



Original Article

Avifauna Species Diversity of Nigeria

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ABSTRACT

Diversity of avian species were studied in Nigeria Institute for Oil Palm Research Edo State Nigeria.. Ten transect lines of 1000 m each and 8 counting stations were randomly placed. Data were collected for twelve months (Dry and Wet seasons). Transects lines were patrolled three times a week and all birds seen and heard were recorded. In all, a total 807 individual bird species spread across 77 bird species, 22 families and 8 orders were recorded. The dominant family was Estrilda it has 7 of the total bird species. Two rare bird species of Malimbe (*Malimbus erythrogaster* and *Malimbus scutalus*) were encountered in the study area. The relative abundance of bird species were higher (25.2 and 18.9) dry season was higher than the wet season (18.9 and 18.2) of the year, This study showed that the value of Shannon diversity index for bird species was higher in the dry season (3.52) than the farmland (3.438). A total of 13 taxas and 17 individual trees species belonging to 13 families were enumerated.

KEYWORDS: Home Range, Diversity, Avian Species, Agricultural intensification and Habitat Fragmentation.

INTRODUCTION

Many countries in the developing world are experiencing rapid population growth, with associated pressure on natural habitat and their native flora and fauna including avian species (Sodersrom et al., 2003). Habitat loss, destruction and degradation are the major threat to avian species richness and diversity (Birdlife International, 2000). This loss of habitats can be as a result of human or natural causes. Human activities contribute more to habitat destruction. Newton (1988) acknowledged the fact that, in the last 400 years, human actions alone has eliminated about 127 of approximate 9672 species of modern birds. Activities like fire wood collection, logging, agriculture, farming, drainage destruction of wetlands, human settlement, building of infrastructures and industries among others have altered lots of habitats (Birdlife International, 2000). Myers (1996) reported that, the loss of tropical ecosystem is of particular concern because the biome contains over half of the world species.

The conservation of forest is a major challenge in West Africa countries because of high dependence on forest resources for livelihood, given the rapid population growth and ensuring increased demands for forest resources, this trend is likely to continue in West Africa (Fargione et al., 2009). Despite the major changes in species distribution and abundance, as a consequence of human-induced changes associated with agricultural practices, having long been identified, substantial gaps still exist in our understanding of the relative impact of different land-uses on the native ecological communities (Lindenmayer et al. 2002). This is particularly true for tropical ecosystems since the bulk of ecological theory that tackles the synergies between agriculture expansion and biodiversity depletion have been developed in temperate areas (Waltert et al., 2004). This study is seeking to understand the diversity of bird species across the major ecological systems of Nigeria in Edo State; a state with rapidly

growing population and with a lot of the natural environment rapidly transforming

MATERIALS AND METHODS

Study Area

Nigeria Institute for Oil Palm Research (Nifor) Benin City.

The Main station of the institute is a campus of 1735ha land area, located near Benin City about 29km from the city center, off the Benin-Akure road, where the bulk of the Institute's research, and administrative personnel and physical resources are concentrated on one thousand hectares of oil palm plantation. It's located at the outskirts of Benin City Edo state with coordinates of (6°38'N, 5°30'E). The rainfall in the area is between 1542 to 2074mm per annum. January and February are the driest months and the wettest months are July and September. The mean annual temperature is 30°C. The relative humidity is not below 65% in the driest months and 100% during the wet seasons (Mengistu, and Salami, 2007). This area surveyed is the oil palm plantation which is compartmentalized into different sizes, with pockets of individual arable farms in the open areas. The staff quarters and the administrative block have an eco-environment, typical rain forest trees in the area still remain standing. The vegetation at the edges of the oil palm plantation as described by (Keay, 1989) is semi lowland rainforest. There are few endemic trees species, notable ones are *Entandrophragma angolensi*, *Khaya ivorensis* (Keay, 1980)

Data Collection

Transects method according to (Bibby, et al, 2000) and point Count methods according to (Sutherland et al. 2009) was used to collect data on bird species diversity. In all a total of 10 transects each measuring 1000 m were placed randomly and 8 counting stations were set up. Each transect was divided into 200 m sections. Transects were surveyed for birds between 06:30 am and 10:00 am. Data on each site was

through agriculture.

collected for 12 months (3 months in the wet seasons and 3 months in the dry season) in 2012 and 2013. During patrol of transects, all birds seen and heard were recorded along with the 200 m section they occur in. The start time and end time for each section was noted, this was to control for the effect of time of day.

From the data collected, avian species diversity was calculated using Shannon diversity index, (Usher, 1991) which is given as:

$$H^i = - \sum P_i \ln P_i$$

Where: H^i = diversity index

P_i = is the proportion of the i th species in the sample

$\ln P_i$ = is the natural logarithm of the species proportion.

Species Relative Population Density

The relative population density of bird species at various sites and seasons were determined as outlined by Bibby *et al.*, (1992) as follows:

$$D = \frac{n_1 + n_2}{\pi r^2 m} \text{Log}_e \left[\frac{n_1 + n_2}{n_2} \right]$$

where: D = density

r = radius of the first zone

n_1 = number of birds counted within zone

n_2 = number of birds counted beyond zone and

m = number of replicate count in such area.

Habitat analysis

Quadrant method (Ogunjiemitie et al, 2005) was used to determine plant species composition. The following data was collected within each sampling quadrants. They include:

Classification method (Longman and Jen'nik 1987) determine the different strata layers of forest. i Total enumeration of all trees above 1m height and basal area $\geq 10\text{cm}$.

ii Total enumeration of all the trees species (s) and family which they belong.

iii The diameter of all the plants above 1m in the height $\geq 10\text{cm}$.

Statistical Analysis

Data collected from the observations were explored with descriptive statistics and analyzed with analysis of variance (ANOVA) using the Statistical Package for Social Sciences (SPSS) version 17 (SPSS, 2008).

RESULT

A total 809 individual birds spread across seventy seven (77) bird species belonging to twenty eight (28) families and eight (8) orders were recorded in Nigeria Institute for Oil Palm Research (Nifor). The family *Estrildae* has highest species (7) of the total number of bird species observed to inhabit this study area. The families *Corvidae*, *Dicruridae*, *Indicatoridae*, *Monaarchidae*, *Phsianidae*, *Strigidae*, *Turdidae* and *Viduidae* have one species each

which is the lowest in the study area. The result of the relative abundance showed that it was highest in the dry season (24.2 and 25.2) than the wet season (18.9 and 18.7). From the result obtained using Shannon-H diversity index the bird species diversity was higher in the dry season (3.52) than wet season (3.43). A total of 7 migrants bird species were encountered in the study area, 4 Intra African Migrants, 2 Palearctic migrant and one vagrant. A total of 17 individual tree species in 13 taxa and 13 families were enumerated, two (2) tree species were observed to fall into tall emergent layer (*Antiaris africana* and *Khaya ivorensis*), and ten (10) tree species were recorded to fall into middle layer strata. Some of the trees in this layer are (*Albizia zygia*, *Alstonia boonei*, *Irvingia gabonensis*, *Elaeis guineensis*, *Pycnanthus angiogenesis* and *Tetrapleura tetaptera*). Five (5) tree species were enumerated to have fall into the understory layer. Some of the tree species are (*Albizia lebbeck*; *Cola acuminata*, *Hannoa klaineana* and *Monodora tenuifolia*). Twelve (12) bird species were observed to utilize tall emergence trees some of the bird species, (54) bird species were observed to utilize understory layer and Ten (10) bird species were observed to utilize grassland within the palm plantation.

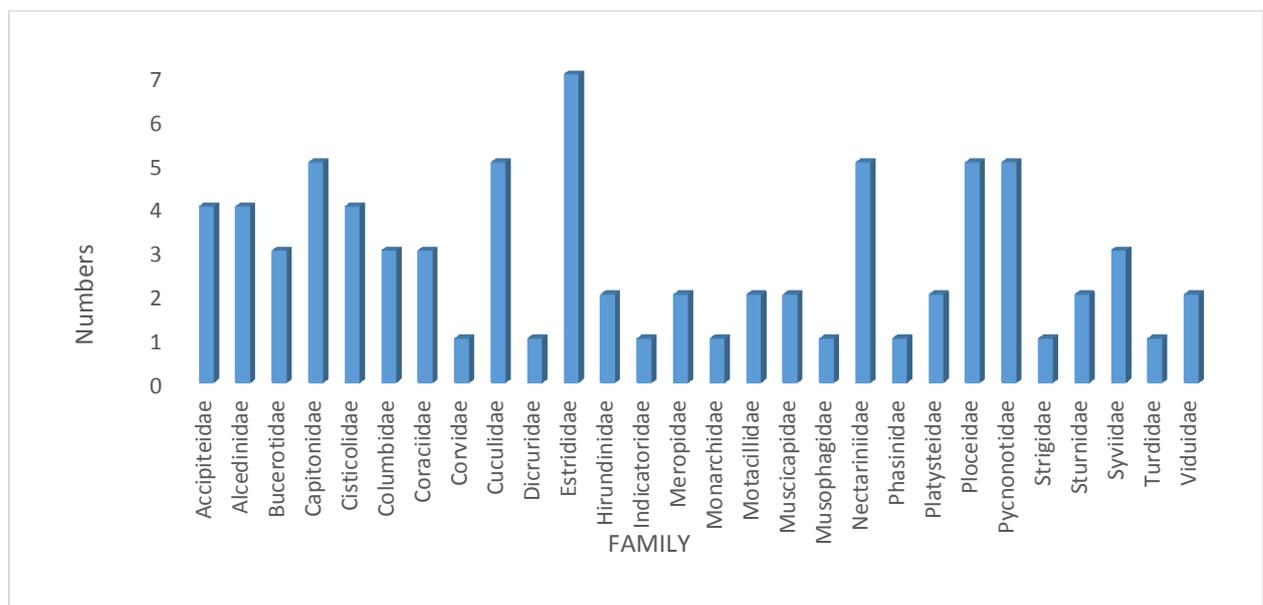


Fig 1. Family Composition of Bird species in the Study Area

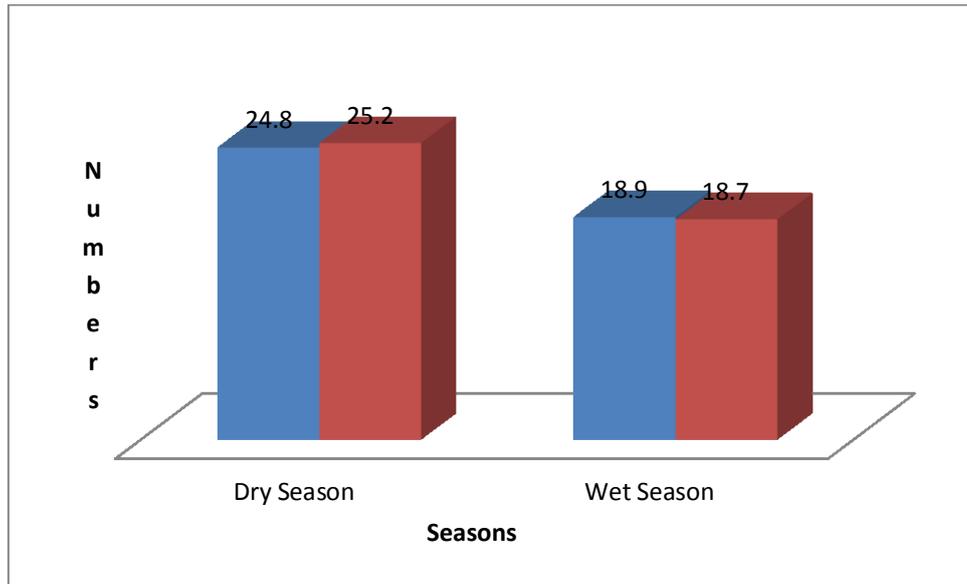


Fig 2. Relative abundance of Bird Species

Table 1 Avian Species Diversity Index in the Four Study Area

Diversity index	Dry Season	Wet season
Taxa	46.00 ^a	43.00 ^a
Individuals	378	431
Dominance_D	0.043 ^b	0.047 ^c
Shannon_H	3.52 ^a	3.428 ^a
Evenness_e ^{H/S}	0.746 ^a	0.717 ^a
Equitability_	0.922 ^a	0.912 ^a

Table 2 Relationship between the Bird species Diversity and weather parameters

	Shannon	temperature	Rainfall	Relative humidity
Pearson Correlation	1.000	.345	-.253	-.185
temperature	.345	1.000	-.991	-.972
rainfall	-.253	-.991	1.000	.994

rhumidity	-185	-.972	.994	1.000
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Table 3 Checklist of Bird Species in the Study Area

Family	Scientific Name	Common Name
Accipitridae	<i>Polyboroides typus</i>	African Harrier Hawk
	<i>Accipiter castanilius</i>	Chestnut Flanked Sparrowhawk
	<i>Kaupifalco monogrammicus</i>	Lizard Buzard
	<i>Milvus migrans</i>	Black Kite
Alcedinidae	<i>Ispidina lecontei</i>	African Dwarf Kingfisher
	<i>Alcedo leucogaster</i>	White Bellied Kingfisher
	<i>Halcyon badia</i>	Chocolate Backed Kingfisher
	<i>Halcyon senegalensis</i>	Senegal Woodland Kingfisher
Bucerotidae	<i>Tockus fasciatus</i>	African Pied Hornbill
	<i>Tockus nasutus</i>	African Grey Hornbill
	<i>Ceratogymna fistulator</i>	Pipping Hornbill
Capitonidae	<i>Tricholaema hirsute</i>	Hairy Barbet
	<i>Pogoniulus scolopaceus</i>	Speckled Tinkerbird
	<i>Lybius vieilloti</i>	Viellot Barbet
	<i>Pogoniulus bilineatus</i>	Yellow Rumped Tinkerbird
	<i>Gymnobucco calvus</i>	Naked Faced Barbet
Cisticolidae	<i>Camaroptera brachyuran</i>	Grey Backed Camaroptera
	<i>Camaroptera chloronota</i>	Olive Geen Camaroptera
	<i>Prinia subflava</i>	Tawny Flanked Prinia
	<i>Apalis flavida</i>	Yellow Breasted Apalis
Columbidae	<i>Streptopelia capicola</i>	Laughing Dove
	<i>Treron calva</i>	African Green Pigeon

	<i>Turtur brehmeri</i>	Blue Spotted Wood Dove
Coraciidae	<i>Eurystomus gularis</i>	Blue Throated Roller
	<i>Coracias cyanogaster</i>	Blue Bellied Roller
	<i>Eurystomus glaucurus</i>	Broad Billed Roller
Corvidae	<i>Corvus albus</i>	Pied Crow
Cuculidae	<i>Chrysococcyx cupreus</i>	African Emerald Cuckoo
	<i>Chrysococcyx caprius</i>	Dideric Cuckoo
	<i>Cercococcyx mechowi</i>	Dusky Long Tailed Cuckoo
	<i>Centropus senegalensis</i>	Senegal Coucal
	<i>Chrysococcyx klaas</i>	Klass Cuckoo
Dicruridae	<i>Dicrurus atripennis</i>	Shinning Drongo
Estrididae	<i>Spermestes bicolor</i>	Black And White Mannikin
	<i>Nigrita bicolor</i>	Chestnut Breasted Negrofinch
	<i>Nigrita canicapilla</i>	Grey Headed Negrofinch
	<i>Estrilda melpoda</i>	Orange Cheeked Waxbill
	<i>Lagonosticta senegala</i>	Red Bellied Firefinch
	<i>Spermestes cucullatus</i>	Bronze Mannikin
	<i>Nigrita luteifrons</i>	Pale Fronted Negrofinch
Hirundinidae	<i>Psalidoprocne obscura</i>	Fanti Saw Wing
	<i>Cecropis semirufa</i>	Rufous Chested Swallow
Indicatoridae	<i>Indicator minor</i>	Lesser Honeyguide
Meropidae	<i>Merops pusillus</i>	Little Bee Eater
	<i>Merops albicollis</i>	White Throated Bee Eater
<u>Monarchidae</u>	<i>Elminia nigromitrata</i>	Dusky Flycatcher
Motacillidae	<i>Motacilla aguimp</i>	African Pied Wagtail
	<i>Motacilla flav</i>	Yellow Wagtail
Muscicapidae	<i>Stiphornis erythrothorax</i>	Forest Robin
	<i>Muscicapa infusate</i>	Sooty Flycatcher
Musophagidae	<i>Tauraco persa</i>	Green Chrested Turaco

Nectariniidae	<i>Hedydipna collaris</i>	Collard Sunbird
	<i>Cyanomitra verticalis</i>	Green Headed Sunbird
	<i>Cinnyris coccinigaster</i>	Splendid Sunbird
	<i>Cinnyris superbus</i>	Superb Sunbird
	<i>Chalcomitra adelberti</i>	Buff Throated Sunbird
Phasinidae	<i>Francolinus bicalcaratus</i>	Double Spurred Francolins
Platysteidae	<i>Platysteira cyanea</i>	Common Wattle Eye
	<i>Platysteira concreta</i>	Yellow Bellied Wattle Eye
Ploceidae	<i>Ploceus melanocephalus</i>	Black Headed Weaver
	<i>Ploceus cucullatus</i>	Village Weaver
	<i>Malimbus erythrogaster</i>	Red Headed Malimbe
	<i>Malimbus scutalus</i>	Red Vented Malimbe
	<i>Ploceus nigerrimus</i>	Viellot Weaver
Pycnonotidae	<i>Andropadus ansorgei</i>	Assorges Greenbull
	<i>Pycnonotus barbatus</i>	Common Bulbul
	<i>Andropadus virens</i>	Little Greenbull
	<i>Phyllastrephus icterinus</i>	Icterine Greenbull
	<i>Nicator chloris</i>	Western Nicator
Strigidae	<i>Strix woodfordii</i>	African Wood Owl
Sturnidae	<i>Poeoptera lugubris</i>	Narrow Tailed Starling
	<i>Lamprotornis purpureiceps</i>	Purple -Headed Glossy Starling
Syviidae	<i>Sylvietta virens</i>	Green Combec
	<i>Hylia prasina</i>	Green Hylia
	<i>Macrosphenus concolor</i>	Grey Longbill
Turdidae	<i>Neocossyphus poensis</i>	White Tailed Ant Thrush
Viduidae	<i>Vidua macroura</i>	Pin tailed whyda

Table 4 Migrant Bird Species in the Study Area

Intra Africa Migrants	Palaearctic Migrants	Vigrant
Africa Grey Hornbill	White Throated Bee Eater	Blue Billed Roller
Black Kite	Yellow Wagtail	
Broad Billed Roller		
Little Bee Eater		

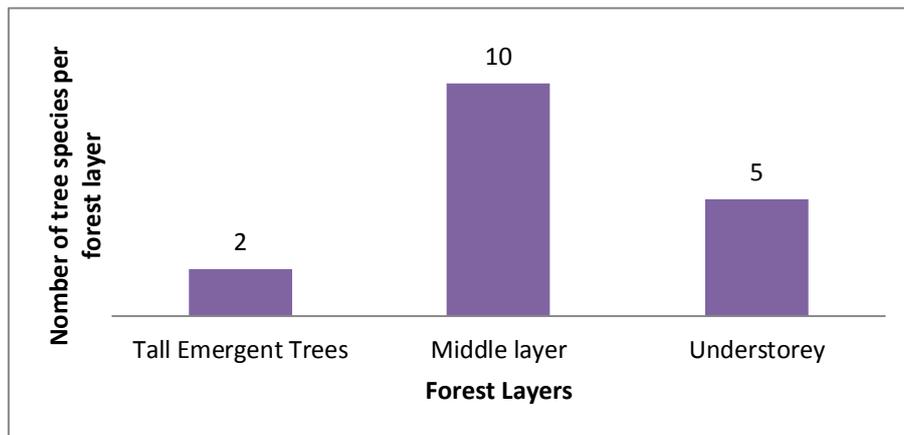


Fig 3. Number of Tree Species in each Strata layer in the Study Area

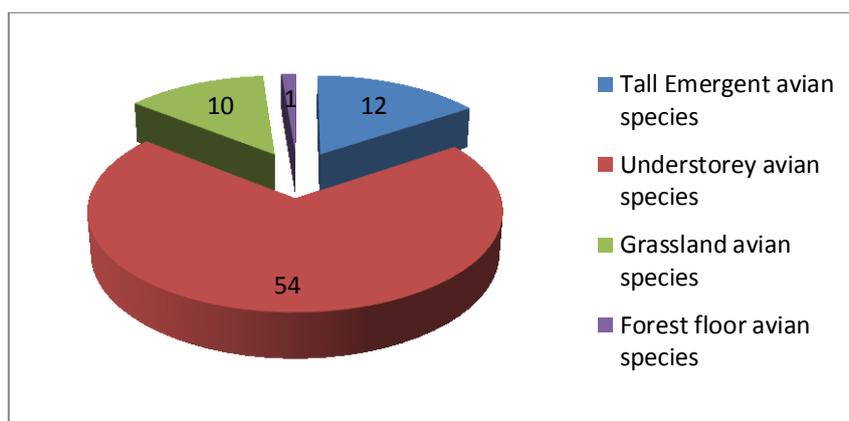


Fig 4. Habitat Specialization of Bird Species in the Study Area

DISCUSSION

Species richness is often used to make quick

assessment and composition of different habitats (Wirens 1989). Species richness is

therefore useful considerations when assessing bird communities. The majority of bird species encountered during this study were resident bird species and few migratory bird species. The 65% of the bird species encountered in the study area were savanna species which in agreement with Braden, et al. (2009) who reported that the structure of bird communities in the same habitat type varies according to the management intensity and bird species community structure is primarily determined by management intensity and habitat type. The original habitat of this area is low land forest, and the highest bird species family recorded here were *Estrildidae* and *Cisticolidae* families. This findings imply that the conversion of structurally heterogeneous forest areas to large scale agriculture would result in a substantial reduction of bird diversity. The study area is an oil palm plantation which is intensively cultivated, thus accounting for high number of generalist species encountered, which are known to thrive in most human disturbed landscape but not of any particular conservation concern (Soderstrom et al., 2003). Although largely unknown for farmland birds, habitat preferences may differ between agro ecological areas or regions because of differences in landscape structure and land-use. This result suggests that there were transformations of forest vegetation to savanna in the areas where these birds were encountered. This is consistent with previous studies, carried out in Cameroon (Waltert et al., 2004) comparing near-primary forest, secondary forests, agroforestry and annual agriculture plots identified an overlap of only 27% between annual agriculture plots and near-primary forest (contrasting with the 62% similarity between agroforestry and near-primary forest) and a similar study in Uganda has identified an overlap of only 19% between intact forest and small-holder agricultural plots (Naidoo, 2004). These are bird species of degraded environment, suggesting that human induced activities such as deforestation have taken place in the study area. Majority of the species encountered in the study area were bird species that utilizes understory and few bird

species that utilizes middle layer and non that utilize tall emergent layers. This suggests that absence of bird species that utilizes tall emergence tree in the study area is due to deforestation and continues slashing of the oil palm plantation. Usher (2009) reported that diversity is the most frequent adopted criterion for evaluation of conservation schemes and that diversity indices correlated with stability of the ecosystem and will be high in biologically protected areas. The result of the relative abundance of bird species in the study area was very high in both seasons of the year. This is also consistent with the work of other studies which suggested a high volume availability of preferred food in the cultivated areas than the uncultivated areas (Kormar 2006). Arable land provides essential foraging opportunities to many European farmland birds (Atkinson et al. 2002). Non-crop vegetation in arable fields provides an important source of seeds, but perhaps as importantly, it recruits insects (Marshall et al. 2003).

The comparison of bird species diversity in the study area between the two seasons indicates there was no significant difference ($P > 0.05$). This findings imply that the conversion of structurally heterogeneous forest areas to large scale agriculture would result in a substantial reduction of bird diversity (Ellis, et al, 2010).

This study revealed that migratory bird species visit the study area. The number of migrant visitors to the study area was very low. This finding is in agreement with Keith et al (1992) who reported that most migratory bird species frequent open savanna woodland where they forages mainly on the ground for insects millipedes, centipedes, spider, snails, earthworms and seeds. It was observed that most of the migrant bird species that utilize the forest agro ecological zone in the Edo state Nigeria are bird species that occupy middle layers and tall emergence trees.

Bird species are important indicators of environmental quality and ecological functionality. At farmland scale, the study of bird species in relation to conserved forest

characteristics is essential to better understand the current status of farmland resources and related functions as well as to monitor progresses towards farmland sustainability (Naido,2004). In the study area we have few trees and less (DBH) resulting in the decline of bird species abundance and richness. This is supported by previous work of Fuller et al. (1996) who reported that the conversion of greater areas of land to farming has reduced habitat heterogeneity and led to reductions in species richness and declines in bird species which were once common forest species.

CONCLUSION AND RECONMENDATION

The transformation of the study area to an oil palm plantation was observed to be responsible of bird community. The response to agricultural intensification factors is consistent with negative effects of landscape level of disturbance on farmland bird species found in previous studies highlighting the relevance of field and farm scale management

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- Leaving out strips of protected areas that link various fields that are swampy in addition to small patches of forest blocks within the oil palm plantation layout is important. This will offer natural protection areas and to serve as corridors or stepping- stone for bird species and wildlife present in the study area.
- Herbicides and pesticides use in the study area should be discouraged as this will have negative impact on the bird species in the study area.
- Conservation officer and eco guards should be employed to monitor the biodiversity in the study area
- There should be greater investment in research to improve the quality of information on the relationship between land use and biodiversity benefit.
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