

**AMERICAN ZOO AND AQUARIUM ASSOCIATION  
ANTELOPE TAXONOMIC ADVISORY GROUP**

# **ANTELOPE HUSBANDRY MANUAL**

## **REDUNCINAE**



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**ZOOLOGICAL SOCIETY OF SAN DIEGO  
at the  
SAN DIEGO WILD ANIMAL PARK**

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1<sup>st</sup> edition  
May 1999

cover photo  
Uganda Kob  
*Kobus kob thomasi*

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## REDUNCINAE

### 1. General Characteristics

**Waterbucks:** wt. 240 (200-300)kg. Males  
wt. 180 (160-200)kg. Females  
ht. 125 (120-136) cm.

**Defassa Waterbuck** *Kobus ellipsiprymnus adolfi-frederici* Matschie, 1906  
The color is variable, ranging from silver-gray, through bright rufous to a very dark brown. It has a white blaze on the rump.

**Common Waterbuck** *Kobus ellipsiprymnus ellipsiprymnus* (Ogilby, 1833)  
Coarse coat with long shaggy hair on the neck. Color is very variable, commonly a grizzled gray with a distinctive white elliptical ring encircling the rump.

#### Lechwe:

**Nile Lechwe** *Kobus Megaceros* Fitzinger, 1855  
Wt. 86 kg. Ht. 94 cm.  
Males possess a long rough coat of dark chocolate color with a distinctive white patch on the nape of the neck and shoulders. Females are solid rufous-colored.

**Lechwe:** *Kobus leche* Gray 1850  
Wt. 127 kg. Ht. 99 cm.  
Long rough coat of bright chestnut to blackish color, with contrasting white underparts.

**Red Lechwe** (a.k.a. Zambezi Lechwe) *Kobus leche leche* Gray, 1850  
Body color is dull yellowish brown, with legs dark brown or black.

**Kafue Flats Lechwe** *Kobus leche kafuensis* Haltenorth, 1963  
Front of forelegs black reaching to upper legs and front of shoulders.

**Black Lechwe** *Kobus leche smithemani* Gray, 1850  
Blackish brown on the back and sides.

**Kob:** wt. 94 (85-121) kg. males wt. 63 (60-77) kg. females  
ht. 90-100 cm. males ht. 82-92 cm. females

**Buffon's Kob** *Kobus kob kob* (Erxleben, 1777)  
Short glossy coat generally a bright gold fulvous color.

**Uganda Kob** (a.k.a. Thomas's Kob) *Kobus kob thomasi* Selater, 1864  
Body is almost uniformly light reddish brown, with white areas about the eyes, above the hooves, and on the underparts, and stripes of black on the fronts of the lower legs.

## ISIS LISTINGS

Page reproduced from ISIS Mammalian Taxonomy, June 1991

14 1419 1419009	MAMMALIA ARTIODACTYLA BOVIDAE	MAMMALS EVEN-TOED UNGULATES COWS, ANTELOPES, SHEEP, GOATS	
1419009016001001	Kobus ellipsiprymnus (no subsp)	Waterbuck	Central Cameroon-Senegal
1419009016001002	Kobus ellipsiprymnus ellipsiprymnus	Common Waterbuck	Angola-Mozambique
1419009016001003	Kobus ellipsiprymnus adolfi-frederici	Defassa Waterbuck	Northeast Tanzania
1419009016001004	Kobus ellipsiprymnus annectens	Defassa Waterbuck	Central African Republic
1419009016001005	Kobus ellipsiprymnus crawshaii	Defassa Waterbuck	Southeast Congo, Zambia
1419009016001006	Kobus ellipsiprymnus defassa Defassa	Waterbuck	Central + south Ethiopia
1419009016001007	Kobus ellipsiprymnus harnieri	Defassa Waterbuck	Uganda, Sudan
1419009016001008	Kobus ellipsiprymnus kondensis	Common Waterbuck	S. Tanzania, Ne. Tanzania
1419009016001009	Kobus ellipsiprymnus pallicus	Common Waterbuck	Somalia
1419009016001010	Kobus ellipsiprymnus penricei	Defassa Waterbuck	Angola - Gabon
1419009016001011	Kobus ellipsiprymnus thikae	Common Waterbuck	Northeast Tanzania
1419009016001012	Kobus ellipsiprymnus tjaderi	Defassa Waterbuck	West Kenya
1419009016001013	Kobus ellipsiprymnus iscadensis	Defassa Waterbuck	Chad
1419009016001014	Kobus ellipsiprymnus unctuosus	Defassa Waterbuck	Central Cameroon-Senegal
1419009016002001	Kobus kob (no subsp)	Kob	Northwest Congo
1419009016002002	Kobus kob kob	Buffons Kob	Senegal-northwest Nigeria
1419009016002003	Kobus kob adolfi	Kob	Chad Region
1419009016002004	Kobus kob alurae	Kob	Nw Uganda, so. Sudan
1419009016002005	Kobus kob bahr-keetae	Kob	Central Shari Region
1419009016002006	Kobus kob leucotis	White-eared Kob	South Sudan, sw Ethiopia
1419009016002007	Kobus kob loderi	Kob	Se. Nigeria, s. Cameroun
1419009016002008	Kobus kob newmanni	Kob	W. Uganda, Ne. Congo
1419009016002009	Kobus kob riparia	Kob	West Africa
1419009016002010	Kobus kob thomasi	Kob	West Kenya, east Uganda
1419009016002011	Kobus kob ubangiensis	Kob	Northwest Congo
1419009016003001	Kobus leche (no subsp)	Lechwe	Zambia
1419009016003002	Kobus leche leche	Red Lechwe	Zambia, Angola, zaire
1419009016003003	Kobus leche kafuensis	Kafue Flats Lechwe	Zambia
1419009016003004	Kobus leche smithemani	Black Lechwe	Northern Zimbabwe
1419009016004001	Kobus megaceros	Nile Lechwe	Africa
1419009016005001	Kobus vardoni	Puku	Africa
1419009016005002	Kobus vardoni vardoni	Puku	Congo, Botswana, Angola
1419009016005003	Kobus vardoni senganus	Senga Kob	Zambia, Malawi, Tanzania

<b>1419009019</b>	<b>REDUNCA</b>	<b>REEDBUCK</b>	
1419009019001001	Redunca arundinum	Reedbuck	Africa (southern Savanna)
1419009019001002	Redunca arundinum arundinum	Reedbuck	Angola - Mozambique
1419009019001003	Redunca arundinum occidentalis	Reedbuck	Gabon - Tanzania
1419009019002001	Redunca fulvorufula	Mountain Reedbuck	Central Africa
1419009019002002	Redunca fulvorufula	Mt. Reedbuck	South Africa
1419009019002003	Redunca fulvorufula	Mt. Reedbuck	Northern Cameroun
1419009019002004	Redunca fulvorufula chanleri	Mt. Reedbuck	Tanzania - Ethiopia
1419009019003001	Redunca redunca	Bohor Reedbuck	Uganda, Tanzania
1419009019003002	Redunca redunca redunca	Bohor Reedbuck	Senegal - Togo
1419009019003003	Redunca redunca bohor	Bohor Reedbuck	Ethiopia
1419009019003004	Redunca redunca cottoni	Bohor Reedbuck	Southern Sudan
1419009019003005	Redunca redunca diana	Bohor Reedbuck	Northeast Congo
1419009019003006	Redunca redunca nigeriensis	Bohor Reedbuck	Nigeria, cent. Africa Rep.
1419009019003007	Redunca redunca tohi	Bohor Reedbuck	Se. Kenya, E. Tanzania
1419009019003008	Redunca redunca wardi	Bohor Reedbuck	Uganda, Tanzania

## 2. Veterinary Care

### Chemical immobilization:

<b>Recommended drugs:</b>	Carfentanil .....narcotic
	M-99 .....narcotic
	Ketamine .....as a supplement
	Isoflurane inhalant .....as a supplement

There are many variables which must be considered when determining proper dosage (age, weight, and physical condition to name a few). A list of sample dosages and more general information on chemical immobilization is available in several books.<sup>1</sup>

Whenever possible, the animal to be immobilized should be shifted from the larger outside exhibit to a smaller adjoining catch pen or inside night quarters prior to darting.

In large multi-species exhibits where it is not possible to shift the animal into a catch pen, care must be taken to protect the darted animal from aggression from conspecifics (particularly males). Also special care must be given to guard areas with water features such as ponds or wallows during chemical immobilizations, as some members of Reduncinae (especially waterbuck and lechwe) tend to flee toward the water after being darted, presenting the danger of drowning. If possible, avoid doing a chemical immobilization during the warmest part of the day. Lechwe often do a lot of running after being darted, increasing the risk of hyperthermia and capture myopathy. Symptoms of these conditions can include panting, unresponsiveness, and inability to stand after immobilization. If these symptoms are present, immediate steps should be taken to cool the animal (such as moving the animal to the shade or a cooler area, hosing the animal with cool water, and cool water enema.)

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<sup>1</sup>DISEASES OF EXOTIC ANIMALS, Joel Wallach D.V.M. and William Boever D.V.M.  
pgs. 222-223, 226, 229.

An eyedrape or towel should be placed over the animals eyes once you have "hands on" to protect the eyes and reduce stress. Protective hoses may be placed on the horn tips for the duration of the procedure to prevent injury to personnel.

**Neonatal examinations:**

A neonatal exam should include a check of the heart and lungs, feet and legs (for deformities), palate (for cleft palate deformities), umbilicus should be soaked with 3% iodine (check for herniation or deformities), BOVA-S (immunoglobulin status), glucose, temperature, weight, state of hydration. A neonatal exam is typically when animals are given their permanent identifications (earnotch, tag, microchip, etc.)

**Parasites:**

In temperate climates, worming in the Fall and Spring may be most effective by taking advantage of cold weather to kill parasite larvae and to reduce infestations during warmer weather.<sup>2</sup> Fecal examination and treatment should be made at least twice annually, and more frequently if the animals are kept on pasture.<sup>3</sup>

In large multi-species exhibits, fecal screening and treatment may be done on a quarterly basis with fecal samples collected one week prior and one week following a scheduled worming to monitor efficacy of treatment. Any additional screenings may be done as needed and should be requested if an animal displays symptoms characteristic of parasitic infestation (i.e. loose stools, stools containing visible tapeworm segments, facial swelling, weight loss, lethargy.)

**Commonly observed parasites and recommended treatments:**

ecto: ticks ..... removal  
endo: Coccidia .....Albon

Strongyles ----- These parasites may be treated with  
Nematodirus ----- Ivermectin when you have "hands on"  
Trichoris ----- the animal. Otherwise the quarterly worming medication may be milled into the alfalfa pellet.<sup>4</sup>

In large multi-species exhibits, hay may be withheld for four days while animals are offered only the medicated alfalfa pellet. The amount of pellet fed out should be increased to compensate for the lack of hay.<sup>5</sup>

**Physiological norms:**

See footnote for information on heart and respiratory rates and blood chemistries.<sup>6</sup>

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<sup>2</sup>Randy Fulk, PH.D., North Carolina Zoological Park

<sup>3</sup>Russell Smith, et al

<sup>4</sup>O.H. Kruse Grain and Milling

<sup>5</sup>San Diego Wild Animal Park

**Common injuries and treatments:**

fractures, lacerations, gore wounds, dystocias

Some members of this subfamily, particularly waterbuck and lechwe, tend to be extremely nervous and flighty when separated from familiar surroundings for treatment or other reasons, necessitating the use of tranquilizers to calm the animals. Recommended drugs for this include:

- Haloperidol .....short duration
- Haldol Decanoate ....long duration
- Trilafon .....long duration

**Other recommended routine medical procedures:**

Hoof trimming may be done as needed if hooves appear abnormally long or are causing lameness.

Pre-shipment/Quarantine: Specific tests may vary depending on destination of animal but generally will include: CBC, CHEM, R/C, TB, Brucellosis, *Mycobacterium paratuberculosis* (Johnes), and fecal sample for parasite check. Also this is typically when animals are given their permanent identifications (earnotch, tag, microchip, etc.)

- Life span:**
- Lechwe ..... 10-12 years
  - Waterbuck, Kob ..... 16-18 years

**Post mortem protocol:**

A thorough post mortem examination (necropsy) of each animal that dies in the facility, by a veterinarian, preferably a veterinary pathologist, provides valuable information not only on the cause of death for that animal, but also on any other concurrent medical problems. Often these problems, such as parasites, nutritional deficiencies, or dental disease, may be present in the animal collection without causing any obvious symptoms. Their detection at postmortem examination indicate that diagnostic tests or treatment should be performed on the remaining animals before clinical symptoms or disease transmission occur.<sup>7</sup>

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<sup>6</sup>DISEASES OF EXOTIC ANIMALS, Joel D. Wallach D.V.M. and William J. Boever D.V.M., pgs.. 207, 1012, 1015

ISIS PHYSIOLOGICAL DATA REFERENCE, Aug. 1996

LYNX (software package) Dept. Of Veterinary Science, Zoological Society of London, Bennett

P.M.

ZOO AND WILD ANIMAL MEDICINE, Murray Fowler, pgs.. 1012, 1014

<sup>7</sup>Hinshaw, Amand, Tinkelman, 1996

**Pathology:**

Necropsy results have shown zinc deficiency in some neonate Red Lechwe. Also there have been a significant number of umbilical hernias in Uganda Kob neonates and mortalities due to inanition (failure to nurse).<sup>8</sup>

**3. Nutrition**

Members of the subfamily Reduncinae are grazing animals and recommended diet includes: Sudan grass, Coastal Bermuda grass, and 1/2" high fiber alfalfa pellet.<sup>9</sup>

Nutrient content:	Crude protein, not less than .....	14%
	Crude fat, not less than .....	3.0%
	Crude fiber, not more than .....	21%
	Ash, not more than .....	10.0%

Daily feeding with food delivered in the early morning will allow the animals free choice to follow their natural inclination to eat in the early morning and late afternoon hours. The number of feeding and watering sites will be determined by the group size and composition. Regular observations should be made to determine if multiple feeding and watering sites are required, to insure adequate access to all individuals. To minimize fecal contamination and ingestion of sand and dirt, all hays should be fed in racks or feeders above the ground.

Fresh water should be available at all times in both indoor and outdoor areas.

In large multi-species exhibits there is very little control over food intake. Consequently the grazing animals will also have access to low fiber herbivore pellet intended for the browsers and other hays (oat, alfalfa, etc.) in addition to their recommended dietary items.

**Maintenance diet for one adult animal:**

**Waterbuck** - 3 qt. (1800 g) 1/2" high fiber herbivore pellet  
1/4 flake (887 g) Sudan grass hay  
1/4 flake (887 g) Coastal Bermuda grass hay

**Nile Lechwe** - 1 1/2 qts. (900 g) 1/2" high fiber herbivore pellet  
1/4 flake (665 g) Coastal Bermuda grass hay

**Kob** - 1 1/2 qts. (900 g) 1/2" high fiber herbivore pellet  
1/3 flake (887 g) Coastal Bermuda grass hay

Salt and mineral blocks should be available, *ad lib.*

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<sup>8</sup>San Diego Wild Animal Park

<sup>9</sup>O.H. Kruse Grain & Milling, Mazuri® ADF-#25 Herbivore

## 4. Captive Management

### Individual identification methods:

In smaller collections small numbered eartags may be sufficient, In larger multi-species exhibits, colored eartags plus earnotching has been used successfully.<sup>10</sup> More detailed information on individual identification methods, including microchipping, has been published.<sup>11</sup>

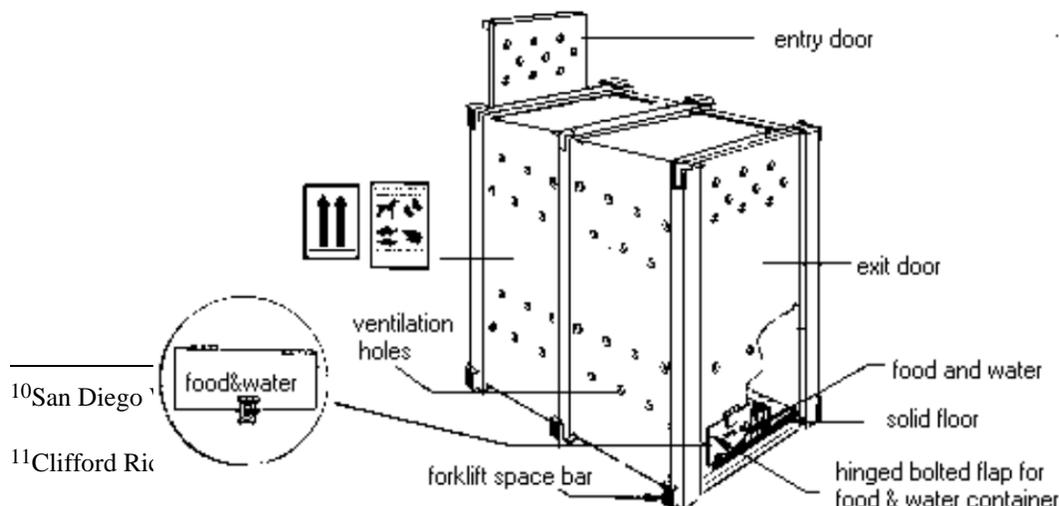
### Recommended crating and transport procedures:

Ideally, exhibit design should incorporate an adjoining smaller “catch pen” into which an animal can be trapped for the purpose of crating. There should be a doorway in the corner of the catch pen leading to an alleyway. The animal is then moved down the alleyway and into a crate or trailer. It may be necessary to follow the animal down the alley with a push board to persuade it into the crate or trailer. A hand held push board may be safely used with the female kob and lechwe, also with waterbuck < 1 yr. A built in push board mounted or suspended on runners is very useful and safer for all involved, when moving adult male or larger female waterbuck.

Transport may be safely accomplished by trailer or crate. In both situations it is important to construct a crate or partition the trailer to give the animal only enough space to stand or lie down. Too much room allows the animal to turn around or jump up, potentially injuring itself. Animals will generally be less agitated if their mode of transport is dark, so holes for ventilation should be just large and numerous enough to allow adequate air flow, while limiting light. A crate or trailer may be bedded with Bermuda grass hay, and a tub for water should be fastened into place near the head end of the crate prior to loading the animal. A fill hole should be located to allow convenient watering of the animal during transport.

### Container Requirement 73

Reproduced with permission of IATA, Mr. Daniel Lebrun, Assistant Director, Marketing & Sales. (The following general IATA information has been slightly modified to reflect the special needs of shipping members of the subfamily Reduncinae.)



## **Container construction**

**Materials:** wood or metal and rubber, burlap or canvas for padding and light reduction, if required.

**Dimension:** The height and width of the container must allow the animal to stand erect with its head extended, even if horned. The size of the container must sufficiently restrict movement so that the animal cannot turn around and in so doing trap or injure itself, nor have space to kick and damage the container. The dimensions will vary according to the species being shipped.

**Frame:** Must be made of 2.5 cm (1 in) solid wood or metal parts, bolted or screwed together.

When the weight of the container plus animal exceeds 60 kg (132 lbs.), additional metal bracing must be present around the whole container.

**Sides:** Suitable plywood or similar material must closely line the frame to a level slightly above the animal's eye over which there must be an area with a series of holes (no bigger than 2" in diameter) for ventilation extending to the roof. The interior must be completely smooth.

**Floor:** The base must be solid and leak-proof, there must be either pegboard or slats bolted to the solid base to give a firm foothold. A droppings tray must be provided under the pegboard or slats to prevent excreta escaping.

**Doors:** Hinged or sliding entry and exit doors must be provided. They must be fastened in such a way that they cannot be accidentally opened. They must have similar ventilation openings as on the sides.

**Ventilation:** Two rows of ventilation holes, with a minimum diameter of (1 inch) 2.5 cm must be present, above eye level, on all four sides.

**Spacer Bars/Handles:** Must be made to a depth of 2.5 cm (1 inch) and formed from the framework of the container.

**Feed and Water Containers:** Food and water containers must be provided with outside access from a hinged bolted flap that must be large enough for the entry of a water dish and/or quantities of appropriate food.

**Feeding and Watering Guide:** Animals do not normally require additional feeding or watering during 24 hours following the time of dispatch. Shipper's watering instruction must be followed. If feeding is required due to an unforeseen delay, fodder must be provided but care must be taken not to overfeed.

**General Care and Loading:** It is recommended that polyethelene sheeting and absorbent material, such as wood shavings, be placed underneath the container and stapled to the sides of the container (without blocking ventilation holes) to prevent spillage of excreta.

Some animals may require tranquilizing for transportation with a long acting sedative. The name of the medication and the time of administration must be provided by the shipper and affixed to the container and that information must also accompany the Shipper's Certification.

For requirements and regulations regarding transport crate size and design, please refer to IATA, USDA, and APHIS.<sup>12</sup>

**Pest control:**

It may be necessary to do rodent abatement, particularly in barns or night quarters. Spraying to eliminate ant infestation may be indicated as they have been known to swarm onto newborn animals.

**5. Housing and Enclosure Requirements**

**Containment barriers:**

In a single species exhibit, members of the subfamily Reduncinae may be contained in an enclosure with a 6' fence (providing the facilities perimeter fence is 8'). The fencing should be constructed of 11 gauge woven or wire chain link.<sup>13</sup> Requirements may vary slightly from state to state.

In large multi-species exhibits other features may need to be incorporated into the design of the containment barriers, i.e. 6-8' high fence with a 3' in rigger (inside overhang), solid construction wall (block wall, concrete, etc.) depending on the other species you are "containing".

**Shelter requirements:**

Shelter design will vary according to weather and temperature at individual institutions. Either a tree or shade structure can provide adequate shade in areas which experience high temperatures. Places which experience cold temperatures may need to provide a shelter which has a roof and three walls or indoor housing.

**Substrate/topography:**

Most members of the Reduncinae are frequently found in a swampy habitat, therefore a relatively flat or slightly hilly terrain with a natural substrate is recommended.

**Temperature/humidity requirements:**

Kobus species range over nearly all of Africa where water is abundant, and they are exposed to a wide range of climates. They can tolerate a wide range of temperatures and can be kept outside year round in many parts of North America. An exact temperature at which animals should be moved from outdoor to indoor housing cannot be mandated since a variety of factors will affect the decision to move the animals indoors. Besides temperature, other weather conditions such as

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<sup>12</sup>International Air Transport Association, United States Dairy Association, Animal & Plant Health Inspection Service

<sup>13</sup>California Department of Fish and Game

rain, sleet, sunny vs cloudy, wind conditions, availability of shelter, the length of time the weather conditions continue, acclimation, etc. are all factors in the decision to move animals indoors. Animals kept outdoors may need to be protected from frostbite in the ears, horns or feet. Animals kept outside should be given access to shade and drinking water in hot weather and shelter or windbreaks during colder months. Animals kept inside can tolerate relatively high temperatures provided a constant supply of drinking water is available, but should be protected from temperatures above 90 F if exposure is prolonged. Heat should be provided in stalls if the outside temperature falls below 45 F.<sup>14</sup>

In large multi-species exhibits lacking indoor or night quarters, special consideration must be given regarding the disposition of newborn animals, (moving Dam and calf to a heated or maternity pen, or pulling the calf to be hand-reared) especially where extreme cold nighttime temperatures are expected.

### **Minimal acceptable and optimal size of enclosures:**

#### **Indoor facilities:**

A single animal should be provided with at least 70 sq. ft, and the size of the stall may need to be increased if the animal will be continuously confined for an extended period of time. Stall size should be increased for each animal housed in the same stall. An increase of about 50 sq. ft. per animal may be sufficient.<sup>15</sup>

#### **Outdoor enclosure:**

Generally 600 sq. ft. for one animal, 800 for two, plus 200 for each additional animal is required.<sup>16</sup> Requirements may vary from state to state.

#### **Capture, handling, restraint facilities:**

In a more "traditional" zoo exhibit it is advisable to have a smaller catch pen (which can also be the inside quarters) adjacent to the large enclosure into which the animal can be trapped or moved prior to capture and handling.

The TAMER® (a drop-floor restraint chute) has been successfully used to restrain females and subadult male waterbuck, and adult (of both gender) kob and lechwe for routine procedures such as TB testing and blood sampling.

In large multi-species exhibits, if unable to trap the target animal into a smaller catch pen, chemical immobilization may be necessary to facilitate capture.

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<sup>14</sup>Randy Fulk PH.D., North Carolina Zoological Park

<sup>15</sup>Randy Fulk PH.D., North Carolina Zoological Park

<sup>16</sup>California Department of Fish and Game

**Utilities:**

In indoor areas, natural, incandescent, or fluorescent lighting all provide adequate environments. Inside housing areas should be provided with fans or cross ventilation.<sup>17</sup>

Water drinkers should be situated so as not to interfere with the horns of the males.

**Sanitation:**

Indoor quarters should be cleaned daily. The outdoor enclosures should be cleaned daily. In large multi-species exhibits where it is not possible to clean the entire enclosure, the areas around the feeding stations should be cleaned daily.

**Special features:**

Pools or wallows for wading are advisable but not essential.

Females of these species tend to tuck their newborns for the first couple of weeks. It is important to provide some "hiding places" for them (rock or tree stump rings, creeps, thick vegetation, etc.)

Lechwe enclosures must include quiet corners and refuges, to avoid forced contacts between animals and keepers during cleaning and care operations.<sup>18</sup>

In large multi-species exhibits it is sometimes difficult to position the veterinarians close enough to dart animals during chemical immobilizations. This is particularly true of the lechwe. It would be wise to incorporate into the exhibit design a built in shooting blind (rock or tree stump ring or a wall with cutouts to shoot from, etc.) These blinds if properly positioned, may also serve as a visual barrier which is useful to reduce aggression toward lower ranking individuals.

**Isolation from similar or the same species:**

The following hybridizations have occurred in zoological collections worldwide:

-*Kobus defassa* Ruppell (Defassa Waterbuck. Sing-sing Waterbuck. Northern Waterbuck)  
x *Kobus ellipsiprymnus* Ogilby (Common Waterbuck. Eastern Waterbuck)  
x *Kobus kob* Erxleben (Buffon's Kob Antelope. Kob)  
x *Kobus megaceros* Fitzinger (Saddle-back Lechwe. Nile Lechwe. Mrs. Gray's Lechwe)

-*Kobus defassa unctuosus* Laurillard (Western Defassa Waterbuck)  
x *Kobus ellipsiprymnus* Ogilby (Common Waterbuck. Eastern Waterbuck)

-*Kobus ellipsiprymnus* Ogilby (Common Waterbuck. Eastern Waterbuck)  
x *Kobus defassa* Ruppell (Defassa Waterbuck. Sing-sing Waterbuck. Northern Waterbuck)  
x *Kobus defassa unctuosus* Laurillard (Western Defassa Waterbuck)

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<sup>17</sup>Randy Fulk PH.D., North Carolina Zoological Park

<sup>18</sup>Elizabetta Falchetti, 1997

- Kobus kob* Erxleben (Buffon's Kob Antelope. Kob)
  - x *Kobus defassa* Ruppell (Defassa Waterbuck. Sing-sing Waterbuck. Northern Waterbuck)
  - x *Kobus megaceros* Fitzinger (Saddle-back Lechwe. Nile Lechwe. Mrs. Gray's Lechwe)
- Kobus leche* Gray (Lechwe)
  - x *Kobus megaceros* Fitzinger (Saddle-back Lechwe. Nile Lechwe. Mrs. Gray's Lechwe)
- Kobus megaceros* Fitzinger (Saddle-back Lechwe. Nile Lechwe. Mrs. Gray's Lechwe)
  - x *Kobus defassa* Ruppell (Defassa Waterbuck. Sing-sing Waterbuck. Northern Waterbuck)
  - x *Kobus kob* Erxleben (Buffon's Kob Antelope. Kob)
  - x *Kobus leche* Gray (Lechwe)<sup>19</sup>

## 6. Behavior and Social Organization:

With lechwe, mixed groups of several males and females are possible. They are generally gregarious. The males are more tolerant of each other than is usually seen in other antelope. A number of males can be kept together, and given enough space, they can be kept together year round. Aggression toward young males by older, more dominant males can occur. The ability to separate or remove males during breeding season is advisable. Females are generally tolerant of each other.<sup>20</sup>

In kob, dominant males are intolerant of any other males over seven months of age. The young males are driven out of the herd at that age by the dominant male. Even in large multi-species exhibits, where there is sufficient space for these bachelor males to avoid confrontation and distance themselves from the dominant male, they still attempt to return to the main group, which results in aggressive encounters. It is therefore advisable to remove young kob males at about seven months of age.

Large herds of Defassa Waterbuck *Kobus ellipsiprymnus adolfi-frederici*, which included several adult males, have been exhibited in large multi-species exhibits. The majority of the time all of the males will stay within the female/calf herd. Occasionally dominant males will single out other males, pursue them, and drive them away from the main herd.

Within a large herd of Ellipsen Waterbuck *Kobus ellipsiprymnus ellipsiprymnus*, their behavior differs somewhat in that dominant males are generally much less tolerant of subadult males >eight months of age.<sup>21</sup>

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<sup>19</sup>Annie P. Gray, 1972

<sup>20</sup>Randy Fulk PH.D., North Carolina Zoological Park

<sup>21</sup>San Diego Wild Animal Park

**Introduction of new animals:**

When new animals are introduced to the facility, they should be kept in the inside quarters and taught to shift from stall to stall before they are released into an outside enclosure. New animals should have an introductory period which allows them visual and olfactory access to the existing group. This can be accomplished by housing the newcomer in the barn and using fence panels to separate it from the established group.

**Age of dispersal/removal of young:**

7-8 months for males

**Introductions and removals (effect on group and group reaction):**

There is very little effect on the existing group when introducing new females. The dominant herd sire should be removed before another male seven months or older is introduced into the exhibit.

**Seasonal changes in social behavior:**

Subordinate males will be drawn to female groups when females come into estrus, resulting in increased aggression. Normally gregarious waterbuck and lechwe males will experience increased aggression as they spar and fight for breeding opportunities.

One or two days prior to calving, females will often become isolative in their search for a secluded place to give birth.

**Mixed species exhibit capability and recommendations:**

The initial phases of setting up a mixed-species exhibit are crucial. Many species will live together compatibly once they become accustomed to each other's presence.<sup>22</sup>

*Kobus ellipsiprymnus adolfi-frederici*, *Kobus kob thomasi*, and *Kobus megaceros* have been successfully exhibited with the following species<sup>23</sup>: eland, white-bearded gnu, cape buffalo, sitatunga, white rhino, giraffe, topi, Thomson's gazelle, Roosevelt's gazelle, fringe-eared oryx, impala, bongo. The following exceptions are noted:

\*Grevy's Zebra herd was relocated to their own exhibit after showing aggression toward many newborns of other species.

\*Aggression occurred between the males of Zambezi and Nile Lechwe. They are no longer housed together.

\* Male Zambezi Lechwe exhibited aggression towards male Defassa Waterbuck. They are no longer housed together.

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<sup>22</sup>Warren Thomas and Edward Marushka, 1996

<sup>23</sup>San Diego Wild Animal Park, East African Exhibit - 125 sq. acres.

*Kobus ellipsiprymnus ellipsiprymnus* have been successfully exhibited<sup>24</sup> with eland cape buffalo, blesbok, springbok, sand gazelle, giraffe, sable antelope, white rhino, white-tailed gnu, Soemmerring's gazelle, Congo buffalo, Hartmann's Mountain Zebra\*, gemsbok\*\*.

\*Occasionally zebra are aggressive toward newborn/neonatal waterbuck.

\*\*One mortality of an adult male Ellipsen Waterbuck *Kobus ellipsiprymnus ellipsiprymnus* occurred during an aggressive encounter with an adult male gemsbok *Oryx gazella gazella*.

\* Infrequent aggression was exhibited between male Ellipsen Waterbuck and male Sable Antelope and Zambezi Lechwe.

\* Male Kafue Lechwe exhibited aggression towards young Sable Antelope, and on one occasion a male rhino. Kafue Lechwe were removed from large multi-species exhibit and housed in a single species exhibit.

**Behavioral indicators of social stress, harassment, or impending social changes such as dispersal:**

increased aggression (chasing, sparring, isolating individuals).

**Olfactory behavior, scent marking, flehmen:**

Males of waterbuck, lechwe, and kob have been observed urinating onto their own bellies and chins and then rubbing the urine onto their own shoulders and backs. All males of the subfamily Reduncinae perform flehmen.

Waterbucks possess diffuse glands which produce a musky scent. Lechwe have inguinal glands. Kob have both inguinal and pedal glands, and preorbital glands.

All species have enhanced waterproofing with sebaceous secretions that oil the entire coat and scent the animal very strongly, especially males.<sup>25</sup>

Individual recognition, particularly between mothers and their offspring, is probably based mainly on scent clues.<sup>26</sup>

**Auditory behavior:**

**Waterbuck:** "Snores" in sexual excitement or in alarm. Female calls calf with a soft a "Muh", calf answers in a high bleating.

**Kob:** When excited, alarmed, or after mating, kob have been heard making a whistling sound through the nostrils 1-5 times. Also females and young have a call sound for one another.

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<sup>24</sup>San Diego Wild Animal Park, South African Exhibit - 90 sq. acres.

<sup>25</sup>Jonathan Kingdon, 1982

<sup>26</sup>Walter Leuthold, 1977

**Lechwe:** In excitement a varied mixture of coughing, grunts, or whistling as in the Kob only softer. Males sometimes snort when suddenly disturbed, calves bleat.<sup>27</sup>

**Courtship behavior:**

When the females come into estrus, the male (or males) will attempt to follow closely, often performing "laufschlag" (males will walk directly behind the female tapping between her hind legs with his forelegs). He will then try to stimulate her to urinate by nudging her hindquarters with his nose, then perform "flehmen" (lip curl). Copulation is generally brief.

**Parental care:**

Newborn calves of the subfamily Reduncinae are classified as "hidlers" or "tuckers". Calves are hidden for 2-4 weeks after birth and are visited by the dam at intervals throughout the day to provide nursing opportunities. Typically a dam will groom her calf while the calf is suckling, paying particular attention to the anal region, which apparently stimulates the calf to nurse and to defecate. The mother will remove all traces of the calf's feces.

**Infant development:**

**Waterbucks :** wt. at birth - 13 kg.

Suckling lasts to 6-7 months. Horns begin growth at 5-6 months.

**Kob:** wt. at birth - 4-5 kg.

After 7 months 's are and 's ½ of the adult weight and and half adult size. Horn growth begins at 5 months. Suckles 6-7 months.

**Lechwe:** wt. at birth *Kobus megaceros:* 4.5 kg. 5.5 kg.

Weight doubles at 4-5 weeks.

wt. at birth *Kobus leche* 5 kg.

Suckling time is 3-4 months.<sup>28</sup>

**Development (weights) of mother-reared calves (Reduncinae)<sup>29</sup>**

**Environmental enrichment:**

Trees, rocks, tree stump rings, pools, wallows all provide opportunities for enrichment .

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<sup>27</sup>Theodor Haltenorth, 1984

<sup>28</sup>Haltenorth, Theodor, 1984

<sup>29</sup>Amer. Assn. of Zoo Keepers, ZOO INFANT DEVELOPMENT NOTEBOOK

## 7. Reproduction and Ontogeny

### Characteristics of cyclicity:

#### Waterbuck

estrous cycle lasts.....21 days  
females estrus lasts.....12-24 hours  
gestation..... 272-287 days  
interbirth interval.....325 to 335 days  
fecundity - females.....1 yr.  
                  males.....3 to 4 yrs.  
age at first reproduction: *Kobus ellipsiprymnus ellipsiprymnus*.....22-24 mos.  
                                  *Kobus ellipsiprymnus adolfi-frederici*..30 mos.  
weight of offspring.....13 kg.  
longevity.....18 yrs.

#### Lechwe

estrous cycle lasts..... 21 days  
females estrus lasts.....24 hrs..  
gestation.....220 to 230 days  
interbirth interval -*Kobus megaceros*:..... 18 mos.  
                                  *Kobus leche leche*.....22 mos.  
fecundity - females.....1 ½ yr.  
                  males.....2 to 2 ½ yrs.  
age at first reproduction...25 mos.  
weight of offspring.....5 kg.  
longevity..... .15 yrs.

#### Kob

estrous cycle lasts.....10-13 days  
females estrus lasts.....24 hrs.  
gestation..... ..261 to 271 days  
interbirth interval..... ..282 to 312 days  
fecundity: female.....13 mos.  
                  male.....14 mos.  
age at first reproduction - females.....1 ½ yrs.  
                                  males.....3 to 4 yrs.  
weight of offspring .....4-5 kg.  
longevity.....16 to 18 yrs.

**Behavioral signs of estrus:**

Females in estrus will often hold their tails out. Males will follow these females closely, sniffing and licking below her tail, stimulating the females to urinate. Males will "test" the urine and perform flehmen. Males will then attempt to mount and copulate with the females.

**Behavioral signs of impending parturition:**

Increased restlessness (standing then lying down repeatedly) is often the most obvious indication of impending parturition. Sometimes the female can be seen stretching and straining. Other physiological signs to look for include enlarged udder and nipples, vaginal discharge, and the tail being held erect.

**Management of pregnant animals:**

Pregnant animals are monitored for signs of impending parturition and symptoms which might indicate dystocia (vaginal discharge, malpositioned calf, dams inability to deliver after lengthy labor) requiring veterinary intervention.

**Physical development and growth characteristics:**

**Waterbuck:** horns begin growth at 5-6 months.

**Kob :** At 7 months, is and is ½ of the adult weight.

Horn growth begins at 5 months and after 1 year horns are as long as the ears.

**Lechwe :** Birth weight is doubled at 4 to 5 weeks.

**8. Assisted Reproduction Techniques**

**artificial insemination-**

**embryo transfer-**

**electroejaculation and other semen collection methods-**

**cryopreservation of semen-**

The following species have had semen procured, post-mortem, and were cryo-preserved.  
(Zoological Society of San Diego)

Defassa Waterbuck *Kobus ellipsiprymnus adolfi-frederici*

Ellipsen or Common Waterbuck *Kobus ellipsiprymnus ellipsiprymnus*

Kafue Flats Lechwe *Kobus leche kafuensis*

Nile Lechwe *Kobus megaceros*

Uganda Kob *Kobus kob thomasi*

**estrous cycle manipulation-**

## 9. Contraception:

Contraception has been used with *Kobus ellipsiprymnus* and *Kobus megaceros* in zoological collections <sup>30</sup>

***Kobus ellipsiprymnus***: methods-Porcine Zona Pellucida Vaccine

***Kobus megaceros***: methods- Melengestrol Acetate Implant (MGA)

For the most recent information and recommendations on methods, failure rate, and problems, please refer to:

- AZA Contraception Advisory Group Contraception Report, II. Ungulates
- CAG Forum which is located at: [www.worldzoo.org/CAG](http://www.worldzoo.org/CAG)
- CAG database manager/CAG Forum manager at **ph.# (314) 781-0900.**

## 10. Hand-rearing:

Bovine colostrum ,procured from certified *Mycobacterium paratuberculosis* (Johnes) -free commercial dairies, is the best choice, but when that is unavailable other colostrum substitutes have been used with good results. <sup>31</sup>

### ZOOLOGICAL SOCIETY OF SAN DIEGO NEONATAL FACILITIES HAND REARING STANDARD PROTOCOLS

#### Formula Information:

SDWAP (Infant Isolation Unit and Animal Care Center):

1st 24 hours:	100% Bovine Colostrum (Igg's>90 mg/ml)
2nd 24 hours:	50% Bovine Colostrum (Igg's>90 mg/ml) 50% Formula
To 1 month:	10% Bovine Colostrum (Igg's>60-85 mg/ml) 90% Formula
To weaning:	100% Formula

SDZ (Children's Zoo):

1st 24 hours:	100% Nutristart (Bovine colostrum substitute)
To 1 month:	10% Nutristart/ 90% Formula
To weaning:	100% Formula

#### Supplements:

All facilities:	Visorbin:	SID through weaning (0.15 cc/lb)
SDWAP:	Bo-se:	Single dose upon arrival (0.05 cc/lb)
	Microbial powder:	Every bottle for first 7 days, then SID through weaning (Probios TM) 1/4 tsp/5lbs
SDZ:	Plexol:	SID through weaning

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<sup>30</sup>AZA Contraception Advisory Group Database

<sup>31</sup>Immustart (manufactured by Immutek Animal Health, Inc. Aurora, Colorado) and Bovine Ig G, Colostrum-Guard (distributed by Jorgensen Laboratories, Inc., Loveland, Colorado)

**Solid Food Introduction:**

SDWAP: Within first week:

- Bermuda hay, flake alfalfa, acacia browse
- 1/4" low fiber alfalfa pellet, manna-milk pellet, omalene horse ration, rolled corn + barley mix.
- Access to mineral salt block

**Gradual:**

Increase proportion of low fiber alfalfa pellet and decrease amount of other pellets.

From 14 days:

- Timothy hay, flake alfalfa, acacia, browse
- 1/4" low fiber alfalfa pellet, omalene horse ration
- Apple, carrot, yam

**Handrearing Protocol:**

**Ellipsen Waterbuck**

Birth weight:

Female 10.2 kg avg. n=7 range 9.3 - 11.1 kg.

Male 8.7 kg avg. n=5 range 8.3 - 9.1 kg

Current Formulas:

1) Whole Goats: Evap. Goats: 2:1

Alternate Formulas:

2) Evap. Goats:SPF 3:1

3) Evap. Cows:SPF 3:1

Feeding Apparatus: red or black lambs nipple

**Feeding Regimen:**

Age	Minimum number of Feedings	Suggested Feeding Times
1-2 days	5	6am, 9, 12, 3, 6pm
1-3 wks	5	6am, 9, 12, 3, 6pm
3-6 wks	4	6am, 9, 1, 5pm
6-10 wks	3	6am, 11, 4pm
2.5-3 mos	3 decreasing volume mid	6am, 11, 4pm
3-3.5 mos	2 decreasing volume both	6am, 4p
3.5 mos	weaned	

**Growth**

Age (wks.)	% change from birth wt.	<u>body wt-birth wt</u> birth wt X 100 hi-lo range	% body weight intake of formula
1.00	18% n=7	3% to 32%	9.4% n=7
2.00	29% n=8	11% to 48%	10.4% n=8
3.00	51% n=8	28% to 82%	10.7% n=8
4.00	74% n=6	45% to 136%	9.4% n=6
5.00	76% n=2	72% & 79%	9.8% n=2
6.00	97% n=2	96% & 98%	9.8% n=2
7.00	115% n=2	97% & 133%	11.8% n=2

**Defassa Waterbuck**

Birth weight:

Female 10.9 Kg avg. n=10 range 8.3 - 13.9 Kg

Male 12.4 Kg avg. n=2 range 11.6 - 13/2 Kg

Current Formulas:

1) Whole Goats : Evap. Goats 2:1

Alternate Formulas:

2) Evap. Goats:SPF 3:1

3) Evap. Goats:SPF 4:1

**Feeding Regimen**

(same as above for Ellipsen Waterbuck)

### Growth

Age (wks.)	% change from birth weight	$\frac{\text{body wt.} - \text{birth wt.}}{\text{birth wt.}} \times 100$	% body weight intake of formula
1	19% n=4	12% to 33%	9.3% n=6
2	36% n=4	27% to 54%	9.0% n=6
3	54% n=4	42% to 69%	8.5% n=5
4	75% n=4	63% to 97%	8.2% n=4
5	108% n=3	85% to 122%	8.3% n=3
6	147% n=2	141% to 152%	7.9% n=2
7	171% n=1		7.6% n=1

### **Nile Lechwe**

#### Birth Weight:

Female 6.0 Kg avg. n=5 range 5.4 - 6.6

Male 5.9 Kg. avg. n=5 range 5.6 - 6.6

#### Current Formulas:

1) Evap. Goats:Water 4:1

#### Feeding Apparatus:

Beige, red or black lamb nipple. Small crosscuts recommended as calves have a tendency toward aspiration and congestion problems.

### Feeding Regimen

Age	Minimum Number of Feedings	Suggested Feeding Times
1-2 days	5	6am, 9, 12, 3, 6pm
1-3 wks	5	6am, 9, 12, 3, 6pm
3-6 wks	4	6am, 9, 1, 5pm
6-10 wks	3	6am, 11, 4pm
10-12 wks	3 decreasing volume mid	6am, 11, 4pm
12-14 wks	2 decreasing volume both	6am, 4pm
3 mos	weaned	

**Growth**

Age (wks.)	% change from birth weight	<u>body wt.-birth wt.</u> birth wt. X 100	% body weight intake of formula
1	19.5% n=5	8% to 25%	12.2% n=5
2	46% n=5	37% to 65%	12.3% n=5
3	70% n=5	63% to 87%	11.9% n=5
4	89% n=5	68% to 103%	10.6% n=5
5	110% n=5	76% to 132%	10.2% n=5
6	139% n=6	103% to 165%	12.2% n=5
7	173% n=4	144% to 186%	9.3% n=4
8	204% n=2	198% & 210%	7.1% n=4
9	231% n=1		
10	237% n=2	217% & 257%	

Note: Usually noted eating hay and pellet by 1 ½ weeks, ruminating by 2 mos.

**Red Lechwe**

Birth weight:

Female 5.3 Kg avg. n=5 range 4.0 - 6.0

Male 6.1 Kg avg. n=5 range 5.8 - 6.4

Current Formulas:

1) Evap. Goats: SPF-Lac: Water 2:1:1

\*SPF portion included as an additional dietary zinc source.<sup>32</sup>

Feeding Apparatus:

Beige, red, or black lamb nipple. Small crosscuts recommended as calves have a tendency toward aspiration, coughing and congestion problems.

**Feeding Regimen:**

same as above for Nile Lechwe

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<sup>32</sup>SPF@ Sterile Milk Replacer (distributed by Pet-Ag Inc., P.O. Box 396, Illinois, 60140)

## Uganda Kob

### Birth Weight:

Female 4.8 Kg avg. n=12 range 3.2 - 6.0

Male 5.4 Kg avg. n=16 range 3.8 - 6.1

### Current Formulas:

1) Evap.Goats: Whole Goats 1:1

2) Evap Goats: Water 4:1

### Feeding Apparatus:

-Beige, red, or black lamb nipple

-Animals are extremely difficult to get nursing from a bottle once they've nursed off their dam.

### Feeding Regimen:

Age	Minimum Number of Feedings	Suggested Feeding Times
1-2 days	5	6am, 9, 12, 3, 6pm
1-3 wks	5	6am, 9, 12, 3, 6pm
3-6 wks	4	6am, 9, 1, 5pm
6-8 wks	3	6am, 11, 4pm
8-10 wks	3 decreasing volume mid	6am, 11, 4pm
10-12 wks	2 decreasing volume both	6am, 4pm
3 mos	weaned	

### Growth

Age (wks.)	% change from birth weight	$\frac{\text{body wt.} - \text{birth wt.}}{\text{birth wt.}} \times 100$	% body weight intake of formula
1	17.7% n=19	6% to 31%	12% n=19
2	33% n=17	10% to 50%	11.0% n=18
3	56% n=16	25% to 89%	10.3% n=16
4	80% n=17	42% to 130%	10.7% n=16
6	143% n=12	105% to 187%	11.7% n=11
8	207% n=6	186% to 230%	8% n=6

Note: Usually noted eating browse around 6 weeks, pellets by 2 months.

**Growth rates-** of handreared animals (weights of typical, healthy, neonates) <sup>33</sup>

**Defassa Waterbuck -**

Birth weight - 10.2 kg  
Day 9----- 13.7 kg  
Day 26----- 18. kg  
Day 38----- 21.13 kg  
Day 53----- 25.45 kg  
Day 60----- 29.32 kg  
3½ mos.---- weaned

**Ellipsen Waterbuck -**

Birth weight - 10 kg	Birth weight---10.2 kg
Day 12----- 14.9 kg	Day 9----- 12.5 kg
Day 20----- 18.86 kg	Day 20----- 14.3 kg
3 ½ mos.----- weaned	Day 27----- 17.2 kg
	3 ½ mos.-----weaned

**Red or Zambesi Lechwe -**

Birth weight - 6.5 kg  
Day 9----- 8.0 kg  
Day 20-----10.1 kg  
Day 31-----11.7 kg  
Day 64-----19.3 kg  
Day 71-----21.3 kg  
3½mos.-----weaned

**Kafue Lechwe -**

Birth weight --- 6.8 kg  
Day 8-----7.7 kg  
Day 26-----11.1 kg  
Day 54-----18.4 kg  
Day 96-----27.5 kg  
3 ½ mos.-----weaned

**Nile Lechwe -**

Birth weight ---5.12 kg  
Day 1-----6.3 kg  
Day 34-----11.0 kg  
Day 54-----15 kg  
3½ mos.-----weaned

**Uganda Kob -**

Birth weight ---4.01 kg  
Day 7-----5.0 kg  
Day 30-----9.0 kg

Birth weight---5.2 kg  
Day 7-----6.2 kg  
Day 30-----8.5 kg

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<sup>33</sup>San Diego Wild Animal Park

Day 61-----14.7 kg	Day 46-----13.5 kg
Day 89-----19.0 kg	4 mos.-----weaned
4 mos.-----weaned	

For more growth rates for members of the subfamily Reduncinae see footnote. <sup>34</sup>

### **Cross fostering-**

#### **Reintroduction of hand-reared animals:**

As soon as possible the handraised animal should be taken back to the original enclosure from the nursery. A temporary fence consisting of portable panels may be erected inside the original enclosure and the animal placed inside. At least one panel should have a door/gate for keeper access. Nursery keepers may then continue to bottle feed at the original enclosure. Reintroduction to the other animals in the exhibit is determined by the animal management team, and may occur before weaning.

In large multi-species exhibits, occasionally hand-reared animals will not rejoin their conspecifics. Sometimes they will stay on the perimeter of the herd, join up with another species, or remain solitary.

#### **Methods to reduce chances of imprinting on humans-**

Avoid prolonged separation of newborn from dam. It is sometimes advisable to delay the neonatal examination at least 24 hours (especially if it is a first time dam or a dam with a questionable "track record"). The examination should be performed as quickly as possible.

#### **Reproductive success of hand-reared animals-**

In large multispecies exhibit reproductive success has proven to be highly variable from individual to individual, and has ranged from 100% mortality to 100% survival.

## **11. Role of keeper in animal management**

#### **Level and type of contact:**

Generally a "hands off" management is preferred to maintain natural behavior.

#### **Role in management decisions:**

Keepers are responsible for making accurate daily observations and evaluations of animals in their area, reporting any suspected health problems or abnormalities, and behavioral or social problems which may be occurring within the exhibit.

#### **Animal training for husbandry and veterinary routines:**

No information specific to Reduncinae was found. Good general information on this subject is available. <sup>35</sup>

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<sup>34</sup>Zoo Infant Development Notebook, AAZK, 1994 , Pages 243-246.

<sup>35</sup> Mellen, Jill D.; and Sue Ellis, 1996

## 12. *In Situ* Programs

See African Antelope Database 1998, (Rod East) IUCN/SSC Antelope, Specialist Group Report, December 1998.

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