

The Impact of War on Wildlife in Radom National Park, Southern Darfur State-Sudan

Shahd A El Khidir* and Osman Mirghani M Ali

Institute of Environmental Studies, University of Khartoum, Khartoum, Sudan

*Corresponding author: Shahd A El Khidir, University of Khartoum, Institute of Environmental Studies, Khartoum, Sudan, Tel: 00249915847188; E-mail: shahd.elkheidir@gmail.com

Received date: October 08, 2018; Accepted date: November 19, 2018; Published date: November 26, 2018

Copyright: © 2018 El Khidir SA, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Abstract

This study was conducted in Radom National Park, which lies within the southwestern part of country savanna woodland. The study aimed to understand the impact of war on wildlife and the impact of human activities inside the park. Due to the insecurity in the area questionnaires were developed to track 25 wildlife animal species in different periods (1974-2016). The study revealed that 87% of wildlife animals disappeared as they have lost their habitats and migrated due to human settlement inside the park. Artisanal gold mining is a new threat in the park. A package of recommendations is presented to remedy the situation and reinstate the park status.

Keywords: National park; Sudan; Gold mining; Woodland; Blash river; Drainage

Introduction

Wildlife Protection in Sudan

There are about 11 areas that are gazetted and declared by the state as protected areas and equal number of areas has been proposed as protected areas (Table 1). Respectively show the distribution of protected areas over the ecological zones of the Sudan. These protected areas include national parks, game reserves, game Sanctuaries and proposed protected areas. Some of these protected areas were gazetted as far back as 1935, while others were recently established such as Jabal Ed-Dair National Park in 2010 and recently El Gazala in 2016.

Growing concern about the status of many protected areas has led to increased interest in effectiveness of the protected areas system and calls for more frequent assessment and revision to assure that protected areas continue to preserve the values for which they were created. Although we have limited information on the status of protected areas in the Sudan, increasing evidence suggest that many are under pressure or are actually experiencing degradation and subsequent loss of biodiversity. The Sudan has made a tremendous effort to establish significant number of protected areas covering more than 10% of the total area of the country. These areas have played a significant role in safeguarding the countries biodiversity, sustaining ecosystem process, and contributing to livelihood of rural communities. Unfortunately, Sudanese protected areas now face increased threats associated with pressures from land use changes in adjacent areas, effects of large scale biophysical changes, inadequate institutional capacity, and enormous financial shortfall in protected areas management agencies and specific protected areas sites. Nevertheless, the Sudanese government has continued to demonstrate commitment to Wildlife Conservation (in general) as reflected by the Khartoum Declaration which was signed by the president in 2002 expressing commitment towards wildlife conservation, and was also demonstrated by the presidential declaration of two protected areas in Jebel Hassania and Wadi Hawar

in 2002 and 2003. The government has continued to demonstrate commitment to protected areas and biodiversity conservation through support to all major international conventions. However, Conservation status in all "Protected areas" of Northern Sudan is considered unsatisfactory (Table 1).

Ecological Zone	National Parks	Game Sanctuaries
Desert	Wadi Hawar	
Semi-desert	Jebel Hassania Algazala	Arkawit-Sinkat Arkawit
Marine Coastal	Sanganeb Dongonab	
High rainfall Savannah woodland	Random	
Low rainfall Savannah woodland	Dinder Taya Pasenda	
Mountain	JabelEd-Dair	

Table 1: Protected areas in Sudan (UNEP, 2010; WCGA, 2016).

Darfur region

Darfur, which means land of the Fur, lies in western Sudan and has faced many years of tension over land and grazing rights between nomadic tribes and farmers from the Fur communities. The conflict which started in 2003 has claimed many lives as well as affecting the economic system, social fabric, education and health services. The impact of conflict also extended to the wildlife and their habitats in the region. Although a peace agreement was signed between the government Sudan and the rebels in the south, six years later southern Sudan seceded from the north and became an independent nation.

In December 2013, a political power struggle broke out between in Southern Sudan. This new war, which is still going, lead to the displacement of many refugees from South Sudan to Darfur.

Radom national park

Radom National Park is one of the two internationally recognized Biosphere Reserves in Sudan and lies in the south-western corner of Darfur state adjacent to the border with the republic of Central Africa and South Sudan (Figure1). It is located within the wooded Savanna covering an area of about 155,399 hectares. Approximately 90% of the habitat is shrub land, while the remainder is forest. There are many settlements within the park and the major villages include: Radom, Mesheitar, Bireikat, Um Gudul, Songo, al Hufra, Bimeza, DeimGushara, Chili West, Majid, Dafag, Titribi, Kafindibei West, Kafindibei East, Amara, Um Hugaar, Kafiakingi, Karmandoura, and Shioulla.

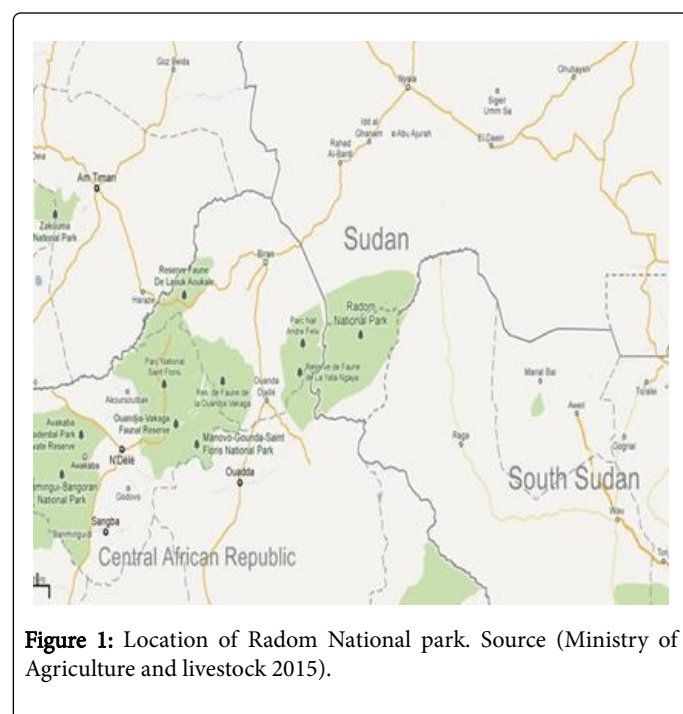


Figure 1: Location of Radom National park. Source (Ministry of Agriculture and livestock 2015).

The drainage system of the Park is well developed and it is influenced by the underline structural feature which is predominantly Basement Complex comprising four main networks, namely:

- Adda valley drainage system which influences the central-southern and north eastern parts of the Park (50% of the Park area), to foster Adda river on its course downstream.
- Um Blasha valley drainage system which is covering 25% of the area to enrich Um Blash River.
- Diofo valley drainage system (covering 15%) and contribute to the water regime on the eastern part.4-Khadra valley drainage system network which covers about 5% is generally rectangular and flows eastwards [1].

Area characteristics

The area is characterized by two main seasonal rivers, Adda and Um Blasha, in addition, streams and pools on the south and south west boundaries adjacent to the international border with the Republic of

Central Africa. These two rivers represent the main source of the water in the Park, beside a few small streams (Khors) flowing from the east and the southern parts of the Park, namely Sirri, Rikki and river Eimmi. Within Adda vicinity, a number of water resources including boreholes and Birkas (Pools) are found.

Topography

Darfur region is mainly composed of sandy gozes which occupies about 10 to 15% of southern Darfur. The region is characterized by gently undulating to nearly level uplands interspersed with various hills and mountains. Clay and Gardud soils occupy the western and south western parts of the Park. Jebel Marra forms the watershed divide where seasonal streams and Wadis flow south of the Jebel. Wadi Kass and Wadi Bulbul flow to the south and south east. Although all these Wadiss are seasonal, some of them retain surface and subsurface waters where shallow wells are dug to grow some vegetables and horticultural crops. Deeper water aquifers are in Baggara, where good drinking water for both human and animals is always available.

Geology

The major geological formations in study area are: (a) Basement Complex rocks covering more than 45% of the area. These do not bear groundwater aquifers and any water found there are only in some localized fractures, (b) Nawa formations which are rarely found as outcrop on the surface. These are composed of fine grain and are poor in terms of carrying groundwater, (c) Nubian Sandstone. This formation bears rich water aquifers, (d) Umm Ruwaba Formation lies over the Nubian Sandstone.

Climate

The study region has a very dynamic climate regime; but recently episodes of drought became more visible. The region is characterized by short mild dry windy winters and long hot rainy summers with adequate sunshine and great variations between day and night temperatures. The winter season begins in December and ends by February. The summer season practically dominates the rest of the year. The yearly normal minimum temperature is 20°C and the annual maximum temperature is 36°C. The humidity increases from north to south and reach 57%.

The rainfall varies between almost 799 mm to 1700 mm in the high rainfall woodland savannah in the southern parts; with average value of 950 mm/annum. The rainfall generally begins in June and ends in October with peaks reached in July or August. However, in recent years a significant delay of rainfall is recorded as well as general retrogression in the amount of precipitation. Although no reliable temporal rainfall information is available, nevertheless from anecdotal data it seems that the rainfall is generally decreasing over the years and the isohyets are moving southwards.

Previous studies

The importance of natural resources exploitation within Radom Biosphere Reserve has increased since 1974 following the survey mission to the area held by Mr. Field (WWF expert), and followed a second expedition organized by a panel of scientists from Wildlife Research Centre during 1976 who set a number of recommendations prior to the declaration of the national park. Later on in 2002 a survey was made by UNESCO-Paris and in 2015 the Sudanese government

held a valuation development study of Radom rural area by the State Ministry of Agriculture and Livestock and set a number of sustainable projects to support the livelihoods of the communities. In general, the government authorities exerted minor efforts to conserve and manage these resources, the main excuse the region is a conflict zone.

Justification of research

There is obviously a drastic decline in wildlife population in Radom National Park in south-Darfur, which might be attributed to many factors including poaching, climate change, loss of habitats, human settlement and activities inside the park such as farming and grazing, subsistence hunting and other unknown factors. However, it is important to study the possible factors that led to the decline of wildlife to save the remaining species.

Objectives

The general objective of this research is to study the extent of impact of war on wildlife animals in Radom National Parks. The specific objectives are:

- To provide more information about the area and its economic value of wildlife.
- To compare the population of wildlife animals by species from the year 1974 to 2015.
- To examine the different reasons including anthropogenic activity for wildlife reduction in the park.
- To draw the attention to the Radom National Park as one of the largest protected areas in Sudan and the only in the rich savannah of Sudan.

Methodology

Interview

An interview was held with a wildlife guard working in Radom National Park who provided information about the situation in the park and helped in setting the questionnaire.

Questionnaire

A questionnaire was developed with a view to obtain a general idea on the census of 25 wildlife species in the park and to compare between their statuses in the park in from 1974 up to 2016 and to elucidate the reasons behind wildlife depletion. The questionnaire targeted a wildlife expert (who recently visited the park as a wildlife research student and now working as a lecturer in Bahri University), a researcher from Wildlife Research Center, a researcher from Wildlife Administrative Unit in Khartoum and the Wildlife Administrator of Radom National Park in Nyala (Supplementary file).

The wildlife targeted species in the RNP were selected according to previous study that was tracking 25 species from 1975 up to 2003 in three periods viz-a-viz., the 1974 survey, in 1976 and in 2003 [2,3]. For the period 2014-2016 information for the same species was collected via a questionnaire by a researcher and experts who recently visited the park.

Results and Discussion

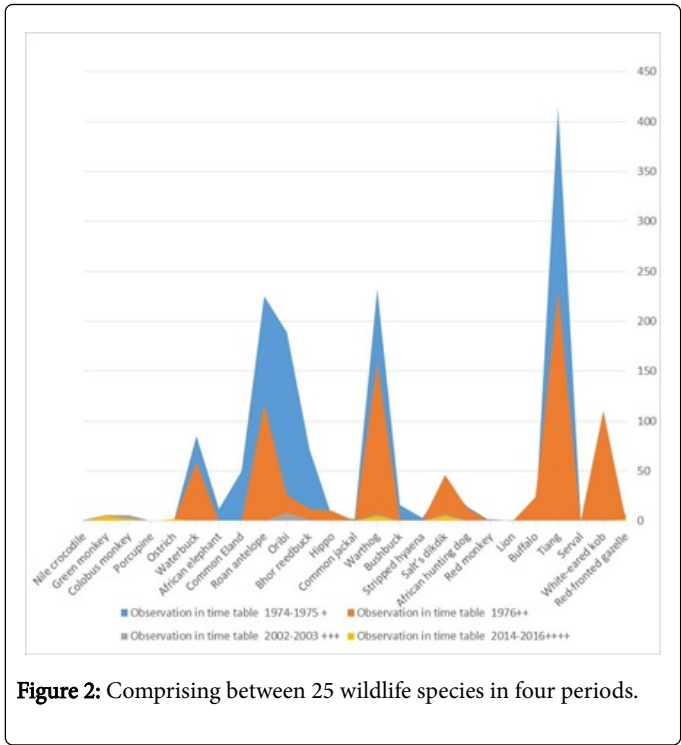
The result shows a massive loss of species from 1976 to 2016 about 87% of species lost in 40 years [4-6].

Meanwhile, there are some species which were not observed in 1974 and 1976 but were observed in 2003 and declined in 2014 and 2016 such as colobus monkey, green monkey, Nile crocodile and ostrich (Table 2) (Figure 2).

Wild animal species	Observation in time table			
English name	1974-1975+	1976++	2002-2003 +++	2014-2016++++
Red-fronted gazelle	5	0	0	2
White-eared kob	50	110	0	0
Serval	1	0	0	0
Tiang	414	230	0	0
Buffalo	2	24	0	0
Lion	1	0	0	*
Red monkey	*	*	2	0
African hunting dog	14	12	**	0
Salt's dikdik	36	46	7	5
Stripped hyaena	3	0	**	0
Bushbuck	16	2	0	0
Warthog	232	159	7	5
Common jackal	2	**	0	0
Hippo	4	10	0	0
Bhor reedbuck	72	12	1	0
Oribi	189	26	8	0
Roan antelope	225	117	0	0
Common Eland	50	0	0	0
African elephant	12	0	0	0
Waterbuck	85	59	0	0
Ostrich	0	0	**	2
Porcupine	0	0	**	0
Colobus monkey	0	0	6	2
Green monkey	0	0	6	5
Nile crocodile	0	0	1	0

+ Mr. Field report. (*)Troops or Herds. ++ Nimir et al and WRC scientist panel. (**)Only trace. +++ (Hassan, Mohamed, Ghaboosh) Sustainable Utilization of Natural Resource. (0)No observations. ++++ Current research study.

Table 2: Observation of wildlife species census in time table.



Factors causing decline in number of wildlife according to respondents:

A number of factors were suggested to have an effect on the presence of wildlife species in the park as listed in the table (Table 3).

Sample Size	Poaching	Drought	Loss of habotats	Gun sound	Human settlement	All above
11	29%	0	16%	19%	29%	7%

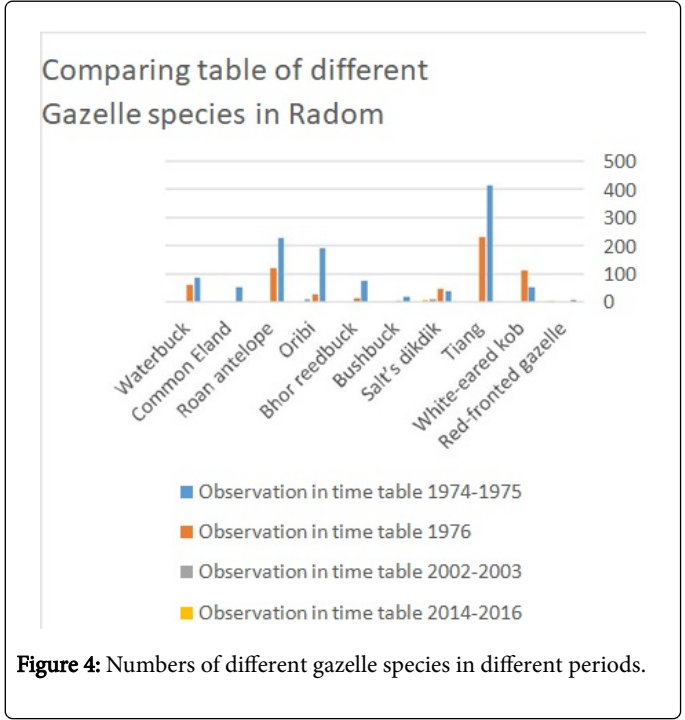
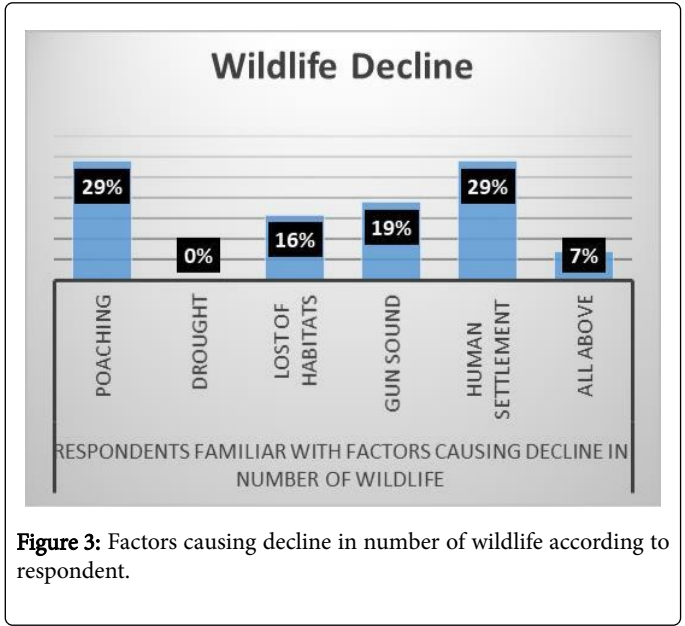
Table 3: Factors causing decline in number of wildlife according to respondent.

The most significant factors are poaching, human settlement in the park and gun sound. There is neither a study on the impact of gun sound on wildlife species nor on the specific impact on every species but most of the species are disrupted by sound. Loss of habitats is connected with human settlement which comes as major factor. The result shows no effect of climate change in the area because as it is considered as rich savanna and the average of rain fall almost constant (Figure 3).

Poaching

It was reported that there had been heavy poaching on wildlife resource since the beginning of war from 1983 till the early 1990s. Accordingly, the density of wildlife was reduced tremendously. In 2003 war started again in Darfur spread of weapon effect in human and wildlife animals in the area. According to Dani (1985), traditional hunting is the major mains of securing animal protein besides obtaining trophies for the local community. In the area where cattle are raised, the milk supply sharply declines, and the available dura does not support the people for the whole dry season. Fish available in streams or bonds may not be enough supplements. Hunting is an

alternative source of food even in areas where livestock is raised [7] (Figure 4).



In almost all African traditions and norms the cattle are not raised for meat at all, and therefore, communities raising cattle do not regularly eat livestock meat except on certain ceremonial occasions. Through it may be considered as a sort of sporting, at the end, hunting is a means of obtaining bush meat to supplement the food storage. In the areas where cattle raising are limited by the presence of tsetse fly or other unfavorable reasons, the bush meat serves as a source of protein for the local community. Apart from their importance as a source of bush meat, wildlife products (skin, ivory, horns etc.) are also a major source of trophies. These ornaments are used for the commercial or traditional purpose [8-11]. Many local handcrafts have sprung up in

big cities and in the local community, where the product like handbag and bag are made from the crocodile, python or serval cat skin (kuotwel, 1998).

Wildlife hunted for mainly three things one for its meat, most of gazelle and birds such as white-eared cop and red-fronted gazelle are hunted for its meat and bush meat [12].

The second reason for hunting wildlife animal is there skin or horn, some species hunted for its skin such as serval, colobus monkey and cheetah. Other species hunted to protect their farms and animals from wild animals such as African hunting dog, hyena and red monkey (Figures 5 and 6).

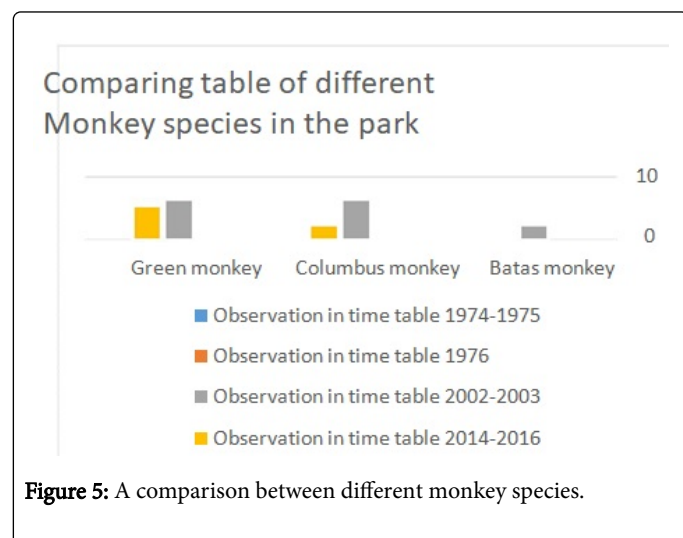


Figure 5: A comparison between different monkey species.



Figure 6: A red fronted gazelle shutdown by poacher.

People practicing the hunting

All people in the park have a big influence in poaching of wildlife animals inside the park, local community and poacher has the uppermost effect in poaching of wildlife animals because of spread of gun among communities, some of the army unit poaching wildlife animals for different reason, meanwhile armed movement has no effect on wildlife mainly because they are not based in the park.

It is quite evident that the proliferation of automatic weapons was the prime tool accounting for mass destruction of game species, which are considerably employed by poachers to shoot down animals for their meat, leather, ivory tusks and other wildlife by-products of high revenue. As a result, several mammalian game species especially the largest ones such as the African elephant, rhinoceros, lions, tigers, buffalos and many antelopes were targeted, massively cleared and being put to the average of depletion (Table 4) (Figure 7) [13,14].

Poacher	Army	Armed movements	Local community	All above
25%	8%	0%	25%	42%

Table 4: People practicing the hunting.

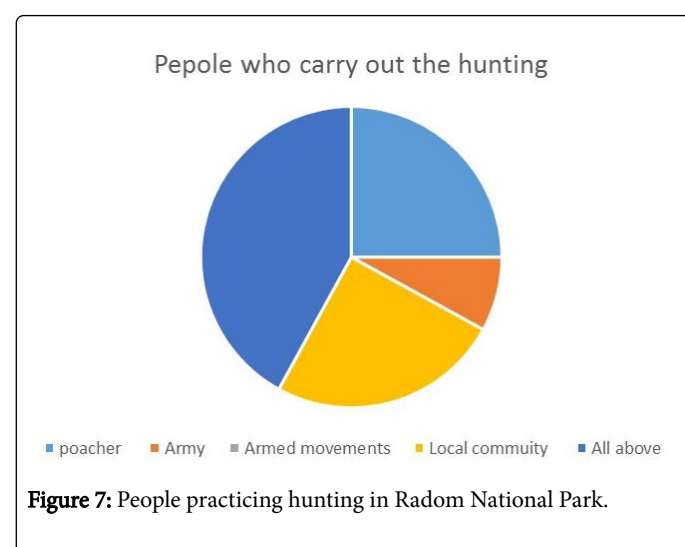


Figure 7: People practicing hunting in Radom National Park.

Drought

Owing to the diverse climate and different types of habitats, a variety of ecosystems remained stable until the mid-eighties when several adverse forces worked jointly and rendered the situation into severe devastation. It is notable that the numbers of animals showed a dramatic decrease during this period, especially when considering factors such as famine, civil war, political unrest and displacement of people, rather than the other environmental damages caused by natural factors such as drought, desertification and deterioration of the soil quality.

Loss of habitats

Generally it could be said that higher population of wildlife animals especially big mammals migrated from the park for many reasons such as the sound of gun and the displacement of human from outside the park to inside it and inhabited around water resource, for example, there are a huge human densities inhabited the banks of Umbelasha River at the northern part of the park, and to lesser extent the areas surrounding Adda River to the east, these factor lead to displacement animals especially big game mammals such as African elephant, big cats, salt's dikdik, roan antelope, buffalo and white eared cop.

Human settlements inside the park

Communities of residents regularly inhabit Radom area incorporates people from several ethnic backgrounds, predominantly occupying areas more or less situated within the vicinity of the main seasonal rivers, and include among others tribes such as Kara, Kerish, Ndogo, bunda, Dinka, Dajo, Berti and Tunjur who inhabit areas around Adda river, whereas other tribal groups in addition to Kara and Kerish such as Binga, Youlu, Faur, Massaleet and Tama inhabit the banks of Umbelasha river and represent the bulk of inhabitants compared to Adda sector to the east and south eastern parts of the Park.

Settlers' who can at the present time be categorized into main two groups:

Residents who inhabited the area before it was recognized as a national park, with approximate population number of about 5170 distributed among 13 villages around river Umblasha with Diem Bushara being the furthest station from Radom village (Figure 2).

The second group represents displaced people who immigrated to the area following its declaration, as a result of natural and socioeconomic changes, which consequently led to intensive human settlement at the north and northwest sides of the Park with a population number of about 10509 during 1990, a number which is known to considerably has risen by now, likewise proportional increase in the number of villages has been realized afterwards to approach 26, initiated by the influx of displaced people and refugees from Darfur, Bahr AlGazal and Chad respectively due to civil war and the attraction of the excellent crop yield reputation of the area [1].

Special concern should be afforded to a third minor-sized group, yet is of great importance. This group cruises the area from southern Darfur to Bahr Al Gazal state twice a year, and who is regarded as the potential threat that frequently causes disturbances within the area. Fortunately, it represents only a small number of nomadic people who entirely depend on the Park's resources in addition to the byproducts of their livestock which are frequently pulled back by tsetse fly infestation.

Generally, it could be said that higher population densities inhabit the banks of Umbelasha River at the northern part of the park, and to the lesser extent the areas surrounding Adda River to the east. Based on the distribution of the people, quite good amount of natural resources are under intensive pressure in the former areas compared to the latter, where greater number of citizens live, and partially due to the ease of movement, a fact that encourages adventurers to invade the area and consequently become an element of uncontrolled exploitation of natural resources found within and around the park.

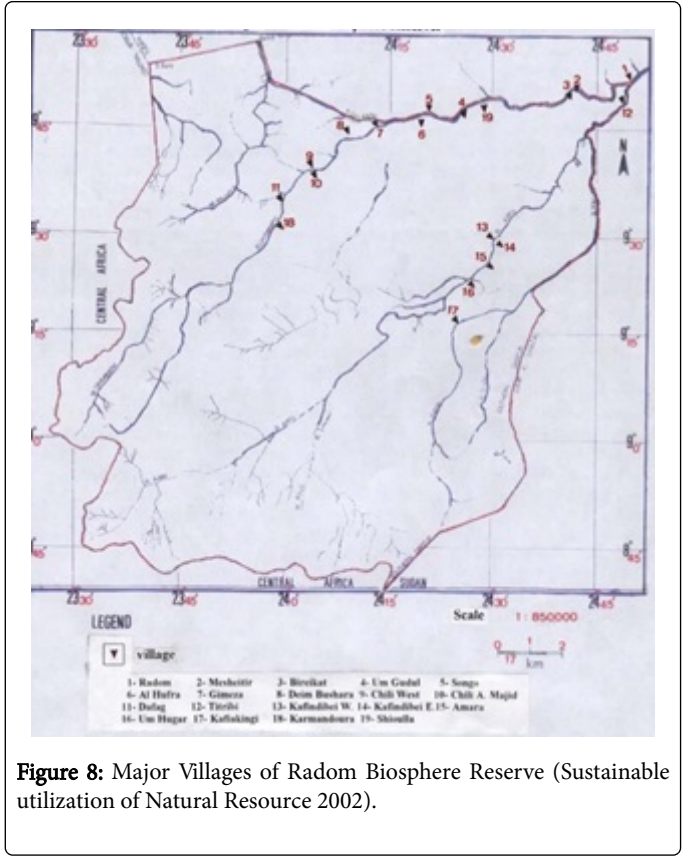
The continuous presence of people within the park boundary yet is considered to be a driving force leading to the depletion of the park unless best conservation and rational management policies being applied [15] (Figure 8).

Human activities

Education levels of settlers: Educational level was so important to implement any socio-economic aspects in the country.

Table 5 shows that the local community educational levels comprise 24% illiterates, 24% primary school, 30% intermediate and 21% are high secondary school education level. The results showed no graduates or postgraduates amongst them, a fact that suggests certain

techniques to be supplied in order to boost their understanding and awareness of their role in environmental degradation, for which 76% of the total settlers are held responsible in the long run.



Educational levels	Percentage (%)
Illiterate	24
Primary school	24
Intermediate	31
Higher secondary school	21
Total	100

Table 5: Educational levels of the local communities. Source (Sustainable Utilization of natural Resource 2002).

Wood cutting

Table 6 shows that 73% of the studied cases draw their basic needs of the firewood from the park, while 24% and 3% subsist for their living on the forest outside the park and the market respectively. The bulk of firewood is used for cooking, lightening and ritual purposes (55%), while 21% of it is for cooking and lightening purposes only as shown in table 3.

Firewood is the main energy source used by the inhabitants for cooking, lightening and ritual purposes (55%). Previously these were collected from cultivated lands around the villages or from the forest outside the Park [10,11]. In the past, this did not affect the vegetation cover of the park, but now most of them (73%) are collected from the

park itself. The most preferred trees exploited for the production of firewood include *Acacia Seyal*, *Pseudo cereal kotschyii* *Combretum sp.* and *Anogeissus sp.* The extensive cutting practice of the above-mentioned species would eventually affect their regeneration compared to the other tree species found within the park. Felling of trees is not practiced for firewood production alone, rather is also carried out to increase the cultivated area. From the other hand, and to a lesser degree is applied during honey harvesting from large trees. However, expansion in agricultural land is usually considered as a solution for productivity declines when the land under cultivation is exhausted coupled with the increase in population [16] (Table 7).

The source of firewood	Percentage (%)
From the park	73
From the market	3
From forest out the park	24
Total	100

Table 5: The source of firewood. Source (Sustainable Utilization of natural Resource 2002).

The uses of firewood	Percentage (%)
Cooking, lightening and ritual purposes	55
Cooking and lightening	21
Total	76

Table 7: The basic uses of firewood. Source (Sustainable Utilization of natural Resource 2002).

Agricultural activities

Figure 3 reveals that the main crops cultivated by the local farmers around the villages include sesame, corn and Viciasp (24%), sesame (15%), and fruits (9%), corn (6%) and hot pepper (3%). Substantial growth was recorded with regard to the total number of villages which recently amount to 28 village, rather than the other smaller settlement pockets that are under way to grow to big villages due to the proportional increase in the population size through movement of small numbers of family members to the buffer areas (lands allowed for subsistent cultivation by the Sudanese laws), which extends for five kilometers within the park's border, so the inhabitants could keep their crops safe from the wild animals especially primates, but unfortunately never return back to their former villages (mother village) upon termination of the cropping season and rather tend to permanently occupy the new territories for many years to come. This devastating behavior results in the confiscation of more lands to their advantage and, eventually, gives rise to new crowded villages to emerge. On the contrary, more complications and loss of public lands takes place [17].

New threats

Radom National Park face a lot of problems and difficulties threat the biodiversity on the area due to conflict in the area, during preparing this research indiscriminate mining wasn't one of them but as I am finalizing this project this new threat is coming up in the last three month (July-September) three mines were drilled and there are

about 30,000 gold prospectors working there. Recently there are four mines inside the park in three areas:

- **DahelAgbash mine:** located in the south-east of Singo, with gold prospectors around 20,000 since, September 2015.
- **Khor Graba & Almangm Al Sharge mines:** located on the east side of the park with gold prospectors around 10,000 since, July 2016.
- **Zinad mine:** New mine was opened in September 2016, located in the south of Khor Shalal and north of Kafingi.

Vegetation

There is no obvious change in vegetation but there is illegal tree cutting for some species such as teek, mahogany, sandal El Radom and many other still are capable of regenerating new seedlings. Most of this cultivation done by Sudanese's army and large company for trading (furniture & cultural Sudanese perfume) [18].

Conclusion

- The study tracked 25 species of wildlife in four periods show that 87% of species are lost due to the instability of the area.
- Human settlement and human activities are the major threat for the existing of wildlife in the park, Number of human being are increasing inside the park, the growth of human population inside the park will lead to a growth of human activities inside the park. There are a lot of activities dispersion the wild animals such as agriculture, woodcutting, mining and grazing. All this activities effect on wildlife existing in the park.
- The widespread poaching in the protected areas and a more widespread use of the gun has increased the danger for the fauna in the park.
- The result shows that all human in the park has to cause in poaching of wildlife from the stockholder, army units and special poacher are hunted down the animals for a different reason.
- The park located in rich savanna woodland area due to that it's not caused by climate change, but there is illegal cutting for some wood species such as teek, mahogany, sandal El Radom and many other still are capable of regenerating new seedlings. Most of this cultivation done by Sudanese's army and large company for trading.

Recommendations

As long as civil unrest continues, not much protection and management of wildlife resource could be achieved. The following recommendations would, therefore, be possible only if both security and peace prevail in the area.

- The whole protection of wildlife species should be backed and strongly supported by active and positive actions of the police department, the court, the state and the federal government.
- Conduct survey for wildlife species in the park by wildlife administrative.
- Rehabilitation of the park to be suitable for wildlife again. As all settlement within protected area is illegal, the inhabitants must be gradually evacuated. The evacuation should be negotiated in terms of new jobs and allocation of new land somewhere far away. In addition, wells with manual pumps should be built outside the boundaries as a remedy for migration into the protected areas for the lack and/or search of water.

- With regards to the conflict between conservation goal and exploitation activities of the protected area by the local population, all collection activities within the vicinity should be banned and entry limits and permits envisaged by regulation should be granted only through an established access point.
- All mining activities in the park should immediately be stopped.

Acknowledgement

I would like to express my deepest thanks to the Wildlife Research Center, Khartoum in particular Mr Nasir Ghaboosh. The permission of the Wildlife Administrative Unit, Ministry of Interior, represented by Mr Noman Abdel Karim Kapoor and the Manager of Radom National Park, Mr. Gafar Ahmed. Special thanks are due to Prof. Ibrahim Hashim, Manager of Wildlife Conservation Association for his kind support and comments. My gratitude goes to the former executive Director of Sudanese Environmental Conservation Society Prof. Muatsim Nimir. I express my gratitude to Mr. Ayoub Eldin Elyas, Head of Department of Wildlife in Bahri University for his support.

References

1. Tirba A K (2001) Current Status of Radom National Park. A report to the Wildlife Conservation Administration. Khartoum, Sudan.
2. Hakim SA, Nimer MB, Hashim MI, Osman EA (1978) Radom Potential National Park, Annual report, Wildlife Research Center, Khartoum, Sudan.
3. Tarig TE, Ameer AM, Nasir YG (2003) Sustainable Utilization of Wildlife Resources in Radom Biosphere Reserve.
4. Nimir MB, Hashim IM, Hakim S (1976). Wild animals in southern west Darfur (Arabic report). Wild Animals Research Unit, Agriculture Research Cooperation. Khartoum, Sudan.
5. Radom Rural Development Project- Evaluation Report (2015) the Ministry of Agriculture and Water Resources-Darfur Regional Authority.
6. Stank V J (1976) The Pictorial Encyclopedia of the Animal Kingdom. Outlet.
7. Thirakul S (1984) Manual of dendrology. Forest inventory and market demand survey project, Ghazal and Central Regions, Sudan.
8. Wilson RT (1979) Wildlife status in southern Darfur, Sudan. Distribution and status at present and recent past.
9. WRC scientist panel (1976). Wildlife Research Center. Annual report. Khartoum. Sudan.
10. Direct interview Researcher direct interview (2016).
11. Human Rights Watch (2004) UN Sudan Information Gateway: An Overview of the Darfur Crisis in Sudan.
12. William JG (1986) Field Guide to the Birds of Eastern Africa, Collins Field Guides.
13. Mr. Field (1975) World Wildlife Fund expert, Sudan government. Consultant report for Radom national Park. Khartoum, Sudan.
14. Harrison MN, Jackso JK (1958) Ecological Classification of the Vegetation of the Sudan. Forest Bulletin No. 2, Agriculture Publications Committee, Khartoum.
15. Ahmed AH (2014) Siddig Biodiversity Journal: Biodiversity of Sudan: between the harsh conditions, political instability and civil wars. Biodiversity Journal 5: 545-555.
16. El Amin HM (1990) Trees and Shrubs of Sudan, Ithaca press. Guildford and Kings Lynn, England.
17. Dudley JP, Ginsberg JR, Plumptre, AJ Hart, Campos JA (2002) Effects of war and civil strife on wildlife and wildlife habitats. Conservation Biology 16: 319-329.
18. The United States Department of Agriculture (2009) "Wildlife Services" A Report president Barack Obama and Congress by Wendy Keefover-Ring War on Wildlife.