Population Status, Feeding Behaviour and Habitat Preference of Helmeted Guinea Fowl (*Numida meleagris*) in Surrounding Vegetation of Cross River University Technology, Obubra Campus

ABSTRACT

The population status, feeding behaviour and habitat preference of the helmeted guinea fowl (*Numida meleagris*) was investigated within ten months, January to October, 2021. The line transect method was used to collect data on the population status of the species. The quadrate vegetation sampling method was used to investigate the preferred habitat. Data generated from the research were analyzed using descriptive statistics, while results were compared using chi-square (^{2}) test. The average number *Numida meleagris* in the study area was 434 and 293 during the wet and dry seasons, respectively. The most important daytime activities of helmeted guinea fowl were feeding, resting, scanning and running. The observed population of the guinea fowl differ significantly across sectors during the wet and dry seasons (^{2}= 8.00, p = 0.03). The relationship between allocated time to each activity and time of the day was greatly significant (t = 4.04, p = .001). The number of individuals was 3.0±4.0 and 5.0±0.2 individuals/km^2 during the dry and wet seasons, respectively. The importance value index (IVI) for *Gmelina arborea, Tectona grandis* and *Elaeis guineensis were* 24.41, 20.39, and 18.17, representing the dominant plant species in the study area. Human disturbance was responsible for loss of habitat, nesting and foraging sites. Protection of the habitat against exploitation will reduce poaching habitat destruction, and restore its nesting sites, thereby increasing its population.

Keywords: Population, helmeted guinea fowl, feeding behaviour, habitat.

1. INTRODUCTION

The helmeted guinea fowl (*Numida meleagris*) is a bird species of the *Numididae* family. They are terrestrial birds capable of strong flight, but prefer to run often than fly. The species are highly polygamous and form breeding pairs [16]. They eat mostly grubs, roots, tubers, small reptiles, crawling insects, and occasionally vegetables and fruits. The species is found in many African countries such as Senegal, Gambia, Guinea, Sierra Leone, Mali, Burkina Faso, Ghana, and Nigeria, as well as in sub-tropical and tropical Savannahs, grasslands, and shrub land [6]. Though the species is classified by the international union for the conservation of nature and natural resources [9] as least concerned (LC), increasing human population, conversion of land for agriculture, burning and environmental degradation have resulted to the decline in the population of the species. The helmeted guinea is also found within the vegetation area in Obubra campus of CRUTECH. This supposedly protected area is not protected as such, as the area is exposed to anthropogenic activities by the locals.

Though the species is wide spread and sparingly distributed in areas where it occurs, the current status of its population, feeding behaviour and habitat preference, as well as its management problems as it relate to human interference are still poorly reported [13]. This is necessary to prevent the decimation of the species population, emigration to other unsafe areas, and possible extermination. For effective conservation strategies to be adopted, understanding the status of the population as well as the habitat preference of the helmeted guinea fowl is desirable. This study is therefore designed to estimate the population density, feeding behaviour, and habitat preference of the helmeted guinea fowl in the study area. Birds generally are good indicators of the quality and health of ecosystems. The helmeted guinea fowl is an important component of the ecosystem. The demand for agricultural land couple with visible anthropogenic activities like hunting of animal for bush meat, decimation of habitats for agricultural and other land development purposes, as well as its use as fuel wood is alarming [4]. These constitutes the major factors threatening the survival of the helmeted guinea fowl within its range, thereby mounting pressure on the species population

and its habitat. There is yet no study on any species of guinea fowl in the study area, but its population in other parts of Africa, Asia and Europe is reported to be declining [7]. This study can provide useful information for effective planning, monitoring and evaluation, while guiding experts on which conservation measures to adopt. This can reduce emigration of species to unsafe areas, maintain a balance in its population if not increase it numbers, and ensure the protection of the species and its habitat.

2. MATERIALS AND METHODS

2.1. Study Area

The study was conducted in the surrounding vegetation of Obubra campus of Cross River University of Technology. The area lies between latitude 5^0 45^1 and 6^0 15^1 North of the equator and longitude 8^0 12^1 East. The total land area of Obubra is 1115km^2 [11]. The climate is characterized by distinct wet and dry seasons, with an annual rainfall distribution of between 2500mm to 3000mm, and an annual temperature of 25 – 27^0 c [1].

2.2. Sampling techniques and experimental procedure

Preliminary survey was conducted to determine the potential location of the species in the study area. The line transect method was used for survey. This method involves walking and recording species on both sides of a predetermined route. In transect distance estimation is perpendicular to the line transect, rather than the distance from the bird to the observer [8]. The area was divided into four (4) sectors; Northern (N), Western (W), Eastern (E) and Southern (S) sectors. Three (3) transects each measuring 3km and 10m in width will be laid in upland agricultural field (UAF), lowland swamp field (LSF) and secondary forested area (SFA) in each of the sectors respectively. Each transect (1.5km) in a 10,000km^2 area was walked simultaneous with trained assistants for sixty minutes to avoid double counting. Data was collected periodically, between morning (6:30am), afternoon and evening (6:30pm), three months each in the rainy season and dry season. The species abundance was recorded using the visual and call method. Silent movement followed by five minutes waiting was allowed before the commencement of the survey to avoid habitat

disturbance [8]. The materials used include binoculars, field note books, pencils, biros, stopwatches, identification guides, data recording sheets, protective clothing, and measuring tape.

2.3. Estimating population

Data was collected consecutively for three days every month for ten (10) months, between morning (6:30am), afternoon and evening (6:30pm). The direct and indirect methods was employed in population estimation. The direct method is the transect method while the indirect method involves calls and visual observation. The population density was determined using the formula D = $\sum \frac{n}{2LW}$.

……..equation 1

Where L = Total transect, n = Number of the species detected, W= width of transect, D = Estimated density of the species [2].

2.4. Feeding behaviour

Time spent and activity carried out during foraging, time of day, length and site of perching, preening, resting, and flying will be recorded using field observations [15]. The focal sampling method was used repeatedly to watch and follow the species for ten minutes, early in the morning and late in the evening. Also, type of food items consumed were recorded.

2.5. Habitat preference

Major plant species were collected and identified using the quadrate method as described by [14], and with the help of a plant taxonomist. Three quadrates measuring 10m x 10m for the secondary forested area, 4m x 4m for upland agriculture field and 2m x 2m for lowland swam field were used [12]. Relative density, relative frequency and relative dominance for plants was determined.

2.6. Data Analysis

The one way Analysis of Variance test was used to analysis and interpret the data from different habitats, and population, while the Chi square and t-test using was used for comparison of population densities across sectors, seasons and habitats at a significant level α = .05. The

importance value index (IVI) for three species in each transect was calculated using the formula: IVI = RD+ RF+ RDO where RD = relative dominance [5].

3. RESULTS

3.1. Population Size of Helmeted Guinea Fowl in the study area

For the wet and dry seasons, a total of 364 helmeted guinea fowls were recorded. The Eastern sector had the least number of birds, while the highest number was recorded in the Southern sector, followed by the Northern sector (Table 1). The total number of guinea fowls in the study area was significantly different (^{2}= 8.00, p = .03**)** in both the wet and dry seasons (Figure 1).

Table 1. Population density of helmeted guinea fowl in the different sectors. N, W, E, and S = Northern, Western, Eastern and Southern sectors.

	Sector				
Season	N	W	E	S	**Total**
Wet	136	65	72	161	434
Dry	93	77	47	76	293
Mean	114.5±21.5	71.0±6.0	59.5±12.5	118.5±42.5	363.5±70.5

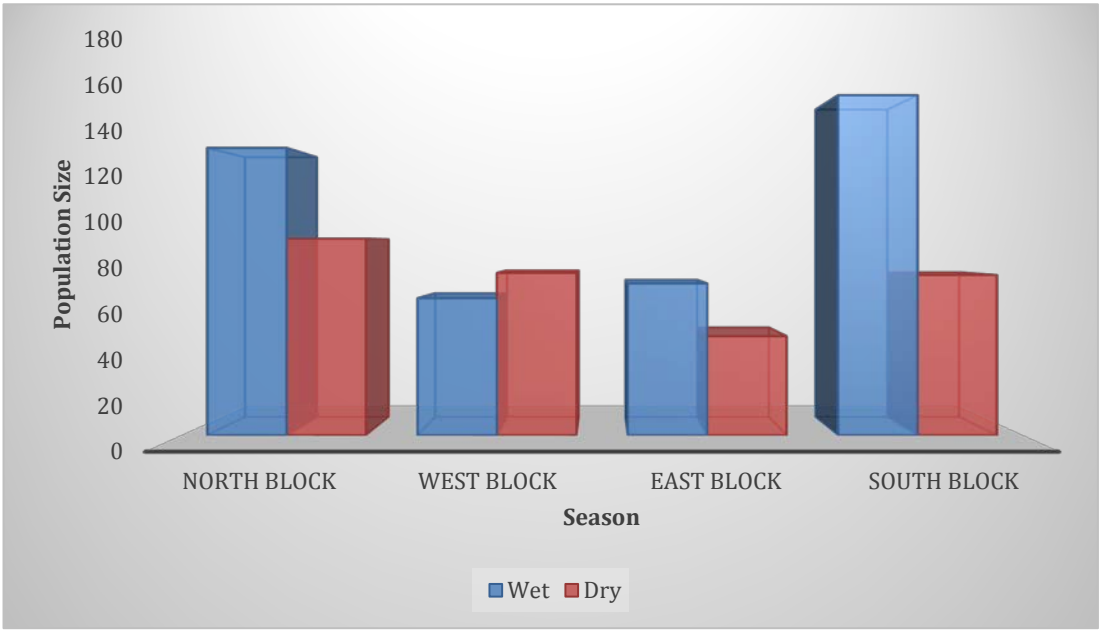

Figure 1: Seasonal comparison of *Numida meleagris* in the study area

3.2. Feeding/Behaviour Pattern of Helmeted Guinea Fowl in the study area

The species was found to be feeding mostly on insects, worms, and fresh grasses especially during the wet season. The activities observed in both seasons were flying, resting, scanning, feeding, and running, with feeding being the most important activity in both seasons (Figure 2). They was a significant difference in the feeding and behavioural pattern of guinea fowls in both seasons (t = 4.04, p = .001**)** (Table 2).

Table 2. Time spent on different activities according to time of day. ^{2}= *Chi-Square test*, *P= Prob. value*

Activity	Time of day (% of hours)					
	6:30-9:30	9:30-12:30	12:30-3:30	3:30-6:30	**^{2} = 4043**	**P = 0.001**
Flying	7	6	3	12		
Resting	9	8	61	7		
Scanning	8	14	22	10		
Feeding	68	65	6	66		
Running	8	7	8	5		

Source: Field Survey 2021

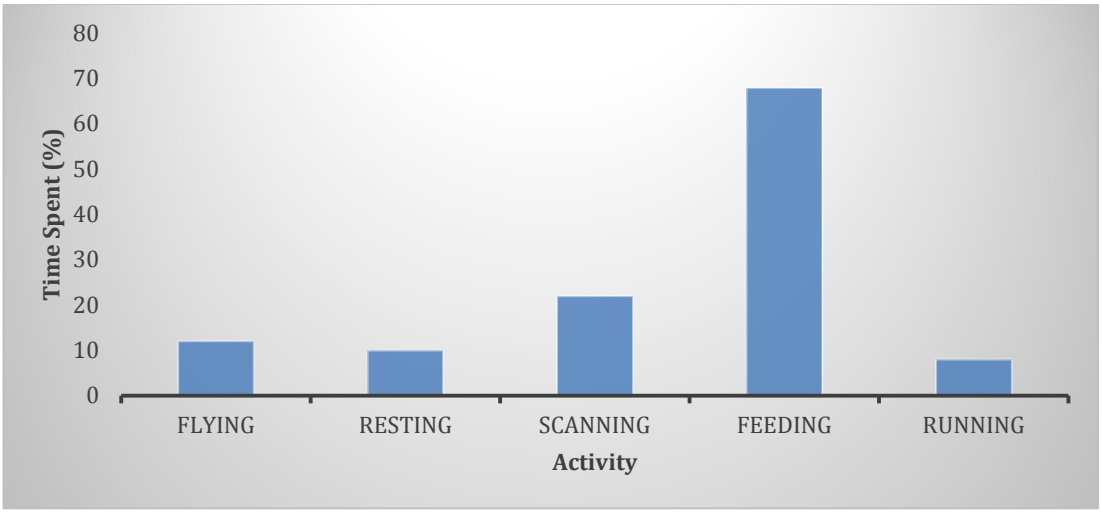

Figure 2: Percentage seasonal activity pattern of *Numida meleagris* in the study area

Table 3. Seasonal variation in no. of individuals of helmeted guinea fowl in the different habitats. UAF=Upland agricultural field, LSF=Lowland swamp field, SFA= Secondary forested area, SE=Standard Error.

Habitat type	**Season**		
	Wet	**Dry**	**Mean±SE**
UAF	243	176	209.5±33.5
LSF	168	98	133.0±35.0
SFA	23	19	21.0±2.0

Source: Field Survey 2021

Gmelina, teak and oil palm were the most dominant plant species observed, across habitats during the study (Table 4).

Table 4. Plant species in the three selected habitats in the study area. D=Density, F=frequency, RF=Relative Frequency, RDo=Relative dominance, IVI=Importance Value Index. Expected results are for D/10m^2, D/4m^2, D/2m^2

Family	**Species**	**RD**	**RF**	**RDo**	**IVI**
Combretaceae	*Terminalia ivorensis*	5.3	5.3	0.03	10.63
	T. superba	5.3	2.6	0.01	7.91
Makvaceae	*Tripochiton scleroxylon*	5.3	4.3	0.02	9.62
Moraceae	*Milicia excelsa*	5.3	3.9	0.02	9.22
	Treculia africana	5.3	0.7	0.00	6.00
Sterculaceae	*Cola nitida*	5.3	2.9	0.02	8.22
	C. gigantean	5.3	4.9	0.03	10.23
Anacardiaceae	*Magnifera indica*	5.3	3.6	0.02	8.92
Lamiaceae	*Gmelina arborea*	5.3	19.0	0.11	**24.41**
	Tectona grandis	5.3	15.0	0.09	**20.39**
Arecaceae	*Elaeis guineensis*	5.3	12.8	0.07	**18.17**
Fabaceae	*Tetrapleura tetraptere*	5.3	1.9	0.01	7.21
	Parkia biglobosa	5.3	2.3	0.00	7.60
	Afzelia african	5.3	0.9	0.00	6.20
Leguminosae	*Pterocarpus mildbraedii*	5.3	3.9	0.02	9.22
	P. osun	5.3	6.9	0.04	12.24
Burseraceae	*Dacryodes edulis*	5.3	1.9	0.01	7.21
Irvingiaceae	*Irvingia gabonensis*	5.3	5.2	0.03	10.53
Rutaceae	*Citrus sinensis*	5.3	2.6	0.01	7.91
Total	**19**	**100.7**	**100.6**	**0.54**	**201.84**

Source: Field Survey 2021

3.2. Habitat Preference/Plant Species Composition of Helmeted Guinea Fowl in the study area

The helmeted guinea fowls observed showed preference for upland agricultural field, than lowland swamp field and the secondary forested area during the wet season than the dry season (Table 3). Significant relationship existed between seasons and across habitats (^{2}= 12.00, p = .02**).**

4. DISCUSSION

The study showed though that the species was generally abundant in the study area, the number of guinea fowls observed showed variations across sectors with the southern sector having the highest population, closely followed by the northern sector. The high population recorded in this sectors may have been due to the availability of food and water in the area as stated by [13]. The highest density of guinea fowl was recorded during wet season, between the months of June and September. During this period, there is abundant food and breeding activities of bird species as asserted by Sutherland, 2000. However, the low densities recorded in eastern and western sectors was majorly due to habitat disturbance, crop cultivation, subsistence hunting and predation [2]. The helmeted guinea fowl feeds largely on invertebrates such as centipedes, ants, termites, spiders, beetles, slugs, snails and worms, most of which are usually in abundant during the wet season. The upland agricultural field was most preferred by the species during both seasons, followed by the lowland swamp field. This was due to the availability of different species of invertebrates for consumption by the species [17]. The species also utilizes swamp areas for drinking water during evening hours, and for rest when the weather is extremely hot [18]. Low numbers of the species was observed in the secondary forested area. The helmeted guinea fowl usually prefers open space for feeding, shelter, escape from predators and mating. However, the selectivity preference of this species was greatly dependent on varied environmental and anthropogenic factors within the surrounding vegetation of the study area as emphasized by [7]. The presence of *Gmelina*

arborea, *Tectona grandis* and *Elaeis guineensis* as the dominant plant species in the study area is an indication that the area is highly disturbed. This is because this plant species are exotic and mostly found areas that are highly degraded. The disappearance of the guinea fowl habitat was as a result of persistent agricultural activities, local poaching and habitat changes resulting from annual bush burning, erosion and other anthropogenic activities.

5. CONCLUSION

The helmeted guinea fowl population is adversely affected by both anthropogenic and environmental factors. The species population is under threat of man's interference in the form agricultural activities and hunting of the species for meat. The protection of the species habitat through demarcation and fencing can ensure the protection of the species and increase its population as well.

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