



# **Inventory and evaluation of Nairobi Animal Orphanage**

Focusing on routines and feeding,  
Black-Backed Jackal, Lion and Patas Monkey

*Inventering och utvärdering av Nairobi Animal Orphanage  
Fokus på rutiner och utfodring, schabrak schakal, lejon och husarapa*

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**Bachelor Theses, 15 HEC, Ethology and Animal Welfare Programme**

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## Summary

This BSc thesis is an introductory step to the collaboration between the Swedish zoo Skansen and Kenya Wildlife Service (KWS). It constitutes of an inventory of the Nairobi Animal Orphanage (AO), a facility that cares for injured and abandoned wildlife species in Kenya. Through the cooperation with Skansen, the KWS will improve their management of the AO. The aim of the inventory and BSc is to evaluate the management of black-backed jackal (*Canis mesomelas*), lion (*Panthera leo*) and patas monkey (*Erythrocebus patas*) regarding their biological needs. The general enclosures, routines and feeding at the AO are also evaluated since they have a great influence on the management of captive animals. The inventory was carried out at the AO in 2009. Enclosures were documented, staff was interviewed and routines were observed. The inventory resulted in several aspects in need of improvements to ensure the welfare of species in captivity. The general planning of the park and state of enclosures need to be considered in relation to the relevant ecology of species. Diets need to be adjusted to suit species specific needs and the presentations of food should allow for natural feeding behaviours. General and daily routines need to be organised and evaluated further. Several improvements can be done without major reconstructions until major changes can be carried through. Suggestions for improvements and the need for further evaluations are discussed. Lack of knowledge and resources restricts the possibilities to provide major changes. Future collaboration with sponsors and Skansen will hopefully guide the KWS to better management and needed welfare.

## Sammanfattning

Det här examensarbetet är det inledande steget i samarbetet mellan den svenska djurparken Skansen och Kenya Wildlife Service (KWS). Det är baserat på en inventering av Nairobi Animal Orphanage (AO), en anläggning för vilda djur i Kenya som skadats eller övergivits. Genom samarbetet med Skansen ska KWS förbättra sin djurhållning på AO. Syftet med inventeringen och examensarbetet är att utvärdera djurhållningen av schabrak schakal (*Canis mesomelas*), lejon (*Panthera leo*) och husarapa (*Erythrocebus patas*) utifrån arternas biologiska behov. De generella hägnen, rutinerna och utfordringen på AO utvärderas också eftersom de har stort inflytande på hållningen av vilda djur i fångenskap. Inventeringen utfördes på AO under 2009. Hägn dokumenterades, personalen intervjuades och rutiner observerades. Inventeringen resulterade i flera aspekter i behov av förbättringar för att försäkra välfärden hos arter i fångenskap. Den generella planeringen av parken och hägnens skick måste övervägas i relation till den relevanta ekologin hos arterna. Dieter behöver justeras för att passa arterns specifika behov och presentationen av foder borde tillåta naturliga födorelaterade beteenden. Generella och dagliga rutiner behöver organiseras och utvärderas ytterligare. Ett flertal förbättringar kan göras utan omfattande ombyggnationer till dess att större förändringar kan genomföras. Förslag på förbättringar och behovet av fortsatt utvärdering diskuteras. Brist på kunskap och resurser begränsar möjligheterna att genomföra större förändringar. Framtida samarbete med sponsorer och Skansen kommer förhoppningsvis att vägleda KWS till bättre djurhållning och den välfärd som behövs.

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# 1. Introduction

## 1.1. Background

### 1.1.1. Kenya Wildlife Service, Skansen and Nairobi Animal Orphanage

This project is issued by the Swedish zoo Skansen which has initiated a collaboration with Kenya Wildlife Service (KWS).

The KWS is a state cooperation which is similar in its operating range, to the Swedish Environmental Protection Agency. It is an organization within nature and wildlife management and one of their goals is to offer information and education in order to enhance the understanding of Kenyan wildlife. Their interest is to continuously develop and improve their work in these areas. Knowledge regarding the handling and husbandry of wild animals is limited which is why the KWS contacted Skansen with the aim to exchange experiences and resources.

The foundation of Skansen was established 1891 and is an open air museum and zoo located in Stockholm. One of their aims is to contribute to the protection and conservation of biodiversity with emphasis on the Scandinavian flora and fauna. Skansen promotes public education as a basic element of their goals.

The Animal Orphanage (AO) is a facility located outside Nairobi at the KWS headquarters. The AO was established in 1964 and was originally a refuge for wild animals that were found orphaned, abandoned or injured through out Kenya, both in protected and non protected areas. The exhibit grew in an unplanned way as well as the number of animals that are displayed in the facility. Animals are kept for treatment, rehabilitation and in rare occasions reintroduced to nature. Most of the animals remain the rest of their lives at the Orphanage for educational purposes. The current objectives of the Orphanage according to the KWS are:

- To give care and sanctuary to animals that have been abandoned or lost their mothers either through poaching, predation or natural causes.
- To promote public interest towards wild animals by exhibiting the variety of species domestic in Kenya.
- For education and research purposes.
- To rehabilitate and when possible reintroduce animals into the national parks.

The present BSc thesis is the introductory step to establish the cooperation between Skansen and KWS, and constitutes of an inventory of the AO. The inventory was conducted by me and two other students at the KWS. In each thesis parts of the inventory will be specified and suggestions for improvements will be presented in the discussion. Three themes are also elucidated, one in each thesis. The two other thesis concern:

- Spotted hyena, Serval, Sykes Monkey, Vervet Monkey and the education at Animal Orphanage, (Hedman, 2009).
- Cheetah, Congo Grey Parrots, Yellow Baboon and Olive Baboon and the rehabilitation at Animal Orphanage, (Sommer, 2009).

This theses deals with the inventory of black-backed jackal (*Canis mesomelas*), lion (*Panthera leo*) and patas monkey (*Erythrocebus patas*). I will also review how the routines and feeding at the AO are managed.

## **1.2. Animal species**

### **1.2.1. Black-Backed Jackal (*Canis mesomelas*)**

#### *Distribution and habitat*

The black-backed jackal have two separate subpopulations; in East Africa and southern Africa (IUCN 2008 Red List). Habitats vary but are in general of two types, with either open woodland or a denser tree and shrub savanna (Kaunda & Skinner, 2003). Mean range size and home range overlapping varies over the year and is larger during the mating season (Loveridge & Macdonald, 2001). The black-backed jackal is also called silver-backed jackal.

#### *Behaviour and social organisation*

Black-backed jackals live in monogamous pairs and the society consists of a hierarchical family group with the mating pair and their offspring (Walton & Joly, 2003). Jackals hold permanent territories (Estes, 1991) that the mating pair defends from other pairs and where aggression is strongest within the same sex (Walton & Joly, 2003). The group sizes vary seasonally between 1 and 8 individuals (Walton & Joly, 2003). Non-breeding helpers usually stay and take care of the pups, while some leave the family unit when they are 1 or 2 years old and take a vacant territory, join an unrelated group or remain close to the parental home range (Estes, 1991; Loveridge & Macdonald, 2001; Walton & Joly, 2003). The jackal social life is well developed (Walton & Joly, 2003). The pair works together with defence, foraging, hunting and care of the pups (Estes, 1991). Time and pattern of activity varies (Walton & Joly, 2003).

#### *Offspring and parental care*

Litter size is usually 3-6 (Walton & Joly, 2003). The cubs start eating regurgitated food and insects from adults at 3 weeks (Estes, 1991; Walton & Joly, 2003). Weaning begins when the cubs are 2 months old and is complete at 4 months (Estes, 1991; Walton & Joly, 2003). When 12-14 weeks old, the pups leave the dens and start to forage with adults (Walton & Joly, 2003). At 6 months they can hunt on their own and at 6-8 months the cubs are self-sufficient and might leave the territory (Estes, 1991). They reach sexual maturity and leave the family unit at 11 months, but 24% of the surviving pups stay as nonbreeding helpers for the first 1,5-2 years (Estes, 1991; Walton & Joly, 2003). The number of helpers affects the pup survival by protecting the cubs and relieves the workload of the parents (Estes, 1991; Loveridge & Macdonald, 2001).

#### *Diet and foraging*

The jackals are omnivorous, opportunistic predators that exploit a wide range of prey (Estes, 1991; Kaunda & Skinner, 2003; Walton & Joly, 2003). Jackals usually hunt in pairs, sometimes scavenge and also cache surplus meat and bury it for the next day (Estes, 1991; Walton & Joly, 2003). According to Kaunda & Skinner (2003) the diet of black-backed jackals mainly contains mammals (32%), fruit (13%), invertebrates (11%), vegetation (10%) and birds (8%). The relations between them vary, but animal prey accounts for at least half of the diet throughout the year. Insects, rodents, hares, young of antelopes, carrion of all kinds, lizards and snakes, eggs and various fruits and berries are the main diet in most areas (Estes, 1991; Walton & Joly, 2003). Jackals also hunt and kill larger mammals (Kaunda & Skinner, 2003; Walton & Joly, 2003). The fruits include seeds of *Grewia* species, large sourplum, buffalo thorn, marula, melons and squashes (Kaunda & Skinner, 2003).

### **1.2.2. Lion (*Panthera leo*)**

#### *Distribution and habitat*

Lions are found in scattered populations south of Sahara, but mostly range in eastern and southern Africa (IUCN 2008 Red List). According to Estes (1991) and Haas et al. (2005) lions occur in most habitats and their home range varies according to prey availability.

#### *Behaviour and social organisation*

Lions are social animals that live in one or several smaller groups and spend parts of the day together or on their own (Estes, 1991; Pusey & Packer, 1987). Structural variations within the pride occur (Heinsohn, 1995) and some individuals can transfer between groups without being part of them. According to Estes (1991) the average group composition is 1-2 adult males, 2-9 adult females, 3-4 subadults and 3 cubs. Young males leave the pride at a takeover or at 2-4 years of age (Hanby, 1987; Pusey & Packer, 1987) and become nomadic or form small groups. Females usually stay with the maternal pride and take part of the communal care of cubs (Haas et al., 2005). Males patrol the territory and defend the pride from other males, while females defend the territorial denning sites, hunting grounds and water holes from other females (Haas et al., 2005). Lions are not very active and spend 20 to 21 hours a day resting (Estes, 1991). They usually sleep or rest during the day and have most of their social activities in the afternoon and hunt in the evening and early morning (Estes, 1991; Haas et al., 2005). Activities include hunting, communal cub rearing, territorial maintenance and grooming (Heinsohn, 1995).

#### *Offspring and parental care*

Lions have no fixed breeding season but might synchronise or follow the patterns of seasonal weather and prey availability (Estes, 1991; Packer et al., 1990). Litter size averages 1 to 4 cubs (Estes, 1991; Packer & Pusey, 1987). The cubs are born and kept in dens or areas with dense bush (Estes, 1991; Haas et al., 2005). Litters born within the same year is raised commonly in the pride after 4-6 weeks of age (Packer & Pusey, 1983). Females can nurse relating cubs as well as her own (Haas et al., 2005). They start to eat solid food at 4-8 weeks and are weaned at 7-9 months (Estes, 1991; Haas et al., 2005). The cubs take part of the hunt from 11 months but can't hunt on their own until they are 16 months old (Estes, 1991).

#### *Diet and foraging*

Lions are opportunistic carnivores (Estes, 1991; Scheel & Packer, 1991) but the feeding and hunting behaviour as well as prey preference differs between prides (Rosevear, 1974). They usually hunt as groups of females, but the male has access to the kill and can sporadically attend the hunting group (Estes, 1991; Scheel & Packer, 1991). Selection of prey varies but most of the prey species is large averaging 150 kg (Haas et al., 2005). East African lions hunt species like wildebeest, zebra, kongoni, warthog, buffalo, eland, kudu, Thomson's gazelle, topi and rodents (Estes, 1991; Haas et al., 2005). Lions can eat up to 1/4 of their own weight (up to 50 kg), but the daily consumption is usually 5-7 kg (Estes, 1991). According to Packer et al. (1990) a female can eat 8.7-14 kg/day, males consume twice as much, subadults two thirds and cubs one third as much as adult females. A study by Clubb and Mason (2007) have shown that lions perform 1.2 hunting sessions per day but only kill once every three days, are active 9 % per 24 hours, travel 11.3 km per day with 2.3 km minimum.

### 1.2.3. Patas Monkey (*Erythrocebus patas*)

#### *Distribution and habitat*

The patas monkey range across central Africa with the Sahara desert in the north and rainforests in the south (Gron, 2006). Populations of patas in Kenya are found in treeless grasslands, dense woodland and savanna woodland. According to Gron (2006) their home ranges in Kenya range from 23.4 km<sup>2</sup> to 32 km<sup>2</sup>. The density of patas is usually very low (IUCN 2008 Red List).

#### *Behaviour and social organisation*

The patas monkey is a diurnal species (IUCN 2008 Red List). Two activity periods during the morning and afternoon (Nakagawa, 1989) contain feeding, grooming and social activities, with a resting period at midday. Patas monkeys have two types of group organisation during the year. The first type consists of a variable number of females with one male (Enstam et al., 2002; Harding & Olson, 1986). The other kind of group is much smaller and only consists of males with 2 to 15 individuals (Gron, 2006). Females rarely change group while males transit during the mating season (Harding & Olson, 1986; Carlson & Isbell, 2001). According to Goldman & Loy (1997) it is common with stable female ranks and unstable group hierarchy within groups of captive patas monkeys. Males usually leave their natal group at three years and remain solitary or in small male groups until they are five years (Gron, 2006). Multimale as well as single-male mating systems occur within wild patas populations (Carlson & Isbell, 2001). The competition between males can be intensive but low frequent all year round regardless of mating system, but males are more likely to get wounded during the conceptive season (Carlson & Isbell, 2001). The mating structure is a consequence of male density and food availability and single-male mating systems is thought to be most common (Carlson & Isbell, 2001). The male interacts infrequently with the females and is usually present at the periphery of the group (Nakagawa, 1992).

#### *Offspring and parental care*

All females participate in the care of offspring (Muroyama, 1994) but the adult males rarely interact with females with infants (Gron, 2006; Zucker & Kaplan, 1981). Infants start to eat solid food at seven weeks (Gron, 2006). After five months the contact between females and infant decrease, but they keep nursing (Chism, 1986). Juveniles are capable to take care of themselves when they are six to seven months old and can survive if abandoned (Gron, 2006). The juveniles are fully weaned at one year, when the female gives birth to a new infant (Chism, 1986).

#### *Diet and foraging*

The patas monkey is omnivorous and the diet varies (Nakagawa, 1989). Patas usually feed on the ground (Gron, 2006). Nakagawa (1989) showed that patas mostly eat a variety of plants, insects and small vertebrates, including a variety of fruits, flowers, leaves, stems, beans, seeds, fungi and gums. The preferred species of trees include *Acacia*, *Balanites* species, *Euclea* and *Carissa* species (IUCN 2008 Red List). Isbell (1998) found that the diet of patas on the Laikipia plateau in Kenya primarily feed on arthropods and gum, out of which *Acacia drepanolobium* count for 83 percent of the plant diet. The gum and young swollen thorns of *Acacia d.* was the most common food items consumed by the monkeys, but flowers, seeds, fruit and leaves also occurred. Isbell (1998) estimated 30-40% of the diet to consist of animals, out of which most were ants that live within the thorns of *Acacia d.*

### ***1.3. Stress related to routines and feeding regimes***

Animals respond to stress by behavioural and physiological adaptations, but chronic stress responses are thought to be harmful to the long-term health of captive animals. According to Morgan and Tromborg (2007) stressors in confinement differ from similar stimuli in the nature since animals in confinement have restricted choices and therefore lack the possibility to control its exposure to them. Their review suggests that an understanding of the factors affecting animals in captivity is essential to improve the wellbeing of zoo animals.

By reviewing several studies, Morgan and Tromborg (2007) have stated different sources of stress for animals in captivity and the effect they might have on their welfare. The abiotic environmental stressors include *sounds* from visitors, machinery, urban transportation systems and historical predators of prey species; *odors* from historical predators, conspecifics, routine cage cleaning that eliminate scent marks; *thermal* regulation and microclimate; *substrate* material, composition and colour. Confinement-specific stressors include *restricted movement* due to enclosure size that affects the activity; absence of *retreat space* from conspecifics and visitors, forced *proximity to humans* affected by the visitor unpredictability, the conflict between the welfare of animals and the visitor view, as well as the maintenance and handling of animals; *routine husbandry* such as cage cleaning; *restricted feeding and foraging opportunities* by providing predictable diet and feeding times, easily attained and consumed food; *abnormal social groups* by isolation, non species-typical compositions, overcrowding and remixing; *predictability* and *unpredictability*.

### ***1.4. Legislation***

Kenya has no specific legislation regarding wild animals in captivity. According to the Swedish law (DFS 2004:19) keeping of animals in zoological parks need to follow current legislation. Cover from wind, rain and sun is needed. Following measurements also apply:

- Enclosure size for Canids 10-30 kg such as jackals include a night enclosure of min 4 m<sup>2</sup>/individual and min 16 m<sup>2</sup> in total; an outside enclosure for exhibition 1000 m<sup>2</sup>; access to a den and possibility to dig.
- Enclosure size for Felines >100 kg such as lions include a night enclosure of min 6 m<sup>2</sup>/individual and min 24 m<sup>2</sup> in total; an outside enclosure for exhibition of 1000 m<sup>2</sup>.
- Enclosure size for ground dwelling primates 5-20 kg such as patas monkey includes an outside enclosure for exhibition of 200 m<sup>2</sup>.

### ***1.5. Purpose***

The aim of this thesis is to:

- Find out and present how the enclosures of black-backed jackal, lion and patas monkey look like and function at the Animal Orphanage.
- Evaluate how these species biological needs are fulfilled within the current management and propose improvements based on the inventory.
- Find out, present and evaluate how the routines and feeding is managed at the Animal Orphanage. Important aspects that needs to be addressed are: how is the Animal Orphanage and enclosures designed in general, how is the staff organised, what daily routines are used at the Animal Orphanage; how are the animals fed in relation to their natural diet and feeding behaviour, and how can their welfare be improved by altered enclosures, routines, feeding and enrichment.

## **2. Method**

### ***2.1. Inventory***

The inventory was conducted in Kenya during three weeks from the 16<sup>th</sup> of March to the 3<sup>rd</sup> of April in 2009. The original ideas for the student BSC thesis were to inventory and evaluate animal enclosures with the aim to suggest improvements. However, early in the process of the practical inventory it was obvious that the improvements were needed on a higher level as well. Animal enclosures were inventoried and information regarding the individual animals, their feed and routines was collected according to plan. After completed inventory, the enclosures and species in most need of development were selected for a more thorough review as well as the routines and feeding. Since this project is a cooperation with two other students (Hedman, 2009; Sommer, 2009), parts of the background and methodology have been worked through together.

### ***2.2. Map of the Animal Orphanage***

The surrounding park fence was measured in meters and drawn up by hand with estimated angles. Each enclosure was placed in relation to each other and the walkways within the park. Distances between enclosures and walkways were also measured and drawn onto the map. Later each measure was determined and compared before the map was drawn up according to scale to give an overview of the park. The map shows the location of each enclosure, their position in the park in relation to the sun, walkways and neighbouring enclosures. It also shows the difference between enclosure sizes, location of KWS facilities and available areas that can be used for extension.

### ***2.3. Enclosures and animals***

The enclosures were measured, photographed and documented in writing. A sketch was also drawn by hand of the enclosure.

All lengths, heights and widths of the enclosures were measured with a measure tape and recorded in centimetres. Doors, openings, roofing and interior such as small houses and platforms were measured when possible. If not, those measurements were estimated when needed. Distance between enclosure fence and security barrier as well as distance to neighbouring enclosures were measured. Photos were taken of the enclosure, beginning with the belonging information board and continued with an overview of the enclosure. Each side was photographed as well as the interior and the individual animals when possible. The sketch over the enclosure included the different measurements, shape of fencing and interior, location of trees, bushes, water facilities and interior. Angles of the enclosures were approximated and drawn out in the sketches. The enclosure's location in relation to the sun and other enclosures were also estimated. The sketches were then redrawn by hand according to scale.

Documentation of the enclosures and individuals included the following categories: *animals* (identification, number, age, sex, origin, time kept in Orphanage), *enclosure* (surrounding area, fencing, ground, vegetation, permanent and temporary interior, sleeping enclosure), *feed* (type, shape, supplements, frequency, feeding time, quantity, how it was given, origin), *enrichments*, *behaviour*, *improvements*. See inventorial checklist in Appendix 1. Information about the individuals was initially collected from the information boards by the enclosure. Information was also gathered from the working staff. Employees were questioned regarding the animals they had the most knowledge of when they were available. Often, more than one person had to be questioned regarding the same animal or topic. Some information

was also gathered from an animal record in excel format. None of the three sources of information were sufficient by themselves and therefore had to be compared and combined.

No ethological studies were carried out regarding the behaviour of animals. All the behaviours presented in the results are based on personal notes from occasional observations. Staff was also questioned if they had enough knowledge about the animals. Short video recordings were taken when behaviours or events of special interests occurred.

## ***2.4. Routines and feeding***

To find out, present and evaluate how the routines and feeding are managed at the Animal Orphanage, several methods were used. The information boards of each enclosure, daily journals and individual animal records was studied and compared to compile all relevant information regarding the general routines and feeding of animals. Relevant facilities were observed, photographed and documented. Staff and authority persons were interviewed about the organisation of staff, daily routines, and feeding of animals. Some of the routines were also observed while the staff was working in the park. Since the interviewees have asked to remain anonymous no names will be mentioned in this BSc thesis.

# **3. Results**

## ***3.1. Animal Orphanage and its routines***

### *Animal Orphanage and Enclosures*

The Animal Orphanage is located outside Nairobi at the KWS headquarters and extends ~6 acres. At the time of the inventory 28 species were kept at the AO in 40 enclosures. The park is surrounded by Nairobi National Park and KWS ground. The park fence is made of wire mesh and wooden poles with four electricity lines on top, which provide a full view of the AO from the outside. The enclosures have been constructed at different times and their condition varies throughout the park. Carnivores, primates and ungulates are kept in neighbouring enclosures that are spread all over the park. Two enclosures of the same species are sometimes located next to each other and most of the primates are kept within the same area.

### *Staff*

The AO has a number of staff with different responsibilities and employment. The Senior Warden is in charge of the AO and some of the staff. By the time of the inventory the staff at AO comprised 1 curator, 5 animal keepers, 5 pen attendants, 3 naturalists and 12-14 volunteers out of which 6-8 are employed by sponsors. The curator is responsible for looking after the exhibit collection and to find an appropriate balance between animal welfare and visitor satisfaction. The Senior Warden and Curator are supposed to consult each other. The animal keepers are responsible for the wellbeing of captive animals together with the curator. Naturalists are responsible for guiding, landscaping and cleaning. The staff needs a completed course in animal health to get employed. Most of the staff works 8 hours per day five days per week, but the animal keepers and pen attendants work all week. All staff except the employed volunteers rotates between the Orphanage and another animal facility at KWS, the Safari Walk. Some of the sponsors work at the AO as volunteers and usually take care of the animals they make donations for. Some of the sponsors have been working at the AO for several years, while others only come in sporadically to spend some time with the animals inside the enclosures.

### *Routines and Journal Keeping*

Until recently a card index system has been used for the general record keeping of animals, which restricts the amount of information. A computerised database is now being developed. The records keep information about each animal regarding its identification, origin, appreciated birth and arrival, origin, relocation or death. Some information is not properly recorded for several animals. Different daily journals are kept for the Animal Orphanage and the Nursery. The daily journals are recorded in handwriting and are generally hard to read. Comments are made by the Pen Attendant (P.A.), Animal Keeper (A.K.), Curator and Senior Warden (S.W.). There are no signatures by the comments except for these standing four.

The daily journal for the AO is divided in different categories: date, species, animal behaviour and health, cleaning, feeding, cage condition and treatments. All columns are not filled out every day, all species or individuals are not reported for each day while some are reported twice. The daily cleaning recorded in the journal contains change of water, rake of cage, removal of faeces, food remains and bones. In some enclosures it is impossible to clean because of aggressive animals that can't be locked into the SE, either because the SE is too small for the species or because the animal refuses to go into the SE. The hay inside the enclosures is supposed to be changed every two weeks, but this is not recorded in the journal. Some of the animals are locked inside their houses at night as a security measure. The journal does not say how much each animal is fed. Notes regarding the cage condition are done every day and mostly conclude that repair is needed. Special supplements and need of deworming is recorded under "treatments", otherwise only recorded as N/A or not necessary. Sometimes it says an animal was treated but not with what or why. The daily journal for the nursery is used to record feeding of the young animals and keep information regarding what and when they are fed, and sometimes how they behave. Some animals are also weighed and measured.

### **3.2. Feeding at the Animal Orphanage**

The curator decides the amount of food for each animal and one of the animal keepers is responsible for the delivery and storage of the feed. The main storage of feed is located at the veterinary facility. The daily amount of food is brought to the AO once a day.



*Picture 1-3. From left: feeding buckets with vegetables, meat storage and breeding facility with food rabbits.*

The same vegetables are ordered all year around, but the amounts differ during the year regarding to season. The types of vegetables and fruit contain avocado, bananas, green beans, cabbage, carrots, maize, papaya, oranges, pineapples, sukuma-wiki/kales and sweet potatoes. Vegetables are delivered twice every week and the amount of each type is weighted and noted in a journal. They are stored on shelves in a separate room. Preparation of food is done in the animal kitchen by 13.30 every day. It is divided in to buckets for each enclosure (Picture 1) and fed to the animals in the afternoon. Hay and lucern is ordered when needed and stored at



the Safari Walk. Pellets and supplements are stored in a separate cool room, but the cooling system was out of function during the inventory. Pellets for cows are used in two forms: dairy cubes and young stock. Melass is also provided to some animals.

Meat is delivered for two days at the time and mainly comprises beef. The meat is hanged inside an open storage room next to the quarantine (Picture 2). The Animal Orphanage also has a small breeding facility with rabbits that the staff kills and feed to some of the carnivores (Picture 3). All carnivores are fed a full diet of beef with a few exceptions of rabbit. Goat is rarely provided. Most of the carnivores are fed beef on bone and the amounts of bone differ between pieces. Ribs contain more bone in relation to meat than a hind leg does. The given weight of food is calculated based on the total weight of meat and bone.

Animals are supposed to get supplements daily, but are only given this on a regular basis when available. Supplements are provided as mineral stone and salt lick. Bone meal for cats and dogs are supplemented to the carnivores and spread onto the meat. The cats are fed a formula of catmilk when available.

The water supply is turned off during the night and many troughs are empty in the morning. The water is supposed to return around 10.00 in the morning, but is rarely supplied before noon. Some animals are therefore without access to water during parts of the night and day. The taps are usually open when the water is turned on and stay open until the staff has time to turn them off. Because of this the troughs get overflowed and lots of water is wasted and leaking onto the ground of the enclosure.

### ***3.3. Black-Backed Jackal at the Animal Orphanage***

#### *Individuals*

The AO have one enclosure with jackals. A breeding pair was kept together, but the male was released previous to the inventory. They had a litter of cubs together of unknown number, which was born in the AO. Some of the cubs were released and some of them escaped previous to the inventory. During the inventory there were approximately three individuals left. The adult female was still present inside the enclosure. The two grown cubs of unknown sex were passing in and out of the enclosure and were sometimes found outside the AO. They usually returned to the enclosure to feed and stayed in the area nearby the enclosure.



*Picture 4. The old enclosure of black-backed jackal before it was rebuilt.*

### *Enclosure*

The jackal enclosure was going through major changes during the time of the inventory. At first the jackals were kept in an enclosure of very bad condition (Picture 4). The fencing was made of double wire mesh and wooden poles with a low and sagging roof of wire mesh covering all of the enclosure. The ground is flat and mostly covered with soil. Lots of large trees within and outside the enclosure provide lots of shade, but also prevent most sunshine from reaching through. The only interior was a small water pond for drinking water and a large platform made of wood in the shape of a table. A house was located at the back made of wood, sheet metal and wire mesh. A wooden pallet bed and sharp objects was found inside the house (Picture 5). Since the jackals were digging holes underneath the fence, they have been passing in and out of the enclosure. Some of the holes were repaired with double wire meshing. This enclosure was taken down by the end of the inventory.



*Picture 5 and 6. From left: inside the house of the old jackal enclosure and the jackal in bad condition with injured chest.*

The new enclosure will be located in almost the same area, between the information centre and the new cheetah enclosure, with the park fence toward the backside. At present, the enclosure is planned to be 216 m<sup>2</sup> (12\*18 m). The visitor walkway will pass along one of the long sides, probably with a safety barrier separating the visitors from the enclosure. Fencing will be 2,5 m high wire mesh with 1,5 m over hang on top and 0,5 m grounding put in concrete. A house will be located at the back, containing two separate boxes with open front. Information about the planned ground, vegetation and interior was not available during the inventory.

### *Feed*

The jackals are fed 1,5 kg beef on bone, but no ribs, six days a week. The meat is put on the platform inside the enclosure.

### *Other comments*

The jackals and the ground of the enclosure is flea infested and their fur is in bad condition. They have been unsuccessfully treated with Frontline and the house and ground are sometimes soaked in water. One of the jackals injured its chest and leg (Picture 6) before the inventory but was not treated during the time of the inventory. By the end of the inventory the jackals were captured for treatment and kept in small cages at the nursery. Their condition, sex and future plans are unknown. Where they will be kept after the treatment is unknown. At present the enclosure is being rebuilt.



### 3.4. Lions at the Animal Orphanage

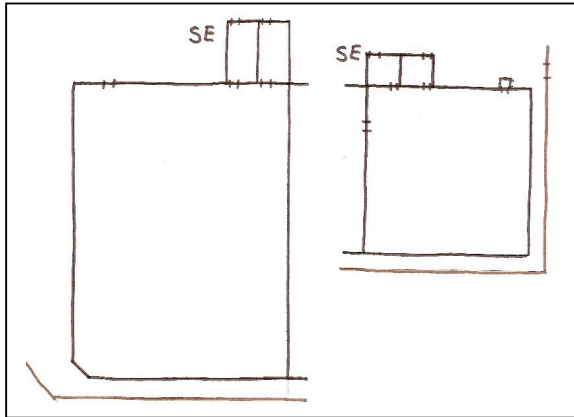
#### *Individuals*

The AO have six enclosures with lions. There are 11 lions (six females and five males).

#### *Enclosures*

Each lion enclosure is located next to another lion enclosure. The pair of enclosures has different locations in the park and is also surrounded by neighbouring enclosures with leopard, hyena, buffalo, ostrich or duiker. The lions are kept individually or as groups of two or three animals of the same sex.

The area of each enclosure differs from 248m<sup>2</sup> to 560m<sup>2</sup> with an area per individual ranging from 85m<sup>2</sup> to 548m<sup>2</sup>. The smaller enclosures keep two or three of the females and the larger enclosures keep one or two of the males. The visitor walkway passes along one or two sides of each enclosure.



*Picture 7. Sketch of two lion enclosures and the small enclosures (SE). The left enclosure is 548m<sup>2</sup> and keeps one male. The right enclosure is 256 m<sup>2</sup> and keeps three females.*

Pictures of enclosures can be seen in Picture 8 and 9. All enclosures have good or full insight and some of them provide some cover for the animals, but not enough. Most enclosures are made of wire mesh and metal poles. Some of the enclosures are older with wooden poles, but most of them are in good shape. They are 2,4-2,8 m high with 0,5-1 m grounding and over hang on top but no roof. The ground is usually flat and covered with soil, especially the pathways along the fencing. Most enclosures have more or less short grass, some of them with patches of high grass. Two of the enclosures have a small hill that provides some cover and also give a good sight. There is a big difference in vegetation and shade between the enclosures.



*Picture 8. Lion enclosure with poor interior and lack of cover.*





*Picture 9. Lion enclosure with most interior and shade but restricted cover.*

Some of the enclosures have large trees inside or nearby the enclosure that provide some shade. However, most of the enclosures lack big trees as well as shade. Most enclosures have permanent tree stumps, large logs or platforms to rest on or to sit on for a better view over the surrounding area. There is only one platform in each enclosure, but they are large enough to make room for all individuals. Only the enclosures that contain a small hill lack platforms. Each enclosure has a permanent water pond made of concrete but they differ in size.



*Picture 10 and 11. From left: two connected small enclosures (SE) and matting as cover.*

Each enclosure is connected to two smaller enclosures (SE) at the back (Picture 7 and 10). The size of the SE range from 6,6m<sup>2</sup> to 36m<sup>2</sup> and 1,6-2,5m high. The fencing and roof is made of wire mesh. A metal sheet covers parts or all of the SE and provides shade. Most of the SE is provided with a pallet bed made of wood or plastic with hay on where the lions can lie to rest and sleep. Only some of the SE contains a water pond or water container and few have matting on the back walls for cover (Picture 11). Two of the SE also contains a small house made of wood, with wire mesh roof, open front or a door with wire mesh front, and hay on the floor.

### *Feeding*

All the lions are fed hind legs or ribs of beef 6 days a week. The amounts differ between the lions with a larger amount to the older males (7-10 kg) and less to the young females (3-4 kg).

The weights include both meat and bone. The meat is usually placed inside the SE. If the lions are present inside the SE, the meat is placed in different locations inside the main enclosure. The doors between the main enclosure and SE are always closed at this time to prevent any contact between the lions and the staff during feeding. The lions usually bring the meat into the main enclosure and eat it at some distance from each other. If the lions can be locked into the SE some time during the day, the bones are removed from the main enclosure. Otherwise it will be removed the following day.

#### *Behaviour*

Most of the lions are alert but not active during the day. They spend a lot of time resting on the platforms or in the SE where they can find some shade. Some of the lions have shown some pacing during the inventory and some of them seem to get a bit stressed by the presence of many visitors. Most of the lions housed in pairs are social with each other. One pair of females was recently put together and they are still trying to work out their dominance order with frequent agonistic behaviour towards each other. One single female was relocated to the enclosure next to three females and they also showed some agonistic behaviour towards each other during the time of the inventory. No physical aggression has been observed between any of the lions. Some enclosures contain a large activity ball that the lions play with on their own or together with the staff.

#### *Other comments*

The doors between the main enclosure and SE are not always open in all the enclosures. The reason for this is to keep the SE empty at feeding time and to teach the lions to use the main enclosure to get them closer to the visitors. In most cases where the SE is locked, there is not enough shade available to the lions and all of them might have to share the one SE that is kept open. The daily rake of the ground causes a lot of dust that according to one of the staff causes eye infections in some animals. Raking also seems to contribute to loss of grass in the enclosures. The older males are quite fat.

### ***3.5. Patas Monkeys at the Animal Orphanage***

#### *Individuals*

The AO have two enclosures with patas monkeys. There are two patas, both males. The monkeys arrived to the orphanage when they were three months old and are now five and nine years old.

#### *Enclosures*

The patas monkeys are kept individually in the two different enclosures. The enclosures are quite similar and located next to each other (Picture 12). Neighbouring enclosures keep baboons, black mangabey, cheetahs, sykes and vervet monkeys. The enclosures have an oval shape with cone formed roof which gives them vertical height. The visitor walkway passes along 50 - 75 % of the enclosures and the visitors have a good view over the enclosure. Fencing of wire mesh is supported by wooden poles all the way from the grounding to the top of the roof. Each enclosure contains a small house made of wood with metal roof (Picture 13). The house is open in each end and is located in the middle of the enclosure 1,5 meter above the ground. It provides cover from the sun and rain as well as from the visitors. The roof of the house can be used as a platform. The flat ground is covered with soil and patches of short or long grass. There are lots of trees in the enclosures, but the crowns are located above the roof, therefore only the tree trunks and branches are available to the monkeys.





*Picture 12 and 13. From left: patas enclosure and the small house.*

The tree crowns provide a good bit of shade in one enclosure, while the other one is too sunny. Between the trees and poles are several planks put up for the monkeys to climb and sit on (Picture 14). The planks and branches have different locations and heights in the enclosure and reach all the way up to the top of the roof. A few small bushes or trees are located inside the enclosure but they do not function very well as cover or for climbing. Apart from the small house and some trees, the interior provide poor cover from rain, sun and visitors. Each enclosure has a permanent water through made of concrete and a metal bowl used for food.



*Picture 14 and 15. Interior planks in the enclosure and the feeding bowl with scattered fruits.*

There is also a small enclosure (SE) in connection with each of the large ones. They are made of double wire mesh and wire netting, wooden poles and a roof of sheet metal. A small house below the roof provides some cover, but apart from that the visitors and other animals have a full view inside the SE.

#### *Feed*

The monkeys are fed 1-2 kg of a range of fruit and vegetables every day. Most of the fruit is usually cut into pieces and put into a metal bowl (Picture 15). The diet contains avocado, bananas, carrots, corn, oranges, papaya, pineapple, sweet potatoes and “kales” (green leaves).

#### *Behaviour*

The monkeys are very active and often seem stressed by the visitors. They are running around the enclosure and pacing by the fence, or climbing upwards to get cover and a good view from the planks underneath the roof. They also show aggressive behaviours when approached by visitors close to the enclosure.

## **4. Discussion**

### ***4.1. Staff and Routines***

#### *Staff*

Due to limited resources and knowledge it might not be possible to make the necessary improvements. The current staff differs in knowledge, training and experience regarding animal husbandry. The sponsored volunteers are considered to be important as additional staff. In relation to the number of species, individuals and responsibilities, the AO might be under staffed since the organisation of work is not as effective as it can be. The management of the AO would improve if the staff was properly trained and educated to keep up with the current knowledge of wildlife husbandry in captivity as well as the need for environmental enrichment and exhibit design.

The engagement of sponsors as a part of the staff is an access, but also causes problems. The sponsors provide financial support as well as knowledge and labour. Even though the KWS has the authority of decisions they lack a policy regarding the sponsorships and the restriction of the engagement of sponsors. The backside of this is the lack of control from the KWS, as it might be difficult to restrict the sponsors from taking part of the care and planning of the AO.

#### *Routines and Journal Keeping*

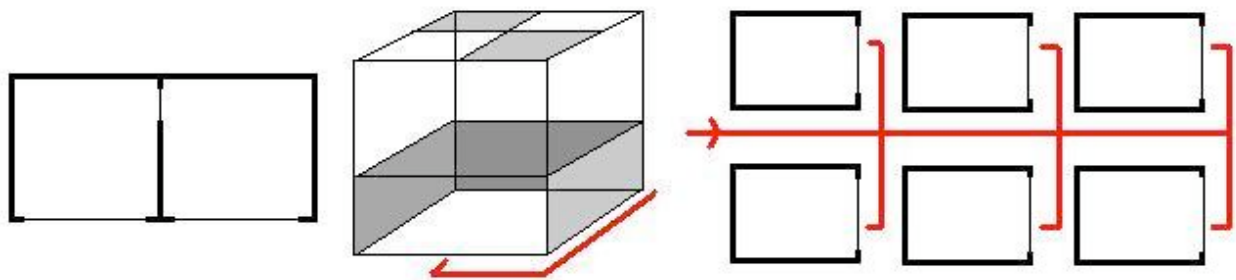
By using a database for the daily records, the journal keeping will be more effective, contain more information and be available to the general staff for further evaluation. Since none of the animals have got specific keepers, it is not possible to tell which staff is responsible for a comment in the journal. Comments need to be signed with a personal signature, to tell who is responsible for the records and should be consulted with further questions. Categories of information within the journals need to be adjusted as some information is missing while other is repeated several times. Continuous information should be kept separated from the daily updates. It seems unnecessary to comment the general bad state of an enclosure when few measures are taken to improve them. Routines for cage cleaning need to be improved for some species where it is impossible for the staff to get into the enclosures, or when the routines are bad for the wellbeing of animals. Reasons for and influence of keeping some animals locked inside their houses at night needs to be evaluated further and better routines need to be worked out to improve the welfare of these animals. Since the specific information regarding treatments of animals is kept in the veterinary records it is not available to the general staff.

### ***4.2. Animal Orphanage and Enclosures***

The available area of the AO is limited and restricts the number and sizes of enclosures. At present, new enclosures are built on available areas and the AO gets more crowded. The number of species might be too high to sustain the relevant resources and knowledge regarding their management in captivity. Even though the number of enclosures are adequate, their size is limited and generally in need of extension. An extension of the AO towards the National Park is thought to be possible by the Senior Warden if a relevant plan is worked out and financial support is provided. To provide a sustainable management in the future, an evaluation of the carrying capacity of the AO is needed. In general, welfare problems in zoos such as the AO need to be prevented before they arise. All enclosures at the AO can be improved in several ways. This can be done by minor or extensive changes of enclosures.

Parts of the external park fencing should be provided with cover to prevent view between the animals in the AO and people at the KWS ground. Some of the enclosures need to be rebuilt since they are in bad shape and do not meet the requirements of security. According to Newberry (1995) the surrounding environment should also be considered since it might affect the health and behaviour of captive animals. Activity and the presence of visitors outside the enclosure can be a source of interest or stress to animals, showing the need for enclosure design that allow for control as well as cover.

Future planning of the park needs to consider the location of enclosures, species and individuals. The location of animals can often be a source to welfare problems and the location of species within the park needs to be considered further, since carnivores, primates and ungulates are kept next to each other. Prey species can be stressed by predatory species, and territorial species might defend their enclosure ground from other territorial animals in neighbouring enclosures. The location of species and enclosures in relation to each other is therefore highly relevant regarding the park planning. If grouping of similar species with carnivores, primates and ungulates in separate parts of the park is a better option needs to be evaluated further. Since many species are territorial, keeping in captivity might cause problems as the area within each enclosure will be defended. Several enclosures at the AO are located next to each other and relatively close to other species. According to Loveridge & Macdonald (2001) the guarding and territorial defence of jackals intensifies as the home range decrease. The home range of species such as lions may overlap although the core areas have little interaction between groups (Estes, 1991; Haas et al., 2005) and aggressive pride defence occurs with high lion density (Heinsohn, 1997; McComb, 1994). Enclosures should therefore be properly separated from each other. Keeping enough distance and preventing view between the enclosures can counteract the need for territorial defense. By covering the lower part of the fence on three sides, the animals can still get a view over the surroundings by using the platforms, and the visitors have access to one side of the enclosure. Cover can be provided on the sides towards neighbouring enclosures and visitor walkway, see sketch in Picture 16.



*Picture 16. Sketch of suggested enclosure cover. Cover for sun and rain on top, with location related to the sun. Cover along the lower part of the fence on three sides provides cover. One side is open for visitors. Enclosures located with openings facing away from each other and away from crowded visitors.*

Miller et al. (2008) showed that pacing in large felines are greater when conspecifics could see each other in neighbouring enclosures due to restricted affiliative or agonistic interactions. By obstructing the view between enclosures one motivation for pacing might be eliminated. According to VanderWaal et al. (2009) habitat quality increases tolerance of related neighbours but do not affect the defence of core area towards unrelated individuals. By providing resources within the enclosure tolerance might increase.

The composition of individuals and enclosure sizes at the AO vary. Enclosures should be designed to keep several individuals, but might only keep a few due to social restrictions. Animal compatibility is important to consider when housing animals together, since



indiscriminate housing can lead to agonistic behaviour and injuries. The three older males of lions are kept in the two largest enclosures as single and as pair, while the five females are kept in the two smaller enclosures as groups of two and three. Since the males are less active than the females, the choice of enclosures should be considered. If the same enclosures will be kept for lions in the future, it might be better if the males switched enclosures with the females. That would provide the females with more space for activities and social distance. By providing the smaller enclosures with a more complex environment, the decreased enclosure size should not be a great problem for the males.

The health and wellbeing of animals is affected by the exhibit design. Advantages with different designs need to be considered regarding visitor appearance, sanitation and animal welfare. All enclosures need to be extended, especially if several individuals will be housed together. At present, the lion enclosures in the AO are located in pairs and can be connected to each other without influencing surrounding enclosures or species. This is only possible if the social relations between the co-living lions are stable. Therefore, it might be more relevant to wait until some of the lions are removed from the AO and focus on interior design instead. According to Morgan and Tromborg (2007) the conditions of captivity can be improved by enhancing the ecological relevance of enclosures and increasing the behavioural opportunity of animals.

The design and interior of enclosures can be species specific or adapted to several similar species. Compared to other cats, the activity level of lions is considered to be quite low (Estes, 1991). They rest most of the day and do not travel as long as other species. They could therefore be thought to have less need for a large and stimulating enclosure, but it still has to provide variation and enough social space. As wild patas monkeys usually live in low densities, spend a lot of time on the ground and travel long distances, it might have different needs than other primates. The patas is physically adapted for a ground dwelling life, with long limbs and high speed (Gron, 2006). The ground within the enclosure should therefore provide enough space for the monkeys to move around and perform daily activities. Wild jackals and patas travel far every day (Gron, 2006; Walton & Joly, 2003) but it is not known whether they have a motivation for travelling in captivity. Further observations of their behaviour in captivity can give more information that can be useful for enclosure design.

Individual distance within a group might change and the established rank hierarchy then gets more rigid (Estes, 1991). The enclosure should therefore provide enough space and resources to permit the animals to keep distance and avoid unnecessary competition. According to Nakagawa (1992) the patas male interacts infrequently with the females and is usually present at the periphery of the group. Therefore the patas enclosure needs to provide possibilities for the male to stay away from the females. It is important that the individuals within the same enclosure can spend time apart. This can be facilitated by providing several places for shade and resting, as well as resources in different locations.

Newberry (1995) have shown that opportunities of camouflage and hiding might make the animal more secure in its enclosure. Since many species live in mixed habitats that provide cover as well as a good view, the enclosures need to imitate a diverse environment. All enclosures need more cover from the rain and sun. Cover also needs to be provided between the enclosures to prevent view from other animals and from visitors surrounding the enclosures, especially where crowding of visitors might occur. A variety of cover needs to be provided along the fence, on top of the roof and inside the enclosures. Proper cover can be facilitated through vegetation such as bushes, high grass and trees, rocks, matting along the fence, platforms, sun roofs and planks. The roof of metal sheet should be exchanged to prevent the loud sound from rain. The small enclosures (SE) should be separated from each other with cover along most of the sides.

Since many species use the distance between individuals as a buffer to reduce competition and agonistic behaviour, the enclosure should be large enough and provide resources at different locations. According to Rowell & Olson (1983) patas monkeys use high points to scan and monitor their surroundings as well as the location and behaviour of group members. By providing several high points for viewing, the possibility for observation will prevent conflicts and agonistic behaviour. By using the upper space in the enclosure, it will make vertical movements possible and provide higher locations for protection. The environmental complexity can be improved by enclosure interior. Most enclosures need platforms in different levels that provide a view over the surrounding area as well as space underneath where the animals can rest in the shade. Tree stumps and logs can be used to climb and sit on. Rocks, hills, tree logs and platforms will make the enclosure more varied and provide opportunities to get a good view of the surroundings. Studies by Chism et al. (1983) and Nakagawa (1999) have found that wild patas monkeys at night spread out within the home range and sleep in trees. By keeping several trees in the enclosure, each monkey can stay on its own and also have a selection of trees to choose from. Structural enrichment such as trees, platforms and ropes increase the amount of usable space and provide choices of location in the enclosure. A variety of objects provide an opportunity to explore and manipulate novel items and presentation (Smithsonian, 2009). Animals that are brought to the AO with their offspring need extra facilities within the enclosure. Dense vegetation and rocks or a tunnel in the ground can provide a den, with one opening for the animal at the front and a door at the back that only is available for the staff.

According to Newberry (1995) individuals that have been kept in captivity for a long time and adapted to the environment might find sudden changes and novel enrichment stressful or uninteresting. Changes are therefore preferably done carefully or before new individuals arrive to an enclosure. Newberry (1995) also found that opportunities for exploration might be relevant for species adapted to unpredictable environments. But it can also be stressful for species lacking this adaption.

Management that is not properly organised or effective, might affect the welfare of animals and waste needed resources, time and effort. To maintain and develop the work at the AO, the credibility from government, sponsors and visitors is important. As the AO currently keep too many animals in relation to the resources, the number and type of species and individuals need to be restricted. By focusing on some species, the resources and management can be more effectively distributed. Hutchins et al. (1995) have shown that a strategic institutional collection plan can provide animal facilities with a composition of animals adapted to the carrying capacity of the park. Further education, communication and cooperation within the staff are also needed.

### ***4.3. Social organisation and behaviour***

The organisation of social animals such as jackals, lions and patas monkeys is complex and restricts the possibilities to group animals in captivity. Social animals should be kept in pairs or groups to provide the expression of social behaviours, enrichment, interactions and confidence. A study by Mason et al. (2007) have found that primates kept individually can develop permanent behavioural abnormalities that are difficult to reduce by enrichment. Keeping in captivity needs to consider the social organisation of each species since the number of animals found in wild population will be a lot more than is possible to keep together in captivity.

Although these species are group living, the special relations between individuals need to be considered before pairing in the same enclosure. The mating system of patas varies within and between populations and it is therefore difficult to form new groups in captivity.

According to Zucker & Kaplan (1981) adult females of patas show low frequency of agonistic behaviours and high frequency of positive contact directed toward other females' infants. It might be possible to keep female patas and infants in the same enclosure, but further observations is necessary to make sure that serious conflicts won't arise. Lions are usually very social within the group, especially within the same sex and when they have grown up together (Estes, 1991). Males should not be kept with infants since infanticide behaviour have been observed in patas (Enstam et al., 2002) as well as lions. According to Loveridge and Macdonald (2001) it might be possible to introduce young immature jackals to an adult pair for a short period of time if the enclosure provides enough resources to avoid conflicts. Since the lions at the AO are kept individually or in pairs of the same sex, it might be possible to introduce them into mixed groups.

Encounters between wild groups of patas are usually agonistic but rarely physical (Groom, 2006). As the conditions in captivity are different from the wild, encounters between unknown animals are more likely to be agonistic and result in aggression. Since several species are territorial, introduction of unknown individuals might result in aggressive defence. How adult individuals of the same or opposite sex can be introduced and housed together needs to be evaluated further. Individuals that arrive to the AO and will stay for a long period of time should be part of an introduction programme to keep individuals of the same species together. If the introduction into the same enclosure or reintroduction to the wild is not possible adult individuals might need to be kept in separate enclosures.

The organisation of social species is largely dependent on breeding and successful upbringing of offspring. None of the animals at AO is allowed to breed and it is not known how the relations between non breeding adults function in captivity. In the wild, pups of a breeding pair of jackals can still be kept with the family unit as adults, but without pups to care for the helpers are not needed and the pair might drive them away from their home range. This problem needs to be considered and evaluated when keeping nonbreeding groups in captivity.

Variations in population densities in lions are related to resource availability and competition (Haas et al., 2005). According to VanderWaal et al. (2009) lion pride size can be larger with consistent levels of prey and access to large prey species that reduce the level of feeding competition within the group. If this is provided, adult offspring can stay with their family group and outsiders might be accepted into new prides (Estes, 1991). By providing the enclosure with varied interior and several of the same resource, individuals are able to make choices and competition is avoided. Doing so will hopefully stabilise the relation between group living animals and improve their welfare.

#### ***4.4. Food and feeding at the Animal Orphanage***

The quality of food and the possibility to express natural feeding behaviour is of great importance for the health and wellbeing of animals. Several species at the AO are provided food that is not adjusted to their natural diet. The choice of food needs to be evaluated further and adjusted to the nutritional need of each species. Species like jackals and patas are omnivorous and adapted to a wide variety of food types within their diet. At the AO jackals are only fed beef and the patas fed fruit and vegetables. By providing food that differs too much from their natural diet, complications regarding the animals' health and welfare might occur. Commercial fruit and vegetables as well as meat from beef cattle have different nutritional content than the natural diet of many species. According to Skansen, sweet domestic fruit is not the best food for primates since they contain a high content of sugar and water and little fibre and nourishment. Most illness in captive primates is food related and fruits ferment quickly in warm and humid environments. The patas diet should contain less

domestic fruits and more natural fruits and leaves, be complemented with gum as well as insects and some meat. The jackal diet should also be adjusted with a variation of food types.

Commercial cow pellets is used in two forms and should be replaced with species specific pellet when needed to provide the animals with appropriate nutritional content. For birds and ungulates parts of the food could be collected in nature and parts of it could be commercial food to make up a balanced diet.

The main part of carnivore diet should contain whole carcasses and meat supplemented with minerals and vitamins as the remaining part. Since none of the carnivores are adapted to a full diet of beef, some of it should regularly be replaced with meat containing less fat since some of the carnivores at the AO are at the risk of getting obese. According to the staff, providing goat would reduce the amount of fat, but goat is not as easy to get. Since the choice and variation of food is restricted for animals in captivity, supplements are an essential part of the diet. Species specific adjustments are necessary and supplements should be provided in the amount and frequency needed to keep the animals healthy.

Since big cats like lions usually hunt and eat once a week or more seldom, they should get fed less regular than they are at present. Species naturally differ in feeding times, where lions eat a larger quantity with low frequency and monkeys eat less quantity with a higher frequency. Feeding once per day is therefore not optimal for most species at the AO and might affect their health and welfare. The time of feeding needs to be adjusted to their natural feeding behaviour. Primates should have access to food several times per day. Large kills and whole prey for some of the carnivores should be interspersed within several days of fasting. Whole preys also allow the expression of natural feeding behaviour. Lions usually share the prey when there is enough for all, but if the prey is too small they can become competitive and the low ranking individuals miss out (Estes, 1991). They often guard the leftovers and might also scavenge on others (Estes, 1991).

Several species at the AO are provided with a diet that differs from their natural choice and the food is presented in predictable locations that is easily accessed and consumed. According to Newberry (1995) a greater variety of types and presentations could allow for more natural feeding behaviours, including foraging and handling of food. It also provides longer duration for feeding and might enrich the animals. A selection of food types for animals like primates provides the diet with a greater nutritional variety, but also give the animal a choice of selection that might make the diet unbalanced. If primates are given all the food in a bowl, they will eat it in short time and choose only the most delicate parts of the meal. To prevent this, the basic food should be fed early in the day when the animals are hungry and will eat it most of it. Complementary food can be given later during the day. Feeding routines adapted to each species might prevent abnormal behaviours and future health problems, and methods of feeding enrichment can increase the feeding related activity.

The amount of food given to the carnivores also needs to be considered since the accounted weight comprises meat as well as bone. The amount of bone differs according to chosen part of the food animal, therefore the amount of meat differs although the total weight is the same. By weighing the remaining bones and comparing it to the given total weight, the amount of meat eaten can be calculated and noted in the daily journal. This information is important to the management of animals and also serves as an indication of its health.

Unlimited water supply should be provided to all animals at all times and proper routines need to be worked out to meet the basic standards of animal husbandry. Mobile feeding bowls should be kept in blocks of concrete to keep it stable. Some of the food is kept in feeding bowls to improve the hygiene, but end up on the ground anyway while the animals search through the bowl and eat. If this has to be prevented, a different way of feeding should be worked out such as feeding boxes for primates.

The small breeding facility with rabbits needs to be evaluated further regarding their keeping, welfare and usage as food animals. The location of food storage should be changed since diseases at the veterinary facility and quarantine can spread between animals through the food. Separate food storage at the AO would decrease the risk of transmission as well as the daily workload of the staff to bring food between the facilities. The staff needs to be updated regarding the natural diets and nutritional needs of each species.

#### ***4.5. Environmental Enrichment and Abnormal Behaviours***

Species, individuals and enclosures vary within the AO and make it difficult to evaluate the animals responses to captivity and the general standard of the current management. According to Mason et al. (2007) species usually express similar abnormalities within taxa and abnormal behaviours and other signs of stress and disturbance can indicate environments that cause poor welfare to animals in captivity. Newberry (1995) have found that the welfare of animals in captivity is dependent on the ability to adapt to captive conditions and that they do not need to remain adapted to natural conditions. Clubb & Mason (2007) showed that daily travel distance, and body weight in relation to home range size, affects stereotypic behaviour, where lions are especially sensitive. It might also affect the patas since this species is unusually wide ranging in natural habitats. Enclosures for naturally wide ranging species should therefore be made larger to allow for locomotion such as sustained running, but according to Clubb & Mason (2007) the stimuli and challenges of a wild ranging lifestyle is probably more important than enclosure size. A complex and enriched environment that allow for choices and control could improve the lives of these species.

The holding power of exhibits is considered to be good if animals are active and perform naturalistic behaviours. Environmental enrichments have been used to induce these behaviours and prevent inactivity and development of abnormal behaviours. According to Mason et al. (2007) environmental enrichment is the most common way to tackle abnormal behaviours by changing the enclosure or husbandry. Mason et al. (2007) have shown that relevant enrichment provides the animal with opportunities to perform normal activities, reduce the motivation for abnormal behaviours and offer enhanced control. According to their study enrichments should be adapted to the function of a behaviour pattern. Since lions have a low activity level, enrichments should mainly focus on the short period of hunting and feeding behaviour. There are several types of enrichments for wild animals in captivity.

Cage furniture increases the enclosure complexity if properly located. A study by Mallapur et al. (2007) have shown that environmental stimuli for primates such as logs, ropes and feeding baskets motivate animals to forage and explore the enclosure, increases the general behaviour repertoire, reduce abnormal behaviours and improve the welfare for singly as well as group housed animals. Toys are frequently used as enrichment for domestic animals and might also be useful for wild species in captivity, such as primates. Primates can also be enriched by providing sheets and blankets, cardboard boxes, mirrors, frozen fruit, plastic balls with hidden food inside, peaces of wood with small holes filled with raisins that requires a tool to reach (Smithsonian, 2009). Mobile interiors will give the monkeys an opportunity to manipulate and have some control over its environment. Markowitz and LaForse (1987) used the “sound” of prey to encourage foraging behaviours in small felines and a transparent plastic tube where a “prey” was pulled through at high speed to encourage hunting behaviour and food was delivered if the cat attacked the “prey”. Their study has identified several key features for enrichment devises, such as novelty, control, motion, food and sound.

Olfactory enrichment is mainly used for carnivores. Dung seems to cause a greater difference in activity level than commercial spices, even though spices also cause behavioural responses that differ regarding to the specific smell (Baker et al., 1997; Schuett & Frase,

2001). Fecal material can be used as olfactory enrichment if regularly checked for parasites and diseases, since it is available within the zoo and keeps the smell of prey animals. Several studies have shown that regular but varied provision of novel objects and olfactory stimulus increases investigation behaviour, scent marking, social interaction and general activity in lions (Baker et al., 1997; Schuett & Frase, 2001; Van Metter, 2008). Peppermint seem to be an effective scent for lions, peaces of meat kept in frozen ice balls can be used as food enrichment and hanging logs stimulate attack behaviours (Powell, 1995). Stimulus objects such as dung in paper bags, scented squash, frozen blood balls and empty metal kegs allow expression of appetitive behaviours in lions (Van Metter, 2008).

Food enrichments are thought to be an effective way to improve the welfare of primates. Food items can be spread out in the enclosure to permit longer duration for foraging behaviours. Dishman et al. (2009) have shown that higher activity levels can be promoted by increasing the complexity of food presentation; spatially separated food boxes reduce the incidence of pirating and adding browse to food boxes increase the activity level in monkeys. Placing fruit and food boxes in trees might also increase the activity level, since the food will be more difficult to get hold of. A box made of wire mesh with small holes will get the monkey to manipulate the box to get out a piece of pellet. By providing the primary feed in a feed puzzle the monkey will spend more time foraging to get the same amount of food, consume every pellet it gets and no waste will end up on the ground.

Positive social contact with the staff will serve as enrichment and can make the monkey more comfortable around the staff and visitors. A schedule of enrichment for different animal species should be available for the animal staff in order to increase the amount of natural behaviours in the animals. Enrichment programs should include a variety of enrichments to prevent habituation, allow for different behavioural expressions as well as differences in species, age, sex and individual interest.

Enrichments have different influence on abnormal behaviours (Mason et al, 2007). According to Baker et al (1997) disinterest in enrichment items might be due to a static environment, established hierarchy and low aggression within the group. But Mason et al. (2007) states that the welfare can be improved by enrichments even though the abnormal behaviour is not reduced or eliminated. According to Mason et al. 2007) enrichment should also be provided to animals that seem to cope and not yet show any signs of stress or abnormalities since they might have greater problems to cope than individuals performing stereotypic behaviours.

## **5. Conclusions**

The inventory of the Nairobi Animal Orphanage has enlightened the need for improvements and further evaluations of the management. The current management is not sustainable and is not providing the preferred welfare for the animals. Several issues have been raised that might be interesting to follow up within the cooperation between Skansen and KWS. Plans and knowledge is generally useless if not implemented and regular evaluations of the management are needed to improve and adapt the AO in the future. Improved design of enclosures as well as organisation of routines is necessary to keep a sustainable facility. Different kinds of enrichment produce different changes in behaviour and a variety of combinations should therefore be used to enrich animals in captivity to account for individual differences and decrease habituation. Basic standards in animal husbandry have to be met to bring the current work forward. The KWS and AO have several goals but are not living up to them today. Careful planning is a valuable way to better management. By guiding them in the right directions, facilities like AO might be able to gain knowledge from others and evolve into self sustaining wildlife management. It is also necessary for people in the west to understand how different conditions than we are used to can be handled and worked around. Even though the management of this facility is restricted by knowledge, resources and space, there are also positive attitudes and willingness to make necessary adjustments. The collaboration with Skansen will hopefully be a way to reach the goals that are stated by the KWS and this thesis.

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# Appendix 1

## *Inventorial checklist*

SPECIES:

Staff in charge:

### A. ANIMALS

1. Identification
2. Number and ages of:
  - females
  - males
  - young
3. Origin
4. Time in Orph.
5. State of health

### B. ENCLOSURE

1. Surrounding area (neighbouring species, walks, etc.)
2. Lengths of sides open to visitors
3. Size and shape
  - displayed, back, outside, inside
  - gates (location, sizes, locks, sluices, security)
  - location in relation to the sun
4. Fence
  - condition
  - material
  - height
  - design
  - grounding
  - security
5. Ground
  - material
  - topography
  - sand pits
  - water ponds
6. Vegetation
  - type and size
  - numbers of large trees or bushes
7. Permanent interior (size and material)
  - protection (wind, sun, rain, visitors)
  - platforms (natural and artificial)
  - feeding devices (mobile, permanent)
  - water troughs (mobile, permanent)

8. Temporary and mobile interior
  - material
  - design
9. Small Enclosure (SE)
10. Risk assessment
11. Area per enclosure and per animal

### C. FEED

1. Type and shape
2. Supplements
3. Frequency
4. Time of day
5. Quantity
6. How its given
7. Placement in enclosure
8. Origin
9. Storage and handling of
10. Adjustments (species, individuals)
11. Quality

### D. ENRICHMENT

1. Type and material
2. Purpose
3. Use
4. Risks
5. Frequency
6. Permanent

### E. BEHAVIOUR

1. Lack of species specific behaviors
2. Social organisation
3. Stereotypes
4. Activity (use of days/nights)
5. Use of enclosure and interior
6. Sharing of space
7. Aggression and dominance
8. Tame individuals
9. Stress and its sources

## F. ROUTINES

1. Supervision of animals
  - overview of enclosure
  - frequency
  - what is observed
2. Cleaning
  - ground, interiors, facilities, etc.
  - frequency
3. Journal keeping
4. Handling of individuals
  - educational purposes
  - methods of capture
  - preparations and purposes with handling (reintroduction, taming)
  - handling of orphans or injured animals
5. Rotation
  - Staff (same persons doing different things)

## G. HEALTH ASSESSMENT

1. Parasites
  - pressure
  - abundance
  - checks and control
  - deworming
2. Vaccination
3. Veterinary routine controls
4. Health journal

## H. GROUND STAFF

1. Problems
  - enclosures
  - handling (animals, feeding, cleaning)
  - visitors
2. Background, education, time at Orph.
3. Management

## I. VISITORS

1. Behaviour of
2. Type
  - age
  - locals/tourists
  - education/leisure

## J. IMPROVEMENTS