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Population Estimate 0f Warthog (*Phacochoerus aethipicus*) in Six Mayas in Dinder National Park (DNP), 2017

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Abstract

This research was conducted in Dinder National Park which lie in eastern part of Sudan, during the dry season of 2016 from February to May with the aims to estimate the population size and structure of Warthog (*Phacochoerus aethipicus*), and to determine the habitat preference and use in the park. The method used for data collection was road count techniques. The method used to estimate the population size was Jolly's method II for unequal size sampling units, the population estimated was found to be 3245 individual, during the study period. This number is higher than the result obtained by Yousif who estimate a number of 1858 animals. Warthog mainly prefer to live in un burnt area. In terms of group structure the percentages of each segment was computed as the males (30%), the young (38%) to females (31%).

Keywords: Warthog; Population; Dinder National Park

Introduction

Warthog (*Phacochoerus aethipicsu*) are found in most of Africa south of the Sahara and are widely distributed in East Africa. They are the only pigs able to live in areas without water for several months of the year. By tolerating a higher than normal body temperature, the Warthog is perhaps able to conserve moisture inside its body that might otherwise be used for cooling [1-3].

It has a rather flattened head with distinctive facial paired protuberances "warts" and large curving canine teeth which protrude as tusk. These are not present in juveniles but grow over the course of a few years, they are larger in males than in females, the body is sparsely covered with bristly hairs and a more dense region of hairs runs along the spine and forms a crest [4].

Warthog prefer habitats where is available vegetation and water, to drink and wallow, and also can be found in dry habitat of Sahel zone where water is not available for six months [5]. They are found in savanna grass land, wood land and avoid densely covered forest and less in areas where grasses are growth tall [6]. The aim of the research was to estimate the population size and structure of Warthog and to determine habitat preference and use in Dinder National Park.

Materials and Methods

The materials used during road count technique along the six transects which were conducted and repeated twice, for each transect are composed of: Field note, data sheet, pen, pencil they are used to record animal numbers, sex and size and habitats description. One pair of Binoculars for seeing distance animals at width of 200 meters from both sides of the road either when moving in car or when during moving on foot.

Methods

Study area: This study was conducted in Dinder National Park, established in 1935, the park which embraces 650,000 ha lies between latitude 11° 45 E 12° 50 N and longitude 34° 30 E 36° 00 N at the south eastern part of Sudan against the Ethiopian frontier. The area of the park principally consists of a low-lying flood plain that slopes gently from the Ethiopian highlands with few rocky hills at its southern corner. The Rahad and Dinder rivers flow north-westerly through the park area. Tributary streams form seasonally flooded lowlands, known as Mayas (marches) in much of the area adjacent to the Ethiopian border. The park comprises three ecosystems: Maya, Riverine and Dahara. Vegetation in these ecosystems is described as consisting of grasslands, wooded land and riparian forest.

Along seasonal streams, the vegetation consists of *Hyphaene thebaica, Acacia sieberiana, Tamarindus indica* and *Ficus* spp.; the understory vegetation consisting of *Ziziphus spina christi* and *Mimosa pigra*. The herbaceous layer comprises coarse grasses, including Sorghum spp. and *Brachiaria* spp. Thorn-bush savanna (Acacia seyal–Balanites aegyptica association) with tall grasses dominates the north, while *Combretum aculeatum* woodland is found in the moister south. *Nymphaea* and *Ipomoea* spp. are common in Mayas and shallow lakes, while the open grass plains are covered by *Themeda triandra*, *Panicum*, *Hyparrhenia* and *Cynodon* spp. The Mayas, the main source of water and green fodder during the dry season (November–June), are dominated by *Echinochloa* spp.

Dinder National Park has a mean annual rainfall of 600-1000 mm, falling between May and November. When the area of the park was extended by adding 2630 km^2, ten villages consequently fell inside the park and there are 38 villages outside its boundary. These villages lie at a distance of less than one kilometer from the boundaries of the park.

A great variety of species occur within the park and this include Reedbuck (*Redunca redunca*), Bushbuck (*Tragelaphus scriptus*), Water buck (*Kobus defassa*), and warthog (*Phacocheorus aethiopicus*). The dominant predators include Lion (*Panthra leo*), and Hyena (*Hyena hyena*). The primates are represented by olive Baboon (*Papio anubis*), Green monkey (*Cercopithecus aethiops*), and patas monkey (*Erythrocebus patas*). There is also great variety of birds' species in the

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park ranging from Egyptian goose, Guinea fowl, Ostrich, Pelicans, Marabou stork, Bustards, Heron, Starling, Rollers and Raptors species. Road count technique is the common method used for estimation of animal population [7]. Road count was done during the dry season February-May 2016.

Count usually by car and started at 7:30 am and ends depend on the length of transect and time for counting animals. Habitat types and condition were also recorded. Width of transect was fixed at 200 meters each on either side of the road to avoid visibility bias.

The study area begins from Galagu (which is main station). The survey was divided in to six transects as following:

1. Galagu – Ras Amer
2. Galagu – Musa
3. Galagu – Geririssa
4. Galagu – Ein Alshams
5. Galagu – Abdel Ghani
6. Galagu – Bait Alwahsh

Data analysis

The collected data were used in estimation the population of Warthog (*Phacochoreus aethiopicus*) existed in Dinder National Park during the dry season, 2017. Estimation of population was done using Jolly's Method II this method was used for unequal sizes of sampling area. It is the best technique for calculation of ratios between animals count and the area searched, based on animal number per sample unit as follows:

Area of study=π (r^2)=circle area

π=3.14

r=Radius

The formula used for analysis is

Number of transect in census zone=$\frac{\text{area of study}}{\text{total area search}}$

R=the ration of animals counted in the area searched

$$R=\frac{\text{total animal count}}{\text{total areaof search}} \text{ or } \frac{\Sigma Y}{\Sigma Z}$$

Where

Y=number of animal

ΣY=total animal count

Z=area search

ΣZ=total area search

Population estimation (Y)=Z*R

Where

Y=the total population (estimated)

Z=the total area searched (census zone)

R=the ration of animal

Population variance is calculated according to the following formula;

The variance between animals counted in all the units

$$S^2y=\frac{1}{(n-1)}[\Sigma y^2-\frac{(\Sigma y)^2}{n}]$$

The variance between area of all the sample unit

$$S^2z=\frac{1}{(n-1)}[\Sigma z^2-\frac{(\Sigma z)^2}{n}]$$

The variance between the animal counted and the area of each unit

$$(Syz)=\frac{1}{(n-1)}[\Sigma yz-\frac{(\Sigma y)(\Sigma z)}{n}]$$

$$\hat{Y}=\frac{N(N-n)}{n}\left[S^2y-2R.s\,y\,z+R^2.S^2\,z\right]$$

Ŷ=the population variance

N=the number of sample unit in population (transect)

n=the number of sample unit in the sample (animal)

Population standard error SE $(\hat{y})=\sqrt{Var(\hat{y})}$

Confident limits=SE.t

95% confidence limits, where (t) is for (n-1) degrees of freedom

$$LL=\hat{y}-t.SE$$

$$UL=\hat{y}+t.SE$$

Chi-square test was used for determination of habitat preference and habitat condition (burn and unburnt) to show whether there is any significant differences between habitat condition used by Warthog (*Phacochoerus aethipicus*).

$$X^2=\frac{(O-E)^2}{E}$$

Results and Discussion

Results

The data were analyze and presented inform of tables; Table 1 shows the number of animals counted in counted in six transect and their habitat used, in Dinder National Park. Table 2 shows the area searched and (3) show the population parameter. X^2=26.27

N\B

O=Observed value from the habitat used burnt and un brunt

E=Expected value from habitat used burnt and un burnt

E=Total Row × Total Colum÷ Ground Total

B=Burned

UB=UN burned

Discussion

Road count has long been a standard for estimation of animals. The advantages of this method it is the best technique for calculation of ratios between animal count and the area searched and also in large areas are quickly and easily transverse in the comfort of auto mile.

The number of animals was counted in six transects and their habitat used as well as condition, as showed in Table 1. Gererissa

Name of transect	Male	Female	Young	Total	Habitat types
Galagu – Ras Amer	10	12	11	33	Grassland
Galagu – Musa	13	14	17	44	Woodland
Galagu – Gererissa	15	16	20	51	Grassland
Galagu – Ein Alshams	12	14	15	41	Woodland
Galagu - Abdel Ghani	8	8	11	27	Grassland
Galagu - Bait Alwahsh	11	8	13	32	Woodland
Total	69	72	87	228	

Table 1: The total number of animals counted in six transect and their habitat used, 2017 in Dinder National Park.

Name of transect	Length\km	Width	Area of search\km^2	No of warthog
Galagu - Ras Amer	16	0.4	6.4	33
Galagu – Musa	16	0.4	6.4	44
Galagu – Gereresa	8	0.4	3.2	51
Galagu – Ein Alshams	12	0.4	4.8	41
Galagu – Abdel Ghani	1.5	0.4	0.6	27
Galagu – Bait Alwahsh	12	0.4	4.8	32
Total	10.9		26.2	228

Table 2: Length and width of transects and the area occupied by warthog, DNP, 2017.

Name of transect	No. of male	No. of female	No. of young	Total
Galagu – Ras Amer	10	12	11	33
Galagu –Muas	13	14	17	44
Galagu – Gererissa	15	16	20	51
Galagu – Ein Alshams	12	14	15	41
Galagu – Abdel Ghani	8	8	11	27
Galagu – Bait Alwahsh	11	8	13	32
Total	69	72	87	228
Percentages	30%	31%	38%	100%

Table 3: Sex ratio between the population parameters.

Name of transect	Woodland	Riverine Forest	Grassland	Burned	Un Burned	Total
Galagu – Ras Amer	13	-	20	9	24	33
Galagu – Musa	19	-	28	-	44	44
Galagu – Gererissa	23	-	28	9	42	51
Galagu – Ein Alshams	15	-	29	-	41	41
Galagu – Abdel Ghani	10	2	17	7	20	27
Galagu – Bait Alwahsh	12	3	20	10	22	32
Total	92	5	139	35	193	228

Table 4: Habitat preference and condition of use (burnt and un burnt) by warthog in the DNP.

Maya is highly populated with Warthog (*Phachoerus aethipicus*) due to available of water and food, Abdel Ghani Maya is less number of individuals due to the few available water and food noticed in the area. Ras Amer Maya and Bait Alwahsh Maya in these sites counts of Warthog (*Phachoerus aethipicus*) almost to be equal in number and also Musa and Ein Alshams Maya funded the number of Warthog (*Phachoerus aethipicus*) are almost equal in the number. The population estimate of Warthog (*Phachoerus aethipicus*) as 3245 individuals in the area of research in the dry season 2016, summarized in Table 2.The population size of Warthog (*Phachoerus aethipicus*) in the park, became increase in comparison to the previous studies conducted by Yousif under the same condition who recorded [8].

The sex ratio between population parameters in six transect

Name of transect	B UB	(O)	(E)	(O-E)	(O-E)^2	(O-E)^2÷E
Galagu – Ras Amer	B	9	5.1	3.1	15.21	2.1
	UB	24	27.9	3.9	15.21	o.55
Galagu – Musa	B	-	6.7	6.7	44.89	6.7
	UB	44	37.2	6.8	46.24	1.2
Galagu – Gererissa	B	9	7.8	1.2	1.44	0.18
	UB	42	43.1	1.1	1.21	0.02
Galagu –Ein Alshams	B	-	6.3	6.3	39.69	6.3
	UB	41	34.7	6.3	39.69	1.14
Galagu – Abdel Ghani	B	7	4.1	2.9	8.41	2.05
	UB	20	22.9	2.9	8.41	0.36
Galagu – Bait Alwahsh	B	10	4.9	5.1	26.01	5.3
	UB	22	27	-5	25	0.92
Total		228				26.27

Table 5: Chi-square test analysis of habitat condition of use by warthog in DNP.

is determined in Table 3, the population of Warthog (*Phachoerus aethipicus*) in this research are higher when the ratio of female to young, this means the production of young during this season is high.

The percentages of each segment was computed as: The young (38%) to female (31%) comprises (1:2) from the total population of 228 individuals and this may be attributed to some female produce more than one young.

Determination the habitat preference burnt or un burnt by Warthog, in the Dinder Nation Park during the study period as show in Table 4 include the grassland, woodland and reverine forest .The distribution and preference of Warthog to the habitat is showed as follow: burnt 25% and un burnt 80% this mean Warthog prefer mostly un burnt grassland rather than burnt area. This may be due to availability of food and shelter and to avoid exposed to predation.

The calculation value of chi-square test in Table 5 show that the crucial value of chi-square is 26.27* consequently means there is a significant statistical difference in the habitat used burnt and un burnt.

Conclusion

The purpose of annual road counting is aimed to investigate the population size for some wild animals like Warthog (*Phacochoerus aethiopicus*) to report whether this population increase or decrease and to determine the possible reasons for that changes also to identify their habitat preference and their social structure. Warthog densities varied according to their location. Warthog (*Phachoerus aethipicus*) is found in any habitat types and this mean they are not affected by habitat type.

Recommendations

1. Excavation of Mayas to increase holding capacity of water and green forages to Warthog (*Phachoerus aethipicus*) and other animals during the dry season.

2. Annual monitoring of the ecology of Warthog (*Phachoerus aethipicus*) could be done by wildlife research center and relevant wildlife institutions.

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