BIRD SPECIES OF MOUAU WITH SPECIAL EMPHASIS ON FORAGING BEHAVIOR OF THE NORTHERN GREY-HEADED SPARROW (*PASSER GRISEUS*)

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ABSTRACT

Ten different bird species were peculiar to the Umudike environment and of these eight were regular thus closely observed and identified. The other two species were scarcely available and may be regarded as visiting birds. The eight species identified were either Passerine or Non-Passerine. The northern grey-headed sparrow (Passer griseus) was one of the Passerine species encountered. The amount of time spent by the birds foraging varied significantly with group size. Pecking rate reduced with increased scanning time. Pecking rate of individuals increased with group size and reduced with increasing group size. Birds in fewer groups will gather food and move away quickly than with smaller groups, the movement characterized by small walks or hops. Scanning rate reduced with increasing group size and increased with reduced group size. Group size was the most determinant factor in determining the relationships between vigilance, hopping and feeding rates.

Keywords: Passerine, Foraging, Pecking rate, Scanning, Hops, Vigilance, Group size

INTRODUCTION

Birds are endothermic reptile-like vertebrates that belong to the class Aves. They are abundant in nature and engage in fascinating behaviors. In Nigeria, a total of 940 species of birds are resident, of which four are endemic and five are rare or accidental (Wikipedia, 2013). They are either passerine or non-passerine birds. Some passerine species known to occur in Nigeria include the following bird species; Swallow, Greenbul, Akalat, Ant thrush, Warbler, Cisticola, Flycatcher, Sunbird, Pied crow, Pin-tailed Whydah, Finch, Sparrows, Seed eater, Weaver birds, among many others (Burrow and Domey, 2001). The Northern Grey-headed Sparrow (*Passer griseus*) is one of the common *Passer* species in Nigeria.

All birds employ foraging behaviour to survive in the ecosystem (Liker and Barta, 2002). This behaviour exhibits how they manipulate their immediate habitat in search for food. To a great extent the kind of food available determines the feeding behavior of bird species. A particular food may exist in many different situations requiring different feeding techniques (Giraldeau and Caraco, 2000). Many birds steal food from other birds, and some bird species rely on klepto-parasitism tactics for locating and capturing food. Some land birds form mutualistic food-searching association either with conspecifics or other bird species (Cueto and Lopez de Casenove, 2000). Studies on the foraging behavior of birds have shown that they can be influenced by some biological factors, such as, habitat, group size and anti-predator vigilance (Beck and George, 2000; Bednekoff and Lima, 2002).

Habitat selections have important implications on foraging behavior. Old and

recent studies have investigated bird foraging behavior to understand microhabitat selection processes. Most of these studies demonstrated that microhabitat selection differs among species, within species and between individuals exposed to different habitats (Beck and George, 2000). A few bird species have been studied in Kainji Lake area, Hadejia-Nguru wetlands and Jos Plateau in Nigeria (Borrow and Domey, 2001). The report showed that differences in microhabitat selection and foraging behavior based on their foraging tactics reflect differences in the use of food resources (Borrow and Domey, 2001; Gabbe *et al.*, 2002). This accounts for the fact that habitat selection may be determined in part by the availability of suitable food substrates. Several other studies have supported the view that the abundance, distribution and availability of food are believed to be the principle factor influencing habitat suitability for birds (Strong and Sherry, 2000; Fayat, 2003).

Vigilance, another behaviour shown by birds, has been predicted to decrease with group size due to increased predator detection and dilution of predator risk in larger groups (Krause and Ruxton, 2002). Group size is an imperative factor in determining an individual's behavioral actions and this applies to all organisms (Krause and Ruxton, 2002). A reduction in individual vigilance with an increase in group size is one of the reported relationships in the study of animal behavior (Ale and Brown, 2007). Animals often interrupt feeding bouts to scan their surroundings. Scanning is referred to as vigilance and may serve several purposes, including; detection of threats and assessment of within-group competition (Krause and Ruxton, 2002). Due to the risk of predation, birds will usually try to forage in areas near dense vegetation that can provide safety.

Vegetation structure is a feature of habitat which provides opportunities and constraints that determine how and where birds detect and capture prey (Whelan, 2001). Such vegetation structures include; leaf morphology, foliage architecture and heights. These structures present in the habitats have a strong influence on bird foraging behavior (Whelan, 2001). They spend less time watching for threats, because with cover nearby, birds are able to flee to safety (Clemens *et al.*, 2001). Studies have shown that distances of just one meter away from cover is risk enough to cause some birds to avoid feeding (Barta *et al.*, 2004).

The influence of foraging behaviour, vigilance and scanning determines passerine bird species choice of field and habitat for foraging. Schulenberg (2010) reported that the pin-tailed whydah (*Vidua macroura*) prefers disturbed grasslands with patches of bare soil for feeding. The house sparrows on the other hand are adapted to forage wherever they find preferable food, such as, in farms, fields, parks, lodges and other human habitations where they eat food scraps from humans (Esteban *et al.*, 2008). There are usually large feeding groups at areas where food is plentiful, usually forming flocks greater than 50 (Arnaiz-Villena *et al.,* 2009) and this aids in increasing the amount of time spent foraging in that particular microhabitat. Solitary birds will often use the chirrup call to attract conspecies to a feeding site, to reduce the amount of time spent alone and the risk of predation (Johnson *et al.*, 2001).

Bird species in Michael Okpara University of Agriculture, Umudike (MOUAU) environment have scarcely been studied. This research was thus aimed at identifying bird species in the MOUAU environment and to describe the foraging behavior of Northern grey-headed sparrow (*Passer griseus*) in near primeval conditions, using indices such as; microhabitat selection, group size and anti-predator vigilance.

MATERIALS AND METHODS

The study was conducted within the campus of Michael Okpara University of Agriculture, Umudike (MOUAU), Abia State, Nigeria. Field work was carried out in three selected sites within the campus. Two of the sites were fields characterized with a variety of native grasses, which contain weed seeds and grass seeds. These grasses also harbor insect life, most especially at the inflorescence. One of the fields, characterized with dense vegetation (small shading trees) is not more than one metre away from the feeding site. The vegetation served as

cover to the birds. In the second field, there were no trees closed by for cover. The third site was close to human habitation, a field located in one of the hostels within the university campus. Leftovers of food from the occupants of the hostel characterized this field.

Observations of the bird to ascertain their species and the activities they carried out was on a daily basis at the three different sites. This was done in the morning and evening hours. Morning observations were carried out between 6.45 am and 11.00 am, while evening observations were carried out between 4.00 pm and 6.00 pm. A pair of 8 × 40 binoculars was used to observe the birds. Other handy materials included; a digital camera, a stop watch and a field guide. The following data were recorded: time of the day, type of microhabitat, and minutes devoted to foraging, vigilance (number of heads-up scan and duration of scanning), number of hops and number of pecks. Recording and observation ended when at most 5 birds were absent from the feeding site for more than 3 minutes.

Data analysis: The data were analyzed for the differences in proportion using chi-square test. Statistical significance was determined using analysis of variance (ANOVA) and the relationships between the variables were established using correlations statistics.

RESULTS

Ten different bird species were encountered in the field in the course of this study. Figures 1 – 5 shows some of the frequently encountered birds. Of these species, eight were regular thus they were closely observed and identified. The other two species were scarcely available and may be regarded as visiting birds. The eight species identified were either passerine or non-passerine (Table 1).

Foraging Behavior of *Passer griseus* and its Relationship with Microhabitat, Group size and Vigilance: The northern grey-headed sparrow (*Passer griseus*) fed more in the evening between 17.00 and 18.30 hours (Tables 2).

In each of the three sites, the group size varied and was the most determinant factor in determining the relationships between the vigilance, hopping and feeding rates. The mean number of pecks in the evening was higher than in the morning hours. Also, the mean number of pecks was higher the field 1 than in the other selected sites. This may be due to the large group size of the species there. In field 1, the group size was closely related to the feeding rate; they pecked more with increasing group size thus significant difference was recorded between the group size and feeding/pecking rate ($r = 0.95$; $p = 0.00$). It should be noted however that the presence of other species of birds in the field often reduced the pecking rate of *Passer griseus*. In field 2, significant difference was not recorded between any of the parameters. However a close relationship between these parameters was recorded.

Number of Scans: Scanning reduced with increased group size. The mean value of heads-up scans was low during the morning and evening vigilance in field 1; though the mean value recorded for time spent scanning was higher in this same field (Table 2). In field 2, though the mean value of heads-up scans recorded was high, it was lower than the mean scanning time in field 1. This may be related to the nearness of field 1 to vegetation.

Pecking and Vigilance: There was a relationship between pecking and vigilance as low scanning rate lead to increased pecking rate. In field 1, the significant effect of vigilance on pecking rate was not a surprise vigilance ($n = 10$, $p = 0.002 < 0.01$) (Table 3). In field 2, a significant effect of vigilance on pecking rate was recorded ($n = 10$, $p = 0.007 < 0.01$). Significance was recorded in the correlations between number of scan and pecks in the evening (Table 3). In field 3 (around human environment), there was no significance ($n = 10$, $r = 0.129$, $p = 0.723$).

Group size and Number of Scans Recorded in the Selected Sites: Microhabitat had no significant effect on the group size of the birds.

Figure 1: Group of Northern Grey-headed Sparrow foraging in one of the fields

Figure 2: Northern Grey-headed Sparrow foraging in the same field as the Pin-tailed Whydah (R-L)

Figure 3: *Passer griseus* feeding on food scraps in a bare patch around field 3

Figure 4: White breasted Negro finch foraging on a grass in nearby field

Figure 5: *Passer griseus* in a tree cover close to their feeding site

Table 1: Bird species encountered in fields in Michael Okpara University of Agriculture, Umudike (MOUAU), Umuahia, Abia State, Nigeria

Passerine species
Pied crow (*Corvus albus*)
Parasitic weaver (*Anomalospiza imberbis*)
White-breasted Negrofinch (*Nigrita fusconota*)
Pin-tailed Whydah (*Vidua macroura*)
Northern grey-headed sparrow (*Passer griseus*)
Non-Passerine species
Cattle Egret (*Bubulcus ibis*)
Eagle (*Aquila spilogaster*)
Vulture (*Torgos tracheliotus*)

The group size was often higher in the sites close to vegetation which served as cover for the birds (Table 4). The amount of time spent foraging varied significantly with group size.

DISCUSSION

From this study, the Umudike environment just like any other stable ecosystem, houses various bird species. The Northern grey-headed sparrows actively foraged on the various selected fields. Depending on the size of the group analyzed and the microhabitat, different trends and statistical significant results were obtained. The birds never fed for more than 50 cumulative minutes in any of the observation period. Pecking rate increased with group size. When in group *Passer griseus* engaged more in active feeding rather than spending their time standing and scanning. Bertram (1980), found out that although individual birds may scan more than birds in a group, the overall proportion of time an ostrich in a flock uses in scanning increases with group size. Since ostrich raise their heads at random times, it makes it impossible for lion to predict the appropriate time to strike (Bertram, 1980). This is not likely to occur in *Passer griseus*, because of their small body size. *Passer griseus* spent less time scanning and exhibited a little heads-up scan as its group size increased, while their pecking rate increased. Solitary birds or birds in pairs are at greater risk of predation, which is why they spend more time scanning. In groups however, responsibility is shared among individuals within the group thus there is reduced rate of scanning by an individual and pecking rate increases. Scanning rate may also be influenced by the microhabitat.

Table 2: Correlation between group size and number of pecks in the various fields

Number of pecks		Field 1		Field 2	
		Morning	Evening	Morning	Evening
Group size	**Morning**				
	Pearson correlation	0.632	0.212	0.141	0.113
	Significant (2-tailed)	0.050	0.556	0.698	0.756
	N	10	10	10	10
	Evening				
	Pearson correlation	0.053	0.950	0.310	0.400
	Significant (2-tailed)	0.885	0.000	0.384	0.253
	N	10	10	10	10

Correlation is significant at 0.01 levels (2 tailed)

Table 3: Correlation between number of pecks and number of scans in the various fields

Number of pecks		Field 1		Field 2	
		Morning	Evening	Morning	Evening
Number of scans	**Morning**				
	Pearson correlation	0.665	0.147	0.328	0.198
	Significant (2-tailed)	0.036	0.685	0.355	0.584
	N	10	10	10	10
	Evening				
	Pearson correlation	0.005	0.852	0.318	0.787
	Significant (2-tailed)	0.988	0.002	0.370	0.007
	N	10	10	10	10

Correlation is significant at the 0.01 level (2-tailed)

Table 4: Correlation between group size and number of scans in the various fields

Number of scans		Field 1		Field 2	
		Morning	Evening	Morning	Evening
Group size	**Morning**				
	Pearson correlation	0.655	0.066	0.730	0.115
	Significant (2-tailed)	0.029	0.556	0.017	0.752
	N	10	10	10	10
	Evening				
	Pearson correlation	0.334	0.794	0.051	0.949
	Significant (2-tailed)	0.346	0.006	0.888	0.000
	N	10	10	10	10

Correlation is significant at the 0.01 level (2-tailed)

The presence of cover at the feeding site, close enough for the birds to fly to for protection in case of danger made for increased feeding. Contrary to Barta *et al.* (2004), *Passer griseus* does not avoid feeding in fields that are more than a meter away from cover. They rather increase their rate of scanning. This result confirms the existence of a scanning-group size effect in flock of Northern grey-headed sparrows similar to what had been previously reported by Schmaltz (2001). Habitat selection by birds is mostly based on the nature of the feeding site and availability of food.

This is consistent with the findings of Strong and Sherry (2000) and Fayat (2003), who recorded that the distribution and availability of food is a principle factor influencing habitat selection. Although risk predation is sometimes considered, it can be diluted by the presence of a large group size. The relationship between group size and vigilance is very useful in the study of the behavior of birds. As the number of birds per site increased, the rate of vigilance reduced, while the feeding rate increased.

In the course of the study, *Passer griseus* was observed to often form flocks with other passerine bird species, such as the Pin-

tailed Whydah (*Vidua macroura*) and a species of the finches' family. They foraged peacefully with the finches, but the pin-tailed whydah will often intrude and interrupt the sparrows' feeding. The Pin-tailed whydah will either chase the sparrows off a patch or off the site completely. The pin-tailed Whydah is known by many agriculturists and field biologists to be very pugnacious towards other species, chasing all manner of birds, both small and large (Schulenberg, 2010). By doing this, they reduced the amount of time spent by the sparrows on feeding.

Conclusion: This study has shown that group size contributes to the foraging behavior of the Northern grey-headed sparrow in fields. It also has shown that scanning-group size affects foraging behavior. However, group size and vigilance are the major parameters that influence the foraging behavior of Northern grey-headed sparrows. Microhabitat selection is not much of a factor influencing their foraging behavior rather they forage in areas having food resource of choice.

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