

A study on the status of reedbuck (*Redunca redunca*) in Dinder National Parka – Sudan

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Abstract:

The Bohor reedbucks (*Redunca redunca*) were studied in Dinder National Park (DNP), Sudan to investigate their population dynamics and activity patterns. The road count methods was employed to investigate the population size age and sex structure, diurnal activity of a herd were studied with 10 minutes recording intervals. There were 153 individual of reedbucks in the study site of which 41% (n = 63) was confined to the EinAshamis Mayas. The sex ratio of reedbuck was 1:1. The population was female biased 51.6% (n = 79) was female excluding juveniles, and (39.2%, n = 60) as males. More adults (29.4%, n = 45) were observed more than sub-adults (9.8%, n = 15) and juveniles (9.2%, n = 14). The herds were seen in aggregation of up to 45 individuals of reedbuck during the dry season in EinAshamis Mayas. The diurnal activity pattern of reedbuck group showed most animals were active feeding throughout early morning and late in afternoon, with a resting period around midday. The nocturnal activity pattern was not recorded due to the fact that no night spot equipment to scan them and no security measurement available during the night hour in the study site. The predation pressure, poaching and habitat degradation were observed as a threat to the species in the Dinder National Park. Certain management measures have been suggested.

Key words: Dinder National Park, Reedbuck, Population dynamics, Diurnal activity

Introduction:

Bohor reedbucks are found in a broad band in Africa from Senegal to Ethiopia and Southward in East Africa to Southern Tanzania (Estes 1991). Bohor reedbucks comprised of five subspecies which include Abyssinian reedbuck, reedbuck, reedbuck, reedbuck, reedbuck. It occurs in southern, eastern and central Ethiopia and Blue Nile Sudan. The taxonomy of the species and its distribution in Sudan was covered by Tigani Allam (2006)

The aim of the present study was as to investigate the population dynamics and activity pattern of reedbuck in park since few research works was done in this aspect so, it became necessary to carry out more studies. However, an understanding of population dynamics and the factors that contribute to maintaining the abundance of this reedbuck species will help to improve the status of other reedbuck antelopes such as waterbuck and reedbuck in Dinder National Park (DNP) and in any other national parks in Sudan

Materials and methods:

The study area:

The study area Dinder National Park was established in 1935 following the London convention of 1933 for the convention of Africa flora and fauna (Mohamed 1994). The study area is situated by the river Rahad at latitude 120 42' N and longitude 350 02' E, and to northwestern to latitude 120 42' N and longitude 340 48' E at Dinder river then latitude 120 32' N and longitude 340 32' E along khor Kennan and finally to the southeast to latitude 110 55' N and longitude 340 32' E (figure 2).

Kenyi (2001) described the climate of the study area, and the topography and soil were covered and described by both Horsworth (1968) and Dasman (1972). In term of flora and fauna of the study area were identified described by Dasman (1972) and Nikolas (1987).



Figure 6: Location Map of Dinder National Park

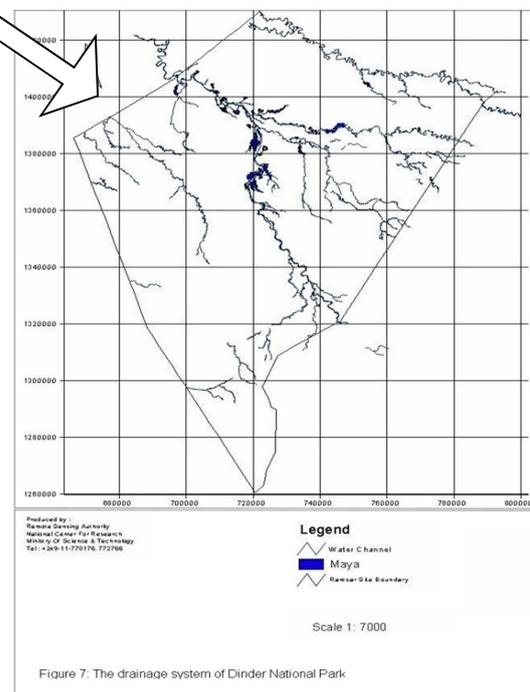


Figure 7: The drainage system of Dinder National Park

Figure (2) The water system of Dinder National Park
Source: Management plan of Dinder National Park 2004

Methods:

The road side counts population status and the activity patterns were carried during dry season February – March 2018. The study site was divided into five transect line which include Galago – RasAmir, EinAshamis , Musa, Grrerisa and Galago – Senate and this was done in order to cover different types of habitat, Thomas et al (2002), Burraclogh (2000), Greenwood and Robinson (2009), Shorrocks (2007). These sampling were done as follow

Population size:

The survey of bohor reed buck was conducted and counting performed starting at 7:00 am – 11:00 pm. The binocular and the field guide for mammal were used during the count. The individuals of reedbucks were recorded in a designed sheet a brief identification notes. The sex and ages category was determine on the basis of the body size, horns size and the presence or absence of horn, (Estes 1991, Afework el al 2010).

Activity patterns:

Group of bohor reedbucks traced to record their activity pattern with 10 minutes time interval (Martin and Bateson 1993 and Funston el al 1994, Altman 1974). The nocturnal activity pattern was difficult to be scanned due to the facts that no modified scan equipment facilities that can be used for scanning during the night and no security measurements available during the night hour which starts at 18:00 pm to 6:00 am. Therefore reedbucks were scanned diurnally in a hidden tree in AbdelGani Mayas the location of their preferred grazing site for consecutive five days. Observations of each day were compiled as the total number of activities preformed 12 hours period i.e 7: 00 – 8:00, 8:00 – 9:00, to 15:00 – 16:00 (Seddon and Ismail 2002, and Afework el at 2010).

Statistical analysis: Data on the population abundance, status and activity patterns were analyzed using micro-soft excel.

Results:

Reedbuck population size:

As indicated in table (1) and table (2). There were 153 reedbuck animals counted in the study site of which 41.2% (n = 63) was confined to Galago – Ein Alshamis area. However, the population varied between the transect line A, C, D and E were not significant (chi $X^2 = 8.7, 3.0, 6.5$ and 6.1 respectively at 4 d.f., $p > 0.05$) and it is significant in transect line B (Chi - $X^2 = 20.6$ at 4 d.f, $p > 0.05$).

The proportion of adults' reedbucks of study area was higher than the lower age's structure. However, was significant (Chi - $X^2 = 22.0, 21.5$ at 4 d.f, $p > 0.05$) and not significant at lower ages structure (Chi - $X^2 = 5.9, 8.0,$ and 7.6 at 4 d.f, $p > 0.05$). The sex ratio of reedbuck was 1:1. For all transect lines census, the population of Bohor reedbucks were female biased 51.6% (n = 79) was female excluding juveniles, and 39.2% (n = 60) was male. More male adults (19.4%, n = 45) were observed than sub adults (9.8%, n = 15) and juveniles (9.2%, n = 14). The group size of reedbucks showed variation from 1 – 5 individual animals. Herds were seen in aggregation of up to 45 individual during the dry season in EinAshamis Mayas. Bohor reedbuck showed a transect movement pattern. More individual of reedbuck were counted in transect A & B during the morning census in dry season. The female accounted for 51.6% excluding juveniles and 39.2% male of the total population of reedbuck at study site. However, the sub adult group contributed 24.8% individual to the total population and the juveniles contributed 9.2% to the population at the study site.

Group composition:

Bohor reedbucks according to many studies the results showed that they normally known to forms different groups. Likewise, in the field Bohor reedbuck observed in different group which is not commonly stand for long period of time, these included group formed by dominant male with adults, sub-adult females and juveniles. Another group comprised of

bachelor adults and sub-adult females. The third group formed by sub-adult males only. The last groups were older isolated male of reedbucks or sometimes form groups of individuals. Regardless of the grouping, however, the herd of reedbuck population were loose and dispersion in all direction.

Table (1): Comparison of individual animals Bohor reedbuck counted in different transect line in Dinder National Park

Transect line	Total Count					Total	M.D	Percent
	AM	AF	SAM	SAF	J			
Galago-RasAmir (A)	11	13	4	6	4	38	3.6	24.8
Galago- Ein Alshamis (B)	20	23	6	8	6	63	9.2	41.1
Galago – Grrerrisa (C)	2	3	1	2	0	8	0.8	5.2
Galago – Musa (D)	4	6	1	2	1	14	1.8	9.2
Galago – Alsenat (E)	8	1	3	5	3	30	2.8	19.0
Total	45	56	15	23	14			
M.D	5.2	5.4	1.6	2.0	1.8	Grand Total 153		

Value Mean Deviation, AM = Adult male, AF = Adult female, SAM = Sub-adult male, SAF = Sub-adult female, J = Juvenile

A= Galago – RasAmir, B= Galago – EinAshamis, C= Galago – Grrerrisa, D= Galago – Musa, E= Galago – Alsenat. M.D = Mean deviation

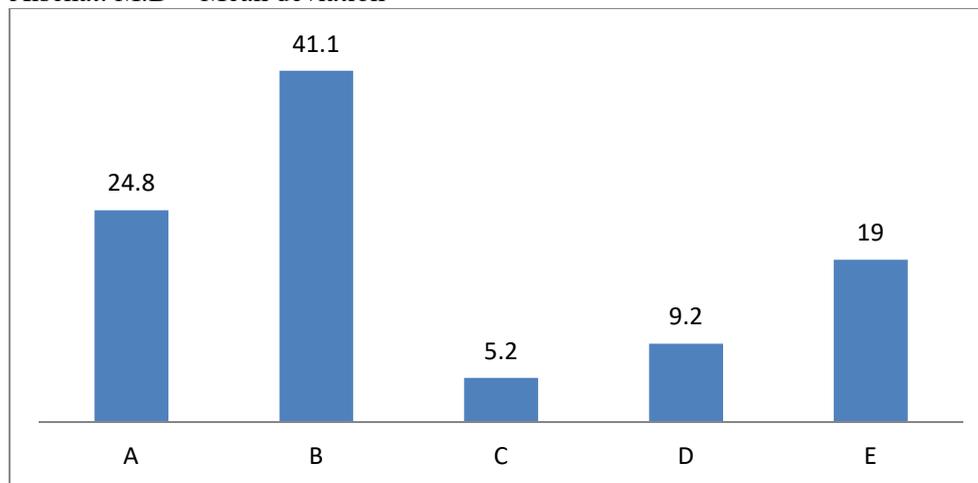


Figure 1 Comparison of total individual count of Bohor reedbuck in percent % in different transect lines

A= Galago – RasAmir, B= Galago – EinAshamis, C= Galago – Grrerrisa, D= Galago – Musa, E= Galago – Alsenat

Table (2): Comparison of ages and sex categories of Bohor reedbuck population between different transect at study site:

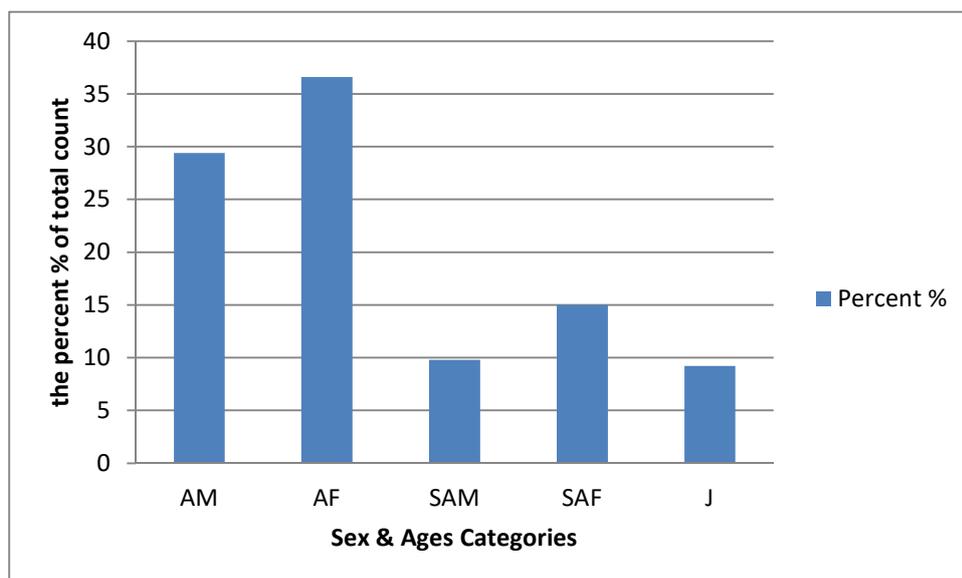
Transect line	Group size	Total count					Total Row	Chi- X ² d.f = 4
		Age and Sex Structure						
		AM	AF	SAM	SAF	J		
A	2.3	11	13	4	6	4	38 ± 3.7	8.7*
B	5.0	20	23	6	8	6	63 ± 7.3	20.6

C	0.2	2	3	1	2	0	8 ± 1.4	3.0*
D	0.3	4	6	1	2	1	14 ± 1.9	6.5*
E	1.0	8	1	3	5	3	30 ± 3.1	6.1*
Total		45 ± 6.3	56 ± 6.9	15 ± 1.9	23 ± 2.4	14 ± 2.1	153 ± 8.2	Total
Percent %		29.4	36.6	9.8	15.0	9.2	100 %	Chi-X ² 44.9
Chi - X ² d.f = 4	8.75*	22.0	21.5	5.9*	8.0*	7.6*	Total Chi - X ² 65.0	

Value Mean ± SD, AM = Adult male, AF = Adult female – SAM = Sub-adult male, SAF = Sub-adult female, J = Juvenile,

A = Galago – RasAmir, B = Galago – EinAshamis, C = Galago – Grrrisa, D = Galago – Musa, E = Galago – Alsenat

Value are not significantly different at p > 0.05, value * are significantly different at p < 0.05



, AM = Adult male, AF = Adult female – SAM = Sub-adult male, SAF = Sub-adult female, J = Juvenile

Figure (2) Comparison of sex and ages categories of Bohor reedback in percent % of the total count in different transect at study site

The diurnal activity:

A total of 330 time budget for every 10 minute scan sampling for five days consecutive of bohor reedback diurnal activity for dry season in AbdelGani Mayas Table (3) and figure (5). During the dry season the diurnal activity pattern of Bohor reedback group the result in table (4) indicated that most animals were actively feeding throughout early morning and late in afternoon with a resting period around mid day. Feeding activity began early and intensified between 7:00 – 9:00 am, 9:00 – 11:00 hrs then it gradually decreased between 11:00 – 13:00 hrs and 13:00 – 15:00. This time mostly used for lying down and ruminating. Feeding restarted again between 15:00 – 17:00 and increased gain up to late 17:00 – 19:00 hrs see figure (6). As a part of their diurnal activity reedback in the park used to move regularly from one location such as bedding site to other such as grazing or watering site which may involve crossing of the transects.

Table (3) Comparison of five days of diurnal activity pattern of Bohor reedback in Abdgani Mayas at Dinder National Park:

Activity	F	LD	W	SR	V	O	Total
Day							
Day 1	25	16	10	3	7	6	67
Day 2	20	13	8	3	6	5	55
Day 3	23	14	9	3	7	6	62
Day 4	27	17	11	4	8	7	74
Day 5	26	16	11	4	8	7	68
Total	121	76	49	17	36	31	330
A.M.	24.6	15.1	9.8	3.4	7.2	6.2	66
Percent %	36.7	23	14.8	5.2	10.9	9.4	100

A.M = arithmetic's means, F = Feeding, LD = Laying down, W = Walking, SR = Standing at rest, V = Vigilance, O = Others

Other* = Defending, urinating, ritual playing, soil licking, fighting, chasing, suckling, drinking, courtship

Table (4) Comparison of diurnal activity of Bohor reedback and time spent at the study site in Dinder National Park:

Activity	7 – 9	9 – 11	11 – 13	13 – 15	15 – 17	Total	Percent %
F	8	7	1	3	6	25	39.7
LD	0	1	6	5	2	13	20.6
W	1	2	3	3	0	9	14.3
RS	0	1	1	0	1	3	4.8
V	2	1	1	1	2	7	11.1
O	1	1	2	1	1	6	9.5

F = Feeding, LD = Laying down, W = Walking, SR = Standing at rest, V = Vigilance,

O = others* = Defending, urinating, ritual playing, soil licking, fighting, chasing, suckling, drinking, courtship

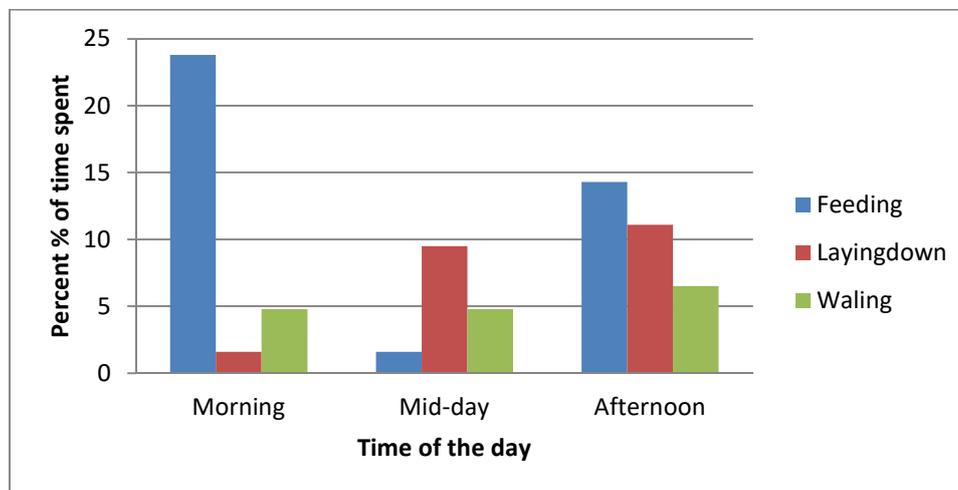


Figure 3 Diurnal activity pattern of Bohor reedback, the time of the day was divided into three periods of time (morning from 7:00 - 11:00, midday from 11:00 - 13:00, afternoon from 13:00 - 17:00)

Discussion:

This survey provided important pioneer steps in investigation of the status and the population dynamics in Dinder National Park (DNP), Sudan. These surveys resulted in observation of 153 individual animals of reedback along the five transect line, a total of 330 scanned diurnal activity pattern of reedback within five days, one case of predation in reedback and human activities factors such as livestock grazing, fishing, cultivation of crops, collection of firewood and any other factors which leads to poaching of the species.

Population Size:

The population size of reedbuck includes 24.8% in Galago - RasAmir, 41.1% Galago - EinAshamis, 5.2% Galago - Grrerrisa, 9.2% Galago - Musa and 19.0% Galago - Alsenit. However, the result showed the land use pattern of the surrounding transect s based on their security for animal species, as such the aggregation and concentration of reedbuck were observed in Mayas EinAshamis where fodder , water and security were available. Similar result were obtained by Tigani Allam (2006) who reported that in the dry season the animals were found in the center of the park around water pool where green fodder and water were available. However, Balakrishnan and Ndhlovu (1992) stated that wild animals avoid localities where human activities are frequents and high. This was clearly observed in Mayas Grrerrisa and RasAmir where there was fishing activities in frequent.

The population dynamics of reedbuck of study site were unknown. The population was biased toward female. Moreover, in assessing the age categories of reedbuck is biased toward adult 66 % (n = 101) adult. Similar results were reached by Tadesse Habtamu, Afework Bekele and Berhanu Belay (2012). However, this biased result toward adults is unfavorable for the population dynamic of reedbuck in the future. in the present study the sex ratio of the adult individual was 1: 1 and between the sub adult group was proportionally 1:1 and the finding agrees with many studies which reported that the sex ratio is 1; 1 since the breeding behavior of reedbuck is harem forming (Skinner and smithers 1990, Taylor 2004). Many researchers: Estes (1991), Afework el al (2010) and Taylor (2004) reported that reedbucks are known to form a group of different individual composition. Likewise in the field different group of reedbuck were identified and observed in the study area and this include a dominant male with female and juveniles. A group of bachelor sub adult male, other group comprised of adult and sub adult female and isolated older male with female and sometimes without females groups.

Diurnal Activity:

The pattern of diurnal activity in reedbuck is specified during the period of early morning and late afternoon. At Dinder reedbuck were observed to be actively feeding throughout early morning and late afternoon with a resting period around the midday. Similarly in the work done by Roberts and Dunbar 1991, they accept reedbuck nocturnal behavior but considered environmental factors such as habitat fragmentation and shortage of food that forced their activity at least to be during a certain time of the day (early morning and late afternoon). Many studies (Jarman, P.J., 1974, Mloszewskmi, J., 1983., Beekman, J.H. and H.H.T. Prins, 1989) reported of rumination in ungulates are closely correlated with resting period that occur intermediately during feeding bunts. However, the reedbuck population at Dinder have their resting pattern occurring around the midday which is the time mostly used for lying and ruminating. Likewise, Mitchell 1976 reported pattern of resting for animals are in a suitable shade to avoid heat stress. Feeding was the major diurnal activity of reedbuck during the time of day, then followed by lying down, walking, vigilance and others and the minor diurnal activity for reedbuck was standing at rest.

Conclusion:

There is a limited study on wet season diurnal and nocturnal activity pattern and breeding behavior. The population size and sex and ages categories of reedbuck of the study site may creates a good opportunity to conduct a detailed long term study on population of diurnal and nocturnal activity and breeding in both dry and wet season. From these results it is possible to conclude that for the sustainability and maintenance of the existing population in Bohor reedbucks in Dinder National Park (DNP) should be Maintain sufficient habitat not to be subjected to excessive degradation. Reducing human depredations on population of these a

ntelopes.

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