WET SEASON INSECT POPULATION OF AN ARABLE LAND AT IFITE-OGWARI CAMPUS OF NNAMDI AZIKIWE, UNIVERSITY, AWKA, NIGERIA

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ABSTRACT

A study on insect fauna in a fallow plot at Ifite-Ogwari was carried out in rainy season between April and June 2018 using the sweep net. On each sampling occasion thirty sweeps were made across the vegetation of the 39920 m^2 plot to monitor the insects on the foliage. A total of 63 insect species and their larvae comprising 12 families and 16 species were recorded during the sampling period. There was a preponderance of Camponotus acvapimensis followed by Pheidole sp., Orthetrum icteromelas, Attractomorpha acutipennis, Heteropternis thoracica and Sphenoptera* sp.*, with the singletons including Phaneropterat nana, Cardiochiles* sp.*, Leptoglossus memberanaceus and Anoplocnemis curvipes. There was no significant difference (p>0.05) in the environmental factors between the three months. The relationships between sweep net catches were not significant (p>0.05). Pheidole and species of Odonata served as faunal indicators. Factors that influence the sweep net catches included types of the plant species in the habitat, anthropogenic activities, management practices, locomotor activities and reproductive cycles of insect species. Other factors affecting sweep net catches were also discussed.

Keywords: Insect population, Ifite-Ogwari, Arable land, Singletons, Sweep net

INTRODUCTION

Insects are critical in the human welfare and invariably remain the most diverse group of extant organisms on earth. Evidently, little is known about these insects and even their relationship with other species. The importance of the insect fauna and the enduring need to have and in-depth knowledge of them necessitated the evolution of the sampling methods and even the modification of the existing ones to study them in their natural and artificial habitats (Ewuim, 2007a). The sweep net is perhaps the most widely used device for sampling insects from vegetation, simple and capable of collecting sparsely dispersed species (Southwood, 1978, 2013; Ewuim, 2007b). It is however important to define a standard sweeping before commencing a sampling program because the method and the pattern of sweeping can influence capture rates (Kogan and Pitre, 1980; Gauld and Bolton, 1988; Ewuim, 2007a). While several methods exist for the purposes of estimating abundance (Clement *et al.,* 2015), each of these ecological sampling methods have their own inherent peculiarities in terms of their merits and demerits and the nature of the insects being studied. It is therefore not possible to accurately count an animal population (Clement *et al.,* 2015) moreso because of the evasive nature and behavior of insect species and the need to actualize conservation and sustainability.

As natural habitats are being destroyed by man especially the vast areas of forests for industrial, agricultural and urbanization purposes (Boorman, 1981; Ewuim et *al*., 2007). Information on these taxa therefore becomes critical and

implicit. The study of these insects in an arable environment will no doubt provide valuable data on them in terms of their distribution and even relative abundance.

MATERIALS AND METHODS

Study Area: The research work was carried out at Ifite-Ogwari Campus, Faculty of Agriculture Nnamdi Azikiwe University, Awka between the months of April and June, 2018. Sampling was carried out fortnightly. Ifite-Ogwari which is approximately 45 km from Awka, the capital of Anambra State, Nigeria, lies between latitude 6.6041 ^{o}N and longitude 6.9507 ^{o}E (Wikipedia, 2018a). The sampling site lies between latitude 6.6348 ^{o}N and longitude 6.9541 ^{o}E. The sampled plot which has an area of 39920 m^2 has the preponderance of *Imperata cylindrica* (L) and considerable patches of *Andropogon tectorum* (Schum and Thonn). Other herbaceous plants include *Phyllantus amarus* (Schum and Thonn), *Conyza, sumatrensis* (Retz.), *Oryza barthii* (A. Chev.), *Mimosa invisa (*Mart.) *Sphenoclea zeylanica* (Gaertner), while the trees includes *Elaeis guineensis* (Jacq.), *Ficus exasperata* (Vahl.) and *Nauclea latifolia* (Smith).

Sampling Method: A sweep net with proportionately long handle (90 cm), area of 615.75 cm^2 (circumference of 87.96 cm) and bag depth of 56 cm was used to sample the habitat fortnightly between April and June, 2018, for variety of insect species. The white sweep net bag was made of sail cloth for effective sampling of the vegetation. On each sampling occasion 30 sweeps were made randomly in the vegetation with the sail cloth bag held tightly and gradually released to recover the collected species. The insects were then placed in containers with cotton wool soaked in chloroform with white filter paper on top to facilitate specimen recovery in the laboratory. Thereafter the insects were preserved in 70 % ethanol.

The insects and their immature forms were identified using insects of Nigeria - checklist and bilogragraphy by Medler (1980). The identified specimens were verified at the Department of Crop Protection, Institute of Agricultural Research, Ahmadu Bello University, Zaria, Nigeria. The voucher specimens were also kept as reference materials for further studies. The monthly total of the various fortnightly catches were compared using ANOVA and separated using Least Significant Difference (LSD) while the sweep net catches were correlated with selected physical variables - aerial temperature and relative humidity, and soil temperature and soil relative humidity, using Pearson Correlation Coefficient, (Pearson product-moment correlation coefficient).

RESULTS

A total of 63 insect species were collected during the study period from the fallow plot. Out of the total of number 16 species recorded, there was preponderance of *Camponotus acvapimensis* followed by *Pheidole* sp. *Orthetrum icteromelas, Attractomorpha, acutipennis, Heteropternis thoracica* and *Spenoptera* sp*.* for the adult species. The singletons included *Phanaroptera nana* sparsa *Cardiochiles* sp. *Leptoglossus membranaceus* and *Anoplocnemis curvipes* (Table 1).

Table 1 also revealed that the highest mean number of sweep net catches of the fallow plot at Ifite-Ogwari was highest in the month of May (1.35 ± 0.296) while least in the month of April (1.06 ± 0.397). The Analysis of Variance result revealed that there was no significant difference between the mean number of sweep net catches of the fallow plot at Ifite-Ogwari (F-statistics = 0.201; P=0.81).

The highest aerial temperature was observed in the month of May (39.30 ± 0.141 °C) while the highest aerial relative humidity was recorded in the month of April (45.25 ± 0.354%). The highest soil temperature was recorded in the month of April (37.55 ± 0.495 °C) while the highest soil relative humidity was observed in the month of April (52.20 ± 0.283%). There was no significant difference in the environmental factors between the three months (P>0.05).

The correlation analysis revealed that number of sweep net catches was negatively correlated with aerial temperature (r = -0.225; P = 0.669) while positively correlated with aerial relative humidity (r = 0.638; P= 0.173), soil temperature (r = 0.807; P=0.052) and soil relative humidity (r = 0.154; p = 0.770). However, the relationship between the sweep net catches was not significant (p>0.05).

Table 1: Sweep net catches of the fallow plot at Ifite-Ogwari, Anambra State, Nigeria

Insect family	Genus and species	April	May	June	Total
Pentatomidae	*Diploxys floweri*	0	2	1	3
Coccinellidae	*Brumoides foudrasi*	1	1	0	2
Biuprestidae	*Sphenoptera* sp.	0	2	2	4
Pyrgomorphidae	*Senegalensis senegalensis* (nymph)	0	2	0	2
	Atractomorpha acutipennis	1	4	1	6
	Atractomorpha acutipennis (nymph)	0	2	0	2
Acrididae	*Heteropternis thoracica*	1	2	2	5
	Zonocerus variegatus (nymph)	0	2	0	2
	Phanaroptera nana sparsa	0	1	0	1
Braconidae	*Cardiochiles* sp.	1	0	0	1
Formicidae	*Camponotus acvapimensis*	4	3	4	11
	Pheidole sp.	6	0	4	10
Acracidae	*Acraea anacreon*	1	0	2	3
Lygaeidae	*Megaiopalpus zymma*	0	0	2	2
Libellulidae	*Orthetrum icteromelas*	2	2	3	7
Coreidae	*Leptoglossus membranaceus*	1	0	0	1
Rhopalocera	*Anoplocnemis curvipes*	0	0	1	1
Total		18	23	22	63
Mean number of insect catches ± SEM		1.06 ± 0.397[a]	1.35 ± 0.296[a]	1.29 ± 0.34[a]	

Rows sharing similar superscripts are not significantly different at P>0.05

Table 2: Comparison of the means of selected physical variables recorded during the sampling period

Parameters	Monthly Mean values ± SD		
	April	May	June
Ariel temp. (°C)	39.13 ± 0.035[b]	39.30 ± 0.141[b]	38.90 ± 0.141[a]
Aerial relative humidity (%)	45.25 ± 0.354[a]	45.05 ± 0.354[a]	45.15 ± 0.071[a]
Soil temp. (°C)	37.55 ± 0.495[a]	36.65 ± 0.212[a]	37.05 ± 0.354[a]
Soil relative humidity(%)	52.20 ± 0.283[a]	52.10 ± 0.424[a]	52.15 ± 0.212[a]

Rows sharing similar superscripts are not significantly different at P>0.05

Table 3: Correlations analysis between number of insect catches and environmental factors

Parameters		Number of insect catches	Aerial temperature	Aerial relative humidity	Soil temperature	Soil relative humidity
Number of insect catches	Pearson Correlation	1				
	Sig. (2-tailed)					
Aerial temperature	Pearson Correlation	-.225	1			
	Sig. (2-tailed)	.669				
Aerial relative humidity	Pearson Correlation	.638	.051	1		
	Sig. (2-tailed)	.173	.923			
Soil temperature	Pearson Correlation	.807	-.149	.756	1	
	Sig. (2-tailed)	.052	.778	.082		
Soil relative humidity	Pearson Correlation	.154	-.466	-.148	.104	1
	Sig. (2-tailed)	.770	.352	.780	.844	

DISCUSSION

The preponderance in the collection of *Camponotus acvapimensis* followed by *Pheidole* is not only as a result of nearness to their nesting sites which favour their foraging activities (Ewuim and Ezenwugo, 1997) even on the vegetation, but ants are responsive to human impact not only through their alteration of physical and chemical environment but through their effects on plants and micro-organisms (Folgarait, 1998; Ewuim, 2007b). *Pheidole* also serves as bioindicator of habitats where they are found together with other species (Anderson, 1997; Ewuim, 2007b), and predators in tropical terrestrial ecosystems (Way and Khoo, 1992; Ewuim, 2007b) in addition to being pests under synanthropic conditions (Ewuim, 2007b). *Orthetrum icteromelas* have also been implicated as having one of their natural habitats as subtropical or tropical moist shrub land in countries including Nigeria (Wikipedia, 2018b), hence their presence in the habitat. It has also been demonstrated that this taxonomic group (Odonata) contains aquatic and sub-aquatic serving as faunal indicators of wetlands (Ewuim, 2004; 2008; Ewuim *et al*., 2001). The factors that affect the abundance and distribution of the singletons are also similar to those influencing the other species obtained in relatively larger numbers, even though some species of Odonata can be evasive to sweep netting and often require skills to effect collection even in intensive studies

Again the relative abundance and population of grasshoppers can be influenced by certain human activities that modify the environment and management practices (Oku *et al.,* 2011) and nature of vegetation. The collection of the pyrgomorphids which are known to be grass-eaters (Ewuim, 2004) in this study no doubt is related to the nature of the vegetation or plant species in the habitat which included *Phyllantus amarus*, *Conyza sumantensis*, *Oryza barthii* and *Sphenoclea zeylanica*. *Sphenoclea zeylanica* has been implicated as plant of marshy habitats and rice fields with significant microbial activities especially the leaves (Gowri *et al*., 2016).

The presence and collection of larvae of grasshoppers is also not only related to the vegetation alone but also to the reproductive cycle of species. The collection of *Zonocerus variegatus* larvae in May is related to the observations that *Z. variegatus* in any one year appears to have two generation (Youdeowei, 1977; Ewuim, 2004). In the long, run even through the physical variables measured did not correlate with the sweep net collections, there is no doubt that in the tropics rainfall is an indispensable limiting factor causing changes in the locomotory activity, density and distribution of arthropods generally (Ewuim, 1996; Abajue, 2016).

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