EFFECT OF ARTIFICIAL WATERHOLES ON DISTRIBUTION OF WILDLIFE FAUNA IN ARBORETUM OF GASHAKA GUMTI NATIONAL PARK, TARABA STATE, NIGERIA

Uloko I. J., Yager, G.O. and Ikyuango, T. I

Department of Wildlife and Range Management, Joseph Sarwuan Tarka University (Formerly Federal University of Agriculture), Makurdi, Benue State, Nigeria
*Corresponding Author: *juluko4u@yahoo.com; (+123) 8034645741

ABSTRACT

This research focused on the influence of using artificial waterhole on wildlife fauna distribution in Gashaka Gumbti National Park. The methodology used was simply to identify/build artificial waterholes for these wildlife animals to aggregate and use during the dry season when most natural streams and springs were dried up. Data were collected from January to end of August, 2018 through Focus group interview of the Park Management Staff (field Rangers and anti-poachers) and field observations from mornings between 6. 00 am to 10.00 am and evenings from 3.00 pm to 6.00 p.m. Night observations were hindered due to insecurity and banditry activities. However, foot prints and fecal droppings were identified. Two artificial waterholes were identified that supplied water to the wildlife animal species during the dry season. Hundred percent of the staff identify the need for waterhole, about 88.57% agreed that animals visited the waterhole mostly in the evening (60%) and 85.71% advocated for more waterholes in the study area. The following animals were observed to have visited the waterhole like Papio anubis (20%), Tragelaphus Scriptus (30%), Cephalophus rufilatus (10%), Chlorocebus tantalus (20%) and Hippotragus eguines (20%). Some wild aves (birds) also benefitted from this water scheme, mostly, Apus affinis and Ceyx picta. It is recommended that, authority should consider conducting regular specific site assessment of the waterholes for their maintenance and modification where and when necessary.

INTRODUCTION

Wildlife habitat is a physical environment that the animal live. Four important basic components must be available for these wildlife fauna to thrive. These are food, water, space and cover. It is well known that water covers about 70% of the earth's surface. Water is very essential for both plants and animals and each have developed various mechanisms in dealing with their specific water requirement for their survival in every ecological space (Meyer and Casey, 2014). However, water related stress can occur when an organism is exposed to either deficiency or overabundance of water in relation to the occupying ecological unit. Without water, life of almost all the fauna species will be short-lived. Moreover, the value of water in both quantity and quality is important for maintaining good health and their physiological functions, (Gerata and Wolanski, 2015; Smarchers, 2015). Furthermore, waterholes are important component of natural range and used as drinking spots by most animals. Water is quite important as solvent for transportation of nutrients, excretion, against overheating as well as lubricant for joints and shock absorption, (Smarchers, 2015).

EFFECT OF ARTIFICIAL WATERHOLES ON DISTRIBUTION OF WILDLIFE FAUNA IN ARBORETUM OF GASHAKA GUMTI NATIONAL PARK, TARABA STATE, NIGERIA

142

Water holes or drinking spots can occur naturally or improvised as boreholes and wells. Water holes provides drinking water for many wildlife species as well as breeding habitat for amphibians such as toads, frogs just to mention a few. Also, water holes come in various shapes and sizes which occur at different locations and are designed and placed at strategic locations for wildlife animal benefit (Du Toit and Ebede, 2017). Wildlife fauna in natural environment such as National Park and Game Reserves often travel long distances during dry season in search of water when the naturally occurring bodies get dried. Most recent management plan of National Parks in the world recommend creation of water holes as alternative source of water for wildlife animals. This is to prevent animals from moving too far away from their home range in protected areas, in order to reduce high risk of poaching (Herve *et al*, 2013 and Mtachiko *et al*, 2006). Gashaka Gumti National Park has two distinct climate- wet and dry seasons. Most water in parts of the Park dry out during the dry season, making these animals to travel long distances for their water requirement thereby increasing the risk of poaching and exhaustion. To alleviate this problem, it has become imperative that an alternative supply of water should be provided to meet their daily water requirements (Epaphras *et al*, 2014).

Artificial provision of water for wildlife in game areas, usually from drilled bole holes is increasingly common in southern Africa. In fragmented game areas without natural or permanent water, provision of these artificial water holes has become a necessity. However, in many other areas it is used to attract animals for game viewing or hunting or even to reduce dry season mortality (Kalwij, 2014). Most water development is intensively used by non-game wildlife including a variety of birds and bats (O'Brien *et al,* 2016). Therefore, with the loss or degradation of natural water sources, water development in dry environment may be critically important to resident birds and every wildlife fauna.

MATERIALS AND METHODS
Study Area
Gashaka Gumti National Park (home of biodiversity) is located in subtropical zone of Eastern Highlands of the guinea savanna area of Nigeria and covers a land area of about 6,731km^2. It lies between latitudes 6°55'N and 11°13'N and longitude 8°05'E and 12°11'E. The Park was originally gazetted as Gumti Gashaka and Serti Game sanctuaries by the defunct North East Government in 1970. The three game sanctuaries were merged and upgraded to a National Park by Nigeria National Park Decree 26 in August, 1991. This was further replaced by the Nigeria National Park Decree 46 of 1999 as Gashaka Gumti National Park. The prominant ethnic groups are Jibu, Dakka, Ngoro, Tigungbaya, Tiv, Mabilla Kaka and Fulani found in the southern part of the Park while in the Northern part of Toungo sector are Chamba, kutim, Potapore, Fulani, Dakka, Nyam-nyam and Kona.

The major occupation of the enclave communities was farming, livestock husbandry, civil service with few but powerful hunters and fishermen. The vegetaion is Tropical lowland rainforest, Sudan/guinea savanna woodland; consisting of red leaves of *Brachystegia eurycoma* and white flower of *Berlina grandiflora* and Montane in the highland areas. Major fauna species are lions, African elephant, waterbuck, buffalo, Chimpanzee, Leopard, Kob, Elephant just to mention a few. Rivers flowing through this park include; River Taraba, Benue and Kam which provide excellent fishing ground. The park is divided into five ranges for easy Park administration such as Toungo, Gumti, Filinga, Gamgam, and Mayo selbe. Two distinct climatic patterns are rainy season (April – October) and dry season (November to March/May) depending on the world climatic changes. The annual rainfall ranges between 1897mm – 2143mm and temperature between 21°C – 32.5^{o}C with an average humility of 26-78% in relation to temperature pattern.
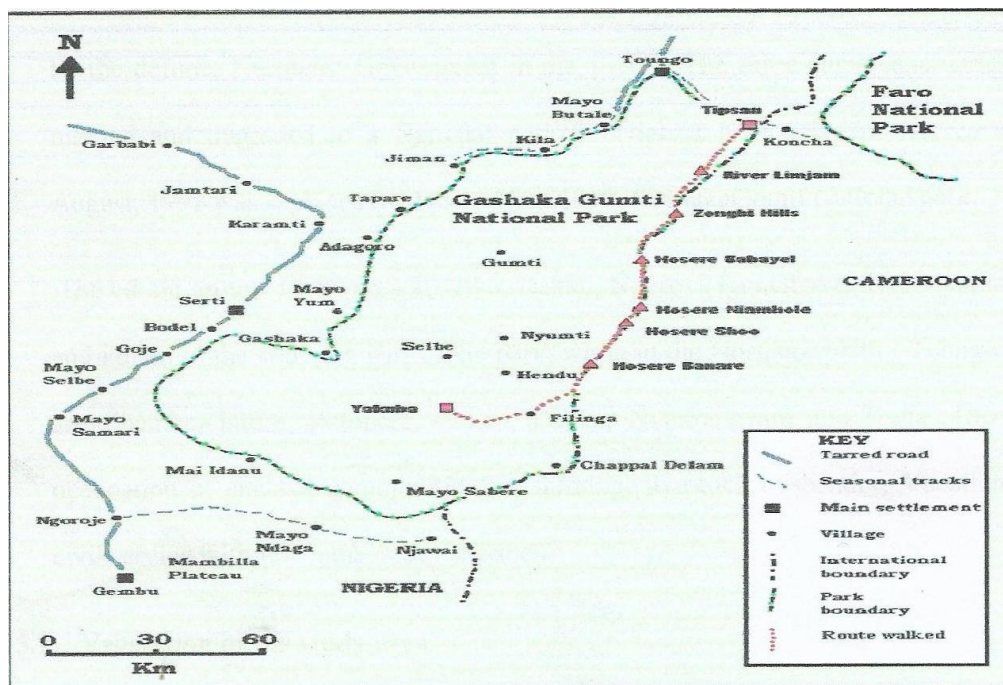
Figure 1. Map of Gashaka Gumti National Park

Data collection procedure

Two methods were used for data collection for this work. These include:

(a) **Focus group interview (FGI)**

Members of Gashaka Gumti National Park totaling 35 were randomly interviewed on the two indentified waterholes and their management practices. The artificial waterholes identified during the interview were visited. GPS was used to get coordinates of the identified water holes.

(b) **Field observation**: Identification of the wildlife fauna species associated with the identified waterholes were done with the demarcation of 24×25 plots around the waterholes. Within the plot, direct and indirect methods of sighting animals were carried out. The following information was recorded at each visited site.

i. Name of the animals sighted around the waterholes

ii. Droppings and footprint of the animals around the waterholes particularly during the off record periods (i.e. Night periods)

Data Analysis

Data were analyzed using descriptive statistic such as simple percentage (%), tables and plates.

RESULTS

Waterholes location coordinate is given in Table 1. Result in Table 2 below indicated knowledge of the management staff on waterholes existence in the park. From the focus group interview of about 35 personnel of the management of the Park, 100% were knowledgeable on waterholes existence and said there was need for waterhole in the Park to compliment the natural water. About 88.57% agreed that animals visited the waterhole while 11.43% thought otherwise. Also, 60% believed the visits were mostly in the evening while 28.57% and 11.43 believed the visits were mostly in the morning and night respectively. Therefore, 85.71% advocated for more waterholes at GNNP while 11.43% thought otherwise perhaps because of financial and difficulty in managing those waterholes.

EFFECT OF ARTIFICIAL WATERHOLES ON DISTRIBUTION OF WILDLIFE FAUNA IN ARBORETUM OF GASHAKA
GUMTI NATIONAL PARK, TARABA STATE, NIGERIA

144

Table 1. Location of Identified Waterholes in the Study Area

S/No.	Waterhole	Location	Coordinates		
1	Base 1	Arboretum	Latitude	7°26'N/50°N	336KM²
			Longitude	11°18'E/39°E	
2	Base 2	Arboretum	Latitude	7°18'N/53°N	337KM²
			Longitude	11°18'E/34°E	

Source: Field Survey (2018)

Table 2. Response of Management Staff on Waterholes in GGNP (n=35)

Items	Frequency	Percentage (%)
Need for waterhole		
Yes	35	100
No	-	-
Do animal visit waterhole?		
Yes	31	88.57
No	4	11.43
When		
Morning	10	28.57
Evening	21	60.00
Night	4	11.43
Do you suggest more waterholes?		
Yes	30	85.71
No	4	11.43

Source: Field Survey (2018)

Plate 1: One of the Artificial Waterholes at Arboretum of GGNP
Source: Field Survey, (2018)

Plate 2: The second Artificial Waterhole at Arboretum of GGNP
Source: Field Survey, (2018)

Table 3 and figure 2 revealed wild mammals that utilized the waterholes in the study area. Five species were encountered and recorded. *Tragelaphus scriptus* (30%) showed high percentage of utilization, followed by *Chlorocebus tantalus, Papio anubis and* *Hippotragus equines* (20%), respectively, while *Cephalophus rufilatus* (10%0 was the least (Figure 2). The bird's species list is given in Table 4. The result indicated that *Apus affinis* (18) had the highest average sighting, followed by *Ceyx picta* (16) and the least was *Neophron*

monachus (03) and *Milvas migrans* (04), respectively. During the field work, it was discovered that Aves (birds) visit these water spots in the morning before moving out for their feeding and also in the evening when returning to roost.
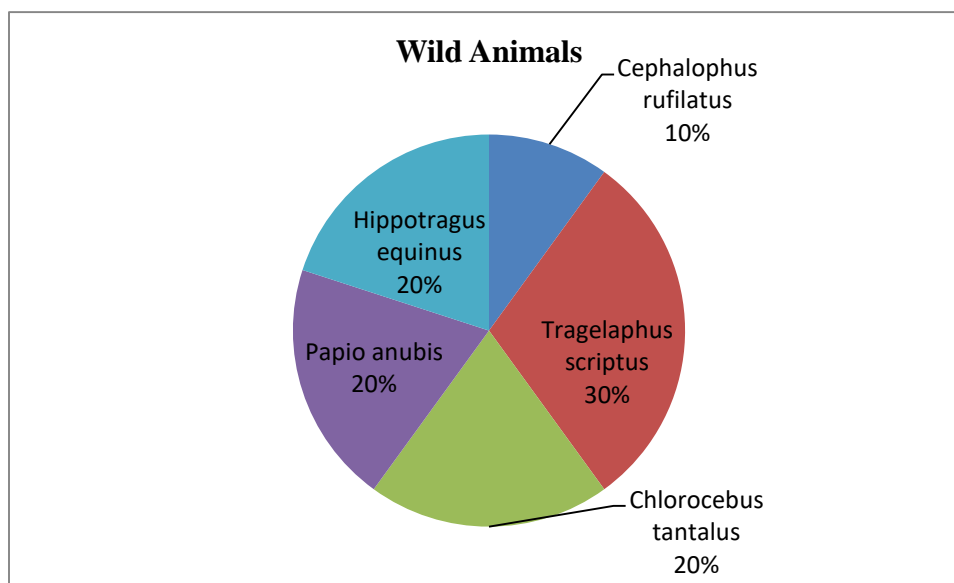

Fig. 2. Percentage of Fauna Species associated with the Artificial Water Holes
Source: Field Survey (2018)

Table 3. Foot prints and faeces droppings sighted around the artificial Waterholes.

S/No.	Common Name	Species	Base 1		Base 2	
			F	D	F	D
1	Red-flanked duiker	*Cephalophus rufilatus*	+	+	-	+
2	Bush buck	*Tragelaphus scriptus*	-	+	-	+
3	Tantalus monkey	*Chlorocebus tantalus*	-	-	-	-
4	Baboon	*Papio anubis*	-	-	-	-
5	Roan antelope	*Hippotragus equinus*	-	-	-	-

Key: F = Footprint, D = Faeces dropping, += Present and - = Absent
Source: Field Survey (2018)

Table 4: Some Aves (Birds) Sighted around waterhole Arboretum

S/No.	Common Name	Species	Average Sighting
1	Great White Egret	*Adeola ibis*	10
2	Common Vulture	*Neophron monachus*	03
3	Pignny kingfisher	*Ceyx picta*	16
4	Little Africans Swift	*Apus affinis*	18
5	African Sand Marhin	*Riparia palridicola*	08
6	Africa Black Kite	*Milvas migrans*	04

Source: Field Survey, (2018)

Plate 3: Feacal dropping of *Tragelaphus scriptus*
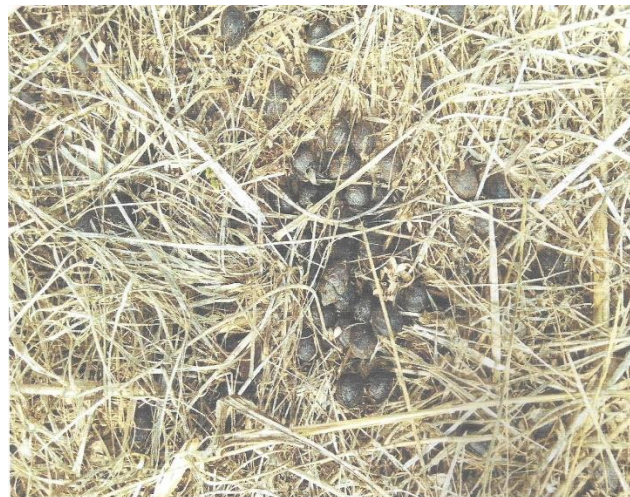Source: Field Survey, (2018)

Plate 4: Fecal dropping of *Cephalophus rufilatus*
Source: Field Survey, (2018).

DISCUSSION

From the research, it was clear that the Park Rangers and other management staff were in support of construction of more waterholes to remove the obvious stress risk of animals walking long distances for water. They were, also, of the opinion and proposed that an earth dam should be constructed within the arboretum and equip it with generating set, pumping machine and led pipe that enable proper functioning of the artificial waterholes, (Lameed, 2016).

Provision of waterholes to compliment the natural streams that got dried during dry season was crucial to these wild animal species for their physiological needs (Cain et al; 2006). Moreover, these waterholes were necessary to prevent wild animals straying from their natural, unprotected abodes to reduce the high risk of poaching by hunters. Epaphras *et al*., (2014) observed that provision of artificial water holes might reduce the over use of the natural water streams and spring allowing the ecosystem to degrade naturally.

Results from this study showed that some animal utilized the artificial waterholes. Some animals were sighted while others were identified through their faecal droppings and foot prints. Perhaps, this was due to some anthropogenic activities around the waterholes such as poaching and logging.

Likewise, Zvidai *et al* (2013) while studying the waterhole usage pattern at the wildlife/livestock interface in semi-arid savanna of Southern Africa observed that elephant tended to visit waterholes close to human settlements where disturbances were reduced. However, most investigators believed that animals sighted around the waterholes were mostly ungulates and game birds, (O'Brien *et al*, 2016). Other non-game species were also reported with resident and migratory birds benefited tremendously from this water development, (Lynn *et al*, 2006) including a variety of other mammals, reptiles and amphibians, (Rosen stock *et al*, 2004). Therefore, it is expected that other species of wild animals apart from the big game and ungulates will visit the waterholes any time encouraging provisions of more in future.

CONCLUSION

Artificial waterholes have been identified as good spots for wild animals and as alternatives for their use during the dry season when most of the natural streams/ springs must have dried up. Management staff of most National Parks in Nigeria should be pushing for these as their use is obvious. This is not different in Gashaka Gumti National Park. Aside, other wildlife species including aves also benefited from these waterholes.

Recommendations:
Based on the results, the followings were recommended;
i. The Park authority should encourage these options to enhance the habitat value for wildlife species. However, regular and site species assessment of the waterholes should be conducted regularly to decide if they should be maintained in their natural state or modified at any given point in time.

ii. The water quality must be ensured for these animals because poor water quality has the potential to harbor water-borne infective pathogens which may lead to illness and mortality among wildlife animals.
iii. Rangers or Anti-poachers should continually monitor the waterholes in order to prevent vandalization of equipment during poaching activities.

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