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Diversity of Dragonflies (Odonata) at Pancur Resort Alas Purwo National Park, Indonesia

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ABSTRACT

Alas Purwo National Park is one of the conservation areas located in the east of the island of Java. Dragonflies are crucial to the ecosystem's equilibrium as predator, bioindicator, and vector for disease control. The sensitivity and presence of dragonflies affect the diversity of dragonflies in a habitat. This inventory can assist the Alas Purwo National Park with additional data and be a basis for making conservation policies. The study aimed to determine the type and diversity index of the dragonflies in this park. The sample location was determined using purposive sampling, and the sample conducted utilised road sampling. This research observed seven species: *Orthetrum glaucum, Orthetrum chrysalis, Lathrecista asiatica, Potamarcha congener, Copera marginipes, Prodasineura autumnalis, and Nososticta insignis.* The Libellulidae family had the most species; on the other hand, the Protoneuridae family had the fewest Shannon-Wiener diversity index (H' = 1.6). Based on the criteria, the diversity index demonstrated moderate results. Pancur Resort Alas Purwo National Park provided a good environment and supported the survival of dragonflies.

Keywords: Alas Purwo National Park, Diversity, Dragonfly, Pancur

INTRODUCTION

Pancur Resorts with an area of 14,427.80 hectares is located at the eastern tip of Java within Alas Purwo National Park. Over 700 flora and 415 fauna species have been recorded. One of the fauna is dragonflies (Rohman *et al*., 2020; Rohman & Faradisa, 2020). According to Kalkman and Orr (2013), there are around 6,580 dragonfly species worldwide (Kalkman & Orr, 2013). Dragonflies are widely dispersed. The spread of dragonflies includes plantations, forests, rice fields, rivers, lakes, and other locations (Simatupang *et al.*, 2019). Dragonflies are generally located near water (Ilhamdi *et al*., 2019). However, it may also be found far from water (Hardersen, 2008; Nafisah *et al*., 2019). It demonstrates high flying ability and mobility (Salami *et al*., 2019).

In addition, dragonflies are crucial to the ecosystem's equilibrium (Renner *et al*., 2022) as aquatic predators and pests (Kandibane *et al*., 2005; Chodey & Noorullah Shariff, 2021). They also show high potential as vector control of various diseases (Vatandoost, 2021). In addition, they also serve as biological indicator of water quality, wetlands and aquatic health (Herlambang *et al*., 2016; Vanacker *et al*., 2018; Rohman *et al*., 2020). Thus, these dragonflies' existence in the ecosystem is determined by its outstanding sensitivity to environmental change (Taradipha & Rushayati, 2018; Noor-Ul-Islam *et al*., 2021).

The existence of dragonflies affect the diversity of dragonflies in a habitat (Korkeamäki & Suhonen, 2002; Schindler *et al*., 2003). The availability of food sources, such as plantation habitats, lakes, primary woods, and waterfalls (Akbar & Basukriadi, 2021), are related to the presence of dragonflies in an environment (Brito *et al*., 2021). The effect of habitat type and landscape context also determines the community structure of adult dragonflies (French & McCauley, 2018). Canopy cover affects adult dragonfly habitat selection (Worthen & Chamlee, 2020) as canopied places have lesser diversity than uncanopied locations (Susanto *et al*., 2022).

This research focused on three locations for sampling. The previous survey stated that there were seventeen dragonflies with extensive survey coverage (BISA, 2019). Other conservation area-related research, including one at Wonoasri Resort, Meru Betiri National Park, recorded eight species of dragonflies (Nur Hikmah *et al*., 2019). The Bawean Island Nature Reserve conservation area recorded twenty-three species of dragonflies (Rohman *et al*., 2020). These data may be utilised for illustration in this study. This inventory may assist Alas Purwo National Park with additional data and be a basis for formulating conservation policies.

MATERIALS AND METHODS

Study Site

This research was carried out from October to November 2021 at Alas Purwo National Park's Pancur Resort. The sample location was determined by employing purposive sampling method. The data were collected between 07:00 to 10:00 Western Indonesia Time (WIB) and 15:00 to 17:00 WIB. Sampling was conducted via road sampling. The location was divided into three sampling locations, and each point contained three replication plots (Figure 1). These three locations were in the coastal forest area of Parang Ireng, Pancur Resort.

This research utilised several instruments including a camera, killing bottle, tweezers, millimetre block paper, ruler, stationery, stereo foam, insect needle, label paper, papilot, and Garmin GPS. Field data recording comprises of types, numbers, habitats and several other supports. Subsequently, books by Fraser (1960) and Theischinger (2009) and related journals were utilised to identify the dragonflies. The data was analysed using the Shannon-Wiener species diversity index (Odum, 1993).

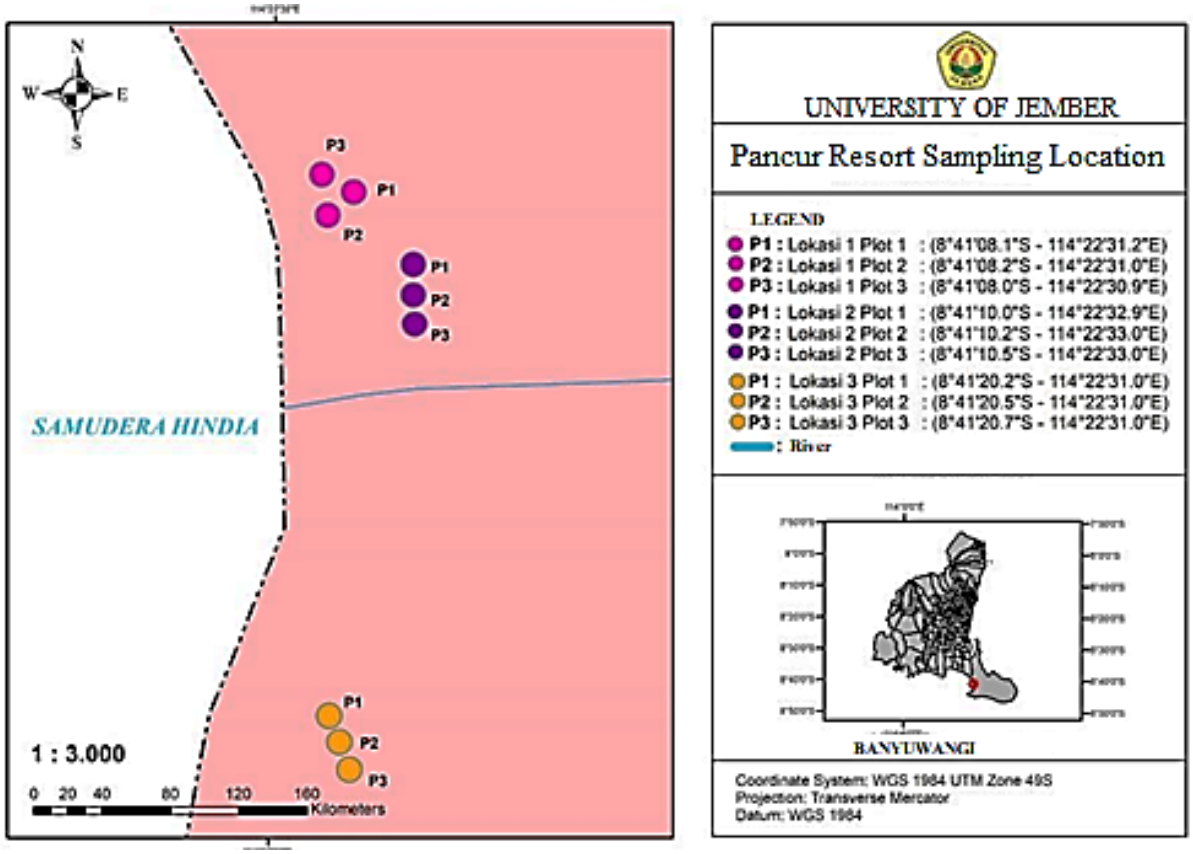

Figure 1. Location of Resort Pancur Sampling (Source: Google Earth, 2021)

RESULTS AND DISCUSSION

This study was conducted in three locations; each location had three replicate points, with nine plots used in studying dragonflies at Pancur Resort, Alas Purwo National Park. The assemblages of dragonfly species are tabulated in Table 1.

There were seven species of dragonflies during the initial survey at Pancur Resort, Alas Purwo National Park, consisting of three families. The first family, Libellulidae, consists of three species: *Orthetrum glaucum, Orthetrum chrysalis, Lathrecista asiatica, and Potamarcha congener*. The Platycnemididae family consists of two species: *Copera marginipes* and *Prodasineura autumnal*. The family Protoneuridae consists of one species, *Nososticta insignis* (Table 1). Six species were discovered at the initial location, including *O. glaucum, O. chrysalis, L. asiatica, P. congener, C. marginipes* and *P. autumnalis*. Simultaneously, two species were discovered at the second location: *P. congener and N. insignis*. In addition, *O. chrysalis* and *P. congener* were discovered at the third location.

Table 1. Dragonflies collected at three locations of Pancur Resort Alas Purwo National Park

No	Family	Species	Location 1	Location 2	Location 3
1	Libellulidae	*Orthetrum glaucum*	√	-	-
2	Libellulidae	*Orthetrum chrysis*	√	-	√
3	Libellulidae	*Lathrecista asiatica*	√	-	-
4	Libellulidae	*Potamarcha congener*	√	√	√
5	Platycnemididae	*Copera marginipes*	√	-	-
6	Platycnemididae	*Prodasineura autumnalis*	√	-	-
7	Protoneuridae	*Nososticta insignis*	-	√	-

The percentage of dragonfly species are as following: *O. glaucum* with 8%, *O. chrysalis* with 18%, *L. asiatica* with 13%, *P. congener* with 42%, *C. marginipes* with 3%, *P. autumnalis* with 3%, and *N. insignis* with 13%. (Figure 2). According to the findings of Subagyo (2016), from the three families found, the Libellulidae family had the highest number of species, while the Protoneuridae family had the lowest number of species, indicating that the Libellulidae family is the most familiar of the three species. The Libellulidae family dominates the surrounding wetland study area. Libellulidae (Genus *Orthetrum*) members are widely distributed, from residential areas to mountain river flows (Simatupang *et al*., 2019; Susanto *et al*., 2021). The findings by Daltro *et al.* (2019) and Rohman *et al*. (2020) revealed that the Libellulidae family dominated the Bawean Island Nature Reserve conservation area. *P. congener* is one of the active flying species. Several factors that can support insect flying activity including moderately high temperature, low light intensity, moderate wind speed, and low to moderate air pressure (Chen & Seybold, 2014).

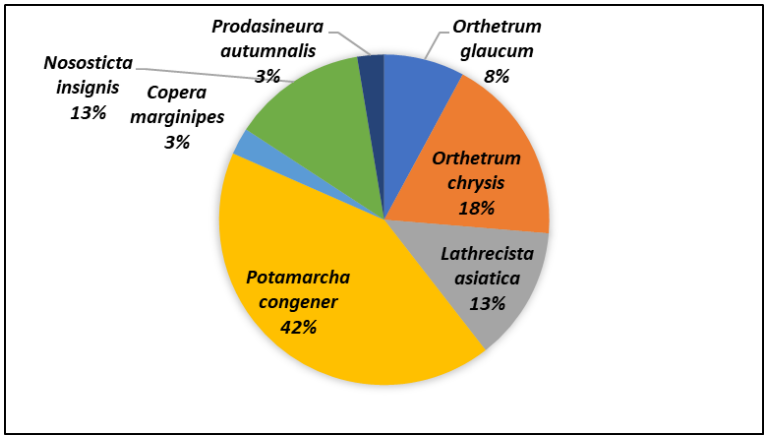

Figure 2. Percentage of dragonflies discovered in the three study locations at Pancur Resort, Alas Purwo National Park

The Shannon-Weiner diversity index analysis (Table 2) reveals that *L. asiatica* has a diversity index of 0.26. On the other hand, *O. chrysalis* has a diversity index of 0.30, *O. glaucum* 0.19, *P. congener* 0.37, *C. marginipes* 0.09, *N. insignis* 0.26, and *P. autumnalis* 0.09. The *P. congener* species has the highest index. The diversity index for dragonflies at Resort Pancur Alas Purwo National Park is 1.6. According to the Shannon-Wiener criterion, it falls under the medium category. This demonstrated that Pancur Resort Alas Purwo National Park is a good environment and supported the survival of dragonflies. The dragonfly diversity index in the three locations was not significantly different, indicating that the location was in good condition, particularly for survival. In addition, abiotic factors play an essential role in the diversity of dragonflies. Dragonflies with abiotic factors (integrity, canopy cover, physical description, water chemistry) and regional environmental variables (bioclimatic, forest cover) have important implications for organisms in environmental monitoring (Oliverira- Junior *et al*., 2019).

Table 2. Dragonfly Diversity Index Value of Pancur Resort Alas Purwo National Park

No	Family	Species	H’
1	Libellulidae	*Lathrecista asiatica*	0.26
2	Libellulidae	*Orthetrum chrysis*	0.30
3	Libellulidae	*Orthetrum glaucum*	0.19
4	Libellulidae	*Potamarcha congener*	0.37
5	Platycnemididae	*Copera marginipes*	0.09
6	Protoneuridae	*Nosoticta insignis*	0.26
7	Platycnemididae	*Prodasineura autumnalis*	0.09
		Total Number	1.6

Notes: H’ = Shannon & Wiener Index

The physical conditions of the environment are crucial factor in the life and development of dragonflies. The air temperature range was 34 – 38 °C with 54 – 72% humidity, a light intensity of 596 – 1673 x 100 lux, and a wind speed of 0.008 – 0.1 m/s (Table 3). These measurements reveal that conditions significantly affected dragonflies' survival. Location one demonstrated the highest air temperature and light intensity; while location two revealed the lowest air temperature and light intensity. The dry season sampling indicated a significant negative correlation between the maximum temperature for the presence of these values. Inversely, low temperatures with increased rainfall and humidity correlated with an increase in infestation (Savopoulou-Soultani *et al*., 2012). Several factors of microenvironment changes may increase the environment's temperature. The suborder Zygoptera appears more impacted by environmental temperature (Castillo-Pérez *et al*., 2022). Moreover, dragonflies' abundance and species diversity are positively correlated with air temperature; however, are correlated negatively with humidity and vegetation cover (Koneri *et al*., 2020; Ramli *et al.*, 2021).

Table 3. Environmental factors of Pancur Resort Alas Purwo National Park October 2021

Location	Air temperature (ºC)	Humidity (%)	Light intensity (Lux)	Wind speed (m/s)
1	38	54	1673	0.02
2	34	72	596	0.008
3	36	60	1618	0.1

CONCLUSION

There are seven species of dragonflies at Pancur Resort, Alas Purwo National Park, namely *Orthetrum glaucum, Orthetrum chrysalis, Lathrecista asiatica, Potamarcha congener, Copera marginipes, Prodasineura autumnal* and *Nosoticta insignis*. The Libellulidae family has the most species; on the other hand, the *Protoneuridae* family has the fewest. The value of the Shannon Weiner index indicated moderate diversity results. Pancur Resort Alas Purwo National Park provides a good environment and supports the survival of dragonflies.

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