

Odonata Diversity at University of Southern Mindanao, Kabacan, Cotabato

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ABSTRACT

Odonata are good biocontrol agents of agricultural pests and vector mosquitoes and even an indicator of environmental changes and health status of ecosystem. However, there are limited studies that have been conducted especially on lowland ecosystems. The study was conducted using time constraint with 4 exposure hours and opportunistic sampling protocols. Result of the study revealed 13 species of odonata belonging to three families, 2 of which are Zygoptera and only one family belonging to Anisoptera with 11 species. Libellulidae dominates the recorded species. 8 species are found in USMARC and 6 species in housing. One Philippine endemic was documented - *Rhinocypha colorata*. Diversity is low in the two sampling sites and high disturbance is found in housing (63%). Similarity index showed that 92% are disconcordant species. Low species diversity and low endemism of odonata is an indicator that the area is already disturbed as measured by the high number of common/oriental species

and existence of environmental and anthropogenic activities. Thus, a conservation strategy for this important species will be implemented.

Keywords: Odonata, USM, disturbance, oriental species

INTRODUCTION

The order Odonata includes both the dragonflies and damselflies separated into three suborders: Anisoptera, Zygoptera and Anizygotera (Williams and Feltmate 1992). They can be seen often flying back and forth or darting inconsistently from early morning until late evenings. Researches in different parts of the globe have revealed that insects like Odonata are good indicators of health status of certain ecosystem (Subramanian *et al.* 2008). Odonata are also important as good indicators of environmental changes as they are sensitive to changes in the habitats, atmospheric temperature and weather conditions (Tiple *et al.* 2012). The authors further mentioned that this group of insects is also a good biocontrol agent. Odonata is one of the groups of insects which experiences numerous shifts in distribution and abundance and consequently extinction risk and biodiversity loss (Thomas *et al.* 2004). The deterioration of freshwater habitats across the globe prompted an increased concern on Odonata (Nelson *et al.* 2011).

Given the facts on the importance of Odonata, only a few studies have been conducted here in the Philippines due to only a few researchers are interested in exploring these species (Cayasan *et al.* 2013). In the study of Quisil *et al.* (2013) on Odonata of Lanuza and San Agustin, Surigao del Sur has found two species which are new Mindanao record. Villanueva and Mohagan (2010) found out three new species of damselflies in Mt. Hamiguitan Wildlife Sanctuary. Villanueva (2011 a,b) reported new records from his Odonata surveys in some parts of the Philippines like Diomabok Lake in Davao Oriental, Catanduanes Island, and Siargao and Bucas Grande islands. He emphasized the need in exploring various areas in the archipelago since several parts of the archipelago's main islands like Mindanao are almost unexplored. Mindanao, as one of the three large island groups, has a rich diversity of fauna and is considered to possess a high level of biodiversity due to high mountain ranges (Amoroso 2007). North Cotabato specifically municipality of Kabacan in Mindanao, Philippines is one of the places with poor Odonatological record. Thus, this study was conducted to document the species of Odonata found in the area of the University of Southern Mindanao, Kabacan, Cotabato.

OBJECTIVES OF THE STUDY

This study aimed to document the species of Odonata found in the area of the University of Southern Mindanao, Kabacan, Cotabato.

MATERIALS AND METHODS

Site Selection

The University of Southern Mindanao is at N 7°1'60" E 124° 52' 60". It is located north in the heart of Kabacan, Cotabato more or less 600 meters from the main thorough fare. Two stations were established during the collection: one at the USM Agricultural Research Center (USMARC) - N 7° 06.600' E 124° 50.551' and the one at USM Housing (N 7° 07.392 E 124° 49.589).

USMARC is surrounded by agricultural crops. Most of the area is planted with rice, a portion of it is planted with banana, corn and fruit bearing trees such as lanzones, rambutan and durian, mangosteen (*Garcinia mangostana*) and *Citrus maxima* (Plate 1). Meanwhile, USM housing is on the western side of the University of Southern Mindanao. The area is also surrounded by agricultural crops such as corn, oil palm tree and few area planted with rice. Vacant lots are also planted with lemon grass (Plate 2). Furthermore, housing is inhabited by people. Both sampling areas are exposed to sunlight (open).



USM, Kabacan, Cotabato 2014.



Plate 2. Faculty Housing, University of Southern Mindanao, Kabacan, Cotabato 2014.

Collection

Opportunistic sampling and 4-hour time constraint techniques at 8 am-12nn exposure for two-month in 2014. Odonata was collected using a catching net.

Preservation

The three specimens of Odonata per species were soaked in ethyl acetate and placed in the triangular wax paper with moth balls to preserve them.

Classification, Identification, and Description

Classification and initial identification of Odonata were done using books, journals, and photographs of identified specimens.

Diversity Index and Cluster Analysis

Diversity index and cluster analysis were determined using BIO PRO software version 2.0 following Villanueva and Mohagan, 2010.

RESULTS AND DISCUSSION

Thirteen species of Odonata were recorded collectively from USMARC and USM Housing during the sampling periods. The diversity index showed differences between the two sampling areas. Two families namely: Protoneuridae and Chlorocyphidae were recorded under Zygoptera and only one family was recorded under Anisoptera- Libellulidae (Table 1). In the recorded species, 11 were Anisoptera and only 2 are Zygopterans. Libellulidae was found to dominate the species documented. The recorded species is dominated by *Pantala flavescens* in Housing and *Diplacodes triviale* in USMARC. Furthermore, eight species are found in USMARC and six species in housing.

The result further reveals that most of the collected species are oriental, and only one is endemic to the Philippines - *Rhinocypha colorata*.

Table 1. Identified Species of Odonata at USM, Kabacan, Cotabato 2014

Species	Housing	USMARC
ZYGOPTERA		
PROTONEURIDAE		
<i>Caconeura ramburi</i>		x
CHLOROCYPHIDAE		
<i>Rhinocypha colorata</i>		x
ANISOPTERA		
LIBELLULIDAE		
<i>Brachydiplax chalybea</i>	x	x
<i>Brachythemis contaminata</i>		x
<i>Crocothemis erythraea</i>		x
<i>Diplacodes triviale</i>		x
<i>Lathrecista asiatica asiatica</i>	x	
<i>Macrodiplax sp</i>		x
<i>Neurothemis terminata</i>	x	
<i>Ortherun sabina sabina</i>	x	x
<i>Pantala flavescens</i>	x	
<i>Potomarcha congener</i>	x	
<i>Raphismia bispina</i>		x

The result of the present study reports the diversity of Odonata in agricultural and human inhabited areas. According to Anbalagan *et al.* (2013) odonates are insectivorous thus an important biocontrol agents of agricultural pests and vector mosquitoes. In the current study, species under Libellulidae dominates and greatest in number. Similar findings were previously reported by various researchers. Bashar *et al.* (2014) have reported highest species diversity with 22 species in five selected areas of Bangladesh. Saha and Gaikwad (2014) reported that Libellulidae was the most dominant family represented by 20 species in parks and gardens in Pune City, India. Related results were published by Dorji (2014); Bora and Meitie (2014); Adarsh *et al.* (2014); Tiple *et al.* (2012); Mapiot *et al.* (2013); and Cayasan *et al.* (2013). Libellulidae is highly spread out worldwide and even in local areas because it is the biggest family of dragonfly worldwide. Aside from this, most species under this family usually populate open and sunny environments as well as in disturbed habitat (Caysan *et al.* 2013) because thermoregulation is made possible by solar radiation in larger species (Dalzochio *et al.* 2011) of dragonfly such as in Family Libellulidae. Result of this study conforms to the findings of the above investigators. Moreover, their body size which are larger can be associated to their pattern of distribution (Dalzochio *et al.* 2011). More species of Anisopterans found in this study might be attributed to the type of ecosystem the sampling area which is exposed to sunlight. According to Arulprakash and Gunathilagaraj (2010) that the presence of shade cover and aquatic vegetation favors Zygopterans than Anisopterans. It was also observed by Remsburg *et al.* (2008) that dragonfly abundance is lower in sites with high or moderate shade cover. Mapiot *et al.* (2013) mentioned that Libellulidae are very common in lowland areas such as ricefields.

The result of the study also reveals that most of the noted species are predominantly oriental and widespread species. Quisil *et al.* (2014) oriental dragonflies species can endure disturbance and subsequently survive even the harshest environment. Therefore, they are good indicators of the degraded environment (Caysan *et al.* 2013).

In this study, the number of species recorded is higher compared to that in the work of Kandinabe *et al.* (2005) which recorded only 12 taxa of Odonata in an irrigated rice field of Madurai. Villanueva and Mohagan (2010) documented only 4 species from the agro-ecosystem of Mt. Hamiguitan. Jomoc *et al.* (2013) recorded 12 and 6 species of Odonata in their sampling sites 4 and 6, respectively, which is almost the same description with the sampling sites of this study. Soniyagandhi and Kumar (2014) recorded 8 species of Odonata in rice ecosystem

at Pandit Jawaharlal Nehru College of Agriculture and Research Institute, India.

Only one endemic species was documented- *Rhinocypha colorata*, a Philippine endemic that can tolerate disturbed habitats (Mapi-ot *et al.* 2013). This species is found in USMARC which is an agricultural. According to Villanueva (2012) it can be observed even in places with human activity and tolerant to streams with agricultural and domestic runoffs.

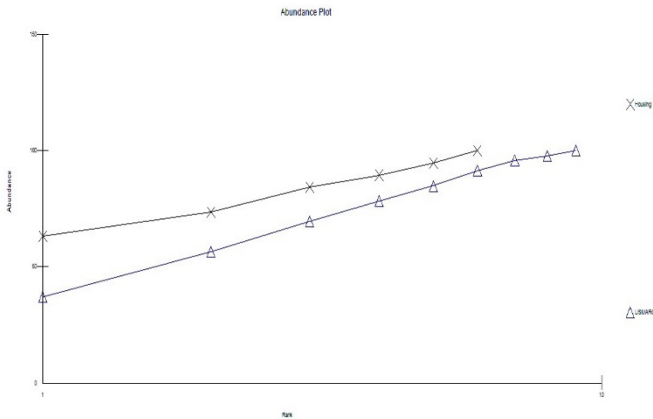


Figure 1. K Plot of Abundance on Odonata Species in USM, Kabacan, Cotabato 2014.

K plot of abundance (Figure 1) reveals that ampleness of sampling was not yet reached, and this implies that additional sampling is needed for possible turnover of the species. Shannon-Weiner index was low in the two sampling areas and a less even distribution is noted (Table 2). The low diversity of species might be attributed also to the limited sampling period (as shown in Figure 1) which decreases the chance of finding isolated and secretive species (Mapi-ot *et al.* 2013). Villanueva and Mohagan (2010) also reported lowest diversity index in agro-ecosystem in Mt. Hamiguitan due to aforementioned reason. Additionally, it was observed that very common species are found in USM Housing indicating that the area is disturbed. This could be possibly attributed to domestic run offs making the habitat of odonates polluted. This is also supported by the dominance of *Pantala flavescens* which could thrive in places inhabited by people and as well as this species feeds on insects such as mosquitoes which thrives in stagnant water.

Table 2. Diversity Indices of Odonata in USM, Kabacan, Cotabato 2014

Indices	Housing	USMARC
Shannon H'	0.534	0.792
Abundance	0.778	0.954
Evenness	0.686	0.83

Parker-Berger index measurement of disturbance on biodiversity showed that both areas are disturbed- Housing 63% and USMARC 37%. Result shows that the sampling sites are somewhat disturbed due to environmental and anthropogenic factors. One reason might be due to the usage of herbicide and insecticides in the two sampling areas. According to Soniyagandhi and Kumar (2014) that a higher reduction of odonatan in the treatment with herbicide + insecticide. Arulprakash and Gunathilagaraj (2011) reported high susceptibility of odonata to pesticides and repeated application might result in a reduction of most species. Villanueva and Mohagan (2010) stated that high disturbance level for odonatan in agro-ecosystem is due to their close association with water habitat. Furthermore, Opiel (2006) reported that habitat disturbance even for small-scale subsistence farming has tremendous impact on odonata diversity.

The similarity of species composition using Bray-Curtis showed that 7% of the species are common to both habitats, and 92% are discorcodant species which means that each habitat is unique for odonata (Figure 2). Both are agricultural areas, but housing differs in such domestic activities which are being introduced.



Figure 2. Dendrogram of Similarity of Species Composition for Odonata in USM, Kabacan, Cotabato 2014.

CONCLUSIONS AND RECOMMENDATIONS

The University of Southern Mindanao has low species diversity and low endemism of odonata which is an indicator that the area is already disturbed as measured by the high number of common/oriental species as well as the existence of environmental and anthropogenic activities. It is recommended that prolong sampling will be done to document more species that might be useful in any conservation effort to be imposed in the said area with regards to odonata population.

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Rhinocypha colorata Selys



Neurothemis terminata Ris



Diplacodes triviales Rambur



Orthetrum sabina sabina Drury



Pantala flavescens Fabricius



Potomarcha congener Rambur

Plate 3. Identified Odonata in University of Southern Mindanao