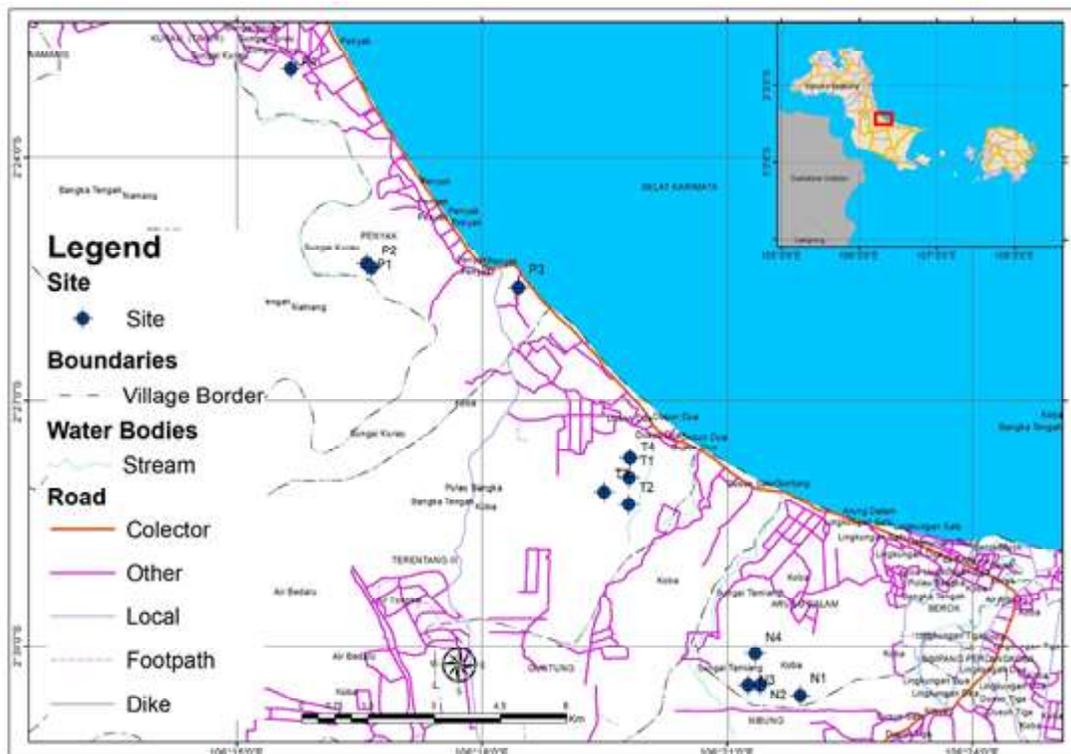


Figure 1. Map of research locations in Central Bangka Regency.

polyrhizus), jeruk kunci (*Citrus* sp.), oyong (*Luffa acutangula*), cempedak (*Artocarpus integer*), pineapple (*Ananas comosus*), chilli (*Capsicum frutescens*) and eggplant (*Solanum melongena*).

Fruit Flies Trap. The type of fruit flies trap used was the lynfield trap. The traps were made from 550 mL clear plastic cups with 8 inlets. Each trap inserted with a dental cotton, 1 mL of attractant and 0.5 mL of deltamethrin 25 EC then dropped using a plastic pipette. The placement of attractant traps was referred to Saputra *et al.* (2019), which in one cardinal direction, one attractant trap was installed. Each location consisted of 4 attractant traps, consist of 2 methyl eugenol attractant traps and 2 cue lure attractant traps. The distance between each methyl eugenol trap was 20 m, and the installation of a cue lure attractant was also 20 m between each cue lure attractant trap. Distance between ME and cue lure trap was 14 m. One methyl eugenol or cue lure attractant trap was installed on citrus plants and the other was attached to a ¾ inch pvc pipe about 1.5 m above ground level. The attractant traps in each location were installed for 3 weeks and the trapped fruit flies were collected once a week. Fruit flies trapped in the attractant trap were put in an insect collection bottle and placed in an incubator at a temperature of ± 40 °C.

Fruit Flies Identification. The number of fruit flies obtained during the study was 4957 individuals. Fruit flies were identified morphologically using a stereo

microscope. The observed characters were facial spots, thorax, abdomen, limbs, and wings. Fruit flies identification was carried out using dichotomous keys adopted from books, theses, and publications containing fruit flies identification keys (Drew & Hancock, 1994; AQIS, 2008; Plant Health Australia, 2011; Drew & Romig, 2013; Khaeruddin, 2015; Drew & Romig, 2016; Larasati *et al.*, 2016; Plant Health Australia, 2018; IPPC, 2019). The specimen vouchers of identified fruit flies were created by direct pinning or indirect pinning methods. Specimens were deposited in the Agrotechnology Laboratory, Faculty of Agriculture, Fisheries and Biology, Universitas Bangka Belitung.

Analysis. The fruit flies species data obtained were presented descriptively, including the distribution data of fruit flies in the Bangka Belitung Island, and the dichotomous key for the identification of fruit flies in Central Bangka Regency.

RESULTS AND DISCUSSION

The previous studies was reported 10 species of Dacini tribe fruit flies on Bangka Island i.e. *B. albistrigata*, *B. atrifemur*, *B. carambolae*, *B. dorsalis*, *B. limbifera*, *B. occipitalis*, *B. umbrosa*, *Dacus nanggalae*, *Z. caudatus*, and *Z. cucurbitae*. (Drew & Romig, 2013; Saputra *et al.*, 2019; Supratiwi *et al.*, 2020). Our study in Central Bangka Regency, have obtained 14 species of fruit flies. Moreover, 5 of the observed species not yet reported previously on

Table 1. Research location in Central Bangka Regency

Village	Longitude (E)	Latitude (S)	Altitude (m)
Citrus plantation site			
Nibung (N)			
1	106° 21' 53,626" E	2° 30' 36,252" S	27
2	106° 21' 24,088" E	2° 30' 28,264" S	25
3	106° 21' 15,534" E	2° 30' 28,508" S	28
4	106° 21' 20,621" E	2° 30' 05,893" S	16
Penyak (P)			
1	106° 16' 35,263" E	2° 25' 18,559" S	20
2	106° 16' 38,752" E	2° 25' 21,497" S	10
3	106° 18' 26,716" E	2° 25' 35,569" S	13
4	106° 15' 39,816" E	2° 22' 54,696" S	6
Terentang (T)			
1	106° 19' 47,964" E	2° 27' 55,750" S	20
2	106° 19' 47,654" E	2° 28' 15,384" S	18
3	106° 19' 29,716" E	2° 28' 06,121" S	21

Bangka Island that are *B. fuscitibia*, *B. melastomatos*, *B. neocognata*, *B. nigrotibialis*, and *Z. apicalis*. Based on reference tracing and research findings, the number of fruit flies species on Bangka Island was now 15 species. The 15 species were shown in Table 2.

The number of fruit flies species obtained during the research in the citrus plantation in Central Bangka Regency were 3 genera and 14 species (Table 2; Figure 2). Fruit flies that trapped in ME were identified as *B. atrifemur*, *B. carambolae*, *B. dorsalis*, *B. occipitalis*, and *B. umbrosa*. Meanwhile, fruit flies that trapped in the cue lure were identified as *B. albistrigata*, *B. fuscitibia*, *B. melastomatos*, *B. neocognata*, *B. nigrotibialis*, *D. nanggalae*, *Z. apicalis*, *Z. caudatus*, and *Z. cucurbitae*. The fruit flies species obtained in this study were trapped only in one type of attractant. This result was in line with the publication of Doorenweerd et al. (2018), that these species were only interested in one attractant, such as cue lure or ME alone, and no fruit flies that were attracted to both ME and cue lure.

On ME attractant, *B. atrifemur* was obtained in Terentang Village, while *B. carambolae*, *B. dorsalis*, *B. occipitalis*, and *B. umbrosa* were obtained at three study sites (Figure 2a). The first report of *B. atrifemur* in Indonesia was in Kace, Mendo Barat, Bangka Regency, Bangka in 2006 on a ME trap in the cempedak plant area (Drew & Romig, 2013). Cempedak plants were also found in the vicinity of the research location, at locations 3 and 4 of citrus plantations in Terentang Village (Table 1; Figure 2a). Thus, it becomes a new note that the *B. atrifemur* were not only distributed in Bangka Regency, but also in Central Bangka Regency. Bangka Regency, but also in Central Bangka Regency. In cue lure attractants, *B. melastomatos* were obtained in Nibung Village while *B. nigrotibialis*, *D. nanggalae*, and *Z. cucurbitae* were obtained in Terentang Village. The *Z. apicalis* were obtained in Penyak and Terentang Villages. In the other hand, *B. albistrigata*, *B. fuscitibia*, *B. neocognata*, and *Z. caudatus* were obtained in three study sites (Figure 2b). The results of this study showed that the cue lure attractant was favored by the three genus of fruit flies: *Bactrocera*, *Dacus*, and *Zeugodacus*, while ME were favored by the genus *Bactrocera*. Cue lure attractants were the dominant attractants in various species in the genus *Dacus* and *Zeugodacus*, and only a few species of this genus were interested in ME attractants (Drew & Romig, 2013; Drew & Romig, 2016; Doorenweerd et al., 2018). Doorenweerd et al. (2018) reported that ME was also preferred by various species of the genus *Zeugodacus*, but in this study it had not been found. The number of

fruit flies species that have been found in Indonesia were 122 species (Drew & Romig, 2012a).

In Indonesia, 122 species of Dacini fruit flies were reported and 11 of them were classified as important pests (Drew & Romig, 2012a). The eleven fruit flies were *B. albistrigata*, *B. carambolae*, *B. dorsalis*, *B. frauenfeldi*, *B. latifrons*, *B. musae*, *B. occipitalis*, *B. umbrosa*, *Z. caudatus*, *Z. cucurbitae*, and *Z. tau* (Drew & Romig, 2012b). In Indonesia, Drew & Romig (2012a) explained that (1) *B. albistrigata*, *B. frauenfeldi*, and *B. umbrosa* were minor pests, (2) *B. carambolae*, *B. dorsalis*, *B. occipitalis*, and *Z. cucurbitae* were major pests, (3) *Z. caudatus* confirmed breeding in flowers cucurbits, not fruits/vegetables for export, (4) *B. musae* is a species with a limited distribution in Papua, (5) *B. occipitalis* was a pest species that was limited in distribution in Kalimantan.

Based on the Regulation of the Minister of Agriculture of the Republic of Indonesia Number 25 year 2020 concerning Types of Quarantined Plant Destruction Organisms that *B. occipitalis* was a type of *B. dorsalis* complex which was only found in Kalimantan, Indonesia (Kementerian Pertanian Republik Indonesia, 2020). Not only in Kalimantan, *B. occipitalis* was reported to be existed in several regions of Indonesia based on morphological identification (Table 2), but for determination in whether this species had entered another region in Indonesia molecular identification may be provided (Martiningisia et al., 2017). Species identification by morphological identification in the *B. dorsalis* complex was partly difficult due to the high degree of diversity of characters within species and the overlapping morphological characters between species (IPPC, 2019). The same species had variations in the morphological character of the pattern and color both on the scutum and abdomen, and sometimes looks similar to other species (Drew & Hancock, 1994; Leblanc et al., 2015; Plant Health Australia, 2018; IPPC, 2019; Nakahara et al., 2019). Morphologically, *B. occipitalis* had similar to *B. carambolae*, *B. fuscitibia*, *B. arecae* and *B. atrifemur* (Drew & Hancock, 1994; Drew & Romig, 2012a; Plant Health Australia, 2018). The *B. carambolae*, *B. papayae*, *B. melastomatos*, and *B. philippinensis* could be identified as *B. occipitalis* due to misidentification (Drew & Hancock, 1994). Misidentification occurred because all of these species have costal bands that overlap $R_2 + R_3$ and varying in width of costal band overlapping $R_2 + R_3$, and marking abdominal terga III - V sometimes similar to another species of *Bactrocera* (Drew & Hancock, 1994; Plant Health Australia, 2018;

Table 2. Distribution, status and categories of fruit fly pests in Indonesia and Bangka Island

No	Species	Male attractant	Distribution in Indonesia ^a	Pest status ^b	Pest category ^c	Distribution on Bangka Island ^d
1	<i>Bactrocera abistrigata</i> de Meijere, 1911	cue lure	(Jawa, Kalimantan, Sulawesi, dan Lesser Sunda)*, Bangka Islands**	Fruit pest (polyphagous)	C	Central Bangka Regency, Bangka Regency
2	<i>Bactrocera atrifemur</i> Drew & Hancock, 1994	ME	(Bangka Islands)*/**	Non-Pest	-	Central Bangka Regency, Bangka Regency
3	<i>Bactrocera carambolae</i> Drew & Hancock, 1994	ME	(Bali, Jawa, Kalimantan, Maluku, Maluku Utara, Sulawesi, Sumatra, Papua)*, Bangka Islands**	Fruit pest (polyphagous)	A	Central Bangka Regency, Bangka Regency
4	<i>Bactrocera dorsalis</i> (Hendel, 1912)	ME	(Bali, Jawa, Kalimantan, Maluku Utara, Sulawesi, Sumatra, West Timor, Papua, Lesser Sunda)*, Bangka Islands**	Fruit pest (polyphagous)	A	Central Bangka Regency, Bangka Regency
5	<i>Bactrocera fuscitibia</i> Drew & Hancock, 1994	cue lure	(Bali, Jawa, Kalimantan, Sulawesi, Sumatra)*, Bangka Islands**	Non-Pest	-	Central Bangka Regency
6	<i>Bactrocera limbifera</i> (Bezzi, 1919)	cue lure	(Jawa, Kalimantan, Sulawesi, Sumatra, Lesser Sunda)*, Bangka Islands	Non-Pest	-	Bangka Regency
7	<i>Bactrocera melastomatos</i> Drew & Hancock, 1994	cue lure	(Jawa, Kalimantan, Sumatra)*, Bangka Islands**	Non-Pest	-	Central Bangka Regency
8	<i>Bactrocera neocognata</i> Drew & Hancock, 1994	cue lure	(Jawa, Kalimantan, Lesser Sunda)*, Bangka Islands**	Non-Pest	-	Central Bangka Regency
9	<i>Bactrocera nigrotibialis</i> (Perkins, 1938)	cue lure	(Kalimantan, Sumatra, Lesser Sunda)*, Bangka Islands**	Fruit pest (oligophagous)	D	Central Bangka Regency
10	<i>Bactrocera occipitalis</i> (Bezzi, 1919)	ME	(Kalimantan)*, (Bangka Islands)** (Jawa, Sulawesi, Sumatra)***	Fruit pest (polyphagous)	B	Central Bangka Regency, Bangka Regency
11	<i>Bactrocera umbrosa</i> (Fabricius, 1805)	ME	(Bali, Jawa, Kalimantan, Maluku, Maluku Utara, Sulawesi, Sumatra, West Timor, Papua, Lesser Sunda)*, Bangka Islands**	Fruit pest (monophagous)	C	Central Bangka Regency, Bangka Regency

Table 2. Distribution, status and categories of fruit fly pests in Indonesia and Bangka Island (continue)

No	Species	Male attractant	Distribution in Indonesia ^a	Pest status ^b	Pest category ^c	Distribution on Bangka Island ^d
12	<i>Dacus nanggale</i> Drew & Hancock, 1998	cue lure	(Sulawesi)*, Bangka Islands**	Non-pest	-	Central Bangka Regency, Bangka Regency
13	<i>Zeugodacus apicalis</i> (de Meijere, 1911)	cue lure	(Jawa, Kalimantan, Sulawesi)*, Bangka Islands**	Non-pest	-	Central Bangka Regency
14	<i>Zeugodacus caudatus</i> (Fabricius, 1805)	cue lure	(Bali, Jawa, Kalimantan, Sumatra, West Timor, Lesser Sunda)*, Bangka Islands**	Cucurbitaceae flower pest	C	Central Bangka Regency, Bangka Regency
15	<i>Zeugodacus cucurbitae</i> (Coquillett, 1899)	cue lure	(Bali, Jawa, Kalimantan, Maluku, Maluku Utara, Sulawesi, Sumatra, West Timor, Papua, Lesser Sunda)*, Bangka Islands**	Cucurbitaceae fruit pest	A	Central Bangka Regency, Bangka Regency

^a * (Drew & Romig, 2012a, Drew & Romig 2012b).

** (Drew & Romig, 2013; Saputra *et al.*, 2019; Supratiwi *et al.*, 2020) and this research result: morphological identification.

*** (Khaeruddin, 2015; Larasati *et al.*, 2016; Pujiastuti *et al.*, 2020): morphological identification.

^b (Vargas *et al.*, 2015; Doorenweerd *et al.*, 2018).

^c (Vargas *et al.*, 2015).

^d (Drew & Romig, 2013; Saputra *et al.*, 2019; Supratiwi *et al.*, 2020) and this research result.

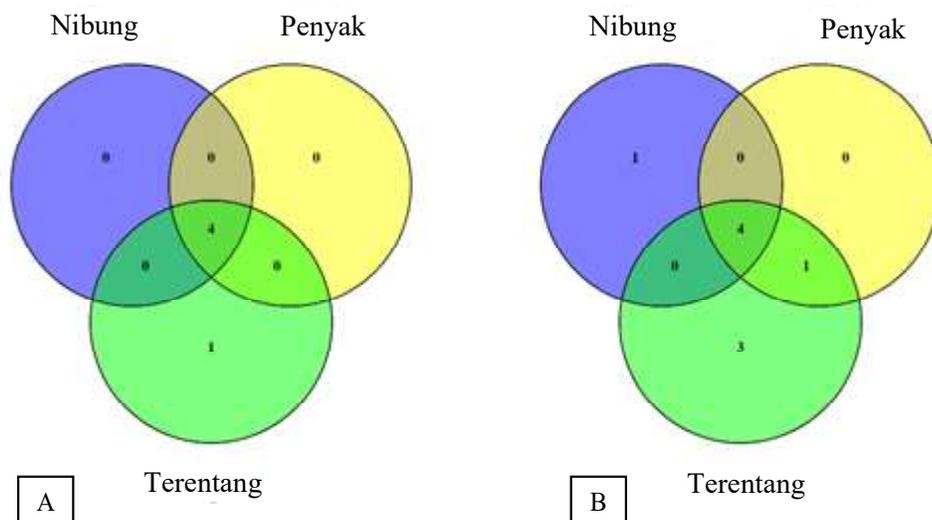


Figure 2. Distribution of fruit flies by type of attractant in the three research locations. (A) Methyl eugenol; (B) Cue lure.

Nakahara *et al.*, 2019). The morphological character of *B. occipitalis* that differentiates it from other *B. dorsalis* complex species could be seen in Drew & Hancock (1994).

The highest number of fruit flies species were obtained in the citrus plantation in Terentang Village, that were 13 species. Meanwhile, the number of fruit flies species obtained in the citrus plantations in Nibung and Penyak Villages were 9 species. The fruit flies species found in the citrus plantation in Nibung village were *B. albistrigata*, *B. carambolae*, *B. dorsalis*, *B. fuscitibia*, *B. melastomatos*, *B. neocognata*, *B. occipitalis*, *B. umbrosa*, and *Z. caudatus*. While in Penyak village were *B. albistrigata*, *B. carambolae*, *B. dorsalis*, *B. fuscitibia*, *B. neocognata*, *B. occipitalis*, *B. umbrosa*, *Z. apicalis*, and *Z. caudatus*. On the other hand the fruit flies species found in Terentang Village were *B. albistrigata*, *B. atrifemur*, *B. carambolae*, *B. dorsalis*, *B. fuscitibia*, *B. neocognata*, *B. nigrotibialis*, *B. occipitalis*, *B. umbrosa*, *D. nanggalae*, *Z. apicalis*, *Z. caudatus*, and *Z. cucurbitae*.

The number of fruit flies obtained in Central Bangka Regency were 14 species and 7 species of which were *B. dorsalis* complex, namely *B. atrifemur*, *B. carambolae*, *B. dorsalis*, *B. fuscitibia*, *B. melastomatos*, *B. neocognata*, and *B. occipitalis*. The species of *B. dorsalis* complex could be characterized by the presence of T pattern on the abdomen with III–IV, the medial vittae in the thorax was absent and present lateral vittae in the thorax, and the scutellum was yellowish (IPPC, 2019). The genera obtained in this study were *Bactrocera*, *Dacus*, and *Zeugodacus*. The genus *Dacus* is easily recognized from the part of the abdomen which was strongly petiolate or elongate-oval and the terga fused on abdomen (AQIS, 2008; Drew & Romig, 2013; Drew & Romig, 2016). The genus *Bactrocera* easily recognized by the shape of the abdomen that is oval or elongate-oval, the terga not fused on abdomen, and medial vittae in the thorax absent (AQIS, 2008; Drew & Romig, 2013; Drew & Romig, 2016). Whereas, the genus *Zeugodacus* is easily recognized by its oval or elongate-oval abdomen, the terga not fused on abdomen, and the presence of medial vittae in the thorax (AQIS, 2008; Drew & Romig, 2013; Drew & Romig, 2016). As for the identification keys of the fourteen fruit flies species based on attractant preferences in Central Bangka, Bangka was shown as follows:

The dichotomous key to identify the Dacini tribe fruit flies based on its attractant preferences in Central Bangka, Bangka

- 1a. Fruit flies were attracted to methyl eugenol attractant.....2
- 1b. Fruit flies are attracted to cue lure attractant.....6
- 2a. Abdominal terga III–IV without T pattern, wing with three additional bands from the costal band towards hind margin: Figure 3A.....
.....*Bactrocera umbrosa*
- 2b. Abdominal terga III–IV with T pattern, wing without additional band from the costal band towards the hind margin.....3
- 3a. Femora glossy black that is on 3/4 of the fore femora from the apical, 1/3 of the middle femora from the apical, and 2/5 of the hind femora from the apical: Figure 3B.....*Bactrocera atrifemur*
- 3b. Femora reddish yellow /fulvous or reddish yellow with a dark pattern/ dark fuscous.....4
- 4a. Costal band confluent with R2 + 3: Figure 3C.....*Bactrocera dorsalis*
- 4b. Costal band overlapping with R2 + 3.....5
- 5a. Abdominal terga III–V with a very wide medial longitudinal and lateral dark margins is wide; costal band continuous and extending to the tip of the wing: Figure 3D.....*Bactrocera occipitalis*
- 5b. Abdominal terga III–V with medium medial longitudinal; anterolateral terga IV is rectangle shape; costal band continuous and extends only at the ends of R4 + 5: Figure 3E.....
.....*Bactrocera carambolae*
- 6a. Abdominal terga fused, abdomen petiolate; costal band overlapping R4 + 5; abdominal terga III–V red brown with a narrow longitudinal medial: Figure 3F.....*Dacus nanggalae*
- 6b. Abdominal terga not fused, abdomen oval.....7
- 7a. Thorax with medial longitudinal vittae.....8
- 7b. Thorax without medial longitudinal vittae.....10
- 8a. Costal band broken after the R2 + 3 tip and there is a large spot on the wingtip: Figure 3G.....*Zeugodacus apicalis*
- 8b. Costal band continuous up to the edge of the wing.....9

- 9a. Facial spots converge; no additional band on dm-cu: Figure 3H.....*Zeugodacus caudatus*
- 9b. Facial spots don't merge, two black spot; there is an additional band on dm-cu: Figure 3I.....*Zeugodacus cucurbitae*
- 10a. Abdominal terga III–IV without a T pattern11
- 10b. Abdominal terga III–IV with a T pattern.....12
- 11a. Wing with one additional band from the costal band towards the edge of the wing edge: Figure 3J*Bactrocera albistrigata*
- 11b. Wing without additional band from the costal band towards the edge of the wing; hind femora in black at 1/3 to 1/2 from the apical: Figure 3K.....*Bactrocera nigrotibialis*



Figure 3. Diversity of fruit fly species Dacini tribe in Central Bangka Regency. (A) *B. umbrosa*; (B) *B. atrifemur*; (C) *B. dorsalis*; (D) *B. occipitalis*; (E) *B. carambolae*; (F) *D. nanggaleae*; (G) *Z. apicalis*; (H) *Z. caudatus*; (I) *Z. cucurbitae*; (J) *B. albistrigata*; (K) *B. nigrotibialis*; (L) *B. fuscitibia*; (M) *B. melastomatos*; (N) *B. neocognata*; (O) body size comparison *B. melastomatos* (above) and *B. neocognata* (below).

- 12a. Lateral postsutural vittae paralel: Figure 3L
.....*Bactrocera fuscitibia*
- 12b. Lateral postsutural vittae narrows posteriorly before
i.a setae.....13
- 13a. Costal band clearly exceeds R2 + 3 and not until
R4 + 5, and at the wingtips costal band widened:
Figure 3M.....*Bactrocera melastomatos*
- 13b. Costal band just overlapping R2 + 3: Figure
3N.....*Bactrocera neocognata*

The dichotomous is the key of determination that is created for the user to be able to determine and recognize an organism (Griffing, 2011). This key consists of a specific set of questions with two questions and lead the user to a species, genus, family, or order of an organism. The questions contained in the dichotomy key are arranged in pairs and show opposite characters. The dichotomous keys are made sequentially starting from general characters to specific characters. An organism with the most unique character among the others will be placed first in the dichotomous key. In fruit flies, dichotomous keys can be made from the characters on the head, scutum, scutellum, femora, wings, abdomen, and genitalia (Drew & Hancock, 1994; IPPC, 2015; Drew & Romig, 2016; Plant Health Australia, 2018). In this study, dichotomous key was made based on the type of male fruit fly attractant to be used easily in determining fruit fly species.

CONCLUSION

The diversity of fruit flies species tribe Dacini in Central Bangka Regency, Bangka was 3 genera and 14 species. Based on morphological identification, fruit flies that trapped in the methyl eugenol attractant trap were identified as *B. atrifemur*, *B. carambolae*, *B. dorsalis*, *B. occipitalis*, and *B. umbrosa*. Meanwhile, fruit flies that trapped in cue lure attractant traps were identified as *B. albistrigata*, *B. fuscitibia*, *B. melastomatos*, *B. neocognata*, *B. nigrotibialis*, *D. nanggalae*, *Z. apicalis*, *Z. caudatus*, and *Z. cucurbitae*. Seven of the fourteen species of fruit flies found in Central Bangka Regency are *B. dorsalis* complex. All fruit fly species obtained were presented with a dichotomous identification key based on male fruit fly attractants.

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