

Kenya Wildlife Service



Immobilization and Translocation Protocol for the African Elephant (*Loxodonta africana*) in Kenya

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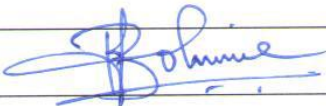
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1. INTRODUCTION

This protocol has been developed to guide the immobilisation and translocation of the African elephant (*Loxodonta africana*) in Kenya. It has been developed due to increasing needs for veterinary interventions in the elephant for the purposes of diagnosis and treatment of diseases and injuries, fitting of monitoring devices (collars), translocation for various management purposes and rescue of orphaned animals.

This protocol is intended to ensure that interventions in elephants are carried out using ‘best practices’ by giving recommendations on the practical aspects. The protocol is based on IUCN guidelines for reintroductions and other conservation translocations as well as internationally recognised practices to ensure acceptable standards of animal welfare. The protocol does not represent an inflexible code of conduct and can be modified on prevailing circumstances to ensure the objectives of any intervention are met. The primary target audience are wildlife veterinarians and veterinary para-professionals.

The protocol is to be implemented in the context of prevailing Kenyan laws and policies pertaining to biodiversity conservation and sustainable management of natural resources and veterinary practice, including the Wildlife Conservation and Management Act of 2013, Veterinary Surgeons and Veterinary Para-professional Act 2011, Prevention to Cruelty Act Cap 360, the Veterinary Surgeons and Veterinary Para-Professionals Regulations of 2013 and the Veterinary Surgeons and Veterinary Paraprofessionals (Code of Ethics) Regulations of 2015. If the immobilisation is for purposes of translocation, this protocol shall be read together with the Guidelines for Translocation of Wildlife Species in Kenya (2018).

2. HISTORY OF ELEPHANT TRANSLOCATIONS IN KENYA

Elephant capture and translocation in Kenya began in 1996 with the translocation of 28 elephants from Mwea National Reserve to Tsavo East National Park. Since then, the technique has evolved significantly, with up to 150 elephants being translocated from Shimba Hills National Reserve to Tsavo East national Park in a single operation in 2005, and an additional 78 in 2006 to resolve human-wildlife conflicts in Shimba Hills. In 2006, another 132 elephants were translocated from Ngulia rhino sanctuary in a single operation. Over 840 elephants comprising of family units and mature bulls have been translocated between 1996 and 2018 for various management purposes. Overall mortality has been 34/840 (4%).

3. BIOLOGY OF THE AFRICAN ELEPHANT

The following characteristics are important to note when immobilizing the African elephant:

- The preferred habitat of the species is dense vegetation which makes immobilization a challenge
- The elephant can be aggressive, and very dangerous when disturbed.
- Elephants are mostly encountered in family groups which can consist of 8 up to 100 individuals. Old bulls may be found alone or with accompanying young males.
- The elephant has poor eyesight but very keen sense of hearing and smell
- Remains in a closely knit group when threatened and may charge any visible source of danger.
- The species has strong maternal bond. A cow will not leave her immobilised calf and may have to be immobilised too.
- It breathes only through its trunk. Physical obstruction of the trunk can cause suffocation
- It has a skin that is 20-30mm in thickness and this is important in selection of needles for immobilisation dart.
- Some males can weigh 6,000-7,000 kgs and females 4,000-6,000kgs, which can be a great challenge during recovery, loading and transportation
- It has a large abdomen and in sternal recumbency the pressure of abdominal organs on the diaphragm and internal blood vessels can cause death.
- They respond very well to immobilization drugs and tranquillizers. Large bulls and females can tolerate high dosages of the opioid immobilization drug
- Males in musth should be approached with caution. This is a period of high testosterone levels in mature bulls and such animals are often aggressive to human approach.

The following are precautions to observe when darting elephants:

- Areas to avoid darting elephants:
 - Adverse terrains such as near cliffs, and near water bodies
 - Very dense vegetation that may make recovery difficult or impossible, or may require follow-up on foot.
 - Slippery terrains as the legs might splay outward and severe injury is likely when this occurs.
- When working on a calf or other animal from a herd, have somebody on the lookout for returning members of the herd.
- Immobilized elephants on their sternums should not be allowed to remain in that position for more than a few minutes.
- Avoid approaching a darted elephant before the drug has taken full effect.
- Withdraw to a safe distance once the antidote has been administered.

4. PRE-IMMOBILIZATION PREPARATIONS

Immobilization of such a large mammal is a specialist function and therefore elephant capture should only be undertaken by experienced personnel and suitable equipment. The approach depends on the purpose of the immobilisation.

4.1 Immobilization for Translocation

- Adequate planning is critical including the long-term commitment to protect, monitor and manage the translocated animals.
- The Guidelines for Translocation of Wildlife Species in Kenya (2018) outline prerequisite logistical coordination and planning activities, as well as the critical personnel required and their capacities and experiences.
- Pre-translocation activities shall include a series of planning meetings where all information, resources and logistics required shall be evaluated, allocated and confirmed. Some of the aspects that shall be evaluated will not be limited to Relevant scientific and technical inputs; careful consideration of the justification and objectives of the proposed translocation; feasibility assessments to determine whether the translocation should proceed as planned; social assessment (engagement with communities and stakeholders at source and recipient areas) and ecological suitability assessments; source and recipient populations including family structures; resources available; security; Environmental and Social Impact Assessments; land ownership and size; connectivity among other key considerations. Every elephant translocation shall be in conformity with the requirements of applicable environmental management and compliance regulations.
- Detailed pre-translocation assessments that require to be undertaken before any translocation of wildlife in Kenya are outlined in the Guidelines for Translocation of Wildlife Species in Kenya (2018).
- If translocating family units, care shall be taken to translocate complete units to avoid negative effects on social organisation and behaviour.
- Where a family unit is too large to be captured all at once because of limitations of personnel and equipment, such a family can be captured twice while ensuring that the complete family is captured to avoid social and behavioural disruptions that can arise if an incomplete family is translocated.
- The veterinarian responsible shall at all times ensure optimal health and welfare of the elephant being immobilized. He/she shall oversee the physical processes of the translocation, including loading, transportation and release.
- A detailed post-translocation monitoring plan as outlined in the IUCN/SSC AfESG guidelines for translocation of African elephant for conservation purposes (2003) shall be implemented.

4.1.1 Current Techniques and Equipment for Elephant Translocation

The translocation procedure is divided into six stages: Capture (Darting), Recovery, Reversal of Anaesthesia, Loading, Transport and Release.

4.1.1.1 Capture (Darting)

4.1.1.1.1 Darting Procedures

- Darting of elephants shall be from a helicopter, or from the ground (on vehicle or on foot). A fixed-wing spotter plane may be required when large numbers are to be translocated to aid in candidate search, selection and monitoring darted animals.
- Radio communication between different teams involved in any capture (air, veterinary, capture, security and scientists) shall be maintained to ensure coordination and success of the operation.
- The preferred dart placement areas shall be parts of the body with good muscle cover preferably on the rump, hind legs, back or shoulders and avoid areas near the ears because of potential of causing injuries.
- When translocating family units, the matriarch shall be darted first, followed by the next oldest females and finally the small calves.

4.1.1.1.2 Helicopter Darting

- The recommended practice is use of a helicopter for darting elephants. This allows ability to control the capture situation and to reduce the risk of injury to personnel involved with the capture.
- The helicopter shall have an experienced helicopter pilot and veterinarian to safely conduct the capture process.
- The helicopter shall also have a spotter to identify the target elephant family or individual bulls. Once identified, the elephant or elephant family shall be steered towards an open ground before darting
- The helicopter is used to dart the elephants as well as to steer them to a suitable area where they can be recovered and loaded.
- After darting, the helicopter shall withdraw and monitor the elephant movement from a distance.
- The helicopter shall control the direction of the elephant after darting to prevent it going into difficult terrain and thick vegetation
- Once the animal goes down, the veterinarian shall be dropped by the helicopter and the pilot shall guide the ground teams to the location of the animal.

4.1.1.1.3 *Vehicle and Foot Darting*

- Exceptions of helicopter darting of elephants include other interventions (e.g. treatment of injuries, fitting collars, etc.) when individual elephants are darted one at a time and the intervention doesn't involve the animal being moved and the terrain and vegetation cover allows tracking the animal from the ground.
- Approach shall be by a limited number of personnel if foot darting, preferably a veterinarian and a security ranger with a high calibre rifle to provide security. The animal shall be approached against the wind to ensure it doesn't smell the darting team. Foot darting should only be done by experienced persons and only with lone elephants.
- For vehicle darting, one vehicle shall approach the elephant. Approach should not be on a straight line, but rather slowly in decreasing circles. This is less threatening and allows time for the animals to become accustomed to the vehicle. The darting team should be patient for the animals are likely to be disturbed by the vehicle and may not allow close approach.
- Radio communication shall be maintained between the darting and support teams.
- Female elephant with young ones shall be approached with caution as they are protective of the young ones.
- A light aircraft (or drone) may be required for monitoring the animal after darting depending on the terrain and vegetation cover to avoid losing the animal after darting.
- Observers may also be placed at strategic high ground points to observe the movement of the elephants where a light aircraft (or drone) is not available.

4.1.1.1.4 *Darting Systems*

- The correct darting system is essential to be able to deliver the drugs effectively to the elephants that are going to be captured and sturdy darts with long needles (60-80 mm long) are required.
- Palmer Cap-Chur® and Dan-Inject® darting systems are used, with long needles that are either plain or collared or barbed.
- The type of dart and projector (rifle) used will be decided according to the preference of the veterinarian responsible for the operation.
- Darting shall always be undertaken by an experienced wildlife veterinarian.
- All dart wounds should be treated with an intra-mammary antibiotic application to prevent abscess formation.

4.1.1.1.5 Immobilization Drugs

- The drugs routinely used for capture of the African elephant are an opioid combined with a tranquilizer, notably Azaperone (a butyrophenone derivative).
- Azaperone is an important support drug as opioid drugs have effects on blood pressure and the veno-dilatory effects of Azaperone help mitigate the hypertensive side effect of the opioid. However, Azaperone should be used judiciously and only a small proportion of the total dose recommended for full tranquilisation should be included into the dart. If too much Azaperone is used, the animal may become disoriented and not willing to get up to its feet after the opioid is reversed. Elephants respond well to opioids on their own, and in such cases the drug reversal is relatively rapid.
- The opioid used routinely is etorphine hydrochloride.
- A30-80 (Thiofentanil) may also be used. Thiofentanil has a slightly quicker knockdown effect than etorphine, which is advantageous when groups of elephants are darted or where the terrain requires quick reaction to the drug. Thiofentanil however may result in shallower breathing and the animal should be monitored closely.
- Juvenile and very young elephants shall be closely monitored for respiratory depression which can be corrected with Butorphanol or Doxapram.
- The type of immobilization drugs to use and dosages shall depend on the body size, age and sex of the animal. Whereas some general guidelines on dosages are provided in Table 1, the final decision on which drugs to use, their dosages and combinations shall be made by the veterinarian in-charge of the operation depending on prevailing circumstances including the health status of the animal, the terrain (use of higher dosages so as to achieve fast immobilization) and excitation status of the animal. The veterinarian in-charge shall also be responsible for preparation of darts.
- Details of the animal including the age, sex, and body condition shall be provided to the veterinarian in advance to enable determination of appropriate drug dosages.

Table 1: Recommended dosages for immobilization of the African elephant

No.	Age	Etorphine	Thiofentanil	Etorphine/Thiofentanil Combination	Azaperone	Hyalas e
1.	Adult bull	14-18 mg	14-18 mg	Half of each drug dosage	60 mg	3,000 IU
2.	Adult females	12-16 mg	12-16 mg	Half of each drug dosage	60 mg	3,000 IU
3.	Sub-adults males/females	7-10 mg	7-10 mg	Half of each drug dosage	40 mg	1,000 IU

No.	Age	Etorphine	Thiofentanil	Etorphine/Thiofentanil Combination	Azaperone	Hyalasone
3	Juveniles	4-6 mg	4-6 mg	Half of each drug dosage	30 mg	
4	Calves	2mg	2mg		20 mg	

Note: Elephants in contrast to other ungulates do not experience an excitement phase following administration of etorphine, and azaperone may be omitted in the dart mixture but administered before administration of the opioid antagonist.

- Animals held in confinement, hand-raised animals, sick animals and old animals require lower drug dosages compared to free ranging healthy animal in optimum body condition.

4.1.1.1.6 Monitoring of Anaesthesia

- Once an animal goes down, the following shall be done immediately:
 - Ensure the animal is on lateral recumbency. Animals on sternal recumbency shall be rolled over immediately onto lateral recumbency. Animals should not be left on their sternum for longer than 15 minutes as lung volumes are markedly reduced due to the pressure of the abdominal contents on the diaphragm and the animal's weight on the sternum. A rigid chest wall with no pleural space further compromises breathing in a sternal position.
 - Flap the top ear pinna to cover the eye, and apply an eye ointment to prevent corneal desiccation
 - Ensure the trunk is straight and patent. Patency can be maintained with a stick at the tip. Elephants breathe with difficulty through the mouth and will become hypoxic and die if the airflow in the trunk is reduced.
 - Animals that go down on a slope with the head lower than its body should be monitored carefully. Repositioning should be made to reduce the pressure of the abdominal contents on the diaphragm which reduces the lung volumes.
 - Animals that go down in situations that affect the efficiency of breathing or reduces circulation to parts of the body should be recovered quickly, or revived as soon as possible.
- The heart rate, respiration rate and pulse rate shall be monitored regularly (at least every 5 minutes) using appropriate accessories. The guiding ranges are as follows:
 - ⊖ Respiration: - 3-4 breaths per minute for adults and 8-16 breaths per minute in young elephants depending on size, monitored with the hand held lightly over the end of the trunk. Respiration is usually very deep and accompanied by snoring noises during exhalation
 - Body temperature: - 36.5°C to 38.5°C. Overheated animals shall be cooled with copious amounts of water all over the body, especially on the ears. Animals

with temperature above 39°C shall be revived to avoid complications associated with hyperthermia. Core body temperature is measured by inserting a clinical thermometer deep into the rectum with a gloved hand and arm. A string should be tied to the thermometer and clipped to the skin or some hair to avoid loss in the voluminous rectum and for periodic retrieval for reading.

- Pulse rate: 28 - 52 per minute, monitored by palpation of the middle ear artery.
- Maintenance of anaesthesia in elephants can be safely achieved by topping up as the anaesthesia begins to wear out after 50 minutes, usually marked by increased trunk and ear movements, then leg movements. When the ear is retraced, the elephant is ready to wake up. IM top up is preferred to IV. Top up doses are calculated at one third the immobilising dose of the opioid.

4.1.1.1.7 Anaesthetic Emergencies and Support drugs

- Support drugs used are antibiotics, anti-inflammatory drugs, and Doxapram.
- Most elephants handle opioid narcosis very well but young and old animals have to be especially carefully monitored to ensure that respiratory distress is not experienced due to the opioid
- The following emergencies can be handled as indicated:
 - In case of respiratory depression manifested by shallow and slow breathing or apnea (cessation or arrest of respiration), analeptics can be used e.g. Doxapram IV adults 20 ml and sub-adults 10 ml.
 - Pink form syndrome is the most common problem encountered if adult elephants remain recumbent for a prolonged period of time. This is a life threatening condition and must be well addressed every time it's noted. It is caused by opioid narcotics that elevate blood pressure and manifests as pink froth from the trunk. It is caused by pulmonary oedema and capillary bleeding. Azaperone at 10-15 mg IV can be used to counteract the hypertensive effects of opioids. Membrane stabilisers such as Flunixin Meglumine and corticosteroids or a diuretic (e.g. Lasix^R) can also be used. Animals exhibiting this condition should be revived as soon as possible.

4.1.1.2 Recovery and Loading

- For translocation, the biggest challenge is recovering the animals into the transport truck for transportation to the release site safely and humanely, without endangering it, the people involved, or traffic which the large transport trucks will be travelling with.
- There are two ways of recovering elephants. These are:

- a) Use of a powerful winch on a flatbed trailer pulled by a tractor. The elephant is rolled over onto a long stretcher made of a conveyor belt. Lying on its side, the elephant is then winched up onto the trailer
 - b) Use of strong hydraulic cranes and special slings to lift the elephant by its legs (while supporting the head) onto a similar conveyor stretcher placed on the back of a flatbed truck. Although this method does look awkward, it is a safe and fast loading method. After loading, the elephant is transported sedated, lying on its side on the conveyor stretcher, to the loading area.
- At the loading area, adult elephants are transferred into a recovery crate while small elephants are loaded into the transport crate for reversal of anaesthesia.
 - All elephants shall be quickly recovered and placed in the transport crate as a family unit so that they are relocated together. This is especially important for mothers and their suckling calves.
 - The recovery crate is a very important piece of equipment in the loading process; its dimensions are such that it is large enough to accommodate a full-sized, mature elephant bull (up to 7 500 kg and 3.5 m shoulder-height).
 - The transport truck and crate are set up in line with and adjacent to the recovery crate and hydraulic crane truck. The elephant is winched or pulled into the recovery crate with its backside going in first.

4.1.1.3 Reversal of Anaesthesia

- After transfer into the recovery crate (for big elephants) or the transport crate (for small elephants), the immobilising process is reversed using at 3-4:1 diprenorphine hydrochloride or 10-15:1 Naltrexone
- Generally, the elephant wakes up within two minutes after the intravenous injection of the antidotes; it will stand up, and immediately walk backwards into the transport crate.
- Re-narcotisation may occur if multiple supplementary doses are given because it may be difficult to estimate the amount of antagonist to use. It is recommended to administer one-half of the antagonist IV and the remainder IM.
- After administration of the antagonist, the animal sometimes stays down for a while although the reversal has been effective and may wake up as someone approaches it. Thus, the veterinary team should be patient and wait for the effects of the drug reversal to become apparent before any intervention is done.

4.1.1.4 Tranquillization

- The elephants are tranquillised before and during transport. This is achieved by using Azaperone and haloperidol. Both these drugs are butyrophenone derivatives. Table 2 summarises recommended dosage rates.
- Tranquilliser is given just before administration of the opioid reversal drug. For large bulls and cows, the tranquilliser can be administered once they are on their feet to avoid situations where the animal becomes reluctant to wake up on its feet after reversal of the opioid.

Table 2: Dosages for tranquillizers used in the African elephant

Drug	Dosage	Length of Activity
Azaperone	<ul style="list-style-type: none">• 100-120mg adult bull• 80-120 mg adult cow• 50mg Sub-adult• 25mg Juvenile	3-4 hours. Can be repeated every 4 hours if necessary
Haloperidol	200mg	Use in adults only and at the beginning of the journey. Effective up to 10 hours

Note: High doses of tranquillisers should be avoided as the animal might go down during transportation. Animals should not be heavily tranquilised when they arrive at the destination as they may be reluctant to leave the crate.

4.1.1.5 Transport and Release

- The crates and trailers that are used to move elephants should be strong enough and must meet certain height and load requirements. A family group can weigh in excess of 30 tonnes, and a moving load of this nature has to be well balanced.
- A low-bed trailer with an overall length of 12.5m is used to accommodate the abnormal load.
- The trailer is designed to conform to traffic requirements in the Kenyan roads. The trailer length should not exceed 12.5 m, while the entire articulated vehicle should not exceed 17.0m and overall width of 2.6m. The combination of the recovery crate and the towing vehicle shall also be designed to conform to the overall length of any combination of vehicles of 22.0m. The height shall conform with the height restriction of 4.6 m from the road service applicable to Kenyan roads.
- The trailer is fitted with two crates, each 6 m long x 2.6 m wide x 3.4 m high, that house the elephants for the duration of the trip. An inside height of at least 3.4 m allows accommodation of large bulls.

- Family groups range in size from 5 to 6 elephants at most in each crate, and generally comprise adult cows and their offspring. The entire family/cohesive group is then moved together in one transport unit.
- The crates are designed to have strong sliding doors with duplication locks and safety locks in place, making it impossible for even the strongest elephant to open them. The floor of the crate is constructed of wooden planks and has gaps to provide ventilation and allow urine, faeces and water applied onto the animals to drain easily from the crate.
- During the loading process, elephants are marked for identification because it is very important to have a cow and her own calves together in the same crate, otherwise it will lead to injuries or even death of the elephant calves, as cows will only nurse and tend to their offspring and often react aggressively towards other calves.
- Experienced personnel including vets, drivers and mechanics, especially for long-distance trips, must accompany elephants to undertake required interventions en route. The transportation team should amongst other equipment have a darting rifle and accessories, pole syringe, tranquillisers, powerful torch, a battery-operated cattle prodder and full water containers for cooling elephants in hot weather, .
- The elephants should be checked regularly for re-narcotisation, lying down, agitated behaviour, or damage to crates, and appropriate action taken. Re-narcotised animals are injected with additional antidote, those in awkward position or on their sternums are encouraged to stand and agitated animals are given additional tranquillisers. .
- When mature bulls are moved, each is transported in its own transport unit.
- While mature bulls are transported individually due to their size and weight, younger bulls may be transported together. The crates used to move bulls are the same dimensions as those used to translocate family groups.
- Unnecessary stops en route shall be avoided. Overnight transportation can be planned where feasible to off load at first light even if it means slowing down to meet the schedule instead of stopping and waiting for the sun to rise.
- Elephants shall be released as family groups in their new environment for better chances of survival.
- Hard (field to field) release shall be the preferred method of translocating elephants in Kenya.
- Elephants shall be released in areas where they can easily access water.

4.1.2 Other Considerations during Elephant Translocation

- The potential limiting factor in elephant capture and translocation is the size of the equipment because it can restrict access to locations and bad roads. This can

however be circumvented by experienced helicopter pilots who are able to herd elephants over long distances (up to 20 km) to more accessible locations.

- The department responsible for species management shall develop procedures and/or guidelines for correctly identifying an active family group earmarked for translocation. By definition, a family group is a cohesive group of females and their calves, led by a matriarch or another older female, and generally comprising no fewer than 6-8 individuals, which associate regularly and closely with one another (Dublin & Niskanen, 2003).
- Translocating incomplete family groups may result in disintegrated social organisation and behaviour such as break-outs, abnormal aggressive behaviour, interactions with people or destruction of facilities. It is of vital importance that adult cows are translocated together with all their offspring.
- Opportunistic pathogens and parasites can occur in elephants during periods of starvation or stressful conditions that can arise during capture and translocations. Thus, 'best practices' shall be adopted to reduce stress
- Mortalities during translocations can also occur from trauma, appropriate measures shall therefore be taken during translocations to minimize trauma.
- In some cases, capture related stress can compromise the immune status of the animal; an antibiotic (preferably long acting preparations) shall be administered intramuscularly, the dosage being dependent on the weight of the animals.
- The dart shall be removed and the wound treated with a topical antibiotic ointment to prevent secondary bacterial infections of the wound which can spread underneath the skin leading to serious complications
- The following shall also be done for each immobilised elephant:
 - Biological samples shall be collected and preserved appropriately for future studies
 - Relevant veterinary records including darting procedure, monitoring of anaesthesia and top up drugs given amongst other information shall be taken and recorded
 - Relevant data of the elephant including body measurements, age and sex shall be taken and recorded
- Other veterinary considerations shall be followed as outlined in the Guidelines for Translocation of Wildlife Species in Kenya (2018)

4.1.3 Post-release Monitoring

- In general, the success of a translocation is measured by the degree of adaptation of the elephants to their new location. Thus, a proper post-release monitoring strategy shall be designed and implemented.

- Selected individuals shall be fitted with collars to facilitate post-release monitoring. Factors to be assessed shall include body condition, any aberrant behaviour, cohesiveness and geographical position of herds as well as movement patterns.
- Other monitoring aids can include:
 - Photo identities
 - White paint applied on the back of the elephant for immediate tracking after release.
 - Bright coloured tag fitted on the tail

4.2 Immobilization for Other Interventions

- Immobilizations for other interventions may include treatment of disease or injury, and fitting of GSM devices.
- The same principles are followed as when immobilizing elephants for translocation including darting, immobilizing drugs, monitoring anaesthesia, treatment of dart wounds and reversal.
- Elephant families have strong family bonds and when one animal is down the rest of the herd will stay making approach of patient difficult.

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