

بسم الله الرحمن الرحيم



Sudan University of Science and Technology
College of Animal Production Science and Technology
Department of Fisheries and Wildlife Science



Supplementary Research to Obtain Bachelor's Degree

**Evaluation of Lions Cages in Kuku Zoo According to standered
Specifications in Convention on International Trade in
Endangered Species (CITES)**

**تقييم أقفاص الأسود في حديقة حيوان كوكو حسب المواصفات القياسية
في الإتفاقية الدولية للإتجار بالأنواع المهددة بالإنقراض (سايتس)**

By:

Afraa Omer Ibrahim Alzaki

Khalid Arga Bagare Hassan

Supervisor:

U. Nadia Yousif Takona

October 2018

Dedication

To our mothers: Mahasin Abd-elkareem Ali

Mecca Omer Haroon

Our fathers

Our families

And all friends in patch 15 Fish Science and Wildlife

Specially (Mashtal Al-ahlam).

Acknowledgement

We are sincerely grateful to O. Nadia Yousif Takona for her supervision, continuous support, help and kindness.

Great thanks for all our colleagues teachers in our department of fisheries and wildlife in the college of science and technology of animal production, Sudan University of Science and Technology.

Deep thanks are extended to Dr. Samia Hamid

And special thanks to Mohammed Omer, Bakri Omer, Gasim Omer, Salah Omer ,Mohammed Alameen Graid and everyone who support us in this Research.

المستخلص

أجريت هذه الدراسة في حديقة حيوان كوكو بغرض التعرف علي سلوك الحيوان في الاسر في الفترة ما بين 26-31 يوليو . تمت مراقبة السلوك في فترة الـ12 ساعة النهارية بصورة متواصلة من 6 صباحا الي 6 مساء وتقييم أقفاص الأسود من ناحية التصميم حسب المواصفات القياسية للاقفاص في اتفاقية سايتس (الاتفاقية الدولية للاتجار بالانواع المهددة بالانقراض) والخروج بتوصيات لادارة الحديقة بانشاء اقفاص بالمواصفات القياسية حسب البنود المذكورة في الاتفاقية.

السلوكيات التي تمت مراقبتها :الراحة،النوم،الحركة،الشرب،التبول ، التبرز،اللعب في الاشبال والتزاوج في الكبار.

Abstract

This study was conducted at kuku zoo in purpose to identify the behavior of lions from 26-31 July 2018. Lions were observed during the daytime from 6 am to 6 pm and an evaluation cage of lions from the side of design according to stander specifications in CITES (Convention on International Trade in Endangered Species) and recommend to the management of KUKU ZOO to establish cages according to CITES stander specifications.

The behaviors that have been observed are resting, sleeping, movement, drinking, pissing, pooping, playing in cubs and mating in adults.

Table of contents

Title	Page number
Dedication	I
Acknowledgment	II
Arabic abstract	III
Abstract in English	IV
Table of content	V
Chapter one	
Introduction	1
Chapter Two	
<i>Literature review</i>	3
Chapter Three	
Methodology	13
Chapter Four	
Results	17
Chapter Five	
Discussion	18
Recommendations and Conclusion	19
Chapter Six	
References	22
Figures	23

Chapter One

(Introduction)



1. Introduction:

1-1 Wildlife in Sudan;

The importance of wild animals creates a great attention from scientist and biologist in the societies and organizations in all countries for its economic recreational and social values (Fadl Elmola 1991).

Sudan is a rich country in wild life it has a great diversity of habitats and species of wildlife animals (flora of fauna).

The variation of the climate in Sudan from desert region in the north semi desert and savanna in the south create a biodiversity in mammals, birds, amphibians, reptiles, and insects.

Because of high extinction in the species there is a need for protection of wild animals in national parks and zoos.

(Imad Fadl Elmola 1991).

1-2 Khartoum Zoo :

The park was established in 1902 in the heart of the Sudanese capital of Khartoum, during the colonial era. At the time, the park contained a few species of animals before its expansion. The park was originally established to preserve rare and endangered animals, birds and reptiles. About 11 thousand square meters.

It is noteworthy that the Sudan included about 13 thousand groups out of 14 groups of wild animals found in Africa.

Since the park was closed and sold, the state has not been interested in setting up an alternative garden, but has distributed the animals to small gardens.

The last director of the park (Mutasim Bashir) said that the park was established at the beginning of the colonial era. It included blacks, gazelles, etc., before it was greatly expanded. In the 1950s, it was reported as the best zoo in Africa. The diversity in the garden was also very good. From an educational point of view, scientist who interested could know the habits and characteristics of animals, birds and reptiles.

"We gave a giraffe to a park in Paris and a rhinoceros for a garden in California. In return, we brought the brown bear from Yugoslavia, which was a gift from President Joseph Tito when he visited Khartoum," he said. The decision was political.

(<https://www.alaraby.co.uk.society>)

1-3 Research objectives;

1. Evaluate lion cages at the KUKU ZOO and recommend management to create cages that conform to international standards of CITE gardens and preserve the safety of visitors.
2. Study the behavior of lion in captivity to learn how to deal with them properly to provide environment similar to the natural environment and address the causes which would change the behavior of a lion

Chapter Two

(Literature review)



© classmate.com

2. Literature review:

2.1 KUKU ZOO:

The Kuku Global Wildlife Park was established in 2008 on the campus of the Faculty of Veterinary Medicine and Animal Production, Sudan University of Science and Technology. The idea construction of the zoo was initiated by the Department of Fish Wildlife, and has been considered by the College of Science and Technology. The objectives for which this park was established are as follows:

1. Educational purposes and objectives. The students of the Department of Fish Science and Wildlife for apply of the practical and conduct the wildlife science .
2. This park also provides the resources and animals needed to conduct applied scientific research and graduate research for the students of the Department of Fish Science and Wildlife at the University of Sudan and other universities and higher institutes. The presence of such a park is an important resource for children to teach different types and behaviors of wild animals.
3. Recreational purposes as this park is considered the richest and most organized at present among all the wildlife parks that are now located in the national capital therefore it's an important place for recreation and entertainment for the citizens of the national capital, especially citizens of Khartoum eastern Nile .

The shape, area and contents of the garden:

The park is a round shape with a total area of about 10 acres and contains cages and pens that house various wild animals and some pets such as horses, sheep and camels.

The garden includes additional buildings including administrative offices and veterinary clinic with umbrellas, nests and catches of various sizes and spaces for the guests' rest, as well as a mosque and bathrooms. The garden offers catering services, cold and hot drinks, games like hammocks and different other games for children.

2.2 Scientific classification:-

Kingdom	Animalia
Phylum	Chordata
Class	Mammalia
Order	Carnivora
Suborder	Feliformia
Family	Felidae
Subfamily	Pantherinae
Genus	Panthera
Species	P.leo

([https:// en.m.wikipedia.org>wiki>lion](https://en.m.wikipedia.org/wiki/lion))

The lion (Panther leo) is species in the family felidae its muscular deep_chested cat with a short rounded head , a reduced neck and round ears and a hairy tuft at the end of its tail .

The lion is sexually dimorphic males are large than female with typical Wight rang of 150 kg (330 to 550 pound) for the former and 120 kg (256 to 400 pound) for the letter male lion have a prominent mane which is the most recognizable feature of the species . A lion pride consists of a few adult male related female and cubs group of female lions typically hunt together preying mostly on large ungulates the species is an apex and keystone predator although they scavenge when opportunities occur some lion have been known to hunt humans although the species typically does not known.

([https:// en.m.wikipedia.org>wiki>lion](https://en.m.wikipedia.org/wiki/lion))

2.3 Lions in captivity:

All members of the cats' family except domestic cats require a license under this legislation:

Housing overview: lions are often social and may kept in compatible groups, they are large powerful land – living species, they don't need trees or high walk ways in their enclosure

However elevated resting platforms should be provided in their

Outdoor enclosures and den area

Keeping experience: in order to protect the welfare of these animals and to protect keeper safety, keeper must be able to demonstrate a good knowledge of husbandry and handling of the species they wish to keep.(cites 2004)

2.3.1 Housing Recommendations:

- **Construction:** although adult lions are not accomplished climbers, they are able to jump very well; young animals can climb very well. And outdoor enclosures should therefore either have very high sides with an overhang or a roof to prevent their escape, outdoor enclosure are normally built metal posts and wire mesh.

All enclosures should have a smaller holding facility for the cats to allow keeper to safely enter enclosures to clean, and permit the vet treatment of the animals if necessary.

As general rule areas should be allowed for two cats to allow the confinement of one animal will still being able to use the other dens in rotations to allow cleaning.

Any concrete or artificial flooring used should be non-slip.

(cites 2004)

- **Size :** all large felids are territorial and require their own space

Enclosures should therefore be as large as possible, it recommended that single animals should have at least 37 meter square (400 feet square) floor space and enclosures should be at least 3.5 m (12 ft) high.

The minimum space provided should be increased by 50% for each additional cat in the enclosure

- **Drainage:** drains should be designed to avoid injury to the animals. Any fecal material must be disposed off in an environmentally sound manner and must be capable of rapidly removing all excess water.

- **Clean Lines:** outdoor enclosures should be in a clean status.
- **Social dynamic and behavioral consideration:** lions may be kept in a group however is still very dangerous to introduce new animals and should only be done by experienced keepers if adequate separation facilities are available.

If more than one animal is kept, some provision should be made to separate them if necessary, this would normally be in the form of a divider in the holding quarter

If a breeding pair is kept, there must be away to separate the female from the male to give birth and rear her young, it's important that the male is able to hear and smell the female during any separation if he is to be reintroduced later.

Prevention of scope: the animal must be secured in a holding pen that can be operated from outside before keeper enters the enclosure, a double door must always be used to prevent the animals escaping past the keeper as the gate is opened. All doors and gates should be padlocked at all times.

The public must not be able to gain access to the perimeter of the enclosures, this may require the reaction of the secondary fence, and signs warning of the danger should be erected.(cites 2004)

- **Food, Drink and Bedding:** these cats require a meat diet, whole prey items should preferably be fed including the skin and bones. its common practice in zoos to starve large cats for one day a week, to prevent obesity and to mimic the natural gorging and fasting feeding methods used in the wild. Appropriate supplements should be provided.

Fresh drinking water provided at all the times.

Bedding material for the animals is not normally required; a wooden sleeping platform for each animal should be provided.

- **Visiting Interval:** the animals must be mentioned at appropriate intervals, normally at least once every 24 hours.
- **Provision for Capture and Transportation:** As has been stated previously, there should be some method of enclosing the animals into a holding pen, to allow the safe cleaning of the enclosure and the administration of veterinary treatment. The door mechanisms for these holding pens should be operable from outside the enclosure.

Veterinary treatment should be provided on-site.

A license, issued by the Department of the Environment, for the keeping of these animals may specify restrictions on the movement of these animals and procedures to be followed. Specially constructed transport crates will be required.

- **Emergency Planning :** There should be a written contingency plan in place to be used in the event of an emergency
- **Prevention and Control of spread of infectious Disease:** The keeper should provide details of their veterinary arrangements with a practice prepared to treat these animals. A schedule of veterinary care, including vaccination and routine parasite control is required, and the keeping of records of veterinary attention is essential.

There are no transmissible diseases carried by these animals that pose a risk to the general public as long as there is no direct contact, and visitors are not allowed to handle the animals or their by-products. Keepers should be aware of the risks of Toxoplasmosis, a potentially harmful parasite that may be transmitted

to humans through cat faeces. For this reason, good hygiene practices should be always observed when handling cats, or cleaning their enclosures (**CITES 2004**).

2.4 Lions in Nature:

- Identification; head broad and powerful muzzle of medium length ears short and round legs and thick and of medium length tail long pelage short but male with neck mane both sexes with short tuft on tip of tail concealing claw. Like horny spine 6-12mm long color varying from tawny grayish yellow to dark reddish brown underside in male somewhat and in female chin breast and belly notably paler almost white upper lips, tail tuft brown to black penis bone. Presence 4 teats measurements HB 145-200, TL 67-102, HT 75-112, WT 120-200 in male and heavier than female (Chris.mathilde 2011).

- Distribution; in early Pleistocene Africa near east India and Ceylon Europe and northern holarctic to mid and N.W south America in historical time still in all Africa (a part from the rain forest be) Sinai. Arabia , large, Asia and Ceylon.

-Habits; Daily rhythm lazy resting for about 20 of 24 hours where undisrupted.

May be active by day (morning and late afternoon) where hunted is entirely nocturnal rest in shade of trees in ticks in the shade of rocks etc. in addition to climbing swims well in need.

Toilet; for licking also mutually scratching with paws rubbing and rolling in loose soil .

Voice; roaring(for marking and claiming territory) very loud.

Enemies; unguarded young at risk from hyenas leopard and pythons hyenas and hunting dog packs sometimes attack adults.

Food; middle sized to large mammals principally gazelles antelopes, zebra (adult or young) sometimes attack adult buffalo, giraffe or hippopotamus. In emergency also feed on small mammals and birds.

Sociability; rarely alone pairs. Sometimes bachelor parties of 2-4 young males usually in family group of 1-3 old males and several (up to 15) females the young of various ages sometimes divided into several troops.

Reproduction; Not limited seasonal females on heat every 3 months for 4-8 days and is mated repeatedly for several days old male mate in sitting position like kaffir cats gestation 102-113 days den hidden among rocks in high grass thickets etc.. litter size 1-6 usually 2-3 days at birth weight 1-1.75 HB, 22 TL, 8 WT at 6 weeks 3.5-6.3 at 6 months , 18-20 at months ago coat of kitten see.

Identification; Eyes open at 6-9 days first teeth at 3 week active at 6 weeks first solid food at 8 weeks first canine teeth and black of tail tip at 15 weeks weaned at 6 months spots mostly lost at 10 months both sexes sexually mature at 18 months hunting capability established at 2 years fully grown at 13-15 in captivity 30 years recorded (Chris Mathilde 2011).

Lions life mating:

Like all mammals the lion life span begins with sexual reproduction , male lions or lionesses have irregular reproduction cycle with fertile period lasting three to four days, during that time the lioness mates with one of the male lions from the pride as often as over 20 minutes.

Researchers believe this high frequency stimulates ovulation and ensures the male lions parentage. Once pregnant, lions gestate for approximately 108 days and usually birth little of 2-4 cubs.

Although a litter can include between one cub and six cubs while lions in captivity may breed every year wild lions only mate every two years even less frequently.

(<http://sciencing.com>>nature).

Mating; both sexes are polygamous and breed throughout the year. But females are usually restricted to the one or two adult males of their pride and they usually breed one or more than once in two years.

Females are receptive to mating for three or four days within a widely variable reproductive cycle. During this time a pair generally mates every 20-30 minutes with up to 50 copulation per 24 hours.

(www.bioon.org)

Sleep; male lions spend 18-20 hours a day snoozing while female get 15-18 hours of the shuteye.

The lionesses spend more time in hunting and taking care of cubs which is why they get slightly less sleep.

(<http://www.sleep.org>articles.sleep.h>)

Pissing; lions are territory by roaring and by scent marking by urinating on trees, bushes or simply on the ground leaving a pungent scent behind defecation and rubbing.

(<https://www.britannic.com>science<sc>)

Eating habits: the way which hunting done by the lions in very different ways than for other cats . They hunt as a group instead of singular.

The female lioness of the prides will do the majority of the hunting typically a male will only hunt on his own; the males are often very good at waiting and watching for the kill to take place.

When they are worried about getting enough to eat, they will linger in the vicinity of the hunting party.

As soon as they take down a kill the dominant male of the pride can march in to eat there is a hierarchy among. the lion pride that determines the eating order they eat first the female that are involved with the hunt re the next to eat the cubs and females have to wait and the adult male can consume more than 34 kg (75 pound) of meat a single male and rest for a week before resuming the hunt.

If prey is abundant both sexes typically spend 21-22 hours a day resting, sleeping, or resting and hunt for only 2-3 hours a day.

<https://www.felineworld.com>

Chapter Three

(Methodology)



3. Methodology:

The study was conducted on five lions (2 males and 3 females) and 4 cubs (2 males and 2 females) at kuku zoo of the Sudan University Science and Technology Faculty of science and technology of animal production department of fish science and wild life – kuku.

The observation of were monitored during 12 hours per day for 9 days between 26-31 July 2018, behavior monitored during day light hours.

A period of observation behavior of cages extended for about 12 hours a day was reported continuously in three days starting 26/27/28 in July and then lions observation in two cages contain (male and two females), and in the second cage (male and female). And the cage of cubs was observed on 29/30/31 in July .In which there are two sexes (2 males and 2 females).

The form of cage is an iron fence with a zine roof and steel and concrete floors , cages of cubs: C1 (width 470cm, length 500cm,and height 300cm). cages for lions male and female: C2 (width 470cm, length 500cm, height 300cm) and the lair are between the 2 cages (width 170cm, height 180cm, length 300cm). cage of 2 lioness and lion: C3 (width 545cm,length 600cm, hight390cm).

The tables are found in all cages of (width 100cm, hight 150cm, length 300cm).

The behaviors that have been observed are:

-Resting, sleeping, movement, drinking, pissing, pooping, mating

And playing in cubs.

-Data analysis by using (Microsoft Office Excel Worksheet 2007).

Chapter Four

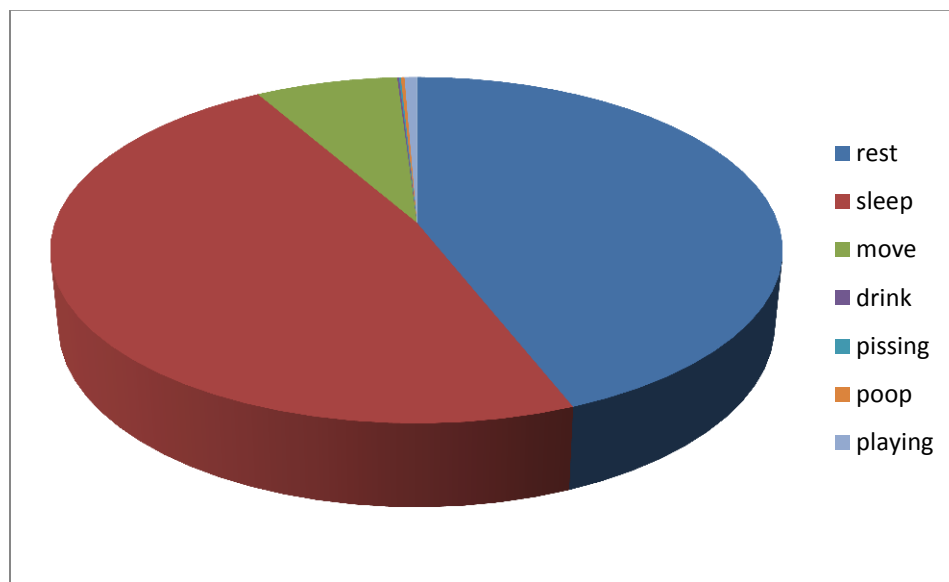
(Results)



4. Results:

Table 1: Observation of cubs in hours:

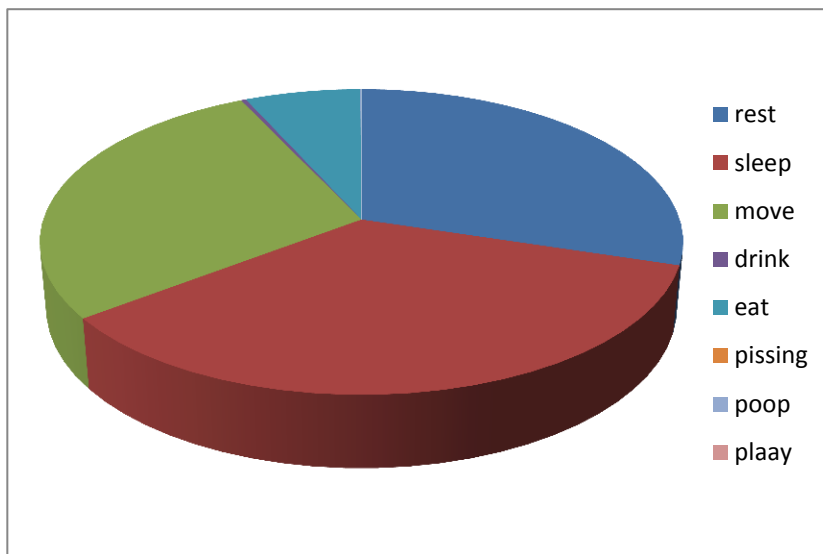
<i>Rest</i>	<i>sleep</i>	<i>move</i>	<i>Drinking</i>	<i>pissing</i>	<i>Poop</i>	<i>Play</i>
4.8	5.2	.8	.01	.01	.02	.07



(graph 1)

Table 2 observation of cub (female):

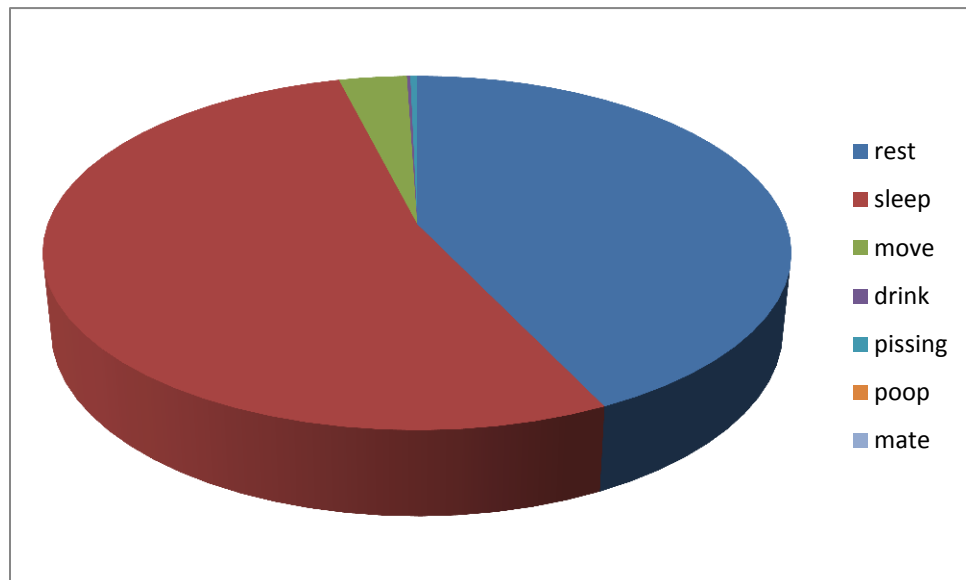
Res t	Sleep	Move	drink	Pissing	Poop	Play
4	4.7	3.8	.04	0	.01	0



(graph 2)

Table 3 observation of adult lions:

Rest	Sleep	Move	Drink	Pissing	Poop	Mate
5	6.2	0.4	.02	.04	0	.001



(graph 3)

Chapter Five

(Discussion)



5. Discussion:

This study was carried out with the aim of monitoring the behavior of the lions (male, female and cubs) agent in captivating in order to find the effect on them so that they can be properly treated

The evaluation of kuku zoo cages gize gardens for the purpose of providing comfortable environment and recommending the management of the kuku zoo create cage with international standards .this study was conducted in the period 26-31 July 2018 at kuku zoo lions in captivity feeds on meat twice a week in general , lions is considered lazy and inert but in the kuku zoo in the morning it is more lazy because as a result of the absence of visitors they often lurk any strange movement with a severe ban until he disappears from seeing .

The lion urinates on the fence of the cage when visitors gather around the cage to defend their.

Resting:

According to the result the lions are less active than the cubs, they are spending about 5 hour in resting during the daytime while cube spend about 4.8 hour.

Movement:

The lions are often sleeping in the den between the two cages after the middle of the day.

Most of their time is spent in resting. their movement (back and forth) inside cages about (.4 hour) per day while cubs (.8 hour) per day, although these animals may be active at any time of the day but the peak activity is after dusk where the period of mingling with each other itself decay and defecate as it activates intermittently during night.

Other group make a preliminary surveillance for prevalence of intestinal parasite in lions of kuku zoo, they observed (Echinococcuse) it indication that...

One of cubs (female) suffers from anomaly in motion as a result of the infection of the macrophages of rodent dog worm (Echinococcus graniollus)

that settle in the brain and pressure on the nerve centers, which makes them behave abnormal specifications, the first increase the movement back and forth inside the cage (graph 2).

Chapter Six

(Conclusion and
Recommendations)



6. Recommendations: -

By studying the behavior of a lion animal located in kuku zoo, we made some recommendations to provide better living and environmental conditions for these animals in captivity, which are as follows:

1 - Cages must be large and wide so that a lion can move freely and practice its natural behaviors .

2 - Should take care of cleaning the cage and the collection of waste and food residues and cleaned by continuing to avoid the infection of some diseases

3 - Put a quantity of sand on the floor of the cage and then sprayed with water to reduce the temperature and therefore not to withstand the animal to high temperature

4 - Veterinarian clinic must be providing.

5- Training keeper and rehabilitation and the development of breeding lion scientific system.

6- Don't provoke a lion, especially by children

7 –External fence must be farther from internal cage.

8-Fresh meat must be provided to feed a lion instead to frozen meat

9-do not throws waste inside the cage, such as bottles.

10 -Clean the cage and spray it with deadly pesticides and repellents for flies and mosquitoes.

11- The cage must be built of strong iron and the openings in which are small to protect against scratching visitor.

12- Drinking basins must be in clean status.

13 - Must replenish drinking water constantly and not leave water for a day or two.

14- Input and output must be provided in drinking basins .

15 – Vent size of fence must be smaller.

16- There must be a tree inside the cage so that a lion can climb on it during the behavior of the play, or rest to imitation making as the natural environment.

17- Provide anesthetic guns to the health unit in the garden.

18- Studies to find out about the behavior of lion in captivity because it facilitates the process of administration.

19- Provide guidance unit of the park so help to achieve the reported recommendations.

7. Conclusion

Lions are animals that are found in some parts of the Sudan and live in the states of south Sudan, Blue Nile, south kordofan states, south Darfur and in the nature reserves of dender and radom .lions depend on their diet on predation of large and medium-sized herbivorous animals were identified daily behaviors .

These activities were observed for a period of six days from 26-31 July. 2018, 12 hours a day. The lions are characterized by some of the daily behaviors identified in the beds, including sleep, behavior, predation, eating, drinking, stand out, mating, and other activities.

REFERENCES:

-(Imad Fadl Elomda 1991, seminar of national parks of Sudan).

-(Department for Environment ,Food and Rural Affairs “Guidance on the Keeping the Lions and Tigers” 2004 , website: www.ni-environment.gov.uk).

-([http://en.m.wikipedia.org>wiki>lion](http://en.m.wikipedia.org/wiki/lion))

-(www.bioon.org)

-Chris Mathilde (2011) Guide of mammals of East Africans Penguin Random House South Africa, 1 BN. 10:978177

-([http://britannic.com>science>sc](http://britannic.com/science/sc))

-([http://sciencing.com>nature](http://sciencing.com/nature))

Figures:



(Sleeping behavior in cubs)



(Sleeping behavior in adult lions)



(Sleeping in lion)



(Sleeping in lioness)



(Resting behavior in adults)



(In resting)



(Resting in cubs)



(Toilet behavior in adult lions)



(Cages from the eastern side)



(Cages from the southern side)