

Diversity And Distribution Of Odonata In University Sumatera Utara, Medan, Indonesian

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Abstract: A total of nine stations randomly selected study sites around the University Sumatera Utara area conducted during a month (16 January 2016 until 16 February 2016) for identified of Odonata. Odonata are insect which function as bioindicator and conservation of an environment status in the area. The sampled were collected using a sweep net (400 μ m mesh, 60 cm x 90 cm) with six times the swing starts at 0900 until 1200 noon hour and identified in the laboratory. Consist of two sub-orders, 4 families, 24 genera, 32 species and 156 individuals identified dragonfly. *Orthetrum sabina*, *Pantala flavescens* and *Agriocnemis femina* are the kinds of dragonflies dominant, while two types of *Vestalis/Arthystira amoena* and *Tholymis aurora* is found only in the Station 3. As much as 54% relative abundance of family Coenagrionidae dominated, followed by Libellulidae (35%), Gomphidae (8%) and the smallest recorded from family Calopterygidae (35). The calculation of the value of the index is done, includes diversity Shannon, evenness and varied of Jaccard index ($H'=2.48-3.79$, $E=0.70-0.85$, $CJ=0.45$ to 1.00). Based on the conservation status, calculated the percentage of attendance dragonfly, divided into four groups of species that are rare (6.28%), there are species (54.24%), many species (24.78%) and very many species (14.70%). This study shows diversity and distribution of Odonata can used as potential as predators and conservation status of ecosystem University of Sumatera Utara areas.

Keywords: Diversity, distribution, Odonata, USU, Medan, Indonesian

1 INTRODUCTION

Odonata as one of the components of biological diversity plays an important role in the food web that is as herbivores, carnivores and detritivore (Strong et al., 1984). Odonata larvae are predators in the aquatic food chain (Benke, 1982), while the adult of Odonata as predators of pests of crops and plantations (Kandibane et al., 2005). There are 5500 species of Odonata have been identified worldwide, with fifteen families, consisting of ten families damselfly (sub-order Zygoptera) and five families of dragonflies (sub-order Anisoptera) (Orr, 2005). Life of Odonata in tropical regions are very dependent on the temperature (Dingemans and Kalkman, 2008), dissolved oxygen, pH (Cynthia and Darell, 1992), the vegetation is heterogeneous, microhabitat (Watanabe et al., 2004), the weather conditions are optimum (Corbet, 1980) and other environmental factors affect the growth of dragonflies (Che Salmah et al., 2006; Siregar et al., 2008, 2009). In natural habitats such as water (ponds, swamps, rivers, mangroves, lakes), forests, rice fields and many other dragonflies were found. However, research on rare dragonfly environment of the University of Indonesia. Habitat unique and strategic role in the environment Odonata raises curiosity about this fascinating winged insect. University Sumatera Utara as the University for Industry is seen as strategic to investigate the biodiversity of flora and fauna as a source of germplasm of life in the world of education and research. As one of the largest state universities in Sumatra, USU as a green campus assessed by multifunction in determiner, protect, and dissemination of information on the sustainability of biodiversity in support of sustainable development. Therefore, the initial research conducted around USU to see where Odonata that will be associated with the function and role in the ecosystem.

Materials and Methods

Sampling was carried out from a month of Odonata collection during 16 January 2016 until 16 February 2016. The sampling location were determined into nine points of observation stations at randomly around the USU areas, comprised of Station 1 (Sport building area), Station 2 (forest education area), Station 3 (Land experimental of Agriculture area), Station 4 (Libraries area), Station 5 (Faculty of Engineering area), Odonata adults were captured using a sweep net (400 μ m mesh, 60cm x 90cm) (Kandibane et al., 2005; Sharma and Joshi, 2007; Benazzouz et al., 2009) with six swing to collect species/individual dragonflies between the hours of 0900 to 1200 noon hour. Specimens collected included insect boxes, pinned, and then in the paper collect the insect collection, and then taken to the laboratory. Furthermore dragonfly insect pinned to the box, put in the oven and heated for 72 hours at a temperature of 60°C, and then the dragonfly is ready put it into the box as preparations preserved dry. Identification of adult Odonata done with a direct view visually in the field, was photographed with a digital camera or from specimens preserved dried using Olympus CX41 microscope (Olympus Tokyo, Japan). Identification adults used identification book such as Asahina (1976, 1979); Askew (1988); Chowdhury and Hammand (1994); Fraser (1933, 1934, 1936); Kumar (1973 a, 1973b); Merrit and Cummins (2006); and Santi (1998). Data specimens of Odonata obtained recorded, made a brief description by observing morphological traits in the field and on the preservation of dry using books Orr (2003, 2005), then calculate the index of diversity Shannon (Magurran, 1988), the diversity index Piloni (Magurran, 1988), while the similarity between habitats of species was measured using Jaccard index (Magurran, 1988).

Results

1. Species Diversity Of Odonata in USU Areas

There are two sub-orders, 4 families, 24 genera, 32 species of Odonata with a total of 156 individuals identified around in the green campus of University Sumatera Utara as shown in Table 1. *Orthetrum sabina*, *Pantala flavescens* and *Agriocnemis femina* is the dominant types of dragonflies were recorded on each sampling stations, whereas the type *Vestalis/Arthystira*

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- Station 6 (Auditorium area), Station 7 (Faculty of Nursing area), Station 8 (Faculty of Art and Culture area) and Station 9 (Faculty of Law area).

amoena *Tholymis aurora* were only recorded at Stations 3. Family *Coenagrionida* dominate (54%) of the families were identified in the field, followed by *Libellulidae* family e (35%), *Gomphidae* (8%), and only 3% of families *Calopterygidae* as shown in Figure 1.

Table 1. Diversities of Odonata in green campus of USU, Medan-Sumatera Utara

Sub order/Family	Name of species	S1	S2	S3	S4	S5	S6	S7	S8	S9
Zygoptera Calopterygidae	<i>Neurobasis chinensis</i>	0	0	0	1	1	1	0	0	0
	<i>Vestalis/Arthystira amoena</i>	0	0	1	0	0	0	0	0	0
Coenagrionidae	<i>Agriocnemis femina</i>	2	2	3	2	3	2	1	2	2
	<i>A. pygmaea</i>	3	2	3	1	1	1	1	1	1
	<i>Argiocnemis rubescens</i>	1	1	1	0	1	1	1	1	1
	<i>Coenagrion calamineum</i>	1	1	1	1	1	1	1	1	1
	<i>C. fluviatilis</i>	0	0	0	1	1	0	0	0	0
	<i>Ischnura senegalensis</i>	2	2	1	1	1	1	1	1	1
	<i>Pseudagrion microcephalum</i>	2	1	1	1	0	1	1	1	1
	<i>P. pruinatum</i>	1	1	1	0	1	0	0	1	0
	<i>P. rubricens</i>	1	1	1	0	1	1	1	1	1
Anisoptera Gomphidae	<i>Burmagomphus plagiatus</i> Gomphidia <i>abbotti</i>	0	0	1	1	0	0	0	0	0
	<i>Ichthyogomphus decoratus</i>	0	0	1	0	0	1	0	0	1
	<i>Onychogomphus thienemanni</i>	1	1	0	1	0	0	1	0	0
Libellulidae	<i>Aethriamanta gracilis</i>	0	0	1	0	0	1	0	0	0
	<i>Brachydiplax chalybea</i>	0	0	1	0	0	0	0	1	0
	<i>Brachythemis contaminata</i>	0	1	1	0	1	1	0	1	1
	<i>Crocothemis servilia</i>	2	1	1	0	0	0	1	1	1
	<i>Diploides trivialis</i>	0	1	1	1	1	0	0	0	0
	<i>Hydrobaileus croceus</i>	0	0	1	1	1	1	1	0	1
	<i>Neurothemis fluctuans</i>	1	0	0	1	0	0	1	0	0
	<i>N. ramburii</i>	0	1	0	1	1	0	0	0	0
	<i>N. terminata</i>	1	1	0	1	0	0	1	0	0
	<i>Orthetrum sabina</i>	3	2	3	2	2	2	2	2	2
	<i>O. testaceum</i>	0	0	1	0	1	0	0	1	0
	<i>Pantala flavescens</i>	1	2	1	2	3	2	3	1	2
	<i>Potamarcha congener</i>	0	1	0	1	0	1	0	1	0
	<i>Rhytonia plutonia</i>	0	0	1	0	0	1	0	0	1
	<i>Rhyothemis phyllis</i>	0	1	0	1	1	0	0	0	0
	<i>Tholymis aurora</i>	0	0	1	0	0	0	0	0	0
<i>T. tillarga</i>	0	1	1	1	1	0	0	0	0	
Total (N)		22	24	30	23	23	20	17	17	18
Score of Families		3	3	4	4	4	4	3	3	3
Score of Species		14	19	24	20	18	17	14	15	15

Note: S1 = Station 1 (Sports building area); S2 = Station 2 (Education forest area); Station 3 (Land experimental of Faculty of Agriculture area); Station 4 (Libraries area); Station 5 (Faculty of Engineering area); Station 6 (Auditorium area); Station 7 (Faculty of nursing area); Station 8 (Faculty of Art and Culture area); Station 9 (Faculty of Law area) at the University of North Sumatra (USU), Medan, North Sumatra.

Recorded from - = No + = 1-19 individuals, ++ = 20-39 individuals, +++ = 40-59 individuals. Source: Primary Data (2011).

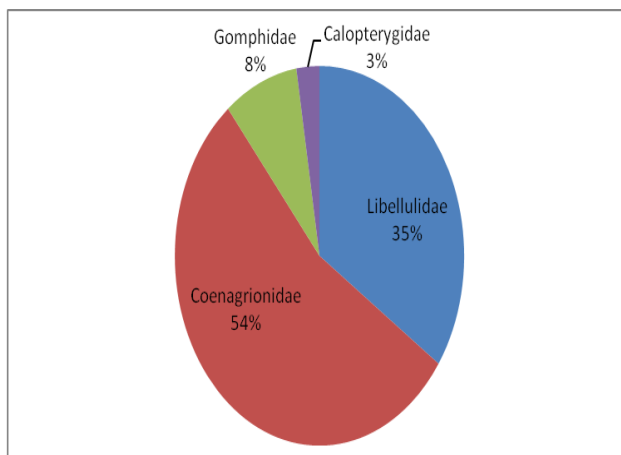


Figure 1. Family percentage of Odonata composition in USU area, North of Sumatra

2. The Biological Indices and Conservation Status of Odonata

Table 2 shows biological indices, consists of Shannon-Wiener diversity index score, Pilou index score (E) and species similarity index score of Jaccard index (Cj). The scores were varied such as: Shannon index has a value $H' = 2.57$ to 3.86 , followed by the Evenness index ($E = 0.58$ to 0.89), while the

value of Jaccard index (Cj) index is between 0.56 to 1.00 . Based on the conservation status of its presence Odonata categorized into four groups of species, which are rarely obtained (6.59%), the species encountered (53.78%), many species (26.48%) and most abundant species (13.15%) as described into Table 3.

Table 2. Biological Indices of Odonata Diversities in USU Areas, North of Sumatra (Primary Data, 2016)

Station	1	2	3	4	5	6	7	8	9
1	1								
2	0.32	1							
3	0.46	0.32	1						
4	0.41	0.46	0.32	1					
5	0.35	0.41	0.46	0.32	1				
6	0.52	0.35	0.41	0.46	0.32	1			
7	0.29	0.52	0.35	0.41	0.46	0.32	1		
8	0.22	0.29	0.52	0.35	0.41	0.46	0.32	1	
9	0.26	0.22	0.29	0.52	0.35	0.41	0.46	0.32	1
H'	2.60	3.48	3.86	3.16	2.97	3.29	2.57	2.78	2.84
E	0.60	0.64	0.89	0.74	0.68	0.79	0.62	0.58	0.68
Cj	0.59	0.76	1.00	0.87	0.76	0.92	0.62	0.64	0.54

Table 3. Conservation Odonata status in USU (adopted by Jacquemin dan Boudot, 1999 and Bennazous et al., 2009)

Status	Species	Perentation (from 31 species)
Rare Species	- Aethriamanta gracilis - Vestalis/Arethystira amoena	6.59%
Unusual Species	- Neurobasis chinensis - Burmagomphus plagiatus - Gomphidia abbotti - Ictinogomphus decoratus - Onychogomphus thienemanni - P. pruinoseum - P. rubrices - Brachydiplax chalybea - Hydrobaileus croceus - Neurothemis fluctuans - N. ramburii - N. terminata - O. testaceum - Potamarcha congener - Rhytonia plutonia - Rhyothemis phyllis - Tholymis aurora	53.78%
Fairly Common Species	- Argiocnemis rubescens - Coenagrion calamineum - Pseudagrion microcephalum - Bracythemis contaminata - Crocothemis servilia - Diploides trivialis - Tholymis tillarga	26.48%
Very Common Species	- Argiocnemis femina - A. pygmaea - Ischnura senegalensis - Othetrum sabina - Pantala flavescens	13.15%

Discussions

1. Species Diversity of Odoanata in USU Areas

Odonata are identified in the green campus of USU which different composition and ecosystem diversity compared to other areas. This is supported by Benazzouz et al. (2009), Gaurav et al. (2007) and, Tribuana et al. (2007), which identifies the number of smaller dragonflies obtained, but similar to a dragonfly the data collected by Sharma and Joshi (2007) and Ghahari et al. (2009), but the composition is lower

than the Tiple et al. (2012) as many as 48 species in Madhya Pradesh, Central India. Such differences may be caused by habitat suitability, vegetation heterogeneous, current weather situation sampling and factors biotic, physical and chemical (Che Salmah et al., 2006; Siregar et al., 2008, 2009), which affect the amount and type of dragonfly caught around the USU campus areas. The family Coenagrionidae were dominant (54%) from the four families were identified in the USU areas, followed by family Libellulidae (35%), Gomphidae (8%), and only 3% of the family Calopterygidae. According

Kandibane et al. (2005) and Sharma and Joshi (2007) noted Libellulidae family and Coenagrionidae is prey (predators). The species of this family are usually aggressive, consuming almost all insects. Libellulid cannibals consume all kinds of aquatic organisms and pests dominant food crops and plantations are the size and texture of the body in accordance consumed dragonflies, are like the Anopheles mosquito larvae, small Sogatella, and other insects (Folsom and Collins, 1984; Blois, 1985). The limited number and species of the family Calopterygidae assumed to be related to the lack of due microhabitat (mostly dragonflies of the family living in the forest), and limited plant vegetation, in addition to environmental factors that are less supportive the growth. However, types of Odonata which the Gomphidae and Coenagrionidae families are common, where rare of Gomphidae climbing plants, live below the substrate or in the mud recorded (Merritt and Cummins, 2004; Orr, 2003). An abundance of individuals and species richness of dragonflies were obtained at each station is different. Suspected factor natural habitat (pools, calm waters, fields with lots of herbs) and plant vegetation heterogeneous (water plants like Juncus sp, Sagitaria sp, Manihot utilisima, Shorea leprosula, Myrtaca fragmantica, etc.) that are often found in station 3 (Land Experimental of Faculty of Agriculture area); 6 station (Auditorium area) and station 4 (Libraries area) is very appropriate and supportive growth Odonata, thus greatly affecting differences in diversity and diversity of Odonata in the USU areas. Dragonfly larvae are very like the condition of waters with plant vegetation and microhabitat humid, this condition is found in the fifth research stations (S2, S3, S4, S5, and S6), only one species was recorded in on Station 3 (Vestalis/Arthystira amoena and Tholymis aurora).

2. The Diversity Index Score and Conservation Status of Odonata in USU

Odonata are identified in USU areas showed that there diversity of Odonata species are higher and varied $H' = 2.57$ to 3.86 , followed by the Evenness index ($E = 0.58$ to 0.89), while the value of Jaccard index (C_j) index is between 0.56 to 1.00 . The diversities of Shannon-Wiener indices of Odonata are low recorded at Station 7 (Faculty of Nursing, $H = 2.57$ and $E = 0.62$) and Station 1 (Sport Building area, $H = 2.60$ and $E = 0.60$), allegedly factor incompatibility habitat and land for Odonata life likely close to water and plenty of plants on depended and mating, but in both these stations are rare conditions. However, the environment of USU areas indicated still awake habitat and vegetation, where dragonflies are still many identified the number and type. While Gaurav et al. (2007) in South India with a value of 1.74 until 2.44 , but similar to the valuable research conducted Gaurav and Joshi (2007) in Shivalik Punjab, India ($H' = 2.98-3.02$). While the Jaccard index value is calculated Kandibane et al. (2005) higher ($C_j = 0.41$ to $1:00$) in Madurai, Tamil Nadu-India. In addition, the conservation status of Odonata based compositions presence indicates that many species are common and more recorded than rare species found around USU. This is supported by research Shelton and Edward (1983) stated that the ability dragonflies survive largely determined by the environmental conditions. In addition, Lawton (1983) states that a large diversity of dragonfly over the life of the plant succession and supported factor stable temperature, pH, relative humidity and the presence of plant vegetation dragonflies demonstrate the ability to survive and multiply in the community in the

neighborhood. Diversity of Odonata can be indicated that the green campus environment USU still awake, because it serves as a dragonfly biondicator a polluted environment, where dragonflies really liked the environment, clean water and insect anti pollutant categories (Siregar et al., 2004). In addition, the dragonfly nymphs are often identified eat mosquito larvae, eggs, frogs, insects, other small fish. When the types of dragonfly classified as a predator found on land for rice cultivation, particularly of the type Agriocnemis pygmaea, A. femina, Ishnura senegalensis, Orthetrum sabina, Pantala flavescens and other species that feed on pests dominant rice crops, such Nephotetix, Nilaparvata lugens, Sogatella furcipera, Scircophaga innotata, Chilo supressalis, Nymphula depunctalis, Valanga, Oxya, Lepidoptera and other rice pests (Watanabe, 1989; Baehaki, 1992; Che Salmah, 1996; Anna and Bradley, 2007). Even sebahagian our society consume some dragonfly as a source of additional protein (Aswari, 2012). Dragonfly very strategic role in the environment, we need to maintain and preserve this beautiful winged insects that function is stabilizing in nature still performing well.

Conclusions

As many as two sub-orders, 4 families, 24 genera, 32 species and 156 individuals of Odonata are identified in green USU campus area. Orthetrum sabina, Pantala flavescens and Agriocnemis femina were the dominant types of dragonflies were recorded at each research station, while the type Vestalis/Arthystira amoena and Tholymis aurora is found only in the Station 3. The family Coenagrionidae were dominant (54%) from the four families were identified in the USU areas, followed by family Libellulidae (35%), Gomphidae (8%), and only 3% of the family Calopterygidae. Diversity of Odonata species are high and varied ($H' = 2.57$ to $3:86$, $E = 0.58-0.89$, $C_j = 0.56$ to $1:00$). An abundance of individuals and species richness of dragonflies were obtained at each station is different. Allegedly natural habitat factors, variations in plant vegetation, time, weather time of sampling, biotic factors, will determine the physical and chemical growth and copulation dragonfly. The percentage is based on the conservation status dragonfly divided four groups of species that are rarely obtained (6.59%), the species encountered (53.78%), many species (26.48%) and most abundant species (13.15%). Diversity number and type of Odonata were identified around the campus green of USU areas demonstrate the role of dragonflies as bio-indicators and predators on farmland. Multifunction of Odonata largely determines in the stability of our ecosystem.... let's keep the existence and preserved it.

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