

Identification and inventory dragonfly Family Libellulidae at Slamet Reservoir, Surabaya, East Java

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Article information	ABSTRAK
Article history:	Waduk Slamet merupakan sebuah waduk buatan yang berada di dataran rendah daerah perkotaan. Keberadaan waduk dengan tipe habitat perairan menggenang ini berpotensi besar menjadi habitat alami berbagai jenis capung terutama Famili Libellulidae. Penelitian ini bertujuan untuk identifikasi dan inventarisasi jenis capung Famili Libellulidae di Waduk Slamet. Pada penelitian ini menggunakan metode Visual Encounter Survey (VES) dengan dimodifikasi menggunakan metode <i>Transect Belt</i> . Metode ini merupakan pengamatan dengan menyusuri garis melingkar yang telah di tentukan. Pengambilan sampel dilakukan dengan cara menangkap capung dewasa menggunakan jaring serangga kemudian diawetkan menggunakan aseton 50%. Setelah diawetkan, bagian tubuh capung dilakukan pengukuran morfometri menggunakan jangka sorong. Hasil penelitian menunjukkan bahwa di Waduk Slamet terdapat 12 spesies capung Famili Libellulidae dengan total 131 individu. Spesies dengan nilai kelimpahan relatif tertinggi yaitu <i>Brachythemis contaminata</i> dengan nilai 51.15%. Sedangkan spesies dengan nilai kelimpahan relatif terendah yaitu <i>Acisoma panorpoides</i> , <i>Diplacodes trivialis</i> dan <i>Pantala flavescens</i> dengan nilai 0.76%.
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	ABSTRACT
Keywords:	Slamet Reservoir is an artificial reservoir located in the lowlands of urban areas. The existence of this reservoir with a stagnant water habitat type has great potential to become a natural habitat for various types of dragonflies, especially the Libellulidae family. This study aims to identify and inventory species of dragonflies in the family Libellulidae in Slamet Reservoir. In this study, the Visual Encounter Survey (VES) method was modified by using the Transect Belt method. This method is an observation by following a predetermined circular line. Sampling was carried out by catching adult dragonflies using insect nets and then preserving them using 50% acetone. After being preserved, the dragonfly body parts were measured by morphometry using a caliper. The results showed that in the Slamet Reservoir there were 12 species of dragonflies from the Libellulidae family with a total of 131 individuals. The species with the highest relative abundance value was <i>Brachythemis contaminata</i> with a value of 51.15%. While the species with the lowest relative abundance values were <i>Acisoma</i>
Inventory	
Dragonfly	
Libellulidae	
Identification	

panorpoides, *Diplacodes trivialis* and *Pantala flavescens* with a value of 0.76%.

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INTRODUCTION

Dragonflies are flying insects that are scientifically classified into the Order Odonata. Dragonflies can be found in various types of habitats (Ansori, 2008), especially in aquatic habitats (Choong et al., 2020; Susanto & Zulaikha, 2021). Dragonflies have a big role in the ecosystem, one of which is maintaining the balance of the food chain (Riyaz, 2021; Susanto & Bahri, 2021). In urban areas, dragonflies can suppress insect populations that have the potential as disease vectors, because dragonflies are carnivorous insects (Herlambang et al., 2016). Dragonflies can prey on small insects such as mosquitoes, flies (Dalia & Leksono, 2014), aphids (Safrudin & Maulana, 2020), small moths and bees (Setiyono et al., 2017). So that the presence of dragonflies in an ecosystem can be an indicator of ecosystem balance (D. W. Pamungkas & Ridwan, 2015). Therefore, knowledge about the identification and inventory of dragonflies at a location is very important, to determine the type and existence of dragonflies as predatory insects that have a big role in the environment.

The Order Odonata has many family members, one of which is the family that is often encountered, namely Libellulidae. The Libellulidae family is a group of dragonflies that have various colors such as blue, red, yellow, and there are many species that have gray wax powder on certain parts of their bodies (Setiyono et al., 2017). The Libellulidae family can be recognized by the various striking patterns on their wings. The abdomen tends to be wide and thin (Rahadi et al., 2013). The Libellulidae family is the most commonly encountered group of dragonflies on a daily basis, there are about 1000 species of members of the Libellulidae family scattered in the world, 51 species of which can be found on the island of Java (Setiyono et al., 2017). Most of the dragonflies belonging to the Libellulidae family have high migratory abilities and good flight abilities, so their distribution can be very far. Most types of dragonflies belonging to the Libellulidae family also have a fairly high tolerance level to changes in environmental quality, so they can be found in various ecosystems such as forest rivers, highland lakes to reservoirs in urban areas.

Slamet Reservoir is administratively located in Lidah Kulon Village, Lakarsantri District, Surabaya City, East Java. Slamet Reservoir is an artificial dam located in a low-lying urban area that was built to hold a lot of water with the aim of preventing flooding. The existence of a reservoir with a stagnant water habitat type supports the presence of insects, so that it can become a natural habitat for various types of dragonflies, especially the Libellulidae family. There is no data regarding the types of Libellulidae dragonflies at the Slamet Reservoir location, making inventory and identification research important so that it can provide information about the types of dragonflies in the Libellulidae family in the Slamet Reservoir, Surabaya City, East Java.

METHODS

This research was conducted on July and August 2021, in each month 2 day observations were made with observation time on dragonflies active activity at 08.00-11.00 WIB. This research was conducted in the Slamet Reservoir, Lakarsantri District, Surabaya, East Java. The location of Slamet Reservoir has coordinates (S7° 18' 2.3 E112° 39' 40.9). Data collection in this study used the Visual Encounter Survey (VES) method (Harms et al., 2014) with modifications using the Belt Transect method (Haritonov & Popova, 2011), modification of the method was carried out to adjust the method of data collection and determining the path of observation at the research site. This method is an observation by recording the number of species and counting individuals found by following a predetermined circular line.



Figure 1. Photo of Slamet reservoir

Sample collection was carried out by catching adult dragonflies using an insect net and then placing them in a plastic box containing acetone. Samples were selected randomly at the observation site, by taking one individual per species each (Simple Random Sampling). Preservation of specimens using 50% acetone. After preservation, the dragonfly body parts are measured using a caliper. The morphological terms followed Bastos et al. (2021), namely: Total Length (TL); Abdomen Length (AL); Thorax Length (THL); Maximum width of the thorax (MWT); Length of the forewing (LFW) and hindwing (LHW); Width of the forewing (WFW) and Width of the hindwing at the base (WHWB). The tools used in this research are Aceton, GPS, stationery, caliper, tweezers, Envelope, cameras, watches, insect nets and identification books (B. C. Pamungkas et al., 2016; Rahadi et al., 2013; Setiyono et al., 2017).

The dragonfly data obtained was then analyzed using relative abundance based on (Suaskara & Joni, 2020) with the following formula:

$$KR = \frac{ni}{N} \times 100\%$$

Information:

- KR = Relative Abundance
 ni = Number of individuals of type i
 N = Number of individuals of all types

RESULTS AND DISCUSSION

Based on observations made in the Slamet Reservoir, Surabaya City, 12 species of dragonflies from the Libellulidae family were found with a total of 131 individuals. Slamet Reservoir is located in a lowland area near agricultural land. So that at this location several species were found that are commonly found in lowland areas, including *Brachythemis contaminata*, *Macrodiplax cora*, *Pantala flavescens* and *Rhyothemis phyllis* species. Slamet Reservoir has a stagnant aquatic ecosystem habitat type with understorey vegetation on the banks and above the waters. The availability of this lower vegetation can support the activities of the Libellulidae family of dragonflies in perching, sunbathing and resting. In addition to vegetation conditions, there are various factors that can affect the presence and abundance of the Libellulidae Family, including habitat type, canopy cover, water quality and others.

Table 1. Result of species, name and conservation status

No	Species	Indonesian Name	English Name	Conservation status
1	<i>Acisoma panorpoides</i>	Capung perut terompet	Trumpet tail	LC
2	<i>Brachydiplax chalybea</i>	Capung sambar dada karat	Blue dasher	LC
3	<i>Brachythemis contaminata</i>	Capung jemur oranye	Ditch jewel	LC
4	<i>Crocothemis servilia</i>	Capung sambar garis hitam	Oriental scarlet	LC
5	<i>Diplacodes trivialis</i>	Capung tengger biru	Blue percher	LC
6	<i>Macrodiplax cora</i>	Capung jemur pesisir	Coatal glider	LC
7	<i>Orthetrum sabina</i>	Capung sambar hijau	Green skimmer	LC
8	<i>Pantala flavescens</i>	Capung kembara	Wandering glider	LC
9	<i>Potamarcha congener</i>	Capung sambar perut pipih	Yellow tailed ashy Skimmer	LC
10	<i>Rhodothemis rufa</i>	Capung sambar punggung Metalik	Common redbolt	LC
11	<i>Rhyothemis phyllis</i>	Capung lebah garis kuning	Yellow Striped Flutterer	LC
12	<i>Tholymis tillarga</i>	Capung senja merah	White barred Duskhawk	LC

Information: Indonesian name and english name source: (Setiyono et al., 2016). Conservation status: LC (Least Concern) Source: (IUCN, 2021).

Table 2. Amount of individuals and relative abundance

No	Species	Amount	Relative Abundance
1	<i>Acisoma panorpoides</i>	1	0.76
2	<i>Brachydiplax chalybea</i>	20	15.27
3	<i>Brachythemis contaminata</i>	67	51.15
4	<i>Crocothemis servilia</i>	3	2.29
5	<i>Diplacodes trivialis</i>	1	0.76
6	<i>Macrodiplax cora</i>	8	6.11
7	<i>Orthetrum sabina</i>	14	10.69
8	<i>Pantala flavescens</i>	1	0.76
9	<i>Potamarcha congener</i>	8	6.11
10	<i>Rhodothemis rufa</i>	4	3.05
11	<i>Rhyothemis phyllis</i>	2	1.53
12	<i>Tholymis tillarga</i>	2	1.53
	Total	131	100

In this study, many species of the family Libellulidae were found perching on understory vegetation at the edge of the water (*Brachydiplax chalybea* & *Brachythemis contaminata*), dead wood twigs (*Rhodothemis rufa* & *Potamarcha congener*), bush shoots (*Macrodiplax cora*) and grass far from the water. (*Acisoma panorpoides*, *Diplacodes trivialis*, *Crocothemis servilia*, *Brachythemis contaminata* & *Orthetrum sabina*). In addition, species were also found flying near the waters (*Pantala flavescens* & *Rhyothemis phyllis*) and perched on dense vegetation (*Tholymis tillarga*).

The results of the analysis of the relative abundance value showed that the species *Brachythemis contaminata* was the species with the highest relative abundance value in the Slamet reservoir with a value of 51.15% which was found as many as 67 individuals. This is because the location of the slamet reservoir has habitat characteristics that match the natural habitat of the *Brachythemis contaminata* species, namely stagnant waters in lowland areas with understory plants on the banks and water bodies. This is in accordance with Setiyono et al. (2017) who reported that *Brachythemis contaminata* species were found in waters with open canopies and perched on plants above the waters.

The species with the lowest relative abundance values were *Acisoma panorpoides*, *Diplacodes trivialis* and *Pantala flavescens* with a value of 0.76% which was found only 1 individual. The small number of individuals in the three species can be caused by differences in the environmental conditions of the Slamet Reservoir with the habitat characteristics of each species. As in the

Acisoma panorpoides and *Diplacodes trivialis* species which have habitats in grass vegetation near the waters (Irawan & Rahadi, 2016; Setiyono et al., 2017), but such conditions are only found in a few points of the Slamet Reservoir, so that this species can still be found even with a small number of individuals. While the *Pantala flavescens* species found in small numbers could be due to the very high cruising range and flying ability of this species (Hobson et al., 2012), so that the fluctuation of the *Pantala flavescens* species at a location was very high.

In the sample collection that has been identified and measured, the results are as follows:

1. *Acisoma panorpoides*



Figure 2. *Acisoma panorpoides*

Morphometry: TL 26.5 mm; THL 6.9 mm; AL 17.6 mm; IFW 21.6 mm; LHW 21 mm; WFW 5.6 mm; WHW 6.3 mm; WHWB 6.9 mm; MWT 3.3 mm.

Morphology: The male *Acisoma panorpoides* species has a thorax and abdomen that are predominantly blue-gray in color. On the thorax and sides of the abdomen there is a black pattern, and on the dorsal side of the abdomen there is an elongated black line. The abdomen enlarges at the 5-7th segment. The eyes are blue-grey. There are yellow dots on the wings. The female *Acisoma panorpoides* species has the same shape and pattern as the male species, with the difference that the female species is green.

2. *Brachydiplax chalybea*



Figure 3. *Brachydiplax chalybea*

Morphometry: TL 36.7 mm; THL 8.9 mm; AL 22.4 mm; IFW 28.9 mm; LHW 27.8 mm; WFW 6.5 mm; WHW 7.6 mm; WHWB 7.9 mm; MWT 4.9 mm.

Morphology: The male *Brachydiplax chalybea* species has a thorax that is dominated by blue color and on the top there is a white powder. The abdomen is dominated by blue until the 6th segment, on the 7th segment to the black tuft. The wings are transparent with a brown color at the base of the wings. The female *Brachydiplax chalybea* species has a shape and pattern similar to the male, with the difference that the female species is dominated by a yellowish brown color.

3. *Brachythemis contaminata*



Figure 4. *Brachythemis contaminata*

Morphometry: TL 28 mm; THL 6.1 mm; AL 17.4 mm; lFW 25.3 mm; LHW 23.1 mm; WFW 6.2 mm; WHW 7.9 mm; WHWB 7.7 mm; MWT 3.8 mm.

Morphology: The male *Brachythemis contaminata* species is dominated by orange color throughout its body. The upper abdomen has thin black stripes and is thickened at the 8th and 9th vertebrae. The wings are bright orange. Compound eyes are yellowish brown. The female *Brachythemis contaminata* species has a shape and pattern similar to the male species, but the female species has a yellow abdomen and transparent wings.

4. *Crocothemis servilia*



Figure 5. *Crocothemis servilia*

Morphometry: TL 44.2 mm; THL 10.2 mm; AL 26.6 mm; lFW 33.7 mm; LHW 32.1 mm; WFW 7.1 mm; WHW 8.7 mm; WHWB 9.3 mm; MWT 5.2 mm.

Morphology: The male *Crocothemis servilia* species is predominantly red in all parts of its body. The abdomen is red and at the top there is a straight black line. Transparent wings. The compound eyes are dark red. The female species of *Crocothemis servilia* has a shape and pattern similar to that of the male species, but the female species is predominantly yellow-brown in color.

5. *Diplacodes trivialis*



Figure 6. *Diplacodes trivialis*

Morphometry: TL 26.9 mm; THL 6.3 mm; AL 16.6 mm; IFW 21.8 mm; LHW 20.9 mm; WFW 4.7 mm; WHW 6.3 mm; WHWB 7.3 mm; MWT 3.1 mm.

Morphology: The male *Diplacodes trivialis* species is dominated by blue-gray coloration throughout its body. Abdomen is grayish blue and at segments 8 to 10 are black, on the top of the black stripe pattern. Compound eyes are blue and darker above. The female *Diplacodes trivialis* species has a pattern similar to that of the male species, but the female is predominantly greenish-yellow.

6. *Macrodiplax cora*



Figure 7. *Macrodiplax cora*

Morphometry: TL 40.3 mm; THL 8.7 mm; AL 26.4 mm; IFW 34.7 mm; LHW 32.3 mm; WFW 7.4 mm; WHW 8.9 mm; WHWB 10.8 mm; MWT 4.9 mm.

Morphology: The male *Macrodiplax cora* species is predominantly red in color on most of its body. The thorax is red-brown with black stripes. The abdomen is red, at the top there is a thick dotted black line. The wings are transparent and at the base there is an orange-brown color. The female *Macrodiplax cora* species is very similar to the male species but is yellow-orange in color.

7. *Orthetrum sabina*



Figure 8. *Orthetrum sabina*

Morphometry: TL 52 mm; THL 10.7 mm; AL 35.8 mm; lFW 36.6 mm; LHW 36.6 mm; WFW 7.6 mm; WHW 9.4 mm; WHWB 10 mm; MWT 5.5 mm.

Morphology: The male *Orthetrum sabina* species is predominantly green with black markings on almost all parts of its body. The piston is green with a black pattern. The abdomen is yellowish green with black stripes and some segments are black and white. At segments 1 to 3 the abdomen is enlarged, segments 4-6 are narrow and slender and segments 7-10 are enlarged again. Transparent wings. The female *Orthetrum sabina* species has the same pattern and color as the male species.

8. *Pantala flavescens*

Morphology: The *Pantala flavescens* species has an orange thorax and a brownish-orange abdomen (Pamungkas, 2016). There is a black line on the upper part of the abdomen with a line that is getting thicker towards the end of the abdomen. The female *Pantala flavescens* species has a body that is dominated by pale yellow with gray eyes and pale pink on the top (Setiyono et al., 2017).

9. *Potamarcha congener*



Figure 9. *Potamarcha congener*

Morphometry: TL 46.9 mm; THL 11 mm; AL 31.2 mm; lFW 36.1 mm; LHW 33.9 mm; WFW 6.7 mm; WHW 8.4 mm; WHWB 8.5 mm; MWT 6.3 mm.

Morphology: The male *Potamarcha congener* species is predominantly dark gray in color. The abdomen of segments 1 to 4 are gray, segments 5 to 8 are brown with a yellow pattern, segments 9 and 10 are black. Transparent wings. The female *Potamarcha congener* species are predominantly yellow and black. The thorax is yellow with black stripes. Abdomen yellowish orange with black stripes.

10. *Rhodotheremis rufa*

Morphology: The male *Rhodotheremis rufa* species is predominantly red in color throughout its body. The wings are transparent with no brown markings at the base of the wings. The female *Rhodotheremis rufa* species is dominated by a light brown color throughout its body with a characteristic found on the upper part of the thorax to the abdomen which has a metallic white line (Setiyono et al., 2017).

11. *Rhyothemis phyllis*



Figure 10. *Rhyothemis phyllis*

Morphometry: TL 34.5 mm; THL 6.9 mm; AL 21.7 mm; IFW 39.9 mm; LHW 37.1 mm; WFW 8.1 mm; WHW 10.1 mm; WHWB 14.3 mm; MWT 4.1 mm.

Morphology: The male *Rhyothemis phyllis* species has a greenish-black thorax. The abdomen is black. The forewings are transparent with black on the tips of the wings. At the base of the hind wings there is a black-yellow-black pattern. The female species of *Rhyothemis phyllis* are very similar to the male species.

12. *Tholymis tillarga*



Figure 11. *Tholymis tillarga*

Morphometry: TL 39.8 mm; THL 7.3 mm; AL 27.3 mm; IFW 33 mm; LHW 33.9 mm; WFW 9 mm; WHW 11.1 mm; WHWB 12.1 mm; MWT 4.4 mm.

Morphology: The male *Tholymis tillarga* species has a reddish-orange thorax and abdomen. The wings are transparent and on the hind wings there is a brown-and-white pattern in the middle of the wings. The compound eyes are yellowish red on the top and greenish yellow on the bottom. The female *Tholymis tillarga* species has a very similar pattern to the male, but the female is predominantly light brown with no red markings on the hind wings.

CONCLUSIONS

Based on the results of research that has been carried out in the Slamet Reservoir, Surabaya City, the results found 12 species of dragonflies from the Libellulidae family with a total of 131 individuals. The species with the highest relative abundance value in the Slamet reservoir was *Brachythemis contaminata* with a value of 51.15% which was found as many as 67 individuals. While the species with the lowest relative abundance value, namely *Acisoma panorpoides*, *Diplacodes trivialis* and *Pantala flavescens* with a value of 0.76%, was found only 1 individual.

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