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A SURVEY OF BUTTERFLY FAUNA IN THE SACRED GROVE OF UMUAJA FOREST, SOUTHERN NIGERIA

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Abstract

Sacred groves in Africa have been widely adopted as an important strategy to assuage the loss of biodiversity. This has led to the protection of sacred groves (which are virgin forest with rich diversity) for their cultural, religious beliefs and taboos. This study represents the first butterfly survey of the Umuaja sacred grove and this was done with the aim of determining the diversity and abundance of butterflies in the grove as an estimate of the ecological status of the protected area. Sweep nets, fruit and rotten fish-baited traps were used to sample the butterflies from March – May, 2017. A total of 72 individuals, representing 14 species in 3 families (Nymphalidae Pieridae and Lyacenidae) were recorded in this study. Nymphalidae (92%) was the highest in terms of species richness (78.6%) and abundance (91.7) while Lycaenidae was the least (3%). Charaxes boueti (a typical bamboo forest species) was dominant with relative abundance of 30.6. Several forest indicator species such as the Melanitis leda, Bicyclus evadne elionas, Charaxes varanes, Melanitis libya, Eurema hecabe and Mylothris chloris were also recorded. Therefore, Umuaja sacred grove was considered to be in stable ecological condition based on the species composition, diversity and the species richness.

Key Words: *Butterfly, Diversity, Sacred Grove, Forest, Ecological Status*

Introduction

Butterflies belong to an important order of insects (Lepidoptera) studied and documented globally since the 18th century (Ghazoul, 2002). They are generally considered as surrogate representatives of environmental quality changes (Amusan *et al*., 2014). These insects, especially the endemic species have been widely used as indicators of habitat biodiversity, because they respond quickly to environmental changes and taxa diversity (Ghazanfar *et al.,* 2016). Also, butterflies have been used as important 'model' organisms used for centuries, to investigate many areas of biological research, including such diverse fields as navigation, pest control, mimicry, evolution, genetics, population dynamics and biodiversity conservation (Widhiono, 2015). In Tropical Africa, especially in Nigeria, conservation of biodiversity in degrading forests have been a major concern where a lot of forests have been lost to deforestation and human activities (Onyekwelu and Olusola, 2014).

For instance, statistics from global forest assessment revealed that Nigeria lost about 410,000 ha (3.7%) of its natural forest due to deforestation between 2000 and 2010 (FRA, 2010; FAO, 2011). This has led to reduction in the abundance and species richness or extinction of forest dwelling species.

One of the indirect ways that biodiversity has been preserved in local communities is the establishment of sacred groves. Sacred groves are usually virgin forest with multi diversity that has been protected by the local people for a very long time for their cultural and religious practices (Onyekwelu and Olusola, 2014). These protected forests are usually associated with traditional regulations such as taboos, totems and myths that limit human exploitation within the areas. These regulations have long preserved the ecological integrity of the sacred forests and appear to play an important role in the conservation of biodiversity in the groves. In some regions in this country, sacred groves represent probably the only remaining examples of old forest vegetation which retain rare and endangered species. As such many of the groves are described as "biodiversity hotspots" (Myers *et al.* 2000). As a result, these sacred groves clearly deserve conservation attention and this is necessitated by the declining cultural practices, taboos and the increased pressure for agricultural land.

The enormous importance of butterflies has made its study receive global attention and several research efforts have revealed high diversity of butterflies in various forests and landscapes (Larsen, 1995; Gaude and Janarthanam, 2015). Some of the few available studies on butterflies in Nigeria include; Perveen and Fazal (2013), Zarim and Ahmed (2014), Amusan *et al*. (2014) and Ogedengbe *et al.* (2014). However, information on the ecological value of sacred/protected forests in terms of its biodiversity is limited because it is difficult to access some of these sites. Comprehensive and long term studies are required to assess the diversity of insects in sacred groves and other protected areas in the country to assess the diversity of insects in the areas in order to understand the important role which the groves play in the conservation of biodiversity. This study is therefore aimed at providing a checklist of species of butterflies inhabiting the Umuaja sacred grove which is a unique bamboo-dominated riparian forest in the Niger Delta area of Southern Nigeria. The abundance and diversity of the species of butterflies will serve as a good indication of the health of the environment in and around the grove.

Materials and Methods

Study Area

Umuaja sacred grove is located in Ukwuani Local Government Area in Delta State. The grove covers Longitude 006º 14′ - 006 º 19′ E and Latitude 05º 56′- 5 º 63′ N (Fig. 1). River Ethiope (a very important river in the Niger Delta Area) takes its source from the grove and it flows from the foot of a huge silk-cotton tree (*Ceiba pentandra*). This river is believed to be the deepest Inland waterway in Africa. The river flows through different towns such as Abraka, Eku and Sapele and empties into the Benin River which eventually empties into the Atlantic Ocean at Koko.

The area is rich in green vegetation and the grove contains varieties of tree species which include mainly Bamboos (*Bambusa vulgaris*), Palm tree (*Elaeis guineensis*)**,** Raphia palm (*Raphia*

hookeri), Bush mango *(Irvingia gabonensis*), Teak (*Tectona grandis*) and a host of grasses of the Poacea family. Although, the main occupations of the indigenes of Umuaja community are farming and fishing. However, these activities are not allowed in the grove because of its sacred nature.

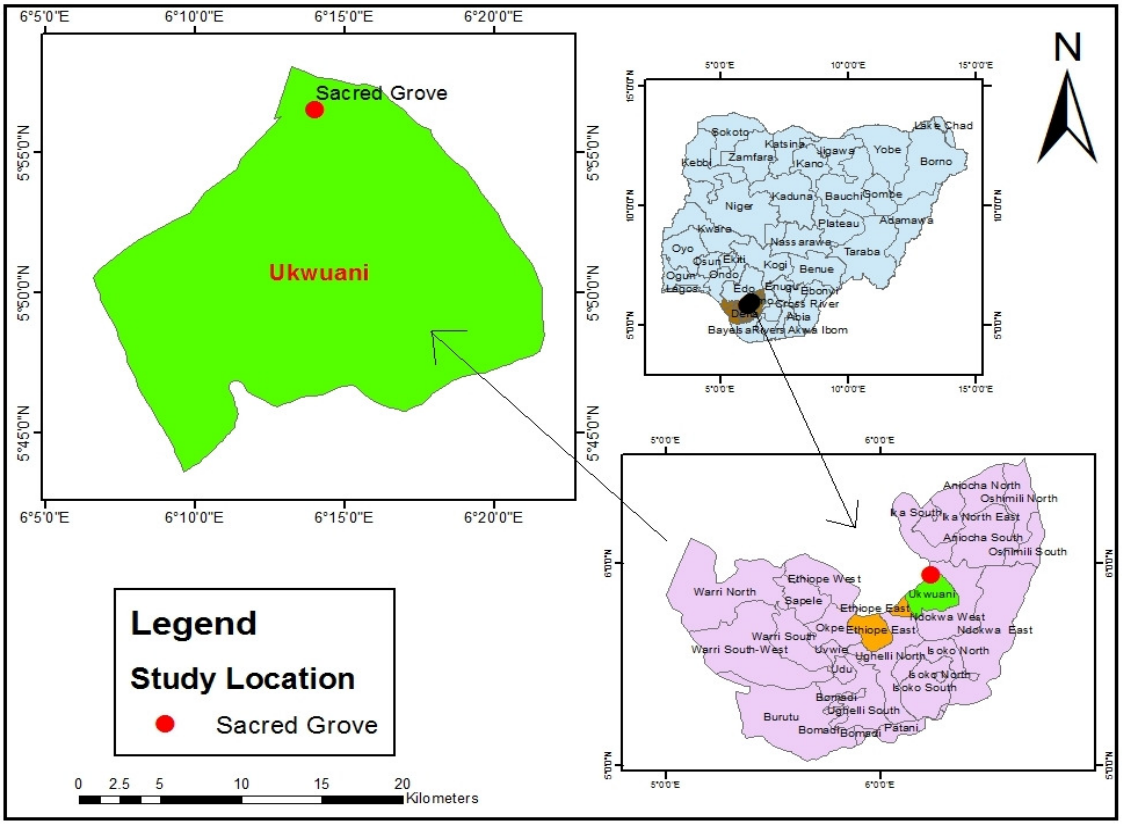

Fig. 1: The location of Umuaja sacred grove in Delta State and Nigeria.

Sampling of Butterflies

Intensive sampling of butterflies was carried out three times a week for 12 weeks (March – May 2017) using aerial nets, fish and banana-baited traps. Sampling of butterflies was usually carried out between 7:00am and 10:00am in the morning and between 4:00pm and 6:00pm in the evenings when the butterflies are expected to be most active (Zarim and Ahmed, 2014; Ojianwuna, 2015). The banana bait was prepared by mashing the banana into smaller pieces. Thereafter, a heap spoon of sugar, yeast and 1 litre of Beer were mixed with the banana to aid fermentation process. This mixture was placed in an air-tight container for three days to allow for fermentation before use. The fish bait was also prepared in the same manner. A total of Eighteen (18) traps i.e nine (9) with each bait type were used. The traps were placed 10m apart from each other and about 2m above ground under patches of sunlight (Aduse-Poku and Doku-Marfo, 2007).

Species Handling and Identification

Standard field handling of specimens was ensured by killing (pinch on the thorax) and taken to the Laboratory where

they were set with entomological pins (No 3) on a setting board and kept in a dark place to dry for one week (CSIRO, 2004). The butterfly specimens were identified using appropriate standard taxonomic keys and guides (Larsen, 2005). After the specimens have been identified, they were kept in a display case and preserved with naphthalene (Youdeowei, 1977).

Results

A total of 72 individuals were recorded in this study. This comprised 14 species distributed in 3 families (Table 1). Nymphalidae was the highest in terms of species richness (78.6%) and abundance (91.7) while Lycaenidae had the least percentage of species and individuals (Fig. 2).

Table 1: Composition and abundance of butterflies in Umuaja sacred grove

Family	Sub-family	Species	Common Names	Relative Abundance
Nymphalidae	Charaxinae	*Charaxes boueti* (Feisthamel, 1850)	Bamboo charaxes	30.6
		Charaxes ameliae doumeti (Henning, 1989)	Blue-spotted charaxes	2.8
		Charaxes tiridates tridates (Cramer, 1777)	Splendid common blue charaxes	16.7
		Charaxes varanes vologeses (Linnè, 1876)	Pearl charaxes	5.6
	Satyrinae	*Melanitis leda* (Linnè, 1758)	Common evening brown	13.9
		Melanitis libya(Distant, 1882)	Velvet eyed evening brown	2.8
		Gnophodes betsimena parmeno (Doubleday, 1849)	Yellow banded evening brown	2.8
		Bicyclus sandace (Hewitson, 1877)	Dark vulga bush brown	2.8
		Bicyclus evadne elionas (Hewitson, 1866)	Small stately bush brown	8.3
	Limenitinidae	*Euphaedra medon medon* (Linnè, 1763)	Widespread forester	2.8
	Nymphalinidae	*Precis milonia milonia* (Felder & Felder, 1867)	Broad banded commodore	2.8
Pieridae	Pierinae	*Mylothris chloris chloris* (Fabricius, 1775)	Dotted boarder	2.8
	Coliadinae	*Eurema hecabe solifera* (Butler, 1875)	Common grass yellow	2.8
Lycaenidae	Liphyrinae	*Aslauga vininga vininga* (Hewitson, 1875)	Central aslauga	2.8

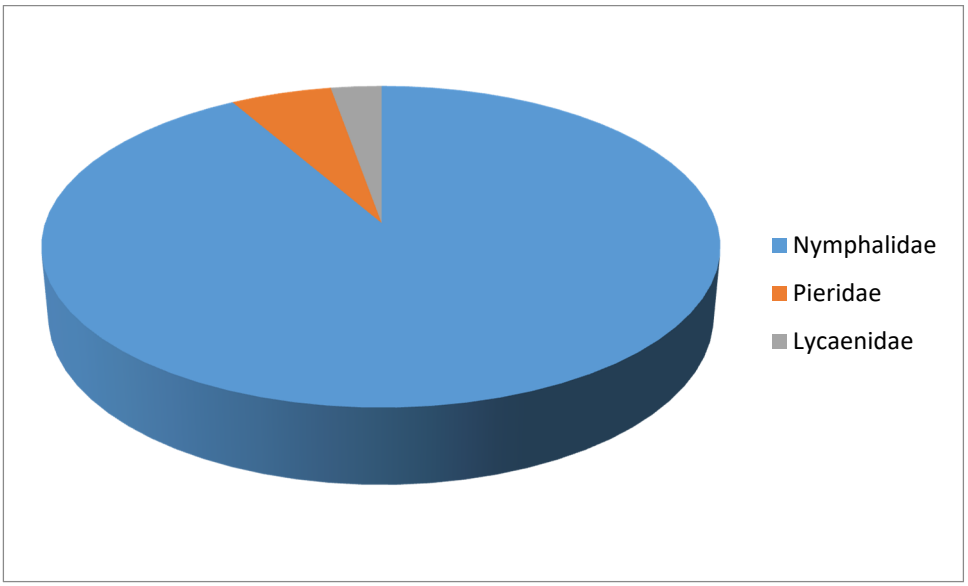

Fig 2: Abundance of butterflies (families) in the Umuaja grove, Delta State, Nigeria.

The identified species are distributed in 7 Subfamilies namely; Charaxinae, Satyrinae, Limentidinae, Nymphalinae, Pierinae, Coeliadinae and Liphyrinae. Analysis of the relative abundance of the recorded species showed that *Charaxes boueti* was dominant in the grove with a relative abundance of 30.6. Species which occurred with the least relative abundance are; *Charaxes amelia, Gnophodes betsimena, Eurema medon, Bicyclus sandace, Precis milonia, Mylothris chloris, Eurema hecabe* and *Aslauga vininga*. The diversity indices showed that species richness and diversity was highest in March while May had the least species diversity and richness (Table 2).

Table 2: Diversity of Butterflies in Umuaja grove, March –May, 2017.

Months	Simson's Index	Margalef	Menhinicks
March	9.35	1.95	1.33
April	6.21	1.40	1.00
May	2.13	0.84	0.67

Discussion

According to Larsen (2005), about 1500 butterfly species have been recorded in West Africa and about 1000 species of have been reported in Nigeria. This implied that the estimated abundance of butterflies in this study accounted for about 0.93% of butterflies recorded in West Africa and about 1.4% of total butterflies that have been reported in Nigeria. This suggested that the grove can be considered fairly rich in terms of species diversity when compared with other similar studies such as Ramesh *et al.* (2010), Addai and Baidoo (2013) and Saikia (2014). The fairly rich fauna may be attributed may be attributed to the homogeneity nature of the vegetation (mainly bamboo) in the groove. Vu and Vu (2011) had reported that forests dominated by bamboo usually have low species diversity compared to natural

undisturbed forests. Another factor that could have contributed to the low species diversity is the reduced light penetration as a result of dense canopy formed by the bamboo vegetation in the groove. Studies have shown that light is an important factor which limit butterfly diversity and assemblage as they are known to be most active during sunny weather (Hill *et al*., 2001).

However, the high number of individuals may be attributed to the presence of River Ethiope which served as a source of water within the grove. Another possible reason for the high number of individuals recorded in the grove is the nature of the habitat which supports lower story and undergrowth vegetation, muds and sands with minerals. All these are potential food sources for butterflies and thus could have been responsible for the high number of butterflies resident in the grove.

The occurrence of Nymphalidae as the most abundant and diverse family corroborate the existing body of data that reported Nymphalidae as the most diverse and abundant family in forests in Southern part of Nigeria (Nganso *et al*., 2012; Amusan *et al*., 2014). Other studies in which Nymphalidae occurred with the highest abundance and diversity include; Jothimani *et al.* (2014), Kurmar and Murugesan (2014) and Widhiono (2015). Although, Nwosu and Iwu (2011) reported a very low number of butterflies in the family Nymphalidae in a similar forest area. The low number recorded in the study was attributed to low density of host plants and nectar plants (Tiple, 2009). The high number of butterflies in Nymphalidae has implications for pollination in this area because these species have been known to be exceptional fruit-feeding butterflies. Therefore, the high number of Nymphalidae recorded in this study may be attributed to the presence of rotten fruits, carrions, human sweat and availability of host plants. Another possible reason is that members of this family have been known to be strong active fliers and this enables them to search and locate food over a long distance and large area (Lodh and Agarwala, 2012). The low occurrence of members of the Pieridae and Lycaenidae may be attributed to the fact that they are not easily attracted to traps. Their small size and host specificity may also be responsible for their low occurrence in the grove (Perveen and Khan, 2014). The members of these two families have been known to have preference for sunny weather but the amount of solar radiation in the grove was greatly reduced by the dense canopy formed by the riparian bamboo vegetation (Nair *et al.* 2014).

The higher species richness and abundance of the butterflies in March compare to the other months may be attributed to convergence at water source and rate of capture. During the dry periods, butterfly are known to aggregate around water source for drink and nourishment unlike the wet season when water is available in all the microhabitats in the grove (Nair *et al*., 2007; Nganso *et al*., 2012; Kumar and Murugesan, 2014). Butterflies are also known to avoid heated environment, so they tend to move towards cooler areas. Hence, the ease of capture and the greater number of individuals collected in that particular month. Similar observations were reported by Janzer and Schoener (1968) and Vu and Vu (2011) in which greater abundance and diversity of butterflies were reported around riparian vegetation in dry seasons than the wet season.

Although, the occurrence of indicator species such as; *Melanitis leda, Melanitis libya*, *Charaxes varanes*, *Eurema hecabe* and *Mylothris chloris* could be an indication of threatened ecosystem but the numbers recorded suggested that the threat is apparent. These species have been reported to only be comfortable in close forest condition in low numbers (Bossart *et al*., 2006; Boafo, 2010 and Nganso *et al*., 2012) but the occurrence of high numbers of individuals could be an indication of habit fragmentation (Larsen 2005). However, findings in this study revealed that only *M. leda* occurred with a reasonable number of individuals (relative abundance = 13.9) while the other indicator species were recorded in very low numbers (relative abundance = 2.8).

Conclusion

The preliminary assessment of the butterfly fauna of the Umuaja grove has contributed to the booming body of knowledge that sacred groves are potential biodiversity hotspots. The protected land supports the resident populations of forest indicator species which was an indication of the stability of the ecological status of the forest. However, the occurrence of certain tolerant species suggested potential sources of threat to the protected area. Integrated approach to the management of the sacred grove and the resources there-in is strongly recommended.

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