Dragonfly Community in Flowing and Stagnating Water in the Cibodas Botanical Garden Area

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Abstract. There are about 5000-6000 types of dragonflies which will continue to grow when new types are found. The diversity of dragonflies in Indonesia is quite high, namely about 750 species or 12.5% of the total in the world. This study aims to determine the dragonfly community in flowing and stagnant water in the Cibodas Botanical Garden Area. The research method used was a descriptive exploratory method, while the data collection technique used the Catch and Release technique (TLK). Data analysis in this study used descriptive analysis. Data collection was carried out in May - July 2018. The locations included in the flowing water group were Sakura Park and Cismun Waterfall, while Air Mancur and Guest House were included in the stagnant water group. The results showed that there were 8 types of dragonflies identified, namely Orthetrum Pruinosum, Orthetrum sabina, Orthetrum glaucum, Pantala flavescens, Neurothermis fluctuans, Neurothemis terminata, Ischnura senegalensis, Coeliccia membranipes. The most common species found was Pantala flavescens with 533 individuals, while the least species found was Neurothemis terminata with 4 individuals. Sub-order zygoptera was found only in 2 types in this study, namely the Coeliccia membranipes with the number of 101 individuals and Ischnura senegalensis with the number of 19 individuals. The dominant types of dragonflies in flowing and stagnant water are Pantala flavescens and Orthetrum pruinosum. The Coeliccia membranipes dragonfly was only found in running water, namely at the location of the Cismun waterfall and Ischnura senegalensis only found in stagnant water, namely at the location of the fountain.

1. Introduction

Dragonflies are a group of insects that are included in the Odonata Order with two Sub Orders, namely Anisoptera and Zygoptera (Gallesi & Sacchi, 2019). The anisoptera is larger and more stocky than the needle dragonfly, and can generally fly faster. The wings of the Anisoptera dragonfly are usually stretched at the time of perching (Khelifa, 2019). Meanwhile, Zygoptera is small and slender like a needle. When perching, the wings of the dragonfly needles fold or close on their back (Roni et al, 2017).

Dragonflies are easy to recognize and have various types, most commonly found in tropical regions as the regions have various types of ideal habitats throughout the year (Vincy, Brilliant, & Kumar, 2016). There are about 5000-6000 types of dragonflies and this number will continue to increase when new species are found. The development of the assessment of the Odonata order is important to be improved (Golfieri, Hardersen, Maiolini, & Surian, 2016) Odonates as indicators of the ecological integrity of the river corridor: Development and application of the Odonate River Index (ORI) in

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northern Italy. Ecological Indicators 61, pages 234-247. For example, examining the distribution and population of Odonata members in the territory of Indonesia, which has a fairly high amount of diversity, which is about 750 species or 12.5% of the total in the world (Shanti, 1998).

Each habitat has different characteristics, supported by the existence of different species. Each species in each of these habitats has their respective functions and are related (Allen, Le Duc, Thompson, 2010). Dragonflies have an important role in this reciprocal relationship. Supporting factors are the number of species, diversity of species, these two factors will describe the relative existence of communities (Sönke et al, 2017).

Research from the World Dragonflies Association (WDA) or the international dragonfly lover community based in the UK in 2012 noted that dragonflies in Indonesia are threatened with extinction, even though there are still around 700 species of dragonflies in Indonesia, and 136 types of them can be found in Java (Syamsul, 2015). Therefore, we are interested in conducting research on dragonfly communities in flowing and stagnant water in the Cibodas Botanical Garden area.

2. Methodology

Research design
This research uses a descriptive exploratory method. Descriptive research conducts analysis only to the level of description, namely analyzing and presenting data systemically, so that it can be easier to understand and conclude while exploratory research is a type of research that aims to find something new in the form of grouping certain symptoms, facts and diseases. Exploratory descriptive research, which aims to describe a state of a phenomenon, in this study is not intended to test certain hypotheses but only describes the existence of a variable, symptom or condition (Arikunto, 2013).

Research Procedures
Research Licensing
The research permit was addressed to the head of the Cibodas Botanical Garden conservation center by providing a research permit. A reply letter was received by the researcher 7 days after the research permit was granted.

Determination of research location
The research was located in the Cibodas Botanical Garden, Cianjur, West Java. 4 research locations were determined, namely, the Fountain, Guest House, Sakura Park and Ciismun Waterfall.

Environmental parameter measurement
Measurement of environmental parameters such as air temperature, wind speed, humidity was by a Weathermeter, altitude was measured using GPS, water temperature was measured using a thermometer, light intensity was measured using a lux meter application and pH was measured using pH indicator paper.

Sampling
Sampling was carried out using insect nets and then photographed to be identified. Dragonflies were identified using the identification books of the Wendit Flying Dragon and Dragonflies of Peninsular Malaysia and Singapore.

Research Tools
The tools used in this study included insect nets, digital cameras, GPS (Global Positioning System), watches, road boards, writing instruments, observation modules, dragonfly identification books, thermometers, weather meters, pH indicators, calipers., and magnifying glass.

Data Collection
The data taken were the types and numbers of dragonflies in the Cibodas Botanical Garden area, at the location of the fountain, guest house, cherry blossom garden, Ciismun waterfall, air temperature, humidity, altitude, water temperature, light intensity and pH.

**Data analysis**

Dragonfly data are grouped based on the location where the dragonfly species are found. Analysis of the data in this study using descriptive analysis, namely explaining the distribution of the community of flowing and stagnant water dragonflies, as well as looking for the characteristics and habits of the types of dragonflies that live in stagnant and flowing water areas.

### 3. Result and Discussion

This study found 8 types of dragonflies, namely 6 from the Libellulidae family, 1 from the Platycnemididae family and 1 from the Coenagrionidae family identified, there are 6 of the anisoptera sub-orders namely *Orthetrum pruinosum*, *Pantala flavescens*, *Orthetrum sabina*, *Orthetrum glaucum*, *Neurothemis terminata*, *Neurothemis fluctuans*, and 2 of the zygoptera sub-order, namely, *Coeliccia membranipes*, *Ischnura senegalensis*.

| Dragonfly Name | Sub-order | Family | Flow | Stagnate |
|----------------|-----------|--------|------|----------|
| Orthetrum pruinosum | Anisoptera | Libellulidae | 244 individuals | 275 individuals |
| Orthetrum Sabina | Anisoptera | Libellulidae | 129 individuals | 143 individuals |
| Orthetrum glaucum | Anisoptera | Libellulidae | 28 individuals | 23 individuals |
| Neurothemis terminate | Anisoptera | Libellulidae | 4 individuals | 0 individual |
| Neurothemis fluctuans | Anisoptera | Libellulidae | 5 individuals | 0 individual |
| Pantala flavescens | Anisoptera | Libellulidae | 288 individuals | 245 individuals |
| Coeliccia membranipes | Zygoptera | Platycnemididae | 96 individuals | 5 individuals |
| Ischnura senegalensis | Zygoptera | Coenagrionidae | 0 individual | 19 individuals |

![Graph 1. Dragonfly Community Diagram in Flowing Water.](image_url)
Flowing Water Dragonfly Community

Based on Figure 1, the dominant type of dragonfly was in Pantala flowing water (Sakura Park). *Pantala flavescens* and *Orthetrum pruinosum* (Ciismun Waterfall). Sub-Order zygoptera, the type of Coeliccia membranipes, was found in the Ciismun Waterfall area. Dragonfly types *Orthetrum sabina* and *Orthetrum glaucum* were found with an even distribution in both places. In contrast to previous research conducted at Sungai Brantas Batu Malang, there were 10 types of dragonflies (Odonata), 8 species including the Anisoptera sub-order, the Libellulidae family namely Diplacodes trivialis, Neurothemis ramburi, *Orthetrum glaucum*, *Orthetrum pruinosum*, *Orthetrum sabina*, *Pantala flavescens*, trithemis festiva, *Zyxomma obtusum*, and 2 species were included in the suborder Zygoptera, the Cholrocyphidae family, namely Libellago lineata and the Coenagrionidae family, namely *Ischnura senegalensis* (Virgiawan, 2014). Another study conducted by Raebel et al., (2010) found dragonfly diversity in 2 sub-orders, 7 families, 18 genera and 21 species including: *Orthetrum sabina*, *Orthetrum pruinosum*, Diplacodes trivialis, *Pantala flavescens*, *Neurothemis ramburi*, *Neurothemis terminata*, Potamarcha congener, Tholymis tillarga, Crocothemis servilia, Brachythemis contaminata, Agrionoptera insignis, Tetrathemis irregularis, Species 2 (Family: Aeshinade), Agriocnemis femina, Agriocnemis pygmaea, *Ischnura phenegalensis*, margin: Aeshinade, and Species 3 (Family: Protoneuridae).

Research on the community structure of dragonflies in the tourist area of Curug Lawe Benowo to determine the differences in community structures in each type of habitat discovered 19 types of dragonflies from 7 different families, with a total number of individuals found from 4 stations as many as 205 individuals. The data from the analysis showed that there is a relationship between the physical conditions of the environment, and the types of dragonflies, which affect the presence and distribution of dragonflies in a habitat, and can be used to describe the structure of the dragonfly community in the area (Alamsyah, 2016).

Flooded Water Dragonfly Community

Based on Figure 2, only 6 out of 8 species of dragonflies were found in stagnant water areas, namely *Orthetrum pruinosum*, *Pantala flavescens*, *Orthetrum sabina*, *Orthetrum glaucum* and two sub-orders of zygoptera namely *Ischnura senegalensis* and Coeliccia membranipes. Another research conducted in the PTP Nusantara X Ajung Subdistrict, Jember Regency, found as many as 638 individuals belonging to 14 species of insects belonging to the Odonata order (Setiawan, 2014). In another study in rice fields as a stagnant water area, there were 5 species of dragonflies, namely *Orthetrum sabina*, Crocothemis servilia, *Pantala flavescens*, Agriocnemis femina and Agriocnemis pygmaea, which consists of 2 families, namely the Libellulidae and Coenagrionidae families (Syamsul, 2015).

The most dragonfly species were found in the cherry blossom garden location, in the location of this cherry blossom park, 7 species were found including Orthetrum pruinosum 135 individuals, *Pantala flavescens* 193 individuals, Coeliccia membranipes 10 individuals, Orthetrum Sabina 66
individuals, Orthetrum glaucum 18 individuals, Neurothemis fluctuans 5 individuals, and Neurothemis terminata 4 individuals.

Fewer species of dragonflies were found at the Guest House location. The difference in the discovery of this species is due to the characteristics of each location, where the location of the cherry blossom park there is a wide flow of water, small trees, riverbank rocks, and there is also a small pond which is often used for laying eggs from dragonflies. While the location of the Guest House is an open location that is often visited by many visitors or tourists, there is no big river like in the location of the cherry blossom garden and there is only a large pool. The difference in the number of dragonflies in an area is caused by the influence of the environmental quality of a place such as temperature, pH, humidity, humidity, weather and availability of food (Syamsul et.al., 2015).

The difference in dragonfly communities in flowing and stagnant water is due to differences in the dragonfly life cycle and the condition of the dragonfly habitat (Sönke et al, 2017). In the two communities, the most common dragonflies obtained were Orthetrum pruinosum, because these dragonflies are found mostly during the dry season. The condition of the habitat of the two communities can also affect the types of species obtained, such as the flowing water dragonfly community and the habitat at the Ciismun Waterfall location has a lot of plant vegetation that grows, cliffs, hilly roads, and a puddle of water covered by plants that allow the dragonfly Coeliccia membranipes to breed.

The community of flowing water dragonflies, at the location of Sakura Park also has many cherry blossom trees and rocks on the riverbank that can be used as a resting place for dragonflies. Meanwhile, the community of inundating water dragonflies at the Air Mancur and Guest House locations has a large and deep pool, the Guest House has also a pool with shallow water and overgrown with many shrubs in the pond which dragonflies use to lay their eggs and many dragonfly nymphs were found at this location.

At Air Mancur, there is grass growing on the edge of the pond which made Ischnura senegalensis dragonflies breed in that location. The location of this stagnant water community is also an open, grassy area with tall and large trees.

There are several factors that can affect the survival of dragonflies in the Cibodas Botanical Garden area. The first is air temperature, where the air temperature in the four observation locations is almost the same, namely 210C - 290C. This is in accordance to a paper entitled "Abundance and Population Dynamics of Odonata based on its Relationship with Rice Phenology in Several Pesawahan Around Bandung, West Java" where the influence of environmental quality lies at the temperature with a maximum 450C optimum 250C and a minimum 150C (Ansori, 2009).

The maintenance of the Cibodas Botanical Garden area is also a factor that can affect the survival of the dragonflies, including cleaning and draining the fountain pool, causing the dragonfly nymphs that are in the pool mud to be cleaned.

The cleaning of the grass that is carried out in all locations makes dragonflies become endangered because of the smoke generated from lawn machines that contain chemicals. The Cibodas Botanical Garden is an area that is full of visitors. Bad visitor activities such as littering, make the habitat of dragonflies in stagnant and flowing waters would slowly be damaged.

4. Conclusion

From the research conducted at Cibodas Botanical Garden, Cianjur, West Java it can be concluded that there are 8 types of dragonflies identified, namely 6 from the Libellulidae family, 1 from the Platycnemididae family and 1 from the Coenagrionidae family. The most common species found was Pantala flavescens with a total of 533 species, while the least species found was Neurothemis terminata with 4 species. Meanwhile, only two species of sub-Order zygoptera, namely the Coeliccia membranipes with 101 individuals and Ischnura senegalensis with 19 individuals.

The dominant types of dragonflies were in the flowing water area (Sakura Park), Pantala flavescens and Orthetrum pruinosum (Ciismun Waterfall). Sub-Order zygoptera, the type of Coeliccia membranipes, was found in Ciismun Falls. Dragonfly types Orthetrum.
This study found 6 of 8 types of dragonflies in stagnant water areas, namely Orthetrum pruinosum, Pantala flavescens, Orthetrum sabina, Orthetrum glaucum and two sub-orders of zygoptera, namely Ischnura senegalensis and Coeliccia membranipes.

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