International Journal of Innovative Agriculture & Biology Research 5(1):1-8, Jan.-Mar., 2017

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Re- Assessment of Seed Acquisition and Dispersal by Olive Baboon (*Papio anubis*) in Gashaka-Gumti National Park, Nigeria

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ABSTRACT
This study focused on seed acquisition and dispersal by Olive Baboon (*Papio anubis*) in Gashaka-Gumti National Park (GGNP), Nigeria. It was undertaken to derive information on the types of seeds disperse by Olive Baboon in the study area, determine the fruit handling behavior as well as the ranging patterns of Olive Baboons. The methodology employed in the study includes the use of direct observation. One troop of habituated Baboons in Gashaka village and Filinga Range were used for the study. The scanning method was used to determine how Baboon acquires and handles seeds, while the Global Positioning System (GPS) was used to determine the distance seeds were moved away from the parent plants. The data obtained were analyzed using descriptive statistics (tables and charts). The results gathered revealed that the number and kinds of tree species eaten and moved by baboon in the plots sampled are very high. The fruits and their seeds observed eaten by Baboon were 2,612 while a total of 31,859 seeds were removed from the parent plants. Findings indicated that *Cercocephalis laurifolis* (30.15%) had the highest seed removed followed by *Landolphia marcurantha* (28.02%), while *Erythrophyleum suavaolens* (0.5%) was the least seed eaten. For seed handling, Olive Baboons swallow whole seeds which were later defecated; some seeds were dropped while some were also spit out. The distance seeds moved ranged from 1 to 25m per individual seed species while the total ranging distance per month ranged between 635m in the month of April to 1200m in the month of December. These findings therefore, suggest that Olive Baboons in the study area are good seeds dispersers after seeds acquisitions. Their activities added to the natural processes of forest regeneration in Gashaka Gumti National Park. Government should therefore continue to promote the conservation of Baboons in the area so as to aid the perpetuation of the forest ecosystem.
Keywords; Olive Baboon, Seed, Dispersal, Gashaka Gumti National Park

INTRODUCTION

Plant seed dispersal by animals is a central process for the self-maintenance and dynamics of tropical forests. Seed dispersal is when seeds are carried away from the parent plant either deliberately or accidentally. According to Herrera (2002), seed dispersal is the process by which individual seeds move from the immediate environment of their parents to settle in a more or less distant area. Seed dispersal determines the spatial arrangement and physical environment of seeds and this is an important step in the reproductive cycle of most plants (Wenny and Levey, 1998). It is important in plant distribution, as it enhances germination of ingested seeds, seedlings survival due to reduced competition in new sites as well as aid in the regeneration of previously disturbed sites

Seed dispersal has for long been a topic of interest to naturalist, but it was not until the last three decades that the ecology of dispersal has received much rigorous scientific attention (Herrera, 2002). Often, animals are involved in dispersal, as when ants, squirrels and mice, collect and store seeds (including

nuts). If the store seed is forgotten, or the animal dies, the seeds might germinate. The role of animals in seed dispersal is well recognized. As many as 75% of tropical tree species produce fruits presumably adapted for animal dispersal (Howe and Smallwood, 1982), and animals are estimated to move more than 95% of tropical seeds (Terborgh *et al.,* 2002).

Primates, for example, comprise between 25% and 40% of the frugivore biomass in tropical forests (Chapman, 1995), eat large quantities of fruit, and defecate or spit large numbers of viable seeds (Lambert, 1999). Primate frugivory and seed dispersal have been quantified by studies in South America (Stevenson 2000), Central America (Chapman 1989a), Africa (Kaplin and Moermond, 1998; Lambert 1999), and Asia (McConkey 2000). Research has illustrated that primates disperse significant numbers of seeds (McConkey 2000).

Baboons are among the largest and most adaptable monkeys on the African Continent. They inhabit nearly all areas, from forests to semi deserts, from Ethiopia to the Cape of Good Hope (Strum, 2001). Baboons are important in their natural environment, not only serving as food for larger predators, but also aiding in seed dispersal due to their messy foraging habits. Thus, they are one of the most successful African primates and are not listed as threatened or endangered.

Dispersal follows seed acquisition which is very important in the dispersal process. Animals may acquire seeds either actively, through the process of selecting different seeds or fruits or passively as hitchhikers attached to their fur or feathers or consumed incidentally with other food (Stiles, 2002). Seed dispersers play critical roles in the regeneration and restoration of disturbed and degraded ecosystems (Wunderle 1997), including newly-formed volcanic soils (Nishi and Tsuyuzaki 2004).

The increase in human population in Nigeria and in Gashaka Gumti National Park, over the four decades has resulted in increased demands for farmlands, livestock grazing and forest resources such as wood for timber, building and energy. This situation has placed enormous pressure on land and wood resources in many parts of the country, and result in degrading natural resources. Also the combined effect of grazing and wildfire by grazers result in the destruction of regenerating seedlings, saplings and some of the vulnerable species in the forest thereby decreasing available seeds and fruits for regeneration (GGNP, 1998).

Although it is clear that primates play an important role in dispersing many seeds throughout tropical forests, the ecological and evolutionary significance of these activities is not well understood. Few studies have been carried out on primate plant relationship such as the ecology of seeds acquisition and dispersal in the Nigerian protected area and GGNP in particular.

This study aimed at investigating the role of Olive Baboons as seed acquirers and dispersal agents and how they contribute to the natural forest regeneration in Gashaka Gumti National Park, which will pave way to promote their conservation and also hitherto unknown information about the species. The objectives of this study included identifying the types of seeds disperse by Baboon in the study area, determine the fruit handling behavior of Olive Baboons and the ranging patterns/distance of seeds moved in the study area.

The Study Area

Gashaka Gumti National Park is the largest and most diverse National Park in Nigeria; covering an area of approximately 6670sq, km. The Park is split between Adamawa and Taraba States. It is located in the northeast of Nigeria between latitude 6°.55' and 8°.05' N, and longitudes 11°. 11' and 12°. 13' E with the Cameroon at its eastern border. The Park's name is derived from two of the regions oldest and most historic settlements; Gashaka village in Taraba State and Gumti village in Adamawa State. Gashaka Gumti National Park was created by federal decree now Act of 1991 by the merging of Gashaka game reserve with Gumti reserve (Gashaka Gumti National Park-GGNP, 1998).

MATERIALS AND METHOD

A Reconnaissance survey was carried out in the study area prior to the detailed study to identify areas where Baboon presence is more among the ranges. And the research work covered a total of 2000m of the study area.

Plotless method was employed and the Park was divided into seven ranges. Study was carried out at the identified ranges e.g. Filinga range within the Gashaka sector. Data collection was carried out for a period of 6 months: December 2012 – May 2013. While the sites were visited five (5) days in the month. The period of visit was between 6:00am – 9:00am in the morning and 3:00pm – 6:00pm in the evening.
The materials used included the following: A pair of binocular, standard GPS instrument, scientific calculator and field note book.

Data Collection Techniques

The researchers and field assistants on arrival at the range observed a troop of Baboon. The troop was followed for a time frame of 2 hours and observation on their feeding habits were observed. The scanning method was used to determine how Baboon acquires and handles seeds. Global Positioning System (GPS) was used to determine the distance seeds were moved away from the parent plants. Data on the types of seeds eaten, seed handling methods, distance the seeds were moved and Baboon fresh droppings for the period were identified and recorded. Defecated seed samples were collected, washed and sorted out to determine species of plants consumed. The data obtained were analyzed using descriptive statistics of tables, chart, and graphs.

RESULTS AND DISCUSSION

From this study, it was observed that a total number of 12 fruit tree species were visited by Baboon troops in the study area, while only eight (8) trees were potentially dispersed. This number was considered very high in respect to Baboon dispersal alone since other animals also participate in the dispersal activities such as birds. For instance, Stiles (2000) confirmed that birds are probably the most important seed dispersers, followed by mammals, fishes, reptiles and amphibians. The findings indicated that the number and kinds of tree species eaten and moved by Baboon in the plots sampled were very high. The finding in Table 1 showed the total number of tree species found and the relative importance of seeds dispersed (12 trees) in the study area. The finding showed that fruits and seeds eaten by Baboon were 2,612 while a total of 31,859 seeds were removed from the parent plants. The finding also showed that *Cercocephalis laurifolis* (30.15%) had the highest seeds removed followed by *Landolphia marcurantha* (28.02%), while *Erythrophyleum suavaolens* (0.5%) had the least seeds eaten. Primates, specifically, consumed more seeds per visit than any other disperser (Holbrook and Loiselle, 2009). The highest seeds potentially dispersed in the study area were from *Cercocephalis laurifolis* (26.52%), followed by *Landolphia marcurantha* (24.64%). The findings indicated that Baboons in GGNP effectively dispersed a total of 9,058 seeds in 4 months of 8 seeds species. This finding agreed with McConkey (2000) that primates disperse significant numbers of seeds, and that a single gibbon group (*Hylobates mulleri* ×*agilis*) dispersed a minimum of 16,400 seeds · km^{-2} · year −1of 160 species in Borneo; and since the survival rate of seeds to 1 year was 8%, a group of gibbons effectively dispersed 13 seedlings· ha^{-1} · $year^{-1}$

Table 1. Relative importance of seeds dispersed (at 12 trees) in the study area

S/N	Tree species	Visits (n)	Eaten per visit (n)	Removed per visit		Potentially dispersed	
				(n)	(%)	(n)	(%)
1	*Annona senegalensis*	14	164	2044	6.42	204	2.25
2	*Cercocephalis laurifolis*	13	739	9607	30.15	2402	26.52
3	*Eleais guineensis Jacq*	23	125	2875	9.02	0	0
4	*Erythrophyleum suavaolens*	8	27	162	0.5	54	0.59
5	*Landolphia marcurantha*	12	744	8928	28.02	2232	24.64

6	*Landolphia landolphioides*	11	235	2585	8.11	1279	14.12
7	*Pakia biglobosa (jacq.) R.Br. ex. G. Don*	9	109	981	3.08	0	0
8	*Parinari excelsa*	13	82	1066	3.34	0	0
9	*Piliostigma Thonnigii*	8	64	512	1.61	0	0
10	*Piper guineensis*	5	85	425	1.33	213	2.35
11	*Vine species*	7	70	490	1.54	490	5.41
12	*Vitex doniana Sweet*	13	168	2184	6.85	2184	24.11
	Total	136	2612	31859	99.97	9058	99.99

Table 2 showed the estimated seeds handled by Baboons and the rate of seed ingestion, dropped, and removed. The table showed that *Eleais guineensis* (103) was the highest seed eaten and dropped while *Landolphia landolphioides* (27) seeds was the least dropped. The table also showed that in the baboon feaces, a total of 10 seeds of *Annona senegalensis* in average were found being the highest followed by *Cercocephalis laurifolis and Landolphia marcurantha* having 4 seeds each in the feaces.

Table 2. Estimated seeds handled by Baboons and the rate of ingestion, drop, and removal

Tree species	Total eaten (n)	Dropped (n)	Removed (n)	Feaces (n)	Presumed dead (n)	Potentially Dispersed (n)
Annona senegalensis	2044	0	2044	10	1840	204
Cercocephalis laurifolis	9607	0	9607	4	7205	2402
Eleais guineensis Jacq	2875	103	2772	0	2772	0
Erythrophyleum suavaolens	162	0	162	3	108	54
Landolphia marcurantha	8928	0	8928	4	6696	2232
Landolphia landolphioides	2585	27	2558	2	1279	1279
Pakia biglobosa (jacq.) R.Br. ex. G. Don	981	62	919	0	919	0
Parinari excelsa	1066	31	1035	0	1035	0
Piliostigma thonnigii	512	0	512	0	512	0
Piper guineensis	425	0	425	2	212	213

Vine species	490	0	490	1	0	490
Vitex doniana (Sweet)	2184	38	2146	1	0	2184

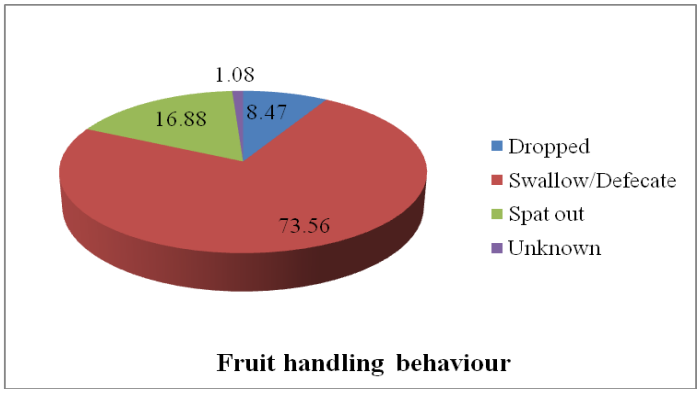

Fig. 1. Fruit handling behavior of Olive baboons in the study area (%)

Fig.1 showed the fruit handling behavior of Olive Baboons in the study area (%). The seeds swallowed and latter defecated were 73.56% been the highest, while seed behavior that was unknown 1.08 was the least. Hence, primates' seed-handling strategies depend on the interactions between their digestive anatomy and the traits of the fruiting species, primates may process the fruits and spit out seeds at or away from parent trees (Norconk *et al.*, 1998).

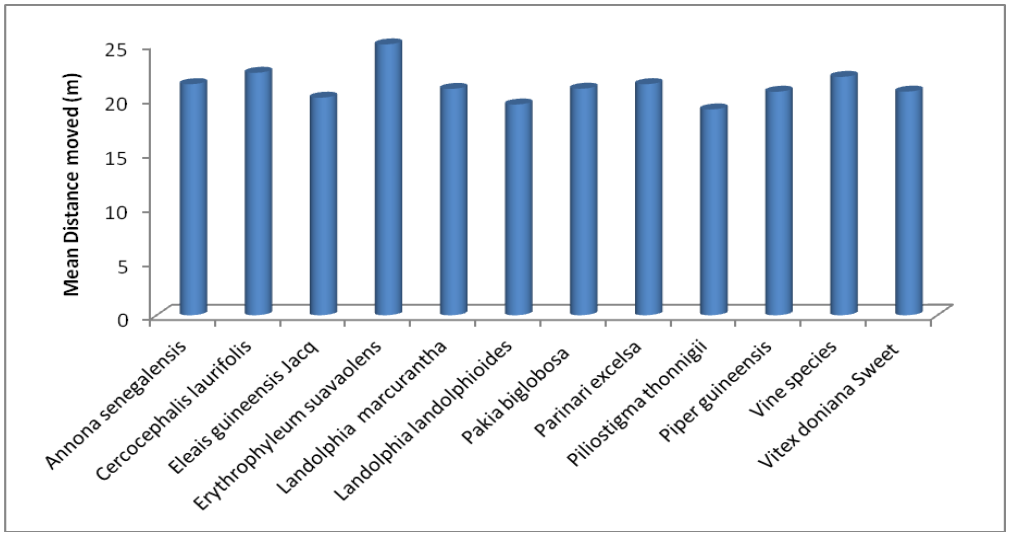

Fig. 2. Ranging patterns/distance seed are moved by Olive Baboons in the study area (m)

The potential distance seeds were moved were estimated by calculating the mean distances seeds were moved away from the parent plants using the Global Positioning System (GPS), while observing the ranging troops starting from the parent plant to the actual location where the seeds were finally dropped. Fig. 2 showed the ranging patterns/distance seeds were moved by Olive Baboons in the study area (m). *Erythrophyleum suavaolens* seeds were moved 25m away from the parent plant having the longest distance range, followed by Vine species 22m, while *Piliostigma thonnigii* 19m had the shortest distance range. This conformed Cain *et al*. (2000) assertion that, although most seeds are dispersed over short distances, long-distance dispersal is crucial especially over geological time scales.

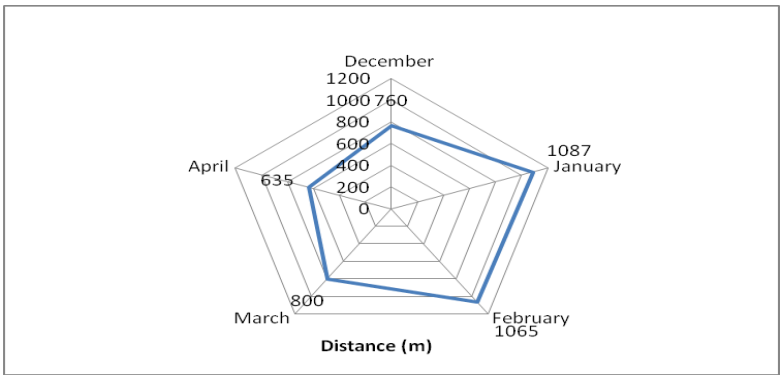

Fig. 3. Ranging patterns/distance of Olive baboons per month in the study area.
Fig 3 showed the ranging patterns/distance of Olive Baboons per month in the study area.

The month of January recorded the farthest distance seeds were moved (1065m) in the area, while the month of April recorded the least distance of 635m.

Table 3. Problems facing baboon in the study area

Problems		Solution
Deforestation	The forests have been destroyed by human beings making it difficult for the baboon to survive.	Indiscriminate deforestation, bush burning and farming activates in the area should be minimized so as to allow wildlife to have enough cover and feed for survival.
Poaching.	There is an indiscriminate killing of baboon by hunters in the park	The park authority should beef up anti-poaching patrol so as to stop humans from entering the park and killing most baboon and other animals
Other predators	Other predators like hyena, leopard are feeding on baboon in the park.	Effort should be made to see that other animals such as rodents increase in number thereby providing food for carnivores so that baboon number will increase.
Scarcity of fruit and water	There is usually scarcity of food especially fruits and water during the dry season in the park.	Government should provide probably additional source of water in the park so as to help sustain the animals during the dry seasons.

CONCLUSION

Olive Baboons in the study area are good seeds dispersers after seeds acquisitions. Their activities add in accelerating the natural processes of forest regeneration in Gashaka Gumti National Park. The distance seeds moved ranged from 1-25m per individual seed species while the total ranging distance per month ranged between 635m in the month of April to 1200m in the month of December. These findings therefore suggest that Olive Baboons are good seeds dispersers after seeds acquisitions. Since their activities add to the natural processes of forest regeneration in Gashaka Gumti National Park, Government should therefore continue to promote the conservation of Baboons in the area so as to aid the perpetuation of the forest ecosystem. Hence, the following recommendations are proffered; there should be extended monitoring programme to all the ranges of the Park. This will go a long way to check illegal activities such indiscriminate killing of wild animals including baboon by hunters in the Park. Indiscriminate deforestation, bush burning and farming activities by the communities surrounding the area should be discouraged, so as to allow wildlife to have enough cover and feed for survival. In addition conservation education should be carried out across communities surrounding the Park; this will enhance their knowledge on wildlife conservation.

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