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Species richness of orb web spiders (Araneae: Araneidae) in Rajah Sikatuna Protected Landscape (RSPL), Bohol, Philippines

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Abstract

The Araneidae (orb-web spiders) is one of the largest spider families. In this study, species richness of orb-web spiders in Rajah Sikatuna Protected Landscape (RSPL) was determined through species richness estimation and biodiversity measures. Sampling was conducted using beat-netting and vial-tapping methods at all layers from ground level to tree canopy layer. One hundred forty six individuals belonging to 34 species under 12 genera were recorded. *Cyclosa hexatuberculata* was identified as new record to Bohol. High species richness was recorded in site 3 with 21 species and 65 individuals. Most of the species found belong to the genus *Cyclosa*. The overall estimated species richness of araneids in this study was 58 species and probably much more. High species diversity (H'=3.168) of araneids was observed in the area. Araneid species in the area were more or less distributed equitably per species.

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Introduction

The orb web spiders or simply Araneids have 169 genera and more than 3,000 described species (Platnick, 2014) of which *Araneus* is the largest genus. They are ecribellate, entelegyne, three-clawed spiders, having eight eyes in two rows (Levi, 2002). The female epigynum ventrally has a copulatory structure, often with a scape or lobe. Palpi of araneid males differ from those of theridiids, tetragnathids, and linyphiids by having the palpal bulb rotated (Coddington, 1986; Levi, 2002). Araneids differ from all other families by having (with the exception of *Cyclosa*, *Zygiella*) a modified canoe-shaped tapetum in the posterior median eyes (Coddington, 1986; Levi, 1986; Levi, 2002). According to Schoener (1969), araneids are sit-and-wait predators. Levold and Finch (2009) reported that species of Araneidae seek shelter while they are waiting for prey. They added that araneids are ecosystem engineers. Unlike most predators, araneids have the ability to survive long periods of low prey availability by reducing their metabolic rates (Anderson, 1970).

Araneid species in the Philippines have been reported mostly on the major islands of Luzon by Barrion (2001) and Chua *et al.* (2014) and in Mindanao by Dacanay *et al.* (2014), Garciano *et al.* (2014), and Enriquez and Nuñeza (2014). However, no such spider surveys have been conducted on the island of Visayas where Bohol is located.

This study was done to determine the species richness of araneid spiders in Rajah Sikatuna Protected Landscape in Bohol. Species richness estimates were computed using EstimateS version 9 and biodiversity indices were calculated using PAST (PAleontological Statistics) software. Hence, this research would provide baseline information on araneid spiders of Bohol and supply additional knowledge on the araneid fauna in the Philippines.

Materials and methods

Study area

The study area was in Rajah Protected Landscape located in the Island of Bohol (Fig. 1).

Fig. 1. Map showing the location of Bohol Island where RSPL is located (Hellingman, 2002).

Five sampling sites were established in five barangays, namely, Nan-od, municipality of Carmen (site 1), Datag, Sierra Bullones (site 2), Marawis, Garcia Hernadez (site 3), Nueva vida este, NVE, Valencia (site 4), and Magsaysay Park, Bilar (site 5).

Sampling sites

Site 1, Barangay Nan-od is found at an elevation of 589 meters above sea level and corn were common in the area. Shrubs and tall trees of molave are also present.

Site 2, Barangay Datag is at an elevation of 538 masl where a large farm of tomatoes and tall trees of molave (*Vitex parviflora*) and mahogany were found.

Site 3, Barangay Marawis which is partly being used for agricultural purposes is at an elevation of 444 masl. Near the site are farms of eggplant, corn, and tomatoes. Balete (*Ficus balete*), shrubs, and bushes were also found in this area.

Site 4, Barangay Nueva vida este has an elevation of 432 masl where burned soil and plants were observed. Tall trees like mahogany and gmelina (*Gmelina arborea*) were found in the site. A portion in the area has farms of pineapple and taro plant.

Site 5, Magsaysay Park has an elevation of 342 masl where molave (*Vitex parviflora*) trees dominated the forest, and monkeys were present in the area.

Sampling was conducted on June 8-15, 2015 for 64 man-hours. Three 1- km transect lines were established in each site. Two collection techniques (vial tapping and beat netting) were done. Samples were placed in vials with 75% ethyl alcohol. Each vial was labeled with the date of collection and site. Identification of collected specimens of araneid spiders was done by Dr. Dupo at the Institute of Biological Sciences, UP Los Banos, Laguna. The suspected new species were labeled with an asterisk (*) and photographed. Biodiversity indices such as Shannon (H) and Evenness (E) were calculated using PAST software application version 3. Species richness estimates were computed using EstimateS software application version 9.

Results and discussion

Species richness

One hundred forty six individuals of orb-web spiders belonging to 34 species under 12 genera were recorded in this study (Table 1). Highest species richness (21) and number of individuals (65) were recorded in site 3 (Marawis) whereas the least species number was recorded in site 5 (Magsaysay Park) with only one species obtained. Out of the 34 species recorded, six species are possibly new to science which include *Araneus* sp., *Araneus* sp. A_2, *Anepsion* sp., *Cyclosa* sp., *Cyrtophora* sp., and *Neoscona* sp. Among the 12 genera, genus *Cyclosa* obtained the highest species richness having nine species. One of the species under this genus includes *Cyclosa hexatuberculata* which was identified as a new record to Bohol. It was also noted as a new record to Pakistan in 2005 (Mukhtar and Mushtaq, 2005) which was originally endemic to India with its common name silver cyclosa spider (Sebastian and Peter, 2009). This species was recorded from Wadali Lake, Amravati of Vidarbha Region (Feroz, 2014) and from selected areas of India (Bastawade, 1993).

Indicated below is the species checklist of araneids collected in RSPL. Most of the araneids were collected on their webs and some were on leaves.

Arachnura sp.

Material: Marawis area, Valencia, Bohol, Philippines, 1 imm, 12.06.2015. Collected from the hanging web.

Araneus sp.

Material: Marawis area, Valencia, Bohol, Philippines, 2♀, 12.06.2015. Collected from the web attached to plants.

Araneus sp. A_2

Material: Marawis area, Valencia, Bohol, Philippines,

1♀, 12.06.2015. Collected from its web.

Araneus inustus C. L. Koch, 1871
Material: Nueva vida este area, Carmen, Bohol, Philippines, 1♀, 14.06.2015. Collected from its web.

General Distribution: Taiwan, Sumatra to Australia.

Araneus mitificus Simon, 1886
Material: Nueva vida este area, Carmen, Bohol, Philippines, 1imm♀, 14.06.2015. Collected from its web.

General Distribution: South, East, and Southeast Asia; west from Pakistan and India, north towards China and Japan, and south towards the Philippines, Papua New Guinea and Australia.

Table 1. Species richness and abundance of araneids in Rajah Sikatuna Protected landscape.

Species	Site 1 (Nan-od)	Site 2 (Datag)	Site 3 (Marawis)	Site 4 (Nueva vida este)	Site 5 (Magsaysay Park)	Total	RA (%)
1.) Arachnura							
Arachnura sp.	0	0	1imm	0	0	1	0.68
2.) Araneus							
*Araneus sp.**	0	0	2♀	0	0	2	1.37
*Araneus sp. A₂**	0	0	1♀	0		1	0.68
Araneus inustus L. (Koch, 1871)	0	0	0	1♀	0	1	0.68
Araneus mitificus (Simon, 1886)	0	0	0	1imm♀	0	1	0.68
3.) Argiope							
Argiope sp.	0	2 imm	1 imm	1 imm	1subA♂	5	3.42
Argiope f. catenulata	0	0	0	1subA♀	0	1	0.68
4.) Anepsion							
*Anepsion sp.**	0	0	1♀, 1subA♂	0	0	2	1.37
5.) Cyclosa							
*Cyclosa sp.**	1♀, 4 imm	1♀, 1♀, 4 imm, 3subA♂	2♀, 3 imm	0	0	19	13
Cyclosa sp. 3Ab	1♂	0	0	0	0	1	0.68
Cyclosa bifida (Doleschall, 1859)	2♀	0	0	0	0	2	1.37
Cyclosa dives (Simon, 1877)	0	0	0	1♂	0	1	0.68
Cyclosa hexatuberculata (Tikader, 1982) NLR	0	1♀, 1limm♀	0	0	0	2	1.37
Cyclosa insulana	0	1♀	1♀, 1subA♂	1♀	0	4	2.74
Cyclosa mulmeinensis (Thorell, 1887)	0	1subA♀	0	1♀	0	2	1.37
Cyclosa f. neilensis (Tikader)	0	1subA♀	1♀., 1♀	0	0	3	2
Cyclosa spirifera (Simon, 1889)/ f.	3♀, 1subA♀	2♀, 1 imm♀	1 imm♀	0	0	8	5.48
6.) Cyrtophora							
*Cyrtophora sp.**	1♂	0	1♀, 2 imm	0	0	4	2.74
Cyrtophora unicolor (Doleschall, 1857)	0	1 imm	1♀	0	0	2	1.37
7.) Eriovixia							
Eriovixia laglaizei	0	0	3♀	0	0	3	2
8.) Gasteracantha							
Gasteracantha sp.	0	0	1 imm	3 imm	3 imm	7	4.8
Gasteracantha arcuata	2♀	0	2♀	0	0	4	2.74
Gasteracantha clavigera (Giebel, 1863)	0	0	0	0	2♀	2	1.37
Gasteracantha diardi (Lucas, 1835)	0	0	0	1♀	0	1	0.68
Gasteracantha doriae (Simon, 1877)/f.	2 imm	0	4 imm	0	1imm	7	4.8
9.) Gea							
Gea sp.	2 imm	1 imm	1♀, 4 imm	0	4 imm	12	8.2
Gea spinipes	1♂	0	1♂, 5 imm, 1subA♀, 2♀	0	0	10	6.8
10.) Macracantha							
Macracantha sp.	0	0	0	0	2subA♀	2	1.37
Macracantha arcuata (Fabricius, 1793)	0	0	14 ♀	2♀	1 imm	17	11.64
11.) Neoscona							
*Neoscona sp.**	1♀	2♀	2 imm	5♀	0	10	6.8
Neoscona olemensis	0	0	1♀, 1 imm, 1	0	0	3	2

			imm♀				
Neoscona nautica/ f.	0	1 imm	1imm♀	1♀	0	3	2
Neoscona f. punctigera	0	0	0	1 imm♀	0	1	0.68
12.) Parawixia							
Parawixia dehaani (Doleschall, 1859)	0	0	0	0	2♀	2	1.37
Total number of species	10	11	21	13	8	34	
Total number of individuals	21	24	65	20	16	146	

Legend: Letters or combination of letters and numbers refer to species name; subscript (number form) refers to no. of individuals; ♀ - Female; ♂ - Male; imm – immature; RA (%) – Relative Abundance; * - possibly new species.

Argiope sp.

Material: Datag area, Garcia Hernandez, Bohol, Philippines, 2 imm, 10.06.2015. Marawis, Valencia, Bohol, Philippines, 1 imm, 12.06.2015. Nueva vida este, Carmen, Bohol, Philippines, 1 imm, 14.06.2015. Magsaysay Park, Bilar, Bohol, Philippines, 1subA♂, 15.06.2015.

Argiope catenulata Doleschall, 1859

Material: Nueva vida este, Carmen, Bohol, Philippines, 1subA♀, 14.06.2015. Collected from its web attached to a leaf.

General Distribution: from India to the Philippines to Papua New Guinea

Anepsion sp.

Material: Marawis area, Valencia, Bohol, Philippines, 1♀ and 1subA♂, 12.06.2015. Collected on the leaves.

Cyclosa sp.

Material: Nan-od area, Sierra Bullones, Bohol, Philippines, 1♀, 4 imm, 08.06.2015. Datag area, Garcia Hernandez, Bohol, 2♀, 4 imm and 3subA♂, 10.06.2015. Nueva vida este, Carmen, Bohol, 2♀ and 3 imm, 14.06.2015. Collected from its web.

Cyclosa sp. 3Ab

Material: Nan-od area, Sierra Bullones, Bohol, Philippines, 1♂, 08.06.2015. Collected from its web.

Cyclosa bifida Doleschall, 1859

Material: Nan-od area, Sierra Bullones, Bohol, Philippines, 2♀, 08.06.2015. Collected from its web.

General Distribution: India to Philippines, New Guinea

Cyclosa dives Simon, 1877

Material: Nueva vida este, Carmen, Bohol, Philippines, 1♂, 4.06.2015. Collected from its web.

General Distribution: China, Philippines

Cyclosa hexatuberculata Tikader, 1982

Material: Datag area, Garcia Hernandez, Bohol, Philippines, 1♀ and 1limm♀, 10.06.2015. Collected from its web.

General Distribution: India, Pakistan.

Cyclosa insulana Costa, 1834

Material: Datag area, Garcia Hernandez, Bohol, Philippines, 1♀, 10.06.2015. Marawis area, Valencia, Bohol, 1♀ and 1subA♂, 10.06.2015. Nueva vida este, Carmen, Bohol, 1♀, 14.06.2015. Collected from their webs.

General Distribution: Mediterranean to Philippines, Australia.

Cyclosa mulmeinensis Thorell, 1887

Material: Datag area, Garcia Hernandez, Bohol, Philippines, 1subA♀, 10.06.2015. Nueva vida este, Carmen, Bohol, Philippines, 1♀, 14.06.2015. Collected from its web.

General Distribution: Africa to Japan, Philippines.

Cyclosa neilensis Tikader 1977

Material: Datag area, Garcia Hernandez, Bohol, Philippines, 1subA♀, 10.06.2015. Marawis area, Valencia, Bohol, Philippines, 2♀, 12.06.2015. Collected from its web.

General Distribution: Endemic to Andaman & Nicobar Islands

Cyclosa spirifera Simon, 1889
Material: Nan-od area, Sierra Bullones, Bohol, Philippines, 3♀ and 1subA♀, 08.06.2015. Datag area, Garcia Hernandez, Bohol, Philippines, 2♀ and 1 imm♀, 10.06.2015. Nueva vida este, Carmen, Bohol, Philippines, 1 imm♀, 14.06.2015. Collected from their webs.

General Distribution: Endemic to India.

Cyrtophora sp.
Material: Nan-od area, Sierra Bullones, Bohol, Philippines, 1♂, 08.06.2015. Marawis, Valencia, Bohol, 1♀ and 2 imm, 12.06.2015. Collected on the leaves.

Table 2. Total number of spiders according to their sexes and life-history stage.

	Site 1	Site 2	Site 3	Site 4	Site 5	Total	Percent (%)	
Adult Male	3	0	1	1	0	5	3	
Adult Female	9	8	28	12	4	61	42	
Immature*	10	7	24	4	9	54	37	\
Immature male	0	0	0	0	0	0	0	/ = 46
Immature female	0	2	9	2	0	13	9	
Subadult male	0	3	2	0	1	6	4	\
Subadult female	1	2	1	1	2	7	5	/ = 9
Total no. of individuals	23	22	65	20	16	146	100	
Total no. of males	3	3	3	1	1	11	8	
Total no. of females	10	12	38	15	6	81	55	

Cyrtophora unicolor Doleschall, 1857
Material: Datag area, Garcia Hernandez, Bohol, Philippines, 1 imm, 10.06.2015. Marawis, Valencia, Bohol, 1♀, 12.06.2015. Collected on the leaves.

General Distribution: Sri Lanka to Philippines, Australia.

Eriovixia laglaizei Simon, 1877
Material: Marawis, Valencia, Bohol, Philippines, 3♀, 12.06.2015. Collected from its web.

General Distribution: India, China to Philippines, New Guinea

Gasteracantha sp.
Material: Marawis, Valencia, Bohol, Philippines, 1 imm, 12.06.2015. Nueva vida este, Carmen, Bohol, Philippines, 3 imm, 14.06.2015. Magsaysay Park, Bilar, Bohol, Philippines, 3 imm, 15.06.2015. Collected from their webs.

Gasteracantha arcuata Fabricius, 1793
Material: Nan-od area, Sierra Bullones, Bohol, Philippines, 2♀, 08.06.2015. Marawis area, Valencia, Bohol, 2♀, 12.06.2015.

General Distribution: Singapore, East Malaysia, Indonesia, Thailand, Myanmar, Sri Lanka and India

Gasteracantha clavigera Giebel, 1863
Material: Magsaysay Park, Bilar, Bohol, Philippines, 2♀, 15.06.2015. Collected from its web.

General Distribution: Thailand, Philippines, Sulawesi

Gasteracantha diardi Lucas, 1835
Material: Nueva vida este, Carmen, Bohol, Philippines, 1♀, 14.06.2015. Collected from its web.

General Distribution: China, Thailand, Malaysia, Sunda Is. China, Thailand, Malaysia

Gasteracantha doriae Simon, 1877
Material: Nan-od area, Sierra Bullones, Bohol, Philippines, 2 imm, 08.06.2015. Marawis, Valencia, Bohol, 4 imm, 12.06.2015. Magsaysay Park, Bilar, Bohol, Philippines, 1 imm, 15.06.2015. Collected from their webs.

General Distribution: Singapore, Malaysia, Indonesia.

Gea sp.
Material: Nan-od area, Sierra Bullones, Bohol, Philippines, 2 imm, 08.06.2015. Datag, Garcia Hernandez, Bohol, Philippines, 1 imm, 10.06.2015. Marawis, Valencia, Bohol, Philippines, 4 imm and 1♀, 12.06.2015. Magsaysay Park, Bilar, Bohol, Philippines, 4 imm, 15.06.2015. Collected from leaves.

Table 3. Biodiversity indices of orb-web spiders in the five sampling sites of Rajah Sikatuna Protected Landscape.

Sampling sites	Site 1 589masl.	Site 2 538 masl.	Site 3 444 masl.	Site 4 432 masl.	Site 5 342 masl.	Total
Species richness	9	12	21	13	8	37
Shannon diversity index (*H'*)	2.133	2.043	2.689	2.359	1.96	3.168
Evenness	0.8294	0.7208	0.7006	0.8141	0.8875	0.6991

Gea spinipes C.L. Koch, 1843
Material: Nan-od area, Sierra Bullones, Bohol Island, 1♂, 08.06.2015. Marawis, Valencia, Bohol, 3♂, 5 imm, and 1subA♀, 12.06.2015. Collected from their own webs.

General Distribution: India, China, Taiwan to Borneo.

Macracantha sp.
Material: Magsaysay Park, Bilar, Bohol Island, 2subA♀, 15.06.2015. Collected from its web.

Macracantha arcuata Fabricius, 1793
Material: Marawis, Valencia, Bohol Island, 14 ♀, 12.06.2015. Nueva vida este, Carmen, Bohol, 2 ♀, 14.06.2015. Magsaysay Park, Bilar, Bohol Island, 1 imm, 15.06.2015. Collected from their webs.

General Distribution: India, China to Borneo.

Neoscona sp.
Material: Nan-od area, Sierra Bullones, Bohol Island, 1♀, 08.06.2015. Datag, Garcia Hernandez, Bohol, 2♀, 10.06.2015. Magsaysay Park, Bilar, Bohol Island, 1 imm, 15.06.2015.

Neoscona molemensis Tikader & Bal, 1981
Material: Marawis area, Valencia, Bohol Isalnd, 1♀, 1 imm, and 1 imm♀, 12.06.2015. Collected from litter, web.

General Distribution: Bangladesh, India to Philippines, Indonesia.

Neoscona nautica C. L. Koch, 1875
Material: Datag area, Garcia Hernandez, Bohol Island, 1 imm, 10.06.2015. Marawis area, Valencia, Bohol Island, 1imm♀, 12.06.2015. Nueva vida este, Carmen, Bohol, 1♀, 14.06.2015. Collected from their webs.

General Distribution: Cosmotropical.

Neoscona punctigera Doleschall, 1857
Material: Nueva vida este, Carmen, Bohol Island, 1 imm♀, 14.06.2015. Collected from its web.

General Distribution: Réunion to Japan.

Parawixia dehaani Doleschall, 1859
Material: Magsaysay Park, Bilar, Bohol Island, 2♀, 15.06.2015. Collected from leaf litter.

General Distribution: India to Philippines, New Guinea

Most of the araneid spiders obtained were females which comprised 55% of the total number of individuals, whereas males composed only 8% of the collected specimens (Table 2). One reason for this is the very risky and energetically costly mate searching of males that could end up to possible death upon fighting against rivals (Schneider and Lubin, 1998). Female spiders, on the other hand, are voracious predators that they eat males before or after mating (Walker and Rypstra, 2008).

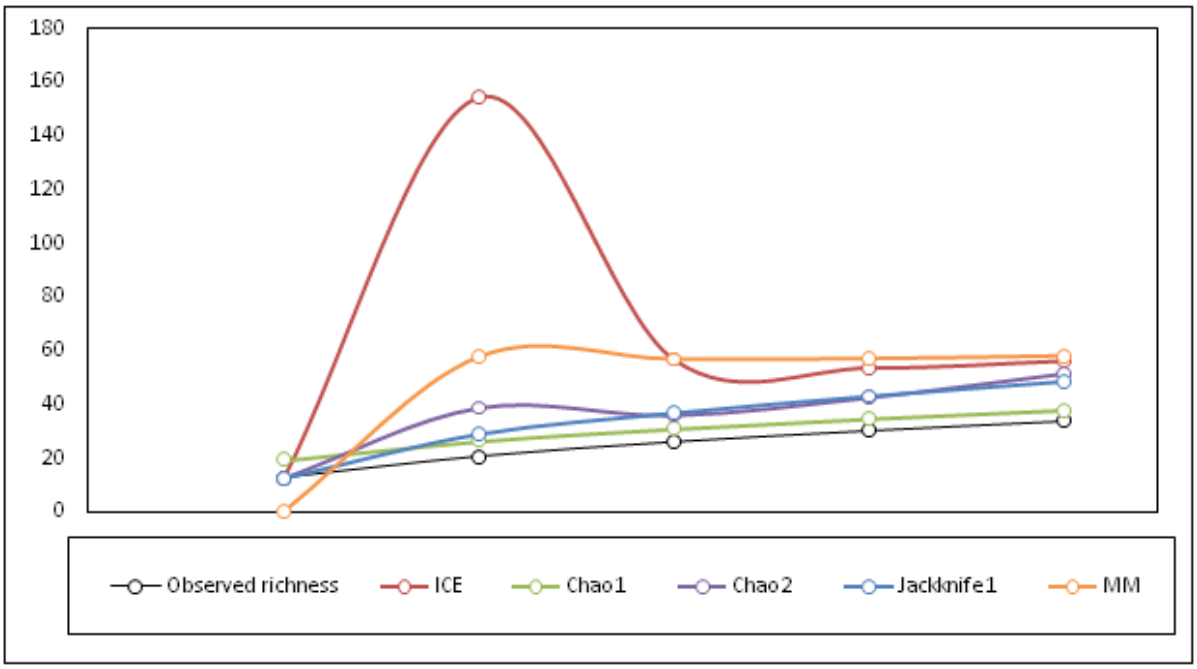

Fig. 2. Species accumulation curves of orb-web spiders found in Rajah Sikatuna Protected Landscape, Bohol, Philippines. ICE: Incidence-based Coverage Estimators (ICE); Michaelis-Menten estimator (MM).

Female spiders are usually the most abundant in a spider community and that males are easily preyed upon due to their smaller sizes. This result coincides with the observation of Coddington *et al.* (1997) that multiple origins of female gigantism and female-biased sexual size dimorphism are demonstrated in orb-weavers. On the other hand, immature individuals had the highest abundance which comprised 46% of the total number of araneids. Only 9% were subadults. This coincides with the findings of Dean and Sterling (1985) in which the immature spiders were found to be the most abundant araneids comprising 94% of the total number of samples collected. Immature spiders disperse when they emerge from the egg sac, primarily to avoid the cannibalistic tendencies of their siblings and to increase survival chances by avoiding overcrowding (Turnbull, 1973; Dean and Sterling, 1985). In addition, immature female and male behavior in most spiders is similar suggesting mortality rates may also be similar at life-history stage (Prenter *et al.*, 1997; Walker and Rypstra, 2008). However, this was supported by the report of Henschel (2002) that females and immature spiders live longer than males. In this study, it is likely that male spiders were wandering at the time of sampling that they may have not been included in the species captured within the sampling site or they may have been preyed by

predator species present in the area.

The observed species richness and species richness estimates of orb-web spiders are shown in Fig. 2. The species accumulation curve for the observed species richness was continuously rising which denotes that the sampling was not complete and not all species of orb-web spiders were totally sampled. For the species richness estimates, species richness was the highest on Michaelis-Menten estimator (MM) with 58.32 species while Chao 1 got the lowest estimate of 37.58 species. Incidence based Coverage Estimator (ICE) reaches a peak of 154.57 species. However, the curve declines until it reaches a final count of 56.4 species. Among the richness estimators, it was MM estimator which showed a chance to asymptote which means that 58 species of orb-web spiders might be the true species richness of orb-web spiders in the sampling area. However, the accumulation curves of the other estimators like Chao 2 and Jackknife 1 which were continuously rising would mean that the 58 species estimated by MM estimator might be exceeded.

The observed species richness of araneid is relatively high in this study as compared to other studies of orb-web spiders in the Philippines. In Pulacan Falls, Zamboanga del Sur, Dacanay *et al.* (2014) recorded 19 araneid species, whereas in Mt. Matutum, South Cotabato only nine species of orb-web spiders were recorded (Garciano *et al.*, 2014). In addition, only two species of araneids were obtained in selected caves in Mindanao (Enriquez and Nuñeza, 2014). Chua *et al.* (2014) also recorded five araneid species in Kabigan Falls, Ilocos Norte while Barrion (2001) recorded only eight species in the Philippine rice fields.

Species diversity

Table 3 shows the biodiversity indices of araneids in the five sampling sites of Rajah Sikatuna Protected Landscape. All sampling sites were located at the lowland areas thus, there was no significant difference of the Shannon diversity indices among the five sampling sites. The overall Shannon diversity index and evenness for the total data were 3.169 and 0.6991, respectively. This means that the species diversity of araneids in Rajah Sikatuna Protected Landscape is relatively high and the abundance of species was distributed equitably per species based on the evenness value. This higher diversity recorded in RSPL is comparable to the study of Chen and Tso (2004) in Orchid Island, Taiwan in which the island has small land area yet the species diversity observed is quite high and the Araneidae family is one of the most abundant families recorded. Among the sampling sites surveyed, site 3 in Barangay Marawis obtained the highest diversity index (H= 2.689) while site 5 in Magsaysay Park was the least diverse site. The composition of vegetation present in site 3, where many shrubs and bushes were found appear to favor diversity of spiders. In site 5, the dominance of molave trees in the area may be one of the factors for the lower diversity. According to Colwell (2009), diversity index value increases as species richness increases. In the case of site 5, only eight species of araneids were recorded in this area which explains the lower value of Shannon diversity index obtained. This result coincides also with the statement of Solow (1993) and Green (1999) that Shannon (*H'*) value increases with the number of species in the community.

Conclusion

Rajah Sikatuna Protected landscape is habitat to 37 species of orb-web spiders of which six are probably new species. The estimated species richness of araneids in this study might be 58 species or more based on the species accumulation curves of the Chao 2 and Jackknife 1 estimators. Species diversity of araneids in Rajah Sikatuna Protected Landscape is high with even distribution of species. It is recommended that surveys be done in other areas in RSPL to get a complete database of araneid species in the area.

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