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## The Diversity of the Dragonfly of Orthetrum Genus in Protected Area of Mount Prau, Central Java Indonesia

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### Abstracts

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Dragonfly of the genus Orthetrum is a dragonfly of the Lebullidae family. This dragonfly has a variety of types of morphological structure, body color, distribution and habitat. Habitat dragonfly of the genus Orthetrum is quite extensive, especially around lowland to upland waters. Protected Forest Mount Prau Central Java, is a rainforest that has a water flow appropriate for life dragonflies. It allows the Dragonflies of all kinds to live and thrive in the environment, including Orthetrum. This research was conducted to find out the types of Orthetrum that can be found in Protected Forest Area of Mount Prau, Central Java. Determination of sampling is done along the river flow at 3 stations with total sub plot of sample as much as 12 point, starting from near settlement flow up to 2100 m toward waterfall source. The results of the sample analysis showed morphological variations in the structure of the thorax and abdomen as well as the color variations and patterns on the thorax, abdomen, and wings. Identification of the dragonfly obtained four types of dragonfly Orthetrum with variations on the sex, the male and female sabina Orthetrum, Orthetrum cafferum males. Orthetrum testaceum male, male and female pruinosum Orthetrum, and Orthetrum male and female glaucum. ©2017 JNSMR UIN Walisongo. All rights reserved.

**Key words:** Dragonflies; Orthetrum; Mount Prau.

### 1. Introduction

Dragonflies are taxonomically categorized as Odonata order in Insecta class which based on its character include dragonflies (sub ando anisoptera) and dragonflies / damselfies (sub-

order zygoptera). Dragonflies have a high enough diversity. Pechenik [1] states that there are about 5200 species of needle dragonfly (zygoptera) and dragonflies (anisoptera) can be found in the world.

Dragonflies ecologically generally act as predators of other insects. Nimfa dragonflies can eat other insect larvae in aquatic environments, such as adult dragonfly prey on flies, mosquitoes and some plant pest insects. Based on the life cycle and dragonfly behavior, it can act as a bio indicator of clean water, since the nymphs of dragonflies can not live in contaminated water or in rivers where there are no plants [2].

The research on dragonflies can be developed based on both taxonomy and ecology, as is done by Sachran [3] which identifies 8 types of dragonflies can be used as bioindicators related to physical and chemical conditions (water quality) in windshed river nature reserve and Pangandaran tourism park. While Wakhid, et al [4] identified from 13 species of dragonflies belonging to 4 families can be identified in Bogani Nani Wartabone National Park, North Sulawesi.

One of the potential existence of the dragonfly in the research in this research is the dragonfly that is in the Prau Forest Protected Forest area with an average height of 1030 mdpl. This area is located in Gunung Prau Mountain located in Kendal District, Central Java. The forest area is still very natural and rarely visited by humans. Kendal Regency has a topographical area of mountainous, hilly and heavily. This region has the potential waterfall (Waterfall Semawur) is very abundant both during the dry season and rain. Preliminary observations in the Prau Mountain area are various types of dragonflies that vary from color, size, to body structure, head, stomach and wings that are one of the genus orthetrum.

Orthetrum is one of the genus of the Lebullidae family dragonfly. Lebullidae is the largest family of the order odonata, sub ando anisoptera. No less than 1000 types of skimmer dragonflies are members of the lebullidae family. Orthetrum adults generally have relatively large body sizes, although there are some that have small bodies.

Dijkstra and Kalkman [5] suggest that the genus Orthetrum includes 60 species. Dijkstra [5] suggests that Orthetrum has a wingspan length of 22-55 mm, with body colors varying

between males and females, as well as body colors that vary among dragonflies of different ages of maturity.

The existence of Prau Prau Nature reserve holds the potential of Dragonflies large enough to be examined from the aspect of taxonomy and ecology. Based on this background, in this article, researchers explain the diversity of Orthetrum in Prau Protected Forest Area, Kendal, Central Java.

## **2. Experiments Procedure**

The tools and materials used in this study include insectnet, papilot paper, plastic clip, needle and syringe, ruler, paper millimeter block, lup, camera, stereo microscope, 4% formalin, identification book. Sampling was performed along streams at 3 stations with a total of 12 sub-plot samples, beginning with a near-settlement stream of up to 2100 m towards the source of the waterfall. Sampling time is done from morning to afternoon in June 2015. Selection of sampling time by considering weather factor based on precipitation precipitation data by Meteorology, Climatology and Geophysics Agency (BMKG). Rainfall in June was at 50 - 100 mm (low category). Low rainfall abundance of dragonflies is higher than in high rainfall, especially during the day [2].

The samples of dragonflies were captured using insectnet and then preserved by injecting 4% formaldehyde fluid and stored into papilot paper or plastic clips. Each sample of the dragonfly is characterized and identified in the UIN Walisongo Biological Laboratory structure by using the insectation key guidebook of LIPI insects and the Dragon Fly Society Press Wendit Dragon Fly book published by Indonesia Dragonfly Society Press.

## **3. Result and Discussion**

The results of morphological characterization of orthetrum dragonflies can be seen in Table 1. From Table 1. shows that morphological variations in thorax and

abdominal structures and color variations as well as patterns on thorax, abdomen, and wings. The results of the identification of four types of dragonfly orthetrum with variations on the sex, namely male and female sabina orthetrum, male caffrum orthetrum. male testaceum orthetrum, male and female pruinose orthetrum, and male and female glaucum orthetrum.

Morphological characters are seen both qualitatively and quantitatively. The qualitative morphological characteristics include the shape, kind, location, color, as well as the shape and color of other ornamentation found on the caput, thorax, abdomen, wings, and external reproduction apparatus (for male and female determination). The quantitative character is a measure of the length of the abdomen and the length of its wings. Based on recorded, measurable and visible characters, then identification was done using several bibliographic sources to identify the family, genus, and species categories of the specimens obtained. Results of classification in general can be seen in Table 2.

Description of each type of Orthetrum in each sample is as follows:

a. *Orthetrum sabina* (common name: "Varigated Green Skimmer" /Green Sambar)

Dragonflies of this species are found to be complete both male and female (see Figure 1). The morphological characteristics of the male abdominal form is a 1-3-grease segment, segment 4-6 slim and segment 7-10 widened dorsoventral direction. An antenodal distal on the front wing is complete, both there are costal and subcostal. A well-developed loop analysis that is small and closed-sealed at the end. [6] The wing's end is colorless or plain, there is a mark or color on the base of the rear wing. Abdominal color is yellowish green and black. The color of the thorax is green and black. The adjacent eye above the head fused in the midline [7]. Based on result of measurement to sample known that abdominal and thoracic length 46 mm. Abdominal length 37.5 mm, front wing length

37 mm and rear wing length 34 mm. Wingspan front 8.5 mm and rear wing width 10.5 mm. The dragonfly is black-brown.










**Figure 1.** *Orthetrum sabina* (Male)

The female body morphology is similar to males. Compound eyes are green, thoracic and abdomen dominant green but alternate with black lines. The length of the female abdomen (32-35) mm, while the wings are wider than males of length (33-36) mm [8]. Results from measurements of female orthetrum samples obtained by abdominal and thoracic length 46 mm. Abdominal length 37.5 mm, front wing length 37 mm and rear wing length 34 mm. Wingspan front 8.5 mm, and rear wing width 10.5 mm.

b. *Orthetrum glaucum* (common name: "Blue Skimmer" / Blue Sambar)

Dragonflies of this species are found to be complete both male and female (see Figure 2 and Figure 3). The morphological features of the male abdominal form are segments 1-4 fat, the 5-10 segment widens the dorsoventral direction. The color of the grayish blue abdomen, the dark blue 8-10 segment tends to be black and the pale blue emblem. The color of dark blue thorax is gray with slightly covered white powder. Transparent wings with dark brown venation. The dark brown pterostigma at the base is a yellowish brown spot. The adjacent eye above the head fused in the midline [7].

**Table 1.** Types of Orthetrum identified from the Protected Forest area of Mount Prau

No.	Type Orthetrum	Male morphology	Female morphology
1	<i>Orthetrum sabina</i> (Green Sambar)		
2	<i>Orthetrum cafferum</i>		
3	<i>Orthetrum testaceum</i> (Orange Sambar)		
4	<i>Orthetrum pruinosum</i> (Red Sambar)		
5	<i>Orthetrum glaucum</i> (Blue Sambar)		

**Tabel 2.** Classification of *Orthetrum*

Filum	Class	Ordo	Subordo	Family	Genus	Species
Arthropoda	Insecta	Odonata	Anisoptera	Lebullidae	<i>Orthetrum</i>	<i>Orthetrum sabina</i> (♂/♀)
						<i>Orthetrum cafferum</i> (♂)
						<i>Orthetrum pruinosum</i> (♂/♀)
						<i>Orthetrum glaucum</i> (♂/♀)
						<i>Orthetrum testaceum</i> (♂)

The results of the measurement of the samples obtained abdominal and thoracic length 44 mm. Abdominal length 32 mm, 36.5 mm front wing length, 36 mm wingspan rear wing, 9 mm front wing width and 11.5 mm rear wing. This characteristic corresponds to several sources that say the morphological features of the male glaucum *Orthetrum* ie the whole body of this species tend to be blue.

Brownish blue composite eyes, dark blue grayish tones with slightly covered white powder. Gray abdomen is grayish and 30 mm in length, dark blue 8-10 segments tend to be black and pale blue emboss. Both wings are transparent with dark brown venation and dark brown pterostigms. Long rear wing of 35 mm and at the base there is a yellowish brown spots. Black limbs and redness at the base [8].



Figure 2. *Orthetrum glaucum* (male)



Figure 3. *Orthetrum glaucum* (female)

The female orgasm of the female glaucum is found to be immature and has morphological features of the abdominal form of the chamber 1-4, the 5-10 segment widens the dorsoventral direction. A dark brownish-brown abdomen and a light brown line extending over the top. In section 8 there is a wing-like emblem. Chestnut color yellow brown, yellow brown syntax and on both sides there are two dark brown lines. Transparent wings with black vein and brownish brown spots, blackish brown pterostigm. The adjacent eye above the head fused in the midline [7]. The results of the measurements on the sample revealed abdominal length and thorax 42 mm. Abdominal length 32 mm, 40.5 mm front wing length, 37.5 mm rear wing length, 9 mm front wing and 12.5 mm rear wing. The limbs are black at the end and the reddish yellow at the base.

c. *Orthetrum pruinosum* (common name: red sambar)

Dragonflies of this species were found to be complete both male and female (see Figure 4 and Figure 5). Characteristic morphology of male dragonfly is the abdominal form of the segment 1-4 fat and the 5-10 segment widens the dorsoventral direction. Abdomen and red embellings, but the upper side of the 1-3 segment is covered with white powder. Chestnut color dark red but covered dark blue powder. Both wings are transparent with black venation and a bit of white powder, black pterostigma and in the base of the rear wing are small brown patches. The adjacent eye above the head fused in the midline [7].

The results of the measurements revealed abdominal length and thorax 42 mm. The length of the abdomen is 30 mm, the front wing length is 37 mm, the wingspan is 35 mm, the front wing width is 8.5 mm and the rear wing is 11.25 mm. This characteristic is consistent with some sources that say that the morphological features of the male Pringuing Orthetrum have a dark brownish green eyes that tend to be black. Dark red chest but covered with dark blue dust. Abdomen and red embellings, but the upper side of the 1-3 segment is covered with white powder and abdominal length (28-31) mm. Both wings are transparent with black venation and a bit of white powder. Black pterostigma, long rear wing (32-36) mm and in the base of the rear wing are small brown patches and black limbs [8].

Morphological characteristics of the female abdominal form is widened dorsoventral direction. The color of the brownish yellow abdomen and between the segments there is a black line. Chestnut yellow brown color with the upper middle of the thorax is a bright brown line. The color of the wings is slightly yellowish with brown velation and pterostigma is brownish yellow. The adjacent eye above the head fused in the midline [7]. The results of the measurements on the sample revealed 39 mm abdominal and thoracic lengths. Abdominal length 27.5 mm,

37 mm front wing length, 37 mm wingspan, 9 mm wingspan and 11 mm rear wing.



Figure 4. *Orthetrum pruinatum* (male)



Figure 5. *Orthetrum pruinatum* (female)

d. *Orthetrum cafferum* (White lined skimmer)

Dragonflies of this species were found *Orthetrum cafferum* males (See Figure 6). This morphological characteristic of the dragonfly on the abdomen of 1-3 seguk seguk and segment 4-10 widened the dorsoventral direction. Abdomen is pale blue, chest x-ray with two colored lines pale yellow or white bones. The wings are transparent with brownish brown spots on the base of the wings and brown pterostigms. The adjacent eye above the head fused in the midline [7].

The measurement results are known abdominal and thoracic length 45 mm, abdominal length 32.5 mm, front wing length

37.5 mm and rear wing length 36 mm. Wingspan front 9 mm and rear wing width 11.5 mm. This characteristic corresponds to several sources that say that the morphological features of the *cafferum* *orthetrum* are medium size and pale blue abdomen. Torax is brownish with 2 pale yellow side lines [9]. The special feature of this species is the pale yellow or white line of bone present in the thorax.



Figure 6. *Orthetrum cafferum* (male)

e. *Orthetrum testaceum* (common name: Orange Skimmer)

Dragonflies of this species were found *Orthetrum* male *testaceum* (see Figure 7). This dragonfly has the morphological features of the abdominal form of 1 to 4 greases and the 5-10 segment widens the dorsoventral direction. Color of orange-brown abdomen and red vermilion stomach. Chestnut orange-brown color, transparent wing color with black venation, there are yellow spots on the base of the rear wing. The pterostigma is black, the adjacent eyes above the head unite in the midline [7]. The measurement results are known abdominal length and thorax 42 mm. Abdominal length 31 mm, front wing length 37 mm, rear wing length 34.5 mm, front wing width 8.5 mm and 11 mm rear wing. This characteristic corresponds to some sources who say that male *testaceum* *orthetrum* has a rear wing length of 34-38 mm and a total body length of 43-48 mm. Males have an orange-brown thorax and a vermilion red abdomen.

Eyes gray brown. There are yellow spots on the base of the rear wing. The female is brownish-yellow with a clear rear wing base [7].



Figure 7. *Orthetrum testaceum* (male)

The results of characterization and identification indicate that the character description of the dragonfly that has been collected in the form of specimen in the form of field photographs and specimens caught shows that in each observation station found a dragonfly belonging to the genus *Orthetrum*. The full picture in Table 3.

According to Table 3, both male and female Sabine *Orthetrum* types can be found at each station, as well as the male cafferum *Orthetrum*. They are found relatively evenly on almost every replication of the three sampling stations. *Orthetrum pruinosum* can also be found on all three stations, although the samples from each replication on the three stations are fewer. The *Orthetrum glaucum* type can only be encountered at station 1, and is not present at either sampling station 2 or 3.

The type of *Orthetrum testaceum* can hardly be found during sampling, except only in repeat 1 at station 3, and even then it can only be sampled as much 1 tail.

*Orthetrum sabina* based on the description of Table 3 shows the wide spread of each station. This species is highly adaptive, can live in a water environment that is not good and live soliter [8]. Susanti [2] states that this species is very abundant and can be found throughout Java Island, even this dragonfly can be found in almost all countries. This dragonfly has a very high adaptability, sehingg can be found from the lowlands to a height of 2500 mdpl.

*Orthetrum glaucum* can be found in 3 stations, but not dominant. This dragonfly lives solitary, in which male dragonflies are often found competing with *Orthetrum pruinosum* to defend its territory. This dragonfly can be found throughout the year, but more at the beginning of the rainy season. Usually perched on the edge of twigs or rocks around the river *Orthetrum pruinosum* Active during the morning until noon and live solitary. Male dragonflies often perched on the edge of twigs or rocks around river waters and more often encountered during the dry season [8].

*Orthetrum testaceum* at the time of sampling is not visible on each plot, this is related to the solitary habit of life, so it is difficult to find in clustered conditions like *O.sabina*. According Rhd [8] dragonfly is active during the morning until noon especially when the sun is hot and solitary life. More common during dry season

Table 3. Existence of *Orthetrum* on three stations in the Prau Island Protected Forest of Mount Prau, Central Java.

No	Species	Station 1			Station 2			Station 3		
		1	2	3	1	2	3	1	2	3
1	<i>Orthetrum sabina</i> (♂/♀)	v	v	v	v	v	v	-	v	v
2	<i>Orthetrum cafferum</i> (♂)	v	v	v	v	v	v	-	v	v
3	<i>Orthetrum pruinosum</i> (♂/♀)	-	v	v	v	-	-	-	-	v
4	<i>Orthetrum glaucum</i> (♂/♀)	-	v	v	-	-	-	-	-	-
5	<i>Orthetrum testaceum</i> (♂)	-	-	-	-	-	v	-	-	-

#### 4. Conclusion

Result of identification of dragonfly of Orthetrum genus in Prahau Prahau Forest area get four types of Orthetrum dragon with variation on sex, ie male and female sabina Orthetrum, male cafferum Orthetrum. Orthetrum testaceum male, male and female pruinosum Orthetrum, and Orthetrum male and female glaucum.

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